

IPRO 319 Project Plan

Objectives

IPRO 319's objective is to determine the feasibility of converting one or more existing dams on the Fox River into low impact hydroelectric facilities, based upon the project's economic viability, stakeholders, permitting, and certification processes.

As part of this objective, the group aims to provide an extensive catalogue of information on low-impact hydroelectricity so as to establish a strong foundation for future IPROs/EnPROs concerned with the project. We hope to take advantage of IIT's unique role as an education and research institution to accomplish the task.

Project Background

There are thousands of Hydropower dams in the United States that can create a pollution-free energy on many rivers and streams. This study will focus on Fox River, which drains 938 square miles in southeastern Wisconsin prior to entering Illinois from its headwater near Waukesha. Between the McHenry County/Wisconsin border and its junction with the Illinois River near Ottawa, the river runs for 115 miles and drains an additional 1,720 square miles. Although it is only 3% of the total area in Illinois, the watershed is home to about 450,000 people (11% of the state total); a number that is likely to increase by more than 30% over the next 20 years. The Fox River is a multi-purpose resource that contributes critical habitat for wildlife, serves as a valuable source for recreation, receives and assimilates pollutants from point and non-point sources and provides source water for public water supplies.

Tseng and Spetzler recently suggested that the Fox River also offers an untapped resource: existing dams along the Fox River could become low impact hydroelectric facilities. On the 100-mile reach of the Fox River between McHenry and Dayton, Illinois, there are 15 dams. One of these, the Dayton dam, is a privately owned and operated hydroelectric facility. The remaining 14 dams were originally built in the 1800s to provide energy for lumber and gristmills. Although they no longer serve their original purposes, most of these dams have been maintained and could provide an opportunity for a sustainable power source.

This study is divided into tasks for each of the four focus areas: Economics, Permitting requirements, identification of stakeholders, and low impact hydropower certification requirements.

Economic Assessment Group

- **Team Members**
 - Ian Seagren
 - Mauricio Burgos

- **Specific Objectives**
 - Use technical and historical data from the available dams on the Fox River in order to establish at most 2 dams from 15, which are feasible for the main objective from a cost-benefit analysis perspective.
 - Examine the Dayton Dam as a reference of a working model. Along with providing insight into actual implementation, this will help to identify possible improvements.

- **Research Methodology**
 - In order to identify the best dam from the cost- benefit angle our group should follow the following path:
 - Obtain technical and historical data from each dam by public documents and field trips to the most promising locations.
 - Interviews with experts in the area of hydropower. Input from relevant individuals involved with the Dayton facility will be pursued.
 - Analyze the data collected based on the following points:
 - Actual physical condition of the dam.
 - Potential power produced by the dam.
 - Feasibility of combining the existing dam with modern generators and turbines available in the market.
 - Research the parameters to calculate the cost of the following areas:
 - Maintenance of the dam.
 - Maintenance of the turbines and necessary auxiliary equipment.
 - Installation and maintenance of the Power transmission lines.
 - Possible modifications to the existing dams.
 - Operation of the Hydropower plant per year.

After this process we should be able to establish which dam has the maximum potential of being a small hydropower station from the Economic Assessment perspective.

- **Task Schedules**
 - 2/9 Propose dam(s) able to sustain a Hydroelectric
 - 2/14 Report about possible repairs and modification to the dams.
 - 2/21 Proposal of the different turbines and generator available in the market.
 - 2/28 Preliminary cost report 1
 - 3/7 Preliminary cost report 2
 - 3/10 Mid-term Progress report
 - 3/21 Final proposal
 - 3/28 Preliminary profit report.
 - 4/4 Preliminary report cost- benefit analysis
 - 4/11 Preliminary project abstract
 - 4/18 Preliminary presentation
 - 4/25 Final proposal with the cost-benefit report

- **Expected Results**

- The goal is an economic analysis that narrows the field down to two or optimally one site for the hydropower plant. In the early stages, the quantitative aspect of this assessment will be stressed. In this way, dams that can not conform to necessary specifications will be removed from consideration. Dams found to have low potential output relative to upgrade costs will also be removed. It is a priority to reduce the field so that other subgroups can focus their research on certain sites. In this way, remaining sites might further be reduced as the research of other subgroups identifies sites with unforeseen problems. As other subgroups investigate potential sites, qualitative costs can be added to the model. Hopefully, one site will stand out in the end.

- **Individual assignments**

- Assignments will be divided on a weekly basis. This approach will help incorporate new elements as they arise. Certain tasks may take more or less time than planned, so adaptation to the changing problem is necessary.

Permitting team

- **Team members**

- Naila Mahdi
- John Trocke
- Jason Fuglestad

- **Research Methodologies**

- The permitting team will research the permits required for each dam to operate hydropower generators for the purpose of supplying electricity. We will start by researching the various commissions and agencies involved in hydroelectric power. Then we each take a few dams to research the federal, state, and local permits needed for each dam. This will all be done using internet resources and by contacting various agencies, government officials, and organizations.

- **Expected Results**

- We expect to find that the local permit requirements are stricter than the federal requirements, and that the local are stricter than the state.
- The final product for this group to present will be an assessment of the feasibility for hydroelectric facilities along the Fox River as far as permitting is concerned. By the end of the semester, we will have a

detailed outline of the permit application processes to obtain permits for hydroelectric power production at the chosen location(s).

- **Task Schedule / Milestones**
 - Each of the permitting team members will be responsible for summarizing the permit requirements for the Army Corps of Engineers, the Federal Energy Regulatory Commission, and the Illinois State Department of Natural Resources.
 - 2/9 Code analysis of Federal, state, and local agencies.
 - 2/16 Continue code analysis.
 - 2/23 Research individual dam permit requirements.
 - 3/2 Continue individual dam research
 - 3/9 With site known, start filing for permit applications.
 - 3/16 SPRING BREAK
 - 3/23 Consult local authorities concerning regulation details.
 - 3/30 Continue consultation.
 - 4/6 Revise application filings based on consultation results.
 - 4/13 Report information needed to complete application for permits.
- **Individual Assignments**
 - Jason will be responsible for code analysis and summarization of the Federal Energy Regulatory Commission handbook.
 - John will be responsible for code analysis and summarization of the Army Corps of Engineers handbook.
 - Naila will be responsible for code analysis and summarization of the Illinois State Department of Natural Resources handbook.
 - All other assignments will be assigned on a weekly basis.

Stakeholders team

- **Team members**
 - Mark Witkowski
 - Joe Gottardo
 - Justin Rossman
- **Objectives**
 - Find out who owns dams and land around dams.
 - Find out who the property holders upstream and downstream from the dam are.
 - Find out what are the active citizen groups in the area.
- **Research Methodology**
 - Internet based research
 - Calling individuals, companies, and government officials.
- **Expected Results**

- To find more opposition to the project than support, however, not enough to terminate the project.
- **Task Schedule**
 - Feb 9: Find out who owns the dams
 - Feb 16: Find out what land is Private/Public Upstream/downstream
 - Feb 21: Identify interest groups in the area
 - Feb 28: Calling system to find out voter information
 - March 9: Finalize specific groups (what they dislike, how to get around them), find which dam has the least opposition, and voter support in area
 - April 4: Update the information and present to the group
- **Individual Assignments**
 - Justin will find general information on Fox from governmental and business sources.
 - Joe will find what land is public and private.
 - Mark will find out about local groups for and against building hydroelectric dam in the area.

Certification team

- **Team members**
 - Aydra Kalynchuk
 - Nezar Ibrahim
- **Research Methodology**
 - Research certification (we've already done this)
 - Research the criteria for certification (collect information from local, state & federal governments/agencies)
 - Determine the requirements for our site
 - Determine how certification affects economic & stakeholder assessment
 - Determine if certification is possible and practical
- **Expected Results**
 - By the end of the semester we will know if certification is possible and practical for the project.
- **Task Schedule**
 - 2/9 facilities recommended for removal
 - 2/16 river flows
 - 2/23 water quality
 - 3/2 watershed protection
 - 3/9 recreation
 - 3/23 fish passage and protection
 - 3/30 threatened & endangered species protection
 - 4/6 cultural resource protection
 - 4/13 determine if certification is possible and practical

- **Individual Assignments**
 - Aydra Kalynchuk and Nezar Ibrahim will be responsible for completing the certification task schedule.

Project Budget

- For our project we were planning at least one trip to the Fox River to see either the existing hydroelectric facility at the Dayton dam or to examine one of the dams that we pick for our project.
 - Travel:
 - 3 cars
 - 100 miles each
 - 42 cents per mile
 - \$126 total
 - Lunch:
 - 12 people
 - \$10 per person
 - \$120 total
 - Total Cost
 - \$246

Overall Expected Results

After a preliminary look at the various obstacles that could possibly derail our project we have found that none are too great. For every problem we have found so far we have also found a solution. Thus we feel we will find at least one site that will fit the specifications of our project.