EXH. MFH-5
DOCKETS UE-19___/UG-19___
2019 PSE GENERAL RATE CASE
WITNESS: MARGARET F. HOPKINS

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-19____** **Docket UG-19____**

FOURTH EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

MARGARET F. HOPKINS

ON BEHALF OF PUGET SOUND ENERGY

JUNE 20, 2019

Energy Management System (EMS) Upgrade
Corporate Spending Authorization (CSA)
Application Request

Getting started:

To track changes between original CSA and Phase/Gate updates, please use a standard file naming convention for your CSA, e.g. CSA_ProjectName_YYYYMMDD_PhaseGateName_v#.

The sections provided expand / are not limited to one row. Ensure you are providing adequate information and backup documentation to support your business case. If a section or item is not applicable, enter N/A; if unknown, enter TBD. The gray fields are provided as prompts; do not leave these fields unaddressed.

Date Submitted:	**9/11/2018**
Officer Sponsor:	David Mills [Director : Shaun Tran]
Completed By:	Rich Larson/George Hendrickson//Bob Caplan/Camilla Nguyen
Phase Gate:	**Execution**

I. Project Overview

You may copy/paste this section from the Initiation Proposal form. Be sure to update each section as applicable, noting any changes from the previous request/Gate.

Problem Statement:

The Energy Management System (EMS) is a collection of software applications that is used at PSE for the following critical functions:

- Monitor and control PSE's power system in real-time; this includes the transmission system (high voltage), part of the distribution system, and the generating units.

- Balance PSE 's generation and power interchange to meet its customers load.

- Provide overall situational awareness of PSE's power System and its neighboring Balancing Authorities.

Upgrading the EMS system is needed to mitigate the overall obsolescence of the system – in particular:

- Obsolescence of the EMS software: since June 2015, PSE's EMS software has entered into its "legacy phase" support with its vendor GE Grid. In this phase, the EMS software has limited support (no OS security patch validation, no Product security patches, and no bug correction). Also, PSE's EMS software is not compatible with Microsoft's latest Operating System.

- Anticipated end of support of the EMS's Operating System: the EMS servers' operating system (Windows Server 2008 R2 Enterprise (SP1)) will become obsolete on 1/14/2020 (this is the date when the extended support end). After this date, there is no more support from Microsoft for this operating system.

- Aging EMS's Hardware: The hardware is the component where obsolescence is the most critical. Indeed, unlike software, when hardware becomes obsolete, the likelihood of a hardware failure increases sharply. As a rule of thumb, it is recommended to replace hardware equipment after 5 years. The EMS servers were purchased on Q1 2011 – so, Q1 2016 should be the time when it is recommended to replace the EMS servers. Keeping the current EMS hardware beyond its obsolescence date (Q1 2016) would represent an

increased risk to the reliability of the EMS system because of the likelihood of hardware failure.

The EMS upgrade is full Hardware and Software Re-platform of the EMS System. In addition to upgrading the EMS system to stay current with hardware and software Technology, PSE will receive technology improvements by virtue of more current software that will increase the operator effectiveness through better Situational Awareness.

This upgrade will target the EMS software version "e-terraplatform 3.1" (on Windows Server 2012 R2).

"e-terraplatform 3.1" is the NOT latest available version of the EMS software from its vendor (GE GRID) (the latest version is "e-terraplatform 3.2") – during the planning and design phases, it was decided to upgrade the EMS system to that version because:

- PSE IT Infrastructure readiness : "e-terraplatform 3.2" is only supported on Windows Server 2016 and PSE IT infrastructure is not ready to support servers based on that operating system;
- Lower project risks : e-terraplatform 3.2 has not been deployed to any utility yet (it was only released in July 2017); being one of the first utility to deploy this latest version would add to the project risks (increased likelyhood of unidentified software bugs);Meeting datacenter decommission deadline: PSE is implementing two new datacenters in 2018 and decommissioning its existing datacenters in 2019. It was decided that, instead of moving the current EMS system to the new datacenters and upgrading it shortafter, the EMS would be upgraded and deployed in the new datacenters, avoiding the risks and cost of a move. As a consequence, the EMS upgrade must be completed prior to the decommissiong of the existing datacenters; upgrading to "e-terraplatform 3.1" within that tight deadline is a much more achievable target than upgrading to "e-terraplatform 3.2".

The planning and design phase has been completed in 2017 (funding of $1.7m for this phase was earmarked out of the IT Operations Budget). The execution phase will start in Q1 2018 and is expected to be completed before the end of 2018. There is a likelihood that implementation will be during Storm Season 2018. This will be mitigated by virtue of the existing system being in full operation at the time of cutover and available to fall back. Also, timing of the implementation can be carefully managed to avoid any uncooperative weather.

Future Vision:	This Upgrade will establish EMS on current Hardware, Operating Systems and Software versions to retain ongoing support from GE Grid and Microsoft. In addition, the move to the new Data Center configurations will improve overall Disaster resiliency.
Proposed Solution:	Engage Contractor Resources from GE Grid to team with PSE to complete the upgrade and install into the new Data Centers.
Alternatives Evaluated:	The alternative to upgrade directly to "e-terraplatform 3.2" (without an intermediary upgrade to "e-terraplatform 3.1") was evaluated and deemed too

	risky to fit in the project timeline (the EMS system needs to be upgraded in the new datacenters before the decommissioning of the existing datacenters).
Primary ISP Alignment:	**Processes & Tools**
Type of Project:	**Risk Mitigation**
OCM Considerations:	Impacted Users (Internal): ☒< 100 ☐< 500 ☐> 500 Impacted Customers (External): ☒None ☐< 100K Electric or < 1K Gas ☐> 100K Electric or >1K Gas Internal Organizational Impact: ☐1 Dept or less ☒2-5 Dept ☐> 5 Dept / Business Platform / Enterprise
Project Complexity & Duration:	☐Straightforward, well understood ☐ < 6 months ☒Complex and well understood ☐< 12 months ☐Complex and not well articulated ☒> 12 months

II. Phase Gate Change Summary

Description of changes, including reasons and justification since the last submission / Phase Gate.

Scope: **Update 4/20/2018:** Add in scope the configuration, testing and deployment of the following new EMS functionalities/enhancements:

Application Area	Feature	Business Value/Motivation
These items do **not** require the 2019 budget and schedule updates noted below.		
NETWORK	Dynamic Ratings implementation	Replace custom and provide tie-line capabilities
NETWORK	State Estimator Statistics	Compliance requirement, effective soon.
DISPLAY	Legacy display cleanup - overlapping tags, potential human performance impact	Potential issues being revealed by like-for-like migration before September go-live
SCADA	SUSPECT quality shown for stale data on SCADA one-line displays	Better situational awareness
RTGEN	Enhanced Gross/Net/Aux Processing	Important improvement
NETWORK	State Estimator replacement values on SCADA one-line displays	Better situational awareness
QKNET	Enhancements to QKNET	Utilize new 3.1 features
FE	Migrate IP-SCADA SMP servers to new DCs	Required before Bellevue EST02 datacenter decommission
These additional items require the 2019 budget and schedule updates noted below.		
SCADA	LO security check switching enhancement	Avoid destructive switching mistakes
SCADA	RAS Enhancements	
SCADA	Telemetry Spike Filtering	
NETWORK	Multiple Time Point Network Analysis	
NETWORK	Line Outage Distribution Factor (LODF) to backup CA	

Budget: **Update 9/11/2018:** Giving back funds to reflect reduced contingency based on Phase change to Execution. Additional funds from reduced forecast to cover actual expense from 2017. Those changes are summarized in the table below:

Category:	2017	2018	2019	TOTAL
Original Capital Allocation	**$1,700,000**	**$9,500,000**	**$500,000**	**11,700,000**
Current Capital Allocation	**$1,700,000**	**$9,500,000**	**$1,200,000**	**12,400,000**
New Capital Allocation	**$2,163,446**	**$8,427,638**	**$1,200,000**	**$11,791,084**
Delta [Current – New)	**+$463,446**	**-$1,072,362**	**$0**	**-$608,916**

	Total cost for the additional scope is **$1,329,000.** Some of this cost is covered by 2018 project surplus. Details related to the cost of the additional scope is summarized in this document : Additional Scope - Cost Details
Schedule:	**Update 4/20/2018:** To achieve the implementation of the above functionalities/enhancements, the project timeline would need to be extended from Q1 2019 to the end of Q2 2019 (June 30th 2019).
Risk Profile:	None

III. Key Schedule and Financial Information

You may copy/paste this section from the Initiation Proposal form. Be sure to update each section as applicable.

Proposed Budget Year(s): 2018-2019

Expected In-Service Date: 12/15/2018

Initial Estimate: **Capital: $11,700,000**
Project O&M: $125,000

Cost Estimate Maturity Score:

To determine the Estimate Maturity Score for the project, review the guidelines and complete/update the Project Cost Estimate Classifications Document here: http://pseweb/Organizations/ProjMgt/EnterprisePM/Pages/Cost-Estimates.aspx. Include a link to, or embedded copy of, the project's completed/updated document for reference.

Score: Class 4 - Concept Evaluation / Preliminary Budget

Cost Estimation Classification Document: link

Updated Estimate for Total Project Cost:

Cost Type	Capital	Project O&M	Total
Cost (without contingency)	**$8,775,000**	**$100,000**	**$8,875,000**
Add **Contingency**	**$2,925,000**	**$25,000**	**$2,950,000**
Total Cost with Contingency	**$11,700,000**	**$125,000**	**$11,825,000**
TOTAL ANNUAL CASH BENEFITS	**$0.0**	**IF APPLICABLE**	
PAYBACK IN YEARS (Total Cost divided by Annual Cash Benefits)		**IF APPLICABLE**	

Estimated Five Year Allocation:

Original:

Category:	2017	2018	2019	2020	2021
Capital (incl. contingency)	**$1,700,000**	**$9,500,000**	**$500,000**	**$0.0**	**$0.0**
Project O&M	**$0**	**$125,000**	**$0**	**$0**	**$0**
Cash O&M Benefits	**$0**	**$0**	**$0**	**$0**	**$0**

Update (4/20/2018):

Category:	2017	2018	2019	2020	2021
Capital (incl. contingency)	**$1,700,000**	**$9,500,000**	**$1,200,000**	**$0.0**	**$0.0**
Project O&M	**$0**	**$125,000**	**$0**	**$0**	**$0**
Cash O&M Benefits	**$0**	**$0**	**$0**	**$0**	**$0**

Update (09/11/2018):

Category:	2017	2018	2019	2020	2021
Capital (incl. contingency)	**$2,163,446**	**$8,427,638**	**$1,200,000**	**$0.0**	**$0.0**
Project O&M	**$0**	**$125,000**	**$0**	**$0**	**$0**
Cash O&M Benefits	**$0**	**$0**	**$0**	**$0**	**$0**

Cash Benefits by Department: *Add/remove rows, as applicable.*

Department Name	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Enter Department Name	$0,000.00	$0,000.00	$0,000.00	$0,000.00	$0,000.00	$ -
Enter Department Name	$0,000.00	$0,000.00	$0,000.00	$0,000.00	$0,000.00	$ -

Ongoing Annual O&M by Department: (e.g., maintenance, FTEs, cloud storage, etc.)
Add/remove rows, as applicable.

Category	Year 1	Year 2	Year 3	Year 4	Year 5	5 Year Total
IT – Applications - EMS	$0,000.00	$0,000.00	$0,000.00	$0,000.00	$0,000.00	

Non-Cash Benefits / Future Cost Avoidance: The risk of system unavailability due to aging hardware and software is reduced. The risk of failure to operate in a Disaster situation is reduced.

Improved Operator Effectiveness.

Cash on Cash Single Payback:

IV. Project Description and Objectives

Project Description: Upgrade the EMS system to a newer version of the EMS software hosted on new virtual machines (VM) based on a newer Operating System. This new EMS system will be located in the new Snoqualmie and Cascade datacenters (with the Scada Front-ends remaining in Bellevue and ESO).

ISP Alignment:

ISP Objectives, Mandatory and/or Corporate Risk	**Strategy** *Abbreviated* **ISP strategy descriptions**	**Benefit Description** *Benefit, measurement and/or scorecard affected*
Financial	☐ Five-Year Strategic Plan ☐ Maximize long-term value ☐ Grow core business ☐ Grow new business	
Customer	☐ Execute the Customer Experience Intent Statement ☐ Recognition of PSE role in community ☐ Customer preparedness & safety ☐ Ideal customer behaviors ☐ Listen & dialogue with customers	
Process and Tools	☐ Streamline processes to drive effectiveness and efficiency ☒ System reliability and integrity ☒ Safety and security of systems, information and assets ☐ Extract and leverage value from existing technology and assets ☐ Optimize product/service portfolio consistent with long-term strategy	The project will: 1/ Mitigate the obsolescence of the EMS software by upgrading to the latest EMS software version available from GE Grid. This will provide PSE with software that is fully supported by its vendor (provide PSE with product patches (security and functional), OS security patch validation, support with latest Microsoft's operating system) 2/ Mitigate the anticipated end of support of the EMS's Operating System by upgrading to a supported Operating System. 3/ Mitigate hardware failure from current aging EMS's Hardware by simply eliminating physical servers and using virtual machines (VM).
People	☐ Develop/Retain best employees ☐ Ownership, innovation and continuous improvement	
Safety	☐ Educate and train employees on effective safety and wellness strategies	

Project Objectives and Deliverables: *Add/remove rows, as needed.*

Objective	**Outcomes / Deliverables**	**KPIs – Describe; Indicated Leading/Lagging**	**KPI Data Sources**
Mitigate overall obsolescence of EMS system	EMS system upgraded: - New EMS software version - New Operating System - Based on Virtual Machines	Obsolescence Score : - Baseline : 110 - Target : 10	Link (baseline) Link (Target)

V. Risk Management

Identify anticipated risks associated with this project. Consider Federal, State, County, Local regulatory requirements, as well as contingencies, exit criteria and strategy. When the project risk register is created, utilize this section to identify critical/top risks and include a link to the risk register for further detail. Add/remove rows as necessary.

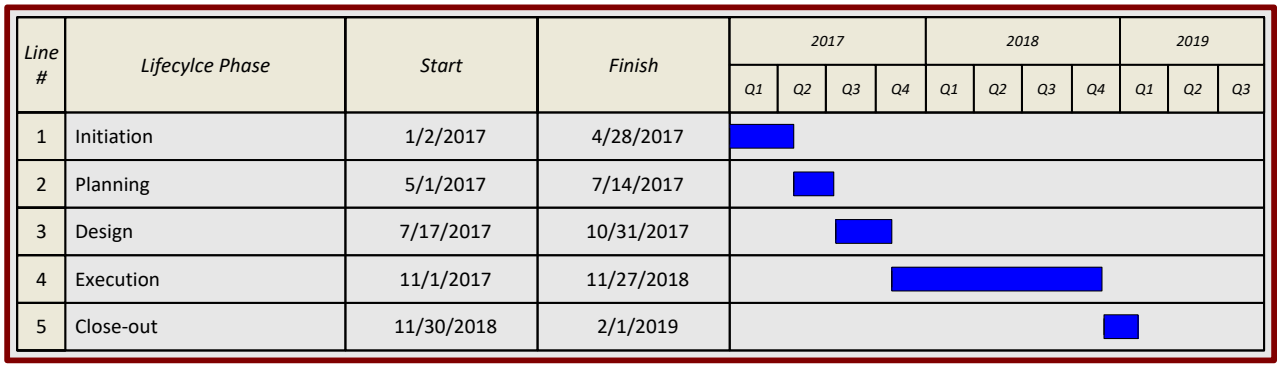
Risk	Likelihood	Impact of Occurrence	How Monitored	Mitigation
Enter Risk 1.	Choose an item.	Choose an item.		

Risk Register: _____

VI. High Level Schedule

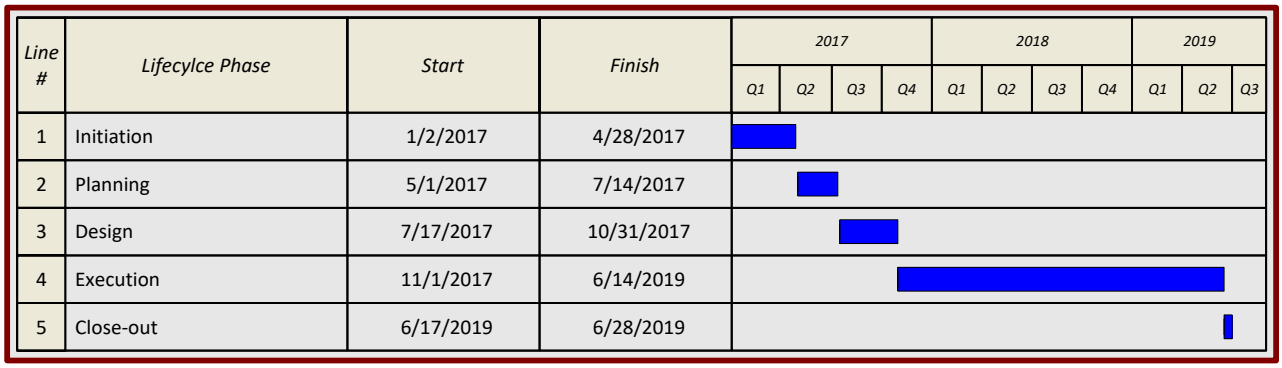
Original:

Line #	Lifecylce Phase	Start	Finish
1	Initiation	1/2/2017	4/28/2017
2	Planning	5/1/2017	7/14/2017
3	Design	7/17/2017	10/31/2017
4	Execution	11/1/2017	11/27/2018
5	Close-out	11/30/2018	2/1/2019



Update (4/20/2018):

Line #	Lifecylce Phase	Start	Finish
1	Initiation	1/2/2017	4/28/2017
2	Planning	5/1/2017	7/14/2017
3	Design	7/17/2017	10/31/2017
4	Execution	11/1/2017	6/14/2019
5	Close-out	6/17/2019	6/28/2019



Update (9/11/2018):

Line #	Lifecylce Phase	Start	Finish	2017				2018				2019		
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1	Initiation	1/2/2017	4/28/2017											
2	Planning	5/1/2017	1/10/2018											
3	Design	1/11/2018	9/11/2018											
4	Execution	9/12/2018	6/14/2019											
5	Close-out	6/17/2019	6/28/2019											

VII. Supporting Documentation

Options: Insert hyperlink to the documents or embed a copy of a document in the sections below. If you embed a document, remove placeholder rows provided. If you choose to provide hyperlinks, ensure access to the referenced location is setup/provided in advance. Add/remove additional document rows, as needed.

Cost Estimating and Budget:	Link
Business Needs and Alternatives:	Link
Benefits Realization Plan:	Link
Project Audit Checklist:	Link
OCM Sizing Worksheet:	Link

VIII. Original CSA Approvals: *Add/remove rows as applicable.*

I. Prepared By	Title	Role	Date	Signature
Loic Roger	Business Analyst BTS	contributor	12/12/2017	

Approved By	Title	Role	Date	Signature
Brian Fellon	Dir. IT Applications	Director sponsor	6/6/2018	 RE Requesting approval for updated (
Shauna Tran	Dir. Load Serving Operations	Director sponsor	5/30/2018	 RE Requesting approval for updated (
David Mills	Sr VP Policy & Energy Supply	Officer sponsor	5/30/2018	 RE Requesting approval for updated (

Acknowledgements	Title	Role	Date	Signature
Evan Sorrell	Mgr. Load Office	Benefit Owner*	5/30/2018	 RE Requesting benefit owner acknowledgme
George Hendrickson	Mgr. Energy Mgmt Systems	IT	5/22/2018	 RE Requesting IT acknowledgment for u
Kalyana Kakani	IT BTSM	IT	5/30/2018	 RE EMS upgrade CSA Approval decision log (

*Benefit Owners must be added to the Approved By section during Execution Phase/Gate.