A New Paradigm for Collaborative Development of Small Hydropower Projects

A Step-by-Step Process

Developed by American Rivers, Community Hydropower Consulting and Bradley Florentin

December 2013

Table of Contents

Introduction

Abundant opportunities for small hydropower development are available on existing infrastructure. What follows is a companion document to the White Paper “A New Paradigm for Collaborative Development of Small Hydropower Projects,” by Matt Rice of American Rivers, Richard Smart of Community Hydropower Consulting, and Bradley Florentin. It describes a collaborative development approach which differs from the traditional hydropower development process in that it actively seeks out input from a wide variety of stakeholders very early in the process. Stakeholders include water users, environmental groups, local community groups and others, engaging their input in the pre-feasibility and feasibility stages of development. Stakeholder input shapes the design phase, resulting in a project that realizes enhanced accillary benefits, and demonstrates support for the collaborative design, permitting and development process.

The Development Process

This document presents a preliminary outline of the new collaborative model for small hydropower project development. This model requires that several concepts be developed and refined early in the feasibility process. As noted in the White Paper, these include:

1. The rationale for developing the project.
2. A set of criteria for identifying potential sites.
3. Development of several conceptual designs (in addition to the maximum power design) representing a range of technical options. These may include alternate sites, a variety of unit sizes and different operating scenarios.
4. A preliminary list of potential impacts for each option. These impacts will vary depending on the proposed site and type of operation. The categories include:
    a. Local environmental impacts.
    b. Impacts on community goals and values.
    c. Economic development impacts.
    d. Project synergistic opportunities.
5. A preliminary “back of the napkin” estimate of economic feasibility for each conceptual design.
6. A set of potential uses for the power.
7. Preliminary estimates of support and risks for each design.
8. Estimated development time-lines, with benchmarks, for each proposed design.

When these concepts have been developed, they become the basis by which the collaborative process for the design of sustainable hydropower is initiated.

Methodology and Resources

The collaborative development process requires:

1. A methodology for gathering information from local stakeholders and other groups.
2. A systematic process for summarizing and evaluating this information.
3. A process to revise or modify the conceptual design, as appropriate.

This section outlines a general methodology for including the local community and other stakeholders in the pre-feasibility process. It is expected details of this process will be adapted to each project based on local community and site conditions. A comprehensive record of each step of the process is necessary for later quantifying and evaluating the input from stakeholders.

The proposed process steps are as follows:

1. Compile a list of community members, organizations and stakeholder groups with a potential interest in the project.
2. Establish a project advisory board.
3. Expand the preliminary list of project impacts.
4. Develop tools for interviews, conducting surveys and holding public meetings.
5. Systematically meet with individuals and stakeholder representatives.
6. Summarize the information received.

Compile a list of community members, organizations and stakeholder groups

Develop a list of individuals, organizations and other groups who have a potential interest in the project. These may include, for example, local water users, utility representatives, governmental officials, school representatives, environmental groups, economic development interests and others.

Establish a project advisory board

Ideally, an advisory board will be composed of three to five stakeholders identified above, with a broad understanding of the community. The charter for the board will be to provide guidance and assistance for including the local community and other stakeholders in the project feasibility process.

Photo Courtesy of Creative Commons

Expand the preliminary list of project impacts

Expand the preliminary list of potential impacts to include:

- Community goals and values
- Environmental and social concerns
- Recreational opportunities
- Economic development issues
- River and watershed health
- Options for mitigating impacts

Develop a set of tools for meeting with individuals, conducting surveys, and holding public meetings

A broad base of literature exists that can assist with this process.

- Engineering resources can outline options for project development.
- Community development literature can assist with developing coalitions.
- Social science research can assist with developing interview schedules, group meeting agendas and creating questionnaires for obtaining information about:
  - Knowledge of small hydropower
  - Types of support/opposition
  - Potential uses for hydropower
  - Local history of hydropower
  - Preferences for development
  - The importance of renewable energy
- Natural science literature can provide information about quantifying river and watershed health; impacts on flora and fauna, and on fish and wildlife.

Private consultants, as well as environmental groups such as American Rivers, have experience in using these methods and tools, as well as experience in developing coalitions, and can be valuable resources.

Conduct interviews, schedule meetings, and administer questionnaires

Using these tools, with guidance from the advisory board, systematically develop plans to meet with individual community members and stakeholder groups, hold public meetings and administer questionnaires. As part of this step, it is important to document the results of each meeting and interview. These results will be used to quantify and assess the project impacts as part of the collaborative process.

Summarize the information

Summarize information received from the interviews, meetings, questionnaires and other sources of data.

Introducing a Project Assessment Matrix

Once a methodology has been developed and information received from stakeholders, a project assessment matrix can be used to array and evaluate these data. In simple terms, an assessment matrix displays in graphic form an array of the evaluation of impacts of a proposed design. It provides a summary "big picture" of the impacts as part of the feasibility stage of development.

The three major drivers of project impacts are:

- Location
- Equipment size
- System operation

The assessment matrix provides information for the project development team to consider multiple options related to each of these three drivers of impacts. The information received from stakeholders during data collection includes both identification of impacts for various options and an assessment of these as positive, negative or neutral. Aggregating these responses onto a matrix allows for an evaluation of these impacts on community values and environmental systems in relation to project options. (When using this collaborative approach to project development, the community context is likely to require the greatest amount of up-front work for evaluating options for sustainable projects.)

Development of the assessment matrix is a dynamic process where impacts are identified and evaluated over time as new perspectives are gained through the collaborative process. The matrix tool, therefore, is not simply a vetting process; rather it is due diligence in evaluating impacts as part of developing project design data. The matrix guides revisions to the conceptual design and potential mitigation opportunities as part of the feasibility process. Using this method will assist in developing a more sustainable project with support from the local community.

Gathering Data for use in the Matrix

Data for the matrix will be gathered during the process of conducting interviews, holding public meetings and administrating questionnaires. The process will include developing a list of potential impacts, including certification parameters from the Low Impact Hydropower Institute, for each possible conceptual design. New impacts can be added to the list as they emerge.

The specific tools for this process are not included in this document but will need to be professionally designed and pre-tested prior to use. These instruments will be designed to obtain data about the impacts and the respondents' assessment of these impacts.

It will be important to maintain detailed records of the meeting and interviews – as these summaries are used to quantify entries to include in the matrix.

A Sample Assessment Matrix

The sample matrix included here illustrates how the evaluation of the various impacts can be arrayed in summary form. It is not intended to be all inclusive or fit every small hydropower project, but does provide a means to summarize the project impacts of various design options.

On the sample matrix that follows, the x-axis lists potential operating plans. The y-axis lists potential impacts. Each cell entry is an assessment rating of the impact as positive (+), negative (–), or neutral (N). Additional impacts can be added as the assessment proceeds. These assessments are based on summaries of responses from the advisory board, interviews, and meetings with stakeholder groups.

This sample matrix displays the "big picture" of potential impacts, both positive as well as negative, based on plans for how the plant may be operated.

Photo Courtesy of Community Hydropower Consulting

Sample Matrix: An Assessment of Impacts Based on Operating Plan

Type of Impact	Proposed Operating Plan											
	Run of River			Peak Load			Base Load			Other		
Community Impact	+	–	N	+	–	N	+	–	N	+	–	N
• Renewable energy goals												
• Economic development												
• Cultural resources												
• Educational opportunities												
Environmental Impact	+	–	N	+	–	N	+	–	N	+	–	N
• Stream flows												
• Watershed protection												
• River health												
• Water quality												

These impact assessments are based on information from the project advisory board and received during public meetings, interviews with local community members and meetings with stakeholder groups. Questionnaire design, meeting agendas and presentations with handouts are not included in this document. These will be developed as part of the project and revised as experience is gained.

As mentioned earlier, this model assumes there is more than one design possible for a given site and therefore there are several potential impacts based on the economic, environmental, and community context. A series of assessment matrices may be developed to array the impacts for each of several design options. These matrices can be a tool for developers, with assistance from the advisory board, for guiding the design of a project that reflects the values and goals of the local community.

The Future of Small Hydropower

Small hydropower has the potential to make a significant contribution to the growing field of renewable energy. Currently, approximately 3% of America's 80,000 existing dams have hydropower equipment installed.

Respect for the environment and the inclusion of many voices in the design process can lead to sustainable projects with community support that move smoothly through the permitting process. It is the belief of the writers of this document and its companion White Paper that using a collaborative approach will encourage greater development of sustainable small hydropower.

Appendix

The collaborative development of sustainable small hydropower projects involves a series of steps not typically included in the feasibility assessment for small hydropower development. These steps include developing a variety of design options as well as an assessment of these options by the community.

The methodology section describes tools to be used for conducting interviews and holding public meetings. These would include questionnaires, meeting agendas and interview schedules. Specific examples of these tools, with refinements, would become "next steps" as part of a pilot demonstration project of the collaborative process.

Development of small hydropower typically has multiple impacts – both planned and unplanned. The following is a partial inventory of potential community impacts as well as environmental impacts. These lists include some of the typical impacts to consider – however, additional examples will be added when details of a specific site are identified.

Potential community impacts may include:

- Enhanced electric grid operation
- Reduction of local carbon footprint
- Local renewable energy goals
- Support energy independence
- Additional recreation programs
- Expanded education programs
- Community heritage/historical uses

Potential environmental impacts may include:

- Enhanced river health
- Stream flows
- Minimum flows
- Water quality
- Fish and wildlife habitat protection
- Watershed protection
- Protection of threatened/endangered species
- Preserve/enhance cultural resources

Photo Courtesy of Canyon Hydro

Contributors

Richard Smart is the owner of Community Hydropower Consulting. He has worked in the hydropower industry for more than 35 years in both industry and academic settings. He has conducted numerous feasibility assessments for utility developers, government and private organizations. He served on the Colorado Governor's Energy Office team that developed a pilot project with FERC to streamline the hydropower project permitting process. Dr. Smart has served as a consultant with the U.S. Department of Energy, the Bureau of Reclamation, and the National Park Service and holds membership in the National Hydropower Association and the Colorado Renewable Energy Society. His interests include sustainable hydropower development and the impacts of engineering projects on community social systems. He holds a B.S. in Electrical Engineering from the University of Kansas and M.A. and Ph.D. degrees in Sociology from the University of Colorado. Richard may be reached at: richard@communityhydro.com.

Bradley Florentin has been an independent consulting civil engineer for eighteen years with extensive experience in the evaluation of stream and fish habitat restoration. He served on the Colorado Governor's Energy Office team that developed a pilot project with FERC to streamline the hydropower project permitting process. He has managed and directed large, multi-discipline teams and projects. Brad's technical expertise blends knowledge and training in riverine hydrolics and wetlands with a passion for sustainability to produce hard scientific solutions with a soft edge. He holds a B.S. in Civil Engineering and an M.S. in Hydraulic Engineering from Colorado State University and is an avid outdoorsman.
Brad may be reached at: bradflorentin@gmail.com.

Matt Rice is the Colorado Director of American Rivers. He directs large scale, high profile, complex water projects under FERC jurisdictional authority in Colorado. He provides policy recommendations and performs project reviews including designation of high value rivers in Colorado under the Wild and Scenic Rivers Act. . His work protecting and enhancing the natural and recreational values of rivers and ecological flows benefitting fish and floodplains serves as a national model for responsible hydropower operations. He holds a B.A. in History from Montana State University and an M.A. in International Studies from the University of Denver.
Matt may be reached at: mrice@americanrivers.org.

Cover photo courtesy of Community Hydropower Consulting.

Disclaimer
No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the written permission of American Rivers.

Editing and Document Design by:
Wolfe Unlimited ~ Technical and Creative Writing
1015 Cottonwood Drive, Windsor, CO 80550
970-689-1980