



## APPENDIX B.2: CURRENT STATE SUMMARIES



## DEFINITION OF CDM

- I. Segmentation and definitions
- II. CDM in Ontario
- III. Jurisdictional scan



# I. SEGMENTATION AND DEFINITIONS

## TECHNOLOGIES AND APPROACHES ASSESSED

- Demand side management (DSM) is an umbrella term that typically refers to energy efficiency and demand response
- This review will investigate all major DSM activities and also includes distributed energy resources (DER) given the increasing importance of distributed energy resources and the fact that much of this activity happens behind the meter
- For the purpose of this report, each technology and approach assessed was mapped to a category for ease of review

Category	Category Description	Technology/Approach	
Energy Efficiency	Technology or approaches that result in less energy to perform the same function.	<ul style="list-style-type: none"> <li>• Resource acquisition</li> <li>• Market transformation</li> <li>• Behavioural</li> </ul>	<ul style="list-style-type: none"> <li>• Performance-based funding</li> <li>• Voltage reduction</li> <li>• Pilots/Research &amp; Development</li> </ul>
Demand Response	Technology or approaches that enable energy shifting or reduction during certain times.	<ul style="list-style-type: none"> <li>• Direct load control</li> <li>• Demand Response capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Time-of-use pricing</li> <li>• Critical peak pricing</li> <li>• Pilots/Research &amp; Development</li> </ul>
Distributed Energy Resources	Behind-the-meter or distribution-connected generation or storage resources that supply all or part of a customer's electricity use.	<ul style="list-style-type: none"> <li>• Solar Photovoltaic (PV)</li> <li>• Solar PV-storage</li> <li>• Storage</li> <li>• Combined Heat &amp; Power</li> </ul>	<ul style="list-style-type: none"> <li>• Electric Vehicles</li> <li>• Microgrids</li> <li>• Pilots/Research &amp; Development</li> </ul>

## ENERGY EFFICIENCY DEFINITIONS

- The following table outlines the definition of each energy efficiency technology and approach investigated including some examples of each

Technology/Approach	Description	Examples
Resource acquisition	Programs that promote products and practices used by energy consumers that drive investments in the short-term	Retrofit program, small business lighting program, coupon program
Market transformation	Programs that create lasting change in market behavior by removing identified barriers or exploiting opportunities to accelerate the adoption of energy efficiency measures	Voluntary standards, new approaches to building management
Behavioural	Programs focused on behavioral transformation of energy use of end consumers	Social benchmarking, home energy reports
Performance-based funding	Performance-based incentive payment calculated via use of whole-building advanced metering infrastructure (AMI) and associated analytics	ESCO model whereby project is financed and developed by the ESCO and payment is per unit of saving
Pilots/Research & Development	Trial initiatives to test new approaches and strategies for delivering energy efficiency to customers	IESO Pay for Performance for multi-site customers, building optimization
Pilots/Research & Development	Trial initiatives to test new approaches and strategies for delivering energy efficiency to the grid	Conservation Fund pilot for Conservation Voltage Reduction
Voltage reduction	Reduction of energy consumption resulting from a reduction of feeder voltage/voltage optimization	Voltage optimization through reactive power compensation, ground wire loss reduction

## DEMAND RESPONSE DEFINITIONS

- The following table outlines the definition of each energy efficiency technology and approach investigated including some examples of each

Technology/Approach	Description	Examples
Direct load control	Programs focused on automatically shifting customer load in response to signals from the system operator or aggregator	Ontario's peaksaverPLUS program
Demand Response Capacity	Programs focused on customers shifting load in response to signals from the system operator or aggregator	Ontario's former Demand Response programs (DR1, DR2)
Time-of-use pricing	Programs that modify customer-facing pricing into pricing tiers based on the time of day (and/or season)	Ontario's time-of-use pricing regime
Critical peak pricing	Programs that align the highest system peaks with customer-facing pricing	Critical peak pricing, critical peak rebates

## CUSTOMER DISTRIBUTED ENERGY RESOURCE DEFINITIONS

- The following table outlines the definition of each energy efficiency technology and approach investigated including some examples of each

Technology/Approach	Description	Examples
Solar PV	Solar PV cited on customer premise, delivered via a utility or 3 <sup>rd</sup> party partner	Micro feed-in-tariff programs
Solar PV-storage	Combination of solar PV and storage technologies into a customer-sited nanogrid	PowerStream's POWER.HOUSE
Storage	Utility incentives designed to accelerate adoption of storage technology. Programs may enable the utility to utilize stored power during peak events	TESLA Powerwall
Combined Heat and Power	Also called co-generation is behind-the-meter generation that involves the production of both electricity and useful thermal energy in an integrated system <sup>1</sup>	Natural gas powered CHP for hospitals, waste energy recovery for pulp and paper facilities
Electric Vehicles	Plug-in electric vehicles as they relate to the ability to shift and manage customer load or use as storage	Electric vehicle charging rates, direct load control devices on charging
Microgrids	Programs or pilots that promote microgrids (combination of storage technology and generation resources). Can consider resiliency/islanding in response to physical or economic conditions	Customer-sited microgrids (solar PV, storage, combined heat and power)
Pilots/Research & Development	Trial initiatives to test new approaches and strategies for delivering distributed energy resources to the grid	Smart grid fund intelligent electric vehicle charging stations

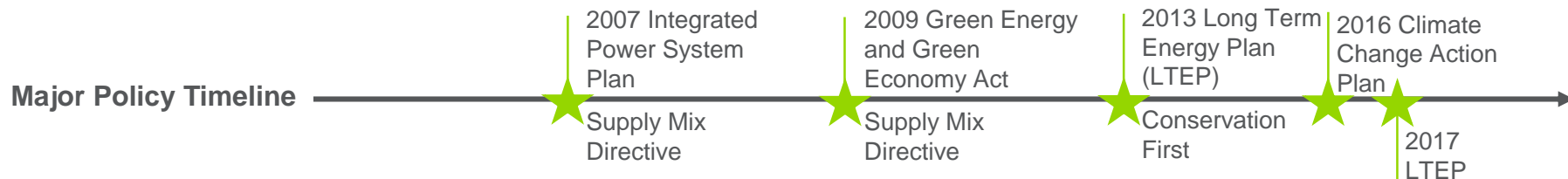


## II. CDM IN ONTARIO



# EVOLUTION OF THE DEFINITION OF CDM IN ONTARIO – LONG TERM VIEW

- The definition of CDM is set by guiding policies which specify overarching, long-term CDM goals/targets at the provincial level, these goals/targets have historically included a broad range of CDM activities



	2005-2007	2008-2010	2011-2014	2015-2020			
Guiding policy	<ul style="list-style-type: none"> <li>15 specific directives</li> </ul>	<ul style="list-style-type: none"> <li>Integrated Power System Plan</li> <li>Supply Mix Directive</li> </ul>	<ul style="list-style-type: none"> <li>Green Energy and Green Economy Act</li> <li>Supply Mix Directive</li> </ul>	<ul style="list-style-type: none"> <li>Long Term Energy Plan</li> <li>Conservation First</li> </ul>			
Long term goals/targets	N/A	3,600 <b>MW</b> by 2025	7,100 <b>MW</b> and 28 <b>TWh</b> by 2030	30 <b>TWh</b> by 2032			
Definition of CDM	2005-2007	2008-2010	2011-2014	2015-2020			
Energy Efficiency							
Behavioural Conservation							
Fuel Switching*							
Self/Co Generation					< 10 MW	< 10 MW	< 10 MW Excl. FIT and mFIT
Demand Management							
Natural Conservation							

\* When established, Fuel Switching referred to a transition from electricity to natural gas resulting in a reduction in electricity use

# EVOLUTION OF THE DEFINITION OF CDM IN ONTARIO – SHORT TERM VIEW (DX)

- The definition of CDM for the purposes of short-term targets is set by specific directives, these targets have historically included a subset of CDM activities that are included in long term goals/targets
- The table below outlines the targets for distribution connected (Dx) customers programs over time and the activities both included in the definition of CDM and supported through programs

	2005-2007	2008-2010	2011-2014	2015-2020
Primary target responsibility	Former OPA (IESO)	Former OPA (IESO)	LDCs	LDCs
Short term goals/targets	1,350 MW	Additional 1,350 MW	1,330 MW and 6,000 GWh between 2011 and 2014	7 TWh by 2020

Definition of CDM		2005-2007	2008-2010	2011-2014	2015-2020
Energy Efficiency	Other programs				
	LDC programs*				
	IESO programs				
Behavioural Conservation					
Fuel Switching					
Self/Co Generation	Renewables	<500 kW			<10 MW
	CHP**	<10 MW			<10 MW
Demand Management					
Natural Conservation					

# EVOLUTION OF THE DEFINITION OF CDM IN ONTARIO – SHORT TERM VIEW (TX)

- The definition of CDM for the purposes of short-term targets is set by specific directives, these targets have historically included a subset of CDM activities that are included in long term goals/targets
- The table below outlines the targets for transmission connected (Tx) customers programs over time and the activities both included in the definition of CDM and supported through programs

	2005-2007	2008-2010	2011-2014	2015-2020
Primary target responsibility	N/A	N/A	Former OPA (IESO)	IESO
Short term goals/targets	N/A**	N/A**	300 MW by June 2015	1.7 TWh by 2020

Definition of CDM	2005-2007	2008-2010	2011-2014	2015-2020
Energy	Other programs			
Efficiency	LDC programs			
	IESO programs			
Behavioural Conservation				
Fuel Switching				
Self/Co Generation	Renewables			<20 MW
	CHP*			<20 MW
Demand Management				
Natural Conservation				

## CURRENT DEFINITION OF CDM

- The current definition of CDM (considered towards targets) is defined by government Directive

Conservation First Framework	Industrial Accelerator Program
<ul style="list-style-type: none"> <li>• Inclusive of activities aimed at reducing electricity consumption and reducing the draw from the electricity grid; for example:                             <ul style="list-style-type: none"> <li>• geothermal heating and cooling</li> <li>• solar heating</li> <li>• small scale (i.e. &lt;10MW) behind the meter customer generation</li> </ul> </li> <li>• CDM should be considered to exclude those activities and programs related to:                             <ul style="list-style-type: none"> <li>• a Distributor’s investment in new infrastructure or replacement of existing infrastructure</li> <li>• any measures a Distributor uses to maximize the efficiency of its new or existing infrastructure</li> <li>• activities promoted through a different program or initiative undertaken by the Government of Ontario or the OPA, such as the OPA Feed-in Tariff (FIT) Program and micro-FIT Program</li> <li>• activities related to the price of electricity or general economic activity</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Inclusive of activities aimed at reducing electricity consumption and reducing draw from the electricity grid, including behind the meter customer generation</li> </ul>

CHP will no longer be eligible as of July 1, 2018 and In front of the meter conservation (IFMC) will be considered as progress towards targets per the 2017 LTEP (released October 2017)

## ELIGIBILITY AND ALIGNMENT WITH POLICY OBJECTIVES

- The following table outlines whether a particular technology or approach is currently eligible to be considered CDM within Conservation First Framework and Industrial Accelerator Program per Directions and which policy objectives the technology or approach aligns with; note: pilots/research and development are not included

Technology/ Approach	Eligible as CDM?	Policy Objectives							
		Initial					Evolving		
		Integration with Regional Planning	Customer Choice	Peak Reduction	Innovation	Market Transformation	Greenhouse gas reductions	Energy Affordability	
Resource acquisition	Y								
Market transformation	Y								
Behavioural	Y								
Performance- based funding	Y								
Pilots/Research & Development	Y								

Alignment: High Moderate Low

## ELIGIBILITY AND ALIGNMENT WITH POLICY OBJECTIVES

- The following table outlines whether a particular technology or approach is currently eligible to be considered CDM within Conservation First Framework and Industrial Accelerator Program per Directions and which policy objectives the technology or approach aligns with; note: pilots/research and development are not included

Technology/ Approach	Eligible as CDM?	Policy Objectives						
		Initial				Evolving		
		Integration with Regional Planning	Customer Choice	Peak Reduction	Innovation	Market Transformation	Greenhouse gas reductions	Energy Affordability
Direct load control	N							
Demand Response Capacity	N							
Time-of-use pricing	N							
Critical peak pricing	N							
Alignment:		High	Moderate	Low				

# ELIGIBILITY AND ALIGNMENT WITH POLICY OBJECTIVES

- The following table outlines whether a particular technology or approach is currently eligible to be considered CDM within Conservation First Framework and Industrial Accelerator Program per Directions and which policy objectives the technology or approach aligns with; note: pilots/research and development are not included

Technology/ Approach	Eligible as CDM?	Policy Objectives						
		Initial					Evolving	
		Integration with Regional Planning	Customer Choice	Peak Reduction	Innovation	Market Transformation	Greenhouse gas reductions	Energy Affordability
Voltage reduction	N*	●		●	●			
Solar PV	Y <sup>1</sup>	●	●	●	●		●	●
Solar PV-storage	N	●	●	●	●		●	●
Storage	N	●	●	●	●		●	●
Combined Heat and Power	N*	●	●	●			○	●
Electric Vehicles	N	●	●		●		●	
Microgrids	N	●	●	●	●		◐	●
Alignment:		● High	◐ Moderate	○ Low				

## THERE ARE SIGNIFICANT POLICIES IN PLACE THAT CAN INFLUENCE AND/OR CONFLICT WITH CURRENT PROGRAMS

- The following policies can improve the economics for certain technologies, in particular for distributed energy resources
- These policies and programs can also influence a customer's participation in energy efficiency programs

Policies/Programs	Description
Net Metering	<p>Credit for electricity customers when excess renewable generation is exported to the grid. Net metering regulation was recently passed in Ontario allowing customers with renewable generation to sell excess energy back to the grid at retail electricity rates. Customers receive a “net” bill.</p> <p>Improves the business case for customer sited solar PV and storage resources. Phase II of the regulation is anticipated to include a position on virtual net metering enabling behind-the-meter resources to be aggregated to provide, for example, ancillary services to the grid.</p>
Industrial Conservation Initiative	<p>Customers who are eligible to participate pay a global adjustment (GA) charge based on their percentage contribution to the top five peak Ontario demand hours over a 12 month base period. Recent announcement to reduce eligibility to customers with &gt;500 kW of peak demand.</p> <p>Improves the business case for customer sited storage, combined heat and power, and microgrids which can help the customer reduce their load during potential critical peak hours.</p> <p>Regulation (O.Reg 429/04) allows customers to maintain their eligibility if participation in the Conservation First Framework, Industrial Accelerator, or Ontario Climate Change Solutions Deployment Corporation programs or Demand Response pilots or auctions results in a decrease in their peak demand below the eligibility threshold.</p>
Industrial Electricity Incentive	<p>Eligible customers that are accepted into the program can receive reduced electricity rates. Can reduce the case (increased payback periods) for customer sited energy efficiency and distributed energy resources.</p>





### III. JURISDICTIONAL SCAN

## JURISDICTIONS REVIEWED

- IESO is unique among system operators in its role with CDM programs that go beyond energy efficiency activities (e.g., long-term system planning, demand response, regional planning, procurement)
- As it pertains specifically to CDM activities, Navigant selected six jurisdictions that are among the most mature and progressive worldwide

<b>Canada</b>	<b>Nova Scotia</b> <b>British Columbia</b>	<ul style="list-style-type: none"> <li>• Nova Scotia and BC Hydro have historically had the highest DSM spending per customer in Canada</li> </ul>
<b>USA</b>	<b>California</b> <b>Massachusetts</b> <b>Vermont</b> <b>New York</b>	<ul style="list-style-type: none"> <li>• California, Massachusetts, and Vermont placed 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> respectively in the ACEEE (American Council for an Energy-Efficient Economy) <i>2016 Energy Efficiency Scorecard</i></li> <li>• New York placed 5<sup>th</sup> on the scorecard, but is a meaningful addition as it is one of the most progressive jurisdictions with respect to expanding investment in DER</li> <li>• All of these jurisdictions have diverse and mature program portfolios and a high level of energy savings achievement (as a % of sales)</li> </ul>
<b>Not Selected</b>	<b>Europe</b> <b>PJM</b> <b>Australia</b>	<ul style="list-style-type: none"> <li>• Certain jurisdictions in Europe, such as Germany, are leaders in CDM activities, however they are generally poor comparables to North American jurisdictions <ul style="list-style-type: none"> <li>• EE in Europe is generally defined more broadly as inclusive of transportation and all fuel types. In addition, the lead delivery and reporting agents are typically governmental bodies, with a priority focus on building codes and appliance standards, as opposed to measure level incentives</li> </ul> </li> <li>• PJM Interconnection does not <u>oversee</u> DSM or DER programming or investment.</li> <li>• Australia did not rank highly on the ACEEE international scorecard</li> </ul>

## JURISDICTIONS – QUANTITATIVE COMPARISON

2015 Averages	Ontario (Average)	British Columbia (BC Hydro)	Nova Scotia (NS Power)	Massachusetts (All Utilities)	California (All Utilities)	Vermont (All Utilities)	New York (All Utilities)
C&I Rate (\$/kWh)*	\$0.125	\$0.09	\$0.12	\$0.09	\$0.13	\$0.13	\$0.08
Residential Rate (\$/kWh)*	\$0.165	\$0.11	\$0.16	\$0.16	\$0.17	\$0.17	\$0.16
Res Customer Count (All Utilities in Jurisdiction) Millions	4.5	1.7	0.5	3.4	13.7	0.3	8.4
C&I Customer Count (All Utilities in Jurisdiction) Millions	0.49	0.2		0.56	1.9	0.05	1.4
Peak (GW)	21	11.5	2.4	16.9	64.9	0.8	38.3

US jurisdictions are presented in 2015 \$USD, Canadian in 2015 \$CAD. US States are summed into an all utility average, Province of British Columbia represents 2014 BC Hydro Annual Report Data, Province of Nova Scotia represents data from nspower.ca. US utilities represent a weighted average across respective jurisdictions.

US data Source: EIA Form 861, FERC Form 1.

## NEW YORK – JURISDICTION OVERVIEW

- New York is a leading jurisdiction with respect to embracing and encouraging innovation in the energy marketplace via a large initiative known as 'Reforming the Energy Vision' (REV) spearheaded by Governor Andrew Cuomo
- This initiative has been developing for several years and supports development of DER pilots and a suite of major policy objectives including affordability, reduced GHG emissions, customer choice, job growth, and clean transit
- REV demo/pilot projects are typically proposed by 3<sup>rd</sup> parties and/or utilities, and are funded by a combination of non-utility revenue streams (varies by project, e.g. digital platform advertising), utility cost savings (e.g. reduction in DSM budget), and one-time and/or annual utility operational expenses

Key Players	Description of Role
<b>NYSDERDA (New York State Energy Research and Development Authority)</b>	<p>Promotes energy efficiency and the use of renewable energy sources. Partners with stakeholders to develop and invest to foster the conditions that:</p> <ul style="list-style-type: none"> <li>• Attract the private sector capital investment needed expand New York's clean energy economy</li> <li>• Overcome barriers to using clean energy at a large-scale in New York</li> <li>• Enable New York's communities and residents to benefit from energy efficiency and renewable energy</li> </ul>
<b>IOUs (Investor Owned Utilities)</b>	7 privately owned utilities in New York
<b>NYPA (New York Power Authority)</b>	Public power authority, owns generation and transmission, only statewide electricity supplier, Promote energy efficiency and the development of clean energy technologies and electric vehicles
<b>New York Public Utilities Commission (PUC)</b>	Leads state policy implementation (largely shaped by the mission of REV) and regulates utility program administrators

## NEW YORK – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>IOUs, NYSERDA, and NYPA (public power authority). New York Public Utilities Commission (PUC) leads state policy implementation (largely shaped by the mission of REV) and regulates utility program administrators</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>Utility revenue decoupling permitted, utilities can also propose “earnings adjustment mechanisms” based on goal attainment</li> <li>NY REV commission proceedings</li> <li>Commission encourages utilities to move from a rebate-centric acquisition approach to one that more broadly focuses on market transformation</li> <li>Increasing focus on innovation -- e.g. in 2016 ConEdison proposed a "Test and Learn" budget to "identify new measures, uses, and delivery mechanisms for existing offerings“</li> </ul>
DR	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>~8 Utilities offer DR programs including ConEd, LIPA, National Grid, and NYPA. NYISO offers both reliability based and economic based DR payments. ~20 non-utility aggregators procure DR from customer groups</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>NY Public Utilities Commission has noted support and encouragement for DR &amp; it is well aligned with REV policy goals</li> <li>REV goals encouraging participation of 3<sup>rd</sup> party market participants</li> <li>NYISO (New York System Operator) accepts DR capacity bids from qualified load resources</li> </ul>
DER	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>Third party technology and software providers, IOUs, NYSERDA, and NYPA</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>NY REV process is enabling and encouraging new market participants (typically funded by utilities) to develop and publically propose innovative DER pilot projects across a variety of customer segments</li> <li>Virtual power plant aggregated solar PV and DR, community solar PV, and AMI-based customer information portals are example pilot projects</li> <li>New York has very supportive net metering and interconnection policies</li> </ul>

## VERMONT – JURISDICTION OVERVIEW

- Vermont is a small jurisdiction in the Northeastern U.S. with clear policy goals to encourage innovation and energy efficiency
- The jurisdiction has been long supportive of load reduction and comprehensive efficiency programs
- Vermont was a pioneer in developing the 3rd party EE administration model, now Efficiency Vermont, funded by volumetric surcharges
- Energy efficiency resource standard goal is among the highest in North America at 2.5% savings as a percent of sales/year

Key Players	Description of Role
<b>Efficiency Vermont (EVT)</b>	3 <sup>rd</sup> Party DSM Administrator operated by the Vermont Energy Investment Corporation (VEIC) Regulated by the Vermont Public Service Commission
<b>Green Mountain Power (GMP)</b>	Vermont's largest investor-owned electric utility. Recognized as an innovative utility with a strong commitment to DER (ran the first TESLA Powerwall pilot, now has a Powerwall program)
<b>ISO-NE</b>	New England grid operator, market administrator, and system planner Does not own infrastructure or deal with retail power

## VERMONT – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>Efficiency Vermont (EVT, 3<sup>rd</sup> Party Administrator), Burlington Electric, Vermont Gas</li> <li>EVT delivers DSM solutions to the majority of the state's electric customers but does not manage or own T&amp;D</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>Utility revenue decoupling permitted</li> <li>Energy Efficiency Resource Standard (EERS) among the highest in North America at 2.5% of sales/year. This goal has become more difficult to reach cost effectively as programs have become increasingly mature</li> <li>Supportive regulatory environment; Efficiency Vermont pioneered the 3<sup>rd</sup> party energy efficiency administrator role</li> <li>Large catalog of energy efficiency measures and delivery strategies</li> <li>Able to organize customer financing through a 3<sup>rd</sup> party financial institution. Long support for market transformation</li> </ul>
DR	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>Efficiency Vermont, Green Mountain Power (the states' largest electric utility), and Opower (now Oracle) have worked together to pilot retail-side DR initiatives</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>2016 statewide comprehensive energy plan (developed by the Department of Public Service) encourages both the energy efficiency utility (Efficiency Vermont) and the distribution utilities to develop 'smart (variable) rates' informed by smart meters. Smart appliances are also encouraged</li> <li>ISO-NE (New England system operator) accepts DR capacity bids from qualified load resources</li> </ul>
DER	<b>Primary Administrator</b>	<ul style="list-style-type: none"> <li>Green Mountain Power and other municipal or cooperative utilities</li> </ul>
	<b>Critical Policy Drivers &amp; Recent Developments</b>	<ul style="list-style-type: none"> <li>2016 statewide comprehensive energy plan (developed by the Department of Public Service) encourages the transition from centralized dispatch to greater volumes of distributed, local energy generation</li> <li>The DPS encourages the PUC (primary regulator) to adjust its rules to encourage this policy goal over time</li> <li>Vermont has very supportive net metering and interconnection policies</li> </ul>

## CALIFORNIA – JURISDICTION OVERVIEW

- California is a leading jurisdiction with a progressive policy environment that prioritizes GHG mitigation, innovation/customer choice, and long-run affordability
- California's Electric Program Investment Charge (EPIC) is a unique customer surcharge funded mechanism for California's top IOUs (Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE)) to invest in a broad range of innovative technologies and programs spanning EE, DR, and DER. EPIC's policy goals include:
  - "GHG emissions mitigation and adaptation in the electricity sector at the lowest possible cost, following the state's loading order for energy, low-emission vehicles/transportation, economic development, and efficient use of ratepayer monies." (CA Energy Commission)

Key Players	Description of Role
<b>PG&amp;E, SCE, SDG&amp;E</b>	California's largest investor-owned utilities, heavily involved in DER and grid modernization
<b>SMUD, LADWP</b>	Large municipal utilities also heavily involved in DER and grid modernization
<b>CAISO</b>	California grid operator, market administrator, and system planner Does not own infrastructure or deal with retail power



# CALIFORNIA – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	Primary Administrator	<ul style="list-style-type: none"> <li>EE is administered by electric utilities, including both large IOUs (such as PG&amp;E, SDG&amp;E, and SCE) and public power entities such as Los Angeles Department of Water and Power (LADWP) and Sacramento Municipal Utility District (SMUD)</li> <li>Additionally, IOU funded EE is delivered by two Regional Energy Networks (REN), one in the SF bay area and one in Southern California</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Utility revenue decoupling is permitted and required by the California Public Utilities Commission (CPUC).</li> <li>Electric Program Investment Charge (EPIC)</li> <li>PG&amp;E's new pay for performance program marks a shift in EE resource acquisition program design, SCE is piloting a similar initiative. These developments are driven by new legislation that focuses on metered energy savings</li> </ul>
DR	Primary Administrator	<ul style="list-style-type: none"> <li>Many utilities, including large municipals such as LADWP or SMUD, offer demand response programs and incentives.</li> <li>3<sup>rd</sup> party aggregators and large energy users may submit qualified capacity bids to CA ISO (CA system operator)</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Due to high levels of renewable generation, peak demand is shifting to ~5-8pm and DR programs may evolve to seek evening reduction</li> <li>Electric Program Investment Charge (EPIC) supports innovative programs</li> </ul>
DER	Primary Administrator	<ul style="list-style-type: none"> <li>Many utilities, including large municipals such as LADWP or SMUD, are investing in DERs and also actively engaged with 3<sup>rd</sup> party providers to develop new initiatives</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Electric Program Investment Charge (EPIC)</li> <li>DER investment is widely supported and encouraged by the CPUC, which is requiring IOUs to file DER plans</li> <li>Southern California Gas has implemented an opt-in distributed energy resources tariff (GO-DERS) to plan, design, procure, construct, own, operate, and maintain distributed energy equipment on customer premises</li> <li>California has very supportive net metering and interconnection policies</li> </ul>

## MASSACHUSETTS – JURISDICTION OVERVIEW

- Massachusetts utilities currently procure the highest relative amounts of energy efficiency of any jurisdiction in North America at ~2.5% savings as a percent of sales/year
- These targets are part of a longstanding commitment to efficiency and low long-run costs
- MA utilities have high avoided costs and high exposure to natural gas infrastructure limitations
- These factors enforce the business case for DSM, DR, and DER

Key Players	Description of Role
<b>MASS Save</b>	DSM services provider; initiative of Massachusetts electric and gas utilities, functions as a 'one-stop-shop' under a uniform brand to provide efficiency services to retail residential and commercial customers
<b>IOUs</b>	National Grid, Eversource, & Unitil are the primary IOUs. Responsible for developing grid modernization plans and DSM investment
<b>ISO-NE</b>	New England grid operator, market administrator, and system planner Does not own infrastructure or deal with retail power

# MASSACHUSETTS – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	Primary Administrator	<ul style="list-style-type: none"> <li>A 3<sup>rd</sup> party entity, Mass Save, contracts with all electric utilities and leverages funding from a system benefit bill surcharge, ISO-NE forward capacity payments, and payments from participation in the Regional Greenhouse Gas Initiative (RGGI). Mass Save is designed to be a single, 'one stop shop' for customer EE services.</li> <li>IOUs (including Eversource and National Grid) also offer their own EE/DR services in addition to Mass Save</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Highest Energy Efficiency Resource Standards (EERS) in N. America, IOUs are currently required to achieve ~2.5% savings as percent of annual sales, National Grid has achieved as high as 3.1% (2014-2015 average)</li> <li>Green Communities Act is the enabling legislation, includes prescriptive detail and strong policy support for EE/DR, focusing on "all cost effective and achievable"</li> </ul>
DR	Primary Administrator	<ul style="list-style-type: none"> <li>National Grid and Eversource (IOUs) manage DR programs</li> <li>ENERNOC, one of the largest DR aggregators is based in Boston</li> <li>ISO-NE (New England system operator) accepts DR capacity bids from qualified load resources</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Strong policy support (Green Communities Act) &amp; available value from ISO-NE</li> </ul>
DER	Primary Administrator	<ul style="list-style-type: none"> <li>Large IOUs, primarily National Grid and Eversource</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Massachusetts has very supportive net metering and interconnection policies</li> </ul>

## NOVA SCOTIA – JURISDICTION OVERVIEW

- Efficiency Nova Scotia, the 3<sup>rd</sup> party DSM implementer for the province, implements a broad portfolio of DSM services across the province
- Nova Scotia has historically had among the highest levels of DSM spending per customer in Canada
- Nova Scotia Power, the province's T&D utility, has not seriously engaged in demand response activities with its customers, and the community feed-in-tariff program that has been successful in developing DER projects is not currently accepting additional applications

Key Players	Description of Role
Efficiency One	3 <sup>rd</sup> Party DSM Administrator funded by Nova Scotia Power ratepayers
Nova Scotia Power	Nova Scotia's largest and primary utility. Owns generation, transmission, and distribution

## NOVA SCOTIA – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	Primary Administrator	<ul style="list-style-type: none"> <li>Efficiency Nova Scotia (ENS, 3<sup>rd</sup> party administrator)</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>ENS most recent 2016-2018 DSM spending levels and continuation of pilot activities were challenged by a 2014 amendment to the Public Utilities Act to that place greater emphasis on short term affordability</li> <li>ENS has a history of delivering a broad portfolio of programs and measures, and is a leader in energy efficiency in Canada</li> <li>Nova Scotia Utility and Review Board (NSUARB – regulator) remains persuaded that energy efficiency is a public good</li> </ul>
DR	Primary Administrator	<ul style="list-style-type: none"> <li>N/A</li> </ul>
	Critical Policy Drivers	<ul style="list-style-type: none"> <li>N/A</li> </ul>
DER	Primary Administrator	<ul style="list-style-type: none"> <li>Nova Scotia Power</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Nova Scotia Community Feed-in Tariff (COMFIT) is part of Nova Scotia's effort to achieve 40% renewable by 2020</li> <li>COMFIT has developed ~150MW of community owned capacity, however the program is not currently accepting additional applications</li> </ul>

## BRITISH COLUMBIA – JURISDICTION OVERVIEW

- British Columbia set standards between '08-'11 to ensure all new capacity is clean or renewable and prioritizes cost effective DSM, however BC Hydro forecast an energy surplus in '12/'13, leading to a DSM moderation strategy that lowered spending by ~40% vs. planned over 2014-2016
- The jurisdiction overall remains supportive of innovative pilots and R&D, and released a climate leadership plan in 2016 that affirms its commitment to clean energy policies

Key Players	Description of Role
<b>BC Hydro</b>	Commercial Crown corporation owned by the Province of British Columbia, serves 95% of BC electric customers Owns generation, transmission, and distribution
<b>Fortis BC</b>	Largest IOU in BC, primarily a natural gas utility, owns natural gas <i>and</i> electric transmission and distribution
<b>BC Ministry of Energy and Mines, BC Utilities Commission (BCUC)</b>	Energy and Mines: BC Hydro regulator, BCUC: Fortis regulator

## BRITISH COLUMBIA – JURISDICTION OVERVIEW

- The table below outlines the agents involved in advancing each of the segmented categories of technologies and approaches, critical policies and recent developments are also outlined

EE	Primary Administrator	<ul style="list-style-type: none"> <li>Utility administered: BC Hydro (Elec), Fortis BC Inc. (Elec), Fortis BC Energy Inc. (Gas)</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>BC Hydro is regulated by the BC Ministry of Energy and Mines, Fortis is regulated by the BC Utilities Commission.</li> <li>Support for utility investment in innovative technologies and delivery methods as part of DSM plans</li> <li>Fortis BC was asked by the regulator in 2015 to document actions taken to support innovative DSM after not including a specific funding request</li> <li>BC Hydro and FortisBC offer a suite of traditional DSM rebates and programs</li> <li>Navigant completed a Conservation Potential Review for all BC utilities in 2017 that indicated significant DSM potential.</li> <li>Province is currently increasing efficiency standards for packaged boilers, gas fireplaces, air source heat pumps, and natural gas space and water heating equipment over the 2018-2020 period</li> <li>BC Hydro has a long track record of implementing voltage reduction programs</li> </ul>
DR	Primary Administrator	<ul style="list-style-type: none"> <li>Utility administered</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>BC Hydro is currently leading DR pilots including a residential hot water direct load control (DLC) program and voluntary commercial and industrial load curtailment</li> </ul>
DER	Primary Administrator	<ul style="list-style-type: none"> <li>BC Hydro</li> </ul>
	Critical Policy Drivers & Recent Developments	<ul style="list-style-type: none"> <li>Ongoing microgrid project in partnership with BC Institute of Technology</li> <li>2013 grid scale battery storage installation completed in partnership with the Canada Clean Energy Fund</li> <li>BC Hydro has led installation of ‘dozens’ of electric vehicle charging stations in BC</li> </ul>

## TYPICAL FUNDING SCHEMES - CONTEXT

**Funding for energy efficiency, demand response, and distributed energy can come from a variety of outlets and strategies that vary by jurisdiction.**

- Navigant reviewed the six selected jurisdictions across three categories:
  - Energy efficiency (EE)
  - Demand Response (DR)
  - Distributed Energy Resources (DER)
- Our research sought to identify the *primary* funding schemes used for reviewed EE/DR/DER activities
- The policy landscapes and technologies themselves are evolving along with a transforming energy sector
- Critically, funding schemes are developing constructs – particularly for DER the funding strategies and regulatory frameworks in use are evolving, or expected to evolve, for most jurisdictions
- For that reason, our results are indicative of the current state and direction
- Furthermore, particularly for some of the Canadian jurisdictions, many DER investments and DR strategies are new (or pilot) endeavours—it should be anticipated that funding strategies and/or program design may change
  - Our funding categories treat pilot programs in the same way as mature programs



## TYPICAL FUNDING SCHEMES - CONTEXT

- Each technology and approach was assessed against three funding categories listed below
- In addition, the assessment specified whether the technology or approach is fully funded or if the funding is uncertain (e.g., pilot programs, changing funding mechanisms, or retiring funding mechanisms)

Funding Category	Description	
DSM	Funding is primarily sourced from an energy efficiency/demand-side management plan that is typically regulator approved. Plans generally cover 1-3 years. Costs are typically recovered as an operating expense included in tariffs, but may also be recovered via a special charge (e.g. VT).	DSM
Other Ratepayer	“Other ratepayer” is used to represent funding that is not approved as part of a DSM budget, but rather is separately approved as part of a different filing request or operating budget. ‘Separate filings’ may include e.g. required smart grid plans or grid modernization plans. Costs are typically recovered as an operating expense included in tariffs, but may also be recovered via a special charge (e.g. CA).	OR
Other (Including typically a mix of public/taxpayer, non-utility, and ratepayer)	Particularly for new DER investments, there may be special public funding used by a utility partner that is leading the investment. For instance, BC Hydro’s Field, BC grid storage project was developed with support from the Canada Clean Energy Fund. This category indicates that funding for existing or newly planned activities has been sourced from what may be a combination of ‘other public’ and varying levels of ratepayer funds. Funding support may also be derived from non-utility revenue streams that are linked to specific DER initiatives (e.g. digital platform advertising).	OF

## ENERGY EFFICIENCY – TYPICAL FUNDING SCHEMES

- Customer EE programs are typically funded as part of DSM regulatory plans
- Voltage reduction is primarily funded outside of DSM budgets in the jurisdictional review, and is generally viewed by utility commissions as a prudent operational enhancement and not a DSM activity

Predominant Funding Source	Indicator
DSM	DSM
Other Ratepayer	OR
Other (e.g., taxpayer)	OF

EE Activity	Ontario	British Columbia	Nova Scotia	Massachusetts	California	Vermont	New York
Resource acquisition	DSM	DSM	DSM	DSM	DSM	DSM	DSM
Market transformation	DSM	DSM	DSM	DSM	DSM	DSM	DSM
Behavioural	DSM	DSM	DSM	DSM	DSM	DSM	DSM
Performance-based funding	DSM	-	-	DSM	DSM	-	DSM
Voltage reduction	DSM, OF, OR <sup>1</sup>	OR	OR	OR	OR	OR	OR

<sup>1</sup> pilots have been funded through multiple sources (Conservation Fund, Smart Grid Fund, etc.)

## DEMAND RESPONSE – TYPICAL FUNDING SCHEMES

- Direct Load Control is typically a DSM activity, bundled as part of e.g. a Smart A/C program, however it can also separately be introduced as a smart grid initiative outside of DSM plans and proceedings
- Most jurisdictions offer Time-of-use and Critical Peak Pricing tariffs (Yes indicates that a pricing program is available to customers either on a mandatory or voluntary basis)

Predominant Funding Source	Indicator
DSM	<b>DSM</b>
Other Ratepayer	<b>OR</b>
Other (e.g., taxpayer)	<b>OF</b>

DR Activity	Ontario	British Columbia	Nova Scotia	Massachusetts	California	Vermont	New York
Direct load control	OR	DSM ^	DSM *	DSM	DSM	-	DSM
Demand Response Capacity	OR	DSM	-	OR, DSM	OR, DSM	OR, DSM	OR, DSM
Time of Use Rates	YES	NO	YES	YES	YES	YES	YES
Critical Peak Pricing	YES <sup>T</sup>	NO	YES**	YES	YES	YES	YES

<sup>^</sup> New pilot activity in 2015 using 103 homes and 4 businesses focused on residential hot water.

<sup>\*</sup> This has been piloted in collaboration with Nova Scotia Power and New Brunswick Power, and is also offered by the Berwick Electric Commission in Berwick, NS. (<http://www.nrcan.gc.ca/energy/funding/current-funding-programs/cef/4975>)

<sup>\*\*</sup> Nova Scotia Power offers 'one-part real time pricing' and interruptible tariffs for very large customers that are categorically similar to CPP.

<sup>T</sup> Ontario has a program allowing large customers with certain NAICS codes and peak demand greater than 500 kW to offset peak during the top 5 hours of the year and pay lower rates. In addition, there are CPP pricing pilots underway for residential customers.

## DISTRIBUTED ENERGY RESOURCES – TYPICAL FUNDING SCHEMES

- Combined Heat and Power may fall under either DSM or as part of broader initiatives that include state or provincial funding
- Many DER pilots are occurring across all jurisdictions
- Electric Vehicle incentives directly to customers are uncommon, these incentives are more generally captured in the form of purchase rebates and charging infrastructure initiatives

Predominant Funding Source	Indicator
DSM	DSM
Other Ratepayer	OR
Other (e.g., taxpayer)	OF

DER Activity	Ontario	British Columbia	Nova Scotia	Massachusetts	California	Vermont	New York
Solar PV	OR	-	-	OF	OR, OF	-	OF
Solar PV-storage	-	-	-	OF	OR	OF	OF
Storage	OR	-	%	#	OR	OR	OR
Combined Heat and Power	DSM	OR	OF *	DSM	OF	DSM	OF
Electric Vehicles (EVs)	OF	-	-	-	OF **	-	-
Microgrids	OF	-	-	-	OF	-	OF

^ PowerStream Ontario is running a solar PV storage pilot.

\* As part of the Nova Scotia Community Feed in Tariff Program (COMFIT), administered by the Nova Scotia DOE but no longer accepting applications. <https://energy.novascotia.ca/renewables/programs-and-projects/comfit>

\*\* Southern California Edison, for example, offers a special metered EV rates.

# Massachusetts is currently developing an energy storage target, 2020 mandates expected to be set in July 2017.

% Very small pilot project <http://www.nspower.ca/en/home/newsroom/news-releases/clean-energy-project.aspx>