ISGAN
INTERNATIONAL SMART GRID ACTION NETWORK

15th Latin American Smart Grid Forum

International panel: Best practices for the requalification of energy systems for the energy transition

Luciano Martini
Chair ISGAN

12 September 2023

Sao Paulo, Brazil

ISGAN
International Smart Grid Action Network

www.iea-isgan.org

Luciano Martini, RSE
ISGAN Chair

ISGAN

ISGAN is the short name for the *International Energy Agency* (IEA) *Technology Collaboration Programme* (TCP) for a Co-operative Programme on Smart Grids (ISGAN – ***International Smart Grid Action Network***).

It is also an initiative of the *Clean Energy Ministerial* (CEM) and was formally established at CEM2 in Abu Dhabi, in 2011 as an Implementing Agreement under a framework of the *International Energy Agency* (IEA).

The *International Smart Grid Action Network* (ISGAN) creates a strategic platform to support high-level government attention and action for the accelerated development and deployment of smarter, cleaner electricity grids around the world.

ISGAN in a nutshell

ISGAN currently consists of 27 Contracting Parties. Their nominated representatives form the Executive Committee headed by the Presidium, assisted by two co-Secretariats and the Operating Agent of ISGAN.

The work of ISGAN is divided into 6 active Working Groups (WG).

Co Secretariat & Operating Agent

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Co Secretariat

KSGI Korea Smart Grid Institute

ISGAN Presidium

ISGAN Executive Committee

ISGAN Executive Committee

The ExCo is a **decision-making body** of ISGAN.
All members are nominated by the **ISGAN Contracting Parties**.

The ExCo sets the ISGAN annual **strategy and objectives** and takes **operational decisions.**

The ExCo is also responsible for setting-up and disbanding of **Working Groups**, approval of their working **scope and reports**, appointment of Working Groups Managers and Leads.
As the need arises, it may also set up ad hoc working groups for specific matters.

ISGAN worldwide presence

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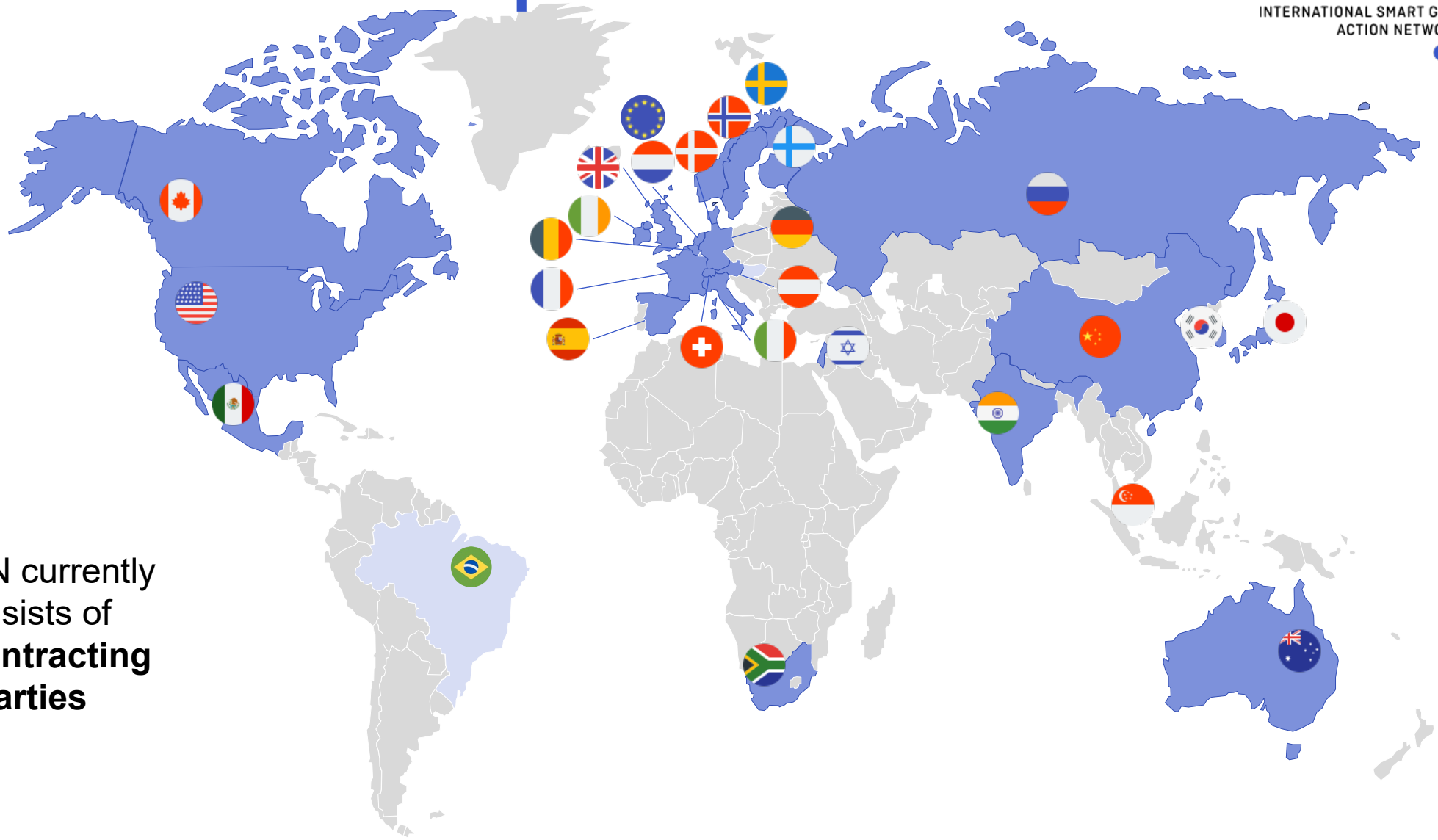

ISGAN currently consists of **27 Contracting Parties**

ISGAN vision

ISGAN's vision is to accelerate progress on key aspects of smart grid policy, technology, and investment through voluntary participation by governments and their designees in specific projects and programs. Its activities center foremost on those aspects of the smart grid where governments have regulatory authority, expertise, convening power, or other leverage, focusing on five principal areas:

- Policy standards and regulation
- Finance and business models
- Technology system development
- Workforce skills and knowledge
- Users and consumers engagement

ISGAN facilitates dynamic knowledge sharing, technical assistance, peer review and, where appropriate, project coordination among its Contracting Parties.

ISGAN work

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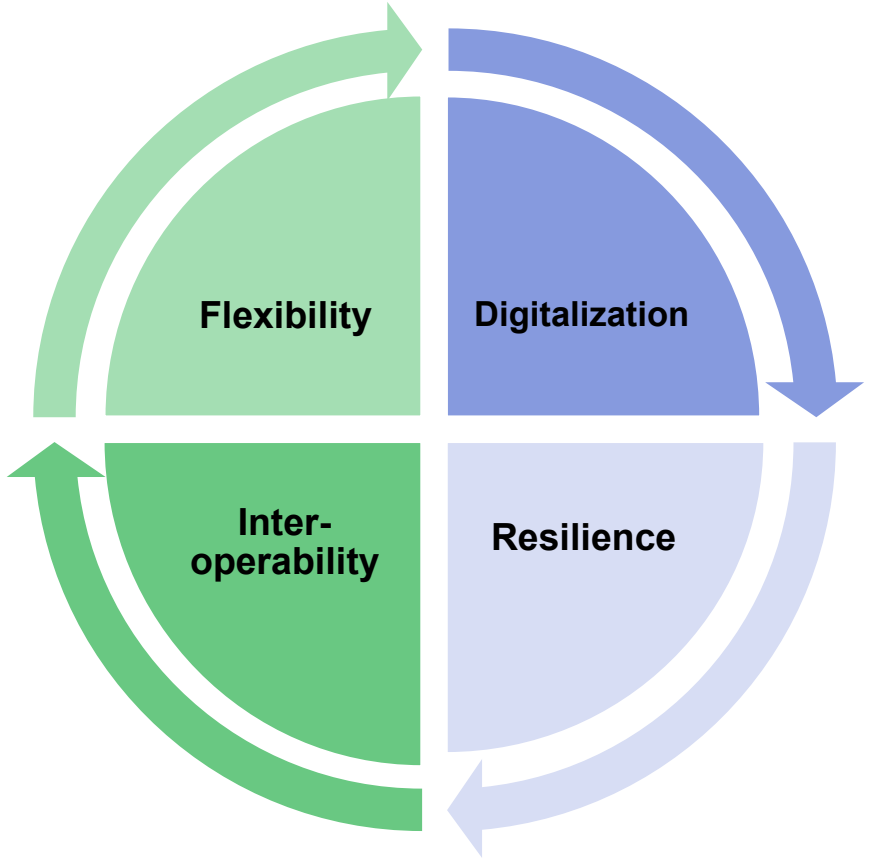
ISGAN activities build a global understanding of smart grid, address gaps in knowledge and tools, improve peer-to-peer exchange and recognize excellence

Main themes



- No direct technology development or demonstration activities
- Develop protocols, tools and best practices, identify environmental issues and mitigation options
- Focus on exchange and dissemination of information and perspectives
- A global benchmark and collaborative attitude among participating countries
- Inform and support policymakers at regional, national and international level about available system innovative solutions

International collaboration:
Main partnerships

ISGAN will continue to build **collaborative ties** with other relevant forums, aligning and differentiating activities as appropriate, in a mutual effort to attain the real outcomes needed in energy systems.

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GSEF
Global Smart Energy Federation

IEA
International Energy Agency

IEA 3DEN

MISSION INNOVATION

GREEN POWERED FUTURE MISSION

21st Century POWER PARTNERSHIP

ETIP SNET
PLAN. INNOVATE. ENGAGE.

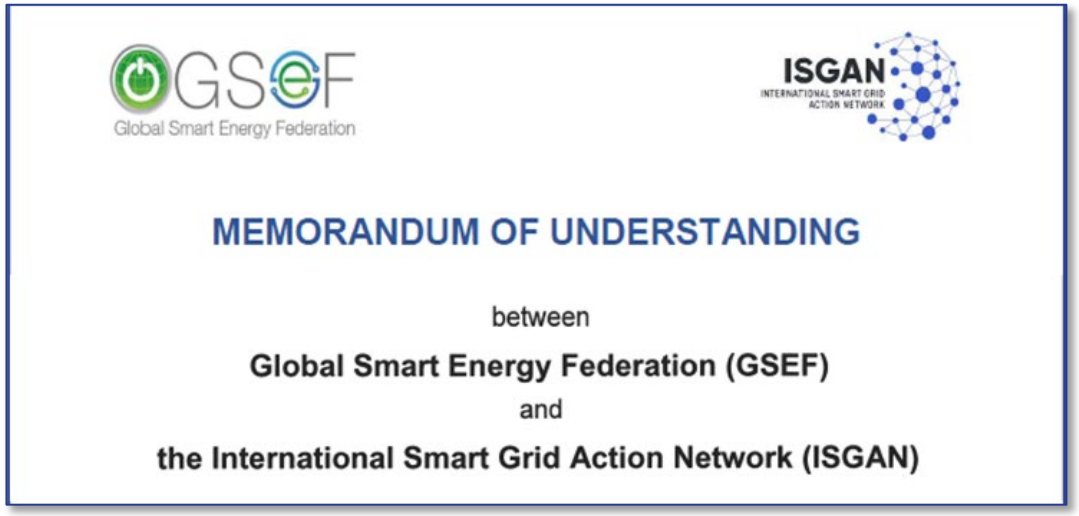
CLEAN ENERGY MINISTERIAL
Accelerating the Transition to Clean Energy Technologies

CLEAN ENERGY SOLUTIONS CENTER
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

ISGAN & GSEF collaboration

ISGAN and GSEF have confirmed the intention to co-operate and work together on projects of mutual interest in the field of Smart Grid.

The two initiatives signed a ***Memorandum of Understanding (MoU)*** at the Global Clean Energy Action Forum (GCEAF) in Pittsburgh, PA, U.S., in September 2022.


GSEF
Global Smart Energy Federation

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MEMORANDUM OF UNDERSTANDING

between

Global Smart Energy Federation (GSEF)

and

the International Smart Grid Action Network (ISGAN)

Signed MoU between the GSEF and ISGAN

GSEF
Global Smart Energy Federation

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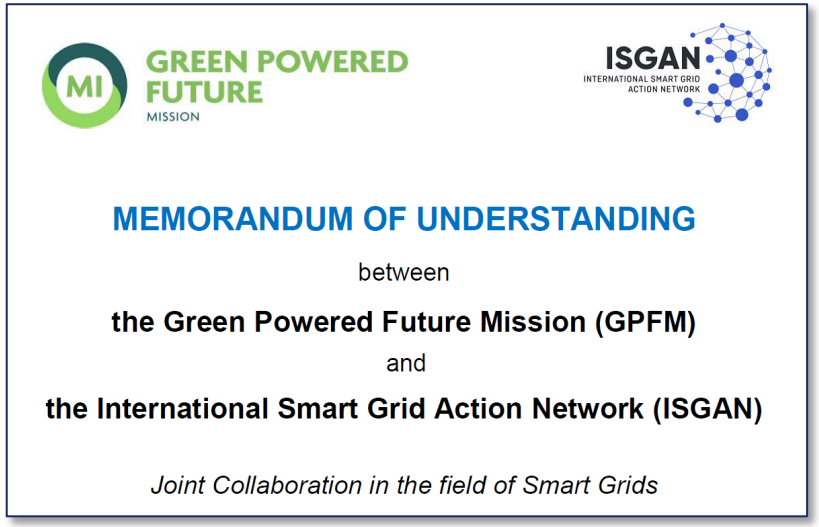
ISGAN & GPFM collaboration

The Green Powered Future Mission (GPFM) and ISGAN have confirmed their **collaborative and action-oriented approach** to address mutually interesting R&I topics.

In September 2022, in the frame of the Global Clean Energy Action Forum in Pittsburgh, PA, U.S., the two initiatives have signed a strategic ***Memorandum of Understanding*** to put the basis for future collaboration.



GREEN POWERED FUTURE MISSION

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MEMORANDUM OF UNDERSTANDING

between

the Green Powered Future Mission (GPFM)

and

the International Smart Grid Action Network (ISGAN)

Joint Collaboration in the field of Smart Grids

Signed MoU between the GPFM and ISGAN, witnessed by Amanda Wilson, Chair of the IEA CERT

ISGAN Working Groups

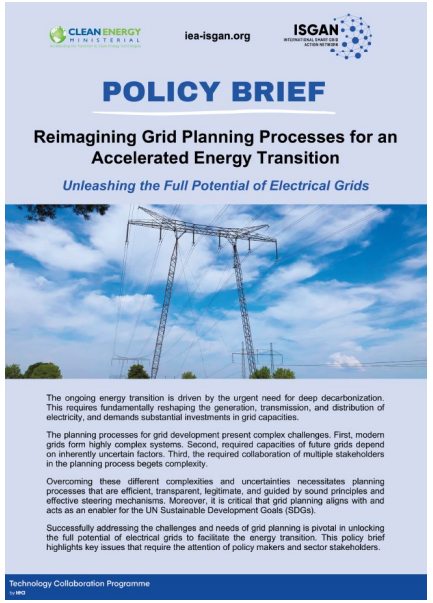
The activities of ISGAN are organized into **six Working Groups (WG)**.

The Working Groups continuously deal with specific **topics** and update their **plans** and **objectives** in view of the annual ExCo meetings.

The **Communication Working Group** brings all tasks concerning communication and dissemination of ISGAN results together.

ISGAN recent events and activities

- Organized **three side events at CEM14/MI-8 Ministerial** in Goa in July 2023
  - ISGAN-GPFM side event: "*CEM ISGAN – MI GPFM collaboration for power system transformation, with special focus on policy and private sector engagement*"
  - ISGAN-21CPP-GPFM side event: "*CEM-MI collaboration for technology innovation and implementation, policy, and regulatory actions to rapidly decarbonize power systems*"
  - ISGAN Awards: The 9th Annual ISGAN Awards Ceremony on "*Artificial Intelligence for Smart Grid*"
- Released at CEM14/MI-8 the **policy brief** developed as part of the ISGAN knowledge-sharing project (KSP) on **"Network Planning under Uncertainty"**
- Delivered **policy messages** to the Clean Energy Ministerial and energy sector stakeholders



Policy brief released at CEM14/MI-8 in Goa

Working Group 6 – Power T&D Systems

WG 6 highlights:

- Facilitate the application of **advanced technologies** needed for **power grids** to contribute in the best way to the attainment of **clean energy**, **climate goals** and **sustainable energy access** to all
- Solutions that enable power grids to maintain and improve the **security**, **reliability** and **quality** of electric power supply while facing challenges related to significant trends in the electricity sector
- Condense to conclusions and develop **recommendations for policy makers**: case books, discussion papers, workshops and collaboration with other initiatives

WG6: Transmission and distribution systems

- **IEA & ISGAN Workshop**
  Flexibility for resilience in integrated systems
- Authors: Irina Oleinikova (NTNU), Antonio Iliceto (ENTSO-E) and Martha Symko-Davies (NREL)
- **Policy recommendations**, based on the ISGAN and IEA Digital Demand-Driven Electricity Networks (3DEN) cooperation initiative and an international high-level expert workshop "*Flexibility for resilience in integrated systems*" held on 3-4 October 2022 at IEA Headquarter in Paris, France

Discussions during the workshop:

- Set of **priority actions** and **potential solutions** that can facilitate the progress.
- Potential **roles and actions** that could be taken by academia and society, international organizations, policy makers, regulators, urban planners, system operators, retailers and consumers contributing to:
  - Urgent need of power system **resilience & flexibility**
  - New approach to **power system planning**
  - Roles of **consumers and energy communities**
  - Role of **market and regulation**
  - Potential actions and **ISGAN T&D WG** relevance

→ a **new T&D WG activity** was proposed with focus on **Flexibility for resilience in integrated systems** to share best practices, learn trough collaboration, and provide policy guidance on deploying flexibility for operation in integrated systems.

The Network Planning under Uncertainty Project

- **Broad Participation:**
  - 12 countries on 3 continents + IRENA
  - Policymakers, Transmission System Operators (TSOs), Distribution System Operators (DSOs) and researchers
- **Established Practice:**
  - 9th Project of the ISGAN Knowledge Sharing Platform, engaging several ISGAN Working Groups
- **Highly interactive:**
  - Knowledge sharing and co-creation in several steps to produce quality policy guidance – with the objective to accelerate the energy transition

The importance of network planning & its challenges

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- ✓ Network planning processes for grid development are **complex**, involve multiple stakeholders and depend on several inherently **uncertain** factors.
- ✓ This ISGAN project has focused on **identifying and proposing solutions** to root causes of complexity and uncertainty – and their consequences – in the network planning process.
- ✓ Grid development is also directly and indirectly linked to the transformation towards a net zero emission energy system and most of **Sustainable Development Goals (SDGs)**.
- ✓ To build future-proof grids, in line with and supporting the SDGs, **planning processes** need to be **efficient**, **transparent**, **legitimate**, and guided by sound principles and effective steering mechanisms.

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Policy Brief

"Reimagining Grid Planning Processes for an Accelerated Energy Transition - Unleashing the Future Potential of Electrical Grids"

It focusses on 7 key policy messages and was released *in July 2023* *at the CEM14/MI-8 Ministerial in Goa*

Policy Messages (1/2)

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1) Develop **cohesive scenarios** for the electricity sector that show the necessary **electrification measures** required to achieve **net zero emissions**

2) Ensure that **grid development plans** enable **deep decarbonization** in line with the developed scenarios

3) Update existing **cost-benefit analyses** to properly capture the values of sufficient **grid capacity** and account for social, environmental, and resilience metrics

Policy Messages (2/2)

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4) Ensure that **regulatory frameworks** foster both conventional and smart grid solutions contributing to the clean energy transition

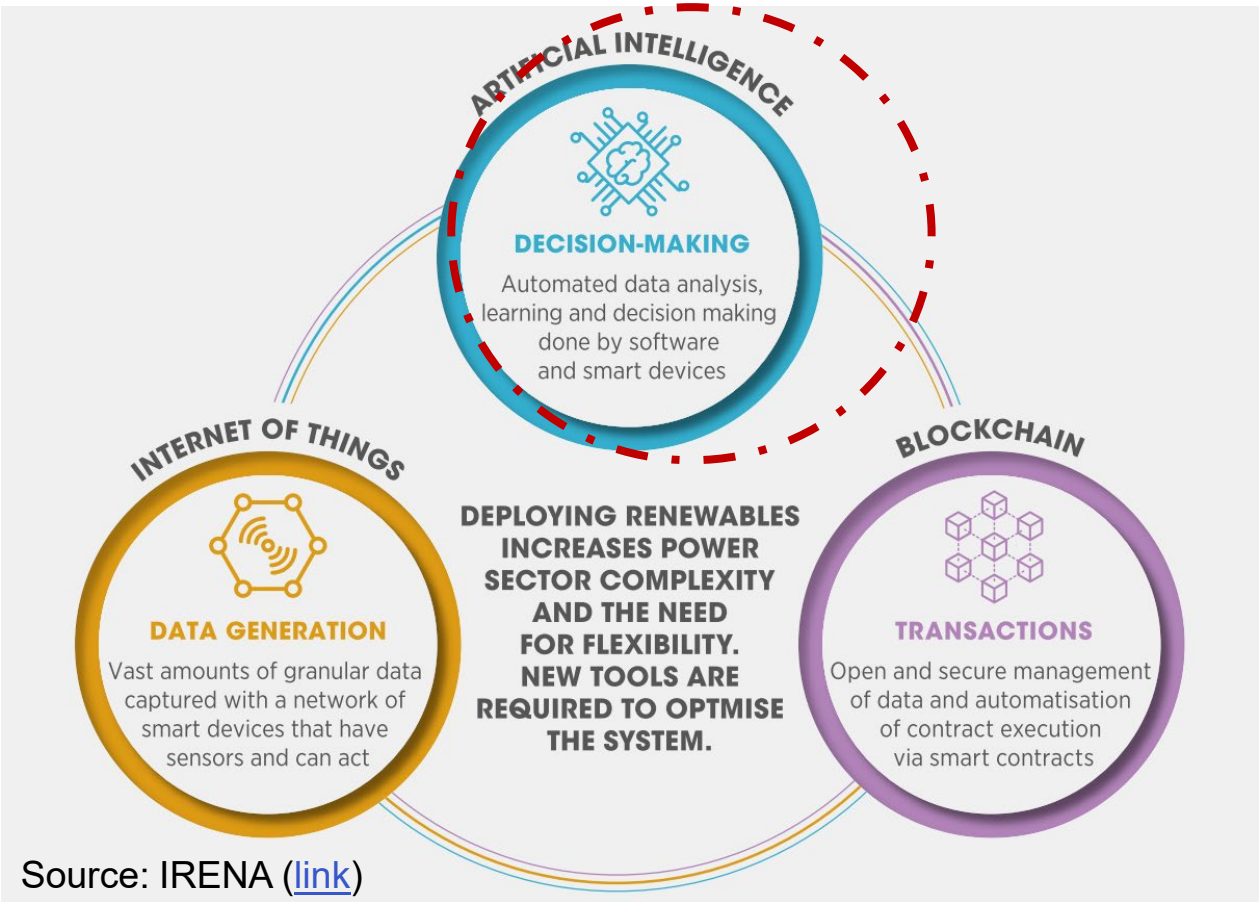
5) Develop **strategies** to recruit and train a **skilled workforce** to satisfy short- and long-term competence needs

6) Promote **stakeholder interaction** at all levels of the **grid planning process**

7) Increase **awareness** and **understanding** of the role of the **electrical grid** for meeting the **Sustainable Development Goals**

Key trend:
Energy system digitalisation

- Digitalisation is a **key amplifier of the power sector transformation**, enabling the management of large amounts of data and optimising increasingly complex systems.
- The growing importance of digitalisation in the power sector is also a **consequence** of advances in two other innovation trends: **decentralisation and electrification**.
- Increased power sector complexity requires a **combination of digital innovations**



Source: IRENA (link)

Working Group 3 – Cost Benefit Analysis & Toolkit

- Working Group 3 deals with methods aimed at **guiding stakeholders' investment** decisions related to Smart Grid technologies by considering economic and social welfare aspects.

Scope:

- **Development of tools** for analysts, regulators, utilities and other actors
- Define **system needs** and decide on **priorities** for Smart Grid system investments along with necessary regulatory changes

WG3: Cost Benefit Analysis

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WHAT? *Tool for Cost-Benefit analysis*

can determine the **requirements** and **priorities** for investing in **smart grid systems** and **regulatory changes**

WHO can use this?

analysts	**regulators**	**utilities**	**stakeholders** of the electrical system

OUTCOMES: The outcomes can be used to

develop **customized business cases**	consider the existing **regulatory and market structures**	analyze the **system's current status**	know the **available resources** and **generation assets**	evaluate the **demand profiles**

WG3: Cost Benefit Analysis

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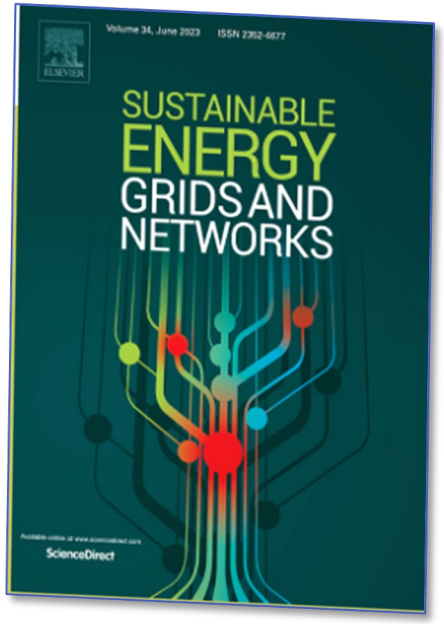
- New paper on ISGAN's Cost-Benefit-Analysis Tool "***smartgrideval***" was published on SEGAN:
  Strategic decision-making support for distribution system planning with flexibility alternatives
- Highlights:
  - **Multi Criteria Analysis approach** Decision Theory-based for planning initiatives
  - Decision Theory for **assessing multiple impacts** considering conflicting criteria
  - Innovative **MCA approach** to model the stakeholder perspectives
  - Methodology validation using **realistic distribution network planning problem**
  - **Decision making support tool** for distribution system planning available online



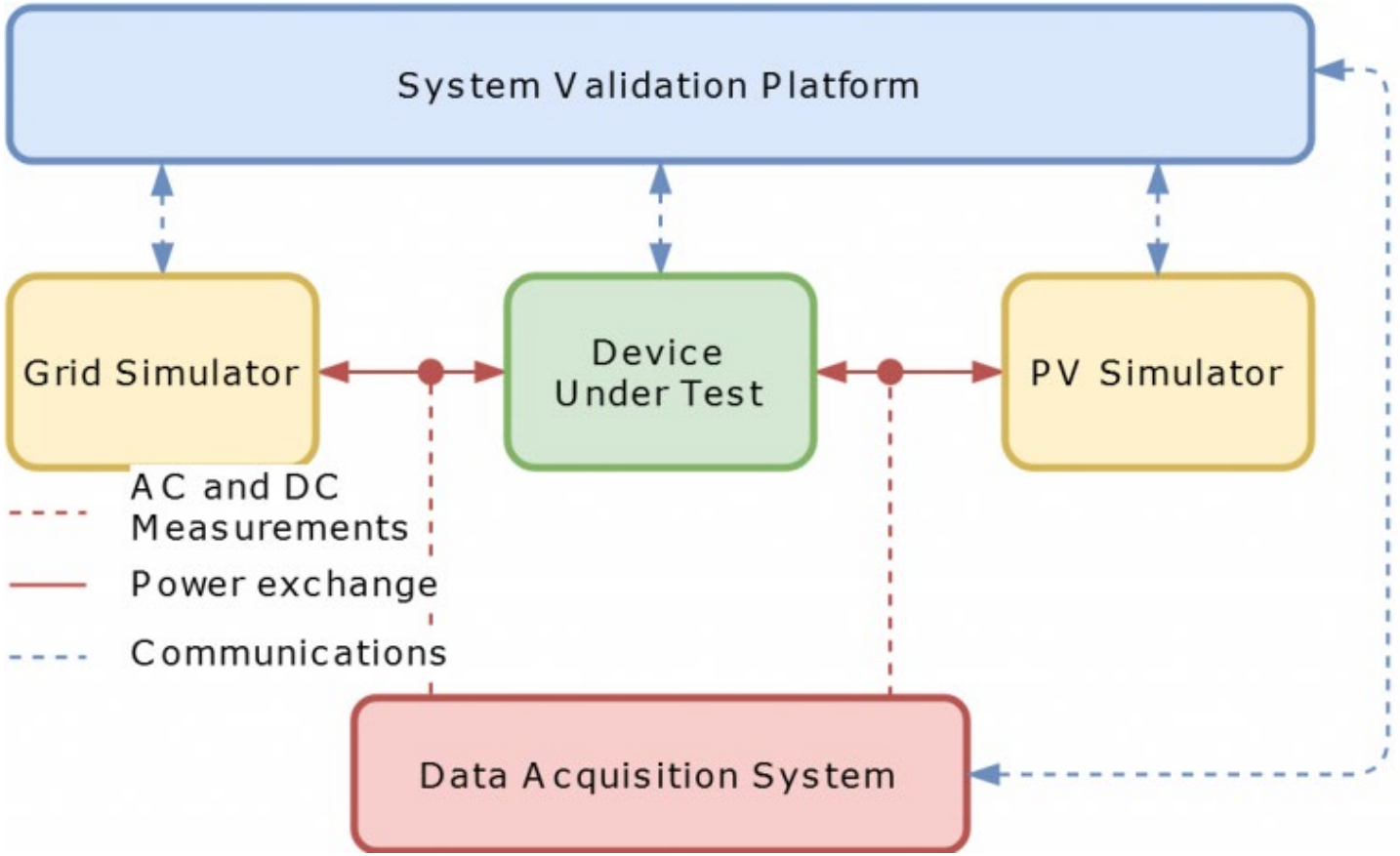
https://www.sciencedirect.com/science/article/pii/S2352467723001467

Working Group 5 – Smart Grid International Research Facility Network

Working Group 5 deals with:

- **Research and testing facilities**, test beds, testing projects: identification of collaboration opportunities among test facilities, state of the art testing practices, identification of testing protocols needing attention
- Strong and active community of researchers engaging in applied research and impactful work on **Smart Grids testing**: DER, power systems, microgrids, protocols for advanced inverter functions for PV and storage integration etc.
- **Smart Grid Modelling**: Server and interfaces to use these systems and topologies. SunSpec Alliance System Validation Platform, to reduce barriers to testing in emerging / developing economies
- **Open-source software tools**, test cases and procedures to be used by DER vendors, universities, research institutions, certification laboratories, standards organizations, etc.

WG5: Open System Validation Platform
for automated inverter testing



Automated testbed with **open-source system validation platform software** (Sunspec SVP)

WG5: Open System Validation Platform
for automated inverter testing

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- The **SIRFN collaboration** work has created a versatile, open-source **DER certification platform** and associated test scripts for multiple certification standards. This platform allows test automation and is known as **SunSpec System Validation Platform** (SVP).
- The SIRFN laboratories are all contributing to an **open-source repository of software tools** that control laboratory equipment to orchestrate DER interconnection and interoperability certification standard testing.
- The test labs are exchanging technical information on the design and operation of the **advanced DER test beds** and software for executing interoperability testing and comparing results for **different DER sizes** and designs on grids with **different frequencies and voltages**.
- This has enabled the SIRFN group to continuously assess the **versatility** and **effectiveness** of upcoming grid codes and associated test procedures from different jurisdictions and provide feedback to the standards development organizations for corrections and enhancements of the test procedures.

WG5: Smart Grid International Research Facility Network

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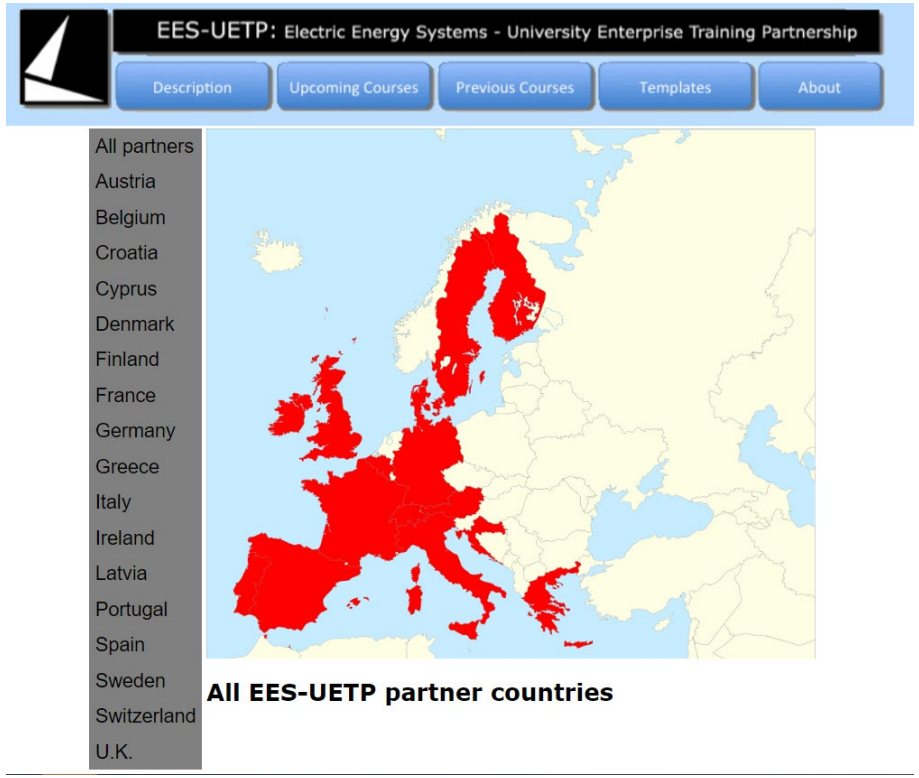
- **Electric Energy System - University Enterprise Training Partnership** (EES-UETP)
- WG5 organized, facilitated, and presented a training course at EES-UETP entitled "***Advanced laboratory testing methods for modern power systems***" from May 8-10, 2023, at TU Dortmund, Germany.

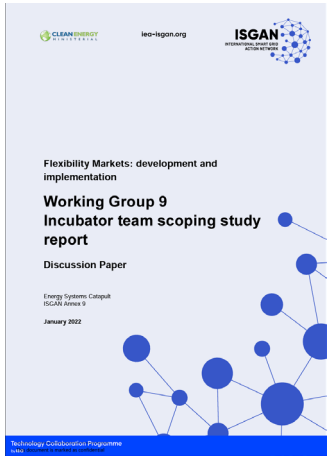
http://www.ees-uetp.com/courses/course2023-01.php

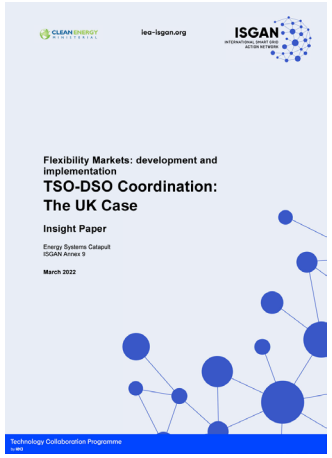


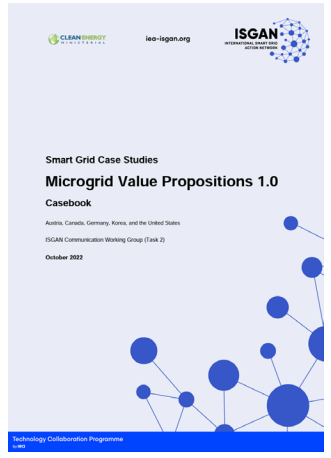
All EES-UETP partner countries

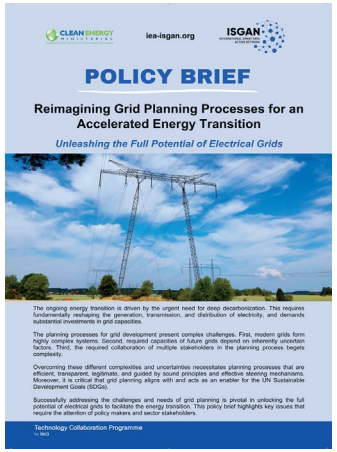
Recent Activities: 2022-2023

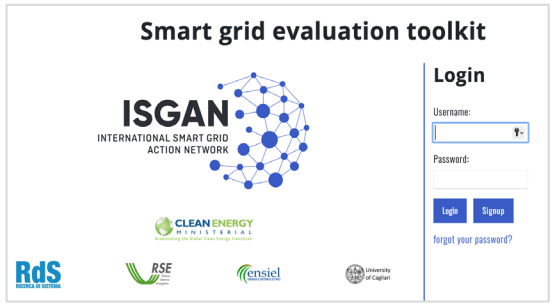
ISGAN Working Groups











ISGAN's Planned Activities (Examples)

- **Launch of First-ever ISGAN "Lighthouse" Project at ISGAN ExCo Week**
  Utrecht, The Netherlands, 25-29 September 2023

  ***A CEM14 goal for ISGAN is to determine a smart grids topic with high impact potential!*

- **Additional ISGAN Virtual Learning Webinars, for example:**
  - **Network Planning under Uncertainty,** *19 September 2023, 14:00 CEST*
  - **Series: Learning from Excellence – Project Lessons from the ISGAN Award of Excellence 2023,** *dates/times TBD*

- **Launch of new smart grids testing joint research activities (WG5)**

ISGAN Award of Excellence (AoE)

Since 2014 **ISGAN, in partnership with the Global Smart Grid Federation (GSGF)**, recognizes and showcases leadership and innovation through an annual **ISGAN Award of Excellence** competition

2023 Award Theme: Artificial Intelligence (AI) for Smart Grid

The **international jury panel** recognizes excellence in innovation, integration, and transformation of smart grid systems, by selecting winning projects based on their potential impact, economic rationale, potential for replication or adaptation, innovation and other benefits.

For more information

ISGAN Website: www.iea-isgan.org

ISGAN Chair, Luciano Martini: Luciano.Martini@rse-web.it

ISGAN Operating Agent, Dr. Mihai Calin: oa@iea-isgan.org

Clean Energy Ministerial: www.cleanenergyministerial.org

IEA Energy Technology Network: https://www.iea.org/tcp/

Thank you for your attention

Luciano Martini

ISGAN Chair

Luciano.Martini@rse-web.it