

Enabling Non-Wires Solutions in Alberta's Deregulated Electricity Market

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INTRODUCTION

Rising demand and decarbonization goals are straining Alberta's distribution grids, yet non-wires solutions (NWS) that defer costly upgrades remain underused.

Alberta runs Canada's only deregulated, energy-only market, so competitive generation and retail coexist with regulated monopoly wires, creating barriers absent elsewhere.

Under performance-based regulation, utilities earn a return on capital but not on operating solutions, a capital bias that discourages NWS at scale.

OBJECTIVES

Integrate NWS into Alberta distribution planning so they deliver net system value and stay financially viable, while keeping power affordable, reliable, and clean.

Build a distribution-focused, Alberta-specific cost-benefit framework adapted from Colorado, Ontario, and New York.

Identify the regulatory and financial barriers to NWS and the reforms that overcome them.

Apply the framework to a demand response deferral to identify types of resources that deferral savings can finance.

METHODOLOGY

This study develops a distribution-focused, Alberta-specific cost-benefit framework that assesses both system value and private financial viability. Demand response (DR) is used as a proof-of-concept application to demonstrate the framework.

A mixed-methods design combines three evidence streams:

- comparative analysis of NWS regulatory and evaluation frameworks from other jurisdictions;
- qualitative analysis of anonymized stakeholder interviews and workshop deliberations conducted by the industry partner
- a quantitative, three-tier cost-benefit model that applies the Alberta framework to a DR distribution-deferral case.

The framework is parameterized using Alberta-specific data and stakeholder evidence and evaluates NWS from utility, ratepayer, and societal perspectives, alongside private financial viability.

The three-level model adapts and extends Colorado's EMTRC, Ontario's OEB benefit-cost analysis, and New York's REV framework for Alberta's market structure.

- Level 1 fits load growth across feeders, treats capacity as lumpy \$5M / 10MW builds, and converts the net present value of deferral into a maximum availability payment (\$/kW-yr).
- Level 2 tests whether a NWS provider can deliver a solution within that ceiling and clear its cost of capital;
- Level 3 adds a full societal test valuing distribution system benefits, avoided emissions, health, reliability, and equity.

Demand response was chosen to test the framework because it is low-capital and data-available; the same three-level structure applies to storage, virtual power plants, and managed EV charging.

RESULTS

Demand response passes the Alberta CBA test. The three-level model shows that DR creates sufficient distribution-deferral value to support an NWS contract, remains deliverable by a third-party aggregator, and generates substantial societal value.

- Level 1 : Deferral value. Deferring the modeled distribution investment for ten years generates approximately \$10.92M in gross present-value savings. After construction-cost inflation and the ratepayer savings reserve, approximately \$7.62M remains available for an NWS contract, equivalent to \$23/kW-year.
- Level 2 : Provider viability. DR is financeable within this ceiling because it relies on existing flexible load and requires limited new capital. The residential portfolio returns an NPV of approximately \$24,000, 7.5% IRR, and a 1.01 benefit-cost ratio at a 7% hurdle rate—effectively break-even with minimal margin.
- Level 3 : Societal value. The largest benefit is avoided distribution investment (\$6.51M), supplemented by avoided GHG emissions (\$3.56M), public-health benefits (\$1.72M), and avoided restoration costs (\$0.23M). The societal cost base is approximately \$1.9M, producing a benefit-cost ratio of 6.55 and approximately \$212/kW of peak relief in net benefits.

While the deferral creates substantial system value, but only a fraction is available to NWS providers, limiting private viability for capital-intensive resources.

Deferral horizon changes resource eligibility. A three-year deferral supports \$58.8/kW-year versus \$23.1/kW-year over ten years, expanding viability for higher-cost resources such as storage while favouring low-capital DR under longer deferrals.

CBA of 10-year deferral using demand response

Metric	Value
Level 1 · Utility Deferral	
Gross deferral saving (PV)	\$10.92M
Maximum NWS budget (PV)	\$7.62M
Availability payment · 10-yr	\$23/kW-yr
Availability payment · 3-yr	\$59/kW-yr
Level 2 · NWS Provider	
Residential benefit-cost ratio	1.01
Commercial benefit-cost ratio	1.00
Level 3 · Alberta CBA (societal)	
Total benefits	\$12.49M
Total costs	\$1.91M
Net present value	\$10.58M
Alberta CBA Benefit-cost ratio	6.55
Net benefit per kW	\$212

CONCLUSION

Demand response emerges as the strongest near-term option for location-specific, time-bound distribution constraints that can be addressed through existing flexible load.

The key barrier is value allocation, not value creation: societal benefits exceed the revenue available to private providers, limiting investment in capital-intensive resources.

Deferral horizon is a critical design lever. A three-year deferral supports approximately \$59/kW-year, compared with \$23/kW-year over ten years, expanding the range of economically viable NWS resources.

Regulatory reform is required to scale NWS, including TOTEX-equivalent treatment of NWS operating expenditure, a revised PBR3 pilot, and standardized benefit-stacking and cost-benefit evaluation.

Scaling also requires grid visibility and interoperability through AMI, ADMS, and DERMS, supported by regulatory learning and utility experience.

Results remain directional pending utility-metered data. Future work should test uncertainty through sensitivity and Monte Carlo analysis and develop Alberta-specific health and equity valuations.

Enabling Reforms to Accelerate NWS Deployment in Alberta

Modernize Regulatory Incentives

- Align utility incentives across capital and operating solutions to support least-cost system planning.
- Strengthen PBR3 and explore TOTEX-equivalent treatment for eligible NWS.

Strengthen Grid Readiness

- Build the visibility, communication, and coordination infrastructure required to integrate DERs reliably.
- Coordinate AMI, ADMS, and DERMS standards and establish consistent DER participation

Establish a Consistent Evaluation Framework

- Enable transparent comparison of NWS and conventional infrastructure based on total system value.
- Apply Alberta-specific cost-benefit analysis incorporating deferral, reliability, environmental, and societal benefits.

Build Institutional Capacity & Confidence

- Create conditions for utilities, regulators, and NWS providers to test, learn, and scale successful approaches
- Support demonstration projects, knowledge-sharing, and clear regulatory guidance.

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