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PACIFICORP ENERGY
Plant: Lake Side

Proposal Date: 08/26/2013
APR#: 10018302

TITLE:	U12 Combustion Turbine Exhaust Cylinder Installation
OBJECTIVE:	Install new turbine exhaust cylinder (SPEX) for Unit 12

Decisions Required:

Approval to spend $3,823,073 to install a spare exhaust cylinder for Unit 12 as the current cylinder is damaged and must be replaced. The installation work is expected to take place during the major combustion turbine inspection scheduled in 2015.

Executive Summary:

During a scheduled combustion inspection which commenced May 11, 2013, deformation to one of six tangential struts (#6 or bottom strut) holding the exhaust bearing concentric with the exhaust casing was observed. A turbine cover lift was performed by the original equipment manufacturer (OEM) Siemens, to allow further inspection. An observed exhaust bearing bore drop resulted in damage and the need to replace row 4 interstage seals. Based upon Siemens' recommendations, realignment of turbine blade rings was completed and an inspection plan developed to monitor deformation progression of the exhaust strut and a further exhaust bearing drop in order to return the unit to service.

This project is for the future installation of a single piece exhaust cylinder (SPEX) in place of the current damaged cylinder. The purchase of a capital spare SPEX cylinder is proposed under APR 10018288. Although it is anticipated the SPEX cylinder will not be installed until the unit's next scheduled overhaul in 2015, this APR to install the capital spare is being routed for approval at this time in the event a forced outage requires its installation prior to the 2015 overhaul.

Key Issues:

Replacement of the existing cylinder with a SPEX cylinder is the only viable long-term option according to Siemens. A root cause analysis is in progress to determine the cause of the bent strut. The rate of degradation of the exhaust strut and potential resulting

exhaust bearing bore / rotor drop with continued operation is unknown.

A similar but more progressed deformed number 6 strut was observed on Unit 11 during this same combustion inspection outage.

Investment Request: $ 3,823k Capital $ 3,800k Direct (without AFUDC)
$ 0k OMAG
$ 3,823k TOTAL

PVRR(d): $166.6 million benefit for completing the project compared to market purchases necessary if the unit is inoperable.

OMAG Budget Status: No OMAG expenditures are expected as part of the project.

CAPEX Budget Status: This capital expenditure is not in the 2013 approved budget / ten-year plan or the current version of the 2014 budget / ten-year plan. Funds from fleet capital will be required to cover this project.

CAPITAL EXPENDITURES - $000

PACIFICORP Share	PRIOR	CY13	CY14	CY15	FUTURE	TOTAL
Budgeted (without AFUDC)	$ -				$ -	$ -
Escalation (2)	$ -			$ -	$ -	$ -
Escalated Budget (without AFUDC)	$ -			$ -	$ -	$ -
Requested (without AFUDC)	$ -			$ 3,800	$ -	$ 3,800
Difference (+/-)	$ -			$ (3,800)	$ -	$ (3,800)
Requested AFUDC	$ -	$ -	$ -	$ 23	$ -	$ 23
TOTAL Requested Funds *	$ -	$ -	$ -	$ 3,823	$ -	$ 3,823

Final Approver: Mike Dunn
President & CEO, PacifiCorp Energy

Sponsor: David Lucas
Gas Fleet Managing Director

Author: Angeline Skinner
Lake Side Plant Manager

1. Introduction

Lake Side began a scheduled combustion inspection on combustion turbine 12 on May 11, 2013. Siemens is the original equipment manufacturer (OEM) and is under contract as the long-term parts and service (LTP) provider for the Lake Side plant combustion turbines. Visual inspections by Siemens identified deformation to the number six

tangential strut supporting the exhaust bearing. The exhaust cylinder is not covered under the LTP, as it is a non-program part. Further evaluation by Siemens identified that the exhaust bearing (#2 bearing) bore had dropped approximately 0.047" causing a lowering of the rotor centerline beyond acceptable limits. Siemens was provided an extra work authorization for $847,623 to remove the turbine cover and perform further inspections. Due to the bearing bore drop, rubs were observed on row 2 and 3 interstage seals. The unit was rendered inoperable until the row 4 interstage seal was replaced and blade rings aligned.

By aligning combustion turbine 12 blade rings, replacing the row 4 interstage seal and refurbishing the remaining interstage seals, continued operations was supported by Siemens along with the implementation of an inspection plan to monitor deformation progression of the exhaust strut and further exhaust bearing drop.

It is anticipated the SPEX cylinder will be installed during the unit's next scheduled overhaul in 2015. Periodic inspections every 1,000 to 2,000 hours of operation are being performed in the interim in an effort to detect a further drop in the exhaust bearing and prevent damage to blades, seals, ring segments or other turbine / compressor components.

The purchase of a capital spare SPEX cylinder is proposed under APR 10018288. This project is to install the SPEX cylinder during the scheduled 2015 major outage for the sum of $3,823,073.

- $3,150,000 Service to install SPEX
- $ 500,000 Division of Responsibility (cranes, scaffolding, insulation etc.)
- $ 23,423 AFUDC
- $ 149,650 Cap-surcharge

  $3,823,073 Total

2. Description and Strategic Fit

This project is to purchase a spare exhaust cylinder for combustion turbine 12 totaling $3,823,073 to replace the current degrading cylinder. Deformation to one of six tangential struts (#6 or bottom strut) holding the exhaust bearing concentric with the exhaust casing has been observed from the inspections associated with the current combustion turbine outage. Replacing the existing exhaust cylinder with the SPEX cylinder is the only long-term viable solution for continued long-term operation.

3. Benefits

a) Customer Service: The rate of degradation of the #6 exhaust strut and potential resulting exhaust bearing bore / rotor drop with continued operation is unknown. An outage could occur if the condition of the exhaust cylinder strut deteriorates further or the exhaust bearing drops to a state rendering the unit inoperable before the scheduled 2015 outage. The replacement SPEX is available for immediate installation thus avoiding risks and time delays associated with availability, pricing and transportation.

b) Risk Mitigation: The exhaust manifold, exhaust bearing strut shields, and exhaust expansion joint assembly cracking could require weld repairs during almost all planned outages and forced outages of sufficient length. Historical repairs of the exhaust cylinder / manifold areas on both combustion turbines since 2009 total $470,000. Replacing the current exhaust cylinder with the SPEX cylinder is expected to resolve "all known technical issues associated with the two-piece exhaust cylinders" according to Siemens.

4. Alternatives Considered

a) Do nothing:

Not replacing the damaged exhaust cylinder will likely render the unit permanently inoperable. Replacement of the existing turbine exhaust cylinder occurs at the end of 2015 for modeling purposes, which results in a favorable PVRR of $166.5m when compared to market purchases necessary if the unit is inoperable.

Present Value of Revenue Requirement (PVRR) Analysis ($000s):

PVRR of Project Presented		($ 4,707,968)
PVRR of Next Best Alternative		($171,277,847)
PVRR(d)	Benefit	$166,569,879

5. Risk Factors Evaluated

The SPEX cylinder was introduced commercially to the Siemens fleet in 2009. The highest operational hours of a SPEX cylinder in service is approximately 25,000 hours. Although units upgraded with SPEX exhausts have been performing as designed according to Siemens, in-service hours are still relatively low.

6. Retirement and Removal Information

This SPEX installation will result in the removal and retirement of the existing exhaust cylinder, manifold, fire suppression and bearing assemblies.

7. Financial Analysis

Project Name:U 12 Comb Turbine Exhaust Cylinder Installation

(In Thousands of Dollars) --- **The financial information presented here is a comparison of the proposed project vs. the next best alternative**.

Project Economics:

	Customer Revenue Requirement	Cash Flows Prior to Regulatory Adjustment	Cash Flows After Regulatory Adjustment *
PVRR Benefit or (Cost) Total Project	$166,570		
PVRR Benefit or (Cost) PPW Share	$166,570		
Project NPV		$103,538	$167
Project IRR		>100%	7.5%
Discount Rate Used		6.74%	6.74%
Capital Productivity Ratio		34.1	1.1
Payback Period (years)		1.6 Years	11.0 Years

	2013	2014	2015	2016	2017	2018
Capital Spending w/o AFUDC	$0	$0	$3,800	$0	$0	$0
Capital Spending w AFUDC	$0	$0	$3,823	$0	$0	$0
Net Cash Flow Without Regulatory Recovery						
Annual	$0	$0	($3,746)	$6,836	$7,241	$7,122
Cumulative	$0	$0	($3,746)	$3,091	$10,332	$17,454
Net Cash Flow With Regulatory Recovery						
Annual	$0	$0	($3,453)	$418	$399	$381
Cumulative	$0	$0	($3,453)	($3,035)	($2,636)	($2,255)
Incremental Earnings Before Interest & Taxes						
Without Regulatory Recovery	$0	$0	($112)	$10,738	$11,403	$11,221
With Regulatory Recovery	$0	$0	$359	$394	$376	$358
Incremental Earnings						
Without Regulatory Recovery	$0	$0	($55)	$6,605	$7,021	$6,911
With Regulatory Recovery	$0	$0	$237	$187	$179	$170
Annual Revenue Requirement						
Calculated	$0	$0	$521	($10,345)	($11,029)	($10,865)
Recovered	$0	$0	$521	($10,345)	($11,029)	($10,865)

* Includes regulatory lag of zero months.

8. Regulatory Recovery Strategy

The asset will be included in construction work-in-progress (CWIP) until the project is used and useful. Allowance for funds used during construction (AFUDC) will be applied while the asset remains in CWIP. Recovery through retail rates will begin once the asset is included in the applicable regulatory filing as made in each state. Filings include general rate cases or other cost recovery mechanisms that may allow for recovery of all or part of the project costs. Assets (and any impacts on the company's ongoing revenue requirement) will be included in regulatory filings if the project is or will be used and useful during the test year used in the respective filing**.**

Rate recovery is subject to approval by the public service commission in each state served by the company and such approval will be sought on a state-by-state basis. Each commission will evaluate the prudence of the company's investment and ultimately

determine any allowed recovery. The company anticipates this project will be approved as a prudent investment and recovery of its ongoing revenue requirement will be allowed, including a return on the amount included in rate base.

9. Project Contingency

A total capital expense of $3,823,073 including cap-surcharge and AFUDC is required to complete this project.

10. Procurement Strategy

This project will be managed as a change order via Exhibit H of the current long-term parts and service contract between PacifiCorp and Siemens Energy. As such, warranty terms and conditions associated with the agreement are applicable.

11. Project Management

David Lucas:	PacifiCorp Gas Fleet Managing Director, Siemens contract management and interface with Sr. PacifiCorp management
Angie Skinner:	Lake Side Plant Manager, daily oversight and direct interface with Siemens for repairs, contract management
Bart Simmons:	Sr. Contracts Attorney, legal review
Justin Swenson:	Lake Side Sr. Buyer, procurement
Joe Hickey:	Assistant Director, procurement
Jayson Branch:	Finance / Accounting Manager, project capitalization
Matt Loveland:	Finance Specialist, economic modeling of options

12. Project Milestones

Installation of SPEX cylinder during the scheduled 2015 major outage.

13. Recommendation

Approval for $3,823,073 to install a capital spare SPEX cylinder during the scheduled 2015 major outage.

Appendix – Economic Model

PacifiCorp - Thermal Economic Analysis Model Page 1 of 2

Ls 2 Ct-St: U 12 Comb Turbine Exhaust Cylinder Installation Offical Curve: 6/28/2013

Inputs:

Dollar Year -	2013	
In-Service Date -	2015	
Average Inflation Rate -	1.9%	
Discount Rate -	6.7%	
Analysis Period -	36	years

Calendar Year	Capital Excluding AFUDC (In Thds)	AFUDC (In Thds)	Book Depreciable Life (Years)	Avoided O&M Savings or (Increases) (In Thds)	Forced Outage Benefit (Equiv. Days)	Risk of Forced Outage (Percent)	Incr. Station Use Increase or (decrease) (KW)	Heat Rate (Restore) or Loss (Btu/Kwh)	Capability Restore or (Loss) (MW)
2013			34						
2014			34						
2015	$3,800	$23	34						
2016			33		365.0	100%			
2017			32		365.0	100%			
2018			31		365.0	100%			
2019			30		365.0	100%			
2020			29		365.0	100%			
2021			28		365.0	100%			
2022			27		365.0	100%			
2023			26		365.0	100%			
2024			25		365.0	100%			
2025			24		365.0	100%			
2026			23		365.0	100%			
2027			22		365.0	100%			
2028			21		365.0	100%			
2029			20		365.0	100%			
2030			19		365.0	100%			
2031			18		365.0	100%			
2032			17		365.0	100%			
2033			16		365.0	100%			
2034			15		365.0	100%			
2035			14		365.0	100%			
2036			13		365.0	100%			
2037			12		365.0	100%			
2038			11		365.0	100%			
2039			10		365.0	100%			
2040			9		365.0	100%			
2041			8		365.0	100%			
2042			7		365.0	100%			
2043			6		365.0	100%			
2044			5		365.0	100%			
2045			4		365.0	100%			
2046			3		365.0	100%			
2047			2		365.0	100%			
2048			1		365.0	100%			

Project Assumptions:

Unit will be inoperable if Turbine Exhaust Cylinder is not installed.

Fixed Assumptions:

Analysis Period Capacity Factor	58.30%	
Heat Rate	7,288	Btu/KWh
Market Point	PACEU	
Fuel Source	LS Fuel	
MDC	257	MW
Plant Property Tax	1.34%	
Total Capital Cost Spent (Saved) esc	$ 3,823	(In Thds)
Dollar Year VOM	$ 2.932	$/MWh

Calendar Year	Medium IPC In Use ($/MWH)	Medium Gas In Use ($/mmBtu)
2013	$0.00	$0.00
2014	$0.00	$0.00
2015	$39.67	$4.04
2016	$41.95	$4.23
2017	$44.24	$4.49

	Med	Low	High
Net After-Tax Cash Flow NPV (In Thds)	$103,538	$64,249	$146,753
Internal Rate of Return (IRR)	>100%	>100%	>100%
Simple Payback Period of Original Investment	1.6 Years	1.8 Years	1.4 Years
Net Benefit to Capital Ratio	34.1	21.6	48.0
Present Value Revenue Requirement PVRR (In Thds)	$166,570	$103,250	$236,216

PacifiCorp - Thermal Economic Analysis Model — Page 2 of 2

Ls 2 Ct-St: U 12 Comb Turbine Exhaust Cylinder Installation — Official Curve: 6/28/2013

Calculated Revenue Requirement Detail (In Thds) — Medium Level

Calendar Year	Capital Revenue Requirement	O&M Cost Reduction (Increase)	Heat Rate (Cost) or Benefit	Station Use & Cap. Restore or (Impact)	Outage (Cost) Benefit	Total (Cost) Benefit	Cumulative PV Revenue Req. Benefit
2013							
2014							
2015	($521)					($521)	($443)
2016	($555)				$10,900	$10,345	$7,795
2017	($535)				$11,564	$11,029	$16,023
2018	($515)				$11,380	$10,865	$23,617
2019	($497)				$12,292	$11,795	$31,340
2020	($479)				$14,061	$13,582	$39,672
2021	($462)				$14,939	$14,476	$47,991
2022	($446)				$15,509	$15,063	$56,102
2023	($429)				$17,096	$16,667	$64,509
2024	($413)				$16,528	$16,115	$72,124
2025	($397)				$17,201	$16,804	$79,564
2026	($381)				$18,877	$18,496	$87,236
2027	($365)				$19,611	$19,246	$94,714
2028	($349)				$17,698	$17,349	$101,030
2029	($333)				$17,748	$17,415	$106,970
2030	($317)				$17,047	$16,730	$112,316
2031	($300)				$15,868	$15,567	$116,976
2032	($284)				$16,266	$15,982	$121,458
2033	($268)				$15,745	$15,477	$125,524
2034	($252)				$16,004	$15,752	$129,401
2035	($238)				$15,792	$15,554	$132,988
2036	($227)				$16,308	$16,081	$136,462
2037	($218)				$16,141	$15,923	$139,685
2038	($209)				$16,704	$16,496	$142,813
2039	($200)				$15,861	$15,661	$145,595
2040	($190)				$16,182	$15,992	$148,257
2041	($181)				$16,216	$16,034	$150,757
2042	($172)				$16,632	$16,460	$153,161
2043	($163)				$17,191	$17,028	$155,492
2044	($154)				$18,000	$17,846	$157,780
2045	($145)				$18,892	$18,747	$160,031
2046	($136)				$19,752	$19,616	$162,239
2047	($127)				$20,891	$20,765	$164,428
2048	($118)				$21,804	$21,686	$166,570
Totals	($10,576)	$0	$0	$0	$542,698	$532,122	
2013 PVRR	($4,708)	$0	$0	$0	$171,278	$166,570	

Net After-Tax Cash Flows Without Regulatory Recovery (In Thds) — Official Curve: 6/28/2013

Calendar Year	Net Operating (Cost) or Benefit	Property Tax	Income Tax Payments	Capital Investment	After-Tax Cash Flow	PV After-Tax Cash Flow	Cumulative PV After-Tax Cash Flow
2013							
2014							
2015			$54	($3,800)	($3,746)	($3,184)	($3,184)
2016	$10,900	($50)	($4,014)		$6,836	$5,444	$2,260
2017	$11,564	($48)	($4,274)		$7,241	$5,402	$7,663
2018	$11,380	($47)	($4,212)		$7,122	$4,977	$12,640
2019	$12,292	($45)	($4,565)		$7,681	$5,030	$17,670
2020	$14,061	($44)	($5,244)		$8,774	$5,382	$23,052
2021	$14,939	($42)	($5,583)		$9,314	$5,353	$28,405
2022	$15,509	($41)	($5,805)		$9,663	$5,203	$33,607
2023	$17,096	($39)	($6,409)		$10,648	$5,371	$38,979
2024	$16,528	($38)	($6,194)		$10,296	$4,866	$43,844
2025	$17,201	($36)	($6,450)		$10,715	$4,744	$48,588
2026	$18,877	($35)	($7,086)		$11,756	$4,876	$53,464
2027	$19,611	($33)	($7,366)		$12,212	$4,745	$58,210
2028	$17,698	($32)	($6,640)		$11,026	$4,014	$62,224
2029	$17,748	($30)	($6,660)		$11,058	$3,771	$65,995
2030	$17,047	($29)	($6,394)		$10,624	$3,395	$69,390
2031	$15,868	($27)	($5,947)		$9,893	$2,962	$72,352
2032	$16,266	($26)	($6,099)		$10,141	$2,844	$75,196
2033	$15,745	($24)	($5,902)		$9,819	$2,580	$77,775
2034	$16,004	($23)	($6,001)		$9,980	$2,457	$80,232
2035	$15,792	($21)	($5,953)		$9,818	$2,264	$82,496
2036	$16,308	($20)	($6,182)		$10,107	$2,184	$84,680
2037	$16,141	($18)	($6,119)		$10,004	$2,025	$86,704
2038	$16,704	($17)	($6,333)		$10,355	$1,963	$88,668
2039	$15,861	($15)	($6,014)		$9,832	$1,747	$90,415
2040	$16,182	($14)	($6,136)		$10,032	$1,670	$92,084
2041	$16,216	($12)	($6,149)		$10,054	$1,568	$93,652
2042	$16,632	($11)	($6,308)		$10,313	$1,507	$95,158
2043	$17,191	($9)	($6,521)		$10,661	$1,459	$96,617
2044	$18,000	($8)	($6,828)		$11,164	$1,431	$98,049
2045	$18,892	($6)	($7,167)		$11,719	$1,408	$99,456
2046	$19,752	($5)	($7,494)		$12,253	$1,379	$100,835
2047	$20,891	($3)	($7,927)		$12,961	$1,366	$102,202
2048	$21,804	($2)	($8,274)		$13,528	$1,336	$103,538
Totals	$542,698	($845)	($204,197)	($3,800)	$333,857		
2013 NPV	$171,278	($378)	($64,133)	($3,230)	$103,538		