Appendix C

June 1, 2016 Clark Fork River Hydroelectric Project Qualifying Upgrades Report

Avista Corporation

Introduction

This appendix provides details about the calculation of qualifying renewable energy output from incremental hydroelectric upgrades on the Company's Clark Fork River Hydroelectric Project. The Clark Fork River Project includes hydroelectric projects located near Clark Fork, Idaho and Noxon, Montana, 70 miles south of the Canadian border. The plants operate under a FERC license through 2046.

Under certain circumstances, incremental electricity produced as a result of efficiency improvements completed after March 31, 1999 may qualify as an eligible renewable resource for purposes of compliance with Washington's Energy Independence Act, RCW 19.285.030(10)(b). Three methodologies to calculate the amount of incremental hydro electricity associated with efficiency improvements are available. All of the acceptable methodologies consider the state of the hydroelectric project in question without the incremental improvements, then with the incremental improvements, and the resulting difference between the generation before and after the incremental improvements constitutes the amount of qualifying generation available to satisfy the Company's goals under the Energy Independence Act.

The accepted methodologies under Docket UE-110523 include:

1. "Annual calculation using hydroelectric model and actual inflows or generation;"
2. "One-time calculation of renewable electricity percentage using an historical period of inflow or generation;" or

3. “One-time calculation of renewable electricity using an historical period of inflow or generation.”

Avista has decided to utilize the third method using historical inflows from 2002 through 2011. This method entails the use of historical inflow or generation based on a minimum of five years or up to the available inflow record of generation. The qualifying amount of renewable energy output for the before and after incremental improvement states are calculated with a hydroelectric model. The megawatt-hour value difference between the two states is used for the future years are the amount of available renewable energy. The Company modeled the two states using Avista’s Hydro Optimization Package (Hydro Model). The Hydro Model used for the studies in this appendix is the same model that the Company uses to optimize its system operations for short- and long-term planning, budgeting, hydro project market valuation studies, supporting hydroelectric upgrade option studies, and in general rate case submissions (Docket No. UE-100467 for the Clark Fork Hydro Model).

The Hydro Model is a mixed-integer linear programming-based system emulating the operation of the Company’s projects. It was developed in support of system operations, financial forecasting, and hydroelectric upgrades. Operating on an hourly time-step, they accurately represent individual turbine and reservoir operations. The model honors all license constraints such as minimum flows and elevation limits in all periods.

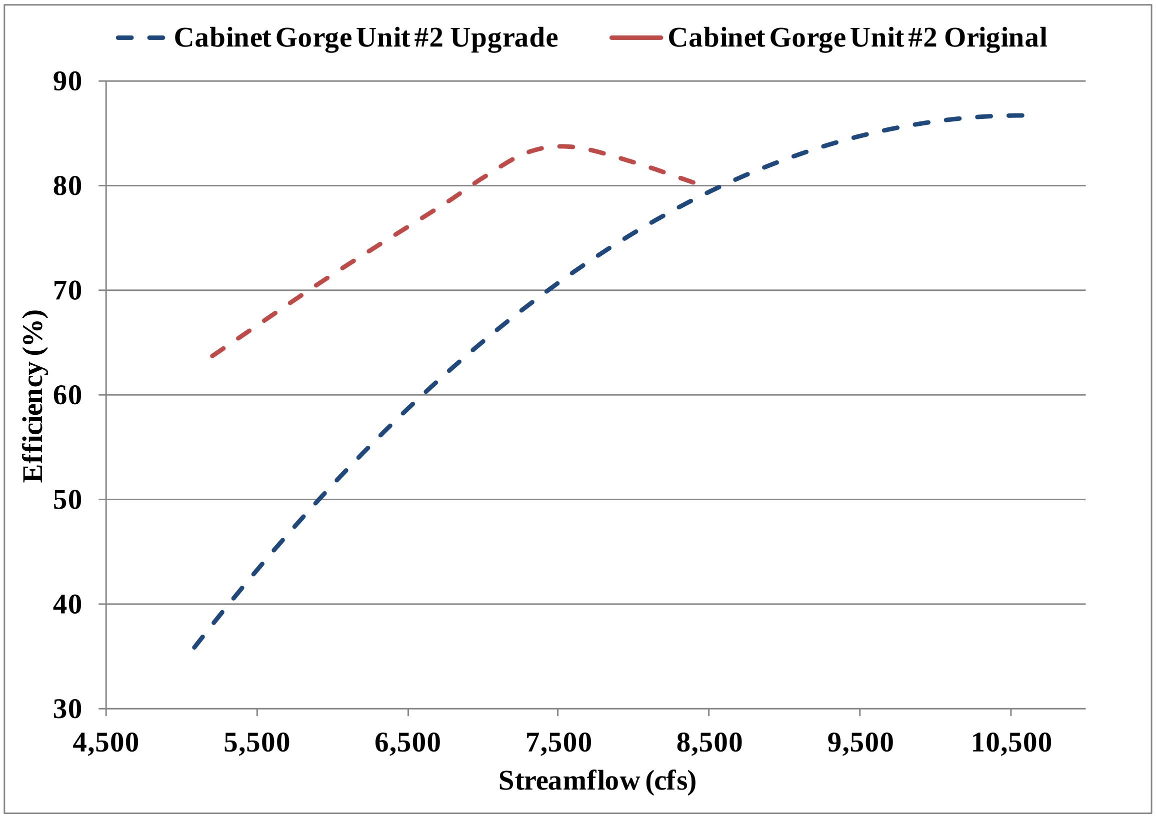
Cabinet Gorge Project Upgrade Descriptions

Qualifying hydroelectric upgrades to Cabinet Gorge Units # 2 – 4 were completed between 2001 and 2007. Details about each of the upgrades is provided below, along with the annual incremental renewable energy output for each unit and the turbine efficiency curves before and after the upgrades.

Cabinet Gorge Unit #2 Upgrade

The Company completed an upgrade of Cabinet Gorge Project Unit #2 in March 2004. The upgrade included the removal and replacement of the original 1952 propeller runner with a modern design mixed-flow runner. Following the upgrade, the Company realized a 17 MW increase in capacity, from 55 MW to 72 MW. The Hydro Model study for Cabinet Gorge Unit #2 resulted in 29,008 MWh of annual qualifying renewable energy. Illustration 1 shows the original and upgraded turbine curves for Cabinet Gorge Unit #2. The upgraded turbine produces energy more efficiently at the higher streamflow conditions where this unit typically operates. The Commission reviewed the Cabinet Gorge Unit # 2 upgrade in Docket No. UE-050482.

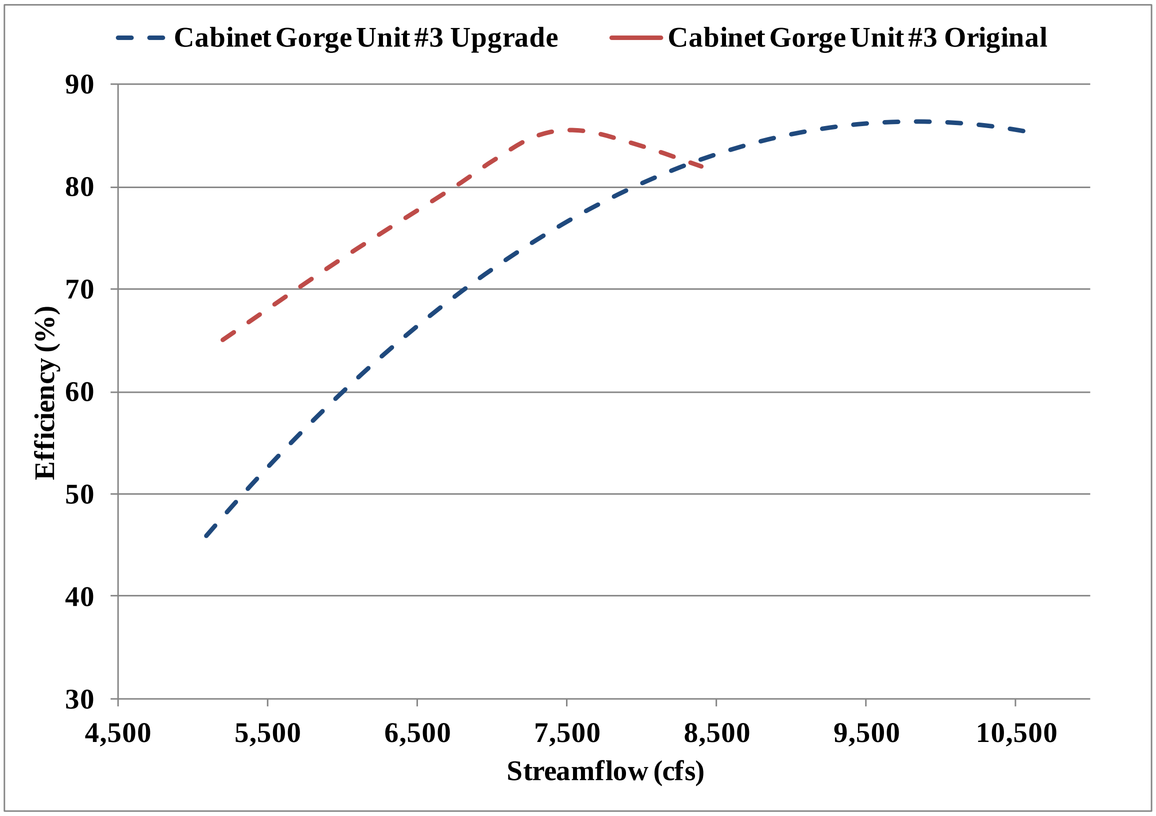
Illustration 1: Cabinet Gorge Unit #2 Turbine Curves



Cabinet Gorge Unit #3 Upgrade

Avista completed an upgrade project in 2001 for the Cabinet Gorge Project Unit #3, which included a runner replacement and generator rewind. The capacity of the unit increased from 55 MW to 72 MW. The Hydro Model study for Cabinet Gorge Unit #3 resulted in 45,808 MWh of annual qualifying renewable energy. Illustration 2 shows the turbines curves for Unit #3 before and after the project upgrade. The upgraded turbine produces energy more efficiently at the higher streamflow conditions where this unit typically operates.

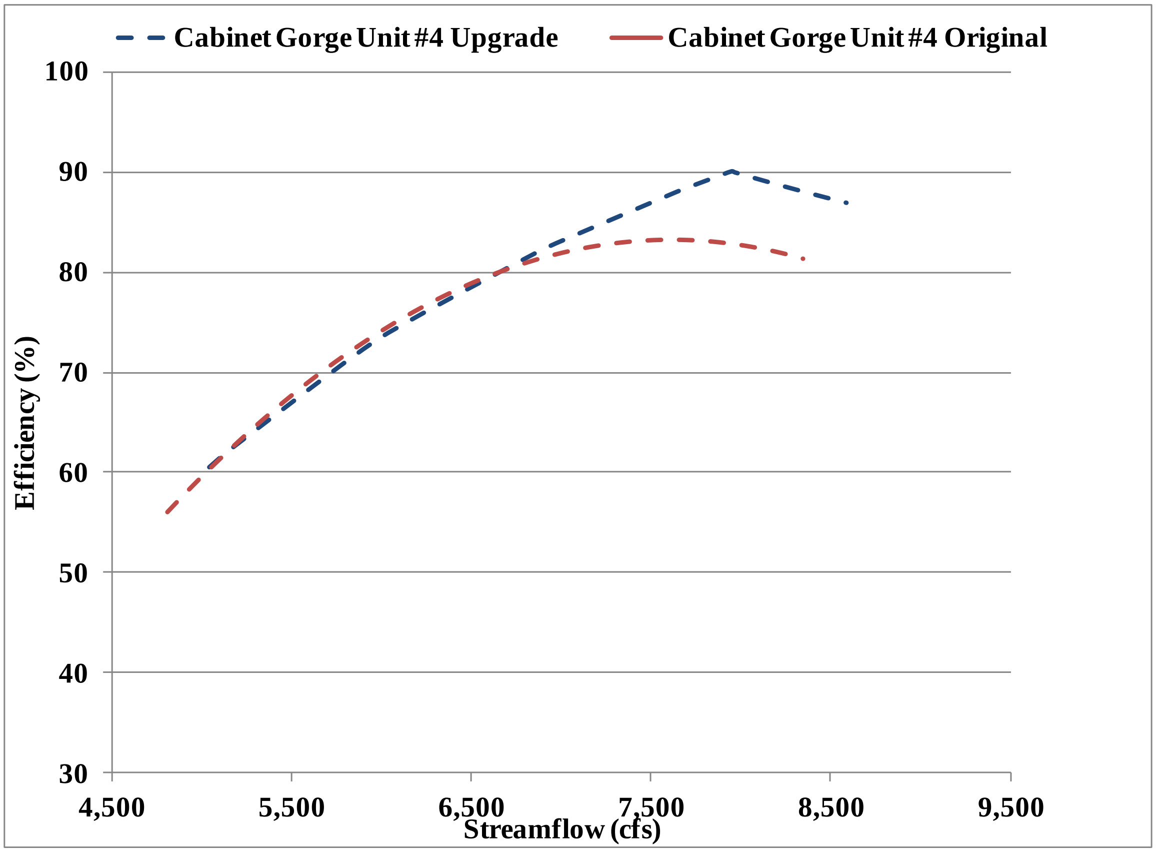
Illustration 2: Cabinet Gorge Unit #3 Turbine Curves



Cabinet Gorge Unit #4 Upgrade

The Company completed an upgrade project in April 2007 for the Cabinet Gorge Project Unit #3, which included a runner replacement and generator rewind. The capacity of the unit increased from 55 MW to 68 MW. The Hydro Model study for Cabinet Gorge Unit #4 resulted in 20,517 MWh of annual qualifying renewable energy. Illustration 3 shows the turbines curves for Unit #4 before and after the project upgrade. The upgraded turbine produces energy more efficiently at the higher streamflow conditions where this unit typically operates. The Commission reviewed the Cabinet Gorge Unit # 4 upgrade in Docket No. UE-070804.

Illustration 3: Cabinet Gorge Unit #4 Turbine Curves



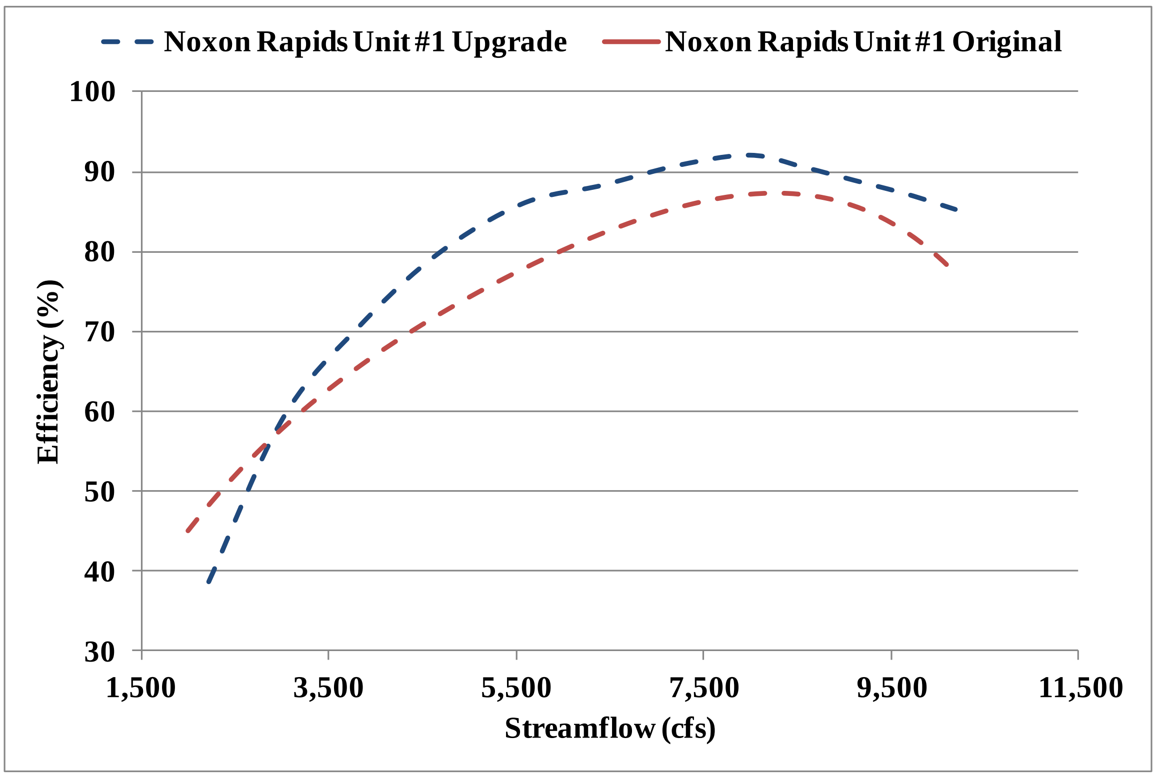
Noxon Rapids Project Upgrade Descriptions

Qualifying hydroelectric upgrade projects to Noxon Rapids Units # 1 – 4 started in 2008 and finished in 2012. The following section provides details about the upgrades, along with the annual incremental renewable energy output for each unit and illustrations of the turbine efficiency curves before and after the upgrades.

Noxon Rapids Unit #1 Upgrade

The Noxon Rapids Unit #1 upgrade began July 2008 and finished in March 2009. The upgrade included replacement of the stator core, stator rewind, new turbine installation, and a complete mechanical overhaul. The upgrade increased the unit rating from 105 MW to 112.5 MW. The costs and additional generation of this project were approved for recovery in Docket No. UE-080416. The Hydro Model study for Noxon Rapids Unit #1 resulted in 21,435 MWh of annual qualifying renewable energy. Illustration 4 shows the turbines curves for Unit #1 before and after the upgrade. The upgraded turbine produces energy more efficiently at the streamflow conditions where this unit typically operates.

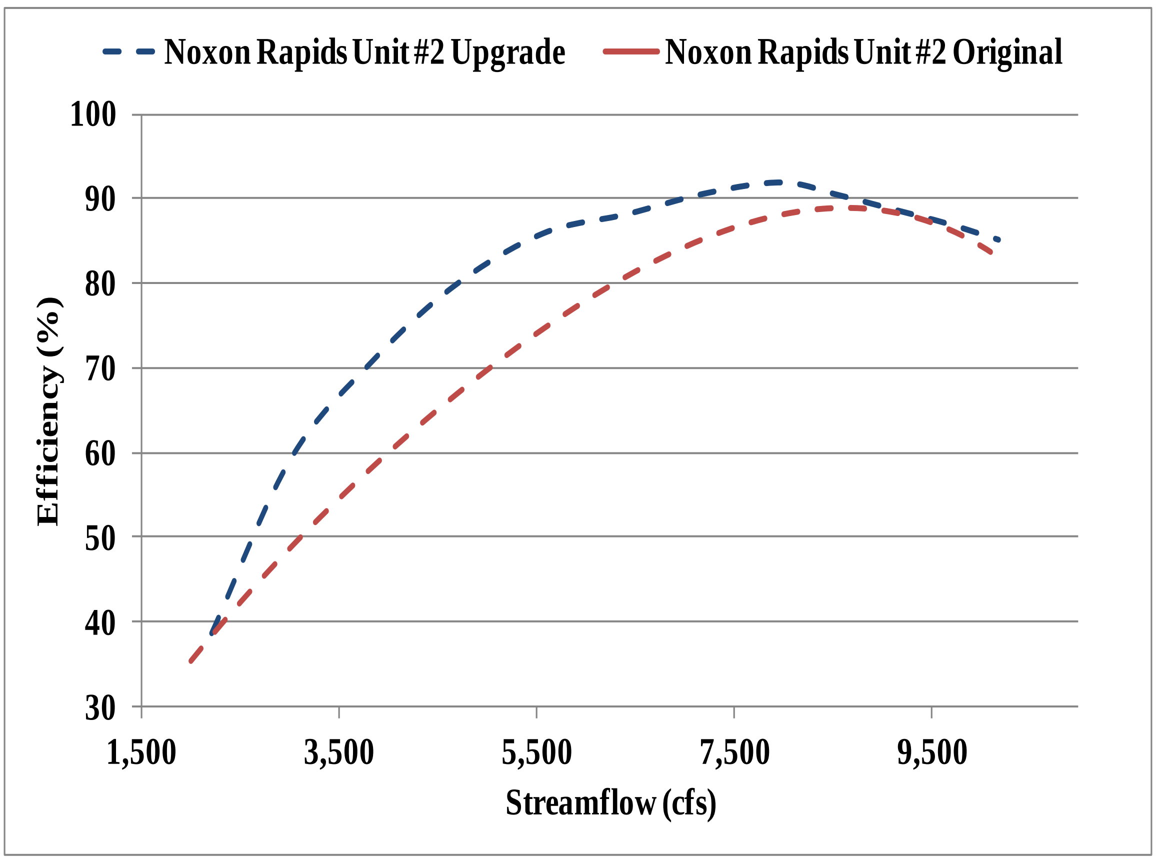
Illustration 4: Noxon Rapids Unit #1 Turbine Curves



Noxon Rapids Unit #2 Upgrade

The Noxon Unit #2 upgrade included a new turbine and complete mechanical overhaul which was completed in May 2011. This upgrade increased the unit rating by 7.5 MW. The costs and additional generation for Unit #2 were approved for recovery in Docket No. UE-100467. The Hydro Model study for Noxon Rapids Unit #2 resulted in 7,709 MWh of annual qualifying renewable energy. Illustration 5 shows the turbines curves for Unit #2 before and after the project upgrade. The upgraded turbine produces energy more efficiently at the streamflow conditions where this unit typically operates.

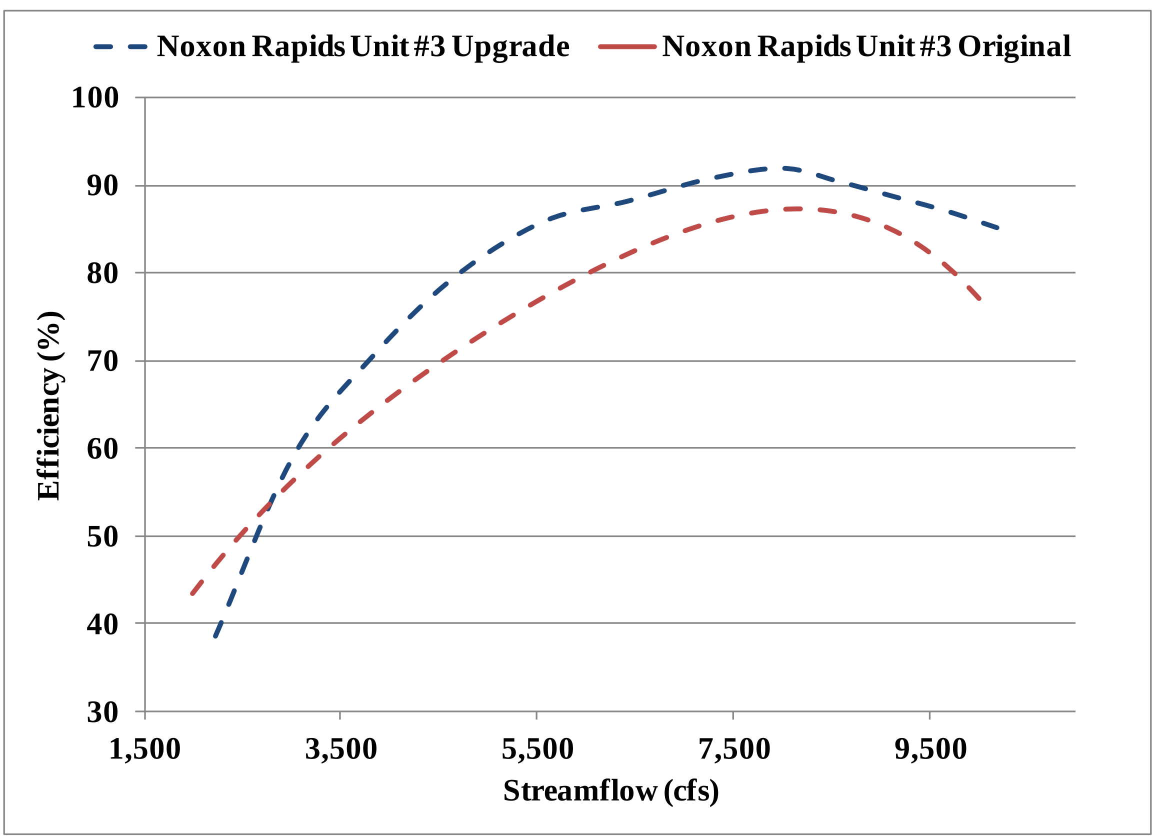
Illustration 5: Noxon Rapids Unit #2 Turbine Curves



Noxon Rapids Unit #3 Upgrade

The Noxon Unit #3 upgrade was completed in May 2010. The upgrade included a turbine runner replacement, which increased boost the unit rating by 7.5 MW. The costs and additional generation for Unit #3 were approved for recovery in Docket No. UE-090134. The Hydro Model study for Noxon Rapids Unit #3 resulted in 14,529 MWh of annual qualifying renewable energy. Illustration 6 shows the turbines curves for Unit #3 before and after the project upgrade. The upgraded turbine produces energy more efficiently at the streamflow conditions where this unit typically operates. The Commission reviewed the Noxon Rapids Unit # 3 upgrade in Docket Nos. UE-090134 and UE-100467.

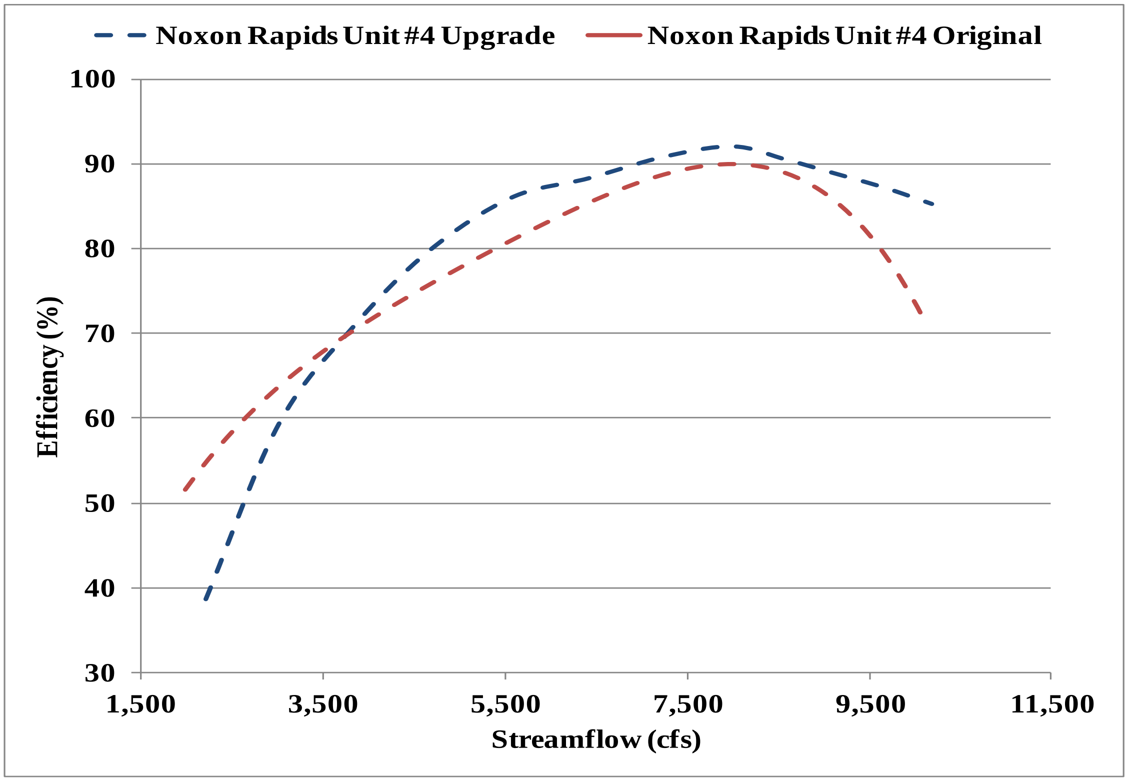
Illustration 6: Noxon Rapids Unit #3 Turbine Curves



Noxon Rapids Unit #4 Upgrade

The upgrade work at Noxon Unit #4 involved the installation of a new turbine and a complete mechanical overhaul. The project started in August 2011 and was completed in May 2012. The Unit #4 upgrade is expected to increase the unit capacity rating by 7.5 MW. The Hydro Model study for Noxon Rapids Unit #4 resulted in 10,934 MWh of 2012 annual qualifying renewable energy after the upgrade was completed in May 2012. Annual qualifying renewable energy will be 12,024 MWh starting in 2013. Illustration 7 shows the estimated turbines curves for Unit #4 before and after the project upgrade. The upgraded turbine produces energy more efficiently at the streamflow conditions where this unit typically operates. The Commission reviewed the Noxon Rapids Unit # 4 upgrade in Docket No. UE-120436.

Illustration 7: Noxon Rapids Unit #4 Turbine Curves



Summary of Clark Fork Upgrades

Table 1 summarizes the annual incremental energy amounts determined by the Hydro Model for 2002 through 2011. The average annual incremental energy over the 10-year period is the amount of qualifying renewable energy output from each hydroelectric upgrade. The supporting documentation for Table 1 is in the confidential work papers for this filing.

Table 1: Clark Fork Annual Incremental Energy from Qualified Upgrades

Incremental MWh							
Year	**Cabinet Gorge #3 Upgrade**	**Cabinet Gorge #2 Upgrade**	**Cabinet Gorge #4 Upgrade**	**Noxon Rapids #1 Upgrade**	**Noxon Rapids #3 Upgrade**	**Noxon Rapids #2 Upgrade**	**Noxon Rapids #4 Upgrade**
2002	46,810	26,882	26,104	23,508	14,667	8,894	27,663
2003	49,045	25,233	21,934	15,482	14,334	4,475	6,662
2004	57,013	16,472	24,553	18,934	10,259	6,509	8,959
2005	56,495	26,096	19,618	18,250	14,045	6,558	11,381
2006	33,813	44,828	12,959	29,488	17,737	6,400	14,587
2007	40,336	26,420	19,451	18,177	11,181	10,171	2,086
2008	36,328	32,724	11,501	25,007	19,828	7,373	27,736
2009	64,735	27,659	22,165	18,554	14,744	8,179	11,361
2010	49,588	22,827	21,658	16,795	13,119	8,685	10,042
2011	23,914	40,941	21,451	33,926	15,372	9,850	31,708
Average	**45,808**	**29,008**	**20,517**	**21,435**	**14,529**	**7,709**	**12,024**