REALIZING A UTILITY OF THE FUTURE

SCENARIO PLANNING PROCESS & OUTPUTS

UTILITY TRANSFORMATION PROGRAM

ADVANCED ENERGY CENTRE
MaRS Cleantech | Ontario, Canada

Objective of Scenario Planning

Support utilities' understanding of the pace of change in the energy sector, and inform intentional decisions to capture value and opportunities in a changing energy landscape.

The Process

The Advanced Energy Centre will facilitate the following process to achieve the core objective:

"We used to be able to address issues in boxes and the boxes would hardly interconnect, but now there are so many interdependencies that are crossing the borders both financially and physically"

"Just understanding the landscape is an ongoing challenge for everybody"

- Executive Interview

TRENDS

IDENTIFY TRENDS OF ENERGY SECTOR TRANSFORMATION

UNCERTAINTY

IDENTIFY TRENDS THAT HAVE A HIGH DEGREE OF IMPACT & UNCERTAINTY

DRIVERS

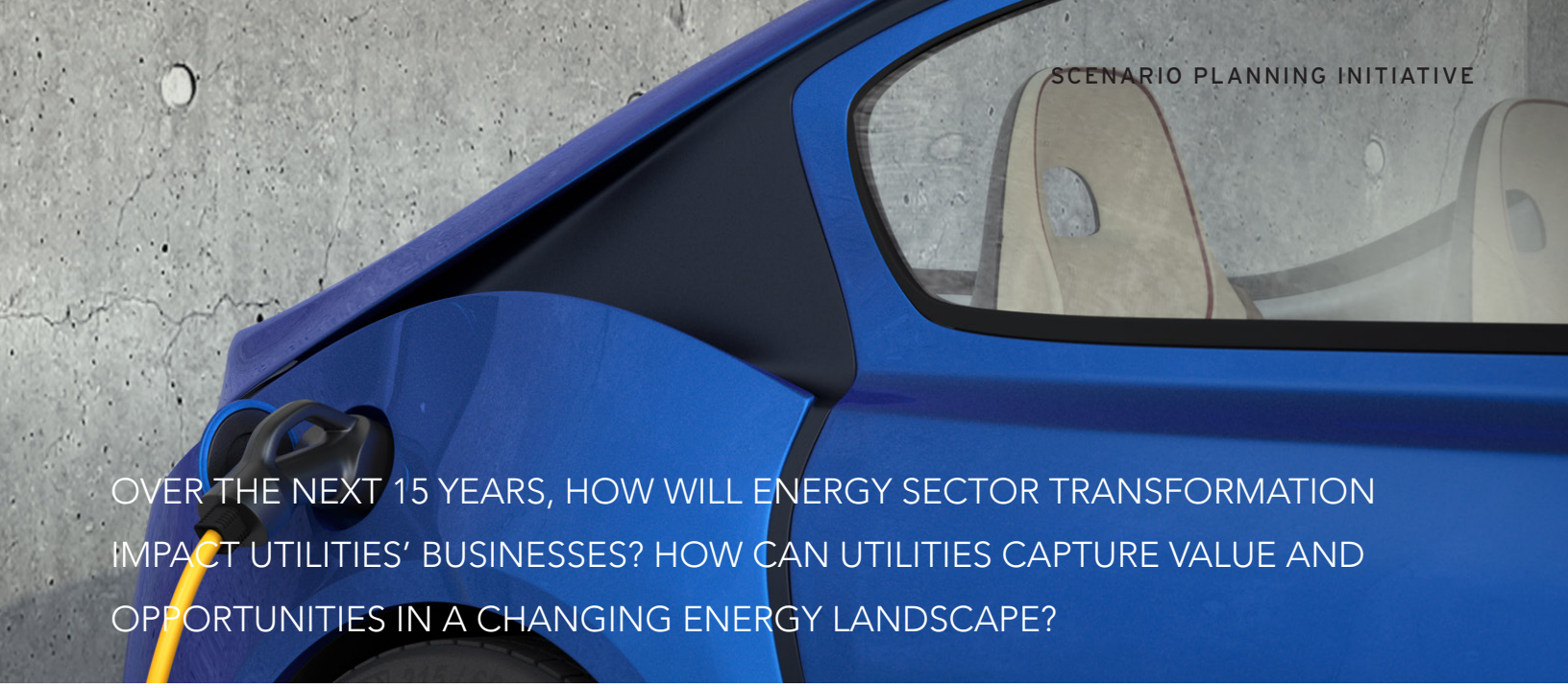
CONSIDER WHAT IS DRIVING THESE TRENDS

SCENARIOS

DEVELOP PLAUSIBLE & DISTINCT FUTURE SCENARIOS

STRATEGY

DRAW STRATEGIC INSIGHTS



OVER THE NEXT 15 YEARS, HOW WILL ENERGY SECTOR TRANSFORMATION IMPACT UTILITIES' BUSINESSES? HOW CAN UTILITIES CAPTURE VALUE AND OPPORTUNITIES IN A CHANGING ENERGY LANDSCAPE?

Identify Trends of Energy Sector Transformation

Over the next 15 years, how will energy sector transformation impact utilities' businesses? How can utilities capture value and opportunities in a changing energy landscape?

- Framing Research Question

Through executive interviews and a literature/media scan, the Advanced Energy Centre will consider insights from a diverse range of energy players, and trusted thought leaders to identify key trends that indicate sector transformation. Scenario planning experts at the Advanced Energy Centre will facilitate a smart, objective, information gathering process and prepare a report outlining research findings and analysis in an aggregated format.

How Trends are Generated

Trends of energy sector transformation are identified collaboratively by Advanced Energy Centre researchers and clients. Trends are identified from a horizon scan of topics surfaced in key industry publications and conferences, customized interviews with senior leaders relevant to the clients' business, and a qualitative cross-impact analysis of key trends, drivers, and issues.

As a neutral third party in the scenario planning process, the Advanced Energy Centre ensures that research is holistic- capturing political, economic, regulatory, environmental, social, and technical data points. The Advanced Energy Centre will also conduct interviews using a specialized scenario planning approach to draw key insights from industry experts. Insights will be captured in an anonymized format for use during the scenario planning process.

SAMPLE: TRENDS OF ENERGY SECTOR TRANSFORMATION

THEMES	TRENDS
1 The electricity generation mix is changing	A. Deployment of utility-scale wind and solar is increasing B. Natural gas prices remaining low C. Baseload generation sources retiring
2 A changing market structure and increased competition are driving alternative business models	A. Capacity and ancillary services are capturing a growing piece of the market B. Energy consumers' preferences are changing and they are becoming increasingly proactive C. Peak demand is growing D. Demand is flattening E. Private-sector investment in clean energy projects is increasin F. Emergence of new entrants posing a growing competitive threat to electric utilities G. Greater price elasticity as consumers respond to price signals in real-time H. Skills requirements for utilities are changing as the energy sector evolves I. Growing income inequality J. Lack of fuel diversity in load centers
3 Environmental stresses lead to greater need for resiliency	A. Weather volatility and climate change demand a greater focus on resiliency B. Growing threat of cyber-attacks on electric utilities
4 Pace of technological change is accelerating	A. Electrification of transportation B. Energy storage becoming economically viable across most U.S. states C. Impacts of disruptive technologies are increasing in speed and scope D. Big data and digitization
5 Political and social pressures related to climate change are driving emission reduction practices	A. Federal policies demonstrate an ongoing commitment to renewable energy, energy efficiency, and climate policy B. State policies demonstrate an ongoing commitment to renewable energy, energy efficiency, and climate policy C. Use of energy efficiency and demand-side management programs are increasing
6 Shifting demands on the transmission and distribution system	A. Advanced smart meter deployment continuing B. Increasing availability and reliability issues posed by aging assets and transmission constraints C. Increasing deployment of DERs and microgrid technologies

OVER THE NEXT 15 YEARS, HOW WILL ENERGY SECTOR TRANSFORMATION IMPACT ONTARIO UTILITIES' BUSINESSES? HOW CAN UTILITIES CAPTURE VALUE AND OPPORTUNITIES IN A CHANGING ENERGY LANDSCAPE?

Prioritize Trends that Have the Greatest Impact & Uncertainty

Over the next 15 years, how will energy sector transformation impact utilities' businesses? How can utilities capture value and opportunities in a changing energy landscape?

- Framing Research Question

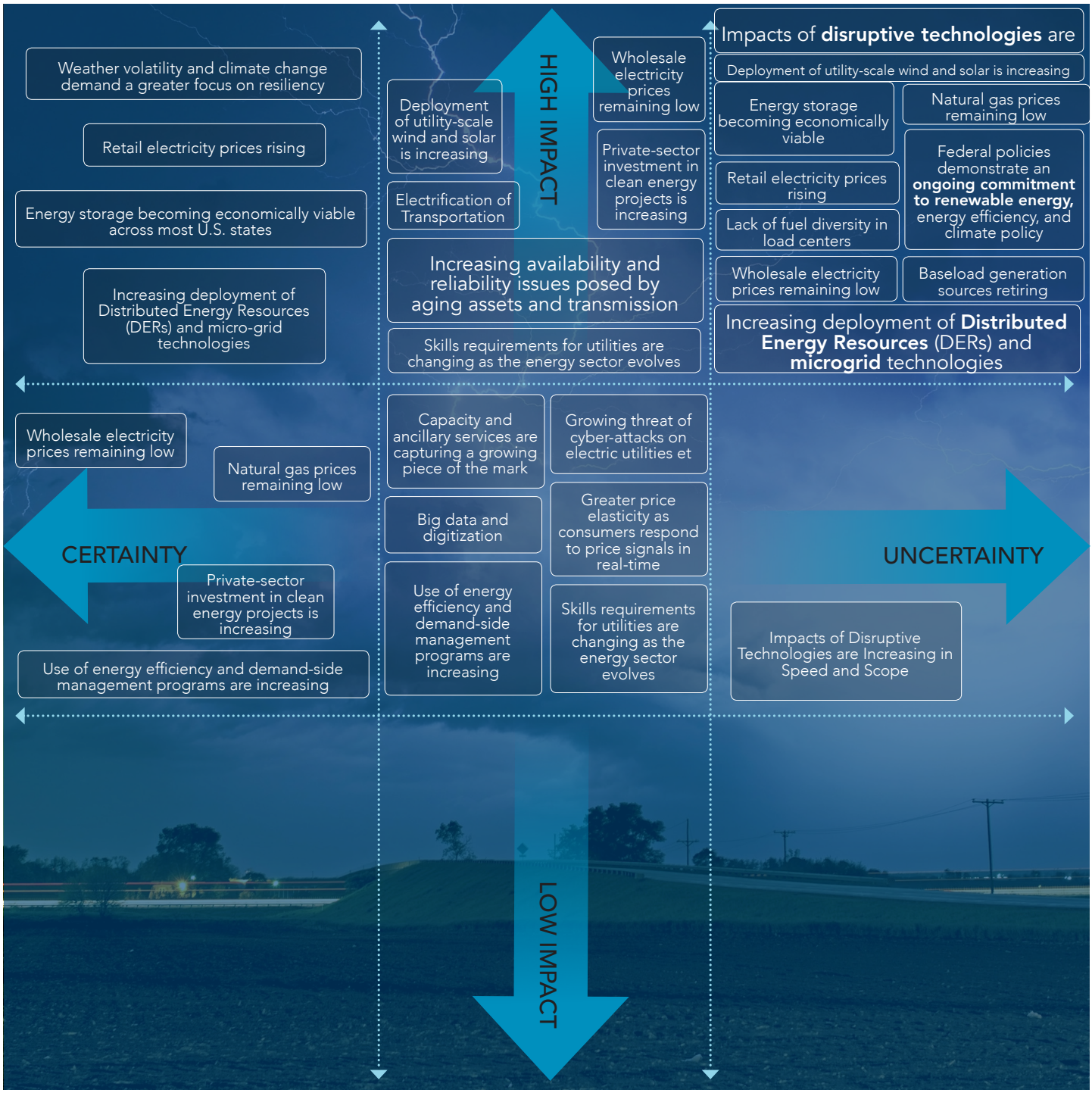
Through executive interviews and a literature/media scan, the Advanced Energy Centre will consider insights from a diverse range of energy players, and trusted thought leaders to identify key trends that indicate sector transformation. Scenario planning experts at the Advanced Energy Centre will facilitate a smart, objective, information gathering process and prepare a report outlining research findings and analysis in an aggregated format.

How Trends are Generated

At Workshop I, participants will be presented with a list of trends that are generated from a horizon scanning exercise and a series of executive interviews. Through a facilitated workshop, participants will identify priority trends per the example below. This produced a list of priority trends, namely, those with a high degree of impact on businesses and varying degrees of certainty. The outcomes of a past exercise are outlined below. The priority trends identified are also encapsulated in the future scenarios generated.

In Workshop I, participants will engage in a facilitated discussion around how trends experienced together could have a big impact that makes it very difficult for energy players to predict. For example, past participants discussed how the pace of technology adoption and the availability of new technologies, alongside the emergence of non-utility companies and individuals in the marketplace, are difficult to predict and could have a major impact on utilities' business'.

The results of discussions around priority trends, the impacts, and uncertainties are reflected in the strategic questions and scenarios produced in this initiative.


Weather volatility and climate change demand a greater focus on resiliency
Retail electricity prices rising
Energy storage becoming economically viable across most U.S. states
Increasing deployment of Distributed Energy Resources (DERs) and micro-grid technologies
HIGH IMPACT
Deployment of utility-scale wind and solar is increasing
Electrification of Transportation
Wholesale electricity prices remaining low
Private-sector investment in clean energy projects is increasing
Increasing availability and reliability issues posed by aging assets and transmission
Skills requirements for utilities are changing as the energy sector evolves
Impacts of disruptive technologies are
Deployment of utility-scale wind and solar is increasing
Energy storage becoming economically viable
Natural gas prices remaining low
Retail electricity prices rising
Federal policies demonstrate an ongoing commitment to renewable energy, energy efficiency, and climate policy
Lack of fuel diversity in load centers
Wholesale electricity prices remaining low
Baseload generation sources retiring
Increasing deployment of Distributed Energy Resources (DERs) and microgrid technologies
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CERTAINTY
Private-sector investment in clean energy projects is increasing
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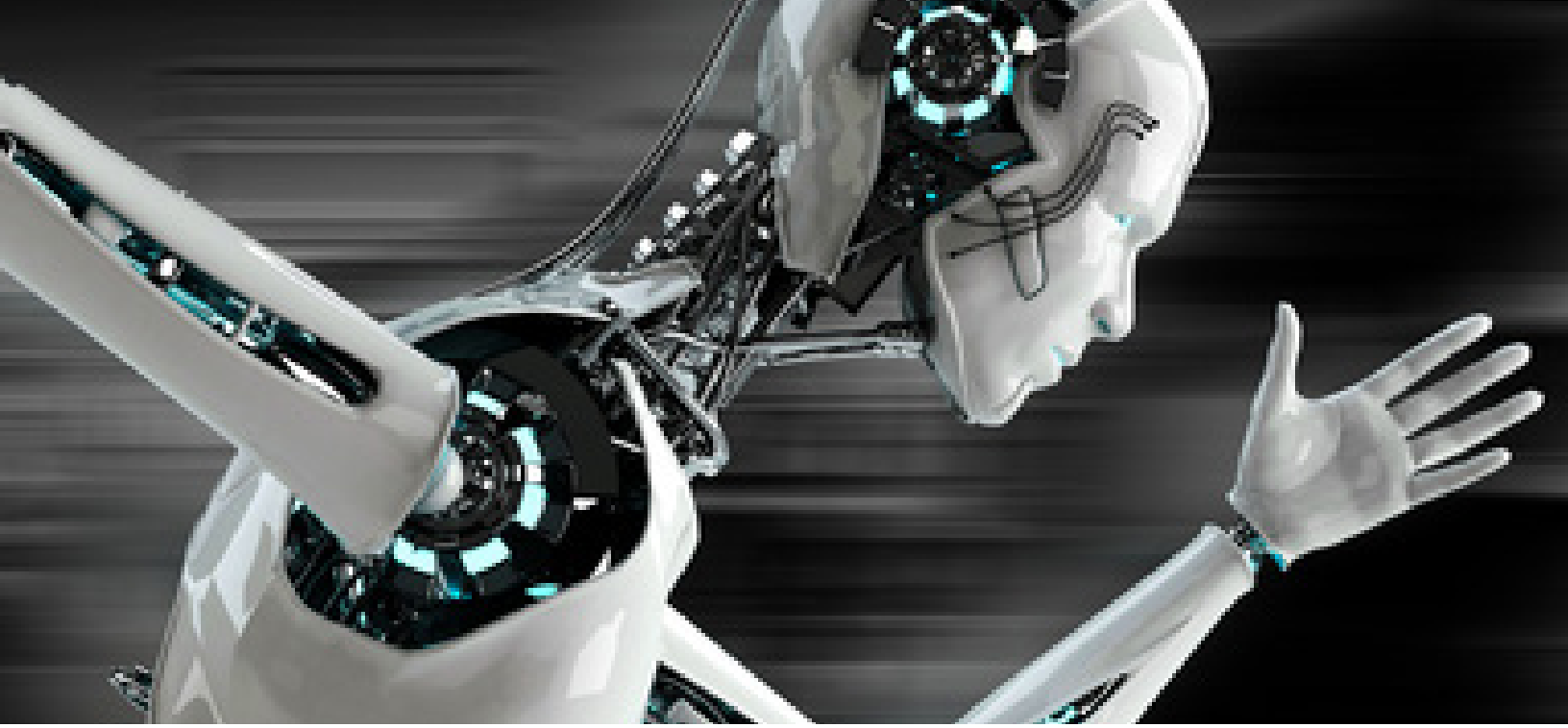
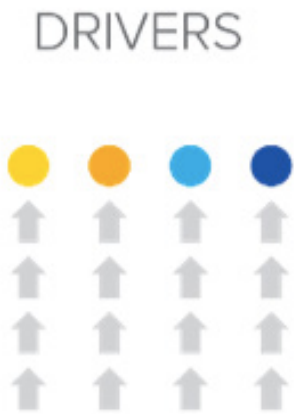
Growing threat of cyber-attacks on electric utilities et
Big data and digitization
Greater price elasticity as consumers respond to price signals in real-time
Use of energy efficiency and demand-side management programs are increasing
Skills requirements for utilities are changing as the energy sector evolves
UNCERTAINTY
Impacts of Disruptive Technologies are Increasing in Speed and Scope
LOW IMPACT



Consider What is Driving Trends



Once high priority trends are identified by scenario planning participants, the Advanced Energy Centre will facilitate a process to consider what is driving these trends. Participants will produce a list of drivers that could impact the direction of these trends in the future. For instance, changing demographics may be identified as driving the rate of technology adoption (e.g. millennials' technology literacy and a broader cultural shift drives demand for new technologies). The wordmap provides an example of drivers identified by past participants. The sample below is a set of drivers that were generated to provide the basis for developing plausible futures in a past delivery.

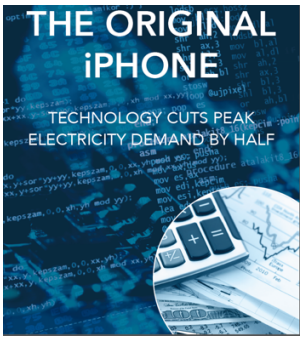
SAMPLE: DIRECT AND INDIRECT DRIVERS

DIRECT DRIVER	INDIRECT DRIVER	
1 Market Competiveness	i. Deregulation ii. Regulatory position iii. Politics	iv. Market design v. Access to capital vi. Advanced technology proliferation
2 Climate Policy	i. Climate-related events/impacts ii. Social awareness/opinions iii. Politics	iv. Voter preferences v. Lobbying vi. Economy
3 Infrastructure strength	i. Aging energy infrastructure ii. Infrastructure investments	iii. Integration of new technologies/DERs iv. Prevalence of security concerns
4 Technology Advancement	i. Customer demands ii. Maturity of technology iii. Cost of technology	iv. Data availability v. Private investment vi. Electrification of the energy system
5 Economic Growth	i. Energy demand ii. Technology availability	iii. Technology adoption iv. Customer demands
6 Flexibility of Traditional Utilities (i.e. Appetite for Change)	i. Utilities' rate of tech adoption ii. Utility structure iii. Utility culture iv. Pace of change	v. Capital investment in clean energy vi. Business models vii. Access to capital viii. Interest in change
7 Electricity Prices	i. Natural gas prices ii. Energy demand	iii. Cost of generation iv. Wholesale prices
8 Customer Characteristics	i. Income inequality ii. Education iii. Climate awareness/societal pressure	iv. Variety of products/services v. Service-oriented business models vi. Technology availability

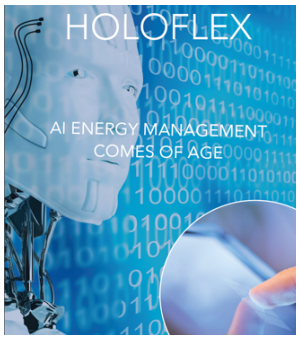
Develop Four Potential Futures

SCENARIOS

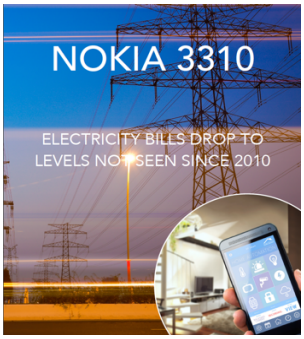
The four possible futures developed are based on the underlying drivers of change in the energy sector, as well as trends with a high degree of impact and a high degree of uncertainty on utilities businesses. These scenarios provide the basis for collectively developing strategic focus areas, and drawing insights to strategic questions. A sample scenario is outlined below for reference.



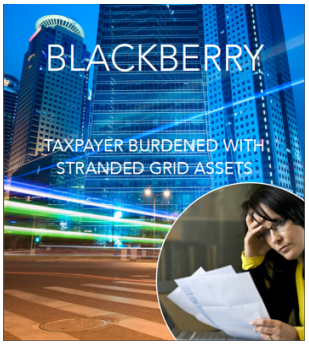
Micro-CHP is widely adopted & Enbridge owns the customer relationship.



High tech world. Tiered service delivery and pricing model for customers based on needs.



Energy becomes less political. Renewables become ubiquitous, energy prices declining.



Electricity grid costs are rolled into the tax base & utilities are owned by municipalities.

The figure above shows the drivers that were most utilized in scenario A. Socio technical drivers, along with intra sector and extra sector drivers, are all utilized while creating this scenario. While drivers such as distributed generation, innovative technology development and technology adoption all play prominent roles, factors related to govenment influence, decarbonisation of energy systems and third party access to grid were not explored in this scenario. Scenario A is discussed in detail below:

Scenario A: The Original iPhone

"PARTICIPANT REACTIONS TO DRAFT SCENARIOS"

This scenario focuses on how innovative technologies could lead to a reduction in peak electricity use, greater customer choice, and convenience. In Workshop II: Scenario Planning, the majority of participants considered this scenario to be probable and had positive reactions—in an exercise where participants reacted to scenarios using emojis, it received predominantly "happy" and "cool" reactions. One of the main concerns expressed regarding this scenario was around cost. The question "who pays?" was asked by a few participants referring to the cost of adopting new technologies in the grid and for the maintenance of grid infrastructure. This is an important consideration, given previous discussions around future-ready business, including questions around business models, partnerships with third party companies, as well as the outstanding question around who is responsible for paying for infrastructure- will it get billed under rate base or tax base etc? Would individual owners or communities own microgrids, will the utilities be managing infrastructure, how would it impact the low-income consumers? During scenario

innovative technology

TECHNOLOGY CUTS PEAK ELECTRICITY DEMAND BY HALF

development after Workshop II, the Advanced Energy Centre worked to address these questions in the final scenario below. Although it was originally considered to be a positive scenario by participants, there are some alarming components such as the collapse of Ontario's capacity markets, which would lead to some drastic consequences for the sector in Ontario. The final scenario is outlined below for consideration.

EXECUTIVE SUMMARY:

In 2031, Ontario has cut peak electricity demand by 40%. Load defection is widespread as low cost CHP technologies and advances in natural gas extraction now offer a significantly cheaper alternative to grid supplied electricity. The grid is seen as back-up so total grid defection remains uncommon. Customers still see value in being grid connected.

Many LDCs have consented to disintermediation through Enbridge Energy Services (EES), a subsidiary of the natural gas company Enbridge. EES offers hassle free, all-in-one residential nanogrids and Commercial and Industrial (C&I) microgrids. LDCs have lost the customer relationship for these system installs, as EES provides all billed connection fees and grid electricity revenue as a pass-through to the LDCs.

Change is coming for LDCs - until now, revenue from fixed grid connection fees have ensured stable income. However, with increases in cyber-attacks and climate change related weather events, the cost of maintaining the grid is rising fast. A new liberal government is in place, with a mandate of addressing increasing concerns over grid reliability, GHG emissions and the high cost of electricity for lower income households. It's a case of innovate or consolidate for many LDCs, as they scramble to find solutions to the increasing cost of grid maintenance.

SCENARIO DESCRIPTION

THE ENERGY SECTOR IN 2031

In 2031, technological advances in distributed generation (DG), energy storage and management, have provided increasingly cheaper alternatives to grid supplied electricity. In particular, advances in shale gas extraction efficiency and the discovery of new extraction sites have contributed to the historically low gas prices in North America over the last decade. Low gas prices have in turn accelerated the proliferation of CHP systems behind-the-meter.

Advances in fuel cell CHP have led to the significant increased self-generation and load defection. By reducing the use of rare metals as catalysts and improving production efficiency through scaled-up manufacturing, the price of CHP has fallen significantly. These technologies provide much of the baseline distributed generation for both residential and commercial and industrial (C&I) customers. A micro CHP system sized at 2 kilowatts can meet the electricity demands of a household up to 85% of the year. The remaining 15% is peak household electricity demand, typically in the morning and evening, supplied by either solar plus storage or grid supplied electricity.

As heat exchangers for CHP technologies become more cost effective, households have capitalized on these systems in summer months as well for air conditioning loads.

Reduction is cost of other DG technologies have continued over the years. Grid parity for solar PV technologies was reached in 2019 and 2021 for residential and industrial applications respectively[1].

Load defection is widespread in Ontario, however total grid defection remains minimal. Customers are nervous about cutting the cord completely and, for the most part, are not willing to make the lifestyle changes required to accommodate systems capable of full grid defection. Customers still see value in having back-up supply and with net metering and TOU pricing, having a grid connection still makes most economic sense.

Despite customers choosing not to grid defect, another key driver behind increasing load defection has been the decreasing reliability of grid-supplied electricity. Many electricity customers have prioritized resiliency since the huge cyber-attack on Ontario's electricity system 10 years ago. Smaller attacks have continued to plague the grid ever since. Climate change related weather volatility and extreme weather events have led to increasing grid blackouts. A major ice storm has occurred in 8 of the last 15 winters, causing havoc on the province's grid. Managing outages has been a growing issue for LDCs in recent years. Still, it should be noted that grid reliability is above average for most of North America.

Widespread DG usage has led to a 40% reduction in Ontario's peak demand compared to 2016 levels. Capacity contracts have not been discontinued at a

fast enough pace, with some even re-committed in the late 2010's and early 2020's by liberal governments. Coupled with decreasing demand, these long-term commitments have led to considerably higher costs of grid supplied electricity.

Although some households have been able to offset their use of grid supplied electricity through DER sources and nano/microgrids, many lower income households are struggling to pay higher rates. These customers cannot afford the up-front payments for renewable self supply systems and nano/microgrids, or do not have the credit rating required to be eligible for installation. In addition, those who are renting, now 47% of the population, are unable to avail themselves of DER benefits. Low income households' electricity incentives are oversubscribed and protesting has begun across Toronto, with last week's sit-in at the Ministry of Energy headquarters ending in 3 arrests.

For those who can afford it, in-home nanogrids and microgrids with baseline generation from CHP technology are the most cost effective use of DER today. Now present on 20% of Ontario's grid, nano and microgrid systems are often seen as a primary electricity supply source. Enbridge Energy Services (EES) has deployed 85% of these systems across Ontario, through their C&I and In-home Energy Services Packages. Many of these systems were piloted in partnership with Ontario's LDCs in the late 2010's and early 2020's.

EES packages are essentially third-party, fully installed and managed nanogrids or microgrids, under ESCO contracts. They are comprised of installed generation and storage technologies (mainly a combination of baseline CHP, solar PV, lithium ion battery storage), as well as home/building energy management systems, all maintained by EES over a 15-year contract term (with the opportunity to extend). Higher tier contract options include the installation of energy efficiency retrofits, smart thermostats, energy efficient lighting etc.

The proliferation of Fuel Cell CHP (particularly micro CHP) has helped make this business model economically viable. The EES packages are on average 50% cheaper than grid supplied electricity. Customers pay an upfront cost of 15% of the total installation cost, with the remaining capital cost and maintenance deducted from their monthly electricity bill. This bill, managed by EES, also includes a fixed grid connection charge and any grid supplied electricity used by the customer (which is then passed onto the LDC). Net metering has allowed for efficient use of TOU pricing. In these systems, the LDC has lost the customer relationship, with all billing and communication done through EES.

Until quite recently, LDCs in Ontario have been relatively unaffected by the increased load defection and the proliferation of EES and other DG systems. LDCs were buffered by fixed distribution charges and customers' lack of desire to load defect. However, LDCs are beginning to struggle to maintain grid reliability and are incurring fees from the IESO for not meeting minimum reliability standards. With increased incidence of cyber-attacks and extreme weather events, many LDCs are struggling with the requirement for growing investments in cyber security and grid infrastructure repairs/asset upgrades.

Pressure is building for LDCs to address grid reliability and income disparity issues in relation to electricity prices. Energy sector reform was a major factor in delivering the Liberal's recent campaign success. This new government is now turning to the LDCs to address these issues, with industry consultations set to chart the best path forward for Ontario's energy sector and a new Long Term Energy Plan is in the works.

And its not just the electricity sector which is greeting an uncertain future, the gas sector has been shaken by the announcement of the new 2050 GHG emission targets. Despite the increased use of natural gas in the province to date, 2030 GHG reduction targets were met. This was due to high efficiency fuel cell CHP, natural gas vehicles (NGVs) and complimentary distributed generation. However, a recent study by Navigant Research predicts that such aggressive targets will require slashing the province's natural gas reliance by almost 50% on 2030 levels.

These are uncertain times for many LDCs, with growing concerns over forced consolidations. However, many see the energy market reforms as an opportunity to innovate and diversify the LDC business model in Ontario to meet the challenges of a changing energy landscape.

2. THE WORLD IN 2031:

CITY: A recent report by the Canadian Real Estate Association stated that connecting your house to a microgrid could boost its value up to 10%, due to perceived reliability benefits and the 'cool factor'. Connected properties are seen as prime real estate. In addition, those connected into a transactive energy

program (e.g. Toronto Hydro's block chain programs for microgrid customers), allowing residents to trade energy with neighbors, could increase their properties' values by another 1.2% on average.

EV uptake remains minimal in Ontario as many drivers opt to purchase NGVs or convert their cars to NGVs. The cost of EV's has failed to reduce enough for the widespread deployment previously predicted. However, Ontario has still been able to meet its GHG emission reduction targets for the transport sector due to the proliferation of NGVs.

BUSINESS: *Panasonic announced the opening of a new fuel cell micro-CHP distribution centre in Hamilton, Ontario. The centre is set to be a main supply hub in North America and will create 120 jobs in the area. Almost 80% of micro CHP systems installed in Canada are manufactured by Panasonic, which has built on its success in Japan over the past 30 years.*

Blackberry announced further expansion of their Waterloo headquarters yesterday, in response to the increasing demand of their grid cyber security services. The telecommunications-turned-software development company is seeing a mounting demand for grid protection applications and services.

Ontario is now seen as a cleantech superpower globally. Investments made by both provincial and federal governments between 2016-2020 have provided a secure foothold to build a thriving sector. In addition, the manufacturing sector in Ontario has seen a big boost in recent years as many global companies have set up production lines in the province. Over the last 15 years, Ontario has developed advanced manufacturing expertise. The low cost energy, due to natural gas prices, has also been a factor. Natural gas production will contribute another $576 billion to Canada's economy over the next two decades, supporting roughly 129,000 jobs[2].

AGRICULTURE: *In response to recent GHG emission targets set by the province, Enbridge has teamed up with Ontario's agricultural community to deploy several multi-MW renewable gas generation projects. The projects will use farm wastes to produce methane through anaerobic digestion, which will then be 'scrubbed' and injected directly into the main gas lines. The target is to have a 25% increase of renewable gas in the provincial natural gas grid by 2040.*

POLITICS*: It's been 10 years since the 2021 cyber-attack on Ontario's electricity grid and LDCs and the IESO are still paying the price. The attack, orchestrated by Chinese hackers, left parts of the grid without power for up to 6 weeks. A recent statement by the IESO claims that the 2021 attack spurred action on grid security in the province. Although the frequency of threats to the grid has tripled over the last 10 years, subsequent attacks have indeed failed to reach the level of disruption of the 2021 incident.*

A petition from the environmental group Greenpeace was delivered today to the federal government. Boasting 50,000 signatures, the petition criticized Canada's reliance on natural gas as only a stop gap in the county's fight against climate change. It called for more action to transition to truly renewable, clean energy sources. The petition referenced environmental concerns over shale gas extraction, citing the contaminated drinking water from a suspected gas leak in Calgary that affected a catchment area of 15,000 people. It also highlighted the recent earthquakes and tremors felt near the shale gas extraction zone in British Columbia.

ENDNOTES:

1.Research conducted by Navigant Research for the Advanced Energy Centre, 2015.

2.https://www.uniongas.com/~/media/aboutus/UG_white_paper_report.pdf

3.http://www.techinsider.io/power-grid-hacking-ukraine-2016-6

BACKCASTING: HOW WE GOT HERE

SCENARIO CONTEXT

2016

- 76 percent of homes heated with natural gas
- Canada has the third largest number of microgrid projects (129 projects) in-service to-date after US and India; Ontario holds 15 percent of the Canadian microgrid projects
- Gov announces scraping of debt retirement charge for household customers and removes 8% provincial HST from bills in an effort to reduce bill costs.
- The Combined Heat and Power Standard Offer Program (2011) and the Combined Heat and Power Standard Offer Program 2.0 (2015)
- Ontario's operational cogeneration capacity was measured at 2,445.38 MWe.
- Canadian Gas Association announces voluntary target of 5% of natural gas from renewable sources by 2025, and 10% by 2030.
- In 2015, Ontario Energy Board issued a new rate design policy that will change the way local distributors bill their residential customers. Distribution charges, currently a blend of fixed and variable (per kilowatt-hour) rates will be an entirely fixed monthly service charge by 2019.

2021

COST △↓
RELIABILITY ↑
REGULATION →
ENVIRONMENT ↓

- China executes huge cyber-attack – 40 percent of grid down and homes and businesses left without power for up to 6 weeks.
- EES begins piloting its Energy Service Package in partnership with LDCs for C&I customers
- Natural gas pipeline between Pennsylvania and Ontario given the go ahead
- New natural gas reserves discovered and advances in shale gas cause prices to plummet.
- $50 million Fund released to connect rural areas to the gas network
- Fixed distribution charge introduced for residential customers
- IESO imposes minimum reliability standards for LDCs for delivering electricity. Fees will be levied on those who fail to meet standards.
- New conservative government begins to discontinue generation contracts but many fear its too little, too late to curb province's chronic oversupply issues.

2026

COST △↓
RELIABILITY ↑
REGULATION →
ENVIRONMENT ↓

- Load defection now wide spread in province but extremely few cases of total grid defection.
- Solar plus storage reaches grid parity for residential and industrial customers
- CHP technologies eligible for net metering payments
- Scaling of production manufacturing causes reduction of price of micro CHP by 40%
- Construction almost done on natural gas pipeline between Pennsylvania and Ontario.
- EV costs not coming down as much as hoped, only reached 6% ownership in province.
- Proliferation of NGV public fuel stops open across Canada - now 250 in total, (triple 2016 levels) with a fifth of these in Ontario alone.
- Uber offers drivers incentive option to convert to vehicles to LNG in effort to clean up fleet
- EES partners with Panasonic to pilot micro CHP in the province within residential and small commercial scale settings
- EES have reached commercial scale for large C&I energy service packages -7% of the grid now has microgrids
- 2022 OEB mandate that Return on Equity for LDCs be reduced from 9% to 6%

2031

COST △↓
RELIABILITY ↑
REGULATION →
ENVIRONMENT ↓

- IESO Capacity market falls due to grid oversupply
- Mass adoption of micro-CHP and in-home nano grids have reached commercial scale and are being installed in homes across the province. Industrial microgrids are widespread. Microgrids and nanogrids now represent 20% of Ontario's grid.
- A plot to take down multiple substations across North Amercia was foiled, but threats to grid security continue across the continent[3]. Continued threats of attack on eastern interconnection cause further concerns on the cost of oversupply issues on Ontario's grid.
- Conservative government lost recent provincial bi-election to Liberals: energy issues a key factor. Their mandate is to tackle increased cost of grid- supplied electricity
- Despite increasing use of natural gas, Ontario has met its GHG emission targets. Thanks to proliferation of high efficiency CHP and NGVs, increased energy efficiency measures and demand response.
- New targets set for 2050 GHG emission reductions, experts point to the need to significantly reduce reliance on natural gas of these are to be met.
- Government has bolstered attempts to discontinue electricity generation contracts.

Collectively Define Strategic Principles for Future Strategies

Through facilitated workshops, participants collectively consider insights we can draw from the four possible futures of the sector as they relate to strategic questions about their business. For instance, if grid parity happens as early as 2021, what insights does this provide into questions around future-ready business, or future-ready infrastructure? An example of what strategic insights might be drawn from this process is outlined on page 13.

What Next?

At the conclusion of the initiative, the Advanced Energy Centre will facilitate a discussion around concrete next steps for the company. An example of past outcomes is outlined below.

KEY ELEMENTS OF A SUCCESSFUL BUSINESS	STRATEGIC ELEMENTS FOR THE RESILIENT UTILITY
DIVERSIFYING SERVICES	Services rather than sale of conventional energy Alternative service models (i.e. generation rental) Take on role of distribution system operator Develop customer engagement tools (convenience) Provide asset management expertise Facilitate Blockchain enabled P2P transactions
COOPERATION AMONG UTILITIES	Develop coordinated data systems Leverage big data to solve management issues Collaborate on R&D for energy efficiency
ENGAGEMENT WITH REGULATORY	Standards need to better address impacts of new technologies Engage with OEB to regulate economic issues and develop a separate team to focus on technical issues Consider asset management best practices Develop platform to share best-practices Long-term procurement strategy to keep rates low Policymakers tell you “what”, market drives “how”
TALENT DIVERSIFICATION & CULTURE CHANGE	Hire for business acumen and commercial experts Focus on bottom-line results Hire for understanding of small business Implement advanced technical skills requirement Customer experience officers Cultural shift to “fail fast”, ”innovation culture” Develop partnerships to bring in outside talent
DISTRIBUTION NETWORK EVOLUTION	Need intelligent distribution network to enable Blockchain & other tech Utility becomes a broker for financial transactions (enabling PVs and EVs on transmission line) Additional value streams: managing energy quality, best-in-class infrastructure projects & management

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