

Box Canyon Hydroelectric Project						
Turbine Upgrade Project Timeline, Scope of Work and Cost History						
Prepared June 12, 2008, J. Snyder, EES Consulting, Inc.						
Date	Event	Scope of Work	Estimated Total Cost	Cost Breakdown	Was This Public Information?	Comments/Notes
August 1, 1998	PUD requests Duke Engineering to study feasibility of turbine upgrades					
February 12, 1999	Duke Engineering Issues Upgrade Study Results	Upgrade all 4 turbines for increased output, but not fish-friendly. Rewind 4 generators, rewind 4 transformers	\$17,201,385	Turbines \$1,600,000 each, generator rewinds \$1 million each, transformer rewinds \$175,000 each, plus tax, engineering and 15% contingency	Yes, included in FERC License Application	Have confirming bid price letters from several suppliers as back-up This price was one of low bidders. Other suppliers estimated up to \$19,668,000. This full study report and back-up all included in FERC License Application
January 30, 2000	PUD submits upgrade proposal to FERC with License application, for 4 upgraded turbines, with 1 as a fish-friendly design				Yes	
December 1, 2001	Duke Engineering begins study of fish-friendly design option					
September 10, 2002	FERC issues Draft EIS for Project, recommends upgrade of 4 turbines, does not mention fish-friendly designs	Upgrade 4 turbines, rewind generators, rewind transformers. Does not include any other plant upgrades or equipment rehab.	\$38,310,000		Yes	see DEIS, section 4.2.1.2
December 9, 2002	PUD obtains DOE grant of \$2 million to assist in installing one upgraded turbine as a fish-friendly design				Yes	
February 21, 2003	WDOE issues Clean Water Act Section 401 Water Quality Certificate for the Project.	Effective date made the same as date of new FERC License- requires a TDG abatement plan be filed			Yes	
September 1, 2004	FERC issues Final Environmental Impact Statement for project and recommends upgrade of all 4 turbines, with 2 as fish-friendly design	Upgrade 4 turbines, rewind generators, rewind transformers, make 2 turbines fish-friendly design. Does not include any other plant upgrades or equipment rehab.	\$36,696,000 for upgrade plus \$6,693,000 to add two fish-friendly turbines, Total Cost- \$43,389,000	FERC costs were for 4 turbines, 2 fish friendly. Using FERC cost for 2 fish-friendly and extending for 4 fish friendly, FERC estimates indicate upgrade with 4 fish friendly turbines would cost \$50,082,000	Yes	FERC Cost estimates shown in FEIS, page 265 and 266. FERC provides the levelized cost per year for 30 years, so multiply FERC costs by 30
June 1, 2005	Federeal Dept. of Energy cancels \$2 million grant due to lack of funding					
July 11, 2005	FERC issues new License for the project. Article 405 orders PUD to upgrade all 4 turbines and generators, and to make 2 of them fish friendly design.				Yes	In FERC License, page 42, footnote 113, FERC states that "Staff estimates the value of energy and capacity to be \$36/MWh
August 8, 2005	PUD submits TDG abatement plan to WDOE, and proposes to upgrade all 4 turbines and generators. WDOE accepted the plan and proposed upgrade, so PUD is then obligated under the 401 Certificate to perform this work.				Yes, sent out to Service List	
January 1, 2006	PUD begins work on turbine supply contract bidding documents					
January thru June 2006	PUD decides to include in the scope of work requested from turbine suppliers other items to address need to upgrade or replace other aging equipment at Box Canyon Dam	Plant operators request preference for all 4 machines to be the same, to save training, spare parts, and vendor engineering- decide to have all 4 fish-friendly.				Also added in: New governors, new exciters, new local control panels, all including installation costs. Fish friendly design requires; a) revised turbine casing; and b) draft tube modifications (all x4). These items added to all 4 turbines, as they would need rehab any way to extend plant life, but not required by FERC.

Feb. 1998 thru Dec. 2006	Commodity Prices undergo record inflation	Copper and Stainless Steel- important components of turbines and generators, increase in cost per ton by over factor of 3				Copper- June 2001- \$74.75; Dec. 2006- 314.7; Machinery Labor Manufacturing Index- Jan. 2000= 1.0, Oct. 2006- 1.429
July 12, 2006	Bid documents issued to Suppliers requesting firm price proposals for turbine upgrade project					
December 16, 2006	Engineers Estimate by EESC issued to PUD		\$69,971,875		Read at Public Meeting	Note: At 4% per year simple inflation, prices from 1998 to 2007 bid date would be expected to inflate 1998 estimates by 42.3%. Increases in commodity prices (see indices data) and world demand were pushing equipment costs up much more quickly than general inflation. Scope was increased significantly from scope of estimates from 1998
December 19, 2006	Upgrade Bids Opened publically at 10:00 am at PUD Offices		\$68,944,200 was lowest evaluated bid- VA-Tech Hydro, Inc. of Austria	Price does not include sales tax or future escalation costs due to commodity cost increases.	Opened at Public meeting	Machines built in later years subject to price inflation based on copper and steel commodity price indices, etc.
June 5, 2007	PUD Board of Commissioners authorizes PUD general manager to sign contract for upgrade of all 4 turbines and generators with VA-Tech Hydro, Inc.		\$68,944,200		Approved at public meeting	
18-Apr-08	Change Order No. 1 issued to VA-Tech Contract for generator core total replacement after inspection and testing		\$8,669,059 adder, total price now \$77,613,259		Approved at public meeting	VA-Tech engineers calculated old cores could not handle upgrade. PUD hired independent third party to verify, and they agreed. (EME Associates, Pittsburgh, PA). Change approved at public Commission meeting.
June 2008 Turbine Contract Status	Models made and tested, generators ordered, turbine blade castings ordered, engineering 75% completed, first unit to be delivered for installation July 2009.		Current Cost of this contract \$77,613,259	New units have improved efficiency and capacity compared to old units. Annual energy output calculated to increase by approx. 43,000 MWh per year (depending on water conditons) with new machines, worth \$1,550,000 per year at \$36/MWh, or worth \$2.62 million per year if sold on Mid-C hub at \$61. Helps offset capital cost.	Contract status routinely discussed at regular public PUD Board of Commissioners meetings	Outstanding issues- turbine shafts field tested and appear to be strong enough for new output- not 100% done with this. Still awaiting resolution of strength of rotor spiders and pole pieces for new output and over-speed. Box output modeled to be 438,824 MWh/yr with old units. New turbines modeled to produce 481,897 MWh/year average (difference 43,073), but actual efficiencies are exceeding bid efficiencies significantly, increasing output further.
Jun-08	Other PUD Internal Costs for contract administration	Add: Sales tax 7.6%, escalation allowance- \$1million, Contingency 3%, 5% allowance for outside engineering support during design and install, 5% allowance for inhouse labor to oversee, inspect, and manage, plus allowance of \$4 million in case rotor spiders and poles need replacement	Total Cost with these additions \$100,575,000	Sales Tax adds \$5,899,000		PUD internal administration costs were never included in any previous estimates, but would clearly be incurred.
Jun-08	Other PUD projects and work expected at Box Canyon for plant rehab and upgrade- not required by FERC, but considered prudent to extend life of plant 50 years (term of new License)	PUD is pursuing other plant rehabilitation projects, not related to the turbine upgrade, that would likely be done whether or not the turbine upgrade occurred	add \$21,500,000. New grand total \$122,075,000 for the entire plant, including the turbine project and all other expected rehab projects.	\$21,500,000 in "Other" upgrades, including: \$1.9million crane rehab.; \$4.1million new transformers; \$344,000 pipe replacements; \$250,000 spillway stop logs; \$230,000 station service power switch replacement, \$800,000 calispell pumphouse pump replacements, etc.		This total includes significant contingency allowances, and allowance for PUD internal costs that may or may not actually be incurred. Estimate is conservative, with strong potential to be completed for less than this amount. Turbine upgrade contract, including tax, is only 68.4% of the \$122,075,000 total plant upgrade and rehab budget