

EU Energy policy and research strategies and programmes

Andreea Strachinescu,

European Commission Directorate-General for Energy Head of "New energy technologies, innovaton and clean coal" unit



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New realities in the global energy markets

New challenges



Shale gas – a game changer



Source: EIA based on Advanced Resources International Inc data, BP





Fall of oil prices and rise of energy prices

ETS Price



New challenges



Investments are stagnating in clean technologies



New Investment in Clean Energy

BILLIONS OF DOLLARS, 2004-14









EU Energy challenges



World Energy Production by Region (%)

The European Union Energy System A few figures



Total Primary 2012: 1 682 Mtoe (Total Primary and Secondary 2012: 1 683 Mtoe)



EU 28 (505 million unhabitants in 2013, ~30% of worldwide GDP) Petroleum and Products Gas

- Solid Fuels
- Nuclear Heat
- Renewables
- Wastes, Non-Renewable

- Still a strong reliance on hydrocarbon

- But with a continuously increasing share of renewables

Sustainability





The European Union Energy System

EU-28 Energy Import Dependency

By Fuel

	1995	2000	2005	2010	2011	2012
Total	43.0%	46.7%	52.2%	52.7%	53.9%	53.4%
Solid Fuels	21.5%	30.6%	39.4%	39.4%	41.7%	42.2%
of which Hard Coal	29.7%	42.6%	55.7%	57.9%	62.3%	62.5%
Petroleum and Products	74.0%	75.7%	82.1%	84.4%	85.1%	86.4%
of which Crude and NGL	73.0%	74.5%	81.3%	84.6%	85.5%	87.8%
Natural Gas	43.4%	48.9%	57.1%	62.1%	67.1%	65.8%

- Hihgly dependent on imports
- Rather high prices impact competitiveness

Security

Competitiveness



Diverse and fragmented

- + 2014: 28 Member States
- + EU legal framework but national regulations
- + Different energy production sources
- + Different histories, INCO relationship, sources of imports and dependencies
- + Different political priorities (green, shale gas, etc.)
- + liberalisation makes good but unequal progress
- + Missing corridors between countries



Import Dependency

EU-28 Energy

2012



Europe's dependence is set to increase

Net oil and gas import dependence by region





Primary energy consumption





Will there ever be cheap energy for Europe?

Energy costs to rise in all scenarios but Europe will benefit most from decarbonisation

(in % of GDP, annually until 2050)



Source: European Commission



Massive investments are required





A "no regrets" scenario for Europe





Priority 1. Boosting energy efficiency

Benefits of EU energy savings target of 20% by 2020





Priority 2. Completing the internal energy market

Estimated effects of opening gas & electricity markets

(in % of GDP - ranges)





Priority 3. Smarter infrastructure





Priority 4. Cost-effective use of renewable sources

Production costs versus subsidies for renewables

(averages, in €/MWh, latest year available)

Production costs

IV DK NEEE MT RO ES CZ PL LT

€/MWh

140

120

100

80

60

40

20

0

SE UK IE

Subsidies over production costs

Subsidies below production costs

Wind energy on-shore

SI

SK BG IT HU CY LU EL



Solar energy (photovoltaics)

EL ER BE AT DE



Priority 5. diversified energy supply The external dimension



This map is for communication purposes only. The information contained in this map does not recessarily reflect the policy of the European Union.



Priority 5. diversified energy supply More indigenous resources



Shale gas licenses and population density

Granted Shale gas licenses:



Where are we now?

20-20-20 targets and 2030 framework



Agreed headline targets 2020 and 2030 Framework for Climate and Energy





Three good reasons for renewable energy policy





The Renewable Energy Directive

National binding targets for RES & specific target for RES-T

Creates a sustainability regime for biofuels Requires national renewable energy action (NREAPs)

Requires reduction of administrative and regulatory barriers & improved grid access Flexibility by facilitating "joint projects" and "statistical transfers



Renewable energy targets for 2020





Main RES support schemes





Progress towards the 20% renewables target

EU renewable energy share of final energy consumption: 15.3% in 2014



Source: European Commission, based on Green-X model (TU Vienna)



Renewable Energy – principles for post-2020 approach

Targets: no breakdown into national or sectoral targets; based on MS commitments

Support schemes: stability, convergence, market orientation - Commission guidance and guidelines on support schemes

Regional cooperation in preparation of national plans



Energy efficiency

2020 and 2030 energy savings targets







Lack of information/ knowledge/motivation

Imperfect foresight

Split incentives



Framework energy efficiency policies



Energy

EU energy efficiency target

European Commission

Trends in primary energy consumption compared to EU target in 2020 (1483 Mtoe)



* Gross inland consumption minus non-energy uses



Energy Efficiency Directive 2012/27/EU

- Article 3: National energy efficiency targets
- Article 4: Long term building renovation strategies
- Article 5: Renovation of central government buildings
- Article 6: Public procurement
- Article 7: Energy efficiency obligations (or alternatives)
- Article 8: Energy audits and energy management systems
- Articles 9-11: Smart metering and billing
- Article 14: CHP and district heating and cooling
- Article 15: Energy efficiency in grids and demand response
- Article 16-17: Qualification, training and information
- Article 18: Energy service markets



Energy efficiency instruments in buildings





Ecodesign and Energy labelling Results Achieved




Financing of Energy Efficiency

Challenges for consumers:

- Lack of knowledge and information
- Lack of data
- High upfront investments
- Imperfect foresight
- Complexity of financing
- Sometimes long payback periods
- Etc.





Energy efficiency progress can be observed across all sectors:



The share of refrigerators meeting the highest energy efficiency labelling classes (A and above) increased from less than 5% in 1995 to more than 90% 15 years later



EU industry improved its energy intensity by almost 19% between 2001 and 2011, compared with 9% in the US



Between 1995 and 2010 the average consumption of new cars in the EU decreased by 27%



New dwellings built today consume on average 40% less than dwellings built 20 years ago



July 2013 Proposal European Commission:

30% savings target by 2030 (vs. 2007 reference)

- EU target; flexibility for Member States
- Based on absolute primary energy consumption
- Review in 2017



European Council Conclusions (October 2014)

The indicative target at the EU level of at least 27% should

- Be delivered in a cost-effective manner;
- Respect the effectiveness of the ETS-system in contributing to the overall climate goals;
- Be reviewed by 2020, having in mind an EU level of 30%.

European Commission to propose

- Priority sectors in which significant energy-efficiency gains can be reaped;
- Ways to address them at EU level, with the EU and the MS focusing their regulatory and financial efforts on these sectors.



Energy efficiency - Concrete actions





Energy policy priorities for 2015:

First steps towards building a resilient European Energy Union with a forward looking climate policy





Energy efficiency as part of the Energy Union

Rethink energy efficiency as an energy source in its own right

This means increasing energy efficiency, in particular in the building sector, and promoting an energy-efficient and decarbonized transport sector as well as efficient products.





I want to reform and reorganise Europe's energy policy in a new European Energy Union.»

Jean Claude Juncker



Energy in the EU: Results achieved

- Greenhouse gas emissions fell 18% (1990-2011)
- Energy efficiency savings: 15.5 % (2013)
- Share of Renewables: 15.0% (2013)
- European renewable energy businesses have a combined annual turnover of €129 billion, **employing over 1 million people**

to be improved

- EU: the largest energy importer in the world
- Competitiveness of energy prices (higher than in the US)
- Internal energy market not yet completed
- 12 Member States still insufficiently connected
- Transparency of gas markets
- Overdependence on single supplier



The way towards: The Energy Union

Where we want to go:

A secure, sustainable, competitive, affordable energy for every European

What this means:

Energy security, solidarity and trust A fully integrated internal energy market Energy efficiency first Transition to a long-lasting low-carbon society An Energy Union for Research, Innovation and Competiveness

How we want to reach it:





Our vision of an Energy Union

- True solidarity and trust; speaking with one voice in global affairs
- An integrated continent-wide energy system
- Sustainable, low-carbon and climate-friendly economy
- Strong, innovative and competitive European economy
- Citizens taking ownership of the energy transition



1 Secure supplies



We have to become less dependent on energy from outside the EU

This means increasing transparency on gas supply; diversifying sources, supplies and routes; working together on security of supply and developing a stronger European role in global energy markets.



Secure supplies Concrete actions





2 Internal energy market



This means connecting markets through interconnections and implementing and upgrading the internal market's software while enhancing regional cooperation and empowering consumers.



Internal energy market Concrete actions





3 Energy efficiency



Rethink energy efficiency as an energy source in its own right

This means increasing energy efficiency, in particular in the building sector, and promoting an energy-efficient and decarbonized transport sector as well as efficient products.



Energy efficiency Concrete actions



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4 Emissions reduction

An ambitious climate policy is an integral part of our Energy Union

The next challenge will be to enforce the 2030 energy and climate framework, while becoming the number one in renewables.



Emissions reduction Concrete actions

Legislation to achieve the 40% GHG reduction target (both in ETS and non ETS)

Increased deployment of alternative fuels and clean vehicles

Renewable Energy Package: RES directive revision, best practices for self-consumption and support schemes

Comprehensive road transport package



5 Research & innovation



Developing EU technological leadership in low carbon technologies

This will reduce energy consumption, empower consumers, create huge industrial opportunities and boost growth and jobs.



Research & innovation Concrete actions





Delivering the Energy Union: A dynamic governance

The Commission will launch a dynamic governance process for the European Energy Union



Successful implementation depends on the political commitment of all actors concerned, including EU institutions and Member States!



#EnergyUnion





European Energy research strategy

2008: The SET Plan

European

Commission



Focus on technologies with market impact up to 2020 (set up of Ells)

- Wind
- Solar
- Electricity grids
- CCS
- Bioenergy
- Nuclear
- Smart Cities and Communities
- Fuel cells and hydrogen



Focus on longer-term research actions beyond 2020 (set up of EERA)

- 20% reduction of CO2 emissions (base1990)

2013: Communication on Energy Technologies and Innovation

European Commission



Key Principles

- New challenges post 2020
- From sectors to system
- Bridging R&I with energy policy
- Making better use of existing financial resources
- Keep options open
- Join endogenous resources



Follow-up



- Integrated Roadmap
- Action Plan –EC and MS financing
- Robust reporting system
- A new coordination structure under the SET plan SG on energy efficiency
- New competences: e.g. nontechnological barriers
- External dimension



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Challenges and Key Issues



- Cost competitiveness/performance
- System integration (smart interfaces, new capabilities of equipment, new or improved services to system, forecast)

Commission

- Supply chains (industrial logistics, maintenance, materials and manufacturing, recycling)
- Non technological aspects (market framework, business models, spatial planning, standards, financing, skills and capacities)
- Societal issues (environment impact, safety, health, social acceptance)



Energy system Holistic approach (I)







Energy system Holistic approach









Future funding for energy policy

What do we want to achieve?

The importance of energy policy is well reflected in the multi-year EU budget for 2014-2020.

Funding priorities over this period will be:

technology
infrastructure,
energy efficiency and renewables, and
improving nuclear safety and decommissioning.





European Energy related programmes



FP7 Energy Theme - budget allocation per year (2007-2013, M€)





6 DSOs (cover more than 50% of the metered electricity customers in Europe) 27 partners (Utilities, Energy Suppliers, Manufacturers, Research Institutes) Duration: 51 months (November 2011 -January 2016

The demonstration on the Danish island Bornholm - more than 50 % electricity consumption from RES.

2000 residential consumers - flexible demand response to real-time price signals; participants will be equipped with


Implementation: FP7 – demo projects TRANSFORM – Smart Cities





THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

European Commission

Three priorities

Excellent science

Industrial Societal leadership challenges

Energy





•A single programme: FP7 + CIP + EIT

Focus on societal challenges



HORIZ 2020 Budget = 70.2 bill Eur

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

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Proposed funding (€ million, 2014-2020)

7 472	
3 851	
5 931	
6 339	
3 081	
1 309	
1 695	
462]
816	
	7 472 3 851 5 931 6 339 3 081 1 309 1 695 462 816

Additional funding for nuclear safety and security from the Euratom Treaty activities * (2014 - 2018)



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Energy challenge – 2014 -2015 calls

- **1. Energy efficiency**
- 2. Smart cities & communities
- **3.** Competitive low-carbon energy
- 4. SME's and Fast Track to Innovation for Energy
- Other actions



WP 2014-2015 Energy efficiency

Buildings and consumers

(Prefabricated modules, building designs, construction skills, deep renovation, demand response, engagement of consumers and public authorities, ICT-based solutions, socio-economic research, etc.)

Heating and cooling (district heating/cooling, market barriers)

- Industry and products

 (heat recovery, procurements, SME-targeted activities)
- Finance for sustainable energy



WP 2014-2015 - Low-carbon energy

- Renewable electricity and heating/cooling (Demonstration and research on next generation of technologies (PV, CSP, wind energy, ocean energy, geothermal energy, hydro energy, solar/biomass heating/cooling); market uptake measures
- Sustainable biofuels / alternative fuels (Demonstration and research on next generation of fuels, market uptake measures)
- European electricity grid / energy storage technologies

(Meshed off-shore grids, transmission and distribution grid, small scale and large scale storage, next generation storage technologies)



WP 2014-2015 - Low-carbon energy

Sustainable use of fossil fuels

(Decarbonising the fossil-fuel based power sector and energy intensive industry through CCS, understanding/preventing/ mitigating the environmental impacts of shale gas exploitation, highly flexible and efficient power plants)

- European Research Area in energy research (ERA-NETs, support to coordinating national R&D activities)
- Socio-economic research (Human factor in the energy system, modelling)
- Cross-cutting issues (SME-targeted activities, NCP network)



WP 2014-2015 - Smart Cities & communities

Lighthouse projects

- Low energy districts
- Integrated infrastructures
- Sustainable urban mobility Enhancing the roll out
- Standards systems –interoperability
- Networks of public procurers joint procurements for SMEs







HORLZ N 2020 THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

Calls	2014 (M€)	2015 (M€)
Energy Efficiency	97,5	98,15
Smart Cities and Communities	92,32	108,18
Competitive Low-Carbon Energy	359,1	372,33
SMEs and Fast Track to Innovation	33,95	37,26
Part B – other actions	75	61
Euratom Fission	48,3	39,6
Part B – other actions	0,3	15,0



HORIZ N 2020 THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

Calls	2014 (M€)							
Competitive Low-Carbon Energy	359,1	372,33						
LCE-7: Distribution Grid		60.00						
LCE-8: Local/Small Scale Energy	44	4.15						
LCE-10: Next Generation Energy Storage								
LCE-9: Large Scale Energy Stora		26.0						
LCE- 5 : Meshed HVDC off-shore		71.2						
LCE-6: Transmission grid and wh	nolesale mark	et						





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Integrated approach

All demonstration projects shall integrate

- Innovative Technology development
- Innovative Business models
- Develop plans for market uptake
- Check existing market barriers and work out proposals for solutions (policy, legislation, regulation, etc.)



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 2014-2020
 First

 CEF Connecting Europe Facility – 5.8 bn€





Implementation MS:

Regional policy



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Eligibility map 2014-20



Less developed region (GDP/head: less than 75% Transition regions (GDP/head between 75% and 90%) More developed region (GDP/head: more than 90%) Cohesion Policy to allocate some 23 billion € (estimate!) to investments in <u>energy</u> <u>efficiency</u>, <u>renewable energy</u>, <u>smart</u> <u>distribution grids and urban mobility</u>, including <u>research and innovation</u> in those areas in complementarity with Horizon 2020

	Billion EUR	Suma Canarias
Less developed regions	164.3	Guyane Guadeloupe Martinique
Transition regions	31.7	
More developed regions	49.5	Acres Madeira
Cohesion Fund	66.4	
European territorial cooperation	8.9	
Of which		Prover and the second through
Cross border cooperation	6.6	
Transnational cooperation	1.8	
Interregional cooperation	0.5	
Outermost regions and northern sparsely populated regions	1.4	
Youth Employment initiative	3.0	REGIOgis
TOTAL	325.1	



Synergies through sequential or parallel projects



National / Regional R&I systems Capacity

Building

"Research Excellence" Hopefully also excellence, but "Innovation Excellence"

Market

Innovation

Research & Development

Energy



Check out the smart specialisations:

RIS3 mapping of regions' and MS intentions in terms of smart specialisation fields allows to detect possible partners:





A success story – wind energy

Example of EC success story : wind I

EU financing for Wind R&D and innovation (2007-2013)

FP7 ~ € 200 million (2007-2013)

EEPR ~ € 565 million(offshore wind in 2008)

NER300 ~ € 273 million (award decisions 2012)

CIP - IEE ~ € 10 million (2007-2013)

WIND: ~ € 1.1 billion (2007-2013)





European Economic Programme Recovery

New turbines, structures and components: 254 million EUR •DE : Bard I, Gravity Foundations, Nordsee

- Ost, Borkum West II
- •BE : Thornton Bank
- •UK : Aberdeen

Offshore Wind-Grid Integration : 311 million EUR Projects addressing priorities for : •Energy Infrastructure Package •North Sea Countries Offshore Grid Initiative





Annual in stalled capacity of offshore wind

(source JRC 2014)



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Country	<2005	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Belgium						30	165		185	186	147	712
China				2		65	275	75	127	53	26	622
Denmark	427					238	207	4	50	349		1274
Finland	1			15	9		2					27
Germany	5		3		5	60	40	88	80	560	904	1745
Ireland	25											25
Japan		11						14		0	23	48
Netherlands	19		108	120								247
Norway						2			0			2
Portugal								2				2
South Korea								2	5			7
Sweden	24			110		30			4	48		216
UK	124	90	95	95	194	187	556	667	1340	351	832	4530
Vietnam										16		16
Total	623	101	206	342	208	612	1244	851	1791	1564	1931	9473



Remains a significant potential for innovation to be captured



Capital cost reductions for selected energy technologies in absolute values - Source: JRC-SETIS SWD(2013)158 final



Thank you

for your attention

Magdalena-Andreea.STRACHINESCU-OLTEANU@ec.europa.eu