iea-isgan.org

ISGAN
INTERNATIONAL SMART GRID ACTION NETWORK

International Energy Agency (IEA)
Technology Collaboration Programme (TCP)

International Smart Grid Action Network (ISGAN)

Annual Report 2020

for the period from 1 March 2020 – 28 February 2021

CLEAN ENERGY MINISTERIAL

Technology Collaboration Programme
by iea

Disclaimer

This report was prepared by the Secretariat of the International Smart Grid Action Network (ISGAN). ISGAN is organized as the Implementing Agreement for a Cooperative Programme on Smart Grids and operates both under a Technology Collaboration Programmes framework created by the International Energy Agency (IEA) and as a Clean Energy Ministerial initiative. The views and opinions expressed herein do not necessarily state or reflect those of any of ISGAN's participants, any of their sponsoring governments or organizations, the IEA Secretariat, or any of its member countries. No warranty is expressed or implied, no legal liability or responsibility assumed for the accuracy, completeness, or usefulness of any information, and no representation made that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring.

August 2021

Message from the Chair

This year marks the 10th anniversary of ISGAN – the International Smart Grid Action Network – and it is my pleasure to present to you the tenth annual report. Despite these difficult and unpredictable times with our daily lives and activity heavily affected by the outbreak of the COVID-19 pandemic, in the year 2020 the ISGAN community proved to be as strong and unite as ever, finding new ways to continue to effectively working together. As a matter of fact, all the ISGAN meetings and workshops this year had to be held virtually. Nevertheless, we are proud to say that all of them have been extremely well attended and allowed us to steadily advance towards our goals.

I am very glad to underline that by acting as both a Clean Energy Ministerial (CEM) initiative and an International Energy Agency (IEA) Technology Collaboration Programme (TCP), ISGAN is unique. It represents a global strategic platform that gathers together governments and grid key stakeholders to support them in defining their energy strategy and related actions to develop and deploy smart electricity grids for the attainment of national, regional and global clean energy and climate goals. In fact, through an extensive international exchange of knowledge and experience, ISGAN calls attention to the value and impact of smarter, cleaner electricity systems as critical enablers for the ongoing clean energy transition. We are fully determined to continue this important work and to support ISGAN's role as a key global platform for cooperation on smart grids leveraging on both technical experts and thought leaders on clean energy.

Thanks to its highly collaborative effort and the quality of its work, ISGAN is attracting more members each year and also during year 2020, despite the adverse conditions, several countries expressed their strong interest to joining in, among them I would like to name Brazil, Israel and Hungary.

I am honored to serve as ISGAN Chair and I would like to thank all Executive Committee members, the Co-Secretariats, the Annexes' Operating Agents, Technical Leads and national experts for their tremendous work and commitment: these people represent the most valuable asset of ISGAN and the main reason behind its success.

Among the successful accomplishments of this year, I would like to firstly highlight the thorough process consisting of questionnaires, meetings and workshops and the self-assessment of the current annexes to lay the basis for the ISGAN next term. In fact, in view of the launch of the third period, it was essential to review ISGAN main scope and objectives as well as its general structure, and to elaborate – with the great help of the newly created Request for Extension Team – a clear strategy for the next five years.

Another significant achievement was the official launch of the new Annex 9 on *"Flexibility Market development and implementation"*, demonstrating that ISGAN is a dynamic initiative, able to grow and to give the needed focus to new topics, thus aligning with the emergent themes of the global energy landscape. Moreover, this new Annex also proves ISGAN attention to important non-technical aspects of smart grids deployment such as market related aspects.

As a third example, I am very proud to highlight that in collaboration with the Power System Flexibility campaign (PSF) we successfully organized the first ISGAN-PSF joint workshop *"A Holistic Approach to Low Emission Energy Systems through the Sector Integration"*, that took place as an official pre-event of the CEM11/MI-5 Ministerial meeting. This Minister's level live workshop has been very successful and represented an excellent opportunity to showcase recent ISGAN and PSF work, including the main outcome of the CEM Horizontal Accelerator *"Electric vehicle and power system integration"* as an innovative collaboration tool engaging four CEM workstreams: 21CPP, EVI, ISGAN and PSF. As integral part of this workshop, the ISGAN Awards 2020 ceremony celebrating the winners of the Award of Excellence of smart grid projects focusing on *"Digitalization Enabling Consumer Empowerment"* was a powerful means to further increase ISGAN visibility, with the actual winners recalled by the Head of the CEM Secretariat during the plenary session.

I would like to conclude my opening remarks to the tenth annual report expressing my strong hope that reading it will stimulate your interest to becoming fully involved with our activity and with the ISGAN community.

Yours sincerely,

Luciano Martini

Table of Contents

1. ISGAN overview 7
1.1. What is ISGAN? 7
1.2. Vision 9
1.3. Activities and Deliverables 10
1.4. ISGAN's strengths 10
1.5. History 11
1.6. ISGAN's organizational structure 12
1.6.1. The Executive Committee (ExCo) 13
1.6.2. The Presidium 14
1.6.3. Contracting Parties 15
1.6.4. Secretariat and Operating Agent 16
1.7. Key Achievements and Highlights in 2020 18
1.7.1. Highlight: Interactive International Knowledge Sharing project on Regulatory Experimenting (incl. Sandboxes) 19
1.7.2. Highlight: Foundation of the new Annex 9 20
1.7.3. Highlight: Ground-breaking new collaboration involving four CEM work streams 21
1.7.4. Highlight: (CEM11) ISGAN-PSF Joint workshop & Sixth ISGAN Awards Ceremony 22

2. ISGAN Annexes 24
2.1. Annex 2: Smart Grid Case Studies 27
2.1.1. Main accomplishments in 2020 28
2.2. Annex 3: Cost-Benefit Analyses and Toolkits 29
2.2.1. Main accomplishments in 2020 30
2.3. Annex 4: Synthesis of Insights for Decision Makers 31
2.3.1. Main accomplishments in 2020 31
2.4. Annex 5: Smart Grid International Research Facility Network (SIRFN) 32
2.4.1. Main accomplishments in 2020 33
2.5. Annex 6: Power Transmission and Distribution Systems 35
2.5.1. Main accomplishments in 2020 36
2.6. Annex 7: Smart Grid Transitions and Institutional Change 39
2.6.1. Main accomplishments in 2020 40
2.7. Annex 8: ISGAN Academy on Smart Grids 42
2.7.1. Main accomplishments in 2020 42
2.8. Annex 9: Flexibility Markets - development and implementation 45
2.8.1. Main accomplishments in 2020 46

3. ISGAN Award of Excellence 48

4. Collaboration and Co-operation 49
4.1. Collaboration with other TCPs, initiatives and organizations 49
4.2. Collaboration with IEA and CEM secretariat 49

5. ISGAN Executive Committee Meetings 50
5.1. 19th ExCo meeting 50
5.2. 20th Exco meeting (27.-29. October 2020) 51
5.2.1. ISGAN Interactive Workshop: How can we create new channels for systematic knowledge exchange between the ISGAN network and key stakeholders at national level? 51
5.2.2. Workshop on the outcome of recent Annex 6 activities 52

6. Deliverables 54
6.1. ISGAN Workshops and Other Events 54
6.2. ISGAN Publications 55
6.2.1. Lessons learned from international projects on TSO-DSO interaction 55
6.2.2. Key Messages Annex 6 – Power Transmission & Distribution Systems 55
6.2.3. Electric vehicle and power system integration: key insights and policy messages from four CEM initiatives 55
6.2.4. ISGAN Annual Report 2019 56
6.2.5. micro VS MEGA trends 56
6.2.6. Annex 5 published five high-level journal publications in 2020 57
6.3. ISGAN Webinars 57

7. ISGAN Financial Report 58

1. ISGAN overview

1.1. What is ISGAN?

The International Energy Agency (IEA) is an intergovernmental organization that works to shape a secure and sustainable future for all, through its focus on all fuels and technologies, and the analysis and policy advice to governments and industries around the world.

The Technology Collaboration Programme (TCP) is a multilateral mechanism established by the IEA with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of thousands of experts across government, academia, and industry located within 55 countries who are dedicated to advancing common research and the application of specific energy technologies.

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

The International Smart Grid Action Network (ISGAN), is a Technology Collaboration Programme of the International Energy Agency. The co-operative programme was formally established in 2011 and is also an initiative of the Clean Energy Ministerial. 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 seeks to support governments and industry with insight and recommendations to high-level decision-makers. In addition, ISGAN closely co-operates with several other organizations, initiatives, and other TCPs.
> 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.
> 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.

▲ Schematic view of a modern electricity grid: Smart Grid

ISGAN's Contracting Parties can then apply results within their own national, sub-national, or regional contexts. The network's impact relies on the development of publications and organization of mutual learning processes and events that will enable smarter investment and improved policy, however, these principles are still heavily dependent on the implementation by authorities in sovereign nations.

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 supply from 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 a global, national and regional level. Another important motivation for Smart Grids is to ensure a resilient and secure energy system.
Investment in Smart Grid technologies and approaches, including Smart Meter deployment, has grown rapidly in recent years around the world. Smart Grids are playing an increasingly 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 are 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 a growing variety of power systems stakeholders and roles in an increasingly connected society, taking advantage of new digital tools and business models focused on the delivery of data-driven energy services

To highlight some of the core objectives and means for achieving smarter, more environmentally friendly electricity systems, ISGAN identified its primary theme as (power system) **flexibility** and a secondary theme, **digitalization** in 2016. In 2017, ISGAN added another important theme, namely, **resiliency**, while in 2019, **interoperability** was added as a side-theme to emphasize its importance in ISGAN's work.

Thus ISGAN's main themes are:

- Power system flexibility
- Digitalization
- Resiliency
- Interoperability

1.2. Vision

ISGAN's vision is to accelerate progress on key aspects of Smart Grid policy, technology, and investment through the voluntary participation of governments and their designees in specific projects and programmes. 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

1.3. Activities and Deliverables

ISGAN facilitates dynamic knowledge-sharing, technical assistance, peer review and, where appropriate, project coordination among its Contracting Parties. The active ISGAN community produces a variety of deliverables each year which can be categorized as shown below:

1.4. ISGAN's strengths

Broad International Expert Network

ISGAN leverages expertise from governments, national laboratories and research institutions, transmission and distribution system operators, public utilities and others from 26 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 Ministe-rial initiatives to advance systems perspectives on power grids and grid integration

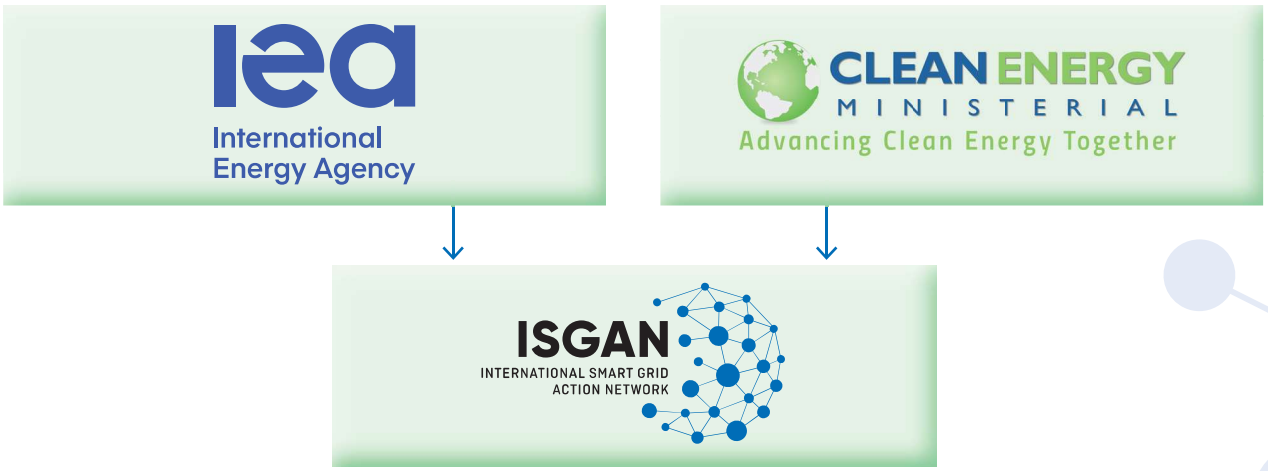
Diverse Portfolio

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

1.5. 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 their second meeting, CEM2 in Abu Dhabi, in April 2011, as an Implementing Agreement for a Cooperative Programme on Smart Grids, operating under the IEA Framework for International Energy Technology Cooperation.

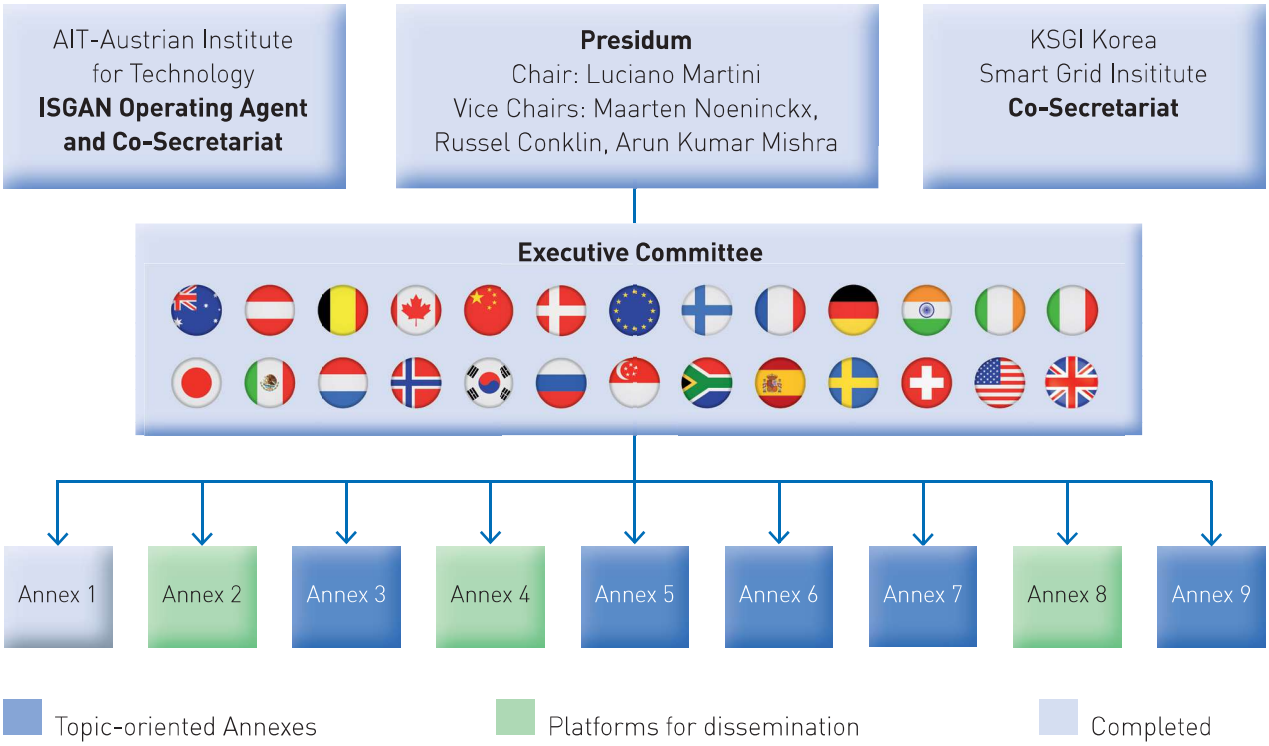
After the end of its first five-year period, an extension for ISGAN was requested and approved by the IEA in February 2017. The extension was granted for the period of 1 March 2017 until 28 February 2022.
At the ExCo18, in October 2019, the Executive Committee of ISGAN agreed to file a Request for Extension for the next five year-period of ISGAN, starting on 1 March 2022. A dedicated working group to prepare the relevant documents has been set up.



1.6. Organizational structure

ISGAN is a Technology Collaboration Programme (TCP), currently consisting of 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 into nine Annexes, which are standing working groups, defining new tasks each year. Each Annex consists of national experts from Contracting Parties and is led by the Annex' Operating Agent and supported by a Technical Lead. Annex 1: Global Smart Grid Inventory has already been completed, with some of its remaining tasks moved to Annex 2: Smart Grid Case Studies.

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 1 March 2017 until 28 February 2022.



Five of the Annexes are topic-oriented (Annex 3: Cost-Benefit Analyses; Annex 5: Smart Grids testing; Annex 6: Future T&D system needs; Annex 7: Smart Grids Transitions – on Institutional Change, Annex 9: Flexibility Markets development and implementation), while three Annexes constitute platforms for dissemination and deployment of Smart Grid practices focused on specific products and methodologies (Annex 2 and Annex 4 comprise of Knowledge Transfer Projects (KTP), Casebooks, and policy insight; Annex 8: Webinar-based virtual training and strategic communication to decision-makers).

1.6.1. The Executive Committee (ExCo)

Each Contracting Party appoints a delegate and an alternate to the Executive Committee. This is the decision-making body of ISGAN who convenes twice a year. The ExCo's main aims are to discuss new developments, identify knowledge gaps and implementation barriers, and shape ISGAN's Programme of Work accordingly.

© Sean Philipp

▲ ISGAN Executive Committee

1.6.2. The Presidium

The Executive Committee is led by the Chair and three Vice-Chairs and together they form the Presidium. Each member of the Presidium is elected for a period of two years, with possible reelection. The first Presidium was elected at the inaugural meeting in Seoul, Korea, in June 2011. Owing to the complexity of ISGAN's activities, having three Vice-Chairs was deemed appropriate.
The current Presidium consists of:

Arun Kumar Mishra
ISGAN Vice Chair
Director NSGM-PMU, India
akmishra@powergridindia.com

Luciano Martini
Chair of ISGAN
Ricerca sul Sistema
Energetico S.p.A, Italy
Luciano.Martini@rse-web.it

Russell Conklin
ISGAN Vice Chair
U.S. Department of Energy
Russell.Conklin@hq.doe.gov

Maarten Noeninckx
ISGAN Vice Chair
Directorate-General Energy FOD economie
Maarten.Noeninckx@economie.fgov.be

▲ ISGAN Presidium

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.

▲ ISGAN's worldwide presence

List of ISGAN Contracting Parties (as of February 2021):

1.	Australia	14.	Japan
2.	Austria	15.	Korea
3.	Belgium	16.	Mexico
4.	Canada	17.	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.	United Kingdom
13.	Italy	26.	The United States of America

ISGAN has been constantly seeking to extend the participation list of Contracting Parties and will continue to do so in the upcoming term of the programme. Countries that ISGAN has been in contact with include Morocco, Czech Republic, Indonesia, Israel, Brazil, Malaysia, Hungary, UAE and Thailand.
At ExCo16 (2018 Vienna, Austria) and ExCo17 (Stockholm, Sweden), Brazil was present as an observer. The ExCo decided by unanimous vote to invite Brazil to become a Contracting Party to ISGAN. The accession process is currently underway.
Israel was present as an observer during ExCo20 (2021, online meeting). The delegate indicated a strong interest for Israel to join ISGAN. The next formal steps were taken in May 2021.

1.6.4. Operating Agent and Secretariat

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. Mihai Calin is the current Operating Agent of ISGAN, Mihai.Calin@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 the management of ISGAN, communication matters as well as the management of the common fund and reporting to the IEA:

Head of the Secretariat: Susanne Windischberger,
Susanne.Windischberger@ait.ac.at; 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
- Chloe Yoon, ysj@smartgrid.or.kr
- Sky Son, jcson jcson@smartgrid.or.kr

1.7. Key Achievements and Highlights in 2020

A particular challenge encountered during 2020 was to ensure that ISGAN continued to work successfully together as a network, despite the many challenges encountered during the COVID-19 pandemic. Amongst many issues, this made the familiar ways of working simply impossible and new approaches had to be found. The overall success of ISGAN activites in 2020 reflects the network ability to manage and operate despite these great challenges, testifying the strengths and cohesion of this TCP.

Two very fruitful online ExCo meetings took place, where the following topics were in the main focus:

1) Request for Extension and Strategy process

   A strategy process for the preparation of the next phase of ISGAN was conducted during 2020.

2) Cooperation with other organizations, TCPs, and initiatives

The Smart Grid space is highly populated with multilateral organizations focusing on the many different aspects of this broad topic. Thus strategic alignment between these organizations is necessary to ensure a strong impact while avoiding any overlaps and duplication of work. ISGAN has invited several other organizations to its ExCo meetings and plans to manage the cooperation in a more formalized manner with a liaison team in the future.

1.7.1. Highlight: Interactive International Knowledge Sharing project on Regulatory Experimenting (including Sandboxes)

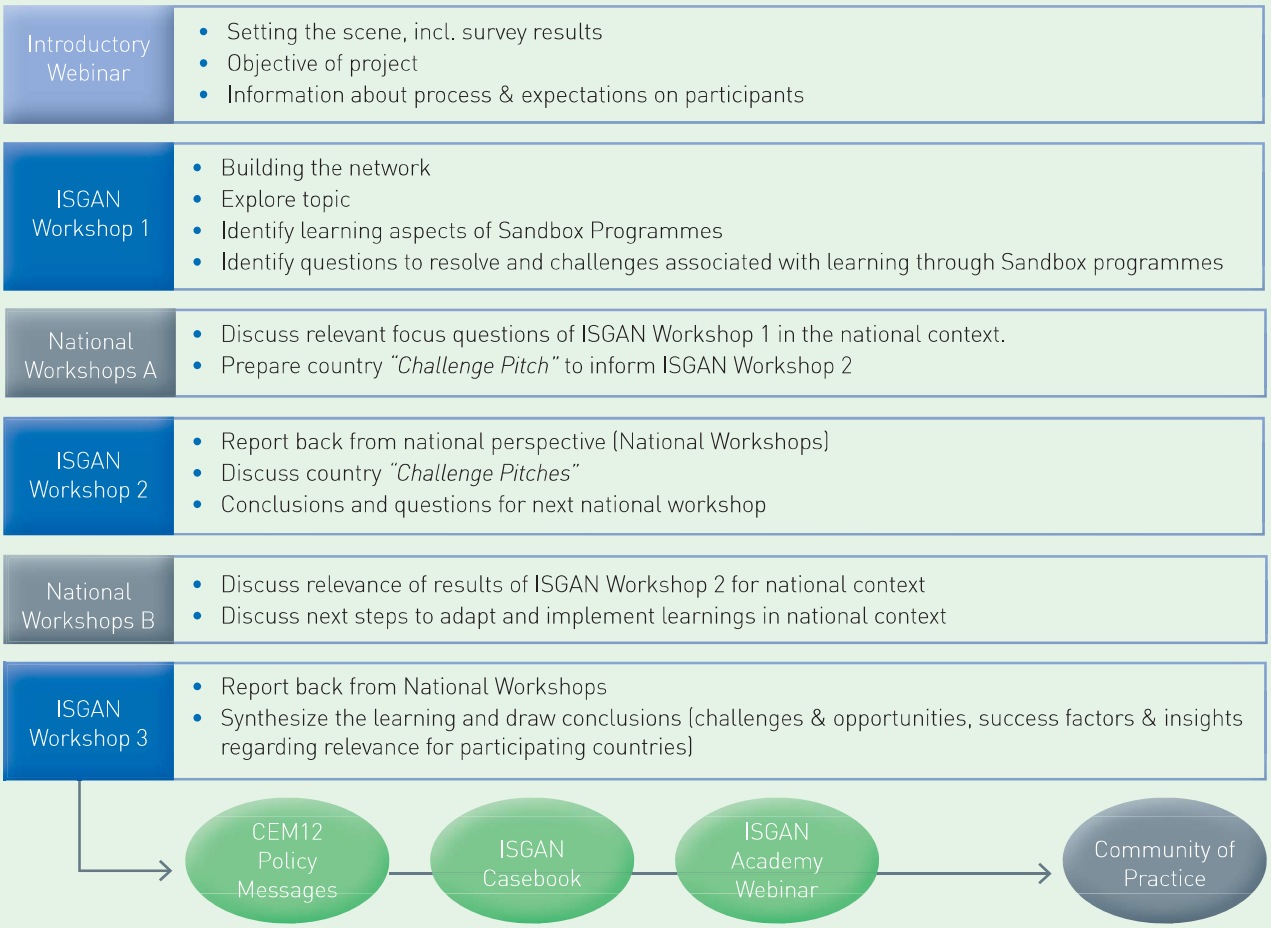
Even though the highly interactive process usually requires live discussions, the KTP-Team was able to conduct a very extensive KTP-Process with several virtual meetings and workshops on the topic of experimental Sandboxes. Resulting from their great experience and very professional leadership, the KTP team adapted the process to a series of online meetings and other knowledge-sharing processes. This KTP project is a follow-up of the successful first project on the same theme which took place in 2019. The project focuses on policy learning from regulatory experimenting, including sandboxes and involving 15 countries across 3 continents. Four ISGAN Annexes cooperate to ensure the meaningfulness and success of the project.

Based on the successful Knowledge Transfer Project (KTP) approach developed within ISGAN since 2016, a new process design was developed for the Regulatory Sandbox 2.0 Project:

- Involving international interactive knowledge-sharing workshops
- Interlinked with national stakeholder meetings to put the international dialogue into national contexts and increase the flow of knowledge and interaction between these levels
- Interactive, digital knowledge sharing and co-creation of new ideas
- Goal-oriented process to synthesize the learning into knowledge products for the wider energy community

Project results are expected after the finalization of the project in June 2021.

Overview of KTP Process



1.7.2. Highlight: Foundation of the new Annex 9

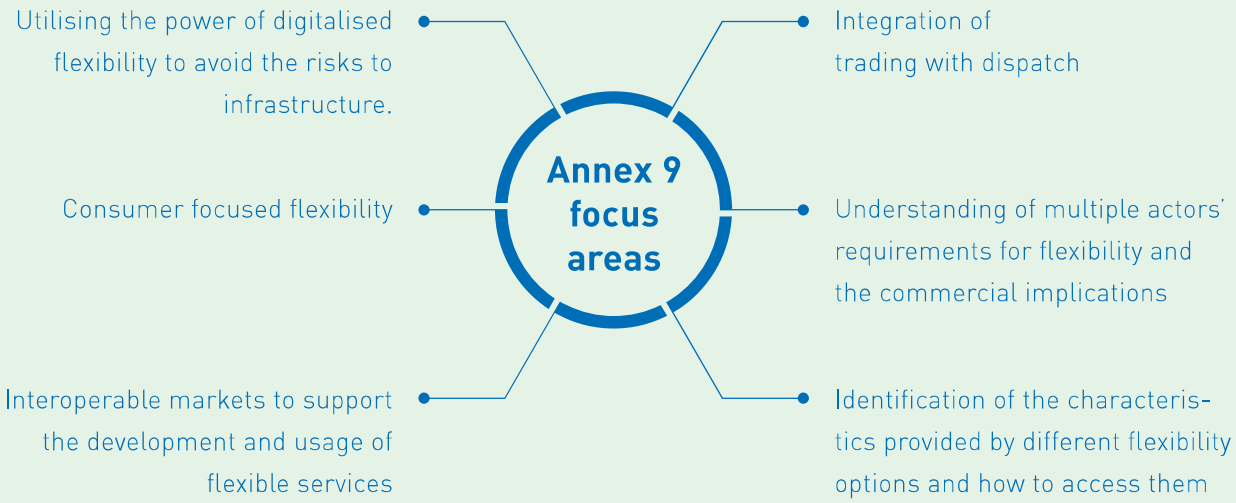
During the 18th meeting of the Executive Committee (Montreux, 30.9.-4.10., 2019) an Incubator team was launched to explore possible new topics to be considered as focus areas for ISGAN. From this initiative, under the lead of the UK, a new Annex 9 on Flexibility Markets Development and Implementation was approved and officially started on January 26th, 2021.
The rapid growth of decentralized renewable energy sources, and their intermittency requires greater levels of flexibility (ability to change the behavior of generation and consumption in response to the availability of supply) within the power system. Market environments that better reveal and reward the value of flexibility are currently under development in several countries. Globally, there are many projects which investigate various solutions to minimize or avoid electricity network reinforcement and as well as those which investigate the development, integration, and impact of trading platforms within the energy market. However, there are also elements underrepresented in research, particularly around market design.

ISGAN Annex 9 has been established to enhance further development and understanding in this area, with the following objectives:

- To enrich and disseminate participants' understanding of flexibility market design.
- To create and curate an evidence base which all stakeholders can utilise to support their decision-making in the flexibility market space.
- To facilitate and extend the debate on best practices in market design

The scope of the Annex considers all aspects of market design for power system flexibility. This includes the whole range of market timescales, from long-term investment signals to second-to-second balancing and response. Furthermore, the entire physical system is encapsulated, from large centralized generation to behind-the-meter sources of flexibility within domestic settings and interfaces with other vectors.
The Annex will focus on all sources of value that flexibility conceivably could capture, going beyond MWh to include characteristics like voltage control, repeatability, inertia, locational constraint alleviation; and aspects of the market that go beyond the trading rules such as consumer support, or how obligations (such as grid stability) are understood and evaluated.

Six areas have been identified to guide the focus of the Annex.



1.7.3. Highlight: Ground-breaking new collaboration involving four CEM work streams

The CEM Horizontal Accelerator for "Power System Integration of Electric Vehicle (EV) Infra-structure" is an innovative mechanism strengthening the collaboration and capitalizing on the synergies between four CEM workstreams: the International Smart Grid Action Network (ISGAN), 21st Century Power Partnership (21CPP), the Electric Vehicle Initiative (EVI) & the Power System Flexibility (PSF) Campaign.
The CEM Horizontal Accelerator is a step towards developing a cross-sectoral and holistic approach to power system integration.

On 19-20 April 2020, the Accelerator gathered some 70 international experts from 17 countries across four continents for a two-day virtual interactive workshop on the theme "Electric Vehicle and Power Systems Nexus: How to support large-scale adoption and effective integration?".
To enable interaction and knowledge exchange between experts before, during and after the workshop as well as transparent project documentation of results, a digital open innovation platform was set up for use by all participants.

The CEM Horizontal Accelerator represents a concerted effort to unify existing CEM workstreams to produce coherent analysis, conclusions and advices that leverage the singu-ar expertise and outreach of each initiative and campaign. This focused and multi-disciplinary approach to EVs offers new insights into power system integration and sector coupling, guiding the development of a modern and integrated energy system.
Project participants consist of a transdisciplinary group of international experts and sector stakeholders from different levels of government, research and industry with complementary knowledge and insights into the EV – power system nexus.

The results from this first phase of the Horizontal Accelerator have been summarized within the "Electric Vehicle and Power System Integration: Key insights and policy messages from four CEM initiatives" report, which was presented at the 11th Clean Energy Ministerial (CEM11) meeting and also contributed to the development of the IEA-coordinated "Global EV Outlook" and the "Status of Power System Transformation" publications.

This report summarizes the opportunities to couple the road transport and power system sectors, articulating policy messages based on current experience, with a particular focus on the role of critical stakeholders in a transformation that crosses multiple sectors.

Thanks to the support from the participating governments of these CEM workstreams and strong analytical input from the workstreams coordinators, the project continued gathering momentum even during the lockdown provoked by the COVID-19 pandemic.

The report is available through this link:
https://www.iea-isgan.org/wp-content/uloads/2020/10/2020-9-15- CEM-Horizontal-Accelerator-FINAL-FOR-POSTING-1.pdf

1.7.4. Highlight: (CEM11) ISGAN-PSF Joint workshop & Sixth ISGAN Awards Ceremony

ISGAN and the Power System Flexibility Campaign (PSF) organized a joint workshop "A holistic approach to low emission energy systems through the sector integration" This event took place as an official pre-event of the CEM11/MI-5 Ministerial meeting on Wednesday 16 September 2020.

The Clean Energy Ministerial 11 (CEM11) was hosted by Saudi Arabia and was entirely virtual and open to all via a live webcast.

This workshop benefitted from the strong commitment by Enrique Gutierrez (PSF) and Luciano Martini (ISGAN) and brought together ongoing and upcoming CEM work from various perspectives, looking at power system integration enabled by digitalization and new technologies for power system flexibility – such as electric mobility and distributed storage. The focus of the discussion was on key policy support, including market design, multi-stakeholder coordination, and cross-sectoral approaches. From CEM, this included the Power System Flexibility Campaign, the International Smart Grid Action Network (ISGAN), and the work of the Horizontal Accelerator for EV Integration.
Mr. Juan Carlos Jobet (Minister of Energy, Chile), Mr. Keisuke Sadamori (IEA Director), Mr. Gilberto Dialuce (DG at Ministry of Economic Development, Italy) and several high-level international experts contributed to this successful live event

The recorded session is available through this link:
https://www.youtube.com/watch?v=uS6IyRgUutY&feature=youtu.be

During the event, ISGAN Awards 2020 ceremony was held, celebrating the Global Excellence in Smart Grid Projects with a special focus on "Digitalization Enabling Consumer Empowerment". Mr. Koyama Masaomi (Director-General, Ministry of Economy, Trade and Industry of Japan) presented the ISGAN Award to the winning projects.

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 ongoing Smart Grid project deployment, has been completed. Any remaining activities or necessary updates are to be included in Annex 2.

Operating Agents lead the Annexes and are supported – depending on the Annex –by technical Leads.
At present eight Annexes are active. Their titles and Operating Agents are:

Annex	Title	Operating Agent	Country
Annex 2	Smart Grid Case Studies	Korea Smart Grid Institute – KSGI	Korea
Annex 3	Cost-Benefit Analyses	University of Cagliari	Italy
Annex 4	Synthesis of Insights for Decision Makers	Korea Smart Grid Institute – KSGI	Korea
Annex 5	Smart Grid International Research Facility Network (SIRFN)	DERLab	Germany
Annex 6	Transmission and Distribution Power Systems	Research Institutes of Sweden – RISE	Sweden
Annex 7	Smart Grids transitions	AIT Austrian Institute of Technology GmbH	Austria
Annex 8	ISGAN Academy on Smart Grids	Institute for Research in Technology IIT, Universidad Pontificia Comillas	Spain
Annex 9	Flexibility Markets development and implementation	Department for Business, Energy & Industrial Strategy – BEIS	UK

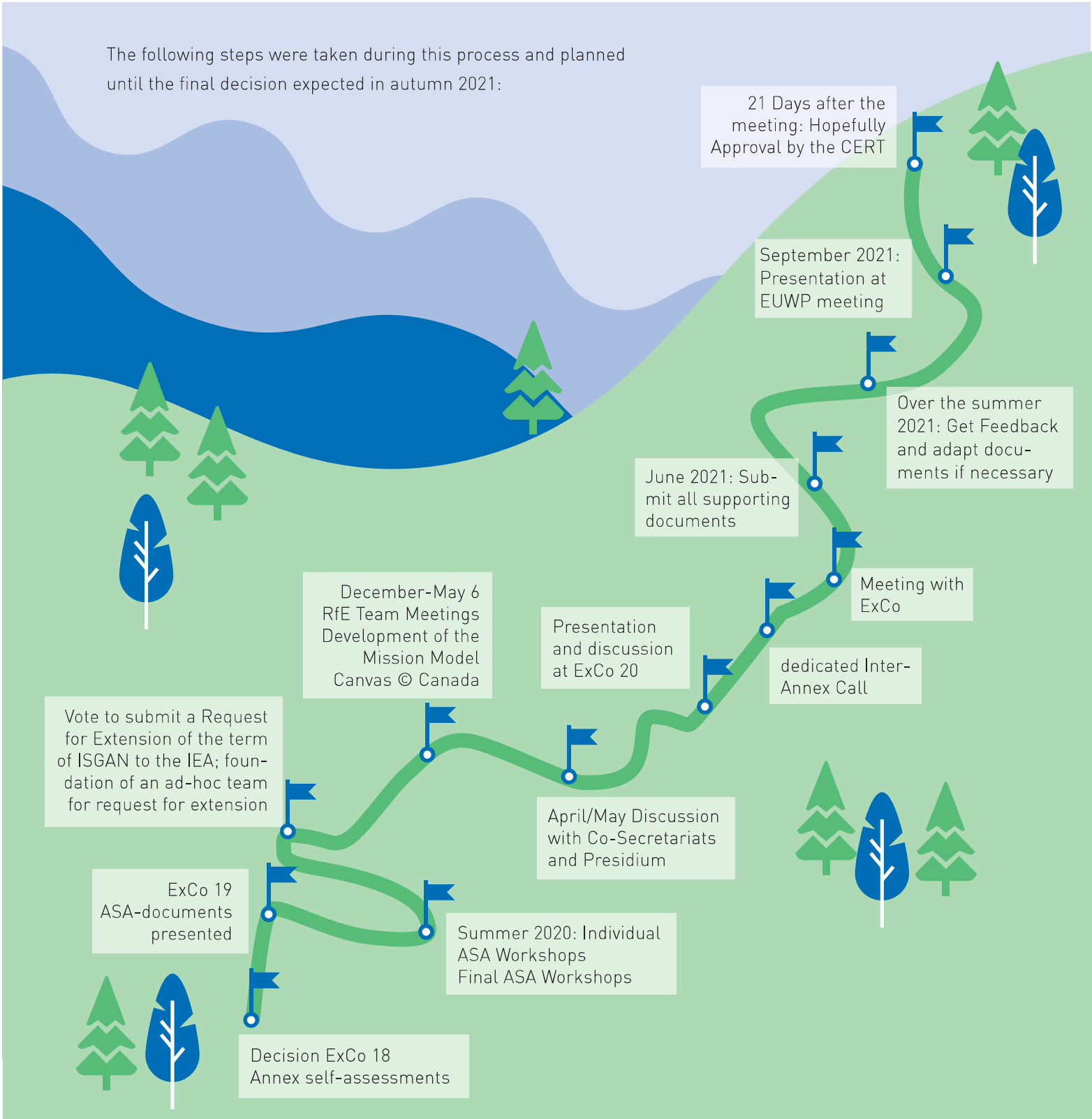
At its 18th meeting, the ISGAN TCP Executive Committee (ExCo) directed Annexes to complete a self-assessment in advance of the 19th ExCo meeting, with the overarching objective to ensure the ISGAN TCP's continued relevance and increasing impact on smart grids development and deployment internationally. The Annex Self-Assessment (ASA) provided a tool by which ISGAN Annexes could take a new, objective look at their programmes, participation, and opportunities for impact taking. The current state of smart grids internationally and the ISGAN TCP's evolving programme, participation, and objectives were taken into account. The ASA documents were further discussed and elaborated in dedicated workshops and contribute to the development of the ISGAN Strategy for the upcoming period of ISGAN.

Further, a Request for Extension team was founded, and several meetings, surveys, summaries and discussions took place. The aim was not only to prepare the documents for the Request for Extension process with the IEA, but also included the opportunity to renew structures within ISGAN to face future challenges which are foreseen.

The following challenges were identified during this process:

- The increasing number of multilateral organizations in the field of Smart Grids
- Impact to national net-zero energy goals is necessary
- Communication within and outside of ISGAN requires improvement
- Optimisation of limited resources

The following steps were taken during this process and planned until the final decision expected in autumn 2021:



ISGAN Annex Participation (as of February 2021)

	Annex 2	Annex 3	Annex 4	Annex 5	Annex 6	Annex 7	Annex 8	Annex 9
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		+			+			
Netherlands	+		+	+	+	+	+	
Norway					+			
Russian Federation		+		+			+	
Singapore	+							
South Africa		+			+		+	
Spain	+		+	+			+ (OA/Lead)	
Sweden	+	+	+		+ (OA/Lead)	+		+
Switzerland		+			+		+	
United Kingdom		+	+	+	+	+	+	+ (OA/Lead)
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 to develop indepth case studies. The common framework, a socalled Case Book, enables the comparison of policies and technologies adopted in different regulatory frameworks, legislations, networks (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 firsthand 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 four Case Books: Advanced Metering Infrastructure (AMI), Demand Side Management (DSM), Consumer Engagement & Empowerment and Energy Storage Systems (ESS). The Case Books are available for download on ISGAN's website 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

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.

2.1.1. Main accomplishments in 2020

Assessment of survey on Smart Grid motivating drivers and technologies

Annex 2 carried out its third survey on "smart grid motivating drivers and associated technologies" which came six years after the last survey in 2014. Since the motivating drivers and technology priorities for countries may have changed in some ways compared to the assessment results in 2014, depending on national progress and other circumstances, this assessment was expected to provide insight to understand the shift of trends of government policies and related supporting technologies for smart grid implementation around the world.

A total of 18 countries participated in the survey from the ISGAN community (Australia, Austria, Belgium, Canada, France, Germany, India, Ireland, Italy, Japan, Korea, The Netherlands, Spain, Sweden, United Kingdom) as well as other non-ISGAN participating countries such as Malaysia, Thailand, and Vietnam.

One key observation from the survey showed that the highest priority is shifted from 'System Efficiency Improvements' to 'Optimizing Asset Utilization'. Regarding key technologies, 'Advance Metering Structure (AMI)' remains the highest topranked technology.

Knowledge Transfer of Smart Grid best practices and lesson learned

The Clean Energy Ministerial (CEM) organized an initiative to facilitate crosssector collaboration between stakeholders from the power and transport sectors. It aimed to address concerns at the intersection of electric vehicles (EVs) and the power grids on which they depend for charging. With the number of EVs growing rapidly, pressing questions have emerged on how to integrate them efficiently into the electricity system and ease related challenges. Related topics include investigating the ideal way to develop and enable solutions that support vehicle electrification and a range of new flexibility opportunities.

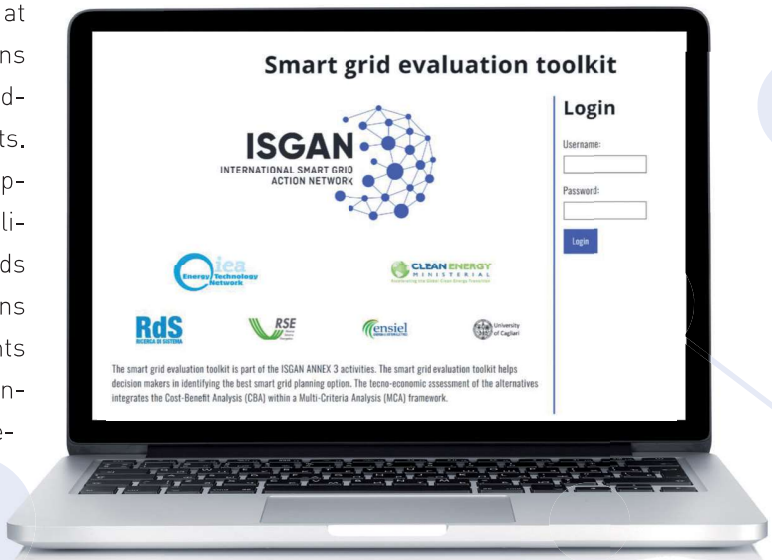
The KTP team of Annex 2 took a leading role in a CEM collaboration on the connection between EVs and power systems. The project known as 'Horizontal Accelerator KTP' saw four workstreams join forces: the International Smart Grid Action Network (ISGAN), the 21st Century Power Partnership (21CPP), the Electric Vehicles Initiative (EVI) and the Power System Flexibility (PSF) campaign. This initiative amplified ongoing work at the intersection of the two domains across the four workstreams. It focused on easing the integration of a rapidly growing number of EVs and their interaction with the electricity system. This enabled the policy implications to be articulated based on current experience, with particular focus on the key stakeholders and their potential roles in this multi-sector transformation.

The summary of the project outcomes was introduced at the previous CEM11 meeting in September 2020 and the report is available for download at ISGAN website.

Participating countries:

2.2. Annex 3:
Cost-Benefit Analyses and Toolkits

Annex 3 incorporates the 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 facilitates the prioritisation of decisions required 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.



The use of an approach which combines the Cost-Benefit Analysis (CBA) for the monetary impacts and the Multi-Criteria Analysis (MCA) for non-monetary impacts is promising to increase the accuracy of the assessment of smart grid initiatives. As a part of ISGAN activities, the smartgrideval software is developed and proposed a as decision support tool in the context of smart grid assessment.

2.2.1. Main accomplishments in 2020

Recent activities focused on evaluating existing approaches and developing new approaches to analyzing the costs and benefits of smart grid technology integration and comparing a range of scenarios at the electrical system level as well as on a regional level.

The ISGAN platform for MCA has been improved with the addition of a new optimization engine and new user-friendly interfaces.

In preparation for the inclusion of the functionality to evaluate projects when flexibility and services compete with grid infrastructures within the tool, the main tasks and a timeline were approved by the Annex participants. The draft of the research activity was approved, and the sharing of activities decided.

Two reports were completed:

- Decision Theory techniques for MC-CBA of Smart Grid projects
- Managing uncertainty in CBA

A policy brief which elaborated on the identified gaps and shortcomings when considering project appraisal when flexibility is included was drafted as well as a policy brief on the expected impact of flexibility on system development.

Participating countries:

France, India, Italy, Korea, Mexico, Russian Federation, South Africa

Sweden, Switzerland, United Kingdom, 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 of 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 the development for the increased understanding of Smart Grids internationally, while recognizing a diversity of drivers and approaches among related technologies, policies, practices, and systems.

2.3.1. Main accomplishments in 2020

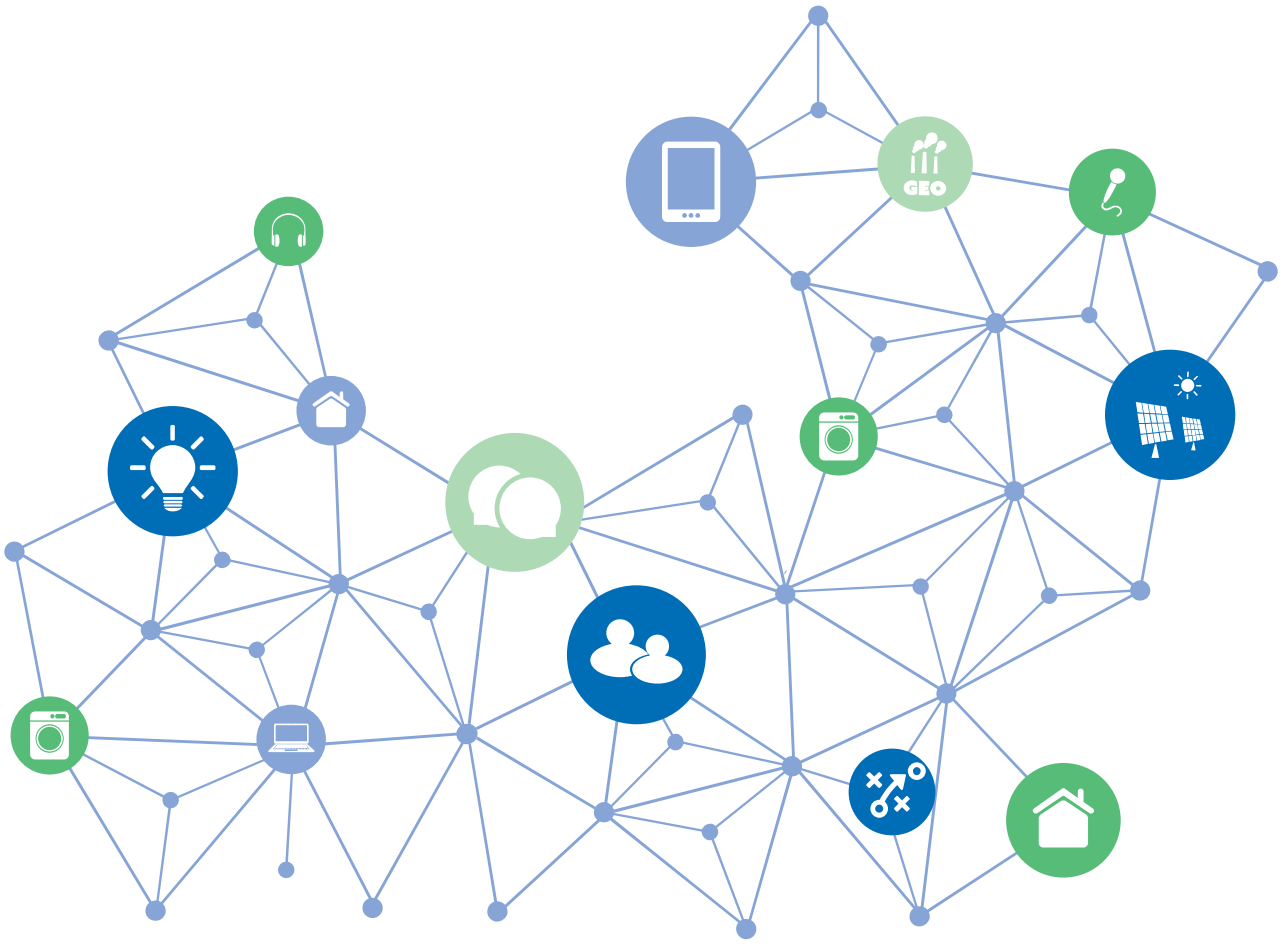
Annex 4 supported several inter-Annex activities in 2020: In collaboration with Annex 2 and 7, Annex 4 supported the publication of policy messages on Innovative Regulatory Approaches with Focus on Experimental Sandboxes to Enable Smart Grid Deployment. Concerning the task of strategic communications, analysis and mapping of all posts on the ISGAN Website were conducted. Furthermore, the ISGAN YouTube channel was maintained. All ISGAN related video clips from other websites (e.g. Leonardo Energy) were collected under this one group: ISGAN – YouTube

Annex 4 supported the outreach to possible new members of ISGAN by collecting information on the governmental contact points of potential member countries from Asia

Participating countries:

Belgium, Canada, China, Denmark, France, India, Italy, Korea, Netherlands, Spain, Sweden, United Kingdom, 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 system 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 cybersecurity, 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 the 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 high-impact work on Smart Grids testing including smart inverters, Battery Energy Storage Systems (BESS), Distributed Energy Resources (DER), Advanced Lab Testing Methods (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 a 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 the 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

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

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

2.4.1. Main accomplishments in 2020

For ISGAN FY 2020, the following achievements were accomplished:

- Public SIRFN Webinar on "Testing Methods and Certification Protocols of IEA-ISGAN:SIRFN", organized by ISGAN:SIRFN and DERlab, October 15th, 2020
- SIRFN Fact Sheet titled "ISGAN Annex 5 General Brochure"
- Task-level activities (joint SIRFN and related SIRFN member publication:

Test Protocols for Advanced Inverter Functions:

- N. Ninad et al., "PV Inverter Grid Support Function Assessment using Open-Source IEEE P1547.1 Test Package," 2020 47th IEEE Photovoltaic Specialists Conference (PVSC), Calgary, Canada, 2020, pp. 1138-1144.
- R. Darbali-Zamora, J. Johnson, N. S. Gurule, M. J. Reno, N. Ninad and E. Apablaza-Arancibia, "Evaluation of Photovoltaic Inverters Under Balanced and Unbalanced Voltage Phase Angle Jump Conditions," 2020 47th IEEE Photovoltaic Specialists Conference (PVSC), Calgary, Canada, 2020, pp. 1562-1569.
- N. Ninad, "Automated Validation Platform for Smart Grid Power Converters" presented in 2020 IEEE PES General Meeting panel session "Implementation and Operation of Advanced Power and Energy System Testing Facilities - Canadian Initiatives".

- J. Johnson et al "Automating RT-Lab PHIL Experiments to Conduct DER Interconnection Conformance Test, Parametrized Fault Experiments, and Cybersecurity Re-search" presented in RT 20 Virtual Event of Opal-RT Technologies.

Power System Testing (PST)

- T. Strasser, E. de Jong, M. Sosnina (ed.), "European Guide to Power System Test-ing: The ERIGrid Holistic Approach for Evaluating Complex Smart Grid Configurations", Springer Nature, Switzerland, 2020, ISBN: 978-3-030-42274-5
- Alam, M.N., Chakrabarti, S., and Liang, X., "A Benchmark Test System for Networked Microgrids", IEEE Transactions on Industrial Informatics, Vol 16; 2020
- Baltensperger, D., Dobrowolski, J., Obushevs, A., Sevilla, F. R. S., & Korba, P., "A distributed control scheme of microgrids in energy internet and its multi-site implementation", IEEE Transactions on Industrial Informatics, 2020
- Hong, Q., Karimi, M., Sun, M., Norris, S., Bagleybter, O., Wilson, D., & Booth, C., "Design and validation of a wide area monitoring and control system for fast frequency response", IEEE Transactions on Smart Grids, 2020

Advanced Laboratory Testing Methods (ALTM):

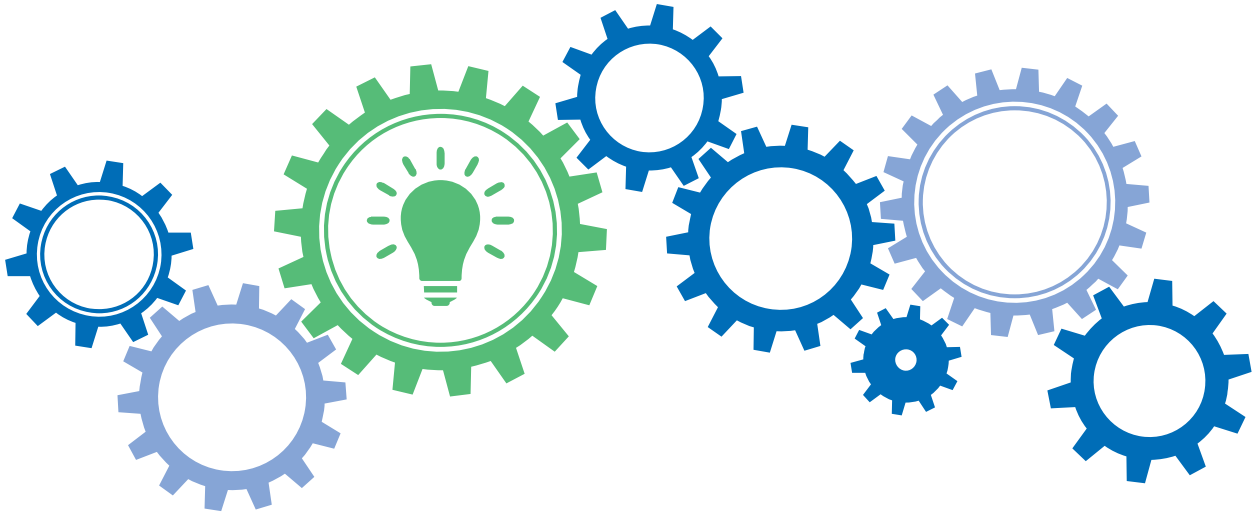
- Joint ALTM journal publication "Advanced laboratory testing methods using real-time simulation and hardware-in-the-loop techniques: a survey of smart grid international research facility network activities," Energies 2020
- M.H. Syed et al., "Real-Time Coupling of Geographically Distributed Research Infra-structures: Taxonomy, Overview and Real-World Smart Grid Applications", IEEE Transaction on Smart Grid, 2020
- Regular Annex 5: SIRFN coordination teleconferences on a monthly base

Note: This list of FY2020, accomplishments is indicative, not exhaustive, and does not include a number of regular and ad hoc interactions and cooperation, especially at Task level.

Participating countries:

Australia, Austria, Canada, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, Korea, Netherlands, Russian Federation, Spain, United Kingdom, 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's main goal is to facilitate the application of advanced technologies needed for power grids to contribute towards achieving various clean energy and climate goals as well as ensuring 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's 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 learned from various stakeholders in the energy community. Different countries around the world face different challenges, apply different solutions to resolve those challenges and have reached different maturity levels in the implementation of those solutions. Through continuous collaboration and interaction, the best practices and success stories obtained from knowledge exchanges between various stakeholders can be used to resolve and/or avoid known problems in an optimal manner.

2.5.1.Main accomplishments in 2020

Operation of the Annex

During FY 2020, Annex 6 has worked on 8 activities and finalized 2 of them. The focus areas helped to steer the activities and review the results. The common efforts were summarized in a 'key messages' document (see appendix) and presented. The monthly calls were well at-tended by the national experts and updates and information was exchanged via monthly emails. Despite travel restrictions, Annex 6 succeeded in organizing 2 workshops/events and joined many online activities.

- An Annex side event during the digital meeting, where key messages were presented and discussed, as well as 'Policy messages from micro vs MEGA trends' and 'Les-sons learned from international projects on TSO-DSO interaction', followed by an open discussion on results, outreach, and cooperation.
- A digital workshop in cooperation with Canadian partners titled "Capturing flexibility from local energy systems," exploring the role distributed energy resources (loads, storage devices, and small generation) will have in a deeply decarbonised, next generation smart grid.

The self-assessment was conducted and discussed with the Annex experts and ISGAN community. After signing the MoU between ISGAN and ETIP-SNET, a cooperation was initiated between Annex 6 and ETIP-SNET (more specifically WG 1 "Reliable, economic and efficient smart grid system)", through the participation within in mutual events and calls and exchanging information,. Annex 6 and ETIP SNET WG 1 have several common fields of interest:

- WG1 focus: business and technology trends contributing to overall energy system optimization at affordable costs
- WG1 considerations: system aspects, addressing the main functionalities, quality and efficiency of the electricity system and the benefits of its integration with the other energy vectors

The cooperation with IEA District Heating and Cooling (DHC) Annex TS3 on Hybrid Energy Networks continued. Several discussions were held with Annex 3 and Annex 9 on common research activities, while Annex activities were presented in Annex 8 webinars (September 2020).

Progress in activities

During FY 2020, Annex 6 has delivered the following tasks through ongoing activities:

Hybrid Energy Networks | Lead: Sweden, Austria

- drafting of a common paper (SWOT analysis) and gathering input from Annex 6 members.

Interoperability of digital systems in energy sector | Lead: Germany

- Internal discussions in Annex 6 webinars and feedback
- Input from various cased studies was collected
- Draft paper was distributed amongst members for review
- The planned workshop during the EXCO week in Berlin on Smart Grid Digitalization and Need for Improved Interoperability was canceled due to COVID.

System and flexibility services | Lead: Spain/Annex 8, Sweden

- Annex 6 members have participated at Swedish forum in March and December and at the Advisory Board meeting in September. The work of Annex 6 was presented at the ISGAN-Coordinet workshop in Rome in January 2020.
- A survey was organized on 'Local market designs for maximizing social benefits'. In-put was received from 33 participants, from 10 countries (Spain, Sweden, Greece, Bulgaria, Belgium, Italy, Germany, Czech Republic, The Netherlands, Austria).
- Preliminary results were discussed on the Annex 6 calls and presented on the Annex 6/Canadian workshop on 'Power System Flexibility from Local Energy Grids'
- A draft discussion paper has been prepared
- A draft research paper has been submitted to PowerTech.

Modelling storage operation | Lead: Italy

- Preliminary results were presented and discussed at Annex 6 calls
- Work on the deliverable has started
- A questionnaire has been sent to the national experts

Flexibility and storage as an alternative to building new grid infrastructure | Lead: Italy

- The activity lead is working on the project.
- Collaboration with Annex 3 was initiated.
- Annex members joined project meeting, advisory board (October 2020) and gave in-put to web consultations (May 2020)
- Discussion on Annex 6 call (April 2020)
- Results were presented at an Annex 8 webinar (September 2020) and on the Canadian workshop.

Power System Flexibility from Local Energy Grids | Lead: Canada, Sweden

- An online workshop was organized on 13th January 2021 with speakers from Sweden, Canada, India, UK, Spain and Italy). Minutes were written
- Drafting of the Annex 6 discussion paper has started

Finalized activities

During FY 2020, Annex 6 has finalized the following activities:

Micro grids vs Mega grids

Under the lead of Irina Oleinikova (NTNU Norway) and Emil Hillberg (RISE Sweden) this activity was finalized.

- Two workshops (Brussels in May 2019 and DynPower conference in Winterthur in September 2019) and a closed meeting (in Montreux 2019) were organized which achieved the participation of 30 experts from 20 organizations in 13 countries. With the contributions from 22 experts in 12 different organizations in 11 countries (Brazil, Canada, Finland, France, Germany, India, Italy, Norway, Sweden, Switzerland, and UK) and review by the focus area (co-)leads from Austria and Italy, a discussion pa-per was published: 'micro vs MEGA: trends influencing the development of the power system'.
- A scientific paper was presented at the CIGRE session 2020
- A policy brief was distributed at the virtual CEM meeting.

Lessons learned from international projects on TSO-DSO interaction

Under the lead of Barbara Herndler (AIT) this activity was finalized, with input/support from several members and projects: Coordinet (Spain), ETH Zurich (Switzerland), Interplan() and SmartNet project (Italy).

- This activity started during 2019, reaching out to various international projects to pro-vide lessons learned, thereafter the consolidation of the outcomes into a video. The first list of interviews resulted in a draft video which was presented at the EXCO meeting in Montreux and a presentation of all the previous experiences and deliverables from Annex 6 on TSO-DSO interaction was given at the public conference in Montreux. With input from Annex 6 during the coordination call, a final video was published.
- The video was supported in December 2020 by a discussion paper which was published on the ISGAN website.

Participating countries:


Austria


Belgium


Canada


France


Germany


India


Ireland


Italy


Mexico


Netherlands


Norway


South Africa


Sweden


Switzerland


United Kingdom


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, coordinated 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 2020

Activities on Regulatory Innovation Zones (Regulatory Experimenting / "Sandboxes")

Building upon the Annex 7 strategy regarding Regulatory Experimenting (Regulatory Innovation Zones, Regulatory Experimenting, Experimental Sandboxes, Regulatory Sandboxes, Innovation Sandboxes, Regulatory Pilots etc.) and the engagement with the European SET Plan Action [https://setis.ec.europa.eu/system/files/set_plan_esystem_implementation_plan.pdf], which explicitly calls for Annex 7's involvement and evaluation of ongoing "Regulatory Innovation Zones" (Innovation Activity (A4-IA0-4)) projects and programs, Annex 7 pursued several related activities. First of all, maintaining the regulatory sandbox repository hosted via the Annex 7 LinkedIn group.

Furthermore, Annex 7 conducted a survey on regulatory sandboxes in collaboration with ETIP SNET. The survey focused on questions of regulatory sandbox design, goals, expected/achieved outcomes and impacts. The survey primarily targeted actors responsible for the design and implementation of regulatory sandbox programmes, i.e., policymakers (minis-tries or energy agencies), regulatory authorities, funding agencies. The results from the survey will contribute to 1) an update of the ISGAN Casebook on regulatory sandboxes and 2) an Annex 7 publication in 2021.

Preparations for inter-Annex Regulatory Sandboxes 2.0 project

Based upon the successful inter-Annex collaboration on the Regulatory Sandboxes KTP 2019 in Stockholm, the latter half of 2020 marked the start of preparations for a new and re-vamped KTP on Regulatory Sandboxes in 2021. Annex 7 joined forces with Annex 2 and Annex 8 to prepare an interactive workshop series based upon a new KTP concept, focusing on the learning and evaluation of sandboxes. The expected outputs are:

1. interactive virtual workshops with relevant actors
2. CEM policy brief
3. ISGAN publication (e.g. Casebook)
4. webinar for dissemination of results

Annex 7 will lead the thematic/content of the Regulatory Sandbox 2.0 project with its expertise on regulatory sandbox programmes.

International Sustainability Transitions Conference – IST 2020 in Vienna (online)

The Operating Agent was co-chairing and co-hosting the International Sustainability Transitions Conference 2020 in Vienna as a three-day scientific online conference with more than 600 participants registered. Out of app. 400 contributions, Energy transition-related papers were prominently represented with 70 contributions.
A 90-minute Dialogue Session on "Learning and Evaluation Concepts for Regulatory Experimenting - from Energy Communities to renewable Hydrogen" was explicitly organized In cooperation with IEA-TCP ISGAN Annex 7 – SMART GRID TRANSITIONS on Friday 21 August 2020, 10:15 – 11:45 (local time, CEST)
The questions discussed in the session were "What do practitioners expect from regulatory experimenting and what kind of support do they need to facilitate their (or their target groups', innovators' and/or need owners') learning processes?"
It included two presentations on "International overview of Regulatory Experimenting Pro-grams and projects" by Klaus Kubeczko and "Conceptual Considerations for Evaluating Regulatory Experimenting Programs" by Dierk Bauknecht. A Practitioners' Panel (65 minutes)

Experts from regulatory bodies and policy makers were asked to provide short input statements on Guiding Questions followed by a dialogue with the conference participants. Experts: Luca Lo Schiavo (Italian Regulatory Authority for Energy, Networks and Environment- ARERA), Nicole Kerkhof-Damen (Netherlands Enterprise Agency), Urban Peyker (Austrian Research Promotion Agency FFG) and Theresia Vogel (CEO, Climate and Energy Fund, Austria)

LinkedIn Discussion Group on Smart Grid Transition

The work on the LinkedIn Discussion Group on Smart Grid Transition was continued in 2020. Its purpose is to establish and maintain a network of researchers and practitioners dealing with smart grid deployment in the wider context of a long-term socio-technical transition to-wards a low-carbon economy. The group covers current issues related to the socio-technical transition of energy systems based on Smart Grid solutions, policies, institutions, law, regulation, strategy, models, research, reflexive governance and orchestration processes. It is open to the wider ISGAN community as well as smart grid policy leaders, decision-makers, re-searchers, economists, analysts, students and journalists. In 2020, its size grew from 80 to more than 120 members and was used for further exchange and discussion, dissemination of results and knowledge of socio-technical transition of smart grid solutions. The discussion group was a key resource for Annex 7 work on the Inter-Annex collaboration on Experimental Sandboxes, where a repository to collect information on governance activities, policy instruments and implementation, as well as scientific contributions.

The discussion group can be accessed (by invitation) here:
https://www.linkedin.com/groups/7489503/

Participation in smart grid-related activities of the Sustainability Transitions Research Network (STRN)
OA Klaus Kubeczko is a member of the Steering Committee of the Sustainability Transitions Research Network (STRN) where he will contribute with his expertise on smart grid transitions.

Participating countries:

Austria, Belgium, Denmark, France, Germany, India, Italy, Netherlands, Sweden, United Kingdom, United States, **Austria (Lead)**, **Austria (Operating Agent)**

2.7. Annex 8:
ISGAN Academy on Smart Grids

The ISGAN Academy offers the ISGAN community the 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 through several 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 2020

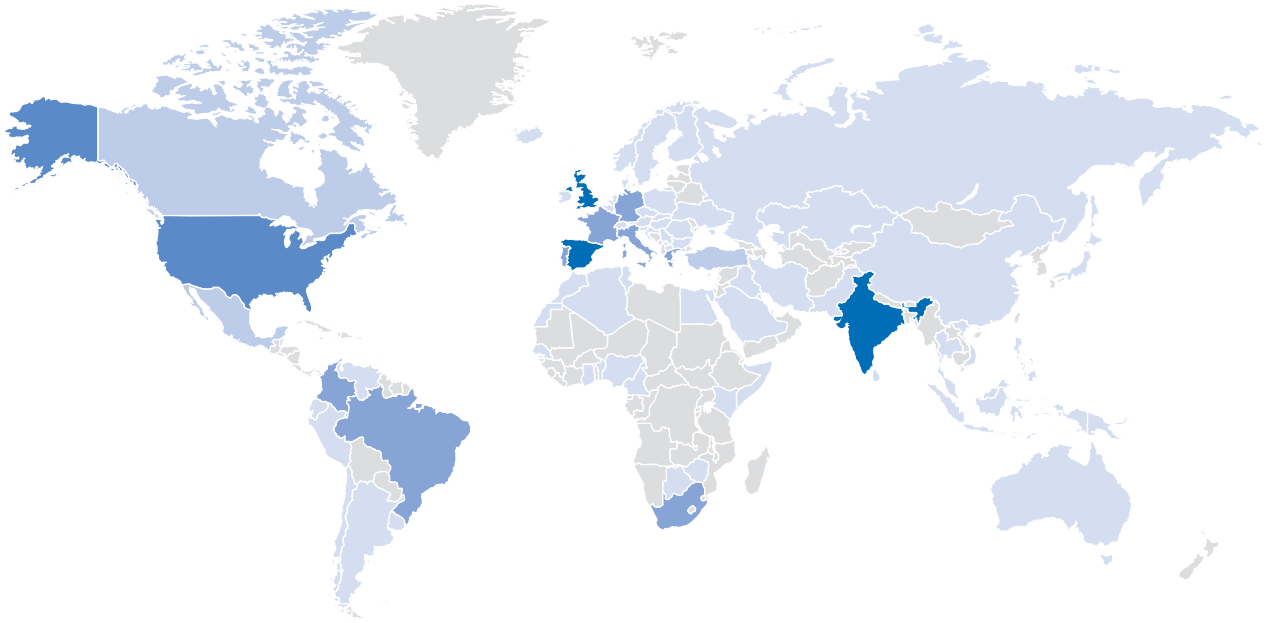
The ISGAN Academy webinars are divided into five different areas:

1. Novel Smart Grids' tools
2. ISGAN Award of Excellence
3. Flexibility in the Power Systems
4. ISGAN Knowledge Transfer Projects
5. New Challenges in Smart Grids

The ISGAN Academy webinars that were held in 2020 are listed in the table below.
All past webinars can be accessed under the following links:

Nº	Webinar Title	Date	Authors
1	Extracting value from data sharing for RES forecasting: Privacy aspects & data monetization	17 December 2020	Liyang Han; Ricardo Bessa.
2	Local flexibility solutions leveraged by RD&I projects as system stability solutions	10 November 2020	André Guimarães; George Boultadakis; Hans Bludszuweit.
3	Flexibility needs at system level and how RD&I projects are leveraging these solutions	6 November 2020	Nuno Amaro; Gianluigi Migliavacca; José Pablo Chaves
4	FlexPlan project	9 September 2020	Gianluigi Migliavacca; Andrei Morch.
5	Smart4RES – Data science for renewable energy prediction	5 June 2020	George Kariniotakis; Pierre Pinson.
6	New business models for distribution grid stakeholders under high penetration of DER	19 May 2020	Ricardo Prata; Rafael Cossent; Ricardo Bessa.
7	ISGAN smartgrideval tutorial	23 April 2020	Fabrizio Pilo; Matteo Troncia.
8	The need to model coupled energy networks to transition to a decarbonized future	27 February 2020	Carlo Brancucci; Kwabena Pambour.

In the following map the number of participants per country are depicted:



Participating countries:

France

India

Italy

Japan

Netherlands

Russian Federation

South Africa

Spain

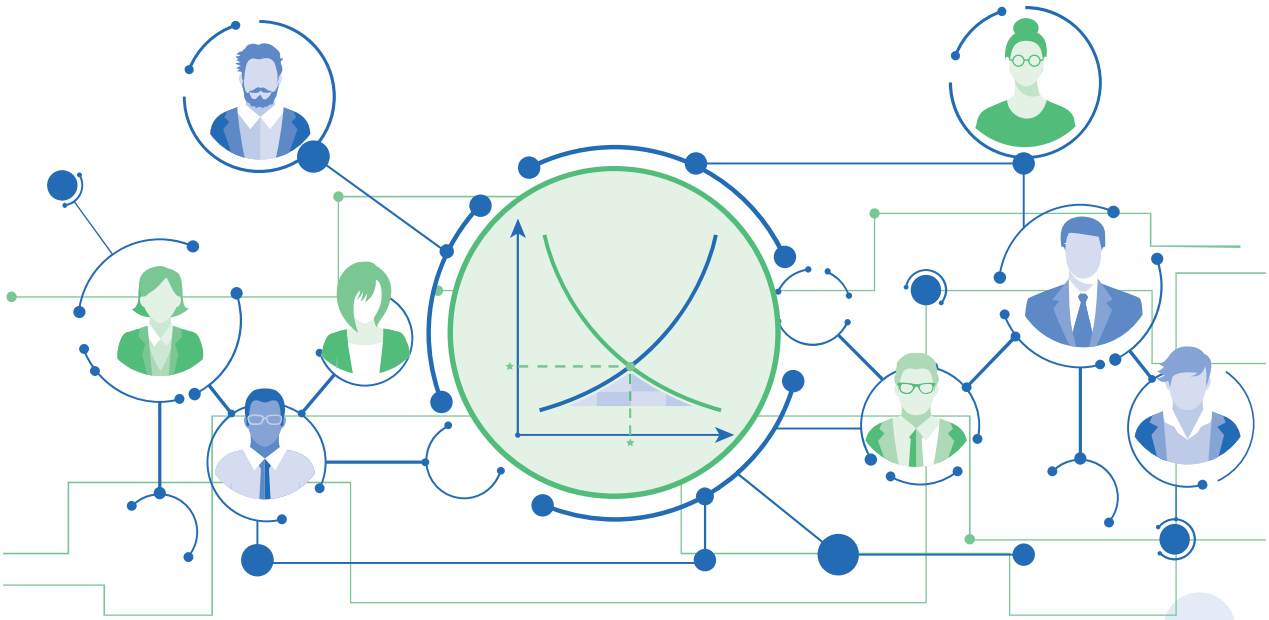
Switzerland

United Kingdom

Spain (Lead)

Spain (Operating Agent)

2.8. ISGAN Annex 9:
Flexibility Markets – development and implementation



The scope of this Annex encapsulates all aspects of market design for power system flexibility. This includes the whole range of market timescales, from long term investment signals to second-to-second balancing and response; the whole physical system from large centralized generation to behind the meter sources of flexibility within domestic settings and interfaces with other vectors; all sources of value that flexibility conceivably could capture, going beyond MWh to include characteristics like voltage control, repeatability, inertia, locational constraint alleviation; and aspects of the market that go beyond the trading rules such as consumer support, or how obligations (such as with respect to grid stability) are understood and checked.
The initial work is guided by six gaps as the overarching framework for how activities are related to each other and the overall objective, but each activity will have significant freedom to explore any topic the participants are interested in as long as it remains related to any of the dimensions listed above.

The objective of the combined impact of the Annex's activities will be:

1. To enrich and disseminate participants' understanding of flexibility market design
2. To create and curate an evidence base all can draw upon to support decision making in the flexibility market space
3. To further facilitate and enhance the debate on best practices in market design

2.8.1. Main accomplishments in 2020

Generation of an activity list

An initial set of potential activities was developed prior to the official confirmation of the Annex, focusing on a series of questions the Annex could answer under each gap mentioned above. These were then discussed with interested member countries, and the UK, Canada and Sweden all identified specific research tasks of interest. These form the initial focus, but all six gaps are considered to be important and should be addressed at an appropriate stage in the life of the Annex.

The Annex started with the following activities:

1. Early research activities of the Annex: the flexibility market topics it is proposed that the Annex will tackle in the early stages (led by the UK, Canada and Sweden)
2. Collaboration focus: alongside delivering flexibility market insights, it is proposed the Annex functions as a catalyst for broader collaboration.
3. Practical considerations of operating the Annex: how the Annex will run in general.

Early research activities of the Annex

Following discussion between the UK, Canada and Sweden it is felt that the best activities to attempt at the inception of the Annex are pieces related to the following topics:

- Task 1: Flexibility Characteristics (led by Canada)
- Task 2: Interoperable markets (led by the UK)
- Task 3: Consumer focused flexibility (led by Sweden)

These activities were selected as the most promising areas for wider participation, due to the level of interest generated in discussions with the various stakeholders engaged throughout the process.

Collaboration focus

This activity will focus on trying to encourage active collaboration between organisations in countries involved in the Annex. The objective of this stream of activity will be to assist the development of research and business relationships to progress thinking and work in the flexibility space. This workstream will be led by the UK.

Participating countries:


Belgium


Canada


India


Japan


Sweden


Operating Agent: United Kingdom

3. ISGAN Award of Excellence

- The ISGAN Award of Excellence and the Global Smart Energy Federation (GSEF) showcase leadership and innovation in Smart Grid projects around the world. The awards highlight the tremendous value of smarter, cleaner, and more flexible electric grids.
- For its 2020 ISGAN Award of Excellence recognizes exemplars in the field of smart grids with a special focus"Digitalization Enabling Consumer Empowerment" a wide range of smart grid project nominations were received, representing projects from 9 different countries throughout the world. An expert jury organized by ISGAN's private sector partner, the Global Smart Energy Federation (GSEF), selected the winning projects.
- The winning projects of the Seventh ISGAN Award of Excellence were announced at its virtual ceremony during the Eleventh Clean Energy Ministerial Meeting (CEM11) on 16th September 2020.

Smart Grids and Smart Communities Demonstration Project
New Energy and Industrial Technology Development Organization (Japan)

FutureFlow
ELES,d.o.o.(Slovenia)

Digitizing the Customer Experience with Real-Time Control
London Hydro (Canada)

Members of the Jury

Our thanks to the members of the 2020 ISGAN Award of Excellence jury for contributing their time and expertise to the evaluation process.

- **Reji Kumar Pillai** (India): Jury Chair, Chairman of the Global Smart Grid Federation (GSGF)
- **Cheong Kam Hoong** (Malaysia): Industry Advisor of University Tunku Abdul Rahman, GSGF Ambassador (Asia)
- **Kentaro Akiyama** (Japan): Professor of Seijoh University
- **Marc Boillot** (France): Founder and CEO of Algorus Consulting, GSEF Ambassador (Europe & Africa)
- **Maria Sandqvist** (Sweden): Executive Director of the Swedish Smart Grid Forum
- **Ravi Seethapathy** (Canada): GSEF Ambassador (Americas)
- **Robert George Stephen** (South Africa): Technology Master Specialist, ESKOM, Former president of CIGRE

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 to align aims, avoid overlaps and share knowledge. In 2020, ISGAN's main cooperation partners and activities were as follows:

4.1. Collaboration with other TCPs, initiatives and organizations

ISGAN cooperates with several other IEA TCPs and other initiatives/organizations to align aims, avoid overlaps and share knowledge:

- Engagement with Mission Innovation, IC1 on smart grids: joint 1st CEM ISGANÐMI IC1 forum on Cooperation to Accelerate Smart Grid Market Uptake
- The long-lasting partnership between ISGAN and the Global Smart Energy Federation (GSEF) continued during 2020: beyond the traditional Award of Excellence, several joint conference calls were attended and a representative from GSEF participated to in ExCo19 in May 2020, reporting on updates and future activities.
- ISGAN and ETIP SNET signed an MoU to cooperate on common fields of research and innovation areas related to smarter, cleaner electricity grids around the world. Specifically, the partnership seeks to:
- Links with other IEA TCPs:
  - ISGAN and Photovoltaic Power System Programme (PVPS) representatives Participated in each other's ExCo meetings during 2020. The Chair of the PVPS TCP gave an overview on the structure, publications and tasks of the TCP during ISGAN ExCo20, elaborating on the experience in getting the right institutions as points of contact for outreach activities to other countries, as well as on how to sustain a country's continuous support.

    Task 14 (High Penetration of PV Systems in Electricity Grids) is of particular interest for the cooperation with ISGAN, as it deals with the interactions of DSOs and TSOs, which are also addressed in ISGAN Annex 6.The Secretariat of the Hydrogen TCP (HTCP) Participated in ISGAN's 20th ExCo meeting in October 2020. The importance of hydrogen for the integration of RES in power grids and the possibility to store electricity through the use of electrolysers for the power grid of the future were highlighted during the presentation. Hydrogen is regarded a key for flexibility and the whole integrated energy system. The main area of cooperation will be sector coupling, but also the cost-benefit analysis of Annex 3 could be a good point for interaction.

    Joining forces in influencing and supporting future policy papers, may be beneficial for both TCPs.

4.2. Collaboration with IEA and CEM secretariat

- Ellina Levina of the CEM Secretariat and Luis Munuera from IEA attended the 19th and 20th ISGAN ExCo Meetings reporting on latest activities and publications, which took place as online meetings due to the COVID-19 crisis.

5. 5. ISGAN Executive Committee Meetings

In light of the COVID-19 pandemic, ISGAN changed its twice-yearly physical ExCo meetings to online meetings. The well-established procedures at ISGAN ExCo meetings ensured the success of various meetings throughout in these difficult circumstances.

5.1. 19th ExCo meeting

ISGAN split its 19th ExCo meeting in two parts in March and May 2020.
The first meeting focused on approvals of programmes of work and the budget to get the next fiscal year off to a good start. The second meeting took place in the form of a two-day online meeting on 19-20 May 2020 and dealt in detail with strategic issues. The Annex Self-Assessments conducted as part of ISGAN's strategy process were discussed. After an Input from the European commission, Michela Marasco on important new developments affecting the future of ISGAN the details concerning the Request for extension were addressed. Both meetings have been extremely well attended and participated by the ISGAN members.

The main decisions and achievements of the ExCo19 meeting were:

- Agreement for the extension of the primary ISGAN theme of flexibility and the sup-porting themes of digitalization, resilience and interoperability through FY 2020
- Planning of activities to update ISGAN's strategy and structure for the Request for Extension (RfE) process
- Creation of a dedicated RfE team
- Self-assessment of the existing Annexes and in-depth discussions in workshops
- Approval of the work of the Incubator team and agreement to continue the exploration of the interest and necessity to create a new Annex on flexibility markets within ISGAN

5.2. 20th Exco meeting (27.-29. October 2020)

Between 27th and 29th of October, ISGAN community marked it's 20th Executive Committee Meeting. The successful meeting was held online overcoming the circumstances caused by the COVID-19 pandemic evolving around ISGAN's strategy and work programme for 2020 and beyond.
ISGAN's strategy and work programme for 2020 and beyond were a centerpiece of discussions, in addition the proposal of a new Annex. Annex 9 will focus on Flexibility Markets, their development and implementation, and will be headed by Operating Agent Iliana Cardenes, of the United Kingdom's Department for Business, Energy and Industrial Strategy (BEIS).

ISGAN is also proud to announce Brazil as its newest Contracting Party, and would like to thank Cyro Vicente Boccuzzi, President of the Latin American Smart Grid Forum for his support throughout this process.
Moreover, Israel is highly interested in joining our ranks and was represented by Yael Harman, Head of Technology and Renewable Energy of the Israeli Ministry of Energy, who took part as an observer. She indicated the strong interest of Israel in joining ISGAN.

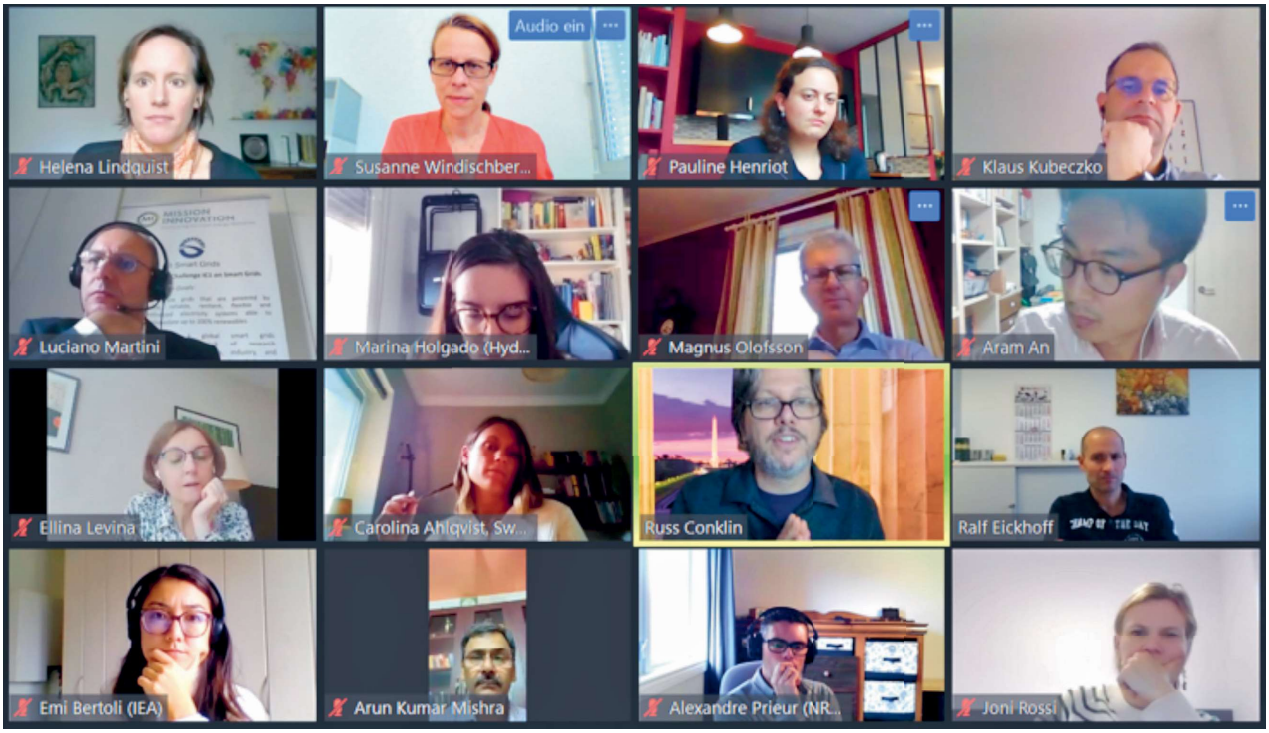
To further ISGAN's international cooperation, representatives from other TCPs were invited to the meeting: Stefan Nowak, Chair of the IEA Photovoltaic Power Systems Programme (PVPS) and Paul Lucchese, Chair of the IEA Hydrogen Technology Collaboration Program (HTCP), who shared insights into the work of their TPCs and possible areas of cooperation with ISGAN. Furthermore, the meeting was complemented by presentations from the IEA and CEM Secretariat.

The 20th Exco meeting focused also on the liaison with other organizations., Inputs were received from CEM- and IEA-Secretariat, Mission Innovation and the Hydrogen TCP (Stefan Nowak, Chair of the IEA Photovoltaic Power Systems Programme (PVPS)) as well as the IEA Photovoltaic Power Systems Programme (PVPS) (Marina Holgado, secretariat of the IEA Hydrogen Technology Collaboration Program (HTCP)).
In conjunction with the 20th Exco meeting two side-event took place:

5.2.1. ISGAN Interactive Workshop: How can we create new channels for systematic knowledge exchange between the ISGAN network and key stakeholders at a national level?

The challenges addressed in this workshop were the barriers to knowledge flow and engagement between stakeholders at a national level with the international level, and vice versa.

Believing that the knowledge and experience from developments nationally – both at policy level and in practice – could be captured in a more systematic way to inform and influence dialogue at the international level, whilst at the same time opening up for involvement from a greater number and a more diverse set of stakeholders nationally is beneficial in creating a more holistic picture of challenges and solutions for Smart Grids. Among the recommendations from the workshop is a new role as connector between the international and national level in each country. In addition, make use of national mirror groups in connection to ISGAN projects. It was also emphasized that web meetings including the services of the ISGAN Academy are important tools for stronger connection between the international and national levels.



5.2.2. Workshop on the outcome of recent Annex 6 activities

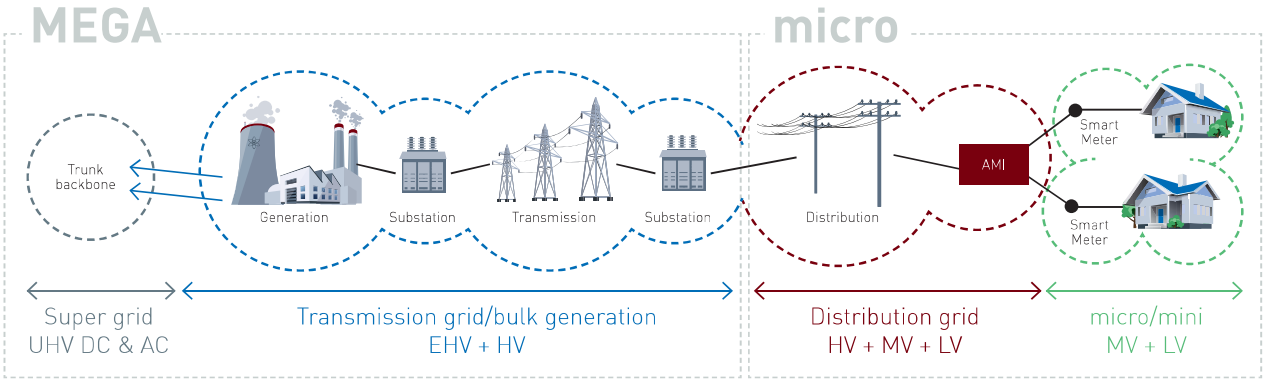
Annex 6 organized a side event to share the results of their work over the past two years. The meeting started with an overview of the focus areas, the Annex is structured into:

- Focus Area 1: Expansion Planning and Market Analysis
- Focus Area 2: Technology Trends and Deployment
- Focus Area 3: System Operation and Security
- Focus Area 4: Transmission and Distribution System Interaction

During the side event, three presentations were given:

- Key messages from Annex 6 (Emil Hillberg, RISE, Sweden)
- Policy messages from micro vs MEGA trends (Irina Oleinikova, NTNU, Norway).

In this regard, an overview of the respective grids and their topology was discussed. From the perspective of investment, it was shown that flexibility needs to consider energy in both time and space, due to the integration of a significant amount of RES. In both cases, MEGA and micro grids are able to integrate RES based on the maxi-mization of local RES and optimization of system-wide energy resources respectively. I



- Lessons learned from international projects on TSO-DSO interaction (Barbara Herndler, AIT, Austria). A video clip provided a high-level overview of the topic, in line with four key questions, consolidating the challenges, successes, lessons learned, and recommendations based on the experience of various projects on TSO-DSO interaction.

The report and videoclip are available through this link:
https://www.iea-isgan.org/lessons-learned-from-international-projects-on-tso-dso-interaction/

A document summarizing the key messages of Annex 6 was published on the ISGAN web-site. It was prepared in order to illustrate, from an Annex 6 perspective, the drivers for change, consequences on operation and planning, and the needs to ensure sustainability and security of supply.
ISGAN - Key Messages Annex 6 - Power Transmission & Distribution Systems (iea-isgan.org)

6. Deliverables

6.1. ISGAN Workshops and Other Events

Several workshops and events organized by ISGAN Annexes and ExCo members took place in 2020 as online events. Some of them were organized back-to-back with ExCo meetings, while others were stand-alone events.

December 16, 2020
Capturing Flexibility in Local Energy Systems Workshop

Canada, with ISGAN Annex 6, hosted a public workshop titled "Capturing flexibility from local energy systems" inviting participants to explore the role distributed energy resources (loads, storage devices, and small generation) will have in a deeply decarbonised, next generation smart grid.
This workshop took place in the following segments:

1. In December 2020: the Pre-recorded presentations were available on the ISGAN YouTube Channel as preparation of the further Workshop segments
2. January 13, 2021 A live 2-hour online-discussion amongst the speakers of the pre-recoded presentations and participants for
   a) Q&A session with the speaker and
   b) open group discussion for drafting the outline of a whitepaper that highlights the potential and encourages future study and implementation.

The presentations were organized in the following three themes:

- Potential of Flexibility Resources
- Bringing Flexibility Together
- Market Policies and Planning Approaches

September 8, 2020
Online workshop "Testing Methods and Certification Protocols"

IEA-ISGAN invites you to the online seminar on "Testing Methods and Certification Protocols", which will take place on October 15th, 2020. The "Smart Grid International Research Facility Network - SIRFN" is a sub-programme of the "International Smart Grid Action Network - ISGAN" and will present its advanced work on testing and validation of Smart Grid systems. The online seminar will include automated testing of distributed generators, holistic validation considerations of energy systems, validations procedures of Microgrid functions and modern laboratory testing technologies.
SIRFN presented its advanced work on testing and validation of smart grid systems. The following topics were covered:

- automated testing of distributed generators
- holistic validation considerations of energy systems
- validations procedures of microgrid functions
- modern laboratory testing technologies.

September 16, 2020

(CEM11) ISGAN-PSF Joint workshop & Sixth ISGAN Awards Ceremony

Please refer to Highlight 1.7.4. Highlight: (CEM11) ISGAN-PSF Joint workshop & Sixth ISGAN Awards Ceremony page 22.

6.2. ISGAN Publications

December 10, 2020:

6.2.1. Lessons learned from international projects on TSO-DSO interaction

Annex 6 presents the lessons learned from international projects on TSO-DSO interaction.
This discussion paper identifies and consolidates the lessons learned from international projects, use cases, and best practices on TSO-DSO interaction. Furthermore, the main results have been summarized and presented in a video. This work aims to present a global view of developments of TSO-DSO interaction based on collaboration from stakeholders within the ISGAN community, as well as additional collaboration partners (TSOs, DSOs, project leaders, etc). The video provides a high-level overview which encapsulates the main findings, while this report forms a supplementary consolidation of the results in order to provide additional information in more detail.
https://www.iea-isgan.org/wp-content/uploads/2020/12/Lessons-learned-from-international-projects-on-TSO-DSO-interaction.pdf

November 6, 2020

6.2.2. Key Messages Annex 6 – Power Transmission & Distribution Systems

In this document
(1) the drivers for change regarding generation, grid, and demand;
(2) the resulting consequences on operation and planning of the power transmission and distribution systems; and
(3) the identified needs to ensure sustainability and security of supply with respect to technology, market innovations and policies are described.
https://www.iea-isgan.org/wp-content/uploads/2020/11/ISGAN_Key_Messages_Annex_6_2020.pdf

October 28, 2020

6.2.3. Electric vehicle and power system integration: key insights and policy messages from four CEM initiatives

This report summarizes the opportunities to couple the road transport and power system sectors. It articulates policy messages based on current experience, with a particular focus on the role of critical stakeholders in a transformation that crosses multiple sectors and is an outcome of the CEM Horizontal Accelerator project. The

Horizontal Accelerator (HA) is an innovative collaboration tool in the CEM being the EV HA focusing on exploring ways in which the transport and power systems can work in the most efficient, sustainable, secure, and resilient way. It brings the work of four CEM workstreams – International Smart Grid Action Network (ISGAN), Electric Vehicles Initiative (EVI), Power System Flexibility (PSF) Campaign, and 21st Century Power Partnership (21CPP), generating best practices and integrated policy messages. The collaboration brought together stakeholders from the business industry, analytical institutions, national and local governments for an interactive work-shop on 19-20 April and generated a number of key insights.
https://www.iea-isgan.org/wp-content/uploads/2020/10/2020-9-15-CEM-Horizontal-Accelera-tor-FINAL-FOR-POSTING-1.pdf

August 2020

6.2.4. ISGAN Annual Report 2019

The Annual Report 2019 provides an overview of ISGAN's ongoing activities and main achievements towards Smart Grid development and deployment to ensure a reliable, economically competitive and environmentally sustainable electricity system as the cornerstone of a modern society.
http://www.iea-isgan.org/wp-content/uploads/2020/10/ISGAN-Annual-Report-2019_web.pdf

May 15, 2020

6.2.5. micro vs MEGA trends

ISGAN Annex 6 has dedicated an activity to study the micro and the MEGA trends, with the objective to present a critical assessment of these trends. micro focuses on local solutions, while MEGA focuses on system or even intra-system wide solutions.
The outcome of this activity is communicated through publications, presentations and work-shops, with contributions from a large number of parties:

- In the Policy Brief: micro vs MEGA – trends in power system development, the condensed knowledge from this activity was published for the 11th Clean Energy Ministerial hosted by Saudi Arabia, September 2020
  https://www.iea-isgan.org/wp-content/uploads/2020/09/ISGAN_PolicyBrief_microvsME-GAgrids.pdf
- In the Discussion Paper (DOI: 10.13140/RG.2.2.11569.61287), the full report is provided from this activity, including detailed insights into the micro & MEGA trends and their perspectives together with experiences from around the World.
- https://www.iea-isgan.org/wp-con-tent/uploads/2020/05/ISGAN_DiscussionPaper_Annex6_microVsMEGA_2020.pdf

6.2.6. Annex 5 published five high-level journal publications in 2020:

- Advanced Laboratory Testing Methods Using Real-Time Simulation and Hardware-in-the-Loop Techniques: A Survey of Smart Grid International Research Facility Network Activities, Juan Montoya (Fh-IEE), et. al., MPDI – Energies, 2020
- Automated validation platform for smart grid power converters, N. Ninad (Canmet-ENERGY), et al., IEEE PES GM Virtual Meeting, 2020
- Evaluation of Photovoltaic Inverters Under Balanced and Unbalanced Voltage Phase Angle Jump Conditions, Rachid Darbali-Zamora (Sandia), et al., IEEE Photovoltaic Specialists Conference (PVSC), 2020
- PV Inverter Grid Support Function Assessment using Open-Source IEEE P1547.1 Test Package, N. Ninad (CanmetENERGY), et al., IEEE Photovoltaic Specialists Conference (PVSC), 2020
- Development and Evaluation of Open-Source IEEE 1547.1 Test Scripts for Improved Solar Integration, N. Ninad (CanmetENERGY), et al., 36th European Photovoltaic So-lar Energy Conference and Exhibition (PVSEC), Marseille, France

6.3. ISGAN Webinars

Nº	Webinar Title		Date	Authors
1	ISGAN smartgrideval tutorial		23 April 2020	Fabrizio Pilo; Matteo Troncia.
2	New business models for distribution grid stakeholders under high penetration of DER		19 May 2020	Ricardo Prata; Rafael Cossent; Ricardo Bessa.
3	Smart4RES – Data science for renewable energy prediction		5 June 2020	George Kariniotakis; Pierre Pinson.
4	FlexPlan project		9 September 2020	Gianluigi Migliavacca; Andrei Morch.
5	Flexibility needs at system level and how RD&I projects are leveraging these solu-tions		6 November 2020	Nuno Amaro; Gianluigi Migliavacca; José Pablo Chaves
6	Local flexibility solutions leveraged by RD&I projects as system stability solutions		10 November 2020	André Guimarães; George Boultadakis; Hans Bludszuweit.
7	Extracting value from data sharing for RES forecasting: Privacy aspects & data mon-etization		17 December 2020	Liyang Han; Ricardo Bessa.

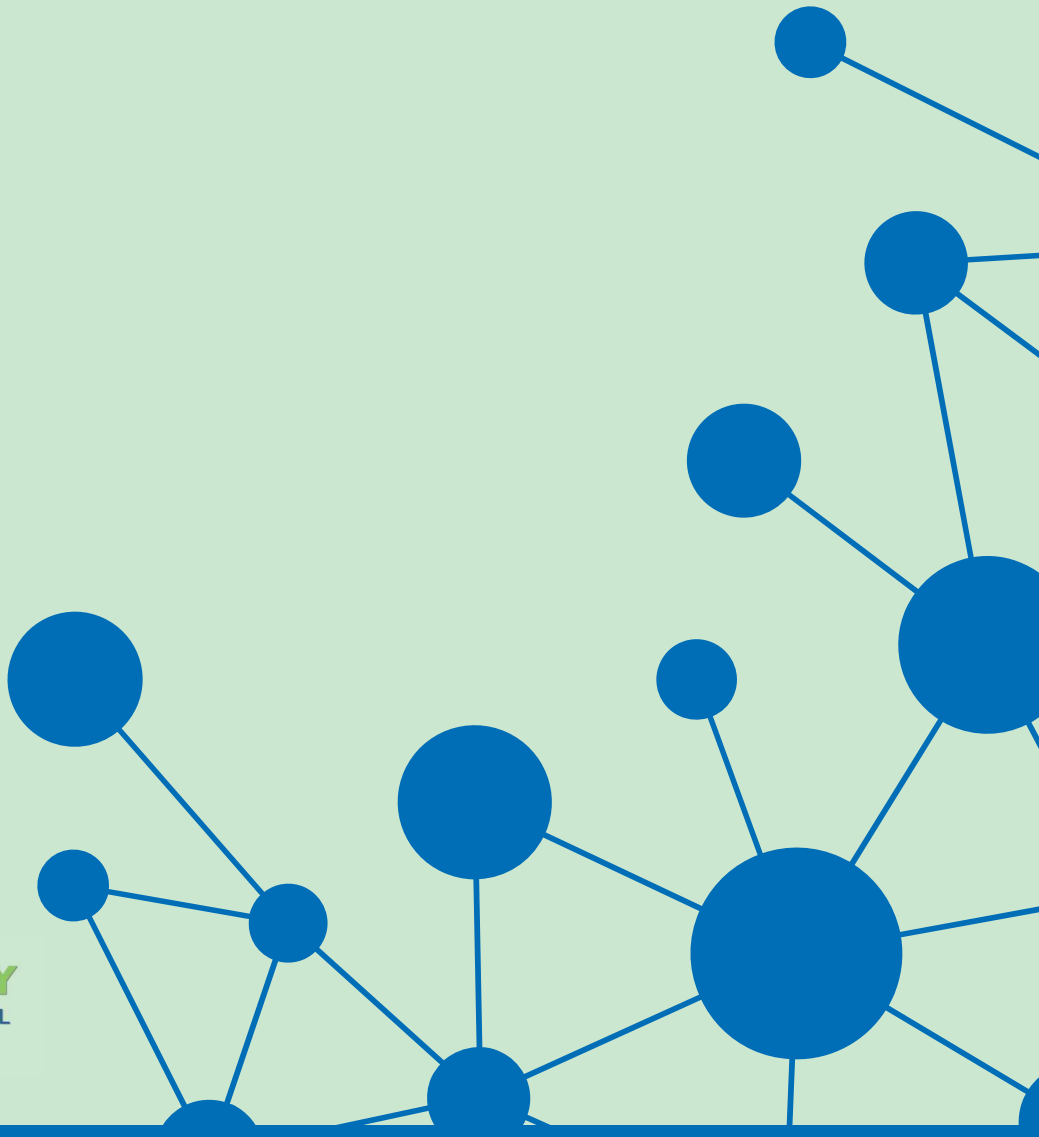
7. ISGAN Financial Report

Status of Finance for FY 2020 1 March, 2020 – 28 February, 2021

(EUROS)			Total Available
ASSETS			
1	Account Balance FY2019		**502.245,43**
REVENUE			
1	2020 contributions as of 31.1.2021: 26 members @ 10,400 each		**219.230,43**
TOTAL R (Revenue)	721.475,86		
EXPENDITURES			
	Secretariats	AIT secretariat functions	**226.500,00**
		KSGI permanent secretariat functions	**24.800,00**
	Reports	ISGAN Annual Reports (2)	**3.105,11**
		Annex Publications / Deliverables) (3)	**120,00**
	ISGAN Academy		**10.000,00**
TOTAL E (Expenditures)			**264.525,11**
BALANCE TOTAL (R - E)			**456.950,75**
ASSET #2 + BALANCE			**560.950,75**

iea-isgan.org

ISGAN
INTERNATIONAL SMART GRID
ACTION NETWORK



CLEAN ENERGY
MINISTERIAL

Technology Collaboration Programme
by iea