

CAPITAL EXPENDITURES – REGULATED HYDROELECTRIC

1.0 PURPOSE AND OVERVIEW

The purpose of this evidence is to provide a project listing and business case summaries for capital expenditures for the regulated hydroelectric facilities during the test period.

2.0 CAPITAL PROJECTS LISTING

OPG has used a tiered structure for reporting on all capital projects which have budgeted expenditures during the 2008 and 2009 test period.

This tiered approach provides a comprehensive picture of OPG's capital project expenditures for regulated hydroelectric facilities. It also recognizes that different levels of information are appropriate for projects of different sizes, based on the large volume of projects undertaken within OPG.

The projects in each tier are shown in the attached tables, with supporting project documentation as required.

Based on the tiered reporting structure, the following information is provided for capital projects:

- For large projects (i.e., total costs greater than \$10M and representing six projects), project summaries or business case summaries are provided.
- For mid-range projects (i.e., total costs of between \$5M and \$10M and representing two projects), short project descriptions are provided.
- For other projects (up to \$5M), an aggregate of the total project costs is provided.

LIST OF ATTACHMENTS

- Attachment A: Niagara Tunnel Project (EXEC0007) Business Case Summary
- Attachment B: R.H. Saunders G.S. – Replace HVAC Project Summary (H-97-1864)
- Attachment C: Sir Adam Beck I G.S. – Unit G9 Upgrade Project Summary (SAB10047)
- Attachment D: Sir Adam Beck I G.S. – Unit G10 Upgrade Project Summary (SAB10050)
- Attachment E: Sir Adam Beck I G.S. – Rehabilitate Canal Lining Project Summary
(SAB10056)
- Attachment F: Sir Adam Beck I G.S. – Unit G7 Generator Frequency Conversion from
25Hz to 60Hz (SAB10032) – Recommendation (Redacted)
- Attachment G: Sir Adam Beck I G.S. – Unit G3 Upgrade Project Summary (SAB10064)
- Attachment H: Sir Adam Beck Pump Generating Station – Dyke Foundation Grouting
Project Summary (SABP0022)

FULL RELEASE FOR NIAGARA TUNNEL PROJECT (EXEC0007)**1. RECOMMENDATION:**

Approve the release of \$963 M for design and construction of the Niagara Tunnel Project (the "Project"), bringing the total Project cost estimate to \$985 M, including \$22.5 M previously approved. Based on the recommended design / build proposal, the new tunnel will be in-service by June 2010, will increase the diversion capacity of the Sir Adam Beck Niagara GS complex by 500 m³/s and facilitate a 1.6 TWh increase in average annual energy output. The cost contingency and schedule contingency included () are each based on a confidence level of 90%. This Project compares favourably with other renewable electricity supply options and is aligned with directions provided to OPG by the Province. Project approval is contingent upon financing, satisfactory to OPG, being provided by the Province.

Total Investment Cost: \$985 M (including \$22.5 M previously approved)

	Year	To 2004	2005	2006	2007	2008	2009	2010	Totals
Project Capital		4	69	194	215	228	209	66	985
2005 Business Plan		5	65	170	160	180	140	15	735
Variance		-1	4	24	55	48	69	51	250


Type of Investment: Strategic Projects (OAR - Section 1.3)

Release Type: Full

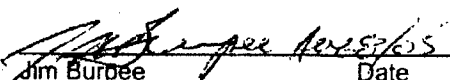
Funding: The Niagara Tunnel Project is in the approved Business Plan as presented above, contingent on financing being provided by the Province.

Investment Financial Measures: The increased energy output resulting from the Project will receive a regulated rate as part of OPG's regulated hydroelectric assets. An equivalent Power Purchase Agreement (PPA) Price estimated for the incremental energy output is 6.7 ¢/kWh (2011\$) and compares favourably with the approximately 8.0 ¢/kWh (2011\$) PPA rate offered under the recent RFP for renewable energy development. Other project financial metrics and sensitivities are presented in the Financial Analysis section of this BCS.

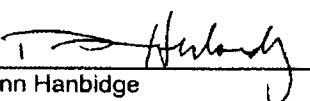
2. SIGNATURES**Submitted by:**


Emad Elsayed
Vice President
Niagara Tunnel Project
Aug 8/05
Date

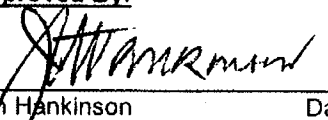
Reviewed By:


Jim Burpee
Senior VP
Energy Markets
Aug 5/05
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Approved By:


Donn Hanbidge
Chief Financial Officer (Acting)
Aug 9/05
Date

Approved By:


Jim Hankinson
President and CEO
Date

3. BACKGROUND & ISSUES**Background**

- The Sir Adam Beck (SAB) hydroelectric complex at Niagara consists of two generating stations (SAB1 and SAB2), and a pumping / generating station (SAB PGS). SAB1 and SAB2 have a total generating capacity of 1,960 MW. SAB PGS has a capacity of 174 MW and is generally utilized to pump / store water during off-peak periods for use during periods of peak electricity demand. The SAB complex currently produces average annual energy output of approximately 12 TWh.
- The Niagara Tunnel development is a unique, site-specific opportunity for OPG to produce additional, low-cost, renewable and environmentally sustainable energy for its customers, enhancing the existing Sir Adam Beck – Niagara hydroelectric facilities in the efficient use of Niagara River flow available to Canada for power generation with a resultant 14% increase in average annual energy output.
- The Canadian streamflow share of the Niagara River has been calculated as ranging from about 600 to 3000 m³/s, averages about 2000 m³/s and exceeds the capacity of the existing SAB diversion facilities (canal and two tunnels) about 65% of the time.
- Feasibility studies for expansion of Ontario Hydro's hydroelectric facilities at Niagara commenced in 1982. Definition phase engineering and environmental assessment work started in 1988 and was suspended in 1993. The Environmental Assessment (EA) was submitted in March 1991 and approval was obtained on October 14, 1998.
- The Environmental Assessment (EA) approval was for the Niagara River Hydroelectric Development consisting of two new tunnels, an underground powerhouse and transmission improvements in the Niagara Peninsula. The EA approval provided Ontario Hydro with the flexibility to undertake the development in phases. A plan to proceed with only one tunnel was initiated in 1998, and tenders were called for detailed design and construction, but work was suspended in 1999 due to uncertain market conditions and imminent corporate reorganization. Expenditures in 1998/99 totalled \$2.5 M and are included in the estimated total project cost. Earlier definition phase expenditures of \$57 M on the Niagara River Hydroelectric Development were written off by Ontario Hydro.
- In November 2002, the Province announced that it had directed OPG to proceed with a new water diversion tunnel at Niagara and subsequently indicated a strong desire to have the project completed in the shortest possible timeframe.
- The timing for completion of the new tunnel is also linked to the required rehabilitation of the 83-year old SAB1 canal, which delivers over one third of the water used at the SAB complex. The canal rehabilitation work is expected to start in 2011 and will require taking the canal out of service for approximately 8-12 months. Having the new tunnel in place will avoid an energy generation loss of 2.7 to 4.0 TWh caused by the canal outage (depending on available Niagara River flow and outage duration).
- On June 24, 2004, the OPG Board of Directors approved a preliminary release of \$10 M to conduct a Request For Proposal process and to carry out such preconstruction activities as OPG deems necessary. Commitments for this work, to the end of June 2005, total \$8.7 M.
- Provisions of an agreement between the Niagara Parks Commission (NPC) and OPG, dated February 18, 2005 (which agreement forms part of the larger Niagara Exchange transaction concerning the long term disposition of water rights on the Niagara River), committed OPG to undertake remedial work at the retired Ontario Power and Toronto Power generating stations as part of reversion of these stations to the NPC and secured the agreement of the NPC that until 2056 it would grant water rights to no party other than OPG. An associated [REDACTED] settlement with

Fortis Ontario, approved by the OPG Board on February 8, 2005, secured an irrevocable assignment of the water associated with Rankine GS. These costs are included in the release estimate for the Project.

- Under Ontario Regulation 53/05, effective April 1, 2005, the Project will become part of OPG's regulated hydroelectric assets and OPG will be given a fair opportunity to recover prudently incurred costs through the regulated rates.
- OPG has been in discussions with the Province regarding financing for the project. However, formal agreement including cabinet approval is still pending.

Project Execution Strategy

- A Design / Build contracting approach was selected for the Niagara Tunnel Project to minimize Project duration, to capture contractor experience and innovations, to appropriately allocate project risks and to provide as much price certainty as practical for design and construction of the Project.
- The Design / Build Contract transfers most tunnel design and construction risks to the contractor and includes bonuses for exceeding the Guaranteed Flow Amount¹ (tunnel flow capacity) and for early Substantial Completion² (In-Service Date), and liquidated damages for failure to achieve the Guaranteed Flow Amount and late Substantial Completion.
- The proposal process followed to determine the preferred Design / Build Contractor for this undertaking included:
 - prequalification following receipt of seven responses to an international invitation for expressions of interest
 - an invitation to four contractor consortia to submit proposals
 - submission of proposals by three contractor consortia
 - proposal evaluation and negotiation
 - contract award based on the best value considering evaluation criteria that included the design and construction approach, cost, risk profile, tunnel flow capacity, schedule, project team, health and safety management, environmental management and quality management.

Regulatory Approvals & Third Party Agreements

- Conditions of the EA Approval have been addressed to the extent possible without contractor input regarding means and methods to be employed during construction.
- The Community Impact Agreement, signed with the host communities on December 23, 1993 addresses predicted impacts on tourism, roads, domestic water supply, and sewage treatment during construction of the Project and includes provisions for engagement of local contractors, suppliers and labour and for local road improvements.
- The Project incorporates work and associated costs required under terms of the agreement between the Niagara Parks Commission and OPG as described above.

Project Management

¹ Guaranteed Flow Amount means the tunnel flow capacity guaranteed by the contractor at the reference hydraulic head and the reference elevation of energy grade line defined in the Design / Build Agreement.

² Substantial Completion means work has progressed to the point where the tunnel facility is ready for use and is sufficiently complete to be used for its intended purpose.

- A strong team has been assembled for management and execution of the Niagara Tunnel Project and includes:
 - The OPG Project Director empowered to ensure effective integration of internal and external resources and timely communications between the project team and other stakeholders
 - Other OPG personnel representing Niagara Plant Group, Water Resources, Law Division, Supply Chain, Corporate Finance, Real Estate, Health & Safety and Risk Management
 - Hatch Mott MacDonald (HMM), an Ontario-based consultant with considerable experience in tunnel design and construction, has been engaged as Owner's Representative and holds primary responsibility for project management, design review and construction oversight with Acres International providing assistance in the areas of geotechnical and hydraulic engineering and third party liaison
 - Torys has been engaged as external legal counsel and has been part of the core project team providing advice on contractual, procedural fairness, environmental, real estate and regulatory matters
 - Strabag AG (a large Austrian construction group, supported by ILF Beratende Ingenieure of Austria, Morrison Hershfield of Toronto, and Dufferin Construction of Oakville), the selected Design / Build Contractor, has extensive international experience in tunnelling and heavy civil underground works.
 - Expert consultants and contractors are engaged, as required, to provide support in areas such as project risk assessment, financial modeling, teambuilding, field investigations, surveying, etc.
- Decision authority for this Project remains with OPG and delegation will be in accordance with OPG's Organization Authority Register (OAR).
- A Project Execution Plan, currently focussed on pre-construction efforts, has been developed and issued to provide the framework for management of the Niagara Tunnel Project, and will be reviewed and revised as necessary during project execution.
- The favourable score of 115, achieved on the Construction Industry Institute's Project Definition Rating Index (PDRI) in April 2005, indicates a high likelihood that completed project planning will result in a successful project (less than 200 = within budget and schedule).
- OPG, with the assistance of URS (a specialist consultant), completed a comprehensive risk assessment (qualitative and quantitative) for design and construction of the Niagara Tunnel Project based on "The Joint Code of Practice for Risk Management of Tunnel Works in the UK", and the recommendations have been incorporated into the project including maintenance of the Risk Register by the Owner's Representative. The quantitative risk assessment provided the basis for establishing the required cost contingency and schedule contingency.

4. ALTERNATIVES AND ECONOMIC ANALYSIS

Investment Cost and Project Funding Assumptions:

- Key assumptions are documented in the Niagara Tunnel Project Model Support Documentation binder.
- The Project is estimated to cost \$985 M, including the previously released funding.
- The Project will receive a 10-year "holiday" for Gross Revenue Charge (GRC) payments.
- The Project will be funded through financing arranged with the Province.

Base Case – Do Nothing (Not Recommended)

- The Do Nothing option would forego the opportunity for OPG to significantly increase average annual energy output from the Sir Adam Beck generating stations and underutilization of Niagara River water available to Canada for power generation would continue. In addition,

OPG commitments, under the Niagara Exchange Agreement, for remedial work at the retired Ontario Power and Toronto Power generating stations would continue to be required as part of the reversion of these stations to the Niagara Parks Commission. A write-off of about \$37 M would be required to cover expenditures committed to date (\$22.5 M) and remaining costs associated with the reversion of the Ontario Power and Toronto Power generating stations.

Alternative 1 – Design & Construct a Diversion Tunnel (Preferred Alternative)

- Design, construct and commission a new diversion tunnel to convey 500 m³/s from the upper Niagara River to the Sir Adam Beck GS complex at Queenston using a design / build contracting approach developed to minimize the risk to OPG, optimize the additional diversion capacity, and achieve price and schedule certainty. The total cost for the Project is estimated at \$985 M.
- Appendix A provides a more detailed breakdown of costs for the Project.

Financial Analysis

- While the Niagara Tunnel is expected to be part of OPG's regulated hydroelectric assets and receive a regulated rate reflecting cost recovery and a return on capital, it is appropriate to consider several financial metrics, as follows, to ensure that this is an economic investment relative to other generation options:
 - Levelized Unit Energy Cost (LUEC) represents the price required to cover all forecast costs, including a return on capital over the service life, escalates over time at the rate of inflation, and it permits a consistent cost comparison between generation options with different service lives and cost flow characteristics.
 - Equivalent Power Purchase Agreement (PPA) Price represents the price required if one were to bid the project into the renewable RFP. It is similar to LUEC except only 15% of the PPA escalates at the Consumer Price Index.
 - Revenue Requirement is a measure that represents the annual accounting cost of this project including an allowed return on capital employed. Revenue Requirement generally declines over time as the rate base is depreciated.
 - These metrics are equivalent in present value terms over the life of the asset and reflect full recovery of costs including a return on the investment.

Financial Analysis	Base Case	Alt.1
Initial or Remaining Costs (M\$)	14	963
NPV (current year PV M\$)	n/a	n/a
Impact on Economic Value (current year PV M\$)		n/a
<i>for Value Enhancing projects include:</i>		
IRR (%)		n/a
Discounted Payback Period (years)		n/a
LUEC (¢/kWh in 2005\$)		4.8
Equivalent PPA Price (¢/kWh in 2011\$)		6.7
Revenue Requirement (¢/kWh in 2011\$)		5.8
Revenue Requirement for OPG Baseload Hydroelectric (¢/kWh in 2011\$) - Includes 10% Return on Equity	3.8	3.9

- The estimated equivalent PPA Price of 6.7 ¢/kWh (2011\$) is approximately 84% of the estimated average PPA Price of 8.0 ¢/kWh (2011\$) for the successful proponents in response to the Province's recent RFP for renewable electricity supply alternatives.

- Completion of the Project will result in a significant increase in average annual energy output from the Sir Adam Beck GS complex with only a marginal increase in the estimated regulated rate for OPG's hydroelectric assets.
- Key assumptions used in the financial analysis are listed in **Appendix B**.

Financial Sensitivity Analysis

- Financial sensitivity analysis of the Project is summarized below and indicates economic results that compare favourably with other future electrical energy supply options in Ontario, including recent submissions for renewable generation options.

Sensitivity Analysis [Jun-2010 In-Service Date]	Incremental Energy TWh	LUEC ¢/kWh in 2005\$	Equivalent PPA Price ¢/kWh in 2011\$	Revenue Requirement ¢/kWh in 2011\$
Preferred Alternative	1.6	4.8	6.7	5.8
Water Availability				
Lower quartile for first 5 years of service	0.7 ⁽¹⁾	5.4	8.1	n/a
Upper quartile for first 5 years of service	2.4 ⁽¹⁾	4.2	5.5	n/a
Overall reduction of 5% in Niagara River Flow ⁽²⁾	1.2	6.4	9.3	n/a
Higher Cost (+10%)	1.6	5.2	7.4	6.3
Shorter Service Life (30 year Life)	1.6	5.8	7.6	7.1
Elimination of 10 year Gross Revenue Charge Holiday	1.6	5.8	8.5	9.1
Other Renewable Supply			8.0	

⁽¹⁾ Calculated for the first 5 years of service only

⁽²⁾ Annual flows assumed to be reduced by 5% each year, compared to historical flows for the life of the tunnel

- Overall, the project economics compare favourably against other renewable options. The sensitivity results indicate that the calculated equivalent PPA Price will continue to be competitive even under a range of pessimistic assumptions for water availability, project cost and service life.

5. THE PROPOSAL

- Enter into a fixed-price Design / Build Contract with Strabag AG to design, construct and commission a new diversion tunnel to convey approximately 500 m³/s of water from the upper Niagara River to the Sir Adam Beck GS complex at Queenston. The concrete-lined tunnel will be approximately 10 km long and have an average internal diameter of 12.6 m. Flow will exceed the increased diversion capacity only about 15% of the time compared to the current 65%, and resultant incremental average annual energy output from the Sir Adam Beck generating stations is estimated at 1.6 TWh (14%). The project includes a new intake and associated modifications to the existing International Niagara Control Works, an outlet incorporating the emergency closure gate near the existing PGS reservoir, and removal of the PGS canal dewatering structure. The new tunnel will be in-service by June 2010 based on Project approval by the OPG Board in July 2005 and award of the Design / Build Contract by September 1, 2005.
- Extend the contract with Hatch Mott MacDonald, supported by Acres International, as Owner's Representative for project management, design review, geotechnical and hydraulic engineering, third party liaison and construction oversight.
- Execute remedial work required at the retired Ontario Power and Toronto Power generating stations related to the reversion of these stations to the Niagara Parks Commission (NPC) to secure agreement that the NPC will grant water rights to no party other than OPG.
- The estimated project cost of \$985 M includes a negotiated firm price for the tunnel Design / Build Contract, agreed payments under the Community Impact Agreement, engineering estimates for Niagara Exchange Agreement costs, Owner's Representative costs, and OPG direct costs, and an overall contingency of approximately [REDACTED] to address project risks, including risks not transferred to the Design / Build Contractor.
- Provided that the Design / Build contract is awarded by September 1, 2005, the Substantial Completion (In-Service) Date guaranteed by the recommended Design / Build Contractor is October 2009, however a schedule contingency of approximately [REDACTED] is recommended to address potential schedule extension due to residual OPG risks primarily associated with differing subsurface conditions. This contingency brings the expected completion date to June 2010.
- The design / build contracting approach for a fixed-price proposal from qualified contractors will reduce the risk of construction cost and schedule over-runs, however, OPG has retained risks associated with differing subsurface conditions and included cost and schedule contingencies accordingly, as described above.
- The estimated project cost flow is as follows:

Project Cost Flow Estimate (\$M) (Including Contingency)	To 2004	2005	2006	2007	2008	2009	2010	Totals
OPG Project Management	[REDACTED]							
Owner's Representative	[REDACTED]							
Other Consultants	[REDACTED]							
Environmental / Compensation	[REDACTED]							
Tunnel Contract	[REDACTED]							
Other Contracts / Costs	[REDACTED]							
Interest	[REDACTED]							
Total Project Capital	3.5	69.2	194.1	215.5	227.7	208.9	66.2	985.2
Costs Approved to Date	3.5	19.0						22.5

6. QUALITATIVE FACTORS

- Sustainable Energy Development
 - The new tunnel will enable increased generation at the Sir Adam Beck GS complex utilizing Niagara River flow available to Canada for power generation that exceeds the capability of the existing diversion system (canal and two tunnels), and reducing spill over Niagara Falls from approximately 65% to approximately 15% of the time.
 - Rehabilitation of Sir Adam Beck GS No.2, completed in April 2005, including overhaul or replacement of primary mechanical / electrical equipment, improving conversion efficiency, increasing discharge capacity by 11% and adding 194 MW (15%) of capacity increases the gap between the existing diversion capacity and generating station discharge capacity.
 - There is potential to upgrade units at Sir Adam Beck GS No.1 by 100 to 150 MW, including conversion of the 25 Hz units, and further optimize conversion efficiency of the additional water to be supplied by the Niagara Tunnel Project.
 - Completion of the Niagara Tunnel Project in advance of an 8 to 12 month outage required for rehabilitation of the Sir Adam Beck GS No.1 diversion canal will significantly reduce associated energy losses (2.7 to 4.0 TWh) and financial losses.
- Community, Government & Customer Relations
 - The Province, through the Ministry of Energy, has indicated a strong desire for the Niagara Tunnel Project to be completed in the shortest possible timeframe.
 - There is broad support for the project in the host communities.
 - There will be significant benefits to the local economy during the approximately 4-year construction period.
- Technical / Operational Considerations
 - The Niagara Tunnel design life is 90 years without the need for any planned maintenance.
- Health & Safety
 - Safety program / performance was a significant factor in contractor pre-qualification.
 - The Design / Build Contractor will be required to develop and implement comprehensive project site specific plans for construction safety and for public safety and security.
- Staff Relations
 - An agreement has been reached with The Society of Energy Professionals regarding "purchased services" required for the Niagara Tunnel Project.
 - Purchased Services Agreement discussions have been completed with the Power Workers Union.
 - In accordance with the Chestnut Park Accord Addendum, trades work has been assigned to the Building Trades Unions.
 - Electric Power Systems Construction Association (EPSCA) conditions apply to the performance of this work.

7. RISKS

- OPG, with the assistance of URS (a specialist consultant), conducted a comprehensive risk assessment (qualitative and quantitative) for design and construction of the Niagara Tunnel. Major project risks were identified through a series of workshops involving the project team and key stakeholders.
- A Risk Register and associated Risk Management Plan will be maintained throughout project execution to manage residual risks.
- Project risks, consequences, mitigation activities and residual risks are summarized in **Appendix C**.
- Based on risks identified and mitigation measures implemented, it has been determined that the contingency for OPG residual risks associated with the tunnel construction component of the Project, based on a 90% confidence level, is [REDACTED] and this provision has been included in the release estimate. The overall Project contingency included in the release estimate is [REDACTED]
- [REDACTED]
- The financial analysis completed for the recommended alternative is based on spending the entire cost and schedule contingency and is therefore considered to be conservative and robust.

8. POST IMPLEMENTATION REVIEW (PIR) PLAN

Type of PIR		Target Project In Service Date		Target PIR Completion Date	
Comprehensive		June 2010		December 2010	
Measurable Parameter	Current Baseline	Target Result	How will it be measured?	Who will measure it? (person/group)	
Tunnel Capacity	500 m ³ /s	500 m ³ /s	Flow test using tracer transit time method.	Design / Build Contractor with oversight by an independent Chief of Test retained by OPG	
In-Service Date	June 2010		Compared with contracted Substantial Completion Date and approved changes.		
Actual Cost	\$985 M		Compared to the approved release.		

Responsibilities

- The OPG Project Director will be responsible for the execution of the Project, and will be responsible for the completion of the PIR.
- The PIR will be undertaken after Substantial Completion of the Project (within 3-6 months).

Project Execution Monitoring

- The OPG Project Director, with the assistance of the Owner's Representative, will monitor on an ongoing basis and summarize as part of the PIR:
 - Project costs to ensure there are no material variances,
 - Project schedule and Schedule Performance Index (SPI) to track progress and to ensure completion in accordance with the contract,
 - Compliance with legislation and project-specific permits and approvals including periodic audits and non-compliance reporting
 - Compliance with the Project Execution Plan including scope management, deliverables, program and resource management, execution, risk management and the handling of health and safety issues.
- Disruption to the local community is to be minimized and will be measured by the public reaction including the number of complaints received
- Oversight by the Major Projects Committee will include frequent updates and guidance provided to the project team at critical points of Project development.

Remedial Work at Ontario Power GS and Toronto Power GS

- Confirm the completion of remedial work required at the retired Ontario Power and Toronto Power generating stations and the subsequent reversion of these facilities to the Niagara Parks Commission.

Tunnel Flow Capacity Verification


- Verification will be completed using the tracer transit time method established by the International Electrotechnical Commission Publication 41 (IEC 41), with testing performed under the direction of a Chief of Test engaged by OPG, and witnessed by OPG and the contractor. This testing will be used to determine whether a bonus or liquidated damages apply relative to the contracted Guaranteed Flow Amount.

Project Financial Analysis

- Re-evaluate financial metrics and compare to Business Case Summary as applicable.

Lessons Learned

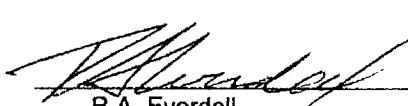
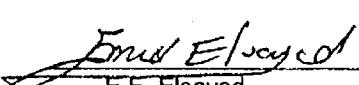
- Document over-all lessons learned for future improvement in other projects.
- Review effectiveness of the design and construction contract arrangements and how effectively they were implemented, including an assessment of any liquidated damages and bonuses paid.

	PROJECT Summary of Estimate	Date	14-Jul-2005
		Project #	EXEC0007

Facility Name:		
Project Title:	Niagara Tunnel Project	

Estimated Cost in Million \$										
Year	2004	2005	2006	2007	2008	2009	2010	Totals		%
OPG Project Management										
Consultants										
Design & Construction										
Other Contracts / Costs										
Interest										
Contingency										
Totals	3.5	69.2	194.1	215.5	227.7	208.9	66.2	985.2		100.0

Notes:	1. Schedule	Start Date:	<u>June 2004</u>
		In-Service Date:	<u>June 2010</u>
	2. Interest and Escalation rates are based on current allocation rates provided by Corporate Finance		
	3. Includes Removal Costs of:		<u>n/a</u>
	4. Includes Definition Phase Costs of:		<u>n/a</u>
	5. Percentages above relate to the total cost.		

Prepared by:	Approved by:
 R.A. Everdell Project Support Manager	 E.E. Elsayed Vice President – Niagara Tunnel Project

Appendix B: Niagara Tunnel Financial Model – Assumptions

Following are the key assumptions used during the modeling of the Niagara Tunnel Project.

Project Cost Assumptions:

1. Design/Build contract costs of [REDACTED] which include [REDACTED] for contingency and GFA (Guaranteed Flow Amount) bonus allowance
2. Other cost of [REDACTED] which include [REDACTED] for contingency
3. Interest during Construction (IDC) of [REDACTED]

Financial Assumptions:

1. Debt Rate of 6%
2. Return on Equity (ROE) of 10%
3. Debt Ratio of 55%

Project Life Assumptions:

1. Substantial Completion Date provided by the proposed Design/Build contractor of Oct, 2009. [REDACTED]
2. The tunnel life is 90 years

Energy Production Assumptions:

1. The tunnel will contribute an additional ~1.6 TWh/yr to the production at the SAB facilities
2. The tunnel will "re-capture" ~1.1 TWh during the SAB1 canal outage in 2011
3. Water transfers to NYPA, consistent with historical conditions, were incorporated into the calculation of the incremental energy output.

Operating Cost Assumptions:

1. When energy production begins OPG will realize a 10 year holiday on Gross Revenue Charge (GRC)
2. Annual OM&A costs of ~\$.1M

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Cost The contractor may encounter subsurface conditions that are more adverse than described in the Geotechnical Baseline Report (GBR)	Unexpected, adverse subsurface conditions could slow tunnel construction and require the contractor to undertake remedial / extra work resulting in legitimate claims for extra costs and / or schedule extension for differing subsurface conditions (DSC).	High	<ul style="list-style-type: none"> The GBR is based on extensive field investigations carried out over a 10-year period and knowledge gained through construction of the existing SAB2 tunnels. The 3-stage GBR process used facilitates contractor input and concurrence before construction begins. [REDACTED] 	Medium
Insurance coverage is inadequate or unavailable because underground construction has developed a reputation for cost over-runs and a negative perception from insurers.	Establishing an Owner Controlled Insurance Program (OCIP) to mitigate insurable risks for OPG, the Owner's Representative, the contractor and affected third parties.	Medium	<ul style="list-style-type: none"> Engagement of key underwriters through project presentations. Following, in principle, the UK Code of Practice for Risk Management of Tunnel Works. A conservative estimate for insurance costs is included in the release estimate. 	Low
The design / build contractor may not complete the tunnel due to non-performance or default.	OPG would need to engage another contractor to complete the tunnel construction.	Medium	<ul style="list-style-type: none"> Requirements in the design / build contract for the contractor to provide bonds and / or letters of credit as security for non-performance or default. Requirements in the design / build contract for the contractor to provide a parental guarantee. 	Low

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Scope OPG triggers variations in the scope of work.	Significant scope changes initiated by OPG could add significant cost and extend the project schedule.	Low	<ul style="list-style-type: none"> Credible potential changes are limited because of the configuration of project and contracting approach. The change control process is documented in the PEP and includes a Change Control Board comprised of OPG and Owner's Representative senior managers. 	Low
Schedule Inability to meet environmental approval conditions in a timely manner.	Schedule delays could result from late submissions, unforeseen requirements or inability to satisfy stakeholder requirements.	Medium	<ul style="list-style-type: none"> Proactive engagement of regulatory authorities Use of a tracking system containing a comprehensive list of required permits and approvals. Regular meetings with Ministry of Environment staff to review status and address outstanding issues. The release estimate includes provisions to address outstanding issues (Welland River). 	Low
Delay in manufacturing and / or delivery of the tunnel boring machine (TBM).	Potential delays in TBM manufacturing, delivery or assembly will be on the critical path for this project and will affect the overall project schedule.	Medium	<ul style="list-style-type: none"> Schedule set by the Design / Build Contractor. Contract provisions including liquidated damages for project delays and performance bond for default. OPG / Owner's Representative will monitor progress at the TBM manufacturer's facilities. 	Low
Inadequacy of the TBM and support systems to achieve required excavation and lining productivity.	Poor performance of the TBM, including frequent breakdown, could delay the completion date, increase the project cost.	Medium	<ul style="list-style-type: none"> Design / Build Contract includes liquidated damages for late Substantial Completion valued to include incremental OPG costs and lost energy production for a period of about 16 to 18 months. 	Low

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Resources				
OPG resources with knowledge and experience required for design and construction of a major tunnel are severely limited.	OPG resource limitations could have significant impacts on project quality, cost and schedule.	High	<ul style="list-style-type: none"> OPG has engaged Hatch Mott MacDonald, an Ontario based consultant with considerable tunnel design and construction management experience, as Owner's Representative for this project. The design/ build contracting approach, engaging internationally-experienced tunnelling experts, will provide the necessary engineering and construction expertise. 	Low
There is potential for a shortage of skilled construction labour resources qualified for performance of major tunnel construction by TBM.	A shortage of required construction labour resources, primarily operating engineers and labourers, could result in higher costs for imported labour or schedule extension.	Low	<ul style="list-style-type: none"> The workforce required is relatively small and the contractor is expected to fill key positions with experienced, regular staff, reducing the likelihood that construction labour resources will limit tunnel construction progress. 	Low
Technical				
Queenston shale, the host rock formation for the majority of the tunnel, has swelling properties when exposed to fresh water.	Swelling of the Queenston shale surrounding the tunnel could over-stress the tunnel lining and cause damage that would interrupt flow through the tunnel and require expensive remedial work.	High	Because this kind of damage could take decades to develop, penalties, warranties or holdbacks are impractical. Instead this risk is being mitigated through conservative, mandatory engineering specifications for aspects of the tunnel design related to rock swelling.	Low

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Design / Performance Criteria Not Met	The constructed tunnel may not meet design / performance criteria such as the guaranteed water flow capacity, accommodation of swelling of the host bedrock, particularly Queenston shale, or design for a 90-year service life.	High	<ul style="list-style-type: none"> Mandatory design requirements established by OPG / Hatch Mott MacDonald. Design Review by an experienced Technical Review Committee. Design / Build Contract includes liquidated damages for failure to achieve the agreed diversion capacity (Guaranteed Flow Amount) valued to compensate OPG for the reduced energy production throughout the 90-year service life. Performance / warranty bonds and / or letters of credit provided by the Design / Build Contractor. 	Low
Environmental / Regulatory Delay in obtaining Regulatory Approvals and Permits	Delay in obtaining required permits, failure to identify required permits or legislative changes requiring new or revised permits have the potential to extend the project schedule.	Medium	<ul style="list-style-type: none"> Regulatory risks are relatively low because Environmental Assessment approval was obtained in 1998 and it is expected that outstanding conditions of the approval will be resolved before tunnel construction commences. 	Low
Inability of OPG to fully recover the project costs through the Regulated Rate	Adverse financial impact on OPG	Low	<ul style="list-style-type: none"> Demonstrate prudence in managing project cost through a comprehensive cost control process Project costs include a contingency allowance which corresponds to a 90% confidence level that the project will be completed within the estimated costs. 	Low

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Health & Safety Serious Construction Accident	There are many safety hazards associated with tunnel construction that need to be identified and appropriately managed (steep grades, slips and falls, falling objects, water hazards, confined space, truck traffic, operating machinery, noise, dust, etc)	High	<ul style="list-style-type: none"> Safety program / performance was a significant factor in contractor pre-qualification Contractor required to develop and submit an acceptable comprehensive site specific safety plan prior to start of construction activities Safety accountabilities clearly identified Site safety monitoring by the Owner's Representative. 	Low
Public Safety and Security	Risk of incidents, accidents and potentially fatalities to unauthorized persons entering the construction site and gaining access to areas and activities having High MRPH hazards.	High	<ul style="list-style-type: none"> Contractor to implement an approved site-specific Security, Public Safety & Emergency Response Plan that is consistent with the Niagara Plant Group's managed system. Site safety monitoring by the Owner's Representative. 	Low
Fire in the tunnel during construction	Health & Safety of construction personnel (and visitors) could be endangered and there could be significant schedule and cost impacts depending on the extent of damage.	Medium	<ul style="list-style-type: none"> Contractor to implement an Emergency Response Plan and provide adequate ventilation. Contractor to provide back-up power supply, a dedicated water supply, and trained personnel to facilitate fire fighting in the tunnel during construction. Project insurance will cover repair of damages. 	Low

Appendix C – Project Risk Profile

Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Investment OPG has retained the hydrologic risk (uncertainty regarding Niagara River flow).	Incremental average annual energy output from the SAB complex could be less than 1.6 TWh resulting in a need to increase base load hydroelectric energy rates to recover project costs.	Medium	<ul style="list-style-type: none"> Financial sensitivity analyses demonstrate that the Niagara Tunnel Project remains competitive with future renewable electricity supply options if less water is available throughout the expected service life. Being part of OPG's regulated hydroelectric assets, the hydrologic risk is expected to be borne by electricity customers through the water variance account. 	Low
A successful claim by others in Canada or the United States to use Niagara River water available for power generation that exceeds OPG's capacity.	OPG could lose rights to use some of the Niagara River water available for power generation.	Medium	<ul style="list-style-type: none"> Under the terms of the Niagara Exchange Agreement, the Niagara Parks Commission provided covenants securing the assurance of NPC that it would grant water rights to no party other than OPG through 2056. Complete the new tunnel so OPG has adequate facilities to utilize Canada's entitlement to water available for power generation to reduce the risk of a claim by others to unused water. 	Low
The 1950 Niagara Diversion Treaty is now subject to renegotiation following a 1-year notice period.	The government in either Canada or the United States could pursue renegotiation of the 1950 Treaty to address issues raised by other stakeholders that could result in a reduction of flow available to OPG for power generation at the SAB complex.	Low	<ul style="list-style-type: none"> No mitigation possible. 	Low

Appendix C – Project Risk Profile				
Description of Risk	Description of Consequence	Risk Before Mitigation	Mitigation Activity	Risk After Mitigation
Other				
Failure to adequately address public / community issues concerning the Project.	OPG's reputation could be damaged by negative public reaction to the Project.	Medium	<ul style="list-style-type: none"> • Implementation of the Community Impact Agreement (tourism, traffic, noise & dust, etc). • Regular public communications. • A Project website maintained with current information. • A Project hotline to receive public concerns / feedback, including timely response. 	Low

Ontario Power Generation – Project Summary

Project Name: R.H. Saunders Generating Station – Replace Heating, Ventilating, and Air Conditioning (“HVAC”) System							
Project Number: H-97-1864		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic			Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A		
Project Start Date (month, year): May 2007				In-Service Date (month, year): May 2008			
Project Description: This project includes the replacement of the HVAC system in the administration building, and the removal of asbestos insulation on the associated piping and air handler units.							
Project Need (i.e., justification for the project): The primary objectives/drivers of this project are to: <ul style="list-style-type: none"> • Eliminate the increasing cost of repairs. The HVAC system is original to the station and is experiencing an increasing rate of component failure and piping leaks. • Replace two HVAC chillers and refrigerant to comply with tabled Ministry of Environment legislation. • Eliminate the health risk of staff exposure to designated substances (asbestos and red lead) in the existing HVAC system. • Eliminate the risk of possible production losses due to potential HVAC system leaks in the administration building generator control and supervisory areas. • Achieve the energy efficiency associated with a new HVAC system. 							
Project Costs:							
	LTD Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan	Future Plan	Total
Capital	\$ 0.3 M	\$ 0.2 M	\$ 8.0 M	\$ 3.0 M			\$ 11.5 M
OM&A							
Initial Release Amount: \$ 7.6 M		Current Release Amount: \$ 11.7 M		Variance (Current Release – Initial Release): \$ 4.1 M			
Variance Explanation (required if current release - initial release >10 percent of initial release): In 2004, a consultant was retained to provide the HVAC system design, specifications, project schedule, project estimate, and bid package for tendering. Based on the consultant’s estimate the project was approved for the initial release amount of \$7.6M. In October 2006, contractor bids were received, which were considerably higher than the cost assumed in the project release estimate. The variance of \$4.1M is mostly due to these external contractor costs. A number of factors have been identified as causes of the cost increase:							

- Additions to the work scope during the tendering period that were not part of the original estimate.
- There was a one year gap between the completion of the project estimate by the consultant and the receipt of project bids. Economic factors in effect during that period led to a rapid rise in material and labour costs.
- The original project cost was underestimated.

Ontario Power Generation – Project Summary

Project Name: Sir Adam Beck I Generating Station – Unit G9 Upgrade							
Project Number: SAB10047		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic				Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A	
Project Start Date (month, year): January 2008				In-Service Date (month, year): December 2009			
Project Description: <p>This project includes: a new generator (with related excitation and governor equipment), a new transformer, new breakers, and new efficient turbine runner. This project will be coordinated and approved with an overhaul of the remaining turbine components (SAB10048), at a cost of \$0.8M (not reflected in the costs below). The design and work scope is expected to be similar to the frequency conversion of Unit G7, planned for 2008.</p> <p>The project is expected to return Unit G9 to its full operating capacity (it is currently de-rated by 30 percent or 10 MW), and provide a further 4.5 MW increase due to the more efficient turbine runner.</p>							
Project Need (i.e., justification for the project): <p>Unit G9 is in poor condition and can no longer be counted on to provide reliable long-term operation; there are substantial issues with major components of both the generator and the turbine. Although frequent maintenance and continual attention have enabled continued operation, the equipment issues are substantial enough that they should be resolved through unit rehabilitation.</p> <p>Unit G9 has not had a major rehabilitation since 1974 and is substantially degraded. Very high vibration levels and unit balance issues have resulted in restricting the generator to 70 percent output. Further deterioration and eventual failure is expected. Allowing Unit G9 to fail from service does not permit maximum utilization of Niagara River flows when additional water will become available to the Sir Adam Beck generating stations through the new Niagara Tunnel.</p>							
Project Costs:							
	LTD Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan	Future Plan	Total
Capital				\$6.0 M	\$ 23.0 M	\$ 1.0 M	\$ 30.0 M
OM&A							
Initial Release Amount:		Current Release Amount:		Variance (Current Release – Initial Release):			
Variance Explanation (required if Current Release - Initial Release >10% of Initial Release):							

Ontario Power Generation – Project Summary

Project Name: Sir Adam Beck I Generating Station – Unit G10 Upgrade							
Project Number: SAB10050		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic				Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A	
Project Start Date (month, year): August 2009				In-Service Date (month, year): December 2010			
Project Description: <p>This project includes: a new generator (with related excitation and governor equipment), a new transformer, new breakers, and new efficient turbine runner. This project will be coordinated and approved with an overhaul of the remaining turbine components (SAB10051), at a cost of \$0.8M (not reflected in the costs below). The design and work scope is expected to be similar to the frequency conversion of Unit G7, planned for 2008. The installation of a new more efficient turbine runner is expected to increase the capacity of the unit by up to 10 MW.</p>							
Project Need (i.e., justification for the project): <p>Unit G10 is near the end of its useful life. It was converted to 60 Hz and underwent a major mechanical overhaul in 1956. The turbine runner was replaced in 1986. However, recent inspections have revealed significant cavitation damage in the turbine. The generator is also in a deteriorated state, and the existing electrical equipment (e.g., breakers, transformer) currently do not have the capability to accommodate the anticipated increase in turbine capacity.</p> <p>Further deterioration and eventual failure is expected. Allowing Unit G10 to fail from service does not permit maximum utilization of Niagara River flows when additional water will become available to the Sir Adam Beck generating stations through the new Niagara Tunnel.</p>							
Project Costs:							
	LTD Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan	Future Plan	Total
Capital				\$ 0.5 M	\$ 6.0 M	\$24.5 M	\$ 31.0 M
OM&A							
Initial Release Amount:		Current Release Amount:		Variance (Current Release – Initial Release):			
Variance Explanation (required if Current Release - Initial Release >10% of Initial Release):							

Ontario Power Generation – Project Summary

Project Name: Sir Adam Beck I Generating Station – Rehabilitate Canal Lining							
Project Number: SAB10056		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic				Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A	
Project Start Date (month, year): June 2009				In-Service Date (month, year): December 2011			
<p>Project Description:</p> <p>The canal rehabilitation work consists of the following:</p> <ul style="list-style-type: none"> • Repair the eroded uppermost portion of the concrete liner near the water level to prevent further erosion and to ensure a smooth flow of water. • Repair the deteriorated 1920's concrete walls above the water to restore integrity and prevent failure of overlying walls and soil slopes. • Apply a concrete liner on the rock walls above the existing concrete liner/walls to prevent further weathering and rock falls, and to maintain the stability of walls and slopes above. <p>The condition of the concrete walls and floor below the water are unknown at this time and will be investigated in a definition phase study prior to the release of this project.</p> <p>The timing of this project has been coordinated with the completion of the Niagara Tunnel project in order to minimize the production losses associated with removing the canal from service.</p>							
<p>Project Need (i.e., justification for the project):</p> <p>The open cut canal is one of three major water paths to the Sir Adam Beck generating stations delivering approximately 600 cubic metres per second. It has a total length of 20.75 km, with an average water depth of 9 to 11.5 metres. It was built prior to 1920 in order to supply water to the Sir Adam Beck I Generating Station. The canal last underwent a major rehabilitation in 1964.</p> <p>In general, the canal liner is in poor condition. A collapse of any portion of the canal liner wall could result in significant production losses and negatively impact to the City of Niagara Falls' water supply.</p>							
Project Costs:							
	LTD Actual	2006 Actual	2007 Budget	2008 Plan	2009 Plan	Future Plan	Total
Capital					\$ 0.5 M	\$ 50.5 M	\$ 51.0 M
OM&A							
Initial Release Amount:		Current Release Amount:		Variance (Current Release – Initial Release):			
Variance Explanation (required if Current Release - Initial Release >10% of Initial Release):							

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	SIR ADAM BECK 1 - GS Unit 7 G7 FREQUENCY CONVERSION FROM 25Hz TO 60Hz		

SIR ADAM BECK 1 GS UNIT 7

G7 GENERATOR FREQUENCY CONVERSION FROM 25HZ TO 60HZ

Project Number: SAB10032

Niagara Plant Group

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	SIR ADAM BECK 1 – GS Unit 7 G7 FREQUENCY CONVERSION FROM 25Hz TO 60Hz		

SIR ADAM BECK 1 GS UNIT 7

G7 GENERATOR FREQUENCY CONVERSION FROM 25HZ TO 60HZ

SAB10032

RECOMMENDATION

Approve the release of \$ 33.4 M for the conversion of the 25 Hz G7 unit to a new 60 Hz unit. This will return G7 to service and increase the installed capacity of Sir Adam Beck 1 GS (SAB 1) by 68.5 MVA. (61.5 MW). G7 will optimize energy production by efficiently utilizing the water available to the Sir Adam Beck Complex, including water availability from the Niagara Tunnel. This generation will be incremental to the 1.6 TWh of generation identified in the Niagara Tunnel Project Business Case in July 2005.

The energy generation from G7 will be possible by increased use of the Pump Generating Station (PGS) to shift energy from off-peak to on-peak, increasing capacity output of the SAB facility.

This project is consistent with OPG's objective of continuing to optimize production from its existing hydroelectric generating assets. The unit is expected to produce an incremental 99 GWh annually.

With equipment upgrades, it is expected that current technology and materials can provide improvements in efficiency. Competitive bids have been obtained for the installation of a new 68.5 MVA, 60 Hz generator. The upgraded G7 is scheduled to be commissioned and placed into service by March 2009.

This project is identified in the current approved business plan with cash flows in 2007 and 2008. A developmental release of \$1.8M has been approved. The total project cost will be \$35.2M.

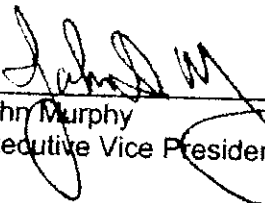
\$000s	2007	2008	2009	Total
Currently Released	1,800			1,800
Requested Now (Full Release)	6,100	23,364	3,946	33,410
Total Project Costs	7,900	23,364	3,946	35,210
<u>Investment Type</u>	<u>Class</u>	<u>NPV</u>	<u>IRR</u>	<u>Discounted Payback</u>
Value Enhancing	17	7,091 (using SEVs)	11.9% (using SEVs)	21 years (Using SEVs)

Investment Financial Measure: The increased energy output resulting from the Project will receive a regulated rate as part of OPG's regulated hydroelectric assets. This project will be included as part of the OPG rate submission to the Ontario Energy board.

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	SIR ADAM BECK 1 - GS Unit 7 G7 FREQUENCY CONVERSION FROM 25Hz TO 60Hz		

2. SIGNATURES


Submitted by:


 John Murphy
 Executive Vice President - Hydro

20 May 2007


Date

Recommended by:


 Pierre Charlebois
 Senior Vice President and
 Chief Operating Officer


Aug 13/07
Date

Finance approval:


 Donn Hanbidge
 Senior Vice President and
 Chief Financial Officer

Aug 17/07
Date

Line Approval:


 Jim Hankinson
 President and CEO

Date

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3. BACKGROUND AND ISSUES

Sir Adam Beck 1 GS (SAB 1) is a ten unit station located on the Niagara River. It was placed in service in 1922 and has seven 60 Hz generating units and three 25 Hz generating units. The station currently has a total capacity of 447 MW, an annual energy production of approximately 1,670 GWh and 2005 production revenue of \$55.1 million (at \$33/MWh).

SAB 1 G7 is a 25 Hz unit. In 2005 the Johnson valve that controls the water flow to the G7 turbine failed, and because OPG's obligation to the 25 Hz market could be met by the SAB 1 GS 25 Hz units G1 and G2, G7 was decommissioned. G7 was subsequently deregistered with the IESO.

As of April 2009, the IESO will end the 25 Hz energy market and 25 Hz power will have no market value. There is no future benefit to having G7 available to generate 25 Hz power.

Beginning in 2009, additional water will be supplied to the SAB complex by the new Niagara Tunnel. A new 60 Hz generating unit will make use of this additional water. Deferring this project will mean OPG will not make full use of the water diversion available.

Similar work involving the replacement of a 25 Hz generator with a new 60 Hz generator and associated components was carried out on SAB 1 G6 in 1994/95. Lessons learned and experiences acquired during that project have been incorporated into this project.

A life cycle plan for SAB1 is currently being prepared which will include the conversion of this unit, the plans for the other 9 units and the impact on the transmission system.

4. ALTERNATIVES & ECONOMIC ANALYSIS

Base Case (Status Quo): Leave SAB1 G7 Out of Service

This alternative does not make use of the water available for generation and does not maximize the generation of hydroelectric energy.

- **This alternative is not recommended.**

Alternative 1:

Install a new 68.5 MVA (61.5 MW capacity) 60 Hz Generator, Transformer, Headgates, Runner, and Upgrade the Turbine

This alternative brings to service a 61.5 MW capacity hydroelectric generating unit that optimizes the use of the water available. It includes a new generator with new protections and controls, a new exciter and digital governor head, new switchgear, new headgates, a new transformer and removal of the failed internal components of the Johnson valve. It also includes a new efficient runner and a turbine upgrade.

- **This is the recommended alternative**

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Alternative 2:

Install a 56.7 MVA (51 MW Capacity) 60 Hz Generator, Transformer, Headgates, Upgrade the Turbine and Re-use the Existing 70-year-old Runner

This alternative is rejected because it does not optimize the use of the water available. Re-using the existing runner, which has an output of approximately 51 MW, limits the size of the new generator to 51 MW, well below the optimal size.

- **This alternative is not recommended.**

Financial Analysis:

\$ Million's	Base Case	Alt 1 (recommended)	Alt 2
Project Cost	0	35.2	34.0
NPV (after tax)	0	7.1	2.5
Impact on Economic Value	0	7.1	2.5
IRR %	0	11.9	10.7
Discounted Payback (Yrs)	n/a	21	31

The NPV calculations are conservative as they exclude some potential benefits.

Additional generation available at the Beck Complex is considered to have a capacity benefit, as it would likely displace other more expensive generation at peak times. However, due to the variety of operational parameters and water constraints during peak months of the Beck Complex, it is very difficult to quantify the capacity benefit with a high degree of precision. They have therefore been excluded to be conservative. To put this into context, a conservative estimate of 5 MW would increase the NVP to \$8.8M, and a capacity benefit of 20 MW would increase the NPV to \$14.0M.

The Beck Complex is often operated for operating reserve and paid through an operating reserve revenue stream. The NPV calculations do not include that benefit as this value is determined at the time of operation depending on system requirements, and how the units are required to operate.

In a rate regulated environment, OPG will receive market prices for any generation exceeding 1,900 MW from the regulated hydroelectric fleet. The addition of G7 will allow generation above 1,900 MW on a more frequent basis. Because this level of generation can not be assured, a conservative approach has been taken and the quantitative benefit has not been included.

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The breakeven levelized Unit Energy Cost (LUEC) for this project over a 50 year period is \$43.32/MWh. This is lower than the recent OPA contracts that are > \$70/MWh.

The Sir Adam Beck facilities are part of OPG's regulated hydroelectric fleet. A Power Purchase Agreement cannot be obtained for this generation. This project will be included in the OPG rate regulation submission. The impact on regulated rates required to recover the costs of this project is expected to be approximately 0.07%

5. THE PROPOSAL

Results to be delivered:

Construct a new SAB1 G7 generator to supply 60 Hz power to the Hydro One connection point. The generator is scheduled to be commissioned by the end of March 2009. The resulting generation capacity will provide an average of 99GWh annually and increase the Beck Complex's ability to provide operating reserve as well as provide assistance with EBG on the system.

This project includes the removal of the existing 54 MVA, 25 Hz, G7 generator and the supply and installation of a new generator, a new transformer, new headgates and a new runner and the upgrade of the turbine and the remaining associated unit components.

Runner

The existing runner dates from 1936. It was last inspected in 2001 and reported to be in good condition but with some cavitation and pinholes in the stainless steel overlay.

Preliminary engineering analysis indicates that power available through the G7 water conveying structures is in excess of 58 MW. The existing runner is rated to produce only approximately 51 MW of power. The existing runner is, therefore, unable to fully utilize the available water.

A contract has been awarded for runner design, runner model development and model testing for new runners for SAB 1 GS. Preliminary engineering indicates that a new runner with an efficiency of approximately 90% and a corresponding output of 58 MW, at efficiency, can be supplied by the runner manufacturer as part of the purchase option OPG has retained.

Generator:

A new 68.5 MVA (61.5 MW capacity), 60 Hz generator can be installed to match the maximum power output of a new runner.

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With a new generator and new runner, G7 will have a high efficiency and will generally be the first unit on / last unit off at the station to maximize generation. The expected annual energy production for SAB 1 will increase by 99 GWh annually on average.

Transformer

The replacement of the 25 Hz generator with a 60 Hz generator necessitates the replacement of the three existing 25 Hz transformers. The existing transformers are in fair condition and the best one will be kept as a spare for Units 1 and 2.

The existing transformer will be replaced with a new 60 Hz, three phase, water-cooled transformer.

Turbine Upgrade

The last significant amount of work on the G7 turbine was carried out in 1975. The normal interval between such work is 25 to 30 years. The turbine upgrade will be performed while the unit is dismantled for the installation of the new runner and new generator. The scope will include the modification of the discharge ring and the installation of greaseless bushings.

Johnson Valve and Headgates

Each generating unit at SAB 1 generating station was built with a Johnson valve to control water flow to the unit. Following the SAB 1 G4 Johnson valve failure in 1999, an engineering study concluded that the Johnson valves had reached the end of their service life and could no longer be relied on to control water flow to the units. A program to remove the internal parts of the Johnson valves and to replace the functionality of the Johnson valves with headgates was initiated. To date, the other 9 units at the station have had this work done.

Other Major Items In Scope

The existing governor control head is at the end of its service life. Replacement parts are not available. The governor head will be replaced with a new digital control head.

A new exciter will be supplied for the new generator.

New switchgear will be supplied for the new generator.

Upgrades to the generator output buswork and to the electrical connections to the Hydro One system are required.

Assessments by both Hydro One and the IESO are required prior to connecting new generation to the Ontario Grid. Agreements have been made with both parties, and

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funding provided in the developmental release to carry out the studies in order to maintain the project schedule.

Ongoing Operational and Maintenance Cost Impacts

Ongoing operation of the converted unit will be absorbed in the existing operation and support infrastructure of the facility. Non standard maintenance costs of \$5k per year, ½ of maintenance FTE as well as a future unit overhaul have been included in the project NPV calculations. These costs will be included in future Niagara Plant Group Business Plans and budgets.

Qualitative factors

Trades work has been reviewed under the Chestnut Park Accord Addendum, and has been awarded to the Building Trade Unions (BTU).

Project activities will be conducted in accordance with Niagara Plant Group Environment, Health and Safety (EH&S) Management System

Project management

A Project Execution Plan identifying scope, schedule and cost has been developed for this project

The project will be executed by the Niagara Plant Group Project Management Department

Post Implementation Review (PIR)

A comprehensive Post Implementation Review will be conducted within 12 months of the date of the return to service of the unit.

The following unit performance parameters will be measured:

Turbine/ generator output: The Niagara Plant Group Production Department will verify that the generator output is 61.5 MW. Revenue metering equipment will be used to measure the output.

Runner performance: The runner performance with respect to cavitation will be assessed by the Niagara Plant Group Production Department and Hydro Engineering by making an inspection of the runner in accordance with the runner warranty details.

The Project Department will review the project by comparing the planned cost and schedule milestones as outlined in the Project Execution Plan to the actual cost and schedule milestones.

6. QUALITATIVE BENEFITS

Qualitative Factors & Sustainable Energy Development

- Installation of headgates at the top of the penstock provides increased level of safety for the powerhouse, staff, and environment in the event of a penstock failure.
- Combining the generator replacement, runner replacement, headgate installation, and turbine upgrade into one outage reduces total outage time, avoids repetitive dismantling and assembly of the unit.
- Increased production of renewable hydroelectric energy (61.5 MW, 99GWh annually).
- Increased efficiency of water use due to the upgraded runner.
- Environmentally friendly generation with virtually no additional environmental impact which will displace more costly and higher emitting fossil fueled facilities.

7. RISK ANALYSIS

See Appendix 2 for Risk Management Table.

Cost Risk:

There is a high level of confidence in the cost estimate for this project. Over 50% of the project estimate is based on quotes or budget estimates from suppliers and past purchase experience.

- The risk of over expenditure on the headgate work (\$2.7M) is low because the work has been done in a satisfactory fashion nine times before by the same contractor.
- The generator design/ supply/ install, the largest single component of the project is a firm bid quotation.
- Preliminary price quotes have been obtained from known suppliers in an effort to develop accurate cost estimates.
- A contingency of 14% is included in the project cost estimate. The overall contingency has been prepared by adjusting contingencies by major item based on its unique risk characteristics.

Assumed Benefits (Generation) Risk:

In order to determine the energy generation potential of G7, historic Niagara River flows were reviewed. The amount of water available at the plant for G7, incorporating water from the new Niagara Tunnel, was determined and the seasonal peak/ off-peak timing of

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this water was predicted. Historic water usage at the SAB Complex was extrapolated into the future and the amount of water available for G7 was determined. In order to optimize the water diversion, the Pump Generating station (PGS) was also optimized.

Schedule Risk:

The schedule is aggressive and there will be numerous contractors on site, raising the possibility of interference. This concern will be managed by closely scheduling and coordinating site work.

Supply/ Procurement/ Quality Assurance Risk:

The potential generator suppliers have been pre-qualified to reduce the risk of unsatisfactory contract performance.

Possible manufacture of runner and generator components overseas presents quality risks. Inspection and test plans are being utilized to monitor the product quality through the manufacturing process.

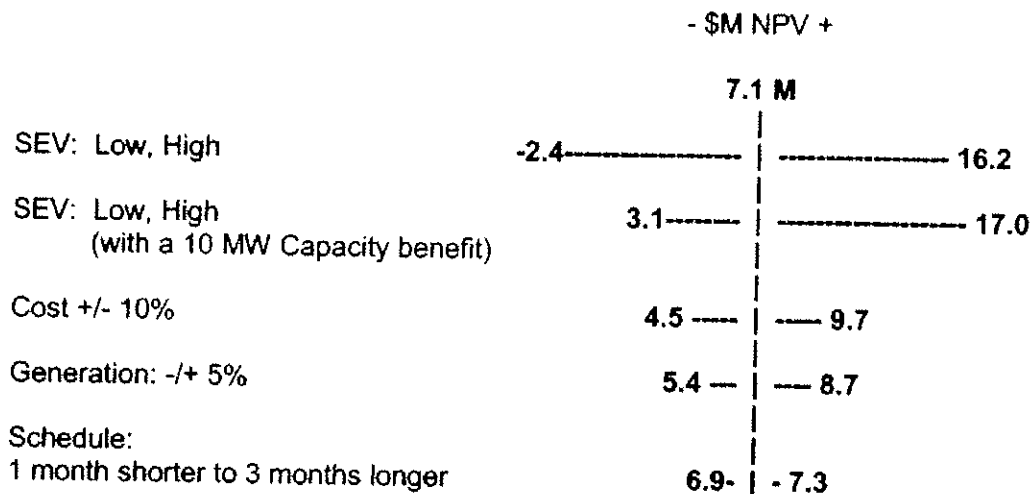
Graphical Representation of Risk using a Tornado Diagram:

The project is considered to be sensitive to the following variables:

- SEV
- Project cost
- Generation
- Project in-service date (project schedule)

A Tornado diagram has been constructed to assess the project NPV with the following variables and changes:

- o Change to SEV: High and Low values
- o Change to SEV: High and Low values, also including a capacity benefit in the NPV calculations equal to 20MW
- o Project cost: + / - 10%
- o Generation: - / + 5%
- o In-service date: schedule shortened by 1 month / extended by 3 months



Schedule has relatively little impact on the NPV due to the seasonal characteristics of the generation from the unit and the timing of the scheduled in-service. Generation also does not have a large impact. The project cost also directly affects the NPV.

The project NPV is most sensitive to a variation in the SEV (market energy price). If a conservative capacity benefit of 20MW is included in the NPV calculation, the impact of low SEV's is greatly reduced, and will result in a positive NPV.

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ONTARIOPOWER HYDROELECTRIC
GENERATION Summary of Estimate

Date March 14, 2007

Project # SAB10032

Facility Name: Beck 1 GS

Project Title:

G7 Generator Frequency Conversion from 25 Hz
to 60 Hz

Years (k\$)	2007	2008	2009	TOTAL	%
Project Mgmt.	446	594	149	1,189	3.4
Engineering	300	400	130	830	2.4
Permanent Materials	2,930	9,568	1,200	13,698	38.9
Construction/ Installation					
- Contractors	2,927	8,230	1,434	12,591	35.8
Interest	307	1,298	433	2,038	5.8
Contingency	990	3,274	600	4,864	13.8
TOTAL	7,900	23,364	3,946	35,210	100%

- Notes: 1 Schedule Start date: May, 2007
In-service dates(s):
Headgates, Johnson valve 9 % Jan. 2008
Generator, balance of work 91% Mar. 2009
- 2 Interest and Escalation rates are based on current
allocation rates provided by Corporate Finance
- 3 Includes Removal Costs of: 750 k\$
- 4 Includes Definition Phase Costs of: 1,800k\$

Prepared by:

Approved by:

Torben Frost

Torben Frost
Project Engineer

John Conlon

John Conlon
Project Manager

APPENDIX 1

Assumptions

Financial Model

Following are the key assumptions used during the modeling of the Project:

Project Cost Assumptions:

1. Quotes from suppliers of major components were used if available.
2. Costs for other components and labour were based on costs for similar work carried out in the past with appropriate escalators applied.
3. Competitive bids can be received for the work to be contracted out.

Financial Assumptions:

4. In a non-regulated scenario, energy produced will provide revenue at the 2006 system energy values (SEVs).
5. The September 2006 Hydro FE Model, was used with a 2007 project start year.

Project Life Assumptions:

6. The project can start immediately after approval.
7. The project can be completed in 22 months and the generator can be commissioned in March, 2009.

Energy Production Assumptions:

8. Niagara River flow modeling tool accurately models the water available to the Beck plants.
9. Existing outage plans can be followed.
10. Generation at the Beck plants can be maximized while adhering to the market dispatches.
11. Historical forced outage rates will be typical in the future.

Operating Cost Assumptions:

12. The new unit will increase OM&A costs by 0.5 FTE (or equivalent cost of work contracted out).
13. On-going Non-Standard costs associated with the new unit will be minimal (5k per year)

APPENDIX 2

Risk Management Table for Full Project Release

Risk Category	Risk Description	Implications	Mitigation	Risk After Mitigation
Cost	Electrical Systems - Hydro 1 - Extent to which OPG is responsible for changes to the Hydro one equipment	Cost: Uncertain – Costs will be firmed up as Hydro One completes their Customer Impact Assessment in November/ December 2007	Due to the uncertainty, include a contingency to increase this amount to	Low
Schedule	Will Hydro One accept 'E' bus?	Schedule: Preliminary schedule from Hydro One indicates no impact, but this requires Hydro One to dedicate adequate engineering and construction effort	Approach Hydro One to start preliminary work on accelerated schedule	Medium
Schedule	Electrical Systems - Hydro 1 to determine what changes they need to make to their system	Schedule: If changes required to Hydro One system are extensive, this may delay in-service date - by several months?	OPG to participate in outage planning and work coordination	Medium
Schedule	IESO System Impact Assessment (SIA) and Hydro One Customer Impact Assessment	Delays in completing the assessments could delay the ability to connect to the Ontario Grid resulting in lost opportunity.	The Developmental release has included funds to start both the IESO and Hydro One assessments	Medium
Schedule	IESO System Impact Assessment (SIA) and Hydro One Customer Impact Assessment results in insufficient transmission Capacity to allow G7 to connect	Should the SIA state that it is not possible to connect new generation to the grid, generation from G7 could be bottled.	SAB 1 has a common bus system. When G7 is completed, G9 will be at the end of its service life. Should capacity not be available on the transmission system, G9 will be taken out of service and not rehabilitated. G7 will be connected to the bus. (See appendix 5 for further discussion)	Low
Cost	Generator removal - costs currently based on G6 costs - current estimate \$535k (not a quote)	Cost: Retaining existing foundation bolts may be challenging	Obtain competitive quotes from contractors Include adequate contingency	Low
Schedule		Schedule: Possible project delay	Schedule work appropriately. The unit is currently not operating, so the removal start is not restricted by outage requirements.	Low
Cost	Generator foundation - more work than what GE has anticipated in proposal	Cost: GE will have cost extras if they cannot use the existing foundation bolts as planned \$50k - \$100 k	Have GE inspect and approve foundation condition as soon as generator is removed Include adequate (50%) contingency on foundation work cost	Low
Schedule		Schedule: May delay in-service date - 3 weeks?		Low

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Appendix 3

Major Component Cost Estimates

Unit Runner

American Hydro has been awarded a contract for runner design, runner model development and model testing for new runners for SAB 1 GS. Preliminary engineering indicates that a new runner with an efficiency of approximately 92% and a corresponding output of 58 MW, at efficiency, can be supplied by the runner manufacturer.

OPG has the option to purchase a runner for unit 7 at a cost of \$ 0.5M.

New Generator

The design and build of a new generator is on the critical path for the project. Work must start in early 2007. GE was one of three vendors submitting proposals. Bids were evaluated with Supply Chain's involvement, and GE was selected to supply and install the new generator. A developmental release has been approved to allow GE to commit to this work, and to cover their cost incurred (up to \$1M) should the project not proceed. A new generator, supplied and installed, will have a cost of approximately \$12M.

Replacement of the existing 25hz Transformer

A new water cooled transformer, will cost \$1.3m based on firm quotes received.

Turbine Upgrade

Upgrades to the turbine, to increase the power output, and modifications consistent with a 25 to 30 year maintenance cycle, will cost approximately \$3.1M.

Johnson Valves and Head Gates

The removal of the internal components of the Johnson valves and installation of headgates has been completed on the other 9 units resulting in reliable work processes and cost estimates.

The internal components of the G7 Johnson valve will be removed and new headgates will be installed in the G7 headworks at a cost of \$3.2M.

Governor Control head

A new governor head, supplied and installed, will cost approximately \$460k.

Electrical system and Connection to Hydro One

This work will cost approximately \$5.0M to upgrade electrical system up to the connection to Hydro One. [REDACTED]

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[REDACTED]

[REDACTED]

IESO System Impact Assessment and Hydro One Customer Impact Assessment

The developmental release (approved) includes \$30k funding to have the IESO complete a System Impact Assessment. This assessment is required prior to connecting any new generation to the Ontario Grid. Although G7 is part of the existing SAB1 complex, the unit was deregistered in 2005, and therefore requires this assessment.

In addition, the developmental release (approved) includes \$15k funding for Hydro One to complete a Customer Impact Assessment which is required prior to adding additional generation to the transmission system.

New Exciter

A new exciter is required for the new generator and is expected to cost \$[REDACTED]k.

New unit Switchgear

New switchgear is required for the new generator and is expected to cost \$[REDACTED]k.

Appendix 4

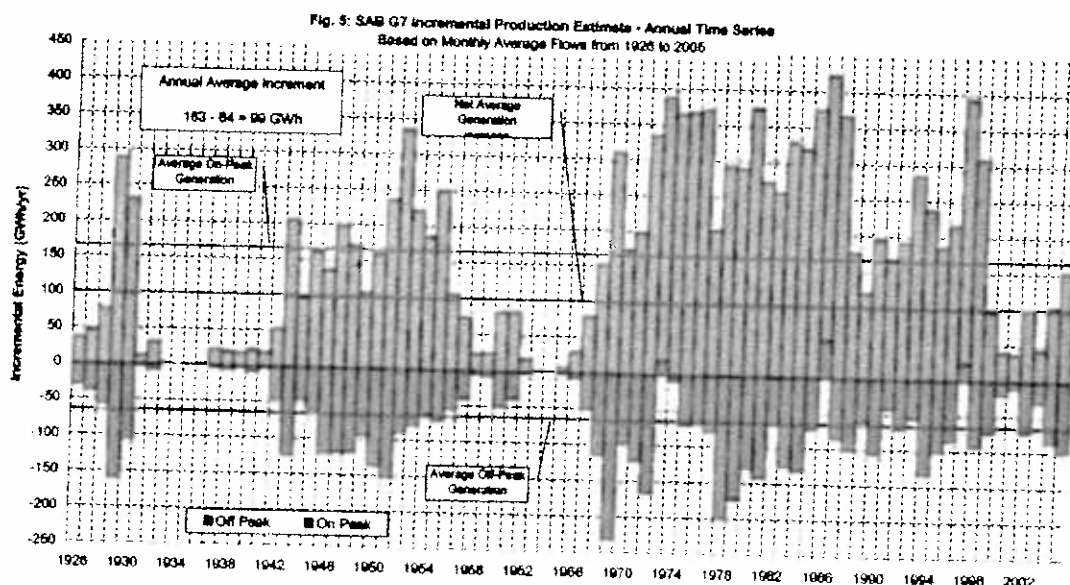
Impact of Tunnel Water on Generation with and without G7

The Niagara Tunnel project assumed the Beck complex will increase its generation on average by 1.6 TWh as a result of increased water diversion. This generation is derived from additional water delivered and an increased ability to utilize PGS to pump. The additional generation would be generated by all the units across the Beck Complex as the tunnel would increase water throughput for a greater period of time. At the time the Niagara Tunnel BCS was presented, G7 was operating as a 25 Hz unit. The Niagara Tunnel BCS was silent on the retirement of the 25hz system and did not contemplate the conversion of any 25 Hz units to 60 Hz. The additional generation was a function of the additional water at the existing station configuration.

To determine the possible generation advantage from the conversion of G7, the generation from the Beck Complex was modeled. Monthly average Niagara River flows from 1926 to 2005, were used to calculate corresponding average tourist and non-tourist hour diversion flows for future diversion capability conditions according to long-term average seasonal restrictions and a DeCew diversion assumption of 200 cms. The model included the new tunnel water as if it were in service for this period. The model was run with G7 not being in service, and with G7 being converted to 60 Hz operation.

Without the G7 conversion, the average annual generation would have been 12,762Gwh. With G7 rehabbed, the average annual generation is 12,861 GWh, for an average annual increase of 99 GWh. This is made up of 163 GWh of on peak generation, offset by -64 GWh of off peak generation, which is the generation required by PGS for pumping.

The graph below indicates the on peak and off peak generation that would have resulted with G7 in service for each of the years since 1926. The green line is the average Net of off-peak (red line) and On-peak (blue line)



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Appendix 5

Risk Mitigation Strategy for Queenston Flow West Transmission Limitation.

The outcome of the IESO System Impact Assessment (SIA) will be known in June 2007 and the outcome of the Hydro One Customer Impact Assessment (CIA) will be known in the fall of 2007. There is a potential risk to the viability of the G7 project if the SIA concludes that the system cannot accept the additional station output provided by G7.

The condition of G9 is an important factor when discussing risks to the viability of the G7 project. G9 is currently operating at a reduced output due to its poor mechanical condition. It is scheduled to be removed from service for major repairs, or to be replaced by a new unit, as soon as G7 is placed into service.

G9 will be taken out of service and G7 can be connected to the station output bus and placed in service. The net effect on the transmission system, by this substitution of G7 for G9, will be minor.

Under the current SAB I unit outage strategy, appreciable capacity is not added to the transmission system until the first quarter of 2010 when SAB I G9 is returned to service. Therefore, there is a 3 year period in which the transmission limitation issue can be resolved. The 25 Hz market will also have ended by that time, and it may be possible to utilize the 25 Hz transmission system to help resolve this issue.

If the transmission system capability issue is not resolved by 2010, the timing of the rehabilitation of G9 will be reassessed and the project will be delayed until the transmission constraints are resolved.

The financial risk to the G7 Conversion Project is reduced to the incremental cost of the G7 project over the cost of the G9 project. This incremental cost is in the range of \$3M to \$10M.

Ontario Power Generation – Project Summary

Project Name: Sir Adam Beck I Generating Station – Unit G3 Upgrade							
Project Number: SAB10064		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic				Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A	
Project Start Date (month, year): October 2009				In-Service Date (month, year): January 2012			
Project Description: <ul style="list-style-type: none"> • This project includes: a new generator (with related excitation and governor equipment), a new transformer, new breakers, and new efficient turbine runner. This project will be coordinated and approved with an overhaul of the remaining turbine components (Project Number: SAB10075) at a cost of \$1.0M. The design and work scope is expected to be similar to the frequency conversion of Unit G7, planned for 2008. • The project is expected to increase the capacity of Unit G3 by 4.5 MW due to the more efficient turbine runner. • The project is a major mechanical and electrical overhaul that will ensure the unit is capable of sustained production for 25 - 30 years until the next major overhaul. 							
Project Need (i.e., justification for the project): <ul style="list-style-type: none"> • The Sir Adam Beck 1 G3 unit was last overhauled in 1985. Hydroelectric units of this type normally require major overhauls on a 25 - 30 year cycle to ensure continued operation. Unit G3 is in fair condition, but by 2011 will no longer be counted on to provide reliable long-term operation; there are issues with major components of both the generator and the turbine. Although frequent maintenance and attention have enabled continued operation, the equipment issues are substantial enough that unit rehabilitation is required. • Turbine runner technology has advanced such that additional production may be obtained from the unit. • Electrical capabilities of this machine are currently sufficient to permit additional production. • Allowing Unit G3 to fail from service does not permit maximum utilization of Niagara River flows when additional water will become available to the Sir Adam Beck generating stations through the new Niagara Tunnel. 							
Project Costs:							
	LTD Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan	Future Plan	Total
Capital					\$ 0.5 M	\$ 31.0 M	\$ 31.5 M
OM&A						\$ 1.0 M	\$ 1.0 M
Initial Release Amount:		Current Release Amount:		Variance (Current Release – Initial Release):			
Variance Explanation (required if Current Release - Initial Release >10% of Initial Release): N/A							

Ontario Power Generation – Project Summary

Project Name: Pump Generating Station - Dyke Foundation Grouting and other protective measures							
Project Number: SABP0022		Project Category: <input type="checkbox"/> Regulatory <input checked="" type="checkbox"/> Sustaining <input type="checkbox"/> Value Enhancing / Strategic				Project Type: <input checked="" type="checkbox"/> Capital <input type="checkbox"/> OM&A	
Project Start Date (month, year): June 2008				In-Service Date (month, year): December 2010			
Project Description: <ul style="list-style-type: none"> Upgrade protective measures: i.e., foundation grouting, upstream clay blanket, and pressure relief systems which were implemented after the 1958 Pump Generating Station failure of the Dyke in order to sustain production of the Pump Generating asset. 							
Project Need (i.e., justification for the project): <ul style="list-style-type: none"> The Pump Generating Station dyke is a manmade dam that provides headpond impoundment for the Pump Generating Station station. The foundation at the site is the Lockport dolomite, which is susceptible to sinkhole formation. Sinkholes in turn may lead to piping, a phenomenon where water leaking through a dam begins to remove material from the dam. This process if left unchecked could result in a sudden dam failure. This dyke failed in 1958 as a result of piping through a joint in the bedrock. After the 1958 failure, a portion of the dyke was grouted, the upstream clay blanket was enhanced and pressure relief systems were installed. A monitoring program was put in place that continues to this day under the provisions of OPG's Dam Safety Program. Diving inspections carried out as part of this monitoring program have located sinkhole-like features and depressions in the bottom of the reservoir. In addition, the results of the last Dam Safety Periodic Review (2005) recommended that a detailed assessment of the protective measures against piping failure should be carried out at the Pump Generating Station. Detailed inspections and testing are scheduled for 2008 and 2009. At the end of the assessment the extent of the required grouting program will be determined. Grouting of a dyke foundation consists of boring a number of holes in the area of concern and then pumping a grouting material into those holes such that they form an impervious barrier to water seepage and particles migration. In general, this technology is complemented by enhancement to upstream clay blankets and pressure relief systems, as required. It is not expected that the entire dyke requires grouting. The total project costs will be driven in large part by the extent of grouting required. 							
Project Costs:							
	LTD Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan	Future Plan	Total
Capital				\$ 0.3 M	\$ 0.7 M	\$ 19.0 M	\$ 20.0 M
OM&A							
Initial Release Amount:		Current Release Amount:		Variance (Current Release – Initial Release):			
Variance Explanation (required if Current Release - Initial Release >10% of Initial Release): N/A							