

An aerial photograph of a large concrete dam on a river. The dam has multiple spillways and a powerhouse. To the right of the dam is a large electrical substation with many transmission towers. The river flows through a valley with green trees and some buildings.

April 2014

Hydropower Development, Mitigation and Best Practices in Ontario

Imagine the result

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Introduction

Canada is an important producer of hydroelectric power generating 74,000 MW of installed capacity.

Ontario has an installed capacity of 8,100 MW primarily developed from the early 1900s through to the 1960s.

Many hydro projects were studied and planned for development in the 1980s and 1990s few if any of these were actually built.

Therefore there was limited professional experience in the environmental community with hydro projects.

Introduction

What is being developed

- Around 2006 plans for a number of new hydroelectric projects in Ontario moved forward
- Most of the recent hydroelectric development in Ontario has been “low-hanging fruit”
 - Re-developments to old hydroelectric plants
 - Expansions to old hydroelectric plants
 - Developments where some existing infrastructure is in place but there is no generating capacity
 - Developments on river systems that have been altered or disturbed from previous hydro or other activities

Advantages of Brownfield Sites

- Economically efficient
 - Some of the existing hydro infrastructure can be used
 - Other related infrastructure such as roads and transmission lines are already in place
- Publicly / Socially acceptable
 - Communities, the public have generally adapted to these facilities
- Environmentally acceptable
 - Environmental effects are significantly less than a development on a pristine River
- Regulatory simplicity
 - Approved water management regimes/operations are often in place
 - Agency recognition of the incremental effect

Construction Mitigation Measures

- Approximately 90% of the construction stage mitigation measures are the same as used in most heavy construction projects located in remote areas and near water
 - Ontario Provincial Standards
- Some mitigation measures can be tailored to hydroelectric development and this has led to the development of a Best Practices document by the Ontario Waterpower Association
- In contrast, most of the operation stage mitigation measures are unique to the site/region/project

Construction Mitigation Measures

- Site Development
- Erosion and Sedimentation Control
- Spills Emergencies and Response
- Hazardous Materials Management
- **Waste Management**
- Stormwater Management
- **Fire Protection**
- **Site Rehabilitation**
- **Worker Environmental Awareness and Training**
- Communications Plan with External Stakeholders
- **Public Safety**
- **Reservoir Clearing and Preparation**
- Local Air Quality Protection
- Noise
- **Access Roads**
- Water Crossings
- Blasting
- De-watering
- **Seasonal construction restrictions (in and out of water)**
- Cofferdam installation and removal
- Planning and design of human uses
- **Worker Restrictions**
- Species at Risk
- Vehicular Restriction and Control
- **Archaeological / historical / special sites**

General Lessons

General lessons

- Hydro projects are constructed in, at and near water.
- Releases to the aquatic ecosystem represent the greatest single threat to the environment during construction.
- Sites are usually cleared in winter to lessen environmental effects.
- Hydro projects and other heavy construction projects are now done as stand-alone camps with minimal reliance on the infrastructure and services of local communities.
- This is done primarily to reduce potential social effects.
- Workforce is brought in for short periods of time and rotated out.
- Workers are generally prevented from accessing and utilizing local natural resources (no hunting, fishing, use of recreational vehicles).

Integration of EIA and Construction for Hydropower

How to achieve integration of EIA and environmental management during construction?



Integration of EIA and Construction for Hydropower

Following Project Approval an EIA commitments document prepared by EA consultant and is used by the Constructor as the basis for a construction Environmental Management Plan or EMP

The EIA consultant is the Owner's Environment representative during the construction phase

EMP is to reflect all the construction period environmental commitments

- But the “means” in how those commitments are to be carried out are left to the constructor
- Mitigations are not to be overly prescriptive (unless required)
- EMP is to be approved and accepted by the Owner and Owner's Environment representative

The constructor is also expected to obtain and follow all requirements with respect to construction stage permits and authorizations.

- 20 to 30 more detailed permits and authorizations are usually required post EA.



Integration of EIA and Construction for Hydropower



Audits

- Audits are scheduled periodically during the construction phase to assess whether:
 - All mitigation measures are being followed
 - EMP is being followed by the constructor
 - Permits and authorizations are being followed
 - There are any effects occurring to the environment
- Audits are typically done on site with access to all documents including permits, workplans, design drawings, monitoring reports, etc.

Advantages

- Improves the likelihood that construction mitigation and monitoring measures are implemented.
- Allows the EIA professional to work closer with the construction team to ensure mitigation measures are followed or tailored to unique circumstances.
- Assists in protecting the interests of the owner
- Assists in achieving a higher level of environmental compliance
- Prevents the EIA professional from being too prescriptive with respect to specific methods
- Assists the EIA professionals in better understanding the practices of large scale heavy construction companies

Challenges

Challenges

- The EIA consultant must avoid becoming prescriptive with respect to specific methods to achieve certain environmental outcomes or mitigations.
 - This doesn't come naturally to all professional staff.
- EIA consultant should have practical experience or formal training in environmental auditing.
 - Or an environmental auditor can be used.
- Requires an owner willing to commit to an EIA team for planning and construction phases.
- Some regulators prefer a more prescriptive approach.

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With thanks to Ontario Power Generation

Imagine the result