



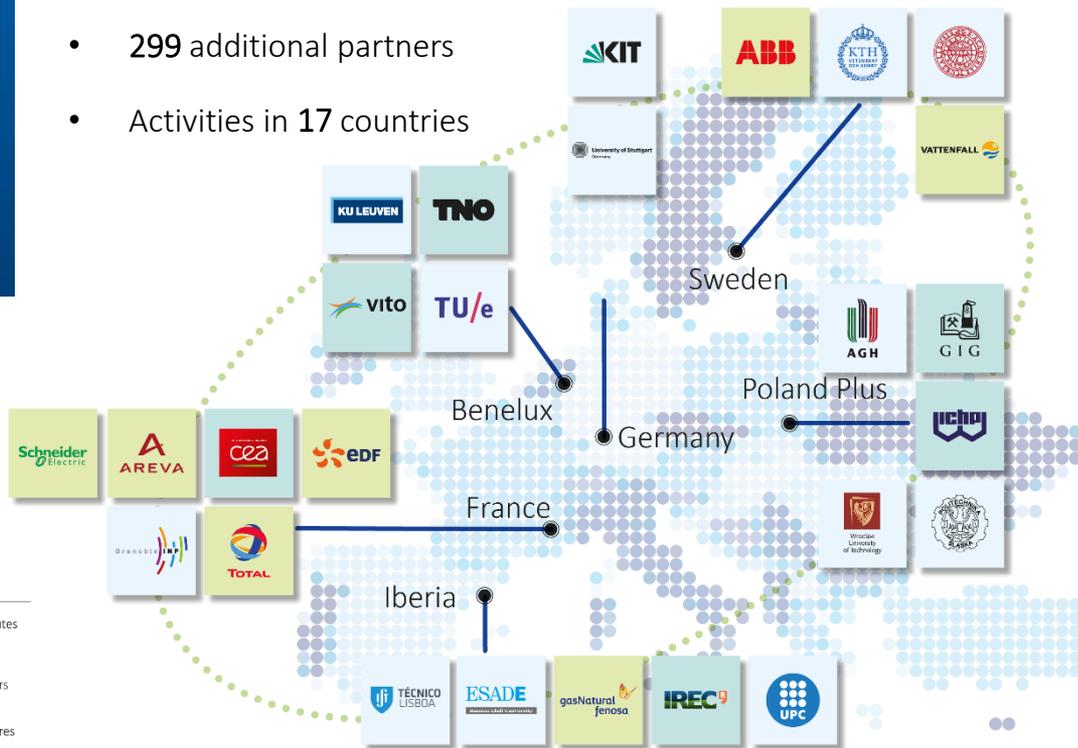
InnoEnergy
Knowledge Innovation Community

InnoEnergy & opportunities for advanced coal technologies in the EU

WG Eco-innovation and advanced coal technologies

- InnoEnergy is the **biggest cleantech accelerator worldwide**
- Company was established in 2010 as a initiative of **European Institute of Innovation and Technology**
- InnoEnergy's strength lies in the broad **pan-European network of Partners**

- 6 co-location centers
- 26 shareholders
- 299 additional partners
- Activities in 17 countries



254

Products and services supported

95

Companies created

55

Million euros of external investment raised

2 144

Business ideas captured

Our goal: sustainable energy

- **Ensure security and safety of supply**
- **Reduce costs in the energy value chain**
- **Reduce CO2 emissions**
- **Improve European competitiveness**
- **Remove barriers to innovation**
- **Encourage sustainable growth**
- **Create jobs**



InnoEnergy thematic fields and technology focus



Clean coal and gas technologies



Energy storage



Energy efficiency



Energy from chemical fuels



Renewable energies



Smart and efficient buildings and cities



Smart electric grid



Nuclear instrumentation

InnoEnergy thematic fields and technology focus



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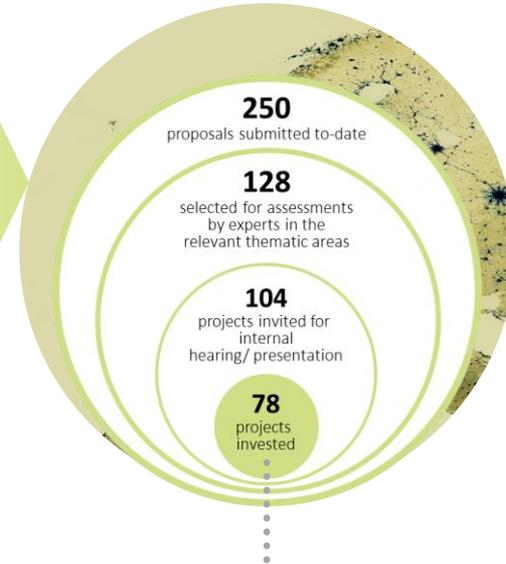
InnoEnergy Innovation Projects – opportunity for commercialization of advanced coal technologies

An innovation project aims to develop a product or service to be sold on the market or implemented as an industry solution

3-7 partners

Commercialising partner
First customer or early adopter
Additional partners

Two or more EU countries
Project duration: 3 years or less
Time to market: 4 years or less



Transparent review and rapid decision making



6 Investment Rounds

147 Million euros invested

- 15 Smart electric grid & Energy storage
- 15 Renewable energies
- 13 Smart and efficient buildings and cities
- 13 Clean coal and gas technologies
- 12 Energy from chemical fuels
- 10 Nuclear instrumentation

Innovation success

Neptune

**Wind power
from sea to sea**



Renewable energy

MrCySeMoL

**Cyber security
tool**



Smart electric grid

EFFIC

**Improving
efficiency
and cost of Solar PV**



Renewable energy

323

Project partners
across Europe

77

Patents filed

90

Products and services
supported

3

Manufacturing
facilities constructed

170.5

Million euros of InnoEnergy
investment

1.4

Billion euros
in project costs

3

Billion euros in forecasted sale

Polygen

Ground-breaking synthetic natural gas plant

Challenge

- Many local thermal power companies (PEC-e), mainly from Central and Eastern Europe, face the problem of falling profitability. On the other hand the companies are obligated to observe the emission standards.

Solution

- low-emission electricity and heat from waste, locally available biomass and other solid fuels will be obtained
- Gasification & methanisation process make it possible to produce synthetic natural gas (SNG) even in the summer months

Value Proposition

- The polygeneration island, a multi-product power installation for small to medium size cities and municipalities.



Partners



Solution: available for piloting

InnoEnergy Investment in Innovation 2013-2016

Thematic Field (6/6) - Clean Coal and Alternative Gas Technologies

14 INNOVATION PROJECTS

INNOENERGY INVESTMENT (2013-2016):

28,7 MILLION €

+ 1,4 M€ AS PARTNERS' OWN RESOURCES *

TOTAL PROJECT COSTS : 114,5 M€



- 19 New Partners since 2013
- 9 Projects led by Industry

27 INNOVATION ASSETS



BIOOGEN	2013-01	1	Innovative technological line for torrefied biomass production - Scale 2 t/h 1.*
	2013-02	2	Innovative technological line for torrefied biomass production - Scale 10 t/h 1.**
	2014-01	3	Know-how of second generation pellets production
	2014-02	4	Know-how of fuel switch from coal to biomass for an existing Power plant
Waste Heat	2013-01	5	combined waste heat recovery and flue gas purification
AME OX200	2013-02	6	Innovative and non-polluting hydro gel system and process for hydraulic fracturing
BioORC	2013-02	7	Innovative power generating system
	2013-02	8	Boiler dedicated to cooperate with power generating system
	2013-02	9	Off-grid cogeneration system with biomass boiler
CarbonOrO	2013-02	10	Biogas Upgrading
	2013-02	11	Industrial Carbon Capture
XSENSOR	2014-01	12	Universal sensor
	2014-01	13	Contactless battery
	2014-01	14	Communication gateway
	2014-01	15	Vibration sensor
	2014-01	16	Magnetic sensor
InnoRam	2014-01	17	InnoRam - Analyser
CNGHRS	2014-01	18	Home Refueling Station (HYGEN)
CO2-SNG	2014-01	19	Modular structured CO2 methanation reactor
	2014-01	20	Installation for electricity storage through SNG production
AMSEP	2014-01	21	ASM Air Sorter
	2014-02	22	Technology for slurry fuel production
Lemur	2014-02	23	Slurry fuel burner
	2015-01	24	GrS Carbon Capture Technology
HYDRAGTS	2015-01	25	GrS Carbon Sequestration Technology
	2016-01	26	Polygeneration unit for heat, electricity and SNG production via waste/biomass gasification
POLYGEN	2016-01	26	Polygeneration unit for heat, electricity and SNG production via waste/biomass gasification
CT Profiler	2016-02	27	CTProfiler

Entrepreneurial success

Technoturbines

***Energy recovery
through hydraulic
turbines***



Spain

Energy efficiency

Ferroamp

***Distributed energy
storage for smart
grids***



Sweden

Smart electric grid

GRADIS

***A new era
of smart lighting***



Poland

Smart electric grid

190+

Early start-ups
supported

100+

Companies created

75.4

Million euros
of external
investment raised

2,520+

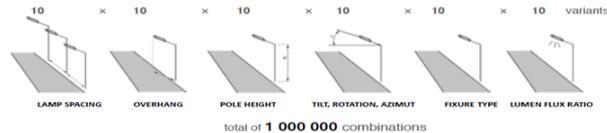
Business ideas
captured

Gradis

Unique solutions for outdoor lighting applications

Challenge

- Building OPTIMAL [the best possible] project for outdoor lightning is very hard.
- Human can only guess when trying to find optimal variant



Solution

- Complete solution for outdoor lighting - from design to control
- PhoCa's artificial intelligence locates the best solution for entire project

Value Proposition

- Multiple possibilities on reducing your **CAPEX** [investment]:
- Less light required -> possible cheaper casting
- Possible longer distances between lamps -> less lamp etc.
- Multiple possibilities on reducing **OPEX** [energy]:
- Tilt, rotation, azimuth etc.
- Dynamic power control due to weather conditions

Reference/Success stories



Solution: available for sale

Tailor-made educational offer

Make best use of InnoEnergy experience

Large network of educational institutions onboard:

- **12 leading technical European universities**
- **2 leading business schools**

Ready made ongoing activities/offer:

- **Executive Education** (including online courses)
- **Tailor made corporate programmes**
- **7 MSc programs** - double degree, international mobility path, game changer profile, blended profile of graduates (engineering/business)



We need to know the specific expectations

We can use this potential in order to prepare tailor made executive education in engineering business or soft skills

Partnership. Assets and in-house services. Strategic investor.

Based on innovation needs and current strategy



- InnoEnergy has a **portfolio of almost 240 assets**
- Services developed by InnoEnergy (examples):
 - Innovation **Scouting**
 - Support in **establishing an accelerator**
 - Insights and **reports**
 - **Open Innovation** sessions
 - **Executive** education

„Tackling Smog with Energy Innovation” – coming InnoEnergy report

Air pollution is responsible for more than 450 000 premature deaths in Europe each year

- Despite significant progress since 1990, air pollution in many European cities often exceeds safe levels.



Transport

NOx	CO2	PM2.5
39%	19%	11%

share of
total
emission

Heating

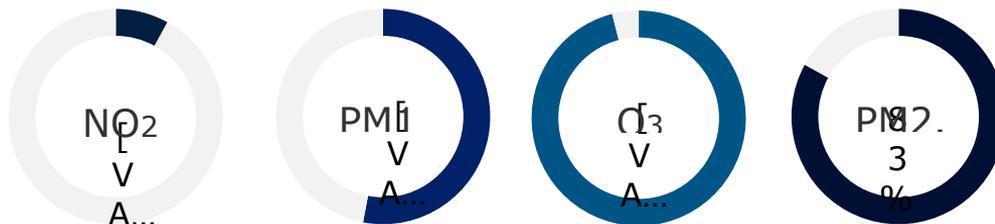


BaP	PM2.5	PM10	CO2	SOx
75%	57%	42%	42%	13%

The level of urban air pollution increased by 8% worldwide between 2008 and 2013**

Lesson from The Great Smog of London (1952) and research conducted by prof. M. Krzyżanowski is alarming: even short-term exposure to high concentrations of air pollutants significantly increases mortality in the long-term. However, concentration slightly above EU levels is also hazardous for human health.

Percentage of population exposed to air pollutant concentrations above WHO air quality guidelines (EU, urban areas)

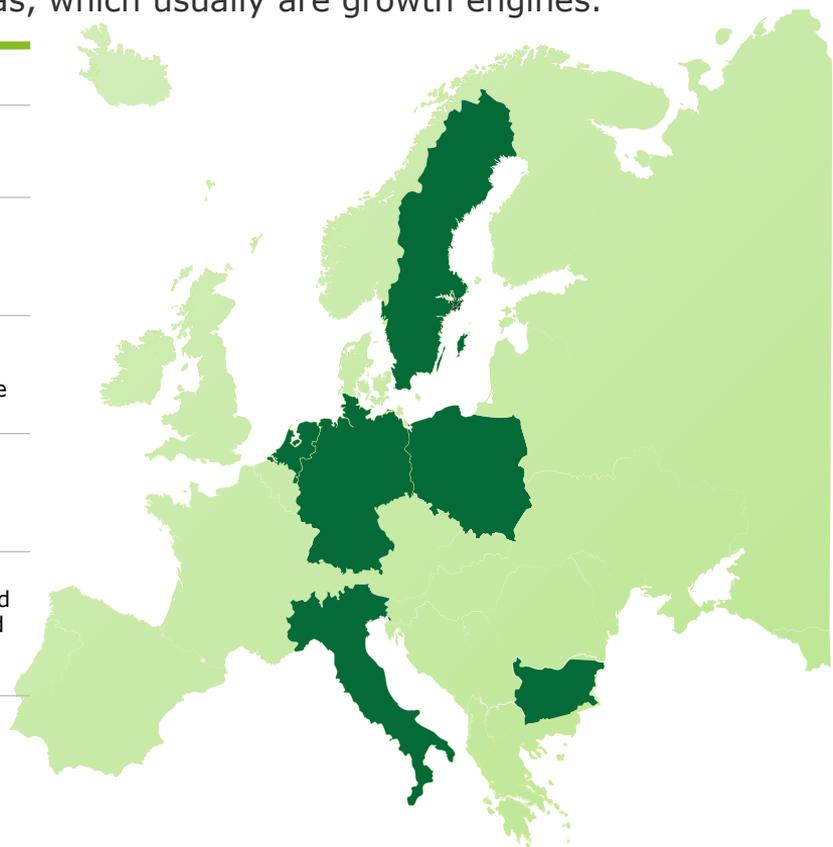


Our report will be just a first step to establish InnoEnergy as the first choice partner for innovators and entrepreneurs focusing on commercial technologies positively contributing to air quality and smog prevention.

Smog in Europe – case-studies of countries in the report

The EU consists of many countries or regions that perform well in terms of economic convergence, but fail to improve air quality. It is more evident in the urban areas, which usually are growth engines.

Country	The biggest challenge related to air quality
Bulgaria	78% of urban population in Bulgaria is exposed to PM10 levels above EU standards. This comes as no surprise as PM10 emission has kept on increasing in the country for the last 15 years (by 38%).
Germany	The biggest air quality problem in Germany is nitrogen dioxide. Even though Germany reduced its NOx emissions by close to 60% between 1990 and 2015, it remains the largest emitter of this gas in the EU, with a 15% share of total NOx emissions.
Italy	76% of urban population in Italy is exposed to ozone concentrations above EU standards, and 59% to too high PM10 levels. Amid high declines in the last decade, the emissions of PM10 have actually increased by 8% between 2011 and 2015.
Netherlands	On the national level, the air quality in the Netherlands is compliant with the EU regulation. Yet, in 20 of the 393 municipalities in the Netherlands calculated concentrations of particulate matter exceed the limit values.
Poland	80% of urban population in Poland is exposed to PM10 concentrations above EU standards. The most pressing issue in Poland is the concentration of benzo(a)pyrene (BaP), which is a carcinogen found in coarse particulate matter. Poland has almost 22% share in total EU-28 emissions of BaP, the highest out of all countries.
Sweden	Sweden has the cleanest air from all of the countries that were analysed in the report, and it is the only country with all national concentrations within the WHO limits in 2015. However, levels of coarse particles and nitrogen dioxide, can be too high on the regional level.



InnoEnergy - a new approach to technology commercialization

Connected
at the heart
of Europe's
energy sector

Collaborative
bringing skills
and resources
together

Commercial
self-sustaining
public-private
partnership

Challenging
new ways
of working
and thinking





InnoEnergy

Knowledge Innovation Community

Thank you for attention

