VIENNA ENERGY FORUM-THE VEF VIRTUAL SERIES

Sustainable Energy and Industry Integration- Session 6

DIGITALISATION AND OPPORTUNITIES TO INNOVATE

1. OVERVIEW OF KEYNOTE & PLENARY ADDRESS

A scene-setting keynote address was given by: Mr. Adam Pawelas, Danone Waters (global utilities manager)

Many opportunities exist for industry to optimize their activities – resulting in not only efficiency in overall industrial processes but also cost control, energy performance, and environmental reporting efficiencies. Covid-19 has resulted in a speeding up of innovation and digitalisation, as industry realized the advantages of digitalization of certain processes during this period.

Some important aspects of digital performance in energy include:

- Be sure of scope and users at the start.
- Be clear about objectives (e.g. savings, cost avoidance, etc) and develop roadmaps and targets to achieve these objectives.
- Using cost data, production data, and KPIs can help to inform decisions.
- Ensure involvement of site team and external expertise if needed.
- Integrate solutions into on-site performance management routines.

How digitalisation can support industry in sustainable energy integration:

- The use of SCADA systems - which include equipment and process visualisation, control and equipment sequencing logistics, alarms on process/machine condition, and equipment performance checks.
- Combining SCADA and production data (can include environmental and cost data)
- Monitoring of energy performance at different levels.

- Alerts and tracking.
- Analysing data patterns and abnormalities - response from control tower (expertise).
- Designing packaging processes that reduce heat and materials, reduces the environmental impact of the process.

Next-level digitalization (trends):

- Software with more expertise support (skills gap or time gain).
- Solution migration for wider-connected digitalisation of factory (next-level digitalisation).
- More automated functions with machine learning (emerging).

2. SUMMARY OF BREAKOUT DISCUSSIONS

2.1 GLOBAL PERSPECTIVES

Sub-question 1: What are the various applications for digitalisation in industry and how does it impact energy use and integration?

Digitalisation has improved the collection and analysis of data, improving understanding of performance and informing decision-making to further enhance performance. This breakout room discussed the **growing applications for digitalisation in industry and how they can impact energy use and integration.** Some examples of this include:

- Digital management systems are increasingly becoming the backbone of many classical departments (e.g. quality and purchasing).
- Increasing complexity in industry results in an increasing need for digital tools. Industry is progressively becoming more complex, for example, with shifts to Mobility as a Service (MaaS) – introducing more players and moving parts to the system.
- Digitalisation opens up almost endless opportunities in companies and across the value chain, in particular complex value chains such as in the automotive industry.
- Moving from cloud to edge (EDGE vs IoT).
- Digitalisation will become even more important as industry moves towards the “as-a-service” economy.

Digitalisation is an enabler for:

- Quantifying the multiple benefits of resource efficiency and energy efficiency – can also help to understand the outcomes that may be desired.
- Decoupling growth and development from energy consumption.
- The growing combination of green and digital innovation.
- Integrated digital platforms - e.g. connecting utility plants with end consumers (to sequence with energy demand).
- Linking players and processes in the value chain: it gives visibility on how energy and GHG emissions trickle into end-use products.

Lessons learned - digitalisation and innovation:

- The importance of design and conceptualisation - if you are going to get the benefits.
- Digitalisation works best when there are multiple benefits (e.g. not just cost-saving)- "integration and achieving multiple benefits is when the story sings".
- Understand what your goals are first, as well as how digitalisation can reduce greenhouse gases.
- The focus should not only be on RoI (Return on Investment) but rather a company's objectives and whether digitalisation will contribute to those objectives.
- It is important to also focus on LCA and recyclability of components (circular economy).
- Looking at supply chains - the bulk of emissions are in the early stages of the value chain.

Sub-question 2: In what way can digitalisation inform investment decision making in industry?

Digitalisation can change investment decision-making and provide opportunities for **strategic investments**. It provides a more nuanced approach to energy-related investments and helps to provide context-aware analysis (e.g. of a specific machine in a specific context). In other words, the situation may arise where the use of a machine that is not the most efficient is optimal given the system.

Properly structured digital tools can **help measure the impact of investments**, and this tool informs future investments.

The value of integration (enabled through digitalisation) is not just financial but also about getting a better return on assets rather than just RoI.

There are various policies to enable digitalisation across the value chain:

- Discrepancies exist in terms of skills in different regions. This needs to be considered when establishing policies relevant to digitalisation.
- There is a need to get firms talking to each other in the same language through communication and cooperation across the value chain.
- To get ISO-50 001 adopted more broadly in energy-intensive industries (less than 20 energy-intensive industries worldwide have adopted so far) – cannot be a national policy issue but rather requires leveraging the purchasing power of companies. For example, this could be achieved if companies commit to only purchasing from suppliers that are ISO 50 0001 certified. Visibility and traceability then become important. Incentives and visibility are also needed to understand what works, what does not work, and what other companies are doing.
- Unexploited potential of ISO 50 001 is still present regarding a systemic view on energy and linking it increasingly with digitalisation.
- Consider digital tools as part of training / technical advice to confirm that outcomes of the training have been adopted, for example.
- Public money is needed for demonstration projects.
- International cooperation is needed to drive equitable progress, and ensure the digital divide is not widened.
- National policies are not always the key to the solution. The question is how to make this an industry-wide standard rather than just a "nice to have"?
- Transparency on financial disclosures, governance, etc. is needed, and this needs to get beyond greenwashing.

2.2 COUNTRY VOICES

Sub-question 1: What are some of the challenges and opportunities in driving innovation, and particularly digitalisation, in the integration of sustainable energy in industry?

See the 'IEA Technology Collaboration Programme on Energy Efficient End-Use Equipment'.[1]

[1]https://www.iea-4e.org/wp-content/uploads/publications/2021/03/2021_02_EMSA_Report_Survey-on-Digitalisation.pdf?utm_source=CleverReach&utm_medium=email&utm_campaign=2021_03_EMSA+Newsletter&utm_content=Mailing_13830913

Challenges:

- Lack of qualified technical skills and the necessary training - interdisciplinary skills are required.
- High investment costs.
- Need for commercial viability as justification for financing: shareholders want to see energy efficiency and green recovery in plans, banks and government also want to invest but need to be confident.
- Lack of standardization for harmonization of protocols.
- Not enough research and development is being seen.
- Policies do not drive the level of innovation and digitalization required.
- Need to look further than just digitalising but rather to digitally transform. Just buying and doing will not work. There is a need to implement, and actively exploit the efficiency opportunities that exist.

Opportunities and recommendations from country experiences:

<u>The United Arab Emirates</u>

Covid-19 has resulted in the realisation of the importance of real-time monitoring, agility, and resilience to change. With remote modelling systems, the impact of Covid-19 was not as pronounced as improvements and methods of driving efficiencies in the context which could still be taken advantage of. Supply chains were able to handle the crisis better and could be more proactive in their decision-making and more resilient to the consequences of the crisis.

Key reflections include:

- **Visualisation** plays an important role in enhancing the understanding of industrial processes (disturbances and what affects them).
- **Measurement and verification:** Organisations want to understand the benefits of the investments they have made. Results from measurement and verification can be used to justify increased innovation and digitalisation.
- Having a **strong financial model** to act as an incentive, leveraging the data and analysis models to be able to go to management and drive these processes.
- Each process in industry will have a different digital transformation.
- First have the data and insights and then do the analytics, modelling, predicting and forecasting. E.g. this enables you to understand and exploit the correlations of variables such as weather conditions and customers behaviour.

Austria

'New energy for industry'[2]: Programme consisting of around 17 projects aiming for decarbonisation of industrial energy system and adding value utilizing Austrian technology that is competitive on market.

Key reflections include:

- There is an opportunity to change processes to **achieve higher energy efficiency,** through the use of digital tools to optimise new technologies in industrial processes.
- In the context of integrating renewable energy sources, there is the problem of fluctuating energy supply. Energy-intense industry needs to be supported by digital technology to **ensure flexibility** from renewable markets. There is also the potential for seasonal energy flexibility.

Russia (MagnitoGorsk Iron & Steel Works)

Reflections were provided from a steel plant in Russia, producing 20 million tonnes of steel per year. Energy savings and digitalisation are extremely important and are interconnected. The plant has installed over 1000 sensors that enable production analysis, cost monitoring, and optimal maintenance.

Opportunities that exist and can be exploited include:

- Big data
- Digital shadows
- Industrial internet of things (IoT)
- More precise data collection and analysis
- Mathematical models of consumption and demand of energy over time

In 2015 the company implemented various zero cost innovative efficiency measures available which led to substantial savings. Using value modelling, the company saw that if they spent money on these, they could go a lot further which helped to justify these investments with top management.

United Kingdom

Successes included:

- The use of metering integrated into onsite equipment result in saving heat and energy. In this context, it is crucial to have metering on-site to ensure an effective integration system that brings the data back in a reliable manner. Thereafter, a company can forecast consumption accurately.
- Training machine learning models to spot energy efficiency by using big data to detect problems early on.

[2] See: https://www.nefi.at/en/

- Using data to optimize assets, for example when something is wrong and assets become too energy-intensive, alerts can warn managers that they need to take a look as something needs fixing or updating.
- Control bands of temperature, pressure, etc. reduces costs of energy consumption and reduces the carbon intensity of industrial processes.
- Flexible consumption to enable as much green power as possible - e.g. flexing consumption to when the sun is shining on the site, or wind is blowing.
- Demand response potential.
- Co-located battery storage on-site holds potential however, to make this worthwhile a supportive policy framework and market opportunities will be required.
- Access to the internet in remote locations using cloud and backup data storage/logging device.

Sub-question 2: What kind of policies are needed to accelerate digitalisation in industry?

A variety of policy interventions were discussed, including:

- **Clear and effective policy** that will be stable, clear, and in place for enough time for installation and payback i.e. Longer-term policy decisions that are transparent to encourage investment.
- Many industries are big enough to not need government support, but small and medium-sized companies, universities, and start-ups will require financial assistance.
- Policies to **push industries** forward in implementing energy conservation measures across all processes.
- Policies in education and **skills development (interdisciplinary).**
- **Capacity building**
- **Subsidies** for research as an important policy instrument to overcome the lack of skills, as well as innovation project funding.
- **Price signals** to allow installation - e.g. in the UK at certain times electricity prices would increase – incentivize industry to time their production using these systems.
- **Contract models** as a solution to return on investments barrier: Business time frame depends on when a return on investment is wanted, which is often shorter than what is realistic for digitalization.

- **Cybersecurity**: Technical solutions needed, good steps have already been taken by the UAE – both by government and industry.
- Markets for flexibility in demand-side assets
- **Incentivising behavioural change** is important for all staff, particularly those with the most experience that may be resistant to changing ways of working
- Implementing **standards** across industry.

2.3 ENABLERS FOR PROGRESS

Sub-question 1: What are the key challenges to driving innovation and digitalisation in industry, particularly in developing country contexts?

There is a widening technology gap between developed and developing countries (digital divide), where developed countries can absorb new technology quicker because of their higher baseline in terms of capacity and technology. In developed countries, change management is the key challenge – more so than technology or capacity. On the other hand, in developing countries, digital take up has been slow, in part due to a distrust in AI, and a focus on commercial buildings and construction technologies. However, Covid-19 has spurred industries to move towards digitalisation. With more openness to change, the key challenge has become a lack of competencies and dependence on international capacities.

Other challenges include:

- How to get from Industry 1.0 to 4.0. Developing countries are currently at 1.0 and have poor energy infrastructure – so this jump seems unattainable to many.
- Lack of financing and poor business models.
- Fear of job losses (although this has decreased over the past few years).
- Security and confidentiality concerns about data being generated and used.
- Accessing the skill sets required e.g. for advanced data analytics.
- Addressing the rebound effect – using sensors and other digital technology could lead to higher energy demand because of the resulting demand for certain metals.
- Reliable energy infrastructure – a key prerequisite for digitalisation and internet coverage is reliable electricity and electricity access, which is not the case in many developing countries, which presents a major barrier to digitalization and innovation in these contexts
- Cannot apply a 'one-size-fits-all' - different industrial sectors need different types of technologies and data.
- Industrial safety – technologies like blockchain could manage the safety and privacy concerns of new technology.

The question lies in how to optimise efficiencies with existing data and with digital technologies. This doesn't require big investments but involves making better use of what exists, which is also dependent on skills sets to enable this. To address this, the context of the country must be understood. An example of how this could be overcome is the 'Smart Industry Readiness Index' that has been used in Singapore.

Sub-question 2: Where are the high impact intervention points to enable progress in innovation and digitalisation for sustainable energy/industry integration?

Advanced analytics and indicators to optimise processes: optimisation is not only dependent on big investment. A 25-40% reduction in energy use is possible just from improving operational control. You can do more with the data available independent of new technology investments. Countries should not wait until they can afford new investments, rather start now with system optimisation by working on what they have. Practices that improve the precision of energy performance indicators and therefore performance are important. Increasing competencies and advancing data analysis techniques that do not require big investments can save energy from today.

Business model: figure out the return on investment (RoI) of a digital technology (however noting the earlier reflection that efforts should be made to demonstrate the contribution to company objectives and not to rely on a favourable RoI alone).

Long run: digitalisation needs to be included in global perspectives. Digitalisation can play a supporting role for other initiatives.

Short-run: Take advantage of recovery funds.

<u>Some important intervention points include:</u>

- **AI** to support supply-demand management of the grid, optimise energy production and use (e.g. smart grids, smart metering), and allow integration of small producers of RE.
- **Drones** - to support logistics and delivery in urban areas, an inspection of power lines, mapping industries in urban contexts.
- **The utilisation of "big data"** - optimise energy use and mobility patterns, optimising transport, improve irrigation, and other efficiencies associated with the Internet of Things (IoT).
- **3D printing** - e.g. in aviation this can lead to lighter parts and reduced fuel use.
- **Blockchain** - energy trading, facilitating the uptake of distributed renewable energy, for example.