



# International Cooperation in Energy Research and Innovation



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# **International cooperation, Energy System Integration**

EU Energy Research, Innovation & policy framework

Examples of on-going co-operation

Energy System Integration activities in Europe

Towards future cooperation



# 1. EU Energy Research, Innovation & Policy framework



# EU Energy R&I & policy framework (1)

## Policy framework 2020

- 20% GHG reduction - binding
- 20% renewables - binding
- 20% energy efficiency

## Strategic Energy Technology Plan (SET Plan)

- "Technology pillar" of the EU Climate and Energy Policy
- Priority-setting tool for H2020 challenge "Secure, Clean and Efficient Energy"

## H2020 challenge "Secure, Clean and Efficient Energy"

- Energy Efficiency
- Competitive low-carbon energy supply
- Smart Cities and Communities



## EU Energy R&I policy framework(2)

Policy  
framework 2030

- 40% GHG reduction (main target)
- 27% renewables
- 27% energy efficiency

European  
Energy Security  
Strategy

- Energy Security to be streamlined in energy research and innovation

President  
Juncker's  
guidelines

- "*A resilient Energy Union with a forward-looking climate change policy*" one of his 10 priorities



# European Strategic Energy Technology Plan (SET plan)

- **Development and deployment of low-carbon technologies in a 2020 perspective and beyond**
- **Reference point for EU, national, regional and private investment in energy R&I, increasing leverage through joint actions**
- **Focus on technologies with market impact up to 2020 European Industrial Initiatives – Smart Grids EEGI**
- **Focus on longer-term research actions beyond 2020 EERA European Energy Research Alliance – Smart Grids ELECTRA**
- **Building an Integrated system view covering demand, generation, optimisation of logistics, smart cities, smart consumers**



# Horizon 2020 Energy programme

**Main RD&D financing instrument at EU level**

Main challenges and messages for the energy challenge

**Support the transition to a reliable, sustainable and competitive energy system by**

- Reducing energy consumption and carbon footprint through smart and sustainable usage
- Boosting the development of renewable and alternative energy technologies and their integration in the energy system
- Making the power system more flexible to include new energy sources and reduce infrastructure upgrade costs
- Decarbonising the power and other industrial sectors

**Maintaining/increasing the competitiveness of European industry**



## 2. Examples of on-going cooperation

- **Joint projects**
- **Participation in "standard" projects**
- **Lab-to-lab cooperation with EERA**
- **Cooperation within ISGAN**



## **Example Joint project: NGCPV**

**A new generation of concentrator photovoltaic cells, modules and systems**

**Example of targeted co-operation**

**EU partners financed by EC, Japanese partners financed by JN**

- Consortium of 7 European, 9 Japanese leading research centres
- Boost the efficiency of multi-junction solar cells
- Corresponding modules and systems
- 2011 - 2015
- Europe ~5 M€ - Japan ~ 5 M€

**Result of a co-ordinated call**



# **EERA Smart Grids - ELECTRA**

## **International collaboration**

**ELECTRA assembles 21 Major Laboratories in Europe**  
**Focus on long-term architecture of electricity grid**  
**Developing international cooperation**

- Contacts developing with DoE, NEDO, other contacts
- International Cooperation Board
- Developing lab-to-lab cooperation
- Opportunities for researchers exchange



# **Example Multilateral Cooperation IEA ISGAN**

## **International Smart Grids Action Network European drive for the development (Italy)**

- Major Economies Forum
- Clean Energy Ministerial
- ISGAN

**Active network with 25 world-wide contracting parties,  
more invited to join**

### **Implementation through Annexes**

- Major European contribution to Annexes



### 3. Energy System Integration Activities in Europe

- **Current drivers**
- **Long-term drivers**
- **Example activities**



# Driver: flexibility in the power system

## Variable renewable generation in Europe (end 2013)

- Wind:  $\approx$  117 GW
- Photovoltaic:  $\approx$  80 GW
- Peak/average Load:  $\approx$  530/380 GW
- Not uniform: much higher concentration in DE, DK, ES, IT, IE, ....

## Challenges

- Events with renewable generation > load at local, national level
- Inaccuracies in prediction of wind / solar power  
example: unforeseen fog leading to 8800 MW PV day-ahead error in DE
- Very high ramp rates
- High frequency volatility
- "Trading errors" due to trading on 1hr basis



# **Driver: long-term very low-GHG scenarios**

**Many detailed studies at national level. Examples:**

**Consumption: heating – optimise the input from**

- ✓ Solar heating, ground heat pumps, air heat pumps
- ✓ Biomass CHP;
- ✓ District heating/cooling grids, heat storage

**Consumption: transport**

- ✓ Battery electric vehicles, fuel-cell electric vehicles
- ✓ ICE-based vehicles: from power-to-gas, power-to-fuel, biofuel

**Consumption: other electricity**

- ✓ From wind – onshore & offshore, solar, hydro, biomass

**Integrate the logistics in time and space:**

- ✓ cross-energy vector, storage, power-to-x, etc?



# Integrated System Initiatives - examples

- **European Electricity Grids Initiative** – Integrating existing and new forms of generation, loads and storage
- **Smart Cities Initiative** - Integrating Energy, Buildings, Transport and ICT solutions at city level
- **Hydrogen & Fuel Cells Initiative** – Developing technology for transport and stationary applications
- **European Green Vehicles Initiative** – Developing vehicles, infrastructure, transport system integration
- **Energy Efficient Buildings Initiative** – Developing solutions for new buildings and for renovation
- **Joint Programmes of the EERA Research Alliance**



## 4. Towards future cooperation



# Cooperation opportunities

## Cooperation opportunities within Horizon 2020

- Participation of European subsidiaries
- Participation of non-European organisations
- Joint projects

## Lab-to-lab collaboration under EERA

## Multilateral cooperation e.g. ISGAN



# Conclusions

**Important needs, ambitions and experience in Europe on Energy Systems Integration**

**Europe, US, Japan have shared interest in bringing more intelligence to the grid**

**Europe, Japan have a similar dependency on external energy resources: limited coal resources, some nuclear, no oil, limited gas**

**Shared drivers in energy security, energy efficiency, shared interest for renewable energy**

**Different options possible for international cooperation**



## **International cooperation strategy for Research and Innovation**

<http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1405329617697&uri=CELEX:52012DC0497>

### **European energy security strategy**

<http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1405329617697&uri=CELEX:52014DC0330>

### **International cooperation with Japan**

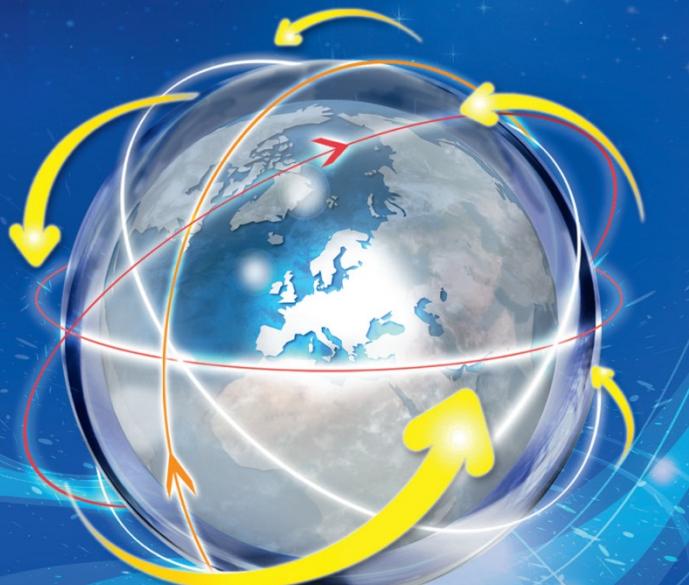
<http://ec.europa.eu/research/iscp/index.cfm?lg=en&pg=japan>

### **Strategic energy technologies Plan implementation**

<http://setis.ec.europa.eu/implementation>

### **Pdt Juncker - A New Start for Europe: My Agenda for Jobs, Growth, Fairness and Democratic Change**

[http://ec.europa.eu/about/juncker-commission/docs/pg\\_en.pdf](http://ec.europa.eu/about/juncker-commission/docs/pg_en.pdf)



# Thank You

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