Advisory

Council for Clean & Reliable Energy

Technology, Innovation & Policy Forum

Strictly Private and Confidential

November 24, 2016

pwc

Agenda

- ***Opportunity Amidst Disruption – Energy Transformation in Canada***
- ***A Decentralized Energy Future? ~2040 Delphi scenarios***
- ***Implications and considerations for Utility business models***

PwC surveyed utility leaders and their customers on possible course of energy transformation in Canada

PwC developed **2 national surveys** to get the big picture view of the energy transformation happening now in Canada...

Survey #1
44 Executives
(Feb.–May 2016)

Provided insights on:

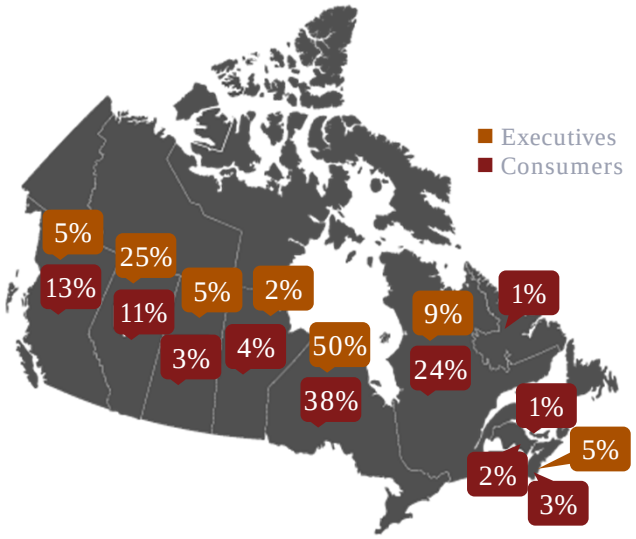
1. Trends executives are noticing now,
2. Key challenges for utilities,
3. Key opportunities for growth, and
4. Potential drivers behind the transformation.

Survey #2
1,504 Consumers
(Jan. 2016)

Provided insights on:

1. The customer role in energy transformation,
2. Relationships with providers, and
3. Customer-centric challenges.

Survey respondents by province

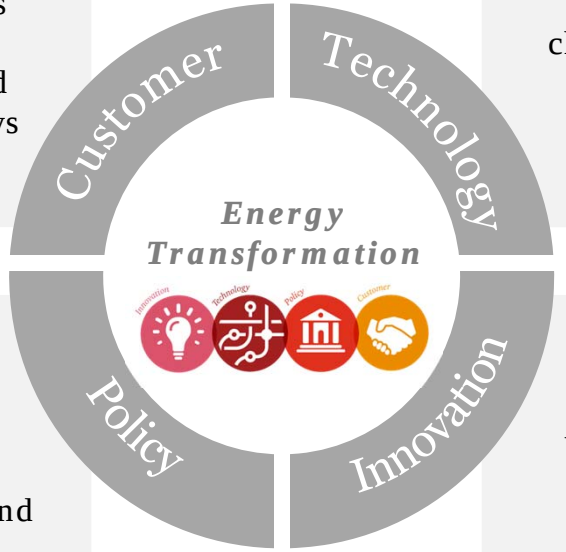


Following the surveys, PwC also conducted **6 in-depth interviews with internal and external subject matter specialists** to explore major survey findings, themes, and impacts.

Our survey found four transformational forces that are changing the energy landscape for utilities

Changing and expanding customer needs must be understood and met in new ways

Disruptive technological advances are changing market dynamics and creating new competitors



The focus of governments & regulators on balancing reliability, sustainability and affordability is driving change

Change, new ideas & a bias for action must be embraced to enable new businesses and new ways of working

43%

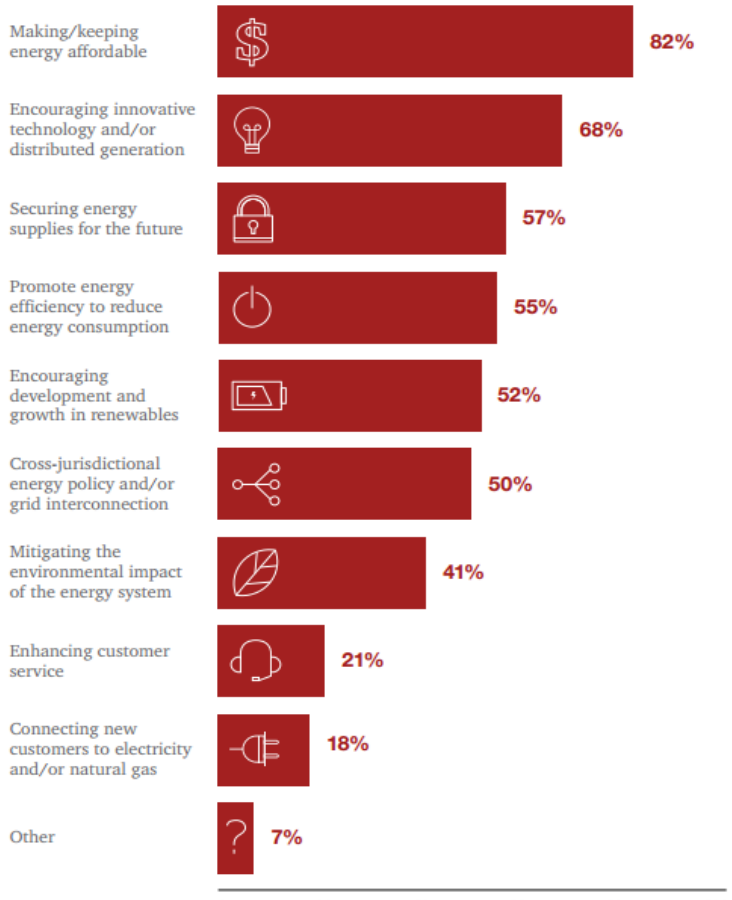
Believe current business models won't be sustainable with energy transformation, but the change can be gradual.

Today → *2040*

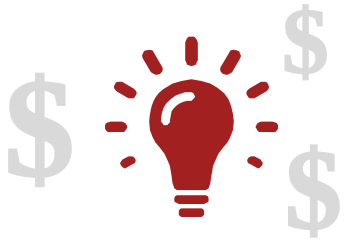
Source: PwC's Canadian Energy Transformation Executive Survey

Executives believe that government must prioritize energy affordability …

How utility executives think Canadians governments should prioritize their initiatives:



Source: PwC's Canadian Energy Transformation Executive Survey



4 out of 5 (or 82%)

of Canadian utility executives believe provincial governments need to make **energy affordability a top policy priority.**

Encouraging innovation technology and / or **distributed generation** follows at **68%.**

… however, most executives say their regulator is holding them back due to misaligned priorities

57% of utility executives feel their regulator is **"holding them back"**, suggesting a disconnect between policymakers' aspirations and the tools available to energy regulators

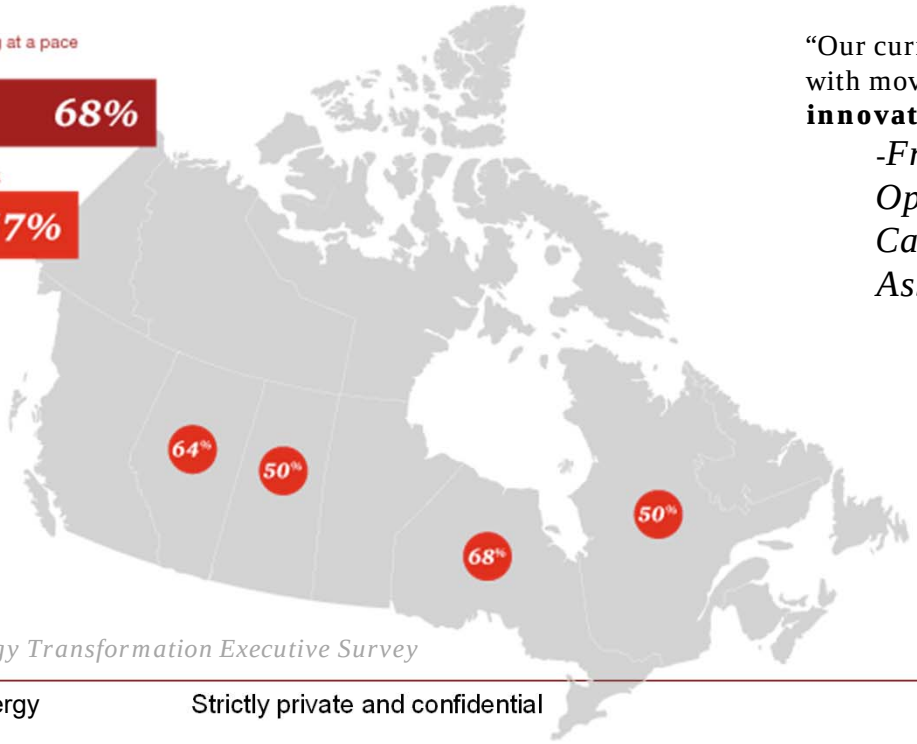
How regulators are impacting utilities companies across Canada

My company's business model is evolving at a pace consistent with energy transformation
68%

My regulator is holding my company back
57%

My regulator is driving energy transformation
25%

My regulator is helping lead my company towards the future
18%



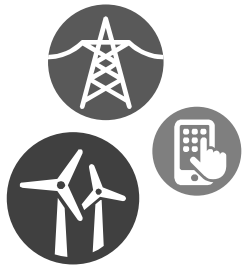
"Our current policies are **not aligned** with moving us to become **more innovative**"

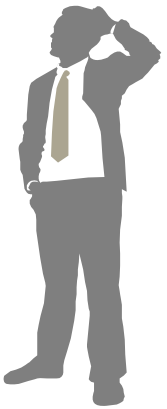
-Francis Bradley, Chief Operating Officer at the Canadian Electricity Association (CEA)

Source: PwC's Canadian Energy Transformation Executive Survey

New technologies will change how the energy market operates long-term

1 Generation	**Solar** (86%) is expected to have the most impact in the short & long-terms, until 2040.
2 Transmission	**Distributed generation** (93%) is expected to have the most significant impact on transmission in the long term (2040).
3 Distribution	New **storage** technologies see the greatest increase in impact through 2040 (86% high impact vs 25% in 2020)
4 Retail	**Electric vehicles** (93%) and other **smart home** technologies are expected to have a high impact through to 2040.



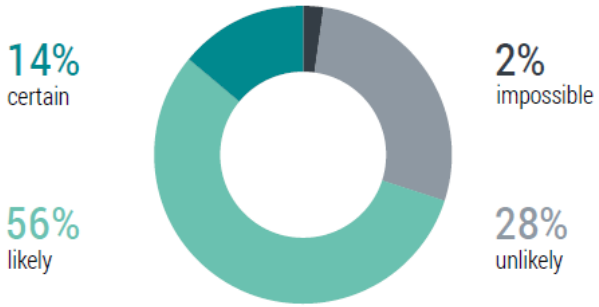
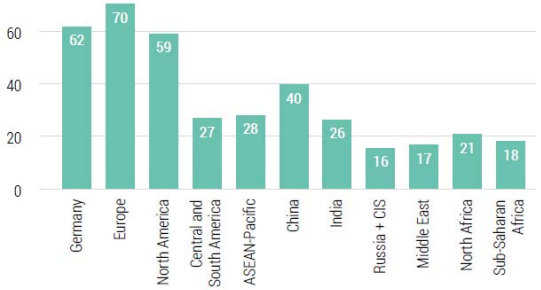
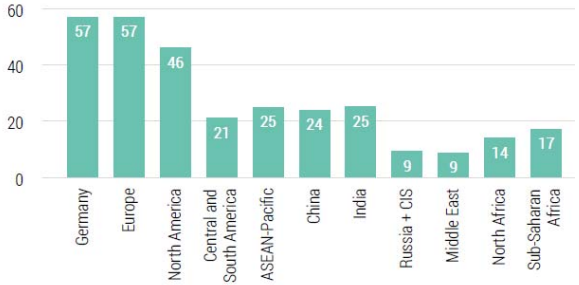


Source: PwC's Canadian Energy Transformation Executive Survey

By 2040, the supply of energy is expected to be more decentralized and agile, primarily in developed economies

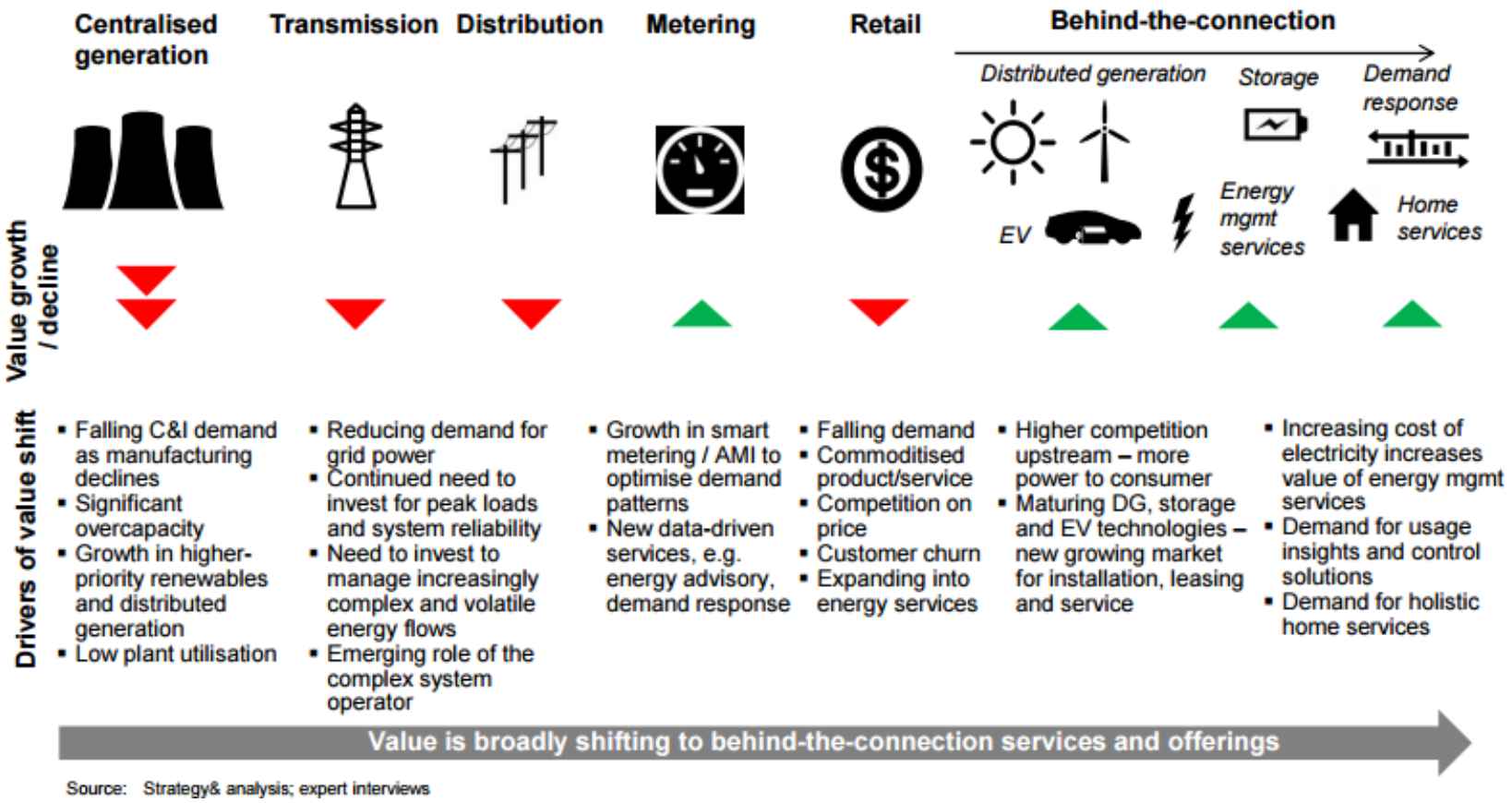
N=350; all numbers indicate % of respond

DELPHI ENERGY FUTURE

Scenario	Likelihood of scenario to be true	Where will it primarily happen?
By 2040, there will be more **decentralized supply of energy** which will be more **flexible** in terms of controlling generation frequency and capacity.		
By 2040, **distributed generation** with renewable energies using **battery storage** will have led to the emergence of new democratic self-governance structures at the **local level**.		

Source: 'Delphi Energy Future 2040' survey of 350 global utility experts conducted as a joint endeavour of the German Association of Energy and Water Industries (BDEW), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and PricewaterhouseCoopers AG (PwC)

Across the energy value chain, control is shifting "downstream"



Source: Strategy& analysis; expert interviews

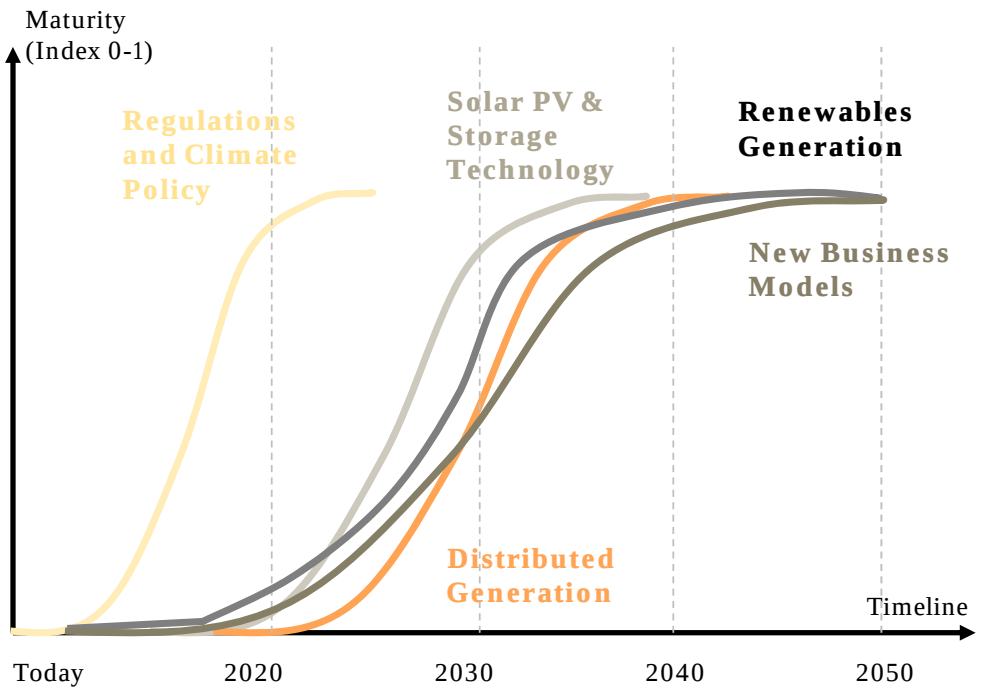
Will Energy Transformation fundamentally change the business model for distributors?

Business model consideration	Delphi Energy Future* study commentary
Big capital projects funded based on a cost-plus/return on rate-base revenue requirement model	**49%** of global energy executives: Likely or certain that the trend of decentralizing energy systems will result in the *majority of energy projects not being funded by large investors*, but rather small community based funds by 2040.
Fixed-fee/variable usage fee pricing model	**59%** of global energy executives: Likely or certain that customers will *pay flat rate fees* for electricity (based on average consumption and individual supply security needs and requirements) by 2040.
"Always on" grid supply	**51%** of global energy executives: Likely or certain that uninterrupted availability of electricity will no longer be a standard service offered by energy companies but will have become an extra service to be purchased separately by the customer by 2040.

**Source: 2016 global study based on interviews with 350 energy experts from 40 countries. Sponsored by PwC, BDEW German Association of Energy and Water Industries, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.*

Energy transformation drivers are moving at different paces, we believe policy changes will lead the way with technology advancement and business model changes following

Relative maturity timeline for key drivers



Discussion

- Interdependent factors make the timelines for change highly uncertain, high-level chronology of change drivers appears clear
- A stable regulatory regime is likely a pre-requisite for substantial investments in disruptive technologies or asset upgrades
- Once policy environment is stable, renewables & DG will pace-up rapidly
- Renewables growth, though initially slow, will be expedited by technology, distributed generations and business model advancements
- New business models will evolve once economics are compelling and/or new entrants “change the game”

Brian Poth, Partner, PwC/Strategy&

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Summary

- National leader of the PwC's Power & Utility Consulting practice, based in Toronto
- More than 20 years working with Utility & Public Sector clients in large scale transformation and change programs
- Experience spans strategy, process and organizational improvement, technology advisory and implementation as well as outsourcing / restructuring
- Leadership roles in the sales, transition and delivery of large scale technology and business process outsourcing relationships, including those with both unionized and offshore delivery

Education
MBA, McGill University
HBBA, Wilfrid Laurier University

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Scale, quality prominence, and deep relationships, skills, and insight

OUR VISION

The pre-eminent strategy through execution firm that delivers superior value, offers premium talent, and is differentiated by its ability to help clients build their own capabilities on a global scale.

strategy&
Part of the PwC network

Global strategy model, leading foresight, capabilities positioning

- **PROVEN TRACK RECORD**—250-year legacy of working with the world's leading institutions to solve their toughest problems
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