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INNOVATION & TECHNOLOGY TRANSFER

Founding Member Of
IPT Alliance®
Intellectual Property & Technology

The Smart Grid Technology and IP global scenario

The Smart Energy opportunity for the Italian industry

Rome, October 22nd 2013

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Geneva - Grenoble - Paris - Hamburg - Karlsruhe - Düsseldorf – Munich - Turin - Milan- Vicenza

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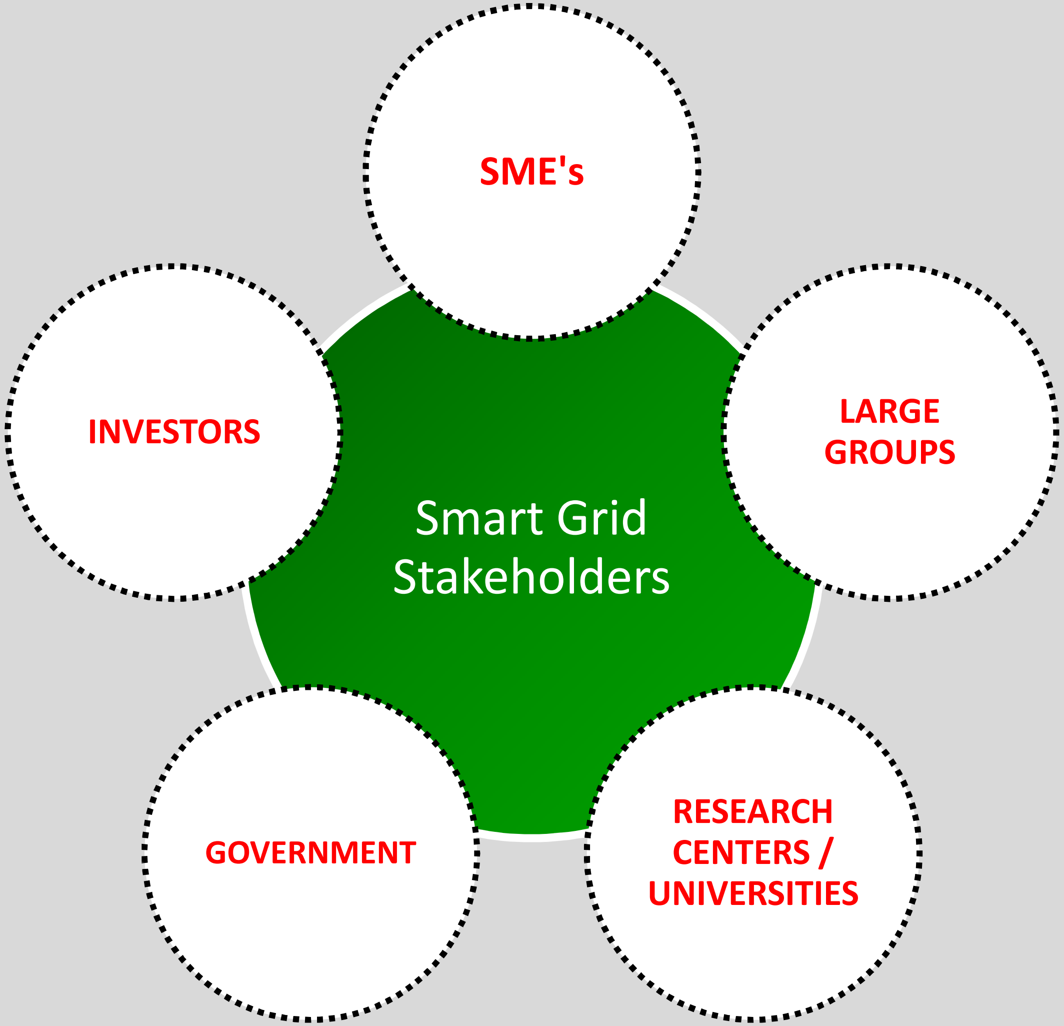
Today's audience

- **High-Qualified Representatives:** Business, Innovation, Technology Managers, Trade Association and Investors



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Our focus today

- The Smart Grid industry big picture
- Why invest? Who is investing?
- What are the main issues?
- Where players are innovating and investing?
- What assets (know-how, technologies, IP) we have in Italy?
- How to leverage and develop the italian innovation and supply chain?

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ICM International is a leading highly specialized European professional and industrial services group

Leverage the intangible assets

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Valuation
&
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Intelligence for competitive advantage

ICM Research
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Competitive
Intelligence
Services

Enabling sustainable innovation

ICM Industrial
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Innovation
&
Tech Transfer
Services

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- **ICM is founding member** of **IPT Alliance**, with **Patev Associates GmbH** (Germany) and **Avenium Consulting SA** (France - Subsidiary di CEA Commissariat à l'énergie atomique et aux énergies alternatives)
- About **150 professionals**
- 10 offices in Europe, presence in **Italy since 2003**

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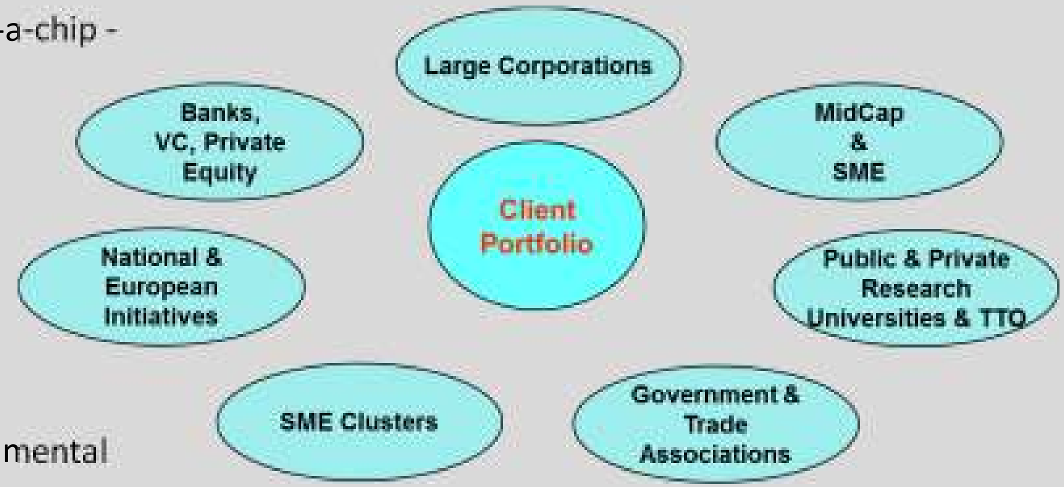
Industries and technologies fields of expertise

Long lasting in many industries and technologies, strong Innovation liason and roots in regions with leading industrial companies, technical universities and research centers

Geneva, Grenoble, Karlsruhe, Turin

- Aerospace
- Automotive
- Banking
- Biochips - lab-on-a-chip - microfluidics
- Chemical
- Consumer goods
- Pharmaceutical
- Life Science
- Electrical
- Electronics
- Energy & Environmental
- Equipment Manufacturing
- Food
- Fuel cells
- Government
- Green Building



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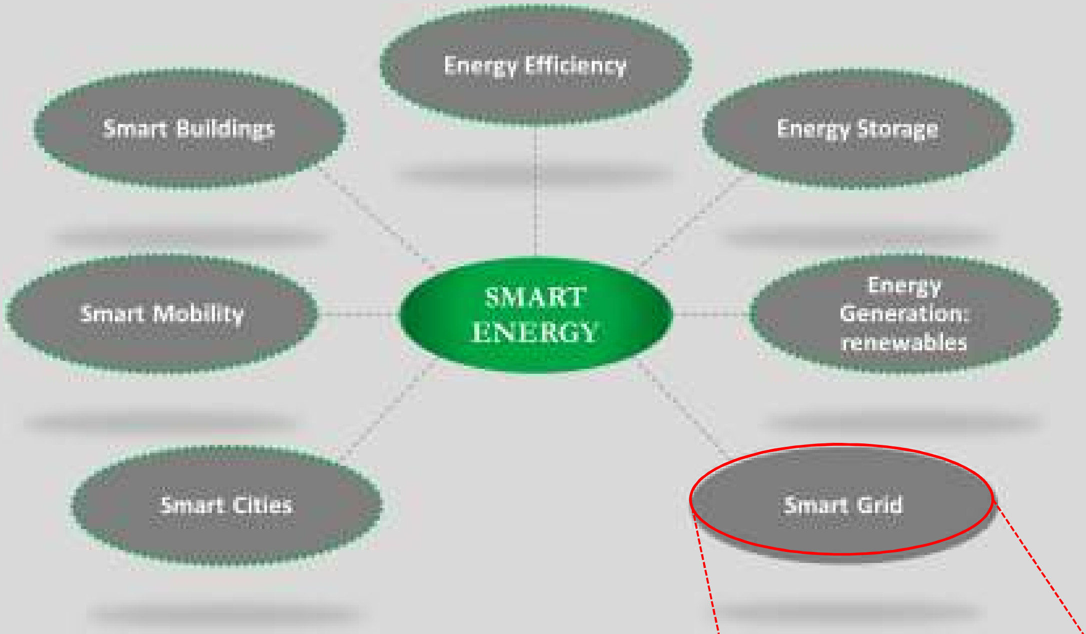
- ICT
- Materials
- Mechatronics
- Media/Digital TV
- Medtech
- Optics
- Packaging
- Photovoltaics
- Private Equity
- Private & public Research
- Secondary batteries
- Smart Grid
- Semiconductors
- Software
- Telecom
- Textiles/Apparel
- Venture Capital

The Smart Grid Big Picture



GLOBAL MARKET SIZE

(hardware + software)

- **2012: $45bn**
- **2015: $89bn**
- **CAGR 2012-2015: +26%**
- **Largest market: Asia**

Source: The Global Cleantech Report 2012

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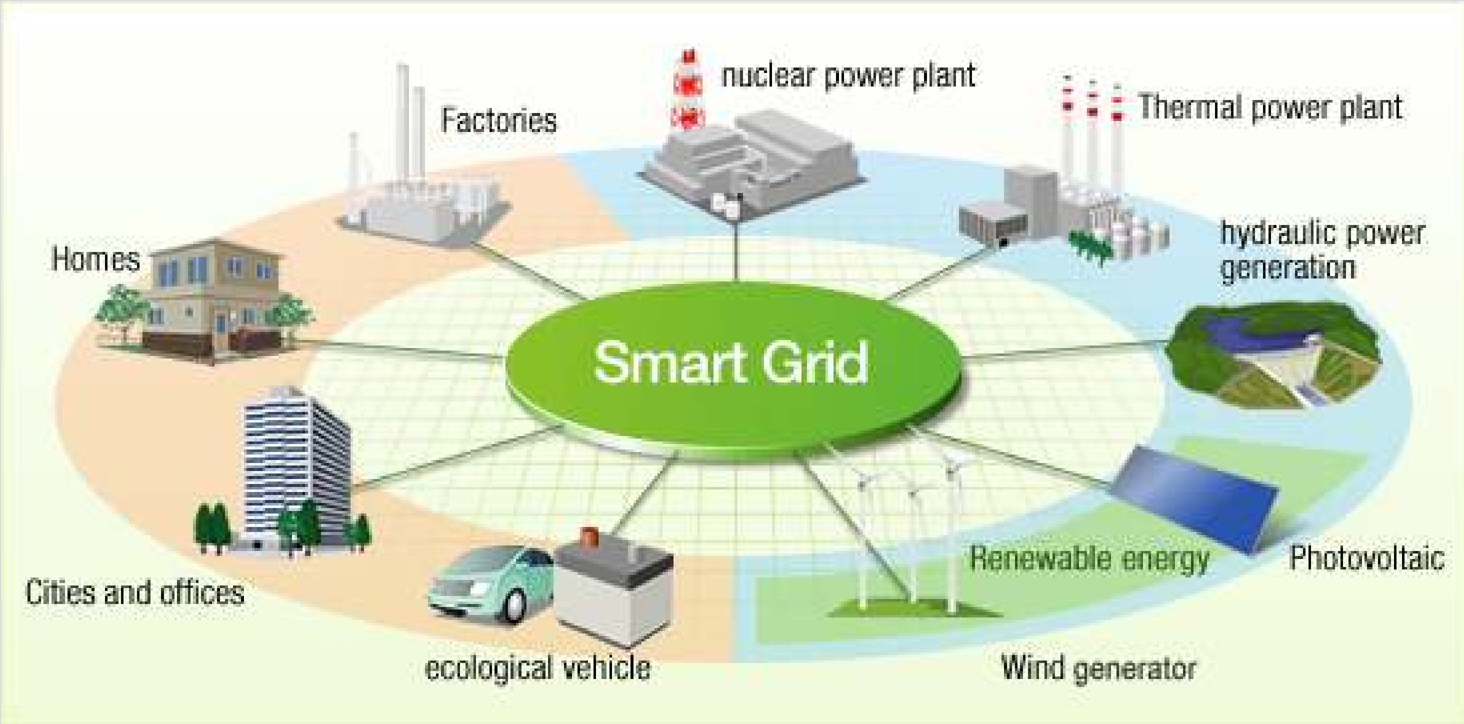
The Smart Grid main issues



- **Complexity**
- **Integration/Retrofitting**
- **Power & ICT Engineering integration**
- **Innovation**
- **Investments**

The Smart Grid market segments

Smart Grids cover a wide range of interlinked technical and commercial areas, bringing together power engineering and information & communication technologies (ICT)

SMART GENERATION
- UTILITY DATA MGMT
- RENEWABLE ENERGY INTEGRATION
- DISTRIBUTED GENERATION

SMART NETWORK (transmission-distribution)
- TRANSMISSION SYSTEMS
- DISTRIBUTION AUTOMATION
- DEMAND RESPONSE

CUSTOMER-SIDE SYSTEMS
- A.M.I INFRASTRUCTURE*
- HOME ENERGY MGMT

*Advanced Metering Infrastructure

- ICT INTEGRATION
- COMMUNICATION NETWORKS
- CYBER SECURITY
- STORAGE

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The Smart Grid ecosystem

The Smart Grid ecosystem

Technical Experts

- Solution and TLC providers
- Service providers (ESCO)
- ICT and system integrators
- Components manufacturers
- Aggregators

Regulators & Policies Institutions

- Standards
- Programmes and policies
- Regulatory landscape/incentives

Utilities/Energy providers

- Facilities
- Virtual power plants (VPP)
- Micro-producers

Financial investors/ traders

- Electricity market operators
- Wholesale electricity market traders

Transmission/Distribution players

- Distribution System Operators (DSOs)
- Transmission System Operators (TSOs)

Public/Private Research centers

Universities

Customers/"Prosumers"

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Why invest?

- Strong demand of energy efficiency
- Pressure on prices
- Environmental issues
- Integration of an increasing renewable installed base
- European and National policies and Strategic Research Agenda
- Huge components, systems and services market
- Increasing demand for services (eg. Customer Energy Management and Data Acquisition and Analysis)
- Demonstrator Project phase – space for positioning

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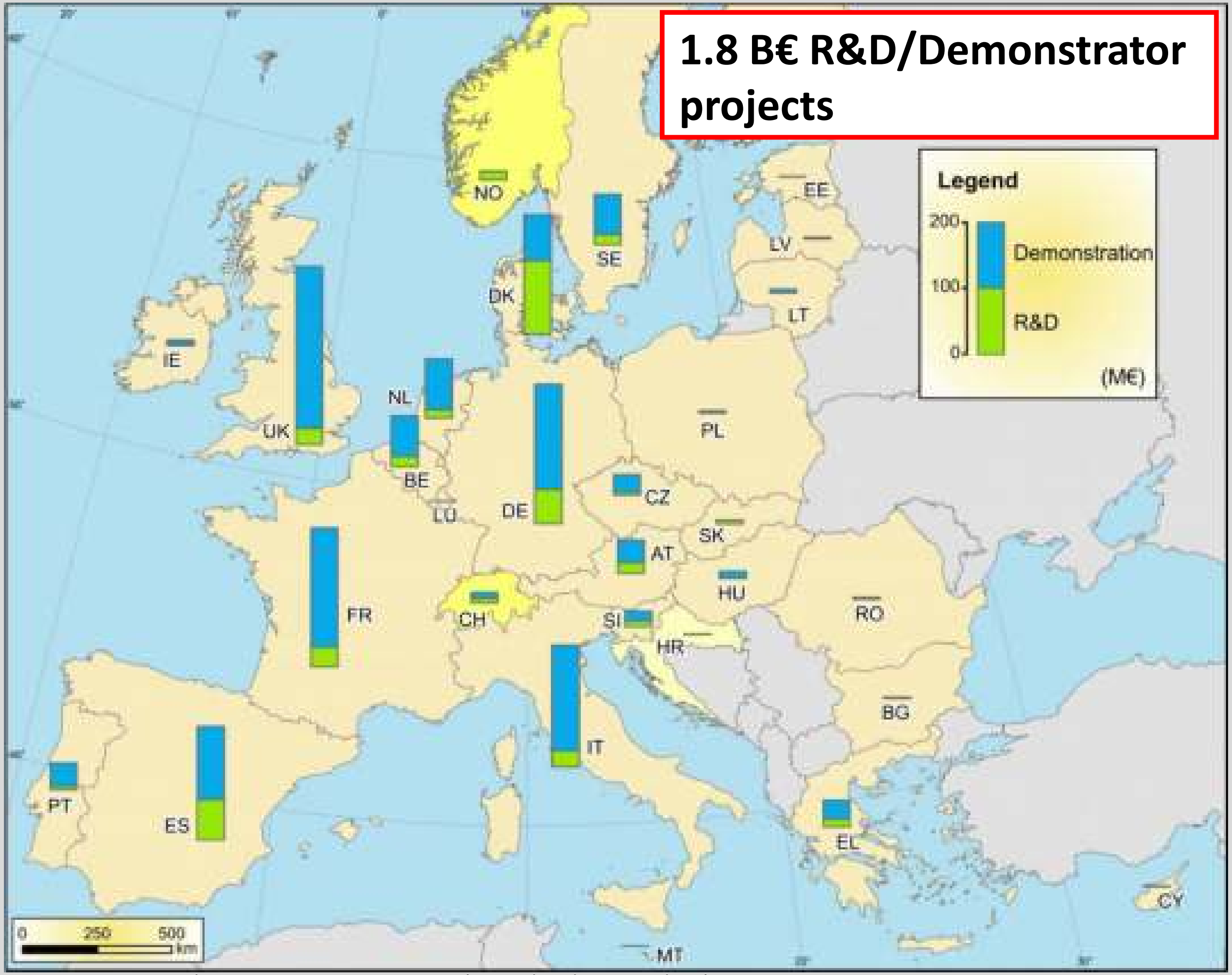
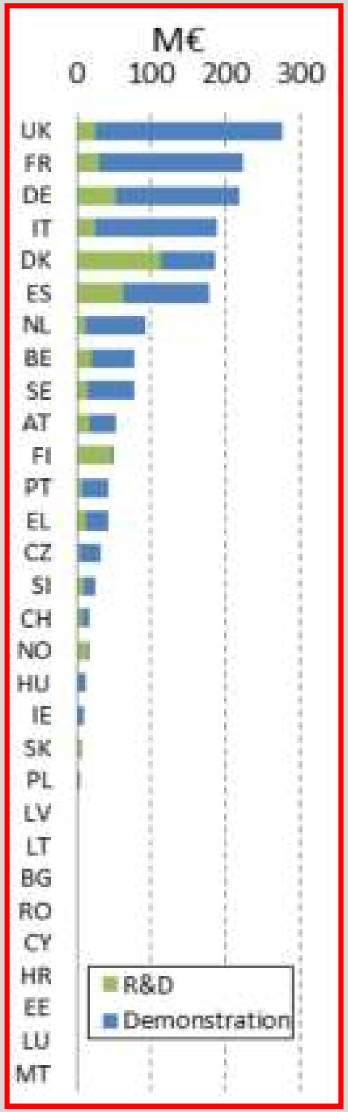
EU: 231 Smart Grid & 91 metering projects





Source: Smart Grid projects in Europe: Lessons learned and current developments

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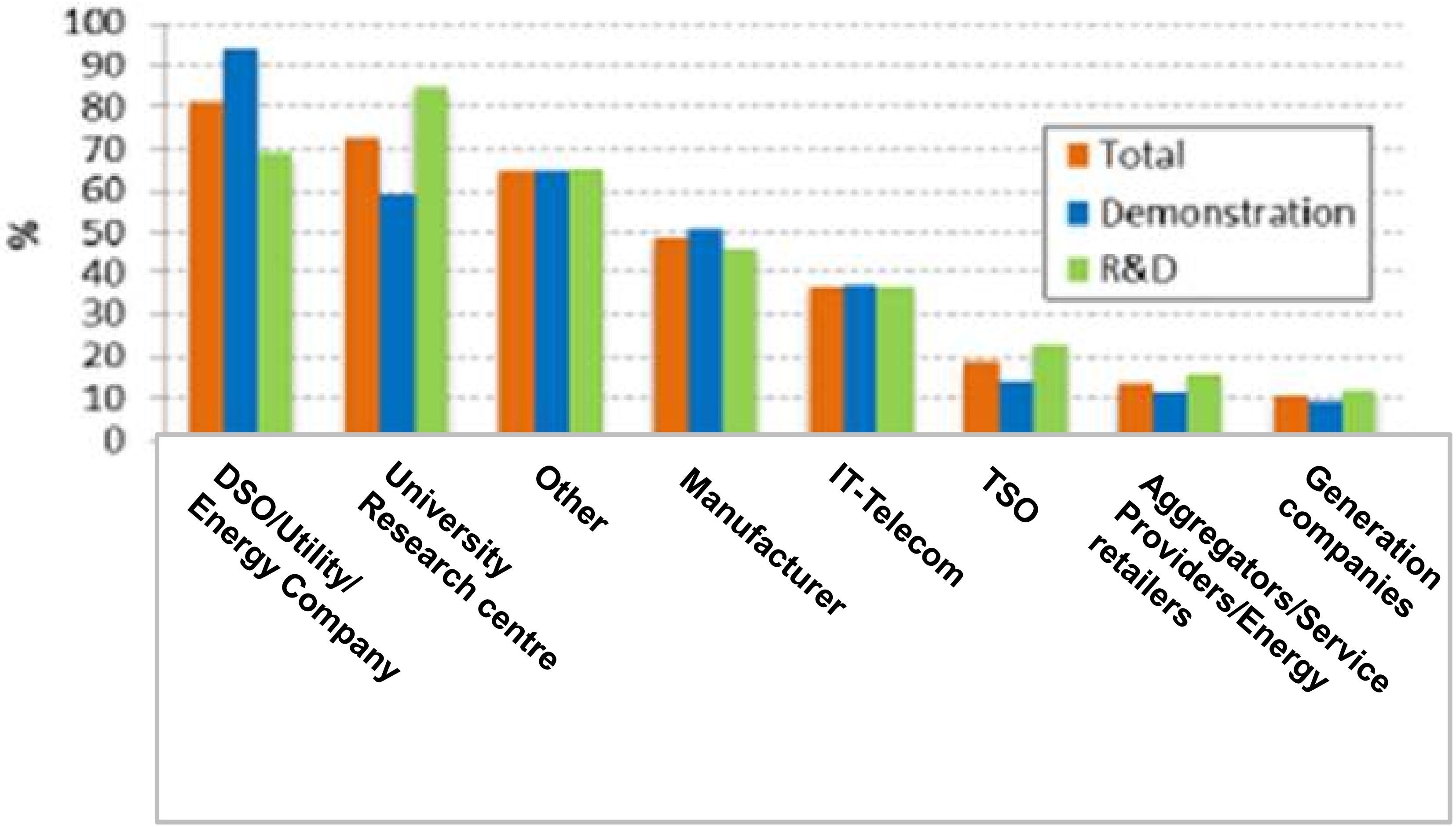
Who is investing



Source: Smart Grid projects in Europe: Lessons learned and current developments

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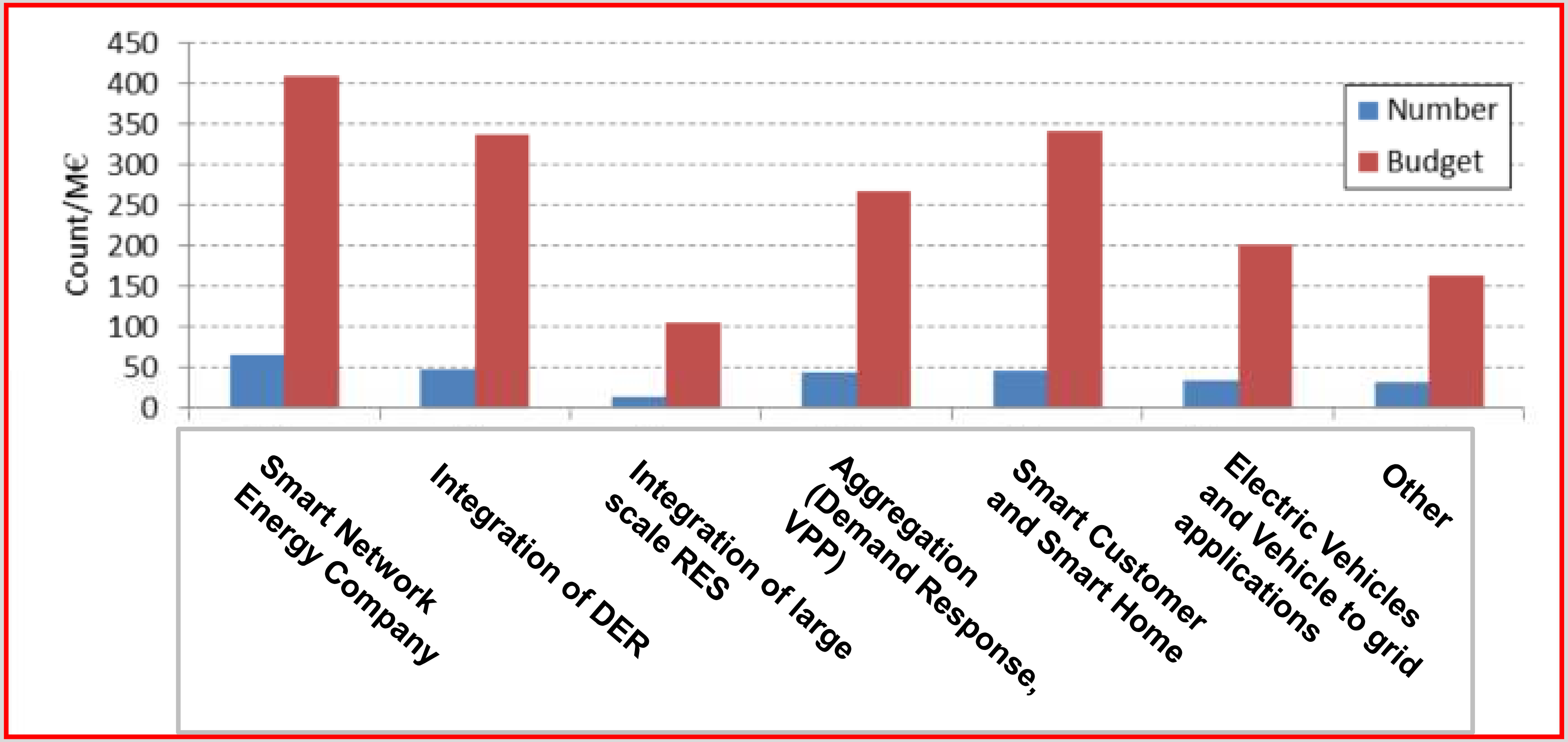
What are the target applications



Source: Smart Grid projects in Europe: Lessons learned and current developments

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The Smart Grid open issues

- Value chain **fragmentation**
- **Different players** and numerous **needs**
- New **business models**
- Technical **standards** and **interoperability**
- A **regulatory framework** to provide incentives for Smart Grid deployment
- A continued support to **innovation** for technology and systems

SUPPLY SIDE

DEMAND SIDE

- Customers level of **awareness**
- A strong **value proposition** for customers
- Customers **understanding** about economic benefits of technology
- **Incentives** designed to stimulate investments

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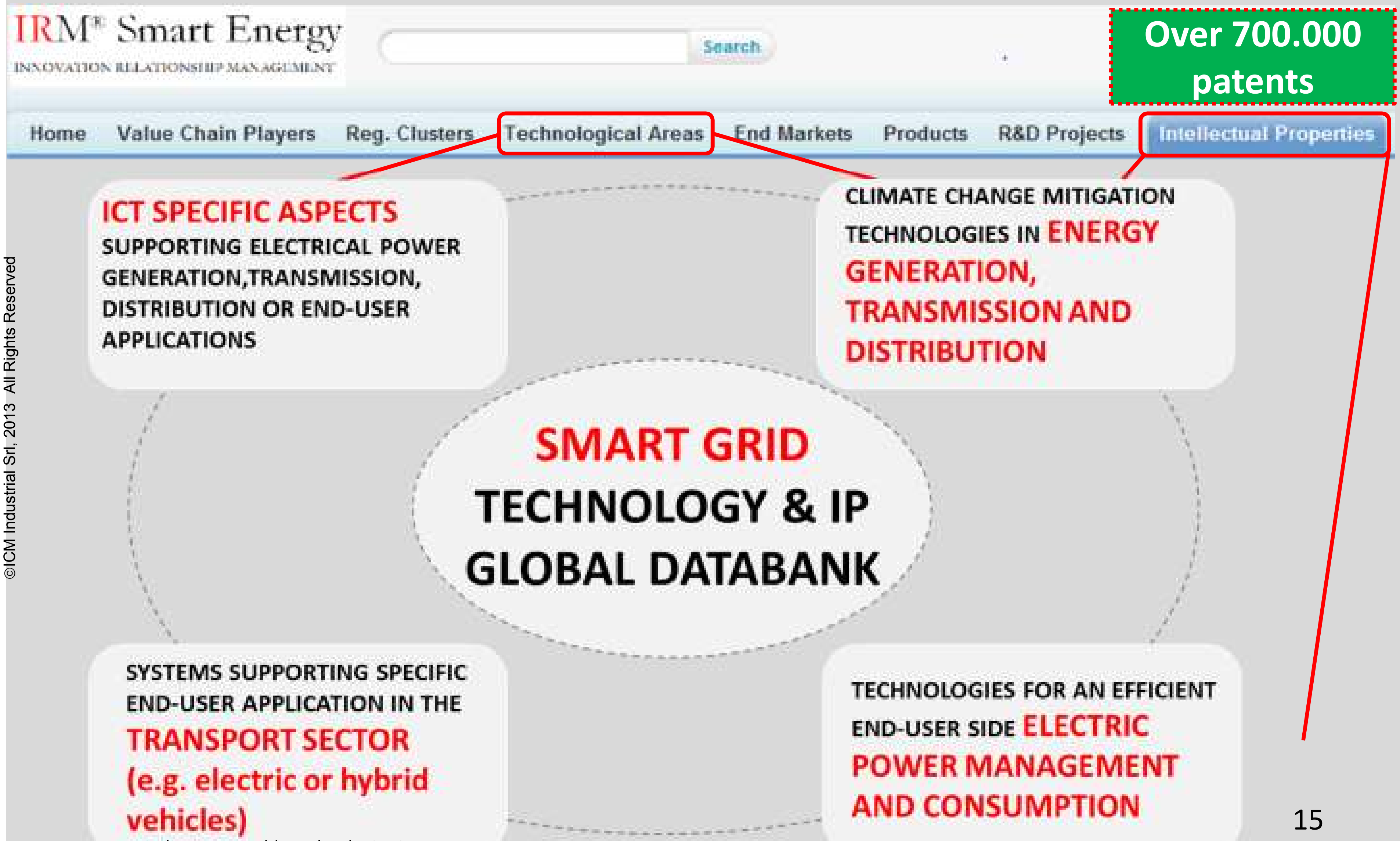
IP global scenario
Smart Grid-related technologies



Source: EPO – Finding sustainable technologies in patents

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Global patenting trend

PATENT INFORMATION

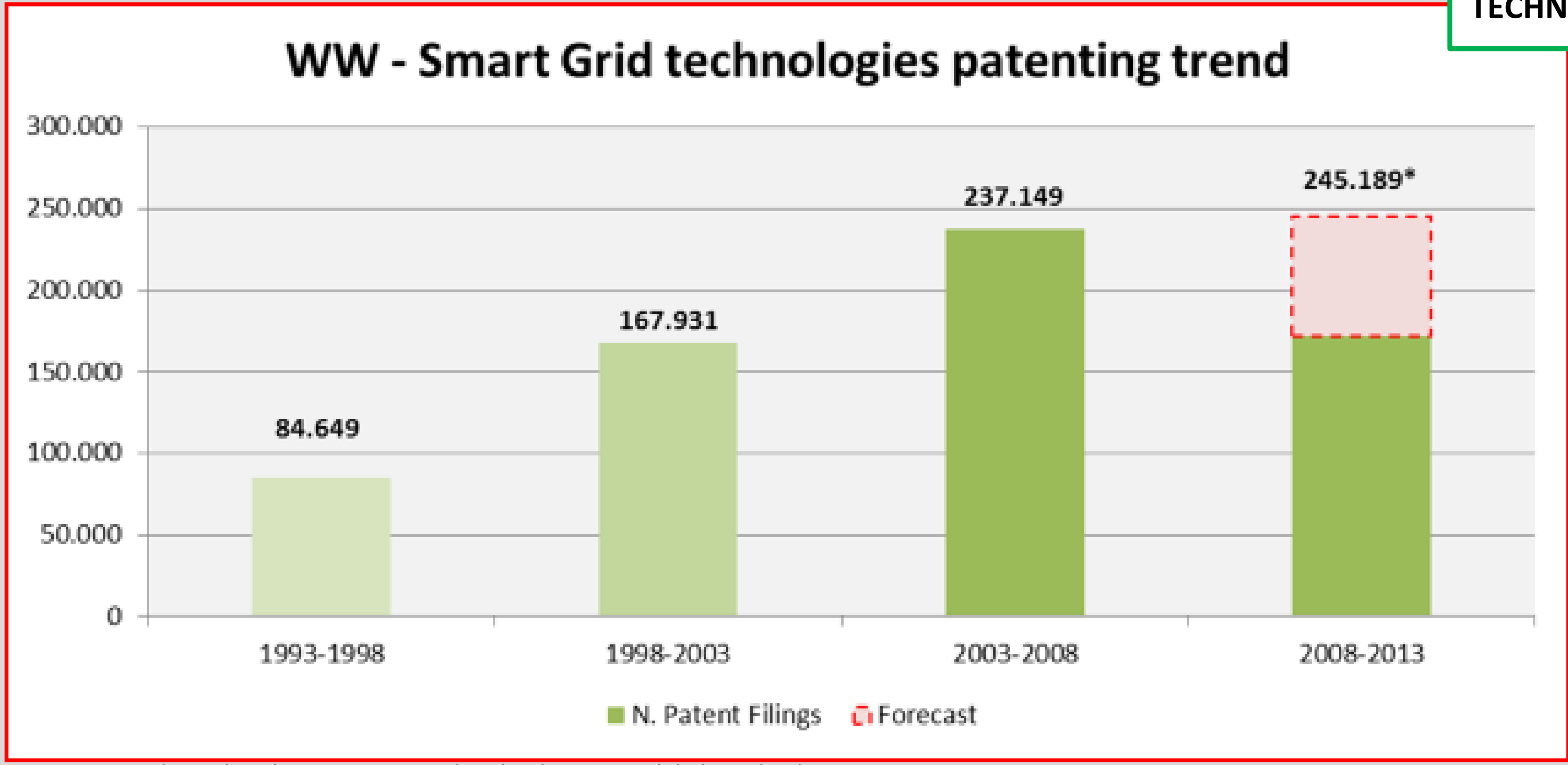
PATENT ANALYSIS

STRATEGIC INSIGHTS

TREND

PLAYERS

TECHNOLOGY



Source: ICM Industrial analysis on Smart Grid Technology & IP Global Databank

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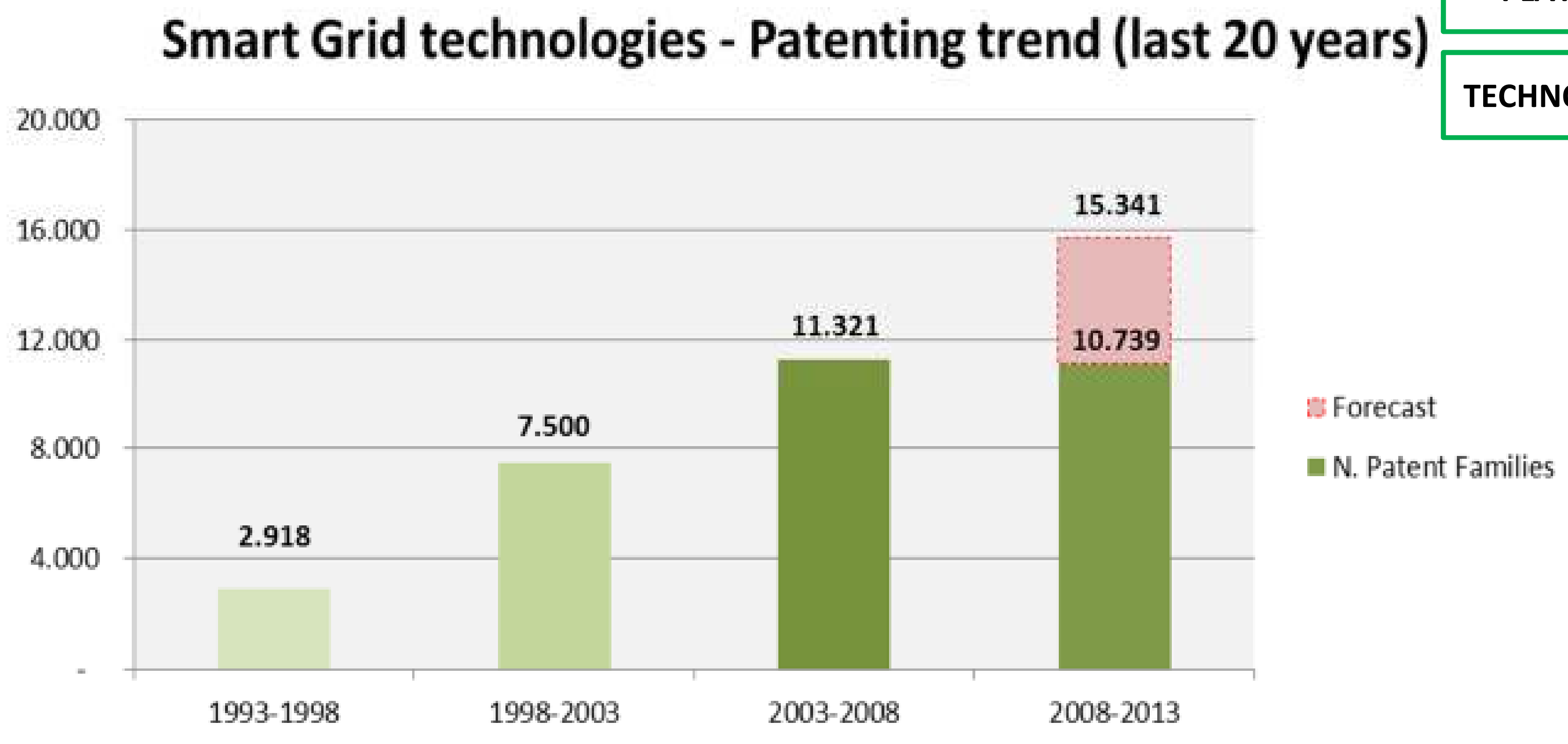
From GLOBAL to LOCAL: Italy coverage (domestic & foreign players)

TREND

PLAYERS

TECHNOLOGY



Source: ICM Industrial analysis on Smart Grid Technology & IP Global Databank

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Italy coverage: Top Players (last 5 years)

TOP-15 INNOVATIVE PLAYERS

RANKING	COMPANY	N.PATENT FAMILIES	% PATENT FAMILIES
1	PANASONIC CORP	591	5,5%
2	SAMSUNG ELECTRONICS LTD	489	4,6%
3	LG CORP	391	3,6%
4	TOYOTA	266	2,5%
5	SIEMENS AG	215	2,0%
6	MITSUBISHI GROUP	208	1,9%
7	GENERAL ELECTRIC	198	1,8%
8	SB LIMOTIVE CO LTD	188	1,8%
9	NISSAN MOTOR	182	1,7%
10	BOSCH	181	1,7%
11	LI TEC BATTERY GMBH	174	1,6%
12	COMMISSARIAT ENERGIE ATOMIQUE	163	1,5%
13	SUMITOMO GROUP	136	1,3%
14	ABB GROUP	135	1,3%
15	HITACHI	130	1,2%

TREND

PLAYERS

TECHNOLOGY

NOTES:

- **LI TEC BATTERY GMBH** is a 50-50 joint-venture between DAIMLER and EVONIK INDUSTRIES AG
- **SB LIMOTIVE CO LTD** is a 50-50 joint-venture between BOSCH and SAMSUNG SDI

Source: ICM Industrial analysis on Smart Grid Technology & IP Global Databank

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Italy coverage: Top Technologies (last 5 years)

TREND

PLAYERS

TECHNOLOGY

TOP-10 INNOVATIVE TECHNOLOGIES

RANKING	TECHNOLOGY APPLICATIONS	% OCCURENCES
1	BATTERY TECHNOLOGY	31,3%
2	LITIUM-ION BATTERIES	16,5%
3	FUEL CELLS	13,7%
4	ENERGY STORAGE FOR ELECTROMOBILITY	6,8%
5	ENERGY STORAGE FOR ELECTROMOBILITY (BATTERIES)	5,5%
6	SECONDARY BATTERIES	5,2%
7	PROTON EXCHANGE MEMBRANE FUEL CELLS [PEMFC]	4,5%
8	SOLID OXIDE FUEL CELLS [SOFC]	4,2%
9	PLUG-IN ELECTRIC VEHICLES	4,2%
10	ULTRACAPACITORS, SUPERCAPACITORS, DOUBLE-LAYER CAPACITORS	3,6%

Source: ICM Industrial analysis on Smart Grid Technology & IP Global Databank

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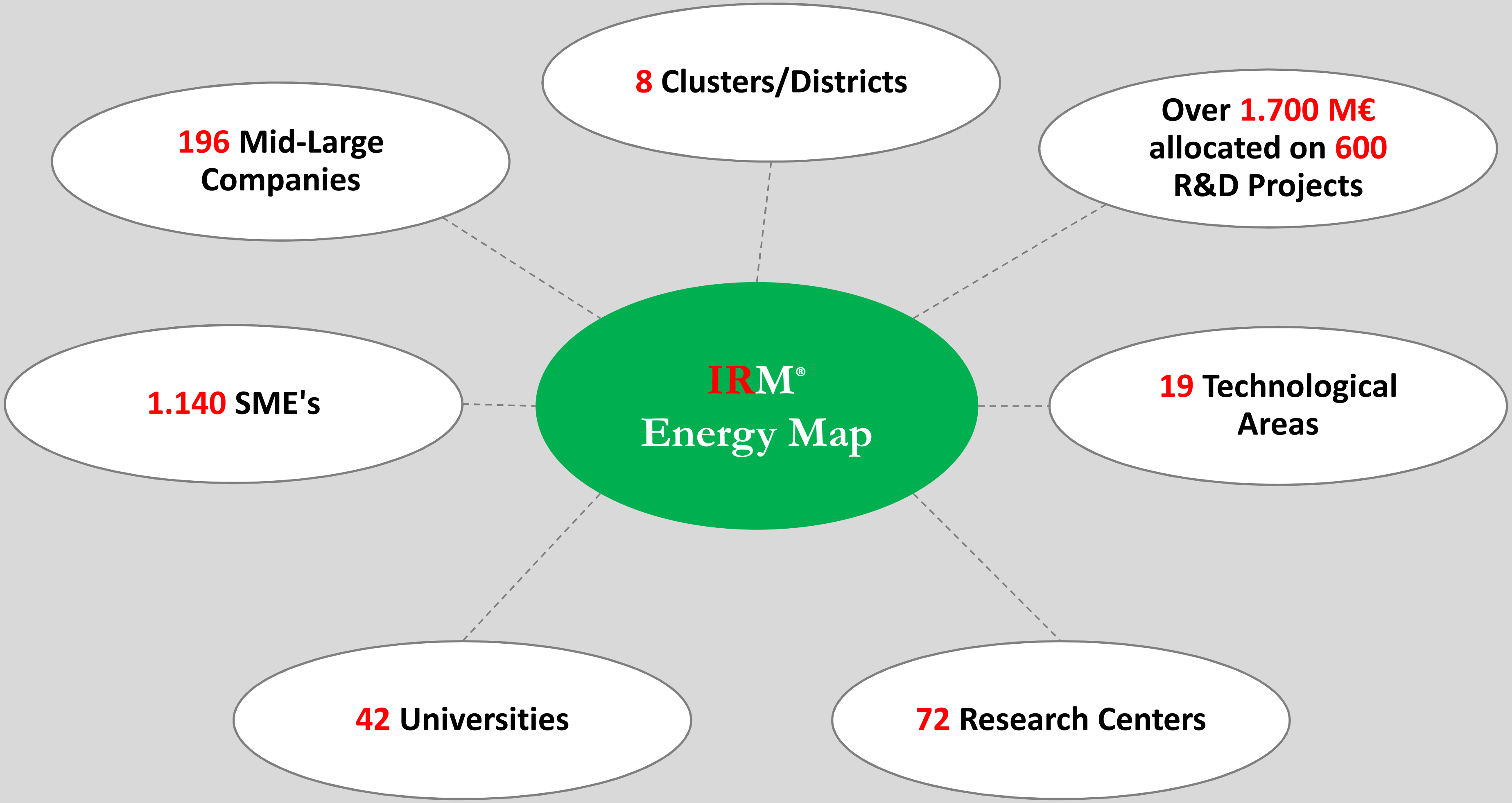
The Italian Energy big picture



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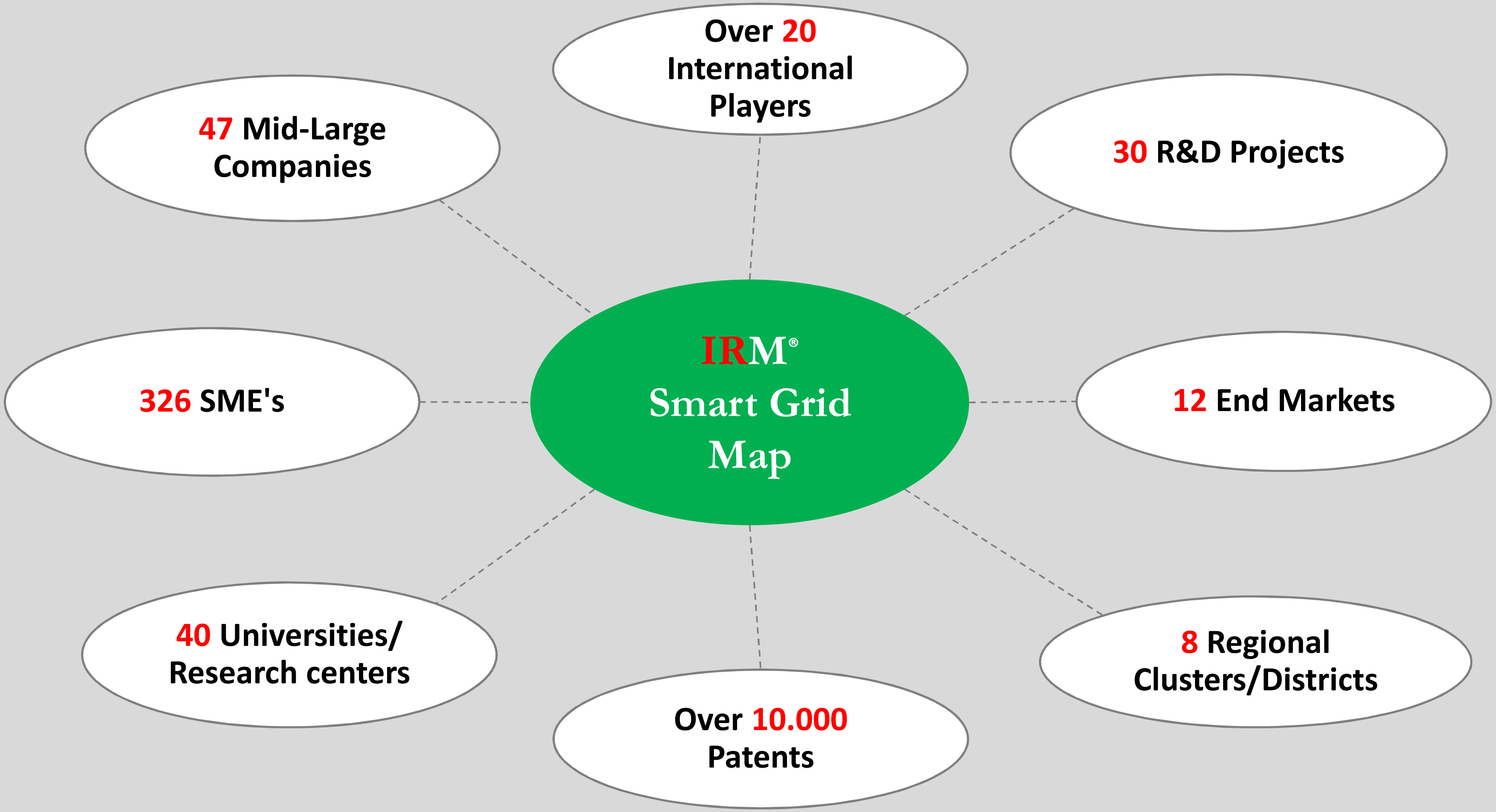
The Italian Smart Grid big picture



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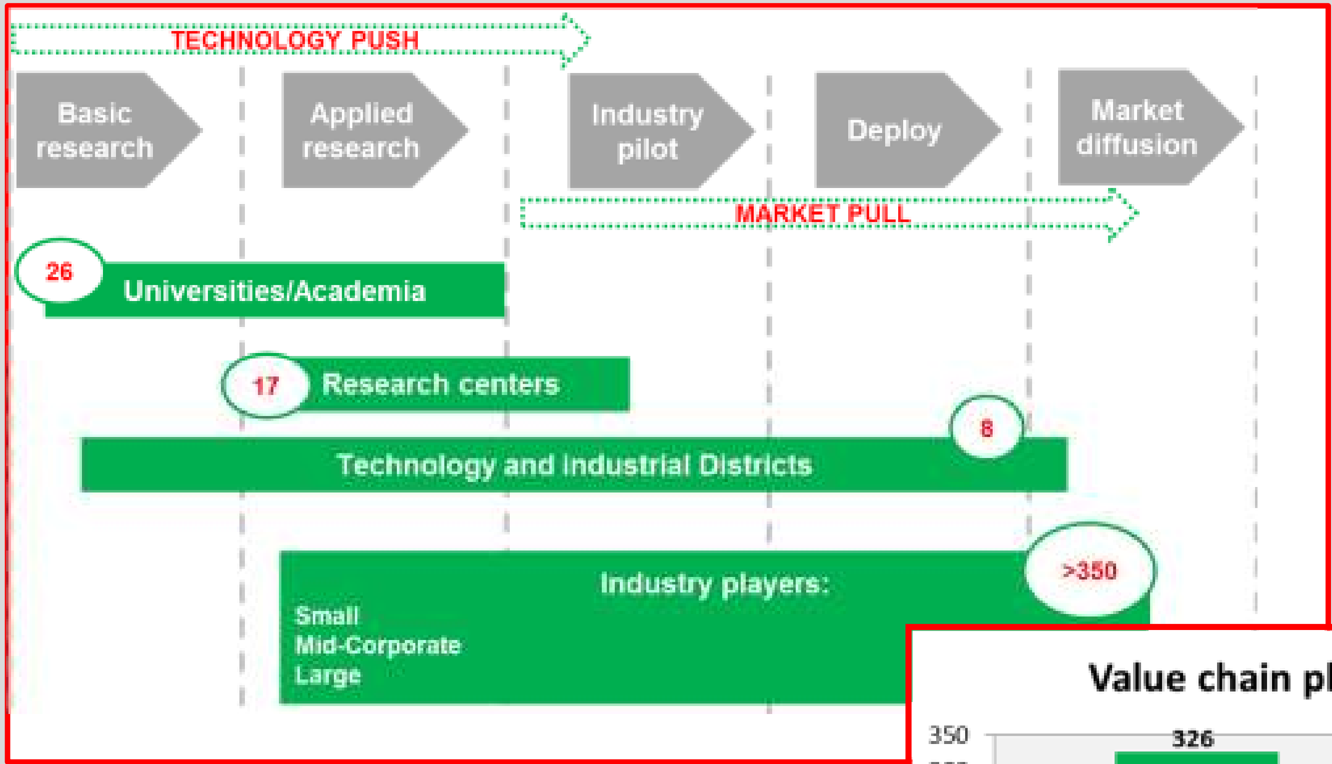
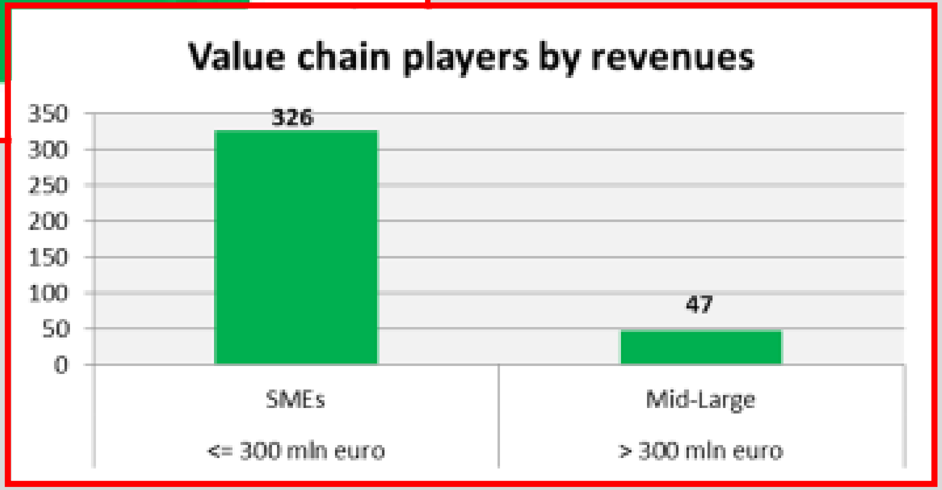
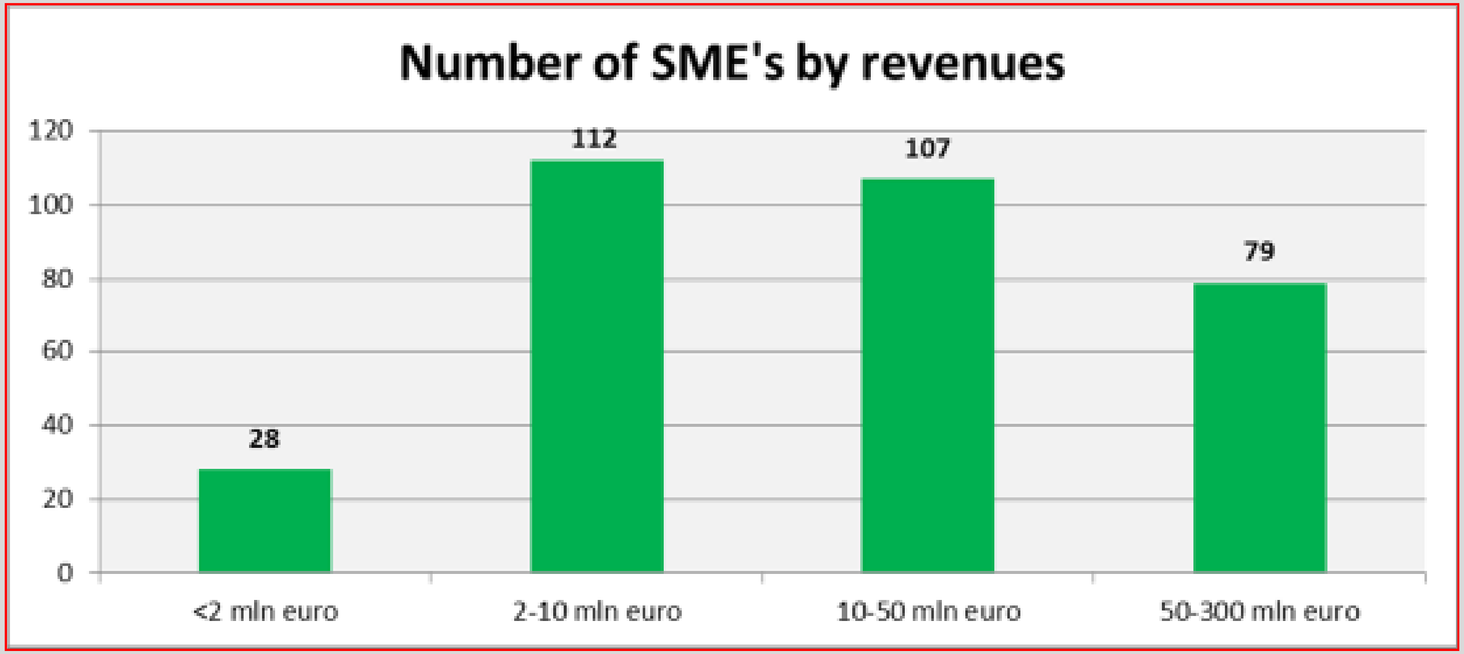
Italy positioning: map of the national players





Italy positioning: a focus on SMEs



- Power utilities
- System Integrators
- Technical experts
- Component and sub-component manufacturers:
  (protection equipments, cables, wires, relays, connectors, semi-conductors, etc.)

Smart grid: Italian core capabilities

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DECLARED BY LARGE GROUPS, DISTRICTS, PRO's

SET PLAN Technology areas	Italian Core Capabilities
Electricity grids	▪ Smart polygeneration micro grid demonstrator ▪ Super conductive components deployment for energy transportation ▪ Smart Grid, VPP, micro grid, DMS, ▪ Control and planning - communication standard ▪ Smart grid energy management systems ▪ Development of power MOSFETs in SiC for Smart Grid applications. Network and communication
Electricity storage in the power sector	▪ Power to gas, hydrogen storage, batteries ▪ Management systems for non-programmable renewables sources ▪ Pumped storage ▪ Development superconducting components (SMES), production of dense electrolytes sodium beta alumina for the production of planar ZEBRA batteries. ▪ Nanostructured materials for advanced batteries ▪ Advanced components for electric storage systems (ionic electrolytes based on alumina) ▪ Hybrid Systems for energy storage through compressed air and hydrogen ▪ Battery Energy System Management ▪ Na-Ni, Lithium-ion battery batteries – CAES ▪ Smart energy management by using innovative power MOSFET with very LOW RDS on to reduce the power consumption

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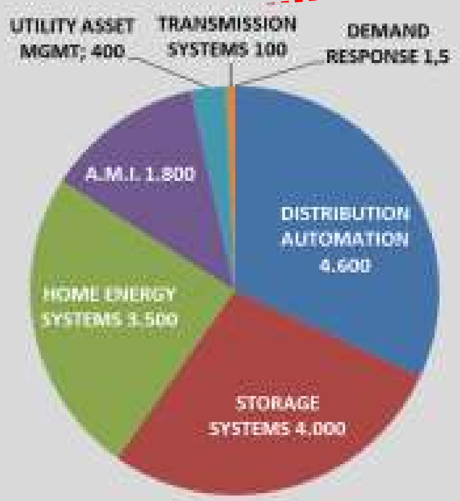
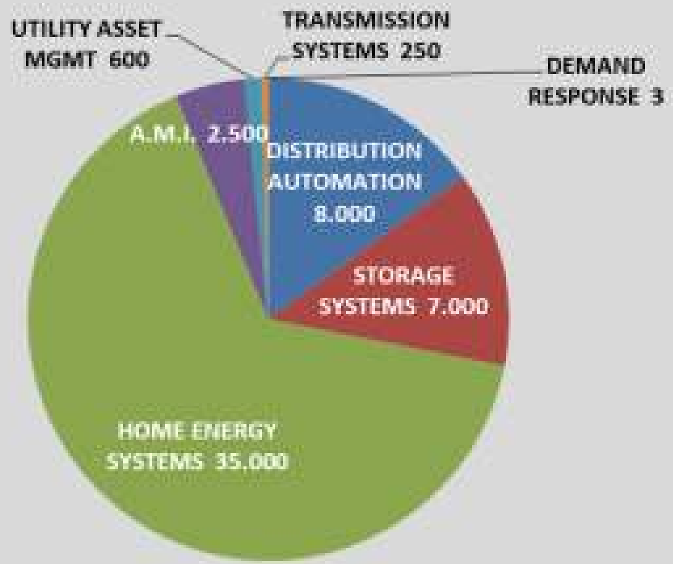
Italy positioning: drivers and potential investments (2020)

2020 WORST CASE
TOTAL INVESTMENTS: 14,4 BLN EURO

DRIVERS

2020 BEST CASE
TOTAL INVESTMENTS: 53,3 BLN EURO





NOTE: data expressed in million euro

- **MARKET**
- **TECHNOLOGY SOLUTIONS**
- **FRAMEWORK CONDITIONS**

Source: Adapted from MIP, Energy Strategy Group – Smart Grid Report 2012

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The Smart Grid opportunity for Italy

Priorities

Adapted from **SEN**: Strategic Energy National Plan

Objectives

1. Foster Energy Efficiency.
2. Promote a competitive gas market.
3. Sustainably develop renewables, in order to exceed the European targets ("20-20-20").
4. **Develop an electricity market fully integrated with the European market.**
5. Restructure the refining industry and the fuel distribution network.
6. Sustainably raise national hydrocarbons production.
7. Modernize the system of governance of the sector.

- **Align electricity prices to EU standards**
- **Develop electricity grids**
- **Integrate distributed renewable generation**
- **Boost advanced distribution control systems**
- **Ensure storage capacity**
- **Guarantee security of service**

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Smart Grid Agenda – some input

- **Build a critical mass of technology assets (know-how & IP) by selected technologies for the country/global**
- **Increase the patenting activity**
- **Maximizing the impact of pilot and demonstrator projects – global showcases**
- **Developing the capabilities of the supply chain by transferring technologies and funding**

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Where ICM has invested and is investing

Areas of investments: Technologies and services for SME, Research Institutions, Large Corporate, Industrial Clusters

Two main investments:

- **IRM Smart Energy Platform for**:
  - Innovation & Technology Management
  - Technology Commercialization
  - Collaborative R&D
  - Technology assets rating and valuation
- **Smart Grid Global Technology and IP Data Bank for Advanced Competitive Market, Technology and IP Intelligence for:**
  - Strategist/Investors
  - Innovation & Technology
  - R&D and Engineering/Product Development

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