

Application of SAN DIEGO GAS & ELECTRIC)
COMPANY for authority to update its gas and)
electric revenue requirement and base rates)
effective January 1, 2019 (U 902-M))

Application No. 17-10-____

Exhibit No.: (SDG&E-25-CWP)

CAPITAL WORKPAPERS TO
PREPARED DIRECT TESTIMONY
OF GAVIN H. WORDEN
ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

OCTOBER 2017



**2019 General Rate Case - APP
INDEX OF WORKPAPERS**

Exhibit SDG&E-25-CWP - CYBER SECURITY

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San Diego Gas & Electric Company
 2019 GRC - APP
 Capital Workpapers

Overall Summary For Exhibit No. SDG&E-25-CWP

| | |
|-----------------|------------------------|
| Area: | CYBER SECURITY |
| Witness: | Gavin H. Worden |

| In 2016 \$ (000) | | | |
|------------------------------|--------------|--------------|--------------|
| Adjusted-Forecast | | | |
| | 2017 | 2018 | 2019 |
| A. Detect | 110 | 0 | 0 |
| B. Identify | 876 | 0 | 0 |
| C. Protect | 2,496 | 3,174 | 3,686 |
| D. Grid Modernization | 2,664 | 4,058 | 1,932 |
| Total | 6,146 | 7,232 | 5,618 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Category: A. Detect
Workpaper: 00815A

Summary for Category: A. Detect

| | In 2016\$ (000) | | | |
|--------------|-------------------|-------------------|----------|----------|
| | Adjusted-Recorded | Adjusted-Forecast | | |
| | 2016 | 2017 | 2018 | 2019 |
| Labor | 0 | 25 | 0 | 0 |
| Non-Labor | 0 | 85 | 0 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | <u>0</u> | <u>110</u> | <u>0</u> | <u>0</u> |
| FTE | 0.0 | 0.2 | 0.0 | 0.0 |

00815A RAMP - Incremental Network Anomaly Detection - Ph3

| | | | | |
|--------------|----------|------------|----------|----------|
| Labor | 0 | 25 | 0 | 0 |
| Non-Labor | 0 | 85 | 0 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | <u>0</u> | <u>110</u> | <u>0</u> | <u>0</u> |
| FTE | 0.0 | 0.2 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

Beginning of Workpaper Group
00815A - RAMP - Incremental Network Anomaly Detection - Ph3

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: A. Detect
 Category-Sub: 1. Smart Grid SCADA ICS monitoring
 Workpaper Group: 00815A - RAMP - Incremental Network Anomaly Detection - Ph3

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|----------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 85 | 0 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 110 | 0 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |

Business Purpose:

SDG&E is expanding IP based communications and establishing substation local area networks to support a variety of projects such as Condition Based Maintenance, Substation Physical Security Enhancements and Advanced SCADA devices. These new IP networks will support the next generation distributed energy resources and SCADA device technologies which are critical in maintaining the availability and security of the SDG&E electric grid. Expansion of these new IP based grid control networks has created the current situation where Information Security has limited visibility and situational awareness in these new networks and devices. Network Anomaly Detection technology provides SDGE's Information Security team with a new level of situational awareness in networks never monitored previously, and also provides SDGE's Operational Technology groups a deeper level of visibility into the process they monitor and support. Network security monitoring is the top active defense mechanism recommended by industry experts after the Ukraine distribution utility cyber incident.

Physical Description:

Continued deployments of the technology and best practices established in previous phases to the following sites: Adding capability to inspect serial communications and detect anomalies Mission and Metro Control Centers, Deployment of sensors in Palomar generation and Cuyamaca backup sites, Deployment of sensor in advanced SCADA substations (TCP/IP); Lilac substation, Point Loma substation, Adding a new network mapping capability to graphically visualize cybersecurity attacks or communications, Development of network capture capability within Silent Defense GUI, Development of centralized sensor rollout and replication capability and Development of centralized sensor configuration update capability

Project Justification:

Reduce recovery time and duration of cyber security event, Ability to identify indicators of compromise within SDG&E's most critical networks / grid environments, New capability to detect, respond and recover from a cyber incident in critical SDG&E SCADA serial networks , Provide Electric T&D Operators visibility into infrastructure configuration and performance Provide network operations visibility into network flows, Analytic platform will provide ability to visualize network flows, security or misconfigurations, Limit impact of cyber security incidents on the electric grid, Potential capability to meet future compliance requirements

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 00815.0
Category: A. Detect
Category-Sub: 1. Smart Grid SCADA ICS monitoring
Workpaper Group: 00815A - RAMP - Incremental Network Anomaly Detection - Ph3

Forecast Methodology:

Labor - Zero-Based

Project is currently in-flight. Based on actual timeline of the project to complete.

Non-Labor - Zero-Based

Project is currently in-flight. Based on actual timeline of the project to complete.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 00815A**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: A. Detect
 Category-Sub: 1. Smart Grid SCADA ICS monitoring
 Workpaper Group: 00815A - RAMP - Incremental Network Anomaly Detection - Ph3
 Workpaper Detail: 00815A.001 - RAMP - Incremental Smart Grid SCADA ICS monitoring
 In-Service Date: 01/31/2017
 Description:

Trailing charges for NAD PH 3 Project

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 25 | 0 | 0 |
| Non-Labor | | 85 | 0 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 110 | 0 | 0 |
| FTE | | 0.2 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: A. Detect
 Category-Sub: 1. Smart Grid SCADA ICS monitoring
 Workpaper Group: 00815A - RAMP - Incremental Network Anomaly Detection - Ph3
 Workpaper Detail: 00815A.001 - RAMP - Incremental Smart Grid SCADA ICS monitoring

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Network Anomaly Detection Phase 3

Program Description: Smart Grid SCADA ICS monitoring

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Detect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: N/A

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Category: B. Identify
Workpaper: 00815C

Summary for Category: B. Identify

| | In 2016\$ (000) | | | |
|--------------|-------------------|-------------------|----------|----------|
| | Adjusted-Recorded | Adjusted-Forecast | | |
| | 2016 | 2017 | 2018 | 2019 |
| Labor | 0 | 127 | 0 | 0 |
| Non-Labor | 0 | 749 | 0 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | <u>0</u> | <u>876</u> | <u>0</u> | <u>0</u> |
| FTE | 0.0 | 1.0 | 0.0 | 0.0 |

00815C RAMP - Incremental Compliance Records Management

| | | | | |
|--------------|----------|------------|----------|----------|
| Labor | 0 | 127 | 0 | 0 |
| Non-Labor | 0 | 749 | 0 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | <u>0</u> | <u>876</u> | <u>0</u> | <u>0</u> |
| FTE | 0.0 | 1.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

Beginning of Workpaper Group
00815C - RAMP - Incremental Compliance Records Management

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: B. Identify
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|----------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 127 | 0 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 749 | 0 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 876 | 0 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |

Business Purpose:

Compliance with NERC CIP regulatory requirements.

Physical Description:

Develop technical requirements for RFP and select new product standards with input from NERC CIP and Collaboration Services Share Point team.

Project Justification:

Compliance with NERC CIP regulatory requirements.

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 00815.0
Category: B. Identify
Category-Sub: 1. Expand deployment of centralized pw and config
Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management

Forecast Methodology:

Labor - Zero-Based

Project is currently in-flight. Based on actual timeline of the project to complete.

Non-Labor - Zero-Based

Project is currently in-flight. Based on actual timeline of the project to complete.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 00815C**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: B. Identify
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management
 Workpaper Detail: 00815C.001 - RAMP - Incremental Compliance Records Management
 In-Service Date: 06/30/2017

Description:

License purchase (non self developed)

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 127 | 0 | 0 |
| Non-Labor | | 113 | 0 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 240 | 0 | 0 |
| FTE | | 1.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: B. Identify
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management
 Workpaper Detail: 00815C.001 - RAMP - Incremental Compliance Records Management

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Security Compliance Management

Program Description: Security Compliance Records Management

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Identify

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: B. Identify
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management
 Workpaper Detail: 00815C.002 - RAMP - Incremental Compliance Records Management
 In-Service Date: 06/30/2017

Description:

License purchase (non self developed)

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 636 | 0 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 636 | 0 | 0 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: B. Identify
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815C - RAMP - Incremental Compliance Records Management
 Workpaper Detail: 00815C.002 - RAMP - Incremental Compliance Records Management

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Security Compliance Management

Program Description: Security Compliance Records Management

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Identify

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Category: C. Protect
Workpaper: VARIOUS

Summary for Category: C. Protect

| | In 2016\$ (000) | | | |
|--------------|-------------------|-------------------|--------------|--------------|
| | Adjusted-Recorded | Adjusted-Forecast | | |
| | 2016 | 2017 | 2018 | 2019 |
| Labor | 0 | 246 | 291 | 291 |
| Non-Labor | 0 | 2,250 | 2,883 | 3,395 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 2,496 | 3,174 | 3,686 |
| FTE | 0.0 | 2.2 | 4.0 | 3.5 |

00815B RAMP - Incremental Smart Grid Substation Gateway Security

| | | | | |
|--------------|----------|--------------|--------------|--------------|
| Labor | 0 | 96 | 144 | 144 |
| Non-Labor | 0 | 972 | 1,188 | 1,272 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 1,068 | 1,332 | 1,416 |
| FTE | 0.0 | 0.7 | 1.5 | 1.5 |

00815D RAMP - Incremental Critical Infrastructure Protection

| | | | | |
|--------------|----------|--------------|--------------|--------------|
| Labor | 0 | 150 | 147 | 147 |
| Non-Labor | 0 | 1,278 | 1,695 | 2,123 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 1,428 | 1,842 | 2,270 |
| FTE | 0.0 | 1.5 | 2.5 | 2.0 |

Note: Totals may include rounding differences.

Beginning of Workpaper Group
00815B - RAMP - Incremental Smart Grid Substation Gateway Security

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|--------------|--------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 96 | 144 | 144 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 972 | 1,188 | 1,272 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 1,068 | 1,332 | 1,416 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 1.5 | 1.5 |

Business Purpose:

- Ensure substation gateway hardware maintains reliability and available per Elect Control Systems requirements
 - Ensure gateway back office applications / infrastructure remain reliable and available (per client requirements)
 - Operational IEDs on TCP/IP network meet Sempra password standards
 - Ability to detect and alert/notify in real time when IED configuration changes or firmware modifications are made
- Provides additional situational awareness on field IEDs for Information Security and Elect T&D asset owners
 Secure remote access to IEDs to enable OT support teams ability to perform configurations remotely as desired, reducing less drive time and costs
- Provides additional situational awareness on field IEDs for Information Security and Elect T&D asset owners
 Secure remote access to IEDs to enable OT support teams ability to perform configurations remotely as desired, reducing less drive time and costs

Physical Description:

Current state Hardware deployed to the field with standardized configuration managed from a centralized system

Project Justification:

This project will enable the field devices to improve configuration and password strength and additional enhanced technical capabilities.

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 00815.0
Category: C. Protect
Category-Sub: 1. Expand deployment of centralized pw and config
Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 00815B**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security
 Workpaper Detail: 00815B.001 - RAMP - Incremental Expand deployment of centralized password and configuration manageme
 In-Service Date: Not Applicable
 Description:

Self developed portion of project

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|--------------------|--------------------|--------------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 96 | 144 | 144 |
| Non-Labor | | 144 | 180 | 192 |
| NSE | | 0 | 0 | 0 |
| | Total | <u>240</u> | <u>324</u> | <u>336</u> |
| FTE | | 0.7 | 1.5 | 1.5 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security
 Workpaper Detail: 00815B.001 - RAMP - Incremental Expand deployment of centralized password and configuration management

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses

Program Description: Smart Grid Substation Gateway Security Phase 2

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security
 Workpaper Detail: 00815B.002 - RAMP - Incremental Smart Grid Substation Gateway Security
 In-Service Date: Not Applicable
 Description:

License purchase (non self developed)

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|--------------|--------------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 828 | 1,008 | 1,080 |
| NSE | | 0 | 0 | 0 |
| | Total | 828 | 1,008 | 1,080 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 1. Expand deployment of centralized pw and config
 Workpaper Group: 00815B - RAMP - Incremental Smart Grid Substation Gateway Security
 Workpaper Detail: 00815B.002 - RAMP - Incremental Smart Grid Substation Gateway Security

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses

Program Description: Smart Grid Substation Gateway Security Phase 2

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
00815D - RAMP - Incremental Critical Infrastructure Protection

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 2. Electric grid system protection
 Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|--------------|--------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 150 | 147 | 147 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 1,278 | 1,695 | 2,123 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 1,428 | 1,842 | 2,270 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 2.5 | 2.0 |

Business Purpose:

The Cybersecurity Protect function refers to developing and implementing the appropriate safeguards so that the company can provide safe and reliable delivery of critical infrastructure services. The Protect Function supports the ability to limit or contain the impact of a potential cybersecurity event. Examples of control Categories within this Function include: Access Control; Awareness and Training; Data Security; Information Protection Processes and Procedures; Maintenance; and Protective Technology.

Protection-oriented activities are focused on avoiding or limiting potential cybersecurity events. Activities in this functional area include: managing asset access, cybersecurity awareness and training, protective technologies and system maintenance. Ongoing cybersecurity awareness and training is important for engaging all employees so that they understand their roles and responsibilities regarding cybersecurity. Other activities in this area include vulnerability management, system implementation, security consulting and support and operating support for protection systems. This support can include: two-factor authentication, the public key infrastructure, malware prevention, web content management, and supporting network protections, such as firewalls and intrusion detection and prevention.

Physical Description:

The evaluation and deployment of hardware and software to achieve the cybersecurity protection requirements.

Project Justification:

Cost estimated are based on cybersecurity subject matter experts and historical experience responding to changing priorities and risks to address:

- Timely replacement of technology controls
- Addressing evolving threat capabilities
- Supporting and/or leveraging new technologies

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 00815.0
Category: C. Protect
Category-Sub: 2. Electric grid system protection
Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 00815D**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 2. Electric grid system protection
 Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection
 Workpaper Detail: 00815D.001 - RAMP - Incremental Electric grid system protection
 In-Service Date: Not Applicable
 Description:

Self developed portion of the project

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 150 | 147 | 147 |
| Non-Labor | | 192 | 255 | 319 |
| NSE | | 0 | 0 | 0 |
| | Total | 342 | 402 | 466 |
| FTE | | 1.5 | 2.5 | 2.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 2. Electric grid system protection
 Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection
 Workpaper Detail: 00815D.001 - RAMP - Incremental Electric grid system protection

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: Critical Infrastructure Protection

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 2. Electric grid system protection
 Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection
 Workpaper Detail: 00815D.002 - RAMP - Incremental Electric grid system protection
 In-Service Date: Not Applicable
 Description:

Non self developed portion

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|--------------|--------------|--------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 1,086 | 1,440 | 1,804 |
| NSE | | 0 | 0 | 0 |
| | Total | 1,086 | 1,440 | 1,804 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 00815.0
 Category: C. Protect
 Category-Sub: 2. Electric grid system protection
 Workpaper Group: 00815D - RAMP - Incremental Critical Infrastructure Protection
 Workpaper Detail: 00815D.002 - RAMP - Incremental Electric grid system protection

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses – Applications

Program Description: Critical Infrastructure Protection

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Category: D. Grid Modernization
Workpaper: VARIOUS

Summary for Category: D. Grid Modernization

| | In 2016\$ (000) | | | |
|--------------|-------------------|-------------------|--------------|--------------|
| | Adjusted-Recorded | Adjusted-Forecast | | |
| | 2016 | 2017 | 2018 | 2019 |
| Labor | 0 | 318 | 483 | 232 |
| Non-Labor | 0 | 2,346 | 3,575 | 1,700 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 2,664 | 4,058 | 1,932 |
| FTE | 0.0 | 2.4 | 3.6 | 1.7 |

16877A RAMP - Incremental Distribution Operations Multifactor Authentication

| | | | | |
|--------------|----------|------------|------------|----------|
| Labor | 0 | 69 | 69 | 0 |
| Non-Labor | 0 | 511 | 511 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 580 | 580 | 0 |
| FTE | 0.0 | 0.6 | 0.6 | 0.0 |

16877B RAMP - Incremental Distribution End Point protection

| | | | | |
|--------------|----------|------------|------------|----------|
| Labor | 0 | 112 | 44 | 0 |
| Non-Labor | 0 | 814 | 342 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 926 | 386 | 0 |
| FTE | 0.0 | 0.8 | 0.3 | 0.0 |

16877C RAMP - Incremental Distribution RTU Password and Configuration Management

| | | | | |
|--------------|----------|----------|------------|------------|
| Labor | 0 | 0 | 49 | 48 |
| Non-Labor | 0 | 0 | 338 | 338 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 387 | 386 |
| FTE | 0.0 | 0.0 | 0.3 | 0.3 |

16877D RAMP - Incremental Privilege Access Manager

| | | | | |
|--------------|----------|----------|------------|------------|
| Labor | 0 | 0 | 92 | 92 |
| Non-Labor | 0 | 0 | 680 | 680 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 772 | 772 |
| FTE | 0.0 | 0.0 | 0.7 | 0.7 |

16883A RAMP - Incremental EDO network security architecture redesign and upgrade

| | | | | |
|--------------|----------|------------|------------|----------|
| Labor | 0 | 92 | 92 | 0 |
| Non-Labor | 0 | 680 | 680 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 772 | 772 | 0 |
| FTE | 0.0 | 0.7 | 0.7 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Category: D. Grid Modernization
Workpaper: VARIOUS

| In 2016\$ (000) | | | |
|-------------------|-------------------|------|------|
| Adjusted-Recorded | Adjusted-Forecast | | |
| 2016 | 2017 | 2018 | 2019 |

16883B RAMP - Incremental Active Directory Domain Controllers for Distribution

| | | | | |
|--------------|----------|------------|------------|----------|
| Labor | 0 | 45 | 45 | 0 |
| Non-Labor | 0 | 341 | 341 | 0 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 386 | 386 | 0 |
| FTE | 0.0 | 0.3 | 0.3 | 0.0 |

16883C RAMP - Incremental Field area network security

| | | | | |
|--------------|----------|----------|------------|------------|
| Labor | 0 | 0 | 92 | 92 |
| Non-Labor | 0 | 0 | 683 | 682 |
| NSE | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 775 | 774 |
| FTE | 0.0 | 0.0 | 0.7 | 0.7 |

Note: Totals may include rounding differences.

Beginning of Workpaper Group
16877A - RAMP - Incremental Distribution Operations Multifactor Authentication

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
 Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|------------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 69 | 69 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 511 | 511 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 580 | 580 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 0.0 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect the control center and automation applications to manage cybersecurity risks

Physical Description:

Deploy hardware, software and personal devices/tokens.

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16877A**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
 Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication
 Workpaper Detail: 16877A.001 - RAMP - Incremental Distribution Operations multifactor authentication
 In-Service Date: 06/30/2018

Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|------------|----------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 69 | 69 | 0 |
| Non-Labor | | 255 | 255 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 324 | 324 | 0 |
| FTE | | 0.6 | 0.6 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
 Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication
 Workpaper Detail: 16877A.001 - RAMP - Incremental Distribution Operations multifactor authentication

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: Grid Modernization Distribution Operations Multifactor Authentication

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Construction Start Date:

In Service Date:06/30/2018

Work Type: Non-Mandated

Work Type Citation: See workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
 Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication
 Workpaper Detail: 16877A.002 - RAMP - Incremental Distribution Operations multifactor authentication
 In-Service Date: 06/30/2018

Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|------------|----------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 256 | 256 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 256 | 256 | 0 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 2. GRID Modernization - Dist Ops multifactor aut
 Workpaper Group: 16877A - RAMP - Incremental Distribution Operations Multifactor Authentication
 Workpaper Detail: 16877A.002 - RAMP - Incremental Distribution Operations multifactor authentication

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Cyber Security

Program Description: Grid Modernization

Risk/Mitigation:

Risk: All Cyber Risks

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16877B - RAMP - Incremental Distribution End Point protection

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 3. GRID Modernization - Dist End Point protection
 Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|------------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 112 | 44 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 814 | 342 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 926 | 386 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.3 | 0.0 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect the control center and automation applications to manage cybersecurity risks.

Physical Description:

Deploy software to operator workstations and servers.

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 3. GRID Modernization - Dist End Point protection
Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16877B**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 3. GRID Modernization - Dist End Point protection
 Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection
 Workpaper Detail: 16877B.001 - RAMP - Incremental GRID Modernization - Distribution End Point protection
 In-Service Date: 04/30/2018
 Description:

RAMP Mitigation - Detect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|------------|----------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 112 | 44 | 0 |
| Non-Labor | | 406 | 172 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 518 | 216 | 0 |
| FTE | | 0.8 | 0.3 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 3. GRID Modernization - Dist End Point protection
 Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection
 Workpaper Detail: 16877B.001 - RAMP - Incremental GRID Modernization - Distribution End Point protection

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: End Point Protection

Risk/Mitigation:

Risk: All Cyber Risks

Mitigation: Detect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 3. GRID Modernization - Dist End Point protection
 Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection
 Workpaper Detail: 16877B.002 - RAMP - Incremental License Purchase
 In-Service Date: 04/30/2018

Description:

RAMP Mitigation - Detect

| Forecast In 2016 \$(000) | | | | | |
|--------------------------|--------------|------------|------------|----------|--|
| | Years | 2017 | 2018 | 2019 | |
| Labor | | 0 | 0 | 0 | |
| Non-Labor | | 408 | 170 | 0 | |
| NSE | | 0 | 0 | 0 | |
| | Total | 408 | 170 | 0 | |
| FTE | | 0.0 | 0.0 | 0.0 | |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 3. GRID Modernization - Dist End Point protection
Workpaper Group: 16877B - RAMP - Incremental Distribution End Point protection
Workpaper Detail: 16877B.002 - RAMP - Incremental License Purchase

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses – Applications

Program Description: End Point Protection

Risk/Mitigation:

Risk: All Cyber Risks

Mitigation: Detect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpapers

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16877C - RAMP - Incremental Distribution RTU Password and Configuration
Management

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 4. GRID Modernization - Dist RTU password and config
 Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|--------------|-------------------|----------|----------|----------|----------|-------------------|------------|------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| | Years | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 48 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 338 | 338 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 | 0 | 0 | 387 | 386 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.3 |

Business Purpose:

Implements a capability to manage endpoint passwords and configurations securely while enabling multiple operators and field technicians to perform their activities with trace-ability.

Physical Description:

Deploy current state hardware and software systems to support RTU password and configuration management.

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 4. GRID Modernization - Dist RTU password and config
Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16877C**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 4. GRID Modernization - Dist RTU password and config
 Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management
 Workpaper Detail: 16877C.001 - RAMP - Incremental GRID Modernization - Distribution RTU password and configuration man
 In-Service Date: 06/30/2019
 Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|----------|------------|------------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 0 | 49 | 48 |
| Non-Labor | | 0 | 168 | 168 |
| NSE | | 0 | 0 | 0 |
| | Total | 0 | 217 | 216 |
| FTE | | 0.0 | 0.3 | 0.3 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 4. GRID Modernization - Dist RTU password and config
Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management
Workpaper Detail: 16877C.001 - RAMP - Incremental GRID Modernization - Distribution RTU password and configuration managem

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: Distribution RTU Password and Configuration Management

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: n/a

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 4. GRID Modernization - Dist RTU password and config
 Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management
 Workpaper Detail: 16877C.002 - RAMP - Incremental Distribution RTU Password and Configuration Management
 In-Service Date: 07/31/2019
 Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|----------|------------|------------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 0 | 170 | 170 |
| NSE | | 0 | 0 | 0 |
| | Total | 0 | 170 | 170 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 4. GRID Modernization - Dist RTU password and config
Workpaper Group: 16877C - RAMP - Incremental Distribution RTU Password and Configuration Management
Workpaper Detail: 16877C.002 - RAMP - Incremental Distribution RTU Password and Configuration Management

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses – Applications

Program Description: Distribution RTU Password and Configuration Management

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: N/A

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16877D - RAMP - Incremental Privilege Access Manager

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 5. GRID Modernization - Privilege Access Manager
 Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|------------|------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 92 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 680 | 680 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 0 | 772 | 772 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect and audit administrative access to manage cybersecurity risks.

Physical Description:

Deploy current state hardware and software systems to support privileged access management.

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16877.0
Category: D. Grid Modernization
Category-Sub: 5. GRID Modernization - Privilege Access Manager
Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16877D**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 5. GRID Modernization - Privilege Access Manager
 Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager
 Workpaper Detail: 16877D.001 - RAMP - Incremental GRID Modernization - Privilege Access Manager
 In-Service Date: 06/30/2019

Description:

| |
|---------------------------|
| RAMP Mitigation - Protect |
|---------------------------|

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 0 | 92 | 92 |
| Non-Labor | | 0 | 340 | 340 |
| NSE | | 0 | 0 | 0 |
| | Total | 0 | 432 | 432 |
| FTE | | 0.0 | 0.7 | 0.7 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 5. GRID Modernization - Privilege Access Manager
 Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager
 Workpaper Detail: 16877D.001 - RAMP - Incremental GRID Modernization - Privilege Access Manager

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: Privilege Access Manager

Risk/Mitigation:

Risk: All Cyber Risks

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: n/a

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 5. GRID Modernization - Privilege Access Manager
 Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager
 Workpaper Detail: 16877D.002 - RAMP - Incremental GRID Modernization - Privilege Access Manager
 In-Service Date: 06/30/2019
 Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|----------|------------|------------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 0 | 0 | 0 |
| Non-Labor | | 0 | 340 | 340 |
| NSE | | 0 | 0 | 0 |
| | Total | 0 | 340 | 340 |
| FTE | | 0.0 | 0.0 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16877.0
 Category: D. Grid Modernization
 Category-Sub: 5. GRID Modernization - Privilege Access Manager
 Workpaper Group: 16877D - RAMP - Incremental Privilege Access Manager
 Workpaper Detail: 16877D.002 - RAMP - Incremental GRID Modernization - Privilege Access Manager

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Cyber Security

Program Description: Privilege Access Manager

Risk/Mitigation:

Risk: All Cyber Risks

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16883A - RAMP - Incremental EDO network security architecture redesign and
upgrade

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 6. GRID Modernization - EDO nw security arch redes
 Workpaper Group: 16883A - RAMP - Incremental EDO network security architecture redesign and upgrade

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|------------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 92 | 92 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 680 | 680 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 772 | 772 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 0.0 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect the control center and automation applications to manage cybersecurity risks.

Physical Description:

Current state hardware deployed to the control center and data center.

Project Justification:

- Supporting new technology used for grid modernization
- Refresh of technology
- Timely replacement of technology controls
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16883.0
Category: D. Grid Modernization
Category-Sub: 6. GRID Modernization - EDO nw security arch redes
Workpaper Group: 16883A - RAMP - Incremental EDO network security architecture redesign and upgrade

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16883A**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 6. GRID Modernization - EDO nw security arch redes
 Workpaper Group: 16883A - RAMP - Incremental EDO network security architecture redesign and upgrade
 Workpaper Detail: 16883A.001 - RAMP - Incremental GRID Modernization - EDO network security architecture redesign and
 In-Service Date: 06/30/2018
 Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|------------|----------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 92 | 92 | 0 |
| Non-Labor | | 680 | 680 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 772 | 772 | 0 |
| FTE | | 0.7 | 0.7 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 6. GRID Modernization - EDO nw security arch redes
 Workpaper Group: 16883A - RAMP - Incremental EDO network security architecture redesign and upgrade
 Workpaper Detail: 16883A.001 - RAMP - Incremental GRID Modernization - EDO network security architecture redesign and upgrad

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: GRID Modernization - EDO network security architecture redesign and upgrade

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16883B - RAMP - Incremental Active Directory Domain Controllers for Distribution

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 7. GRID Modernization - Active Dir Domain Controllers
 Workpaper Group: 16883B - RAMP - Incremental Active Directory Domain Controllers for Distribution

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|------------|-------------------|----------|----------|----------|----------|-------------------|------------|----------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Years | | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 45 | 45 | 0 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 341 | 341 | 0 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 0 | 0 | 0 | 0 | 0 | 386 | 386 | 0 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect the control center and automation applications to manage cybersecurity risks.

Physical Description:

- Deploy hardware/virtual server
- Migration of OMS/DMS to new AD for electric distribution

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16883.0
Category: D. Grid Modernization
Category-Sub: 7. GRID Modernization - Active Dir Domain Controllers
Workpaper Group: 16883B - RAMP - Incremental Active Directory Domain Controllers for Distribution

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16883B**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 7. GRID Modernization - Active Dir Domain Controllers
 Workpaper Group: 16883B - RAMP - Incremental Active Directory Domain Controllers for Distribution
 Workpaper Detail: 16883B.001 - RAMP - Incremental GRID Modernization - Active Directory Domain Controllers for Distrib
 In-Service Date: 03/31/2018
 Description:

RAMP Mitigation - Protect

| Forecast In 2016 \$(000) | | | | |
|--------------------------|--------------|------------|------------|----------|
| | Years | 2017 | 2018 | 2019 |
| Labor | | 45 | 45 | 0 |
| Non-Labor | | 341 | 341 | 0 |
| NSE | | 0 | 0 | 0 |
| | Total | 386 | 386 | 0 |
| FTE | | 0.3 | 0.3 | 0.0 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 7. GRID Modernization - Active Dir Domain Controllers
 Workpaper Group: 16883B - RAMP - Incremental Active Directory Domain Controllers for Distribution
 Workpaper Detail: 16883B.001 - RAMP - Incremental GRID Modernization - Active Directory Domain Controllers for Distribution

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Configuration Monitoring

Program Description: GRID Modernization - Active Directory Domain Controllers for Distribution

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Construction Start Date:

In Service Date:03/31/2018

Work Type: Non-Mandated

Work Type Citation: See workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation:

Beginning of Workpaper Group
16883C - RAMP - Incremental Field area network security

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 8. GRID Modernization - Field area network security
 Workpaper Group: 16883C - RAMP - Incremental Field area network security

Summary of Results (Constant 2016 \$ in 000s):

| Forecast Method | | Adjusted Recorded | | | | | Adjusted Forecast | | |
|-----------------|--------------|-------------------|----------|----------|----------|----------|-------------------|------------|------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| | Years | | | | | | | | |
| Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 92 |
| Non-Labor | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 683 | 682 |
| NSE | Zero-Based | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 | 0 | 0 | 775 | 774 |
| FTE | Zero-Based | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 |

Business Purpose:

As distributions moves towards more automation in the control network, it is necessary to provide more security controls to protect the field area networks and substations to manage cybersecurity risks.

Physical Description:

Deploy current state hardware and software systems to support field area network security.

Project Justification:

- Supporting new technology used for grid modernization
- Addressing evolving threat capabilities

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
Witness: Gavin H. Worden
Budget Code: 16883.0
Category: D. Grid Modernization
Category-Sub: 8. GRID Modernization - Field area network security
Workpaper Group: 16883C - RAMP - Incremental Field area network security

Forecast Methodology:

Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

Non-Labor - Zero-Based

Based on Project Manager and Subject Matter Expert estimates.

NSE - Zero-Based

N/A

**Beginning of Workpaper Sub Details for
Workpaper Group 16883C**

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 8. GRID Modernization - Field area network security
 Workpaper Group: 16883C - RAMP - Incremental Field area network security
 Workpaper Detail: 16883C.001 - RAMP - Incremental GRID Modernization - Field area network security
 In-Service Date: 06/30/2019

Description:

| |
|---------------------------|
| RAMP Mitigation - Protect |
|---------------------------|

| Forecast In 2016 \$(000) | | | | |
|---------------------------------|--------------|-------------|-------------|-------------|
| | Years | <u>2017</u> | <u>2018</u> | <u>2019</u> |
| Labor | | 0 | 92 | 92 |
| Non-Labor | | 0 | 683 | 682 |
| NSE | | 0 | 0 | 0 |
| | Total | 0 | 775 | 774 |
| FTE | | 0.0 | 0.7 | 0.7 |

Note: Totals may include rounding differences.

San Diego Gas & Electric Company
2019 GRC - APP
Capital Workpapers

Area: CYBER SECURITY
 Witness: Gavin H. Worden
 Budget Code: 16883.0
 Category: D. Grid Modernization
 Category-Sub: 8. GRID Modernization - Field area network security
 Workpaper Group: 16883C - RAMP - Incremental Field area network security
 Workpaper Detail: 16883C.001 - RAMP - Incremental GRID Modernization - Field area network security

RAMP Item # 1

RAMP Chapter: SDG&E-7

Program Name: Boundary Defenses - Applications

Program Description: GRID Modernization - Field area network security

Risk/Mitigation:

Risk: A major cyber security incident that causes disrupt

Mitigation: Protect

Forecast CPUC Cost Estimates (\$000)

| | <u>2017</u> | <u>2018</u> | <u>2019</u> |
|------|-------------|-------------|-------------|
| Low | 0 | 0 | 0 |
| High | 0 | 0 | 0 |

Funding Source: CPUC-GRC

Forecast Method: Zero-Based

Construction Start Date:

In Service Date:06/30/2019

Work Type: Non-Mandated

Work Type Citation: See Workpaper

Historical Embedded Cost Estimates (\$000)

Embedded Costs: 0

Explanation: