

***ISGAN Annex 6 -
The power grid as an enabler for an efficient
utilization of renewable resources***

*IEA TCPs Joint Workshop
Energy Efficiency in Future Electricity Systems: The Invisible Fuel*

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Milano, Italy***

Outline of the presentation



- Annex 6 Power T&D systems
 - Objective and Achievements
 - Future work
- The power grid as an enabler for energy efficiency and a sustainable energy system
- Proposal for future inter-TCP cooperation

Objective



- Facilitate the use of smarter and stronger power grids given significant trends in the industry (integration of large amounts renewable energy sources, aging infrastructure, integration of information technology systems, etc)
- Condense to conclusions and recommendations for policy makers

The main objective of this Annex is to establish a long term vision for the development of “Smarter and Stronger Power T&D Systems”. The Annex shall consist of efforts to improve understanding of Smart Grid technologies applicable to or influencing power system performance, transmission capacities and operating practices; accelerate their development and deployment; and promote adoption of related enabling regulatory and government policies.

From “OBJECTIVES” in the PoW for Annex 6

ISGAN – Annex 6



Sweden (lead)

Austria

Belgium

Denmark

France

India

Italy

Norway

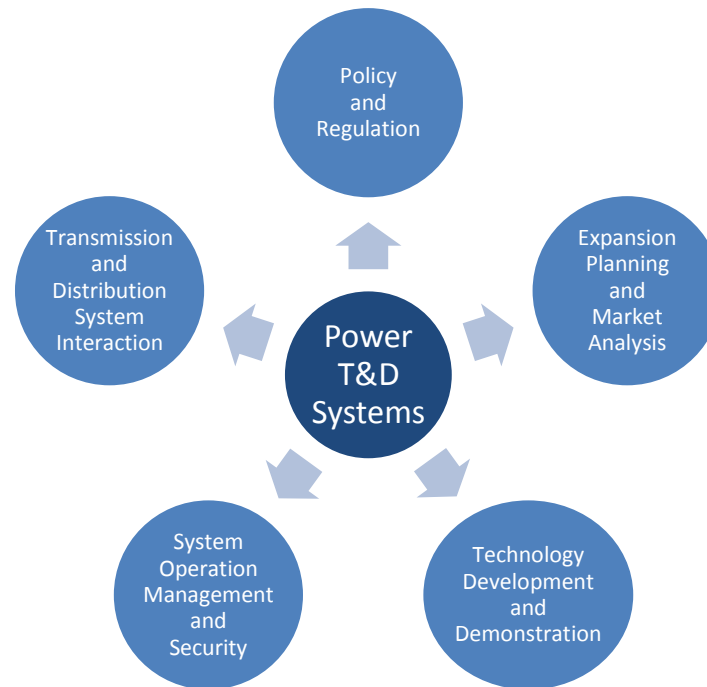
South Africa

United States

Ireland

Canada

Switzerland



Power grids as enablers for large scale integration of renewables!

Work plan



Collaboration with other initiatives

Case Book

2015
T&D Case Book
Version 1.0

Annex 6
Power T&D
Systems



Best
TRANSMISSION
FOR
SUSTAINABILITY
Paths

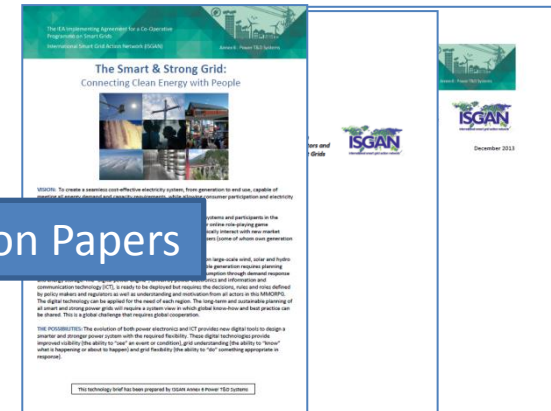
NASPI North American
SynchroPhasor Initiative

SmartNet

Discussion Papers

Workshops

Papers and outreach
based on Annex work



Achievements



Publication name	Year	Type of Publication
FLEXIBLE POWER DELIVERY SYSTEMS: An Overview of Policies and Regulations and Expansion Planning and Market Analysis for the United States and Europe	2013	Discussion paper
FLEXIBLE POWER DELIVERY SYSTEMS: An Overview of Policies and Regulations and Expansion Planning and Market Analysis for the United States and Europe	2013	Published executive summary
Smarter & Stronger Power Transmission: Review of feasible technologies for enhanced capacity and flexibility	2013	Discussion paper
Smarter & Stronger Power Transmission: Review of feasible technologies for enhanced capacity and flexibility (SUMMARY VERSION)	2013	Published executive summary
TSO-DSO interaction: An Overview of current interaction between transmission and distribution system operators and an assessment of their cooperation in Smart Grids	2014	Discussion paper
The Smart & Strong Grid : Technology, Policy, and Finance to Connect People with Reliable Clean Energy	2014	Policy Brief
The Smart & Strong Grid : Connecting Clean Energy with People	2014	Technology Brief
Spotlight on Smart and Strong Power T&D Infrastructure ver. 1.0	2015	Case Book
Deploying Smart and Strong Power Grids: Best Practices from Austria, Ireland and Around the World	2015	Public Webinar
Synchrophasor Applications for Wide Area Monitoring and Control	2016	Discussion paper
Spotlight on Smart and Strong Power T&D Infrastructure ver. 2.0	2016	Case Book
Storage and balancing as key elements for future network planning and electricity markets design	2016	Discussion paper
The role and interaction of microgrids and centralized grids in developing modern power systems – A case review	2016	Discussion paper

Achievements



- Papers based on Annex 6 work

Title of the paper	Arena	Conference/Magazine	Year	Authors
An International Review of the Development of Technologies for Smart Grid	Conference Paper	Protection, Automation & Control World Americas, Raleigh, NC, USA	Sept 2014	Carl Ohlen, STRI Kjetil Uhlen, NTNU
Spotlight on Smart and Strong Electric Power Infrastructure - Best practice shared from the ISGAN Annex 6 case book	Conference Paper	India Smart Grid Week, Bangalore, India	March 2015	Susanne Aceby, STRI Bo Normark, Power Circle
Why the TSO-DSO Relationship Needs to Evolve	Newsletter article	IEEE smart Grid Newsletter	July 2015	Antony Zegers, AIT Susanne Aceby, STRI Karin Haas, NREL
The role and interaction of microgrids and centralized grids in developing modern power systems	Conference Paper	India Smart Grid Week, Dehli, India	March 2016	Jonas Tjäder, STRI Susanne Aceby, STRI Caroline Bastholm, Dalarna University
Spotlight on Smart and Strong Electric Power Infrastructure - Best practice shared from the ISGAN Annex 6 case book	Web magazine	The ICER Chronicle June 2016 web magazine	June 2016	Susanne Aceby, STRI Bo Normark, Power Circle

- Organized or co-hosted ~2 workshops/yr

Coming activities



- TSO-DSO interaction
 - *What are the requirements on data exchange and ICT to realize the TSO-DSO interaction needed to fully utilize the flexibility opportunities?*
- Share scenarios
 - *What requirements on the electricity system can we see regarding e.g. flexibility and digitalization by looking at future scenarios?*
- Knowledge sharing Webinar (Garpur)
 - *How do we consider the flexibility opportunities when working with reliability management?*
- Efficient use of energy
 - *How can we use the flexibility potential to have a more efficient use of energy and what potential gaps are there to realize this?*

The Power Grid as an Enabler



Potential for energy efficiency in the power sector – three key aspects

- *The increase of renewable sources integration (and in particular of variable renewables such as wind and solar and of high efficiency co-generation);*
- *The reduction of network losses, adopting all technically sound measures and economically sustainable solutions;*
- *The implementation of demand-response schemes, including demand aggregation, to enhance system flexibility, reduce load peaks, and increase energy conservation.*

In all these three areas, the transmission and distribution grids has an important role to play

The Power Grid as an Enabler



The increase of renewables sources integration

- A well developed and smart electric grid will enable a high penetration of renewable production resources
 - Increased hosting capacity of the grid
 - Decrease the need for curtailment
 - Manage both large scale integration and distributed renewable resources on local level

The Power Grid as an Enabler



The reduction of network losses

- Network losses can be reduced using smart control of the grid, but....
- ...a more efficient use of the grid with the help of smart control functions may also increase technical network losses as....
- ...smart grid solutions give new opportunities to optimize between capital and operational costs by deferring network reinforcement and enabling cheaper and more timely connections

The Power Grid as an Enabler



Utilizing demand side flexibility

- A well developed and smart electric grid will enable proper market functions to capture the full potential of demand side resources and customers active participation
- Smart grids enabling demand response will contribute to more efficient use of the network
 - More efficient resolution of network issues – congestion management etc.
 - Deferring or avoiding network reinforcement etc.
- An integrated view is necessary, optimizing flexibility benefits for the whole system

Proposed collaboration project

Starting point



- Different means can lead towards the same goal - a more flexible and sustainable energy system
- Crucial to apply a multi-dimensional system view- least cost mix of renewable energy and energy efficiency implementation.
- Power grids will play a key role in fostering overall efficiency of the energy system
 - Enhance controllability with advanced measurements, system information and ICT
 - Optimize use of clean production resources with the help of DSM
 - Utilize energy efficient electrical equipment, both in the network and at customer level

Program of work



- Proposed objective
 - Deliver a joint policy paper applying a wider system approach to efficient use of energy
 - Point out remaining needs regarding e.g. innovation, regulation and knowledge about user behaviour to reach an efficient and sustainable electricity system focusing on efficient use of energy while maximizing the use of available clean renewable energy
- Timing
 - Start February 2017
 - Presentation at a public workshop in Brussels in connection to ISGAN ExCo14 Q3/Q4 2017

Possible outcome – joint paper



- Identify important policy interdependency in promoting over all energy system efficiency (Smart Grid, RES, EE etc.)
- Identify common principles and recommendations that allows for solutions tailored to national and regional needs
- Advise on policy and regulation to capture (and fairly distribute) the value of innovative solutions benefiting the over-all energy system
- Increase understanding, identify and develop renewable energy and energy efficiency policies which deliver the best outcomes for the policy investment dollar.

Thank you!

ISGAN website

<http://www.iea-isgan.org/>

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