Efficiencies and Objectives in Short Term Hydro Optimization

Mapping out efficiencies and losses in hydro stations to have proper objective functions to minimize water used for a given amount of MW in short term optimization algorithms

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Background

• We wanted to define power-water flow relations and average/marginal production functions for short term hydro optimization?
  – What? Calculate efficiencies and loss functions for turbines and waterways to relate water and power for hydro stations?
  – Why? To have an accurate model of how water is transformed into megawatts to accomplish better optimization, determine nonlinearities, etc.
  – What was expected: We had only a general idea of what these functions would look like.
Results

• Models were defined for multiple units running, representing composite efficiencies, from turbines and complex waterways.

• Similar model was defined for production functions and its average and marginal values using different engineering units.

• All these quantities were calculated and plotted for 3 actual test stations, each with 3 to 6 units.
Conclusions/Recommendations

• Investigate key quantities further, when combining different subsets of running units with gaps and power ranges?

• Investigate the error with making convex approximations (convex hulls) as convexity may simplify the optimization

• Gaps may complicate with additional integer variables in an MIP formulation.

• Combine with signals from long range models