PEMBINA Institute

# Getting Time-Varying Rates Right in Alberta

## Why DSM must come before price signals

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## Why DSM must come before price signals

### Key takeaways

Time-varying rates are not a starting point for increasing electricity demand. Price signals work best when introduced into an electricity system with strong demand-side management (DSM) already in place. Energy efficiency and demand response reduce baseline consumption, build customer understanding, and create the flexibility needed for meaningful participation.

Affordability, reliability, flexibility, and customer choice should guide the sequencing of reforms. Technology investments such as advanced metering and data platforms add the most value once DSM capabilities are established, rather than serving as a prerequisite for action.

Customer equity, trust and optionality are central to successful rate design. Time-varying rates tend to perform best when participation is opt-in, or where clear and easy, opt-out pathways exist. This helps to avoid uneven impacts and long-lasting sensitivity around electricity pricing.

Electrification creates localized pressures on distribution systems that system-wide price signals alone may not address. A staged "crawl–walk–run" approach supports affordability, reliability and customer readiness while reducing risk and unnecessary system investment.

Alberta's electricity system is entering a period of rapid change. Electric vehicles, rooftop solar and the growing use of behind-the-meter technologies, including smart home technologies, are reshaping how electricity is consumed and where pressures emerge on the grid. At the same time, interest is growing in tools like time-varying rates (TVR) to encourage customers to shift when they use electricity. As this conversation advances, one question matters more than any other: **What needs to be in place for price signals to actually work?**

Experience from other jurisdictions provide a clear answer: time-varying rates are not a starting point. Rather, they are a tool – one that works best when introduced into a system that already has strong demand-side management (DSM) in place.

# Price signals rely on capability, not just intention

Time-varying rates assume customers can respond to price signals. That response depends on customers having flexibility, options and confidence that participation will not compromise affordability or comfort.

In jurisdictions where TVR has delivered meaningful results, customers were already supported by long-standing DSM programs, including energy efficiency and demand response. These programs reduce baseline customer consumption, improve energy literacy and create practical pathways for customers to shift their electricity use.

Many utilities have focused deliberately on building customer readiness before introducing new rates. For example, Sacramento Municipal Utility District (SMUD) administered energy efficiency and demand response programs for over five decades, embedding DSM as a core part of the utility-customer relationship well before introducing time-varying rates.[1] When SMUD later explored TVR, it emphasized bill impact transparency through bill comparison tools, and bill protection mechanisms.[2] Paired with targeted education and outreach, this approach improved understanding, reduced confusion and built confidence, without exposing customers to financial risk.[3]

Where this foundation is missing, price signals tend to produce uneven results. Customers with flexible schedules or newer technologies may benefit, while others — renters, seniors, shift workers, small businesses or households with medical needs — may have limited ability to adjust.

The system cost implications of DSM and TVR sequencing are significant. DSM delivers measurable cost savings, while maintaining reliable access to energy. In North America, every $1 invested in DSM returns up to $4 in savings to the utility system, reflecting avoided energy supply, transmission and distribution infrastructure costs.[4] This is why jurisdictions around the world use DSM as a core system resource.

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[1] SMUD has been administering energy efficiency and conservation programs since the 1970s. Sacramento Municipal Utility District (SMUD), "Our history." https://www.smud.org/Corporate/About-us/Company-Information/Our-History

[2] SMUD, *SmartPricing Options: Final Evaluation* (2014), 45, 109. https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/research-SmartPricing-options-final-evaluation.ashx

[3] Alcides Hernandez et al, "Reducing Carbon, Giving Customers Control: TOD in Sacramento," in *Moving Ahead with Time of Use Rates* (American Public Power Association, n.d.). https://www.publicpower.org/system/files/documents/Moving-Ahead-Time-of-Use-Rates.pdf

[4] Kari Hyde, Ceileigh McAllister and Emma Caramazza, *Beyond the Meter: Harnessing demand-side management to power Alberta's energy future* (Pembina Institute, 2025). https://www.pembina.org/pub/beyond-meter

By lowering both customer energy bills and utility system costs, DSM delivers durable, economy-wide value. Time-varying rates, in contrast, primarily affect when electricity is used and do not reliably deliver comparable system cost reductions on their own. Without DSM in place to reduce *overall* and *peak demand*, price signals alone have limited ability to lower long-term system costs or avoid infrastructure investment.

## Start with outcomes, not technology

Discussions about demand flexibility often gravitate quickly toward enabling technologies such as advanced metering infrastructure (AMI), data platforms and customer interfaces. These tools matter — but only once the intended outcomes are clear.

Across jurisdictions, four objectives consistently guide effective approaches to demand flexibility:

**Affordability:** avoiding unnecessary infrastructure investment and helping customers manage bills.

**Reliability:** particularly at the local distribution level as electrification accelerates.

**Flexibility:** enabling the system to adapt to changing load patterns.

**Customer choice:** recognizing that households and businesses differ in their ability to respond to price signals.

Different objectives require different capabilities. Improving affordability and local reliability often starts with energy efficiency and demand response. Once customers and utilities have better visibility into how energy is actually being used, more advanced rate structures can be implemented.

A recurring lesson is that **DSM clarifies where technology investments add value**, rather than technology determining the path forward.

## Customer equity, trust and optionality are system design issues

Rate design is never neutral. Time-varying rates can create opportunities for customers who can shift usage, but they can also challenge those with limited flexibility. As a result, **customer equity and trust are not secondary considerations; they directly influence whether TVR delivers its intended outcomes.**

Experience across jurisdictions shows that optionality matters. TVR tends to perform best – and earn greater public acceptance – when customers can *choose* whether and when to participate. Opt-in structures allow customers to self-select based on their ability to respond, while clear, easy opt-out pathways help maintain trust where broader adoption is pursued. Optionality allows price signals to function as an opportunity rather than an obligation, aligning participation with customer capability.

Ontario's experience illustrates why this matters. Between 2009 and 2011, the province introduced smart meters alongside mandatory time-of-use pricing (TOU) for most residential [5]customers. ☐At the time of this initial rollout, DSM programs were present but not yet designed or scaled to support widespread customer response to time-based pricing signals, and customer education was modest. Many households reported difficulty shifting usage due to work schedules, caregiving responsibilities, medical needs or housing constraints, such as rental vs. homeowner status. Importantly, Ontario's early TOU experience was not limited to residential customers. Mandatory time-of-use pricing also applied broadly to small commercial customers, with these accounts representing roughly 15-20% of[6].☐ Many of these customers had limited ability to shift load due to operating hours, process and refrigeration demands, and limited access to automation.

The result was increased public scrutiny and a lasting sensitivity around electricity pricing and rate design. This response was not necessarily driven by opposition to modernization itself, but by a perception that customers were expected to adapt without having the tools, supports or choices needed to do so.[7] The intended reduction through TOU of 1350 MW by 2010 was not met and demand rose by 100 MW instead; modest peak reductions were offset by increased off-peak consumption.[8]

[5] Ontario Energy Board, "Smart meter deployment and the Application of Time-of-use Pricing." https://oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/smart-meter-deployment-and

[6] This estimate is based on customer class energy volumes reported in Ontario Energy Board Regulated Price Plan supply cost reports and sectoral consumption data published by the Independent Electric System Operator, which together distinguish residential, small commercial (generally defined as General Service under 50 kW) and large commercial/industrial electricity use.

[7] Mike Crawley, "Ontario's smart meters failing to cut electricity demand," *CBC News,* November 24, 2016. https://www.cbc.ca/news/canada/toronto/smart-meters-hydro-bills-ontario-time-of-use-pricing-1.3862462

[8] Auditor General of Ontario, *Annual Report 2014*, Section 3.11: Smart Metering Initiative. https://www.auditor.on.ca/en/content/annualreports/arreports/en14/311en14.pdf

Over time, Ontario adjusted its approach. The province expanded DSM offerings, introduced rate choice — allowing customers to select between tiered pricing, TOU and ultra-low overnight options[9] — and improved communication and bill comparison tools.[10]

This evolution highlights why DSM portfolios in most jurisdictions explicitly address equity by reducing energy use, improving comfort and lowering bills for energy-burdened households. These foundations help ensure customers are not left behind as systems evolve and that future pricing reforms are more widely accepted.

## Local grids don't respond evenly to system-wide price signals

Electrification does not arrive evenly. EV charging, electrified cooling and rooftop solar adoption tend to cluster by neighbourhood. In Alberta, some new residential developments include rooftop solar as a standard feature, while certain suburban areas show higher concentrations of EV ownership.

System-wide price signals can help reduce overall peaks, but they do not automatically resolve localized constraints. In some jurisdictions, TVR has led customers to shift usage into the same low-cost periods, creating secondary peaks that place additional stress on neighbourhood feeders.

This is where DSM plays a critical role. Managed EV charging, for example, allows utilities to smooth overnight charging and reduce coincident peak demand without requiring customers to actively monitor prices or change daily behaviour.[11] FortisAlberta's Managed EV Charging pilot demonstrates how direct control load management can support feeder-level reliability and complement price-based approaches as EV adoption grows.[12]

[9] Government of Ontario, "Ontario Launches New Ultra-Low Overnight Electricity Price Plan," media release, April 11, 2023. https://news.ontario.ca/en/release/1002916/ontario-launches-new-ultra-low-overnight-electricity-price-plan

[10] Ontario Energy Board, "Choosing your electricity price plan." https://www.oeb.ca/consumer-information-and-protection/electricity-rates/choosing-your-electricity-price-plan

[11] WeaveGrid, "What is EV Managed Charging?" May 8, 2024. https://www.weavegrid.com/news/what-is-ev-managed-charging

[12] FortisAlberta, *Electric Vehicle Smart Charging Pilot Results: Technical Report* (2025). https://fortisalberta.com/docs/default-source/default-document-library/ev-pilot_technical-report.pdf

# What effective sequencing looks like

Jurisdictional experience points toward a staged approach to demand flexibility that aligns customer readiness, system needs and technology maturity.

## Crawl

Begin with energy efficiency and basic demand response. These measures reduce baseline consumption, support affordability and improve understanding of how and when energy is used. Early DSM efforts help customers manage bills, ease peak pressures and build familiarity with flexibility, without requiring new technologies or significant system upgrades.

## Walk

As awareness and visibility improve, expand demand response and targeted load management, and begin incorporating behind-the-meter distributed energy resources (DERs), such as managed EV charging, smart thermostats, or customer-sited solar paired with controls, where appropriate. Continued investment in energy efficiency remains essential, helping customers maintain flexibility and manage costs. Modest technology upgrades, including interval metering and meter data management systems (MDMS), can support more predictable participation and provide better insights into local load and customer behaviours.

## Run

With strong DSM capability in place and clearer visibility into system and local load patterns, Alberta will be better positioned to consider more complex rate structures and fully technology-enabled participation. This may include more advanced coordination of behind-the-meter resources, dynamic customer options and enhanced data platforms. Even at this stage, energy efficiency and demand response remain critical to stabilize costs, expand customer choice and support reliable system operation as electrification accelerates.

Across all stages, **DSM is not a transitional tool; it is the backbone that supports affordability, reliability, customer confidence and meaningful choice.**

# A conversation worth continuing

Alberta has an opportunity to build demand flexibility in a way that supports affordability, reliability and customer trust. Experience elsewhere shows that this is achieved through

thoughtful sequencing — starting with DSM, building capability and visibility — and only then layering in more complex tools such as time-varying rates, offered in ways that respect customer choice. As utilities, governments, regulators and industry continue to explore next steps, grounding the conversation in pragmatic approaches and system realities can help ensure that demand flexibility delivers lasting value for customers and the electricity system alike.

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The Pembina Institute acknowledges that the work we steward and those we serve span across many Nations. We respectfully acknowledge the space our organization is headquartered in as the traditional and ancestral territories of the Blackfoot Confederacy, comprised of the bands Siksika, Piikani, and Kainai, the Îyârhe Nakoda Nations, including the bands of Goodstoney, Chiniki, and Bearspaw, and the Tsuut'ina Dené. These Lands are also home to the Métis Nation of Alberta — Region 3 whose Peoples have deep relationships with the Land.

These acknowledgements are some of the beginning steps on a journey of several generations. We share them in the spirit of truth, justice, reconciliation, and to contribute to a more equitable and inclusive future for all of society.