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Energy Efficiency and Digitalization: *Preparing for our emergent future*

Joyce Henry | Director General, Office of Energy Efficiency,
Natural Resources Canada, Government of Canada

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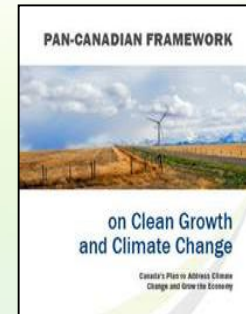
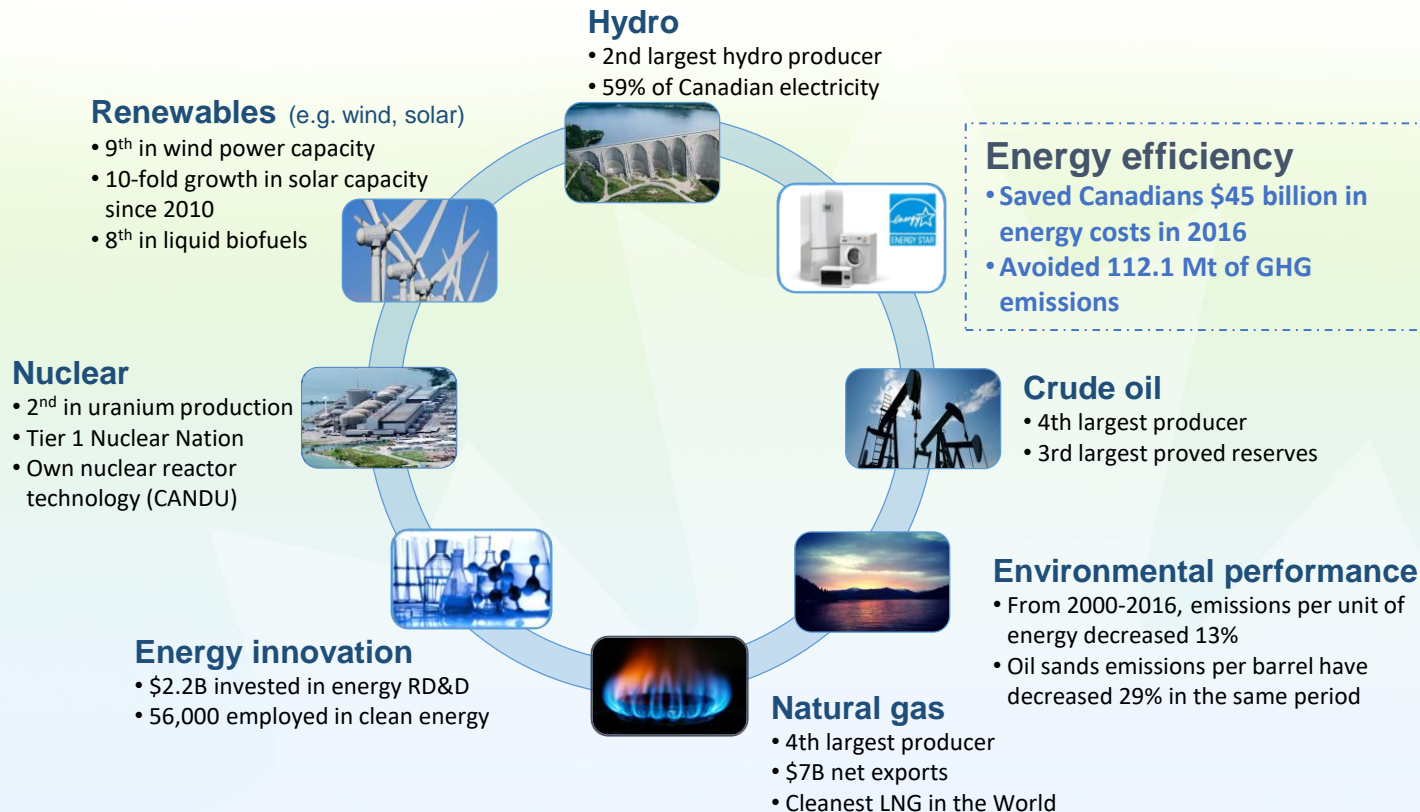
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Objectives

With respect to the digitalisation of energy efficiency, share:

- Potential **strategic implications and directions**; and,
- Examples of **early implementation efforts** at the federal Office of Energy Efficiency that position ourselves and move us forward.

Efficiency is an important part of Canada's diverse energy landscape



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Efficiency is also critical to Canada's clean growth plan



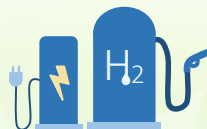
BUILD SMART: CANADA'S BUILDINGS STRATEGY

- **Codes:**
 - Net-zero energy ready building code by 2030
 - Model code for existing buildings by 2022
- **Standards:** stringent new standards up to 2030, notably heating equipment
- **Labelling:** work towards mandatory labelling & disclosure



INDUSTRIAL ENERGY MANAGEMENT

- **Energy management:** accelerating the adoption of energy management tools and performance certifications, such as ISO 50001.



LOW-CARBON TRANSPORTATION & ALTERNATIVE FUEL

- **Infrastructure Deployment:**
 - EV fast-chargers
 - natural gas stations
 - hydrogen refuelling stations
 - + further deployment projects



GREENING GOVERNMENT

- **Retrofits:**
 - 9 million m² – floor area to be retrofitted
 - \$345m – private sector investments
 - \$45m – energy savings annually
- **Deployment** of electric vehicles/lower carbon vehicles in the fleets of federal organizations supported.
- **Energy management** training for staff.

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Digitalization of energy efficiency is an emergent opportunity...and challenge

- **Breadth and depth of implications are uncertain**
 - Greater societal discussion is happening with both direct and indirect implications for energy systems
- **Need to consider how to think about and act on digitalization** in the context of energy efficiency policy and programming



How do we design and deliver policies and services in the digital era?

To us, digitalization is about enabling the use of emerging technologies and new ways of working to monitor, understand and influence energy use and energy efficiency at various scales in a responsible, secure, and sustainable manner.

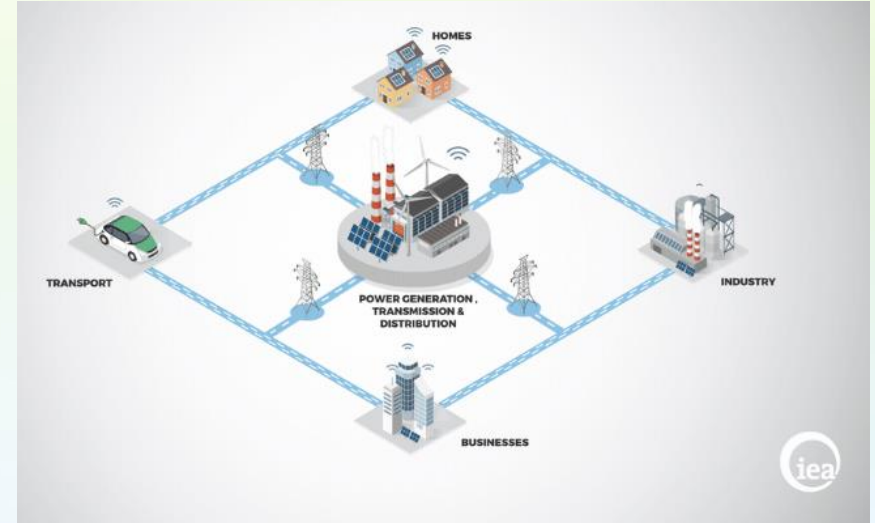


Image from IEA: <https://www.iea.org/digital/>

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Strategic Insights for Digital Readiness

We appear to be moving from...

- **Humans** make most energy-use **decisions**.
- **Isolated** products, isolated systems, local control.
- **Old**, sparse, and high-level **data** sent to general, human audiences.
- High levels of **individual ownership** & control.
- “Soft” measures **loosely estimated**.
- **Physical** products and borders.
- **Appeal** to logic and morals.

Towards...

- **Computers** increasingly make energy-use **decisions**.
- Everything **connected** and potential to manage in more integrated fashion.
- **Real-time**, customized, granular, two-way and interactive **data** flow to both humans and machines.
- **New ownership** models (*especially Uberisation and Servicisation*)
- **Better measurement** of non-energy costs/benefits.
- **Virtual** products and borders.
- Digitally **nudge** social and physical environments.

What *might* digitalization mean for what we currently do?



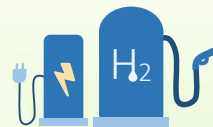
BUILDINGS

- Integrate buildings with their environment more?
- Smart/connectivity elements of building codes?
- Remove barriers to modular/factory built buildings?



INDUSTRIAL ENERGY MANAGEMENT

- Advance life-cycle assessment and circular economy data collection ecosystems?



LOW-CARBON TRANSPORTATION & ALTERNATIVE FUEL

- Support better logistics uptake?
- Nudge drivers and eventually work to green driver training of autonomous vehicles?
- Real-time usage incentives?



GREENING GOVERNMENT OPERATIONS

- Bundle energy service agreements across co-located buildings of different departments?
- Support standing offers across jurisdictions?
- Increase ambition of demonstration projects?

Better non-energy benefit measurement?
Support 3rd party energy/mobility as a service (E/MaaS)?
Real-time information to humans and machines?

With digitalisation, what *might* we do more, or differently?

Potential to more deeply expand energy efficiency (EE) into	<p>Cities – Model National Energy Code for smart cities? Do we need digital twins of our entire built environments?</p> <p>Finance – Eventually EE’s many benefits more visible and measurable?</p> <p>Supply Networks – Life-cycle analysis and impacts?</p>
Emerging consumer environments	<p>As virtual assistants purchase for consumers will we influence them to purchase Energy Star by default for example?</p>
Virtual borders	<p>Virtual product testing centers enforcing energy standards in 3D printable files?</p> <p>How to deal with potential for remote foreign energy management?</p>
A.I. and EE standards	<p>How to write EE standards for machines that learn and continuously improve?</p>
EE & Smart Grids	<p>Support Provinces to help make EE a powerful real-time grid resource?</p>

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We're starting to work on 'no regrets' actions

...including recommendations from IEA's *Digitalization and Energy* report:

- Building digital awareness, expertise, and capacity within our organization
- Experimenting, including through "learning by doing" pilot projects and via partnerships
- Participating in broader inter-agency discussions on digitalization and energy efficiency

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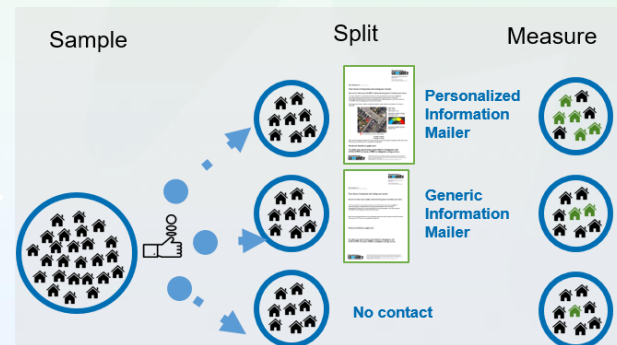
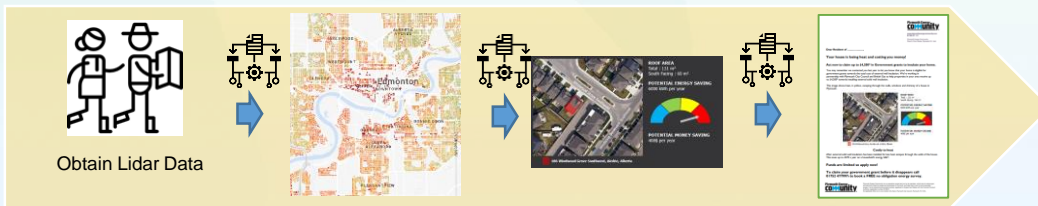
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Making energy visible to nudge energy efficiency and low carbon action

Using data and digital technologies to identify high impact energy efficiency and low carbon opportunities and engage citizens in more customized ways to act on them

- Geospatial mapping and thermal imaging to segment and reach households with information about potential energy saving and transition opportunities
- Field experiments to assess if such information might nudge action



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Using AI to improve brand compliance

Exploring how **Artificial Intelligence** and **Machine Learning** can help better understand how the **ENERGY STAR** logo is misused on websites and social media



- Exploring the capability of emerging technologies
- Experimenting to create value and insights
- Quantifying the instances of ENERGY STAR logo misuse
- Reducing brand misuse

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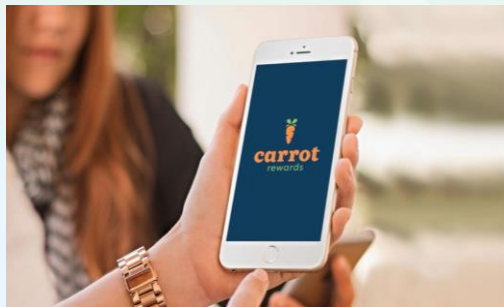
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Going to where Canadians are with engaging and rewarding content

Testing points-based rewards via a mobile app as a means of improving energy efficiency awareness, interest and action



- Partnering with Carrot Rewards to engage and reward Canadians for learning and taking energy efficient actions
- Delivering content in interactive ways using a variety of channels
- Testing our content to understand what works

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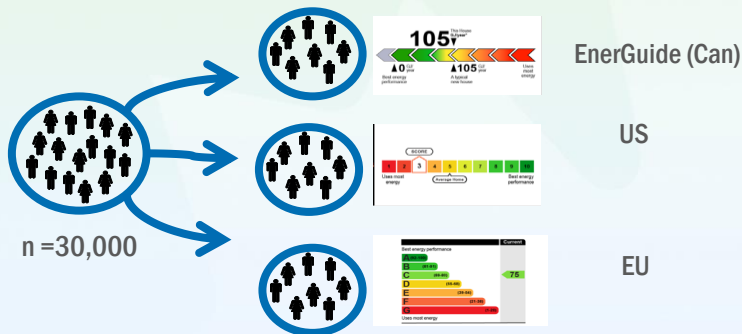
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Service experiments to understand needs and deliver value

Testing how well Canadian homeowners in understand the **EnerGuide for Homes** label to inform improvements and digital innovation opportunities

- Identifying our touchpoints with citizens (e.g. the EnerGuide label)
- Surfacing and testing our assumptions
- Quantifying how well Canadians understand our tools
- Generating insights to inform digital transition and solutions



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Thank you!

Questions and correspondence to:

Joyce Henry, Director General
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, Ottawa, Ontario
Joyce.Henry@canada.ca

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