



# MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

*Rely on us.*

TO: Commissioners Simpson, Helgeson, Manning, Mital and Brown  
FROM: Erin Erben, Chief Customer Officer; Catherine Gray, Portfolio Management Supervisor (AIC); and Greg Kelleher, Senior Resource Analyst  
DATE: November 21, 2016  
SUBJECT: Cost of New Generating Resources  
OBJECTIVE: Information Only

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## **Issue**

This update provides information to the Board, as requested, on the cost of new generating resources.

## **Background**

Although the 2011 Integrated Electric Resource Plan (IERP) analysis resulted in recommending investment in new energy efficiency, conservation, and demand response (demand-side) resources, maintaining an understanding of the costs of new generating (or supply-side) resources is useful for our work in resource portfolio optimization, market awareness, and an estimation of existing generation asset value.

The average levelized costs and characteristics of generating resources provided were taken from the Northwest Power Council's Seventh Power Plan, adopted in February 2016. The Seventh Power Plan is the most current regional conservation and electric power plan, used to determine the priority of cost-effective resource acquisition. The Council is required to provide this information under the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act).

Technical and policy issues relevant for changes to the region's power system including conservation resources, generating resources, resource adequacy, natural gas, and resource strategies were key considerations in the development of the Seventh Power Plan. Specific issues explored include the Pacific Northwest and California power markets, new policies on renewable energy and greenhouse gas emission standards, and emerging technology such as energy storage.

## **Discussion**

Various characteristics of resources were examined under many different possible future conditions to ensure adequate, economic, efficient, and reliable power for the next 20 years.

A summary of the primary generating resources (solar, wind, and natural gas) prioritized and considered commercially viable on a large scale in the Pacific Northwest based on recent plant builds for renewables and natural gas plants are reflected in the tables below.

**Table 1 - Summary of Renewables**

<b>Resource</b>	<b>Technology</b>	<b>Reference Plant Name</b>	<b>Typ Plant Size MW</b>	<b>All-In Capital Cost</b>	<b>Levelized Fixed Cost</b>	<b>Levelized Cost of Energy</b>
Solar	Utility-Scale Solar PV	Utility-Scale Solar PV ID	17.4	\$ 2238 /kW	\$ 204 /kW-yr	\$ 91 /MWh
		Utility-Scale Solar PV ID with transmission expansion	17.4	\$ 2238 /kW	\$ 292 /kW-yr	\$ 130 /MWh
		Utility-Scale Solar PV WA	47.6	\$ 2238 /kW	\$ 204 /kW-yr	\$ 121 /MWh
Wind	Utility-Scale Wind	Wind Columbia Basin	100	\$ 2307 /kW	\$ 303 /kW-yr	\$ 110 /MWh
		Wind Montana	100	\$ 2419 /kW	\$ 363 /kW-yr	\$ 106 /MWh
		Wind Montana with transmission expansion	100	\$ 2419 /kW	\$ 375 /kW-yr	\$ 109 /MWh
		Wind Montana using Colstrip Transmission	100	\$ 2307 /kW	\$ 323 /kW-yr	\$ 94 /MWh
Geothermal	Conventional, Binary-cycle	Conventional Geothermal	39	\$ 4827 /kW	\$ 633 /kW-yr	\$ 85 /MWh

**Table 2 – Summary of Natural Gas**

Resource	Technology	Reference Plant Name <sup>1</sup>	Typ Plant Size MW	All-In Capital Cost	Levelized Fixed Cost	Levelized Cost of Energy
Natural Gas	Combine Cycle Combustion Turbine	CCCT Adv 1 Wet Cool East	370	\$ 1234 /kW	\$ 182 /kW-yr	\$ 71 /MWh
		CCCT Adv 2 Dry Cool East	425	\$ 1384 /kW	\$ 196 /kW-yr	\$ 74 /MWh
		CCCT Adv 2 Dry Cool West	426	\$ 1379 /kW	\$ 204 /kW-yr	\$ 78 /MWh
	Reciprocating Engine	Recip Eng East	220	\$ 1315 /kW	\$ 191 /kW-yr	\$ 137 /MWh
		Recip Eng West	220	\$ 1315 /kW	\$ 208 /kW-yr	\$ 149 /MWh
	Aero derivative Gas Turbine	Aero Gas Turbine East	179	\$ 1124 /kW	\$ 192 /kW-yr	\$ 139 /MWh
		Aero Gas Turbine West	178	\$ 1120 /kW	\$ 214 /kW-yr	\$ 154 /MWh
	Frame Gas Turbine	Frame Gas Turbine East	200	\$ 817 /kW	\$ 148 /kW-yr	\$ 128 /MWh
		Frame Gas Turbine West	200	\$ 814 /kW	\$ 174 /kW-yr	\$ 145 /MWh

Other generating resource classifications analyzed in the Seventh Power Plan include secondary<sup>2</sup> and long-term.<sup>3</sup> Secondary resources such as new hydroelectric and nuclear are commercially available, but development may not be feasible due to economic and environmental barriers. Energy storage technology is another resource considered to have limited near-term economic potential but could be a significant resource in the future. Storage technology has the ability to add value in different ways based on project siting and is rapidly being recognized as an important element of the future power system.

EWEB’s long-term forecast does not indicate a need for additional supply-side resources within the next five years. However, we will continue to maintain an understanding of the costs of new generating resources for use in other activities, such as portfolio optimization, market awareness, and estimation of existing generation asset value.

**Recommendation**

Information only

**Requested Board Action**

No board action

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1 East and West of Cascades. Adv 1 and 2 indicate the base technology of the CCCT plants used as a reference for costs.

2 Commercially available but limited development potential

3 Emerging technologies that have long-term potential but not commercially viable like wave technology.



# MEMORANDUM

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TO: Commissioners Simpson, Helgeson, Manning, Mital and Brown  
FROM: Mark Zinniker, Generation Engineering Supervisor  
DATE: November 23, 2016  
SUBJECT: Leaburg Dam Roll Gate Hoist Improvements  
OBJECTIVE: Information Only

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## Issue

In recent years, EWEB experienced the catastrophic failure of two hydraulic motors used to hoist the Leaburg Dam Roll Gates. The hydraulic motor for Roll Gate No. 2 failed in January 2012. EWEB was in the process of completing replacement of that hoist system with an electric motor-driven system when the hydraulic motor for Roll Gate No. 1 failed in December 2014.

## Background

Following failure of the second hydraulic motor, the Federal Energy Regulatory Commission's (FERC's) Regional Engineer for Dam Safety directed EWEB to replace the failed hoist system for Roll Gate No. 1 with an electric motor-driven system as soon as possible and prior to the 2015/2016 wet weather season. The FERC also directed EWEB to proactively replace hydraulic motor hoist system for Roll Gate No. 3 with an electric-driven system due to the demonstrated unreliable performance of the hydraulic motors. The FERC required that EWEB accomplish the Roll Gate No. 3 hoist system replacement prior to the 2016/2017 wet weather season.

The Board of Commissioners approved contract amendments for Knight Construction to replace the hydraulic-motor driven systems on May 5<sup>th</sup>, 2015. Knight Construction was successful in completing replacement of the failed Roll Gate No. 1 hoist system prior to onset of the 2015/2016 wet weather season.

## Discussion

Knight Construction mobilized back to Leaburg Dam for replacement of the third and final hydraulic motor-driven hoist system in June 2016. Their work went well and EWEB approved dry testing of the new Roll Gate No. 3 system on November 2<sup>nd</sup>. Following final inspections of the gate systems in early November, Wildish Construction completed removal of the isolation bulkheads in front of the roll gate on November 16<sup>th</sup>. EWEB has commenced wet testing of the new hoist system and will continue to test the equipment over as broad of a range of gate openings as winter river flow conditions allow. Performance of all three electric-driven systems has been satisfactory to date and

EWEB staff are very pleased with the enhanced reliability, operational capabilities, and expected service life of the new hoists.

During testing of the new hoist systems, EWEB staff observed indications of excessive wear on the ‘teeth’ of the racks and cog wheels of all three gate systems. These teeth are what the gates use to ascend and descend as necessary to vary gate opening with changes in river flow. The observed locations and levels of wear are not unexpected on gates with 88 years of service life. Based on investigations and measurements taken during the recent construction work, EWEB’s engineering consultants are developing repair plan options for the worn teeth. EWEB expects to select a repair approach in the next few months for implementation on one of the gates during the summer of 2017. This work will result in another construction period at Leaburg Dam, but the duration is expected to be weeks in length rather than the five to six month construction periods that have occurred during the last three years.

Regarding the overall cost of the Leaburg Dam hoist replacement work, total spending for work on all three gates is expected to reach \$7.4 million by the end of 2016. Litigation between EWEB and the hydraulic-motor system designers, construction contractor, and equipment supplier is underway to recover costs associated with recovery from the catastrophic failures. EWEB is unable to publicly comment on the litigation at this time.

**Recommendation**

None – Information only

**Requested Board Action**

None – Information only