



# *International collaboration in clean energy technologies innovation*

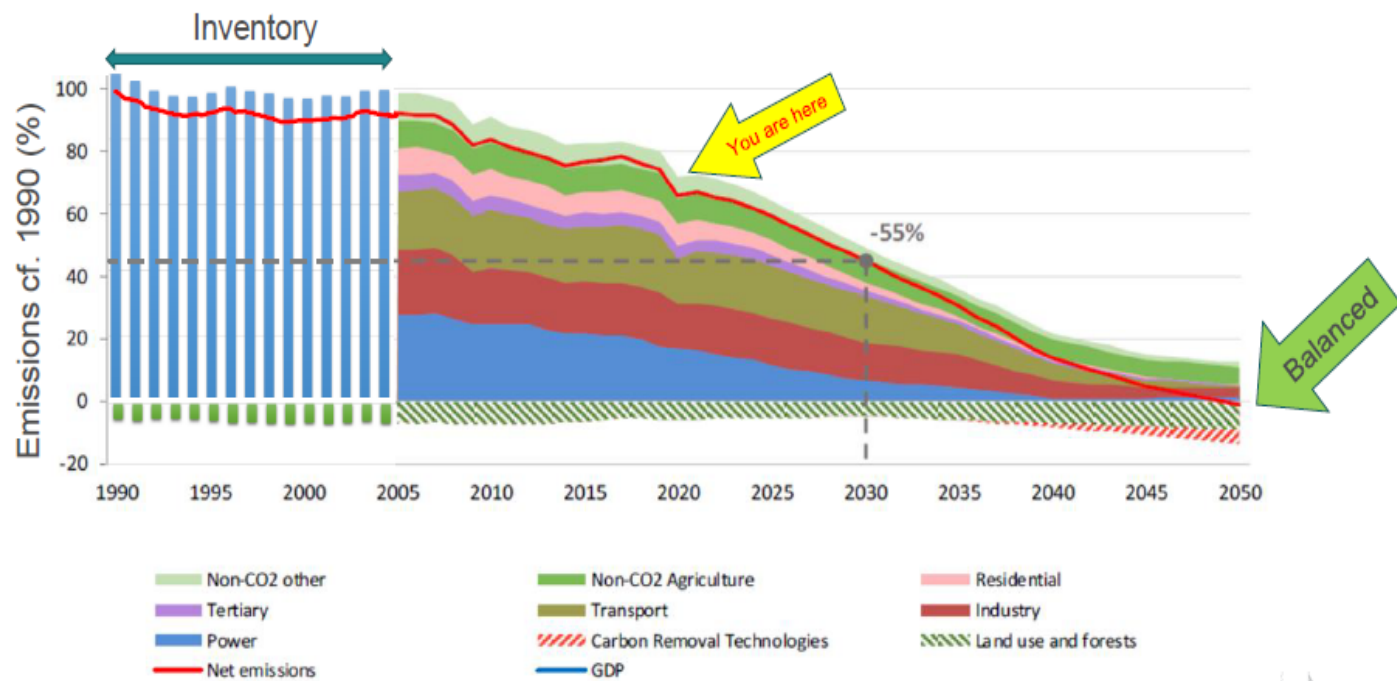
**Marcello Capra**  
**Italian Ministry of Ecological Transition**

*LCS-RNet, 16 December 2021*

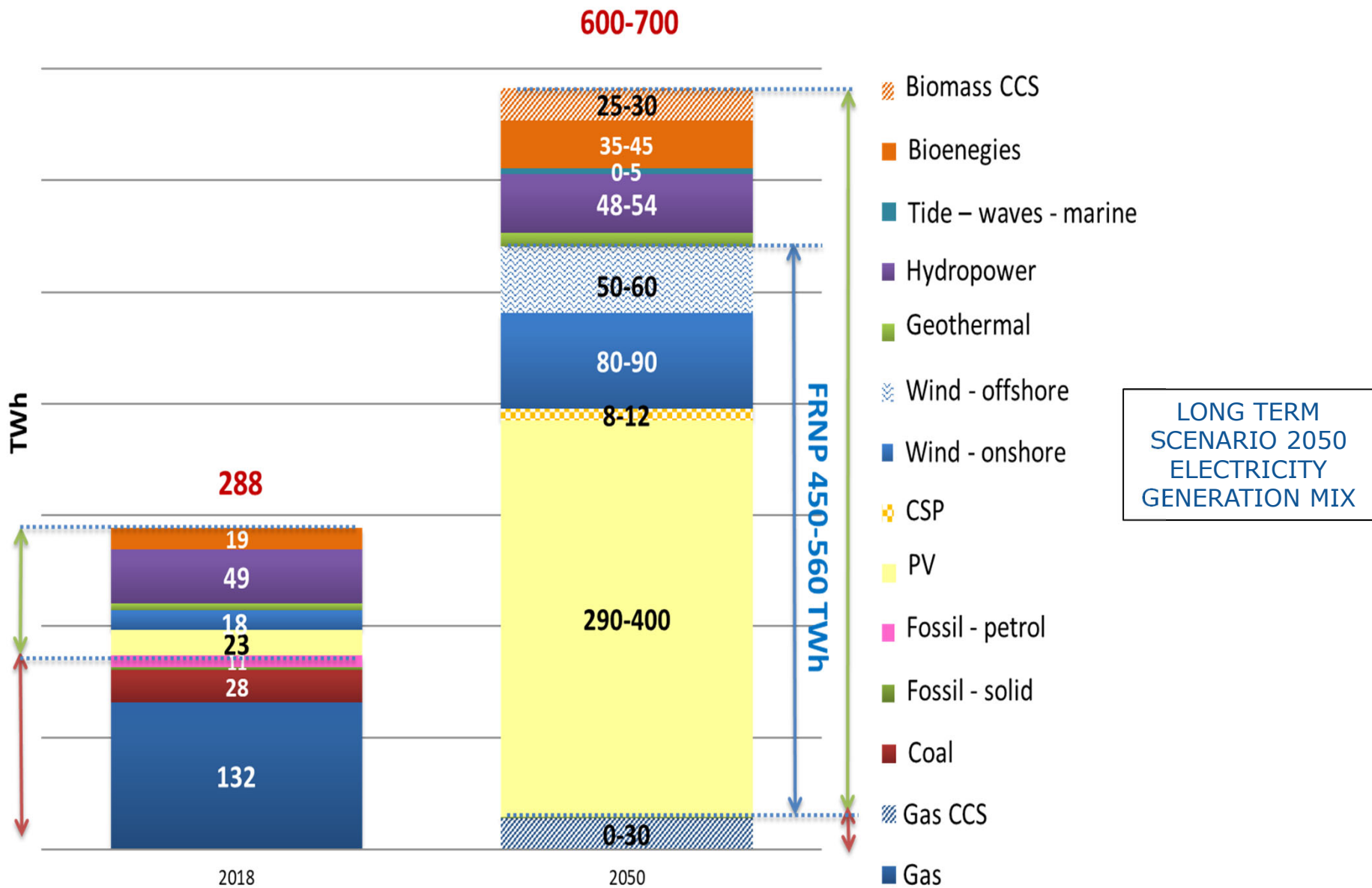




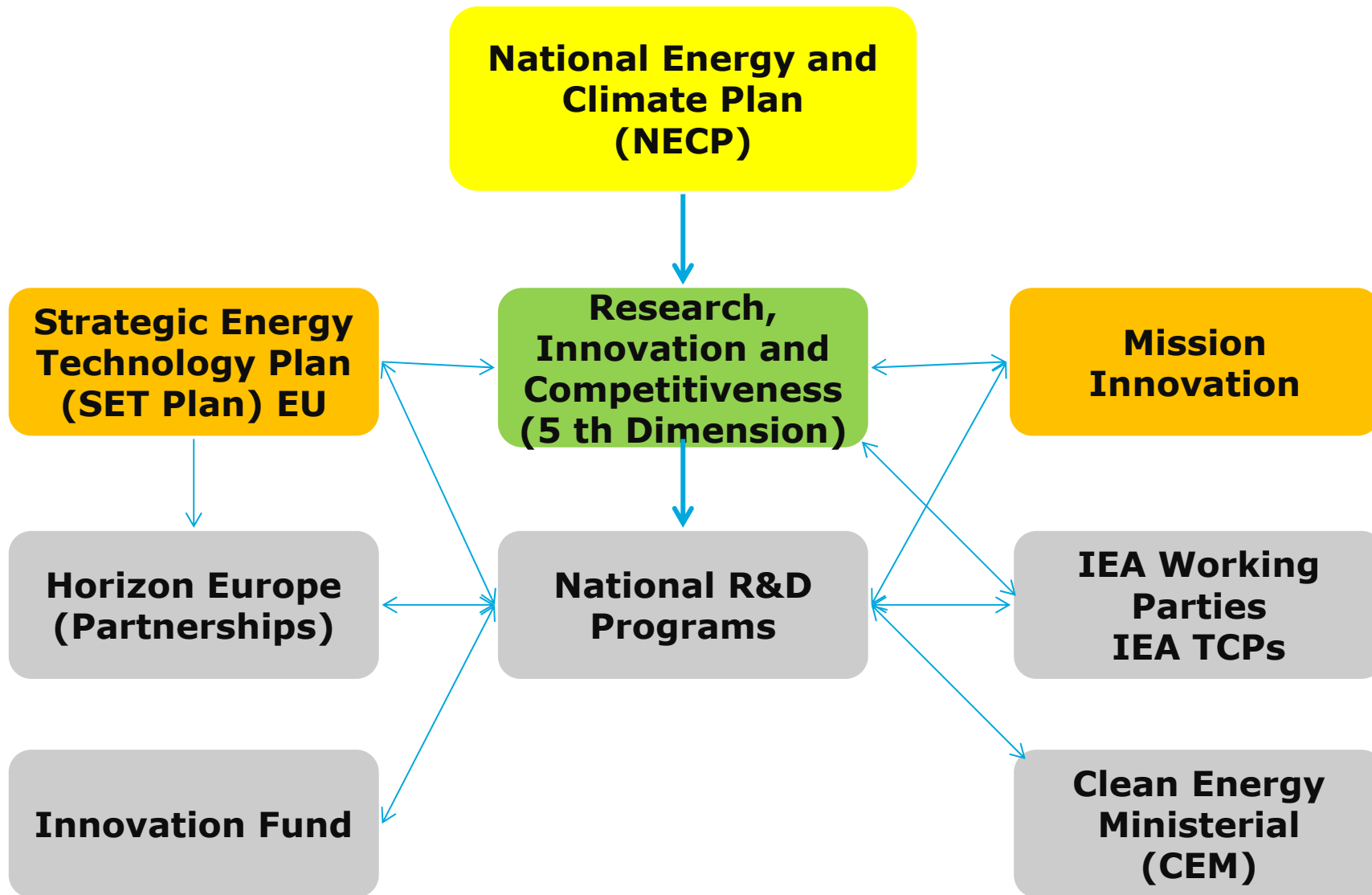
# Pathway to climate neutrality



# Evolution of the Italian energy mix



**International cooperation**



## Italy is part of the EU SET-Plan and it is a promoter of Mission Innovation launched at COP21 to boost frontier projects for *clean energy technologies*

MISSION INNOVATION  
Accelerating the Clean Energy Revolution

- **International partnership** joined by **25 nations** (plus EU Commission) with the aim to promote technology innovation to support energy transition by means of doubling of public funds for *cleantech research*.
  - **Italy committed to double public funds for R&D for clean energy** (from 222 Million € in 2013 to **444 Million € in 2021**).
- **Italy has a co-leadership role for the implementation of IC#1 on *Smart Grids technologies* and now in the development of the new Mission Power in the future MI 2.0**

The European Strategic Energy Technology Plan  
**SET-Plan**  
Towards a low-carbon future

- **Reference Program for investment at national, regional and UE level, and for private investment to support R&D and innovation in the energy sector.**
- **The main implementation program of the SET Plan is Horizon Europe.**

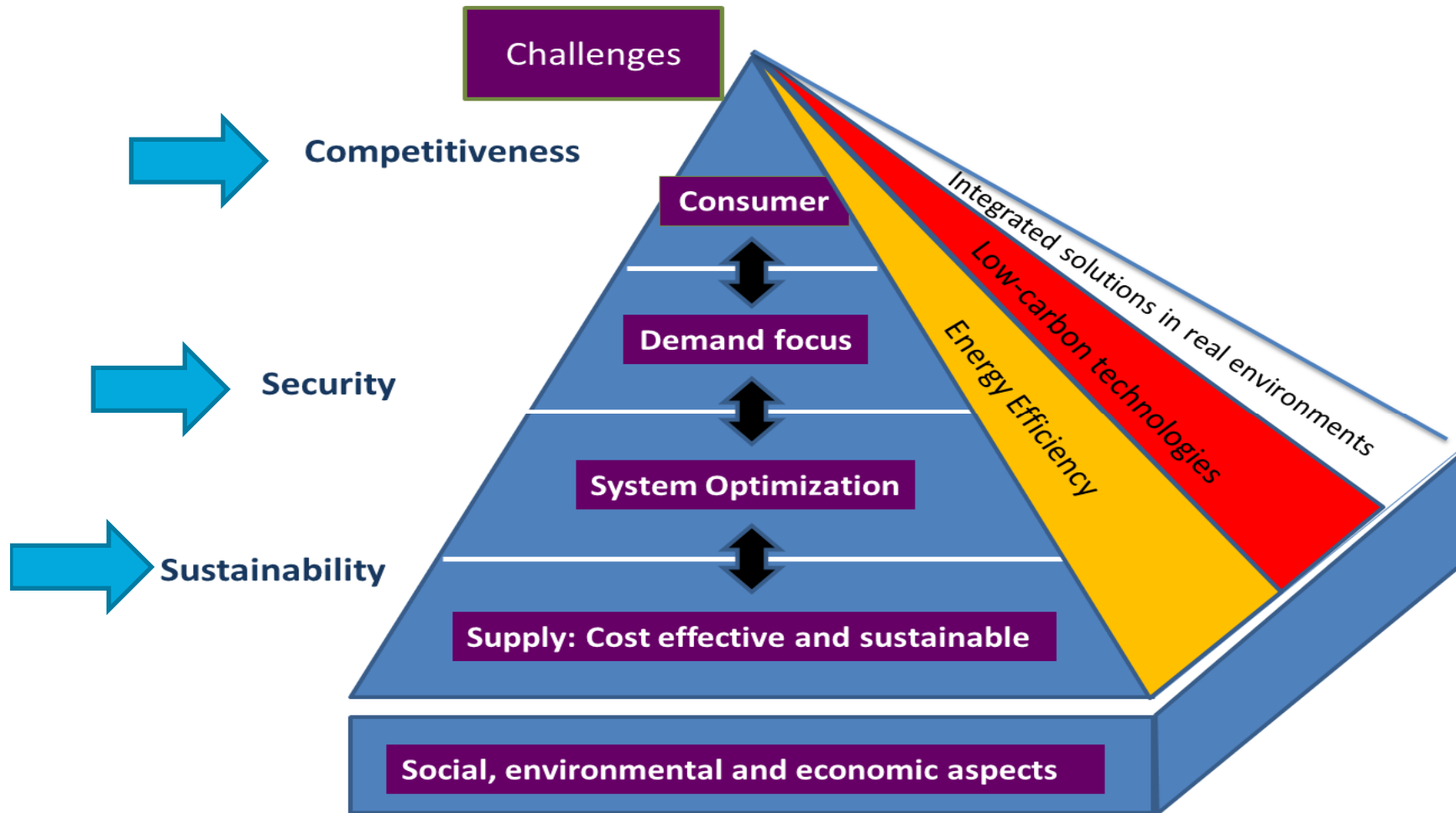
# The Strategic Energy Technology Plan (SET Plan)

*At the European level, the SET Plan is the strategic response to the major climate and energy challenges. Its aims include:*

- in the medium term (2020), a greater dissemination of technologies already available today among the EU countries
- in the long term (2050), a concentrated technological research and innovation collaborative effort in the industrial system



# SET Plan Integrated Roadmap



**SET Plan Integrated Roadmap (13 themes)**  
**In origin they were 30**

**ENERGY UNION R&I & Competitiveness priorities**

**SET Plan (10 key actions)**

T10: Development of renewables

T8: System flexibility

T1: Engaging consumers  
 T2: Smart technologies for consumers

T6: Modernising the electricity grid  
 T7: Energy storage  
 T8: System flexibility  
 T9: Smart cities & communities

T3: Energy efficiency in buildings  
 T4: Energy efficiency in heating & cooling  
 T5: Energy efficiency in industry & services

T7: Energy storage

T13: Biofuels, fuel cells & hydrogen, alternative fuels

T11: Carbon capture storage/use

T12: Nuclear energy

**N°1 in Renewables**

**Smart EU Energy System with consumers at the centre**

**Efficient Energy Systems**

**Sustainable Transport**

**1. Performant renewable technologies integrated in the system**

**2. Reduce costs of technologies**

**3. New technologies & services for consumers**

**4. Resilience & security of energy system**

**5. New materials & technologies for buildings**

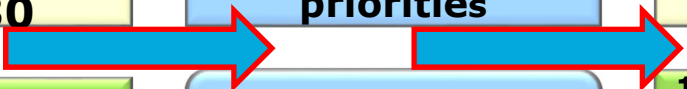
**6. Energy efficiency for industry**

**7. Competitive in global battery sector (e-mobility)**

**8. Renewable fuels**

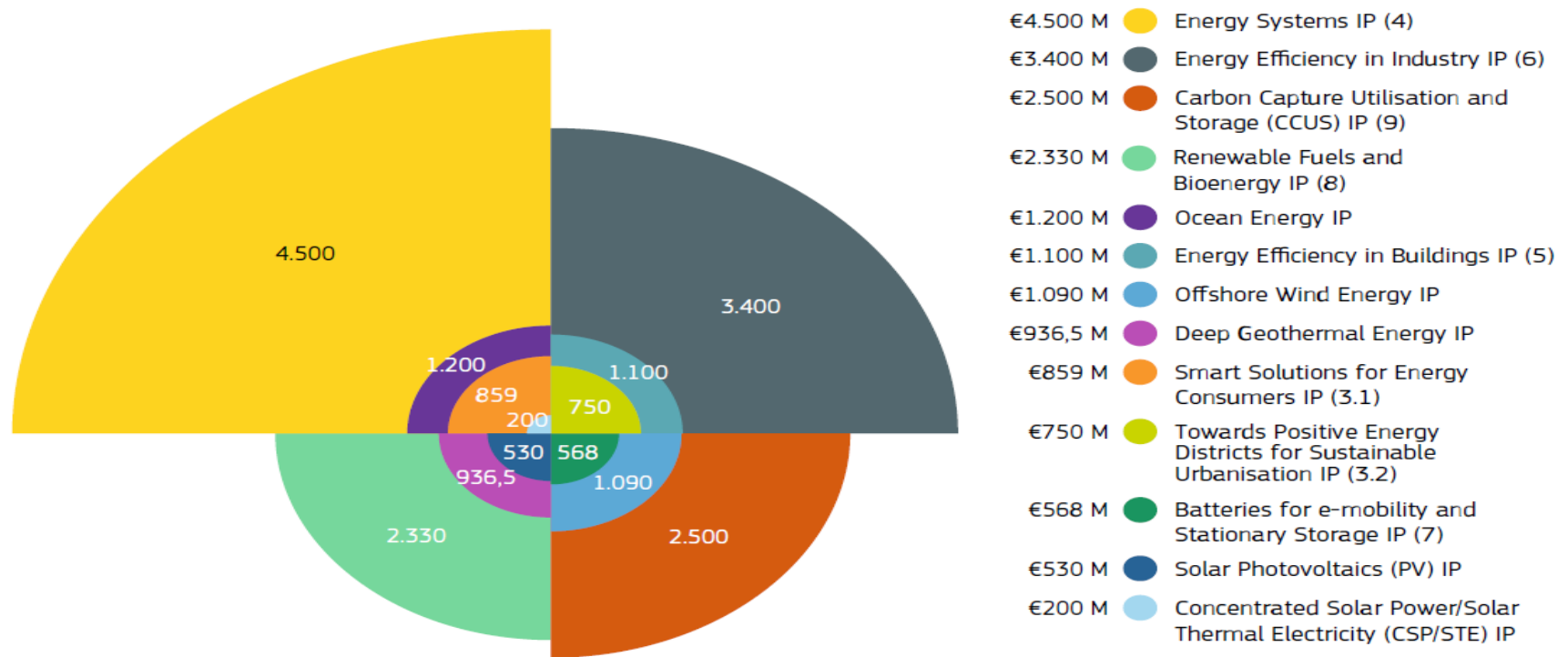
**9. CCS/CCU**

**10. Nuclear Safety**



# SET Plan: next steps ahead (>20Bln €)

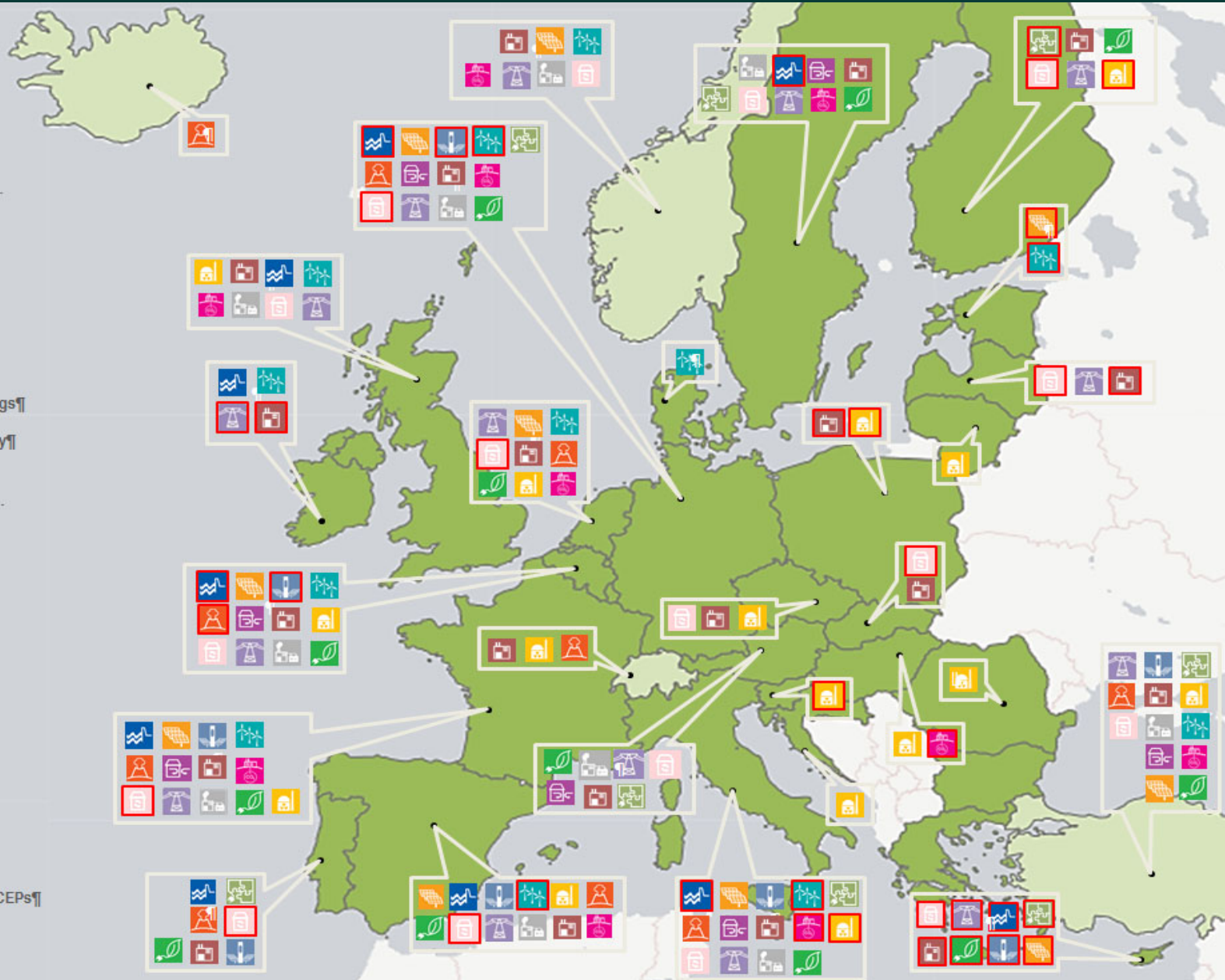
EXPECTED VOLUME OF INVESTMENTS IN R&I ACTIVITIES  
AS IDENTIFIED IN THE IMPLEMENTATION PLANS (EUR MILLION)



# Consistency between SET-Plan commitments and technology priorities in the NECPs

## LEGEND

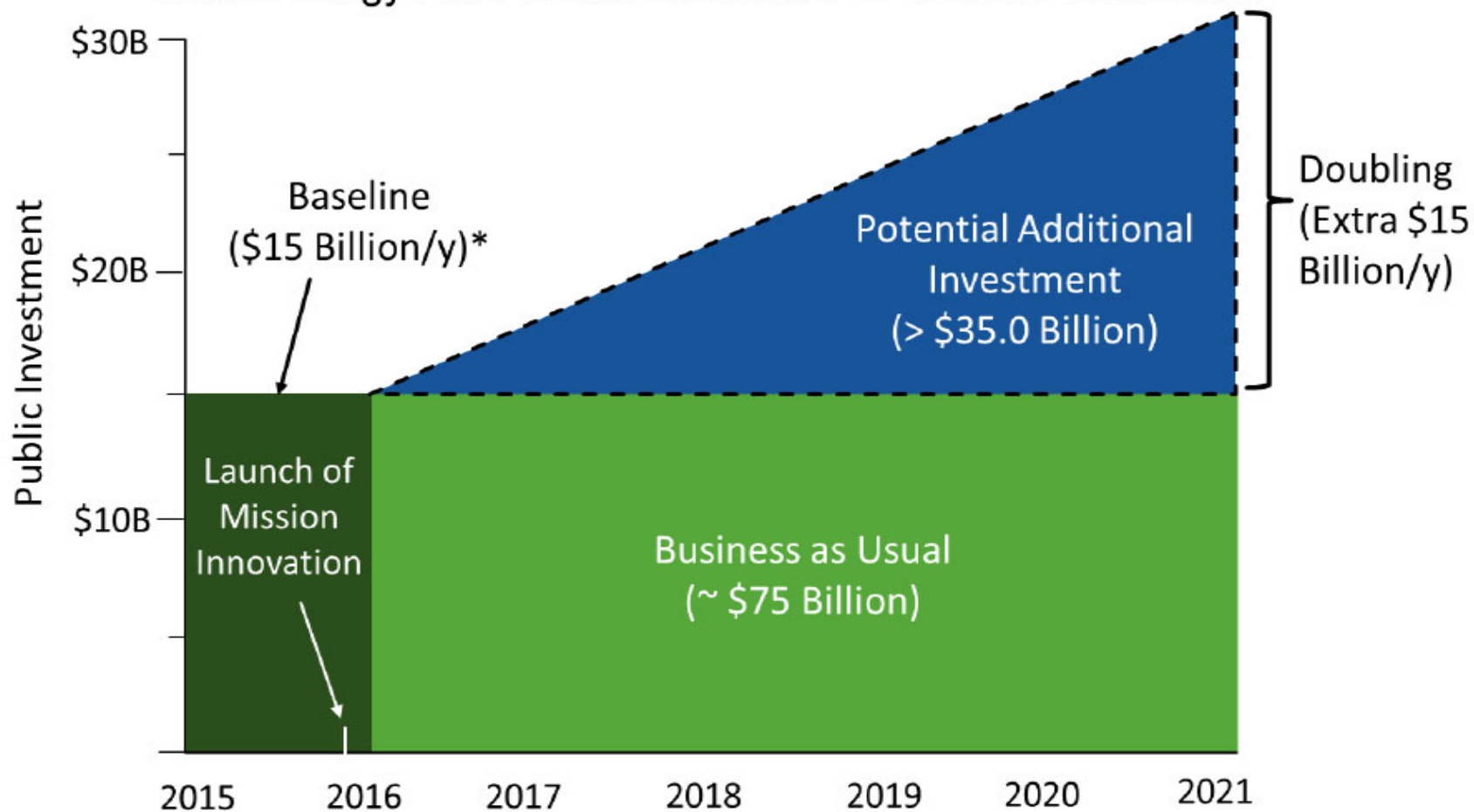
-  Solar-Photovoltaics
-  Concentrated-Solar-Power-  
Solar-Thermal-Electricity
-  Offshore-Wind-Energy
-  Deep-Geothermal-Energy
-  Ocean-Energy
-  Energy-Efficiency-in-Buildings
-  Energy-Efficiency-in-Industry
-  Smart-Solutions-for-Energy-  
Consumers
-  Positive-Energy-Districts
-  Energy-Systems
-  Batteries-(E-Mobility-and-  
Stationary-Storage)
-  Renewable-Fuels-and-  
Bioenergy
-  Carbon-Capture-Utilisation-  
and-Storage
-  Nuclear-Safety
-  SET-Plan-not-mentioned-in-NCEPs





- **Mission Innovation (MI)** is a global initiative of 25 countries and the European Commission, announced in **Paris at the COP21**.
- As part of the initiative, participating countries have committed to seek **to double their governments' clean energy (R&D) investments** over five years, while encouraging greater levels of private sector investment in clean energy technologies.
- In parallel with MI the **Breakthrough Energy Coalition (BEC)**—a group of entrepreneurs, business leaders, and institutional investors led by **Bill Gates**— was launched with a first commitment to invest more than US\$ 1 billion in a fund called Breakthrough Energy Ventures

### Clean Energy R&D Investment Chart for Mission Innovation



\* MI Baseline of USD \$15 billion per year in clean energy R&D is compiled from reports of 21 MI Members.



- **Smart Grids Innovation Challenge** – to enable future grids that are powered by affordable, reliable, decentralised renewable electricity systems
- **Off-Grid Access to Electricity Innovation Challenge** – to develop systems that enable off-grid households and communities to access affordable and reliable renewable electricity
- **Carbon Capture Innovation Challenge** – to enable near-zero CO<sub>2</sub> emissions from power plants and carbon intensive industries
- **Sustainable Biofuels Innovation Challenge** – to develop ways to produce, at scale, widely affordable, advanced biofuels for transportation and industrial applications
- **Converting Sunlight Innovation Challenge** – to discover affordable ways to convert sunlight into storable solar fuels
- **Clean Energy Materials Innovation Challenge** – to accelerate the exploration, discovery, and use of new high-performance, low-cost clean energy materials
- **Affordable Heating and Cooling of Buildings Innovation Challenge** – to make low-carbon heating and cooling affordable for everyone
- **Renewable and Clean Hydrogen Innovation Challenge.**



# Innovation Challenges

- **Innovation Challenges** are global calls to action aimed at accelerating research, development, and demonstration (RD&D) in technology areas where MI members believe increased international attention would make a significant impact in our shared fight against climate change.
- The Innovation Challenges **cover the entire spectrum of RD&D**; from early stage research needs to technology demonstration projects.
- These challenges are aimed at catalyzing the global research efforts in areas that could provide significant benefits in reducing greenhouse gas emissions, increasing energy security, and creating new opportunities.
- The Innovation Challenges were developed **through a collaborative process** between MI members. Engagement in an IC is **entirely voluntary** and is built around a coalition of interested countries.





# Innovation Challenges

		Australia	Austria	Brazil	Canada	Chile	China	Denmark	EC	Finland	France	Germany	India	Indonesia	Italy	Japan	Mexico	Norway	Republic of Korea	Saudi Arabia	Sweden	The Netherlands	UAE	UK	USA
1	Smart Grids Innovation Challenge	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
2	Off Grid Access to Electricity Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
3	Carbon Capture Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Lead	Participant
4	Sustainable Biofuels Innovation Challenge	Participant	Participant	Lead	Lead	Lead	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
5	Converting Sunlight Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
6	Clean Energy Materials Innovation Challenge	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
7	Affordable Heating and Cooling of Buildings Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Lead	Participant
8	Hydrogen Innovation Challenge	Lead	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant



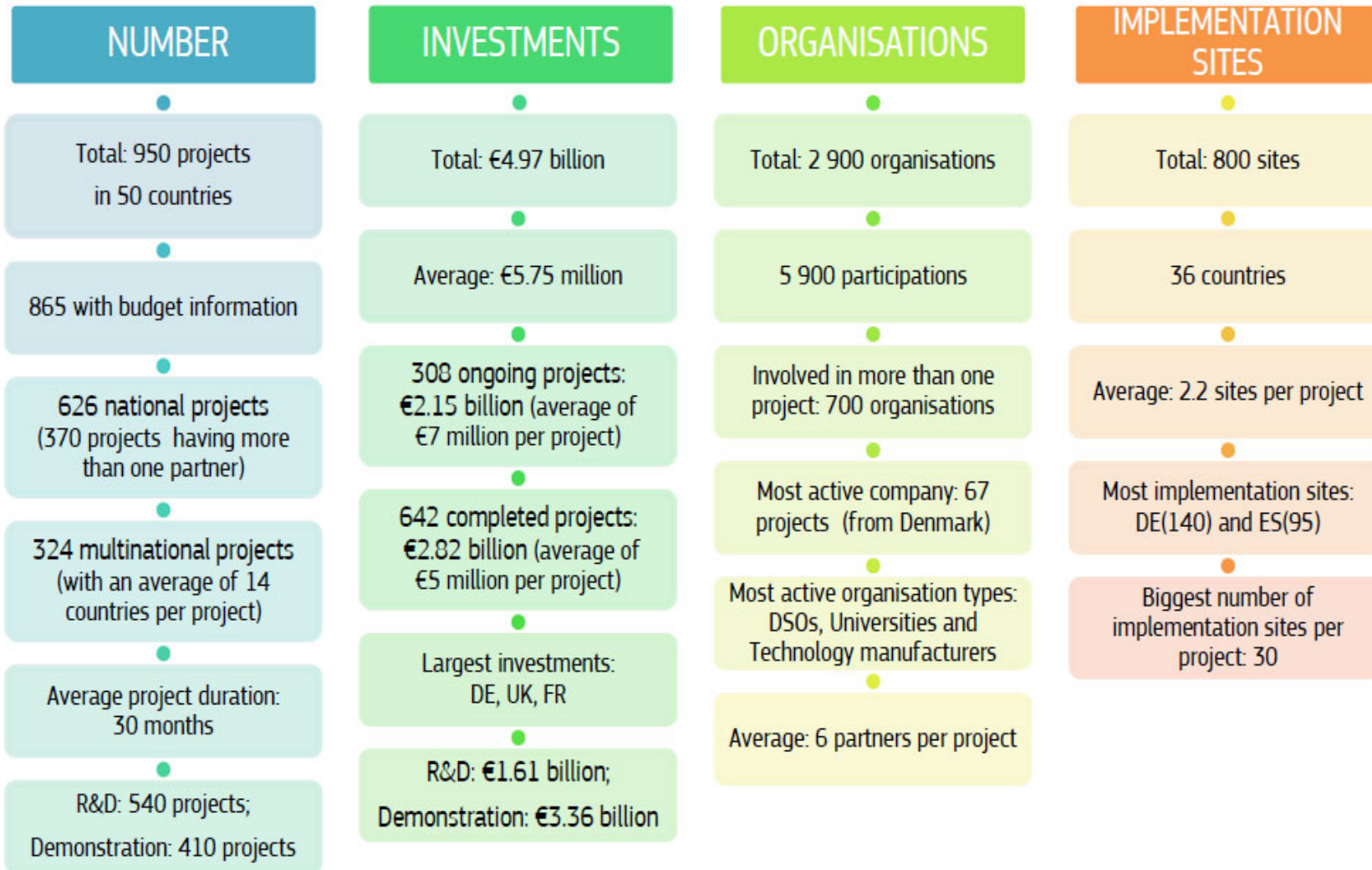
Lead



Participant

# Smart Grids

# Smart Grids: projects and initiatives in the EU



# Smart Grids: collaboration framework in the EU



- THE INTEGRATED SYSTEM IS AT THE CENTER OF THE DEVELOPMENT OF THE EUROPEAN ENERGY STRATEGY ;
- A DIGITAL AND RESILIENT INTEGRATED ENERGY SYSTEM IS AN ESSENTIAL ENABLER FOR THE DEVELOPMENT OF ALL OTHER SECTORS ;
- COORDINATION WITH OTHER VALUE CHAINS IS STRATEGICALLY VERY IMPORTANT IN THE EU CONTEXT



## ***"Rome Declaration on Smart Grids Innovation "***

Rome, November 21st – 23rd, 2018

- To launch six R&D joint Tasks of cooperation: **'Storage integration', 'Demand response', 'Regional electricity highways', 'Flexibility options', 'New grid control architectures' and 'Power electronics'**
- To fully engage the **private sector and business investors** to accelerate the adoption of smart grids technical solutions
- To launch the **Smart Grids Innovation Accelerator (SGIA) Platform**. This will serve as a suitable tool to enable knowledge sharing of technical results and best practices, thus removing barriers and providing insights to boost smart grids market uptake

Hydrogen

# NATIONAL HYDROGEN STRATEGY PRELIMINARY GUIDELINES - KEY FIGURES 2030



About 2% penetration of hydrogen on final energy demand



Up to 8 Mton of avoided CO<sub>2</sub>eq emissions



About 5 GW of electrolysis capacity for hydrogen production



Up to 10 B€ of investments for H<sub>2</sub> (RES to be added), half of them from ad hoc resources and funds



Up to 27 B€ of additional Gross Domestic Product



More than 200k temporary and up to 10k permanent jobs created

## Potential Clean Hydrogen Mission Collaboration Actions

*With innovation being a cornerstone of the Mission Innovation platform, Members will focus on specific actions to foster international collaboration and develop strategies to achieve the overarching goal of 2 USD per kg of hydrogen. Examples of possible actions include:*

- Monitoring global R&I initiatives and continuously identifying specific strategies and activities to accelerate cost-reductions and technological breakthroughs.
- Establishing knowledge exchange networks with MI Members to foster collaboration on relevant programmes and initiatives.
- Working with MI Members to develop a database of clean hydrogen production R&I projects by members to prioritise potential areas for enhanced collaboration.
- Coordination with other international partnerships to avoid duplication and leverage resources will be critical. Efforts are underway through IPHE, IEA, CEM, WEF, FCH JU and other initiatives to address barriers including safety, codes, and standards, and facilitating international trade for hydrogen.



# Strong public-private partnership with a focused objective

EU Institutional Public-Private Partnership (IPPP)



## Fuel Cells & Hydrogen Joint Undertaking (FCH JU)



**Industry grouping**  
About 130 companies  
50% SME



**Research grouping**  
About 70 institutions



To implement an *optimal research and innovation programme* to bring FCH technologies to the point of market readiness by 2020

## “Hydrogen Valleys”:

A “**Hydrogen Valley**” can be defined as a geographical area - city, region, island or industrial site - where **several hydrogen applications** are combined together into an **integrated hydrogen eco-system** that consumes a significant amount of hydrogen. A Hydrogen Valley should ideally cover the entire hydrogen value chain (production, storage, distribution and final use).

