the problem

■ Conventional electricity generation causes air emissions.
■ Fossil fuel-fired power plants are responsible for 67 % of the nation's sulfur dioxide emissions, 23 % of nitrogen oxide emissions, and 40 % of man-made carbon dioxide emissions.
■ Electricity generation using hydro energy offers an alternative with zero emissions.
■ Several existing low-head dams in US have good potential for small-hydroelectric.

objectives

■ Electricity generation using hydro energy offers an alternative with zero emissions.
■ Design a cost-effective small hydroelectric power plant in an existing low-head dam on Fox River, in the state of Illinois.
■ Evaluate impacts in the environment, power system and in the local community.

methodology

Environment Team

■ Analyze the impact on river flow, water quality, fish protection, watershed protection and recreation.
■ Create a list of all required permits and respective documents for the implementation of this project.

Design Team

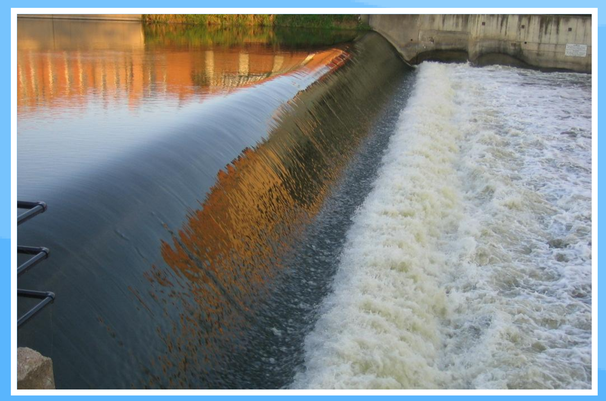
■ Design a small hydroelectric power plant at two existing dams on Fox River: Elgin Dam and Stolp Island East Dam
■ Obtain efficient designs while maintaining good aesthetics.

Marketing Team

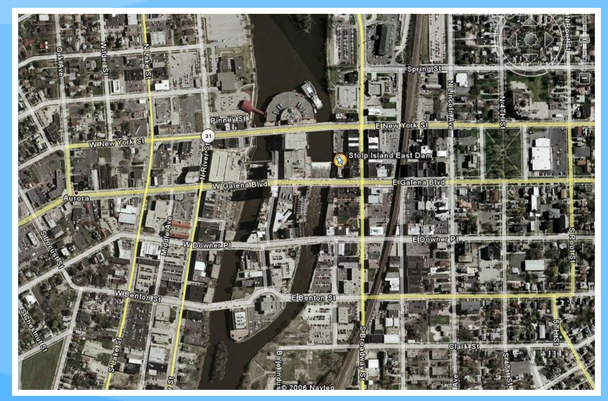
■ Simulate the operation of ComEd power system including the small-hydro units.
■ Perform sensitivity cost analysis of such designs.
■ Investigate Renewable Energy Credits

Elgin Dam

Elgin Dam



Stolp Island East Dam



Stolp Island East Dam

IPRO 343 Technical & Market Integration of Small Hydroelectric Energy

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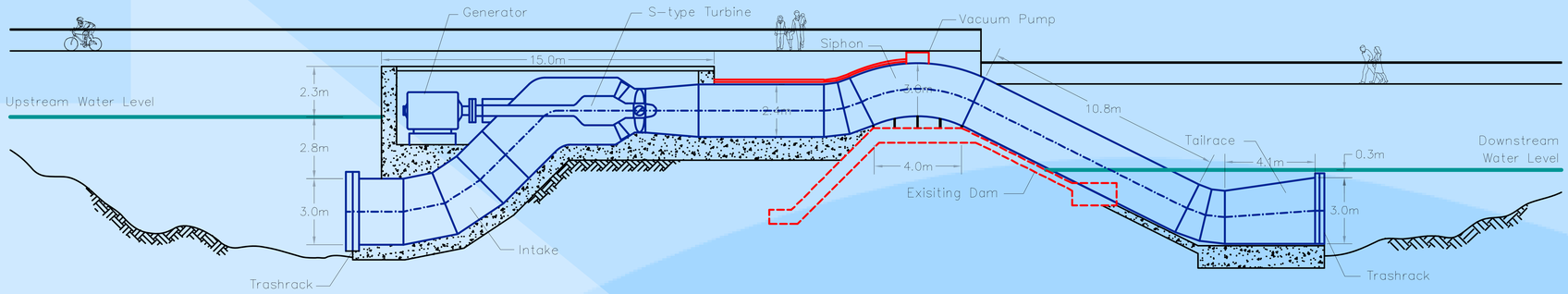
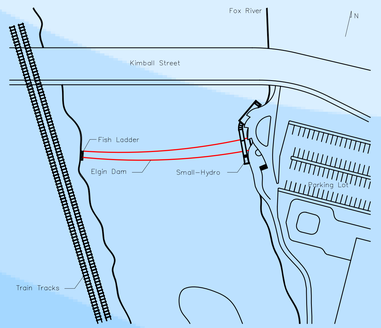
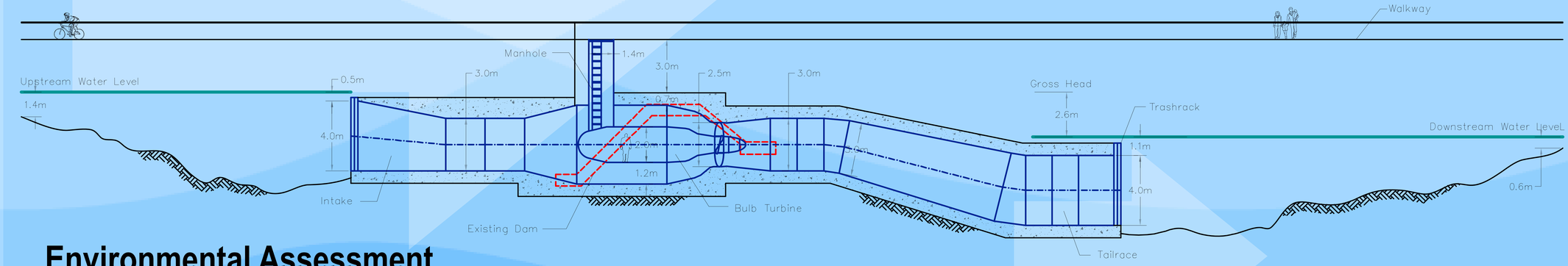
the results

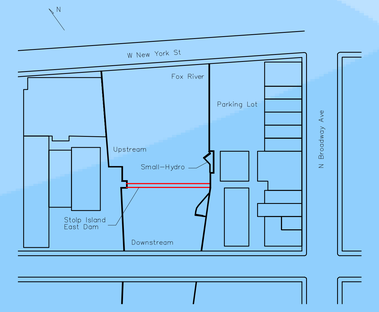
small hydro design at elgin dam





small hydro design at stolp island east dam





Environmental Assessment

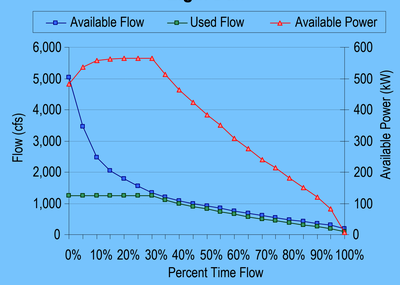
- The proposed designs maintain river flows that are healthy for fish, wildlife, and water quality
- These designs look forward to be in compliance with water quality standards.
- Effective fish passages are already provided at Stolp Island West Dam and Elgin Dam.
- Recreation: The free access to the water and surroundings of these will not be impacted.
- Educational activities can be carried out involving the local community with the new renewable generation facilities.

Renewable Energy Credits

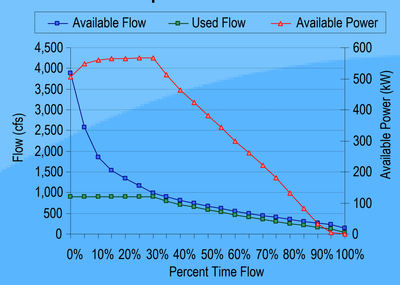
- Illinois Renewable Energy Resources Program: Any hydropower system that will not involve new construction or significant expansion of hydropower dams could apply for grant award up to 1 million dollars.
- EPACT 05: The production 0.9¢/kWh tax credit is available for electricity produced from small scale hydroelectric stations.

Design Flow

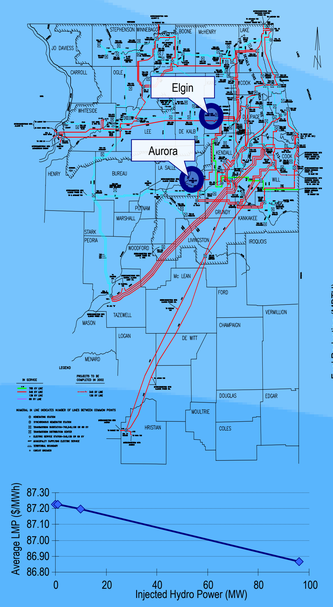
Elgin Dam



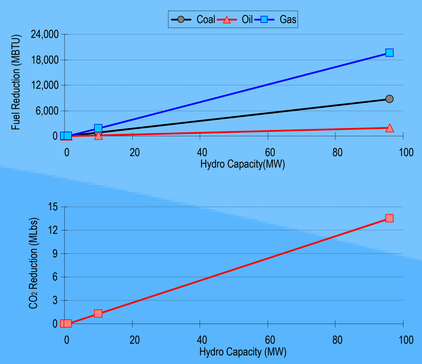
Stolp Island East Dam



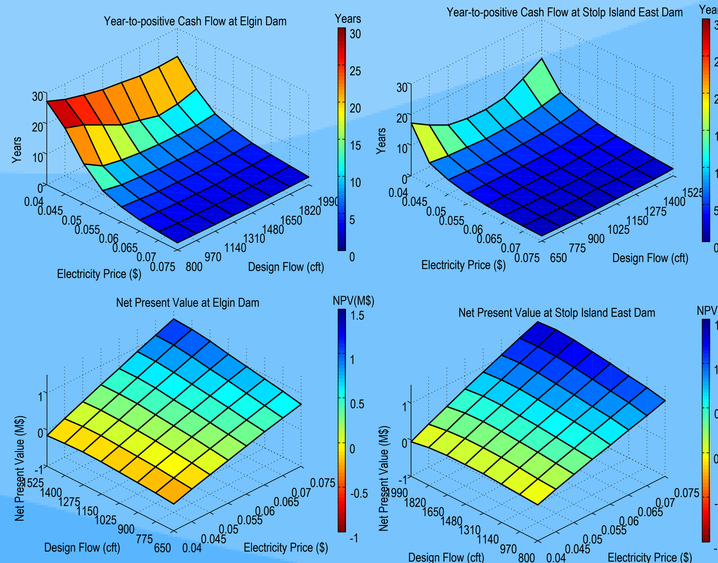
Power System Simulations



- A significant impact of a single small hydro unit cannot be expected.
- With the increase of the small hydro capacity, the electricity price at peak hours drops, fossil fuel consumption is reduced and pollution emissions are mitigated.



Sensitivity Cost Analysis

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