

Evolving Architecture of the Net Zero Power System

Speaker : *Luciano Martini, RSE/ISGAN Chair,
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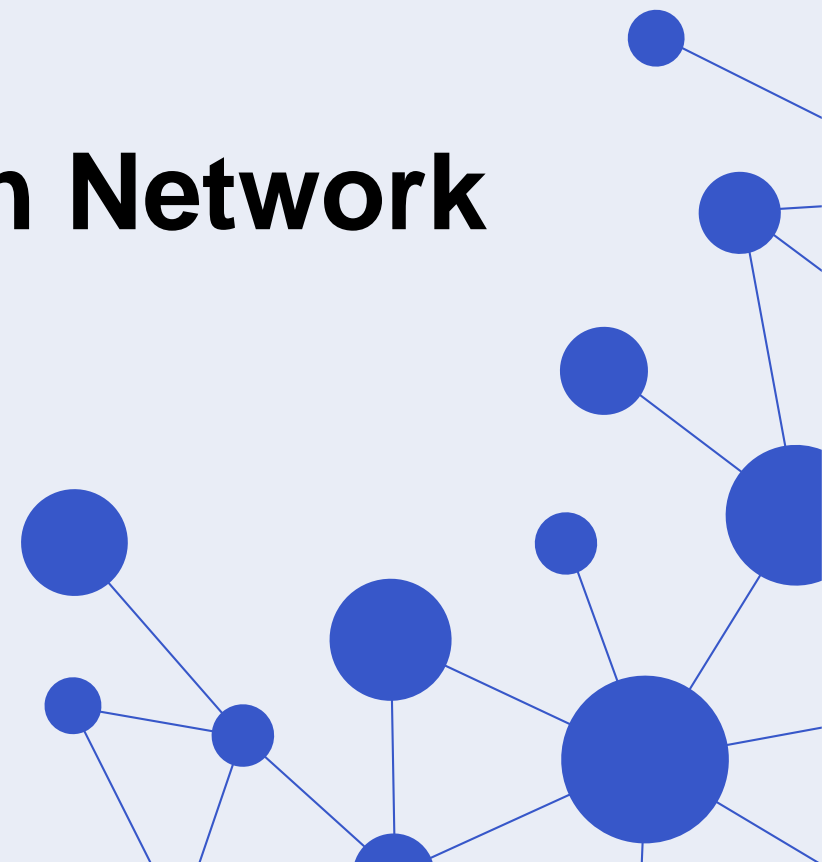
ISGAN

International Smart Grid Action Network

Luciano Martini, *Chair*

Evolving Architecture of the Net Zero Power System

1 March 2023, New Delhi



Evolving Architecture of the Net Zero Power System



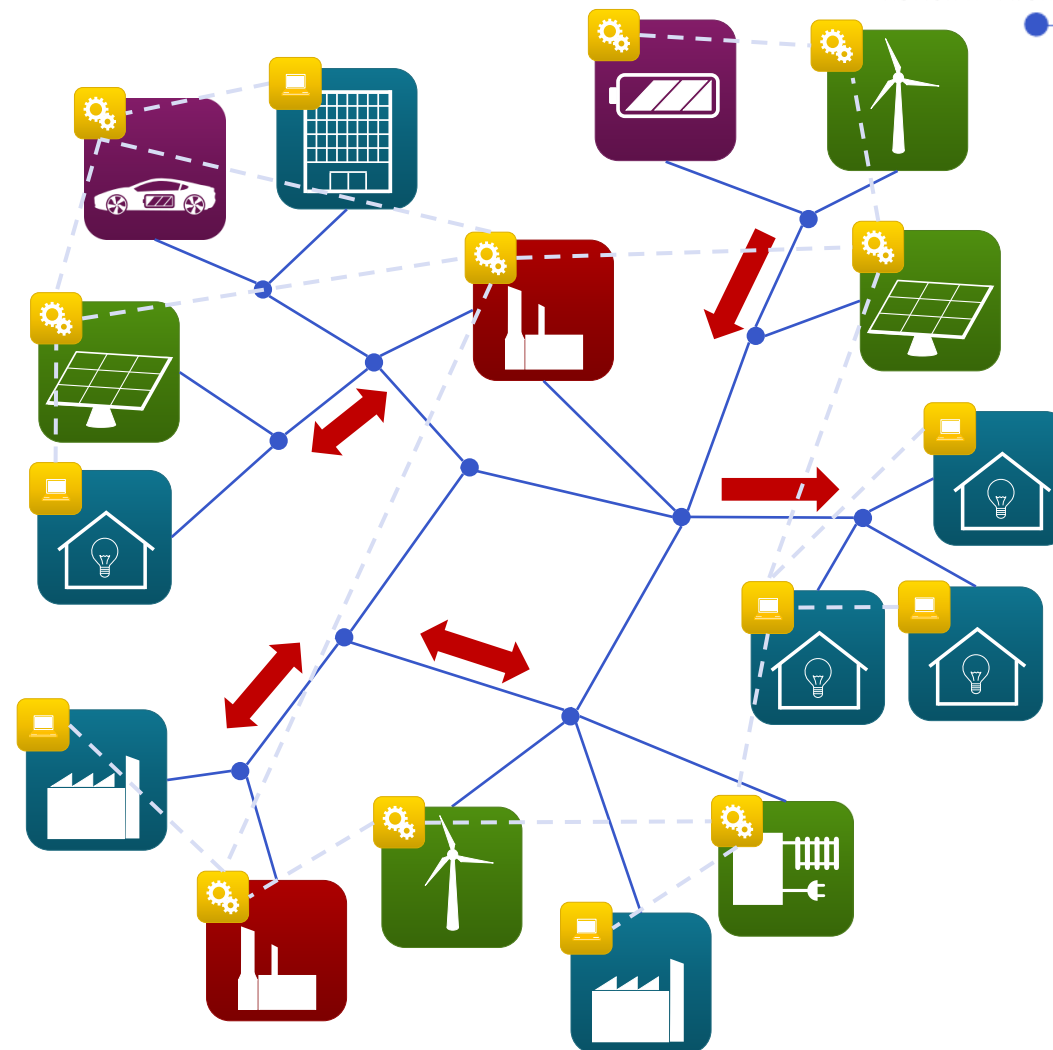
Discussion points:

1. Emerging Integrated Grid with DER and Two-Way Power Flows
2. Grid-Edge and Behind-the-Meter Resources and its Management
3. Evolving Grid Architecture with Two Buses
 - a) Standardized and Open Interfaces
 - b) Standardized Tools and APIs
 - c) Standards-based and Standardized Models
 - d) Self-registration of Devices, Applications and Systems
 - e) Roadmap for New Architecture for the Grid

Energy System Transformation

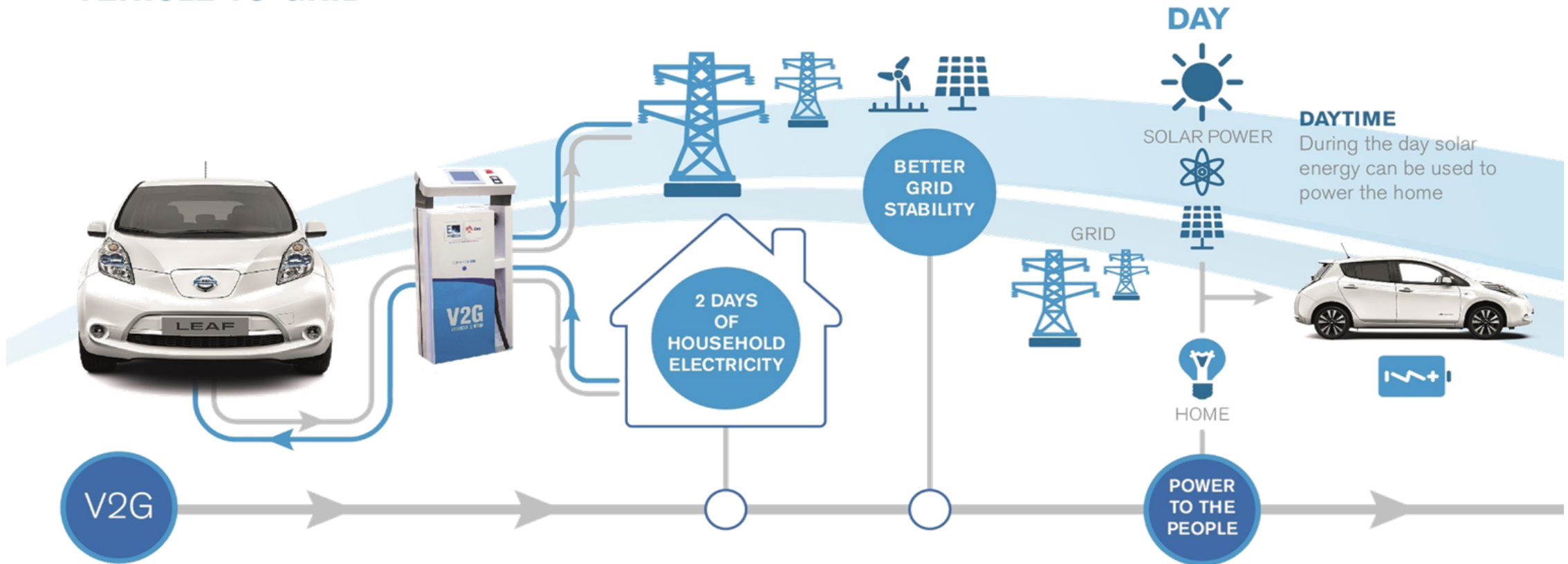


- **Information and Communication Technology (ICT)** enables better monitoring, operation, decision making and control
 - Strong coupling among systems
- **Challenges in energy systems**
 - Uncertainty due to integration of distributed energy resources
 - Complexity due to increase in the number of active actors



Electromobility impact on power system

VEHICLE-TO-GRID



ISGAN Working Group 6

Power transmission & Distribution Systems



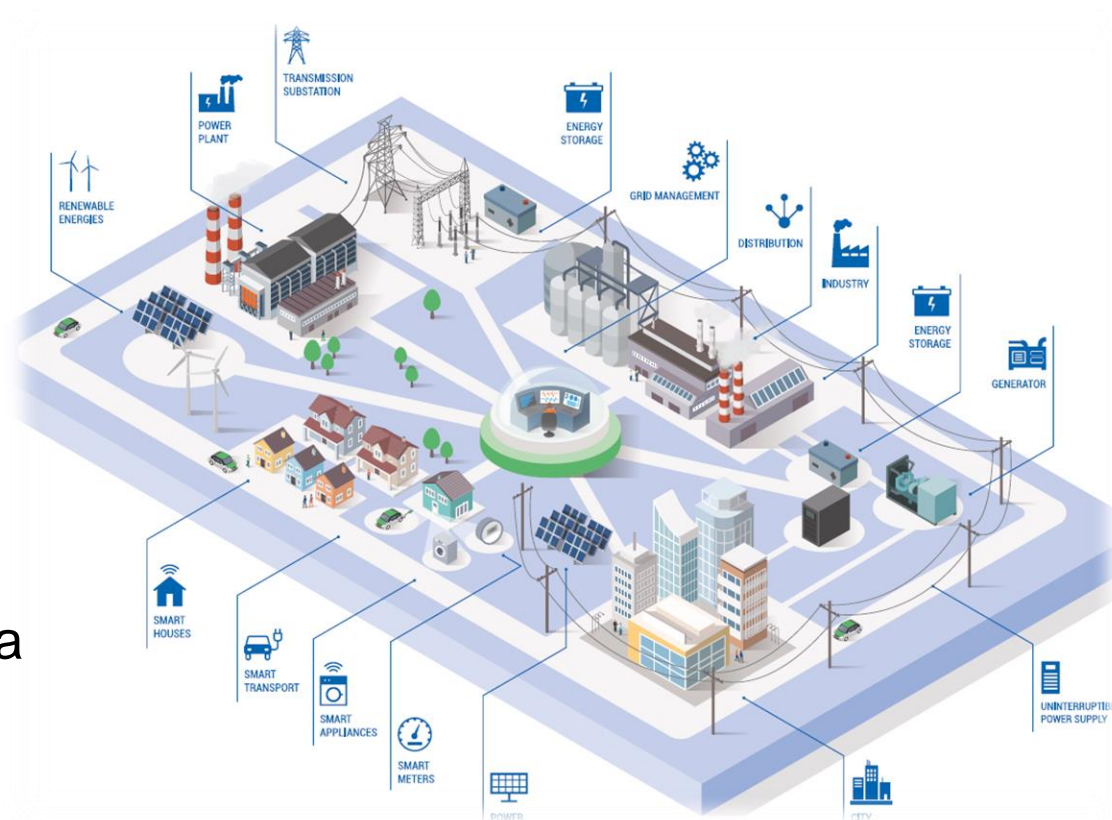
Objective: To establish a **long-term vision** for the development of future sustainable power systems

Addressing **system-related challenges** in the development of the future power system:

- **Technologies**
- **Market solutions**
- **Policies**

Structure:

- The activity in Working Group 6 is carried out by a global network of experts
- Managed within 4 Focus Areas



Overview focus area



Expansion Planning and Market Analysis

Lead: Gianluigi Migliavacca (RSE), IT

- Studying the functioning of electricity markets (day-ahead and real time)
- Analyse the evolution of the transmission and distribution networks and their planning modalities

Technology Trends and Deployment

Lead: Emil Hillberg (RISE), SE

- Identify potential and feasibility of innovative solutions supporting grid operation and capacity
- Make recommendations and support demonstration, promotion and deployment of promising technology

System Operation and Security

Lead: Kjetil Uhlen (NTNU), NO

- Assess available methods and tools for operational monitoring and control
- Identify needs for new tools and methods to manage future challenges in balancing control

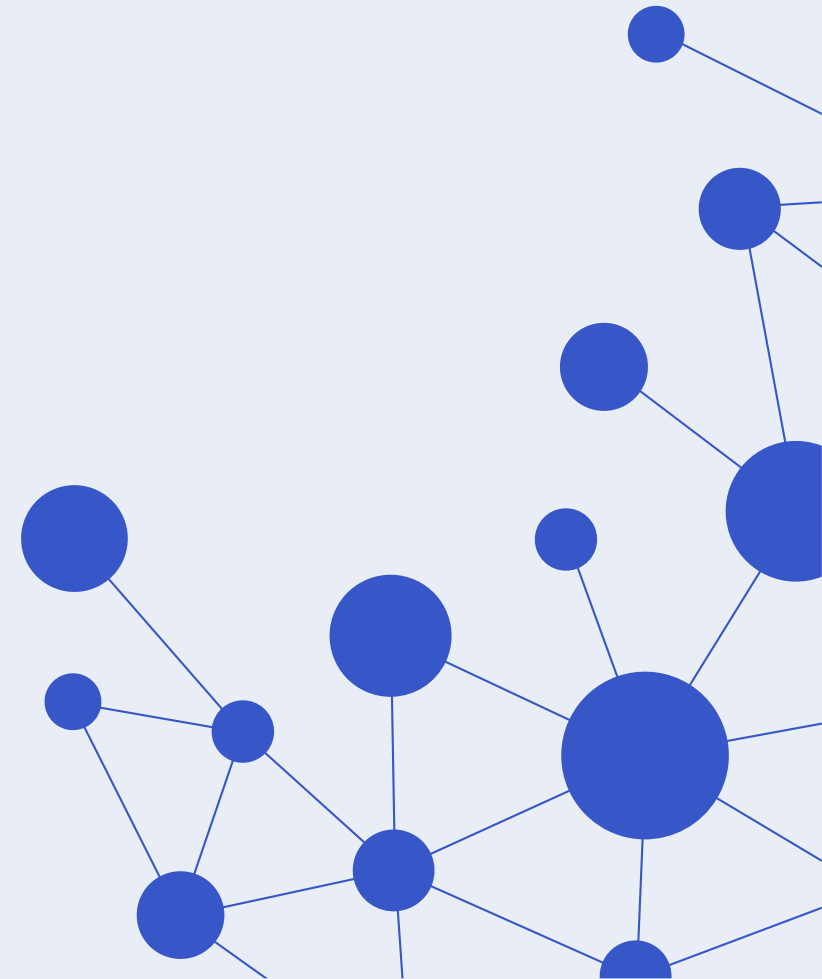
Transmission and Distribution System Interaction

Lead: Antony Zegers (AIT), AT

- Study how distribution and transmission networks could interact in the future, ensuring stable grid operation under high levels of renewables

micro vs MEGA Grids

ISGAN Working Group 6 activity results



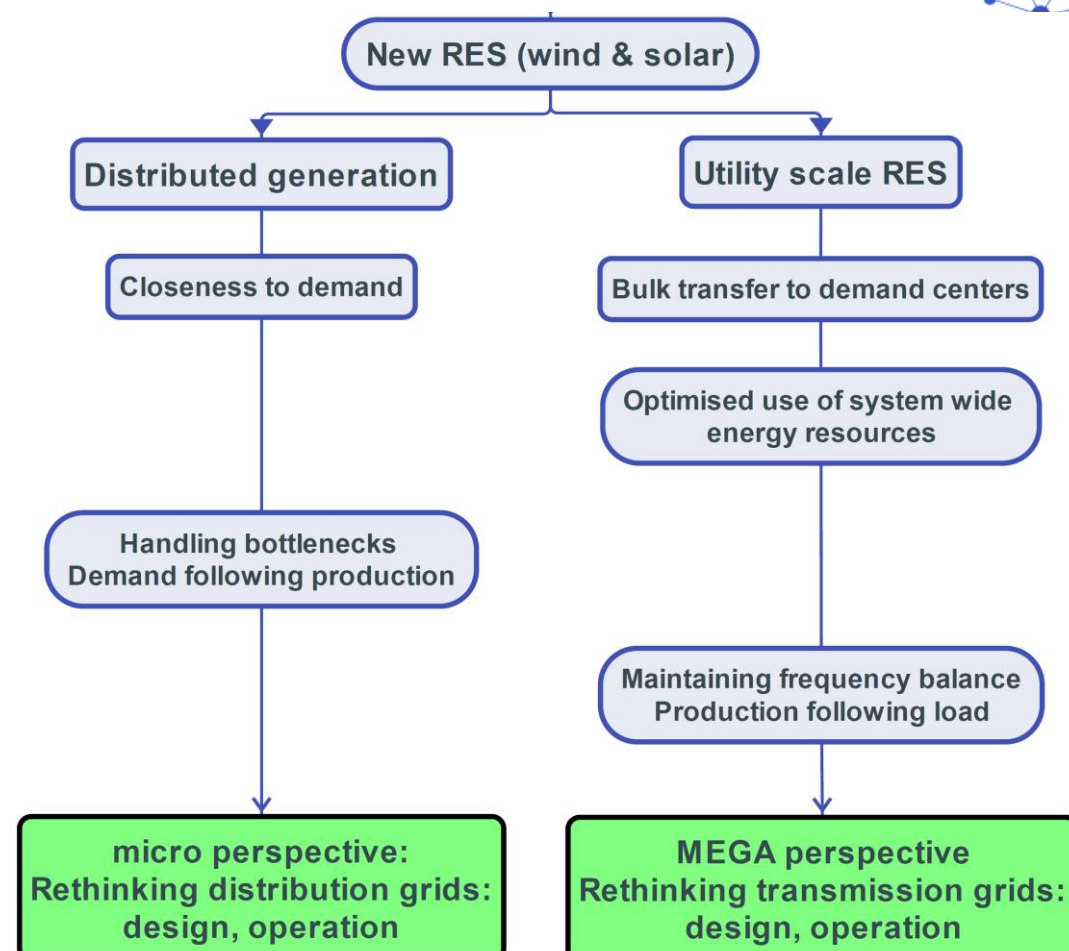
micro vs MEGA grids

Spawning from the aim to enable very high penetration of renewables, two trends are emerging with significant impact on the grid evolution:

**micro
&
MEGA
perspectives**



Intermediate results: iea-isgan.org/micro-vs-mega-grids



micro vs MEGA grids

Characteristics, Drivers & Challenges



	micro perspective	MEGA perspective
Characteristics	Bottom-up & Small scale	Top-down & Utility scale / bulk-scale transfer and gen
	Short-term / agile / alternative grid development	Long-term / slow / traditional grid development
	Many actors (inter-sectoral development)	Few actors (mainly power and energy sector)
Drivers	Close vicinity of the demand	Exploit complementarities of load/prod across regions
	Self-sufficiency / energy independency	Maintain the long-term system adequacy
	Innovative markets / user-centric perspectives	Facilitate international trading / market integration
Challenges	Cost parity	Long-term financial commitment
	Concentrated demand sites	Long lead-time decision-to-commissioning
	Interoperability & standardisation	Justify socio-economic value of investments

micro vs MEGA grids



- Whole-system coordination between micro and MEGA perspectives are needed to provide the most value of investments, largest socio-economic welfare & optimal use of resources

Final activity report under development, publications planned during 2020



Thank you for your kind attention

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For more information on ISGAN:

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Thank You

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India Smart Utility Week (ISUW)