IRENA
INNOVATION WEEK
solutions for a renewable-powered future

IRENA
International Renewable Energy Agency

DIGITALISATION AND DECENTRALISATION TRACK

DIGITAL APPLICATIONS FOR THE ENERGY TRANSITION: ARTIFICIAL INTELLIGENCE AND BIG DATA

Session overview

"It's better to have artificial intelligence than no intelligence", said Stephen Woodhouse, Chief Digital Officer of Pöyry, in his remarks. Technology advancements in artificial intelligence (AI) over the last few years – in conjunction with the growth in generation from distributed renewables, the wider use of smart devices and the increasing importance of demand management services, among others – is leading to major changes in the power sector.

Maher Chebbo, Chief Innovation Officer, GE Power Digital commented that only 2% of data gathered is intelligently analysed. As power systems become more complex, the role of AI is evolving from being a facilitating and optimising tool to an absolute necessity. AI has the potential to enable better grid integration of variable renewable energy (VRE) sources, such as wind and solar, by forecasting generation and consumption and thus mitigating intermittency in the system.

The session aimed to identify the means by which AI, paired with big data, can contribute to the energy transition, the risks associated with this technology, and what policy makers and regulators can do to enable this. The session was moderated by **Maher Chebbo, Chief Innovation Officer, GE Power Digital** and comprised three introductory presentations followed by a panel discussion.

Presentation 1:
An introduction to AI, machine learning, and big data and their impacts on the energy sector

Marc Peters (CTO Energy, Environment & Utilities Europe, IBM) gave a high-level overview of the digitalisation taking place in the energy sector and what to expect in the coming decade. He emphasised that when talking about AI technology, one should bear in mind that the results coming from AI are only as good as the data they are trained with. Biased data will lead to biased AI.

Presentation 2:
Unlocking the "fifth fuel" – Increased energy efficiency with machine learning and big data

Manon Dirand (Head of Sales, BeeBryte) described how BeeBryte reduces energy usage by taking power consumption data and analysing it in conjunction with outside data such as forecasts or electricity prices. She provided an example of how AI applications allow substantial gains in energy efficiency: in a case study for an office building, summer energy consumption could be reduced 8% by intelligently managing the air conditioning system.

Presentation 3:
AI-powered system operation – A view to the future

Stephen Marland (VP Innovation, National Grid UK) presented on how National Grid UK is investing in minimal viable products to support AI start-ups. From the utility viewpoint, AI enables important improvements in, for example, the interaction with the consumer, real-time decision support and maintenance.

Panel discussion

In addition to the presenters mentioned above, the panel included:

- Dongxia Zhang, Senior Engineer, China Electric Power Research Institute
- Markus Wolf, Regional Manager, EPRI International
- Doris Gemeinhardt-Brenk, Head of Unit Digitisation and Interconnectivity; Internet Platforms, Bundesnetzagentur

Highlights from the discussion:

- **Greater complexity requires greater intelligence.** The energy system is becoming more complex, and the increases in VRE generation and consumer empowerment bring more uncertainties and greater degrees of freedom to the system. For this reason, the role of AI is evolving from a facilitating and optimising tool to an absolute necessity. While many promising applications were highlighted, the discussions made clear that the disruptive potential is only beginning to be understood and is far from being fully exploited. Many more pilots and deployments of digital-enabled solutions are needed in more countries and applications.
- **AI changes processes in the industry.** The power sector has an enormous amount of data, and most advances supported by AI to date have been in meteorology, control and predictive maintenance of power plants. A key AI application for integration of VRE today is advanced weather forecasts (for wind, solar and demand) integrated with near-real-time grid data (e.g., integrating 160 different forecast models). AI also can improve long-term infrastructure (grid) planning and asset management. In the future the industry will benefit immensely from use of that data in decision making and planning, condition monitoring, robotics, inspections, certifications, supply chain optimisation and generally increasing efficiency. "We are about to move into a new era of AI, where AI goes beyond a narrow usage into broad and ubiquitous application and changes the way we've been doing things," said Marc Peters, CTO of Energy, Environment and Utilities Europe at IBM.
- **Applications in demand-side management and efficiency lead to substantial savings.** Through combining AI forecasts with high-resolution price signals and analytics, substantial reductions in energy use have become a reality (e.g., BeeBryte). The World Economic Forum states that digitalisation and AI can lead to savings of USD 1.3 trillion in industry and USD 2 trillion in society. A GE study shows savings of USD 276 billion through a 1% improvement of efficiency in five sectors, including aviation, gas and healthcare.
- **AI is only as good as the data we train it with.** Today only 2% of the data gathered is intelligentially analysed. AI is benefiting from an explosion in processing power and mountains of new data to guide human decision makers. The goal is not 100% automation; however, with the growing complexity of our energy systems, experts alone cannot do the job without the help of data and analytics. The quality of AI output depends on the quality of the data input.

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