2021 General Rate Case

Amended Testimony on Enterprise Technology – OU Capitalized Software

Before the
Public Utilities Commission of the State of California

Rosemead, California
February 20, 2020
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I. INTRODUCTION

A. Content and Organization of Volume

This Volume presents Southern California Edison’s 2019-2023 capital expenditures forecast of $506 million to implement capitalized software to support business capabilities across SCE Business Planning Groups (BPGs) and enterprise-level systems. The capital software projects have been centralized within this testimony consistent with SCE’s presentation of IT capital software projects in prior rate cases and for parties’ convenience. Chapter I summarizes our financial request, provides an overview of how we estimate planned costs for software projects, and provides a comparison of authorized and recorded spending for 2017 and 2018. Next, Chapters II through VIII describe in detail the specific software projects we plan to execute to benefit our customers, employees, and other stakeholders through improving our capabilities and our infrastructure during 2019 and 2020. This testimony is organized by BPG, Business Planning Element (BPE), and Work Activity (Project Name) for further convenience and clarity. Finally, Chapter IX describes SCE’s planned 2021-2023 software spending to advance our capabilities within specific BPGs, including SCE’s currently estimated strategic allocation of that planned spending.

B. Summary of SCE’s Capitalized Software Request

SCE’s capital expenditures forecast for OU capitalized software for 2019-2023 is $506 million. This forecast includes $96 million in 2019, $92 million in 2020, and $98 million in 2021, which represents a temporary reduction relative to historical spend for our OU capitalized software portfolio. This temporary reduction is due to SCE’s implementation of the Customer Service Re-Platform (CSRP), which necessitates that SCE decrease the delivery of OU capital software projects until that implementation is complete in early 2021. After the CSRP implementation is complete, SCE forecasts $110 million annually for OU capitalized software projects in 2022-2023 due to the need to return

---

¹ Chapters II-VIII contain itemized testimony for six projects that are exceptions in respect to having start dates beginning in the 2021-2023 timeframe. However, these projects are presented within their respective BPG chapters due to SCE having more certainty regarding these technology solutions. As explained in Chapter IX.B.2, the forecast for these projects are then deducted from the 2021-2023 portfolio amount that is available for allocation.

² This testimony amendment reflects the deferral and/or removal of capital expenditures from the OU capital software portfolio to realign with the revised CSRP go-live in early 2021. For administrative convenience, this testimony also incorporates SCE’s previous errata submitted on November 22, 2019.
delivery of OU capital software projects to a level more closely aligned with SCE historical recorded spending in the most recent three years (2016-2018). SCE’s forecast approach is discussed in more detail in Chapter IX.

SCE’s 2019-2023 capital expenditures forecast includes progressing the functionality or capabilities of SCE’s existing and new operating software across the broad range of BPGs. Capital projects encompassed in this forecast are typically new or driven by adding new functionality and can also include certain refreshes. Projects that fall within broader programs such as Grid Modernization, CSRP, or Cybersecurity (i.e., Interior Defense, Perimeter Defense, etc.) are excluded from this forecast and are addressed in their respective testimony volumes. Because the availability of new technologies is continuously advancing, SCE routinely assesses the capital software project portfolio to prioritize the delivery of foundational technology that aligns with SCE’s current business needs. These business needs, and therefore the capital software projects proposed in this volume, support SCE’s strategy to provide our customers and our communities with cleaner energy, a modern grid, and value across all our stakeholder groups.


C. Risk factors, Safety, Reliability and Connection with RAMP

Enterprise Technology provides indirect but essential enabling tools for SCE to provide safe, reliable, and affordable service to our customers. We are increasingly relying on technology to help us detect and respond more efficiently to unsafe situations such as down wires, power outages, and wildfires. We are further investing in technology to strengthen the security of our grid, physical facilities, and customer data. Conversely, failure to appropriately invest in foundational technology would introduce significant security, reliability, and financial risk to our customers, employees, and technology environment. This would be detrimental to SCE’s core operations. The support technology provides to SCE’s ability to reduce various risks is apparent in the representation and inclusion of IT

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2 Refreshes contained in this volume are incidental to projects providing new functionality, are not cyclical in nature, or are medium-to high complexity.
costs in SCE’s RAMP filing. SCE’s most prominent technology-related RAMP forecast is Cybersecurity, which is discussed in detail in Exhibit SCE-04, Vol. 3. In addition, this volume contains a few projects where IT plays a supporting role in RAMP mitigation activities. These projects are listed in Table I-1 below.

Table I-1
Other OU Software Projects Supporting RAMP

<table>
<thead>
<tr>
<th>GRC Activity</th>
<th>RAMP Control / Mitigation Name</th>
<th>RAMP ID</th>
<th>Risk Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Solutions</td>
<td>Non-Electric Facilities/Protection of Major Business Functions - Enhanced</td>
<td>C3b</td>
<td>Physical Security</td>
</tr>
<tr>
<td></td>
<td>Protection of Generation Capabilities</td>
<td>C2</td>
<td></td>
</tr>
</tbody>
</table>

D. Regulatory Background/Policies Driving SCE’s Request

Similar to the important role technology plays in SCE’s safety and reliability performance, our request provides our business lines with technology-based services needed to meet numerous regulatory compliance obligations and support federal and state policy goals. For example, SCE must adhere to the North American Electric Reliability Corporation (NERC) mandated Critical Infrastructure Protection (CIP) requirements and standards or risk being levied financial penalties. SCE is also a participant of the California Independent System Operator (CAISO), which oversees the operation of California’s bulk electric power system, transmission lines, and electricity generated and transmitted by its utility members. SCE’s IT systems must be able to operate and comply with processes required by CAISO market initiatives or risk not only financial penalties, but exposure to high market prices. In addition, at the conclusion of each General Rate Case, new rates are developed and implemented in SCE’s billing system. Depending on rate changes required, some may be accommodated manually but at a significant cost. These are just a few examples of regulatory drivers that influence SCE’s IT and OU capital software costs. Where applicable, regulatory mandates and policy drivers are further described within the respective capital project testimonies in this volume.
E. Compliance Requirements

In D.12-05-021, SCE was directed to “establish SCE has prudently examined alternatives for cost-effectiveness before seeking Commission approval.” 4 SCE has considered alternatives to projects and have detailed those evaluations in this testimony.

In D.15-11-051, the CPUC required that SCE “include its own forecast and the Commission’s adopted forecast from the previous GRC alongside historical costs, and brief explanations detailing any changes in the scope of a category.” 5 The individual capitalized software projects requested address this requirement within their respective testimonies. In addition, SCE provides a broader discussion and request correlating to the capital software portfolio expenditure variances between authorized and recorded 2017-2018 expenditures. This is detailed in the section below.

F. 2018 GRC Decision

1. Comparison of 2017 & 2018 Authorized to Recorded Capitalized Software Expenditures

In D.19-05-020, the Commission determined that contingency amounts included in capitalized software project forecasts were not recoverable, as a forecast item:

We, however, do not agree that budgeting for contingencies for software projects is necessarily appropriate in a general rate case….We do not allow SCE’s request for 2017 of $24.75 million and $23.86 million for 2018 software contingencies….If additional funds become necessary, SCE may seek to establish the necessity in the next GRC. 6

Because SCE did require “additional funds” to execute on its capitalized software projects in 2017 and 2018, SCE respectfully requests that the Commission find that the amounts SCE recorded over authorized for its capitalized software projects, $8.23 million for 2017 and $15.37 million for 2018, are reasonable.

Table I-2 compares SCE’s 2017-2018 OU capitalized software requested and authorized expenditures from the 2018 GRC to 2017-2018 recorded values.

4 D.12-11-051, Conclusion of Law 4.
5 D.15-11-021, pp. 224.
6 D.19-05-020, pp. 151-152. See also id., COL 89.
There are a variety of factors that influence the variances between SCE’s forecast and recorded costs that are unknown at the time of our GRC filing. Changing operational priorities and technological advances can lead to additional business requirements and scope, thus causing project overruns. Conversely, these same factors can lead to finding efficiencies and ways to “do it for less.” Technical complexities can also arise that create unforeseen needs such as extending the pre-planning or testing phases of a project. Depending on the stage of a project’s life cycle, these changes in schedule can result in SCE either exceeding its forecast level or deferring expenditures into subsequent years, recording an underrun for that respective year. In Sections 1.a and 1.b below, SCE provides an explanation of the business needs that resulted in the variances between the authorized and recorded amounts for 2017-2018. In addition, the itemized project testimonies in Chapters II-VIII identify changes in scope, timing, and forecasts that have transpired relative to SCE’s 2018 GRC.
a) **2017 Recorded Expenditures**

**Figure I-1**

*Comparison of 2017 Requested, Authorized, and Recorded OU Capitalized Software Expenditures*

*(Nominal $000)*

As shown in Figure I-1, SCE recorded $8.23 million over 2017 authorized capital expenditures of $104 million. Part of this overspend is attributable to the following projects that were authorized but recorded in excess of the authorized amounts: Enterprise Platform Core Refresh (EPCR), Consolidated Mobile Solution (CMS), Database Backup Optimization, Routable Generic Object Oriented Substation Events (RGOOSE), and SmartConnect Data Migration/Teradata SAP. The core reasons for the unanticipated costs for these and other projects in this category are:

- Technology advances from vendors which were unanticipated in 2016 when SCE submitted its 2018 request but were subsequently deemed prudent to incorporate into our solutions. For example, EPCR moved from a standard historical refresh to a transformational technology platform change, which helped improve performance and cost optimization as future benefits are realized for integrated systems.

- Unexpected requirements which arose during the software development lifecycle and were added to project scope because they created additional value for the business, addressed emerging
compliance needs, or allowed for a more cost-effective deployment. For example, the CMS project re-planned its approach to development into a more agile approach to achieve better outcomes. The re-planning broke the work into additional phases and moved some work and costs from 2016 into 2017.

- Delays to address unanticipated technical complications with integration, testing, or data integrity. For example, for SmartConnect Data Migration/ Teradata SAP there were product/vendor defects and performance design challenges discovered during testing and integration. These represented significant technology complexities that could not be fully anticipated in the planning cycle.

Table I-3 provides a listing of all the projects that exceeded their authorized amounts in 2017 by more than $1 million.²

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**Table I-3**

Projects Recorded Above 2017 Authorized
(Nominal $000)

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2017 Request</th>
<th>2017 Authorized</th>
<th>2017 Recorded</th>
<th>2017 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-CC-CC-000022</td>
<td>Enterprise Platform Core Refresh</td>
<td>$8,047</td>
<td>$6,706</td>
<td>$16,610</td>
<td>$9,905</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000041</td>
<td>CMS</td>
<td>$372</td>
<td>$372</td>
<td>$2,277</td>
<td>$1,905</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000073</td>
<td>Database Backup Optimization</td>
<td>$402</td>
<td>$335</td>
<td>$1,644</td>
<td>$1,309</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000243</td>
<td>BGOOSE Project</td>
<td>$5,934</td>
<td>$4,946</td>
<td>$8,151</td>
<td>$1,205</td>
</tr>
<tr>
<td>CIT-00-OP-CS-000074</td>
<td>SmartConnect Data Migration/ Teradata SAP</td>
<td>$4,224</td>
<td>$3,520</td>
<td>$4,527</td>
<td>$1,007</td>
</tr>
<tr>
<td>Various</td>
<td>Project with Variance &lt; $1M Above 2017 Authorized</td>
<td>$14,112</td>
<td>$11,927</td>
<td>$14,442</td>
<td>$2,515</td>
</tr>
</tbody>
</table>

**Total** | $33,091 | $27,806 | $45,652 | $17,846 |

(2) **Projects not Authorized but Undertaken in 2017**

In 2017, SCE recorded $44.33 million in OU capitalized software expenditures for projects that were not forecast in SCE’s 2018 GRC. The majority of these costs resulted from the cGIS Improvements, Enterprise Skype Voice, Pega Robotics, and Digital Managed Services projects. The following emergent and unanticipated business needs were the primary drivers of the projects within this category:

² See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2017 OU capital software expenditures with a variance greater than $1 million relative to 2017 authorized.
• Issues related to performance, stability, functional gaps, and user adoption which surfaced after the original projects closed and after the 2018 GRC filing had been submitted. In order to realize the intended value of the business case and mitigate negative impacts to SCE’s operations, additional expenditures were necessary to resolve these issues. For example, cGIS Improvements was launched in order to mitigate defects and gaps in meeting the business requirements for cGIS which would impact the business case if not resolved. Additional detail is provided in the cGIS Improvements testimony in Section VI.9.

• New technology became available that was not previously anticipated, which resolved a significant business need. For example, the Pega Robotics project was undertaken because robotic process automation technology had matured to automate more complex tasks which would improve employee and contractor onboarding and expedite the handling of damage claims.

• Positive business case benefits of migrating to a cloud-based platform (including decommissioning an on-premise solution, total cost of ownership cost reductions, and reliability and scalability improvements) resulted in a business decision to initiate some work, such as the SCE.com Digital Managed Services project.

Table I-4 provides a listing of all 2017 recorded project expenditures over $1 million that were not forecast, and therefore not authorized.8

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8 See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2017 OU capital software expenditures with a variance greater than $1 million relative to 2017 authorized.
As shown in Figure I-1, SCE recorded $20.61 million below the 2017 authorized capital expenditures of $42.73 million for several projects. This underspending was primarily driven by the following changes and decisions:

- Impacts to projects on integrated systems from major programs such as CSRP and EPCR related to testing and production environment conflicts, development environment freezes, and schedule shifts. For example, the Meter Data Management System (MDMS) project had inter-dependencies with CSRP and data being moved from Teradata to HANA/Hadoop. This caused shifts in priorities and schedules as those projects made unanticipated changes, resulting in less recorded expenditures in 2017.

- Unexpected complications in finalizing a common solution and design across technologies caused schedule delays and expenditures into subsequent years. For example, Work Management (WM)-Portfolio Management used this common solution and design approach to address a diverse set of business needs. This caused the solution
selection and agreement process to take longer than expected, but it was more thorough.

- Descoping certain requirements that were not started yet in 2017, but no longer prudent to undertake due to broader forthcoming technology solutions. For example, Digital Customer Self Service descoped some requirements until after the implementation of Digital Managed Services in order to avoid duplication.

Table I-5 provides a listing of all the project expenditures in 2017 that recorded more than $1 million below 2017 authorized.²

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2017 Request</th>
<th>2017 Authorized</th>
<th>2017 Recorded</th>
<th>2017 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-SD-PM-000236</td>
<td>MDMS Upgrade</td>
<td>$6,739</td>
<td>$6,269</td>
<td>$1,840</td>
<td>($4,429)</td>
</tr>
<tr>
<td>CIT-00-OP-NS-000446</td>
<td>NERC CIP-014 PSP Critical Subs</td>
<td>$7,564</td>
<td>$7,564</td>
<td>$3,207</td>
<td>($4,357)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000077</td>
<td>WM - Portfolio Management</td>
<td>$6,035</td>
<td>$5,029</td>
<td>$1,890</td>
<td>($3,140)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000225</td>
<td>CAISO Market Enhancements (2016-2017)</td>
<td>$4,025</td>
<td>$3,352</td>
<td>$1,141</td>
<td>($2,212)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000237</td>
<td>Digital Customer Self Service</td>
<td>$7,544</td>
<td>$6,286</td>
<td>$4,385</td>
<td>($1,902)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000154</td>
<td>Vegetation Management Ph2 - Q2 May/June</td>
<td>$5,733</td>
<td>$4,778</td>
<td>$2,912</td>
<td>($1,865)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000068</td>
<td>Enterprise Content Management</td>
<td>$3,420</td>
<td>$2,849</td>
<td>$1,704</td>
<td>($1,145)</td>
</tr>
<tr>
<td>Various</td>
<td>Projects with Variance &lt; $1M Below 2017 Authorized</td>
<td>$7,443</td>
<td>$6,602</td>
<td>$5,044</td>
<td>($1,558)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$48,500</strong></td>
<td><strong>$42,730</strong></td>
<td><strong>$22,122</strong></td>
<td>($20,608)</td>
</tr>
</tbody>
</table>

(4) **Projects Authorized but not Undertaken**

SCE was authorized $33.34 million for 2017 OU capitalized software projects in the 2018 GRC, which ultimately did not go forward. This was primarily driven by the following emergent and unanticipated business needs:

- Requirements were deferred or descoped due to the implementation of a major program such as CSRP and EPCR. For example, Alerts and Notifications had to be reevaluated in order to determine what scope

² See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2017 OU capital software expenditures with a variance greater than $1 million relative to 2017 authorized.
would still be applicable after the implementation of the Preference Center being delivered via CSRP.

- Competing for testing, development, and production environments with higher priority programs caused delays. For example, Lotus Notes Migration is dispositioning multiple apps built on Lotus Notes to other systems and the competition for environments caused delays.

- Delays due to management decisions based on resource capacity and financial constraints. For example, Test Smart Form Tool (TSFT) was delayed when other business needs within T&D were determined to be higher priority for a software solution.

- Discovery of more cost-effective methods of solutioning the business requirements during planning and prior to any spend initiation. For example, during the implementation of Energy Management System (EMS), an alternative method for rapid restoration of backup data was discovered which reduced spending on the Enhanced Business Resiliency project.

Table I-6 provides a listing of all the projects authorized in 2017 that were greater than $1 million, but not undertaken.\textsuperscript{10}

\textsuperscript{10} See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2017 OU capital software expenditures with a variance greater than $1 million relative to 2017 authorized.
### Table I-6
**Projects Authorized but not Undertaken**
*(Nominal $000)*

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2017 Request</th>
<th>2017 Authorized</th>
<th>2017 Recorded</th>
<th>2017 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-SD-PM-000223</td>
<td>Alerts and Notifications</td>
<td>$4,325</td>
<td>$3,604</td>
<td>$(3,604)</td>
<td>$(3,604)</td>
</tr>
<tr>
<td>CIT-00-OP-CS-000067</td>
<td>Lotus Notes Migration</td>
<td>$3,923</td>
<td>$3,269</td>
<td>$(3,269)</td>
<td>$(3,269)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000811</td>
<td>Test Smart Form Tool (TSFT)</td>
<td>$3,017</td>
<td>$3,017</td>
<td>$(3,017)</td>
<td>$(3,017)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000141</td>
<td>CCS/CRAS</td>
<td>$3,420</td>
<td>$2,149</td>
<td>$(2,149)</td>
<td>$(2,149)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000226</td>
<td>Energy Trading and Risk Management (ETRM)</td>
<td>$3,017</td>
<td>$2,515</td>
<td>$(2,515)</td>
<td>$(2,515)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000227</td>
<td>Generation Automation Upgrade &amp; Control Systems Refresh</td>
<td>$3,017</td>
<td>$2,515</td>
<td>$(2,515)</td>
<td>$(2,515)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000051</td>
<td>Enhanced Business Resiliency</td>
<td>$3,017</td>
<td>$2,515</td>
<td>$(2,515)</td>
<td>$(2,515)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000071</td>
<td>Legal Re-platform</td>
<td>$2,213</td>
<td>$1,844</td>
<td>$(1,844)</td>
<td>$(1,844)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-00093</td>
<td>SCMT</td>
<td>$2,012</td>
<td>$1,677</td>
<td>$(1,677)</td>
<td>$(1,677)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-00086</td>
<td>Grid Management Dashboards</td>
<td>$2,012</td>
<td>$1,677</td>
<td>$(1,677)</td>
<td>$(1,677)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000140</td>
<td>Disaster Recovery Betterment</td>
<td>$2,012</td>
<td>$1,677</td>
<td>$(1,677)</td>
<td>$(1,677)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000232</td>
<td>Scheduling Refresh Release 2</td>
<td>$1,509</td>
<td>$1,509</td>
<td>$(1,509)</td>
<td>$(1,509)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000232</td>
<td>Graphical Design Tool (GDT)</td>
<td>$1,509</td>
<td>$1,257</td>
<td>$(1,257)</td>
<td>$(1,257)</td>
</tr>
<tr>
<td>Various</td>
<td>Projects Authorized &lt; $1M, Not Undertaken</td>
<td></td>
<td></td>
<td>$5,552</td>
<td>$3,413</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>$40,534</strong></td>
<td><strong>$33,336</strong></td>
<td><strong>$0</strong></td>
<td><strong>$(33,336)</strong></td>
</tr>
</tbody>
</table>

**b) 2018 Recorded Expenditures**

*Figure I-2*

**Comparison of 2018 Request to Authorized and Recorded OU Capitalized Software Expenditures from 2018 GRC**
*(Nominal $000)*

(1) **Projects Recorded Above 2018 Authorized**

Refer to WP SCE-07, Volume 1 Authorized to Recorded.
As shown in Figure I-2, in 2018, SCE recorded $15.37 million over 2018 authorized capital expenditures of $105.48 million. Part of this overspend is attributable to the following projects with recorded spend in excess of what was authorized: Power Costs, Inc. (PCI) Replacement, Enterprise Platform Core Refresh (EPCR), and Test Smart Form Tool (TSFT). The core reasons for the unanticipated costs for these and other projects in this category are:

- Technology advances from vendors which were unanticipated in 2016 when SCE submitted its 2018 request but were subsequently deemed prudent to incorporate into our solutions. For example, as discussed above, EPCR moved from a standard refresh to a transformational technology platform, which helped improve performance and cost optimization as future benefits are realized for integrated systems.

- Higher than expected vendor costs and longer than expected testing cycles to validate the functionality of the new systems, as experienced by the PCI Replacement project.

- The opportunity to take advantage of costs savings from bundling or vendor incentives. For example, the TSFT project added pre-paid maintenance of the license cost, which resulted in higher spend, but a savings on the licenses due to bulk/volume purchasing.

The table below provides a listing of all the projects that recorded more than $1 million above their respective 2018 authorized amounts.\(^\text{12}\)

\(^{12}\) See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2018 OU capital software expenditures with a variance greater than $1 million relative to 2018 authorized.
Table I-7
Projects Recorded Above 2018 Authorized
(Nominal $000)

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2018 Request</th>
<th>2018 Authorized</th>
<th>2018 Recorded</th>
<th>2018 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-09-DM-DM-000042</td>
<td>Power Cost Inc (PCI Replacement)</td>
<td>$3,527</td>
<td>$2,940</td>
<td>$10,624</td>
<td>$7,684</td>
</tr>
<tr>
<td>CIT-09-CC-CC-000022</td>
<td>Enterprise Platform Core Refresh</td>
<td>$8,767</td>
<td>$7,306</td>
<td>$13,849</td>
<td>$6,543</td>
</tr>
<tr>
<td>CIT-09-DM-DM-000081</td>
<td>Text Smart Form Tool (TSFT)</td>
<td>$1,008</td>
<td>$1,008</td>
<td>$4,102</td>
<td>$3,094</td>
</tr>
<tr>
<td>CIT-09-SD-PM-000231</td>
<td>EMS Refresh</td>
<td>$2,691</td>
<td>$2,242</td>
<td>$4,457</td>
<td>$2,214</td>
</tr>
<tr>
<td>CIT-09-DM-DM-000022</td>
<td>Graphical Design Tool (GDT)</td>
<td>$5,527</td>
<td>$2,940</td>
<td>$4,454</td>
<td>$1,514</td>
</tr>
<tr>
<td>CIT-09-SD-PM-000230</td>
<td>Gas Solar Control Systems Refresh</td>
<td>$605</td>
<td>$605</td>
<td>$2,042</td>
<td>$1,437</td>
</tr>
<tr>
<td>Various</td>
<td>Projects with Variance &lt; $1M Above 2018 Authorized</td>
<td>$2,519</td>
<td>$2,100</td>
<td>$3,045</td>
<td>$945</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$22,643</td>
<td>$19,140</td>
<td>$42,572</td>
<td>$23,432</td>
</tr>
</tbody>
</table>

(2) Projects not Authorized but Undertaken in 2018

In 2018, SCE recorded $68.96 million in OU capitalized software expenditures for projects that were not forecast in SCE’s 2018 GRC. The majority of these costs resulted from the cGIS Improvements, Digital Managed Services, Windows 10 Upgrade, Identity Governance & Access Management (IGAM), SmartConnect Data Migration/Teradata SAP projects. The following emergent and unanticipated business needs were the primary drivers of the projects within this category:

- Issues related to performance, stability, functional gaps, and user adoption which surfaced after the original projects closed and after the 2018 GRC filing had been submitted. In order to realize the intended value of the business case and mitigate negative impacts to SCE’s operations, additional expenditures were necessitated to resolve these issues. For example, cGIS Improvements was launched in order to mitigate defects and gaps in meeting the business requirements which would impact the business case and user adoption if not resolved.

- A significantly positive 5-year benefit-to-cost ratio and supporting business case benefits of migrating to a cloud-based platform (including decommissioning an on-premise solution, total cost of ownership cost reductions, and reliability and scalability improvements) resulted in a business decision to initiate some work, such as, as discussed above, the SCE.com Digital Managed Services project.
Lack of insight to emerging vendor support and obsolescence issues which, when remediated, would lead to cost and performance improvements as well as capability improvement and greater employee engagement, as experienced with the Windows 10 Upgrade and IGAM projects.

The table below provides a listing of all 2018 recorded project expenditures greater than $1 million that were not forecast, and therefore, not authorized in SCE’s 2018 GRC.\textsuperscript{13}

\begin{table}[h]
\centering
\caption{Projects not Authorized but Undertaken (Nominal $000)}
\begin{tabular}{|c|c|c|c|c|}
\hline
WBS & Project Name & 2018 Request & 2018 Authorized & 2018 Recorded & 2018 Variance \\
\hline
CIT-00-SD-PM-000191 & eGIS Improvements & & $10,070 & $10,070 \\
CIT-00-OP-CS-000078 & SCE.com Digital Managed Services & & $8,953 & $8,953 \\
CIT-00-DM-DM-000155 & Windows 10 Upgrade & & $7,765 & $7,765 \\
CIT-00-SD-PM-000261 & Identity Governance & Access Management (IGAM) & & $5,729 & $5,729 \\
CIT-00-OP-CS-000074 & SmartCost Data Migrator/Teradata SAP & & $4,939 & $4,939 \\
CIT-00-OP-NS-000446 & NERC CIP-014 PSP Critical Sales & & $4,523 & $4,523 \\
CIT-00-SD-PM-000252 & MDMS Upgrade & & $4,345 & $4,345 \\
CIT-00-DM-DM-000050 & Outage Management System Refresh (OMS) & & $2,514 & $2,514 \\
CIT-00-SD-PM-000170 & WM-PPM (Ph2) & & $2,257 & $2,257 \\
CIT-00-SD-PM-000258 & Enterprise Skype Voice & & $1,762 & $1,762 \\
CIT-00-SD-PM-000276 & Residential Rate Reform - Phase 2 - IT & & $1,442 & $1,442 \\
CIT-00-SD-PM-000262 & Lease Accounting & & $1,343 & $1,343 \\
CIT-00-DM-DM-000024 & SCE.com Strategic Upgrade & & $1,140 & $1,140 \\
CIT-00-SD-PM-000283 & IMEP 2018 & & $1,014 & $1,014 \\
\textbf{Various} & Projects with Recorded < $1M, Not Authorized but Undertaken & & & \\
\hline
\end{tabular}
\end{table}

\textbf{(3) Projects Recorded Below 2018 Authorized}

As shown in Figure I-2, SCE recorded $24.95 million below the 2018 authorized capital expenditures of $34.24 million for several projects. This underspending was primarily driven by the following changes and decisions:

- Impacts to technology selection based on vendor investments to improve their products beyond known product roadmaps. For example,

\textsuperscript{13} See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2018 OU capital software expenditures with a variance greater than $1 million relative to 2018 authorized.
the Consolidated Outage Notification Initiative (CONI) project ended up being cheaper than expected due to vendor investments in the product to support both 3G and 4G devices simultaneously, which negated the need for SCE to invest in co-development time and costs.

- Unexpected complications in finalizing a common solution and design across technologies caused schedule delays and expenditures into subsequent years. For example, Work Management (WM)-Portfolio Management used this common solution and design approach to address a diverse set of business needs. This caused the solution selection and agreement process to take longer than expected, but it was more thorough.

- Energy market changes outside the control of SCE. For example, the CAISO Market Enhancements project experienced lower spend due to smaller impacts to our systems from the mandatory market changes driven by CAISO than what SCE expected.

The table below provides a listing of all the 2018 project expenditures that recorded more than $1 million below 2018 authorized.14

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14 See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2018 OU capital software expenditures with a variance greater than $1 million relative to 2018 authorized.
Table I-9

Projects Recorded Below 2018 Authorized (Nominal $000)

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2018 Request</th>
<th>2018 Authorized</th>
<th>2018 Recorded</th>
<th>2018 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000142</td>
<td>CONI (BID CS)</td>
<td>$16,857</td>
<td>$16,857</td>
<td>$4,680</td>
<td>($12,177)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000077</td>
<td>WM - Portfolio Management</td>
<td>$6,448</td>
<td>$5,207</td>
<td>$1,789</td>
<td>($3,417)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000225</td>
<td>CAISO Market Enhancements (2016-2017)</td>
<td>$4,031</td>
<td>$3,359</td>
<td>$7</td>
<td>($3,352)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000237</td>
<td>Digital Customer Self Service</td>
<td>$4,031</td>
<td>$3,359</td>
<td>$375</td>
<td>($2,968)</td>
</tr>
<tr>
<td>CIT-00-OP-CS-000067</td>
<td>Lotus Notes Migration</td>
<td>$3,023</td>
<td>$2,519</td>
<td>$1,008</td>
<td>($1,512)</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000073</td>
<td>Database Backup Optimization</td>
<td>$1,512</td>
<td>$1,260</td>
<td>$130</td>
<td>($1,130)</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000228</td>
<td>Data Monitoring and Surveillance</td>
<td>$2,015</td>
<td>$1,680</td>
<td>$1,303</td>
<td>($377)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$37,717</strong></td>
<td><strong>$34,240</strong></td>
<td><strong>$9,292</strong></td>
<td><strong>($24,948)</strong></td>
</tr>
</tbody>
</table>

(4) Projects Authorized but not Undertaken

SCE was authorized $52.1 million for 2018 OU capitalized software projects in the 2018 GRC, which ultimately did not go forward. This was primarily driven by the following emergent and unanticipated business needs:

- Requirements were deferred or descoped due to the implementation of a major program such as CSRP and EPCR. For example, as discussed above, Alerts and Notifications had to be reevaluated in order to determine what scope would still be applicable after the implementation of the Preference Center being delivered via CSRP.

- Delays due to reassessment of solutions and the phasing of implementation. For example, Enterprise Content Management focused on a long-term roadmap for Information Governance in 2017, and subsequently resource challenges impacted SCE’s ability to start the project on time.

- Discovery of more cost-effective methods of solutioning the business requirements during planning and prior to any spend initiation. For example, as discussed above, during the implementation of EMS, an alternative method for rapid restoration of backup data was discovered which reduced spending on the Enhanced Business Resiliency project.

- Plans to make custom configuration changes to COTS software through large project scope were updated when it was determined that
implementing enhancements and smaller fixes coupled with business process changes met the business requirements, as was the case for Scheduling Refresh Release 2 and Transmission Telecommunications WM Solution.

The table below provides a listing of all the projects above $1 million authorized in 2018 but not undertaken.\textsuperscript{15}

\textbf{Table I-10}

\textit{Projects Authorized but not Undertaken}

\textit{(Nominal $000)}

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Name</th>
<th>2018 Request</th>
<th>2018 Authorized</th>
<th>2018 Recorded</th>
<th>2018 Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000141</td>
<td>CCS/CRAS</td>
<td>$5,946</td>
<td>$4,955</td>
<td>($4,955)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-00068</td>
<td>Enterprise Content Management</td>
<td>$5,240</td>
<td>$4,366</td>
<td>($4,366)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000238</td>
<td>Alerts and Notifications</td>
<td>$4,938</td>
<td>$4,115</td>
<td>($4,115)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000232</td>
<td>Scheduling Refresh Release 2</td>
<td>$3,527</td>
<td>$3,527</td>
<td>($3,527)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000051</td>
<td>Enhanced Business Resiliency</td>
<td>$4,031</td>
<td>$3,359</td>
<td>($3,359)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000093</td>
<td>SCMT</td>
<td>$3,023</td>
<td>$2,519</td>
<td>($2,519)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000245</td>
<td>Contact Center Optimization</td>
<td>$2,922</td>
<td>$2,436</td>
<td>($2,436)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000187</td>
<td>Substation Health Assessment Tool</td>
<td>$2,620</td>
<td>$2,184</td>
<td>($2,184)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000226</td>
<td>Energy Trading and Risk Management (ETRM)</td>
<td>$2,419</td>
<td>$2,015</td>
<td>($2,015)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000140</td>
<td>Disaster Recovery Betterment</td>
<td>$2,318</td>
<td>$1,932</td>
<td>($1,932)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000072</td>
<td>Enterprise Schedulers Consolidation</td>
<td>$2,267</td>
<td>$1,889</td>
<td>($1,889)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000066</td>
<td>Seismic Risk Assessment</td>
<td>$2,015</td>
<td>$1,680</td>
<td>($1,680)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000078</td>
<td>Energy Planning Platform (EPP) Upgrade</td>
<td>$2,015</td>
<td>$1,680</td>
<td>($1,680)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000095</td>
<td>Transmission Telecommunications WM Solv</td>
<td>$2,015</td>
<td>$1,680</td>
<td>($1,680)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000070</td>
<td>Technology Consolidation &amp; Optimization</td>
<td>$2,015</td>
<td>$1,680</td>
<td>($1,680)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000146</td>
<td>Modernize Tools for Software Development</td>
<td>$1,512</td>
<td>$1,260</td>
<td>($1,260)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-SD-PM-000206</td>
<td>Substation 3D Design</td>
<td>$1,270</td>
<td>$1,058</td>
<td>($1,058)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000028</td>
<td>Usage Measurement System (UMS)</td>
<td>$1,209</td>
<td>$1,008</td>
<td>($1,008)</td>
<td></td>
</tr>
<tr>
<td>CIT-00-DM-DM-000145</td>
<td>Application Distribution</td>
<td>$1,209</td>
<td>$1,008</td>
<td>($1,008)</td>
<td></td>
</tr>
<tr>
<td>Various</td>
<td>Projects Authorized &lt; $1M, Not Undertaken</td>
<td>$12,022</td>
<td>$7,752</td>
<td>($7,752)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>$564,534</td>
<td>$52,101</td>
<td>$0</td>
<td>($52,101)</td>
</tr>
</tbody>
</table>

\textbf{G. 2019-2023 Capital Software Forecast Approach}

As described in SCE-06, Vol. 1, Pt. 1, SCE routinely assesses the capital software project portfolio to prioritize the delivery of OU software projects considering alignment with current business needs and areas of strategic importance.\textsuperscript{16} Proposed software projects undergo SCE’s governance.

\textsuperscript{15} See WPSCE-06V01P02 pp. 1 – 9 for an explanation of all recorded 2018 OU capital software expenditures with a variance greater than $1 million relative to 2018 authorized.

\textsuperscript{16} See SCE-01, Policy.
process before starting. This process is in place to review and confirm investments are prudent and financially responsible. As projects progress through the governance process, the design and architecture become more detailed and mature. However, most projects that are several years out have not gone through this governance process yet because the pace of technology change continues to evolve, making it difficult to predict what technology will be available in the future. As a result, SCE understandably has less information about projects that will begin in years 2021-2023 than it does about projects beginning prior to 2021.

To account for the inability to precisely predict what technology solutions will be available during the 2021-2023 GRC period (two to four years after the filing of this application), SCE proposes a hybrid forecast approach that consists of: (1) an itemized forecast and testimony for all projects over $3 million that have forecast spending in 2019-2020; and (2) a portfolio-based forecast based on historical costs for forecast spending in 2021-2023. SCE believes this latter portfolio-based forecast for 2021-2023 costs is reasonable, as fully described in Chapter IX of this volume.

H. Overview of Capitalized Software Project Estimation

The SCE capitalized software projects in this testimony include a combination of both ongoing, or “in-flight,” projects, and future initiatives. In prior GRCs, SCE presented project forecasts based on cost estimates that were performed in the early stages of the project life cycle. Contingency ranges from 20 to 35% were included within the cost estimates to account for unknowns and would be refined later during the project life cycle when more project-specific data was available, such as when SCE has completed Requests for Information (RFIs) and Requests for Proposal (RFPs) from vendors, or when an analysis of different possible solutions has been completed, resulting in a specific system architecture design recommendation with specific technology products identified as part of the design. In response to the Commission direction provided in D.19-05-020 in SCE’s 2018 rate case, SCE has progressed the cost estimates of both in-flight projects and projects with 2019 or 2020 start dates for purposes of the

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17 SCE also provides an itemized forecast for six projects beginning in the 2021-2023 period due to having a higher degree of certainty regarding the planned technology solution. Refer to Section IX.B.3 of this Volume for additional explanation of these six projects.

18 See A.13-11-003, APPWPS05V02P02. pp. 23-27 and SCEs response to A.13-11-003, Data Request, DRA-027-JOH #16.

19 SCE presents an itemized forecast for six projects beginning in the 2021-2023 period due to having a higher degree of certainty regarding the planned technology solution. Refer to Section IX of this Volume for additional explanation.
GRC. This effort spanned several months and involved additional SCE personnel that typically do not perform system architecture design until later in the project estimating process (normally after Step 1 in Figure I-3). SCE’s customary practice when estimating is to perform rough order of magnitude (ROM) costing early in the project life cycle in order to have an early indication of the scope and size of the project. Upon approval, SCE initiates detailed solution analysis to fully assess the requirements and solution for the outcome being sought. Once solution analysis is completed, a detailed and high confidence estimate is produced for funding consideration. For the in-flight, 2019, and 2020 projects presented in this volume, much of the solution analysis work was performed earlier in order to increase the accuracy of the GRC estimates.

By doing so, SCE’s 2021 GRC project estimates more accurately reflect the expenditures in the cost categories where SCE reasonably expects costs to be incurred that would otherwise be accounted for with contingency, thereby reducing forecast contingency for these projects to 0%. Due to the resources that would be required and the amount of unknown information necessary to predict the appropriate technology components, it is unrealistic for SCE to provide equivalent estimates for projects
beyond 1-2 years out. This is another supporting factor SCE considered in determining the approach to our 2021-2023 forecast.

SCE’s estimation methodology for the projects discussed in this volume beginning prior to 2021 involves analyzing historical capitalized software projects with equivalent scale and complexity. Complexity is determined by the functionality of the application being purchased (sometimes referred to as COTS – Commercial-Off-The-Shelf) or developed (sometimes referred to as In-house Application Development), and by the number and complexity of integration points, connecting software systems, and data being transferred between systems.

The COTS and In-house Application Development estimation methodology uses spreadsheet-based calculations. The methodology includes assigning standard assumptions by project type that are adjusted to account for known non-standard differences from the generic estimates used in the estimation model template. These adjustments are based on IT and the sponsoring Operating Unit’s current understanding of the complexity of the initiative, the likelihood of leveraging an existing product, the integration points, the data transferred amongst systems, the volume of data transferred, the data validation required through the transfer, and the transfer intervals and automation required. SCE uses historical data from the last five years of capitalized software projects to derive the generic estimation template parameters based on the following six categories:

1. Simple COTS Product
2. Medium Complexity COTS Product
3. High Complexity COTS Product
4. Simple Software Development
5. Medium Complexity Software Development
6. High Complexity Software Development

The estimation methodology includes several type of labor resources identified below:

- SCE Labor - This is an estimate of the total team size and uses a blended billing rate based on SCE resources (SCE employees and Managed Services Providers). The duration of the high-complexity (large) development project is assumed to be 2,000 hours or approximately one year. Medium complexity and simple (small) development projects are assumed to require approximately six months and three months, respectively. The actual duration may be

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20 Id.
more and the number of SCE employees could be less, meaning the base cases are estimating
a total effort and not necessarily a fixed timeframe.

- Vendor Labor - This is an estimate for the cost of labor provided by the software company
  who created the COTS package. The software vendors provide us with technical expertise of
  their software products and expertise from experience in deploying their products at other
  companies.

- Systems Integrator (SI) - This is an estimate of the work performed by a person or company
  that specializes in bringing together component subsystems into a whole and ensuring those
  subsystems function effectively together.

- Business Consultants - Business Consultants assist internal SCE resources in the sponsoring
  Operating Unit with many of the business activities required on a technology project.
  Business Consultants can support development of business requirements with stakeholders,
  assist with design reviews, and support overall project management. Business Consultants
  are also often used if SCE is seeking to deploy new business capabilities and would benefit
  from the experience and guidance of industry experts.

- Technical Consultants - Technical Consultants assist when new technology is being
  introduced or complex real-time interfaces require specific expertise. However, the number
  of technical issues that arise during project development is typically fewer than the number
  of issues that arise due to the complexity inherent in redesigning business processes to fit the
  technical solution. As a result, technical consultants are not typically required to the same
  extent as the business consultants.

The estimation methodology also provides an ongoing annual O&M labor support cost based on
a percentage of the overall labor costs of the completed project. SCE uses historical ongoing support
costs of previously implemented capitalized software projects as a way to estimate the anticipated future
support costs.

Details of the cost estimates for individual projects discussed in this volume are provided in
 corresponding workpapers.
II.

RESILIENCY

This Chapter addresses SCE’s 2019-2020 forecast for capitalized software projects to support Resiliency. This entails the ability of SCE to protect our customers, employees, and other stakeholders and to recover our business operations quickly in the event of disruptions. The main elements under Resiliency address areas such as cyber and physical security, emergency management, and wildfire management. This request includes the following four projects, each over $3 million: (1) Enterprise Content Management, (2) Perimeter Security at Critical Facilities (NERC CIP-014), (3) Enterprise Visitor Management, and (4) Physical Access Management System Refresh. These capital software projects will allow SCE to mature and improve functions and capabilities for better management of areas such as business continuity planning, crisis management, and physical security.

A. Business Continuation

1. Enterprise Content Management (CIT-00-DM-DM-000068)

Table II-11
Enterprise Content Management
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000068</td>
<td>$1,704</td>
<td>$2,280</td>
<td>$2,657</td>
<td>$2,420</td>
<td>$13,568</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td>$2,849</td>
<td>$4,566</td>
<td>$4,000</td>
<td>$4,420</td>
<td>$19,460</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td>$3,420</td>
<td>$5,240</td>
<td>$5,400</td>
<td>$5,400</td>
<td>$19,460</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Project or Program Description

The Enterprise Content Management program is focused on improving SCE’s capability to manage a diverse and complex set of business records. With SCE’s operations becoming increasingly electronic-based, the volume of files and data to be maintained continues to grow. The majority of this information exists in a variety of electronic formats, such as electronic spreadsheets, PDF files, and “structured” IT-supported database systems used across the enterprise. The volume,

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21 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.
frequency of change, and variety of this information is increasing, as are the external agencies and internal regulations governing SCE’s business processes. The operations of SCE are highly dependent on the accessibility, accuracy, governance, and compliance of this information.

This project will implement a set of eight solutions to provide advanced content management capabilities to improve reliability, safety, and electronic discovery (eDiscovery) operations to minimize the risks of regulatory non-compliance related to record-keeping. The project will also deploy tools and controls to improve the accuracy of records across SCE’s operating units and improve classification of information for SCE to meet its information protection needs.

To achieve these objectives, we will implement the following solutions:

1. **Digital Signatures**: Integrate digital signature technology and capability with identified critical business processes that have signature requirements as a part of their workflow.

2. **Centralization of Critical Records**: Continue to migrate critical records from file shares and individual computers to SCE’s standard content management repository.

3. **Records Management Enhancements**: Enhance records management capabilities for repositories such as SharePoint to comply with records management requirements, apply automation, and manage lifecycle of records in alignment with records retention schedules.

4. **Management of Email Records**: Apply records management controls for email records in Microsoft Outlook.

5. **Automate Records Management**: Provide the ability to automate routine records management responsibilities for employees.

6. **Preserve Digital Records with Extended Retention**: Deploy capabilities to preserve and enable access to SCE records that have extended retention timelines ranging from 25 years to 100 years and beyond.

7. **Enterprise Search**: Provide a single user interface for employees to search content across multiple SCE repositories.

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22 Critical records include records that, if mismanaged, will affect grid reliability, employee or customer safety, compliance, Company financials, or the business reputation of SCE.
8. **Manage Structured Data Lifecycle:** Implement lifecycle management to structured data records to properly store and disposition records according to appropriate procedures.

b) **Need for Capital Project or Program Including Risk Avoided**

1. **Digital Signatures**

   If a signature is required to confirm an electronic document as a business record, the document must be printed, signed, and then scanned to create the finalized business record. This paper-based signature process is inefficient and expensive, especially when considering the scope of the Company’s operations. In some cases, it may be hard to confirm the integrity and reliability of the signature process. In a multi-page document, text and other content can be altered and inserted without being noticed. If the signature process does not have integrity or reliability, the Company may undergo reputational damage, significant financial penalties, and non-compliance events.

2. **Centralization of Critical Records**

   A significant portion of SCE’s critical records are contained in repositories that require enhanced controls such as versioning, legal hold management, metadata tagging, and audit trails. These records are critical to operations, safety, and compliance. To mitigate the risks of mismanagement of these critical business records, these repositories must be migrated to the Company’s Enterprise Content Management system so we can apply proper controls to the business records. These controls provide for advanced security and protection, version control capabilities, enforcement of records retention policies, standardized metadata tagging, advanced search features, legal hold management, and audit trail capabilities.

3. **Records Management Enhancements**

   SCE’s Enterprise Content Management repositories, ranging from SharePoint to network file shares, serve day-to-day operational needs. But they lack robust records management capabilities that enable records classification, declaration, and lifecycle management in accordance with SCE’s retention schedules. SCE must enhance the existing capabilities of these tools to help verify routine records management can be performed. With this solution, SCE can effectuate our records retention policy and enforce legal holds to support pending litigation or investigations, by enabling rules and workflows that will automate the process.
Management of Email Records

Over the past few decades, email has become pervasive across all aspects of the Company’s business operations. The Company produces a significant volume of email every day to support its operations. According to the Association of Records Managers and Administrators (ARMA), an international consortium of leading records management experts, on average 5% of all emails are classified as business records. These records must be retained pursuant to the Company’s record retention schedule and given the same records management protections and controls as document-based records. There is currently no efficient solution implemented at SCE to provide for proper records management of email-based records.

Automate Records Management

The method for determining records retention qualification (identifying, declaring, and retaining the records) is currently performed manually. This requires time from all SCE employees and makes the process vulnerable to unintentional errors and incorrect judgment. Automating our recordkeeping will involve managing the lifecycle of records based on pre-defined rules and automating these rules in record repositories where the records are found. This model is based on pre-establishing rules and using technology to automate how we identify, qualify, and retain records. This continues throughout the entire lifecycle of the records.

Preserve Digital Records with Extended Retention

The Company’s Records Management Program addresses the lifecycle of SCE’s records from creating the record, to retaining it, to disposing of it. Many files have a long retention time and are in electronic format. Over time, the long-term preservation of these records is at risk due to frequent changes in technological electronic formats and media standards, technological obsolescence, and degradability of technological media. Each file format can present challenges in the long-term obsolescence of past format standards. Similarly, the obsolescence and changes to previously standard electronic information storage media presents reliability issues in accessibility of data.

The inaccessibility of information related to equipment specifications, engineering drawings, or operational procedures could cause reliability issues in maintaining operations, or trigger delays when attempting to restore or resume critical operations. Risks also arise in our ability to produce information related to eDiscovery and other compliance matters if the required

documentation is not accessible or retrievable. This solution will mitigate risks associated with managing the long-term preservation of records, which will have significant impacts on SCE’s operations, compliance, and ability to support eDiscovery requests.

(7) **Enterprise Search**

The diversity of electronic information sources has increased greatly and continues to do so as the volume of electronic business information has grown exponentially. While the Company has worked to centralize its critical information in its Enterprise Content Management systems, many other business documents exist on diverse sources, such as email, files shares, and local disk drives. The time consumed to retrieve documents or records to support critical operations of the Company is high. Implementing Enterprise Search will significantly reduce the time and cost to retrieve documents/records and enhance the Company’s eDiscovery operations.

(8) **Manage Structured Data Lifecycle**

Much of the Company’s data is stored in its IT-supported application systems (e.g., SAP). Due to increasing demands and business need for more information, the data in these systems are increasing exponentially. This “structured” information must be properly managed throughout its full data lifecycle, from creation to disposition.

Currently there is no tool in place to give structured data lifecycle management capabilities. This requires employees to manage, archive, and dispose of the data in the Company’s IT-supported application systems. Structured data lifecycle management will address issues triggered by the exponential increase in unmanaged structured data and improper retention. This tool will help reduce storage costs associated with archived data and improve performance of day-to-day operational systems.

c) **Benefits**

The proposed project will enhance safety, reliability, and compliance efforts by improving the quality of SCE’s critical information. It will also minimize the manual efforts currently required by employees to perform routine information governance activities. In addition, the Enterprise Content Management program is expected to improve employee culture and awareness of risks associated with mismanagement of the Company’s information.

d) **Scope and Cost Forecast**

As the volume of business data and information grows, and the pace of regulatory and business changes quickens, the importance of having timely, effective, and controlled records
management increases. The variety of solutions and platforms where this information is processed and stored is rapidly increasing. This increasingly complex information landscape, combined with the growing pace of change in technology, creates challenges for SCE’s information governance and record-keeping capabilities. At the same time, SCE’s operations are highly dependent on this information being accessible, accurate, and compliant with nearly 5,800 legal citations and regulations. The scope of each of the eight initiatives identified below is required to support the evolving information governance needs and mitigate the associated risks and challenges.

(1) **Digital Signatures**

This project will implement a digital signature technology, which is supported by standard technology products at SCE. This includes the Microsoft Office suite of applications, Adobe Acrobat-based documents, and other IT-supported document formats, including specialized Computer-Aided Design and Drafting (CADD) document formats. The implementation includes digital (electronic) signatures for all eligible employees, with the ability to digitally sign these documents and enhance workflow of critical business processes that involve signatures.

(2) **Centralization of Critical Records**

The centralization of critical records will include performing Redundant, Obsolete, and Trivial (ROT) analysis, deleting redundant and obsolete records that meet the Company’s retention timeline, and migrating records to SharePoint. As part of this migration, the project will establish metadata associated with each record, develop an access-based permission design, and apply retention schedules to manage the lifecycle of critical records of the Company.

(3) **Records Management Enhancements**

These records management enhancements will manage content residing within the Company’s repositories, such as SharePoint. This in-place records management capability will provide employees with the ability to properly manage new business information repositories that may be added in the future. This will also provide the ability to meet the management capabilities found in Department of Defense (DOD) 5015.20 standard industry measure of records.

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For example, these regulations and citations include the California Public Utilities Code and Code of Federal Regulations.
(4) **Management of Email Records**

This project will implement an email-based records management solution within the Company’s email system (MS Outlook) that will automate an email retention policy. As part of this scope, the solution will provide the ability to meet the Department of Defense (DOD) 5015.20 standard industry measure of records management capabilities.

(5) **Automate Records Management**

This project will implement Rules-Based Recordkeeping (RBR) to enable an automated method of recordkeeping, based on pre-established rules. The solution will leverage pre-established document handling rules, and automate the qualification, declaration, and records retention classification of documents. This solution will collect metadata from the user and apply pre-defined records lifecycle management rules across structured systems like SAP and unstructured repositories such as SharePoint. The objective is to automate records retention rules for about 70 critical record types.

(6) **Preserve Digital Records with Extended Retention**

The digital records preservation capability will preserve, on a long-term basis, the Company’s records in the face of changes in technological electronic format and media standards, technological obsolescence, and degradability of technological media (i.e., microfile and tapes). This solution will enable electronic records with extended retention periods to remain accessible through a standard electronic format.

(7) **Enterprise Search**

The Enterprise Search capability will make business information accessible and retrievable from multiple enterprise-type sources, such as enterprise content systems, email, file shares, and cloud-services repositories. The Enterprise Search solution will search and present content from multiple repositories into a single results user interface, thereby providing a consolidated view of this information. This Enterprise Search capability will integrate structured and unstructured information such as engineering standards, specifications, and safety checklists, and display its results. Users will also be able to filter search results by author, repository grouping, and other pieces of metadata to aid in locating the most current and most relevant content. The Enterprise Search solution will also preserve the in-place security protections of the information in its existing repositories.
(8) Manage Structured Data Lifecycle

Unlike the typical lifecycle management solutions based on unstructured data (e.g., Word, Excel, Visio, JPEGs, etc.), this effort will enable records management, archiving, and legal disposition of the data residing within the Company’s IT-supported structured data transactional systems, including SAP.

e) Alternatives Considered

One alternative would be to manage this complex information landscape manually. To manually address the diverse information management needs would require significant dedicated staff. This staff would need to augment operational, safety, and compliance teams, who would continue to spend additional time and effort to carry out routine tasks associated with searching, declaring, classifying, and dispositioning SCE’s records. This manual alternative could cause high costs over a long period. Additionally, the distributed employee teams would lack necessary governance compared to a technology solution that enables consistent governance with the help of technology tools. Choosing a manual solution may affect the reliability of company operations, impact regulatory or legal compliance matters, cause unsafe conditions for employees and customers, or cause financial or reputational damage.

f) Basis for Capital Expenditure Forecast

The total 2019-2023 project costs are $12.164 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

SCE was authorized $2.85 million in 2017 and $4.37 million in 2018 for this project but recorded only $1.70 million in 2017 and $0 in 2018. SCE spent less than authorized because, after doing an assessment to develop the long-term roadmap for Information Governance in 2017, resource challenges impacted SCE’s ability to start the project on time. Despite this delay, the need for this project persists for all the reasons discussed above. Additionally, while SCE completed the Electronic Document Management/Records Management (eDMRM) project in 2018 to manage

See WPSCE-06V01P02 pp. 10 – 12.
approximately 20 million critical business records, the technology available for business records management has since developed to the point that the additional required capabilities included within scope for this project are now achievable.

B. Physical Security

1. Perimeter Security at Critical Facilities (NERC CIP-014) (CIT-00-OP-NS-000446)

<table>
<thead>
<tr>
<th>Table II-12</th>
<th>Perimeter Security at Critical Facilities (NERC CIP-014) 2019-2023 Forecast (Nominal $000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-OP-NS-000446</td>
<td></td>
</tr>
<tr>
<td>Recorded</td>
<td>Forecast</td>
</tr>
<tr>
<td>Recorded / Forecast</td>
<td>$332</td>
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<td>2018 GRC - Authorized</td>
<td>$1,973</td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td>$1,973</td>
</tr>
</tbody>
</table>

a) Project or Program Description

NERC CIP-014 is a physical security standard which requires utilities to perform a high-level threat and vulnerability analysis to detect potential threats, weaknesses, and corresponding risks in the event of an attack on a critical grid infrastructure component. Specifically, it requires SCE to identify and protect transmission stations and substations, and their associated primary control centers, which if rendered inoperable or damaged because of a physical attack, could cause widespread instability, uncontrolled separation, or cascading within an interconnection. The standard further provides a structured framework in which an initial risk assessment must be carried out by utilities and be reviewed by an independent third party. The standard also requires utilities to perform a tailor-made assessment and evaluation of potential threats and associated vulnerabilities related to each critical location. Finally, the utility must develop and implement a plan to protect the identified assets from physical threats and verify the plan by an independent third party.

This Perimeter Security at Critical Facilities project allows SCE to comply with the NERC CIP-014 standard by physically protecting critical facilities (control centers and substations) using a video management system, video analytics, a gunshot detection system, public announcement, and situational awareness tools and technologies.

b) **Need for Capital Project or Program Including Risk Avoided**

SCE is required by NERC to implement standards to mitigate attacks on transmission substations and their associated primary Control Centers that, if rendered inoperable or damaged because of physical attack, could result in system instability, uncontrolled separation, or cascading within an interconnection. This project is necessary to implement and comply with those standards or risk severe financial penalties.\(^{27}\)

1. **Benefits**

The Perimeter Security at Critical Facilities project will reduce the overall susceptibility of the power grid to physical attacks by identifying and protecting transmission substations and their associated primary control centers. The project will further deploy a multi-layered approach to detect, deter, delay, respond and monitor potential intrusions and attacks with the creation of uniform standards of technology, processes, and procedures. These steps to address physical security risk and vulnerabilities related to the reliable operation of the Bulk Electric System (BES) are critical to the safety of our customers and public and will also avoid the risk of financial penalties from non-compliance.

c) **Scope and Cost Forecast**

The implementation of enhanced physical security measures at critical Bulk Electric System facilities will lessen the overall vulnerability of the Bulk Electric System against physical attacks. The scope of the project includes: (1) telecom work to build circuits and deploy network infrastructure to allow ESOC (Enterprise Security Operations Center) to monitor and respond to events at remote sites/substations. (2) applications for intrusion detection (seismic, physical, shots fired, radar, perimeter) and video analytics will be installed to trigger alarms that notify ESOC when a threat has been detected.\(^{28}\)

1. **Alternatives Considered**

SCE considered hiring more security officers in order to meet the necessary protections mandated by NERC CIP-014, but this approach proved to be too costly and was not feasible as these sites require 24x7 coverage. Manpower alone, without the technological improvements and upgrades, would not satisfy the regulatory needs. The vast layout of SCE sites makes


\(^{28}\) *See Exhibit SCE-04, Vol. 4.*
meeting the requirements with manpower alone unreasonable as there would still be gaps in coverage that would not exist if technology, which provides the ability to track and monitor continuously, is used. Gunshot detection, license plate recognition, and the ability to update and notify a large number of people about an incident are all situations for which technology advancements have proven to be more effective.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $5.60 million\(^2\). The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

SCE was authorized $7.6 million in 2017 and $0 in 2018 for this project but recorded $3.2 million in 2017 and $4.5 million in 2018. The increase in project expenditures is due to the need to redefine scope and resolve technical solution issues beyond the original project scope and forecast that occurred in 2016. These challenges delayed completion of the planned and previously authorized original scope of work from 2017 and shifted some work into 2018.

\(^2\) See WPSCE-06V01P02 pp. 13 – 15.
2. **Enterprise Visitor Management (CIT-00-SD-PM-000277)**

**Table II-13**

*Enterprise Visitor Management*

*2019-2023 Forecast*  
*(Nominal $000)*

<table>
<thead>
<tr>
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<td>$0</td>
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</tr>
<tr>
<td>2018 GRC - Authorized</td>
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<tr>
<td>2018 GRC - Original Request</td>
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</tbody>
</table>

a) **Project or Program Description**

This project will implement visitor management software (VMS) across all major SCE sites which will enable SCE to register and track visitors at each site and across different sites. The VMS documents and gathers information about a visitor’s entry and exit at a facility.

b) **Need for Capital Project or Program Including Risk Avoided**

The primary needs for this project are both safety and security. Violence in the workplace, industrial espionage, and terrorism threaten the security of personnel and property. Companies are vulnerable and liable when facilities are not secure. Creating a workplace environment where SCE employees, contractors, vendors, and visitors feel safe is of the utmost importance and meets duty of care requirements. The number of visitors that enter enterprise corporate offices, field sites, and other company facilities has created a need to establish and maintain an electronic enterprise visitor management system as part of an overall security plan. As the number of visitors to SCE’s facilities increases, the current manual method to track visitors becomes inefficient and introduces possible gaps in security and safety.

Having a VMS is essential when developing an automated roster that can be accessed remotely in the event of an evacuation or denying access to a known individual who may pose a risk to our facilities or employees. Electronic visitor management systems ensure that the visitor sign-in process is more efficient, accurate, and consistent. It also provides the ability to store visitor information in a database which may be utilized to conduct analysis or establish protocols to increase scrutiny for individuals identified as posing a potential risk to our facilities or personnel. Visitor management software increases building security and protects facilities, employees, and assets.
(1) **Benefits**

An electronic enterprise visitor management system will not only add an additional layer of security to SCE’s facilities, but it will also improve guest support, increase operational efficiency and augment SCE’s emergency response strategy. It is not intended to replace other security measures but to augment existing procedures and capabilities. When implemented with the other components of SCE’s security infrastructure, it forms a comprehensive security program.

c) **Scope and Cost Forecast**

The scope of the project includes a centralized visitor management software solution that is scalable to accommodate visitors at all SCE high population sites and designated critical facilities. With the use of a visitor management system, Corporate Security will be able to quickly and accurately identify all visitors who are in a facility, conduct analysis/reporting on visitor data, easily maintain a watch list, and streamline the check-in process through managed or self-service kiosks. SCE staff will be able to easily pre-register visitors and receive notification upon the visitor(s) arrival.

(1) **Alternatives Considered**

SCE considered keeping its existing visitor management system of paper logs and guest books, but the sensitivity and criticality of SCE’s sites call for a more robust visitor management system that provides the ability to conduct analysis and analytics. Furthermore, with automation of security systems, fewer sites are staffed with on-site security officers to enforce and validate paper visitor logs.

Another alternative considered is to use our current access control system to issue hard access cards to each visitor, but this becomes prohibitively expensive due to hardware, creates another level of application management which would be expensive to program, and adds a level of vulnerability to our access control system due to the number of cards that could be mismanaged. This approach would also require a physical presence to control and issue the hard access cards.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $1.38 million.³⁰ The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this

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³⁰ See WPSCE-06V01P02 pp. 16 – 18.
project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

3. Physical Access Management System Refresh (CIT-00-DM-DM-000174)

Table II-14
Physical Access Management System Refresh
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Physical Access Management System Refresh</th>
<th>Recorded</th>
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<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Project or Program Description

This project refreshes SCE’s existing physical access management system. In an organization’s security, physical access control systems play a vital role. The main purpose of the access control system is to monitor authorized access and mitigate unauthorized access to our physical and cyber assets. In addition, access control systems play a key role in protecting employees and the general public by limiting access to areas with significant safety hazards without the proper training and equipment. These systems aide security with managing authorization, meeting mandatory compliance and regulatory requirements, ensuring accountability, and protecting facilities that require higher security on account of sensitive data, networks, or other critical or high value assets.

b) Need for Capital Project or Program Including Risk Avoided

Refreshing the physical access management system provides SCE the opportunity to make key software version upgrades, expand interoperability with other physical security software systems, add compatibility with enterprise software and personnel databases, and reduce cyber risk through the patching of vulnerabilities. The access control system is the primary driver to ensure SCE complies with the NERC CIP-006 and CIP-014 standards for the control of physical access in the high, medium, and low impact facilities of SCE. Non-compliance with this regulation can lead to fines up to
$1 million per instance per day and reputational damage. If SCE continues to invest in outdated technology during the forecast period, SCE’s access control system will be at risk for non-compliance.

(1) **Benefits**

Delaying change can be especially dangerous in the access control infrastructure, where escalating security threats can quickly cripple an organization’s ability to protect its people, facilities, and data assets. Physical access controls should be continuously updated and maintained to ensure system operability at all perimeter access points. They also enable the ability to monitor access into and out of critical sites. These records indicate the name of person(s) entering the site, their business purpose, their entity affiliation, and badge swipes. Ultimately this system plays a part in SCE maintaining security of the Bulk Electric System. Thus, this project is necessary for safety, security, continued grid protection and compliance.

c) **Scope and Cost Forecast**

Maintaining the current release of C*Cure 9000 software is vital to the development and maintenance of the overall system. The scope of this project includes upgrading the physical access management system that provides SCE with multi-site access control and alarm monitoring capabilities.

(1) **Alternatives Considered**

SCE considered the alternative of keeping the current system on its existing hardware, ignoring the need to update, and instead upgrading and replacing as the hardware drops off support and maintenance. This alternative was rejected because this would ultimately increase the overall risk posture and reduce the capability of security as it relates to video, data, safety, and management. This also increases the long-term cost as it is normally more expensive to maintain and replace severely outdated hardware/software. There are also software compatibility issues which may negate the efficient use of the software.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $3.45 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this

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See WPSCE-06V01P02 pp. 19 – 21.
project includes costs for SCE employees, supplemental workers, and consultants, as well as software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

C. **Resiliency Projects less than $3 Million**

**Table II-15**

Resiliency Projects less than $3M

*Work Breakdown Structure (WBS) Forecast Capital Expenditures (Nominal $000)*

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
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<td>CIT-00-DM-DM-00017</td>
<td>Asset Management/Bar Code Capabilities</td>
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<td>$499</td>
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<td>CIT-00-DM-DM-000173</td>
<td>Detection for Drones</td>
<td>$902</td>
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<tr>
<td>CIT-00-DM-DM-000236</td>
<td>Predictive Analytics for People &amp; Device</td>
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<td>CIT-00-OP-SM-000026</td>
<td>Mobile Field Response</td>
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<td><strong>Total</strong></td>
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<td>$2,149</td>
<td>$50</td>
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<td>$50</td>
<td>$4,149</td>
</tr>
</tbody>
</table>

Table II-15 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).\(^{32,33}\)

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\(^{32}\) See WPSCE-06V01P02 pp. 22 – 33.

\(^{33}\) Predictive Analytics for People & Devices is an exception to other projects in this chapter as the forecast begins in the 2021-2023 timeframe but is presented herein with other Resiliency BPG projects due to SCE having more certainty regarding this technology solution. As explained in Chapter IX.B.2, the forecast for this project is deducted from the 2021-2023 portfolio amount available for allocation.
III.

CUSTOMER INTERACTIONS

This Chapter addresses SCE’s 2019-2020 forecast for capitalized software projects to support Customer Interactions. This entails the ability of SCE to transact with our customers in a reliable and modern way which is easy and intuitive for them and allows for a mutually positive experience. The main elements under Customer Interactions address things such as outage, customer contact, billing and payment, education and outreach, and customer care. This request includes the following five projects, each over $3 million: (1) CSOD Staff Augmentation, (2) CS Post Operational Work, (3) Digital Experience Roadmap, (4) Advance Analytics, and (5) Rate Design. These capital software projects will allow SCE to mature and improve customer-facing functions and capabilities to better execute on interaction management with all of our stakeholders.

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34 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast carrying over to the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.

35 Digital Experience Roadmap is an exception to other projects in this chapter as the forecast begins in the 2021-2023 timeframe but is presented herein with other Customer Interactions BPG projects due to SCE having more certainty regarding this technology solution. As explained in Chapter IX.B.2, the forecast for this project is deducted from the 2021-2023 portfolio amount available for allocation.

36 SCE’s OU Capital Software forecast includes avoided cost benefits from the CSRP business case. OU Capital Software forecast costs in this GRC (post-CSRP) within the Customer Interactions BPG are considerably lower than the forecast costs for Customer Service OU projects in the 2018 GRC. This is due to reduced development effort relative to legacy capitalized software, especially for the CSS mainframe. SCE’s go-forward forecast to improve customer-facing capabilities no longer includes the need to upgrade, integrate, or increase functionality of the outdated CSS mainframe due to CSRP. These future costs are avoided in our forecast for this part.
A. Customer Contacts

1. CSOD Staff Augmentation (CIT-00-DM-DM-000190)

Table III-16
CSOD Staff Augmentation
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>CSOD Staff Augmentation</th>
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<tr>
<td>2018 GRC - Original Request</td>
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<td></td>
</tr>
</tbody>
</table>

a) Project or Program Description

The Customer Service Operations Department (CSOD) Staff Augmentation project is driven by SCE’s implementation of the new Customer Service Re-Platform (CSRP) program. Existing staff must be trained prior to CSRP going live, thus requiring the Customer Contact Center (CCC) and Revenue Services Organization (RSO) to augment their staff with temporary workers to support and maintain customer service levels. Additionally, because permanent employees will be inexperienced working with the new system and temporary employees will be inexperienced with both the current and new system, we expect productivity to be temporarily lower than normal based on analysis performed regarding increased average handle times. As a result of this temporary lower productivity, the CCC and RSO will have to rely on temporary third-party vendors to provide customer transaction support before and after CSRP is implemented. This staff augmentation will help SCE meet its responsibility to maintain satisfactory customer service levels within the CCC and RSO.

The portion of the CSOD Staff Augmentation project covered in this capitalized software volume of testimony consists of the IT costs to support this staff augmentation, including the costs to deploy workstations with all the necessary software, hardware, and connectivity to accept calls and process transactions to support customers.

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37 See Exhibit SCE-03, Volume 3.
b) **Need for Capital Project or Program Including Risk Avoided**

The implementation of the CSRP will introduce substantial changes by replacing the legacy mainframe customer billing system with a new standardized and centralized SAP-based platform. Peer reviews have demonstrated that backlog grows quickly in the RSO back office transactions and when CCC cannot process requests properly or there are system implementation issues. Our CSOD will need to add people in 2019 to support CCC and RSO employees who will be in training to learn the new systems. CSOD will also need to add incremental resources and vendors in 2020 to support system readiness. We expect the 2019 resources to all be on-site, and we have a network capacity study underway to evaluate if sufficient bandwidth is available to support the required capacity through stabilization. In 2020, we expect to bring on two new outsource service providers with utility and SAP knowledge. IT is partnering with Corporate Real Estate to build permanent and temporary training rooms required to educate the augmented staff to support SCE customers. IT will incur costs to provide the infrastructure for the workstations with the necessary technical equipment and connectivity for the temporary augmented staff so they may answer customer calls for CCC and process RSO transactions. IT will also support two new temporary third-party outsourced vendors with the software required to connect to our infrastructure to accept SCE customer calls and process SCE customer billing transactions. Through these temporary mechanisms, this project will allow SCE to maintain the customer experience and timely collection of revenue.

(1) **Benefits:**

The core benefits of the capitalized software portion of this project include (1) allowing for the augmented staff to successfully connect to SCE’s systems and provide the needed support for CCC and RSO through implementing the technology foundation for devices and training, (2) deploying the correct IT infrastructure to help with maintaining customer satisfaction levels by avoiding long wait times, and (3) increasing network connectivity to mitigate revenue loss by supporting customer billing transactions and minimizing billing issues.

c) **Scope and Cost Forecast**

In response to the significant impacts expected from CSRP, CSOD initiated this project so IT costs can be planned to support a smooth transition to our new SAP platform for both CCC and RSO. The forecast took into consideration the IT costs associated to support this program with a total of 15 training rooms consisting of (1) eight permanent training rooms with reliable audio visual (AV) systems to include ceiling mount projectors and screens; (2) two new training rooms fully
equipped to support 21 trainees per room with dual monitors, keyboards, mouse, Windows 10 devices, proper wire management to accept live calls, ceiling mount projectors, permanent screens, and permanent speakers with audio playback; and (3) five temporary training rooms with a 21 person capacity, with the same configuration to support training. This project also includes provisioning telecom hardware capacity with sufficient bandwidth, back-up power, and wireless throughput. Other costs within the forecast are to support two new vendors to connect to our SCE systems to process transactions on behalf of the CCC and RSO departments and to provide sufficient bandwidth to SCE and each vendor site.

(1) **Alternatives**

There are no viable alternatives, as doing nothing is not a feasible option. Without the IT work to support the infrastructure required for training rooms, telecom for connectivity to our network, AV, and desktop support required for training and augmented staff to work post training, our existing employees would need to work overtime for many months, depending on the stabilization period of the new system, impacting worker safety and satisfaction. This effort avoids an overall decline in employee morale. Doing nothing would also result in negative customer satisfaction impacts within the CCC, with long customer call wait times, and in RSO for potential inaccurate bills or large bills if bills are delayed and multiple months are billed in one statement.

**d) Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $3.49 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers and consultants, software and vendor costs, and hardware costs, and new required permanent facilities which will utilize IT equipment for over 5 years. Any new IT equipment purchased for augmented staff will be reallocated after 2022 to new users requiring equipment. The estimating is based on average hold time call volume analysis along with transaction backlog review costs required to support CCC and RSO workstations, network capacity and connectivity, along with training facility requirements.

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38 See Amended WPSCE-06V01P02 pp. 34 – 36, which has been updated to align with the revised CSRP implementation in early 2021. At the time of filing SCE’s 2021 GRC Application in August 2019, SCE assumed the new training vendors would be on-boarded in 2019. SCE’s amended forecast assumes this portion of the project will now begin in 2020.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

2. **CS Post Operational Work (CIT-00-DM-DM-000204)**

*Table III-17*

**CS Post Operational Work**

2019-2023 Forecast

*(Nominal $000)*

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a) **Project or Program Description**

This project implements new functionality improvements to SCE’s Customer Service Re-Platform (CSRP) which were deferred until the initial implementation of the new system. These deferred functionality improvements fall into three main categories: (1) support Community Choice Aggregation (CCA) Operational Improvements, (2) support two regulatory mandates: Power Factor Adjustment (PFA) and Schedule Lighting compliance checks, and (3) support Net Energy Metering (NEM) Program Updates. The implementation of these deferred functionality improvements will include the automation of current manual processes. Manual workarounds are often labor-intensive and implementing these new functionalities will aid with new products and ensure continued adherence to regulatory mandates. Beginning in 2020, and in support of the CCA Operational Improvements, SCE will begin the work needed to transition the existing CCA Dashboard from legacy systems into CSRP. This pre-implementation integration work is necessary for a seamless transition into CSRP and will enable the dashboard to continue providing both SCE and CCAs visibility of key CCA customer information such as usage data, payments, and enrollment/de-enrollment status.

b) **Need for Capital Project or Program Including Risk Avoided**

Changes to the existing legacy applications have been limited or restricted in order to reduce complications related to CSRP interdependencies and integration. After CSRP is
deployed, there will be remaining requirements that will need to be implemented. These requirements are being held until after the planned 2021 deployment of CSRP and will require automation of back office processes and additional integration of customer data. This program will look to prioritize and deploy this scope and implement the functionality identified during the CSRP “design freeze” period as necessary to implement as follows:

1. The CCA Operational Improvements are needed to provide CCA enrollment visibility through a dashboard which can then be shared with each CCA. This Dashboard will interface with SAP to provide an updated view of each CCA’s mass enrollment progression, as well as a summary view of generation charges sent to SCE with acknowledgement confirmations. This will optimize the back-office processes and enhance third party experiences by providing added visibility to customer account statuses. Successful implementation of this self-service dashboard will help drive down the number of inquiries needed during the processes. This project also includes system changes to address the current operational inefficiencies related to the generation bill data currently transmitted from the CCA’s back office to SCE systems via an Electronic Data Interchange (EDI) file. This system change is required to transition from the current EDI format to a Managed File Transfer (MFT) process to allow for more accurate and timely processing of the CCA’s bill data. Also included in this project are system changes to the Non-Energy Billing (NEB) system. Other Operating Revenue (OOR) fees are billed to each CCA for operational activities completed throughout the month. Due to high volumes of CCA accounts and current system limitations, SCE can only partially bill the CCA’s these fees. System changes will address the high volumes and delays due to manual work arounds and allow SCE to produce an accurate and timely bill to the CCA’s.

2. The first regulatory mandate, Power Factor Adjustment (PFA), exempts a subset of large commercial customers from a PFA, based on Advice Letter 3986-E which was approved on June 24, 2019. The Customer Billing Organization is currently processing these exemptions manually. Once CSRP is live, the billing of the PFA will no longer be a separate line item as it is today, so the automation provided by this project is needed to accurately bill customers without the PFA.

The second regulatory mandate relates to the Schedule Outdoor Area Lighting Service (AL-2) and Schedule Lighting – Street and Highway, Customer-Owned Installation, Metered Service (LS-3) compliance check. Advice Letter 3957-E-A was approved with an effective date of March 1, 2019 and allows SCE to perform routine incidental usage load validation. This affects approximately 18,000 service accounts and the current process includes monthly tracking of these...
accounts, annual load usage validations, rate changes to the Otherwise Applicable Tariff (OAT), and customer letters to notify them of rate changes, when applicable. This project will allow SCE to perform the required compliance check through an automated system process.

(3) The Net Energy Metering (NEM) Program Updates improvements are needed so that SCE can enhance its system capabilities to update existing NEM functionality. NEM aggregation billing is currently automated in the SCE billing system. However, a Petition for Modification of Resolution E-4665 has been submitted. This modification, if approved, would significantly change the billing algorithm and methodology for NEM aggregation billing, which would need to be implemented post-CSRP go live. Additionally, Resolution E-4792, approved June 23, 2016, mandates that SCE transition NEM customers to the prevailing NEM tariff once they have reached the 20th anniversary on their original Permit to Operate (PTO) date. NEM enrollment on the prevailing tariff is currently a manual process that is supported by Customer Billing Operations. This is cumbersome and the system automation provided by this project would be more efficient and would ensure a seamless transition for our customers. This automation is especially important because SCE has 400,000 NEM customers and the volume of customers subject to this prevailing tariff transition will continue to increase in the coming years.

(1) **Benefits**

Enabling these identified deferred functionality improvements will allow SCE to continue to meet regulatory mandates and avoid the long-term costs of additional staffing for manual workarounds that, absent this project, will be required. The system automations provided by this project will support accurate and timely billing, reduce the manual intensive processes associated with the setup, enrollment and billing of programs and rates, and improve processes and communications with SCE’s third-party partners. Additionally, this project will support SCE’s focus on providing customers with a portfolio of rate options and clean energy solutions to meet their needs.

c) **Scope and Cost Forecast**

As mentioned in Section 2.a above, in 2020 SCE will begin systems integration work needed to transition the CCA Dashboard from legacy systems to CSRP. In 2021, SCE will begin the following initiatives:

(1) **Support CCA Operational Improvements.** The scope of the CCA Operational Improvements include the ability to track the progress of mass enrollments and display generation charges and payments collected by SCE through a shared dashboard. This is designed to
provide incremental visibility for the CCAs to view the mass enrollment progress and operational activities related to each CCA’s accounts. Enhancements to the Non-Energy Billing (NEB) process will provide timely and accurate bills of Other Operating Revenue (OOR) fees to each of the CCA’s.

(2) **Support Regulatory Mandates.** The implementation related to the PFA regulatory mandate consists of providing automation to process PFA exempt customers and accurately bill these customers without the PFA. The implementation related to the Schedule Lighting regulatory mandate consists of providing an automated system process that will allow SCE to perform the required compliance check.

(3) **Support NEM Program Updates.** The scope of the Net Energy Metering (NEM) Program Updates are to enhance SCE’s system capabilities to automate the process by which NEM customers are removed from their existing NEM tariff on their 20th anniversary and moved to the prevailing NEM tariff.

d) **Alternatives considered:**

SCE considered including the functionality improvements discussed above within the scope of the CSRP project. This approach was evaluated but rejected since it would add significant risk to the main CSRP project. SCE also considered maintaining the current manual workarounds. However, while in some cases those manual workloads could be sustained for a time, in most cases the number of affected customers is too large for manual processing to be a viable ongoing solution.

e) **Basis for Capital Expenditure Forecast**

Based on the scope of these three areas of enhancements, the forecast for this project is $500,000 in 2020 and $3.361 million in 2021.\(^{39}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs. For the CCA enhancements (estimated at $1 million), SCE will utilize modules within CSRP. For implementing the two mandates (estimated at $1.361 million), SCE will use new CSRP billing classifications. For the NEM enhancements (estimated at $1 million), SCE will leverage

\(^{39}\) See WPSCE-06V01P02 pp. 37 – 39.
the new CSRP interfaces. For all three together, SCE estimates medium to complex changes that will come out to about 4,100 hours of development effort for all three areas of support required.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

3. **Digital Roadmap (CIT-00-DM-DM-000202)**

| Table III-18 |
| Digital Roadmap |
| 2019-2023 Forecast |
| (Nominal $000) |

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a) **Project or Program Description**

Customer engagement with SCE’s digital offerings has increased significantly in the past five years. Digital capabilities remain a foundation of SCE’s strategy for the customer experience, and SCE needs to continue to expand its self-service approach and deliver capabilities for SCE’s growing base of online customers who engage via digital channels. This program will develop and implement a roadmap of new features and new design elements, building on the current cloud-based digital infrastructure. The roadmap will emphasize the customer and end-user experience, simplifying the overall experience and improving ease-of-use for core self-service transactions for customers.

b) **Need for Capital Project or Program Including Risk Avoided**

This Digital Roadmap initiative will implement features to enable three digital strategies to support Digital Operations and Management: The first digital strategy involves a focus on the basics. This includes an optimized and functioning digital platform to meet the self-service

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40 Refer to SCE-03, Vol 4, section II.C.3 Table II-5.
41 Refer to SCE-03, Vol 4, section II.C.3.a for background on SCE’s request for this project.
42 Refer to SCE-03 Vol 4, section II.C.3 – “Improving Digital User Experience.”
capabilities that SCE’s customers demand with an easy to navigate experience. The average year-over-year growth of 45 percent for page views for the self-service outage center\(^{43}\) indicates that customers want to be able to complete the entirety of their SCE interaction within the digital channel as opposed to starting and leaving due to an unsatisfactory experience. This project meets that need by upgrading the user experience with a redesign of the SCE.com website, including site navigation architecture. Because customers are increasingly adopting technology such as smart speakers (Alexa, Google Home, etc.),\(^{44}\) SCE also needs to expand its digital ecosystem to accommodate this growth. This is the focus of SCE’s second digital strategy. This project will enable the integration of new digital channels, such as virtual agents and other updated self-service tools (e.g., chat support), to process core self-service transactions and further shift customer transactions to lower-cost digital channels. Lastly, our digital strategy includes the creation of personalized experiences. Customers are accustomed to web sites and other digital channels that provide personalized, targeted, and relevant content and messages.\(^{45}\) This project will enable the needed integration and infrastructure to deliver a more personalized digital experience for customers.

(1) **Benefits**

These investments will improve customer satisfaction by investing in an upgrade of the user experience on SCE.com, as well as enabling more personalized, targeted, and relevant content and messages. Additionally, improving the ability for customers to utilize existing and new digital channels and services (e.g., smart speakers, chat bots) through this project will further the shift of customer transactions to digital methods, which helps reduce call volume to the SCE call center and enables a more satisfactory self-service option for customers. Lastly, by investing in new digital technology that is in line with consumer industry trends, both in terms of functionality and usability, this program will increase SCE’s overall digital capabilities and improve the current digital experience for customers.\(^{46}\)

\(^{43}\) Refer to SCE-03, Vol 4, section II.C.3 Table II-5.


\(^{46}\) Refer to SCE-03, Vol 4, section II.C.3 for additional testimony related to SCE’s request for this project.
c) **Scope and Cost Forecast**

As referenced above, the Digital Roadmap initiative will implement features to support three digital strategies to support Digital Operations and Management: 47 (1) Focus on the Basics; (2) Expand SCE’s Digital Ecosystems; and (3) Create Personalized Experiences.

- **Focus on the Basics**: This strategy focuses on features to improve the core digital experience for customers through a redesign of the SCE web platform to better align with user experience (UX) principles. This will require additional site navigation, system logic, and back-office integration. SCE’s current web design is outdated by modern standards and putting the user experience at the forefront of the redesign will improve adoption and use of the website. For instance, reducing the number of steps it takes for a user to easily access their most frequently used transactions will increase the value the SCE web platform can bring to customers.

- **Expand SCE’s Digital Ecosystems**: This strategy aims to supplement the core SCE.com web platform, software, and systems through integration with third-party powered virtual assistants, chat bots, and enablement of additional new digital self-service platforms and software for core transactions, in alignment with market trends for new customer digital products.

- **Create Personalized Experiences**: This strategy includes investments which will provide the integration infrastructure needed to translate customer behavioral insights into personalized digital interactions. This program will implement the infrastructure and machine intelligence solution that will allow our web platform to identify which customer is accessing our web solution and analyze past customer behavior and needs. Once integrated, we can begin dynamically generating information and content tailored to individual users.

(1) **Alternatives Considered**

Without additional investment in the SCE digital platform, SCE may end up failing to meet customer expectations and standards for a digital experience. Additional incremental investments could be made over time to introduce smaller features, but that would have a more limited

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47 Refer to SCE-03, Vol 4, section II.C.3 – “Improving Digital User Experience.”
impact on customer satisfaction. Alternatively, SCE has the option to not invest in additional customer-facing digital experience capabilities, de-emphasizing self-service through the digital platform, and routing customers to options with the call center. This option was rejected because the digital experience would decline in comparison to user expectations and if customers abandon their usage of the digital and web platform, it would lead to higher operational costs over time and impact customer satisfaction.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $4.42 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, consultants, software and vendor costs, and hardware costs.

1. **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

### B. Customer Care Services

#### 1. Advanced Analytics (CIT-00-DM-DM-000250)

**Table III-19**

*Advanced Analytics*  
*2019-2023 Forecast*  
*(Nominal $000)*

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**a) Project or Program Description**

SCE has a continued need to advance the ability to analyze customer data and identify actionable patterns to provide proactive recommendations to customers. The implementation of the CS Re-Platform (CSRP) program in 2020 will drive efficiencies in analytics due to the consolidation

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48 See WPSCE-06V01P02 pp. 40 – 47.
of multiple data sources into one single source of customer data. This project will build upon that SAP customer database and provide the right tools and technology to develop new consolidated customer data models that would not have been available in the CS legacy applications. These customer data models will identify new opportunities for SCE to more cost effectively meet strategic objectives by better aligning customer needs with the services provided by SCE. By identifying and modeling customer use cases through this project, SCE will be able to predict customer wants and proactively inform customers of suggested actions to fulfill them. For instance, through analysis of customer socioeconomic and demographic data in conjunction with SCE circuit mapping data for usage and load patterns, SCE could identify the propensity of customers to purchase electric vehicles (EVs) and proactively send customers additional information on EVs and rebate programs to increase EV adoption.

b) Need for Capital Project or Program Including Risk Avoided

This program will not only improve SCE’s insight into customer behavior utilizing consolidated customer data models, but will also allow SCE to operationalize that insight across multiple customer channels. SCE will be able to develop these models through the infrastructure and user tools funded through this program to test use cases and discover new findings based on customer data. Additional insight into customer behavior is needed to help SCE identify new opportunities for customer satisfaction, operational cost reductions, and self-service transaction enhancements.

Use cases include:

- predicting the most common call types from customers and addressing their needs before they call;
- identifying rates and programs that will best meet customer needs to improve adoption; and
- identifying failed self-service transactions by tracking customer interaction points across multiple customer channels.

Predictive interactions, when a customer need is anticipated and a resolution is proactively suggested, will be built upon the consolidated customer data models and will be implemented across multiple customer contact channels to operationalize customer insights. An example scenario may include proactively notifying certain customers of payment plan arrangements if they are identified as customers likely to have requested one in the past. Such notifications could deflect calls to
the Customer Contact Center (a higher cost channel), as well as provide more proactive customer
service.

This program will also design and implement the application and data integration
to allow for a unified transactional experience across multiple channels based on customer data.
Through analysis of customer transactions, SCE can react and respond to customer needs in real-time.
Example scenarios include when a customer is unable to complete a transaction in one channel and must
switch to a different channel to finish. Through this program, SCE will build the integration to track a
customer transaction through multiple channels to support user experience continuity for the customer.

Finally, as part of the implementation of CSRP, customer data will be updated
and consolidated as part of the data conversion process. This centralization of customer data will allow
for better and more efficient reporting, reducing the number of different databases we currently need to
connect to in order to collect and store customer data. This project will build upon this centralization by
optimizing operational reporting. Rather than having to generate reports from multiple and different data
sources, SCE will be able to develop new reporting structures that can quickly process information from
one consolidated source of information more cost-efficiently.

(1) **Benefits**
The analytics advanced through this program will be used broadly across
Customer Service to generate insights, drive decision-making, and improve operational performance.
SCE will utilize this platform to optimize product and marketing spend, measure customer behavior, and
monitor interactions across all channels.49

Measuring customer behavior and interactions in real-time across multiple
channels will be key to deliver insights on how SCE can best optimize the customer experience.
Analyzing the moments when customers choose to switch channels, SCE can identify the pain points
within each contact channel, resolve the issue, and help serve customers in lower cost, higher
satisfaction contact channels. By doing so, SCE can also analyze and correct the pain points in the
customer’s experience to prevent future occurrences of this issue, helping to serve more customers
within a lower cost channel.

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49 See SCE-03, Vol 2, section II.C.3.a for additional testimony on SCE’s request for this project.
c) **Scope and Cost Forecast**

This initiative will implement the technology and infrastructure that will improve existing reporting capabilities and enable new customer analytics capabilities. Operational reporting will be enhanced through additional data modeling, system infrastructure, and data extracts. In order to establish a competency for self-service analytics, this initiative will construct a separate standalone technology testing environment and end-user tools and applications. This environment will be utilized by end-users to self-service their analytics needs, allowing users to efficiently and effectively develop and test data models. Integration and tracking will also be developed in order to analyze and optimize the customer experience across multiple channels.

(1) **Alternatives**

Rather than advance internal analytics capabilities, SCE could look to procure a fully external analytics platform to outsource this capability. However, this was rejected because it would require additional development for SCE to integrate and duplicate data with a third-party application, which would be avoided by developing a solution with both internal and external elements. A solely external solution would also require a non-SCE party to host and store SCE data, which could increase the risk of unintended data exposure for our customers.

A second alternative SCE considered would be to no longer invest in additional analytics and reporting capabilities. This option was rejected because this project is necessary to SCE having a more detailed understanding of SCE customer behavior. By having those additional customer insights, SCE will be able to optimize effort and dollars more efficiently.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $3.53 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, consultants, software and vendor costs, and hardware cost and for developing specific business outcomes required by this project.

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50 See WPSCE-06V01P02 pp. 48 – 50.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in the 2018 GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditure in 2017 or 2018 for this project.

**C. Billing & Payments**

1. **Rate Design (CIT-00-DM-DM-000201)**

   **Table III-20**
   **Rate Design**
   **2019-2023 Forecast**
   *(Nominal $000)*

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   a) **Project or Program Description**

   SCE continues to design, develop, and implement tariffs and rate management tools to better incentivize customer behavior not only to optimize their individual usage patterns but also to contribute to California’s state energy goals. This can be accomplished through a combination of providing additional educational information to customers, enhancing self-service tools, and providing effective rate options for customers. This program will include: (1) additional rate analysis capabilities for customers; (2) implementation and configuration of new rate designs; and (3) bill and rate presentment capabilities to improve customer understanding. In conjunction, these three focus areas will allow SCE to improve the customer experience and knowledge around SCE rates and tariffs.

   b) **Need for Capital Project or Program Including Risk Avoided**

   Customers are increasingly utilizing self-service capabilities\(^51\) to obtain additional information on different rate options and complete their transactions to help optimize energy usage and costs. This project will simplify the ability for customers to make educated decisions regarding their energy consumption.

\(^{51}\) Exhibit SCE-03, Volume 5, Section II.C.3.a.2 – “Energy Management Tool” contains details on growth of Rate Plan Comparison Tool (RPCT) users.
The implementation of CS Re-Platform (CSRP) will introduce substantial changes by replacing the legacy customer billing system with a new SAP-based platform. By moving away from the legacy application landscape, SCE will be able to standardize our existing tariff structures, as well as consolidate customer information into a single system or data source. This SAP-based platform will serve as the backbone for SCE’s tariff design moving forward. However, SCE will need to implement additional capabilities to support new rates that are likely to be required to support commission mandates, such as new rates to support California’s energy goals. Additionally, this initiative will ensure that SCE remains compliant with new and existing mandates. By upgrading key components and capabilities related to billing and rates, SCE will be better positioned to respond to compliance requirements. These billing capabilities are tied directly to the billing solution being replaced by CSRP. Thus, because CSRP’s revised implementation date is in early 2021, the implementation of billing and tariff capabilities in SAP will need to be deferred until 2021 as well. As a result, the implementation scope in 2020 is limited to focus on rate analysis capabilities, while allowing for the implementation of tariff and rate presentment capabilities to begin in 2021 to align with the CSRP implementation timeline. No other changes are anticipated, other than the shift in cost allocations to reflect dependencies with CSRP implementation.

Rate analysis capabilities are an essential component in driving customer understanding of their different tariff options. SCE created a Rate Plan Comparison Tool (RPCT), and in the past few years, the volume of users and visits have grown significantly, as well as a corresponding increase in customer feedback to enhance the capabilities of the tool. Through this initiative, SCE intends to broaden access to its rate tools and expand the available modeling capabilities to help customers make more informed decisions about their best rate. This will meet customers’ desire for information about their energy usage and rate options, both from a digital experience and from a billing experience, and ultimately impact customer satisfaction by expanding ease of transactions.

Rate presentment tools are critical in ensuring that customers understand their rates and how to reduce or shift energy during peak times. Graphical enhancements to the bill are useful for customers to better understand Time-Of-Use (TOU) and other rates. For example, SCE recently provided new graphs on TOU customer bills that clarified peak time periods, usage, costs per kWh, and

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52 Exhibit SCE-03, Volume 5, Section II.C.3.a.2 – “Energy Management Tool” contains details on growth of Rate Plan Comparison Tool (RPCT) users.
total costs per peak period. A survey\textsuperscript{53} of bundled customers who were provided with the new TOU graphs on their bill showed that 92% of customers found the new TOU graphs helpful, and SCE will look to implement a similar bill experience with CCA customers.

(1) **Benefits**

SCE is committed to remaining compliant with regulatory mandates. This initiative will build upon technology from the CSRP program in order to enable SCE to more efficiently develop new rates and tariffs that meet regulatory needs, as well as provide more options to customers. Additionally, SCE has received customer requests through surveys\textsuperscript{54} and CCAs to add additional capabilities for rate analysis and bill presentment. This initiative will help SCE to better meet those increasing customer demands and enable SCE to more effectively communicate to customers around various rate options and to better inform customers about their optimal rate choices and how different rates might impact their bills.

c) **Scope and Cost Forecast**

This initiative will implement features based on three key areas: rate analysis, rate design, and rate presentment. SCE will be updating the rate analysis modeling capabilities and user experience for existing customers, as well as expanding to additional customers and users who currently do not have access to those functions. Potential improvements for existing customers who can access the RPCT may include an enhanced multi-account experience, as well as the ability to better model scenarios for clean energy technologies, such as solar and storage. SCE hopes to expand access to rate analysis tools to additional customers by including additional rates and enabling customers with only a few months of usage history to view rate information and make rate changes. SCE also intends to support the mandated\textsuperscript{55} migration of Legacy TOU (TOU-D-A/B/T) customers onto new rates by helping them better understand the migration and their rate options through the RPCT.

As the need for new tariffs arise, the rates to support these tariffs will still need to be designed, tested, and implemented in accordance with the standards designed in SAP within the new billing system. Potential examples may include the development of new Net Energy Metering successor tariffs or new rates that enable locational adjustments.

\textsuperscript{53} TOU Default Survey 1B, Summer 2018.

\textsuperscript{54} TOU Default Survey 1B, Summer 2018.

\textsuperscript{55} 2018 GRC Ph 2 A.17-06-030 SCE-06 p. 21.
In order to better communicate these changes to our customers, adjustments and new features to the billing experience, such as a visual paper bill redesign or digital bill experience with interactive elements, will be made to better convey rate choices and options to SCE customers. Surveys have shown that bill enhancements such as new TOU graphs improve customer understanding of energy usage and resulting bill impacts. Per Advice Letter 3656-E submitted to the Commission, SCE will launch an effort to assess CCA billing format needs to generate bill parity for SCE and CCA billing information by integrating new TOU graphs and other bill elements. This project allows SCE to operationalize the findings from this assessment.

(1) **Alternatives considered:**

One alternative is to continue using existing technology solutions without additional investments. This alternative was rejected. This project will not only expand rate analysis capabilities, but also allow for the increase of new users for the RPCT tool. Without it, SCE will be excluding certain subsets of users and providing an inconsistent customer experience overall. The investments made by this project will allow SCE to build off the core capabilities implemented by CSRP to model additional rates within the Rate Analysis tool and provide a more holistic customer experience that matches what customers are looking for and aids customers in making better rate choices. In addition, without the planned investment in rate design capabilities, SCE may not be able to support the configuration of new rates and other regulatory requirements in an integrated and automated fashion, which could lead to higher costs.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $6.76 million. The forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, consultants, software and vendor costs, and hardware cost and for developing specific business outcomes required by this project.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

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See WPSCE-06V01P02 pp. 51 – 53.
Table III-21
Customer Interactions Projects less than $3M
Work Breakdown Structure (WBS) Forecast Capital Expenditures
(Nominal $000)

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000024</td>
<td>SCE.com Strategic Upgrade</td>
<td>$518</td>
<td>$87</td>
<td></td>
<td></td>
<td></td>
<td>$605</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000194</td>
<td>Digital Mobile App</td>
<td>$794</td>
<td>$483</td>
<td>$483</td>
<td></td>
<td></td>
<td>$1,760</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000199</td>
<td>Digital Virtual Agent</td>
<td></td>
<td>$1,127</td>
<td>$1,388</td>
<td></td>
<td></td>
<td>$2,514</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000251</td>
<td>Customer Information &amp; Data Management</td>
<td>$391</td>
<td>$830</td>
<td>$830</td>
<td></td>
<td></td>
<td>$2,052</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>$1,312</td>
<td>$2,088</td>
<td>$2,701</td>
<td>$830</td>
<td>$0</td>
<td>$6,932</td>
</tr>
</tbody>
</table>

Table III-21 lists capitalized software projects for Customer Interactions which have total forecasted project costs of less than $3 million and which are forecasted to be complete within this rate case cycle (i.e., 2019-2023).\textsuperscript{57, 58, 59}

\textsuperscript{57} See WPSCE-06V01P02 pp. 54 – 65.

\textsuperscript{58} Digital Roadmap will provide the integration for virtual agent and other self-service technologies. Digital: Virtual Agent will implement and enhance specific virtual agent solutions.

\textsuperscript{59} Customer Information & Data Management is unrelated to the Advanced Analytics project and is focused on data sharing solutions.
IV.

DISTRIBUTION GRID

This Chapter addresses SCE’s 2019-2020 forecast for capitalized software projects to support Distribution Grid. This entails the ability of SCE to maintain and advance the safety, methods, and tools by which we flow electricity to our customers. The main elements under Distribution Grid address things such as aging infrastructure, vegetation management, field inspections, and grid monitoring and operability. This request includes the following project, over $3 million: (1) Field Automated Test System (FATS) & Electrical Metering Services Tracking System (EMST) Replacement. This capital software project will allow SCE to mature and improve functions and capabilities to better manage work and assets.

A. Metering Activities

1. Field Automated Test System (FATS) & Electrical Metering Services Tracking System (EMST) Replacement (CIT-00-DM-DM-000267)

Table IV-22

<table>
<thead>
<tr>
<th>Field Automated Test System (FATS) &amp; Electrical Metering Services Tracking System (EMST) Replacement</th>
<th>2019-2023 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Nominal $000)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FATS &amp; EMST Replacement</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000267</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Project or Program Description

SCE has developed two interrelated work management systems to design, install, test and read complex metering: Field Automated Test System (FATS) and Electrical Metering Services Tracking System (EMST). Both the FATS and EMST systems are custom developed legacy systems that are obsolete due to their legacy programming language and legacy operating systems. FATS and EMST must be replaced to avoid inherent failure and/or corruption risk of either or both systems.

60 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables, and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.
An installed electric meter can undergo a variety of tests such as installation, routine, customer complaint, Public Utilities Commission inquiry, SCE request, or special tests. The FATS application automatically loads pending meter tests, generates revenue metering field work requests, routes pending tests to the right meter technician, guides the meter technician through the meter test as they perform it, stores the test results electronically, and notifies SCE technical and management personnel of the test results. In addition, timesheet information on each meter test is captured and forwarded to timesheet clerks daily who manually enter data into SAP.

The EMST application tracks requests for Meter Engineers to provide engineering designs for new complex metering installations. The design steps include identification and ordering of meters and components as well as development of engineering sheets to guide the installation. Once the design is complete and materials are available, the work is assigned to a meter technician to complete the installation using FATS. The EMST tool also provides a reporting mechanism to evaluate performance and establish service level goals based on their ability to measure the most important metering information.

The scope of this project is to replace the FATS and EMST systems with a commercial off the shelf solution to attain a comprehensive metering service work management system that is more responsive to the business and the needs of field resources with configurable software that can be enhanced without requiring custom code.

b) Need for Capital Project or Program Including Risk Avoided

The existing FATS and EMST suite of complex metering service applications have several risks. First, both the EMST and FATS software were written in a legacy programming language, Delphi 7, which is no longer supported commercially. This exposes SCE to risks of untimely system recovery if the existing systems fail. Moreover, the inflexibility of the Delphi 7 programming language to make modifications without the source code makes it difficult to update these critical systems and results in increasing challenges and costs to align with the latest business process and technology advancements made in the last two decades. Second, both FATS and EMST run on Windows 2003 servers which Microsoft will stop supporting by 2020. Given the existing environment of both systems, there is an inherent failure and/or corruption risk of either or both systems.

c) Scope and Cost Forecast

The scope of this project is the replacement of the FATS and EMST systems with a commercial off the shelf solution.
The primary functions of a new solution to replace the FATS system are the ability:

1. To provide summary and work order detail information that includes status, resource allocation, time sheet, tests executed and test results (Engineering Sheets), and meter reads;
2. To allow for daily work supervision activities such as organizing, monitoring, reviewing, and reassigning of work;
3. To provide the ability to audit, analyze, and track meter technician errors on completed work orders for quality assurance and training purposes; and
4. To provide the capability to run reports for field operations.

The primary functions of a new solution to replace the EMST system are the ability:

1. To create requests for engineering support of complex meter work;
2. To track the status of Meter Engineering requests and resource efficiency;
3. To provide electronic means for creation of Engineering Sheets;
4. To dispatch job specific Engineering Sheets to Meter Technicians for service configuration needs;
5. To track the cost associated with the materials required for engineering the job; and
6. To review each job for its accuracy before uploading it for completion

(1) Alternatives Considered

(a) Alternative #1:
SCE considered not pursuing this project, and instead continuing on the current versions and delaying the refresh. We did not choose this option because the existing FATS and EMST solution exposes SCE to several risks due to the legacy programming language which is no longer supported commercially and the lack of support from Microsoft for Windows 2003 Server.

(b) Alternative #2:
SCE considered replacing the existing field tool solution by building or buying a customized solution. We did not choose this option because we chose to leverage meter testing capabilities best practices in this space with existing commercial off the shelf technology solutions.
d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $6.32 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

1. **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

B. **Distribution Grid Projects less than $3 Million**

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000162</td>
<td>JPA WM</td>
<td>$162</td>
<td></td>
<td>$339</td>
<td></td>
<td></td>
<td>$500</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000233</td>
<td>Electronic WO Package Automation (e-WOP)</td>
<td>$1,073</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,073</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>$0</td>
<td>$1,234</td>
<td>$339</td>
<td>$0</td>
<td>$0</td>
<td>$1,573</td>
</tr>
</tbody>
</table>

Table IV-23 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).

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61 See WPSCE-06V01P02 pp. 66 – 68.
62 See WPSCE-06V01P02 pp. 69 – 74.
V.

ENTERPRISE SUPPORT

This Chapter addresses SCE’s 2019-2020 forecast for capitalized software projects to support Enterprise Support. This entails the ability of SCE to broadly provide the underlying foundational services on which the bulk of our business lines depend. The main elements under Enterprise Support address things such as technology, human resources, finances, procure to pay, strategy, and real estate. This request includes the following seven projects, each over $3 million: (1) Legal SharePoint Upgrade, (2) Digital Managed Services, (3) Enterprise Platform Core Refresh, (4) Windows 10 Upgrade, (5) System D Replacement, (6) Virtual Hybrid Data Center, and (7) HR Re-Platform. These capital software projects will allow SCE to mature and improve functions and capabilities to better execute on improving the reliability of our technology products and systems, managing information, and managing costs.

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63 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables, and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.

64 Virtual Hybrid Data Center is an exception to other projects in this chapter as the forecast begins in the 2021-2023 timeframe but is presented herein with other Enterprise Support BPG projects due to SCE having more certainty regarding this technology solution. As explained in Chapter IX.B.2, the forecast for this project is deducted from the 2021-2023 portfolio amount available for allocation.
A. Legal

1. Legal SharePoint Upgrade (CIT-00-DM-DM-000160)

Table V-24
Legal SharePoint Upgrade
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Legal SharePoint</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td>$853</td>
<td>$3,645</td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Project or Program Description

This project is to upgrade and migrate the current Claims Information Manager System (CIMS) used by the Law Department from the on-premise SharePoint to the new online SharePoint. The new version will be a partial redesign of the application that will stabilize the application and improve its performance.

b) Need for Capital Project or Program Including Risk Avoided.

CIMS is a custom-built application used to manage thousands of claims from incidents each year (e.g., SCE received 11,715 new claims in 2018). This system is used by the Claims Department, and serves as a one-stop solution to manage the complexities of claims. Claims against SCE are administered by the Claims Department, and include bodily injury, damage to electrical appliances, accidents involving SCE vehicles, and property damage. Claims filed by SCE against third parties ordinarily involve damage to SCE facilities or equipment caused by third parties, accidents involving SCE vehicles, and energy theft. CIMS went into operation in 2012. This system provides capabilities such as task board (workload scheduler), calendaring, workflow, built-in Word templates, activity logs, scanning, screen capture, and dynamic reports. The system enables the user to provide each claim file with a written chronology of all actions taken regarding the underlying claim. Over the years, this system has helped the Claims Department manage the claims workload and has provided them with valuable decision-making data.

The CIMS application has reached the end of its support lifecycle, which makes the technology old and unstable, as well as subject to outages and performance issues. The new system will be custom-built for Claims and will utilize the latest version of SharePoint Online which will make
CIMS more stable. The current model (SCE hosting SharePoint) causes more issues because upgrades come in periodically over 5-7 years. Moving to the cloud allows SCE to leverage Microsoft’s rolling release model, which means new versions, improvements, and features regularly. This will support the Claims Department in its three key areas: collections, liability, and subpoenas. The new system will continue to be a custom-built platform for Claims. Because of the current technology, SharePoint 2010, heavy use of workflows, and tight integration with Microsoft Office, Microsoft SharePoint will continue to be the development platform for the CIMS Upgrade. The CIMS Upgrade will possess the attributes mentioned above and resolve the issues of technical obsolescence (e.g., inability to operate with new systems and technical platforms such as Microsoft Office 2016 and Windows 10). SCE is presently using several temporary code repairs and constant monitoring to run CIMS, but this is only an interim solution. Because of its size and complexities (technical obsolescence being the biggest issue), the CIMS application is difficult and costly to maintain. For example, CIMS utilizes integrated custom documents for its letters which are not compatible with Windows 10, which SCE is upgrading to, and the latest version of Microsoft Office. This prevents the organization from achieving a fully collaborative environment because Claims cannot be upgraded with the rest of SCE. This increases the time required by the claims representative to create and review documents. Another related problem is the inability to provide access to the claim from any location. The system is not cloud based and forces the representative to be connected to the network during their field investigation.

(1) **Benefits**

This will give the Claims Representatives more flexibility in their investigation by reducing the time to process a claim. The time to process a claim involves several stages beginning with a person filing a claim, investigation and research, liability analysis, and response (pay/deny). Customers expect SCE to resolve claims promptly and equitably, and by reducing the time to handle a claim is one way to improve overall customer satisfaction. Failure to do so can lead to costly time spent on fielding complaints rather than resolving claims. Timely claims handling can also help avoid the chances for litigation. This is a direct benefit of the upgrade because it will provide stability and address performance issues. Monitoring costs throughout the claims process will also benefit the customer.

The upgrade will allow SCE to better monitor their collection process by tapping into other systems and validating that all damage reports from incidents, such as vehicle hit
poles. This will allow SCE to potentially collect payments from responsible parties and therefore write off less, which benefits customers.

c) **Scope and Cost Forecast**

The scope of this project is the upgrade of the CIMS application to management claims business process. The project will:

- Upgrade from SharePoint 2010 to SharePoint Online;
- Enable CIMS application and remediate issues in the new SharePoint Online System; and
- Stabilize performance.

(1) **Alternatives Considered**

One alternative is to not upgrade CIMS, which introduces the risk of claims not being recorded and responded to by the required timelines. The CIMS application, which currently uses SharePoint 2010, has been restarted 399 times in the last year because of stability issues experienced by the Law Department. We are also facing the issue of Microsoft not being available to support the application because it runs on an outdated platform they no longer provide services for. There are also limited options to modify or improve the application because it is built on SharePoint 2010. Another alternative is to migrate “like for like” functionality, which would require significant customization to archive data and be cost prohibitive.

d) **Basis for Capital Expenditure Forecast**

SCE is requesting $3.64 million for the 2019 – 2023 period to complete this project.\(^{65}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in the 2018 GRC, so there were no authorized capital expenditures for 2017 or 2018. However, this project began and recorded $853,000 in 2018. There was a similar project listed in the 2018 GRC Projects less than $3 million table (Legal Re-

\(^{65}\) See WPSCE-06V01P02 pp. 75 – 77.
Platform)\(^{66}\) which was to evaluate the entire Legal Platform in order to standardize and optimize the Legal departments technology, people, and process needs. This project remains separate and will result in moving our on-premise application to the cloud.

### B. Enterprise Technology

#### 1. Digital Managed Services (CIT-00-OP-CS-000078)

**Table V-25**

**Digital Managed Services**

**2019-2023 Forecast**

*(Nominal $000)*

<table>
<thead>
<tr>
<th>Digital Managed Services</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**a) Project or Program Description**

DMS will move SCE’s digital assets (primarily SCE.com) from within the SCE data center (on-premises) to the cloud, hosted by Microsoft (off-premises). Additionally, SCE.com DMS would transfer the management and execution of all ongoing IT maintenance/enhancement services, as well as a subset of CS business services, to a single third-party managed service provider. Finally, SCE.com DMS would enable multiple critical components in support of the CS Re-Platform (CSRP) project by providing flexibility in data integration and platform scaling (increased usage and functionalities for and by the customer) in future years.

**b) Need for Capital Project or Program Including Risk Avoided**

SCE.com DMS will migrate all existing SCE.com capabilities from on-premises .NET and WebSphere solutions to a cloud-based digital services solution. Doing so is expected to increase stability, security, supportability, and the ability to flex or contract capacity on demand. Decommissioning the .NET and WebSphere solutions will also result in technology simplification. In addition, this initiative will improve reliability, availability, and performance of SCE’s core customer facing platform for self-service transactions and information. Finally, SCE.com DMS will implement an API architecture framework which will modernize the integration exchange between SCE.com and on-

\(^{66}\) Refer to A.16-09-001 SCE-04, Vol.2, Ch. V, Section E, Table V-63.
premise legacy applications, resulting in increased system reliability and availability. Overall the SCE.com DMS platform will improve SCE’s ability to implement new changes rapidly, provide a modernized digital platform which can scale automatically to meet increased site visits, and improve agility and innovation while enabling the fulfillment of digital requirements for major programs (e.g., CSRP, Grid Modernization).

(1) **Benefits**

The project’s 5-year benefit-to-cost ratio of 1.73x consists of cost reductions ($16.9 million, net of incremental costs), avoided costs ($21.1 million), and redeployed labor ($11.7 million), but also necessary capital investment in order to achieve the overall business case benefits. Key qualitative benefits supporting this initiative include aligning with SCE’s technology strategic direction; aligning with the enterprise initiative to reduce costs by simplifying SCE’s application landscape; supporting the implementation of CSRP; outsourcing to a digital services provider, which will improve the management and execution of SCE.com; and reducing SCE.com performance issues and service disruptions by increasing the scalability and flexibility of the SCE.com platform.

c) **Scope and Cost Forecast**

This project will consolidate all the SCE.com on-premise .NET and WebSphere applications by migrating core customer interactions such as billing and payment, outage communications and reporting, turn on and turn off services, view usage, and static informational content to a single cloud-based digital services solution.

(1) **Alternatives Considered**

Alternative 1: SCE.com remains as-is with current constraints and SCE.com DMS occurs after CSRP. This alternative would avoid immediate cost outlay for the SCE.com DMS initiative, deferring those costs until after 2020. In addition, there would be no immediate IT or Business resource impacts. However, the downsides of this alternative include the inability to scale SCE.com in support of future Digital & CSRP requirements; no reduction in current operational risks & costs; delayed simplification of the IT landscape; high likelihood of significant business disruption continuing with the potential to increase; and inability to meet customer expectations of frequent and accelerated implementation speed for new offerings. These downsides outweigh the benefits of this alternative.
Alternative 2: SCE.com remains as-is and no DMS SCE.com project is executed. This alternative would require SCE to make an immediate capital outlay of $8.5 million in order to address current constraints, pain points, and integration framework with CSRP. The benefits of this alternative include the fact that the current managed service provider is experienced with the platform. The downsides include the need for an unplanned SCE.com capital investment of at least $8.5 million in 2018; no simplification of the SCE IT landscape; no reduction in the current operational risks and costs; continued use of the current SCE.com on premise solution which is highly complex; the current on-premises platform stability concerns will remain unaddressed and will result in increased likelihood of significant business disruption; and the fact that this alternative does not address implementation speed and performance concerns with new offerings. These downsides outweigh the benefits of this alternative.

   d) **Basis for Capital Expenditure Forecast**

   SCE is requesting $4.3 million for the 2019 – 2023 period to complete this project. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

   (1) **Comparison of 2017 & 2018 Authorized to Recorded**

   This was not included in the 2018 GRC, so there were no authorized capital expenditures for 2017 or 2018. However, the business case associated with migrating SCE.com to a cloud-based platform, including decommissioning the SCE.com on-premise solution, total cost of ownership cost reductions, and reliability and scalability improvements resulted in SCE’s business decision to initiate work in 2017. This project recorded $12.5 million in 2017 and 2018. SCE forecasts $4.3 million in 2019-2020 to complete the remaining scope of work for the DMS project.

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67 See WPSCE-06V01P02 pp. 78 – 80.
2. **Enterprise Platform Core Refresh (CIT-00-CC-CC-000022)**

**Table V-26**  
**Enterprise Platform Core Refresh**  
2019-2023 Forecast  
(Nominal $000)

<table>
<thead>
<tr>
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<tr>
<td>Recorded / Forecast</td>
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<td></td>
<td></td>
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<tr>
<td>2018 GRC - Original Request</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>$16,814</td>
</tr>
</tbody>
</table>

**a) Project or Program Description**

The Enterprise Platform Core Refresh (EPCR) is a maintenance driven project that upgrades the entire SAP footprint and refreshes computing and storage components, mitigating risks to our core Enterprise Resource Planning (ERP) platform and providing the ability to deploy the latest innovation from SAP. Upon completion of the final major release of the ERP Project in 2007, SCE (1) began updating HR Legal patches every year (and, when required for the HR legal patches, upgrades the entire suite to the latest patch level); and (2) perform a major software refresh every third year (i.e., EPCR). Through this approach, SCE stays current with a maintainable version of the software, which allows SCE to deploy the desired innovations provided by our software maintenance agreement, while reducing obsolesce and maintenance risks.

EPCR stabilizes capabilities across the enterprise such as payroll, purchasing, access management, financial management, billing, work order management, and data storage by applying operational patches and upgrades where necessary. This results in business improvements by increasing the speed of computing, which increases operational efficiencies for SCE personnel and customers. In SCE’s 2021 GRC, EPCR also includes the transition of SCE’s database platform to the HANA computing database platform and the addition of a disaster recovery platform as further discussed below.

**b) Need for Capital Project or Program Including Risk Avoided**

ERP Software systems, such as SAP, need to be upgraded/refreshed on a regular schedule to mitigate both the risk of failure and operational risk. Implementing SAP Support and Enhancement Packages allows us to keep the SCE ERP system up to date with security and product fixes in a timely manner. This avoids disruptions that would otherwise begin to occur as the SAP
platform starts to reach the end of its support lifecycle. Such disruptions could potentially result in delays with assigning and responding to customer outages, as well as in costly business impacts related to banking and cash management. The last EPCR was implemented in 2015, and the current ERP system (ECC 6.0) is due to become obsolete in 2025, with some elements reaching end-of-life as early as 2020. The fact that ECC 6.0 will become obsolete results in the need for SCE to migrate to the HANA platform as part of this project. The newer HANA platform further provides performance and reliability improvements in capabilities such as database services, advanced analytics processing, application development, data access, and administration. The HANA platform is based on in-memory computing, which is the storage of information in the main random access memory (RAM) of dedicated servers rather than complicated relational databases operating on comparatively slow disk drives.

EPCR also reduces some risk associated with security and disaster recovery through the addition of a disaster recovery platform. This includes the build out of a mirror environment for the SAP Enterprise Core Platform that may be necessary in the event of an emergency. Through the provision of up-to-date security patches to the system, it also prevents opportunities to exploit system vulnerabilities through unauthorized access to SCE data and information.

(1) **Benefits**

Benefits of this project include staying current with the SAP product line in order to maximize the return on investment from the deployment of SAP, while also minimizing the operational risks due to SAP system interruptions discussed above.

Complementary to fulfilling the primary need of avoiding risk from obsolescence, EPCR is important for the successful implementations of key strategic initiatives such as CSRP and Grid Modernization. This is because EPCR will stabilize SCE’s core data exchange and information storage platform, which will improve business process data flows and limit interruptions which could otherwise disrupt major implementations, like CSRP and Grid Modernization, which are integrated with core SAP components.

c) **Scope and Cost Forecast**

The scope of the EPCR project includes the refresh of computing and storage components of SAP, as well as migration of the SAP operating database infrastructure to the latest version of SAP’s database technology (i.e., HANA). This entails upgrading the versions of various SAP applications (where required) and migrating the SAP application servers to an upgraded operating
system called SUSE. This is a necessary step to successfully complete the transition to the HANA platform. The scope further includes ensuring that the following are compatible with SAP HANA and the upgraded SAP version:

- Custom developments in SCE’s SAP landscape;
- SAP components, third party add-ons, and bolt-on applications;
- Technical interfaces that support SAP and non-SAP systems across the enterprise;
- SAP peripheral systems (e.g., Governance Risk and Compliance, Supplier Portal, etc.); and
- Build out of disaster recovery system.

The majority of the project was completed over the 2014-2018 period, and the remaining forecast in 2019 of $3.56 million is to enhance a custom user interface that will simplify an SAP screen input. It was built on a platform that was aging and not compatible with the new HANA technology. The cost is to upgrade and regression test the new user interface screen platform. This work was scheduled to occur in 2018 but was deferred into 2019 to avoid operational impacts and complications to CSRP, which was under development in 2018 and required some of the same resources and environments as EPCR.

(1) **Alternatives considered:**

Prior to executing the program, consideration was given to delaying the EPCR Program until after the CSRP Program was implemented and stabilized. It was determined to be more cost effective and a less risky alternative to implement on current technology prior to the CSRP go-live. Not completing this work prior to CSRP would result in additional operational impacts (BIEs) and an unstable environment, causing additional risk to CSRP implementation.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project costs are $3.56 million, all of which is forecast to be spent in 2019. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project

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68 SUSE is an operating system that controls the technology.
69 See WPSCE-06V01P02 pp. 81 – 83.
cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

SCE was authorized $14.012 million for 2017-2018 for this project ($6.706 million for 2017 and $7.306 million for 2018). The 2017-2018 recorded expenditures for this project exceeded what SCE was authorized by $9.904 million in 2017 and $6.543 million in 2018. This is because SCE’s 2018 GRC forecast was reflective of a standard SAP Core refresh and did not include or anticipate the need for a technical transformation to HANA. SAP released significant technology advancements to the HANA platform between 2017 and 2018, resulting in a smaller physical footprint in the data center and significant performance gains which could not have been anticipated prior to SCE’s filing of our 2018 case. Taking advantage of these improvements from the vendor greatly enhanced SCE’s ERP capabilities as noted throughout this testimony. The amount SCE recorded over 2017-2018 authorized levels was further exacerbated by the 2018 GRC Decision reductions to SCE’s request by $1.34 million in 2017 and $1.46 million in 2018 for contingency.

3. **Windows 10 Upgrade (CIT-00-DM-DM-000155)**

**Table V-27**

*Windows 10 Upgrade*

*2019-2023 Forecast*

*(Nominal $000)*

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<thead>
<tr>
<th>Windows 10 Upgrade</th>
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<th>Forecast</th>
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<td></td>
<td>2015: $7,765</td>
<td>2020: $4,197</td>
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<tr>
<td></td>
<td>2016:</td>
<td>2021:</td>
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<td></td>
<td>2017:</td>
<td>2022:</td>
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<tr>
<td></td>
<td>2018:</td>
<td>2023:</td>
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<tr>
<td><strong>Total</strong></td>
<td>$20,419</td>
<td><strong>Total</strong></td>
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**a) Project or Program Description**

The focus of this project is to upgrade our current Windows-based operating systems to a single modern platform, Windows 10, which will enable cost savings and performance improvements. This project spans the entire SCE enterprise and employee base. SCE has adopted the Microsoft platform as the corporate standard to provide core capabilities such as email, chat, phone, collaboration, word processing, spreadsheet data analysis, and information presentation. Staying current with the Windows platform by upgrading to the next version allows SCE to be in alignment with our internal computing strategies as well as the Microsoft Enterprise Strategy. This is important in order to
take full advantage of the maintenance and service offerings in our contract with Microsoft. Windows 10 will simplify the desktop experience and provide a consistent computing experience across phones, tablets, and PCs, making our employees more responsive and productive. It will also provide current enterprise-grade security to help protect against modern threats and simplify the management of both corporate and employee-owned devices on our network.

b) **Need for Capital Project or Program Including Risk Avoided**

It is necessary to implement Windows 10 now in order to avoid increased costs from the Windows 7 Operating System which reaches end of life in 2020. To ensure continued vendor support, operational stability, and cybersecurity compliance, Windows 7 needs to be replaced in all areas of SCE. SCE will also face similar issues in coming years with the other Windows operating systems that followed Windows 7; deploying Windows 10 now will prevent those issues from occurring as well.

(1) **Benefits:**

The benefits to this project include:

- Enhanced productivity, security, and tools that will advance the way we work;
- Standardization of the Windows OS (Operating System) enterprise-wide;
- Provision of enterprise-grade cybersecurity; and
- Avoided cost savings in hardware refresh, software license, and maintenance upgrade costs by upgrading these operating systems to one standardized Windows platform.

c) **Scope and Cost Forecast**

The scope of this project includes upgrading the existing Windows XP, Windows 7, Windows 8, and Windows 8.1 operating systems to the current Microsoft platform of Windows 10 with Office 2016 for approximately 15,000 devices (laptops, desktops, and Surface devices). It further includes the following requirements:

- Conduct Windows 10 compatibility testing for Mission critical applications
- Remediate existing applications impacted by the Windows 10 or the Office 2016 upgrade
- Execute the enterprise rollout in the following phases based on the application readiness of each Organizational Unit (OU):
OUs with highly common and Microsoft compatible applications with no need for remediation

OUs with remediated applications

Provide organization readiness, communications, and training activities to prepare users for transition in all OUs

(1) **Alternatives considered:**

One alternative to this project is to continue to use the Windows 7 Operating System as a business and IT solutions technology. This alternative was rejected because the Windows 7 Operating System reaches end of life in 2020, which means that there would be a financial impact to SCE to continue supporting the Microsoft Windows 7 Operating System for continued vendor support, operational stability, and cybersecurity compliance. Additionally, continued operation and use of Windows 7 beyond Microsoft support could cause cybersecurity problems associated with standard monthly security updates.

SCE also considered upgrading to Windows 8.1. However, Windows 10 was determined to be more cost-effective because Windows 8.1 will reach its end-of-life in 2023 and require incremental O&M to maintain a CSA, thereafter. Windows 10 will not become obsolete until 2026. Further, Windows 10 provides enhanced cybersecurity features that are not offered with Windows 8.1.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 forecast for this project is $12.42 million. The capital forecast was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. SCE did not include this project as a request in our 2018 GRC because at the time SCE filed in 2016, we were in the very early stages of planning to move off the dated Windows platforms and did not recognize the benefits of doing so by 2020. Once SCE had better insight to the

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20 See WPSCE-06V01P02 pp. 84 – 86.
vendor support and obsolescence issues, it was necessary to perform immediate upgrades of several systems and infrastructure components. This included Microsoft System Center Configuration Manager (SCCM), Microsoft APP-V, and our Citrix infrastructure, which support the adoption of Windows 10. In total, SCE recorded $234,000 in 2017 and $7.765 million in 2018 for this project. The remaining project expenditures will provide for upgrading these support systems, followed by rolling out the new Windows 10 platform across the enterprise.

4. **System D Replacement (CIT-00-SD-PM-000268)**

**Table V-28**  
*System D Replacement*  
*2019-2023 Forecast*  
*(Nominal $000)*

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<th>System D Replacement</th>
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<td>2018 GRC - Original Request</td>
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</table>

Various WBS include: CIT-00-SD-PM-000268 and CIT-00-SD-PM-000268

a) **Project or Program Description**

The IBM Mainframe Data Warehouse database (System D) is being decommissioned after Customer Service Re-Platform (CSRP) implementation and all relevant database tables of applications that reside on System D need to be moved elsewhere or replaced by the end of 2020. There will be a grace period of one year and then the mainframe will be turned off in 2021.

While the CSRP program will replace CS-related applications and their functionality for reporting, this project will include the database tables of non-CS applications (mainly T&D and Finance) not covered by the CSRP program. The work will include moving the database tables of those applications along with their functionality for reporting to a different source prior to CSRP implementation.

b) **Need for Capital Project or Program Including Risk Avoided**

SCE’s mainframe legacy applications are highly complex and interdependent because they were built and integrated over time to provide critical customer service and other functions, such as billing and energy-usage management, customer care, outage communications, demand-side management, distribution automation and meter reading, and disaster recovery. An increasing number of
the legacy systems are becoming outdated or obsolete, which increases the risk of failure. Over time, continued modification of the legacy applications has resulted in degraded system performance and increased complexity and manual intervention to maintain them. Therefore, system obsolescence and failure risk, coupled with difficulty in modifying and maintaining customer systems, have hampered SCE’s ability to meet current and future business needs.

Mainframe system failure events in the last few years have resulted in impacts to critical customer service functions. It can take several hours or days to fully recover from a significant mainframe failure event, impacting the ability to perform customer billing, payment processing, collections activities, outage reporting to customers, and routine service transactions, including customer self-service on SCE.com. These events cause delays to bills and impact the Customer Contact Center in its ability to effectively respond to customer service requests. Additionally, because the complex system interfaces to the Customer Services System (SCE’s current customer service platform) serve over 4,200 users across the Company in Customer Service, Transmission and Distribution, and Finance and Revenue Reporting, these mainframe failures also impact these organizations as well as third parties such as Energy Service Providers and Community Choice Aggregators who rely on SCE usage, billing, and payment data for their revenue processing. Finally, the complex nature of the mainframe technology portfolio results in systems outages of several hours any time emergency or routine maintenance is performed. This project will mitigate these risks by moving the remaining T&D and Finance functionality off of the mainframe and on to more modern, stable, and reliable platforms.

(1) **Benefits:**

By reducing the number of system interfaces through the implementation of the CSRP project, SCE will also reduce the risk of system failures and technology operating costs. In addition to allowing for productivity improvements within the Customer Service organizations, CSRP will allow costs savings through the decommissioning of the legacy mainframe infrastructure. These cost savings will not be possible without moving the non-CS related applications and data in scope for this project out of the mainframe’s System D, due to the tight interdependent integration that was built between them.

c) **Scope and Cost Forecast**

The scope of this project covers the Finance and T&D applications (and database tables of those applications) not covered by the CSRP project. The work will include moving the active database tables of those applications that can transition to Hana/Hadoop prior to the CSRP. It will also
include decommissioning both (1) inactive database tables which can be decommissioned right away
(following standard procedures); and (2) other tables that are active and in scope for CSRP and thus
cannot be decommissioned until CSRP goes live.

The active database tables of applications in scope are:

- FDW (Financial Data Warehouse) – The database tables for this application are retained for historical reporting purposes only. The data will be moved to HANA/Hadoop and the tools used to access the data rewritten to point to the new source. This system has a Business Objects universe and reports that will need to be directed to the new source.

- Joint Pole Assets (JPAP & PDAP) – The database tables for this application are retained for historical reporting purposes only. The data will be moved to HANA/Hadoop and the tools used to access the data rewritten to point to the new source.

- Customer Receivables – Accounts Payable – This is a view-only historical database containing accounts payable information. The tables for this database will be moved to HANA/Hadoop and the tools used to access the data rewritten to point to the new source.

(1) **Alternatives Considered**

The only alternative is to keep the applications as they are in System D, but this alternative is not feasible as it would prevent SCE from decommissioning the mainframe and cause SCE to incur operational costs that are unaccounted for.

**d) Basis for Capital Expenditure Forecast**

The total 2019-2023 costs for this project are $3 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

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71 See WPSCE-06V01P02 pp. 87 – 89.
Comparison of 2017 & 2018 Authorized to Recorded

There were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

5. Virtual Hybrid Data Center (CIT-00-DM-DM-000221)

Table V-29
Virtual Hybrid Data Center
2019-2023 Forecast
(Nominal $000)

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<th>Virtual Hybrid Data Center</th>
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<td>$1,678</td>
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a) Project or Program Description

Data centers must adapt to the new demands being put on them by the competing desires to optimize performance and cut costs. The need for virtual versions of applications, hardware platforms, storage devices, and computer networks and data moving to the cloud is growing. Having a hybrid data center infrastructure which marries on premises and cloud solutions makes sense as it brings together the best of both worlds. This project will create a continuously improving service experience by enabling rapid introduction of new methods, ideas, and products. This hybrid data center will implement a platform which is based on common and reusable design patterns but allows adaptation to accommodate emerging technologies. The hybrid data center will enable significant overall cost reductions through transitioning a substantial amount of our infrastructure to the cloud by 2027.

The SCE Virtual Hybrid Data Center will:

- Replace manual provisioning processes with automated provisioning processes;
- Replace ad hoc network design with pattern-based network design;
- Add continuous monitoring of foundational infrastructure, thus increasing reliability;
- Add redundant and automatically scaled networking infrastructure, thus removing single points of failure;
• Implement standard application architecture patterns, thus reducing the time needed to migrate an application to the hybrid data center;
• Implement secure sandbox environments, allowing applications to quickly explore new technologies with production-like data; and
• Reduce operational costs by adding fine-grained cost management reporting.

b) Need for Capital Project or Program Including Risk Avoided

The project supports improved reliability through built-in cloud resiliency.
Business processes will be significantly improved by being able to respond to growing business demands using more responsive and readily available cloud technologies. Existing telecommunications paths between private and public cloud data centers were designed without redundancy for low traffic volumes. These will be replaced by high speed telecommunications having redundant paths between the on-premises data centers and public cloud data centers. This will enable using the public cloud for business critical applications and big data processing of video and imagery and will allow implementation of modern analytics tools which would have been difficult to implement using existing data center compute resources.

c) Scope and Cost Forecast

In addition to the specifics discussed in the project description above, the scope of this effort includes:

• Automation of cloud resource provisioning – This will implement processes and tools which replace manual provisioning of virtual machines with automated processes using modern management tools. This will result in the ability to provision resources following standard patterns and with minimal manual configuration and record keeping.

• Improved communications resiliency – This will complete a high-speed direct network circuit from Chino Air Operations, Pomona Innovation Village (PIV), and Irvine Operations Center (IOC) to a cloud provider co-location center. Additionally, this will implement network failover and improve cyber security authentication. This will result in faster network speeds and more reliable network connection between critical locations and the cloud.

• Migration of applications to cloud platforms – This will identify applications which will realize improved business processes or reduced cost
by migrating them to the cloud. These applications will be migrated from on-premises data centers to third party hosted locations. These migrated applications will be less costly to operate and maintain.

(1) **Alternatives Considered**

Developing a cloud platform on existing SCE data centers was considered. This approach would allow for faster provisioning of resources but was rejected because SCE would be unable to benefit from immediate cloud service additions and improvements made by the major cloud service providers.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 costs for this project are $1.68 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

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72 See WPSCE-06V01P02 pp. 90 – 92.
6. Identity Governance and Access Management (CIT-00-SD-PM-000261)

Table V-30
Identity Governance and Access Management
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Identity Governance &amp; Access Management (IGAM)</th>
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<td>2018 GRC - Authorized</td>
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<tr>
<td>2018 GRC - Original Request</td>
<td>$0</td>
<td>$0</td>
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a) **Project or Program Description**

The Identity Governance and Access Management (IGAM) project will upgrade the tools and processes that SCE uses to provide computer users with access to the right system at the right time. IGAM provides SCE’s workforce access to applications, revokes access to SCE systems when employees leave, protects critical data through central access control, enables productivity and performance through efficient access provisioning where access to all of SCE’s different systems is granted through a centralized tool, and addresses regulatory and compliance requirements, including access to SOX-controlled data and applications.

b) **Need for Capital Project or Program Including Risk Avoided**

The current system that SCE uses to provide centralized access control has reached end of life and extended support is no longer available from the vendor. The new product offered by the existing vendor is not compatible with our existing solution, which requires us to replace the legacy system as proposed through this project. In addition, the systems landscape that SCE needs to support has become more diverse since the current system was installed, and now includes traditional systems hosted on-premise at the SCE data centers as well as a number of third party cloud-based systems accessed over the Internet.

Thus, SCE will need to upgrade of replace the system to avoid future security and compliance risks and to minimize the risk to on-going operations across SCE. Also, there are issues with the current user experience and process efficiency where current processes are unable to provide access in a timely fashion, which in turn impacts efficiency and user satisfaction.
c) **Scope and Cost Forecast**

The scope of the project includes: (1) implementing a central identity and access management technology solution that tracks registered SCE computer users and what systems they have access to; (2) enabling standardized and automated access for on- and off-boarding (this enables new SCE users to be assigned to one or more groups, which in turn grant access to various systems; conversely, when users leave SCE their access can be revoked from a centralized system); (3) providing self-service for end-users to enable users to request access to systems and have that request be routed to the appropriate approving manager(s); and (4) improving access control for major projects by enabling temporary groups to be created for projects where the project team members can be granted access to the appropriate systems for the duration of the project.

(1) **Alternatives Considered**

- **Do nothing.** This is not a realistic option since the current system is no longer being supported by the vendor and is over 15 years old.
- **Upgrade the existing system.** This was considered as an option, but the modern system offered by the original vendor is sufficiently different from the system currently installed at SCE and the work involved would be equivalent to installing a completely new system.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 costs for this project are $10.27 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. However, this project began and recorded $5.73 million in 2018 due to the need to mitigate the risk of the vendor not being able to support the product. In fact, when SCE consulted with IBM about extending the support for their old product, they indicated that they could not because they no longer had people with that expertise. No support on an identity management solution

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73 See WPSCE-06V01P02 pp. 93 – 95.
means no new cyber security patching, which would increase the risk of continuing to delay the project to replace the legacy identity management system.

7. HR Re-Platform

Table V-31
HR Re-Platform
2019 – 2023 O&M Forecast
(Nominal $000)

<table>
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<tr>
<td>2018 GRC - Authorized</td>
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</tr>
</tbody>
</table>

a) Project Description

The Human Resource (HR) Re-Platform will replace SCE’s existing primary SAP Enterprise Resource Planning (ERP) Human Capital Management (HCM) system and consolidate multiple existing legacy systems into a cloud-based human-resource application. The existing applications independently support the following HR functional areas: Recruiting Marketing, Employee Self Service, Employee Central, Compensation Management, Case Management, and Workforce Analytics. As part of this project, SCE will improve its HR business processes and modernize its HR systems. Many of SCE’s existing HR systems and applications are obsolete or have limited vendor support going forward. Due to the age of these systems, SCE has limited ability to maintain and enhance these systems to enable new HR business processes.

b) Need for Project Including Risk Avoided

A primary objective for SCE’s HR organization is to create efficient processes and manager/employee self-service capabilities in order to reduce operational overhead. Core to achieving these objectives is enabling the following outcomes through a technology-based solution:

- Self-service for managers and employees – Provide employees and managers with data and information they need to perform everyday HR processes, without having to ask HR staff or go through the Shared Service Center for help.

24 See WPSCE-06V01P02A 95a – 95c
- Optimization of the HR technology portfolio – Transition business functions and processes from the existing SAP system and legacy systems to a new cloud-based application.

- Lower total cost of ownership – Decommission or consolidate applications, which will lower the costs of future technology development.

In addition to these objectives, there is a core technology shift driving this project based on SAP’s strategy. With improvements in cloud computing, SAP plans to stop development of improvements for the SAP ERP HCM modules SCE is currently using in Q1 2020. They have shifted focus to cloud-based applications and intend for their remaining ERP solution to only support base functions such as payroll, absence management, and time keeping. If we continue to rely on SAP on-premise solutions, we risk not getting the latest updates and security patches timely or the most up-to-date solutions to business problems because SAP is no longer focusing their development on these platforms.

(1) Benefits

There are several key benefits to re-platforming our HR systems. Providing more self-service functionality will eliminate manual, paper-based processes and reduce administrative support requirements leading to reduced costs. Transitioning to a portfolio of cloud-based systems will make our HR processes more widely available at reduced costs, providing benefits to our employees and operational efficiencies. It will also reduce our ownership costs of these systems long-term as the cloud-based portfolio provides timely and seamless access to the latest releases and innovations from SAP in a more efficient manner at a lower price point.

c) Scope and Cost Forecast

This project will replace the SAP ERP HCM module functionality with a cloud-based human resource application. Although HR functions will transition to the new solution, SCE intends for HR information in the existing SAP application to continue being utilized by shared service functions such as payroll, timekeeping, work management, and finance. The project scope will focus on the following areas:

- Employee Central – SCE will replace the Personal Administration (PA) and Organization Management (OM) modules in SAP. Employee Central will allow SCE to manage all employee data (personal and job) and organizational data. The improved integration will provide visibility to the entire workforce
and allow SCE to combine workforce data with financial and operation information from existing applications.

- **Compensation** – SCE will replace the existing compensation module in SAP, which is currently highly customized for business needs. As part of this scope, SCE will align the compensation program based on market benchmarks. SCE’s Short-Term Incentive Plans (STIP) and Executive Incentive Compensation (EIC) plans incentivize employees and executives to achieve goals that benefit our customers.

- **Recruiting Management** – This will replace Taleo, which is an Oracle application used at SCE for all recruiting activities. The new solution will source the talent for all positions within our company, post jobs on sources across the country, including job boards, colleges/universities, and social networks. It will also give recruiters instant access to candidates and postings. SCE can develop analytics by job, source, campaign, or many other data points to retrieve data quickly to optimize spend and reduce recruiting cycle time.

- **Workforce Analytics and Planning** – The Workforce Analytics and Planning module will support people, analytics, and workforce insights to drive talent decisions. Additionally, it will provide SCE the ability to identify the capabilities, skills, and talent needed in the short term and long term to achieve its objectives.

The result of this project will be an environment in which employee services are provided using a secure login to an on-premise and cloud-based Human Resource application suite. The SAP payroll and time-keeping modules will remain unchanged and continue to stay within SAP ERP. The scope will also include retrofit of 100+ interfaces currently in place to external vendors and internal systems.

(1) **Alternatives Considered**

The alternative of maintaining the current SAP ERP HCM platform for the employee functions described above is not viable because SAP will terminate maintenance and enhancements of HCM functionality. If we remain on the existing obsolete solution, SCE would assume maintenance risk and responsibility for the application. The existing portfolio of non-SAP HR
applications would also be replaced in a less consolidated manner, leading to inefficiencies, including redundancy of technology efforts and incremental process change impacts to the organization.

d) **Basis for Forecast**

This project will start in 2020 and be completed in 2023. The forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

**C. Enterprise Support Projects less than $3 Million**

**Table V-32**

*Enterprise Support Projects less than $3M*

*Work Breakdown Structure (WBS) Forecast Capital Expenditures (Nominal $000)*

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
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<td>$231</td>
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<td>Centralized Solution for Vehicle Assignment and Inspection Data Storage</td>
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</table>

Table V-32 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).\(^{25}\)

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\(^{25}\) See WPSCE-06V01P02 pp. 96 – 122c.
VI.

SUBSTATION

This Chapter addresses SCE’s 2019-2020 forecast for capitalized software projects to support Substations. This entails the ability of SCE to maintain and advance the safety, methods, and tools by which we transition the flow of electricity from generation to our customers. The main elements under Substation address things such as aging infrastructure, field inspections, and grid monitoring and operability, as described in Exhibit SCE-03. This request includes the following fifteen projects, each over $3 million: (1) Energy Management System (EMS) Refresh, (2) Outage Request Log (ORL), (3) Centralized Remedial Action Scheme (CRAS) Re-Platform, (4) Graphical Design Tool (GDT)/GSD - Tract/UGDDG - AUD Refresh, (5) Scope and Cost Management Tool (SCMT), (6) Grid Mapping Capability Refresh, (7) Field Tools Lightweight Solution, (8) Test Form Smart Tool, (9) cGIS Improvements, (10) SAM – Outage Management System, (11) WM Dashboard, (12) Network Metering Management System, (13) WM Portfolio Management, (14) Transformer Connectivity Model, and (15) Design Manager Optimization. These capital software projects will allow SCE to mature and improve functions and capabilities to better manage work and assets.

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76 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.
A. **Capital Related Expense**

1. **Energy Management System (EMS) Refresh (CIT-00-SD-PM-000231)**

   **Table VI-33**
   
   Energy Management System (EMS) Refresh
   
   2019-2023 Forecast
   
   (Nominal $000)

<table>
<thead>
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<th></th>
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<td></td>
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<td></td>
<td>$14,459</td>
</tr>
</tbody>
</table>

a) **Project or Program Description**

The Energy Management System (EMS) is operated by the Grid Control Center (GCC). The GCC monitors and controls the bulk power system 24/7, using SCE’s EMS, and its output is displayed on a video wall that graphically depicts the status of SCE’s and neighboring utilities’ bulk power systems.

This project will refresh the aging hardware and software components of the EMS system to maintain system availability. In addition to a technical refresh of the EMS hardware and software, this project will consolidate the EMS and Phasor systems. SCE’s Phasor system collects, stores, and shares Phasor Measurement Units (PMU) data. Consolidating EMS and Phasor onto a single platform will reduce hardware and software costs and simplify the maintenance of both systems. It will also provide a unified operator view of system conditions, eliminating the need for two separate but related systems.

b) **Need for Capital Project or Program Including Risk Avoided**

The primary driver for the EMS Refresh Project is the aging EMS system, since the vendor will not support the current version after 2019. The risk of hardware failure continues to rise as the system ages. By the time of the refresh, the hardware will be nine years old. Refreshing EMS will allow SCE to maintain system reliability at 99.95% or greater and reduce the risk posed by components reaching the end of life. System reliability of EMS is important to SCE Grid Operations because EMS system failures could impair the system operators’ ability to safely operate the grid. Besides the reliability needs, the current EMS configuration is also nearing its maximum data storage and processing capacity, and thus requires expansion.
(1) Benefits

In addition to the operational benefits of the technical refresh described above, consolidating EMS and Phasor systems will eliminate the following:

- The need to maintain dual systems, providing savings on Compliance and Operational support activities.
- The need to refresh each of the EMS and Phasor systems independently, resulting in a cost avoidance of $7.0 million.

c) Scope and Cost Forecast

The EMS Refresh will replace aging computing hardware and network equipment critical to maintaining communications with field devices. It will also enhance existing test environments to provide more effective testing prior to deployment. In addition, the refresh project will upgrade system and application software and expand user capacity to meet projected future growth.

The EMS and Phasor consolidation will migrate the separate instances of each of the applications, currently deployed on separate General Electric solutions, to a shared instance of the application. This consolidation will substantially reduce the total number of components in the system, reducing complexity and thus maintenance and support costs.

This project was launched in June 2016 and is expected to complete in mid-2019.

The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.\(^{27}\)

(1) Alternatives Considered

(a) Alternative 1:

SCE considered keeping the existing solution without modification. We did not pursue this option as the current version of EMS will not be supported by the vendor, and it does not provide on-going savings realized from consolidation of EMS and Phasor.

(b) Alternative 2:

SCE considered enhancing the existing solution by performing a refresh of EMS hardware and software now, but not consolidating the Phasor and EMS systems. We did

\(^{27}\) Refer to Chapter I.H of this testimony Volume.
not pursue this option because conducting the EMS Refresh and Phasor Refresh projects independently
would lead to higher costs, both in terms of project and maintenance costs. This alternative is estimated
at $23.04 million as compared to the selected approach, estimated at $17.93 million.

(c) Alternative 3:

SCE considered enhancing the existing solution by performing an
EMS hardware refresh without upgrading software and not consolidating the Phasor and EMS systems.
We did not pursue this option for the same reasons as alternative two. In addition, this option would not
address the risk posed by third-party software components also nearing end of life. This solution is also
expected to have costs higher costs ($20.5 million) compared to the selected option ($17.93 million).

d) Basis for Capital Expenditure Forecast

The total 2019-2023 costs for this project are $2.21 million. The capital forecast
for this project was developed using SCE’s internal cost estimation model. This model utilizes industry
best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for
this project includes costs for SCE employees, supplemental workers, and consultants, software and
vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

SCE was authorized $12.75 million in the 2018 rate case for EMS
(including $6.02 million for 2017 and $2.23 million for 2018). SCE recorded $6.75 million in 2017 and
$4.46 million in 2018. SCE is now forecasting total project costs of $17.93 million over 2016-2019, with
$2.21 million forecast for 2019 to complete the remaining scope of work for the EMS project. SCE
recorded more than authorized in 2017 and 2018, and the total project forecast has increased, because of
work related to addressing cybersecurity vulnerabilities. This work was required to ensure the EMS has
the appropriate cybersecurity controls in place to mitigate the risk of cyber-attacks to one of the primary
systems controlling the electric grid. The additional labor to design, install, test, and deploy these
additional cyber controls is the driver of the increased expenditure.

See WPSCE-06V01P02 pp. 123 – 125.
2. **Outage Request Log (ORL) (CIT-00-DM-DM-000177)**

*Table VI-34*

**Outage Request Log (ORL)**

**2019-2023 Forecast**

*(Nominal $000)*

<table>
<thead>
<tr>
<th>Outage Request Log (ORL)</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>2018 GRC - Authorized</td>
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<td>$3,062</td>
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<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td>$0</td>
</tr>
</tbody>
</table>

**a) Project or Program Description**

The Outage Request Log (ORL) program will replace the existing set of software applications used to request planned outages by grid operations and T&D field personnel in order to perform a variety of maintenance, upgrade, or construction activities necessary to ensure grid reliability. The current software application runs on an antiquated IBM legacy technology platform that is no longer supported by the vendor and is obsolete. The funding for this project was requested in a previous GRC filing. However, the project was delayed due to higher priority for wildfire-related projects, specifically related to inspecting and identifying potential ignition risks on our Transmission and Distribution assets, which resulted in unavailability of project personnel and funds. However, this application is important in the remediation of potential ignition risks where long-cycle, planned outages are needed to address the issues found during the enhanced off-cycle inspections.

**b) Need for Capital Project or Program Including Risk Avoided**

The Outage Request Log is a custom developed application on the obsolete IBM Lotus Notes & Domino platform applications used for managing the lifecycle of long-cycle outages. The current IBM platforms hosting the ORL Lotus Notes applications are beyond the end of their life and IBM no longer supports these platforms nor does IBM retain staff or invest in cybersecurity and maintenance updates necessary to continue operating on these platforms. As a result, it is necessary to migrate the ORL to a modern platform with flexible expandable modules to continue to achieve safe scheduling of outages for crews and customers as requirements change in the future. A lack of long cycle outage support would result in reliability issues due to equipment/assets not being repaired, replaced, or installed. Commercial Off-the-Shelf (COTS) software is available to meet SCE’s ORL
requirements and we anticipate buying and installing the software for the market servicing the utility industry.

(1) **Benefits**

The benefits of this project are to enable the complete decommissioning of Lotus Notes while retaining and enhancing the required outage planning and tracking functionality. ORL must be migrated off of the Lotus Notes and Domino platforms before these technologies are decommissioned in order to avoid a disruption in our ability to schedule and manage long-cycle planned outages. Additionally, the implementation of the new ORL software will provide for vendor support and maintenance including cybersecurity patching, the ability to address new requirements, and the capability for the application to scale up to meet the needs of increased usage (such as when long-cycle planned outages are necessary to remediate wildfire ignition risks on T&D equipment). Lastly, the ORL application will be capable of better integration with other systems as well as reporting and metrics on scheduling and executing planned outages, providing better visibility to SCE to allow for continuous improvement in this area.

c) **Scope and Cost Forecast**

The scope of this project is to provide the following functionality:

- Simplify the planned outage approval process;
- Provide the ability to create customized individual log applications that target specific activities in T&D;
- Integrate operational and IT processes and data enabling SCE to move towards convergence of grid technologies in the field with IT systems in the data centers for greater situational awareness and automation;
- Enhance mobility for crews, and the eliminate of paper-based processes; and
- Reduce wasted crew hours through higher productivity and more accurate and timely information in the field.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered keeping the existing solution without modification. We did not pursue this option as the current Lotus Notes platforms have reached the end
of their life and the vendor IBM no longer supports the Lotus Notes platform with no current maintenance support agreement for Lotus Notes.

(b) **Alternative 2:**

SCE considered replacing the existing solution by building a customized solution. We did not pursue this option because it would require SCE and contracted resources to identify the required skills and to set up the development and testing environments. This alternative was also not pursued because it would not be cost-effective to create such a solution because it would require significant future internal maintenance costs and resources.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 costs for this project are $3.06 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

3. **Centralized Remedial Action Scheme (CRAS) Re-Platform (CIT-00-SD-PM-000272)**

![Centralized Remedial Action Scheme (CRAS) Re-Platform Table](Table VI-35)

**Centralized Remedial Action Scheme (CRAS) Re-Platform**

**2019-2023 Forecast**

(Nominal $000)

<table>
<thead>
<tr>
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</table>

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22 See WPSCE-06V01P02 pp. 126 – 128.
a) **Project or Program Description**

The Centralized Remedial Action Scheme (CRAS) is operated by the Grid Control Center (GCC). The GCC monitors and controls the protection schemes at substations where major generation connects to the bulk power system 24/7, using SCE’s CRAS, and its output is displayed on a video wall that graphically depicts the status of SCE’s and neighboring utilities’ bulk power systems.

This project will refresh the aging hardware and software components of the CRAS system in the GCC to maintain system availability. In addition to a technical refresh of the CRAS hardware and software, this project will consolidate the CRAS onto the same GE platform as the EMS systems. We will migrate CRAS into the same platform as EMS after the EMS project discussed above is complete to unify situational awareness and control of the bulk electric system. Consolidating CRAS and EMS onto a single platform will reduce hardware and software costs and simplify the maintenance of both systems. It will also provide a unified operator view of system conditions, eliminating the need for two separate but related systems.

b) **Need for Capital Project or Program Including Risk Avoided**

The primary driver for the CRAS Refresh Project is the aging hardware platform that the CRAS system runs on, since the vendor discontinued standard support of the current version in 2017 on that hardware platform. The risk of hardware failure continues to rise as the system ages. By the time of the refresh, the hardware will be 9 years old. Refreshing CRAS will allow SCE to maintain system reliability at 99.95% or greater and reduce the risk posed by components reaching the end of life. System reliability of CRAS is important to SCE Grid Operations because CRAS system failures could impair the system operators’ ability to safely operate the grid. Besides the reliability needs, the current CRAS configuration is also nearing its maximum data storage and processing capacity, and requires expansion.

Finally, moving the CRAS central scenario planner and contingency analyzer in the grid control center to new hardware on the EMS platform mitigates the risk of cascading outages by ensuring the remedial action schemes implemented in the substation relays connecting large generators to the grid have coordinated protection schemes that reflect the state of the grid at all times.
(1) **Benefits:**

In addition to the operational benefits of migrating the CRAS software to the same platform as EMS, described above, consolidating CRAS and EMS systems will eliminate the following:

- The need to maintain dual hardware platforms, providing savings on Compliance and Operational support activities.
- The need to refresh each of the CRAS and EMS systems independently, resulting in a cost avoidance of $3.0 million in the future.

**c) Scope and Cost Forecast**

The CRAS refresh scope will replace aging computing hardware and network equipment in the Grid Data Center critical to maintaining communications with field devices. It will also enhance existing test environments to provide more effective testing prior to deployment. In addition, the refresh project will upgrade system and application software and expand user capacity to meet projected future growth.

The CRAS and EMS consolidation will migrate the separate instances of the GE XA21 platforms to a shared infrastructure. This consolidation will substantially reduce the total number of components in the system, reducing maintenance, support costs, and operational complexity.

This project is expected to be launched in July 2019 and would be complete by December 2020.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered keeping the existing solution without modification. We did not pursue this option as the current version of CRAS will not be supported by the vendor, and it does not provide on-going savings realized from consolidation of CRAS and EMS.

(b) **Alternative 2:**

SCE considered enhancing the existing solution by performing a refresh of CRAS hardware and software now, but not consolidating the EMS and CRAS systems. We did not pursue this option because conducting the CRAS Refresh and EMS Refresh projects independently will lead to higher costs, both in terms of project and maintenance costs.
(c) **Alternative 3:**

SCE considered enhancing the existing solution by performing a CRAS hardware refresh without upgrading software and not consolidating the EMS and CRAS systems. We did not pursue this option for the same reason as alternative two. In addition, this option would not address the risk posed by third-party-software components also nearing end of life.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 costs for this project are $13.40 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

4. **Graphical Design Tool (GDT)/GSD - Tract/UGDDG - AUD Refresh (CIT-00-DM-DM-000023)**

*Table VI-36*

<table>
<thead>
<tr>
<th>GDT Refresh/GSD - Tract/UGDDG - AUD Refresh</th>
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<td>2018 GRC - Original Request</td>
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a) **Project or Program Description**

The Automated Utility Design (AUD) Refresh project, which has previously been called the Graphical Design Tool (GDT) Refresh project, is an effort that will replace both of our

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80 See WPSCE-06V01P02 pp. 129 – 131.
existing graphical design solutions, AUD 2009 and Underground Drafting System (UDS) with AUD 8.1. Both AUD 2009 and UDS are AutoCAD-based products that are on versions no longer supported by the vendor. AUD 2009 was implemented in 2009 to perform graphical designs for SCE’s transmission and distribution planners and estimators. UDS was implemented in 2008 as a standalone solution specifically to address the needs of Tract Design and the Underground Drafting and Design Groups within the Distribution organization. In addition to both AUD 2009 and UDS no longer being vendor supported, neither application is compatible with Windows 10, SCE’s current operating system standard. Therefore, this project consists of upgrading our existing AUD 2009 and UDS applications in order to sustain ongoing operations.

The Commission adopted the AUD Refresh as part of SCE’s 2018 GRC under the names Graphical Design Refresh and GSD Tract- UGDDG. The AUD Refresh, was originally planned to begin in 2015. However, during our planning process it was determined that the only available version of AUD (AUD 2014) was at the end of the development lifecycle and therefore could not be enhanced to accommodate SCE’s core requirements. To mitigate the risks of developing on an aged, unsupported platform, SCE made the decision to delay the AUD Refresh effort to incorporate a later vendor product release. This decision allowed SCE to upgrade to the newest version of AUD (AUD 8.1) for this project, which would allow for SCE core requirements including future integration capabilities and the elimination of additional standalone design tools. As part of the AUD Refresh, SCE will expand utilization to tract and underground teams and decommission UDS which is now considered obsolete since it is unable to integrate with other SCE applications and is not compatible with Windows 10. SCE launched the AUD Refresh project in late 2018 and expects to complete this project in 2019.

b) **Need for Capital Project or Program Including Risk Avoided**

As technology evolves, failure to upgrade AUD 2009 and UDS would impact SCE’s ability to support electrical design operations. Both AUD 2009 and UDS are no longer being maintained by the vendor, which exposes SCE to increased risks of application failure and exposure to cyber security threats through the lack of vendor supported security updates and break-fix maintenance support. Additionally, AUD 2009 will not operate on Windows 10. Application failure of AUD 2009 or UDS would result in the need to perform manual calculations, manual ordering of materials, and the manual re-entry of design data into multiple systems for downstream processes. Cyber breaches could

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\(^{81}\) See SCE-05, Vol. 2 from A.13-11-003.
compromise customer related data and could introduce malware into interfacing systems. Refreshing AUD will eliminate all non-standard design applications and will allow for improved process and systems integration while reducing complexity in SCE’s system landscape.

**c) Scope and Cost Forecast**

The scope of the AUD Refresh project is to upgrade the existing AUD 2009 application and replace the existing UDS application with AUD 8.1, the most current version of AUD available. Within the scope of the AUD refresh are the following:

- Replace the unsupported, non-Windows 10 compatible legacy AUD 2009 with AUD 8.1;
- Replace the unsupported, non-Windows 10 compatible UDS application with AUD 8.1;
- Utilize an iterative design review process to ensure greater collaboration while in development and reduced risk and defect identification in testing the solution;
- Create an integration layer with SCE’s comprehensive Geographic Information System (cGIS) that will improve the accuracy and timeliness of cGIS updates with asset information from AUD’s graphical design;
- Replace complex legacy enhancements that require separate maintenance by moving to the current AUD 8.1 that has built those enhancements into the standard product;
- Leverage T&D end user resources in design reviews, testing, and training development to ensure a higher quality outcome and greater levels of user acceptance upon implementation and deployment of the solution;
- Improve the capability of creating work order polygons to support complex designs covering multiple assets over a geographic area;
- Perform end-to-end integration testing prior to implementation;
- Perform performance testing of the application prior to end user deployment;
- Perform end user training in support of improved user adoption; and
- Decommission legacy AUD 2009 and UDS applications and migrate all related graphical designs into the new solution.
1 Alternatives Considered

(a) Alternative 1:

SCE evaluated not pursuing this project, and instead continuing on the current versions of AUD 2009 and UDS. Further delay was not recommended based on the age of the existing applications and their inability to operate in a Windows 10 environment. Maintaining the old applications would create complexities in integrating with other systems, risk of application failure and additional licensing and hardware costs. It would be difficult for SCE to continue securing maintenance for the current versions of AUD 2009 and UDS as they are no longer supported by the product vendor. Additionally, delaying further would not address the business needs explained above.

(b) Alternative 2:

SCE evaluated re-platforming to a new COTS solution. We did not pursue this alternative because moving to a new platform would require significant development efforts around re-creation of all design standards and templates for a new system, paying for additional licensing costs, and replacement of all existing integration points. A brand new solution would require the re-development of all standards, workflows, forms and reports to be used by end users. To address these changes, SCE would incur significant Organizational Change Management (OCM) costs as it relates to additional training, end user support, and productivity loss to support the end user adoption of a brand new COTS solution.

d) Basis for Capital Expenditure Forecast

SCE forecasts $5.10 million to complete this project in 2019-2023. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

SCE was authorized $4.17 million over 2017 and 2018 in the 2018 rate case for the AUD refresh. SCE recorded $4.45 million in 2018, due to the delay in the start date of the project. SCE initially estimated the AUD Refresh effort to cost $6.6 million dollars. SCE is now requesting a total of $9.56 million from 2018 to 2019, which is $5.39 million over the 2018 authorized

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82 See WPSCE-06V01P02 pp. 132 – 134.
and $2.96 million over the initial estimate. This $2.96 million increase to the original estimate is necessary due to a need to purchases licenses for the front end user interface that is now being managed by a different vendor as well as purchasing licenses for the integration layer that will seamlessly integrate with SCE’s cGIS. Other that the additional license costs, there has been no significant change to the overall estimate to design, build, test and implement the solution.

5. **Scope and Cost Management Tool (SCMT) (CIT-00-DM-DM-000093)**

**Table VI-37**

*Scope and Cost Management Tool (SCMT) 2019-2023 Forecast (Nominal $000)*

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a) **Project or Program Description**

The Scope and Cost Management Tool (SCMT) is foundational to the Work Management process as it will provide a standard method of estimating the scope and costs of a project throughout its lifecycle. An improved scope estimating solution is required for SCE to more efficiently estimate the cost for all T&D and FERC 1000 projects, while managing to forecasts (via Portfolio Management) in a consistent manner. SCMT will allow for estimation accuracy commensurate with the phase of the project and level of engineering estimate available. As large capital projects progress from initial template-based estimates, to post job walks, or to detailed design,83 SCMT will provide the ability to conduct scope and cost estimates with more detail.

SCMT will also allow SCE to perform consistent scope and cost estimating earlier in the project planning process. As an input into the Portfolio Management solution, it will enable SCE to produce a comprehensive project forecast from inception to completion.

The SCMT project will provide an integrated and scalable enterprise level platform that enables SCE to replace the existing home grown SCMT solution with an industry standard

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83 Detailed design estimates for work orders managed in SCE’s Design Manager would be produced from within the Design Manager application.
solution. This first phase is a like-for-like solution. Future phases (out-of-scope) will then scale up that platform to enable additional capabilities and allow future replacement of the other disparate set of tools in use today with a single user-friendly platform in future projects. SCE uses a combination of software tools developed in-house, along with commercially available products. As these products age, their performance diminishes. Their inability to handle new types of work make them less useful. Replacing them with up-to-date technology will alleviate the issues described above and provide a platform capable of meeting future needs.

D.19-05-020 adopted the Scope Cost Management Tool project as part of SCE’s 2018 GRC. This project was delayed as a result of a management prioritization decision to better align the project with the Work Management Project and Portfolio Management Project in this GRC.84 SCE started the project in 2019.

b) **Need for Capital Project or Program Including Risk Avoided**

Implementation of an industry-standard Scope and Cost Management Tool will allow SCE to cost out the scope included in our current capital operating roadmap plans and more efficiently determine future spending needs. This allows SCE work managers and planners to perform more consistent estimates for increasingly complex projects. This is accomplished by providing predictable and consistent scope and cost estimating tools integrated to other enterprise work management tools. Additionally, SCMT will help enable SCE management to better analyze variances between planned and actual project costs and scope, across all large capital projects. This analysis will provide opportunities to improve the cost basis for future projects and improve our future project scope costing and project controls capabilities. The estimates that the SCMT solution will provide are expected to be an input into the Portfolio Management solution described above.

This will be an improvement over SCE’s existing process, which develops scope based on conceptual engineering prior to work order creation.85 This has been inadequate because refinement to scope and costs often occur later in the planning and development phases of a project. These revisions can cause impacts to the project schedule and budget when not properly re-estimated.
This project modernizes SCE’s tools and processes in use today and improves our current capabilities in several major areas:

1. Ease of use – Effective project scoping and costing is an involved and often complex process. The solution will allow for a more standardized user experience by embedding complex rules and processes into the workflow. It will also provide project scope and cost templates easily adjusted for a project.

2. Consistency – A standardized tool will improve consistency of estimates and therefore reduce variances. It will also provide more intelligence for users to understand the variances between estimated and actual costs.

3. Performance – Besides not meeting SCE’s functional needs, the tools in use are slow and cumbersome. The current tool can take up to 10 minutes or longer to calculate and display results for large projects. Due to the architecture of the current tool, a user’s computer and its processor are wholly occupied when running the SCMT analysis. The employee is left with little else to do other than to wait for the transaction to complete. By using contemporary tools and technology with modern architecture, the new solution will be more responsive and scalable.

4. Better Integration – As SCE moves toward a more robust EPC (engineering, procure, construct) model, the project scope and costing tools must integrate with both internal and external systems. This is especially true for major capital construction projects.

5. Flexibility – The current tools are limited in functionality to Transmission and Distribution projects only. Since SCE is expanding the need for project scoping and costing consistency into other areas (e.g., Transmission Telecom), a more extensible and scalable tool will be required. As other project types are incorporated into SCE’s IPSEC model, we can leverage the new Scope and Cost Management Tool for them as well. By addressing the areas mentioned above, SCE will improve overall capital project efficiencies, while providing more consistent capital spend plans.

c) **Scope and Cost Forecast**

The scope of the project is to provide an integrated and scalable enterprise level estimating platform that will:

1. Provide an initial estimate of scope and cost using standard project templates, then modified and revised as project scope is refined;

2. Provide a standardized platform for capital project scope estimation so they are consistent and repeatable;
3. Expand the range of projects that can be estimated (e.g., major capital project, programmatic project, interconnection, FERC 1000 projects, etc.); and

4. Assist in improved cost controls by providing a standard cost estimating methodology.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered enhancing the existing solution by addressing the performance issues and extending the capabilities to include all project types. We did not pursue this option because it would not be practical to meet our needs for better performance and would require extensive work to integrate with other future systems. As stated above, the performance issues are inherent to the system architecture and data model. Any enhancements would require significant changes in the code and database, which would not be practical. Additionally, since the data model is very different from other systems used in the IPSEC model, integration would be especially difficult and prone to errors as there is no effective way to directly map across the data models.

(b) **Alternative 2:**

SCE considered replacing the existing solution by building another customized solution to meet the needs of the SCMT scoping and costing functionality. We did not pursue this option because it would not meet our requirements to use an industry-standard platform and to minimize future maintenance costs. As stated previously, the existing tool was a custom-built solution that was internally developed by leveraging the existing database from the MDI tool, and it did not perform adequately.

(c) **Alternative 3:**

SCE considered leveraging its existing portfolio and performing an integrated build by distributing the current functionality across other IT work management initiatives, such as P6, SAP Project Systems, and Design Manager upgrades, if possible. This would include a detailed gap analysis of the capabilities of these tools to the business requirements and then develop processes for leveraging them. As reporting and notifications are major components of SCMT, other

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86 MDI (Multiple Document Interface) is a Microsoft Windows programming interface for creating an application that enables users to work with multiple documents at the same time.
systems must also be leveraged (e.g., Business Intelligence (BI) tools, eDMRM,\textsuperscript{87} SharePoint, Outlook).

Similar to Alternative 1 above, modifying other systems to meet the requirements was not pursued as there are significant gaps in functional requirements as well as dependencies on systems and work processes that would require major changes (e.g., earlier creation of SAP work orders, even for conceptual/unapproved project analysis).

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $4.672 million.\textsuperscript{88} The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

D.19-05-020 adopted the SCMT project as part of SCE’s 2018 GRC and authorized $4.17 million for the total project costs ($1.67 million in 2017 and $2.5 million in 2018). The SCMT project did not have any recorded dollars in 2017 or 2018 because the project was delayed due to budget and resource constraints, as well as a desire to better align the project with the Work Management Project and Portfolio Management Project. Additionally, the overall project forecast has increased from the $4.17 million in the 2018 GRC authorized forecast to $4.67 million forecast in this rate case, which is approximately a 10% increase. This slight increase is necessary to account for year-over-year inflation based on the delay in the project start.

\textsuperscript{87} eDMRM is Enterprise Document Management Records Management, a central records repository where certain archived documents are stored.

\textsuperscript{88} See WPSCE-06V01P02 pp. 135 – 137.

**Table VI-38**  
**Grid Mapping Capability Refresh**  
**2019-2023 Forecast**  
(Nominal $000)

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**a) Project or Program Description**

The Grid Mapping Capability Refresh (GMCR) will upgrade or replace SCE’s existing GE Smallworld solution. GE Smallworld is the primary Geographic Information System (GIS) application used by SCE’s Grid Operations to map asset data specific to maintaining the electrical connectivity network. The information supplied in GE Smallworld supports processes for asset inspection and repairs within the electrical connectivity network. Streetlight asset data is also maintained within this tool. GE Smallworld integrates with several core applications including the Outage Management System (OMS), SAP, Customer Service System (CSS), and comprehensive Geographic Information Systems (cGIS). The new solution will improve data quality, data consistency, and support processes to increase grid reliability.

**b) Need for Capital Project or Program Including Risk Avoided**

The current version of GE Smallworld was last upgraded in 2008 and is no longer supported by the vendor. As the application is not certified to run on the current standard Windows 2012 servers, SCE is currently running the application on Windows 2003 servers and Windows XP. While this project was requested in the 2018 GRC, this project had no authorized costs from the 2018 GRC decision. SCE is requesting this project again, in order to mitigate the risk of a system failure due to the age of the application and the lack of vendor support. Any application failures under this existing environment pose a risk to SCE’s core operations managing the electrical connectivity network.

Improvements in the Grid Mapping solution are focused mainly on technology obsolescence and increasing data accuracy, and would:
• Reduce risk due to technology incompatibility;
• Position SCE for routine maintenance of a current vendor supported application, minimizing risk of application failure or downtime;
• Improve electrical connectivity network data accuracy, contributing to the safety of both the public and field workers;
• Improve identification of asset data used to respond to interruptions, and restoration of electrical service outages (planned and unplanned);
• Minimize risk of information security exposure / cybersecurity breaches by implementing the current version software with the ability to accommodate the latest security standards; and
• Align grid connectivity network data to cGIS solution leading to enhanced data quality, data consistency, and reduced risks to data integrity.

c) **Scope and Cost Forecast**

The scope of the GMCR projects is to upgrade or replace the existing GE Smallworld application with a new solution that will align our existing grid mapping business capability with geospatial asset visualization industry standards, thus improving its overall integration with SCE’s primary cGIS capability. The new solution will improve data quality, data consistency, and support processes to increase grid reliability. These improvements include the following:

• Modify the GIS data model to current industry standards;
• Replace and integrate legacy GIS tools into a single platform;
• Create a systems integration to support a comprehensive electrical connectivity network; and
• Decommission legacy applications and migrate all related asset data into the new solution.

(1) **Alternatives Considered**

(a) **Alternative #1:**

One alternative is to continue using the current version of the tool, which is out of vendor support; this would neither address the issues identified above nor deliver the aforementioned benefits. As the current version of the tool is no longer supported by the vendor, this alternative is considered high risk to system reliability and is not recommended.
(b) **Alternative #2:**

Another alternative is to perform a basic technical refresh of the existing GE Smallworld application. This alternative would provide technical stability to SCE’s existing GE Smallworld application. However, a technical refresh would not achieve our objective of simplifying the application landscape of our GIS capability for the electrical connectivity network. Additionally, this option may not align to standardizing our capability of managing geo-spatial asset data. If this alternative were adopted, additional effort might be required to enhance data quality, ensure data consistency, and reduce risks to data integrity.

(c) **Alternative #3:**

A third alternative is to replace the existing tool with a custom developed application. This option would be a complex and costly process of identifying and designing all electrical connectivity system data elements. Additionally, developing a new application would require the need to integrate and build several new interfaces with our other existing software applications and would be costly to develop and maintain.

**d) Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $4.09 million.\(^\text{89}\)

The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

While this project was requested in the 2018 GRC, this project had no authorized costs from the 2018 GRC decision. Although SCE originally planned on starting this project in 2018, there were no recorded dollars in 2018 due to a shift in the scheduled project start. The GMCR start was shifted in order to support a freeze in the GIS landscape while core areas of the cGIS Improvements effort could be implemented. The overall GMCR project forecast decreased from the original request of $5.20 million in the 2018 rate case to $4.09 million in this rate case. This decrease in estimate assumes SCE will be able to leverage much of our existing infrastructure, and the primary costs for development effort will be in the replacement or upgrade of the GE Smallworld application.

\(^{89}\) See WPSCE-06V01P02 pp. 138 – 140.
Although the GMCR project estimate was not authorized in the 2018 Rate Case, this project is critical and necessary to pursue. Failure to pursue the GMCR effort would pose a significant risk to routine operations of the electrical connectivity network due to the age of the current application and the lack of vendor support. It would also increase the risk concerning SCE’s ability to support the electrical connectivity network, data quality and security breaches, and SCE’s ability to respond to outages and service interruptions.

7. **Field Tools Lightweight Solution (CIT-00-SD-PM-000273)**

   **Table VI-39**
   **Field Tools Lightweight Solution**
   **2019-2023 Forecast**
   *(Nominal $000)*

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   Various WBS include: CIT-00-SD-PM-000273 and CIT-00-DM-DM-000047

   **a) ** **Project or Program Description**

   The Field Tools Lightweight Solution (FTLS) project is a mobility strategy in support of modernizing and expanding SCE’s Consolidated Mobile Solution (CMS) capabilities. The Consolidated Mobile Solution (CMS) is an integrated work management system that supports all field work processes from field initiation through closing. FTLS, previously included in SCE’s 2018 GRC filing as the Field Tools Upgrade project, builds on the existing CMS platform with the development of lightweight tools that will enable SCE’s field personnel, system operators, and office workers to improve employee safety, outage responsiveness, and SCE’s ability to meet compliance obligations.

   **b) ** **Need for Capital Project or Program Including Risk Avoided**

   SCE continues to focus on maintaining and improving the safety and reliability of our electrical grid. In support of this objective, SCE must continue to improve our ability to identify, respond to, and execute work in the field. Through the development of FTLS, SCE will achieve greater work mobility and enable field personnel and system operators to be more responsive, efficient, and effective in support of these objectives.
FTLS will improve work performance by optimizing work and resource assignments across the IPSEC (Initiate, Plan, Schedule, Execute, and Close) process. In addition to directly supporting field resource responsiveness and effectiveness, this initiative aligns SCE’s mobility strategy to effectively execute work as planned within SCE’s Work Management Portfolio Management and Work Management Dashboard projects as described in this current 2021 Rate Case. This effort optimizes the alignment between upfront planning and management process with the downstream execution of field work. Failure to pursue the FTLS effort is a significant risk to SCE’s ability to optimize its field operations in support of increasing demands around maintaining and improving the safety and reliability of our electrical grid. In support of this objective, SCE must continue to improve our mobile capability and our ability to identify, respond to, and execute work in the field. 

c) **Scope and Cost Forecast**

The Field Tools Upgrade project builds on the platform delivered by the existing mobile solutions. It will enhance this platform to: (1) enable access of information from mobile devices such as smartphones, iPads, and tablet devices, (2) enable location-based services to reduce the data footprint in the Field Tool device, (3) allow contractors and mutual assistance crews to use the Field Tool in case of a storm, (4) expand use of the Field Tool to other SCE Operating Units instead of buying or building a comparable system, and (5) improve data quality, data consistency, and interface between the Field Tool and SCE supporting office systems such as SAP and Geographical Information Systems (GIS).

1. **Alternatives Considered**
   1. **Alternative 1:**
      SCE considered not pursuing this project. While the current Field Tool is operational, our experience suggests that as additional assets are added to the existing system and the user base expands, the potential for the system performance to degrade increases. In addition, the enhanced mobility options such as tablets and smartphones could not be provided to SCE’s field personnel under this alternative. Mobile devices can improve efficiency, usability, and user safety for certain tasks such as inspections.
   2. **Alternative 2:**
      SCE also considered replacing the existing field tool solution by building or buying a customized solution. This option was rejected because it would not be cost-
effective to create such a solution, it would cause a redundant application, and it would create additional maintenance costs to the existing system.

d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project forecast is $9.65 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

SCE was authorized $830 thousand for this project in 2018. However, the FTLS project did not have any recorded dollars in 2018 due to a shift in the scheduled project start. The FTLS start was shifted in order to support organizational and work flow changes within T&D that are needed to optimize their IPSEC and Work Management processes. The overall FTLS project forecast decreased slightly from the original request of $10.00 million in the 2018 Rate Case to $9.65 million in this rate case. This decrease in estimate assumes SCE will be able to leverage much of our existing hardware and infrastructure, and the primary costs will be for lightweight application development, APIs (application programming interfaces) and integration testing across an optimized workflow.

8. **Test Smart Form Tool (TSFT) (CIT-00-DM-DM-000081)**

**Table VI-40**

*Test Smart Form Tool (TSFT)*  
*2019-2023 Forecast*  
*(Nominal $000)*

<table>
<thead>
<tr>
<th>Test Smart Form Tool (TSFT)</th>
<th>Recorded</th>
<th>Forecast</th>
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<tbody>
<tr>
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<td></td>
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<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
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<tr>
<td>2018 GRC - Original Request</td>
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</tbody>
</table>

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20 See WPSCE-06V01P02 pp. 141 – 143.
a) **Project or Program Description**

This project consists of the replacement of the current Microsoft Access based Test Smart Form Tool (TSFT), a non-IT supported application, with a commercially available off-the-shelf-solution (COTS) tool in order to meet NERC CIP Reliability Standards, specifically NERC CIP-010-2 and NERC CIP-007-6.\(^{21}\) TSFT is used to collect evidence for all work performed on T&D managed Bulk Electric System (BES) Cyber Assets and associated Protected Cyber Assets (PCA). Due to the limitations within Microsoft Access databases, the current TSFT Microsoft Access tool is unable to meet the new NERC CIP standards. TSFT was authorized in SCE’s 2018 GRC filing under NERC CIP Compliance project.

b) **Need for Capital Project or Program Including Risk Avoided**

This project is needed because the current Microsoft Access TSFT is insufficient in its design and is limited in its capabilities to meet SCE’s operational and reliability requirements as stated in NERC V5, NERC CIP-010-2, NERC CIP-010-2 R2, and NERC CIP-00706.\(^{22}\) As a result, the TSFT application needs to be replaced with a more robust permanent solution that minimizes manual intervention, while meeting the NERC CIP Reliability Standards. Additionally, the current TSFT has minimal security, does not integrate with other systems, and cannot accommodate the required user base. Due to the above limitations of the current TSFT solution, a replacement solution is necessary to adhere to the current NERC V5 standards.

c) **Scope and Cost Forecast**

The remaining scope of this project for 2019 consists of designing, building, and delivering a software system that will have the ability to integrate with SAP, Aspen, and Doble Protection Suite, allowing SCE to manage system security and reducing the risk of compromising the operation or stability of the BES. This system will implement in 2019, providing preventative controls to assist field technicians in successfully completing settings configurations, storing compliance evidence, and validating security data, as well as in facilitating and protecting BES Cyber Asset passwords to authorized users.

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\(^{21}\) NERC V5 introduced stringent requirements for NERC CIP-010-2 Configuration Change Management, NERC CIP-010-2 R2 Configuration Monitoring, and NERC CIP-007-6 Malicious Code Prevention on the BES (Bulk Electric System).

\(^{22}\) *Id.*
Alternatives Considered

(a) Alternative 1:
SCE considered keeping the existing interim MS Access tool and not pursuing this project. SCE rejected this alternative, however, because continued use of the existing tool will cause SCE to become out of compliance with the NERC compliance mandates and will lead to more self-reporting of non-compliance. The result would be substantial NERC fines.

(b) Alternative 2:
SCE also considered developing a custom TSFT solution on an SCE-approved platform with interfaces to propagate the data to the source systems of record. SCE rejected this alternative because SCE lacks sufficient internal expertise to build a custom TSFT in house. As a result, attempting to build a custom TSFT in house would likely result in longer project time and higher costs, including (potentially) external vendor services. Prolonging the delivery of a solution would also potentially delay NERC CIP compliance, placing the BES Cyber System at risk until a solution is secured.

d) Basis for Capital Expenditure Forecast
The 2019-2023 capital forecast for this project is $3.3 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

Comparison of 2017 & 2018 Authorized to Recorded
D.19-05-020 adopted the Test Smart Form Tool project as part of SCE’s 2018 GRC and authorized $4.0 million for the total project costs ($3 million in 2017 and $1 million in 2018). SCE did not have any recorded spending in 2017 for this project but recorded $4.10 million in 2018. This project was delayed initially as the result of a management prioritization decision due to resource constraints in the planned start year due to higher priority projects. SCE started the project using O&M funds in 2017 to perform initial business planning and process work, and the capital work on the project began in 2018. Upon completion of the planning work, the overall TSFT project forecast increased from $4 million to $7.4 million for two primary reasons. First, the initial scope did not account

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21 See WPSCE-06V01P02 pp. 144 – 146.
for pre-paying maintenance of the license cost, which is necessary to save on the licenses due to bulk/volume purchasing and which allows capitalization of the cost. Second, vendor costs increased once the detailed design and analysis phase of the project was complete and detailed requirements were known. The project is expected to complete in 2019.

9. **cGIS Improvements (CIT-00-SD-PM-000191)**

   **Table VI-41**
   
   **cGIS Improvements**
   
   **2019-2023 Forecast**
   
   (Nominal $000)

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<td>$0</td>
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</table>

   a) **Project or Program Description**

   This project consists of necessary improvements to the comprehensive Geographic Information System (cGIS). The cGIS项目 provides SCE with the capabilities to maintain and view SCE electric asset records, which is vitally important given that SCE requires accuracy and consistency for its asset data in order to design and operate the electric grid safely and reliably. cGIS is an integrated set of systems supporting electrical design, asset mapping, and construction and maintenance operations. In addition to managing asset data, cGIS also provides work management capabilities to support asset mapping workflow.

   cGIS was initially developed in 2015 (Phase I), and was deployed to Transmission & Distribution (T&D) in 2016. Although the operational data became available and consumed by multiple systems through cGIS’s initial implementation, performance issues, complexity with the user interface, and complex operational processes limited SCE’s ability to gain widespread user adoption of the new cGIS solution. As a result, SCE engaged external consulting services to assess the technology landscape and application usability in order to understand the people, process, and technology challenges SCE faced with cGIS. This assessment recommended continuing to proceed with a cGIS improvement project and forming a Spatial Data Digitization team as part of the cGIS improvement project to address the following:
• Improve system performance to enhance throughput;
• Improve system stability and reliability;
• Enhance end user functionality to address needed capabilities;
• Improve data quality and accuracy of asset information;
• Improve operational processes and align processes to leverage system; functionality as intended;
• Improve governance over the management of geospatial asset records; and
• Develop and implement an Organization Change Management (OCM) strategy to support adoption across T&D.

The cGIS Improvements program was started in 2017 to address these assessment recommendations. A phased development and system implementation approach was used in order to verify the results of each implementation prior to moving to the next implementation. The project intends to complete all planned releases by the end of 2019. All communications and training efforts to support end user deployment and adoption across T&D will complete in 2020.

b) Need for Capital Project or Program Including Risk Avoided

This project is needed to gain the widespread user adoption of SCE’s current cGIS. Without widespread adoption, SCE could experience issues with data quality and records accuracy as users would continue to use disparate processes and tools to update asset data. cGIS Phase I was a major transformational program that migrated offline copies of drawings to a centralized Geographic Information System. Currently, cGIS data is used to support the maintenance and inspection of electrical assets as represented on SCE’s geospatial landbase maps, as well as for managing the electrical connectivity data model. Failure to maintain accurate electrical asset information would impose risks to the reliability of the electric grid and the safety of SCE’s customers and employees.

c) Scope and Cost Forecast

The scope of the cGIS improvement project includes the following technology and process improvements:

• Implement monitoring and load balancing tools to improve system reliability;
• Automate multiple manual functions in the cGIS application space;
• Upgrade the cGIS supporting applications to current versions to improve performance;
Expand the backend database environment to support large volumes of data transactions originating from cGIS;

Optimize business processes to minimize manual data entry and data extraction performance capabilities; and

Develop and implement a comprehensive training and support team structure to transition users to cGIS.

Targeted completion is planned for Q4 2019. Through the cGIS improvement effort, SCE has also extended the useful life of the cGIS solution, and thus has extended the date to refresh the application out accordingly.

(1) Alternatives Considered

(a) Alternative 1:

SCE considered keeping the existing solution without improvements and instead adding significant staffing to T&D. This alternative was rejected because this would not be a sustainable model in the long run. Without the system improvements, T&D users will not use cGIS and the data will become stale.

(b) Alternative 2:

SCE also considered keeping the existing solution and starting earlier on the transition to SCE’s long-term architecture using Environmental Systems Research Institute (ESRI) product stack, a 3rd party Geographic Information System software product. However, SCE did not pursue this option because the estimated duration for the transition to the long-term architecture is at least 5 years. Additionally, data would continue to grow stale thus increasing the risk of inaccurate electrical asset data.

d) Basis for Capital Expenditure Forecast

In this rate case period (2019-2023), SCE forecasts $8.99 million to complete the project, which began in 2016.\textsuperscript{24} The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

\textsuperscript{24} See WPSCE-06V01P02 pp. 147 – 149.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

The original cGIS project was authorized in the 2015 GRC and completed in December 2015. The current cGIS improvement project was not included in the 2018 GRC because issues around cGIS performance, stability, functional gaps, and user adoption surfaced after the original cGIS project closed and after the 2018 GRC filing had been submitted. Thus, there were no authorized expenditures for 2017 or 2018. The cGIS improvement efforts recorded $22.11 million from 2016 to 2018, and SCE is forecasting an additional $8.99 million in 2019 for a total of $31.1 million from 2016-2019. The $31.1 million expenditure resulted from a change in prioritization across the T&D portfolio as cGIS is foundational to SCE’s ability to update and manage critical asset business records. Investing in the cGIS improvement effort was critical to ensuring the ability to accurately and effectively update critical asset records and minimize risks to data quality and data integrity.

10. **SAM – Outage Management System (CIT-00-DM-DM-000050)**

**Table VI-42**

**SAM – Outage Management System**

**2019-2023 Forecast**

(Nominal $000)

<table>
<thead>
<tr>
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<td></td>
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<td>$6,700</td>
</tr>
</tbody>
</table>

a) **Project or Program Description**

The Outage Management System (OMS) is used by SCE’s Grid Operations division to monitor, identify, and operate electrical network and associated assets during electrical system outages on SCE’s distribution network. D.15-11-021 adopted the Outage Management System (OMS) Refresh project as part of SCE’s 2015 GRC. Since then, we have made cost and schedule adjustments to the project. The project was originally scheduled to begin in July 2014 and complete in June 2016. In SCE’s 2018 GRC, SCE explained that, in order to accommodate an extended pre-engineering phase due to scope increase and related vendor scope re-definition, the project start date was delayed to November 2014 and would end in December 2017. In that GRC, SCE categorized the additional scope from the 2015 GRC as (1) a Transmission Substation-level (Trans-Sub) Connectivity
Model; and (2) additional OMS enhancements, including further integration with Smart Meter functionality.

In this GRC, SCE extends the schedule one more time to December 2019. After completing the upgrades requested and authorized in our 2018 GRC filing in 2017, SCE determined that more work was needed in order to fix performance and stability issues resulting from the software upgrade and hardware re-platform and to accommodate additional enhancements. The additional scope required to fix the OMS performance and stability issues and complete this project with investments in 2018 and 2019 is comprised of: (1) dedicated critical infrastructure components to isolate OMS from the influences of other heavy resource consuming applications in a shared environment; (2) upgrade of middleware components for improved cybersecurity, improved performance, and OMS stability; (3) improvements to monitoring tools such as network monitoring, infrastructure at component level monitoring, and device monitoring at a user level for better diagnosis of isolated issues; and (4) process improvements to have quicker response and resolution to high criticality issues.

b) **Need for Capital Project or Program Including Risk Avoided**

The functionality and upgrades requested and authorized in our 2018 GRC filing for the OMS refresh were completed in 2017, but the implementation caused OMS performance and stability issues that required extensive troubleshooting with the vendors and necessitated the additional scope discussed herein. The investments in 2018 and 2019, totaling $5.45 million, are required to resolve the operational issues and fully realize the benefits of this program.

(1) **Benefits**

The benefits of performing the additional scope for this program in 2018-2019 are that doing so ensures operational stability and acceptable OMS performance. First, refreshing the OMS system will retain the vendor support required for on-going operations and help deliver more reliable system operations and performance. The OMS technical refresh will also improve availability and reliability of interfaces with other key SCE operating systems that enable OMS to reduce system down time and meet business objectives.

Second, the current system has a stand-alone Distribution circuit model, and it does not show the connections between the Distribution system and the Transmission system. A better grouping of affected distribution circuits will reduce manual analysis and help streamline dispatch decision-making. The Trans-Sub Connectivity model implementation in OMS is needed to provide
visibility to the Transmission network and to avoid analysts having to do time-consuming manual analyses to fully determine outage impacts. The availability of the Trans-Sub Connectivity model in OMS will also provide direct visibility to Transmission level outages, allowing a building block toward establishing an end-to-end Grid Connectivity model.

Third, we have identified a set of enhancements to the current OMS functionality. Implementation of automated methods to prioritize outage incidents will lead to better decision-making during storm response and help reduce outage response times. In addition, the capability to seamlessly “ping” customer meters from OMS, both individually and by groups of meters, to confirm an outage or restoration in near real-time will assist in timely decision-making by Grid Operations.

Finally, the upgraded infrastructure deployed in 2018 and 2019 will offer better security, improved performance, and be more reliable. Isolation of certain infrastructure components will prevent OMS from becoming susceptible to other growing applications’ resource consumption. Enhanced monitoring of detailed components will help diagnose isolated issues in a very timely manner. Process improvements will significantly reduce the turnaround with issue fixes by providing easier ways to register issues with the required detail, and by providing improved means to align support teams to get onto critical issues and resolve them in an expedited manner.

c) **Scope and Cost Forecast**

In 2018 and 2019, SCE will invest $5.45 million in infrastructure, cybersecurity, and software to improve OMS performance and stability and reduce operational impacts and continuing operational risks. This work includes software and hardware investments to improve the stability of the OMS and increase end user performance as discussed in the benefits section above.

(1) **Alternatives Considered**

(a) **Alternative No. 1:**

SCE considered keeping the existing solution delivered as part of the 2018 OMS project scope without modification. We did not pursue this option because it would lead to significant risk to (1) system availability as the product will be unsupported by the vendor, and (2) reliability and public safety while SCE operates manually during times of OMS system outage. Any associated benefits related to enhancements and the Trans-Sub Connectivity model would not be realized under this alternative.
d) **Basis for Capital Expenditure Forecast**

SCE will record $2.94 million in 2019 to complete this project, bringing overall project costs over 2014-2019 to $16.36 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

SCE was authorized $3.071 million in 2017 to complete the OMS Refresh project, but was able to complete the authorized functionality and upgrades for only $2.635 million. This spending under authorized was due to the vendor software design and upgrade not being as complex as originally anticipated. However, due to the performance and stability issues that arose (because the older software design was not suited to run on a modern platform) after SCE completed the OMS refresh in 2017, it became necessary for SCE to record an additional $2.51 million in 2018 and $2.94 million in 2019 to ensure operational stability and acceptable OMS performance. This 2018-2019 spending is the focus of this testimony.

11. **WM Dashboard (CIT-00-SD-PM-000155)**

<table>
<thead>
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<th>WM Dashboard</th>
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<tbody>
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<td><strong>Table VI-43</strong></td>
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<td><strong>2018 GRC - Authorized</strong></td>
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<td><strong>2018 GRC - Original Request</strong></td>
<td><strong>$46</strong></td>
<td><strong>$1,006</strong></td>
</tr>
</tbody>
</table>

25 See WPSCE-06V01P02 pp. 150 – 152.
to the core enterprise applications. This will ensure that we further leverage existing core enterprise
systems and interfaces and increase data integrity in our core enterprise applications. The resulting data
in our core enterprise applications will then be exposed to an enterprise wide reporting environment
where integrated work management reporting, analytics, and dashboards will be developed that will
enable consistent planning, forecasting, and reporting across all T&D work. It will provide an integrated
view of work across all departments at a level that is not available today.

D.19-05-020 adopted the T&D WM Dashboard project as part of SCE’s 2018
GRC. However, the project schedule and budget have subsequently been expanded:

- **Expanded Schedule:** SCE decided it was prudent to extend the schedule for
two reasons. First, SCE wanted to align this project with other related project
schedules and those project objectives. Initially the project’s execution
strategy was “lift and shift” – lifting the current legacy application
functionalities and shifting into existing enterprise systems with an
assumption of little to no changes to business processes. However, as new
initiatives (Work Management Portfolio Management, etc.) emerged in the
work management space, new opportunities were identified to streamline and
optimize business processes rather than to move inefficient processes to new
systems. Second, because several enterprise systems are home to the Access
database functionalities, SCE needed to line up the project schedule with the
availability of other enterprise systems to account for system development
freezes (CSRP, SAP, DM, etc.).

- **Increased Costs:** Project costs increased for three main reasons. First, the
extended schedule has increased project costs. Second, after the 2018 GRC
application was filed, SCE discovered that additional work groups within
T&D were also using Access and Excel as business tracking databases. This
expanded the scope of the project from eighteen databases to twenty-three.
Third, after SCE began the common analysis and design phase, SCE
discovered that the complexity and interrelationships of the Access databases
and outdated processes would increase the complexity of the resulting design.
For example, during the analysis phase of the project, several integration
requirements with other enterprise systems (SharePoint, CMS, etc.) were identified that were not envisioned during the initial estimation period.

b) **Need for Capital Project or Program Including Risk Avoided**

T&D does not currently have a reporting and analytics solution that would provide the organization with a comprehensive view of performance across all resources and work types. The organization currently relies on the remaining Microsoft Access databases in an attempt to fill this gap. These are used by planners, project managers, and Resource Planning and Performance Management (RPPM) to track the status of work order tasks (e.g., planner related tasks such as design and permitting), key work order dates (e.g., customer commitment, regulatory compliance dates, and material delivery dates), and contractor crew scheduling status, among others. The current tools and processes have the following issues:

- Data quality and accuracy issues caused by using isolated systems that are not automatically updated;
- No comprehensive view of T&D’s construction and maintenance work, thus requiring multiple tools to gather and reconcile resource and work status;
- Limited resource capacity and demand management capabilities for current trackers across T&D’s planning organization;
- No automated work flow management capabilities for the current independent trackers, and no integration with core systems such as Design Manager, SAP, or Click, which requires employees to manage work in multiple systems;
- The same data fields have to be entered in several trackers resulting in extensive duplicate data entry effort; and
- The siloed tools are not coded to standards and are difficult to maintain, making them prone to lock up and crash, which results in lost time while the system and data is restored.

c) **Scope and Cost Forecast**

The WM Dashboard project will decommission the Access databases by replacing tracker task data with equivalent data from core enterprise applications and ensuring that associated processes are transitioned to the core enterprise applications. This will ensure that we further leverage existing systems and interfaces and increase data integrity in our core applications.
The resulting data in our core enterprise applications will then be exposed to an enterprise wide reporting environment where integrated reporting and dashboards will be developed that will provide an integrated view of work across departments at a level of detail that is not available today. Through this functionality, SCE can report on department employee utilization, department employee capacity, work progress, work volume by status (completed, in-flight, etc.), work volume by department, and by work type. This project will also deliver improved forecasting and demand management capabilities and resource capacity planning.

The WM Dashboard Project is being implemented in three phases. Phase 1 of the project is complete, which consolidated three Microsoft Access databases into one in alignment with business groups consolidation. As an outcome of this effort, two Microsoft Access databases were decommissioned. In addition, high-level common analysis and design was completed across the interdependent databases. This was performed because interrelationships and dependencies that exist between the databases meant that they could not be analyzed independently. Lastly, an Enterprise reporting environment was established for two Work Management Systems, Primavera P6 and ClickSchedule.

Phase 2 of the project includes transitioning the functionality of four Microsoft Access databases into enterprise systems and the consolidation and re-platform of three additional Microsoft Access Databases into a single Enterprise SQL Server solution. This phase has already started and is targeted for completion in 2020. This phase will bring business-line wide visibility to the Underground Civil workgroup and Electrical Contractors by consolidating the work functions into a single Enterprise Tool with expanded reporting and analytics, replace an outdated material management tool, and stabilize the New Business Planning workgroup.

Phase 3 of the project includes common analysis and design and the disposition of the remaining work management related trackers into enterprise systems. These phase 3 trackers are dependent on the currently in-flight WM Portfolio Management Enterprise capital software project and will leverage the resulting solution. This phase will also establish an Enterprise reporting environment for the WM Portfolio Management System and will develop standardized project and portfolio management system reports. This phase has already started and is targeted for completion in 2021. This project began in October 2016 and will be completed by the end of 2021. In this rate case period (2019-2021)

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26 Refer to WM Portfolio Management SCE-06, Vol. 1, Part 2, p. 128
the total remaining project costs are $3.09 million, for a total project cost from 2016-2021 of $4.73 million.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered not pursuing this project and instead continuing to use the current Access and Excel tools to manage workflow. However, if we chose not to pursue this project, then this would address none of the existing issues or achieve the benefits described above. Continued use of the Access database would result in continued disruptions to the business, as the systems are unstable and experience frequent outages due to the volume of users trying to work in them. Additionally, due to the instability of the databases, SCE is not building new data fields into the systems. This is resulting in the creation of even more disparate methods of tracking additional data and is perpetuating the operational inefficiencies of managing information and the inability to share common data across organizations.

(b) **Alternative 2:**

SCE considered procuring a COTS solution to meet the T&D work management needs. We did not pursue this option because it would not meet our requirements, nor would it leverage the current technology footprint. Since there is no commercially available product that currently meets all of SCE’s business requirements, any selected tool would still require effort to configure and develop the code necessary to integrate with SCE’s existing enterprise work management tools. In addition, adding a new tool into SCE’s portfolio would add new complexity and additional cost to maintain.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $3.09 million.\(^{27}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

\(^{27}\) See WPSCE-06V01P02 pp. 153 – 155.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

D.19-05-020 authorized $0.05 million in 2016, $0.83 million in 2017 and $0.42 million in 2018 for this project. SCE recorded $1.64 million from 2016-2018, including $0.05 million in 2016, $0.61 million in 2017 and $0.98 million in 2018. Since the 2018 case, the total project forecast has also increased to $4.73 million and the schedule has been extended to 2021, as fully discussed in the project description above.

12. **Network (Metering) Management System (NMS) (CIT-00-DM-DM-000142)**

**Table VI-44**

*Network Metering Management System (NMS)*

*2019-2023 Forecast*

*(Nominal $000)*

<table>
<thead>
<tr>
<th>Network Metering Management System (NMS)</th>
<th>Recorded</th>
<th>Forecast</th>
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<tr>
<td>Recorded / Forecast</td>
<td></td>
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<tr>
<td>2018 GRC - Authorized</td>
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<tr>
<td>2018 GRC - Original Request</td>
<td>$16,857</td>
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**a) Project or Program Description**

The Network (Metering) Management system (NMS) provides the capability for SCE to communicate and collect data from over 5.1 million smart meters in our territory. NMS authenticates meters and transfers data from the meter to SCE’s backoffice applications for further processing. This data is used to generate customer bills as part of the meter to cash process, and to collect voltage data and outage events from SCE’s AMI meters. Currently, the NMS connects to over fourteen thousand cell relays, which aggregate interval reads and events from the entire meter population. The cell relays communicate with the NMS via a legacy carrier cellular technology commonly referred to as 3G. The telecommunications carriers we use, such as Verizon and AT&T, are currently planning on replacing 3G with 4G (LTE) technologies. This project consists of completing necessary upgrades to the NMS application, including the deployment of 4G compatible NMS software and computing equipment. The replacement of the actual cell relays with new 4G Socket-based routers is not part of this project.
b) **Need for Capital Project or Program Including Risk Avoided**

Currently, NMS operates on the 3G wireless technology network protocol that will be phased out beginning in the late 2020 to early 2021 timeframe. Additionally, SCE has a contractual obligation to maintain the NMS vendor software within the latest two release versions to preserve vendor support of the system and devices. SCE is currently four versions behind the latest vendor release version. As a result, in order to minimize the impact to core meter operations, SCE must deploy 4G compatible NMS equipment to continue to read our 5.1 million smart meters and ensure operational stabilization and contractual compliance with the software vendor. Failure to upgrade the NMS application in this way would directly impact billing, outage detection, and meter management once the current 3G technologies are sunset by the carriers. In addition, this software upgrade will help enable the installation of new 4G (LTE) hardware – Socket Based Routers and new 4G Itron Cellular Meters.

1) **Benefit**

The NMS upgrade program will allow for the continued operations of SCE’s advanced meter infrastructure, known as SmartConnect, through the change in carrier backhaul technologies from 3G to 4G (LTE). This will avoid disruption to meter operations and allow the continuation of meter to cash processes throughout the transition of the cellular backhaul technology. Additionally, bringing the NMS up to the current vendor release version allows for better maintenance through cybersecurity patches, new functionality, and maintenance releases.

c) **Scope and Cost Forecast**

The upgrade includes the following:

- Software upgrade of the NMS system to version 7.0 from version 3.9, which includes the ability for the system to communicate with new 4G Socket based routers and Cell relays to continue to communicate with all 5.1 million SmartConnect meters;
- Computing hardware upgrades to allow for a more resilient design of the NMS; and
- The ability to ensure the NMS upgrade has minimal impact to business processes such as outage management and billing by making sure communications during the cell relay upgrades can support both 3G (the old
cell relays) and 4G (the new socket based routers) during the deployment period.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered not pursuing this project, and instead continuing on the current version and delaying the refresh. However, further delay is not recommended based on the age of the existing application. Incorporating and maintaining old architecture creates complexities when integrating into modern platforms and can add costs and delays to efforts such as operating systems and server upgrades. The current version will be difficult for SCE to maintain, as it is no longer supported by the product vendor. Delaying further will not address the business needs explained above. Additionally, SCE has a contractual obligation to maintain the NMS vendor software within the latest two release versions to preserve vendor support of the system and devices.

(b) **Alternative 2:**

SCE might have considered replacing the existing system with a COTS solution but the NMS has proprietary cybersecurity and meter management capabilities that do not appear to be generally available for our metering system. The risks of trying to replace the NMS with a generic management system would require integrating it with the existing upstream applications as well as the 5.1 million existing meters in production. This option was also not pursued because implementing a new software would carry high costs and a high risk of disruption to meter operations.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total forecast costs are $2.87 million, with total project costs from 2018-2019 of $7.55 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

SCE was authorized $16.86 million for this project in 2018. Ultimately, however, the project ended up being more straightforward than expected due to vendor investments in

28 See WPSCE-06V01P02 pp. 156 – 158.
the product to support both 3G and 4G devices simultaneously, which negated the need for SCE to invest in co-development time and costs. As such, SCE only recorded $4.68 million in 2018, and now only forecasts needing $2.87 million to complete this project for a total project cost of $7.55 million (compared to original project forecast in the 2018 GRC of $31.32 million).

13. **WM Portfolio Management (CIT-00-DM-DM-000077 and CIT-00-SD-PM-000270)**

   **Table VI-45**

   **WM Portfolio Management**  
   **2019-2023 Forecast**  
   **(Nominal $000)**

---|---|---|---|---|---|---|---|---|---|---|---|
| Recorded | 2,464 | 1,890 | 4,047 | 5,770 | 1,781 | |
| 2018 GRC - Authorized | 2,464 | 5,029 | 5,207 | |
| 2018 GRC - Original Request | 2,464 | 6,035 | 6,248 | |

Various WBS include: CIT-00-DM-DM-000077 and CIT-00-SD-PM-000270

a) **Project or Program Description**

The scope of the Work Management Portfolio Management (WM: PPM) project is to implement an integrated Project and Project Portfolio business process, enabled by an integration of various new and existing technologies, across the entire T&D IPSEC (initiate, plan, schedule, execute, close) work process model, to include the following capabilities:

- Deploy a T&D enterprise level Project and Portfolio platform with common business processes and project/program templates for all project types.
- Provide an enterprise platform where all planning, forecasting, prioritizing (optimizing) capital spend, strategic bundling of projects, and scheduling of work and resources can occur in a collaborative environment across all work groups.
- Create an integrated technology environment across the enterprise technology work management platform (e.g., SAP- ECC modules, Primavera P6, Copperleaf C55, etc.).

The implementation of the full enterprise Project/Portfolio Management tool will enable SCE to decommission multiple existing systems that are currently being used in disparate means across the organization and range from complex, internally developed software applications to simple MS Access and Excel spreadsheets.
The WM:PPM effort was approved in the 2018 GRC and is being implemented in 2 phases with each phase split into multiple solution deliveries. The Phase 1 project has rolled out a majority of its approved functionality with later phases to be integrated with the Phase 2 delivery. Phase 1 implemented an Enterprise Scheduling Platform with consistent processes that have been implemented to substation, transmission, and parts of the work in distribution and generation. Additional work types and groups are being added over time as maturity grows in the organization. Phase 2 has rolled out limited project and portfolio management functionality for an initial smaller group of users and work types. This rollout will be utilized to build maturity in the organization and to test functionality. The forecast for this project in this GRC is for continuing Phase 2 work, including finalizing the detailed design and development of the integrated solution, along with completion of the enterprise-wide roll out and decommissioning of certain existing outdated systems.

b) **Need for Capital Project or Program Including Risk Avoided**

T&D capital projects are planned and managed as a portfolio. Each portfolio component represents a collection of projects similar in nature. The similarity is usually based on the asset being worked on, or the construction being performed. However, conflicts within different projects across the portfolio can occur due to resource, scheduling, or operating constraints. For example, it may not be feasible to perform Distribution overhead conductor replacement concurrent with Transmission reconductoring on the same overhead pole line, from a field coordination perspective. Potential resource constraints may also exist while attempting to simultaneously execute Distribution 4kV substation elimination work and Substation Infrastructure Replacement work if both projects depend on the same substation apparatus personnel. The Portfolio Management solution identifies these kinds of potential conflicts early to resolve the operational impacts and maximize productivity. The Portfolio Management solution also provides a means to optimize capital spend by strategically bundling similar work (or work on common assets) and by incorporating SCE’s risk-based modeling (e.g., PRISM – Prioritized Risk-Informed Strategic Management) into project prioritization and scheduling.

By building a long-term plan for the portfolio based on standardized project schedules, the Portfolio Management solution will allow T&D to quantify demands across T&D by work group, asset, circuit or system, and geography. This will allow SCE to assess the organizational, customer and financial implications related to “what if” scenarios or changes in investment plans. For example, if several projects within the portfolio were tracking under budget or behind schedule, the Portfolio Management solution would allow the organization to assess various mitigation alternatives.
By managing all large projects as a portfolio, schedule or cost deviations of individual projects from their respective project plans can be balanced by adjusting plans for other projects if feasible.

Project schedules were and will continue to be developed based on standard project templates for each area of the portfolio. This will allow SCE to monitor actual project performance against the standard portfolio schedule template and will improve visibility to project risk. Actual project performance, across many projects over time, can be aggregated for each area of the portfolio. The aggregated data can be fed back to improve the corresponding standard portfolio schedule template. This performance-based feedback loop will drive continuous improvement of the portfolio standard schedule and maximize long-term planning efforts.

The level of infrastructure replacement and modernization that SCE expects to execute within the next few years requires effective and efficient long-term planning and project management. Ineffective planning and project scheduling can cause project delays, project over runs, write offs, or frequent cycles of work ramp-up and ramp-down. These results can cascade into overloaded workloads for employees as work spikes and deadlines accelerate.

Portfolio and project management capabilities within T&D are performed to various degrees of maturity and across a variety of applications. For example, Distribution projects are submitted for portfolio review within several custom-built solutions (e.g., spreadsheets, MS Access, etc.) and managed using different scheduling tools and methods, which cannot work together. Conversely, Distribution employees rely on Excel and Access to perform reviews of the portfolio using disparate data sets. Distribution capital projects are managed using a combination of multiple tools (e.g., SAP, Design Manager, Access, and Excel). As a result, project/portfolio data within T&D is not integrated. This lack of integration creates an organizational blind spot for resource, finance, and project managers and employees. These groups regularly support work plans being driven by Transmission and Distribution projects. This information can be unreliable and becomes difficult to manage when project dates change.

The Project Portfolio Management project will enable resource managers to balance demand and capacity more efficiently by providing a long-range overview of project needs. Roles and hand-offs will become more defined and standardized across the system. Implementing Portfolio Management will provide focus on critical activities. It will also minimize rework and false starts resulting from a lack of overall job coordination. The tool will allow resource constraints to be
identified earlier to better assess the ramp-up needs of resources (internal or contract) or the resequencing of work, before capital charges record.

A common project management solution that all employees utilize will also provide portfolio and project managers a comprehensive view of project status and risk.

By meeting these objectives, SCE will improve its overall ability to deliver capital projects as measured by quicker project execution, reduced project delays, timely and effective scope on-ramp/off-ramp, and improved resource and contractor management. Project plan progress can be consistently and accurately monitored, and project plan risk can be mitigated.

c) Scope and Cost Forecast

The Portfolio Management project will implement additional functionality, workflow configuration, and system integrations to the COTS Project and Portfolio Management Solution (PPM) that was deployed in late 2018 as well as expand the user base to additional user groups. This phase will integrate with other applications within T&D’s existing work management solutions (e.g., SAP). Project scope includes:

1. Portfolio Planning & Forecasting—Provide a centralized tool for all large capital programs where program scope, costs, resources and schedules are prioritized and approved, as the baseline portfolio investment plan. Provide a tool where project data related to schedule, costs and resources can be aggregated and summarized across capital programs, resource pools and cost categories. Provide the ability to generate forecasts (schedule, budget, and resource) for capital projects, the programs the capital projects belong to, and the portfolio of capital programs.

2. Project Scheduling Enablement—Provide an interface to the Edison enterprise scheduling tool for all large capital work to be planned and managed allowing for consistent management of schedules and resources and project monitoring against portfolio baselines. Provides integration of project schedule data back into the Portfolio Planning solution for risk management, change control governance, and project oversight.

3. Cost Enablement—Improve project forecasting by aligning project schedule structure with how we track costs to allow future alignment of schedule and cost.

4. Contractor Enablement—Provide a tool where project data for project work assigned to contractors can be integrated into the view of the overall portfolio, reducing the specialized hand-offs between groups and eliminating the translation of contractor data into project status views on
a delayed basis. Provide a means for contractor collaboration through a standard project documentation exchange and project documentation retention solution.

5. Reporting Data—Provide portfolio and project data to enterprise reporting databases. This would be for integration into the centralized reporting and analytics solution with data for work outside the Portfolio Management solution.

(1) **Alternatives Considered**

(a) **Alternative 1**

SCE considered replacing the existing solution by building a customized solution using SCE and consultant resources or contracting with a third party to build it. We did not pursue this option because it would require SCE and contracted resources to identify the required skills and to set up the development and testing environments. This alternative was also not pursued because it would not be cost-effective to create such a solution because it would require significant future maintenance costs.

(b) **Alternative 2:**

SCE considered replacing the existing solution by procuring a new commercially available tool or service. We did not pursue this alternative because it would require SCE to go through the competitive bid process for both the tool and additional support services to integrate it with the existing tools in our IPSEC model. This option was also not pursued because implementing a new tool would also carry additional costs for training and other organization change management activities.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $7.55 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

D.19-05-020 adopted the WM Portfolio Management project as part of SCE’s 2018 GRC and authorized $12.63 million for the total project costs ($2.46 million in 2016, $5.0

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22 See WPSCE-06V01P02 pp. 159 – 163.
million in 2017, and $5.17 million in 2018). SCE recorded $8.4 million from 2016-2018, including $1.89 million in 2017 and $4.05 million in 2018. SCE spent less than authorized in 2017 and 2018 because of the delays discussed in the next paragraph.

The total project forecast has increased by $3.32 million to $15.95 million since the 2018 GRC, and the schedule for completion has been extended to 2020. Part of this is because during SCE’s endeavors to align all Work Management initiatives across the enterprise, the total time to finalize functional needs, architect the full enterprise landscape, select the correct solutions, and complete technology and vendor agreements took longer than initially planned. Additionally, following the previous GRC, as part of an overall enterprise view of the work management initiatives, an effort was undertaken to finalize a common analysis and design across all associated technologies and processes. This was a complex effort that required more time than originally anticipated. However, an additional benefit coming from the common analysis and design was that SCE identified opportunities to better align future needs such as addressing all Project initiation and pre-initiation workflows, not all of which were addressed by this project’s initial scope (e.g., SCE’s Poles and Linear Assets inspections). As a result, the total solution selection and agreement process took longer than expected. In addition to the added time required for a more complete solution, SCE determined that the proper solution should also account for emergent needs such as SCE’s SB 901 requirements.100 This more complete and robust solution requires more integration between SCE enterprise systems. These vital new requirements are responsible for the increase in system design and development costs.

14. **Transformer Connectivity Model (CIT-00-DM-DM-000245)**

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</table>

a) **Project or Program Description**

The Transformer Connectivity Model project will replace the existing transformer connectivity application currently hosted on the antiquated mainframe (which is scheduled to be decommissioned) with a new application with improved functionality.

The Transformer Connectivity Model is designed to provide the capability for users to update the electrical connectivity relationship of meters to structures (i.e., poles), transformers, and the rest of the electrical grid, as represented in our grid connectivity model, to ensure accurate electrical connectivity information is available for planners, engineers, grid operators, and other stakeholders, as well as for all other systems across SCE that require accurate transformer connectivity information. Specifically, this application allows users to update the electrical connectivity model with new or corrected meter to structure (pole) and transformer information when it changes in the field. This will allow us to ensure our field personnel have the tools needed to correct data in the field. For example, if the customer was moved to a new transformer or circuit after a storm, field personnel could make this update in the field so that we have an accurate record of the delivery path of electricity to our customers.

b) **Need for Capital Project or Program Including Risk Avoided**

This project is needed to replace the existing transformer connectivity application currently hosted on the mainframe and add new functionality that allows field workers to update the connectivity in the field which will provide fast and accurate information back to all the systems that rely on the transformer connectivity model. The mainframe is currently scheduled to be decommissioned as we move many of our customer service applications from the mainframe to the new Customer Service Re-platform (CSRP) ISU version of SAP. This project falls outside the scope of the CSRP project to ensure reliable delivery of energy across our distribution network. Because the SAP software CSRP will use does not support the current functionality of the connectivity model, it is necessary for the old mainframe code to be re-developed to run in our enterprise asset management system. Having a transformer connectivity model is essential because it is used by our grid control systems to assist in switching plans, conduct engineering studies for new DERs, support outage restoration plans, dispatch crews, and generally support real-time grid operations. Additionally, our planning and engineering departments rely on an accurate model, provided by the transformer connectivity model, to develop forecasts and make grid investment decisions at the circuit level.
c) **Scope and Cost Forecast**

The scope of this project includes the development of a new application, including an updated user interface, to edit and create new transformer connectivity relationships, a database to store the data, and a service and integration layer to enforce data validation checks, enforce business rules, and integrate with other systems and analytics platforms.

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered keeping the existing Transformer Connectivity solution on the mainframe. However, we did not pursue this option because the cost of maintaining such an antiquated platform to host this solution was much higher than developing a new solution on a modern platform.

(b) **Alternative 2:**

SCE considered purchasing another solution by procuring a vendor’s COTS product for this capability but no products that fit our scope were available. Most of the COTS products would overlap with the scope of many other systems and would require a greater investment in time and money compared to just building a new application specific to SCE’s transformer connectivity needs.

Neither of these options addresses the current issues described above in the most cost-effective way.

(d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $3.5 million.\(^\text{101}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

\(^{101}\) See WPSCE-06V01P02 pp. 164 – 166.
15. **Design Manager Optimization (CIT-00-DM-DM-000243)**

**Table VI-47**

*Design Manager Optimization*

**2019-2023 Forecast**

*(Nominal $000)*

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a) **Project or Program Description**

The objective of the Design Manager Optimization project is to provide necessary improvements to SCE’s Design Manager (DM) application. DM is a web-based application, that was developed within SCE. As the usage of this tool has expanded and technology has evolved, there is an urgent need to improve performance and upgrade the underlying technology that runs the application. The current DM Optimization project will update the software and hardware infrastructure, and it will add functionality to enable enhanced throughput of work in support of SCE’s capital construction and maintenance programs. DM is important as it acts as the intermediary between the Graphical Design Tool (GDT) application and SAP, and because it is the pricing and estimating tool used by SCE planners in both Transmission and Distribution and by Substation’s engineers. In addition to pricing and estimating, DM is also used for work initiation, work order creation, service design, task management, and reporting of planner, estimator, and engineers work.

b) **Need for Capital Project or Program Including Risk Avoided**

DM Optimization will reduce risk by providing the technology updates needed to (1) mitigate performance and productivity loss, (2) mitigate large volumes of support needs, (3) mitigate data quality and application stability issues, and (4) reduce the possibility of application failures resulting from outdated or unsupported vendor technology. In addition, DM Optimization will enhance usability of the application in line with the performance needs of the Customer Service Re-Platform (CSRP) program.

c) **Scope and Cost Forecast**

To achieve these benefits, the DM Optimization effort will employ a combination of front-end and back-end enhancements to:
Improve and enhance the user interface to improve overall workflow and user experience;

Improve page and screen load time to reduce end user time on screen load;

Improve transaction execution time by improving how the transactions are processed and how the system integrates with other applications;

Improve the quality of the underlying code through a process of re-factoring the code used within the application; and

Reduce system freezes, slow performance, and non-reproducible errors.

(1) Alternatives Considered

(a) Alternative 1:
SCE considered not improving the Design Manager application and instead addressing the need for performance improvements and productivity gains solely through end user training and process re-design. We did not pursue this option as end users would have to continue dealing with slow and inconsistent system performance. Additionally, not improving the application would not address issues with data, nor would it enable enhanced throughput of work in support of SCE’s capital construction programs and the increase in maintenance work orders as a result of inspection remediation efforts.

(b) Alternative 2:
SCE considered building a replacement application or purchasing another vendor’s COTS to address SCE’s design and pricing needs. Buying a COTS or building a new solution would both take years to implement based on the complex engineering and pricing calculations that would need to be developed in the new application. Additionally, buying a new COTS system would require an investment in new license purchases and the development of interfaces and integration capability with SCE’s existing software applications.

Neither of these options address the current issues described above in the most timely and cost-effective way.
d) **Basis for Capital Expenditure Forecast**

The total 2019-2023 project cost for the DM Optimization project is $5.3 million, with $1.5 million forecast for 2019 and $3.8 million forecast for 2020. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project. Issues around Design Manager performance, stability, and functionality were escalated for resolution in 2019, after the original Design Manager project closed.

B. **Substation Projects less than $3 Million**

Table VI-48

*Substation Projects less than $3M*  
*Work Breakdown Structure (WBS) Forecast Capital Expenditures*  
*(Nominal $000)*

<table>
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<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
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<td><strong>$36</strong></td>
<td><strong>$36</strong></td>
<td><strong>$6,961</strong></td>
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</table>

Table VI-48 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).  

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102 See WPSCE-06V01P02 pp. 167 – 169.  
103 See WPSCE-06V01P02 pp. 170 – 186.
VII.

ENERGY PROCUREMENT

This Chapter addresses SCE’s 2019-2020\textsuperscript{104} forecast for capitalized software projects to support Energy Procurement. This entails the ability of SCE to maintain and advance the safety, methods, and tools by which we procure an appropriate mix of electricity for our customers. The main elements under Energy Procurement address things such as energy resource management and fuel and purchase power. This request includes the following four projects, each over $3 million: (1) EPM Analytics Platform, (2) IMEP 2018, (3) Energy Market Trading System Replacement (EMTSR), and (4) Integrated Position and Risk Management.\textsuperscript{105} These capital software projects will allow SCE to mature and improve functions and capabilities to better execute on power dispatch and monitoring.

\textsuperscript{104} As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.

\textsuperscript{105} Integrated Position and Risk Management is an exception to other projects in this chapter as the forecast begins in the 2021-2023 timeframe but is presented herein with other Energy Procurement BPG projects due to SCE having more certainty regarding this technology solution. As explained in Chapter IX.B.2, the forecast for this project is deducted from the 2021-2023 portfolio amount available for allocation.
A. Energy Resource Management

1. Energy Procurement and Management (EPM) Data Analytics Platform (CIT-00-SD-PM-000259)

Table VII-49
Energy Procurement and Management (EPM) Data Analytics Platform
2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Energy Procurement and Management (EPM) Analytics Platform</th>
<th>Recorded</th>
<th>Forecast</th>
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</thead>
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<td></td>
<td>2014</td>
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<tr>
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<tr>
<td>2018 GRC - Authorized</td>
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<td>2018 GRC - Original Request</td>
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<tr>
<td>2018 GRC - Total</td>
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<td>$2,000</td>
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<tr>
<td>Total</td>
<td>$13,245</td>
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</tr>
</tbody>
</table>

Various WBS include: CIT-00-SD-PM-000259, CIT-00-DM-DM-000078, and CIT-00-DM-DM-000029

a) Project or Program Description

Energy Procurement and Management (EPM) manages SCE’s portfolio of contracted and utility owned generation resources operations in the CAISO energy market. These operations happen on a 24/7/365 basis and generate large amounts of data.

This project will implement a centralized data repository for EPM data. This will enable EPM users to access relevant data in a central location, perform self-service reporting, and utilize a number of data reporting and analytics tools.

This project includes and supersedes two projects that were approved as part of SCE’s 2018 GRC Application: Energy Planning Platform (EPP) Upgrade and Usage Measurement System (UMS).

b) Need for Capital Project or Program Including Risk Avoided

EPM’s current technology infrastructure consists of a number of separate systems and functional gaps between the systems that are being supplemented by User-Developed Applications (UDAs). Several business processes are fragmented and include manual process steps. The existing systems and processes cannot scale to handle the forecasted resource growth, primarily due to new

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106 Examples of User-Defined Applications (UDAs) include Access databases, SAS programs, and advanced Excel spreadsheets, often with macros.
renewable and distributed energy resources (DERs) coming on-line in the next few years, without SCE having to hire additional staff to handle the increased workload. This project avoids SCE having to hire additional staff.

(1) **Benefits**

This project will resolve an existing issue in the way that SCE reports load data to CAISO. The current load profiling methodology that SCE uses to handle behind-the-meter residential (rooftop) solar in the existing systems requires a manual process to accurately account for excess solar generation coming back into the SCE distribution system. This project will automate that process, reducing inaccuracies by making use of direct measurements from SCE’s SmartConnect meters to measure its customers load more accurately.

This project will support the use of advanced data analytics tools to maximize the value of current and future contracts and minimize ongoing power procurement costs. It will also enable SCE to handle a more complex energy portfolio without having to increase staffing levels. Two specific areas that will benefit from this project are:

- **Gas burn forecast improvements.** This is currently handled via a UDAs where traders use a manual process to search through historical data for “similar days” (i.e., days with similar forecasted load and weather conditions) to determine the correct amount of operational gas to procure for the upcoming days. The analytics platform will enable this manual process to be replaced with automated tools that can predict gas burns based on a model rather than a manual search for similar days.

- **Load forecast improvements.** Any deviations between the forecasted and actual load is settled at the CAISO real-time price, which can be costly for SCE’s customers. The current load forecast models rely on a variety of data inputs, including forecasted and historical weather and historical load. This project will make additional data available to the load forecasting models, enabling the analysts that are maintaining the models to identify relationships between the additional data sources and the load forecast. This will allow the load forecasting models to be gradually improved by adding additional market data and using
advanced analytics techniques. Finally, the project will enable SCE to
decommission legacy hardware and software as we transition the
existing data repositories onto the new platform.

- **PCIA (Power Charge Indifference Adjustment) True-Up Calculations.** This project will allow for tracking of contract portfolio
  vintages and performing true-ups for costs related to Resource
  Adequacy (RA), renewables, and brown power, as required by
  D. 18-10-019.

  SCE estimates that this project will provide approximately $7.9 million in
cost reductions over a 5-year period due to the decommissioning of legacy hardware and vendor
software. In addition, this project will provide around $4 million in avoided costs due to removing the
need to refresh existing software that will be replaced by the new system.

c) **Scope and Cost Forecast**

  The scope of this project is to implement a centralized data repository for EPM
data. As mentioned above, this project supersedes the Energy Planning Platform (EPP) Upgrade project
and includes the Usage Measurement System (UMS) projects, which were originally planned for 2018
and 2019. During the project planning activities, SCE determined that including these projects in the
larger EPM Analytics Platform would be the best approach since the projects provide related
functionality and can be implemented using the same technology platform. The scope of the UMS
project was merged into the overall scope of the EPM Analytics Platform project.

  This project will also (1) consolidate systems with similar data and/or
functionality, including the existing Energy Planning Information Center (EPIC) and Power
Procurement Data Repository (PDR) databases, (2) replace the obsolete Usage Measurement System
that processes the SCE load meter data for submission to CAISO, (3) implement a master data
management tool to manage data across multiple systems and databases, and (4) eliminate several
UDAs.

  (1) **Alternatives Considered**

  (a) **Alternative 1:**

  Do nothing. This would not remedy the current issue with meter
data submissions to CAISO, which is currently a manual process. It would also require SCE to hire
additional staff to handle the new energy contracts in the coming years.
(b) **Alternative 2:**

Upgrade the existing Energy Planning Platform (EPP) and Usage Measurement System (UMS) tools as described in the 2018 GRC. This would resolve the CAISO meter data submission issue, but it would still require SCE to hire some additional staff to handle the onset of new energy contracts. Nor would this alternative enable SCE to decommission any legacy hardware and software.

Finally, the technology and products available for data analytics has been improving rapidly in recent years since the time of writing of the 2018 GRC submission and are now capable of supporting the functionality that was planned to be provided by the separate EPP and UMS projects.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $13.24 million.\(^{107}\)

The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

As discussed above, this project will provide approximately $7.9 million in cost reductions over a 5-year period due to the decommissioning of legacy hardware and vendor software. In addition, this project will provide around $4 million in avoided costs due to removing the need to refresh existing software that will be replaced by the new system. Both of these benefits have been incorporated into the relevant SCE forecasts for ongoing IT operations costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

D.19-05-020 authorized $2.67 million in 2018 for the Usage Measurement System (UMS) and Energy Planning Platform (EPP) Upgrade projects. As discussed above these two projects were superseded or included in the new EPM Analytics Platform project. This project started in late 2018 and, as a result, only $0.00 million ($2,000) was recorded in 2018.

\(^{107}\) See WPSCE-06V01P02 pp. 187 – 189.
2. **CAISO Market Enhancement Program (IMEP) (CIT-00-SD-PM-000283)**

   **Table VII-50**  
   **CAISO Market Enhancement Program (IMEP)**  
   **2019-2023 Forecast**  
   *(Nominal $000)*

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<th>CAISO Market Enhancement Program (IMEP)</th>
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<td>$4,023</td>
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Various WBS include: CIT-00-SD-PM-000213, CIT-00-SD-PM-000164, CIT-00-SD-PM-000121, CIT-00-SD-PM-000162, and CIT-00-SD-PM-000215

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**a) Project or Program Description**

SCE operates in the CAISO energy markets on a 24/7/365 basis. CAISO conducts an annual process to identify and prioritize future market initiatives. Once identified, each of the initiatives is ranked based on two criteria: (1) benefits including grid reliability, overall market efficiency, desire by market participants, and (2) feasibility, including market participants’ implementation impact (costs and resources) and CAISO implementation impact (costs and resources).

The CAISO Policy Initiatives Catalog[^108] outlines the priority issues identified by the CAISO and stakeholders that may require enhancements to the energy market. This list is used by SCE to identify market initiatives that have a high likelihood of being addressed in the 2019-2023 timeframe. Although the exact timelines and requirements are still being defined by CAISO, SCE must be able to respond and implement required system enhancements once these market initiatives are mandated by CAISO.

This project was approved as part of SCE’s 2018 GRC Application and continues through this GRC cycle.

b) **Need for Capital Project or Program Including Risk Avoided**

SCE is a CAISO participant and subject to the CAISO’s tariff and operating procedures. Therefore, SCE must update existing systems to implement CAISO market changes to continue to stay compliant with CAISO tariffs and participate in the CAISO market.

(1) **Benefits**

This project will ensure continued compliance with the CAISO tariff provisions and enable SCE to benefit from ongoing CAISO market enhancements.

c) **Scope and Cost Forecast**

The scope of this project is to implement market changes as mandated by CAISO by enhancing existing SCE systems and processes. Based on the Policy Initiatives Catalog discussed above, CAISO plans to make significant enhancements to their Day Ahead and Real Time Markets during the 2019-2023 timeframe. Other initiatives on the roadmap will enhance the integration of energy storage and distributed resources. The CAISO multi-state Energy Imbalance Market (EIM) will be enhanced and additional participants are expected to join the EIM market. SCE forecasts this project to cost $9.85 million over 2019-2023.

(1) **Alternatives Considered**

This project implements CAISO tariff changes, which are required for regulatory compliance. Therefore, no alternatives have been considered.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $9.85 million. The capital forecast for this project for 2019 was developed using SCE’s internal cost estimation model since the CAISO requirements are more defined. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

For 2020-2023 we do not have specific CAISO requirements available and the $2 million per year cost forecast is based on the estimate for 2019 of $1.85 million, historical spend (see below), and upcoming CAISO market changes as known at this time.

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109 See WPSCE-06V01P02 pp. 190 – 192.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

D.19-05-020 authorized $3.33 million in both 2017 and 2018 for the CAISO Market Enhancements project. SCE recorded $1.14 million in 2017 and $1.02 million in 2018 for this project. The lower spend was due to smaller impacts from the CAISO market changes in 2017 and 2018 than forecasted. In order to better align forecasts with actual recorded costs, while still taking into account upcoming CAISO market enhancements, SCE has adjusted the request for this project to $1.85 million in 2019 and $2 million per year starting in 2020.

3. **Energy Market Trading System Replacement (EMTSR) (CIT-00-DM-DM-000042 and CIT-00-SD-PM-000226)**

**Table VII-51**

Energy Market Trading System Replacement (EMTSR)

2019-2023 Forecast

(Nominal $000)

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td>$1,957</td>
<td>$2,927</td>
<td>$10,624</td>
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<td>$19,131</td>
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</tr>
<tr>
<td>2018 GRC - Authorized</td>
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<td>$5,029</td>
<td>$4,955</td>
<td>$11,941</td>
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</tr>
<tr>
<td>2018 GRC - Original Request</td>
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<td></td>
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</tbody>
</table>

Various WBS include: CIT-00-DM-DM-000042 and CIT-00-SD-PM-000226

a) **Project or Program Description**

This project replaces two of the core systems used for procuring energy on behalf of SCE’s customers and for operating in the CAISO energy markets on a daily basis:

- The Energy Trading and Risk Management (ETRM) System Replacement project will replace the existing ETRM system, which was installed in 2008 and is used to store and process all power and gas transactions, including (1) conventional bilateral power contracts; (2) physical and financial power; and (3) gas transactions.

- The existing bidding and scheduling system is used to enable SCE to participate in the California Independent System Operator (CAISO) energy market. The system was installed at SCE in 2009 and manages generator outages, creates and submits energy bids to the CAISO energy markets to
purchase and sell electric power, and downloads market awards and market prices from CAISO.

This project is related to the CAISO Market Enhancement (IMEP) project described above because both projects are related to CAISO. The difference between the two projects is that the IMEP project implements ongoing market changes mandated by CAISO, whereas this project is a one-time effort to replace the system platform used for day-to-day operations.

This project was approved as part of SCE’s 2018 GRC Application under the project names “PCI Replacement” and “Energy Trading and Risk Management (ETRM) System Replacement.” This project combines the two previous efforts into a single project since there are dependencies between the two efforts. Other than combining the two projects, there have been no other scope or schedule changes to what was approved in the 2018 GRC.

This project is currently in flight and is planned to be fully implemented in 2019.

b) **Need for Capital Project or Program Including Risk Avoided**

As mentioned above, in the 2018 GRC this project was listed as two separate projects. SCE decided to combine the two projects into a single project after analyzing the dependencies between the projects. There are multiple system interfaces between the two systems. For example, trades for physical power captured in the ETRM system will be scheduled into the CAISO market through the bidding and scheduling system. After the end of the operating day, CAISO prices flow back into the trading system for use in the trade settlement process. These system interfaces create dependencies between the two projects, and SCE decided that the best way to manage these dependencies was to manage these two projects as a single combined project.

The existing ETRM system needs to be replaced because its vendor has since switched to a new product and thus is no longer offering enhancements to the existing ETRM system. Additionally, the existing ETRM system runs on old versions of Microsoft Windows Server and Oracle database server, which are no longer supported with software upgrades and security fixes by the vendors. Finally, the existing ETRM system requires a multitude of spreadsheet workarounds to support the current business needs. Moving to the new system will reduce the need for these manual spreadsheet workarounds.

SCE has already selected a new energy trading and contract management platform, which has been implemented and is currently used to manage renewable contracts. By replacing the existing ETRM system with this system, SCE can handle conventional, renewable, and
financial transactions in a single system. This will simplify the accounting and reporting processes since
data from only a single system must be extracted.

As for the current bidding and scheduling system, there are unresolved issues that must be addressed by replacing this system with other (newer) vendor products. These issues include lack of ability to keep up with CAISO market changes, system performance, and limited functionality for analytics.

SCE requires enhanced system functionality for its bidding and scheduling system in the following areas:

- **Ability to participate in CAISO market simulations.** CAISO market changes are implemented through a cycle consisting of stakeholder proposals to design the market changes, workshops to review the detailed technical design of the market changes, market simulation of the changes, and finally go-live where the changes are implemented in the production environment. The purpose of market simulation is for both CAISO and market participants (including SCE) to test the new market changes using as close to the actual systems and business processes as possible. SCE has frequently in the past had to market simulations using manual workarounds instead of the actual software since our vendor could not deliver software updates in time for the CAISO market simulations.

- Adequate performance in the SCE environment with data volumes as required by CAISO. CAISO data volumes have increased dramatically after the Market Redesign and Technology Upgrade (MRTU) market went live in 2009. SCE has seen issues where our current system struggles to retrieve and process the CAISO data volumes in a timely manner.

- Better functionality for analytics. Analytics is increasing in importance as the CAISO market grows more complex and the portfolio of renewables and distributed energy resources continues to grow. Good analytics depend on access to updated and relevant data that is easy to retrieve using a variety of data reporting and analysis tools. SCE has experienced issues where data is stored in the current vendor database in a format either inaccessible or hard to retrieve and analyze using industry-standard reporting and analysis tools.
(1) **Benefits**

This project will consolidate all of SCE’s wholesale energy trades and bilateral contracts into a single system. It will reduce the need for manual spreadsheet workarounds and streamline the capture and management of energy transactions. It will also simplify the accounting and internal and regulatory reporting processes.

This project will also replace the existing bidding and scheduling system with a new system that will offer similar or better functionality at the same or lower total cost of ownership.

c) **Scope and Cost Forecast**

This project will replace the existing bidding and scheduling system with new third-party vendor solutions selected through a competitive solicitation process. The ETRM system will be replaced by the system purchased as part of the Commodity Management Platform (CMP) project, which was approved as part of SCE’s 2015 GRC Application.

The total project costs for the 2019-2023 period are $3.62 million. The total project costs for the entire project duration (2016-2019) are $19.1 million.

(1) **Alternatives Considered**

This project was approved as part of the SCE 2018 General Rate Case and is currently in-flight and planned to be implemented during 2019, so no alternatives have been considered for this testimony.

d) **Basis for Capital Expenditure Forecast**

In this rate case period (2019-2023), the total project costs are $3.62 million.\(^{110}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

\(^{110}\) See WPSCE-06V01P02 pp. 193 – 195.
(1) **Comparison of 2017 & 2018 Authorized to Recorded**

**Table VII-52**

*Energy Market Trading System Replacement (EMTSR)*

*2019-2023 Forecast*

*(Nominal $000)*

<table>
<thead>
<tr>
<th></th>
<th>Recorded</th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td>$1,957</td>
<td>$2,927</td>
<td>$10,624</td>
<td>$3,624</td>
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<td>$19,131</td>
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<tr>
<td>2018 GRC - Authorized</td>
<td>$1,957</td>
<td>$5,029</td>
<td>$4,955</td>
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<td>$11,941</td>
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<tr>
<td>2018 GRC - Original Request</td>
<td>$1,957</td>
<td>$6,035</td>
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<td>$14,937</td>
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Various WBS include: CIT-00-DM-DM-000042 and CIT-00-SD-PM-000026

The 2018 GRC final decision authorized a total of $9.92 million for the PCI Replacement and the ETRM System Replacement projects for 2017 and 2018. The recorded cost during this period was $13.55 million. The increase was due to higher than expected vendor costs and longer than expected testing cycles to validate the functionality of the new systems. These same factors also drive the increased cost forecast for 2019.

4. **Integrated Position and Risk Management (CIT-00-DM-DM-000246)**

**Table VII-53**

*Integrated Position and Risk Management*

*2019-2023 Forecast*

*(Nominal $000)*

<table>
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<tr>
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</thead>
<tbody>
<tr>
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<td>$3,000</td>
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<td></td>
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<td></td>
<td></td>
<td>$6,000</td>
<td></td>
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<tr>
<td>2018 GRC - Authorized</td>
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<td></td>
<td></td>
<td>$0</td>
<td></td>
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<td></td>
<td>$0</td>
<td></td>
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</table>

**a) Project or Program Description**

This project will integrate position and risk management into the new trading system that is being implemented through the Energy Market Trading System Replacement project described above.

Position management aggregates all SCE energy purchases across all instruments (e.g., bilateral contracts, energy market purchases and sales, and energy options purchases and sales) and
shows the net position—how much energy SCE has purchased for each time interval (e.g., a day, week, month, or year)—and compares that to the forecasted customer load that SCE is obligated to serve during that same interval. Monitoring the position helps the SCE operators decide how much power needs to be purchased for each time interval looking forward. This information can then be used when evaluating market prices to decide when the power can be purchased at the lowest price for SCE’s customers.

Risk management looks at risks embedded in the position described above. Risks include price risk when market prices change, volume risk when load forecasts or renewable resource production change, and counterparty risks due to possible defaults. Risks need to be managed carefully to avoid large impacts to SCE’s customers as market conditions change.

b) **Need for Capital Project or Program Including Risk Avoided**

Currently, SCE’s position is being tracked in multiple systems, databases, and spreadsheets. This makes it cumbersome to develop a single view of the position, and there is a possibility that different tools may present a view of the position that is not reflected in another tool.

Currently, risk management is mostly handled using in-house developed tools and spreadsheets. The new trading system provides built-in functionality that can replace the in-house tools.

(1) **Benefits**

This project will consolidate the SCE energy position management and risk management. This will provide a consolidated view and will prevent discrepancies among multiple disparate systems. An updated and accurate view of the SCE position will also help in making the best and lowest-cost procurement decisions when buying power to serve our load.

c) **Scope and Cost Forecast**

The scope of this project is to configure SCE’s new energy trading system to perform integrated position and risk management. The basic functionality is already built into the new trading system SCE recently installed as part of the Energy Market Trading System Replacement project, but it needs to be configured to meet SCE’s needs. Modern trading systems like the one SCE recently installed provide significant functionality out of the box, but the system functionality is generic and needs to be set up to support the SCE business processes and the energy products that SCE transacts in.

Specifically, the configuration will cover:
• Defining the various position reports, including time horizon, location and products included; and
• Defining the approach and methodologies to be implemented for risk management (e.g., Value at Risk (VaR)), which calculates how much the value of SCE’s power portfolio changes when market prices change.

SCE forecasts this project to cost $6.0 million.

(1) Alternatives Considered

(a) Alternative 1:
SCE considered in-house development using available reporting and analytics tools. SCE has invested in a reporting and analytics platform, which could be utilized to develop the reports and displays needed for this project. However, performing position and risk management within the trading systems as proposed by this project ensures that data is updated immediately and there is no wait for data to be transferred from the trading system to the reporting system. This alternative would also require SCE to develop additional system interfaces to move data from the trading system to the reporting system.

(b) Alternative 2:
SCE also considered maintaining the current tools. This would result in lower initial costs since this project would not be needed. However, it would not mitigate the operational risks that are unavoidable with the current multiple systems that are used today.

d) Basis for Capital Expenditure Forecast
In this rate case period (2019-2023), the total project costs are $6.0 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded
This was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

See WPSCE-06V01P02 pp. 196 – 198.
B. **Energy Procurement Projects less than $3 Million**

Table VII-54

*Energy Procurement Projects less than $3M*

*Work Breakdown Structure (WBS) Forecast Capital Expenditures*

*(Nominal $000)*

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<thead>
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<th>WBS</th>
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<th>2021</th>
<th>2022</th>
<th>2023</th>
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<td>CIT-00-DM-DM-000170</td>
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<td>$2,825</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$2,825</td>
</tr>
</tbody>
</table>

Table VII-54 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).\textsuperscript{112}

\textsuperscript{112} See WPSCE-06V01P02 pp. 199 – 204.
VIII.

GENERATION

This Chapter presents SCE’s 2019-2023 forecast of $25.123 million for capitalized software projects in support of the Generation BPG, as presented in SCE-05 Vol. 1. As shown in Table VIII-55, this request is comprised of six categories that include five individual capital projects (each exceeding $3.0 million): (1) Generation Automation Standardization, (2) Dam Hydro Monitoring and Surveillance, (3) Hydro Facilities FERC Security Enhancements, (4) Asset Performance Management & Optimization, and (5) Enhance Control Room-Generator Network Redundancy. As further described in SCE-05, Vol. 1, adoption of this capital expenditure forecast will provide funding for the continued safe and reliable operation of these power generating assets and maintain compliance with environmental objectives and other regulatory requirements. These capital software projects will also allow SCE to mature and improve functions and capabilities to better execute on power dispatch and monitoring, predictive maintenance, and regulatory compliance.

<table>
<thead>
<tr>
<th>Ref. #</th>
<th>CGO Number</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CIT-00-SD-PM-000228</td>
<td>Hydro Dam Safety - Security Cameras</td>
<td>1,245</td>
<td>1,516</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,761</td>
</tr>
<tr>
<td>2</td>
<td>CIT-00-DM-DM-000165</td>
<td>Hydro Facilities FERC Security Enhancements</td>
<td>-</td>
<td>2,484</td>
<td>2,484</td>
<td>2,484</td>
<td>-</td>
<td>7,451</td>
</tr>
<tr>
<td>3</td>
<td>CIT-00-SD-PM-000227</td>
<td>Generation Automation Standardization</td>
<td>1,840</td>
<td>2,715</td>
<td>1,227</td>
<td>-</td>
<td>-</td>
<td>5,782</td>
</tr>
<tr>
<td>4</td>
<td>CIT-00-DM-DM-000187</td>
<td>Enhance Control Room-Generator Network Redundancy</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
<td>1,000</td>
<td>500</td>
<td>2,500</td>
</tr>
<tr>
<td>5</td>
<td>CIT-00-DM-DM-000079</td>
<td>Asset Performance Management</td>
<td>-</td>
<td>2,473</td>
<td>2,052</td>
<td>-</td>
<td>-</td>
<td>4,525</td>
</tr>
<tr>
<td>6</td>
<td>Various</td>
<td>Projects less than $3M</td>
<td>-</td>
<td>1,913</td>
<td>190</td>
<td>-</td>
<td>-</td>
<td>2,104</td>
</tr>
</tbody>
</table>

TOTAL 3,085 11,101 6,953 3,484 500 25,123

113 As described in Ch. IX, some projects that have costs forecast for 2019-2020 also have costs forecast for the 2021-2023 portfolio period. Where this occurs, the 2021-2023 forecasts for these projects are included in the presentation of the respective project testimony and tables and subtracted from the amount available for the 2021-2023 portfolio allocation in line 12 of Table IX-65 of this Volume.

114 Enhanced Control Room-Generator Network Redundancy is an exception to other projects in this chapter as the forecast begins in the 2021-2023 timeframe but is presented herein with other Energy Procurement BPG projects due to SCE having more certainty regarding this technology solution. As explained in Chapter IX.B.2, the forecast for this project is deducted from the 2021-2023 portfolio amount available for allocation.
1. **Hydro Dam Safety – Security Cameras (CIT-00-SD-PM-000228)**

   **Table VIII-56**

   **Hydro Dam Safety – Security Cameras**
   **2018 GRC Request, Authorized and Recorded/2019-2023 Forecast**
   *(Nominal $000)*

<table>
<thead>
<tr>
<th>Hydro Dam Safety - Security Cameras</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td>$123</td>
<td>$838</td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td>$123</td>
<td>$1,006</td>
</tr>
<tr>
<td>Total</td>
<td>$4,764</td>
<td></td>
</tr>
</tbody>
</table>

   **a) Project or Program Description**

   Hydro operates and maintains 22 dams that are considered by FERC to be either large and/or high-hazard dams, and many of these facilities are located in mountainous terrain at elevations over 7,000 feet above sea level. These locations are oftentimes remote and difficult places to work. SCE’s dams are under FERC jurisdiction and FERC has an ongoing effort to increase the safety of dams across the U.S. by improving the monitoring of the dams and by improving the dams’ ability to withstand natural disasters, including seismic events (earthquakes) and severe storms.

   **b) Need for Capital Project or Program Including Risk Avoided**

   Certain dams, including those in the Eastern Hydro region, are considered both high-hazard and time-sensitive. Time-sensitive means that emergency services need to be promptly notified in case of a dam failure for potential evacuation of downstream towns. Currently, SCE monitors its dams through remote sensors that measure water levels and water flows. When a sensor returns an unexpected or abnormal reading (which frequently occurs), an operator must travel to the dam to perform a visual inspection. In many cases, the travel time required can exceed two hours, which in an emergency condition is not adequate.

   This project will install monitoring cameras and telecommunications at each of the 22 high-hazard dams to enable remote visual surveillance of these dams.

   **(1) Benefits**

   The primary benefit for this project is improved response time to a pending or developing dam failure by adding visual surveillance capabilities to high-risk dams, and to
remove the need to send operations personnel to perform visual inspections when abnormal sensor readings are received.

c) **Scope and Cost Forecast**

The project scope at each dam will be similar and includes the purchase and installation of cameras and communications infrastructure. Cameras require the ability to capture periodic still images (e.g., 5 frames per minute) and remotely capture a still image on demand (sometimes infrared vision will be required to capture images at night or in snowy conditions). Cameras and communications equipment must remain operable in remote areas and under harsh weather conditions. In addition, not all dams have electric power and necessary communications infrastructure so this will be provided via solar and/or wind generation and satellite and/or microwave communications. Installation will occur according to the risk priority assigned to each dam and some installations may span multiple years (i.e., installations at various dams may commence in the fall of the first year and conclude in the second).

This project captures the IT components (e.g., cameras and communications equipment) of the Dam Monitoring and Surveillance Project. Supporting testimony for SCE’s RAMP risk analysis, construction of field towers, permitting, and related building materials is captured within SCE-05, Vol. 1. As shown in Table VIII-56, the IT portion of this project is $2.761 million for 2019-2023, and the total 2019-2023 capital forecast for this project is $5.161 million.\(^{115,116}\)

\begin{enumerate}
\item **Alternatives Considered**
\item **Alternative 1**

SCE considered installation of fixed power and fiber-optic communications links to each dam. Initial cost estimates performed in 2012 showed that the fixed power and fiber-optics communications link would not be a least cost option. Communications equipment costs were approximately $2.4 million for these seven dams; assuming similar complexity for the other dams the total project cost estimate would have been approximately $8.2 million, which was not the least cost option.
\end{enumerate}

\(^{115}\) $2.400 million in SCE-05, Vol. 1 and $2.761 million in this testimony for a total of $5.161 million. In addition, $2.003 million was recorded for this project prior to 2019.

\(^{116}\) Refer to WP SCE-05 Vol. 1, Chapter II.C.7.
(b) Alternative 2

SCE considered the use of remote-control unmanned aircraft (aka. drones) fitted with cameras to monitor the dams. Use of drones was deemed to not be a viable option due to it being an unproven technology for this application. Currently, FAA regulations require drones to be flown only within line-of-sight, which limits their usefulness in remote areas. In addition, a drone may not be able to fly (or survive the flight without crashing) in harsh weather conditions, including heavy rain, cold and snow. It is also unclear if commercially available drones exist that could satisfy the business needs listed above (and public safety requirements). In addition, some of the SCE dams are located on land managed by the US Forest Service and the regulatory environment for drones on federally managed lands is evolving. For these reasons, this alternative was not pursued further.

d) RAMP Integration

(1) Reconciliation between RAMP and GRC

SCE presented a 2019-2023 forecast in its RAMP filing of $2.098 million for this project, which is $0.663 million lower than SCE’s 2021 GRC forecast of $2.761 million. This is due to work being pushed from 2018 into 2019 due to permitting delays for construction activities, as further described in section e.1 below.\footnote{Included as portion of Generation BPG within SCE-05, V.01, Table I-10, RAMP ID C6.}

e) Basis for Capital Expenditure Forecast

In this rate case period (2019-2023), the requested project costs are $2.761 million.\footnote{See WPSCE-06V01P02 pp. 205 – 207.} Total 2019-2023 forecasted costs for the project are $5.161 million.\footnote{$2.400 million in SCE-5, Vol. 1, and $2.761 million in this testimony for a total of $5.161 million.} The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

The 2018 GRC decision authorized $2.641 million for this project for 2016 through 2018, and recorded costs during this period were $2.003 million. The project construction start was delayed until 2017 as several sites located at high altitude had become inaccessible during the
2016 winter. The installation progress was further delayed due to a slower than expected permitting process for the construction activities, which were in large part a result of the Federal Government shutdown that occurred in 2018.

2. Hydro Facilities FERC Security Enhancements (CIT-00-DM-DM-000165)

Table VIII-57
Hydro Facilities FERC Security Enhancements
2018 GRC Request, Authorized and Recorded/2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000165</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Recorded / Forecast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$7,451</td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
</tbody>
</table>

a) Project or Program Description

SCE’s hydro dams and powerhouses are critical components of the energy infrastructure and are secured with alarms and other security equipment. FERC safety inspections at Big Creek have identified several issues related to non-functioning security equipment (e.g., door alarms at dams and powerhouses). In most cases, the sensors malfunctioned due to unreliable telecommunications infrastructure. Several of these installations are in remote locations that rely on telephone lines for telecommunications. This project will improve telecommunications to selected dams and powerhouses to enable better monitoring and alarming of critical sites.

b) Need for Capital Project or Program Including Risk Avoided

Hydro dams and powerhouses are a critical part of SCE’s generation fleet. The security threat picture is evolving and new or increased threats are being identified on an ongoing basis. SCE needs to maintain and improve its security posture to counter these threats.

(1) Benefits

The primary benefit is enhanced physical security at specific high-priority dam structures and powerhouses and maintaining compliance with FERC safety requirements.
c) **Scope and Cost Forecast**

The scope of this project is to improve telecommunications to selected dams and powerhouses to enhance monitoring and alarming of real-time conditions. Communications methods available include:

- Fiberoptic network
- Ethernet-based network
- Satellite-based network
- Cell phone-based network
- Radio-based network

Each of these methods offer advantages and disadvantages in speed, reliability, coverage and cost. SCE plans to deploy a combination of these communication methods to meet the unique requirements of each location. The capital cost for this project is $7.451 million.

(1) **Alternatives Considered**

SCE considered not pursuing this project. However, this alternative was rejected because not pursuing this project would fail to meet the FERC security requirements.

d) **RAMP Integration**

(1) **Reconciliation between RAMP and GRC**

As shown in Table VIII-58, SCE presented a 2019-2023 forecast in its RAMP filing of $7.500 million, which is slightly higher (approximately $0.048 million) than SCE’s 2021 GRC forecast. The minor variance is attributable to rounding in the RAMP filing.
e) **Basis for Capital Expenditure Forecast**

In this rate case cycle (2019-2023), the total forecasted project costs are $7.451 million.\(^{120}\) The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs. As shown in the Table VIII-58, this project was included in SCE’s RAMP filing.  

\(^{120}\) See WPSCE-06V01P02 pp. 208 – 210.

\(\text{Table VIII-58} \)

**Hydro Facilities FERC Security Enhancement Controls**

**RAMP vs. GRC Capital Forecast Comparison**

\((\text{Nominal } $000)\)

<table>
<thead>
<tr>
<th>RAMP Risk</th>
<th>RAMP ID</th>
<th>RAMP Control Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Security</td>
<td>C3b</td>
<td>Non-Electric Facilities/Protection of Major Business Functions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Filing Name</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAMP</td>
<td>$-</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$-</td>
</tr>
<tr>
<td>GRC</td>
<td>$-</td>
<td>$2,484</td>
<td>$2,484</td>
<td>$2,484</td>
<td>$-</td>
</tr>
<tr>
<td>Variance</td>
<td>$-</td>
<td>$(16)</td>
<td>$(16)</td>
<td>$(16)</td>
<td>$-</td>
</tr>
</tbody>
</table>

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

This was not included in a prior GRC, so there were no authorized capital expenditures for 2018. Nor did SCE record any capital expenditures in 2018 for this project.
B. **Fossil Fuel Generation**

1. **Generation Automation Standardization (CIT-00-SD-PM-000227)**

   Table VIII-59

   **Generation Automation Standardization**

   **2018 GRC Request, Authorized and Recorded/2019-2023 Forecast**

   *(Nominal $000)*

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,515</td>
<td>$1,680</td>
<td></td>
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<tr>
<td>2018 GRC - Original Request</td>
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<td>$2,015</td>
<td>$1,500</td>
<td>$2,500</td>
<td></td>
<td>$9,033</td>
</tr>
</tbody>
</table>

   **a) Project or Program Description**

   Control systems are a critical part of a power plant as they are required to implement operator instructions and continuously monitor conditions of power plant equipment. The Mountainview control system was last refreshed in 2013 and the five Peaker powerplants are currently running on hardware and software installed in 2007 by the original equipment manufacturer. In the near future, the installed hardware and software will receive reduced support from our vendors. This in turn means that spare parts will cease to be manufactured and will become harder to obtain and software updates will become less frequent. The project will refresh the existing systems to standardize the operator user interfaces, make available all the plant data to systems and users on a near real-time basis with consistent and NERC compliant cybersecurity across all six gas-fired power plants.

   **b) Need for Capital Project or Program Including Risk Avoided**

   Control systems at power plants need to be refreshed at regular cycles. Equipment installed throughout the plant is subject to mechanical vibration and temperature variation, which causes the equipment to deteriorate gradually and have an increased failure rate with time. Over time, vendors will introduce new equipment models and will generally stop manufacturing and supporting equipment after a certain number of years. This makes it difficult to obtain spare parts for existing systems that are no longer produced and supported by the vendors.

   (1) **Benefits**

   This project will bring multiple benefits:
• Maintain reliability and availability at the Mountainview and Peaker plants.
• Make real-time plant data available to users outside of the plants.
• Enhance cybersecurity at the plants.

c) **Project Scope**

This project will refresh the control systems, enhance cybersecurity, and make plant data available to business users at Mountainview and the five Peakers. As part of this refresh effort, SCE will replace portions of the existing systems with equivalent systems from the same supplier used for the hydroelectric plants. Utilizing universal control systems from one vendor streamlines the training of support engineers and operators. Additional refreshment enhancements include standardization of: (1) real-time plan data to users located outside the plants, and (2) cybersecurity service layers for these plants to comply with the cybersecurity requirements for plant control systems. As shown in Table VIII-59, SCE forecasts total project costs of $7.849 million, with $5.782 million forecasted for this GRC cycle (i.e., 2019-2023).

(1) **Alternatives Considered**

(a) **Alternative 1:**

SCE considered not pursuing this project. However, this alternative was rejected because not pursuing this project would impact the reliability of SCE’s gas-fired plants, fail to mitigate cybersecurity exposures and risks, and not make plant data readily available to business users and business systems.

(b) **Alternative 2:**

SCE also considered moving forward with a lower-cost project that did not include the cybersecurity enhancements. However, this alternative was rejected because of the need to mitigate cybersecurity exposures and risks.

d) **Basis for Capital Expenditure Forecast**

The total forecasted project costs are $7.85 million in this rate case cycle (i.e., 2019-2023). The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project

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[121] See WPSCE-06V01P02 pp. 211 – 213.
cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

The 2018 GRC decision authorized $4.194 million for this project for 2017 and 2018. The recorded cost during this period was $2.067 million. This is primarily due to the fact that the project start was delayed from 2017 to 2018 to allow time for on-site job walks with the vendor to further refine the scope of work for each site.

2. Enhance Control Room-Generator Network Redundancy (CIT-00-DM-DM-000187)

Table VIII-60
Enhance Control Room-Generator Network Redundancy
2018 GRC Request, Authorized and Recorded/2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Enhance Control Room-Generator Network Redundancy</th>
<th>Recorded</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,500</td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
</tbody>
</table>

a) Project or Program Description

SCE has three existing generation control centers located in Big Creek, Bishop and Mountainview, each of which is staffed on a full-time basis. The Big Creek center manages the Big Creek hydroelectric project, the Bishop center manages the power plants in the Bishop/Mono basin plus the plants in the San Joaquin Valley and Kernville areas, and the Mountainview control center manages the gas-fired plants in the LA Basin and the SCE-owned solar plants. This project will enable a second control center to continue to operate the generator in the event the first one becomes unavailable.

b) Need for Capital Project or Program Including Risk Avoided

From a business continuity standpoint, it is preferable to have redundant control centers so that a plant can remain in-service if the primary control center becomes unavailable due to natural or human-made causes.
1. **Benefit**
   
The primary benefit of this project is control center redundancy, where a generator can keep operating if the primary control center becomes unavailable by being controlled from an alternate control center.

c) **Scope and Cost Forecast**
   
This project will enhance the existing communications to provide the bandwidth and low latency (delay) required for these control centers to function as backups for each other. This project was included in the 2018 SCE RAMP filing, and the cost estimate remains unchanged.

1. **Alternatives Considered**

   (a) **Alternative 1:**
   
   SCE considered building a separate backup control center that could function as a backup for each of the three existing control centers. This backup center would be an unmanned facility that would be utilized only when one of the existing control centers would become unavailable. This alternative was rejected because, in addition to construction costs for the backup center building, there would be similar telecommunication costs to connect the new backup control center to the existing power plants.

   (b) **Alternative 2:**
   
   SCE also considered keeping the current state with no backup control centers. This is the least-cost option, but it does not provide necessary redundancy for generation control centers. In the case of an existing control center becoming unavailable the plants controlled by the affected control center would go off-line, which could impact grid reliability.

d) **RAMP Integration**

   (1) **Reconciliation Between RAMP to GRC**
   
As shown in Table VIII-61, SCE presented a total project forecast in its RAMP filing of $2,500 million over the 2019-2023 period. This is equivalent to SCE’s total project forecast in its 2021 RAMP forecast of $2,500 million but has been updated to start one year later and is now requested for the 2021-2023 period.
e) Basis for Capital Expenditure Forecast

In this rate case period (2019-2023), the total project costs are $2.500 million. The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) Comparison of 2017 & 2018 Authorized to Recorded

This project was not included in a prior GRC, so there were no authorized capital expenditures for 2017 or 2018. Nor did SCE record any capital expenditures in 2017 or 2018 for this project.

122 See WPSCE-06V01P02 pp. 214 – 216.
3. Asset Performance Management and Optimization (CIT-00-DM-DM-000079)

Table VIII-62
Asset Performance Management and Optimization
2018 GRC Request, Authorized and Recorded/2019-2023 Forecast
(Nominal $000)

<table>
<thead>
<tr>
<th>Asset Performance Management and Optimization</th>
<th>Recorded</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded / Forecast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 GRC - Authorized</td>
<td>$120</td>
<td>$2,473</td>
</tr>
<tr>
<td>2018 GRC - Original Request</td>
<td>$504</td>
<td>$1,000</td>
</tr>
</tbody>
</table>

a) Project or Program Description

One of the key aspects of an Asset Management program is the ability to view assets at the portfolio level in order to assess asset health and risk of failure across the portfolio rather than at an individual level. This enables users to identify the assets most in need of maintenance and allocate maintenance funds in the more effective manner (i.e., to get the most reduction in risk of failure for the funds available). SCE has an existing tool utilized for the T&D portfolio, and this project includes configuring this tool to handle the Generation asset portfolio as well.

b) Need for Capital Project or Program Including Risk Avoided

A structured asset management program uses asset health and risk of failure as the main drivers for maintenance and/or replacement of an asset rather than fixed schedules. This enables SCE to repair or replace assets when they need to be replaced (i.e., before they fail and cause outages) rather than on a predefined fixed schedule. It also helps with prioritizing assets for maintenance based on risk of failure and impact of failure. This maintains reliability and helps with controlling ongoing costs.

(1) Benefits

The implementation of a structured asset management program within Generation would enable SCE to identify the highest-priority assets and prioritize maintenance utilizing a risk-based decision-making model rather than on a predefined fixed schedule, as is largely the current practice.

c) Scope and Cost Forecast

A key aspect of asset management is the estimation of asset health utilizing available asset data (e.g., age, number of hours in operation) and in-situ operational measurements (e.g.,
vibration monitoring, oil chemistry analysis). SCE has implemented work management tools in the T&D portfolio and these tools will be configured to work for generation assets. This project will provide the analytics and reporting tools necessary to rank asset health, asset risk, and evaluate different approaches to management. Additionally, a third party vendor tool will be utilized to automate the creation of work orders, develop new processes and procedures to adapt existing maintenance practices to the new risk-based asset management approach.

(1) **Alternatives Considered**

(a) **Alternative 1:**

In-house development. SCE has already invested in an enterprise platform for data reporting and analytics, and one option is to utilize this platform to develop the necessary reports and analytics. However, SCE has already invested in tools for asset portfolio and risk management for the T&D portfolios, and since these tools already have the functionality needed for Generation without having to develop any tools with redundant functionality.

(b) **Alternative 2:**

Single vendor tool. SCE considered purchasing a single tool to cover all requirements of this project. However, no single vendor tool currently provides good functionality across all functional areas that are needed for this project. In addition, purchasing a single vendor tool would provide redundant functionality to the tools that have already been purchased for the T&D portfolio.

d) **Basis for Capital Expenditure Forecast**

As shown in Table VIII-62, the total project costs are $4.525 million for this rate case period (2019-2023). The capital forecast for this project was developed using SCE’s internal cost estimation model. This model utilizes industry best practices and SCE subject matter expertise to estimate project cost components. SCE’s forecast for this project includes costs for SCE employees, supplemental workers, and consultants, software and vendor costs, and hardware costs.

(1) **Comparison of 2017 & 2018 Authorized to Recorded**

In SCE’s 2018 GRC, SCE requested $504,000 and was authorized $420,000 in expenditures for 2018. SCE did not record any costs for this project as it was delayed but is still necessary for the reasons discussed above and is now forecast to begin in 2020.

See WPSCE-06V01P02 pp. 217 – 219.
Table VIII-63 lists capitalized software projects whose total forecasted project costs are less than $3 million and are forecasted to be complete within this rate case cycle (i.e., 2019-2023).  

<table>
<thead>
<tr>
<th>WBS</th>
<th>Project Description</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT-00-DM-DM-000183</td>
<td>Operational Reliability Analysis Program (ORAP)</td>
<td>$143</td>
<td>$190</td>
<td></td>
<td></td>
<td></td>
<td>$334</td>
</tr>
<tr>
<td>CIT-00-DM-DM-000233</td>
<td>Project Management Tool Integration for Generation</td>
<td></td>
<td></td>
<td>$662</td>
<td></td>
<td></td>
<td>$662</td>
</tr>
<tr>
<td>CIT-00-SD-PM-000260</td>
<td>Hydrographic Quality Control</td>
<td></td>
<td></td>
<td>$1,108</td>
<td></td>
<td></td>
<td>$1,108</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$0</td>
<td>$1,913</td>
<td>$190</td>
<td>$0</td>
<td>$0</td>
<td>$2,104</td>
</tr>
</tbody>
</table>

See WPSCE-06V01P02 pp. 220 – 228.
IX.

SCE’s PORTFOLIO-BASED FORECAST FOR 2021-2023 OU CAPITAL SOFTWARE PROJECTS

Table IX-64
Summary of 2019-2023 OU Capitalized Software Forecast
Nominal $000

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OU Capital Software Forecast</td>
<td></td>
<td></td>
<td></td>
<td>Nominal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-2018 Recorded</td>
<td>$95,000</td>
<td>$112,000</td>
<td>$121,000</td>
<td>$96,000</td>
<td>$92,000</td>
<td>$98,000</td>
<td>$110,000</td>
<td>$110,000</td>
</tr>
<tr>
<td>Itemized</td>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table IX-64 summarizes SCE’s 2019-2023 OU capitalized software forecast. SCE’s hybrid forecast approach consists of: (1) an itemized forecast for projects with forecast spending in 2019-2020; (2) a 2021-2023 portfolio-based forecast comparable to an average of SCE’s 2016-2018 recorded costs.\(^{125}\) Chapters II-VIII of this Volume presented the itemized request for 67 2019-2020 OU capitalized projects totaling $96 million in 2019 and $92 million in 2020.\(^{126}\) This Chapter outlines SCE’s 2021-2023 OU capital software request of $98 million in 2021 and $110 million annually in 2022 and 2023. At the time of filing SCE’s 2021 GRC Application in August 2019, SCE’s 2021-2023 OU capital software forecast of $110 million annually reflected a CSRP “Go-Live” date in 2020. In SCE’s amended testimony, SCE’s OU capital software forecast for calendar year 2021 has been adjusted downwards to $98 million to align with the revised CSRP implementation date in early 2021. However, SCE’s 2021-2023 portfolio-based forecast approach and allocation methodology is unchanged and reflects SCE’s expectation that execution of OU capital software projects will return to levels comparable to those historically recorded, following a temporary slow-down in 2019 to the beginning of 2021 due to the

\(^{125}\) For the purpose of providing comparable historical recorded to forecast costs in this Volume, SCE has excluded recorded costs that are now forecast in separate Volumes (e.g., Grid Modernization Planning & Analytic Tools, Cybersecurity Perimeter & Interior Defense, Cybersecurity Grid Modernization, etc.).

\(^{126}\) SCE also provides an itemized forecast for six projects beginning in the 2021-2023 period due to having a higher degree of certainty regarding the planned technology solution.
CSRP implementation. Section IX.A-D provides supporting factors for the appropriateness of SCE’s 2021-2023 forecast approach, and Section IX.E provides additional detail regarding the allocation of the portfolio forecast and examples of capabilities or types of OU capital software projects SCE anticipates for the 2021-2023 timeframe.

A. **SCE’s Forecast Methodology Based on Recorded Data is Reasonable**

1. **This Methodology is Consistent with Commission Practice**

While SCE has utilized an itemized forecast for our OU capitalized software projects in prior rate cases, the Commission also has a long-standing practice of evaluating the reasonableness of forecasts based on recorded data. Further, the rate case plan does not require utilities to forecast capital expenditures on an itemized basis. Indeed, SCE has presented capital forecasts in various other areas in our rate cases that are based on last year recorded or multi-year averaged historical data, particularly when external drivers can be unpredictable. In various forums, the Commission has indicated that relying on historical data to forecast future costs is reasonable. For reference, the following are all examples from SCE’s 2018 GRC in which the Commission evaluated, and authorized funding based on historical data:

- Exhibit SCE-02, Volume 2 (New Service Connections-Underground Cable)
- Exhibit SCE-02, Volume 4 (Distribution Maintenance & Inspection)
- Exhibit SCE-02, Volume 5 (Substation Capital maintenance)
- Exhibit SCE-02, Volume 7 (Transmission Construction & Maintenance)
- Exhibit SCE-07, Volume 3 (Corporate Real Estate-Substation Capital Maintenance Blanket)

All of these examples of capital blankets share some similar characteristics. First, these blankets are all comprised of numerous smaller projects, of varying size. Second, the projects within these blankets are generally not reactive, which means a certain amount of planning and preparation is involved before the project can be executed. Third, projects in these blankets can be unplanned and vary in cost depending on the emergent business need being addressed. Fourth, there is reasonable visibility

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127 See D.04-07-022, pp. 14-16 and D.89-12-057.

of what business needs will be solved by projects in the short term (i.e., between 6 and 24 months), but not as much visibility of what projects will be executed to solve longer term business needs. Finally, while historical spending for these blankets has varied, it has varied within a relatively limited range.

These characteristics are shared with the Capitalized Software portfolio. The portfolio has a range of project sizes, all of which require planning and coordination with existing systems. OU capitalized software projects fill planned and emergent business needs simultaneously, and costs can vary significantly. SCE requires flexibility to ensure that we are working on the most important projects, using our internal and external resources most effectively.

2. **The Rapid Pace of Changing Technology no Longer Supports an Itemized Forecast for OU Capitalized Software Projects in 2021-2023**

While the rapid pace of technology advancement in recent years has provided new operational efficiencies and customer offerings, it has also created challenges in our ability to predict what technology solutions will be available in the future with a high degree of precision. For projects that begin 3-5 years after the GRC Application is filed, this is particularly true not only for IT, but also for the business lines that will require a technology solution. Apart from not being able to predict constantly evolving technology product choices, other events triggering the need for technology solutions are sometimes outside of SCE’s control. For example, compliance mandates can arise from numerous regulatory agencies (e.g., CPUC, FERC, NERC, CAISO) that were not predicted. Similarly, externally driven business needs can quickly arise and require a technology solution, which was the case for such projects such as Community Choice Aggregation (CCA) Renovation. This project was not requested in SCE’s 2018 GRC. However, the formulation of Clean Power Alliance of California in 2017 resulted in an influx of CCA accounts, requiring modifications to SCE’s billing system to accommodate the large volume of requirements for data and billing presentation from different CCAs. Finally, systems can have performance issues or lack readiness within existing technology at the time of implementation. These situations can require unplanned modifications to improve data integrity, system reliability, and user adoption. SCE’s cGIS Improvements project, which is discussed in Section VI.A.10, is an example of this type of unplanned business need that informs SCE’s priorities in this portfolio.

The lack of predictability and changing business needs are evidenced in Section I.F.1 of this volume, which compare the population of SCE’s 2017-2018 authorized projects to those undertaken. The section outlines some of the various unknowns that transpire, causing SCE to react and deviate from the planning current at the time SCE files a rate case, even as early as 1-2 years out. This is
reinforced in the figure below that compares (1) SCE’s 2018 GRC forecasts for 2016-2018 to corresponding 2016-2018 recorded amounts, and (2) SCE’s 2018 GRC forecasts for 2019-2020 to SCE’s 2021 GRC forecasts for years 2019-2020. As shown, at the time SCE filed its 2018 GRC in 2016, the minimal level of detail known about projects scheduled to start several years out, and the inability to know what potential project requests might arise for those latter years, resulted in the forecasts decreasing substantially in 2019-2020 to $65 million and $51 million, respectively. SCE subsequently recorded $121 million in 2018, $28 million over 2018 authorized. The variances between the GRC forecasts SCE made in 2016 for years 2019 and 2020 and SCE’s updated itemized forecasts for 2019-2020 in this filing are also substantial. SCE’s itemized forecasts in this filing for 2019-2020 indicate that the corresponding itemized forecasts in the 2018 GRC were vastly underestimated by approximately $77 million.
3. **SCE’s Portfolio-Based Forecast is Necessary in Light of D.19-05-020**

In past GRCs, SCE attempted to compensate for the inability to accurately predict what technology solutions would be available in the future by incorporating contingency amounts into its capitalized software forecasts. These contingency amounts were intended to account for the expected variances in actual costs as contrasted with early-stage planning costs. While the Commission had historically authorized the recovery of reasonable contingencies in the capital software portfolio, in the 2018 GRC, the Commission disapproved of this practice, finding that budgeting for software contingencies is not appropriate in a general rate case. As a result, the Commission disallowed recovery
for the entirety of the contingency amounts SCE had forecasted.\textsuperscript{129} In light of that Decision, an itemized forecast is no longer viable for the outer years of the GRC. Without being able to include a reasonable contingency amount, SCE has no way of accounting in an itemized forecast for the project scope and cost variations that inevitably arise in projects between conception and completion years later. We have provided separate testimony for the few projects where there is sufficient certainty concerning the specific technology solution between 2021-2023 in their respective BPGs (i.e., Chapters II-VIII of this volume). For the remainder of our forecast, SCE uses the accepted practice of a multi-year average of historical data and describes the targeted capability areas within BPGs for the 2021-2023 timeframe. This is consistent with the Commission guidance to establish the necessity of the work now then provide a more accurate itemized forecast for the later years in the next GRC.

B. \textbf{Determination of 2021-2023 Portfolio-Based Forecast Amount and Allocation}

1. \textbf{Impact of CS Re-Platform (CSRP) Implementation on 2019-2020 Forecast}

As shown in Figure IX-4 above, SCE’s capitalized software costs increased from 2016-2018 as SCE has continued to rely more on technology solutions in the field, for our office work, and in our interactions with customers. Although our recorded costs have steadily increased, SCE forecasts a temporary decline in expenditures starting in 2019 and continuing through the beginning of 2021. This is due to the implementation and stabilization of SCE’s CSRP system,\textsuperscript{130} which necessitates a temporary system freeze limiting SCE’s ability to make integration, upgrades, and operational changes. The changes being made through the implementation of CSRP internally will impact 8 core business processes, over 260 sub-processes, and impact over 4,200 users of over 220 applications. From an external perspective, CSRP will directly impact all 5.5 million of SCE’s customers and about 55 third parties who have direct interfaces with our systems. Because of this significant breadth of impact, it is easy to see how fully integrated this work is across multiple systems and data sets at SCE. There would be no way to successfully implement a project of this magnitude without freezing work on the other integrated systems being modified by CSRP, or without pausing other important work to free up the expertise of people in IT and across SCE to ensure a successful, quality implementation. As a result,

\begin{itemize}
  \item \textsuperscript{129} In D.19-05-020, p. 152, the Commission reduced SCE’s 2017 forecast by $24.75 million and 2018 forecast by $23.86 million associated with software contingency.
  \item \textsuperscript{130} A stabilization period is required to ensure that the new system is working as expected and to safeguard against potential negative impacts to operations when temporary increases in work volumes and average handle times are expected.
\end{itemize}
SCE anticipates there will be limited capacity from a resource and systems perspective, which will in turn lead to the delivery of less OU capital software projects. This is reflected in SCE’s slightly lower 2019-2020 capital request. However, SCE will need to resume normal delivery of OU capitalized projects following the CSRP implementation in early 2021. While it is likely a backlog of demand may exist and push the actual spend higher, at this time SCE conservatively forecasts $98 million for 2021, which is equal to SCE’s preliminary 2019 recorded expenditures\(^{131}\) and $110 million annually for 2022-2023, which is the 3-Year average of 2016-2018 recorded expenditures.

2. **Treatment of Forecast Expenditures for Projects Beginning 2021-2023**

SCE’s 2021-2023 portfolio-based request assumes authorization of $98 million for 2021 and $110 million for each of 2022 and 2023, inclusive of projects that start prior to 2021 and continue into the 2021-2023 portfolio period. For example, where a project such as Rate Design (discussed in Section III.C) begins in 2020 and has a forecast of $2 million per year thereafter for 2021-2023, $2 million from the $110 million portfolio would be allocated to the Rate Design project each year reducing the remaining portfolio available for allocation to $108 million each year. In addition, Chapters II-VIII include itemized forecasts and testimony for six projects\(^{132}\) that have start dates in the 2021-2023 timeframe. Because SCE has more certainty regarding the technology solutions for these six projects, SCE developed individual cost estimates. Therefore, these forecasts are also deducted from the 2021-2023 portfolio amount available for allocation. Table IX-65 summarizes the carryover amounts included in the 2021-2023 portfolio by BPG, including the six projects beginning in 2021-2023 where itemized project estimates were produced, and the resulting balance available for allocation of the portfolio discussed in Section B.3.

\(^{131}\) At the time of filing SCE’s 2021 GRC Application in August 2019, SCE’s 2021-2023 forecast of $110 million annually assumed CSRP would be implemented in 2020. SCE’s amended testimony and forecast adjusts the 2021 forecast downwards from $110 million to $98 million to align with the CSRP implementation occurring early 2021.

\(^{132}\) Digital Roadmap, Integrated Position & Risk Management, HR Re-Platform, Virtual Data Hybrid Data Center, Enhance Control Room-Generator Network Redundancy, and Predictive Analytics for People & Devices.
3. **2021-2023 Estimated Portfolio Allocation by BPG Reflects SCE’s Strategic and Business Priorities**

Section B.2 provided an explanation of how expenditures carried into the 2021-2023 portfolio period will impact the annual portfolio available for allocation in Table IX-65. This section describes the currently estimated allocation of the available remaining portfolio among SCE’s BPGs in order to provide a directional indication of where the expenditures are expected to occur in the later years of the GRC period. As 2021-2023 OU capital software expenditures will be reviewed as part of SCE’s 2024 GRC, parties and the Commission also have the opportunity to review the prudency of 2021 recorded vs. authorized levels and the 2022-2023 project forecasts that will be more current when SCE files its 2024 GRC Application.

The Figure below provides the currently estimated percentage allocation of the 2021-2023 portfolio by BPG. SCE considered the following factors in developing the BPG allocation:

- **Distribution Grid and Substation**: The future focus within these BPGs will be in support of our strategies for cleaning the power system and strengthening and

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133 See WPSCE-06V01P02 pp. 229 – 236.
modernizing the grid. We will emphasize capabilities to enable work and asset management across the grid in order to be more responsive to our customers and manage the information and data exchange necessary to ensure a smart, clean, and responsive grid. At this time, we are anticipating a slight reduction from historical levels due to completion of large projects including CRAS, cGIS Improvements and Field Tools Lightweight Solution.

- **Customer Interactions**: The future focus within the Customer Interactions BPG will be in support of our customer facing strategies. We plan a continued focus on customer satisfaction, customer self-service offerings through technology options, and the ability to provide proactive notifications to SCE customers. We will target new improvements in the way we interact with customers through our contact center and mobility, as well as enhancing our customers’ ability to make the best energy choices for them.

- **Resiliency**: The future focus within this BPG will be in support of our strategies for business continuity planning, crisis management, and physical security, and business needs related to wildfire mitigation efforts. In addition to keeping our customers, communities, and employees safe, future projects in this BPG will allow us to implement enhanced security and access controls across our network to strengthen the protection of their data as well.

- **Generation and Energy Procurement**: As we move in to the outer years of this rate case, power dispatch and monitoring, predictive maintenance, and regulatory compliance will be the key areas of focus for the Generation and Energy Procurement BPGs. We have future opportunities to refresh our Generation Management System to keep pace with CAISO requirements, initiate better asset planning related to generation and procurement, as well as to simplify our technology systems to increase cost savings.

- **Enterprise Support**: Enterprise Support represents a broad population of enterprise functions including Legal, Human Resources, Finance & Strategy, Enterprise Operations, Audits, Safety, Ethics & Compliance, IT, and Regulatory. Therefore, there is also a broad array of strategically beneficial work being targeted for the future in this BPG. Future spend in these areas supports almost all business outcomes across
SCE and drives operational and service excellence across the enterprise. Some of the key solutions being planned are improvements to our core, foundational SAP systems, improving our analytics capabilities to become more predictive to benefit response times for our customers and reduce costs, and to make our tools and practices more efficient internally, leading to speed and cost improvements.

**Figure IX-5**

**OU Capital Software**

*2021-2023 Estimated Portfolio Allocation by BPG*