Status of EERA Joint Programme in Energy Systems Integration and the International Institute of Energy Systems Integration

CITIES, Copenhagen, May 25th 2016

Mark O'Malley

EERA
European Energy Research Alliance

Joint Programme on Energy System Integration (**ESI**)

www.eera-set.eu

EERA is an official part of the EU SET-Plan.

http://setis.ec.europa.eu/

EERA
European Energy Research Alliance

Coordinating energy research for a low carbon Europe

JOINT PROGRAMMES

- AMPEA
- BIOENERGY
- CARBON CAPTURE AND STORAGE
- CONCENTRATED SOLAR POWER (CSP)
- ECONOMIC, ENVIRONMENTAL AND SOCIAL IMPACTS (JP E3S)
- ENERGY EFFICIENCY IN INDUSTRIAL PROCESSES
- ENERGY STORAGE
- ENERGY SYSTEMS INTEGRATION
- FUEL CELLS AND HYDROGEN
- GEOTHERMAL
- NUCLEAR MATERIALS
- OCEAN ENERGY
- PHOTOVOLTAIC SOLAR ENERGY
- SHALE GAS
- SMART CITIES
- SMART GRIDS
- WIND ENERGY

Energy Systems Integration

The EERA Joint Programme in Energy Systems Integration

This Joint Programme in Energy Systems Integration seeks to bring together research strengths across Europe to optimize our energy system, in particular by benefiting from the synergies between heating, cooling, electricity, renewable energy and fuel pathways at all scales. The energy elements of the water and transport system are also included as is the enabling data and control network that enables the optimization.

The Joint Programme in Energy Systems Integration is designed to develop the technical and economic framework that government and industries will need to build the future efficient and sustainable European energy system. It is fully aligned with the recently published SET Plan Integrated Roadmap and potential impact include increased reliability and performance, minimisation of cost and environmental impacts and, in particular, increased penetration of renewable energy sources.

The Joint Programme is organised in 5 Sub-Programmes (SP) that target different aspects of Energy Systems Integration. Given the nature of Energy Systems Integration, the SPs are strongly interlinked.

SP1: Modelling, coordinated by Dr. Juha Kiviluoma, VTT (FI)

SP2: Forecasting, aggregation & control, coordinated by Prof. Henrik Madsen, DTU (DK)

SP3: Technology, coordinated by Prof. William D'haeseleer, KU Leuven (BE)

SP4: Consumer, coordinated by Mr. Didier Van den Abeele, CEA (FR)

SP5: Finance & regulation, coordinated by Dr.ir. Laurens J. De Vries, TU Delft (NL)

The Description of Work (DoW) for the Joint Programme in Energy Systems Integration is available here.

News of this program

Useful documents

EERA intranet

Coordinator

Prof. Mark O'Malley
e-mail

Claire Cullen
e-mail

Contact at EERA

Maria Oksa
e-mail

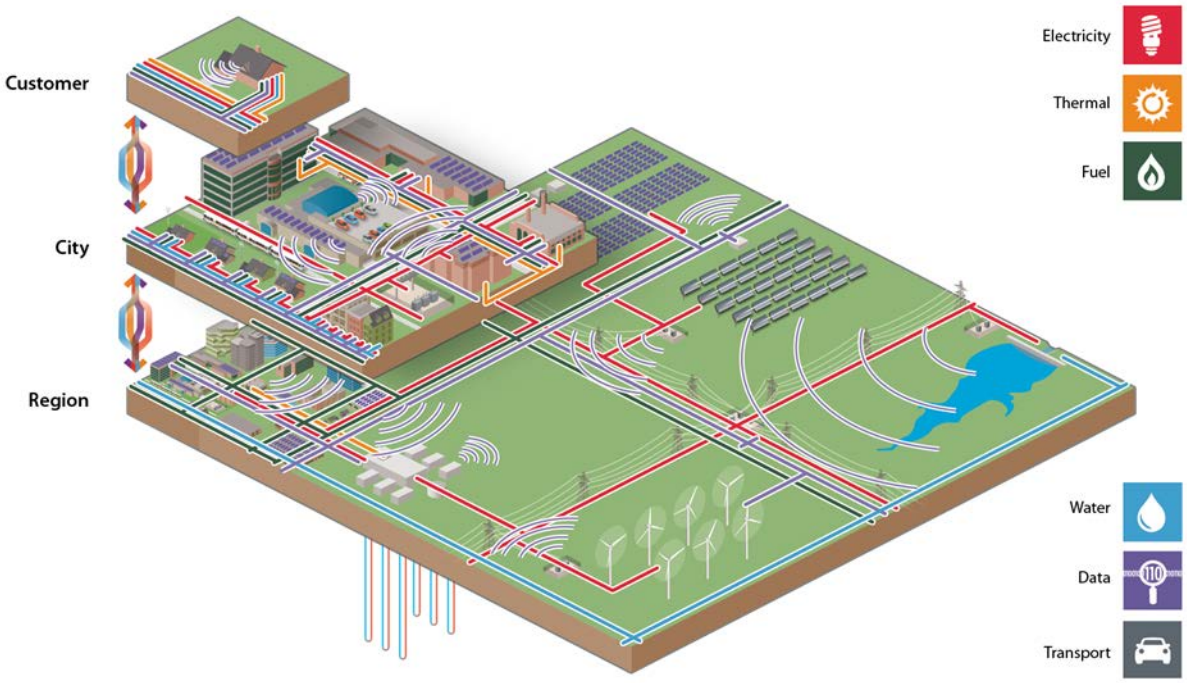
Time Line

- Formation in 2013/2015
- Approved Dec 2015
- Kick Off Meeting Dublin May 9 & 10th 2016

Participating Organisations

- AIT; Austria
- BERA; KU Leuven; VITO; Belgium
- DTU; Denmark
- VTT; Finland
- CEA; France
- Fraunhofer, IWES; EFZN; Germany
- UCD; Ireland
- ENEA; Italy
- LEI; Lithuania
- ECN; TU Delft; Groningen; Netherlands
- IRIS; Norway
- CIEMAT; CIRCE; Spain
- UKERC; Strathclyde; Newcastle, Manchester, Imperial, Durham, Edinburgh; UK
- etc.

Energy Systems Integration

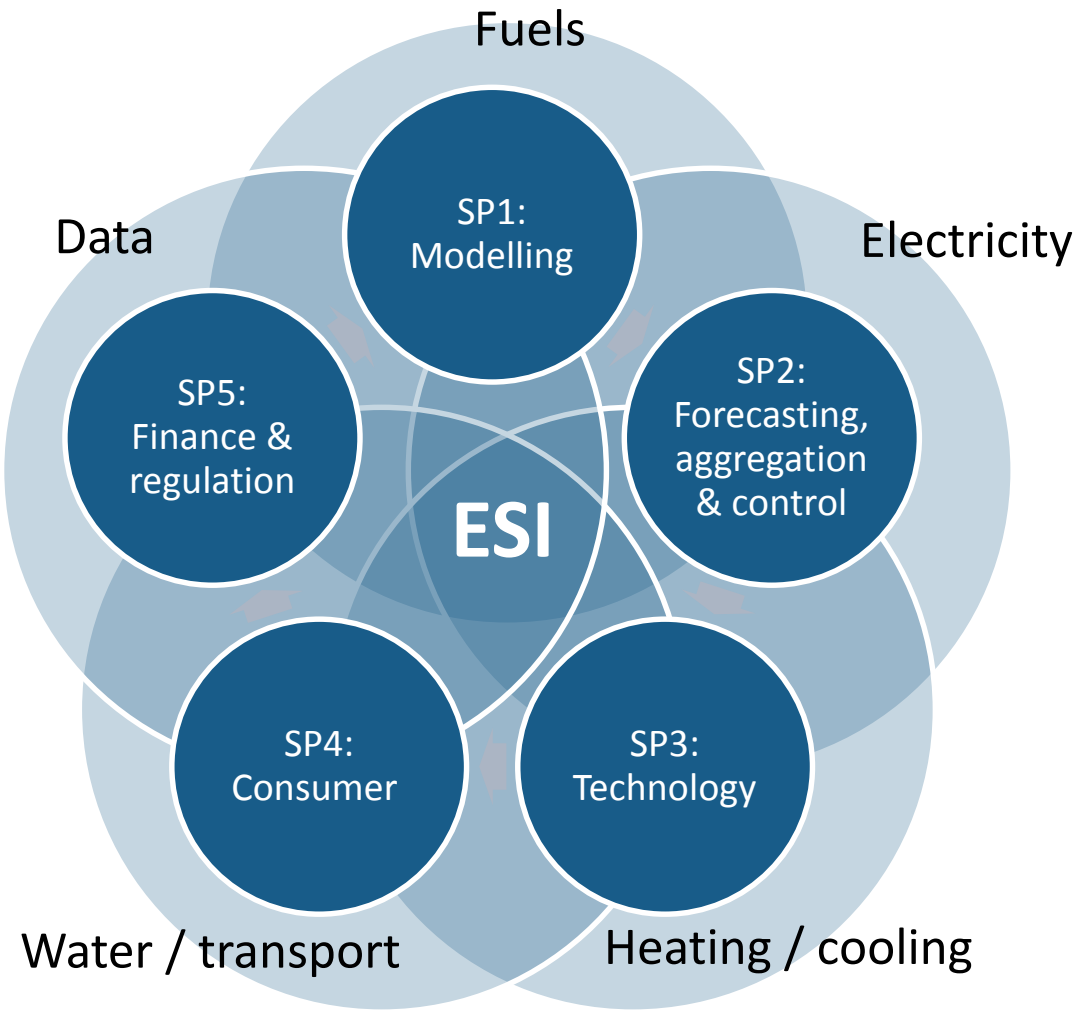


- **optimization** of energy systems across multiple pathways and scales
- increase reliability and performance, and minimise **cost and environmental impacts**
- most valuable at **the interfaces where the coupling** and interactions are strong and represent a challenge and an opportunity
- control variables are **technical economic and regulatory**

MAIN AIM OF JP ESI

The overall aim of the Joint Programme (JP) in Energy Systems Integration (ESI) is to develop the technical and economical tool box that government and industries will need to build the future efficient and sustainable European energy system . As such it seeks to optimize the energy system by leveraging the synergies between electricity, gas, heat, and fuel pathways at all scales. The energy elements of the water and transport system are also included in ESI as is the enabling data and control network that enables the optimization. The control variables in this problem are technical, economic and regulatory.

DESCRIPTION OF WORK



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EUROPEAN ENERGY RESEARCH ALLIANCE EERA AISBL

Description of Work

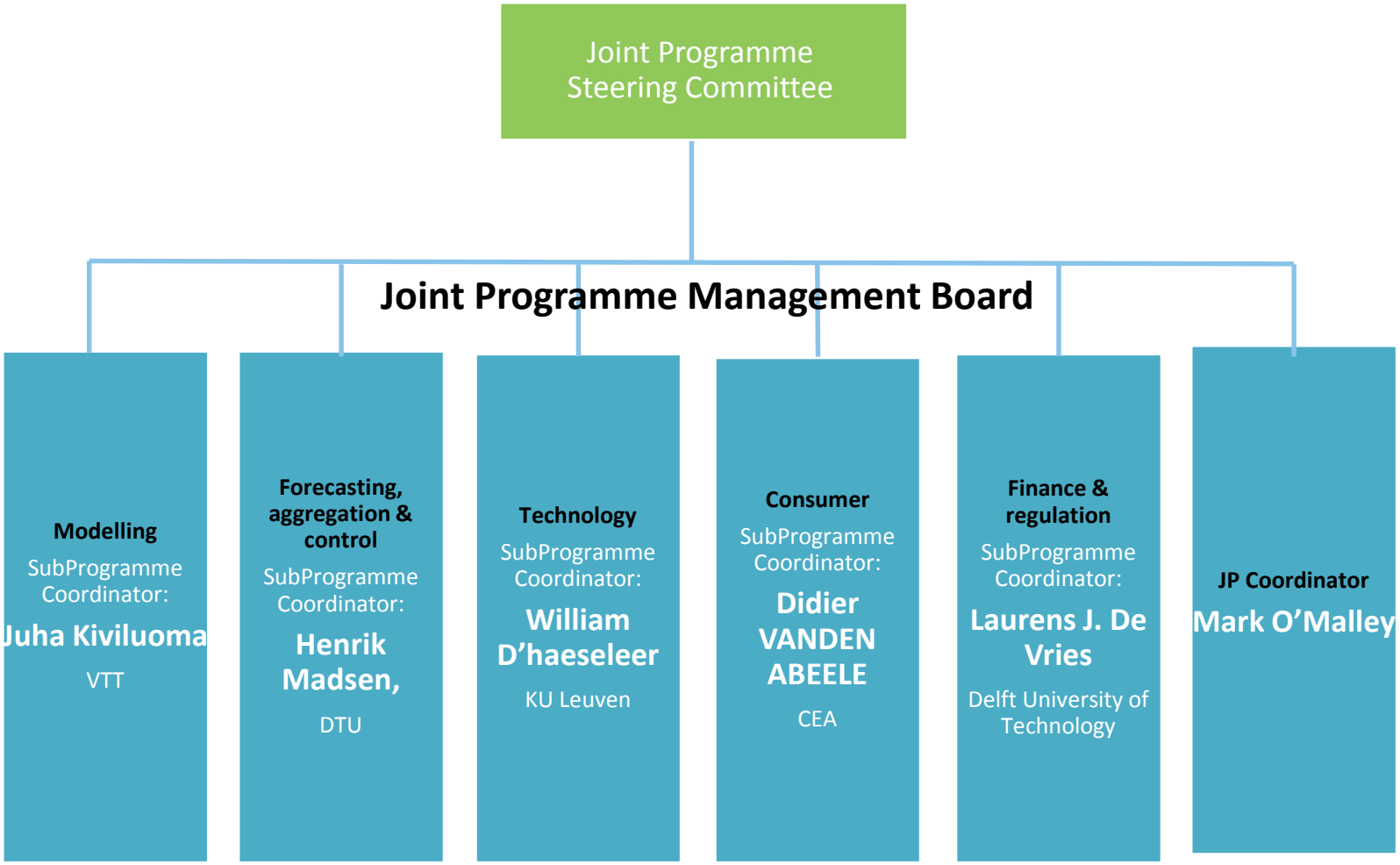
Joint Programme on Energy System Integration (ESI)

Version submitted for consideration by EERA December 2015, consisting of revision of original Description of Work submission to EERA at summer strategy meeting in Amsterdam, June 24th and 25th with the integration of additional material related to short- and medium-term plans, and interaction with other JPs, which was prepared in an addendum and approved by EERA Ex Co sub-committee on November 26th 2015.

December 7th 2015

OVERLAPS WITH OTHER JPS

- JP ESI scope is horizontal
  - Overlaps are inevitable
- JP ESI to complement other JPs
  - Smart Grids, Smart Cities, E3S, Wind, Storage, etc.
  - Overlaps will scientifically strengthen other JPs
- Overlaps to be actively managed
  - Similar to other joint programmes


Joint Programme Steering Committee
Joint Programme Management Board
Modelling
SubProgramme Coordinator:
Juha Kiviluoma
VTT
Forecasting, aggregation & control
SubProgramme Coordinator:
Henrik Madsen,
DTU
Technology
SubProgramme Coordinator:
William D'haeseleer
KU Leuven
Consumer
SubProgramme Coordinator:
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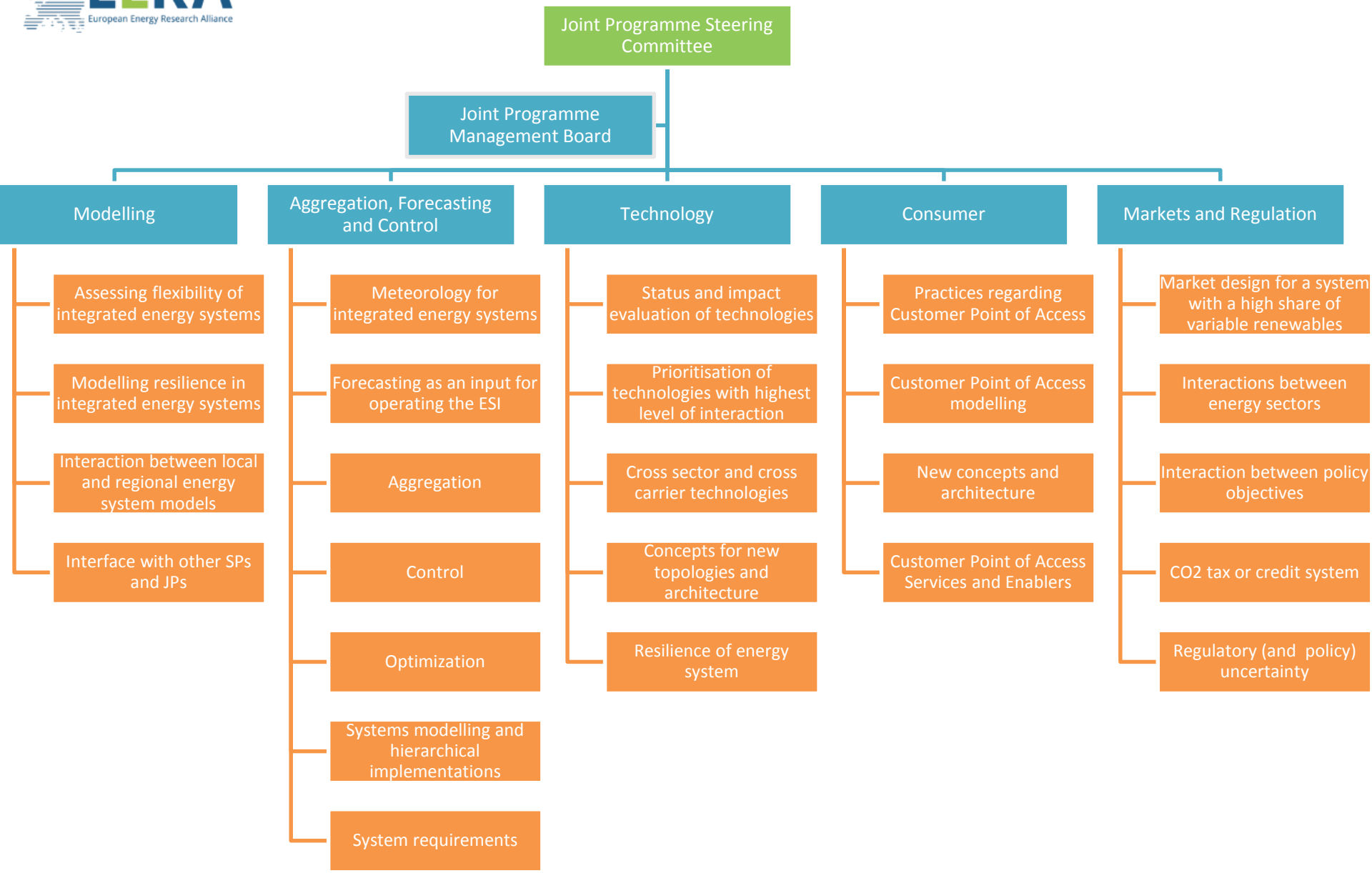
CEA
Finance & regulation
SubProgramme Coordinator:
Laurens J. De Vries
Delft University of Technology
JP Coordinator
Mark O'Malley


Joint Programme Steering Committee
Joint Programme Management Board
Modelling
Assessing flexibility of integrated energy systems
Modelling resilience in integrated energy systems
Interaction between local and regional energy system models
Interface with other SPs and JPs
Aggregation, Forecasting and Control
Meteorology for integrated energy systems
Forecasting as an input for operating the ESI
Aggregation
Control
Optimization
Systems modelling and hierarchical implementations
System requirements
Technology
Status and impact evaluation of technologies
Prioritisation of technologies with highest level of interaction
Cross sector and cross carrier technologies
Concepts for new topologies and architecture
Resilience of energy system
Consumer
Practices regarding Customer Point of Access
Customer Point of Access modelling
New concepts and architecture
Customer Point of Access Services and Enablers
Markets and Regulation
Market design for a system with a high share of variable renewables
Interactions between energy sectors
Interaction between policy objectives
CO2 tax or credit system
Regulatory (and policy) uncertainty

iiESI.org

iiESI International Institute for Energy Systems Integration

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Imperial College London

KU LEUVEN

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Pacific Northwest NATIONAL LABORATORY

UCD DUBLIN

EPRI ELECTRIC POWER RESEARCH INSTITUTE

DTU

Solving complex global energy challenges requires changing the way we THINK about energy systems, providing opportunities to SHARE knowledge, and helping nations EVOLVE by informing the discussions that are guiding energy investments and policy decisions.

KIER 한국에너지기술연구원 KOREA INSTITUTE OF ENERGY RESEARCH

Time Line

- First Meeting Feb 2014 in Washington DC
- Formal membership agreements signed in Early 2016
- 6 members signed up – 3 in process
- First formal members meeting July 18th at IEEE Power Engineering Society Meeting

Next Event

Skoltech Center for Energy Systems

2nd International Conference of Skoltech Center for Energy Systems
organized jointly with International Institute for Energy Systems Integration

Shaping research in integrated gas-, heat- and electric- energy infrastructures

Hotel Hilton Leningradskaya, Moscow, 30-31 May 2016