

Moving to a Sustainable Model on the Trent-Severn Waterway

Observations and Recommendations

for a

Successful Strategic Shift



Prepared for: Panel on the Future of the Trent Severn Waterway
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Executive Summary

This report has been prepared by the Ontario Waterpower Association (OWA) and specifically on behalf of the owners and operators of waterpower (hydroelectric) facilities on the Trent-Severn Waterway (TSW). In arriving at the advice contained herein, the OWA has carefully considered the stated purpose of the Panel on the Future of the Trent Severn Waterway (The Panel), the detailed analysis undertaken, as contained in the series of supporting documents prepared for the Panel members, the input received through the Panel's consultation and, most importantly, the direct dialogue afforded the OWA with the Panel. Appropriately, Panel members challenged the OWA to articulate the "ideal state", reflective of the achievement of the balance of objectives with which they were charged. From the OWA's perspective, this state can be defined to include the following:

- Waterpower is valued - every kilowatt (hour) of existing and potential power counts
- Water is not wasted but well managed and the environment is protected
- Infrastructure is safe and public safety ensured
- Water resource management is properly resourced with investments tied to revenue streams

The OWA is of the view that moving to this state will not only contribute to enhanced renewable energy production, but to the broader social, economic and environmental sustainability of the system. This report provides an overview of waterpower production and potential, reviews the industry's relationship with the TSW, identifies key policy drivers, assesses challenges and opportunities and recommends strategic actions to shift the organization from a primary focus to one that delivers integrated water resource management. Advice is offered on the key questions of legislative reform, governance and organizational structure. Most importantly, the OWA advocates a proactive "transition strategy" designed not only to migrate the TSW to the ideal state but also to take advantage of immediate opportunities for improvement.

Waterpower production and development on the Trent-Severn Waterway has a history that dates back for more than a century. The waterway's future is integrally tied to a collective and constructive water management regime. Our proposals build on these realities, are premised on our co-existence and are offered on the spirit of co-operation.

Introduction: Trent-Severn Waterway Review in Perspective

Waterpower development and production have co-existed with the values and management objectives of the Trent-Severn Waterway for more than a hundred years. From the first hydroelectric generating facility commissioned at Sills Island Lock 6 Dam 6 in 1900 to the recent redevelopment of Glen Miller in 2005, the evolution of the waterway has included a growing contribution of reliable renewable energy.

As was the case across southern Ontario, the first quarter of the last century was a time of active waterpower development on the Trent-Severn, as communities became electrified and the province moved into the industrial age. Until the early 1950's, almost all of our electricity came from waterpower. Many of the facilities constructed during this era continue to produce electricity today.

In the late 1980's and early 1990's interest was re-kindled in the small hydro sector, driven by the Ontario Hydro Demand Supply Plan and the Non-Utility Generation Program that targeted the development of 1,000 MW of new renewable energy. In response, a number of facilities on the Trent Severn Waterway were "re-developed"; including those in Marmora and Campbellford as the province actively encouraged the optimization of waterpower.

Today, we are in an environment that has re-emphasized the importance of clean, renewable energy in meeting our social, economic and environmental objectives. Federal and provincial governments are both implementing policy direction that supports waterpower, particularly with respect to climate change strategies. It is timely, therefore, that the Panel on the Review of the Trent Severn Waterway has been asked by the federal Minister of the Environment to assess and provide advice on the future of the waterway.

Pursuant to the Motion passed in Parliament, the Panel is expected to provide recommendations that realize the TSW's potential to become:

- a premier recreational asset
- a world-class destination for recreational boaters
- a greater source of clean, renewable electrical power
- a facilitator of economic opportunity and renewal in the communities along its 386 km length
- a model of environmental sustainability

Inherent in this motion is a movement away from a "primacy" of objectives for the waterway (i.e. navigation) to a more balanced approach, considerate of the multiplicity of interests and benefits served. This direction is also apparent in the breadth of issues the Panel has been asked to examine:

- how to protect and present the Waterway's cultural heritage;
- ways of assuring the future of the Waterway natural environment;
- how the Waterway can contribute to the present and future outdoor recreational needs of Canadians and particularly the growing and diverse population of the Greater Golden Horseshoe;
- a water management regime that is seen to meet the demands and expectations of a diverse array of stakeholders and needs;

- a framework for jurisdictional and inter-agency coordination and governance along the Waterway corridor;
- ways in which the Waterway can contribute to economically sustainable communities, including the role of renewable energy; and,
- a sustainable funding framework.



Waterpower production and development on the Trent-Severn Waterway has a history that dates back for more than a century. The waterway's future is integrally tied to a collective and constructive water management regime.

Figure 1 – Swift Rapids Generating Station – Orillia Power. A 7.8 MW facility originally constructed in 1917, redeveloped in 1978 and upgraded again in 1993. The station is a valuable asset to the community and a prime example of continued investment and improvement.

In consideration of the goals and objectives of the Panel review, the OWA offers its view of the “Ideal Future State” of the Trent-Severn Waterway to be one in which:

- Waterpower is valued - every kilowatt (hour) of existing and potential power counts
- Water is not wasted but well managed and the environment is protected
- Infrastructure is safe and well managed
- Water resource management is properly resourced with investments tied to revenue streams

From the perspective of the waterpower sector, while the panel’s work will undoubtedly inform the future vision, mandate and structure of the Trent-Severn Waterway, there are immediate and short-term opportunities to contribute to the objectives of the Panel Review that, if capitalized upon, can help facilitate an orderly transition to the eventual desired state. This “low-hanging fruit”, particularly in terms of water resource management, provides the best potential for early successes in the evolution of the waterway.

The Involvement of the Ontario Waterpower Association

The Ontario Waterpower Association (OWA) was formed in May 2001 and represents the collective interests of more than 95% of the waterpower production and producers in the province. Large, small, industrial and municipal waterpower generators as well as environmental, legal, financial and engineering consultants to the industry are all Association members. The OWA's objectives are to:

- Represent the common interests of Ontario's waterpower industry in a corporate relationship with government.
- Provide an effective forum for coordinating and promoting the common interests of the waterpower industry in Ontario.
- Enhance the competitiveness of the Ontario waterpower industry.
- Identify common interests and cooperate with various organizations to promote a positive image for waterpower.

While the OWA does not become directly engaged in the business interests of individual proponents, issues of public policy of relevance to the sector are within the mandate of the Association. An overview of the recent efforts on matters related to the TSW is provided in order to outline the context within which the industry's advice to the Panel is now being offered.

In the fall of 2004, the OWA informed the federal government (Parks Canada, Environment Canada, NRCan) of concerns related to the apparent disconnect between operational approaches of Parks Canada and policy positions of the government (e.g. Kyoto). The Association advocated strongly for improved cross-agency co-ordination and consistency. Parks Canada's response to the issue provided important insight to the political and structural challenges facing the achievement of the government's objectives. In short, the Agency suggested that it is beyond its purview to address matters not directly related to its core parks and historic sites mandate.

In response, the OWA pursued a joint discussion with key federal departments and Parks Canada, focused on the regulatory and policy context for water resource management, water rental rates and operational efficiencies. Key messages included:

- significant water is wasted
- the TSW is either unwilling or unable to consider renewable energy a priority
- revenue from waterpower rentals should be more directly related to operational improvements
- low-risk optimization can be achieved in the short term
- modest modifications to water resource management can result in substantial benefits

In the summer of 2005, Parks Canada and the Ontario Ministry of Natural Resources co-hosted a "Integrated Watershed Management" workshop, broadening the discussion of water management to include Conservation Authorities, MOE, Municipalities and the waterpower industry. Included among the recommendations of the final report is the observation that "there are some immediate gains to be made and these should be explored", again confirming that significant structural change need not take place prior to the implementation of strategic improvements.

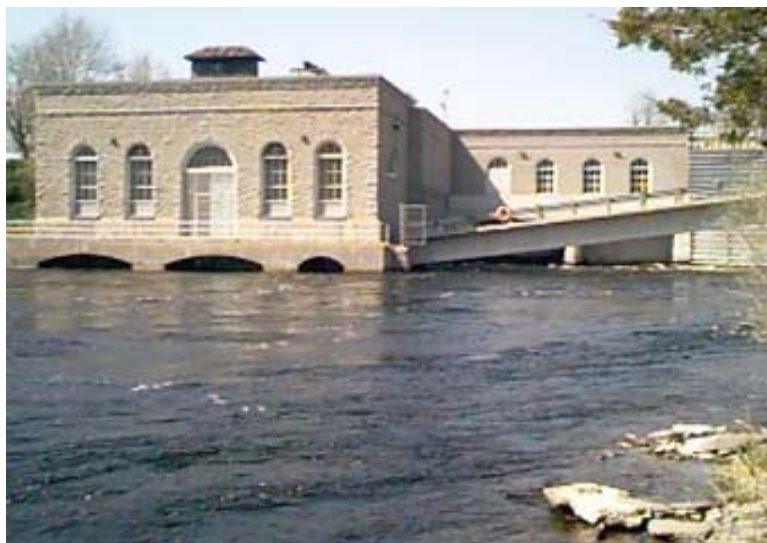
As an outcome of the workshop, and following dialogue with TSW, the OWA developed a draft "Terms of Reference" for a joint steering committee for consideration by TSW, focused on the identification and implementation of best bet initiatives (Appendix G). In response, however, Parks Canada expressed the limitation of its priorities and policy authority by suggesting that:

- bringing existing licenses and operations on both the Rideau and Trent-Severn Waterways into good standing remains the top priority for Parks Canada.
- Parks Canada will continue to work with Natural Resources Canada and Environment Canada to develop an appropriate response to OWA's proposals regarding incentives and support for new and/or improved hydroelectric development on federal lands.
- Parks Canada sees that the draft Terms of Reference for this Steering Committee/Working Group should be examined in the context of the draft Terms of Reference being prepared for the Integrated Water Management Steering Committee (this committee was never established).

In the spring of 2006, the OWA continued to pursue with TSW its response to the Terms of Reference and commitments made. The Association expressed significant concern regarding the potential for another lost opportunity with respect to short-term improvements. Eventually TSW responded, indicating:

“our capacity on the hydro and water management front is severely limited. At the present time, it is more than fully engaged in attempting resolve a range of issues associated with existing licences and leases and in responding to a significant number of unsolicited applications to develop new sites along the Waterway”

Almost two years after the commencement of formal discussion between the OWA and federal agencies, with no resolution of the disconnection between policy and operations, the current initiative to seek government support for a formal review of the role and future of the TSW was led by MP Bruce Stanton. The OWA has supported this undertaking by providing contextual information to the Panel and a number of the supporting studies undertaken. The Association remains convinced that there are interim improvements that can be made to achieve multiple benefits and encourages the Panel to incorporate these measures into its transition strategy for the future state of the waterway. Based on the most recent examples of the extreme regulatory burdens faced by new waterpower proposals on the waterway and the lack of capacity in the waterway to address these proposals the OWA is of the view that an immediate change in direction is required while the transition takes place.



There are immediate and short-term opportunities to contribute to the objectives of the Panel Review. This “low-hanging fruit”, particularly in terms of water resource management, provides the best potential for early successes in the evolution of the waterway.

Figure 2 - Campbellford Generating Station – Algonquin Power. To the left in the photo is the original facility, constructed in the early 1900's. To the right is the new development, commissioned in 1994, designed to respect the architectural integrity of the original station and making better use of the available water. Investment was spurred by the government's policies encouraging small hydro.

Throughout the dialogue, the OWA has recognized the challenges the TSW faces in terms of its capacity to effect change. On more than one occasion the Association has advocated to the Minister of the Environment for new investment in the TSW, linked to the government's environmental (e.g. Climate Change) and renewable energy policies. The OWA continues to be of the view that, through strategic re-alignment of existing federal programs, the TSW could be transformed into a modern integrated resource management agency.

Waterpower's Role and Contribution

Waterpower is unique on the system in that facilities provide direct revenue to the Parks Canada Agency through licenced tenure for the occupation of federal lands. According to TSW, in 2006, waterpower revenue was 9%-11% of the annual operating expenditures and was formed about 1/3 of their total external revenues. It should be noted that since water rental revenues are tied to energy production, increased waterpower output (for example through improved water management) also results in increased revenue to Parks Canada.

Today a total of twenty (20) waterpower facilities in Ontario occupy federal lands on the Trent-Severn Waterway, spanning from the Big Chute facility at Severn Falls to the recently re-developed Glen Miller station at Trenton. A listing of facilities is provided as Appendix A and a map is included as Appendix B.

In total, these facilities account for almost 100 MW of installed capacity and annually produce, on average, 500,000 MWh of clean, renewable energy. Applying a conservative estimate with respect to replacement value, this infrastructure represents between \$400 and \$600 million of investment.

The renewable energy produced, using a proxy value of \$50/MWh based on the Hourly Ontario Energy Price (IESO), equates to an annual value of \$25 Million in production. If the existing facilities were to be constructed today, that value would more than double, based on the province's policy initiatives to encourage distributed, renewable generation (e.g. Standard Offer Program). Annual taxes paid to municipalities are in the order of \$0.5M and annual water rentals to Parks Canada are approximately \$2M.

This energy production represents an annual offset of approximately 400,000 tonnes of CO₂ – roughly equivalent to the annual emissions of 100,000 cars. In economic terms, using the government of Canada's proposed valuation of \$15 per tonne, this represents an additional environmental-economic value of \$6 million. The true value of hydro generation will only increase as the full (environmental) costs of alternatives are refined and policies and programs to address Climate Change mature.

The OWA has estimated that relatively modest modifications to operational regimes can create substantial opportunities for increased production of renewable energy from the existing facilities. Appendix H (the OWA's initial presentation to the Panel – June 2007) emphasizes this point. It is conservatively estimated that operational efficiencies through improved water management could result in a 10-20% increase in energy production from existing facilities, with the attendant increase in benefits, including direct revenue to the TSW.

Moreover, there are a number of new developments being actively pursued on the TSW and several re-development opportunities across the system. For example, an 8MW proposal at locks 22 and 23 has recently completed the environmental assessment process. This development alone is expected to add another 30,000 MWh of new renewable energy to the TSW's output. This one proposal has been reported to be valued at more than \$25 Million and over the next 15 years will add an estimated \$45 million to the local and regional economy.

Appendix D provides a listing of preliminarily (and conservatively) identified waterpower development and re-development opportunities.



Waterpower is unique on the system in that facilities provide direct revenue to the Parks Canada Agency through the occupation of federal lands. Since waterpower royalties are linked to energy production, increased waterpower output (for example through improved water management) results in a direct financial benefit to the Waterway.

Figure 3- Inside the London Street Generating Station – Peterborough Utilities. In 2003, during the north-eastern blackout, power from this century-old facility was routed to run the Peterborough Memorial Hospital.

With proactive public policy defining renewable energy as a key objective for the TSW, it is reasonable to expect that efficiency improvements, re-developments and new developments could double renewable energy production on the waterway, again with the associated economic and environmental benefits. Extrapolating from the example at locks 22 and 23 new investment in waterpower projects across the entire system could reasonably be expected to contribute direct and indirect economic and employment benefits approaching \$500 million.

In addition, while it is difficult to quantify, waterpower across the system provides important electricity and public benefits (e.g. voltage support), including supply security. For example, during the 2003 blackout, electricity was generated from a local waterpower facility to power Peterborough's hospital.

Drivers for Change

From a public policy perspective there are a number of key federal and provincial initiatives that should be considered as primary drivers for change. The alignment of federal and provincial policy emphasis on renewable energy is increasingly considered critical to the achievement of shared environmental and socio-economic objectives. This provides a unique opportunity to shift from a management approached premised on the primacy of one benefit to an integrated and balanced approach that will yield multiple benefits, including waterpower production and development.

Significant drivers in energy and water management include:

- Federal leadership on Climate Change (Turning the Corner, Made in Canada solutions, International negotiations)
- Federal investment in renewable energy and small hydro (EcoEnergy, Capital tax incentives, NRCan initiatives)
- Provincial targets for new renewable energy (2,700 MW by 2010, 8,000 MW by 2025)
- Provincial policy focused on distributed renewable generation (Standard Offer Program)
- The emergence of dam and public safety as priority public policy



The alignment of federal and provincial policy emphasis on renewable energy provides a unique opportunity to shift from a management approach premised on the primacy of one benefit to an integrated balance for multiple benefits, including waterpower production and development.

Figure 4 -Construction activity at Glen Miller– Innergex. Originally a 1MW facility, Glen Miller was redeveloped with an installed capacity of 8MW in 2005 in response to the province’s policies encouraging new renewable energy. The re-development employed state-of-the-science technology, including “fish-friendly” Ecobulb turbines.

Together, and coupled with the emergence of the “water agenda”, these policy thrusts provide solid rationale for re-aligning the mandate and objectives of the TSW. At the very least, an increased emphasis on effective and efficient water resource management, a specific focus on renewable energy production and development and renewed investment in infrastructure safety would be consistent with a “House in Order” approach for the federal government. Early action will serve to demonstrate “Leadership by Example”.

Key Challenges and Opportunities

Considerate of the Panel's mandate, the proposed "ideal state" and the identified drivers of change, the OWA has assessed five (5) core challenges and associated opportunities facing the waterway. This evaluation is then used to help inform recommended functional and structural shifts and legislative and governance reform.

The primacy of navigation

While the scope of the panel's review clearly anticipates an expanded and improved balance in terms of water management priorities and objectives, the primacy of navigation is solidly enshrined in the legislative, policy and practical framework of the TSW. In the case of waterpower, the allocation of water resources is viewed as being "surplus" to this primary use. Ironically, several waterpower licences stipulate that "water not be wasted" – illustrative of the need for improved water management and the current conflict in management objectives.

Opportunity – The Panel has a unique opportunity to refocus the priorities for water management of the system, through a distinct articulation of goals and objectives and their integration. The strategic shift proposed must be premised on this fundamental change.

Misalignment of policy and operational objectives

An outcome of the conflicting and competing priorities has been the disconnect between broader government policy objectives and the restrictions on operational flexibility. For waterpower, in particular, the emphasis on climate change and renewable energy has not translated to an improved management regime. Achieving even incremental and modest change has been met with resistance.

Opportunity – The waterpower industry is intimately familiar with the challenges of managing for multiple expectations and is recommending an approach that will improve and regularize stakeholder involvement and coordinated water resource management. By clearly defining roles, responsibilities and decision-making structures specific to the TSW, conflict will be reduced. Through the direct involvement of all infrastructure managers on the proposed "Authority", cooperation and coordination will be improved.

Deteriorating infrastructure, unfunded liabilities and under resourced operations

It has been almost universally observed that the TSW does not have the capacity to deliver on its responsibilities to maintain its infrastructure. This challenge will only increase as the province moves to introduce a regulatory standard for dam safety and the public expectations grow. As owners and operators of water management infrastructure on the system, waterpower proponents are increasingly concerned about the potential direct impact of this unfunded liability. There is the critical need for an immediate capital infusion commitment to repair infrastructure to strictly address present and future public safety and liability issues. These dollars need to be spent even if there is no change to the status quo.

Opportunity – The OWA has advocated for the strategic investment of resources aligned with key federal priorities (e.g. Climate Change, Renewable Energy), and is of the view that a proposed shift can enable improved linkages to such opportunities. Additional staff and resources are required by the TSW. An immediate priority must be placed on operating improvements and capital investment to address the already identified deficiencies.

Antiquated legislation, regulation

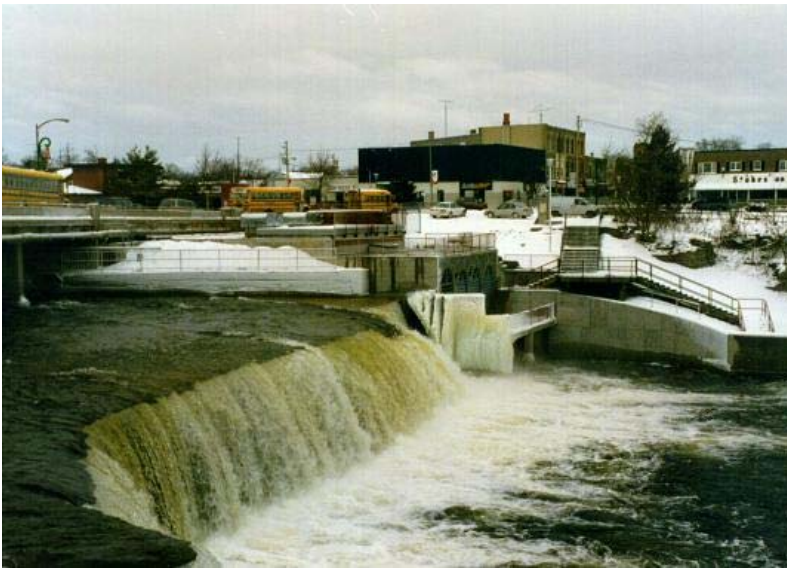
The OWA's review of selected federal legislation (Appendix E) suggests that much of the conflict of priorities is rooted in the disparate legal framework under which the TSW operates. For example, from the industry's perspective, the Dominion Waterpower Act could be considered legislation for which the "time has come" (e.g. "Every undertaking under this Act is hereby declared to be a work for the general advantage of Canada"), yet its relative importance is considered minimal and its application has proven burdensome. As evidenced by the regulatory challenges encountered by recent waterpower proposals, the overlapping, duplicitous and iterative framework for new waterpower on federal lands borders on being prohibitive for the scale of projects on the waterway.

Opportunity – The OWA has proposed a renewed and revitalized legislative, regulatory and policy framework using existing building blocks and reflective of the Panel's priorities. An "Act to Sustain and Enhance the Trent Severn Waterway", provides the opportunity to address the existing inadequacies, and showcase the TSW as a model of integration and sustainability. In addition, a "red-tape" review focused on streamlining approvals for waterpower is strongly recommended. Active projects provide important case examples of the required process improvements.

Reactive water management decision-making

As illustrated and further described in Appendix C, the current operation has a high rate of water wastage, impacts on the ecosystem (e.g. erosion) and risks due to sudden and dramatic changes in water levels and flows. These challenges are directly related to the conservative and reactionary approach to water management related to the use of outdated decision support tools and compounded by the inadequacy of operational resources. From the waterpower industry's perspective, the potential for the most immediate and significant gains across the system lies in addressing this challenge.

Opportunity – As described in Appendix F, the industry in general employs much more sophisticated water management tools and techniques than are now employed on the TSW. Ontario Power Generation, in particular has already invested significant resources in helping to design a decision support tools specific to the TSW in order to enable a more gradual draw down of water storages to ensure water can be converted to energy and enhance ecosystems. There is an immediate opportunity to improve water resource management through investment in completing this water management tool for the Waterway.



There is a critical need for an immediate capital infusion commitment to repair infrastructure to strictly address present and future public safety and liability issues. These dollars need to be spent even if there is no change to the status quo.

Figure 5 - Fenelon Falls Generating Station – Shaman Power. A Significant re-development in the mid-1990's, water is managed not only for navigation, but also for other socioeconomic objectives. Throughout the tourism season, water is passed by the facility to provide for “scenic views” of the falls.

Enabling the Strategic Shift

As outlined in the introduction, the OWA is of the view that it is as important for the Panel recommendations to include not only a desired destination, but also the path forward. The Panel's report should enable the legislative, policy, governance, resourcing and cultural shifts that are required to achieve the desired end state. As is the case with any plan, it is implementation that matters. This overview provides a perspective on the key “signposts” that should be considered indicative of progress.

Organizational Capacity and Competency

Both in the short term and over time, the organization requires the capacity and competencies to effectively work with the waterpower industry, from policy, approvals and operational perspectives. Given the key drivers of specific relevance to waterpower, this will be the case regardless of whether significant legislative or governance change is adopted. Key areas of emphasis will include:

- **Policy**
 - Water Resource Management
 - Tenure
 - Resource valuation (e.g. taxation, water rentals etc.)
 - Site Allocation and New Developments
 - Integration of Federal/Provincial Environmental Assessments and Approvals
 - Dam and Public Safety
- **Operations**
 - Resourcing/Staffing
 - Data and Information Management
 - Modern computerized water management modeling
 - Communications
 - Infrastructure renewal

The requirement for specific policy and operational emphasis and supporting resources can be illustrated through the approach taken by the TSW to the determination of waterpower rental policies over time. While licences issued under the Dominion Waterpower Act are administered through the TSW, the government's policy direction has been ad hoc - alternatively negotiating with individual licencees, adopting provincial policy or establishing policy independently. This is in sharp contrast to the approach taken provincially, wherein industry-government analysis of resource valuation is undertaken, within the broader policy context for renewable energy and water resource management. For example, on provincial Crown land water rentals and taxes are forgiven for ten years for all new developments and incremental generation. This policy has been in place for more than 20 years and is defined in regulation, providing the certainty required for investment. While similar provisions are possible under the existing Dominion Waterpower Act, the policy has not been put in place federally.

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Legislative Framework

The OWA proposes that, in order to fully realize the potential benefits of integrated water resource management on the system, the federal government needs to develop and introduce "Act to Sustain and Enhance the Trent Severn Waterway". The Act should:

- Be administered under the Minister of the Environment
- Include key elements of other organizational enabling legislation
 - (Environment, Natural Resources, Transport, Parks Canada)
- Build on but supersede other directly but more narrowly focused relevant legislation, regulation - e.g.
 - Dominion Waterpower Act and Regulations
 - Historic Canals Regulations
 - Navigable Waters Protection Act
 - Canada Shipping Act
- Incorporate Purpose/Objective statements from the Panel Review objectives e.g.

"The purpose of this Act is to facilitate the realization of the TSW's potential to become:

- a premier recreational asset
- a world-class destination for recreational boaters
- a greater source of clean, renewable electrical power
- a facilitator of economic opportunity and renewal in the communities along its length
- a model of environmental sustainability

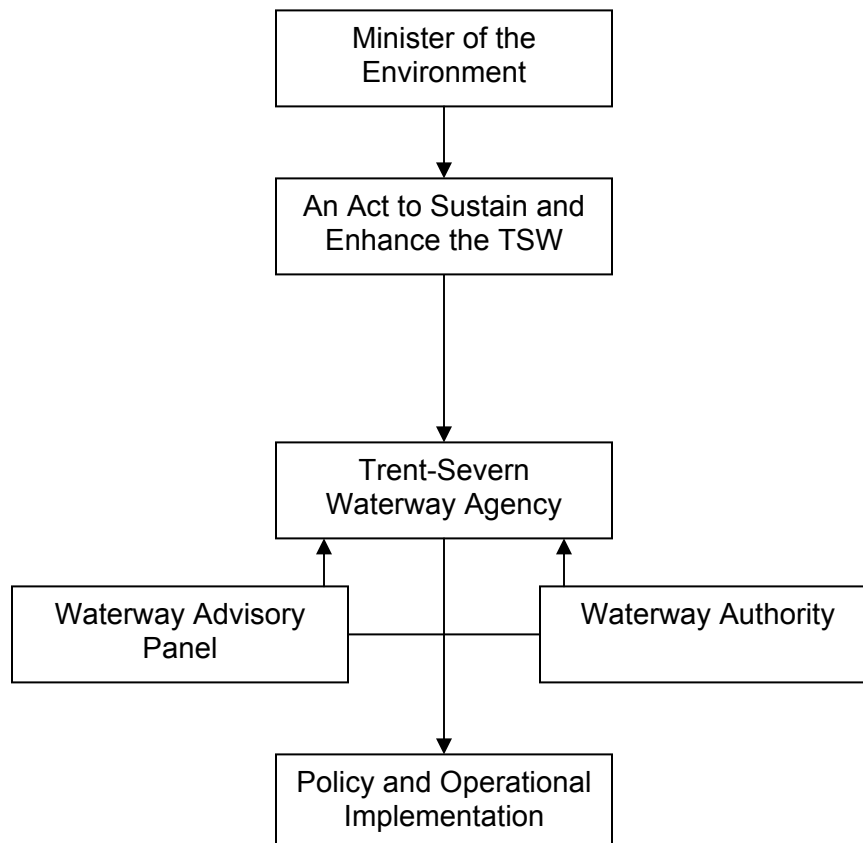
Governance

The OWA has carefully considered the proposal offered in the consultant's report to the Panel in this regard, and is of the view that an alternative model that retains operational decision-making with the system operator will serve all interests better. This advice is based on the industry's direct experience with multi-jurisdictional "control boards" and has also been informed by very recent experience in implementing "Water Management Planning" across Ontario.

As described below, a governance model should be designed such that:

- The Act establishes a distinct Trent-Severn Waterway Agency, with political accountability to the Minister
- A Trent-Severn Waterway Agency should be established and have all of the water management resources of the present, improved to reflect the broader and more balanced purpose of the Act
- The Act should provide for the Minister’s establishment of a “Water Management Authority” comprised of representative sectors owning and operating water management infrastructure on the system (e.g. TSWA, Conservation Authorities, waterpower producers etc.), recognizing their unique role in water resource management
- The Water Management Authority should be focused on operational strategies and investments that achieve the intent of the Act (e.g. improved modeling, cooperative management, infrastructure improvements etc.)
- The Act should further provide for the establishment of a Waterway Advisory Panel, comprised of representative interests (e.g. riparian, tourism, recreation, municipal, waterpower etc) along the waterway. Water Management Plans prepared by the Authority can be validated through this structure
- The Advisory Panel should be focused on broader policy and planning initiatives that contribute to the Act’s implementation
- Policy and Operational staff should have the capacity to relate to and work with the Authority and the Panel

Figure 6 – Conceptual Organizational Design



Transition

Given the already identified opportunities and the reality of the time it will take to effect significant structural change, the OWA strongly encourages the Panel to recommend that the TSW be functionally transitioned into the concept of a new agency while the legislation is developed. Key steps in such a transition should include:

- incorporation of Panel Review objectives as TSW's new policy framework
- improved water resource management (i.e. not "wasted") in the short term
- establishment of the support structure required to address new development proposals
- investment in the key capacities and competencies of a repositioned Agency
- strategic investment in tools and infrastructure to inform and improve water resource management
- establishment of the basis for the recommended Water Management Authority and Advisory Panel (i.e. create the entities outside of legislation)

Conclusion

The OWA is of the view that the ideal state will not only contribute to enhanced renewable energy production, but to the broader social, economic and environmental sustainability of the system. This report provides an overview of waterpower production and potential, reviews the industry's relationship with the TSW, identifies key policy drivers, assesses challenges and opportunities and recommends strategic actions to shift the organization from a primary focus to one that delivers integrated water resource management. Advice has been offered on the key questions of legislative reform, governance and organizational structure. Most importantly, the OWA advocates a proactive "transition strategy" designed not only to migrate the TSW to the ideal state, but also to take advantage of immediate opportunities for improvement.

Waterpower production and development on the Trent-Severn Waterway has a history that dates back for more than a century. The waterway's future is integrally tied to a collective and constructive water management regime. Our proposal builds on these realities, is premised on our continued co-existence and is offered on the spirit of co-operation.



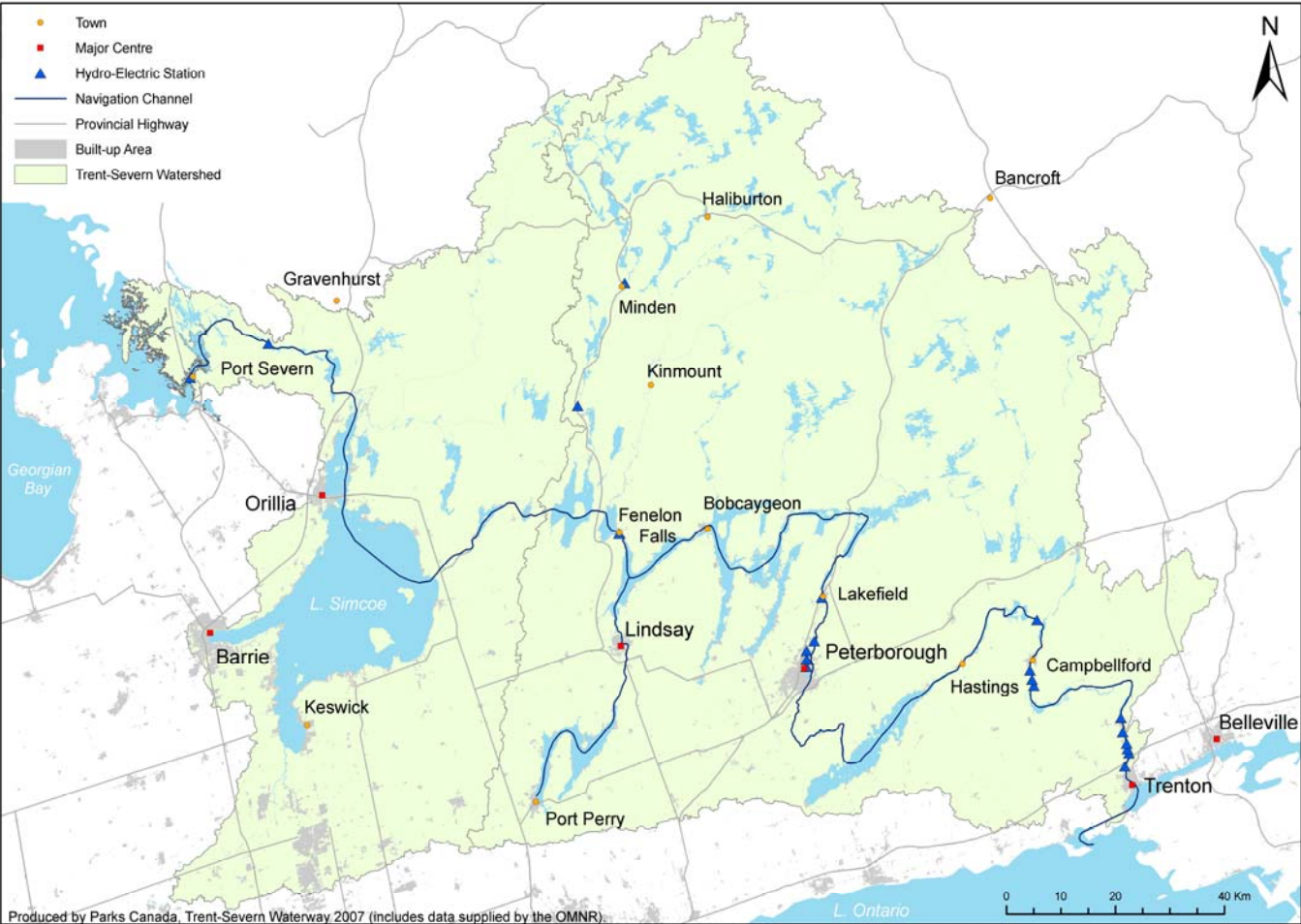
Figure 7. Healey Falls Generating Station – Ontario Power Generation. OPG has expressed an interest in and ability to increase the installed capacity of the facility from 11.8 MW to more than 18MW. Investment would be better realized in terms of greater power production with the establishment of a water management regime that is more considerate of and conducive to waterpower production

Appendix A – Waterpower Facilities on the TSW

Facility	System	Year (re)Built	Capacity (MW)
BIG CHUTE	SEVERN	1909/94	10
SWIFT RAPIDS	SEVERN	1917/1993	7.8
CAMPBELLFORD	TRENT	1909	4
FENELON FALLS	TRENT	1997	2.6
GLEN MILLER/SUNOCO	TRENT	2005	8
MARMORA	TRENT	1992	1
NASSAU DAM	TRENT	1900	2.4
PETERBOROUGH PUMPHOUSE	TRENT	1909	0.2
LONDON ST. STN	TRENT	1950	4.1
AUBURN	TRENT	1912	1.85
CROW BAY (LOCK 14 DAM 12)	TRENT	1994	2
FRANKFORD (LOCK 5 DAM 5)	TRENT	1913	2.6
HAGUES REACH (LOCK 10 DAM 9)	TRENT	1925	3.6
HEALEY FALLS (LOCKS 16 & 17)	TRENT	1914	11.67
LAKEFIELD (LOCK 26)	TRENT	1928	1.8
MEYERSBURG (LOCKS 8 & 9 DAM8)	TRENT	1924	5.3
RANNEY	TRENT	1922	10.4
SEYMOUR (LOCK 13 DAM 11)	TRENT	1909	6.4
SIDNEY (LOCK 2 DAM 2)	TRENT	1911	4.4
SILLS ISLAND (LOCK 6 DAM 6)	TRENT	1900	1.6

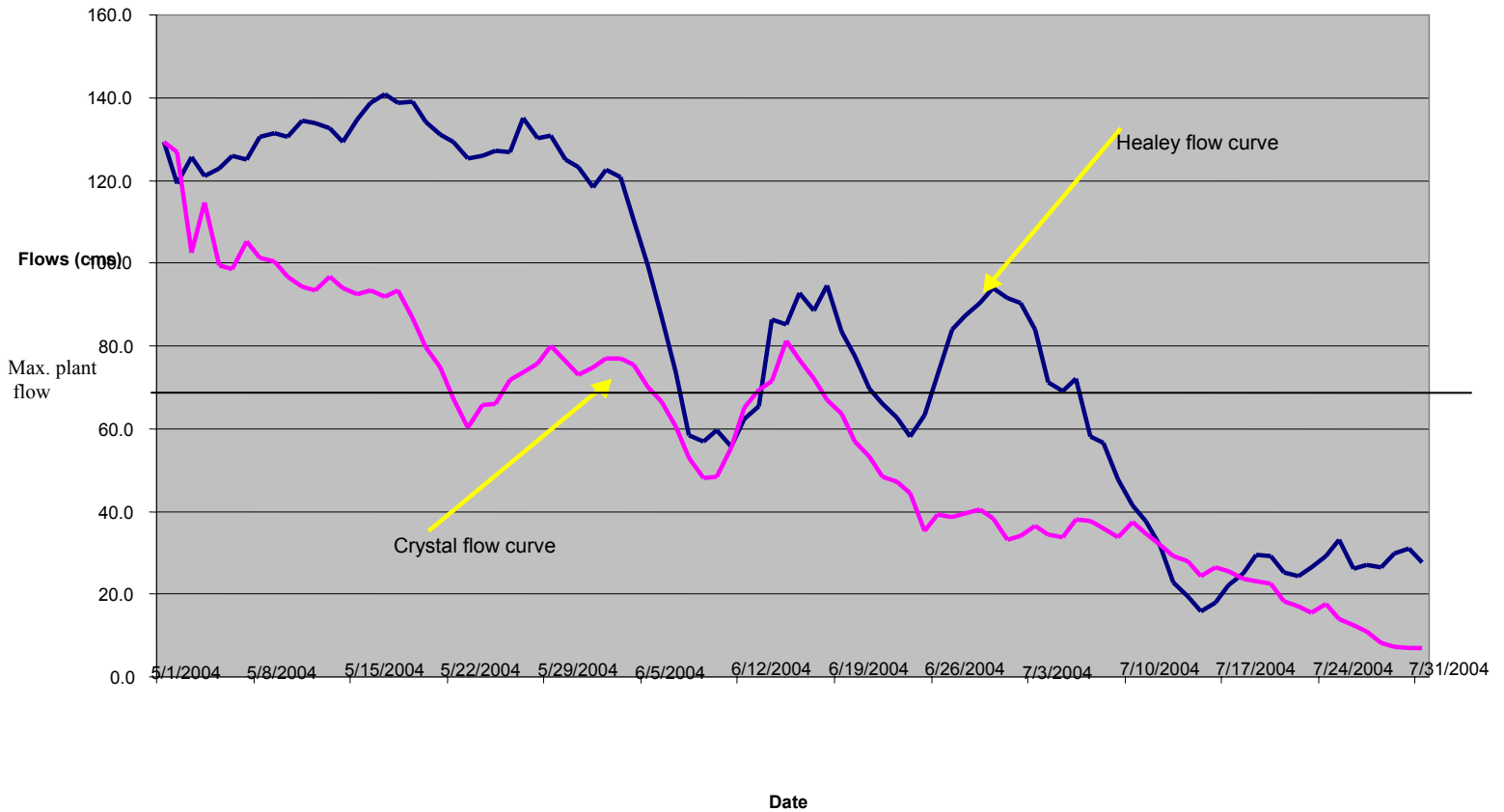
Appendix B

Hydro-Electric Stations on the Trent-Severn Waterway



Appendix C - Case Example – Water management on the TSW compared to another Regulated System

Healey vs. Crystal Falls



Note: The above graph plots the outflow curves from two similar waterpower facilities, one of which (Healey Falls) is located on the Trent-Severn Waterway, the other (Crystal Falls) is on the Sturgeon River. Healey Falls' maximum plant flow is 70cms (i.e. any flow over 70 cms is spilled; flow below 70cms means the facility is run below "capacity". The timescale runs from the first of May, through the end of July, so as to capture the beginning of "Navigation Season" on the TSW. Of specific importance in the comparison is the marked difference between the slope of the spring drawdown curves and the iterative spiking of water flows provided to the Healey station. Not only does this result in lost energy production (and revenue to the TSW), but also it undoubtedly creates issues for aquatic ecology and riparian interests.

**Appendix D – Identified New and Re-development Opportunities
(sources: Hatch Energy Report, 2005*, OWA members)**

Site	Development Type	Estimated Capacity (MW)
Sawyer Creek	New	1.95
Douro	New	2.38
Otonabee	New	2.38
Nassau Mills	New	2.78
Washago	New	1.04
Port Severn	New	2.9
Lock 25	Retrofit	3.4
Lock 24	Retrofit	3.4
Lock 23	Retrofit	3.4
Lock 22	Retrofit	3.5
Glen Ross Lock 7	Retrofit	3.76
Burleigh Falls	Retrofit	5.85
Trenton Lock 1	Retrofit	6.81
Couchiching Lock 42	Retrofit	1.39
Young's Point	Retrofit	1.72
Lock 19	Retrofit	1.85
Buckhorn Lock 31	Retrofit	2.20
Hastings Lock 18	Retrofit	2.54
Healey Falls	Redevelopment/Expansion	10.4
Sills Island	Redevelopment/Expansion	0.7
Ranney Falls	Upgrade	1.5
Total		65.85

* Only sites with an estimated installed capacity of > 1MW are included in the Hatch Report. A full inventory of evaluated sites is available from the Ontario Waterpower Association

Appendix E – Summary of Selected Federal Legislation

Legislation	Minister	Relevance	Issue/Opportunity
Parks Canada Agency Act	Environment	Minister responsible for “all matters not by law assigned to any other department” relating to areas of natural or historic significance to the nation (historic canals)	TSW is not designated a “national historic site”, Agency mandate could be viewed as restricted to “residual matters”
Department of the Environment Act	Environment	Minister responsible for “all matters not by law assigned to any other department” relating to the natural environment, renewable resources, water, the coordination of the policies and programs of the federal government	Ministry has a broader mandate than the Parks Canada Agency, and may be better positioned to address the breadth of water management considerations
Department of Natural Resources Act	Natural Resources	“natural resources” includes energy developed from water Only ministry with a specific mandate for sustainable development	NRCan has led the “small hydro” program on behalf of the federal government, but is a minor policy player – (note all “energy legislation” is under the Minister of Natural Resources”)
Department of Transport Act (Historic Canals Regulations)	Transport	Minister has responsibilities for canals. “The Minister shall direct the construction, maintenance and repair of all railways and canals and of all other works appertaining or incidental thereto that are constructed or maintained at the expense of Canada and are placed under the Minister’s management, charge and direction.”	Regulation powers include the “management, maintenance, proper use and protection of the canals and other works” Regulation specific to Historic Canals (TSW is a listed historic canal) – focus on permitted uses and navigation

Legislation	Minister	Relevance	Issue/Opportunity
Canada Shipping Act	Transport	Specific objective (f) develop a regulatory scheme that encourages the viable, effective and economical use of Canadian waters by recreational boaters;	Primary emphasis of registration, licencing, safety measures.
Dominion Waterpower Act / Regulations	Indian and Northern Affairs	Enabling legislation and Regulations specific to waterpower development on federal lands	Viewed as antiquated, but provides greatest opportunity to move waterpower forward
Navigable Waters Protection Act	Transport	Navigable Water Works Regulation - specific to dams “The owner of a works shall maintain the limits of flow and elevation of water for navigation purposes as required by the Minister”	Establishes a basis for the “primacy of navigation” that needs to be addressed.
Canadian Environmental Assessment Act	Environment	CEAA Screening required for all new and/or redeveloped waterpower projects	Opportunity to use OWA’s proposed Class EA for Waterpower Development to standardize EA process for new/expanded waterpower projects and to harmonize federal and provincial approvals

Appendix F – Improved Water Management Modeling

Operation of the Trent-Severn Waterway is mainly based on rule curves and past experience. For risk aversion, the rule curves for the lakes and reservoirs along the waterway are followed as closely as possible. However, the uncertainty of the weather patterns often keep the operator busy in scheduling various levels of discharges in quick succession in order to meet the requirements of the rule curves. This has long been recognized as an operating problem of the TSW waterway.

OPG is committed to an improved operation of the waterway that will benefit all stakeholders. Over the last two years, OPG studied ways to improve the operation and explored a better model to represent the Trent-Severn Waterway. A prototype was developed for the Severn River.

The proposed model would perform two functions. One is to simulate a water discharge schedule given a forecasted inflow series. For sites with logs, the program would show the number of logs to be removed or added as well as the duration of log changes. Another function is to simulate multiple inflow series to develop an operating range on the water levels at the concerned sites. The model is aimed to find the best compromise between conflicting demands on discharges and water storages. The target reservoir storages are regulated by the rule curves while the target discharges are specified by the user as user input. The user may also specify the tolerance of the solution away from the target discharges.

The performance of the proposed model depends on the quality of the data. The data required include description of storage-forebay relationships, flow-log relationships, and multiple years of inflow series.

The following tasks are required to develop a fully functional model for operating the TSW waterway:

- (1) investigation and documentation of the criteria, constraints and business rules used by the operator of the waterway
- (2) collection of the rule curves, log data (for sites with logs) and inflow data for the lakes and reservoirs along the waterway
- (3) determination of the storage-forebay and flow-log relationships for all lakes and reservoirs along the waterway
- (4) specification of user interfaces
- (5) designing the database for storing the data
- (6) formulating the TSW operation model for simulation of flows and discharges at different sites along the waterway
- (7) development of a prototype for the model
- (8) validation of the prototype against historical data
- (9) development of a production-grade program
- (10) extension of the program for risk assessment using multiple inflow series
- (11) further development of the program for optimizing the discharge schedule (if time allows).

It is estimated that the project could be completed within a year.

Appendix G Draft Terms of Reference – January 2006

Ontario Waterpower Association/Federal Waterways

Steering Committee and Working Groups

Optimizing Waterpower Potential

Background:

Waterpower facilities on federal Crown lands are licenced pursuant to the provisions of the *Dominion Waterpowers Act* and regulations thereunder. Notwithstanding that the authority for the legislation rests with the Minister of Indian and Northern Affairs Canada, administration of the licences and their provisions, at least in Ontario, has been led for some years by Parks Canada, related to their operational responsibilities for federal canals.

More than two-dozen waterpower facilities in Ontario occupy federal lands on the Trent-Severn and Rideau systems. In total, these facilities represent almost 100 MW of installed capacity and produce, on average, approximately 500 GWh of clean, renewable energy. This represents an offset of approximately 40 million kg of CO₂.

For a number of years, waterpower proponents have dealt individually with the federal government with respect to water resource management, licencing and new development. While these relationships have, for the most part, been positive and productive, there has been an increasing recognition of the need for and value of a collective dialogue between Ontario's waterpower industry and the federal government.

To initiate this discussion, an introductory session was convened between representatives of the Ontario Waterpower Association (Ontario Power Generation, Orillia Power, Fortis Inc.) and the federal government (Parks Canada, Natural Resources Canada, Environment Canada) in April, 2005. The discussion focused primarily on the challenges and opportunities to contribute to the Government of Canada's renewable energy policy objectives through waterpower production on federal waterways. The meeting established the ongoing dialogue between the industry and the federal government.

Since the introductory session, individual discussions have continued between industry and federal representatives, culminating in a formal meeting between Parks Canada and OWA Board representatives on October 3, 2005. A key outcome of that meeting was the commitment to joint action through the establishment and resourcing of a Steering Committee and Working Groups (Trent-Severn and Rideau) tasked with identifying and implementing operational adjustments in advance of the 2006 navigation season.

The waterpower industry and the federal government share an interest in the efficient use of water resources and minimizing wastage as is of the views that there is substantial potential for improvement in generation capacity. Should gains be made, the benefit would to be both parties.

Mandate:

The Steering Committee is responsible for providing overall advice and direction to the individual working groups, consistent with the principles described herein. The Committee will also oversee reporting, monitoring and evaluation of implementation.

The Working Groups are mandated to identify opportunities to make operational improvements to water management infrastructure on federal waterways, (Trent-Severn /Rideau), and to develop incremental implementation plans targeted for commencement in May 2006.

Composition:

Both the federal government and the industry are to engage policy and technical expertise. The following composition is suggested:

Steering Committee

Federal Government

Director, Dominion Waterpower Act
Policy Advisor, Parks Canada (Ottawa)
Policy Advisor, Environment Canada

Ontario Waterpower Association

President, OWA
Representatives (2), OWA Board of Directors

Working Groups

Federal Government

Policy and Planning Advisor, TSW/Rideau
Operations Managers (2-3 each) TSW/Rideau

Ontario Waterpower Association

Representative, OWA
Industry Operations Manager(s)
Industry Water Management Practitioner(s)

Objectives:

The objectives are to:

- further the collective relationship between Ontario's waterpower industry and the federal government
- develop cooperative approaches to improve the coordination of water resource management
- share and exchange information and tools to improve the collective "systems" understanding of the management of infrastructure on federal waterways
- develop tangible actions for improved water resource management among infrastructure owners and operators

Governing Principles:

As proposed at the October 2005 meeting, the initiative is to be guided by the following principles:

- long-term sustainability of the waterway can best be ensured through responsible water resource management
- it is in the best interest of the federal government and the waterpower industry to strive for a balance of social, economic and environmental benefits including the optimization of revenues from hydroelectric production
- the generation of clean and renewable energy from hydroelectricity contributes to federal and provincial policies and objectives
- allocation and apportionment of water resources must consider the needs of affected stakeholders and interests. As water infrastructure operators, the federal government and the waterpower industry have a unique role and relationship in this regard.

Member Responsibilities:

- All members are responsible for providing information, expertise and input of relevance to the mandate to the working group
- Members are to focus primarily on technical and operational considerations related to water management infrastructure
- Members are responsible for contributing their time and any costs associated with attending meetings
- The OWA (and/or members) and Parks Canada will jointly share all costs related to hosting meetings and working group products, to an initial maximum of 10K.

Reporting Relationships:

The Working Groups will be jointly chaired by one representative from each of the Parks Canada Agency and the Ontario Waterpower Association.

Deliverables and Timelines:

- January 2006 – Steering Committee/ Working Groups established, first meeting to review ToR convened
- February 2006 – Information and “tools” exchange, system operation review and analysis
- March 2006 – Identification of low risk operational adjustments in immediate, short and medium term
- April 2006 – Scenario and proposed system operations and communications plan for 2006 navigation season developed and approved
- May 2006 – Commencement of plan implementation
- May-October 2006 – implementation monitoring and assessment
- November-December 2006 – plan evaluation and proposed adjustment (if required)
- January 2007 (cycle begins again)

Appendix H – OWA Presentation to The Panel – June 2007

Slide 1

Renewable Energy Opportunities on the Trent-Severn Waterway

Presentation to
The Panel on the Future of the Trent-Severn Waterway

Ontario Waterpower Association – June 20, 2007

Slide 2

Presentation Outline

- The Ontario Waterpower Association
- Recent history of efforts with the TSW
- Waterpower on the system
- Key challenges
- A case example – Ontario Power Generation
- Opportunities
- Recommendations

Slide 3

The Ontario Waterpower Association

- The provincial renewable energy organization committed to the sustainable development of Ontario's waterpower resources
- Representing 99% of Ontario's renewable waterpower generation
- Responsible for one quarter of the province's energy supply
- Focused on public policy affecting waterpower

Slide 4

Recent History of Effort with the TSW

- November 2004 – OWA informs the federal government of concerns related to the disconnect between the operation of the TSW and the policies on climate change
- December 2004 – Parks Canada indicates that its mandate does not include renewable energy
- January 2005 – OWA encourages a joint discussion with federal agencies
- March 2005 – Parks Canada re-iterates position that renewable energy is outside its mandate

Slide 5

Recent History of Effort with the TSW

- April 2005 – OWA arranges a joint discussion with key federal departments (Parks Canada, NRCan, Environment Canada)
- May 2005 – EC responds, suggesting that the OWA has raised broader public policy issues – offers to facilitate a multi-stakeholder discussion of water management
- June 2005 – Parks Canada and MNR host an "Integrated Water Management Workshop"
- Workshop recommends "immediate gains should be pursued" – no action taken to date

Slide 6

Recent History of Effort with the TSW

- October 2005 – Federal departments meet with the industry to map a path forward
- November 2005 – OWA drafts a Terms of Reference for a Steering Committee focused on water resource management and waterpower opportunities
- January 2006 – OWA and federal agencies confirm the mutual interest in implementing the Terms of Reference

Slide 7

Recent History of Effort with the TSW

- April 2006 – TSW responds to OWA efforts to initiate formal dialogue:
 - “Our capacity on the hydro and water management front is severely limited. At the present time, it is more than fully engaged in attempting to resolve a range of issues associated with existing licences and in responding to a significant number of unsolicited applications to develop new sites along the waterway”

Slide 8

Recent History of Effort with the TSW

- May 2006 – OWA meets with TSW to advocate for progress
- TSW indicates that there is a potential for review of the governance and mandate of the waterway
- TSW indicates that immediate priorities are:
 - An improved waterpower site release process
 - Revision to water rental rate structures
 - Tenure
 - Water resource management

Slide 9

Waterpower on the TSW

- 18 facilities across the TSW (Severn Falls to Sonoco)
- ~ 100 MW of installed capacity
- Offset of 40 million kg of CO2 – 100,000 cars
- Direct revenue to TSW
- Modifications to existing water management can increase production by up to 20%
- Re-development and new developments can add an additional 30%
- These federal lands can contribute to climate change objectives!

Slide 10

A Case Example - OPG

- OPG and others are recipients of the water controlled by TSW.
- The primacy of navigation needs to be balanced to achieve multiple benefits.
- The understanding and management of complex watersheds and associated risk needs to be improved.

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TSW Operations

- There are immediate, significant improvements possible within the parameters of the existing licenses and the Dominion Water Power Act that would benefit renewable energy production without affecting any other resource use values, including navigation.
- Adjusting the current approach to water management would improve impacts on the ecosystem, public safety and protection to property owners.
- Water spilled past our generating plants means that generation must come from other sources.

Slide 12

TSW Operations

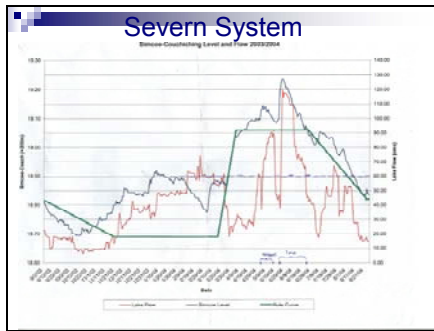
- TSW operate within narrow water level ranges - the goal is to stay with little allowable deviation from that range.
- Dam operations performed to correct the undesirable elevation or trend, can be large in magnitude and frequent. When elevations perceived as too low, dams are all but closed off. When elevations are too high, floodgates opened and a tremendous volume of water is released.
- Operation appears reactionary in nature. May be that tools currently used to operate the system need to be updated to the new set of tools with higher level of capability.

Slide 13

TSW Operations

- During high flow and transition periods including high precipitation events, the rate of change in flows on the outlet dams of the TSW systems is extreme.
- Frequent and dramatic changes in flows from outlet dams, particularly during transition to navigation periods, if moderated could significantly improve generation without impacting navigation on the system. Power producers would like to see a "smoother" flow regime.

Slide 14

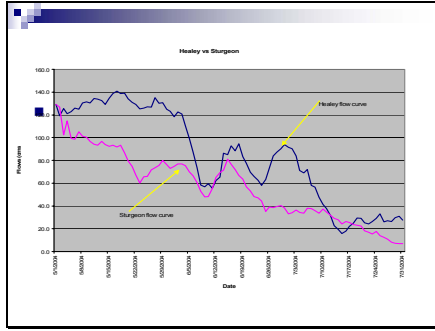


Slide 15

TSW Operations

- During dry summer periods, water flows are relatively and perhaps unnecessarily low due to large volume of water run out of the system storages in spring to reduce the risk of undesired high flows for navigation i.e. >130 cms.
- Maximum flow constraints during the navigation season that appears to drive a behaviour that is not conducive to smoother flows on the system.

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Slide 17

Water Management Model

- One key factor to the solution is to ensure TSW has the resources and tools to perform their role.
- The current tools used to operate TSW system are somewhat antiquated (Ares reservoirs simulation program now more than 20 years old).
- Current operation is high maintenance for TSW staff, forced on addressing the many competing interests of stakeholders. This process is laborious and stressful. High expectations on the TSW water manager.

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Water Management Model

- Modern water models work at a much higher level of sophistication → required for management of complex water shed given competing interests → better understanding of risk and improved risk management.
- By using a database in the model, calculate percentile operating ranges using TSW's own historical data.

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Where do we stand today?

- TSW appears receptive to a new ways of operating and a decision support water management tool.
- OPG has been modeling part of the system and sharing with TSW to demonstrate the benefits of better tools.
- TSW has agreed to some deviations in operating ranges in their reservoirs. These changes are small currently but a step in the right direction.

Slide 20

Opportunities

- Take early action on "low hanging fruit" – success leads to success
- Leverage industry investment in a water management model for TSW
- Leverage industry investment and experience in Water Management Planning

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Opportunities

- Re-balance priorities on the TSW – from the primacy of navigation to multiple benefits.
- Revisit operating ranges on storage lakes -alleviate need for immediate and dramatic changes on water flows.
- Pursue water management regimes that uses storage reservoirs to a much higher degree for flow attenuation.
 - Flow changes are much less volatile with reliance on the buffering effect of the associated storage reservoir.

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Opportunities

- Increase flexibility for log and dam operations in terms of frequency and timing.
- Eliminate single line rule curve and work within an operating range that is appropriate to all system users.
- Position waterpower revenues as a key contributor to water resource management

Slide 23

Recommendations

- Recognize our common interests (industry manages infrastructure too)
- Build on the efforts already undertaken between the OWA and TSW – we can be “ahead of the curve”
- Position the TSW as a case example of the federal commitment to its Climate Change Agenda – “House in Order” approach
- Strategically invest in water management tools and capacity – linked to waterpower revenues
- Make targeted improvements first – build a basis for positive change

Slide 24

Thank you