Hydropower: Safe for Whom?

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Abstract

Being the fourth largest hydroelectric producers in the world the United States produces approximately seven percent of its total power from hydropower (USGS, 2012). Its life-span is 50-100 years, much more than other renewable energy sources. However, in multiple areas there has been a severe decline in the population of the fish due to hydropower. The way that hydropower dams are constructed, it leaves very little options for fish to swim through the turbines without getting injured or killed. The goal of this project is to analyze the efficiency of these dams based on the turbines being implemented, as well as how well they cooperate with the environment.

Background

•Hydropower turbines have been around since 1849 when James Francis developed the Francis Turbine, since then as a result, a rapid decrease in fish population occured.
•The Penobscot River in Maine prior to 1830 contained over two million American shad and over 100,000 Atlantic salmon.
•By 1868 the Penobscot's population of American shad was reduced to approximately 5000 and by 1908, it was rare to see any salmon at all in the Penobscot River (Opperman, Jeffrey J. 2011).

Francis Turbine (Voith)

Kaplan Turbine(Voith)

Project Goals/Objectives

•To analyze hydropower turbines and their effect on the environment.
•To find a trend in select turbines in their efficiency and environmental impact.
•To present the most beneficial and environmentally friendly turbine that can replace current turbines in a cost effective way through grant opportunities.

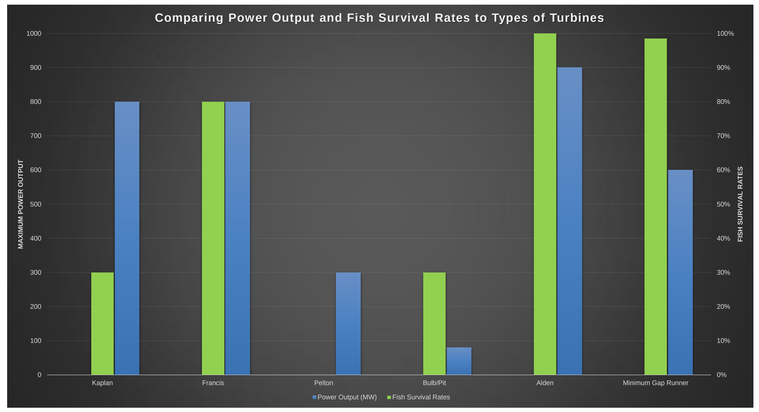
Methods

We researched:
•Damage caused by hydropower turbines.
•Hydropower technologies currently being used.
•Grant opportunities for funding research projects and implementing fish friendly turbines.

Additionally, we:
•Conducted a phone interview with Greg Allen, the director of environmental and engineering services .
•Went to Alden laboratory and visited Celeste Fay for tour around the facility.
•Analyzed data for several turbines to determine the most efficient and environmentally friendly turbine with the fish survival rates.

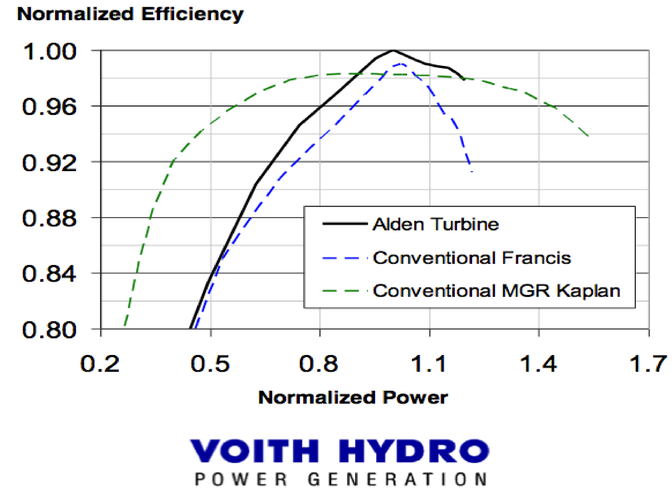
Results

- The Alden Turbine and the Minimum Gap Runner are the two turbines with the best fish survival rates.
- The Minimum Gap Runner has the best overall efficiency.
- The Department of energy is offering grants for further research.



Minimum Gap Runner (Voith)

Alden Turbine (Voith)



VOITH HYDRO
POWER GENERATION

Recommendations

Through our research in analyzing various Hydro turbines, we have determined that the Alden turbine is the most viable option. Alden Laboratories, have optimized their turbine not only to be highly efficient in producing energy but also to allow a safe passage for fish. Based on the turbine's size, we recommend its implementation for areas where hydropower plants already exist, so that it may be added as additional energy production as well as supplying safe fish passage. Some grant opportunities can be established with the U.S. Departments of Energy, Agriculture, and the Interior from anywhere between $500,000- $82million.

Acknowledgments

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