International collaboration in the pre-standardisation phase: the scientific foundation of normative documents

Michele de Nigris

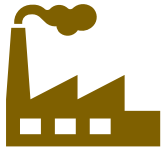
Director – Department Sustainable Development and Energy Sources

IEA EGRD Meeting 21-22 November 2024

The main advantages of standardisation of products/services



- HIGHER LEVEL OF QUALITY – WITH ADEQUATE LEVEL OF GUARANTEE OF PERFORMANCES
- HIGHER LEVEL OF SAFETY WITH CERTIFICATION



- REDUCED NUMBER AND DISPERSION OF PRODUCTS/SERVICES RATINGS AND CUSTOMISED CHARACTERISTICS
- REDUCTION OF THE COSTS OF PRODUCTION FROM ECONOMY OF SCALE
- USE OF STANDARDISED COMPONENTS AND SUBCOMPONENTS
- POSSIBLE DIVERSIFICATION OF SUB COMPONENTS AND MATERIALS SUPPLIERS

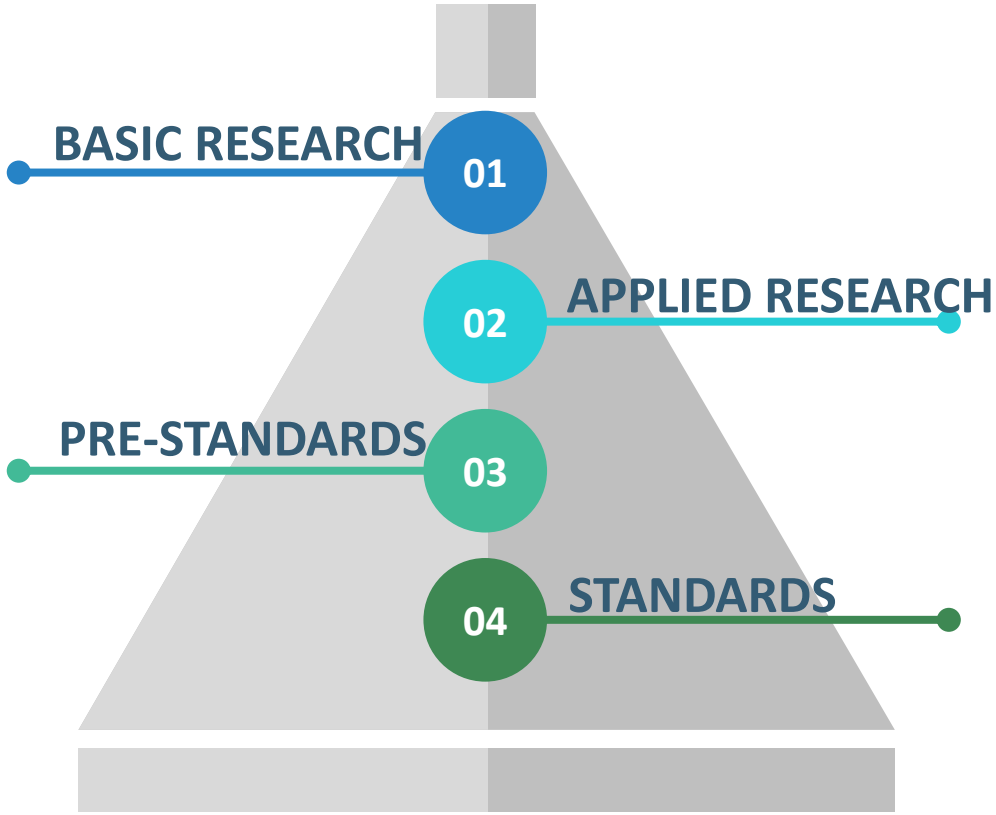


- BETTER RELATION BETWEEN SUPPLIER AND CLIENT
- ACCESS TO NEW MARKETS – CLEAR FUNCTIONALITIES AND GARANTEED MINIMUM PERFORMANCES
- ANTICIPATION OF TECHNICAL NEEDS OF THE FINAL USERS OF PRODUCTS/SERVICES
- REDUCTION OF COSTS AND DURATION DURING THE NEGOTIATION PROCESSES

Typical phases in the development of products/services

Strategic activities – Initially developed in universities (open) or industrial laboratories (closed) – competitive - paper and patent driven.

To demonstrate scalability and replicability of the solutions developed; often based on initial applications is service (sandboxes). Aimed at generalization of results and application to different environments and situations.

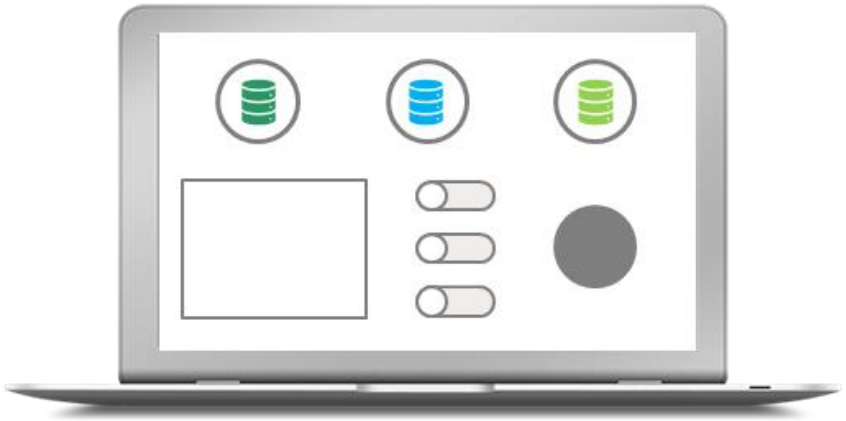


Application driven - to validate and apply basic research in laboratory and simulated systems. Requires collaboration with need owners – operators, industries.

Stabilizing the solutions for a widespread and universal application, defining ratings, functionalities and minimum requirement and unleashing interoperability

The most evident example – data spaces and interoperability

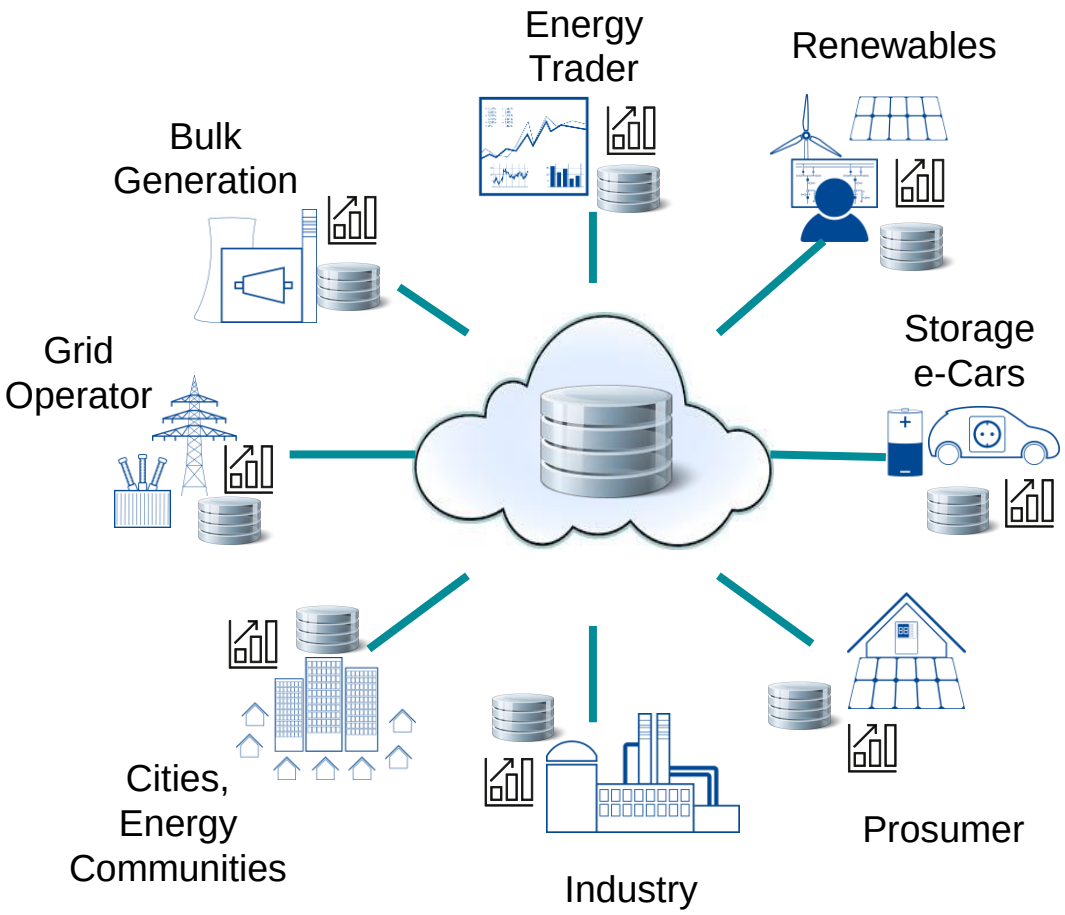




Data spaces are ecosystems that data providers, intermediaries, and users can access to share data and enable the functionalities of the energy systems (e.g. observability and control of networks, market participation of storage operators, EV charging, etc.).

There are various **energy data spaces** that are **not always interoperable** within each sector (e.g. electricity) and, more generally, among sectors (e.g. P2X).

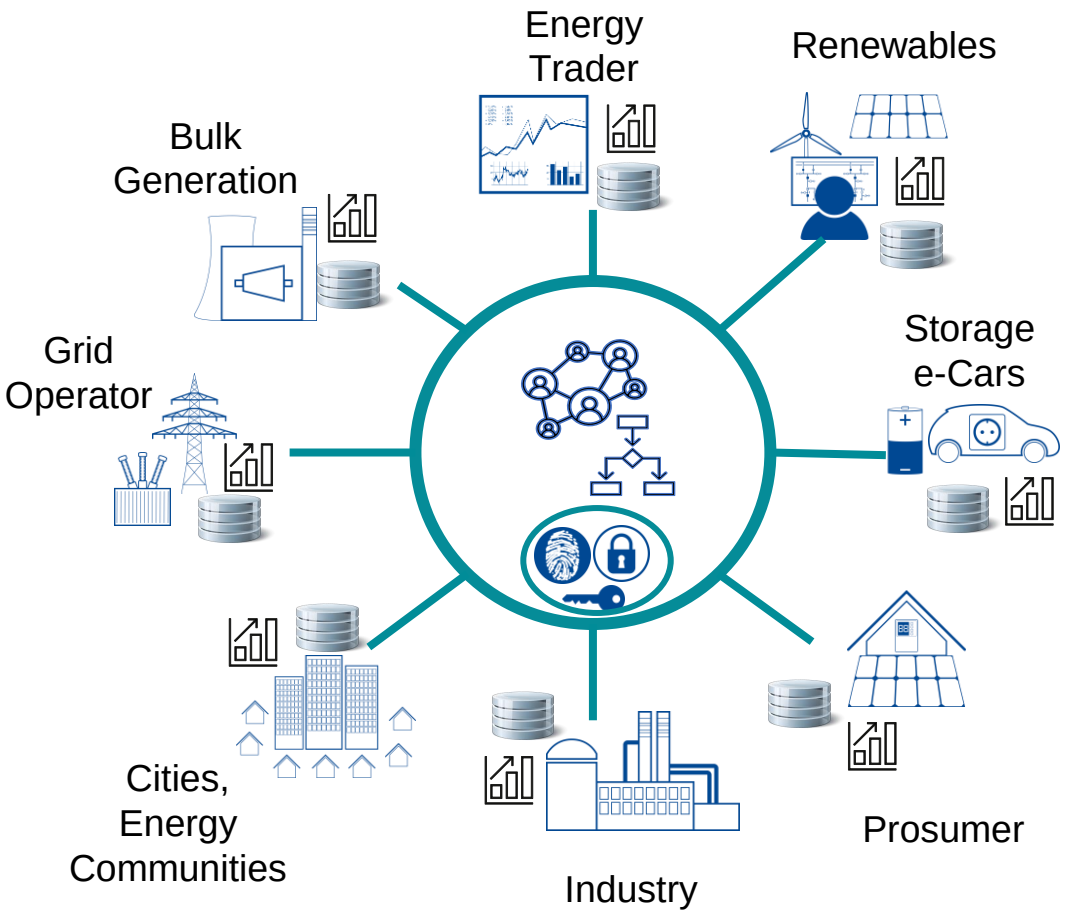
Evolution of data spaces for energy system development



Central Datahub:

- Loss of data sovereignty;
- No governance;
- Not possible for critical infrastructure.

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Distributed data spaces:
- Data access only per defined Use Case;
- Data exchange is also possible cross vertical and cross border.

Communication Infrastructure
- Data „only once“;
- Common governance;
- Standardized interfaces.

Standard architectures and interoperability

SGAM: reference model to analyse and visualise smart grid use cases in a technology-neutral manner
SGAM acts as a reference designation system providing three main axis for the dimensions of:

- value creations chain (“Domains”);
- automation pyramid (“Zones”);
- interoperability (“Interoperability Layer”)

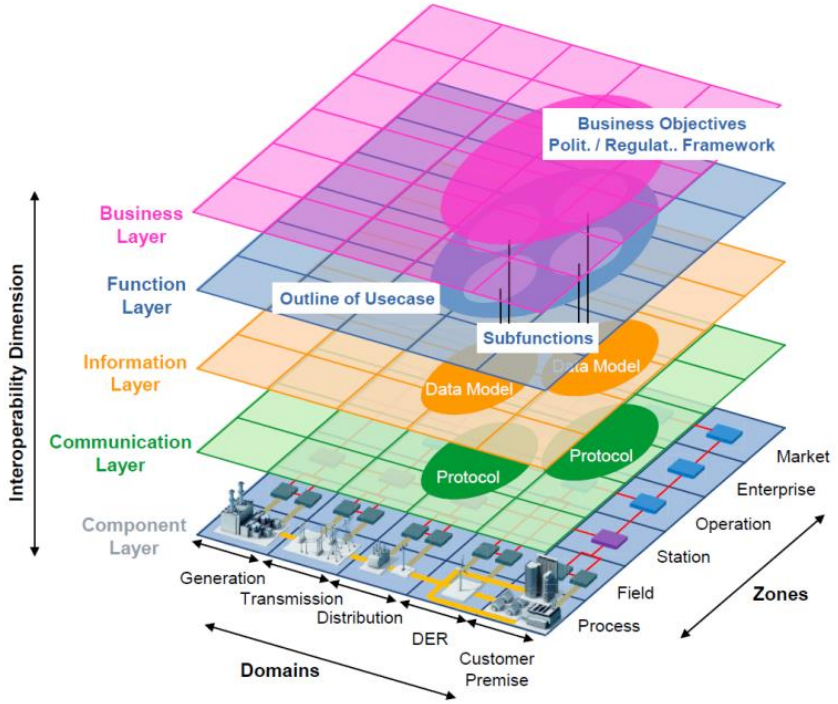


Figure 1: SGAM Framework [8]



- **Legal Layer**
  - Defines the legal basis for data exchange
- **Organizational Layer**
  - Defines the business processes required for data exchange
- **Semantic Layer**
  - Describes the meaning and value of exchanged data
- **Technical Layer**
  - Describes the required technical systems and standard

Evolution of data spaces





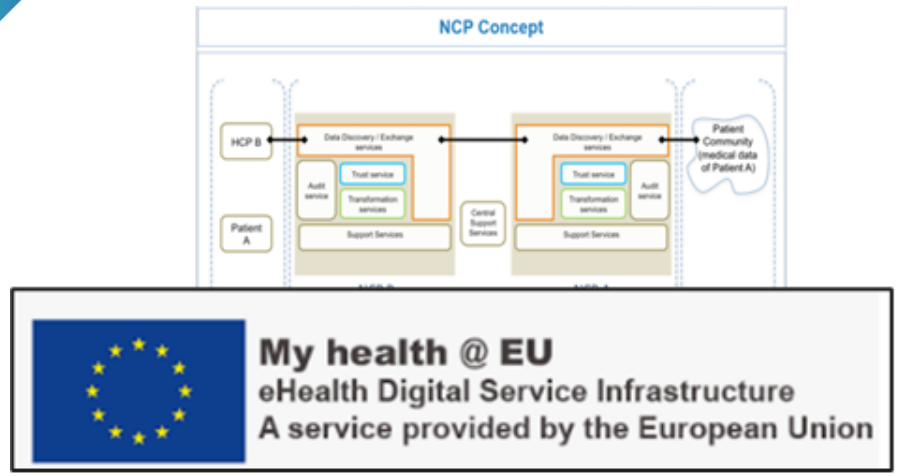
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Pre- standardisation needs

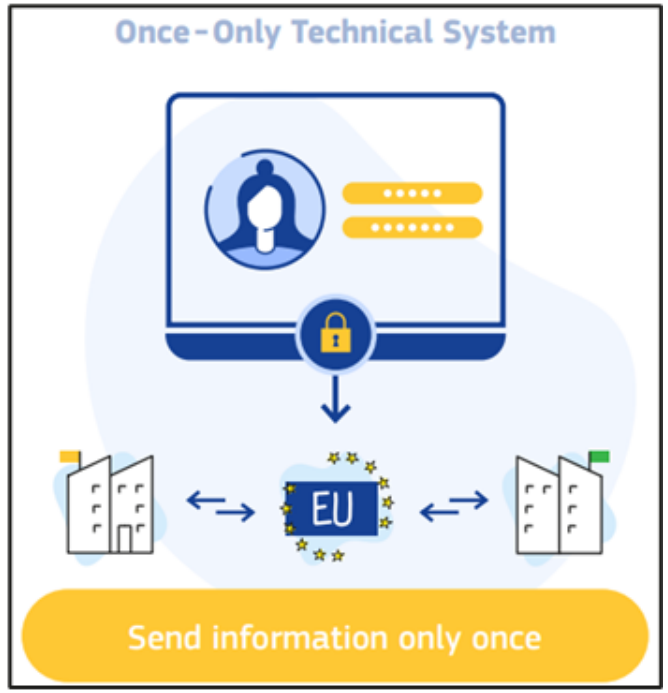
European data spaces in the energy field should rely on an **interoperable IT framework for multi-lateral and cross-sector data exchange**, in order **to enable energy system integration from local to pan-European dimension**.

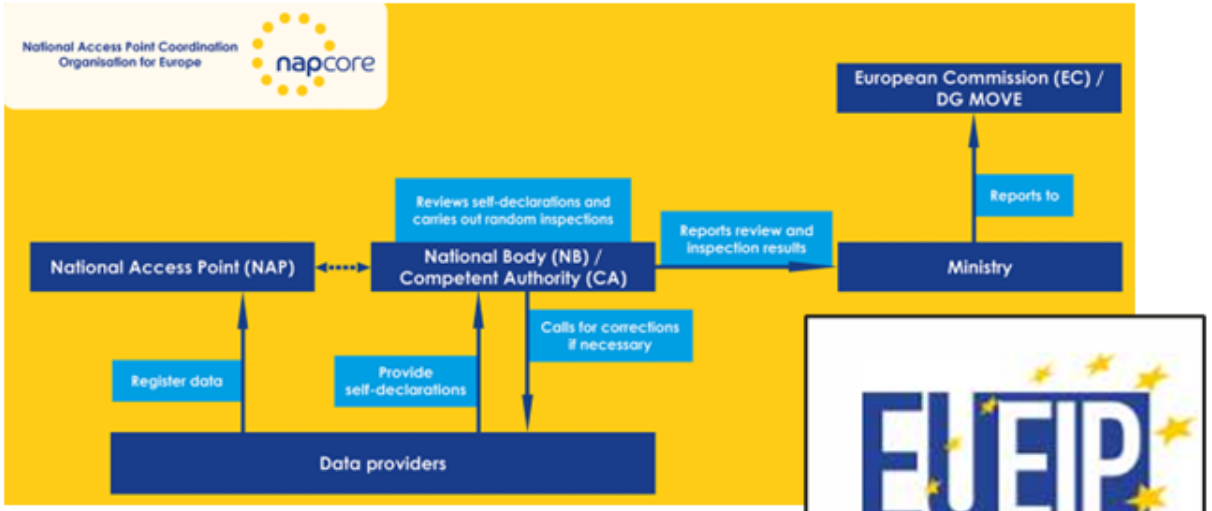
Existing initiatives at European level



CEF Digital
Connecting Europe

interoperable europe





EUEIP
European ITS Platform

int:net

SIMPL
Secure IoT Management PLatform

GAIA-X

An example of excellence in the IEA community – ISGAN SIRFN

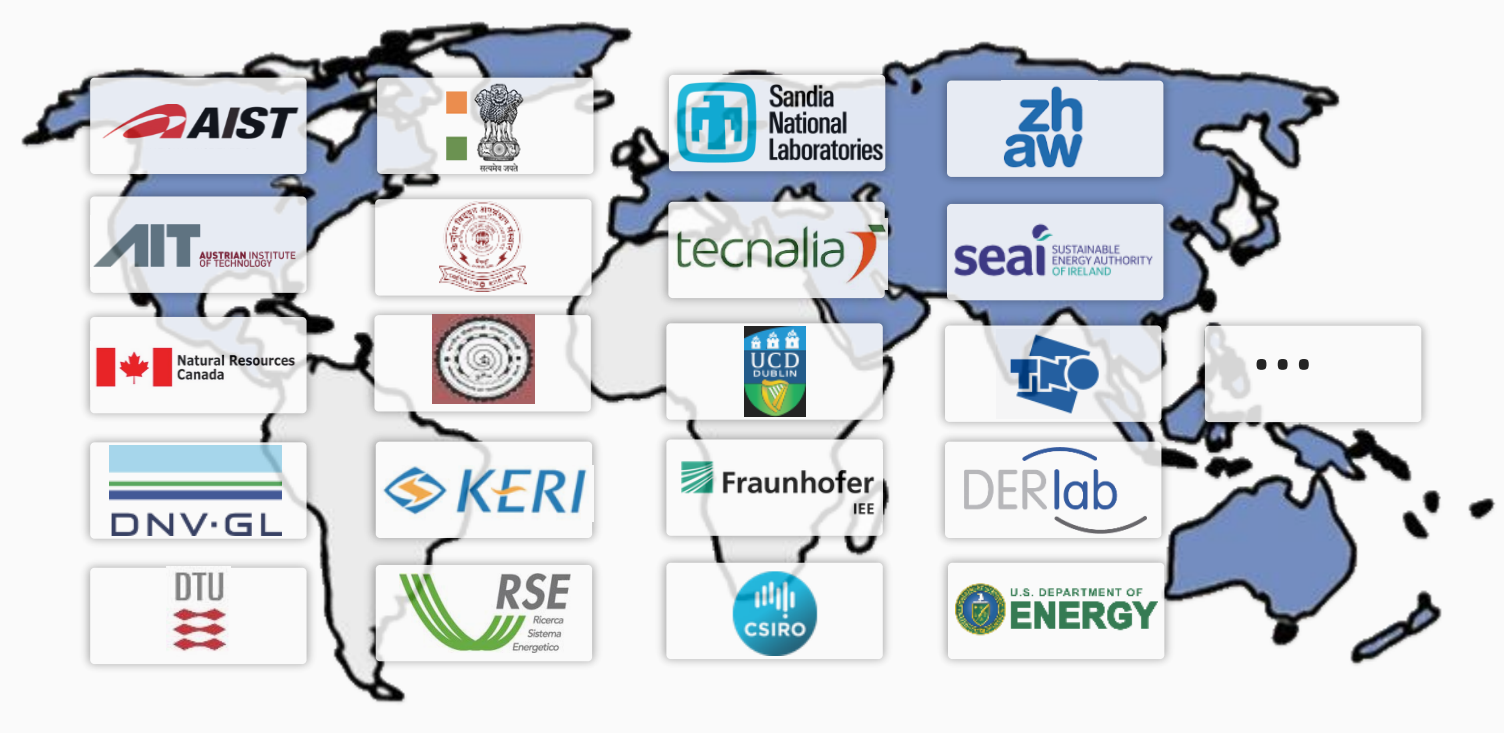
SIRFN in a nutshell

- SIRFN: smart grid testing facilities in countries participating in the ISGAN
- 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.
- SIRFN's collaborative testing/evaluation capabilities are meant to be leveraged by the international community to enable improved design, implementation, and testing of smart grids



Lead WG Manager

SIRFN network of excellence



Facts …

- Benchmark Systems & Models
- Real-Time & Co-Simulation
- Rapid Control Prototyping & Hardware-in-the-Loop
- Testing automation tools
- Grid Code & Standard
- Reports & Dissemination Material

…. and figures

- >20 active members
- 15 countries
- America, Asia, Australia, Europe

Research Infrastructure Topics of SIRFN

- Staying ahead needs continues updating…
- Combining activities of research, laboratories and industry

DER & Plants

Active Distribution Grids

Related to Testing

Testing Methodologies & Methods

Microgrids

Cyber-Physical Energy Systems

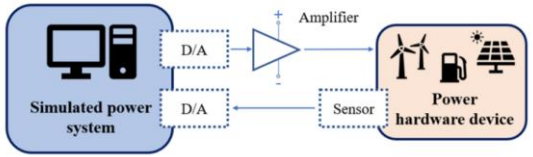
Research Infrastructure Upgrade

Power System Dynamics

Electrical Vehicles

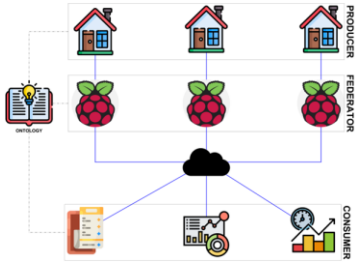
Grid Forming Inverter

SIRFN examples of recent activities



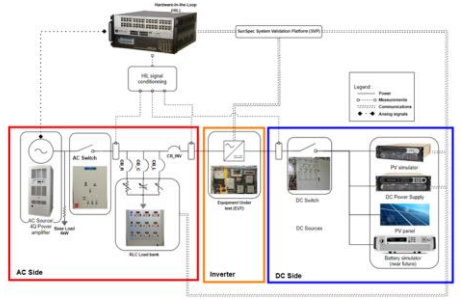
Testing of Grid-Forming Inverter

- Scope:
  - Design novel interfacing methods for robust PHIL setups for testing GFm converters with black-start capability.
  - Develop and validate interfacing compensation schemes, including optimized scaling, delay compensation, and stabilization methods, to enhance stability and accuracy while mitigating the impact of time delay and limited converter capability on grid forming control performance in PHIL setups.



Data Space for R&I international Collaboration

- Scope:
  - Strengthen inter-laboratory interaction of SIRFN members through the exchange of data and sharing of research data in a secure and efficient manner.
  - Overcome legal and technical barriers to data sharing by establishing common standards, tools, and infrastructures, ensuring interoperability and common trust framework among different ecosystems.



Extension on openSVP Testing Automation

- Scope:
  - Further develop the openSVP automated test platform to perform tests according to EN50549 and VDE 4105 standards.
  - Implement the test platform in new research laboratories within the SIRFN network, expanding its application to a wider range of standards and laboratory equipment.

Concluding remarks

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- The increasing complexity of the energy system requires integrated approaches with the contribution of specialised stakeholders. This is the first reason for the opportunity of collaboration;
- The integrated energy system is composed of technologies and solutions from several different sectors (electricty, gas, heating and cooling, water, hydrogen etc.). All these systems need to work in synergy and interfaces need to be adequately developed. This calls for standardisation;
- The digitalisation of several processes has implications along the different layers of the extended SGAM and the interfaces need to be adequately standardised;
- Standards are the result of negotiations among different (national/technological/industrial) interests. Preceding these negotiations with a strong scientific pre-standardisation activity can enable smoother and leaner processes;
- The IEA with its well established and legally strong framework is an ideal platform for joint research and pre-standardisation work. Collaboration in this framework needs to be strenghtened and adequately valorised.

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Contatti

Rimani sempre aggiornato con RSE perché

#wemoversearch

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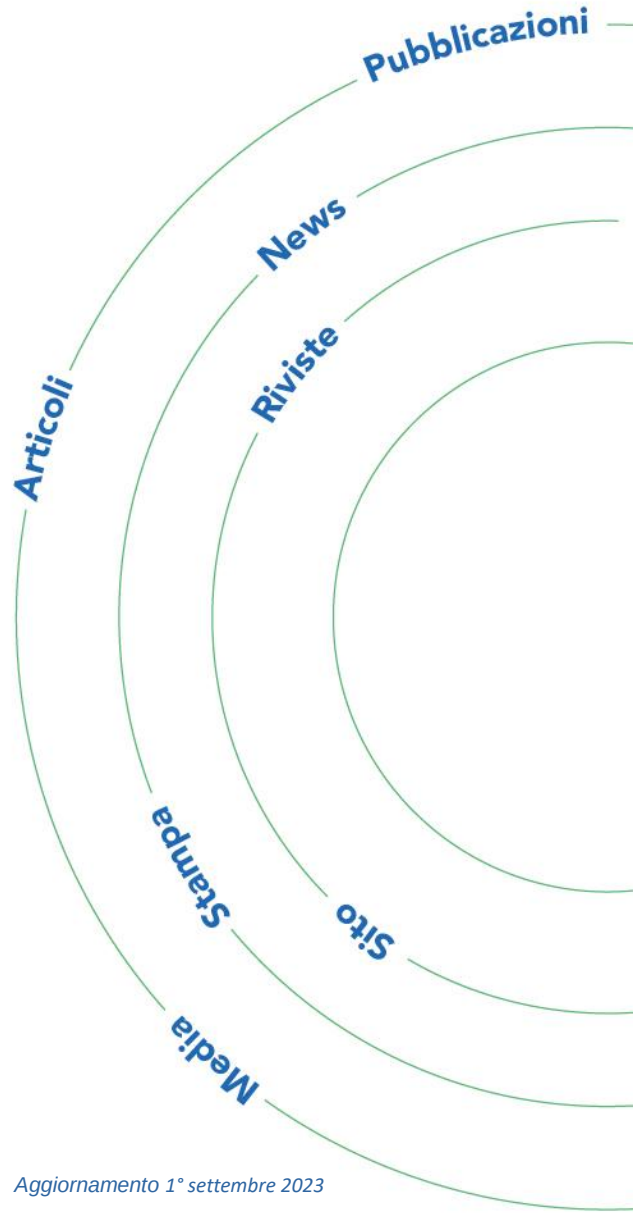
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