The Impact of Exempting the Muskrat Falls Project from Oversight by the Newfoundland and Labrador Board of Commissioners of Public Utilities

Report for the Commission of Inquiry
Respecting the Muskrat Falls Project

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Scope of report

This report has been commissioned by the Commission of Inquiry Respecting the Muskrat Falls Project to provide an assessment of the impact of exempting the Muskrat Falls Project from regulatory oversight by the Newfoundland and Labrador Board of Commissioners of Public Utilities (PUB) on the development and costs of the project.

Agenda

1. The Purpose of Economic Regulation
2. Best Practices in the Design of Regulatory Agencies
3. Advantages and Disadvantages of Delegating Oversight to Agencies
4. NL's Board of Commissioners of Public Utilities
5. Regulatory Oversight of Major Electricity Infrastructure Projects
    - Alberta, Manitoba, Nova Scotia, and Ontario
6. Oversight of Muskrat Falls
7. Consequences of Exempting Muskrat Falls from PUB Oversight
8. Conclusions

The Purpose of Economic Regulation

The Purpose of Economic Regulation

- Regulatory agencies substitute for normal competitive market forces in the electricity sector, where utilities often have a monopoly.

- Regulators protect consumers by setting rates based on utility's cost of service – utility allowed to recover prudent costs and earn a financial return on assets.

- Key task for regulators is to determine 'reasonable' level of operating and capital costs.

- Challenges
    1. **'Hidden' information** – hard for external party to accurately observe prudency of utility decisions given complexity of operations.
    2. **Utility incentives** – increasing regulated asset base leads to higher profits.

Well-designed regulatory arrangements can mitigate information and incentive challenges. Public policy organizations and academic experts have proposed key governance features of regulatory agencies that determine effectiveness.

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Best Practice in the Design of Regulatory Agencies

1. **Objectives** – Clear principle-based goals established in legislation. E.g. Ontario Energy Board: "*protect the interests of consumers with respect to prices…promote economic efficiency…facilitate the maintenance of a financially viable electricity industry*".

2. **Resources and powers** – Sufficient agency budget and staff resources to fulfill mandate. Formal powers to gather information, investigate, enforce regulation, set penalties.

3. **Independence** – Autonomy from government increases decision-making impartiality and stakeholder confidence. Commissioner appointment and agency budget mechanisms.

4. **Accountability** – Appeal mechanisms to courts provide safeguards for stakeholders. Agency reporting requirements to executive and/or legislative branches facilitate government review of performance.

Best Practice in the Design of Regulatory Agencies

5. **Stakeholder participation –** Ability of intervenors to participate in hearings – provide evidence and testimony, cross-examine others – improves informational environment.

6. **Evidence-based decision-making** – Agencies operate as quasi-judicial tribunals: receive evidence under oath, allow cross-examination to test reliability of facts and arguments. Requirement for regulators to rationally base decisions on evidence provided during hearings ensures decisions are not arbitrary, and raises importance of credible evidence.

7. **Transparency** – Public availability of information about regulatory processes, evidence, and decisions improves accountability of agencies to stakeholders - has the regulator adhered to mandate or are there grounds for appeal. Transparency about government expectations of regulator allows ministers and legislature to monitor performance.

Advantages and Disadvantages of Delegating Oversight to Agencies

Advantages

1. Develops reliable information about utility costs, benefits, impacts and risks – especially valuable for large, complex projects.
2. Strengthens public and stakeholder trust in regulation through transparent, evidence-based, open processes.
3. Improves stability and predictability of regulation when agencies are independent.

Disadvantages

1. Time-consuming, costly administrative process.
2. Less flexibility to consider factors outside scope of legislated agency mandate (generally economic).

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NL's Board of Commissioners of Public Utilities

1. **Objectives** – *Electrical Power Control Act, 1994*, requires "efficient production, transmission and distribution" and "lowest possible cost consistent with reliable service". PUB mandated to set reasonable rates, permit utilities to earn a just and reasonable return, ensure sufficient planning by utilities. Regulates Hydro and NP with ~308,000 customers.

2. **Resources and powers** – Structure and powers specified in *Public Utilities Act*. 4 commissioners, 12 staff, budget ~$2.5m (excl. hearing costs) – among smallest in Canada.

3. **Independence** – PUB is independent entity with legislated mandate, authority and resources. 10-year commissioner appointment terms strengthen independence, as does PUB funding from industry assessments. Gov't has some directive powers.

4. **Accountability** – PUB decisions may be appealed to Court of Appeal. PUB is accountable to Minister of Justice and Public Safety who presents budget to cabinet. Transparency and Accountability Act requires PUB to submit annual performance report to House of Assembly.

NL's Board of Commissioners of Public Utilities

5. **Stakeholder participation** – Intervenor participation is common in major applications, and PUB encourages stakeholder representation in hearings with cost awards. E.g.: Hydro's 2013 Amended GRA involved 8 intervenors and 43 public hearing days.

6. **Evidence-based decision-making** – PUB relies on evidence provided by applicant, intervenors, PUB staff, and expert consultants. PUB has authority to obtain utility records, summon witnesses and take evidence under oath. Publishes written decisions and orders that explain evidentiary basis and rationale.

7. **Transparency** – PUB notifies public about applications and pre-hearing conferences through local media. Documentation relating to applications is publicly accessible through PUB website and electronic management system.

NL's Board of Commissioners of Public Utilities: Summary

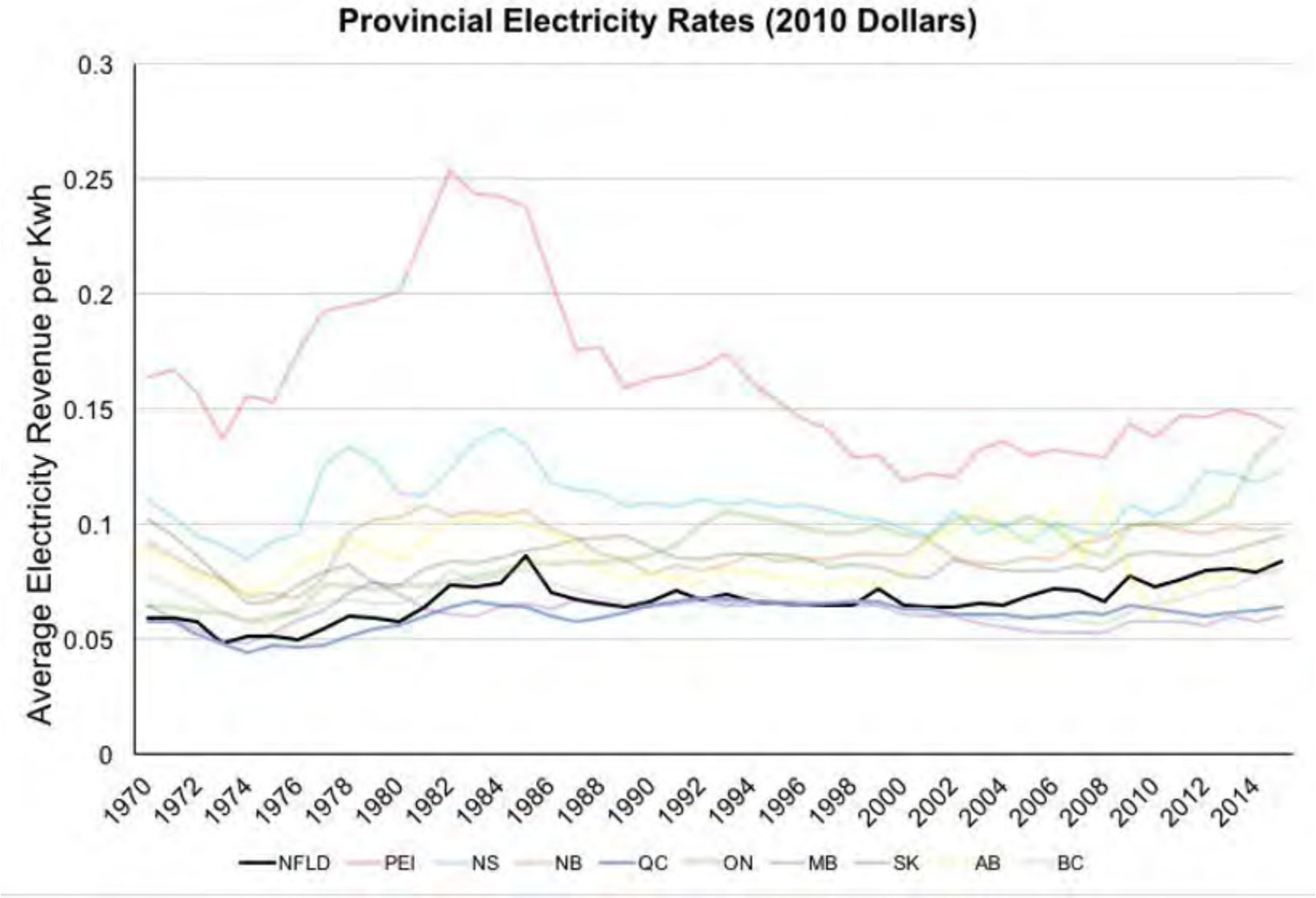
- PUB is structured to provide expert, independent determination of whether utility investments and expenditures are consistent with providing lowest-cost power to consumers.

- PUB experience: 419 public utility orders from 2006/7 to 2015/16.

- Newfoundland Power (2006): "*Regulation in this province has been stable, has worked well and is currently moving in the right direction*".

- Power Advisory (2015 report) identified some areas for improvement:
  - Integrated resource plans would provide long-term plan for the sector
  - Time-of-use rate structures would encourage more efficient consumption, reduce peaks
  - Regulation of Hydro has been infrequent and twice appealed to courts.

Electricity Rates in NL, 1970-2015



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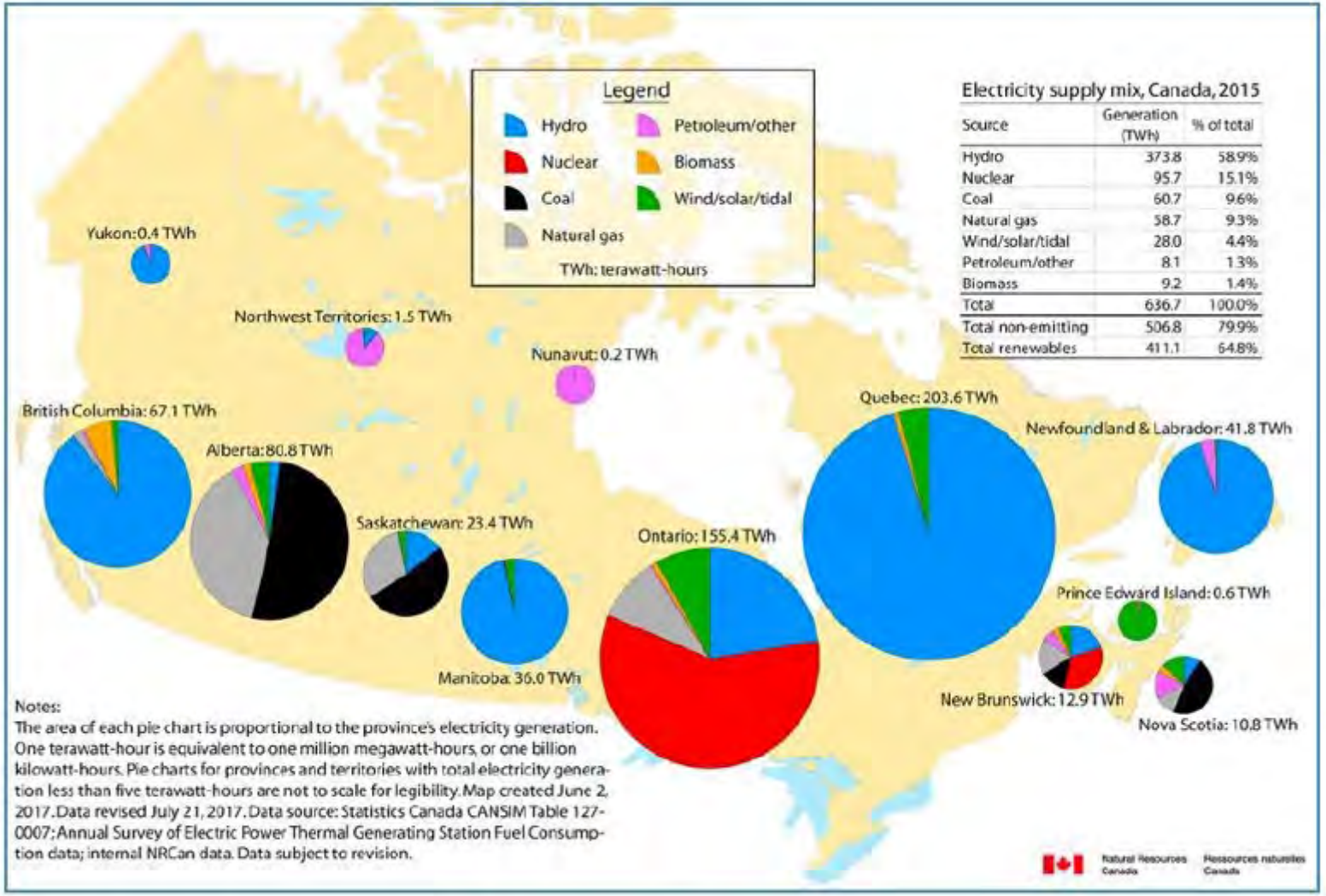
Case Studies of Major Electricity Projects in other Provinces

- Four case studies of regulatory oversight of megaprojects in Canada
  - Commenced or completed over last decade
  - Different provinces
  - > $1 billion cost
- Assess regulatory oversight at each stage of project development

Case Studies of Major Electricity Projects in other Provinces

1. Maritime Link, Nova Scotia ($1.6bn)
2. Darlington Nuclear Generation Station Refurbishment, Ontario ($12.8bn, est.)
3. Western Alberta Transmission Line, Alberta ($1.7bn)
4. Keeyask Generation Station, Manitoba ($10.5bn, est.)



Electricity supply mix, Canada, 2015

Source	Generation (TWh)	% of total
Hydro	373.8	58.9%
Nuclear	95.7	15.1%
Coal	60.7	9.6%
Natural gas	58.7	9.3%
Wind/solar/tidal	28.0	4.4%
Petroleum/other	8.1	1.3%
Biomass	9.2	1.4%
Total	636.7	100.0%
Total non-emitting	506.8	79.9%
Total renewables	411.1	64.8%

Source: Natural Resources Canada, Submission, 20 September 2017.

Stages of Regulatory Oversight for Major Electricity Projects

Project Identification	Evaluation	Approval	Execution & Oversight	Cost Review & Recovery
• **Why is the project needed?**	• **What are the project costs and risks relative to alternatives?**	• **Who approves the project, and on what basis?**	• **How is the project monitored?**	• **How are costs reviewed and recovered?**

Effective Regulation of Major Electricity Projects

- **Project Identification**
  - System planner, or utility together with system planner, develops long-term integrated resource plan that includes generation, transmission, conservation, and demand-management options for meeting future system needs.
  - Planner or utility may identify new project consistent with system plan.
- **Evaluation**
  - Regulator reviews system plan or project proposal to test whether it meets mandated criteria such as cost effectiveness.
  - Regulatory review is comprehensive in scope and conducted through open, transparent, evidence-based process.
  - Project proponent provides high confidence cost estimates and project management plans
  - Environmental agency may conduct separate expert impact analysis.
- **Approval**
  - Regulator approves project, including cost and schedule, if it meets criteria. Conditions possible.
  - Or, government approves project based on evidence and recommendation from comprehensive regulatory evaluation.

Effective Regulation of Major Electricity Projects

- **Execution and Oversight**
  - System planner, regulator or government-appointed independent expert monitors project progress against agreed cost and time benchmarks, and liaises with proponent management or board.
  - Change proposals or cost deviations evaluated.

- **Cost Review and Recovery**
  - Upon completion of project or project stage, proponent applies to independent regulator for cost recovery in rates.
  - Regulator assesses prudency of expenditures through open, transparent, evidence-based process, approving only prudently incurred costs.

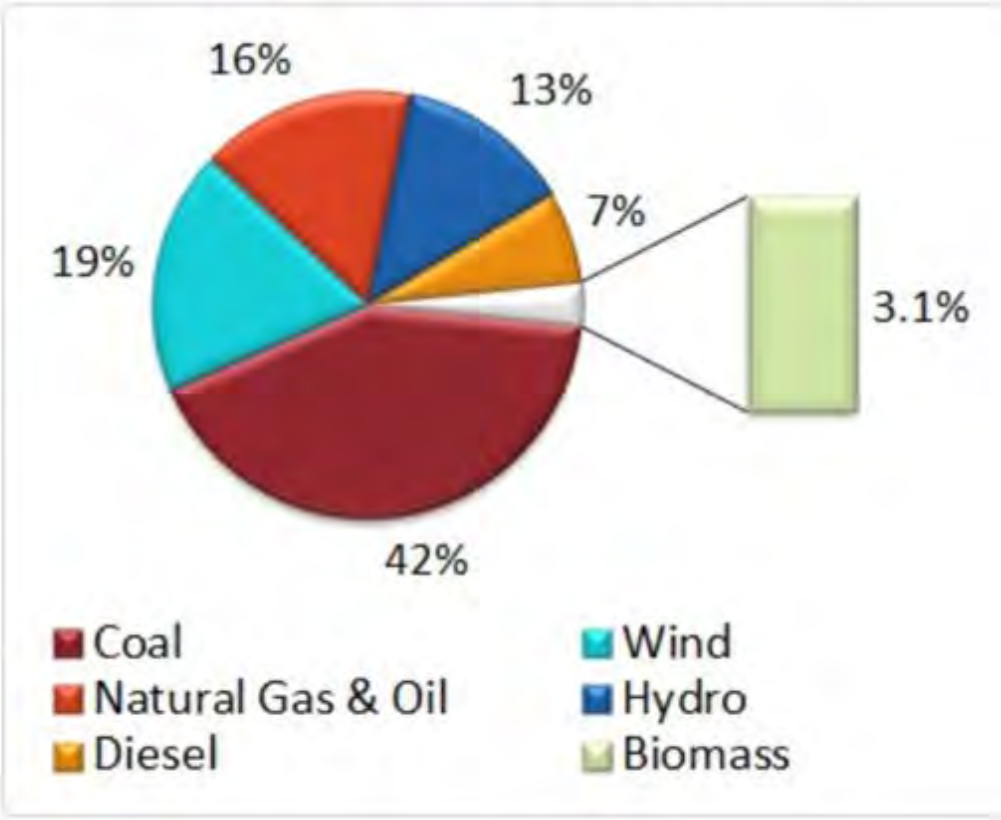
Case Study 1: Maritime Link, Nova Scotia ($1.6bn)

Electricity Sector Profile – Nova Scotia

Nova Scotia's Fast Facts (2015)

Installed Capacity*	2,979 MW
Annual Generation	11,129 GWh
Annual Consumption	10,412 GWh
Customers	~ 506,000
Annual Exports	31 GWh
Annual Imports	428 GWh
Transmission System length (≥ 69 kV)	~ 5,300 km
Interconnections with New Brunswick	

Installed Capacity Mix (2015) [1]



Source: Natural Resources Canada

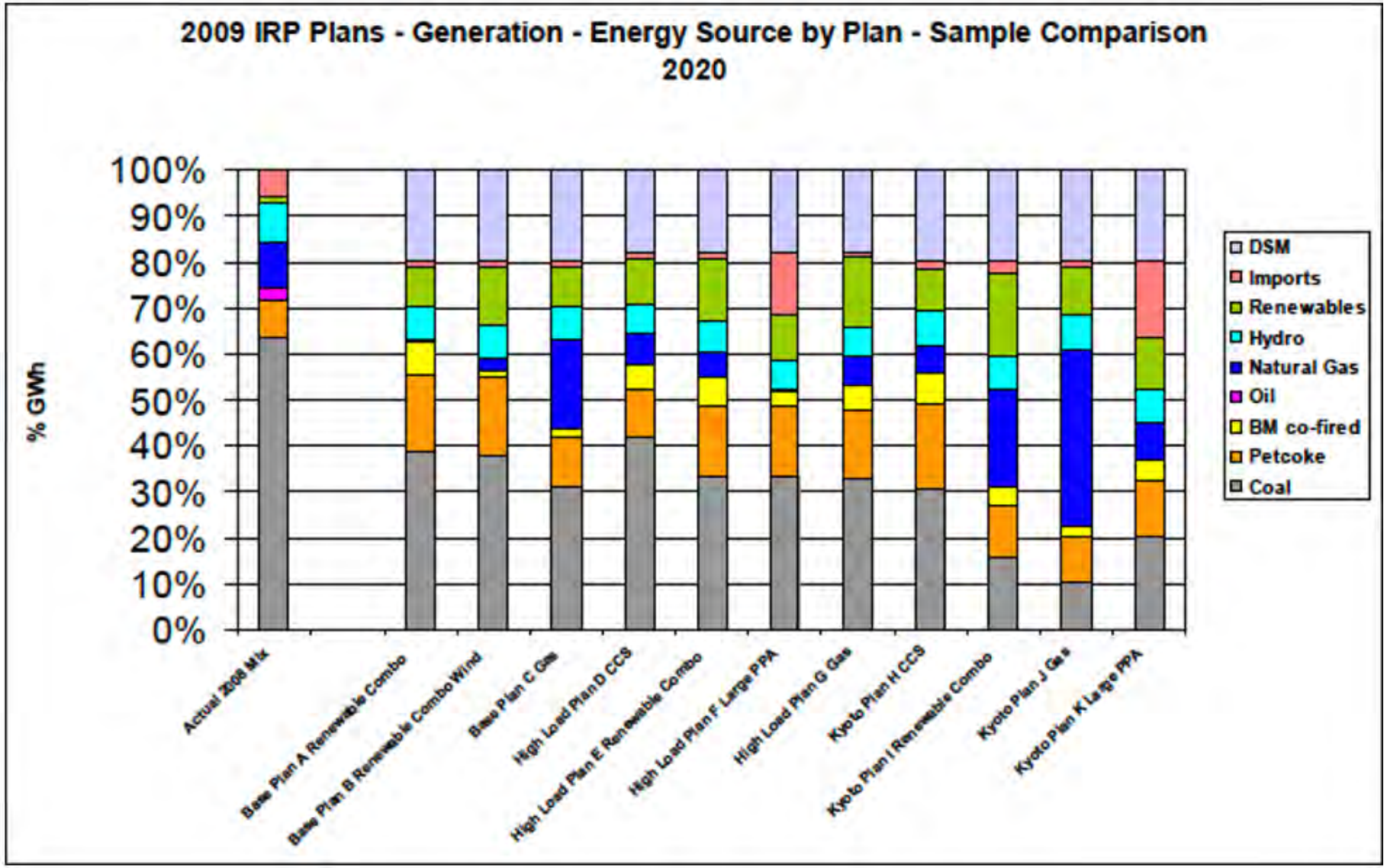
Maritime Link: Project Identification

- Nova Scotia Power developed Integrated Resource Plan in 2009 in consultation with NS Utility and Review Board (UARB) and with sector stakeholders
  - Significant growth planned in renewable energy
  - Provincial renewable energy target of 25% by 2015, 40% by 2020
  - Emphasis on demand-side management

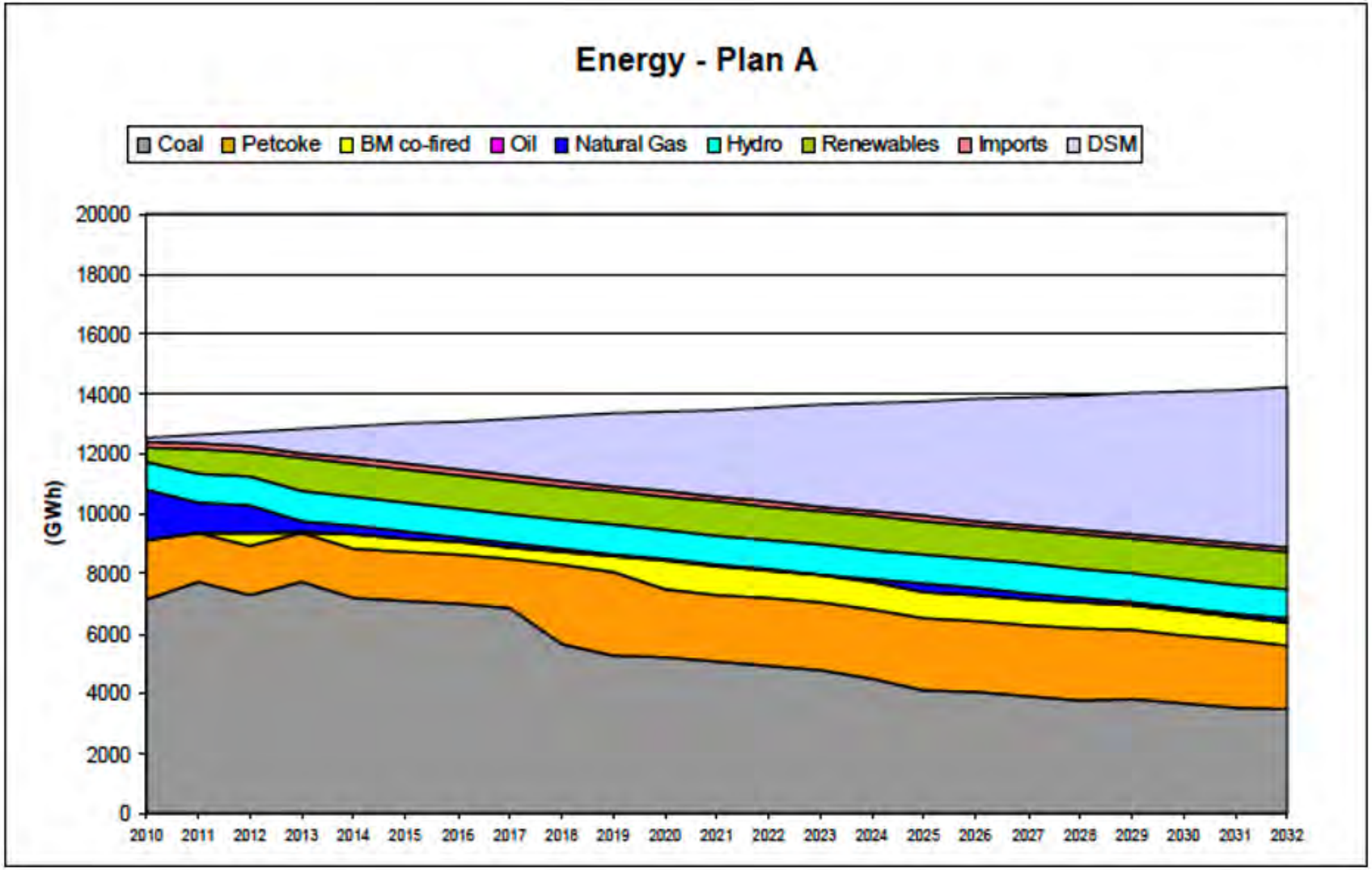
- In 2010, proposal for Maritime Link (ML) and Muskrat Falls jointly developed by Emera and Nalcor, leading to November 18 agreement.

- Term sheet indicated that ML would be subject to approval by UARB for inclusion in NSPML rate base.

Nova Scotia Power Integrated Resource Plan, 2009



Nova Scotia Power Integrated Resource Plan, 2009



Maritime Link: Evaluation

- Emera subsidiary, Nova Scotia Power Maritime Link (NSPML) applied to UARB for approval of ML project in January 2013, after Nalcor reached DG3 cost estimate.

- UARB conducted open, transparent, evidence-based review including 23 intervenors and 9 days of hearings to determine whether ML was (i) lowest-cost alternative and (ii) consistent with province's environmental goals for electricity sector - two criteria for approval as specified by the government in legislation.

- Key intervenors and UARB retained 7 expert consultants to provide evidence and opinions
  - UARB Counsel – Synapse and Morrison Park
  - NSPML – WKM and Ventyx
  - Government of Nova Scotia – PowerAdvisory
  - Consumer Advocate – Resource Insight
  - Small Business Advocate and Consumer Advocate – Levitan

Maritime Link: Evaluation

- Availability to NSPML of non-firm market-priced energy from Muskrat Falls emerged as a crucial issue
  - Original agreement with Nalcor did not provide guarantee of quantity
  - NSPML defended arrangement, but 7 intervenors raised concerns
  - Significant cross-examination and discussion during UARB hearings

- After hearing evidence and testimony, UARB concluded there was "substantial uncertainty" about future long-term availability, creating a risk for rate-payers
  - Found that some consultants' evidence was thorough, insightful and useful, others' was weaker
  - Found that some of NSPML's arguments were "**inconsistent**"
  - Found that NSPML was **selective** in presenting choices of scenarios, which "*portrayed [ML] in its most favourable light*"
  - Noted that under cross-examination by the consumer advocate, NSPML witness testified that NSP had previously attempted to extract contractual concessions from Nalcor for future supply of market-priced energy, but failed

Maritime Link: Evaluation

This episode illustrates the value of an open, transparent, evidence-based regulatory review process in protecting ratepayer interests

- The availability of market-priced energy was a **complex issue** with **uncertain impacts and risks**
- **Scrutiny by intervenors and PUB staff** during hearings and cross-examination **revealed new information about assumptions, logic, and reliability of conclusions** of the proponent's application, **identifying weaknesses**
- It is risky to assume ex ante that proponent or intervenor submissions are necessarily correct
- Regulators are required to **weigh-up evidence from all parties** in reaching a rational conclusion

Maritime Link: Approval

- In July 2013, UARB concluded that the ML project was the lowest cost alternative only with an enforceable agreement for access to market-priced energy.

- UARB approved ML, with expected (P97) cost of $1.7bn, subject to condition that new access agreement would be reached between NSPML and Nalcor.
  - UARB could have rejected the application but instead used its expertise to point to a solution

- UARB reviewed and approved new agreement in November 2013, permitting ML to proceed. Expected operational date late 2017.

Maritime Link: Approval

"[the Board] agrees that cost overruns are a serious concern for ratepayers"…

"if costs do increase beyond $1.7 billion, NSPML indicated it will apply to the Board for the approval of these additional costs in a timely manner."

…

"The Board expects NSPML to have strict controls during the design and construction phase of the ML project to keep its costs within the approved envelope. While the Board will consider any additional request for cost overrun approval, ***the prudency test will be applied in rendering its Decision****".*

Maritime Link: Execution and Oversight

- UARB directed NSPML to file quarterly project status and cost reports with the UARB, and also to submit independent engineer's reports.

- ML completed on schedule and on budget at end of 2017, but not fully operational due to Muskrat Falls delay.

Maritime Link: Cost Review and Recovery

- NSPML required to apply to UARB for cost recovery in rates.
- UARB has authority to review and approve ML project costs to assess prudency through open, transparent, evidence-based process, before permitting inclusion in rate base (and rates).
- UARB declined NSPML's 2017 application to recover costs since ML was not "used and useful". Allowed partial, temporary interim assessment.
- Once ML is fully operational, NSPML must re-apply to UARB for inclusion in rate base.

Maritime Link: Summary

The NS government's approach to the Maritime Link is a good example of effective regulatory oversight

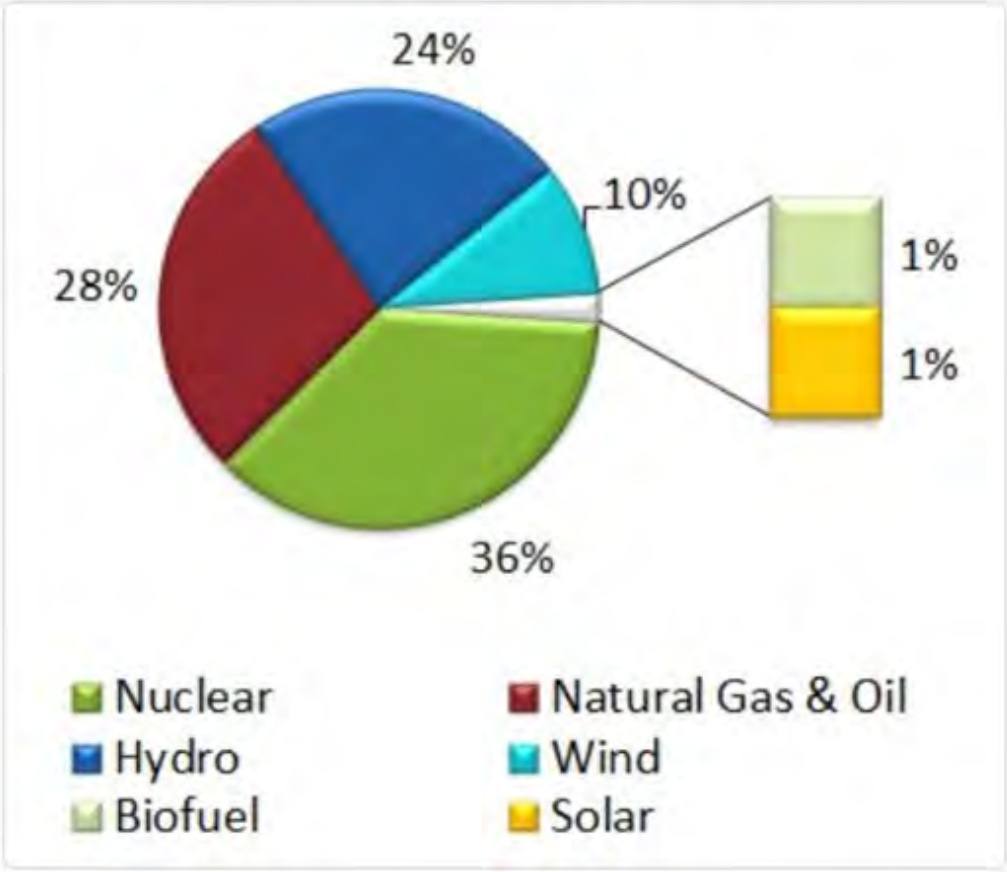
- Comprehensive, independent regulatory review of project that was consistent with previously-approved integrated resource plan
- Potential economic risk identified and mitigated by conditions established by the regulator
- Approval based on comprehensive evaluation of whether project met required economic and environmental criteria
- Regulatory monitoring of project during construction stage
- Final regulatory review of prudency of expenditures before costs can be recovered in rates.

Case Study 2: Darlington Nuclear Plant Refurbishment ($12.8bn, est.)

Electricity Sector Profile - Ontario

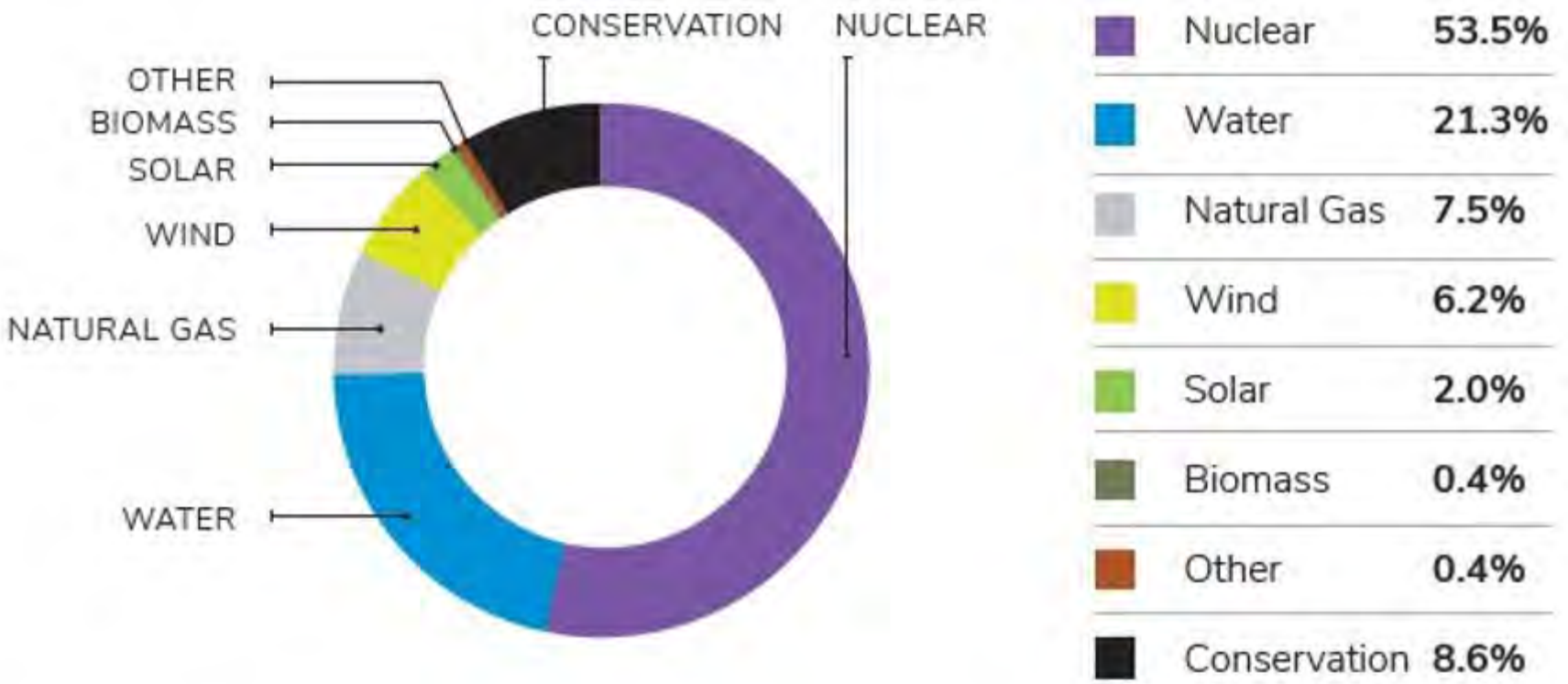
Ontario's Fast Facts (2015)	
Installed Capacity	35,591 MW
Annual Generation	153.7 TWh
Annual Consumption	137 TWh
Customers	~ 4.9 million
Annual Exports	22.6 TWh
Annual Imports	5.8 TWh
Transmission System length (≥ 115 kV)	~ 30,000 km
Interconnections with Quebec, Manitoba, New York, Michigan, Minnesota	

Installed Capacity Mix (2015) [1]



Source: Natural Resources Canada

Ontario's Electricity Generation and Conservation (2016, TWh)



Source: Ministry of Energy

Note: Generation reflects the sum of transmission and distribution connected sources. Conservation value represents persistent savings in 2016 from programs and codes and standards since 2006.

Darlington: Project Identification

- Electricity system planner (Ontario Power Authority) identified need for nuclear capacity as part of 2005 Supply Mix Advice Report
  - Need for 15,000MW new capacity in Ontario by 2025; nuclear capacity was low-cost base load supply with low emissions, and could provide 63%-83% of new capacity

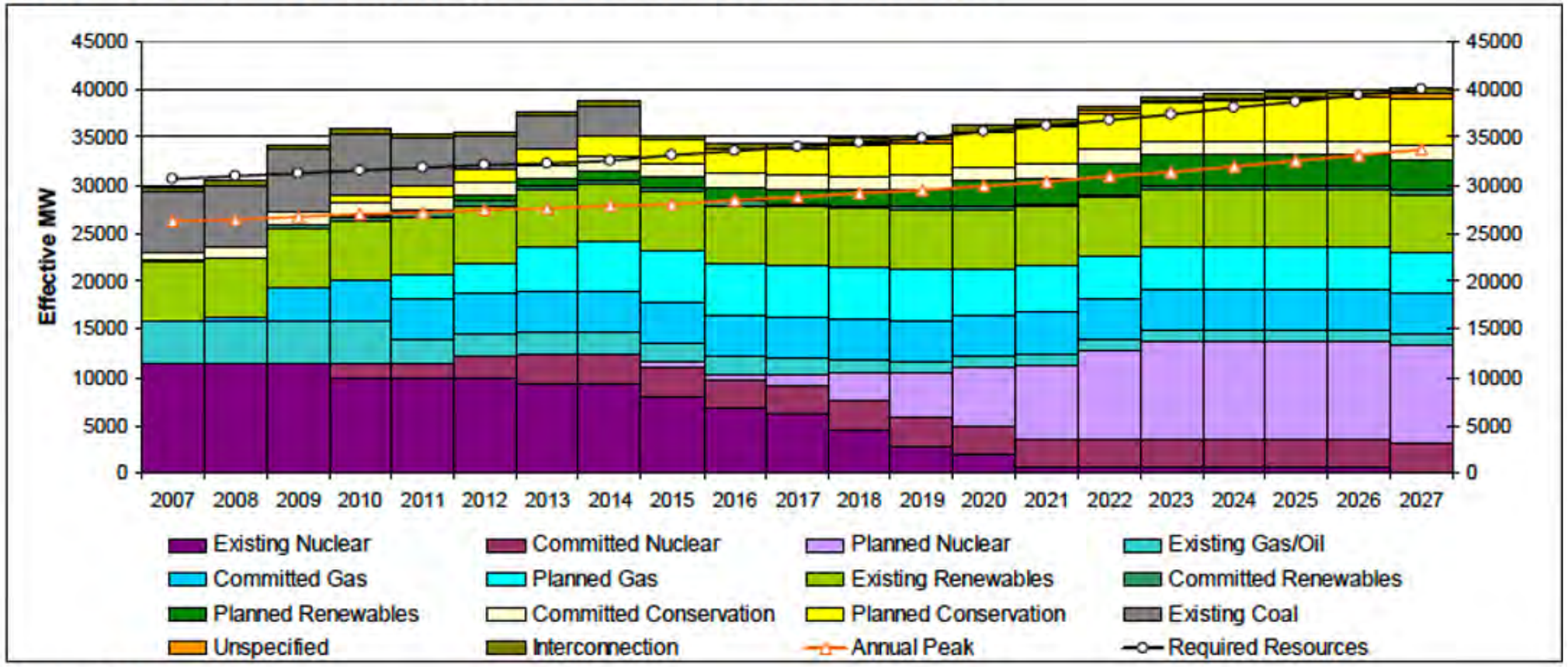
- Minister directed OPA in 2006 to develop comprehensive Integrated Power System Plan
  - Conservation target of 6,300MW by 2025; renewable energy target of 15,700MW by 2025; eliminate coal generation, maintain natural gas capacity; develop nuclear plan for up to 14,000MW capacity

- Subsequent 2010 and 2013 Long Term Energy Plans, developed by Independent Electricity System Operator and Ministry of Energy, identified need for new or refurbished nuclear capacity. New nuclear rejected as option in 2009 and 2013 after competitive bid process due to cost.

- Ontario Power Generation's Darlington nuclear plant predicted to reach end of service life by 2020.

Ontario's Integrated Power System Plan, 2007

Figure 3: Case 1A Cumulative Resources: Effective MW



Source: OPA

Darlington: Evaluation

- Integrated power system plan (IPSP) partially evaluated in 2007/8, after OPA submission, by regulator (Ontario Energy Board) in public, open process to ensure economically prudent.
  - Phase 1 public hearings with 30 intervenors in January 2008 -> 34 key issues identified
  - Phase 2 hearings with 44 intervenors began in September 2008 – but suspended by new Minister of Energy who directed OPA to revise IPSP to include more ambitious conservation and renewable targets

- Minister directed Ontario Power Generation in 2006 to undertake detailed feasibility studies of refurbishing Darlington.
  - OPG commenced Initiation phase in 2007, Definition phase in 2009 (at cost of $2.2bn).

- Subsequent Long-Term Energy Plans developed by Ministry, OPA and Independent Electricity System Operator with stakeholder consultation, but OEB approval not required.
  - IESO analyses showed nuclear amongst lowest cost sources of energy
  - 2010 LTEP – nuclear to account for 50% of province's energy
  - 2013 LTEP – confirmed nuclear refurbishment to go ahead, no new nuclear build

Darlington: Approval

- OPG board approved high confidence (P90) cost estimate of $12.8bn in November 2015 and endorsed project.
- Minister of Energy endorsed project in January 2016.
- “Off-ramps” enable government to stop project at pre-specified points if cost or schedule targets are breached, or if external demand and supply factors change need for the capacity.
- Government regulation in 2016 required Ontario Energy Board to accept the need for the project but to scrutinize prudency of expenditures ex post.

Darlington: Execution and Oversight

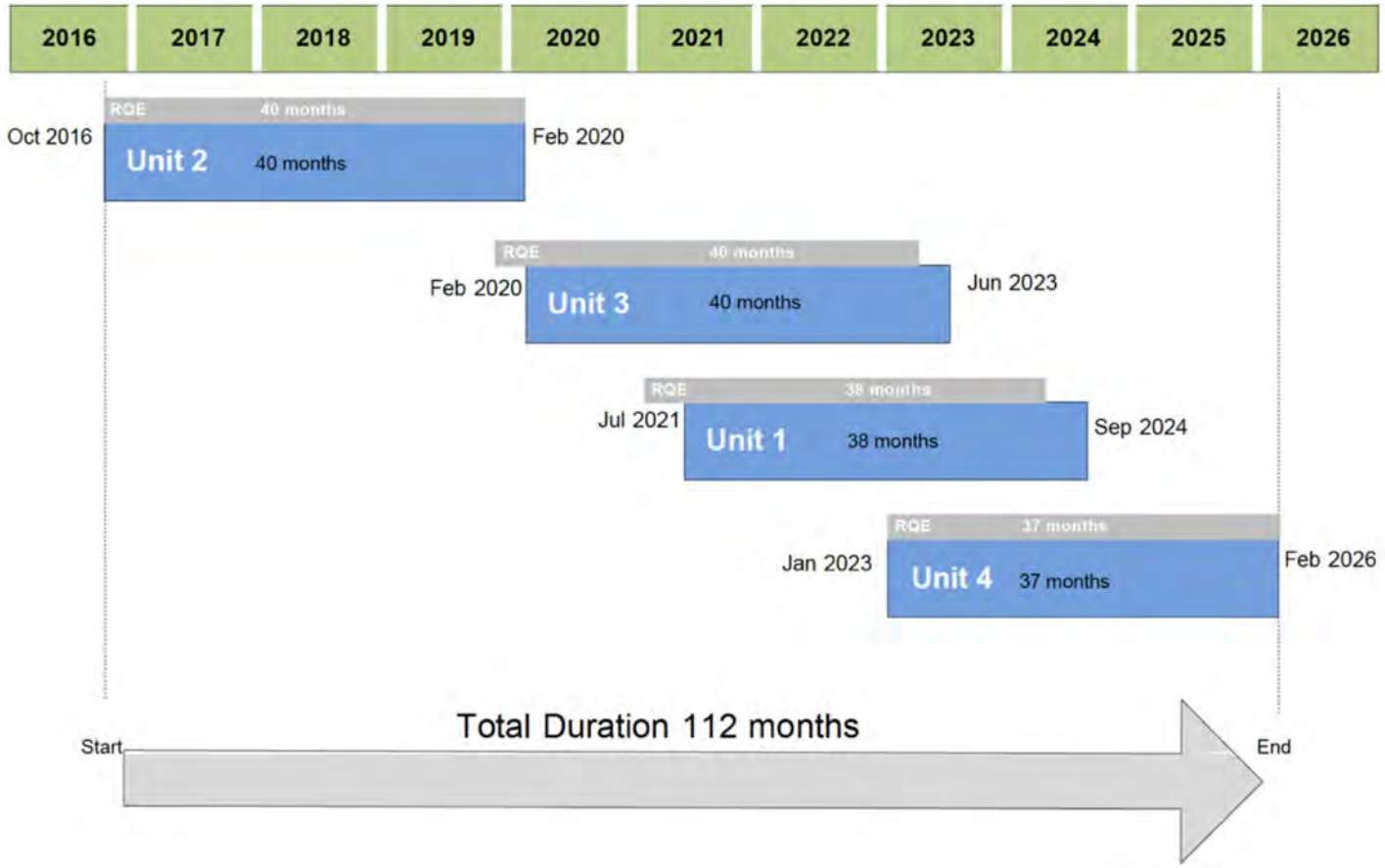
- Project entered Execution phase in 2016, nine years after start of the Initiation phase, with disconnection of first unit.

- Multiple layers of internal and external oversight
  1. Darlington Refurbishment Committee with a majority of external experts, reporting to OPG's board
  2. Refurbishment Construction Review Board (also with a majority of external experts in megaprojects and nuclear power), reporting to OPG's CEO
  3. OPG's internal audit group
  4. External expert advisor (member of Darlington Refurbishment Committee), appointed by government, reporting to Ministry of Energy.
     - Reports quarterly to Ministry on confidential basis, has full information and access to OPG

- Major contracts filed with regulator.

Darlington: Execution and Oversight

Project Identification → Evaluation → Approval → Execution & Oversight → Cost Review & Recovery



Source: Ontario Power Generation

Darlington: Execution and Oversight

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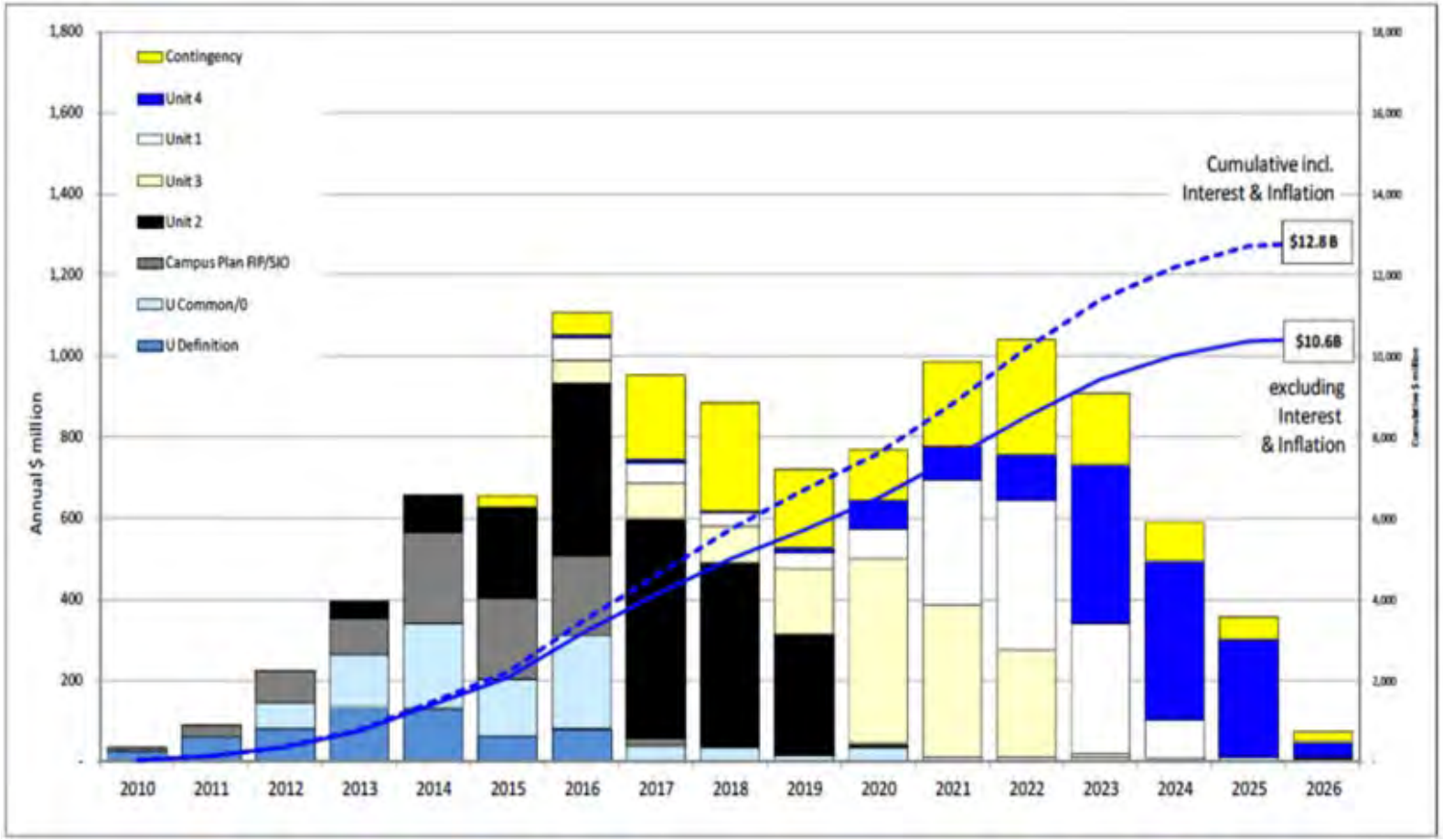


Source: Ontario Power Generation

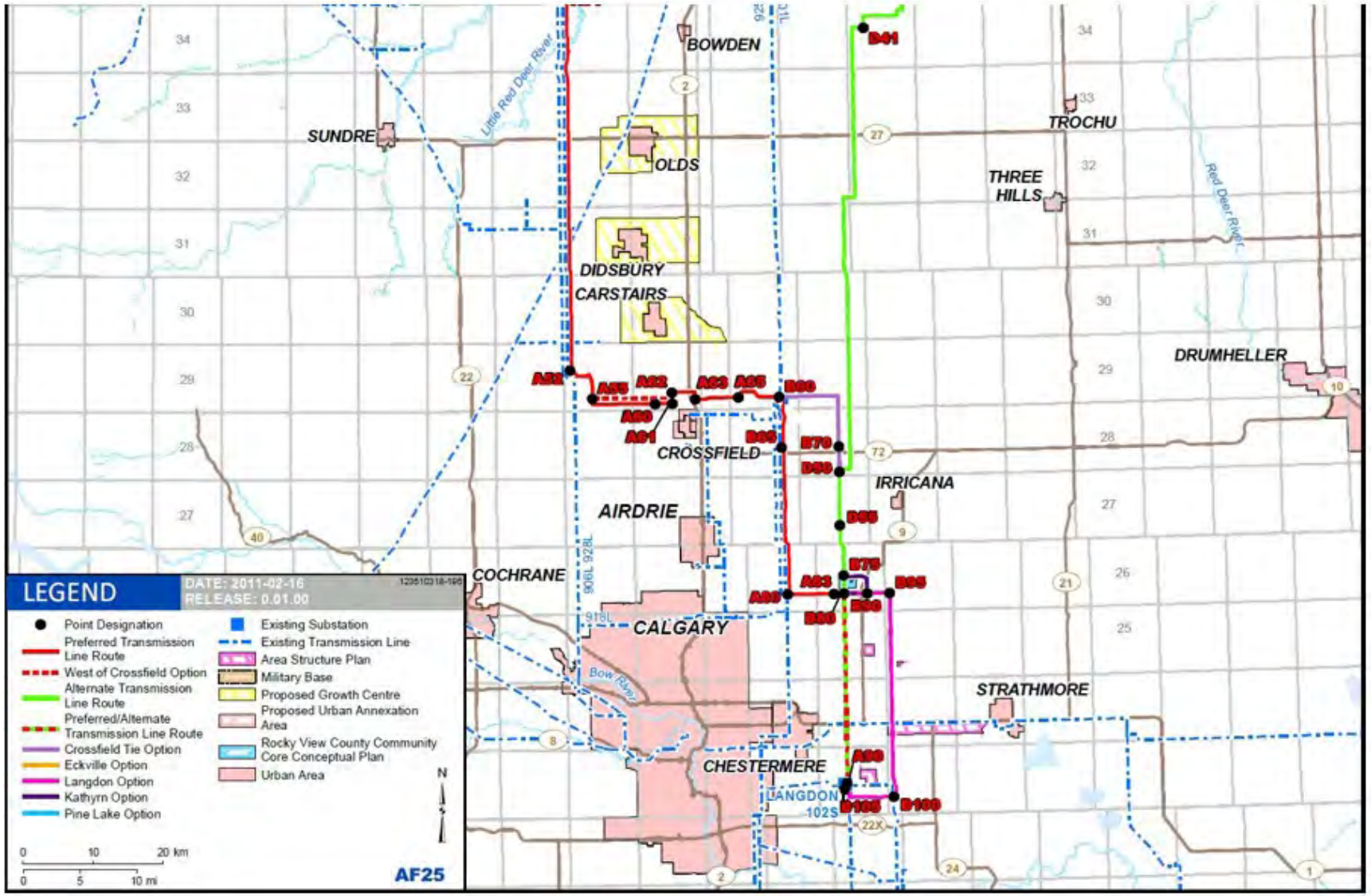
Darlington: Cost Review and Recovery

- OPG must apply to Ontario Energy Board for cost recovery after refurbishment costs are incurred.
  - Ontario Regulation 53/05: "*The Board shall ensure that Ontario Power Generation Inc. recovers capital and non-capital costs, and firm financial commitments incurred to increase the output of, refurbish or add operating capacity to a generation facility…**if the Board is satisfied that the costs were prudently incurred and that the financial commitments were prudently made***."

- OEB reviews prudency of Darlington expenditures and financial commitments through open, transparent, evidence-based hearings.
  - Applications in 2007, 2010, 2013 and 2016 for recovery of DRP-related costs

- OEB has found that Darlington expenditures incurred to date (~$7bn) have been prudent. Project currently on schedule and on budget.

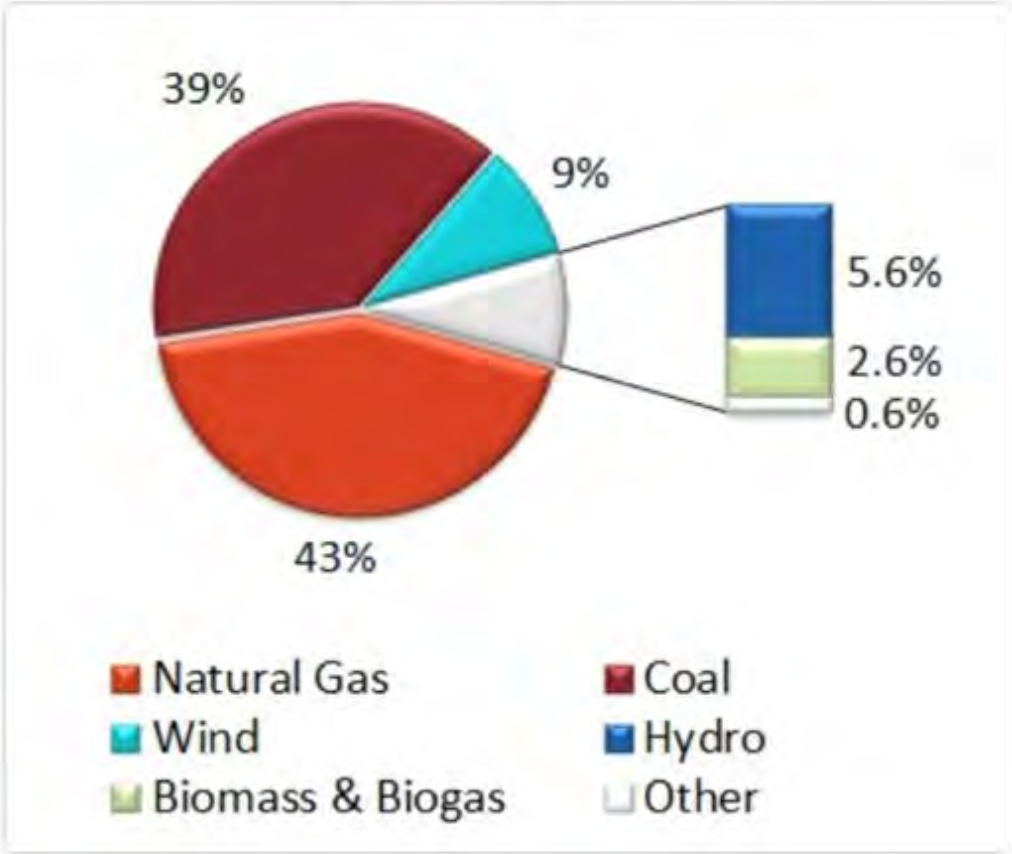
Case Study 3: Western Alberta Transmission Line ($1.7bn)



Electricity Sector Profile - Alberta

Alberta's Fast Facts (2015)	
Installed Capacity	16,130 MW
Annual Generation	81,620 GWh
Annual Consumption	82,400 GWh
Customers (major service areas only)	~1.75 million
Annual Exports	650 GWh
Annual Imports	1,430 GWh
Transmission System length (≥ 69 kV)	~ 25,295 km
Interconnections with British Columbia, Saskatchewan, Montana	

Installed Capacity Mix (2015) [1]



Source: Natural Resources Canada

Western Alberta Transmission Line: Project Identification

- Alberta Electric System Operator (AESO) identified need for new north-south transmission capacity in its 2004 *Ten Year Transmission System Plan*
  - No major transmission lines added to north-south system in 20 years while load and generation capacity had grown significantly
  - Constraint on development of competitive wholesale electricity market

- AESO's formal Needs Identification Document (NID) submitted to Energy and Utilities Board (EUB) in 2004 for review. NID approved by EUB in 2005 after 2 weeks of hearings involving 15 intervenors. AESO then directed Altalink to submit a WATL project application to the EUB.

Western Alberta Transmission Line: Evaluation

- Altalink initiated the formal evaluation process with its September 2006 application to the EUB. However, in 2008, the government dissolved the EUB and replaced it with a new agency, the Alberta Utilities Commission (AUC).

- To expedite transmission applications that had been delayed, the government deemed WATLand several other transmission lines as Critical Transmission Infrastructure in legislation in 2009.

- Altalink filed a new application with the AUC in 2011, which held hearings focused on the siting of the proposed line.

- (In 2012, the government enacted legislation that rescinded its powers to deem projects as Critical Transmission Infrastructure, restoring full authority to the AUC to review and approve AESO needs projects based on economic, social and environmental impacts.)

Western Alberta Transmission Line: Approval

- The AUC approved Altalink's WATL application after hearings and review in December 2012.
- AESO had previously approved cost estimate of $1.4bn with accuracy range + 20%/-10% in 2011.

Western Alberta Transmission Line: Execution and Oversight

- AESO closely monitored project execution (commencing in 2013) and reviewed Altalink's project change proposals and procurement systems. Regulations required cost reporting and monthly updates. Altalink senior management met monthly with AESO to review project progress.
  - AESO approved 13 Project Change Proposals totaling $290 million

- Transmission Facilities Cost Monitoring Committee, composed of multiple stakeholders, monitored and publicly reported semi-annually on project progress and costs.
  - Observed that Altalink's turnkey contract with Siemens for a converter station was effective in cost control (Siemens absorbed increased labour and input costs).

Western Alberta Transmission Line: Cost Review and Recovery

- Altalink must apply to AUC for recovery of WATL costs in transmission tariffs.
- AUC reviews expenditures through open, transparent, evidence-based proceedings to determine prudency. AESO's judgement of prudency based on its involvement in project development can affect AUC assessment.
- Final cost of WATL was $1.7bn, within original approved cost range. Government-caused delays in approvals process contributed to the slightly higher costs. AUC review underway in late 2018.

Common themes in Maritime Link, Darlington, and WATL projects

Three megaprojects constructed to date largely on budget and on schedule

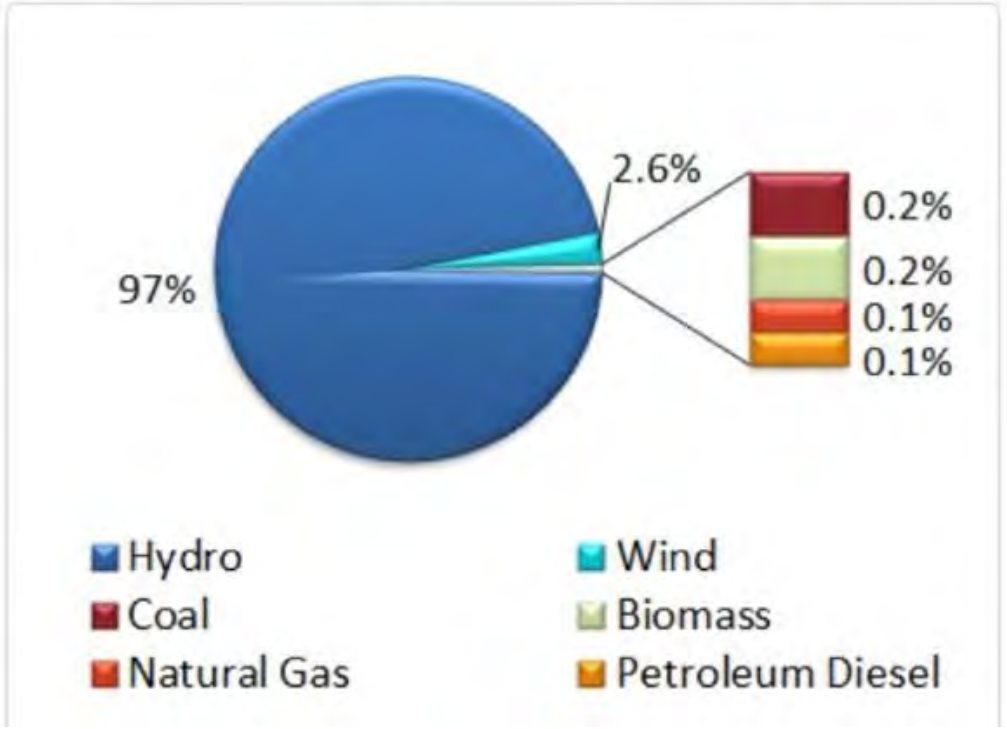
- Projects consistent with existing integrated resource or system plans, which also emphasized (in ON and NS) important contribution of conservation and demand-management.
- Independent regulator or system planner conducted unrestricted evaluation of project proposals
- Independent monitoring of project construction phase by industry regulator, system planner or government-appointed expert.
- Final regulatory review of prudency of project expenditures – regulator determines whether costs can be recovered in rates

Case Study 4: Keeyask Generating Station, Manitoba ($10.5bn, est.)

Electricity Sector Profile - Manitoba

Manitoba's Fast Facts (2015)	
Installed Capacity	5,701 MW
Annual Generation	36,040 GWh
Annual Consumption	22,443 GWh
Customers	~ 561,900
Annual Exports	9,878 GWh
Annual Imports	216 GWh
Transmission System length (≥ 24 kV)	~ 13,000 km
Interconnections with Ontario, Saskatchewan, North Dakota and Minnesota	

Installed Capacity Mix (2015) [1]



Source: Natural Resources Canada

Keeyask Generating Station: Project Identification

- Keeyask identified by Manitoba Hydro (MH) in 1990s as a means to improve system reliability, meet future energy demand, and serve U.S. export markets.
- Development agreements signed with four local First Nations communities in 2000 and 2009, after which environmental and engineering studies commenced.
- Keeyask is one component of MH's 2013 $20bn plan for new generation and transmission projects.

Keeyask Generating Station: Evaluation

- Government directed Public Utility Board in 2012 to commence a Needs for and Alternatives To (NFAT) review of Keeyask and other projects – *after* government had already agreed in 2011 to future $4bn export deal with Minnesota and Wisconsin, and *after* MH had commenced major Keeyask capex

- Government also restricted the scope of the NFAT review, tilting in favor of the project
  - Excluded an associated 1,384 km, $5bn transmission line
  - Excluded commercial arrangements with Aboriginal partners
  - Excluded prior MH development proposals or government assessments

- PUB's NFAT report in 2014 recommended Keeyask approval, partly due to $1.2bn of sunk costs, but recommended other planned projects be rejected.

- External experts later (in 2016) criticized restrictions on NFAT and assumptions, found approval of project "imprudent" since risks not fully assessed.

Keeyask Generating Station: Approval

- Province issued environmental, water power and fisheries licenses for Keeyask in 2014, enabling construction to commence July 2014. No major public government announcement of project sanction.

- 2014 $6.5bn cost estimate, predicted to be in service by end 2019

Keeyask Generating Station: Execution and Oversight

- MH commenced major construction and expenditures for Keeyask in 2010, prior to NFAT review.
- General Civil Contract finalized in March 2014, prior to NFAT completion.
- According to external experts reporting later to the PUB, Manitoba Hydro did not have effective governance systems for oversight of the main contractor which operated under a cost-plus contract.
- No independent, project-specific oversight mechanism appointed by government. Instead, government relied on Manitoba Crown Corporations Council (civilian board, disbanded in 2016) and Crown Corporations Standing Committee of the Legislature.

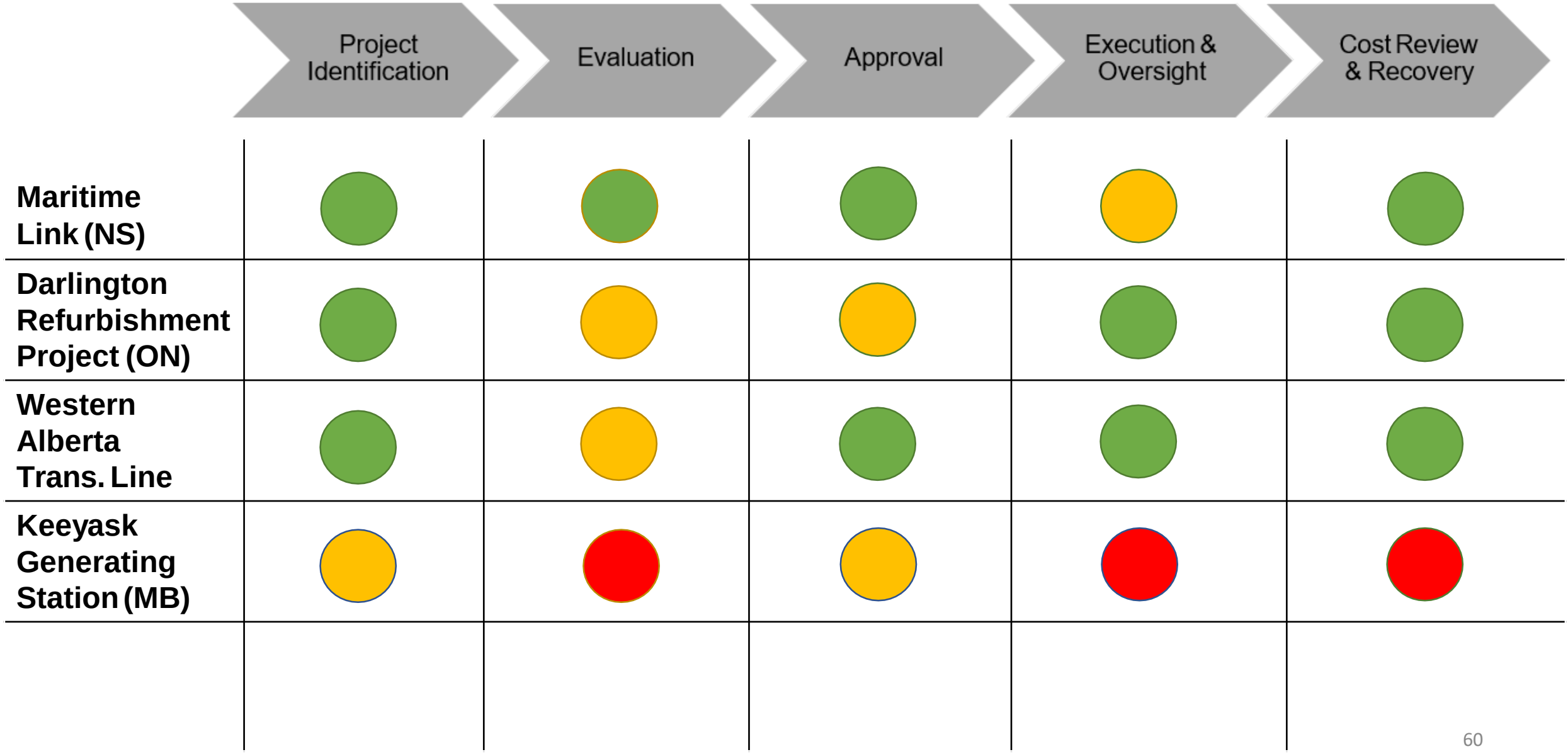
Keeyask Generating Station: Cost Review and Recovery

- The PUB has had no authority to (dis)approve or review the prudence of Manitoba Hydro's *capital* project plans or associated capital expenditures. (This historic restriction was lifted by a new government in April 2017).

- The PUB is, however, able to review *operating* costs, and determine whether they should be recovered in rates.

- Keeyask costs are predicted to reach $10.5bn (~70% increase compared to sanction date estimate), leading to credit-rating agency concerns about MH and provincial debt levels.

Summary evaluation of regulatory oversight of major electricity projects



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1. The Purpose of Economic Regulation
2. Best Practices in the Design of Regulatory Agencies
3. Advantages and Disadvantages of Delegating Oversight to Agencies
4. NL's Board of Commissioners of Public Utilities
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7. Consequences of Exempting Muskrat Falls from PUB Oversight
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Muskrat Falls: Project Need Identification

Muskrat Falls was identified in NL's 2007 Energy Plan. However, there was not a public integrated resource planning process involving the PUB and stakeholders that fully considered a range of supply and demand-side options for the electricity sector.

- Reports over several years have suggested system planning reforms
  - "*requiring that the entity responsible for supplying customers file with the regulator its evaluation of future resource requirements would be appropriate" … "a public IRP process would provide a transparent framework for the evaluation of these [options]* - Power Advisory, 2015
  - 2011 Joint Review Panel recommended IRP process should be used: "*such an approach would involve interested stakeholders and look simultaneously at demand and supply solutions and alternative uses of resources over the medium and long term*"
  - "*system planning guidelines that have the benefit of input from all stakeholders would be desirable to ensure both fair competition and appropriate system development. To attract the most competitive proposals for system additions, the system plan should be available publicly*" – Nfld. Power, 2006

Muskrat Falls: Project Need Identification

Multiple reports and experts have recommended NL place greater emphasis on conservation and demand-management (CDM) to meet future system requirements.

- Navigant (2011)
  - Noted target of conservation savings of 79 GWh in 2013 = 1% of annual demand. Actual savings were 49 GWh. Recommended "Nalcor could consider the impact of a longer term CDM initiative"
- Power Advisory (2015)
  - Described conservation targets as "modest" compared to 5% achievements in Ontario and Nova Scotia
  - Argued that end-use modelling would allow better understanding of impact of new technologies (e.g. mini split heat pumps) on future load
- PUB (2011)
  - Advised using "*end-use modeling before making a determination in relation to a large incremental increase in capacity such as the Interconnected Option*"
- Feehan (2012)
  - Argued that higher pricing could substantially reduce future demand, negate need for new MF supply

Muskrat Falls: Evaluation

Muskrat Falls was not evaluated by a comprehensive, independent, expert regulatory review process after reliable cost estimates were ready.

- Government requested PUB to conduct a review of MF in June 2011, but review was restricted:
  - Limited to 2 specific, defined options – Interconnected and Isolated Island, 2011-2067 period
  - Accurate cost estimates not available
  - Short time frame
- Implications
  - PUB not permitted to evaluate broad range of supply and demand-side options
  - Unable to reliably assess which of the 2 defined options was lower cost
  - March 2012 conclusion: "*the information provided by Nalcor in the review is not detailed, complete or current enough to determine whether the Interconnected Option represents the least-cost option*"
- Joint Review Panel reached similar verdict in August 2011
  - "*the Panel concluded that Nalcor's analysis, showing that Muskrat Falls to be the best and least-cost way to meet domestic demand requirements, was inadequate*"

Muskrat Falls: Approval

NL government sanctioned MF project in absence of a positive recommendation from the independent regulator following a comprehensive, expert review.

- Government cited support from consulting reports
  - MHI October 2012 (with DG3 costs), Ziff Energy Oct 2012 – not scrutinized by PUB
  - Navigant 2011, MHI January 2012 – already incorporated in PUB conclusion
- Consultant reports may be valuable, but quality and reliability not easily observed
  - Findings may be sensitive to assumptions, forecasts, data, methodologies – subjective judgements
  - Financial relationship with client can raise question of impartiality
- Regulatory review process – expert, independent scrutiny by staff and by intervenors – can provide assessment of report quality. Consultant reports are an **input** into regulatory process
- In pipeline sector, federal government makes final sanction decision on major projects after review and recommendation by NEB
  - Out of 26 major projects 2007-2017, government followed NEB recommendation 25 times; no instance of NEB denial followed by government approval

Muskrat Falls: Execution and Oversight

Effectiveness of government oversight over the Muskrat Falls project queried by governance experts due to absence of regular independent assurance function.

- Oversight Committee (OC) of senior bureaucrats established in 2014, one year after construction commenced
  - Has met regularly with Nalcor management, 4 times with Ernst and Young (reporting on project cost and schedule status). Reports quarterly to government

- Effectiveness of OC questioned by Ernst and Young (EY) which noted that the OC lacked regular, independent, expert information on the project, relying primarily on Nalcor reports

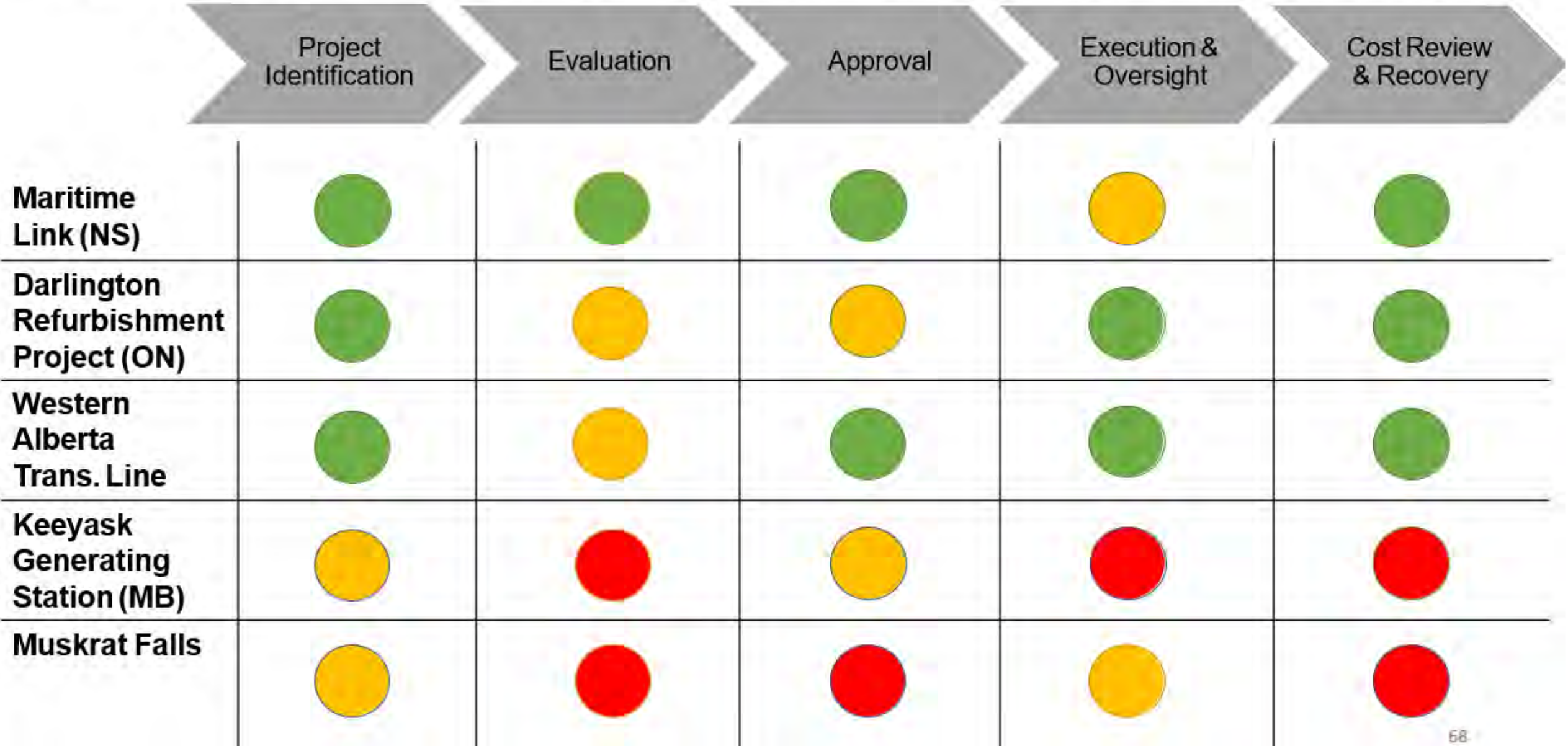
- EY recommended in 2017 that "*an enhanced independent assurance function performed by a qualified independent third party on a regular basis (e.g. monthly/quarterly) would better enable the OC to fulfill its mandate and meet the expectations of stakeholders*"

Muskrat Falls: Cost Review and Recovery

The government exempted Muskrat Falls project costs from normal PUB prudency review (Regulation 120/13).

- Federal loan guarantee requires NL Hydro to recover all costs of MF energy in regulated rates.
- Absence of threat of regulatory disallowance of costs reduces incentive for Nalcor to manage construction costs as tightly as possible compared to regime with final regulatory review.
- 2018 cost estimate of $12.7bn (72% increase from sanction date estimate), completion expected 2020 (~3 years late).

Summary evaluation of regulatory oversight of major electricity projects



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Consequences of Exempting Muskrat Falls from PUB Oversight

In the absence of a positive recommendation from an independent, expert regulator, the government took a significant risk when it sanctioned Muskrat Falls that it would be the lowest-cost approach to securing the province's electricity future.

- By requiring the PUB to commence the review in 2011, by restricting the review scope, and by limiting the time available, the government was ultimately not as informed as it could have been about the project's costs and risks relative to other alternatives.

- DG3 cost estimates were not scrutinized by an independent regulator in the context of an open, transparent, evidence-based review process; and other potential supply and demand-side options were not investigated by the PUB.

- Consulting reports released after March 2012 were not tested or validated by the PUB's review process.

Consequences of Exempting Muskrat Falls from PUB Oversight

The government also took a risk that Nalcor would prudently manage construction of the project without the prospect of future regulatory disallowance, and that the Oversight Committee would satisfactorily monitor progress and hold Nalcor to account.

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Conclusions

1. Effective regulatory oversight is particularly important for protecting ratepayer interests in megaprojects due to the scale of risks and impacts, the irreversibility of investment decisions, and the consequences for multiple generations.

2. A key advantage of regulatory oversight is **improved information** about project benefits, costs, impacts and risks – obtained through open, transparent, evidence-based decision-making procedures. Regulatory due process thereby reduces the probability of selecting poor or uneconomic alternatives, and increases the probability of identifying and selecting beneficial projects.

3. Effective regulation also creates **strong incentives** for proponents to manage projects within approved budgets, lowering the chance of major cost over-runs and delays.

Conclusions

4. Regulatory agencies in Alberta, Nova Scotia, and Ontario have played central roles in evaluating, monitoring and reviewing megaprojects such as the Western Alberta Transmission Line, Maritime Link, and Darlington nuclear generation station refurbishment project. To date these projects have been largely completed on budget and on schedule. In Manitoba, the PUB has had a much more restricted role in evaluating and overseeing the Keeyask generation project, which is significantly over budget and several years delayed.

5. **Newfoundland and Labrador's approach to regulatory oversight of Muskrat Falls has not met the high standards that other provinces such as Alberta, Nova Scotia and Ontario have adopted in regulatory oversight of megaprojects, as described in the report.**

An Alternative Scenario

It is not possible to know with certainty what might have happened had the PUB had unrestricted regulatory oversight authority. However, it is plausible that a review could have commenced in 2013, after DG3 cost estimates were released in late October 2012.

If a review had occurred in 2013/14 (allowing up to 18 months duration), new information and events could have made the Interconnected Option less attractive as compared to the 2011/12 analysis for several reasons:

1. The PUB would have assessed a broad range of supply and demand-side options. It could have limited the time frame of analysis to 2041 and the capacity requirement to serve domestic needs only (rather than include exports). Detailed scrutiny of many options could have yielded a lower-cost solution than Muskrat Falls.

An Alternative Scenario

2. The PUB would have had new load information in 2013, showing that total Island load grew more slowly in 2011 and 2012 than originally forecast by Nalcor in 2010 (about 2% less in 2012).
   - May have strengthened PUB concern that "*there is not an immediate need for the large incremental supply associated with the Interconnected Option*". (March 30, 2012 report)

3. In November 2013, Nalcor committed to provide NSPML with 1.2 TWh of additional non-firm energy per year on average over an expected 24-year period, following the UARB's requirement for NSPML to strike an energy access agreement. This additional commitment by Nalcor could potentially alter the economics of the Muskrat Falls project, and would likely have led to a PUB review of the implications.

4. DG3 cost estimates for the Interconnected Option were almost 20% higher than the DG2 estimates – the higher cost would likely have reduced the attractiveness of Muskrat Falls relative to other potential options excluded from the 2011/12 PUB review.

An Alternative Scenario

5. Had the PUB review occurred during 2014, it could have coincided with the 50% drop in world oil prices as a result of increased US shale oil and non-OPEC oil production. Changes in market analyst forecasts of future oil prices could have affected the CPW differential between the Interconnected Option and other options, including the Isolated Island alternative.
   - It was estimated in 2011/12 that a 20% reduction in the oil price and a 20% reduction in load would lead to similar CPWs between the Interconnected and Isolated Island options.

These factors could have reduced the probability of the PUB finding in favour of the Muskrat Falls project. If the PUB had explicitly concluded after a comprehensive review that Muskrat Falls was not needed at that time or was not the lowest-cost alternative, it would have been more difficult for the government to justify a sanction decision.

If the government had decided to proceed, allowing the PUB to review project costs and to assess prudency could have contributed to better cost containment and on-time delivery during the construction stage.

Appendix

Maritime Link, Nova Scotia ($1.6bn)

- Proposal for Maritime Link (ML) and Muskrat Falls jointly developed by Emera and Nalcor, leading to November 18, 2010 agreement.
- Term sheet indicated that ML is subject to approval by NS Utility and Review Board (UARB) for inclusion in rate base.

- Emera subsidiary, Nova Scotia Power Maritime Link (NSPML) applied to UARB for approval of ML project in January 2013, after Nalcor reached DG3 cost estimate.
- UARB conducted open, transparent review including 23 intervenors and 9 days of hearings to determine whether ML is (i) lowest-cost alternative and (ii) consistent with province's environmental goals - two criteria for approval as specified by the government in legislation.

- In July 2013, UARB concluded that the ML project was lowest cost only with enforceable agreement for access to market-priced energy.
- UARB approved ML, with expected (P97) cost of $1.7bn, subject to condition that new access agreement is reached between NSPML and Nalcor.
- UARB reviewed and approved new agreement in November 2013, permitting ML to proceed. Expected operational date late 2017.

- UARB directed NSPML to file quarterly project status and cost reports with the UARB, and also to submit independent engineer's reports.
- ML completed on schedule and on budget at end of 2017, but not fully operational due to Muskrat Falls delay.

- UARB has authority to review and approve project costs to assess prudency through open, transparent evidence-based process, before permitting inclusion in rate base.
- UARB declined NSPML's 2017 application to recover costs since ML was not "used and useful". Allowed partial, temporary interim assessment.
- Once ML is fully operational, NSPML must re-apply to UARB for inclusion in rate base.

Darlington Nuclear Power Plant Refurbishment, Ontario ($12.8bn, est.)

Project Identification

- Ontario Power Generation's Darlington nuclear plant predicted to reach end of service life by 2020.
- Electricity system planner (Ontario Power Authority) identified need for nuclear capacity as part of 2006 comprehensive Integrated Power System Plan.
- Subsequent 2010 and 2013 Long Term Energy Plans, developed by Independent Electricity System Operator and Ministry of Energy, identified need for project.

Evaluation

- Energy system plan partially evaluated in 2007/8 by regulator (Ontario Energy Board) in public, open process to ensure economically prudent and cost effective.
- Minister directed Ontario Power Generation in 2006 to undertake detailed feasibility studies of refurbishing Darlington.
- OPG commenced Initiation phase in 2007, Definition phase in 2009 (at cost of $2.2bn).

Approval

- OPG board approved high confidence (P90) cost estimate of $12.8bn in Nov 2015 and endorsed project.
- Minister endorsed project in 2016. "Off-ramps" enable government to stop project at pre-specified points.
- Government regulation required Ontario Energy Board to accept the need for the project but to scrutinize prudency of expenditures ex post.

Execution & Oversight

- Project entered Execution phase in 2016, nine years after start of the Initiation phase.
- Multiple layers of oversight: (i) special committee of OPG's Board, (ii) OPG's internal audit group, (iii) external megaproject expert review board reporting to OPG's CEO, and (iv) external expert advisor (who sits on special committee of OPG board) reporting to Ministry of Energy.
- Major contracts filed with regulator.

Cost Review & Recovery

- OPG must apply to Ontario Energy Board for cost recovery in rates for each unit's refurbishment costs incurred during the agreed time period.
- OEB reviews prudency of Darlington expenditures and financial commitments through open, transparent, evidence-based hearings. Can deny recovery of imprudent expenditures.
- OEB has found that Darlington expenditures incurred to date (<$5bn) have been prudent.

Western Alberta Transmission Line, Alberta ($1.7bn)

- Alberta Electric System Operator (AESO) identified need for new north-south transmission capacity in its 2004 *Ten Year Transmission System Plan.*
- AESO's formal needs plan approved in 2005 by Energy and Utilities Board (EUB), after which AESO directed Altalink to submit a WATL project application to the EUB.

- Altalink submitted WATL application to EUB in 2006 for evaluation of economic, social and environmental impacts, conducted through open, public hearings.
- Government dissolved EUB in 2008 and created new Alberta Utilities Commission (AUC), limiting its role in major infrastructure needs evaluation. Cabinet gained power to designate and approve Critical Transmission Infrastructure (CTI) projects (which may also be recommended by the AESO).

- WATL designated by Cabinet as CTI in 2009.
- Altalink filed detailed WATL technical proposal with AESO in 2011, including $1.4bn cost estimate with accuracy range of +20% to -10%, which AESO approved.
- AUC approved WATL route and siting in 2012 after extensive open, public hearing process.

- AESO closely monitored project execution and reviewed Altalink's project change proposals and procurement systems. Regulations require cost reporting and monthly updates.
- Transmission Facilities Cost Monitoring Committee, composed of multiple stakeholders, monitored and publicly reported semi-annually on project progress and costs.

- Altalink must apply to AUC for recovery of WATL costs in transmission tariffs.
- AUC reviews expenditures through open, transparent, evidence-based proceedings to determine prudency. AESO's judgement of prudency based on its involvement in project development can affect AUC assessment.
- Final cost of WATL was $1.7bn. AUC review underway in late 2018.

Keeyask Generating Station, Manitoba ($10.5bn, estimate)

Project Identification

- Keeyask identified by Manitoba Hydro (MH) in 1990s as a means to improve system reliability, meet future energy demand, and serve export markets.
- Keeyask is one component of MH's $20bn plan for new generation and transmission projects.

Evaluation

- Government directed Public Utility Board in 2012 to commence a Needs for and Alternatives To (NFAT) review of Keeyask and other projects. Terms of reference restricted the review scope, excluding an associated major $5bn transmission line.
- PUB's NFAT report in 2014 recommended Keeyask approval, recommended other projects be rejected.
- External experts later criticized restrictions on NFAT and assumptions, found approval of project "imprudent".

Approval

- Province issued environmental, water power and fisheries licenses for Keeyask in 2014, enabling construction to commence July 2014.
- 2014 $6.5bn cost estimate, expected to be in service by end 2019.

Execution & Oversight

- MH commenced major construction and expenditures for Keeyask in 2010 and power export contracts were agreed in 2011 - all prior to NFAT review.
- According to external experts reporting later to the PUB, Manitoba Hydro did not have effective governance systems for oversight of the main contractor. Limited independent oversight of the project by government.

Cost Review & Recovery

- The PUB has had no authority to (dis)approve or review the prudence of Manitoba Hydro's capital project plans or associated capital expenditures. This historic restriction was lifted by a new government in April 2017.
- The PUB is able to review operating costs, and determine whether they should be recovered in rates. PUB reviews are open, transparent and evidence-based.
- Keeyask costs are predicted to reach $10.5bn, leading to credit-rating agency concerns about MH and provincial debt levels.

Muskrat Falls, Newfoundland and Labrador ($12.7bn, estimate)

- Muskrat Falls and Gull Island projects identified by NLH for their provincial and export market potential.
- MF announced by government as potential project in 2007 provincial energy plan.
- Nalcor signed agreement with Emera in 2010 to jointly develop the MF site and transmission link.

- Government asked PUB in 2011 to conduct a restricted review of MF in comparison to one specific alternative supply option.
- PUB conducted public hearings and concluded in 2012 that Nalcor's information on MF project costs was too imprecise and uncertain to determine whether it was the least cost option.
- Federal-provincial joint review panel in 2011 concluded that Nalcor's business case for MF was inadequate and recommended independent analysis of alternatives.

- Government sanctioned project in late 2012, citing support from selected consultant reports.
- Cost estimated in October 2012 at $7.4bn, completion expected by 2017.

- Government appointed Muskrat Falls Oversight Committee of senior bureaucrats in early 2014. Four independent members appointed in 2017.
- Ernst and Young (EY) provided three reports to government on project status and risks in 2015, 2016 and 2017.
- EY recommended government appoint an independent expert to provide regular monitoring and reporting to the Oversight Committee.

- PUB prohibited by legislation in 2012 from reviewing MF costs and prudency of expenditures.
- PUB is required by legislation to incorporate all MF costs in electricity rates when project is completed.
- 2018 cost estimate of $12.7bn, completion anticipated 2020.