

Gaps and Barriers for Energy Technology Development and Deployment View from ISGAN TCP

> Presentation by Maarten Noeninckx Paris 20 March 2017









International Smart Grid Action Network TCP (ISGAN)

'Strategic platform to support high-level government attention and action for the accelerated development and deployment of smarter, cleaner electricity grids around the world'



An initiative of the Clean Energy Ministerial (CEM)



 Organized as the Implementing Agreement for a Co-Operative Programme on Smart Grids (ISGAN)



The CEM is the only multilateral forum dedicated exclusively to the advancement of clean energy technologies and related policies. ISGAN is the only global government-to-government forum on smart grids









ANNEX 1

Main drivers that motivate the governments to develop and apply smart grid solutions and the related technologies.

Identify gaps, opportunities, synergies among smart grid activities and programmes

Catalogue the wide range of smart grid activities underway, mapping the actual activities against the drivers and interests.

Several outstanding smart grids projects have been discussed during webinars and workshops



ANNEX 2

Case Books dedicated to outstanding smart grid applications.

To date, two case books have been delivered, and specifically on Advance Metering Infrastructure (AMI) and Demand Side Management (DSM). A third case book about Consumer Engagement & Empowerment is under preparation.

The Case Books have been transformed into web-based dynamic documents and are meant to be updated on a regular basis..



ANNEX 3

Tools for the assessment of the present smartness of electricity networks

Tools for the evaluation of benefits and costs of smart grids projects characterised by a limited system impact (i.e. local projects).

Six toolkits have been developed covering storage, network automation, ICT and AMI.



ANNEX 7

Governance and sociotechnical issues associated with smart grids deployment.

Preparation of a prototype of a smart grids foresight process to help policy makers to orchestrate a sustainable transition.

Evaluation of processes of market forming, actor involvement and integration

LinkedIn Discussion group entitled "smart grid transition"



ANNEX 5

Smart grid 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,

RES integration: Test Protocols for Advanced Inverter Functions for PV and storage integration

Power Systems Testing: Assess testing needs for systems of systems accounting for growing interdependencies

Lab Testing Methods: Advance state-of-the-art hardware-inthe-loop testing systems



ANNEX 6

Improve understanding of Smart Grid technologies

accelerate their development and deployment and promote adoption of related enabling regulatory and government policies.

Sectors considered: Policy and regulation, expansion planning, Market Analysis, Technology demonstration, System Operation, Security, T&D interaction and optimization.

Discussion papers, state-ofthe art reports, case books



ANNEX 8

Offer the ISGAN community of high level engineers and decision makers a means of rational and efficient continuous technical skills complement and update in the field of smart grids.

The Academy is proposed as a set of e-learning core modules dealing with the entire value chain of smart grid.

Fundamentals and further reading modules are also provided as appendices





AWARD OF EXCELLENCE

Showcases leadership and innovation in SG projects to accelerate global exchange of best practices and promote replication or adaptation of proven concepts in other markets, countries, and regions. In partnership with the Global Smart Grid Federation (GSGF)

- 2014: Consumer Engagement
 & Empowerment
- 2015: Excellence in Smart Grids for Renewable Energy Integration
- 2016: Smart Grids for Reliable Electricity Service





ANNEX 4

Organization of knowledge, key issues, important themes, insightful analysis for the benefit of decision makers.

Lessons learned and best practices on smart grid.

Dissemination of efforts of other ISGAN Annexes

ISGAN interface towards the "Ask an Expert" initiative

Interaction with the CEM Clean Energy Solution Centre (webinars, knowledge sharing, ISGAN On-line Smart grid glossary.







ADDRESSING GAPS AND BARRIERS FOR SMART GRID TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

Different approaches and experiences

Contribution to Technology evolution



- NO DIRECT TECHNOLOGY DEVELOPMENT OR DEMONSTRATION ACTIVITIES
- EXCHANGE AND DISSEMINATION OF INFORMATION AND PERSPECTIVE
- DEVELOP PROTOCOLS AND BEST PRACTICES, IDENTIFY ENVIRONMENTAL ISSUES AND MITIGATION OPTIONS
- A GLOBAL BENCHMARK AND COLLABORATIVE ATTITUDE AMONG PARTICIPATING COUNTRIES
- INDICATE TO EMERGING COUNTRIES THE TECHNOLOGICAL ALTERNATIVES AVAILABLE FOR THEIR OWN DEVELOPMENT

SIRFN – ANNEX 5: TESTING PROTOCOL FOR SMART INVERTERS

- DEFINITION OF TEST PROTOCOLS FOR ADVANCED INVERTER
 INTEROPERABILITY FUNCTIONS
- SEVERAL LABORATORIES HAVE APPLIED THE PROTOCOLS AND COMPARED RESULTS IN DIFFERENT CONDITIONS
- PROTOCOL ASSESSMENT HAS BEEN SHARED WITH KEY STAKEHOLDERS AND ARE NOW ACTING AS THE KEY INPUT FOR CERTIFICATION PROCEDURES (UL 1741SA; IEEE 1547, Korea, etc.)



Importance of Smart Grids Testing (and Annex 5)



- Smart grids integrate previously isolated systems in larger, more complex systems-of-systems.
- This increases the importance of grid sensing and control to manage and balance in real-time a growing diversity of generation and end-use assets.
- Effective lab testing methods, protocols, and practices are needed to validate performance and evaluate growing interdependencies <u>before</u> costly demonstrations and deployments proceed
- Lab testing also informs standards development



SIRFN EXAMPLE: As the number of rooftop PV inverters increases, so does the importance of their predictable response to grid operator signals. If one inverter fails to ride through a voltage disturbance as commanded, then there is likely little problem. But if many inverters fail to ride through, then the risk of a cascading failure increases. Hence, ISGAN SIRFN developed test protocols for a set of core functions to assess inverter response to grid operator signals.

* Technology Knowledge Exchange –

Integrate renewables Improve markets Integrate renewables



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Publication name	Year	Type of Publ.	Level	Driver	Irend *
FLEXIBLE POWER DELIVERY SYSTEMS: An Overview of Policies and	2013	Discussion paper	TSO	个	Integration
Regulations and Expansion Planning and Market Analysis for the					
United States and Europe					
Smarter & Stronger Power Transmission: Review of feasible	2013	Discussion paper	TSO	14	Integration
technologies for enhanced capacity and flexibility					digitalization
TSO-DSO interaction: An Overview of current interaction between	2014	Discussion paper	TSO+DSO	1	Decentralization
transmission and distribution system operators and an assessment of					
their cooperation in Smart Grids					
The Smart & Strong Grid : Technology, Policy, and Finance to	2014	Policy Brief			Integration
Connect People with Reliable Clean Energy					
The Smart & Strong Grid : Connecting Clean Energy with People	2014	Technology Brief		全日	Integration
					<u> </u>
Spotlight on Smart and Strong Power T&D Infrastructure ver. 1.0	2015	Case Book	TSO+DSO		Integration,
					decentralization,
					digitalization
Deploying Smart and Strong Power Grids: Best Practices from Austria,	2015	Public Webinar	TSO+DSO		S Integration,
Ireland and Around the World					decentralization,
					digitalization
Synchrophasor Applications for Wide Area Monitoring and Control	2016	Discussion paper	TSO	수 유	Digitalization
Spotlight on Smart and Strong Power T&D Infrastructure ver. 2.0	2016	Case Book	TSO+DSO		S Integration,
					decentralization,
					digitalization
Storage and balancing as key elements for future network planning	2016	Discussion paper	TSO	수 \$	Integration
and electricity markets design					
The role and interaction of microgrids and centralized grids in	2016	Discussion paper	DSO	*	Broader economic
developing modern power systems – A case review					growth and access

Contribution to Market development



- RAPID UPTAKE OF RENEWABLES REQUIRES SMART GRIDS DEPLOYMENT
- BOLSTER THE DEMAND FOR SOPHISTICATED CONTROL SYSTEMS
- ISGAN GLOBAL PARTICIPATION REPRESENTS MORE THAN 90% WORLDWIDE INVESTMENTS
- EXPERIENCES EXPRESSED ARE UNIQUE FORUM OF DISCUSSION AND EXPERIENCE SHARING

ISGAN ANNEX 2 – CASE BOOK ON ADVANCED METERING INFRASTRUCTURE



- GATHERS THE EXPERIENCE OF DEPLOYING SMART METERS IN 19 COUNTRIES, CHARACTERISED BY DIFFERENT NETWORK CONDITIONS, REGULATIONS, ENERGY MIX, LEGISLATION, CONSUMER REACTIONS
- LESSONS LEARNED FROM THIS BENCHMARK AND INSIGHT IS OF HIGH VALUE FOR THE POLICY MAKERS
- MORE THAN **3300 COPIES** OF THE PDF VERSION THIS REPORT HAVE BEEN DOWNLOADED
- IMPORTANCE OF FINAL USER ACCEPTANCE, REGULATION, PRICING POLICIES, PRIVACY, CYBERSECURITY, DATA ANALYSIS (BIG DATA) AND AMI BUSINESS CASES

Contributing to Policy Insight

- TOP PRIORITY FOR ISGAN.
- **UNBIASED TECHNICAL EXPERTISE** AND THE DIRECT INTERACTION WITH POLICY MAKERS ARE TWO MAJOR ASSETS.
- SUCCESS FACTORS: TECHNICAL SOUNDNESS OF THE INFORMATION AND KNOWLEDGE **EFFICIENT TRANSLATION** OF THE TECHNICAL CONCEPTS INTO IMPACTFUL POLICY MESSAGES.
- **DEDICATED ANNNEX** SET UP SINCE THE BEGINNING OF THE INITIATIVE.

ISGAN ANNEX 2 – ASSISTING THE GOVERNMENTS OF MEXICO AND SOUTH AFRICA



- **MEXICO'S TRANSFORMATIVE POWER SYSTEM REFORMS:** OPPORTUNITIES TO INTEGRATE ADVANCED DEVICES AND APPROACHES INTO MEXICO'S ELECTRICITY GRID AND ACTIVELY SEEKING INTERNATIONAL EXPERIENCE ON THIS TOPIC
- SOUTH AFRICA DEVELOPING THE MARKET FOR ROOFTOP **PHOTOVOLTAIC: FFFFCTIVELY SHOWCASED EMERGING** FRAMEWORKS, METHODOLOGIES, AND EXPERIENCES FOR INTEGRATING ROOFTOP PV IN ELECTRIC POWER SYSTEMS AND MARKETS, AND HOW THEY COULD POTENTIALLY BE APPLIED IN SOUTH AFRICA



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Vision and Mission



Vision: The vision of ISGAN is **the attainment of national, regional and global clean energy and climate goals** supported by the integration of advanced technological, operational and analytical capabilities for electric power grids, including the smart management and coordination of the participants in the electricity system.





Mission: The mission of the International Smart Grid Action Network is to provide a platform for the development and exchange of expertise and competence on smarter, cleaner electric power systems and to serve as an important channel for communication of related knowledge, trends, and lessons learned, and future plans in support of national, regional and global climate and clean energy objectives.







Key messages

 ISGAN emphasizes the importance of strong, reliable, resilient, flexible, and affordable power grids, supported by the digitalization of the electricity system for achievement of goals on the "grid edge" (e.g., integration of EVs, RE, energy storage, and demand side management)

• The path forward

- ISGAN notes five (5) major global trends for electricity systems: decarbonization, decentralization, integration, digitalization, and (broader, sustained attention to) economic growth and access
- Of critical importance to progress on all five trends is the flexibility of the electricity system enabled by smart grid solutions
- ISGAN has selected flexibility and digitalization as its principal themes for 2017 (and maybe beyond)

Workplan





- Continue to target, first and foremost, Government agencies and officials, especially those developing or implementing policies and programs on smart grids.
- Identify areas for increased attention and investment; examine smart grid development in relation to regulatory and institutional considerations and technical needs; improve international collaboration and competency on smart grid testing and evaluation; and further enable a global community of smart grid practitioners.
- Assess its potential role in **deeper grid modelling**, analysis, metrics and scenarios development in support of broader climate and clean energy efforts, such as the IEA Energy Technology Perspectives suite of activities



Thank you!



For more information, please visit:

- o ISGAN: <u>www.iea-isgan.org</u>
- 21st Century Power Partnership: <u>www.21stcenturypower.org</u>
- Power System Challenge: <u>www.powersystemchallenge.org</u>
- Clean Energy Ministerial: <u>www.cleanenergyministerial.org</u>
- IEA Energy Technology Network: <u>https://www.iea.org/tcp/</u>
- Clean Energy Solutions Center including "Ask-an-Expert" service: www.cleanenergysolutions.org
- Global Smart Grid Federation: <u>www.globalsmartgridfederation.org</u>
- Contact: <u>maarten.noeninckx@economie.fgov.be</u>
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