OLD HICKORY HYDROPOWER REHABILITATION ANALYSIS REPORT TEAM CUMBERLAND

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OBJECTIVES

- Determine the benefits of turbine-generator unit replacement
- Optimize the design of the replacement units

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CONSTRAINTS

- Inter-blade/Inter-channel vortices
- Pressure pulsations
- Outflow cavitation
- Equipment Limitations
- Pool Elevations
- Minimum Tailwater
- Time of No Generation
- Power Production Ramp Rates
- Spill Ramp Rates
- Minimum Flow
- Dissolved Oxygen

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ANALYSIS

Construction Cost

Scheduled Outage

Water Availability & Energy Modeling

Comparative Benefit-Cost Analysis

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DEFINITION OF ALTERNATIVES

Alternative	Description	MW	Rated Plant Capacity (MW)	Cost
Existing		25.0	100.0	
1	4 Peak Correct Kaplans	44.5	178.0	$95,779,000
2	4 Uprated Kaplans	44.5	178.0	$98,679,000
3	3 Kaplans, 1 Fixed	44.5	178.0	$98,848,000
4	2 Kaplans, 2 Fixed	44.5	178.0	$97,117,000

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COMPARISON OF ALTERNATIVES

	Alternative 1 - 4 Peak Correct Kaplans	*Alternative 2 - 4 Uprated Kaplans*	***Alternative 3 - 3 Kaplans, 1 Fixed***	*Alternative 4 – 2 Kaplans, 2 Fixed*
Estimated Outage Cost/year	$1,770,250	$1,770,250	***$1,770,250***	$1,770,250
Construction Costs	$95,779,000	$98,679,000	***$98,848,000***	$97,117,000
*Estimated Annual Energy Benefit**	$2,078,139	$2,158,631	***$1,988,183***	-$403,311
*Estimated Annual Capacity Benefits**	$1,344,179	$2,349,544	***$2,765,907***	($2,603,055)
BCR	0.78	1.00	***1.05***	-0.67

*at completion of construction

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RECOMMENDATIONS

- Implement Alternative 2 (4 uprated Kaplans)
- Conduct shaft study during design phase
- Utilize optimization software, such as GDACS T2

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PATH FORWARD

- Program Management Plan Approval – 2Q17
- Design – 3Q17
- Construction – 2022

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