Please share your questions and comments with us!

For online audience: please write your questions/comments in English via the chat option:

For Panelists: you can rise your hand using the Reaction option
## Workshop Agenda – Wednesday 23 June 2021

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speakers</th>
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<tr>
<td>14.00-14.10 CET</td>
<td>Introduction</td>
<td><strong>Dr Brian Motherway</strong>, Head of Energy Efficiency Division, IEA</td>
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<td><strong>Dr Vik Pant</strong>, Chief Scientist and Chief Science Advisor, Natural Resources Canada</td>
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<tr>
<td>14.10-15.00 CET</td>
<td>Session 1: Digital tools for data driven decision making and policy design</td>
<td><strong>Dr Vik Pant</strong>, Chief Scientist and Chief Science Advisor, Natural Resources Canada</td>
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<td><strong>Ms Yujuan Xia</strong>, China National Institute of Standardisation</td>
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<td><strong>Mr Gabriel Prudencio Fláño</strong>, Head of Sustainable Energies Division, Ministry of Energy, Government of Chile</td>
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<td><strong>Ms Rebecca Knights</strong>, Director, Energy Policy and Programs and Department for Energy and Mining, Government of South Australia</td>
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<td><strong>Ms Hanna Grene</strong>, Director of Energy, Americas, Microsoft</td>
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<td><strong>Mr Matt Golden</strong>, Chief Executive Officer, Recurve</td>
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<td>Moderator: <strong>Dr Nicholas Howarth</strong>, Energy Policy Analyst, IEA</td>
</tr>
<tr>
<td>15.00-15.50 CET</td>
<td>Session 2: Enhancing policy implementation and monitoring with digital tools through improved communication and connectivity</td>
<td><strong>Mr Arijit Sengupta</strong>, Director, Bureau of Energy Efficiency, Government of India</td>
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<td><strong>Dr Ashok Sarkar</strong>, Senior Energy Specialist and Task Team Leader – Energy Efficiency Projects, The World Bank Group</td>
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<td><strong>Dr Ronita Bardhan</strong>, Assistant Professor of Sustainability in Built Environment, Leader Sustainable Design Group, University of Cambridge</td>
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<td><strong>Prof Tadj Oreszczyn</strong>, Director, Smart Energy Research Lab, University College London</td>
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<td><strong>Mr Ian Maddock</strong>, Co-Founder and Chief Revenue Officer, MyHeat</td>
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<td></td>
<td></td>
<td>Moderator: <strong>Dr Nicholas Howarth</strong>, Energy Policy Analyst, IEA</td>
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<tr>
<td>15.50-16.00 CET</td>
<td>Summary and next steps: Better Energy Efficiency Policy with Digital Tools</td>
<td><strong>Ms Vida Rozite</strong>, Energy Policy Analyst, IEA</td>
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</tbody>
</table>
Digitalization Across ClimateTech Value Chains

- **Built Environment**
  - Construction, Fabrication, Assembly

- **Heavy Industry**
  - Predictive Maintenance, 24/7 Uptime, Green Mining

- **Energy**
  - Generation, Transmission, Storage, Consumption

- **Mobility**
  - ZEV, Electric Vehicles, Alternative Fuels

- **Buildings**
  - Design, Ventilation, Retrofitting

- **Land Use & Water**
  - Monitoring, Planning, Replenishment

- + many others…
Session 1: Digital tools for data driven decision making and policy design

23 June 2021 – 14.10-15.00 CET
Dr Vik Pant, Chief Scientist and Chief Science Advisor, Natural Resources Canada
Case Study: A Grander View
NRCan’s ecoENERGY Efficiency for Buildings

Energy Efficient Features Enabled by Digitalization

- Automated natural cooling
- Heating, ventilating, and air conditioning (HVAC) sensors and controls

Energy Efficiency
Digital Tools:
Energy Modelling

With NRCan’s CanQuest energy modelling software, building operation can be simulated for better planning.

Energy Efficiency Policy
Key Takeaways

1. Accelerate applications of Digital Technologies
2. Promote a Digital-Driven Culture
3. Develop Strategic Partnerships
4. Establish Governance of Digital solutions

Kitchener, Ontario, Canada
Information Platform for China Energy Labelling Program

Yujuan Xia
China National Institute of Standardization
CEL registration process

EE testing
obtain a testing report in required format

Label registration
upload EE testing report and fill other required information in CEL implementing rules

Generate QR code randomly which can be downloaded by the manufacturer and be used for making and printing a label

After label registration, the registered information are made available to public through CEL website, and the QR code can be scanned using phone, such as using Scanning function of WeChat
Information needed for CEL registration

CEL implementing rules for products

产品能源效率标识实施规则的主要内容包括：（Main content）

1. 制定依据和适用范围 Products scope
2. 标识的样式和规格 Label content, appearance and specification
3. 能源效率检测 EE testing
4. 标识信息的确定 Determination of label information especially the EE grade
5. 标识的印制、加施和展示 How to print, stick and display label
6. 标识的备案 Label registration
7. 标识的公告 Label announcement
8. 附则 Attachment

附件1：标识样式和规格 Label template with detailed sizes
附件2：能源效率检测报告 EE testing report
附件3：能源效率标识备案表 CEL registration form
Label template — Room air conditioner for example

Background: Blue and White
Length: 109 mm, width: 66 mm

Information required for Heat pump ACs:
(1) Name of Manufacturer;
(2) Model;
(3) EE grade;
(4) Annual performance factor \([\text{W·h}/\text{W·h}]\);
(5) Rated cooling capacity (W);
(6) Rated heating capacity (W);
(7) Cooling seasonal power consumption\((\text{kW}·\text{h})\);
(8) Heating seasonal power consumption\((\text{kW}·\text{h})\);
(9) No. of EE standard;
(10) QR code;
Information required for registration — more than those displayed on label and means more possibilities

<table>
<thead>
<tr>
<th></th>
<th>Information on Energy Efficiency Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>2</td>
<td>Spec. &amp; Model</td>
</tr>
<tr>
<td>3</td>
<td>Ext. Model</td>
</tr>
<tr>
<td>4</td>
<td>Trademark</td>
</tr>
<tr>
<td>5</td>
<td>Rated cooling capacity (W)</td>
</tr>
<tr>
<td>6</td>
<td>Rated heating capacity (W)</td>
</tr>
<tr>
<td>7</td>
<td>Nominal heating capacity (W)</td>
</tr>
<tr>
<td>8</td>
<td>Cooling seasonal total energy (kW·h)</td>
</tr>
<tr>
<td>9</td>
<td>Heating seasonal total energy (kW·h)</td>
</tr>
<tr>
<td>10</td>
<td>Cooling seasonal energy efficiency ratio (W·h)/(W·h)</td>
</tr>
<tr>
<td>11</td>
<td>Heating seasonal performance factor (W·h)/(W·h)</td>
</tr>
<tr>
<td>12</td>
<td>Annual performance factor ((W·h)/(W·h))</td>
</tr>
<tr>
<td>13</td>
<td>Energy efficiency grade</td>
</tr>
</tbody>
</table>
Information required for registration — more than those displayed on label and means more possibilities

<table>
<thead>
<tr>
<th>Date of First Use of Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
</tr>
<tr>
<td>This energy efficiency label is used from MM/DD/YYYY.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product category</td>
</tr>
<tr>
<td>Revolution-fixed cooling only air conditioner</td>
</tr>
<tr>
<td>Revolution-fixed heat-pump air conditioner</td>
</tr>
<tr>
<td>Revolution-adjustable cooling only air conditioner</td>
</tr>
<tr>
<td>Revolution-adjustable heat-pump air conditioner</td>
</tr>
<tr>
<td>Low ambient temperature air source heat pump air heaters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compressor types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revolution-fixed cooling only air conditioner</td>
</tr>
<tr>
<td>Revolution-fixed heat-pump air conditioner</td>
</tr>
<tr>
<td>Revolution-adjustable cooling only air conditioner</td>
</tr>
<tr>
<td>Revolution-adjustable heat-pump air conditioner</td>
</tr>
<tr>
<td>Low ambient temperature air source heat pump air heaters</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-phase</td>
</tr>
<tr>
<td>Single-phase</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure type</th>
</tr>
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<tbody>
<tr>
<td>Split</td>
</tr>
<tr>
<td>Integral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rated cooling capacity (CC) (W) (Unsuitable for low ambient temperature heat pump air heaters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC≤4500</td>
</tr>
<tr>
<td>4500&lt;CC≤7100</td>
</tr>
<tr>
<td>7100&lt;CC≤14000</td>
</tr>
</tbody>
</table>
**Information required for registration — more than those displayed on label and means more possibilities**

### Air conditioner

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Nominal heating capacity (HC) (W) (Only required for low ambient temperature heat pump air heaters)</td>
<td>□HC≤4500 □4500&lt;HС≤7100 □7100&lt;HС≤14000</td>
</tr>
<tr>
<td>21</td>
<td>Communication protocol functions</td>
<td>□ Sensor □ WIFI □ Bluetooth □ Others</td>
</tr>
<tr>
<td>22</td>
<td>Rated voltage (V)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Rated frequency (Hz)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Rated current for cooling (A)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Rated current for heating (A)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Maximum input current (A)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Rated input power for cooling (W)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Rated input power for heating (W)</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Maximum input power (W)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Manual control of electrical heater</td>
<td>□Yes □No □Selected by user with reserved interface for controller</td>
</tr>
<tr>
<td>31</td>
<td>Display of electrical heating condition</td>
<td>□Yes □No</td>
</tr>
<tr>
<td>32</td>
<td>Input power of electrical heater (W)</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Single-pole switch</td>
<td>□Yes □No</td>
</tr>
<tr>
<td>34</td>
<td>Switch (all-pole disconnection)</td>
<td>□Yes □No</td>
</tr>
<tr>
<td>35</td>
<td>Mechanical thermostats</td>
<td>□Yes □No</td>
</tr>
<tr>
<td>36</td>
<td>Control devices in addition to thermostats</td>
<td>□Yes □No</td>
</tr>
<tr>
<td>37</td>
<td>Weak parts for protection in abnormal work</td>
<td>□Yes □No</td>
</tr>
</tbody>
</table>
Information required for registration — more than those displayed on label and means more possibilities

### Air conditioner

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<tbody>
<tr>
<td>38</td>
<td>Electronic control circuit</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Non-detachable power line</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Separate control panel</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Wound lead controller</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Remote controller</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Refrigerant / Infusion (g)</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Dimensions (WxDxH) (mm x mm x mm)</td>
<td>Indoor unit</td>
<td></td>
<td>Outdoor unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Noise dB(A)</td>
<td></td>
<td></td>
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#### List of Basic Product Configuration

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<tbody>
<tr>
<td>46</td>
<td>Compressor</td>
</tr>
</tbody>
</table>

#### Accessories

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<tr>
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<tr>
<td>47</td>
<td>Extension Application Form</td>
</tr>
<tr>
<td>48</td>
<td>Change Application Form</td>
</tr>
<tr>
<td>49</td>
<td>Front view of product</td>
</tr>
<tr>
<td>50</td>
<td>OEM Statement</td>
</tr>
<tr>
<td>51</td>
<td>Brand Licensing</td>
</tr>
<tr>
<td>52</td>
<td>Manufacturer and Importer Information List</td>
</tr>
<tr>
<td>53</td>
<td>Copies of contracts entered into between manufacturer and importers and foreign manufacturers</td>
</tr>
<tr>
<td>54</td>
<td>Certificate of Relationship</td>
</tr>
<tr>
<td>55</td>
<td>Entrustment documents</td>
</tr>
<tr>
<td>56</td>
<td>Copies of business licenses or registration certificates of manufacturer and importer</td>
</tr>
<tr>
<td>57</td>
<td>Nameplate photo</td>
</tr>
</tbody>
</table>
Application of registration database

The information for product models registered can be output in EXCEL format, and statistical analysis can be carried out conveniently to provide information on:

- market share of each EE grade;
- market share of each subcategory for a specific product;
- year-to-year evolution of EE for specific products; etc.

These information can provide reference for policy making and EE standards revision.
Application of QR Code

- Allow for providing more information than those included in label, they are not core EE indicator but are important for consumers and market surveillance such as resolution for flat-panel TVs; refrigerant for ACs, refrigerators, etc..
- Allow for further data development to better guide consumers in purchasing Such as based on EE parameters and refrigerant information (type and filling quantity), providing information about electricity usage and CO2 emission based on some assumptions and calculation
- Allow for providing more information about whether the product has got other certification:
Application of QR Code

- Allow manufacturers to display product manual and guidelines for using appliances:
  Help for users to find the manual conveniently, and may help to save paper resources;
  More product information for consumers, help them better understand the target product and save energy during usage.

- Help for market surveillance makes it possible to obtain registered information in real time with smart phone only rather than logging on CEL website with a laptop, help officials to find out whether the product has registered and whether the registered information is consistent with the attached label, etc., which significantly improves the convenience and timeliness of supervision.
Thanks for attention!

Website: www.energylabelrecord.com
Digitalization of Energy

June 2021
The 3 pillars of Energy Modernization

- Decarbonization
- Decentralization
- Digitalization
Benefits of Digitization in the energy sector

- **Better and more information** achieves:
  - increase **analytical capacity** and conduct better project and policy evaluations
  - promote the development of **more transparent and competitive** markets
  - **optimize production** processes and reduce costs and make **better projections** of variables

- **Optimization** through performance monitoring that is facilitated in different processes, constituting a key tool for the **energy efficiency** of processes

- **Process automation** is possible (machine learning, AI, robotics) allowing efficiencies

- **Flexibility** by coordinating energy systems that facilitates the development of **renewable energy**

Energy sector faces the big challenge of **moving towards an end-user-centric paradigm**, taking advantage of the opportunities given by digitalization.
Study
Prospection in Energy Digitalization in Chile

• Study Name: Prospection in Energy Digitalization in Chile, University of Chile. 2020

• Main Contents:
  I. Review of the national and international state of the art
  II. Analysis of barriers and opportunities
30 digitalization applications in energy
8 categories

Smart Grids
- Smart Substation, Feeder automation, Microgrids

Distributed energy resources
- Demand Response, Energy Storage, Virtual Power Plant (VPP), Distributed Energy

Clients Domain
- Prosumers & P2P, Retailing Billing, Customer orientation

Process Management
- Process optimization, Process automation, Emission monitoring

Mobility
- Transportation personal use, Public transport, Transport cargo, Shared Mobility

Data Management
- Predictive maintenance, Forecasting, Predictive analytics

Smart Cities
- Smart traffic, Smart home & building, Smart farm, Smart parking, Smart waste mngmt, Smart fleet mngmt

Others
- Market mngmt & operation, Ancillary services, Teleworking

Source: Prospection of Energy Digitalization in Chile, Centro de Energía, U. de Chile, 2020
Enabling technologies for digitization in energy
6 categories

Smart Home/Buildings
Load Monitor, in home display, smart thermostat, smart light, smart plug/switch, smart appliance, hub

Smart Grids
Smart meters, AMR/AMI, V2G, EV, PHEV, IED, PMU, WAMS

IoT & IoE
Smart sensors, sensor and actuator networks, LAN/HAN/NAN/WAN, Cloud, 5G

Big Data, Machine Learning, Artificial Intelligence
Machine learning, data mining, nature inspire intelligence, artificial neural networks, multi-agent systems, clustering, natural language processing, digital twin, autonomous vehicle

Blockchain

Physical Action
Actuators, 3D printers

Source: Prospection of Energy Digitalization in Chile, Centro de Energía, U. de Chile, 2020
Barriers and opportunities in digitalization

1. Infrastructure
   - Development of enabling technologies are required.
   - The use of smart meters is not massified yet.

2. Security
   - Protocols for privacy, data sovereignty and information security are needed.

3. Economics
   - Implementation and deployment of infrastructure and solutions require public and private investments.
   - High investment cost

4. Regulation
   - Several applications require a modification or update of the current regulation

5. Capacity Building
   - Need of new skills, knowledge and digital education

Source: Prospection of Energy Digitalization in Chile, Centro de Energía, U. de Chile, 2019
What comes next? Policy recommendations

To take a more active approach:

• Promote **coordination** between the different **institutions**

• **Increase** public investments in digital **infrastructure**, build a robust ICT infrastructure

• Adopt a **common data architecture, tools and standards** and increase the quality, reliability and security of devices and services

• Reduce the **digital gap** between the different **territories** of the country

• Greater investment in **human capital and education**

• **Pilot programs** to promote the use of different digital applications

• Encourage **private investment** in projects associated with digitization

Source: Prospection of Energy Digitalization in Chile, Centro de Energía, U. de Chile, 2020
The way in which we communicate a solution is very important for policy success.

It is necessary for people to perceive the benefits of policies.
Policy design with participation is key

• We want our policy to be rooted on people’s needs and address them

• People need to be part of the diagnosis, as well as on weighting prospective solutions

• People need to be part of the implementation of energy policies:
  For policies to be appropriated it is key to integrate actors in the policy design process

End goal of policies and actions:
Enhance people’s quality of live and boost sustainable development
Thank you

Gabriel Prudencio
Head of Sustainable Energy Division
garudencio@minenergia.cl
DIGITAL TOOLS FOR ENERGY EFFICIENCY POLICY

A SOUTH AUSTRALIAN VIEW

Rebecca Knights
Department for Energy and Mining
CONTEXT: SOUTH AUSTRALIAN SYSTEM DEMAND
Digital tools are enabling different policy solutions to energy system challenges.

They offer new opportunities to manage a system with high penetration of renewable energy.

- Agents to remotely disconnect and reconnect rooftop solar in an emergency.
- Household smart meters capable of separating essential supply from non-essential.
Digital tools were employed to design the Retailer Energy Efficiency Program

- AccuRate (CSIRO software tool) simulation to generate hourly profile for heating and cooling for an entire year

Digital tools were enablers for the program design

- New activities that relate to when consumers use energy (Virtual power plants, Demand response aggregation)
• Digital tools are enabling more efficient monitoring and compliance

• Electronic certificates of compliance – electricians certify works is safe and compliant with AS & Regulations
  • Accessible via desktop and mobile devices
  • Facilitates collection of information on DER
  • Provides for desktop audits
  • Timely targeting of compliance activities
Contact

Rebecca Knights
Director, Energy Policy and Programs
Energy and Technical Regulation

Department for Energy and Mining
11 Waymouth Street
Adelaide, South Australia 5000
GPO Box 320
Adelaide, South Australia 5001
E: rebecca.knights@sa.gov.au
Disclaimer

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Decarbonizing the grid

Hanna Grene
Director, Energy Industry for the Americas
Microsoft is committed to sustainability

- **2012**: Carbon neutral
- **2018**: 50% of supply of renewable energy
- **2020**: 60% of supply of renewable energy
- **2025**: 100% of supply of renewable energy
- **2030**: Diesel-free datacenters & carbon negative
- **2050**: Removal of all historical carbon emitted directly or through electrical consumption

Discussion topics today:
- Microsoft as an energy consumer, partner, and innovator
- Digital enablement in policy and market transformation
Jointly developed a first-of-its-kind hourly matching (24/7) of renewable energy solution

“We are very happy to further develop our relationship with this advanced offering. Microsoft has high renewable ambitions, and this solution shows how new digital solutions and technology can be used to enable fossil free living. The solution gives us possibilities to offer customers specific data and unique precision, that can support them in decisions, environmental efforts and communication.”

Andreas Regnell
Senior Vice President, Vattenfall
Australian Energy Simulation Center (AESC)

- Simulation of the entire energy supply
- Integrates data from multiple suppliers and systems of record
- Enhanced forecasting and grid reliability
- Detailed models of wind, solar and battery storage systems
- Simulated grid behaviors to better enhance decision support
- Objective is a one-minute simulation with 3 minutes of processing time
- Enhanced support for environmental mitigation
Power & Utilities Value Chain

**Generation**
- Sensors & IIoT monitoring
- Renewable integration and markets
- Fuel switching
- Equipment optimization
- Generation optimization
- Carbon capture & storage

**Transmission & Distribution**
- Drones for monitoring & inspection
- Substation modernization & security
- ADMS, VPP and DERMS
- Distribution automation
- Grid sensors and advanced analytics

**Commercial & Residential**
- AMI (smart meter) analytics
- Commercial generation & storage
- Commercial fleet management
- Demand management and load flexibility
- Building to grid integration and management and aggregation

**Prosumer**
- Energy usage analytics
- Onsite renewables, storage & aggregation
- Smart appliances & energy management
- EV managed charging
- Usage regulation to shift load
Azure represents a secure, global computing foundation. Over 160 datacenters across the planet are protected with world-class, multi-layered protection. Each physical datacenter is secured with cutting-edge operational security:
- Restricted access
- 24x7 monitoring
- Global security experts

Global cloud infrastructure with custom hardware and network protection. 61 Azure regions.
71% of US customers are served by a utility with a carbon or emission reduction goal.
May 3rd 2021 California Duck Curve

- > 14 GW evening ramp
- 2.5 GWh renewables curtailed
Renewables Are Creating Expensive Problems

Decarbonization Creates Costly New Load Shapes
Integrating the Virtual Power Plant

Demand Flexibility

➔ Dispatchable
  Storage, Demand Response, EV Charging

➔ Predictable
  Energy Efficiency, Solar, Electrification
Open-Source Revenue-Grade Software

→ **Revenue-Grade:** open-source, auditable, reproducible

→ **Verifiable** Standard for demand flexibility calculations

→ **Scalable** to every meter on the grid

→ **Automated** from smart meter data to settlement-quality transaction
Digitization Is The Platform for Grid Innovation

**Resource Planning**
Meter level analytics to identify potential and target customers

**Fleet Management**
Real-time Asset Level Telemetry to Manage VPP Deployment

**Ledger**
Revenue-Grade Transactions, Integration, and Reg. Compliance
A Market Platform for Flexibility as a Resource

Energy savings
Peak Reduction
Carbon Reduction

Customers

Grid Benefits

Utility

Cash Flow for Grid Value

Cost-effective incentives

Aggregators

Energy Solutions

Business Models
Technology
Behavior

Metered performance
## Policy Strategies to Enable Demand Flexibility

<table>
<thead>
<tr>
<th>Data Access</th>
<th>Meter-Based Quantification</th>
<th>Performance Payment</th>
<th>Competitive Procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Access frameworks are risk-based and include market use cases</td>
<td>✓ Deploy AMI, and require using it for EE/DR/Storage programs</td>
<td>✓ Call for expansion of performance oriented program designs</td>
<td>✓ Adopt technology neutral solicitations</td>
</tr>
<tr>
<td>✓ Utilize best practice in security (i.e. differential privacy)</td>
<td>✓ Track changes in consumption for targeting &amp; participants</td>
<td>✓ Define expectations with potential aggregators</td>
<td>✓ Leverage common meter-based outcomes for payment / criteria</td>
</tr>
<tr>
<td>✓ Operationalized for scaled application</td>
<td>✓ Adopt definition of “savings” that considers change in consumption</td>
<td>✓ Support market with training, data and instruments to manage risk (like insurance)</td>
<td>✓ Fund all DERs via procurement funding &amp; tied to grid planning (IRP, RA, NWA, or General Rate Cases)</td>
</tr>
</tbody>
</table>
Session 2: Enhancing policy implementation and monitoring through improved connectivity

23 June 2021 – 15.00-15.50 CET
IEA Energy Efficiency Policy and Digital Tools Workshop

Session 2: Enhancing policy implementation and monitoring with digital tools through improved communication and connectivity
Wednesday 23 June, 15.00-15.50 CET

Mr Arijit Sengupta
Director,
Bureau of Energy Efficiency
Digitalisation and its importance

- **Digitalization** is the adoption or integration of digital technologies into everyday life by the digitization of everything that can be digitized

- **Vision of Digital India**: a programme to transform India into a digitally empowered society and knowledge economy.

- Digital technologies are therefore emerging to become integral to 21st century low-emission energy systems as these can play a major role in delivering effective solutions

- Enable policymakers to meet the energy efficiency targets

- They have a huge potential to reshape the consumer perceptions on the services and interactions.
## Relevance to appliance energy efficiency

<table>
<thead>
<tr>
<th>Data collection and management</th>
<th>Sales, stocks, usage patterns, energy use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools for data analysis</td>
<td>Trends, policy impact, market changes, energy savings</td>
</tr>
<tr>
<td>Product Registration</td>
<td>Transparency, streamlining processes, information for consumers</td>
</tr>
<tr>
<td>Monitoring and Compliance</td>
<td>Effectiveness of policy measures, transparency and accountability,</td>
</tr>
<tr>
<td>Awareness and Outreach to consumers</td>
<td>Information and education, Access to relevant information for informed decisions, engaging consumers to provide feedback, complaints redressal</td>
</tr>
</tbody>
</table>
India as case study

• Product registration system
  https://beestarlabel.com/Home/Searchcompare

• Information on energy savings and number of appliances in each star rating band for all appliances under labeling program on the website
  https://beestarlabel.com/Home/EnergySavings

• PPAT tool for prioritization of products for labeling program and policy analysis

• Mobile application for informed purchased decision making and features such as information on monetary savings and product related feedback
  https://beestarlabel.com/Home/MobileApp

• Consumer behaviour study to get real time data on appliance usage pattern and behaviour to support policy decision, revision and evaluation
Tools and Technique

• Calculation of appliance energy consumption and savings
  – Tools for product prioritization, policy analysis and energy savings
  – Mobile App.
  – QR code

Advantages

- Selection and prioritization of products, projections for market growth
- Estimation of energy saving potential for policy decisions and impact analysis
- Support data acquisition, handling and visualisation
- A historical view of electricity consumption over time (also indicating the resulting costs)
- Provide labelled appliance data in accessible manner influencing purchase decisions
- A household-specific recommendation service on how to save energy
## BEE Star Label Mobile application

### Air Conditioners
- **AKAI**
  - **AKW-18SCE**
  - **Cost Saving (5 yrs): ₹15030**

### Refrigerator
- **AKAI**
  - **AKS-18SPE**
  - **Cost Saving (5 yrs): ₹13130**

### Lighting
- **AKAI**
  - **AKS-185CE**
  - **Cost Saving (5 yrs): ₹13130**

### TV
- **AKAI**
  - **AKS-185CE**
  - **Cost Saving (5 yrs): ₹13130**

### Geysers
- **AKAI**
  - **AKS-125CE**
  - **Cost Saving (5 yrs): ₹8740**

### Ceiling Fans
- **AUX**
  - **ASW245-LH**
  - **Cost Saving (5 yrs): ₹16945**

### Pumps
- **AUX**
  - **ASW185-LH**
  - **Cost Saving (5 yrs): ₹2342**

### Inverters
- **AUX**
  - **ASW185-LH**
  - **Cost Saving (5 yrs): ₹2342**

---

**Brand:** AKAI  
**Model:** AKS-185PE  
**Type:** Split air conditioner  
**Variable speed compressor:** No  
**Heat pump:** No  
**EER (W/W):** 3.51  
**Cooling capacity (W):** 5110  
**Power (W):** 1455
PATNet - Home Page
Benefits of PATNet portal to Industries

• Industries (DCs) can fill their Energy Return Forms online instead of sending it on email or hard copy.

• Online forms filled in by the DCs are automatically shared with the SDA with a copy to BEE.

• Total 803 DCs have successfully registered on PATNet from PAT Cycle I to PAT Cycle VI covering 13 energy intensive sectors across PAN India.

• SDAs and EmAEA firms have also given login on the PATNet portal.

• Before and after trading of Energy Saving Certificates (ESCerts) are automatically updated on the dashboard of every DC.
Thank you
Making Energy Efficiency Implementation Smarter: The Role of Digital Tools:

Ashok Sarkar

IEA Energy Efficiency Policy and Digital Tools Workshop
23 June 2021
Demand-side EE Ecosystems are Complex…
Digital Transformation Can Address Multiple EE Barriers

**Implementation Barriers**
- Small and Dispersed
- Multiple Stakeholders
- No “One Size Fits All” Solutions
- High Transaction Costs
- Heterogenous Market
- Financing based on “Savings” (Not Asset-Based)

**Barriers Addressed by Digital Transformation**
- Data/Information
- Transaction Costs
- Measure
- Analyze
- Communicate

---
Source: DNV-GL (2019)
Digital Tools have a Role in Every Pillar of EE Market Transformation: Addressing Market Failures & Barriers through Multi-Pronged Efforts

Policy and Regulations
- Overarching EE legal framework (EE Law)
- Cost-reflective energy pricing
- Building Codes/ Appliance standards
- EE incentive schemes w/ funding sources
- EE targets by sector
- Public budgeting/procurement encourages EE

Institutions
- Dedicated entity with EE mandate
- Clear institutional roles/accountability
- Inter-ministerial coordinating body
- Assignment of roles for monitoring and compliance enforcement
- Authority to formulate, implement, evaluate and report on programs
- Tracking of progress for EE targets

Information and Awareness
- Database on energy consumption
- Industrial and building stock
- Information center/case study database
- Database of service providers, EE technologies, equipment providers
- Broad, sustained public awareness
- Appliance labeling

Technical Capacity
- Energy auditor/manager training and certification programs
- Private sector training programs (banks, ESCOs/EE service providers, end users)
- EE project templates (audits, M&V plans, EPC bidding documents, contracts)
- Energy management systems developed

Finance
- Commercial bank lending (credit lines, guarantees)
- Pay As You Save -based EE financing
- Utility Demand Side Management
- Commercial ESCO financing
- Public Super ESCO
- Public sector EE financing
- EE Residential home/appliance credit
- EE Equipment leasing incentives
- Green/EE building incentives

Successful Energy Efficiency Programs


ASHOK SARKAR (World Bank), IEA Workshop Presentation, 23 June 2021
Illustrative Example: India – EESL…(1)
How Digital Tools Helped Transform EE Markets at Scale

• National-level Deployment
• Analytics
• M&amp;V
• Real-time Monitoring & Impact Evaluation
• O&amp;M
• Lower Transaction Costs
• Higher Accuracy
• Better Comparison and Targeting

Source: UJALA Dashboard
http://ujala.gov.in
Illustrative Example: India – EESL...(2)
How Digital Tools Helped Transform EE Markets at Scale

Building Energy Efficiency Program (BEEP)

Source: BEEP Dashboard: https://beep.eeslindia.org/
Future Energy Systems → Unlocking More EE through Digitalization

- Decentralized energy assets and resources, incl. generation, storage, and electric vehicles – connected to the network.
- Digitalization of this network will allow data, communications and analytics to be used to improve the energy efficiency and resilience of the system.
- Customers are likely to have a more active role than they do today; individually-owned assets can provide flexibility to the system, and new markets could allow trading between households or communities.

Source: EnergyRev (2020)
Thank You

For More Information:

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Senior Energy Specialist – Team Leader
Energy & Extractives Global Practice
The World Bank, Washington, D.C.
E-Mail: asarkar@worldbank.org

https://www.linkedin.com/in/dr-ashok-sarkar-ph-d-35b58187/
Digital Tools for *good energy & health policy* in the Global South

*A case of low-income housing in India*

**Dr. Ronita Bardhan**  
Assistant Professor of Sustainability in the Built Environment  
Director, MPhil in Architecture and Urban Studies  
Department of Architecture;  
University of Cambridge
Research Group

Good health and well-being through design
This vertical informs the SDG3. We investigate how building design affects health and well-being in resource constrained settings.

Sustainability in low-income habitat through design
This vertical informs the SDG11. We derive data-driven solutions for vulnerable communities to tackle problems of climate change: heat island effects, flooding, for climate sensitive urban planning.

Energy efficiency through design
This vertical informs the SDG7. We use state-of-the-art building simulations and experimental methods to derive demand side energy efficient solutions.

Gender equality through design
This vertical informs the SDG5. We also address mainstreaming through participatory housing design for sustainability.

Research domain
I see ‘design as a Solution’.

‘Effective design Can foster Well-being’ and that the measure of effectiveness is inherent in outliers’.

Solution lies in Outliers
Mumbai ~Around 65% live in the cramped, airless slums/slum like, making for easy dis-stress, and transmission of the disease.

- REUTERS, 2020

(Source: Gully Boy, The movie)
Gender mainstreaming
Energy

Gender mainstreaming
Thank you!!

rb867@cam.ac.uk
Decarbonising the built stock: A digital twin of London and smart meters

Tadj Oreszczyn, UCL Energy Institute
Smart Energy Research Lab (SERL)

Electricity data
- Daily
- Half-hourly
- All participants (in theory)
- Includes exports if available
- Up to 12 months before consent, ongoing collection

Energy Performance Certificate
- ~50% of participants
- Sourced externally, publicly available
- Updated quarterly/as appropriate

Gas data
- Daily
- Half-hourly
- All participants with a SMETS2 mains gas meter (~70%)
- Up to 12 months before consent, ongoing collection

Weather data
- ECMWF ERA5 reanalysis data
- Publicly available
- Hourly, 30km resolution
- Initially surface temperature, adding ~20 more variables
- Updated quarterly

SERL (13,000) Observatory Dataset

SERL Survey
- ~40 questions on the dwelling, occupants and attitudes/behaviours
- ~97% of participants partial/complete
- One-off collection
3DStock – A Digital Twin

Building heights and domestic building floor areas

Light Detection and Ranging (LIDAR)

3DStock

Valuation Office Agency
Non-domestic rating: Business Floorspace England and Wales

AddressBase

Ordnance Survey

EPCs & DECs

Energy Efficiency Rating

UK 2005

Land parcels & sites

Land Registry

Others:
- Experian
- UK Buildings
- Census
- ............

Department for Business, Energy & Industrial Strategy
3DStock model of Camden High Street, London. The dominant activity on each floor of each building is colour coded. Houses and flats are shown in grey.
LBSM (London Building Stock Model)

All buildings—domestic, non-domestic and mixed use—33 boroughs of Greater London. 3.78m premises = 1.5 million houses, 1.9 million flats + 250,000 non-domestic premises.

- fuel poverty
- minimum energy efficiency standard (MEES).
- poorly performing non-domestic buildings
- Plan energy improvements.

Public version see: https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/london-building-stock-model
Recommended fabric improvements for London (% of houses in each borough)
Solar Opportunity Map

Public version:
https://maps.london.gov.uk/lsom/
Other uses and results from 3DStock

**Research** (much government related)
- EPCs overpredict energy use in poorly insulated properties but underpredict energy use in new homes. New empirical EPC?
- High rise buildings use more energy
- What is the normal post covid energy use

**Local and national government planning**
- Post construction reporting platform – Building Passports
- Local planning for net zero (skills, materials, heat distribution)
- National policy planning and evaluation (very cost effective)
- Performance contracting, metered energy savings etc
- Measuring building heat loss from smart meters rather than surveys
Digital Technologies can help with the following key challenges:

1. Where and how to start?
   • which homes are heat pump ready?
   • where are the greatest savings?
   • material and labour required?
   • providing home owners with the best information?

2. Doing the job well
   • Reducing performance gap

3. Helping you manage your energy use
   • Managing the complexity
   • Stopping wasted energy
Thank You & Acknowledgements

Links for further information:

• Digital Twin Animation.
  https://www.youtube.com/watch?v=ppi0ssQPC3I&feature=emb_logo

• London Building Stock Model
  https://maps.london.gov.uk/lbsm-map/public.html

• London Solar Opportunity Map
  https://maps.london.gov.uk/lsom/


• Smart Energy Research Lab  https://serl.ac.uk/

• Centre for Research into Energy Demand Solutions
  https://www.creds.ac.uk/

• Active Building Centre  https://www.activebuildingcentre.com/
~19% of global GHG emissions come from buildings
MyHEAT builds tools that Make Energy Visible to enhance energy efficiency programs to enable these emissions reductions.
Individual high resolution HEAT Maps are created for each roof to show areas of potential heat loss. Buildings are then given a score of one to ten and shown how they compare to others in their city.
Thermal Atlas City Ranking

We rank cities based on a number of factors including size, population density, average age of building stock, and overall HEAT Rating. See below for cities similar to Calgary and how they compare when it comes to heat loss:

Edmonton
- Overall City Rank: 11
- CO2 Reduction Potential: 1.35
- Energy Efficiency Programs: 12
- Electric Vehicle Charging Stations: 12
- Average Age of Homes: 39 years

Hamilton
- Overall City Rank: 22
- CO2 Reduction Potential: 2.6
- Energy Efficiency Programs: 5
- Electric Vehicle Charging Stations: 3
- Average Age of Homes: 21 years

Grande Prairie
- Overall City Rank: 31
- CO2 Reduction Potential: 1.36
- Energy Efficiency Programs: 1
- Electric Vehicle Charging Stations: 1
- Average Age of Homes: 47 years
Homeowner Journey

Homeowners can access their personalized home profile, and instantly connect to online rebates and energy savings tips.
Governments and other stakeholders are using the MyHEAT data to:

- Combat energy poverty
- Reduce consumption & building emissions at a mass scale
- Get funding to homeowners that need it the most
- Track change in building thermal efficiency
Ian Maddock

Co-founder & Chief Revenue Officer
at MyHEAT

ian@myheat.ca
IEA - Energy Efficiency Policy and Digital Tools Workshop

Workshop – 23 June 2021

ing. Domenico Palladino - Department of Energy Efficiency Unit (DUEE)
APP of ENEA for the Energy Evaluation and Seismic Vulnerability of Public Residential Buildings

Do not replace the Energy Audit, they allow to collect all the data required for the Energy Audit elaboration and for the Seismic Analysis

Free APP, available for tablet and smartphone, ONLY FOR PRELIMINARY ANALYSIS

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APP of ENEA for the Energy Evaluation and Seismic Vulnerability of Public Residential Buildings

General Information
- Tecnico rilevatore
- Dati generali
- Dati geometrici
- Manutenzione edilizia
- Manutenzione impianti e servizi presenti
- Conformità normative

Seismic vulnerability analysis
- Pericolosità del sito
- Vulnerabilità
- Livello di intervento

Energy analysis
- Consumi
- Involucro
- Climatizzazione invernale
- Climatizzazione estiva
- Energia elettrica e illuminazione
- Solare termico
- Solare fotovoltaico
- Gestione del verde
- Valutazioni
- Interventi

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Energy analysis

- Energy consumption (bills)
- Building envelope
- Technical building systems:
  - Heating
  - Cooling
  - Domestic hot water production
  - ventilation
  - Lighting
  - Other electrical consumption
  - Solar thermal collectors
  - Photovoltaic
- Green area

Input:

- Consumi
- Involucro
- Climatizzazione invernale
- ACS
- Ventilazione
- Solare termico
- Solare fotovoltaico

Output:

- Gestione del verde
- Valutazioni
- Interventi

- Energy assessment
- Energy improvements

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Energy class level for Heating - $IEN_R$

Energy class level for Electric Energy - $IEN_E$

\[ IEN_R = \frac{C \cdot F_e \cdot F_h \cdot F_{ta}}{V \cdot GG \cdot F_{mr}} \]

$C = \text{annual consumption [Wh]}$

$F_e = \text{correction factor based on S/V}$

$F_h = \text{correction factor based on the real heating turn-on/off}$

$F_{ta} = \text{correction factor based on the indoor air temperature}$

$V = \text{volume of buildings}$

$GG = \text{Heating Degree Day}$

$F_{mr} = \text{correction factor based on the real heating period}$

\[ IEN_E = \frac{E \cdot F_h \cdot F_{us}}{S_u \cdot F_{me}} \]

$E = \text{annual consumption [e]}$

$F_h = \text{correction factor based on the real heating turn-on/off}$

$F_{us} = \text{correction factor based on special use}$

$S_u = \text{useful area of buildings}$

$F_{me} = \text{correction factor based on the real period of use}$

\[ \begin{align*}
1 & \leq 1.5 \\
1.5 & - 2.5 \\
\geq 2.5 & \text{INSUFFICIENTE}
\end{align*} \]
APP of ENEA for the Energy Evaluation and Seismic Vulnerability of Public Residential Buildings

Energy Improvement solutions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Variable</th>
<th>Improvement solution</th>
<th>Energy Class Level for heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Wall</td>
<td>poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climatic Zone</td>
<td>D, E, F</td>
<td>Thermal coat</td>
<td>Medium or insufficient</td>
</tr>
<tr>
<td>External Wall</td>
<td>Without insulation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interventi

- Involucro
  - Si consigliano i seguenti interventi:
    - Installazione di sistemi schermanti (orizzontali/ verticali, interni/esterni, frangisole fissi/orientabili, venezione, tende avvolgibili, lamelle nel vetrocamera)

- Climatizzazione invernale
  - ACS

- Climatizzazione estiva
  - Si consigliano i seguenti interventi:
    - Installazione di schermature solari

- Ventilazione
  - Illuminazione
    - 1
  - Fonti rinnovabili
  - Gestione del verde
    - Monitoraggio dei consumi

APP of ENEA for the Energy Evaluation and Seismic Vulnerability of Public Residential Buildings

1. Survey Report
2. Energy Class Level of Buildings
3. Energy Class Level of the Energy Measures to improve the energy performance
4. Vulnerability of the structure
5. Priority Level to improve the building security

http://italiainclassea.enea.it/safe-school-4-0-app/

https://www.enea.it/it/efficienza-energetica/enea-rende-disponibile-app-per-misurare-la-vulnerabilita-energetico-strutturale-degli-edifici-scolastici

http://italiainclassea.enea.it/condomini4-0/

https://www.enea.it/it/efficienza-energetica/condomini-4.0/

IEA - Energy Efficiency Policy and Digital Tools Workshop – 23 June 2021
Thank You
For Your Attention

ing. Domenico Palladino

domenico.palladino@enea.it