

Implementing Agreement for a Co-Operative  
Programme on Smart Grids

# Annual Report 2018

for the period from March 1<sup>st</sup> 2018 to February 28<sup>th</sup>, 2019

# Disclaimer

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August 2019

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# Message from the Chair

It is my pleasure to present to you the eighth annual report of ISGAN. As both a Clean Energy Ministerial (CEM) initiative and an International Energy Agency (IEA) Technology Collaboration Programme (TCP), ISGAN continues to be a trusted center of expertise and the only global government-to-government forum on smart grids. I hope this report will give you further insights to the achievements of ISGAN and the critical role of smart grid development for the affordable and reliable integration of clean energy technologies around the world.

ISGAN participants span the globe, including most major developed and emerging economies on five continents. I am delighted that ISGAN during this year has expanded its already broad membership to 26 contracting parties, as UK became a contracting party in January 2019.



To leverage ISGAN's activities, outputs, and growing network of experts ISGAN is striving to broaden its collaboration with other international power systems activities. Recognizing that smart grids cut across R&D and deployment, I am particularly pleased that ISGAN and Mission Innovation (MI) Innovation Challenge #1 on smart grids (IC1) have agreed to join forces, manifested by a letter of intent (LOI) agreed November 23, 2018 in Rome. Other prominent examples of successful collaborations are the highly recognized public workshops organized back-to-back with ExCo meetings such as the 8th International Conference on Integration of Renewable and Distributed Energy Resources IRED2018 (ExCo16, Vienna).

ISGAN recognizes that technology is not the primary factor limiting smart grid deployment and during the year regulatory aspects and market design has been given increased attention by ISGAN. As an example, ISGAN organized several successful activities during the 9th Clean Energy Ministerial meeting (CEM9) to highlight opportunities and needs to accelerate smart grid deployment through innovative market design and on energy storage systems.

ISGAN's Annexes play a pivotal role as standing working groups that continuously develop and share knowledge and tools, identify trends, highlight emerging solutions, and point to opportunities for policy and development. All seven Annexes have been active and delivered numerous impactful results during the year. The success of our work is a result of the enthusiastic participation of its member countries experts. I would like to express my appreciation to all of you engaged in the ISGAN community and especially to the Leads and Operating Agents of our Annexes and the ISGAN co-Secretariats without whom our achievements would not have been possible.

Sincerely,

Karin Widegren

# Table of Contents

1.	ISGAN overview .....	6
1.1.	What is ISGAN? .....	6
1.2.	Vision .....	8
1.3.	ISGAN's strengths .....	8
1.4.	History .....	8
1.5.	ISGAN's organizational structure .....	9
1.5.1.	The Executive Committee (ExCo).....	10
1.5.2.	The Presidium .....	10
1.5.3.	Contracting Parties .....	11
1.5.4.	Secretariat and Operating Agent.....	12
1.6.	Key Achievements in 2018 .....	14
2.	ISGAN Annexes .....	20
2.1.	Annex 2: Smart Grid Case Studies .....	22
2.1.1.	Knowledge Transfer Project .....	23
2.2.	Annex 3: Cost-Benefit Analyses and Toolkits .....	25
2.2.1.	Main accomplishments in 2018.....	25
2.3.	Annex 4: Synthesis of Insights for Decision Makers.....	27
2.3.1.	Main accomplishments in 2018.....	27
2.4.	Annex 5 Smart Grid International Research Facility Network (SIRFN) .....	29
2.4.1.	Main accomplishments in 2018.....	30
2.5.	Annex 6: Power Transmission and Distribution Systems.....	31
2.5.1.	Main accomplishments in 2018.....	32
2.6.	Annex 7: Smart Grid Transitions and Institutional Change.....	34
2.6.1.	Main accomplishments in 2018.....	34
2.7.	Annex 8: ISGAN Academy on Smart Grids .....	36
2.7.1.	Main accomplishments in 2018.....	36

3.	ISGAN Award of Excellence .....	38
4.	Collaboration and Co-operation .....	39
4.1.	Ninth Clean Energy Ministerial (CEM9).....	39
5.	ISGAN Executive Committee Meetings .....	40
5.1.	15 <sup>th</sup> Executive Committee meeting (ExCo15), Newcastle, Australia .....	40
5.1.1.	ISGAN community visit to Summerhill Waste Management Facility .....	40
5.2.	16 <sup>th</sup> Executive Committee meeting (ExCo16), Vienna, Austria .....	41
6.	Deliverables.....	44
6.1.	ISGAN Publications .....	44
6.2.	ISGAN Workshops and Other Events.....	46
6.2.1.	Activities during Nordic Clean Energy Week and CEM9 .....	46
6.2.2.	Workshop on Mission Innovation Challenge 1 .....	47
6.2.3.	Smart Energy for Smart Cities .....	47
6.2.4.	SIRFN Workshop on Test Protocols, Methods and Microgrid Research .....	48
6.2.5.	IRED 2018 .....	48
6.3.	ISGAN Webinars .....	48

# 1. ISGAN overview

## 1.1. What is ISGAN?

ISGAN, the International Smart Grid Action Network, is a Technology Collaboration Programme (TCP) of the International Energy Agency (IEA). The co-operative programme was formally established in 2011 and is also an initiative of the Clean Energy Ministerial (CEM).

The Clean Energy Ministerial is a high-level global forum striving to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Initiatives are based on areas of common interest among participating governments and other stakeholders.

ISGAN is an IEA Technology Collaboration Programme, and as such seeks to support governments and industry with insight and recommendations to high-level decision-makers. In addition, ISGAN closely co-operates with Mission Innovation, a global initiative that promotes the acceleration of the clean energy transition.

Operating as both an IEA TCP and a CEM Initiative, ISGAN is an international platform for the development and exchange of knowledge and expertise on smarter, cleaner, and more flexible electricity grids ("Smart Grids"). ISGAN provides an important channel for the communication of experience, trends, lessons learned, and visions in support of global, national and regional clean energy objectives as well as new flexible and resilient solutions for Smart Grids.



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▲ Smart Grids

ISGAN seeks to improve global understanding of the benefits and opportunities of Smart Grids, to accelerate their development and deployment through furthering knowledge, frameworks, and tools. ISGAN's Contracting Parties can then apply these within their own national, subnational, or regional contexts. The network's impact relies on the development of publications that will enable smarter investment and better policy but is also heavily dependent on the implementation by authorities in sovereign nations.

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 emphasizes knowledge sharing by design and seeks to identify and implement effective communication mechanisms to ensure that results are useful for decision makers.

ISGAN recognizes that robust, resilient, and smart electric grids play a key role in enabling greenhouse gas (GHG) emission reductions. This is achieved through:

- Management of electricity demand
- Integration of growing supplies of both utility-scale and distributed small-scale renewable energy systems
- Accommodation of an increasing number of electric and plug-in hybrid electric vehicles,
- Improvement of operational grid efficiency
- Application of energy-efficient technologies at their full potential

Smart Grids also enable better utilization of existing electricity generation assets. In coordination with the IEA and CEM, ISGAN strives to improve the potential of Smart Grid technologies at global, national and regional levels.

Investment in Smart Grid technologies and approaches, including Smart Meter deployment, has grown rapidly in recent years around the world. Increasingly, Smart Grids are playing a critical role towards the affordable and reliable integration of clean energy technologies. To ensure that Smart Grids can continue to meet current and future power system challenges, there is an increasing need for more adaptive regulatory frameworks and market designs that enable the development of innovative business models and accelerate market uptake. Challenges that Smart Grids will be expected to manage in parallel include:

- Integration and interaction among an increasingly complex and diverse set of clean energy technologies, including sector coupling across electricity, space heating/cooling, transport, etc.
- Accommodation and coordination of all available sources of flexibility with the ability to improve system efficiency, maintain system reliability and resiliency, and cost management
- Increased use of local energy systems and microgrids including storage, where appropriate
- Engagement of an growing variety of power systems stakeholders and roles in an increasingly connected society, taking advantage of new digital tools and business models focused on delivery of data-driven energy services

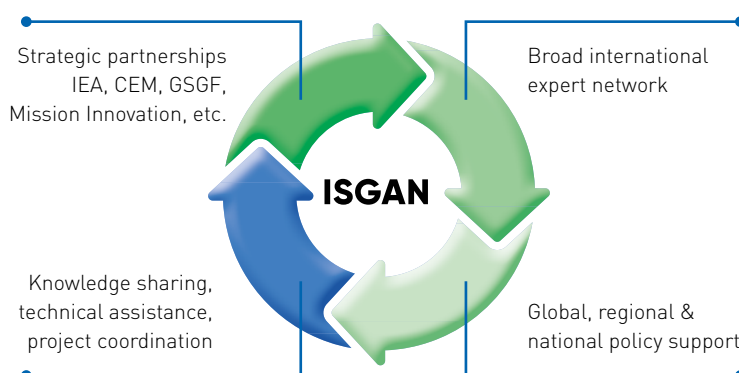
## 1.2. Vision

ISGAN's vision is to accelerate progress on key aspects of Smart Grid policy, technology, and investment through voluntary participation of governments and their designees in specific projects and programs. Its activities center foremost on those aspects of Smart Grids 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
- User and consumer engagement

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

### ISGAN's value proposition



## 1.3. ISGAN's strengths

### Broad Expert Network

ISGAN leverages expertise from governments, national laboratories and research institutions, transmission and distribution system operators, power generators, and other stakeholders from 25 countries from five continents

### Partnerships with Thought Leaders

ISGAN engages leading private sector Smart Grid initiatives, the IEA Energy Technology Network, and other Clean Energy Ministerial initiatives to advance systems perspectives on power grids and grid integration

### Diverse Portfolio

ISGAN implements a range of activities to support a better global understanding of Smart Grids and the value they offer, address gaps in knowledge and tools, enhance peer-to-peer exchange, and otherwise improve international coordination

## 1.4. History

ISGAN was launched in Washington, D.C., USA, in July 2010, at the first Clean Energy Ministerial meeting (CEM1), a forum for energy and environment ministers and stakeholders from 23 countries and the European Union. ISGAN was formally established at CEM2 in Abu Dhabi, in April 2011, as an Implementing Agreement for a Co-operative Programme on Smart Grids, operating under the IEA Framework for International Energy Technology Cooperation.

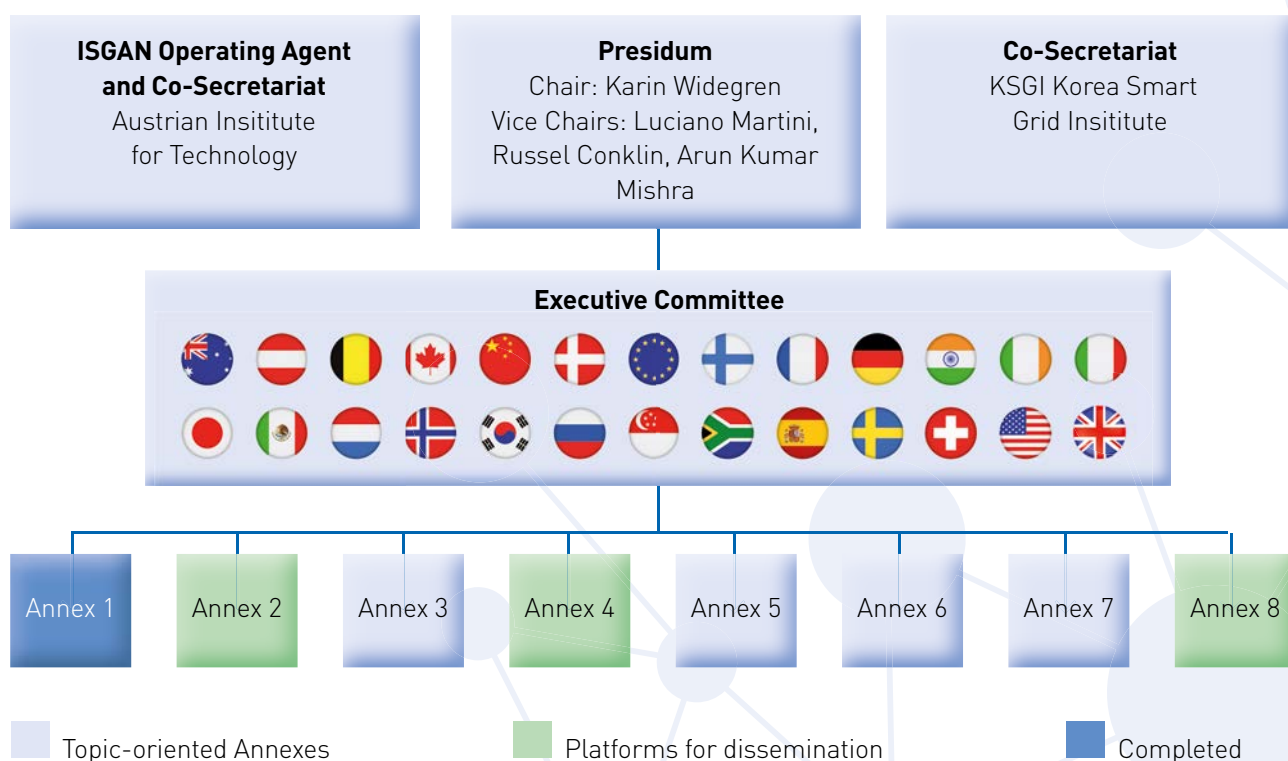
After the end of its first five-year period, an extension for ISGAN was requested and approved by the IEA in February 2017. The extension was granted for the period of March 1<sup>st</sup>, 2017 until February 28<sup>th</sup>, 2022.



## 1.5. ISGAN's organizational structure

ISGAN is an implementing agreement with currently 26 Contracting Parties. Their nominated representatives form the Executive Committee which is headed by the Presidium and assisted by the co-Secretariats and the Operating Agent of ISGAN. The activities of ISGAN are organized in eight Annexes, which are standing working groups. Each Annex consists of national experts from Contracting Parties and is led by the Annex' Operating Agent and its Lead. Annex 1 has already been completed, with some of its remaining tasks moved to Annex 2.

Four of the Annexes are topic-oriented (Smart Grids testing, future T&D system needs, cost-benefit analyses and institutional changes), while three Annexes constitute platforms for dissemination and deployment of Smart Grid practices focused on specific products and methodologies (Annexes 2 together with Annex 4 comprise knowledge transfer projects (KTP) and case books, Annex 4 strategic communication to decision makers, Annex 7 social aspects and Annex 8 webinar-based virtual training).



## 1.5.1. The Executive Committee (ExCo)

Each Contracting Party appoints a delegate and an alternate to the Executive Committee. This is the decisionmaking body of ISGAN and convenes twice a year. Its main aims are to discuss new developments, identify knowledge gaps and implementation barriers, and shape ISGAN's Programme of Work accordingly. ExCo meetings are well attended; on average, 80% of the Contracting Parties and of Annex Operating Agents/ Leads participate in ExCo meetings.



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▲ ISGAN Executive Committee

## 1.5.2. The Presidium

The ExCo is led by the Chair and one or more Vice-Chairs, together they form the Presidium. Each member of the Presidium is elected for a period of two years, with possible re-election. The first Presidium was elected at the inaugural meeting in Seoul, Korea, in June 2011. During ExCo17 in Sweden, Maarten Noenickx was elected as fourth Vice Chair.

The current Presidium consists of:

- **Karin Widegren**, ISGAN Chair  
Widegren Energy, representing the Swedish Energy Agency  
karin@widegrenenergy.se
- **Arun Kumar Mishra**, ISGAN Vice Chair  
Director NSGM-PMU, India  
akmishra@powergridindia.com
- **Luciano Martini**, ISGAN Vice Chair  
Ricerca sul Sistema Energetico S.p.A, Italy  
Luciano.Martini@rse-web.it



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▲ ISGAN Presidium

- **Russell Conklin**, ISGAN Vice Chair  
U.S. Department of Energy  
Russell.Conklin@hq.doe.gov
- **Maarten Noenickx**, ISGAN Vice Chair  
SPF economie  
Strategic Advisor  
Directorate-General Energy  
Strategy and Coordination

### 1.5.3. Contracting Parties

Under the IEA Framework for International Energy Technology Co-Operation, ISGAN is open to all governments, yet only upon invitation from the ISGAN Executive Committee. Although ISGAN is primarily focused on government-to-government cooperation, it is also open to entities designated by the participating governments, including academic institutions, select private sector and industry associations as well as international organizations.



### List of ISGAN Contracting Parties (as of February 2018):

1.		Austria	14.		Japan
2.		Australia	15.		Korea
3.		Belgium	16.		Mexico
4.		Canada	17.		The Netherlands
5.		China	18.		Norway
6.		Denmark	19.		Russian Federation
7.		The European Commission	20.		Singapore
8.		Finland	21.		South Africa
9.		France	22.		Spain
10.		Germany	23.		Sweden
11.		India	24.		Switzerland
12.		Ireland	25.		The United States of America
13.		Italy	26.		United Kingdom

During ExCo16 (2018) in Vienna, the United Kingdom, Morocco and Brazil were present as observers and indicated their interest in joining ISGAN. At the same meeting, the ExCo decided by unanimous vote to invite the UK to become a Contracting Party.

The UK signed the implementing agreement in January 2019 and became the 26<sup>th</sup> Contracting Party of ISGAN.

ISGAN has been constantly seeking to widen its group of member states, and will continue to do so in the upcoming term of the programme. Countries that ISGAN has been in contact with include Morocco, Brazil, Czech Republic and Turkey.

At ExCo16 (2018) in Vienna, Austria, Brazil was present as observer. The ExCo decided by unanimous vote to invite Brazil to become a Contracting Party to ISGAN. The accession process is currently underway. Several other countries are in discussion with ISGAN about their potential participation in the TCP and attendance of upcoming ExCo meetings.

#### 1.5.4. Secretariat and Operating Agent

As per the Implementing Agreement, an Operating Agent (OA) must be appointed as a legal representative of ISGAN. AIT Austrian Institute of Technology has been holding the position of ISGAN OA since June 2017. During ExCo16, Werner Friedl took over the position of the ISGAN Operating Agent.

- **Werner Friedl**, Operating Agent of ISGAN, [Werner.Friedl@ait.ac.at](mailto:Werner.Friedl@ait.ac.at)

ISGAN is supported by two co-Secretariats, as per the decision taken at ExCo13: AIT Austrian Institute of Technology and the Korea Smart Grid Institute (KSGI).

The Co-Secretariat at AIT is responsible for all organizational and communication matters:

- **Susanne Windischberger**, [Susanne.Windischberger@ait.ac.at](mailto:Susanne.Windischberger@ait.ac.at)
- **Sean Philipp**, [ISGAN@ait.ac.at](mailto:ISGAN@ait.ac.at)

The Co-Secretariat at KSGI is responsible for the support of ISGAN deliverables to the Clean Energy Ministerial, the ISGAN Award of Excellence and coordination and contact activities within Asia:

- **Aram AN**, [realaram@smartgrid.or.kr](mailto:realaram@smartgrid.or.kr)
- **Chloe Yoon**, [ysj@smartgrid.or.kr](mailto:ysj@smartgrid.or.kr)



## 1.6. Key Achievements in 2018

ISGAN proudly looks back at numerous highlights and achievements in 2018. Its activities led to valuable interactions with high-ranking officials, fruitful discussions with professional experts and public dissemination activities. Highlights of 2018 include:

- ISGAN's activities during the Nordic Clean Energy Week and the Clean Energy Ministerial (CEM9)
  - Workshop and high-level panel discussion on the **Acceleration of Smart Grid deployment through innovative market design**
  - Side event concerning **Perspectives on Smart Energy Storage Systems**
- Highly recognized public workshops in course of the programme of the ExCo meetings:
  - Public workshop on **Smart Energy for Smart Cities**, Newcastle, Australia, as part of the Newcastle Smart City Strategy (ExCo15, Newcastle)
  - 8<sup>th</sup> International Conference on Integration of Renewable and Distributed Energy Resources IRED2018 (ExCo16, Vienna)
- Thematic knowledge exchange projects (KTP): During ExCo16 in Vienna, a KTP workshop on KPIs in Public Support took place. A Summary of the event was published.
- Award of Excellence:
  - 4<sup>th</sup> ISGAN Award of Excellence (FY2018) focusing on **Flexibility**: Award ceremony took place during CEM9
  - 5<sup>th</sup> ISGAN Award of Excellence (FY2019) focusing on **Local Integrated Energy Systems (Smart Micro-grids)** was launched at CEM9
- Bimonthly webinars organized by the ISGAN Academy and co-hosted by the Clean Energy Solutions Center
- Publication of several discussion papers, event summaries and policy briefs. Please refer to Chapter 6.1, ISGAN Publications
- Collaboration and co-operation with other IEA networks and CEM initiatives. Please refer to Chapter 4, Collaboration and Co-operation.

# Highlight: Cooperation with Mission Innovation | Innovation Challenge 1 Smart Grids.

ISGAN deepened its cooperation with Mission Innovation, IC1 on Smart Grids. A letter of intent was signed on “Joint collaboration between Mission Innovation, Innovation Challenge on Smart Grids (IC1) and the International Smart Grids Action Network (ISGAN) on strategic topics of mutual interest in the field of Smart Grids”.



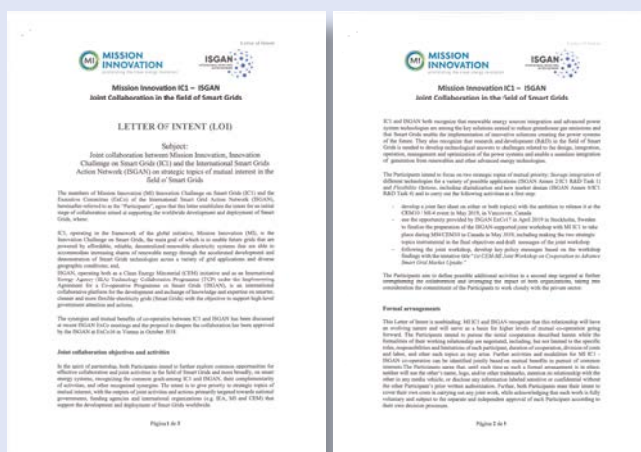
**MISSION INNOVATION**

accelerating the clean energy revolution

An official co-hosted side event titled “First CEM ISGAN | MI IC1 Forum to Facilitate Cooperation to Accelerate the Market Uptake of Smart Grids” was planned for CEM10 May 29<sup>th</sup>, 2019, in Vancouver, Canada.

Furthermore, ISGAN and MI published joint fact sheets on the topics ‘storage’ and ‘flexibility’:

- Energy Storage Integration
- Grid Evolved: Power System Flexibility



Further cooperation between Mission Innovation and ISGAN will include joint workshops and factsheets, newsletters and publications as well as webinars.



▲Signing of Letter of Intent

## Highlight: IRED 2018



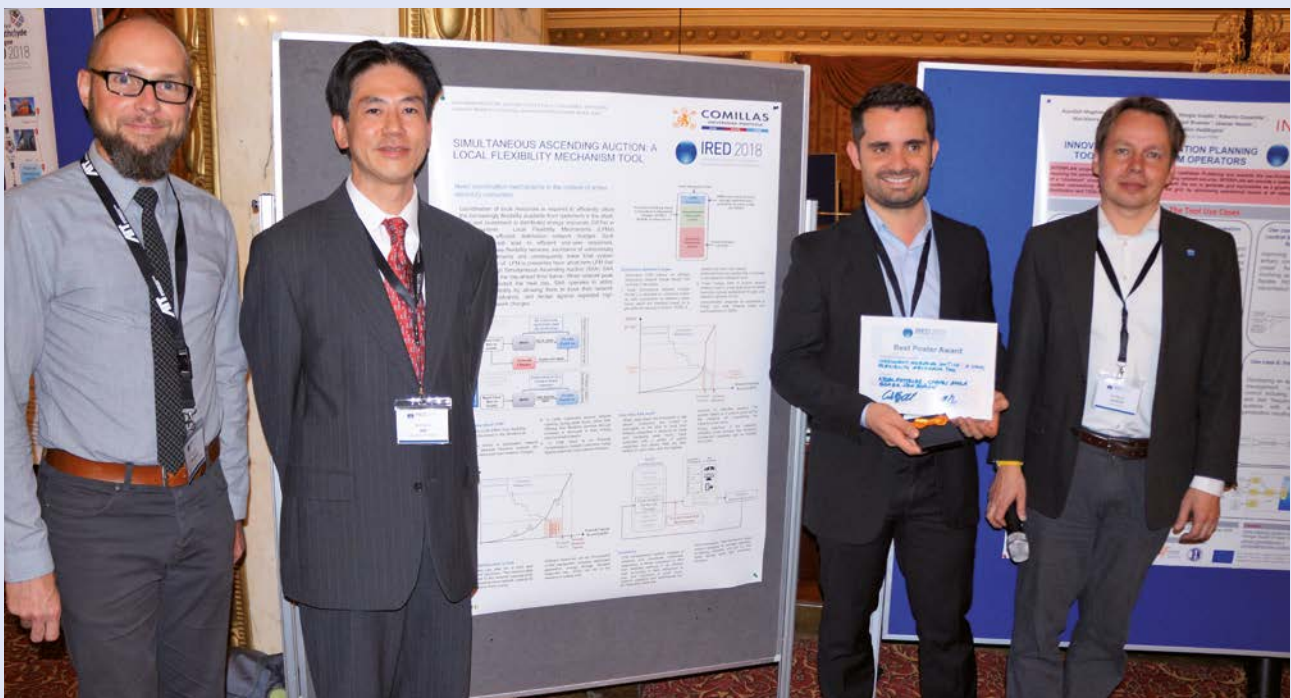
“History meets future” was the motto of the 8<sup>th</sup> International Conference on the Integration of Renewable and Distributed Energy Resources (IRED) in Vienna, Austria which was held back-to-back with ISGAN ExCo16, with active participation of ISGAN members. At the conference, the future of distributed energy resources and their role in the power system management and operation was discussed in the historic ambience of the city of Vienna.

IRED is a global conference gathering experts from industry, government and academia to share information on state-of-the-art technologies, research and know-how and to engage in lively discussions related to the integration of renewable and distributed energy resources into power systems. The conference focused on the technical, market, and regulatory issues that challenge the integration of these resources into the grid. The goals of IRED were to:

- Share status and latest results of research projects
- Better understand and communicate the visions from various stakeholders
- Learn from individual national programmes and policies
- Discuss main issues and barriers and identify areas of future research and potential solutions
- Stimulate international, national, and regional project and programme coordination

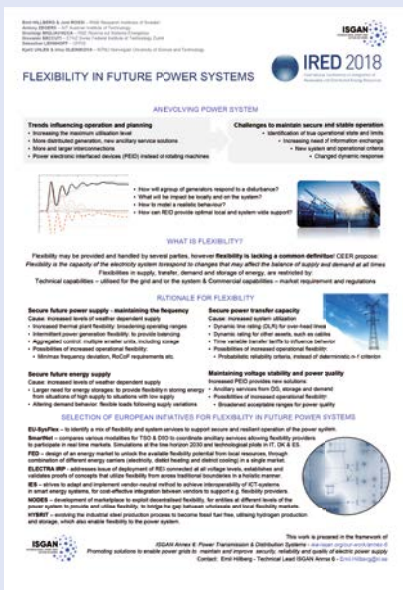
The conference offered several opportunities for in-depth discussions within pre-conference sessions, post-conference breakouts, a poster session, and evening events.

Several posters and talks were presented by ISGAN members. The best poster award was presented to José Pablo Chaves Ávila, Operating Agent of ISGAN Annex 8 (ISGAN Academy) for his poster on ‘Simultaneous Ascending Auction: A Local Flexibility Mechanism Tool’, published by Ibtihal Abdelmottaleb; José Pablo Chaves Ávila; Tomás Gómez San Román (Institute for Research in Technology, Universidad Pontificia Comillas, Madrid, Spain).



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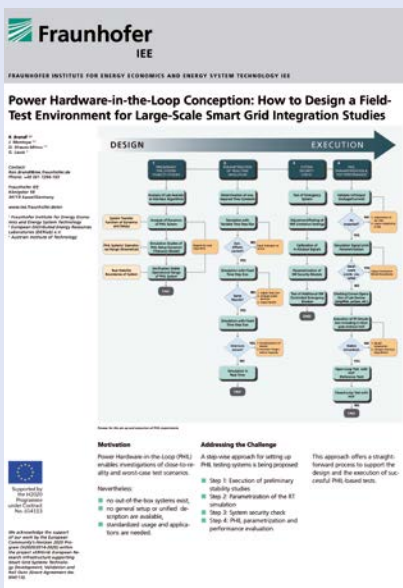
## ISGAN Posters at IRED 2018



## Flexibility In Future Power Systems

The poster presented part of an ongoing work to improve the understanding of flexibility and the needs in the future power system

Emil Hillberg, Joni Rossi – RISE Research Institutes of Sweden,  
Antony Zegers – AIT Austrian Institute of Technology, Gianluigi  
Migliavacca – RSE Ricerca sul Sistema Energetico, Giovanni Beccuti –  
ETHZ Swiss Federal Institute of Technology Zurich, Sebastian  
Lehnhoff – OFFIS, Kjetil Uhlen, Irina Oleinikova – NTNU Norwegian  
University of Science and Technology



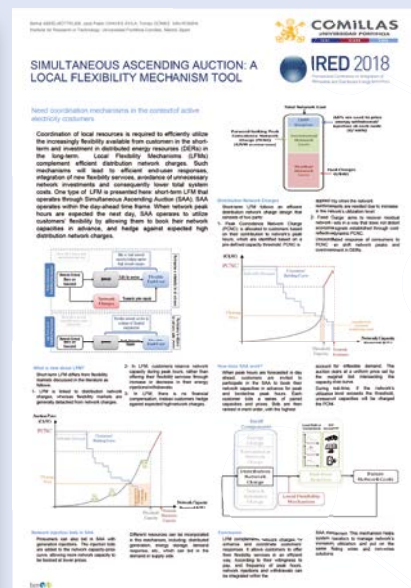
# Power Hardware-in-the-Loop Test Bench for the Integration of Renewable and Distributed Energy Resources

Ron Brandl (Fraunhofer IEE, Kassel, GER), Diana Strauss-Mincu (Fraunhofer IEE, Kassel, GER), Juan Montoya (Fraunhofer IEE, 34121, GER)



## Transmission and Distribution in the Future Power System

Emil Hillberg; Technical Lead  
ISGAN Annex 6, Joni Rossi  
Operating Agent ISGAN Annex  
6 RISE Research Institutes of  
Sweden)



## Simultaneous Ascending Auction: A Local Flexibility Mechanism Tool

Ibtihal Abdelmotteleb; José Pablo Chaves Ávila; Tomás Gómez San Román, Institute for Re-search in Technology, Universidad Pontificia Comillas, Madrid, Spain



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## 2. ISGAN Annexes

The activities of ISGAN are organized in Annexes. In contrast to other IEA TCPs, these Annexes are standing working groups that continuously deal with Smart Grids-related topics and update their plans and objectives for the upcoming year at the spring meetings of the Executive Committee. To date, Annex 1 “Smart Grid Inventories”, delivering a general picture of on-going Smart Grid project deployment, has been completed. Any remaining activities or necessary updates are included in Annex 2.

Operating Agents and – depending on the Annex – also technical Leads are nominated for each ISGAN Annex.

At present seven Annexes are active. Their Operating Agents are:

Annex	Title	Operating Agent	Country
<b>Annex 2</b>	Smart Grid Case Studies	Korea Smart Grid Institute - KSGI	Korea
<b>Annex 3</b>	Cost-Benefit Analyses	University of Cagliari	Italy
<b>Annex 4</b>	Synthesis of Insights for Decision Makers	Korea Smart Grid Institute - KSGI	Korea
<b>Annex 5</b>	Smart Grid International Research Facility Network (SIRFN)	DERLab	Germany
<b>Annex 6</b>	Transmission and Distribution Power Systems	Research Institutes of Sweden, RISE	Sweden
<b>Annex 7</b>	Smart Grids transitions	AIT Austrian Institute of Technology	Austria
<b>Annex 8</b>	ISGAN Academy on Smart Grids	Institute for Research in Technology IIT, Universidad Pontificia Comillas	Spain

# ISGAN Annex Participation (as of February 2019)

	Annex 2	Annex 3	Annex 4	Annex 5	Annex 6	Annex 7	Annex 8
Australia				+			
Austria	+	+	+	+	+	+ (OA/Lead)	
Belgium			+		+	+	
Canada	+		+	+	+		
China	+		+				
Denmark			+	+		+	
European Commission		+					
Finland				+			
France	+	+	+	+	+	+	+
Germany	+			+ (OA)	+	+	
India	+	+	+	+	+	+	+
Ireland	+			+	+		
Italy	+	+ (OA/Lead)	+	+	+	+	+
Japan				+			+
Korea	+ (OA/Lead)	+	+ (OA/Lead)	+			
Mexico		+			+		
The Netherlands	+		+	+	+	+	+
Norway					+		
Russian Federation		+		+			+
Singapore	+						
South Africa		+			+		+
Spain	+		+	+			+ (OA/Lead)
Sweden	+	+	+		+ (OA/Lead)	+	
Switzerland		+			+		+
United States	+	+	+	+ (Lead)	+	+	

## 2.1. Annex 2: Smart Grid Case Studies



The objective of Annex 2 is to assess outstanding examples of current case studies, develop and validate a common case study template and a methodological framework so as to develop in-depth case studies. The common framework, a so-called Case Book, enables the comparison of policies and technologies adopted in different regulatory, legislative, network (grid), and natural environments. The overarching aim is to collect sufficient information from case studies around the world to extract lessons learned and best practices as well as to foster future collaboration among the participating countries.

ISGAN participants contributing to this Annex shape the analyses of, and methodological frameworks for, Smart Grid-related case studies, as well as the selection of topics or projects for new case studies. The participants have first-hand access to the insights identified through analyses of new and existing case studies dealing with Smart Grid developments in specific countries.

To date, ISGAN Annex 2 has published three Case Books: on Advanced Metering Infrastructure (AMI), Demand Side Management (DSM) and Consumer Engagement & Empowerment. In 2018 a new Case Book on Energy Storage Systems (ESS) has been published and an update is planned for FY2019. The Case Books are available for download on ISGAN's website [www.iea-isgan.org](http://www.iea-isgan.org).

Since 2016, Annex 2, supported by Annex 4, has drawn special attention to its Knowledge Transfer Projects (KTP) led by task leader Magnus Olofsson and knowledge transfer expert Helena Lindquist. More information on KTP workshops can be found on the ISGAN website:

<http://www.iea-isgan.org/wp-content/uploads/2018/05/2.-KTP-FactSheet.pdf>

## 2.1.1. Knowledge Transfer Project

In 2018, ISGAN has successfully conducted a KTP workshop on KPIs for public support for Smart Grid Research, Development and Innovation (RD&I).

The general, long-term objective of the Knowledge Transfer Project (KTP) on Public Support to Smart Grid RD&I project was to yield better results from publicly supported projects, by facilitating concrete and practical peer-to-peer guidance between public stakeholders regarding the design and implementation of funding programmes and similar support structures at national or regional level.

During the interactive KTP workshop in Vienna from October 18<sup>th</sup>-19<sup>th</sup>, 2018, the group of participants from 11 countries concluded on the following key messages in regard to Key Performance Indicators (KPI) and their importance and use in public funding of Smart Grid Research Development & Innovation (RD&I).

Workshop participants expressed their interest in further collaboration. A number of ideas were generated, including pooling certain KPIs from different countries or to apply best practice KPIs on an international funding programme. To promote and enable further dialogue on these matters, a LinkedIn group was formed after the workshop.

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The KTP aims to capture, collect, and share knowledge about Smart Grid technologies among countries and their key stakeholders. Building on ISGAN's experience in delivering deep-dive workshops, the KTP fosters meaningful international dialogue on Smart Grids with a focus on developing competence and building capacity.

The workshop format, which requires significant preparation, promotes individual learning while emphasizing active participation in the co-creation of concrete results. This is achieved through collaboration among interdisciplinary participants with complementary competencies. Informal and collaborative, KTP workshops:

- **Encourage open dialogue** about successes and lessons learned from grid modernization efforts around the world
- **Promote cross-organizational dialogue** inspired by experiences and results achieved
- **Create a forum for peer-to-peer learning** where all participants can contribute to and benefit from the collective thinking process.

## The main outcomes and recommendations are as follows:

### Usability

- KPIs are important tools for steering, monitoring and evaluating results and impact of Smart Grid RD&I.
- KPIs measure the intended benefits of RD&I, which can be communicated to tax payers.

### Risks

- KPIs may steer funding recipients in the wrong direction if measurability takes precedence over achieving the aim of the policy objective, e.g. when the number of published papers is used as KPI. This does not guarantee that relevant or high-quality results are created by funded projects.
- KPIs are not the only tool for assessment, as unforeseen benefits may fall outside the initial scope and mission of the RD&I action.

### Benefits

- KPIs help policy makers understand and prioritize among competing Smart Grid RD&I initiatives.
- KPIs are an important monitoring tool indicating the performance and progress of RD&I actions.
- KPIs can help make outcomes and impact more visible, comparable and assessable.

### Recommendations when using KPIs

- Quantitative KPIs, which should be formulated by the SMART principle, may be complemented with qualitative indicators to accurately measure and describe the impact of results.
- Consider and specify at which levels (policy, programme, project etc.) the KPIs shall be used and how they affect each other across different levels. The research community should be involved in the process of creating KPIs. One should be careful in using input indicators (e.g. expenditure, gender diversity, time demand, etc.).
- Consider KPIs in an international, national and end-user context. KPIs should evolve over time and be part of a continuous learning process.

## Participating countries:



Austria



Canada



China



France



Germany



India



Ireland



Italy



Korea



Netherlands



Singapore



Spain



Sweden



United States



Korea (Lead)



Korea (Operating Agent)

## 2.2. Annex 3: Cost-Benefit Analyses and Toolkits



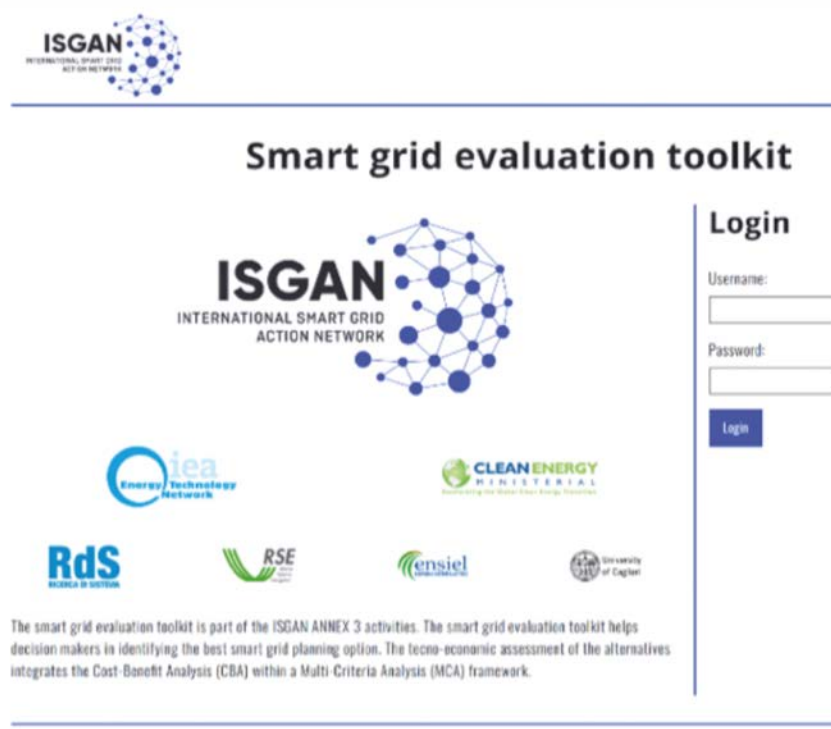
Annex 3 deals with methods aimed at guiding stakeholders' investment decisions related to Smart Grid technologies by considering economic and social welfare aspects. The scope of this Annex spans the development of tools for analysts, regulators, utilities and other actors to define system needs and decide on priorities for Smart Grid system investments along with necessary regulatory changes. Annex 3 develops a global framework and related toolkits, which provide a way of identifying the benefits of demonstrating and deploying Smart Grids technologies in a standardized way. Annex 3 also puts the achieved benefits in relation to their costs.

### 2.2.1. Main accomplishments in 2018

Recent activities focused on evaluating existing approaches and developing new approaches to analysing the costs and benefits and comparing a range of scenarios at the electrical system level as well as on a regional level. In particular, the experts from Annex 3 have investigated socioeconomic impacts of Smart Grids and the related regulatory implications. Three recently published reports identify existing gaps and shortcomings in current Cost-Benefit Analyses (CBA) when applied to Smart Grid projects, include new metrics for the assessment of benefits that may not be uniformly distributed among the stakeholders and, finally, propose new tools that can further improve Cost-Benefit Analyses. To be specific, a CBA can be enhanced with a Multi Criteria Analysis (MCA) that fills some of the gaps of CBA and is better suited for the evaluation of non-monetary and asymmetrical benefits.

#### Web-based platform for multi criteria decision-making and Cost-Benefit Analysis

In 2018, Annex 3 studied the integration of Cost-Benefit-Analysis and multi criteria decision-making. The software platform can be accessed on <http://smartgrideval.infora.it/admin/>. New Multi Criteria Methods (MCM) were proposed and improved for the application in the Smart Grid field. These methods were subsequently implemented on a publicly accessible web platform that can be used by everyone after registration.



▲ Home page of ISGAN's web-based CBA and MCM



Request **your invitation code** by writing at: [info.smartgrideval@gmail.com](mailto:info.smartgrideval@gmail.com)



Check your e-mail, in a while you will receive **your personal invitation code**



Go to the website: <http://smartgrideval.infora.it/>



Log-in in the website with username: **smartgrideval** and password: **smartgrideval**



Click on the **Signup** button



Fill the gaps in the **Signup** page



Click on the **Signup** button on the bottom of the **Signup** page



Registration completed, you can log-in with your credentials at: <http://smartgrideval.infora.it/>

#### ▲ Steps required for registration

### Smart Grid projects with Battery Energy Storage Systems (BESS)

A second focus area of Annex 3's work in 2018 was on the use of storage in medium and low voltage distribution networks. Two reports referring to Italy and Austria were compiled on this topic. With reference to Italy, the deployment of DSO-owned storage has been thoroughly analyzed by applying CBA and MCM methods. The most significant findings are that BESS can on very rare occasions be more convenient than other options (such as new electrical infrastructures, Volt/VAR regulation, Demand Response programs, etc.), if DSO are not permitted to use BESS for offering system services under market conditions. However, it was proven that under specific circumstances, i.e. with high shares of RES, BESS can be a valid option to relieve voltage regulation issues and resolve local power congestion in both medium and low voltage networks. With reference to Austria, and in particular from the investor's point of view, the application of the JRC Cost-Benefit-Analysis for Smart Grids to multiple usage concepts of battery storage systems, has shown negative net present value results, independent of the respective business model. Nevertheless, the social net present value is positive regardless of the business model. The analyses reflect the social benefits (in the form of the monetary benefit to households through participation in the storage system). Both studies highlighted the need of new regulatory and market rules, which are deemed necessary to foster the development and the integration of BESS in distribution systems and give policymakers clear messages.

#### Participating countries:



Austria



European  
Commission



France



India



Italy



Korea



Mexico



Russian  
Federation



South  
Africa



Sweden



Switzerland



United  
States



**Italy  
(Lead)**



**Italy  
(Operating  
Agent)**

## 2.3. Annex 4: Synthesis of Insights for Decision Makers



The core objectives of Annex 4 are to organize knowledge, identify key issues, distill important themes, and provide insightful analysis for decision makers. Another important task of Annex 4 consists in consolidating and disseminating the efforts of other ISGAN Annexes, as well as, when appropriate, Smart Grid efforts beyond ISGAN in support of greater outreach and impact.

Annex 4 ultimately provides communication tools, products, and platforms that foster development of greater international understanding of Smart Grids, while recognizing a diversity of drivers and approaches among related technologies, policies, practices, and systems.

### 2.3.1. Main accomplishments in 2018

In collaboration with the Swedish Forum for Smart Grids, Annex 4 organized a full-day work-shop and an official side event at CEM 9 on **Opportunities to accelerate Smart Grid deployment through innovative market design**. A policy brief and a workshop summary were published.

In collaboration with other Annexes, Annex 4 assisted in the design and implementation of KTP workshops.

Annex 4 took part in the development of the recently finalised ISGAN Communications Strategy and Action Plan which will give the Annex guidance on specific measures that can be utilized to enhance the Annexes' outreach and impacts.

During the development of the Communication Strategy and Action Plan, the communication objectives were clarified. The objectives distinguish between internal and external objectives. Also, the target audience was defined and divided into sub-sets: 'internal or external' and 'experts or non-experts on Smart Grids'. The relevant sub-set will be identified for each publication and the communication will be devised accordingly.

For the Action Plan, all communication activities of ISGAN need to fit into one of the following categories (following the Communication Strategy's Master narrative):

- Smart Grids affect you as an individual
- Smart Grids are based on innovative technologies
- Smart Grids require collaboration
- Smart Grids are developed by humans

Taking the audience and the Master narrative into account, the appropriate channels for the communication are chosen.

---

**Participating countries:**



Austria



Belgium



Canada



China



Denmark



France



India



Italy



Korea



Netherlands



Spain



Sweden



United States



**Korea (Lead)**



**Korea (Operating Agent)**

## 2.4. Annex 5: Smart Grid International Research Facility Network (SIRFN)



SIRFN enables participating countries to evaluate pre-competitive technologies and systems approaches in a wide range of Smart Grid use cases and geographies using common testing procedures. Research testbeds were selected based on their complementary capabilities to conduct specialized, controlled laboratory evaluations of integrated Smart Grid technologies. These include cyber security, plug-in hybrid integration, load management, automated metering infrastructure, protection, network sensing, energy management, renewable energy integration and similar applications. In this way, research within each individual participating country can benefit from the unique capabilities and environments of the other partner nations. Research data will be made available to all SIRFN participants to accelerate the development of Smart Grid technologies and systems and enable appropriate supporting policies.

The Annex consists of a strong, active community of researchers engaging in applied research and impactful work on Smart Grids testing including smart inverters, BESS, DER, ALTM, power systems, microgrids, etc. Open source software tools, test cases and procedures to be used by DER vendors, universities, research institutions, certification laboratories, standards organizations, etc. are developed.

Input to national and international standards development has major impact on the capabilities of Smart Grid and DER equipment for electrical performance and communications capabilities.

**The work in this Annex is divided into the following technical projects:**

### Test Protocols for Advanced Inverter Functions

- Test Protocols for Advanced Inverter Functions
- Goal: Develop and demonstrate consensus-based interoperability test protocols for advanced distributed energy resources (DERs)
- Evaluation of DER devices and test protocols
- Inform/accelerate adoption of certification protocols by national and international standards organizations

### Microgrids

- Evaluate microgrid requirements for on-grid and off-grid operation
- Define microgrid functionalities for on-grid operation
- Define testing procedures for the functionalities

NEW  
ROLLOUT

### Advanced Laboratory Testing Methods

- Enhanced lab testing & testing methods (HIL, Co-Sim)
- Creation of a work basis for future contributions to
  - Supporting holistic testing and accelerated manufacturing
  - Creating standardized testing procedures and toolboxes
  - Establishing novel research areas for real-time/HIL applications

NEW  
ROLLOUT

### Power System Testing

- Numerous interdependencies in power system control
- Testing components only may miss such interactions/interdependencies
- Seeks to define requirements for real systems testing, applying state-of-the-art advanced lab testing methods

NEW  
PRO-  
POSAL

## 2.4.1. Main accomplishments in 2018

In March 2018 at the India Smart Grid Week, New Delhi, India, J. Johnson gave a talk on “International Collaboration on the Evaluation and Certification of Interoperable Grid Support Converter”. During the IRED2018 conference in October 2018, an ERIGrid/SIRFN open workshop took place. Advanced inverter functions were demonstrated at several facilities during the year in India, Australia (both March 2018) and Mexico (September 2018).

Automated DER interoperability certification tests were executed at four institutions across the world using a common open source software tool. Recommendations for certification test protocols to be implemented in national grid codes or international standards were given.

### Participating countries:



Australia



Austria



Canada



Denmark



Finland



France



Germany



India



Ireland



Italy



Japan



Korea



The Netherlands



Russian Federation



Spain



United States

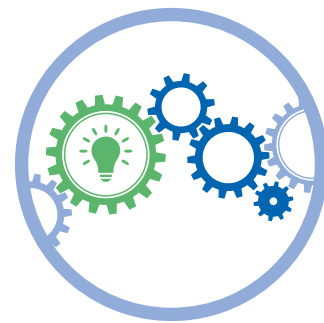


**United States (Lead)**



**Germany (Operating Agent)**

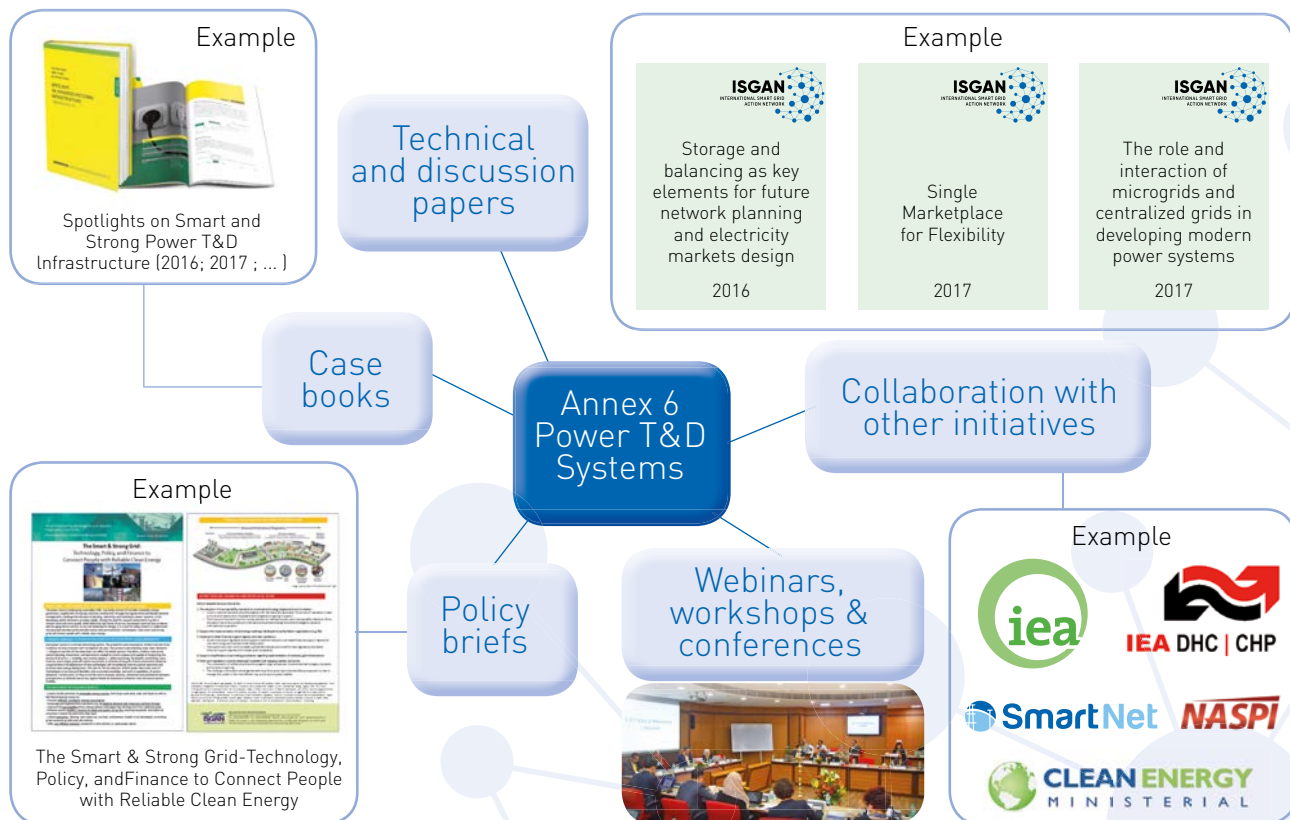
## 2.5. Annex 6: Power Transmission and Distribution Systems



Annex 6 focuses on potential system-related challenges in the development of future Smart Grids. The Annex' main goal is to facilitate the application of advanced technologies needed for power grids to contribute in the best way to the attainment of clean energy and climate goals as well as sustainable energy access to all. The Annex promotes solutions that enable power grids to maintain and improve the security, reliability and quality of electric power supply.

The Annex' work is based on collecting, integrating, synthesizing, and distributing information on Smart Grid technologies, practices, policies, and systems through discussion papers, webinars, reports and presentations at relevant seminars, conferences and workshops. The idea is not to repeat what has already been done, but to draw valuable insights and lessons. Different countries around the world face different challenges, apply different solutions to those challenges, and have reached different maturity levels in the implementation of those solutions. By learning from each other, both when it comes to best practices and success stories and from projects confronted with problems we can reach proven solutions quicker and avoid repeating mistakes.

Annex 6's participation gives access to an international network of experts in the area of building future grids. The possibility of gaining and sharing knowledge within the Annexes brings us closer to the goal envisaged by ISGAN: Achieving global, national and regional clean energy and climate goals with the help of Smart Grids.



▲ Annex 6 deliverables

## 2.5.1. Main accomplishments in 2018

In 2018, ISGAN Annex 6 published discussion papers on **System efficiency, DSO/TSO interaction best practice analysis on data exchange and ICT requirements**, and on **Flexibility needs in the future power system**. The last paper was also published on Research Gate with the following DOI: [doi.org/10.13140/RG.2.2.22580.71047](https://doi.org/10.13140/RG.2.2.22580.71047)

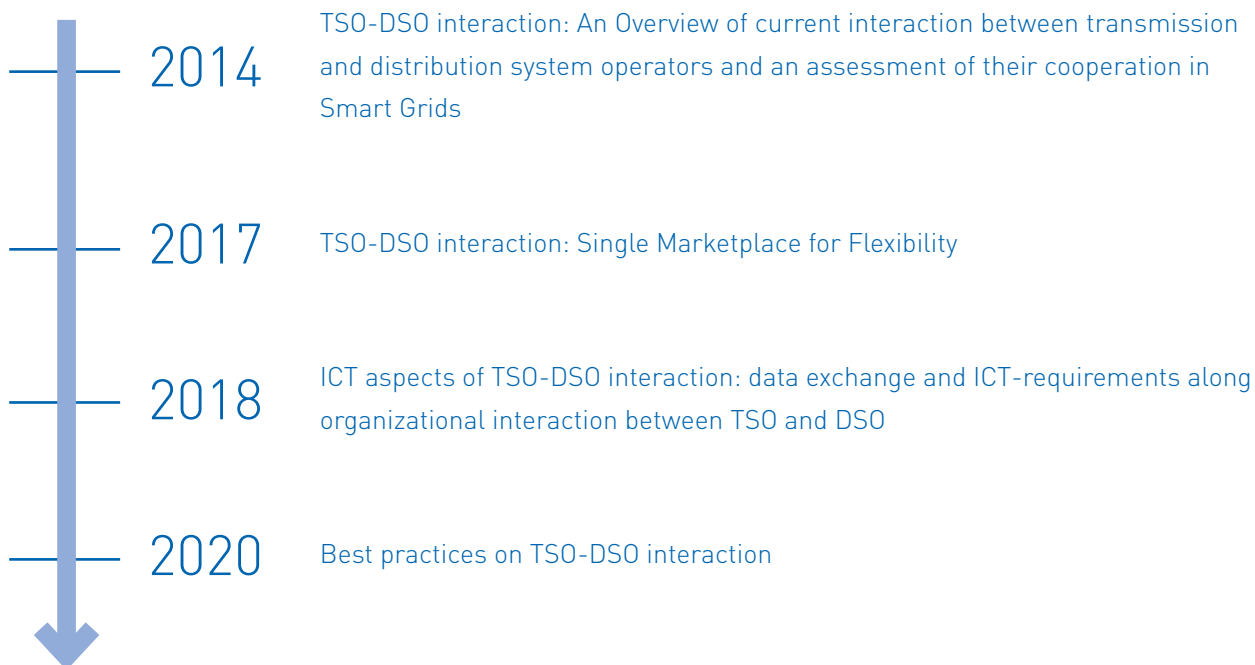
Two posters were presented at the IRED2018 conference in October in Vienna, Austria. At the same conference, Annex 6's National Experts gave presentations on **'Data exchange and ICT-requirements for TSO-DSO interaction - an international best practice analysis (IRED)'**.

A presentation on the **'Need of flexibility in the future power system'** was given at DynPower in September 2018, Winterthur, Switzerland.

Annex 6 cooperates with several other initiatives. In 2018, a mutual agreement with **Hybrid Energy Networks (IEA DHC Annex TS3)** was signed, which defined the cooperation in the next 3 years and the focus on networking and joining events in 2019.

### TSO-DSO interaction

Annex 6 continued its ongoing work on TSO-DSO interaction, which serves as a reference in this field. Papers that were written in the past are still relevant and the discussion paper on 'Single Marketplace for Flexibility' is often discussed and consulted.



In 2018, the discussion paper on **DSO/TSO interaction best practice analysis on data exchange and ICT requirements** was published and the results were presented on the IRED conference in October 2018 in Vienna, Austria. This paper examines how ICT aspects are considered in the interaction between TSOs and DSOs, based on a questionnaire regarding technical aspects, regulatory aspects, flexibility markets, drivers and barriers for TSO-DSO interaction as well as experiences from projects and lessons learned. The work on TSO-DSO interaction will continue with a new activity in 2020.

## Flexibility

Annex 6 recognized that there is an increased focus on solutions to provide flexibility to the power system. However, flexibility is still not a unified concept in the power system, and there are many different needs and solutions related to the flexibility concept. During FY 2018, Annex 6 has made an effort to increase the understanding of different flexibility needs, in order to support the communication of flexibility within and outside the power system community. The discussion paper on **'Flexibility needs in the future power system'** was used as a basis for several follow-up activities, including a poster at the IRED conference, an interactive workshop on flexibility at the ISGAN conference on **'The future of electricity markets in a low carbon economy'** and as input for a co-branded fact sheet on **'Power system flexibility'** between Annex 6 and MI/IC1.

## Sector coupling

In 2018, Annex 6 started on issues related to sector coupling and signed a mutual cooperative agreement for the next three years with the new IEA DHC (District Heating and Cooling) Annex TS3 on Hybrid Energy Networks. Annex 6 joined the first Annex TS3 meeting (April 25<sup>th</sup>-26<sup>th</sup>, 2018) in Gothenburg, Sweden, and had regular contacts with the group. They joined efforts to organise a workshop on **Smart Grids & District Heating and Cooling: Key Integration Aspects**, which was a very good starting point for a deeper understanding of key integration aspects on different levels. One of the next concrete steps will be the development of a joined and comprehensive analyses of the barriers and opportunities for hybrid energy networks based on the workshop results and further studies. This analysis should act as a key reference for support policy makers in their decisions towards decarbonization pathways.

### Participating countries:



Austria



Belgium



Canada



France



Germany



India



Ireland



Italy



Mexico



The Netherlands



Norway



South Africa



Sweden



Switzerland



United States



Sweden (Lead)



Sweden (Operating Agent)

## 2.6. Annex 7: Smart Grid Transitions and Institutional Change



The ongoing transition of energy systems describes the process of replacing a comparatively simple regime of just-in-time electricity production characterized by unidirectional trickle-down distribution, towards complex, responsive, multidirectional systems. As a result, the electricity sector is undergoing a transformation toward an industry providing energy logistics services to match demand with volatile energy supply. Smart Grids will become the backbone of smart energy logistics. First of all, this requires new institutional structures and governance processes, as well as shared views on socio-technical transition pathways. How this institutional change shall be orchestrated, is the key topic of Annex 7 and also a key policy issue for the IEA and the Clean Energy Ministerial.

The scope of this Annex is to co-ordinate applied social science and socio-technical change processes related to this transition towards a sustainable electricity system as well as to collect results and inform policymakers. The Annex' experts further seek to analyze shared cognitive frameworks (e.g. shared visions, norms and concepts) and informal modes of social organization (e.g. human psychology, culture, habits and customs). Thus, their work clearly complements other ISGAN approaches like technology development, technological system integration and techno-economic analyses. Hence, the Annex contributes analysis and policy advice regarding the framework conditions of the system transition from the current fossil-based to a more sustainable decarbonized energy regime.

The Annex aims at establishing a network of researchers and practitioners sparking off an international, co-ordinated interdisciplinary research activity in the social sciences supporting and complementing technology-oriented Smart Grid activities. In short, Annex 7 accumulates information and knowledge from innovation studies, political sciences, institutional economics, sociology and energy law, and makes it palpable for policy makers and other stakeholders at multiple administrative levels. This includes supporting policy development in the field of Smart Grid-related research, technology development and innovation (RTI).

### 2.6.1. Main accomplishments in 2018

The main accomplishments in 2018 centred around the topic of Regulatory Sandboxes. An Inter-Annex Regulatory Sandboxes Collaboration project was started and a webinar on "Regulatory Innovation Zones for Smart Energy Networks" (in collaboration with Leonardo Energy) took place on September 14<sup>th</sup>, 2018. A RIZ/Sandbox Repository was launched to collect pertinent publications.

Furthermore, Annex 7 contributed to the KTP workshop on 'Public Support to Smart Grid RD&I. Focus: Key Performance Indicators'. In addition, a seminar titled "Smart Grids and smart energy systems for the low carbon energy transition" was held. Details on the seminar can be found under the following link:

<http://www.sustainability.man.dtu.dk/english/research/eer/research-projects/iea-isgan>

Annex 7 delegates took part in the IST 2018 conference in Manchester and presented five papers including contributions from SE, DK, AT, NL.

Annex 7 also contributed to CEM9 with two policy communications:

- Smart Grid Transitions – On Institutional Change (Policy Communication)
- The Smart Grid Discourse Arena – A global social network analysis (Policy Communication)

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#### Participating countries:



Austria



Belgium



Denmark



France



Germany



India



Italy



the Netherlands



Sweden



United States



**Austria (Lead)**



**Austria (Operating Agent)**

## 2.7. Annex 8: ISGAN Academy on Smart Grids



The ISGAN Academy offers the ISGAN community a possibility to share knowledge and engage with experts in the field of Smart Grids through an e-learning platform. The platform offers webinars on topics ranging from power system fundamentals to more specialized seminars on breakthrough Smart Grids solutions.

The information includes recent developments, best practices, interesting methodologies, Smart Grids theory, applications and deployment. The ISGAN Academy is set up of a number of e-learning modules dealing with different Smart Grids aspects. Fundamentals and further reading material are provided as complementary appendices to the critical learning path.

With the help of webinars developed by Annex 8, stakeholders obtain a means to stay updated on recent developments, pilot projects, demonstrations, software tools and case studies. Supporters of the Annex can contribute by judging the quality of the contents and the relevance of the selected topics by nominating representatives to the Academic Committee.

### 2.7.1. Main accomplishments in 2018

The following webinars were held in 2018:

- February 2019: How to replicate solutions for the flexibility challenge?
- December 2018: ISGAN Award on Coordinating power control
- September 2018: Multicriteria and cost benefit analysis for smart grid projects
- June 2018: Comprehensive planning for Universal electricity access: The Reference Electrification model (REM)
- April 2018: Perspective on ISGAN Knowledge Transfer Projects (KTP) in Mexico, Belgium and India.

All past webinars can be accessed under:

<http://www.leonardo-energy.org/resources/1070/isgan-academy-58ec8d2e7b9b0>

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#### Participating countries:



France



India



Italy



Japan



The Netherlands



Russian Federation



South Africa



Spain



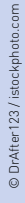
Switzerland



**Spain  
(Lead)**



**Spain  
(Operating Agent)**



### 3. ISGAN Award of Excellence

The ISGAN Award of Excellence and the Global Smart Grid Federation (GSGF) Best Smart Grids Project Award showcase leadership and innovation in Smart Grid projects around the world. The awards highlight the tremendous value of smarter, more flexible electric grids.

The ISGAN Award of Excellence Committee consists of KSGI (administration), PNNL (co-ordination) and delegates from Singapore, Japan and USA.

In 2018, the 4<sup>th</sup> Award of Excellence was granted and the 5<sup>th</sup> Award of Excellence launched its call for submissions.

For the fifth Award of Excellence, ISGAN and GSGF seek projects that exemplify excellence in Smart Grids for **Local Integrated Energy Systems (Smart Microgrids)**.

Results of the 4<sup>th</sup> ISGAN Award of Excellence (FY2018) focusing on **Flexibility**:

- A total of 14 nominations from 10 different countries were received.
- Winning project: **'Coordinating Power Control'** by Sustainable Energy, Sweden.
- Six further projects were honored with the title **Finalists**:
  - Smart Grid Deployment Project (Korea)
  - Smart Operator – Efficient control and monitoring of the low-voltage grid (Germany)
  - SysDL 2.0 – Ancillary services from large-area distribution grids (Germany)
  - Local Energy System with Customer Flexibility (Sweden)
  - OpenADR4Chile (Italy)
  - Instability Detector of the Gaspésie Regional Power System: DIR-Gaspésie (CGART-ALGOIRES) (Canada)

The award ceremony announcing the winning project of 2018 took place on May 24<sup>th</sup>, 2018. At the same event the 5<sup>th</sup> ISGAN Award of Excellence (FY2019) was launched. The Award focused on **Local Integrated Energy Systems (Smart Microgrids)**. A total of 16 nominations from 10 different countries were received.



▲ Finalists and Winner of the Smart Grids Award with Ibrahim Baylan, the Swedish Minister for Policy Coordination and Energy, ISGAN Chair, Karin Widegren and GSGF representative Valérie-Anne Lencznar



▲ Finalists and Winner of the Smart Grids Award with GSGF representative, Valérie-Anne Lencznar

## 4. Collaboration and Co-operation

One of ISGAN's key activities revolves round reaching out to and cooperating with outside stakeholders, clean energy initiatives and similar target groups. In 2018, ISGAN's main co-operation partners and activities were as follows:

- Engagement with Mission Innovation, IC1 on Smart Grids: The close cooperation has been further deepened by a Letter of Intent on "Joint collaboration on strategic topics of mutual interest in the field of Smart Grids".
- GSGF: A renewed "Memorandum of understanding between the Global Smart Grid Federation and ISGAN represented by the OA AIT Austrian Institute of Technology GmbH, acting on behalf of the contracting parties to the implementing agreement for a co-operative programme on smart grids (ISGAN)" was signed. GSGF took part in ExCo16 in Vienna.
- 21<sup>st</sup> Century Power Partnership: Informal collaboration including contributions to each other's workshops, reports etc.
- ENTSO-E and EDSO for Smart Grids: cooperation on the Conference, InnoGrid 2019 planned.
- ERA-NET SES: ISGAN became an official ERA-Net Smart Energy Systems Associ-ated Partner.

### 4.1. Ninth Clean Energy Ministerial (CEM9)

The 9<sup>th</sup> Clean Energy Ministerial was held on May 24<sup>th</sup>, 2018 in Copenhagen, Denmark. ISGAN disseminated deliverables at several CEM side events in order to increase its visibility and promote its activities to external stakeholders around the world. ISGAN released a series of deliverables for CEM10, including recently issued ExCo & Annex publications, including:

As part of CEM9, an official **Side Event on the importance of market design to smart grid deployment** was arranged jointly by ISGAN and the Swedish Smart Grid Forum.

The Swedish Minister for Energy, Ibrahim Baylan, took part in the event, which organized as a high-level panel discussion. It brought together key stakeholders and policy experts from the private sector, IEA and CEM member countries. The influence of market design on Smart Grid deployment in an international context involving opportunities on both the local/decentralized and the regional/interconnected level was in focus for the discussion.

The high-level panel discussion was preceded by a full-day workshop on Thursday, May 23<sup>rd</sup>. The highly interactive dialogue during the workshop was based on a draft policy brief distributed in advance to the participants as a starting point for the discussions on how to accelerate the implementation of Smart Grid solutions. The outcome from the workshop resulted in a concrete list of recommendations which was forwarded to the participants of the CEM9 side event together with the final version of the policy brief.

## 5. ISGAN Executive Committee Meetings

The Executive Committee Meetings in FY2018 took place in Newcastle, Australia, March 12<sup>th</sup>-16<sup>th</sup>, 2018 and in Vienna, Austria, October 11<sup>th</sup>-15<sup>th</sup> 2018.

### 5.1. 15<sup>th</sup> Executive Committee meeting (ExCo15), Newcastle, Australia

ExCo15 was kicked-off by a full day designated to workshops with a number of side events. Please refer to the list of workshops in chapter 6.2 for full details. Contracting Parties from 18 countries participated at ExCo15.

The following changes in ISGAN's leadership team were made during the meeting:

- The Executive Committee, by unanimous vote without abstention or objection in the absence of the candidate, elected Arun Kumar Mishra, the Alternate Delegate from India, as an ISGAN TCP ExCo Vice Chair for a term of two years (i.e., through ExCo19 in Q1/Q2 CY 2020), effective as of March 14<sup>th</sup>, 2018.
- The Research Institutes of Sweden (RISE) started as of March 1<sup>st</sup>, 2018 to serve as Operating Agent for Annex 6 Transmission & Distribution Power Systems.



#### 5.1.1. ISGAN community visit to Summerhill Waste Management Facility

On March 13<sup>th</sup>, 2018, the ISGAN community visited the waste management facility in Summerhill, Australia. The head of the facility presented its capabilities in terms of waste collection and treatment in the local context. He raised the crucial importance of education in waste management and recycling and the measures currently undertaken in Newcastle.

The two main initiatives include waste-to-energy (WTE) and processed engineered fuel (PEF). PEF refers to the processing of waste to produce feedstock for WTE and involves sorting, screening and shredding of waste. The process ensures that the feedstock is suitable for the WTE facility, maximizes its efficiency, reduces waste from the WTE facility and, finally help to transport fuel more efficiently.

Giving an overview of the issues the industry is facing right now, the head of the facility mentioned fast changing regulation and the attitudes and awareness of the overall population. He pointed out the 70% recycling target established by the authorities, which is, however, currently difficult to achieve. Currently, the average recycling rate stagnates at around 45%.

Population density and the size of cities and communities seems to play a major role in this situation. As citizens of large cities are less strongly and less directly engaged with their environment, recycling activities are much more difficult to trigger than in smaller communities. This creates an opportunity for regulatory change from recycling to diversion and recovery (waste-to-energy).

### Highlights from ExCo15

- Annexes and ExCo members had the opportunity to present proposals for the use of the ISGAN Common Fund to promote ISGAN's strategic interests. The following projects were approved by the Executive Committee:
- Second phase of the development of ISGAN's Strategic Communications Plan
- Annex 3 software tool development
- Joint ISGAN-Mission Innovation side event during CEM10 in Vancouver, Canada



## 5.2. 16<sup>th</sup> Executive Committee meeting (ExCo16), Vienna, Austria

ExCo16 took place at the Federal Ministry for Transport Innovation and Technology in Vienna, Austria. Contracting Parties from 19 countries participated as well as observers from Morocco, Brazil and UK.

In addition to the meeting, a KTP workshop on key performance indicators for public support and an Annex 6 workshop took place. Please refer to chapter, 6.2 ISGAN Workshops, for further details on all side events.

Consecutively to ExCo16, the conference IRED 2018 took place in Vienna. Details on this ISGAN-supported conference can be found in Chapter 1.6: Key achievements in 2018, and 6.2.5 IRED 2018.

A site visit to the Vienna testbed Aspern Smart City Research (ASCR) took place on the last day of the ExCo week. During the visit, participants were able to see the demo center, have a walk through Seestadt Aspern, an urban quarter currently under development, and visit an intelligent secondary substation within the testbed.

Aspern Smart City Research focuses on energy management, smart buildings, smart grids, smart ICT and smart users. An integrative system approach is applied to optimize the utilization of energy, technologies and consumption.

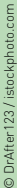
ASCR was awarded the world's best Smart Project 2016. It prevailed against more than 250 projects from 45 countries at the Smart City Expo World Congress in Barcelona, the world's largest event on smart cities. In an interactive showroom, the ASCR Demo Center, visitors were given the opportunity to learn about the complex research programme and all its facets.



▲ Evening event: guided tour Schönbrunn Castle

## Highlights from ExCo16

- Observers from UK, present during ExCo16, announced the interest of the UK in joining ISGAN. The Executive Committee extended an official invitation to the United Kingdom to become a new ISGAN Contracting Party.
- A lunch meeting with the Global Smart Grid Federation (GSGF) took place during ExCo16. After introducing both organizations, their structure and member base were compared. Furthermore, a brainstorming session took place to find further opportunities for cooperation.
- During ExCo16, a new type of session took place: The group was divided into three parallel breakout sessions. The ambition of the parallel breakout sessions was to give time for lively discussions. To meet the wishes of the ExCo to allocate more time for strategic matters to stimulate active discussions among representatives, the Secretariat proposed this new format. The sessions were intended for discussions on issues of strategic importance. No votes were taken during these parallel sessions. In cooperation with the Presidium, the following three topics have been identified and were discussed during the breakout sessions:
  - Future Cooperation within CEM (21CPP and other CEM workstreams) and other relevant initiatives (ERANet Smart Grids+, etc.).
  - Interaction with MI IC1 Smart Grids and detailed discussions on the joint workshop at CEM10 in Canada.
  - Discussion of further proposals on the budget line "Strategic actions" proposals for FY2019.



## 6. Deliverables



### 6.1. ISGAN Publications

One of ISGAN's most important outputs are publications for its target audience of policy makers and other stakeholders. They intend to support decision-making through the experience and insights from the Annexes' National Experts and a continuous international knowledge exchange.

#### **Flexibility needs in the future power system**

##### **Discussion paper**

##### **ISGAN Annex 6**

Emil Hillberg (RISE), Antony Zegers (AIT), Barbara Herndler (AIT), Steven Wong (NRCan), Jean Pompee (RTE), Jean-Yves Bourmaud (RTE), Sebastian Lehnhoff (OFFIS), Gianluigi Migliavacca (RSE), Kjetil Uhlen (NTNU), Irina Oleinikova (NTNU), Hjalmar Pihl (RISE), Markus Norström (RISE), Mattias Persson (RISE), Joni Rossi (RISE) & Giovanni Beccuti (ETHZ)

#### **Executive Summary of KTP on Public Support to Smart Grid RD&I**

##### **Focus: Key Performance Indicators**

##### **Project Report**

##### **ISGAN Annex 2**

Helena Lindquist (LightSwitch), Magnus Olofsson (Svenska Energiinstitutet)

The 4<sup>th</sup> Knowledge Transfer Project (KTP) on Public Support to Smart Grid RD&I took place during October 18<sup>th</sup>-19<sup>th</sup>, 2018 in Vienna, Austria. The KTP was primarily caters to government funding agencies working daily on the design and implementation of funding programs to support Smart Grid development at national or regional levels.

#### **ICT aspects of TSO-DSO interaction Data exchange and ICT requirements along organizational interaction between TSO and DSO**

##### **Discussion Paper**

##### **ISGAN Annex 6**

Mark Stefan (AIT), Antony Zegers (AIT), Friederich Kupzog (AIT)

Data exchange and ICT requirements along organizational interaction between TSO and DSO

#### **Social costs and benefits of Smart Grid technologies**

##### **Discussion Paper**

##### **ISGAN Annex 3**

Anna Nordling (WSP), Sirje Pädam (WSP), Claës af Burén (WSP), Peter Jörgensen (WSP)

This Discussion Paper maps and reviews existing literature about costs and benefits of Smart Grid projects and identifies gaps in current guidance. The report also includes an analysis of how network regulation affects the costs and benefits of Smart Grid technologies. The report allows the Swedish Smart Grid Forum to select models and methods in order to assess different Smart Grid projects and applications. It also provides input for further work on the topic of decision making for Smart Grid technologies.

## **ISGAN Side Event at CEM9 – Policy Brief and Workshop Summary: Opportunities to Accelerate Smart Grid Deployment through Innovative Market Design**

Jointly organized with the Swedish Smart Grid Forum as part of the Nordic Clean Energy Week in Malmö, Sweden, and Copenhagen, Denmark, May 23<sup>rd</sup>-24<sup>th</sup>, 2018

Editor: Karin Widegren, Chair of the ISGAN Executive Committee

## **ISGAN Annual Report 2018**

Susanne Windischberger (AIT), Ksenia Poplavskaya (AIT)

Implementing Agreement for a Co-Operative Programme on Smart Grids. Annual Report 2018 for the period from March 1<sup>st</sup>, 2018 to February 28<sup>th</sup>, 2018

## **MC-CBA toolkit: Model and case study**

### **Discussion Paper**

#### **ISGAN Annex 3**

Fabrizio Pilo (University of Cagliari), Matteo Troncia (University of Cagliari)

The document describes the mathematical model of the MC-CBA framework. This framework is exploited by original software, the MC-CBA toolkit. The software combines the CBA within an MCA process. The MC-CBA toolkit allows for an output-based assessment of the alternatives based on an automated comparison procedure. To describe the features of the MC-CBA toolkit, a case study related to the project selection among different Smart Grid development plans is presented.

## **System Efficiency**

### **Discussion paper**

#### **ISGAN Annex 6**

Giovanni Beccuti (ETH Zürich)

In the era of deployment of a smarter and more sustainable energy system, an overall perspective of system efficiency becomes increasingly important.

## **Factsheet on ISGAN's Knowledge Transfer Project**

### **Annex 2 and Annex 4**

This factsheet briefly describes ISGAN's approach to the Knowledge Transfer Project, a platform for meaningful dialogue and capacity building to facilitate Smart Grid deployment. A booklet with a summary of all ISGAN Annexes was published and distributed during the CEM9 meeting in Sweden and Denmark.



## 6.2. ISGAN Workshops and Other Events

Several workshops and events organized by ISGAN Annexes and ExCo members took place in 2018. Some of them were organized back-to-back with ExCo meetings, while others were stand-alone events.

### 6.2.1. Activities during Nordic Clean Energy Week and CEM9

The 9<sup>th</sup> Clean Energy Ministerial (CEM9) and the 3<sup>rd</sup> Mission Innovation Ministerial (MI-3) were co-hosted by the European Commission together with Denmark, Sweden, Norway, Finland and the Nordic Council of Ministers. It took place in the cities of Copenhagen, Denmark, and Malmö, Sweden, respectively, on May 22<sup>nd</sup>-24<sup>th</sup>, 2018. The overall theme for the event was Energy Integration and Transition: towards a competitive and innovative low carbon economy. ISGAN hosted two side events during CEM 9:

#### **Workshop on Intelligent market design – boosting global smart grid deployment**

- The workshop took place in Malmö May 23<sup>rd</sup>, 9:30-16:00 followed by a high-level panel discussion (CEM9 Side Event in Copenhagen May 24<sup>th</sup>) in collaboration with the Swedish Forum for Smart Grid. These events highlighted opportunities and needs to accelerate Smart Grid deployment through innovative market design. How should energy markets be designed to allow for energy system integration and a greater variety of stakeholders and roles? And what are the key elements in market design that we must focus on to accelerate deployment of smart grid technologies and solutions? These were the key questions discussed during a highly interactive international dialogue. The outcome of the dialogue provided input to a high-level panel discussion in Copenhagen, Denmark the following day, focusing on concrete policy recommendations pushing the market design agenda forward. A summary report from the workshop and panel discussion, including the final version of the policy brief discussed and refined during both events, was published  
Event website: <http://swedishsmartgrid.se/intelligentmarketdesign>.

#### **CEM9 Side Event Perspectives on Energy Storage Systems**

As part of the ninth Clean Energy Ministerial meeting in Copenhagen, an official Side Event on Energy Storage Systems was arranged on May 24<sup>th</sup>, 2018. The event was organized by ISGAN, in collaboration with the CEM initiative 21<sup>st</sup> Century Power Partnership and Mission Innovation; Smart Grids Innovation Challenge 1. According to the International Energy Agency, energy storage is a key clean energy technology, which will play a critical role in the transition to a climate neutral energy system.

The event gathered international experts for a knowledge exchange dialogue to inform a coming Case Book on Energy Storage Systems to be published by ISGAN later this year.

Examples highlighted at the event covered chemical storage (batteries) for power systems frequency response, the use of thermal inertia in buildings and chemical storage for seasonal balancing of power systems (ammonia and hydrogen).

From the discussions it was noted that future, rather than present, needs should be in focus in the coming Case Book. It was also suggested that examples based on regulatory experiments should be given priority, as these are of key importance to create an enabling environment for energy storage technologies.



### 6.2.2. Workshop on Mission Innovation Challenge 1

Synergies and interactions between Mission Innovation Challenge 1 (MI IC1) and ISGAN have been discussed within the ISGAN community at CSIRO, Newcastle.

The public workshop started with an overview what Mission Innovation (MI) is, how it developed and what the six major R&D topics they work on are.

Mission Innovation (MI) is a global initiative of 22 countries and the European Union to dramatically accelerate global clean energy innovation. As part of the initiative, the participating countries have committed to seek to double their governments' clean energy research and development (R&D) investments over five years, while encouraging greater levels of private sector investment in transformative clean energy technologies. These additional resources will significantly accelerate the availability of the advanced technologies that will define a future global energy mix that is clean, affordable and reliable. MI has developed eight Innovation Challenges (IC), the first of which is entitled IC1: Smart Grids.

MI IC1 was founded in autumn 2016 and is co-led by Italy (Luciano Martini), India (Sanjay Bajpai) and China (Yibo Wang).

### 6.2.3. Smart Energy for Smart Cities

In conjunction with ExCo15 two workshops took place concerning this topic. The first was a public workshop at Fort Scratchley, Australia on March 13th, 2018.

The Newcastle Smart City Strategy (2017-2021) is a four-year framework outlining the key priorities and actions to be delivered by Council in its commitment to leading Newcastle's transition to a smart and innovative city. Several sessions with ideas bombing, a brainstorming technique, took place to share views between ISGAN delegates and delegates from Newcastle including councilors, Newcastle Smart City key partner organizations, businesses and industry representatives. The topics for these group works were centered around living labs as well as the collection of ideas for a sportsground as the energy hub of the city.

A follow-up workshop was held two days later as a closed workshop with ISGAN delegates.

## 6.2.4. SIRFN Workshop on Test Protocols, Methods and Microgrid Research

The workshop took place as an ISGAN side event to ExCo15 on March 12th, 2018 in Newcastle, Australia. Talks were held by Jay Johnson, Sandia on **Test Protocols for Advanced Inverter Functions: Current developments and future opportunities** and by Helfried Brunner, AIT on **Advanced Laboratory Testing Methods**. Discussions centered around collaboration with DERlab's technical groups on standardization, testing procedures and inter-lab collaboration, and the role of Microgrids research in future power system research.

## 6.2.5. IRED 2018

The 8<sup>th</sup> International Conference on Integration of Renewable and Distributed Energy Re-sources (IRED) was held in Vienna, Austria from October 16<sup>th</sup>-19<sup>th</sup> 2018. Back-to-back with IRED, ExCo16 also took place in Vienna [October 15<sup>th</sup>-19<sup>th</sup>, 2018].

At IRED 2018, ISGAN members presented several posters and gave a number of presentation at the conference, thus increasing ISGAN's visibility.

Event website: <http://www.ired2018.at/Home/>

For more details, please refer to Section 1.6, Highlights.



## 6.3. ISGAN Webinars

As part of the deliverables of Annex 8, ISGAN Academy on Smart Grids, several webinars took place:

Date	Registered participants	Topic
18 04 2018	101	Perspectives on ISGAN Knowledge Transfer Projects (KTP) in Mexico, Belgium and India
13 06 2018	250	Comprehensive Planning for Universal Electricity Access. The Reference Electrification Model (REM)
04 09 2018	350	Multicriteria and cost benefit analysis for smart grid projects
10 12 2018	360	Coordinating Power Control. ISGAN awards winner 2018
21 01 2019	241	How to replicate solutions for the flexibility challenge?



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