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STI FORUM

Science, Technology & Innovation for the Sustainable Development Goals

ENERGY

Enabling systemic energy efficiency improvements and accelerating implementation of the 2030 Agenda through energy system digitalization

virtual side event
03 May 2023 I 14:30–15:45 CEST

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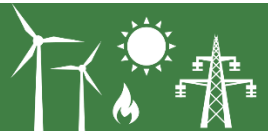
Tentative agenda



14:30-14:35	**Welcome and housekeeping**	
14:35-14:45	**Opening and scene-setting**	**Andrei Covatariu** Co-Chair, Task Force on Digitalization in Energy, UNECE
14:45-15:15	**Expert discussion**	**Elizabeth Massey** Co-Chair, Task Force on Digitalization in Energy, UNECE **Sylvain Clermont** Bureau member, Group of Experts on Cleaner Electricity Systems, UNECE **Sean Ratka** Economic Affairs Officer, UN ESCWA
15:15-15:30	**Interaction with audience**	
15:30-15:40	**Wrap-up and concluding remarks**	**Stefan Buettner** Chair, UNECE Group of Experts on Energy Efficiency
15:40-15:45	**The way forward**	

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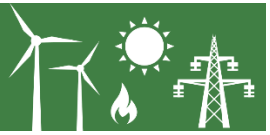
Housekeeping



Igor LITVINYUK
Economic Affairs Officer, UNECE
Secretary, Groups of Experts on Energy Efficiency and on Cleaner Electricity Systems

This meeting is being recorded for notetaking purposes

Please use chat function for comments and questions, or raise your hand during Q&A session

Presentations will be posted to UNECE website

Meeting time: 14h30-15h45 CEST

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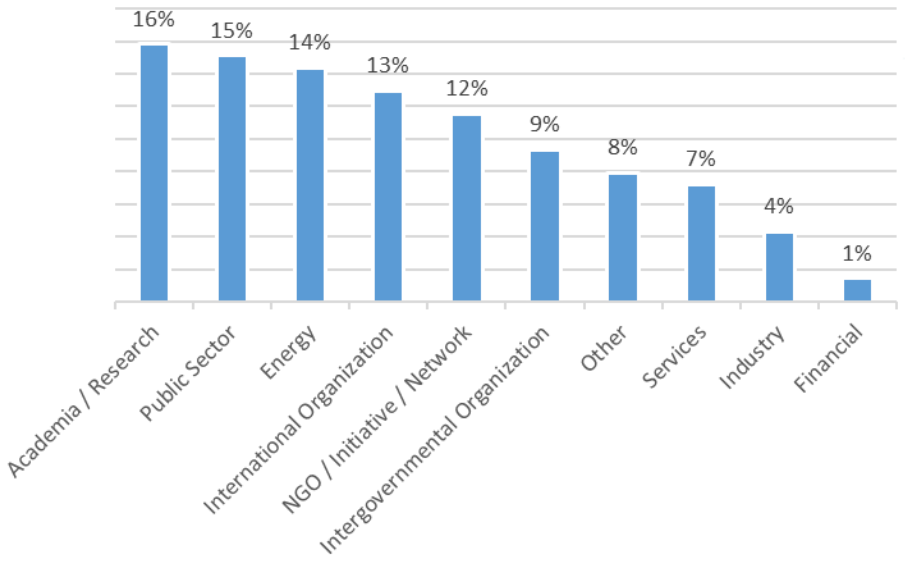
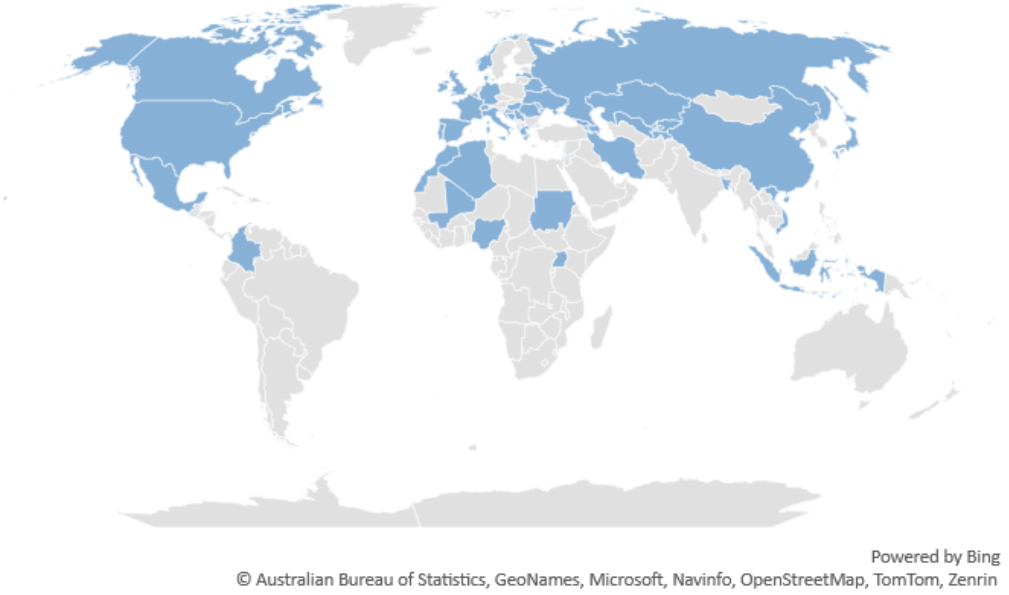
Registration snapshot

Igor LITVINYUK
Economic Affairs Officer, UNECE
Secretary, Groups of Experts on Energy Efficiency and on Cleaner Electricity Systems

139 registrations from 49 countries, representing:





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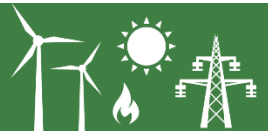
Opening and scene-setting



Andrei COVATARIU
Co-Chair, Task Force on Digitalization in Energy, Group of Experts on Energy Efficiency, UNECE

Why focus on digitalization in energy?

Our reasons

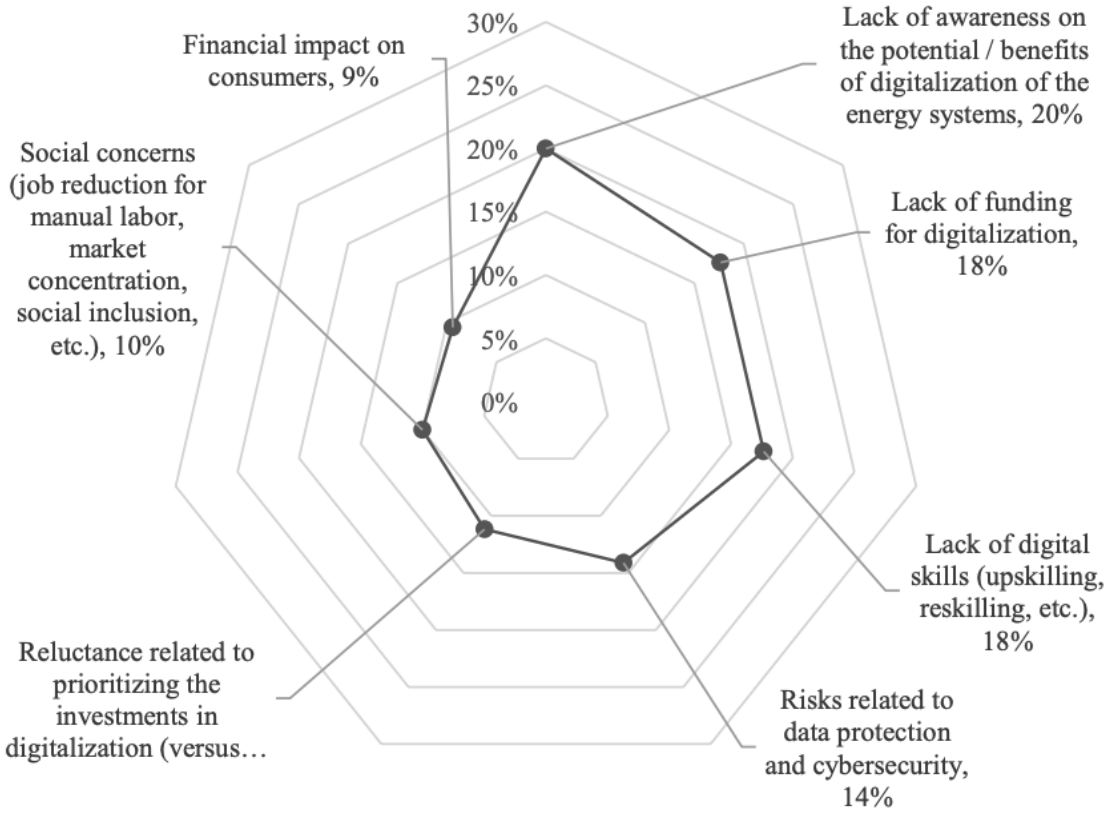
- **Digitalization** is an emerging trend revamping the energy landscape and enabling progress toward continuous energy efficiency improvements.
  - *Technologies are facilitating new market opportunities: digital innovations – tools, technologies and processes, such as Artificial Intelligence (AI), Blockchain, Machine Learning, Advanced Data Analytics, Internet-of-Things (IoT), Big Data, Cloud Computing, Sensors, Automation, 3D Printing, Robotics, etc. are inspiring energy suppliers, transmission and distribution companies, and demand sectors (buildings, industry, transport and other), to establish new business models allowing to generate, deliver and consume energy in a more sustainable fashion.*
- In its Work Plan for 2020-2021, the Group of Experts on Energy Efficiency was therefore mandated to "explore the role of digitalization and increased use of big data and geo-spatial data in provision of energy services", leading to the creation of the "Digitalization in Energy" Task Force.

Key elements of digital integration into the energy landscape

Testing our reasons

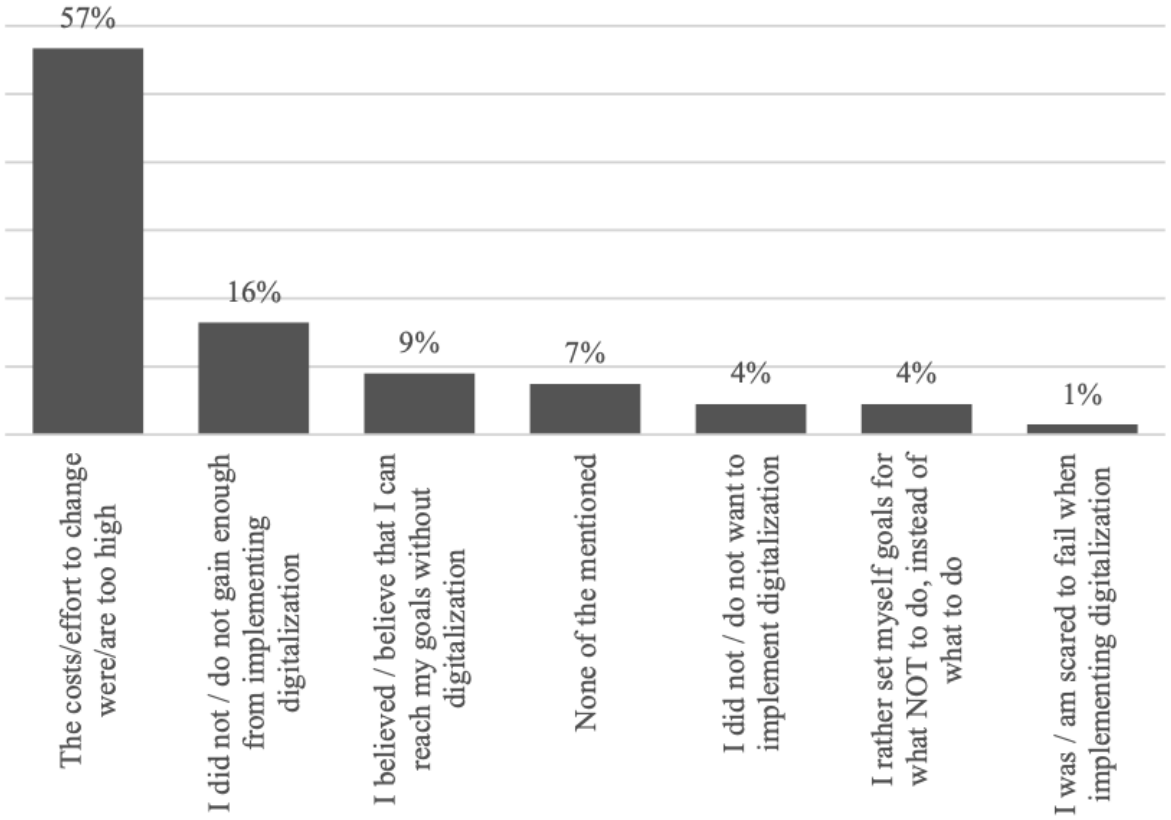
Figure III

Survey results: key barriers that are holding countries back from implementing digital technologies quicker



Testing our reasons

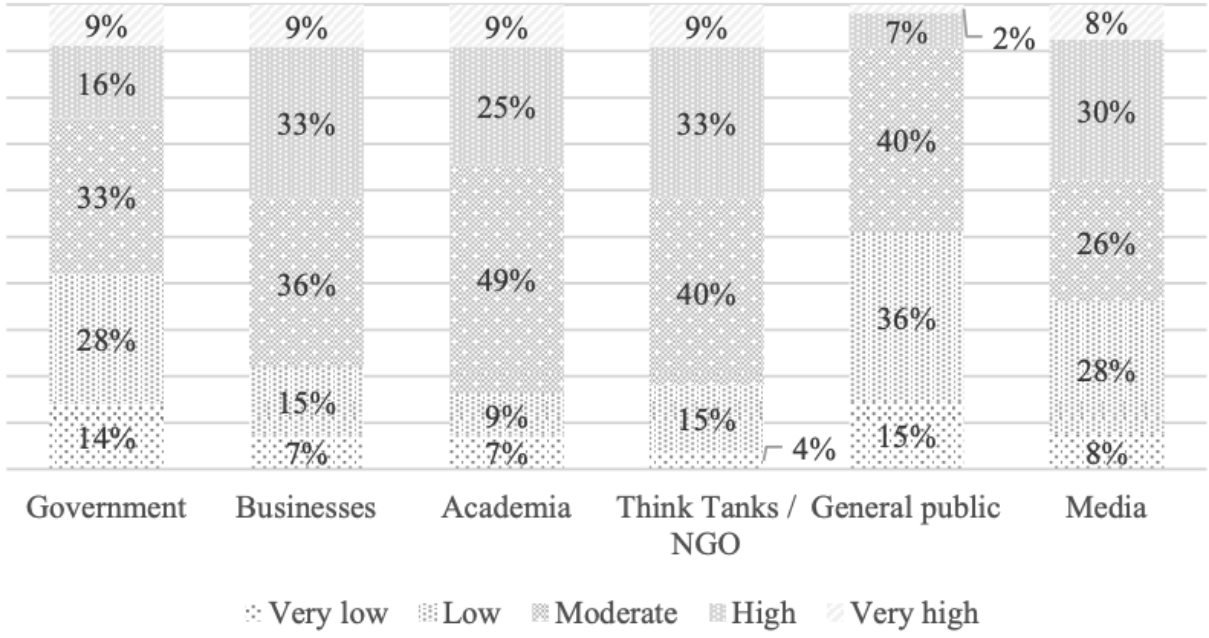
Figure VI
Survey results: main reasons holding back implementation of digitalization in energy



Testing our reasons

Figure VII

Survey results: distribution of responses on rating of digitalization literacy among the selected stakeholders (percent)



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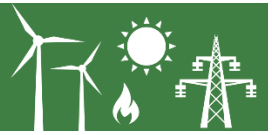
Expert discussion



Dr Elizabeth MASSEY
Co-Chair, Task Force on Digitalization in Energy, Group of Experts on Energy Efficiency, UNECE

Sylvain CLERMONT
Bureau member, Group of Experts on Cleaner Electricity Systems, UNECE

Sean RATKA
Economic Affairs Officer, UN ESCWA

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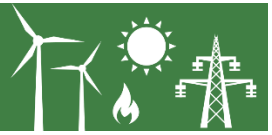

Dr Elizabeth MASSEY
Co-Chair, Task Force on Digitalization in Energy, Group of Experts on Energy Efficiency, UNECE

Big Data and Demand-Side Analytics

Key Challenges

Challenges of big data and analytics-driven demand-side management

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- Challenge 1 – Data Sharing and Democratization of Data
  - Data Curation
  - Data Availability
  - Data Integration and Legacy Systems Management
- Challenge 2 – Utility Analytics Sector Skills Availability
  - Data Translation into Operations Needs
  - Data Monetization
  - Cybersecurity and Grid Resiliency
- Challenge 3 – Big Data Analytics Modelling R&D efforts
  - Data and Analytics Maturity
  - Data Analytics Model Availability
  - Big Data, Advanced Analytics Model R&D Efforts and Outreach

Spotlight: Opportunities

Key Strategies for Consideration

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Potential Solutions are Closer than you think!

Strategy	Focus	Applications
Integrity	The System and Information is Accurate and Correct	Data Curation, Data Integration, Cybersecurity and Data Translation
Availability	The Systems, Information and Services are available as appropriate to the operational needs of the Energy Provider	Data and Analytics Model Availability, Advanced Analytics R&D&D Efforts, Cybersecurity and Outreach/Education
Confidentiality	Ensures that only the correct, authorized users, systems and resources can view, access, change or otherwise use the data	Data Democratization, Cybersecurity, Grid Resiliency

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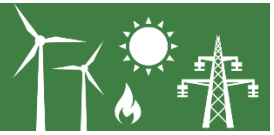
Expert discussion

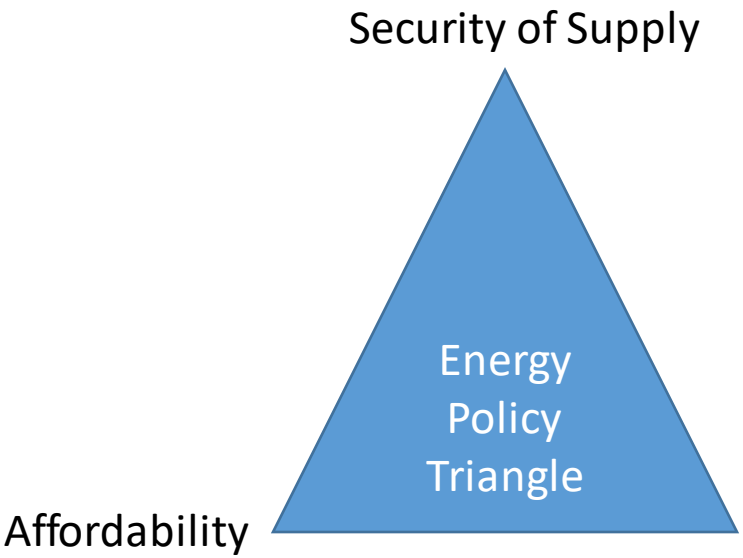


Sylvain CLERMONT
Bureau member, Group of Experts on Cleaner Electricity Systems, UNECE

Digitalizing electricity systems

The Electricity Landscape is Changing

Electricity is vital for society



Balance challenged by

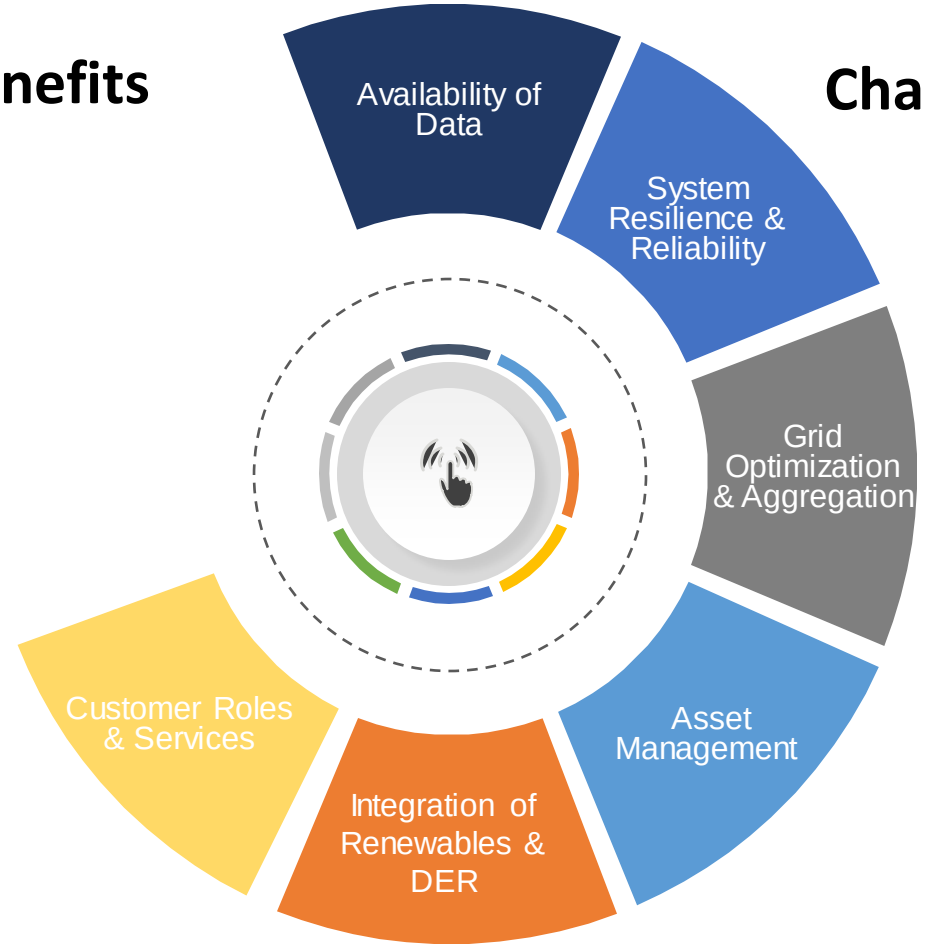
- **Extreme weather events**
- **Adaptation to climate changes**
- **Energy crisis**
- **Grid resiliency**

- **In addition to:**
  - **Decarbonation**
  - **Energy transition**
  - **Electrification**
  - **Integration of renewables and distributed energy resources (DER)**
  - **Changing role of consumers**
  - **Etc.**

Digitalization as an enabler to balance triangle

Why Digitalization of the Electric Grid?

Benefits



Challenges

Skilled Workforce

Cybersecurity and data privacy

Compatibility of technology

Business case

Digitalization as an Enabler

Digitalization as an enabler to

- Integration of Renewables
- Electrification
- Reliability and Resilience
- Active Role for Customer
- Grid Optimization
- Etc.

Cleaner Electricity System

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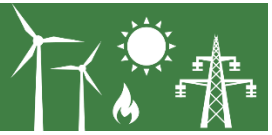
Expert discussion



Sean RATKA
Economic Affairs Officer, UN ESCWA

The Role of Blockchain in the Sustainable Energy Transition in the Arab Region

UNITED NATIONS
الاسكوا
ESCWA

Shared Prosperity Dignified Life

ESCWA Core Functions

To serve as the:

- **Think Tank** of the region – by undertaking innovative research and supporting quality data collection and analysis for evidence-based policy;
- **Advisor** to the region – by providing regional, sub-regional and national capacity building and technical advisory services to member States; and
- **Voice** of the region – by creating regional platforms for deliberation and consensus building that feed global fora and transform the aspirations of Arab citizens into commitments for action.

Energy-focused activities

Implementation Approach

- Regional Convening Power for Intergovernmental Mechanisms
- Informing Regional Processes for Global Negotiations and National Action
- Building Partnerships
- Conducting analytical studies and reviews
- Field projects, Capacity building and knowledge sharing,

Sustainable Energy System

- Circular Carbon Economy framework
- Enabling Just and Inclusive energy transition
- Regional Interconnections (Electricity/Natural Gas)
- Technology Transfer/Policies & Regulations

Energy Efficiency (EE)

- Programs to double the share of EE
- Regional Initiatives to Upscale EE in MC
- EE policies Development at National & Regional levels
- Energy Productivity in Key Economic Sectors

Renewable Energy (RE)

- Programs to significantly increase the share of RE in energy mix
- RE policies at National & Regional levels
- RE Technology Assessment / Implementation
- RE Financing Schemes

Climate Change Mitigation

- Integration of EE & RE, Hydrogen, Fuel Switching
- Extractive Industries
- Carbon management technologies
- Gas Methane and Gas Flaring Management
- Waste to Energy Technologies

Program Mandated by the **ESCWA Committee on Energy, Group of Experts on Fossil Fuels,**
Support provided to the **Arab Ministerial Council for Electricity**

Is the Arab region on track?

Electrification

- **Nearly 91%** access (98% of urban vs 83% of rural) in 2021

Renewables

- **5.1%** of TFEC, mainly in the residential sector (2021)

Clean cooking

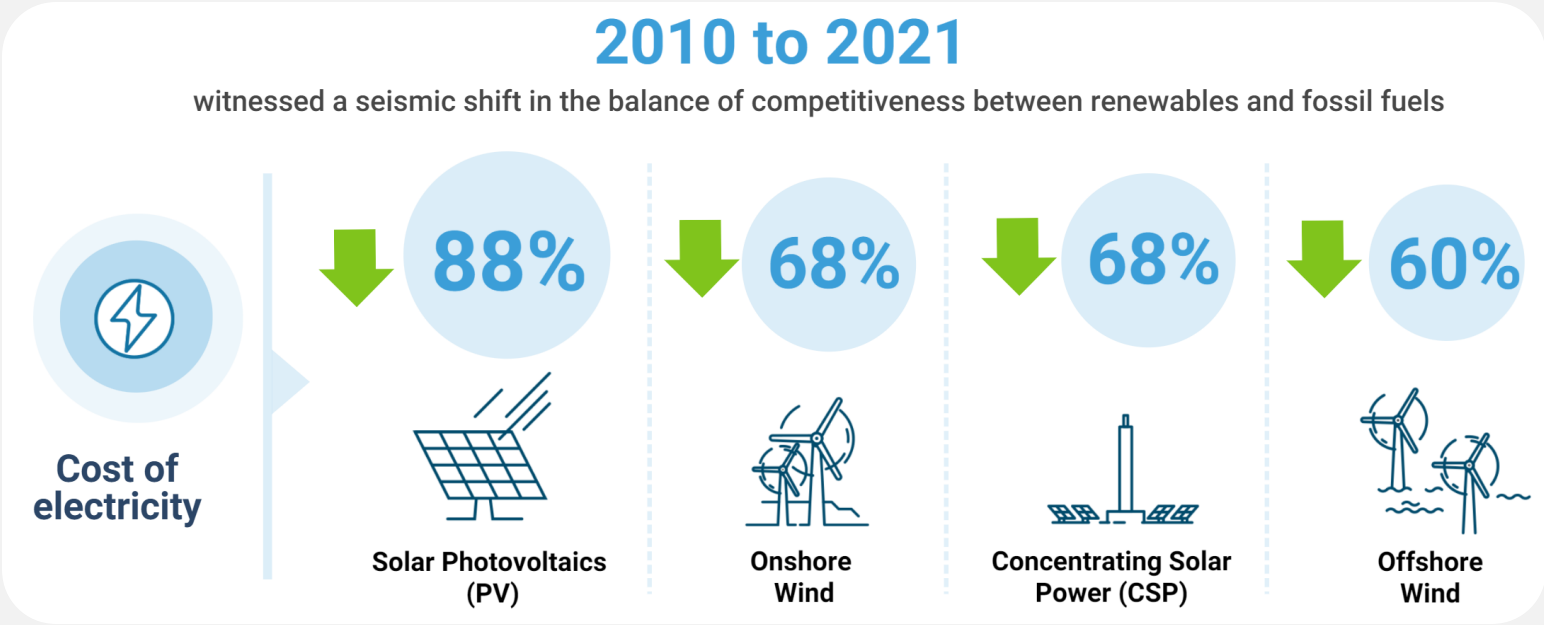
- **88%** access (2021)

Source: ESCWA, 2023; IEA, 2023; World Bank, 2023

Just and inclusive energy transition – Drivers

- **Policy imperatives**
  - Sustainable Development and Economic Growth (SDGs)
  - Climate and Environmental agenda (Paris Agreement)

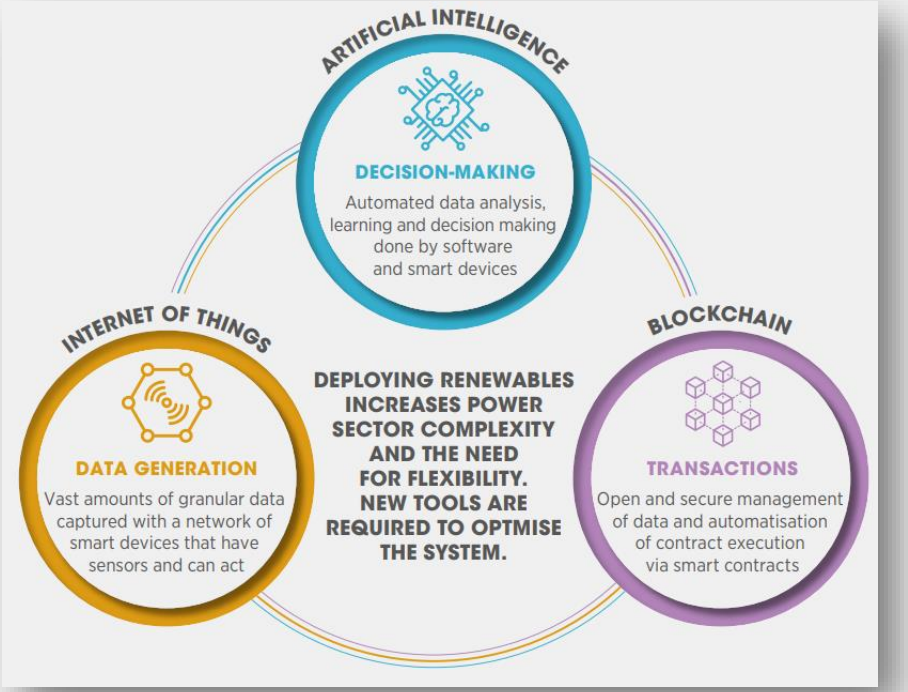
- **RE strong business case**
  - 2/3 of newly installed renewable power in 2021 had lower costs than the cheapest fossil fuel-fired option in the G20
  - Lowest cost PV projects located in GCC



Source: IRENA, 2022

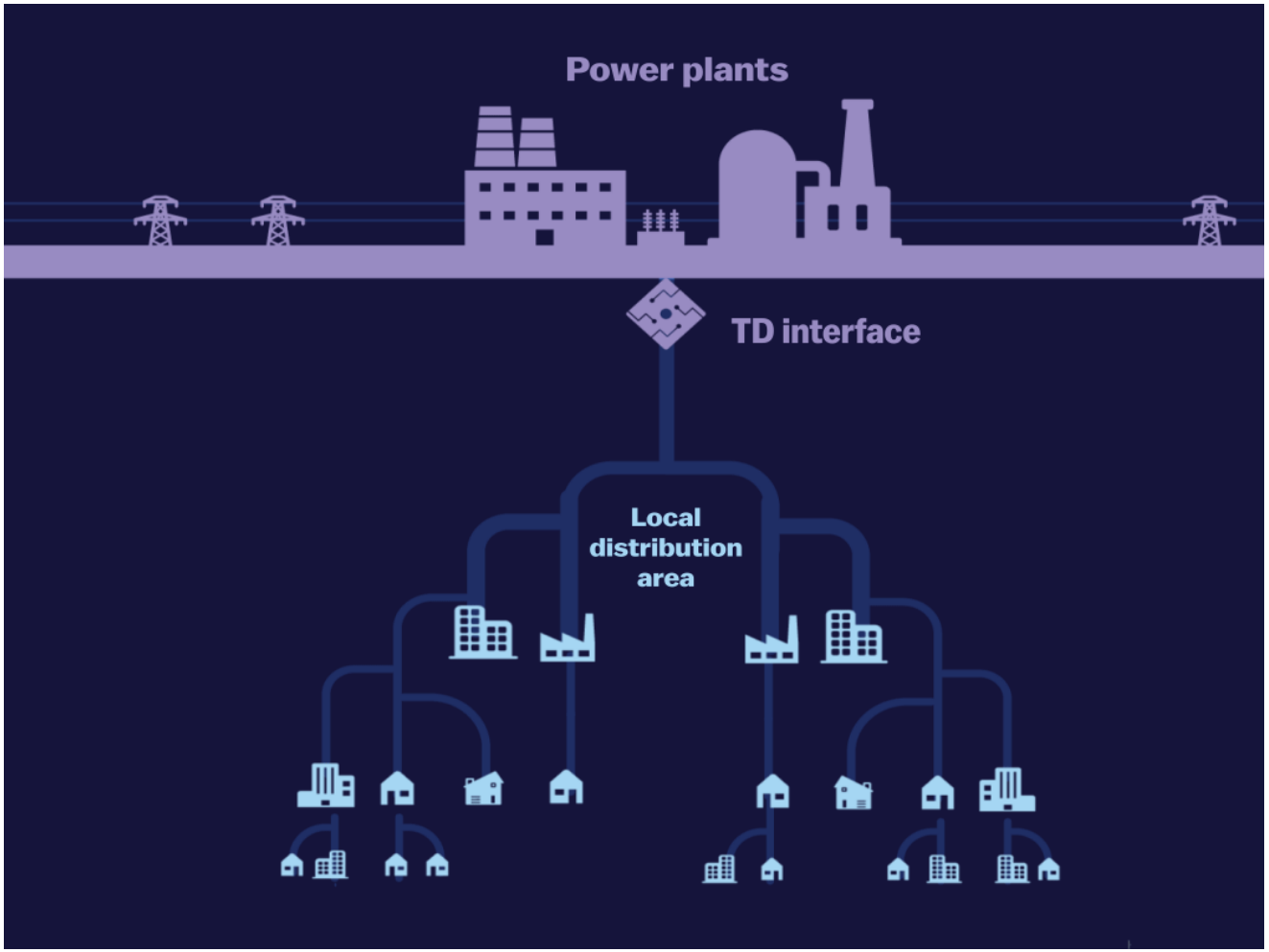
Increased power sector complexity requires a combination

- Increasing shares of distributed, variable RE are making power grids more complex and difficult to manage
- New digital solutions are helping to manage this complexity
- Innovations should be implemented holistically for greater impact



Source: IRENA, 2019

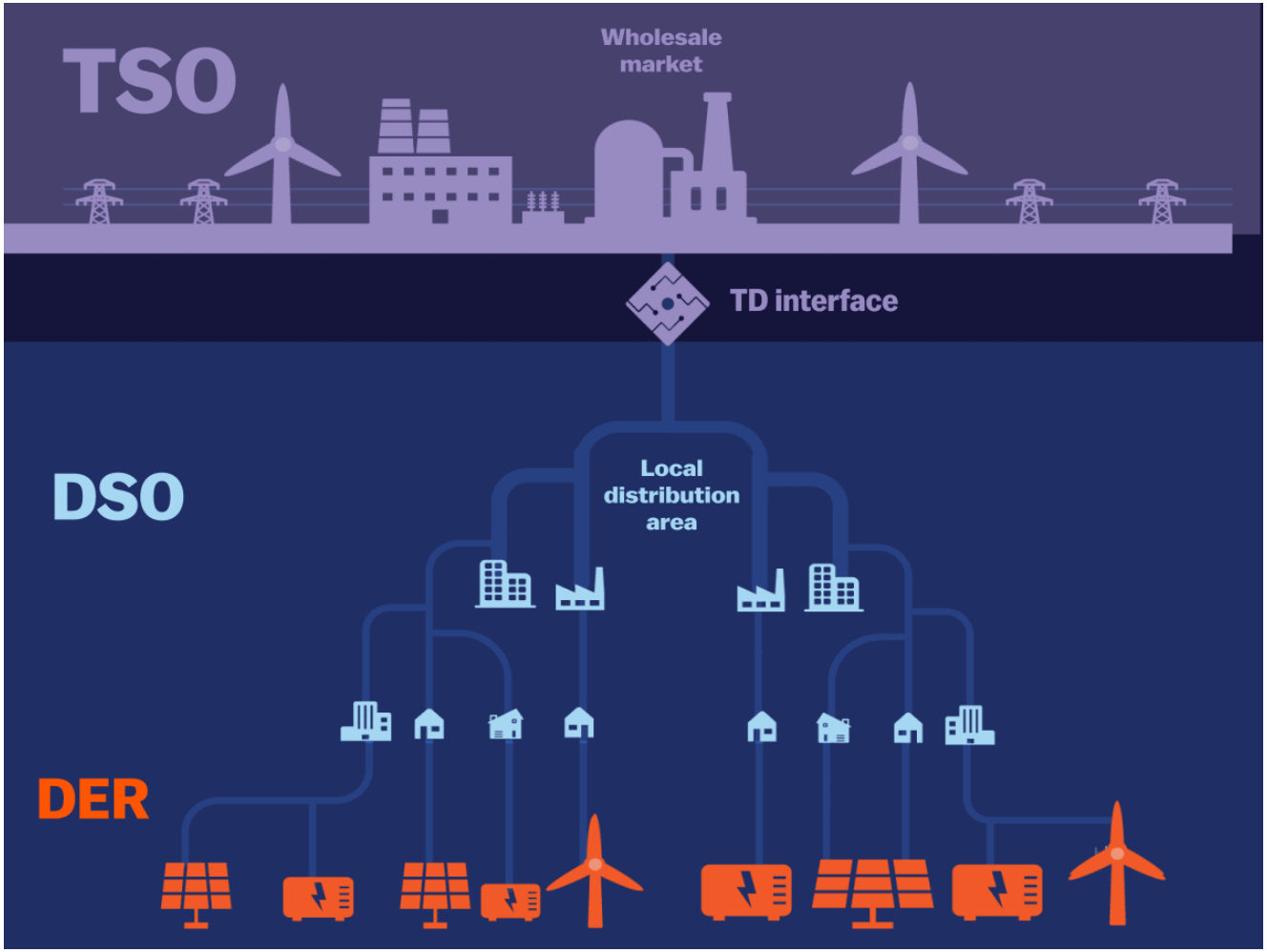
The energy system is fundamentally changing



From a top-down grid model to a decentralised model where power and payments flow both ways

Source: Roberts, David and Javier Zarracina. “Clean energy technologies threaten to overwhelm the grid. Here’s how it can adapt.” Vox Media. 1 December 2018.

The energy system is fundamentally changing



From a top-down grid model to a decentralised model where power and payments flow both ways

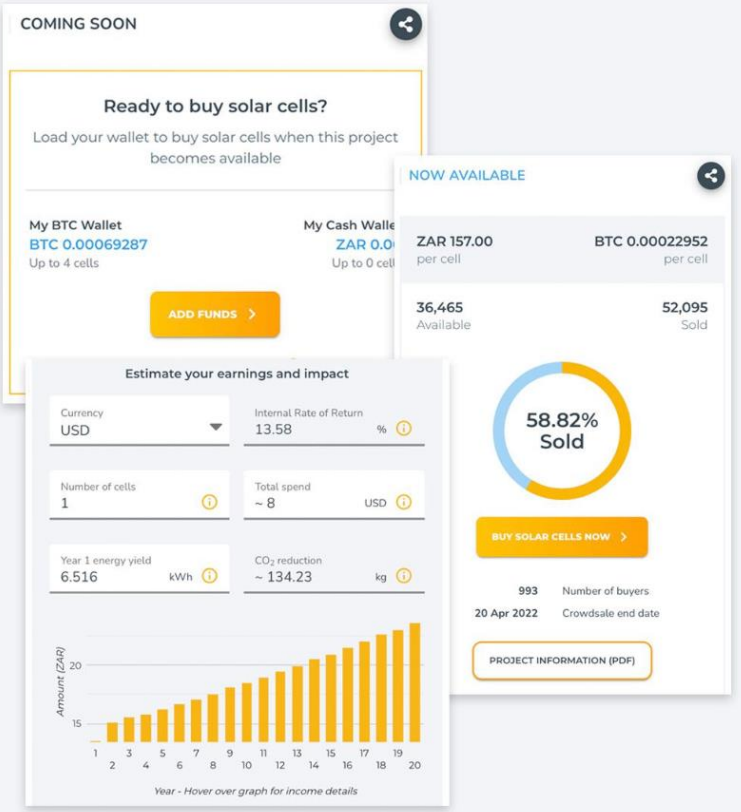
Source: Roberts, David and Javier Zarracina. “Clean energy technologies threaten to overwhelm the grid. Here’s how it can adapt.” Vox Media. 1 December 2018.

The role of Blockchain

- **Decentralized project finance:** Crowdfunding via blockchain has enabled investors from around the world to invest in small-scale rural RE projects in developing countries with increased transparency and reduced costs.
- **Decentralized energy markets:** Blockchain technology is being used to create decentralized energy markets, where individuals and businesses can buy and sell renewable energy directly with one another, without the need for costly intermediaries. This could help to efficiently allocate renewable energy resources and drive the adoption of renewable energy sources.
- **Smart contracts:** Blockchain technology is being used to create smart contracts in the renewable energy sector. These are self-executing contracts with the terms of the agreement between buyer and seller written directly into lines of code. This helps automate many of the processes involved in energy trading.
- **Renewable energy certificates:** Blockchain is being used to create, track and trade renewable energy certificates while minimising transaction costs (enabling smaller generators to participate) and increasing transparency.
- **Renewable energy provenance:** Blockchain is being used to ensure real-time matching of consumption with locally sourced clean energy (ex. EV charging) while providing a trusted audit trail

Case study – Decentralised project finance

- Sun Exchange is a peer-to-peer solar leasing platform.
- Via the platform, anyone, anywhere in the world, can own solar energy-producing cells and generate income by leasing those cells to power businesses and organisations in emerging markets, with installations and maintenance taken care of by one of Sun Exchange's installation partners.
- The company identifies schools, businesses and organisations that want to go solar. Solar engineers work with local solar construction partners to evaluate proposed solar projects and ensure they meet certain criteria. Once solar projects have been accepted as viable and responsible, a crowd sale is run for the solar cells that will power the project.
- 66 solar project crowd sales complete. Investors across 180 countries. Over 18 GWh of clean energy generated so far.



Case study – REC marketplace

Via Singapore Power's REC marketplace, buyers are automatically matched with sellers around the world, based on their preferences, secured through blockchain technology.

Sellers

Companies who generate or own RECs, and wish to sell their RECs to buyers on the marketplace.

REC Platform

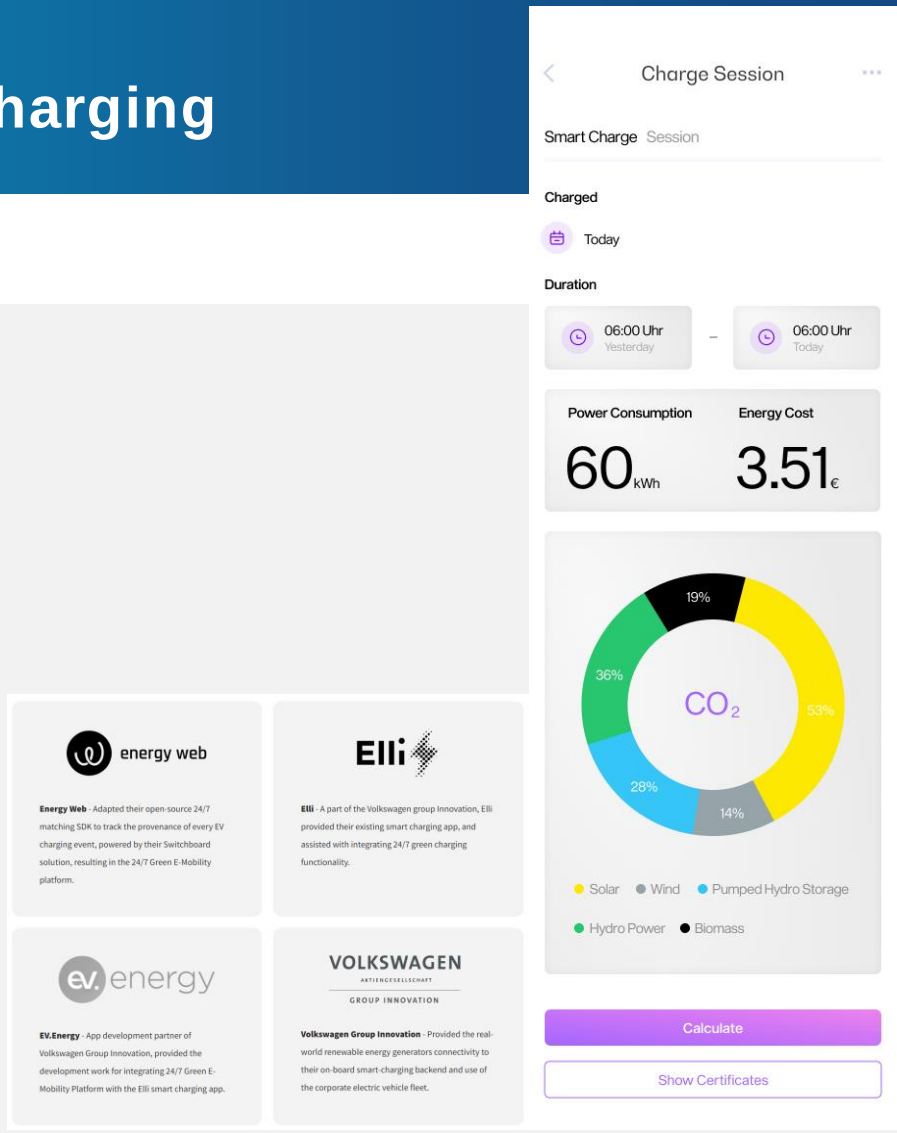
Through blockchain technology, we enable fast and convenient trading of RECs based on user-defined preferences.

Buyers

Companies wanting to do their part on sustainability put in their demand to be matched automatically to sellers.

Case study – Renewable EV charging

- Volkswagen, Energy Web, and Elli cooperated in a Proof of Concept (PoC) to assess technical viability of using the technology to decarbonize EV charging.
- The purpose was to demonstrate a green charging app built on blockchain can enable granular matching between EV consumption and renewable generation.
- The PoC allowed EV owners to set preferences for electricity generation type and location that dictate the EV's charging schedule and ensure real-time matching of consumption with locally sourced clean energy.
- Blockchain provided the trusted audit trail so that the EV owner can trace and prove the provenance of each kWh used to charge their EV's battery.



Case study – Dubai Electricity and Water Authority's digital transaction strategy

- DEWA's blockchain platform, established in 2017, automates processes such as tenancy contract renewals and activation of electricity and water services, as well as EV transactions, with the aim to make them faster, safer, and more efficient.
- These efforts align with the Emirates Blockchain Strategy 2021 and Dubai Blockchain Strategy, which aim to streamline and digitize government processes and reduce carbon emissions from the transportation sector.
- DEWA also collaborates with organizations like Smart Dubai and the Roads and Transport Authority to establish a unified national EV charging blockchain network that connects all public and private partners across the UAE.

Case study – Carbon certification

- In Nov 2022, Adnoc and Siemens Energy announced plans to jointly develop blockchain-based technology to certify the carbon intensity of a range of products produced by the state oil company.
- As part of the collaboration, the two companies will explore digital certification of Adnoc's low-carbon Murban crude, ammonia and aviation fuels.
- The information will be automatically recorded on a decentralised blockchain ledger
- Specialists from both companies will also jointly create technology to hasten the pace of decarbonisation and the transition to clean energy.
- "Such transparency will allow independent regulators to certify the carbon intensity of products. It will also give customers greater confidence and clarity over the carbon footprint of their purchases," Adnoc said.

Challenges to adoption of blockchain in the Arab energy sector

- Infrastructure challenges
- Limited technical expertise
- Insufficient policy and regulatory frameworks
- Challenges linked to electricity sector monopolies and limited participation and investment from the private sector
- Political and economic instability
- High costs
- Limited public awareness and acceptance

Way forward in the Arab region

Arab countries can leverage blockchain technology as part of a toolbox of digital technologies to manage increasing energy sector complexity while pursuing a just, inclusive, and sustainable energy transition.

- Create a roadmap for the implementation of digital technologies, including blockchain, in the energy and related sectors to encourage private sector participation and investment
- Identify, adapt, and adopt best practices from around the region and the world
- Restructure energy markets and build out the required infrastructure to enable smart grids with multidirectional flow of power and data
- Empower consumers to become prosumers by enabling smart metering
- Invest in digital infrastructure and technology
- Promote digital skills and education
- Encourage public-private partnerships
- Increase public investment in clean energy
- Accelerate progress on renewable energy and regional integration

Sean Ratka
Economic Affairs Officer,
Sustainable Energy
Climate Change and Natural
Resource Sustainability
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Thank you

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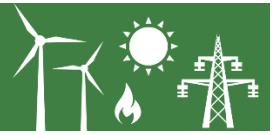
Interaction with the audience: Q&A session



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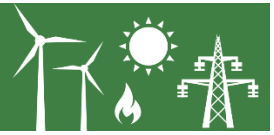
Wrap-up and concluding remarks



Stefan M. BUETTNER
Chair, Group of Experts on Energy Efficiency, UNECE

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Recap and the way forward

Igor LITVINYUK
Economic Affairs Officer, UNECE
Secretary, Groups of Experts on Energy Efficiency and on Cleaner Electricity Systems

Documents developed by the Task Force on Digitalization in Energy of the Group of Experts on Energy Efficiency in 2020-2022

GEEE-7/2020/INF.3
Digitalization: enabling the new phase of energy efficiency

ECE/ENERGY/GE.6/2021/5
Improving Efficiency of Buildings through Digitalization

ECE/ENERGY/GE.6/2022/4, ECE/ENERGY/GE.5/2022/4
Digitalization: Accelerating the Electricity System Transformation

ECE/ENERGY/GE.6/2022/5
Addressing Behavioural Barriers to Energy Digitalization

GEEE-9/2022/INF.3
Policy discussion – Challenges of big data and analytics-driven demand-side management

In the pipeline for 2023:

- On critical **security and privacy concerns** provided by digitalizing electricity systems and on corrective and preventive measures including system security risks, individual cyber safety, proactive policies
- On opportunities provided by data and **data analytics** in grid management and operations, in energy efficiency, in market opportunities and in renewable energy

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Enabling systemic energy efficiency improvements and accelerating implementation of the 2030 Agenda through energy system digitalization

virtual side event I 03 May 2023 I 14:30–15:45 CEST

ENERGY

THANK YOU FOR PARTICIPATION!

Task Force on Digitalization in Energy

For further information, please visit
- Group of Experts on Energy Efficiency: https://unece.org/sustainable-energy/energy-efficiency
- Group of Experts on Cleaner Electricity Systems: https://unece.org/sustainable-energy/cleaner-electricity-systems

To get involved in the activities, please contact: litvinyuk@un.org