EXH. MFH-4
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____**

THIRD EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

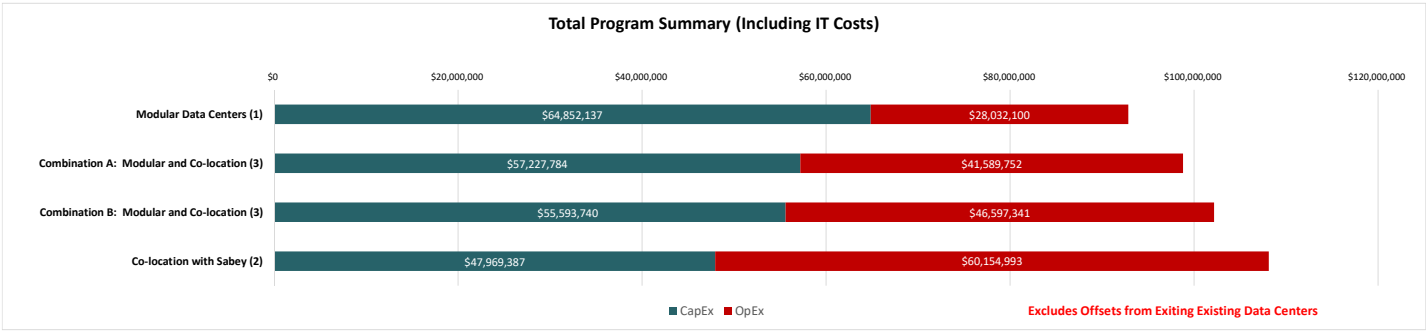
MARGARET F. HOPKINS

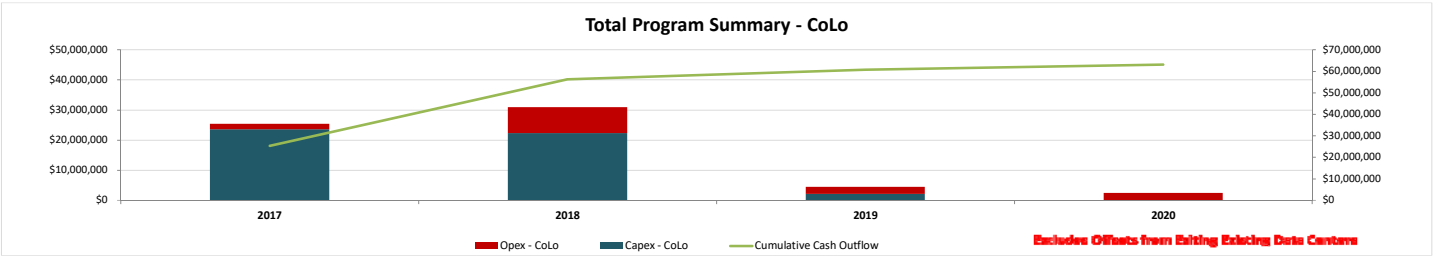
ON BEHALF OF PUGET SOUND ENERGY

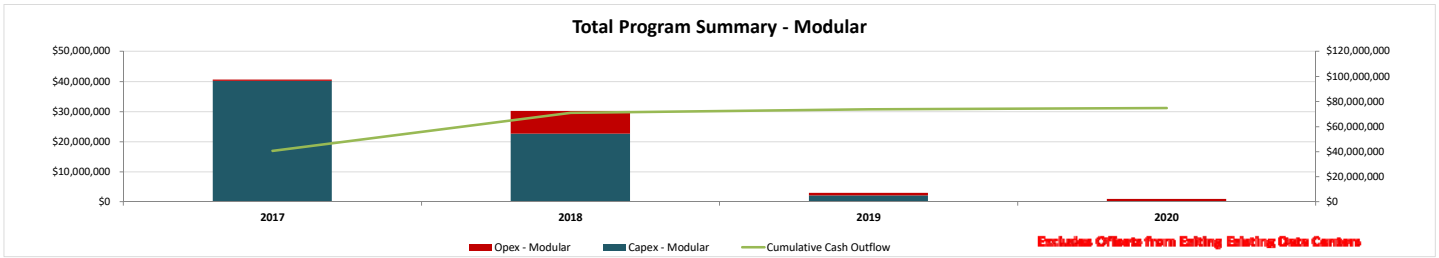
JUNE 20, 2019

Scenarios	5 Yr Capex	5 Yr Opex	Total 5 Yr Cash Outlay	20 Yr Capex	20 Yr Opex	Total 20 Yr Cash Outlay	Customer View: NPV Revenue Requirement	Pros	Cons
Modular Data Centers [1]	**$17,460,953**	**$3,663,506**	**$21,124,459**	**$17,460,953**	**$20,943,700**	**$38,404,653**	**90,777,584**	Least risk for NERC applications and SCADA, full control of operations, rate base benefit, lowest OCM for IT org	Slightly higher upfront capital ($10M)
DC 1 (Mount Si)	$9,730,476	$1,831,753		$9,730,476	$10,471,850				
DC 2 (Wild Horse)	$7,730,476	$1,831,753		$7,730,476	$10,471,850				
IT Hardware Buildout - Modular	**$47,391,184**	**$7,034,400**	**$54,425,584**	**$47,391,184**	**$7,088,400**	**$54,479,584**			
DC 1 - Mnt. Si	$26,020,592	$3,607,200		$26,020,592	$3,634,200			Utilize existing PSE fiber at Mnt Si; limit circuit lease to 18 mo at Wild Horse until PSE fiber is extended	
DC 2 - Wild Horse	$21,370,592	$3,427,200		$21,370,592	$3,454,200				
Co-location with Sabey [2]	**$1,228,203**	**$6,928,571**	**$8,156,774**	**$1,228,203**	**$35,066,593**	**$36,294,796**	**85,243,623**	Slightly lower lifetime cost to customer; assumes that the 2018 one-time expense is able to be recovered via an Expedited Rate Filing	Risk of not being able to support NERC and SCADA applications, highest O&M headwind, less control of DC operations
DC 1 (Sabey - Seattle)	$622,080	$3,887,864		$622,080	$19,677,091				
DC 2 (Sabey - Quincy)	$606,123	$3,040,708		$606,123	$15,389,502				
IT Hardware Buildout - Colo	**$46,741,184**	**$10,634,400**	**$57,375,584**	**$46,741,184**	**$25,088,400**	**$71,829,584**			
DC 1 (Sabey - Seattle)	$25,870,592	$5,767,200		$25,870,592	$12,994,200				
DC 2 (Sabey - Quincy)	$20,870,592	$4,867,200		$20,870,592	$12,094,200				Circuit lease expense make this the most expensive option
Combination A: Modular and Co-location [3]	**$10,336,600**	**$4,872,461**	**$15,209,060**	**$10,336,600**	**$25,861,352**	**$36,197,951**			Risk of not being able to support NERC and SCADA applications, highest O&M headwind, less control of DC operations
DC 1 (Modular - Mount Si)	$9,730,476	$1,831,753		$9,730,476	$10,471,850				
DC 2 (Colo - Sabey Quincy)	$606,123	$3,040,708		$606,123	$15,389,502				
IT Hardware Buildout - Combo A	**$46,891,184**	**$8,474,400**	**$55,365,584**	**$46,891,184**	**$15,728,400**	**$62,619,584**			
DC 1 (Modular - Mount Si)	$26,020,592	$3,607,200		$26,020,592	$3,634,200				
DC 2 (Colo - Sabey Quincy)	$20,870,592	$4,867,200		$20,870,592	$12,094,200				
Combination B: Modular and Co-location [3]	**$8,352,556**	**$5,719,617**	**$14,072,173**	**$8,352,556**	**$30,148,941**	**$38,501,498**			Risk of not being able to support NERC and SCADA applications, highest O&M headwind, less control of DC operations
DC 1 (Modular - Wild Horse)	$7,730,476	$1,831,753		$7,730,476	$10,471,850				
DC 2 (Colo - Sabey Seattle)	$622,080	$3,887,864		$622,080	$19,677,091				
IT Hardware Buildout - Combo B	**$47,241,184**	**$9,194,400**	**$56,435,584**	**$47,241,184**	**$16,448,400**	**$63,689,584**			
DC 1 (Modular - Wild Horse)	$21,370,592	$3,427,200		$21,370,592	$3,454,200				
DC 2 (Colo - Sabey Seattle)	$25,870,592	$5,767,200		$25,870,592	$12,994,200				
Potential Savings/Offsets									
Exit Bothell and PSE Data Centers (Offsets)	**$1,900,000**	**($6,257,057)**	**($4,357,057)**	**$1,900,000**	**($54,976,964)**	**($53,076,964)**			
Circuits	$0	($1,080,000)		$0	($9,180,000)				
Bellevue	$0	($557,255)		$0	($5,455,374)				
Bothell	$1,900,000	($4,619,802)		$1,900,000	($40,341,590)				

Notes:
(1) Reflects 2 modular data centers with one located on existing PSE-owned land and one purchasing new land
(2) Reflects 2 data centers set up under co-location arrangements
(3) Reflects 1 modular data center and 1 co-located data center that satisfy our requirement of geographic diversity







Project owner name: ***Kurt Palmer*** **Business Unit:** ***IT Infrastructure***
Date completed: **Operational Program**: *New Backup Data Center*
Date when the CSA will be completed: 5/29/2015

1. Problem to be solved, condition to improve, or capabilities desired:

PSE currently operates and maintains four Data Centers:

- *EST 2nd floor serves as our Resiliency Center (Backup Control Center) and Backup Data Center*
- *PSE 9th floor supports Trade floor and Phone system (Rolm and VOIP). We also have approximately 234 Telco circuits going out at this Data Center supporting other PSE locations.*
- *ESO supports critical communication that supports System Ops/Load Office along with Gas Operations*
- *Bothell H serves as our main Production Data Center*

Network Operations Center is located in Bothell H and monitor's PSE's IT Production Systems 24x7.

Data Center Limitations:

- *All have limited/costly expansion or load capability limitations*
- *All are located within the I-405 corridor and earthquake fault line*
- *All are located within 12 miles of one another*
- *None were built to allow concurrent maintenance – today we cannot shift load from Production Data Center to our Backup Data Center*
- *All have inherent risks that prevent PSE from providing adequate redundancy*
- *Both Bellevue Data Centers are in leased office locations not built for Data Center Infrastructure*
- *Bellevue Backup Data Center Infrastructure has very limited room to expand and grow to support the Business Continuity and DR initiatives*

In order to meet the business critical needs, technology and business recovery, growth and planned technology deployment including Business Continuity and DR over the next five to ten years PSE must replace our current Backup Data Center in Bellevue EST location. Our critical business systems today like: EMS, GAS, OMS, PSE.com are expected to be available, reliable and secure 24X7 and we are at risk in not being able to recover and support 24X7 availability in our current Backup Data Center if and or when a Disaster occurs.

Planning in 2016 will include assessment of a Resiliency Center, the high-level estimated costs included in this document is just for the new Backup Data Center. Corporate Facilities has ear-marked estimated budget for the Resiliency Center and property if not currently owned by PSE.

See Appendix: Table outlines - Data Center Best Practice criteria which includes DR/Backup , identify gaps in Best Practice and measures how gaps impact PSE. Goal is the maintain critical applications, system reliability, redundancy which allows us if needed to fail over to a Backup Data Center in a Disaster, scheduled maintenance and outages (if required) which reduces downtime, ensure safety and secure systems – protect PSE's data, information, IT assets and business applications.

2. **With what Integrated Strategic Plan (ISP) objective and strategy does this align and how is efficiency gained? Consider the strategic measurement that will be impacted.**

   This would support the financial, and process and tools, mandatory and corporate risks objectives of the ISP.

ISP Objectives, Mandatory and/or Corporate Risk	**Strategy** *Abbreviated* **ISP strategy descriptions**	**Benefit Description** *Benefit, measurement and/or scorecard affected*
Safety	☐ Educate and train employees on effective safety and wellness strategies	
People	☐ Develop/Retain best employees ☐ Ownership, innovation and continuous improvement	
Process and Tools	✓ ☐ Effectiveness and efficiency ✓ ☐ System reliability and integrity ✓ ☐ Safety and security of systems, information and assets ☐ Extract and leverage value from existing technology and assets	
Customer	☐ Customer Experience Intent Statement ☐ Recognition of PSE role in community ☐ Ideal customer behavior	
Financial	✓ ☐ 5-year Strategic Plan ☐ Long-term value ☐ Grow core business ☐ Grow new business	
Mandatory	☐ Regulatory body ☐ Internal audit finding ✓ ☐ Business continuity	
Corporate Risk	✓ ☐ Corporate risk	*Business Continuity*

3. Cost and duration

IT CSA Summary Financial template.xls

Line #	Lifecylce Phase	Start	Finish	2016				2017				2018	
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Planning -Backup Data Center	1/1/2016	6/29/2016										
2	Design – Backup Data Center	7/1/2016	12/30/2016										
3	Implementation – Backup Data Center	1/2/2017	12/29/2017										

4. Change Management

All business applications will have validation tasks to ensure their system, data and transactions have backed up successfully from the Bothell Production Data Center to the new Backup Data Center.

5. Sign-Off

Signer	Title	Date	Signature
Carolyn Danielson	Manager – IT Facility Infrastructure		
Jason Shamp	Manager – Enterprise Systems		
Kurt Palmer	Director of IT Infrastructure		
Margaret Hopkins	CIO		

Appendix

Data Center Infrastructure Analysis

Goal: Maintain critical application availability; scheduled outages drive downtime

Methodology to achieve goal: **(1)** Identify Best Practice criteria; **(2)** Identify gaps in Best Practice; **(3)** Measure how gaps impact PSE

Best Practice Categories	**(1)** Best Practice Criteria	**(2)** Does PSE align with Best Practice? Y=yes; N=no	**(3)** Gap assessment level of impact (H= High; L=Low)				Comments
			Production Data Center	ESO Data Center	9th Floor PSE Data Center	Backup Data Center	
Location	Located outside a seismic zone	N	H	H	H	H	None of these locations meet seismic "Fully Operational" Standards
	Located outside a flood zone	N	H	L	L	L	Bothell Data Center could not be retrofitted to avoid flooding
	Locations cannot be affected by same event	N	H	H	H	H	An earthquake can affect all buildings
Ownership	Control of data center space is Best Practice	N	H	L	H	H	PSE only owns ESO facility
Life Span	Average Data Center life span is 10 years	N	L	H	H	H	Industry average
Structural	Floor loading supports equipment weight	N	H	L	H	H	Bothell and BUCC have floor loading limits preventing optimal utilization
	Located on ground floor	N	H	H	H	H	
Mechanical	Cooling systems support design configuration	Y	L	H	H	H	Water supply for cooling system has single source. Bothell DC is best practice.
	Cooling systems includes N+1 redundancy	N	L	H	H	H	Additional Cooling equipment would need to be added to each site to increase redundancy.
Electrical	(UPS) uninterruptible power supplies include N+1 redundancy	N	L	L	L	H	BUCC has single power path from P-1 UPS Room to EST-02
	DC/AC sources of power available	Y	L	L	L	L	
	Backup generations provide N+1 redundancy	N	L	H	H	H	Single generator for ESO, PSE-09, BUCC
Fire	Fire suppression systems functional	Y	L	L	L	L	
	Fire monitoring systems functional	Y	L	L	L	L	
Receiving	Loading dock, including staffing, supports 24x7 operations	N	H	H	H	H	
Elevators	Freight elevators available if data center not	N	H	L	H	H	

Data Center and Disaster Recovery Program
Corporate Spending Authorization (CSA)
Application Request

Date Submitted:	February 9, 2018
Officer Sponsor:	Margaret Hopkins
Completed By:	Carolyn Danielson, Jeff Neumann, Brian Fellon
Phase Gate:	**Design**

I. Project Overview

Problem Statement:

Data Center Problem Statement: PSE has approximately 65 IT systems classified by Corporate Business Continuity as Critical to PSE's core business functions. Per the business continuity classification criteria, these systems must be recovered within 24 hours in the event of a disaster. Examples of systems that fall into this category are the Energy Management System, Geospatial Information System, Outage Management System, Email, etc. In addition to the disaster recovery requirements, these critical systems are expected to be secure, reliable, and available 24X7. In our current Data Center scenario, PSE would not be able to recover these systems within their designated Recovery Time Objectives (RTO) and meet the 24X7 availability expectations. Our existing Data Centers are substandard and geographically located on the same earthquake zone. A major earthquake in the Cascadia subduction zone could simultaneously render all of our Data Center facilities unusable.

Current State

- PSE operates and maintains four Data Centers:
  - **Bothell H** Building serves as the primary Production Data Center
  - **Bellevue EST 2nd floor** (EST-02) serves as the Backup Data Center and the Backup Control Center.
  - **Bellevue, PSE 9th floor** (PSE-09) supports Trade Floor operations and the phone systems used by the entire Bellevue campus. PSE-09 also houses 234 Telco circuits that extend to other PSE facilities outside of Bellevue.
  - **Eastside Operations (ESO)** Data Center supports critical communications for System Operations/Load Office and Gas Operations.
- The IT Network Operations Center, located in Bothell H, monitors PSE's IT Production Systems 24x7 at all four Data Center locations.

Limitations:

- All Data Centers have limited/costly expansion capabilities
- All are located within 12 miles of each other along the I-405 corridor within the same earthquake zone.
- We cannot shift load from the Bothell H Production Data Center to our Backup Data Center in EST-02 to perform maintenance.
- All sites have inherent limitations, such as available power, cooling, and capacity, which prevent PSE from providing adequate redundancy.
- Bothell H, EST-02 and PSE-09 are in leased office buildings not suitable for Data Center Infrastructure.
- EST-02 cannot scale or expand to house all critical systems for the purposes of Disaster Recovery.
- Bothell H is located in a flood zone

Disaster Recovery (DR) Problem Statement: PSE needs to ensure that applications and infrastructure are available to support critical business functions in the event of a disaster. Many critical systems have limited or no disaster recovery capabilities and require a solution to ensure that these systems can be recovered within their designated Recovery Time Objectives (RTO).

Current DR Limitations:

- 37% of PSE's critical applications do not meet Business Continuity's requirements for disaster recovery or redundancy.
- While 63% of the critical systems have some level of disaster recovery in place, it would be difficult to simultaneously recover these systems within 24 hours if a site-wide incident occurred. This is due to the manual nature of the current system architecture.
- Many critical systems cannot failover today, because of downstream dependencies on other applications that do not have disaster recovery capabilities.
- We do not have the ability to "return" to the primary production Data Center after we invoke the disaster recovery site, without rebuilding from scratch.
- Disaster recovery testing requires significant downtime to production systems and is highly disruptive to critical business processes.

A robust solution needs to be implemented to:

- Support the day to day reliability and availability requirements of critical systems
- Automate (or nearly automate) the failover and recovery of critical systems in the event of a disaster
- Successfully failover an entire Data Center

Future Vision:	PSE must replace our current Data Centers with highly redundant and resilient facilities and infrastructure that meets availability requirements for day to day operations and the business continuity/disaster recovery requirements for critical business processes and systems.
Proposed Solution:	This program proposes to construct two new Data Center facilities architected to mitigate the Business Continuity/Disaster Recovery Entity Risk and to close all outstanding Internal Audit commitments. The program will: 1. Combine the Data Center and Disaster Recovery Initiatives to optimize cost, schedule and resources, as approved by the CIO and Officers in August 2016. 2. Develop *Facility Resiliency* design options such as Active/Active or Active/Near Active to enable less than 24 hour recovery capability for all critical systems. 3. Evaluate Data Center facility options (co-location, co-location/modular build, modular build) and location options to establish Seismic Zone separation. Determine optimal solution and implement selected option. 4. Implement Industry Best Practice for Data Center facility and operations. 5. Address the maturation of the infrastructure technology standards and asset management, as well as any other data, environment, and or processing standards required. 6. Design and configure all applications to the new Data Centers standards, such that they meet their Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) 7. Design the core IT Infrastructure to accommodate current workload and scale for projected growth through 2019. 8. Migrate, validate, remediate, and cutover all ***Critical*** Applications and systems to the new Data Centers by June 30 2018. 9. Validate Disaster Recovery plans & capabilities for all Critical applications. 10. Migrate, all *non-critical* applications to the new Data Centers by end of 2018. Validate disaster recovery plans for all non-critical applications.
Alternatives Evaluated:	Alternatives considered: 1. **Do nothing** – This option leaves the company at risk of severely diminished ability to operate if a natural disaster occurs. Additionally, the ability to support future growth is severely limited. 2. **Attempt to fortify the existing Data Centers**. This option could address some of the issues requiring mitigation; however, it does

	not provide a comprehensive solution to protect the company from the exposure of a regional earthquake or allow for future growth and expansion capabilities.
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

Scope:

The initial scope was to build a secondary Data Center to support migration and failover of applications from the primary Data Center to the secondary.

Significant scope changes include:

- Combine the Data Center upgrade with the Disaster Recovery Initiatives as approved by the CIO and Officers in August 2016.
- Construct two new Data Centers capable of supporting the full spectrum of PSE's business continuity/disaster recovery objectives and mitigating the risk associated with the existing Data Centers all residing within the Cascadia subduction zone.
- Implement highly resilient and redundant facilities that provide near instantaneous failover (Active/Active) for applications that can leverage this capability, along with improved architecture for the remaining applications (e.g. Active/Near Active).
- Migrate all applications/systems to the new Data Centers to meet disaster recovery objectives (vs. just Critical Applications).

Budget:

Adding a Data Center and the high availability architecture significantly increased the budget. The original capital budget estimated at $40,000,000 was expanded to accommodate the second Data Center, the highly resilient infrastructure, ancillary systems/services, and the migration of all applications to meet disaster recovery objectives.

Current estimation is:

Capital: $ 76,322,000(Comprised of $1,322,000 in 2016, $63,000,000 in 2017, $10,000,000 in 2018 and $2,000,000 in 2019)

Project related O&M: $647,558 in 2017, $2,732,889 in 2018, $2,139,396 in 2019.

On-going annual OM from 2020: ~$2.48M on average.

Five year OM (2018 to 2022) total: $ 12.2M

Twenty year OM (2018 to 2037) total: $49M

Schedule:

The addition of a second Data Center with full failover capabilities and the transition of all applications to the new architecture increased the level of effort. The updated schedule is forecasted to extend the program to the end of 2019.

Risk Profile:

The risk posed by the substandard nature of existing Data Centers remains unchanged; however, the risk of completing the project on time and within budget has increased due to:

- The addition of a significant amount of scope
- The loss of the planned Data Center site at Wild Horse
- The implementation of Active/Active, Active/Near Active technology that is new to PSE
- The combination of two significant efforts: Data Center project and the Disaster Recovery project

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III. Key Schedule and Financial Information

Proposed Budget Year(s):	2016-2019
Expected In-Service Date:	Data Centers 12/2017, Migrated Critical Applications 06/30/2018, Migrated Non-critical Applications 12/31/2018
Initial Estimate:	The projected cost associated with the original Data Center project was $46.7 million dollars.

Cost Estimate Maturity Score:

Score: **Class 3 - Baseline Budget Ready**

Cost Estimation Classification Document: N/A

Updated Estimate for Total Project Cost:

Phase Name:	**Design Phase**	**Contingency 15%**	**15%**	
Cost Type	**Capital**	**OMRC**	**Opex**	**Total**
Cost (without contingency)	$ 66,366,956	$ 100,000	$ 5,419,843	$ 1,886,799
Contingency (auto-calculated)	$ 9,955,043		-	$ 9,955,043
Total (auto-calculated)	**$ 76,321,999**	**$ 100,000**	**$ 419,843**	**$ 1,841,842**
Total Annual Cash Benefits	$ -	If Applicable		
Payback in Years (auto-calculated)	$ -	If Applicable		

Estimated Five Year Allocation:

Category:	**2016**	**2017**	**2018**	**2019**	**2020**
Capital (incl. contingency)*	$1,322,000	$63,000,000	$10,000,000	$2,000,000	$0,000
OMRC	$0,000	$0,000	$100,000	$0,000	$0,000
Opex**	$$0,000	$647,558	$2,632,889	$2,139,396	$2,472,043
Cash O&M Benefits***	$0,000	$0,000	$0,000	$0,000	$ 2,874,966

* IT Operational funds were used to cover additional HW not covered by the Data Center initiative.

** The O&M expense includes the $800K EMC credit offset.

*** OM benefits are from the elimination of lease and non-electricity spend for Bellevue EST2 and Bothell building H.

Cash Benefits by Department:

Ongoing Annual O&M by Department:	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Software Hardware	**$ 647,558**	**$ 1,520,767**	**$ 1,007,274**	**$ 1,339,921**	**$ 1,349,480**	**$ 1,359,995**
Facilities Infra (1239)	$ 14,000	$ 38,000	$ 45,900	$ 54,590	$ 64,149	$ 74,664
Enterprise Sys (1213)	$ 396,939	$ 347,726	$ (224,290)	$ (224,290)	$ (224,290)	$ (224,290)
Ntwk & Secur Infra (1211)	$ 236,620	$ 766,828	$ 817,451	$ 1,141,408	$ 1,141,408	$ 1,141,408
Telecom (1215)	$ -	$ 130,613	$ 130,613	$ 130,613	$ 130,613	$ 130,613
Application	$ -	$ 237,600	$ 237,600	$ 237,600	$ 237,600	$ 237,600

Circuit Lease	**$ -**	**$ 962,122**	**$ 962,122**	**$ 962,122**	**$ 962,122**	**$ 962,122**
IT Shared Servc (1256)		$ 962,122	$ 962,122	$ 962,122	$ 962,122	$ 962,122
Outside Service Other	**$ -**	**$ 150,000**	**$ 170,000**	**$ 170,000**	**$ 170,000**	**$ 170,000**
Facilities Infra (1239)	$ -	$ 150,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000
Total On-going OM Costs	**$ 647,558**	**$ 2,632,889**	**$ 2,139,396**	**$ 2,472,043**	**$ 2,481,602**	**$ 2,492,117**

Non-Cash Benefits / Future Cost Avoidance: Securing the facility and sharing the building as office space at Snoqualmie benefits PSE by reducing the costs for both the Data Center and the office space in the original purchase, as well as for on-going maintenance. Additionally, implementing the new Data Centers, and supporting technology will ensure PSE is able to continue operations in the event of a disaster and will enable the future expansion of the modules, should PSE need to do so.

Cash on Cash Single Payback: N/A

IV. Project Description and Objectives

Project Description: The Data Center/Disaster Recovery project will establish two new Data Centers and migrate all applications and systems from the existing Data Centers in order to create seismic separation and enable recovery of these systems within their designated Recovery Time Objectives (RTO) and meet the 24X7 availability expectations.

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	Enhancing PSE's ability to recover systems quickly and reliably during an event, supports our Customers preparedness and safety, and demonstrates our commitment to the communities we serve.
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	Introducing two new Data Centers and migrating to Active/Active technology is intended to improve reliability of the systems, particularly during an "event". In the transition, migrating systems to virtual environments will have the added benefit of streamlining the support and maintenance of our infrastructure.
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:

Objective	**Outcomes / Deliverables**	**KPIs – Describe; Indicated Leading/Lagging**	**KPI Data Sources**
Enhance business continuity capabilities.	2 Data Center's that enable the failover and recovery of critical applications in less than 24 hours and well within their Recovery Time Objectives.	Disaster Recovery test results meet stated RTO and RPOs. (Lagging)	
Expand Data Center capacity to support future growth.	Ability to expand Data Center environments along with prepositioned capacity through 2019.	PSE will not be required to secure additional facilities to support anticipated growth for the near future. (Lagging)	

Project Alternatives Assessment:

Alternative	Pros	Cons	Cost	Duration
Do nothing.	No Cost	Does not meet the business objectives.	$0	1 Year NA
Fortify existing Data Center.	Less cost Less project risk Can be accomplished sooner.	Does not meet the business objectives.	$3.1M	1 Year
Build Colocation Data Center	Lower lifetime cost	• Risk of not being able to support NERC and SCADA applications • Higher O&M expense during and after Data Center construction • Less control of Data Center operations	$48M capital $60.2M O&M	Twenty years (2018- 2037)

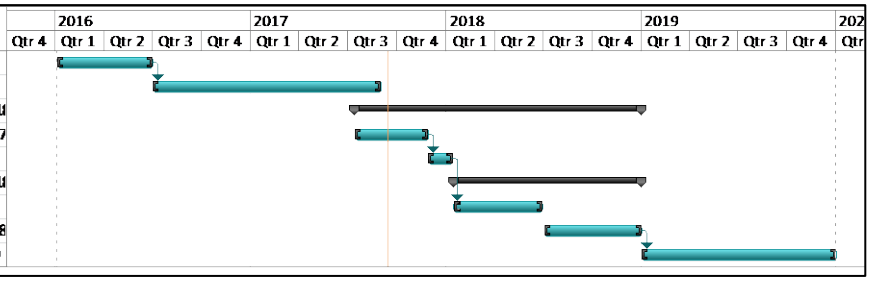
V. Risk Management

Risk	Likelihood	Impact of Occurrence	How Monitored	Mitigation
Program will not meet the planned schedule.	Medium	High	Daily/Weekly Program status meetings to follow progress	Additional resources are being added to key groups to provide backup. Additionally if issues are encountered teams will work long days/weekends to recover the schedule.
Disruption to other programs' schedules and day to day operations due to migration disruption.	Medium	Medium	Monitored through status meeting on migration plans	Strong coordination and communication with business customers and in-flight programs. OCM program will play a critical role in this mitigation process.
Resource Contention	High	Medium	Project plans identify required resources. These requirements are communicated to resource managers.	PM's and Tower Leads work together to identify contentions and options for addressing them.
Cost	Medium	High	Forecasts will be created for each area and compared with actuals.	The program will compare actual costs against progress at the end of March to validate projections.
Complexity of Migrations	High	Medium	Extensive design sessions have been conducted to evaluate the complexity by application.	To accommodate the complexity, three patterns of migrations have been identified, and applications will follow one of the approved patterns based on its architecture.

Risk Register: Program Risks Log

VI. High Level Schedule

Task Name	Duration	Start	Finish
Initiate	129 days	Mon 1/4/16	Thu 6/30/16
Planning & Design	305 days	Fri 7/1/16	Thu 8/31/17
Execution	**382 days**	**Fri 7/14/17**	**Mon 12/31/1**
DC Construction	97 days	Fri 7/14/17	Mon 11/27/17
Infrastructure Build Out	34 days	Tue 11/28/17	Fri 1/12/18
Application Migration	**251 days**	**Mon 1/15/1**	**Mon 12/31/1**
Key & Critical	120 days	Mon 1/15/18	Fri 6/29/18
Remaining Apps	131 days	Mon 7/2/18	Mon 12/31/18
Decommission	261 days	Tue 1/1/19	Tue 12/31/19



VII. Supporting Documentation

Cost Estimating and Budget:	Cost Analysis Feb 8 2018
Business Needs and Alternatives:	Alternatives Analysis Feb 8 2018
Benefits Realization Plan:	Benefits Realization Plan
Project Audit Checklist:	Project Audit Checklist_By_Phase
OCM Sizing Worksheet:	N/A

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

I. Prepared By	Title	Role	Date	Signature
Carolyn Danielson	Mgr IT Infrastructure Facilities	Program Owner	 RE Revised CSA for DC DR Program.msg	
Gregg Hynek	PM	Program Manager	 RE CSA.msg	

Approved By	Title	Role	Date	Signature
Carolyn Danielson	Mgr IT Infrastructure Facilities	Program Owner	 RE Revised CSA for DC DR Program.msg	
Brian Fellon	Dir IT Applications Services	Program Sponsor	 RE Revised CSA for DC DR Program.msg	
Margaret Hopkins	CIO	Exec Steering Committee Member		
Doug Loreen	Dir Safety & Preparedness Safety & Business Continuity	Steering Committee Member	 RE Revised CSA for DC DR Program.msg	
Jeff Neumann	Dir IT Infrastructure Svcs,	Program Sponsor	 RE Revised CSA for DC DR Program.msg	

Acknowledgements	Title	Role	Date	Signature
		Benefit Owner*		
		IT		

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

Data Center and Disaster Recovery Program
Corporate Spending Authorization (CSA)
Revision Request

Date Submitted:	October 26, 2018
Officer Sponsor:	Margaret Hopkins
Completed By:	Carolyn Danielson, Jeff Neumann, Brian Fellon, Doug Loreen
Phase Gate:	**Execution**

I. Project Overview

Problem Statement:

Data Center Problem Statement: PSE has approximately 65 IT systems classified by Corporate Business Continuity as Critical to PSE's core business functions. Per the business continuity classification criteria, these systems must be recovered within 24 hours in the event of a disaster. Examples of systems that fall into this category are the Energy Management System, Geospatial Information System, Outage Management System, Email, etc. In addition to the disaster recovery requirements, these critical systems are expected to be secure, reliable, and available 24X7. In our current data center scenario, PSE would not be able to recover all of these systems within their designated Recovery Time Objectives (RTO) and meet the 24X7 availability expectations. The existing data centers are substandard and geographically located on the same earthquake zone. A major earthquake in the Cascadia subduction zone could simultaneously render our data center facilities unusable.

Current State

- PSE operates and maintains four data centers:
  - **Bothell H** Building serves as the primary Production data center
  - **Bellevue EST 2nd floor** (EST-02) serves as the Backup data center and the Backup Control Center.
  - **Bellevue, PSE 9th floor** (PSE-09) supports Trade Floor operations and the phone systems used by the entire Bellevue campus. PSE-09 also houses 234 Telco circuits that extend to other PSE facilities outside of Bellevue.
  - **Eastside Operations (ESO)** data center supports critical communications for System Operations/Load Office and Gas Operations.

- The IT Network Operations Center, located in Bothell H, monitors PSE's IT Production Systems 24x7 at all four data center locations.

Limitations:

- All data centers have limited/costly expansion capabilities
- All are located within 12 miles of each other along the I-405 corridor within the same earthquake zone.
- We cannot shift load from the Bothell H Production data center to our Backup data center in EST-02 to perform maintenance.
- All sites have inherent limitations, such as available power, cooling, and capacity, which prevent PSE from providing adequate redundancy.
- Bothell H, EST-02 and PSE-09 are in leased office buildings not suitable for data center Infrastructure.
- EST-02 cannot scale or expand to house all critical systems for the purposes of Disaster Recovery.
- Bothell H is located in a flood zone.

Disaster Recovery (DR) Problem Statement: PSE needs to ensure that applications and infrastructure are available to support critical business functions in the event of a disaster. Many critical systems have limited or no disaster recovery capabilities and require a solution to ensure that these systems can be recovered within their designated Recovery Time Objectives (RTO).

Current DR Limitations:

- 37% of PSE's critical applications do not meet Business Continuity's requirements for disaster recovery or redundancy.
- While 63% of the critical systems have some level of disaster recovery in place, it would be difficult to simultaneously recover these systems within 24 hours if a site-wide incident occurred. This is due to the manual nature of the current system architecture.
- Many critical systems cannot failover today, because of downstream dependencies on other applications that do not have disaster recovery capabilities.
- In many cases we do not have the ability to "return" to the primary production data center after we invoke the disaster recovery site, without rebuilding from scratch.

- Disaster recovery testing requires significant downtime to production systems and is disruptive to critical business processes.

A robust solution needs to be implemented to:

- Support the day to day reliability and availability requirements of critical systems.
- Automate (or nearly automate) the failover and recovery of critical systems in the event of a disaster.

Future Vision:

PSE must replace our current data centers with highly redundant and resilient facilities and infrastructure that meets availability requirements for day to day operations and the business continuity/disaster recovery requirements for critical business processes and systems.

Proposed Solution:

This program proposes to construct two new data center facilities architected to mitigate the Business Continuity/Disaster Recovery Entity Risk and to close all outstanding Internal Audit commitments.

The program will:

1. Combine the data center and Disaster Recovery Initiatives to optimize cost, schedule and resources, as approved by the CIO and Officers in August 2016.
2. Develop *Facility Resiliency* design options such as Active/Active or Active/Near Active to enable less than 24 hour recovery capability for all critical systems.
3. Evaluate data center facility options (co-location, co-location/modular build, modular build) and location options to establish Seismic Zone separation. Determine optimal solution and implement selected option.
4. Implement Industry Best Practice for data center facility and operations.
5. Address the maturation of the infrastructure technology standards and asset management, as well as any other data, environment, and or processing standards required.
6. Design and configure all applications to the new data centers standards, such that they meet their Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO)
7. Design the core IT Infrastructure to accommodate current workload and scale for projected growth through 2019.

8. Migrate, validate, remediate, and cutover all ***Critical*** Applications and systems to the new data centers by June 30 2018.
9. Validate Disaster Recovery plans & capabilities for all Critical applications.
10. Migrate, all *non-critical* applications to the new data centers by end of 2018. Validate disaster recovery plans for all non-critical applications.

Alternatives Evaluated:

Alternatives considered:

1. **Do nothing** – This option leaves the company at risk of severely diminished ability to operate if a natural disaster occurs. Additionally, the ability to support future growth is severely limited.
2. **Attempt to fortify the existing data centers**. This option could address some of the issues requiring mitigation; however, it does not provide a comprehensive solution to protect the company from the exposure of a regional earthquake or allow for future growth and expansion capabilities.
3. **Co-Locate both of PSE's data centers** with another partner. This option was not selected over concerns about the ability to meet NERC requirements, and a diminished control over our data center operations.
4. **Co-Locate one of PSE's data centers** with another partner. This option was not selected over concerns about the ability to meet NERC requirements, and a diminished control over our data center operations.

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. CSA Revision Change Summary

Summary: The CSA Revision dated February 2018 included building two data centers, migrating all applications to the new data centers, creating disaster recovery plans, validating disaster recovery capabilities*, and decommissioning the existing data centers in Bothell and Bellevue.

To date, the DC/DR team successfully constructed the new data centers in Snoqualmie and Cle Elum, and is progressing ahead of schedule with migration of the applications to the new data centers. The current schedule has the migrations completing in November, allowing the program to initiate decommissioning activities early, which will in-turn enable the program to complete mid-year 2019, nearly 6 months ahead of schedule!

However, migrating the applications to the new data centers and in many cases establishing new Disaster Recovery capabilities in a new technical environment has proven challenging. Without prior experience with the new ACI Fabric technology the DC/DR team didn't have historical data to guide the budget estimates for the CSA Revision in February of 2018. To enable a fast start, it was agreed to work to a target of $10,000,000 for migrations and adjust the budget to reflect our experience, once the team was operating at peak capacity. Incorporating our progress to date, and the current velocity, the estimate to complete the application migrations is $13,500,000. With the critical applications complete and solid progress on the remaining applications the team is confident the revised budget estimate for migrations is representative of the final costs.

In addition to the challenges with migrating the applications, preliminary planning for the decommissioning work identified a significant dependency for decommissioning the Bellevue data center with the move of the Back Up Control Center (BUCC). Because of the dependency, the Steering Committee agreed to descope decommissioning the Bellevue data center and re-align it with the BUCC project. The preliminary planning also uncovered significant costs associated with returning the building housing the Bothell data center to its former state, and determined the network and telecom requirements were more than anticipated due to the site evolving into a major hub over the years. Together these factors increased the decommissioning estimates despite the reduced scope.

Overall with the progress on application migrations and decommissioning planning, the costs are better understood. To reflect the current understanding of the effort required, this CSA Revision requests an additional $4,800,000 comprised of:

- $3,500,000 to complete the application migrations
- $1,300,000 to initiate decommissioning activities in 2018.

* Note: Individual critical applications DR capabilities were validated; however, testing a complete shutdown of the Snoqualmie data center and failover to Cascade data center is out of scope for this program.

Scope: The scope of building two new data centers, and migrating the applications has remained the same; however, two changes in scope have been agreed to by the DC/DR Steering Committee. They include:

- Addition of testing DR for Tier 3 applications post migration
- Descoping Bellevue data center decommissioning

Tier 3 DR Testing – The plan for Tier 3 applications using the architecture approved approach utilizing VMWare High Availability was based on the assumption a subset of applications would be used to show the VMWare High Availability solution supported RTO for all applications using this architecture. However, the approach was reviewed with Executive Steering Committee and the decision was each application is required to perform the test to show they each meet their RTO requirements. This decision changed the scope of work and the effort required to accommodate the testing of each application. The budget increase associated with this CSA Revision includes costs to perform the tests. Bellevue DC Decommissioning - During preliminary decommissioning planning, a significant dependency between decommissioning the Bellevue data center and the Back Up Control Center (BUCC) project was identified. Due to the interdependencies between the two efforts, a plan to de-scope decommissioning the Bellevue data center from the DC/DR program and re-align it with the BUCC project was approved by the Steering Committee and Executive Steering Committee in June 2018. This approach would eliminate the need to upgrade the radio system as a part of the DC/DR program, and avoid moving the sensitive equipment twice. The reduction in risk and associated costs far outweigh the implications of re-aligning decommissioning the Bellevue data center with the BUCC project.

Budget:

The 2018 budget was primarily comprised of activities associated with the migration of applications from the old data centers to the new data centers along with the creation/validation of the related Disaster Recovery Plans. Because the new data centers are constructed on a technology platform that is new to the company it was difficult to estimate the level of effort required to:

- migrate the applications to the new environment
- create Disaster Recovery plans
- perform tests to validate individual applications met their Disaster Recovery objectives

Further compounding the ability to accurately forecast the migration costs was the requirement to upgrade a number of the applications in order for them to be compatible with the new environment.

Using experience gained while migrating most of the complex applications, the program created a cost model that accurately predicts the cost to migrate and validate the remaining applications. The model forecast costs of $13,500,000 for application migrations and disaster recovery plans/validation, with a planned completion in October. This is an increase of $3,500,000 over the target cost set with the previous CSA revision set in February 2018. Contingency for 2018 of $438,115 was consumed prior to the prior CSA Revision submitted in February and was not replenished with funding provided as a result of the revision request. The 2018 Contingency Tracker is located on the DC/DR SharePoint site located here.

Like cost projections for application migrations, decommissioning costs were established prior to planning and design. Preliminary decommissioning planning, conducted over the first half of 2018, has uncovered several factors that significantly impact the costs. Those factors include:

- Bothell G Building is major hub for the Telecom fiber network and Leased TELCO interconnects requiring Transport equipment to remain within the Bothell G Building, to be used to provided continued Telecom and Network support to all buildings within the Bothell Campus, as well as to remote locations fed from the Bothell G Building
- The Bothell campus (to include Bothell G & Call Center, Bothell H & IOC, and Bothell O) has significantly expanded its user capacity requiring Transport and Network equipment to support remaining resources.
- New equipment must be added when the network and telecom gear is moved from Bothell H to Bothell G in order to support the existing staff at the campus.
- The engineering effort to redesign the corporate communications network is substantially bigger than originally estimated due in part to the growth that has occurred at the Bothell campus and in part due to it being a major communications hub for the company. The corresponding fiber splicing, telco connections and innerduct build work once the redesign is complete is expected to take significantly more time than anticipated as well.
- Additional $250,000 in network hardware is required to support campus and corporate network hub
- Extensive work to remove structural additions and recondition the roof and floor of the Bothell DC is required by the landlord

Further discovery and design is planned for Q4 2018 that could further effect the estimates; however, based on preliminary planning for decommissioning the Bothell data center, the costs for decommissioning the Bothell data center alone could exceed the original decommissioning budget of $2.3 million for 2019. To facilitate early completion of the program, the DC/DR program is requesting funds to initiate decommissioning activities in 2018. This includes buildout of new spaces for gear remaining in Bothell, discovery and design of telecom, voice, and network changes required to reroute, or discontinue existing circuits/equipment in preparation for final decommissioning activities planned for 2019. The cost projections for the decommissioning activities that can be completed in 2018 are $1,300,000.

The impact of these changes are reflected in the total program costs outlined below:

- Capital: $ 81,883,233 (Comprised of $1,488,882* in 2016, $63,694,351* in 2017, $14,800,000 in 2018 and $2,300,000 in 2019)
- Project related O&M: $490,938 in 2017, $2,169,317 in 2018, $1,455,983 in 2019.
- On-going annual OM from 2020: ~$1.25M on average.
- Five year OM (2018 to 2022) total: $7,380,823
- Twenty year OM (2018 to 2037) total: $26M

Note: Decommissioning costs for the Bellevue data center will need to be incorporated into the BUCC project CSA/plans separately. This requirement had been communicated to the team developing the CSA for moving the BUCC.

* Based on actuals

Schedule: The DC/DR program's tremendous progress on migrating the applications has allowed it to explore starting decommissioning work, previously planned for 2019, in 2018. Aggressive performance during the application migrations in combination with de-

scoping the Bellevue data center decommissioning activities has positioned the program to complete ahead of schedule. The current projections show:

- Migrations and Disaster Recovery planning/validation activities are scheduled to complete in November 2018
- Bothell data center decommissioning activities will complete mid-year 2019
- Decommissioning of the Bellevue data center will be dictated by the project responsible to relocate the BUCC

Risk Profile:

Business Continuity – As of June 28th, 2018 the risks identified by the Data Center/Resiliency Center Analysis by Business Continuity in August 2015 have been substantially mitigated. On July 31st Josh Henderson with Internal Audit notified us that "We were able to close this action plan from the 2016 BC audit on-time!" With a few approved exceptions, the Critical applications were migrated to the new data centers, their Disaster Recovery plans written, and with one exception, validated they can meet their RTO requirements by the June 30th commitment. Arguably, most of the key objectives of the DC/DR program (particularly for the critical applications) have been met and PSE's risk posture has been reduced significantly. While work remains, primarily for the Tier 3 & 4 applications, our technical ability to continue critical business operations, even in a regional disaster event, is generally assured!

Budget – The risk associated with the remaining budget requirements has been mitigated, but not eliminated, with the completion of approximately 90% of the work, and the development of a cost model that is based on the experience acquired during the migration of the critical applications. The risk is further mitigated by de-scoping the decommissioning activities related to the Bellevue data center.

Schedule - The risk associated with the schedule has also been substantially mitigated as the Data Center construction, infrastructure buildout and critical application migrations have completed; however, while the non-critical application migrations have been planned, the plan is aggressive and continued commitment by resources across PSE is essential to meeting the aggressive plan. The decommissioning schedule risk has been mitigated by re-aligning the decommissioning of the Bellevue data center with the movement of the BUCC and the plan to start the decommissioning activities in 2018.

Current risk profile – Nearly all applications are now fully functional in the two new data centers, significantly improving the Business Continuity profile should a serious disaster event occur. The primary remaining budget/schedule risk is associated with:

- migration of remaining non-critical applications
- telecom, networking and facilities activities in support of decommissioning the Bothell data center

III. Key Schedule and Financial Information

Proposed Budget Year(s):	2016-2019
Expected In-Service Date:	Data centers 12/2017, Migrated Critical Applications 06/30/2018, Migrated Non-critical Applications 10/15/2018
Initial Estimate:	The previous projected cost associated with the data center/Disaster Recovery project was $76.3 million dollars with a scheduled completion date of 12/31/2019.

Cost Estimate Maturity Score:

Score: **Class 3 - Baseline Budget Ready**

Cost Estimation Classification Document: N/A

Updated Estimate for Total Project Cost:

Phase Name: Execution				
Cost Type	**Capital**	**OMRC**	**Opex**	**Total**
Cost (without contingency)	$ 81,883,233	$ 0	$ 4,116,238[1]	$ 86,399,471
Contingency (auto-calculated)	$	$ 0	$ 0	$ 0
Total (auto-calculated)	**$ 81,883,233**	$ 0	**$ 4,116,238**	**$ 86,399,471**
Total Annual Cash Benefits	$ -	If Applicable		
Payback in Years (auto-calculated)	$ -	If Applicable		

[1] Includes Years 2016 – 2019 only

Estimated Five Year Allocation:

Category:	**2016**	**2017**	**2018**	**2019**	**2020**
Capital (incl. contingency) [1]	$ 1,488,882	$ 63,694,351	$ 14,800,000	$ 2,300,000	$ 0
OMRC	$ 0	$ 0	$ 0	$ 0	$ 0
Opex[2]	$ 0	$ 490,938	$ 2,169,317	$ 1,455,983	$ 1,241,963
O&M Benefits[3]	$ 0	$ 0	$ 0	$ 582,323	$ 1,164,646

[1] IT Operational funds were used to cover additional HW not covered by the DC/DR initiative.

[2] The O&M expense includes the $800K EMC credit offset.

[3] OM benefits are from the elimination of lease and non-electricity spend for Bothell building H.

5 YEAR IT OM spending associated with data centers: Year over Year Delta

Cost Element	2017 Headwind	2018F to 2017B	2019F to 2018F	2020F to 2019F	2021F to 2020F	2022F to 2021F
Software Hardware	490,938	1,207,195	(713,334)	(214,020)	9,559	10,515
Facilities Infrastructure (1239)	14,000	38,000	7,900	8,690	9,559	10,515
Network & Security Infra (1211) [1]	236,620	714,481	(506,820)	-	-	-
Enterprise Systems (1213) [2]	240,318	86,501	(214,414)	(222,710)	-	-
Telecom Services (1215)	-	130,613	-	-	-	-
Apps- ServiceWatch	-	237,600	-	-	-	-
Phone Expense	-	962,122	-	-	-	-
IT Shared Services (1256)	-	962,122	-	-	-	-
OM: Year on Year Delta	**$ 490,938**	**$ 2,169,317**	**$ (713,334)**	**$ (214,020)**	**$ 9,559**	**$ 10,515**

[1] The drop in 2019 is due to the 75% Cisco 3 Yr maint. retirement by YE 2018, 25% Checkpoint retirement by Mid 2019 and the 90% F5 retirement by June 2018.
[2] The drop in 2019 and 2020 is due to the retirement of Cisco UCS and Sirius by the June 2019.

5 YEAR IT OM addition associated with data centers: 2017 as a base year

On-going OM (Excl labor)	2017F to 2017B	2018F to 2017B	2019F to 2017B	2020F to 2017B	2021F to 2017B	2022F to 2017B
Outside Service Other	$ -	$ -	$ -	$ -	$ -	$ -
Facilities Infrastructure (1239)	-	-	-	-	-	-
Software Hardware	$ 490,938	$ 1,207,195	$ 493,861	$ 279,841	$ 289,400	$ 299,915
Facilities Infrastructure (1239)	14,000	38,000	45,900	54,590	64,149	74,664
Network & Security Infra (1211)	236,620	714,481	207,661	207,661	207,661	207,661
Enterprise Systems (1213)	240,318	86,501	(127,913)	(350,623)	(350,623)	(350,623)
Telecom Services (1215)	-	130,613	130,613	130,613	130,613	130,613
Application (Servicewatch)	-	237,600	237,600	237,600	237,600	237,600
Circuit Lease	$ -	$ 962,122	$ 962,122	$ 962,122	$ 962,122	$ 962,122
IT Shared Services (1256)	$ -	962,122	962,122	962,122	962,122	962,122
Total On-going OM Costs	**$ 490,938**	**$ 2,169,317**	**$ 1,455,983**	**$ 1,241,963**	**$ 1,251,522**	**$ 1,262,037**

Non-Cash Benefits / Future Cost Avoidance: Securing the facility and sharing the building as office space at Snoqualmie benefits PSE by optimizing support for both the data center and the office space in one location. Additionally, implementing the new data centers, and supporting technology, will ensure PSE is able to continue operations in the event of a regional disaster and will enable the future expansion of the modules, should PSE need to do so.

Cash on Cash Single Payback: N/A

IV. Project Description and Objectives

Project Description: The Data Center/Disaster Recovery (DC/DR) program will establish two new data centers and migrate all applications and systems from the existing data centers in order to create seismic separation and enable recovery of these systems within their designated Recovery Time Objectives (RTO) and meet the 24X7 availability expectations.

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	Enhancing PSE's ability to recover systems quickly and reliably during an event, supports our Customers preparedness and safety, and demonstrates our commitment to the communities we serve.
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	Introducing two new data centers and migrating to Active/Active technology is intended to improve reliability of the systems, particularly during an "event". In the transition, migrating systems to virtual environments will have the added benefit of streamlining the support and maintenance of our infrastructure.
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:

Objective	**Outcomes / Deliverables**	**KPIs – Describe; Indicated Leading/Lagging**	**KPI Data Sources**
Enhance business continuity capabilities.	2 data center's that enable the failover and recovery of critical applications in less than 24 hours and well within their Recovery Time Objectives.	Disaster Recovery test results meet stated RTO and RPOs. (Lagging)	
Expand Data Center capacity to support future growth.	Ability to expand data center environments along with prepositioned capacity through 2019.	PSE will not be required to secure additional facilities to support anticipated growth for the near future. (Lagging)	

Project Alternatives Assessment:

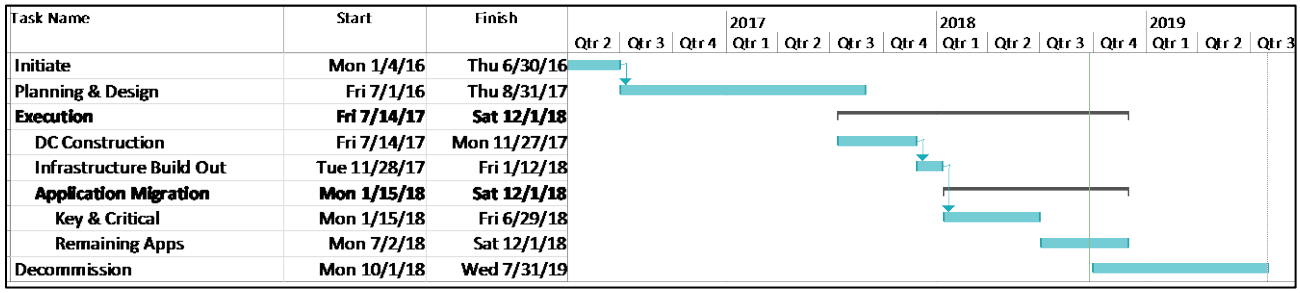
Alternative	Pros	Cons	Cost	Duration
Do nothing.	No Cost	Does not meet the business objectives.	$0	1 Year NA
Fortify existing Data Center.	Less cost Less project risk Can be accomplished sooner.	Does not meet the business objectives.	$3.1M	1 Year
Build Colocation Data Center	Lower lifetime cost	• Risk of not being able to support NERC and SCADA applications • Higher O&M expense during and after data center construction • Less control of data center operations	$48M capital $60.2M O&M	Twenty years (2018- 2037)

V. Risk Management

Risk	Likelihood	Impact of Occurrence	How Monitored	Mitigation
Program will not meet the planned schedule.	Medium	High	Daily/Weekly Program status meetings to follow progress	Additional resources are being added to key groups to provide backup. Additionally if issues are encountered teams will work long days/weekends to recover the schedule.
Disruption to other programs' schedules and day to day operations due to migration disruption.	Low	Medium	Monitored through status meeting on migration plans	Strong coordination and communication with business customers and in-flight programs. OCM program will play a critical role in this mitigation process.
Resource Contention	High	Medium	Project plans identify required resources. These requirements are communicated to resource managers.	PM's and Tower Leads work together to identify contentions and options for addressing them.
Cost	Low	High	Forecasts will be created for each area and compared with actuals.	With 90% of the work complete the budget variance risk is reduced.
Complexity of Migrations	Low	Medium	Extensive design sessions have been conducted to evaluate the complexity by application.	Most of the critical and complex migrations are complete.

Risk Register: Program Risks Log

VI. High Level Schedule



VII. Supporting Documentation

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

I. Prepared By	Title	Role	Date	Signature
Carolyn Danielson	Mgr. IT Infrastructure Facilities	Program Owner		See Below
Gregg Hynek	PM	Program Manager	10/29/18	 RE Revised CSA to reflect EPP's denial of

Approved By	Title	Role	Date	Signature
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Brian Fellon	Dir IT Applications Services	Program Sponsor	10/26/18	 RE Revised CSA to reflect EPP's denial of
Margaret Hopkins	CIO	Exec Steering Committee Member	11/2/18	 RE Revised CSA to reflect EPP's denial of
Doug Loreen	Dir Safety & Preparedness Safety & Business Continuity	Steering Committee Member	10/26/18	 RE Revised CSA to reflect EPP's denial of
Jeff Neumann	Dir IT Infrastructure Services,	Program Sponsor	10/29/18	 Re Revised CSA to reflect EPP's denial of

Acknowledgements	Title	Role	Date	Signature
Carolyn Danielson	Mgr. Infrastructure Facilities	Benefit Owner*		See above
Jeff Neumann	Dir. Infrastructure Services	IT		See above

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