

# Renewable energy business and policy in Europe, in brief

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# Content

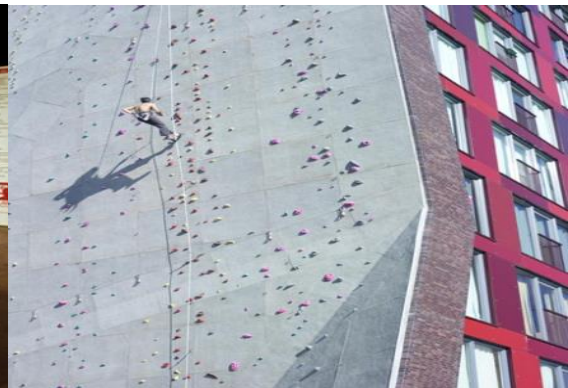
- Changes on energy markets
- Markets of renewable energy
- Policies on the energy market
- Conclusions

# Commercial

# University of Twente

- Technology with “Human Touch”, about 2 500 faculty, 8 000 students on campus
- World top Entrepreneurial University, CSTM – department sustainable development

Krozer Y. (2008), Innovations and the Environment, Springer, London; Krozer Y. (2015) Theories and Practices on Innovating for Sustainable Development, Springer, Dordrecht



# End of Commercial

# Changes on the energy markets

# Large energy resources

- Earth receives solar energy  $\pm 8\,000$  times all annual energy consumption
- Renewable energy consumption is only 19% of the energy consumption

Energy Flow (EJ=10 <sup>10</sup> MWh)	
Solar	3,850,000
Wind	2,250
Biomass	3,000
Energy use	487
Of it Electricity	57

# Many renewable energy technologies

- Biomass: e.g. wood to ethanol, rapeseed to diesel
- Waste: e.g. organic waste to methane, grease to oil
- Hydro: e.g. mechanic-electric, piezo-electric, salt-sweet
- Geothermal: e.g. heat exchange, deep earth heat
- Solar: e.g. electric (PV), thermal
- Wind: e.g. windmills, kites, sail
- Energy efficiency (insulation, storage, distribution, co-generation, processing, energy service companies - ESCO)



# Global knowledge work



Knowledge work, from nil to 20% of all labour in 1900s, generated economic development

It performs when social interactions (urban cafes and global contacts) with natural qualities (rural space and tranquility)

# Changing energy demands

Current demands: energy output per USD

Emerging demands:

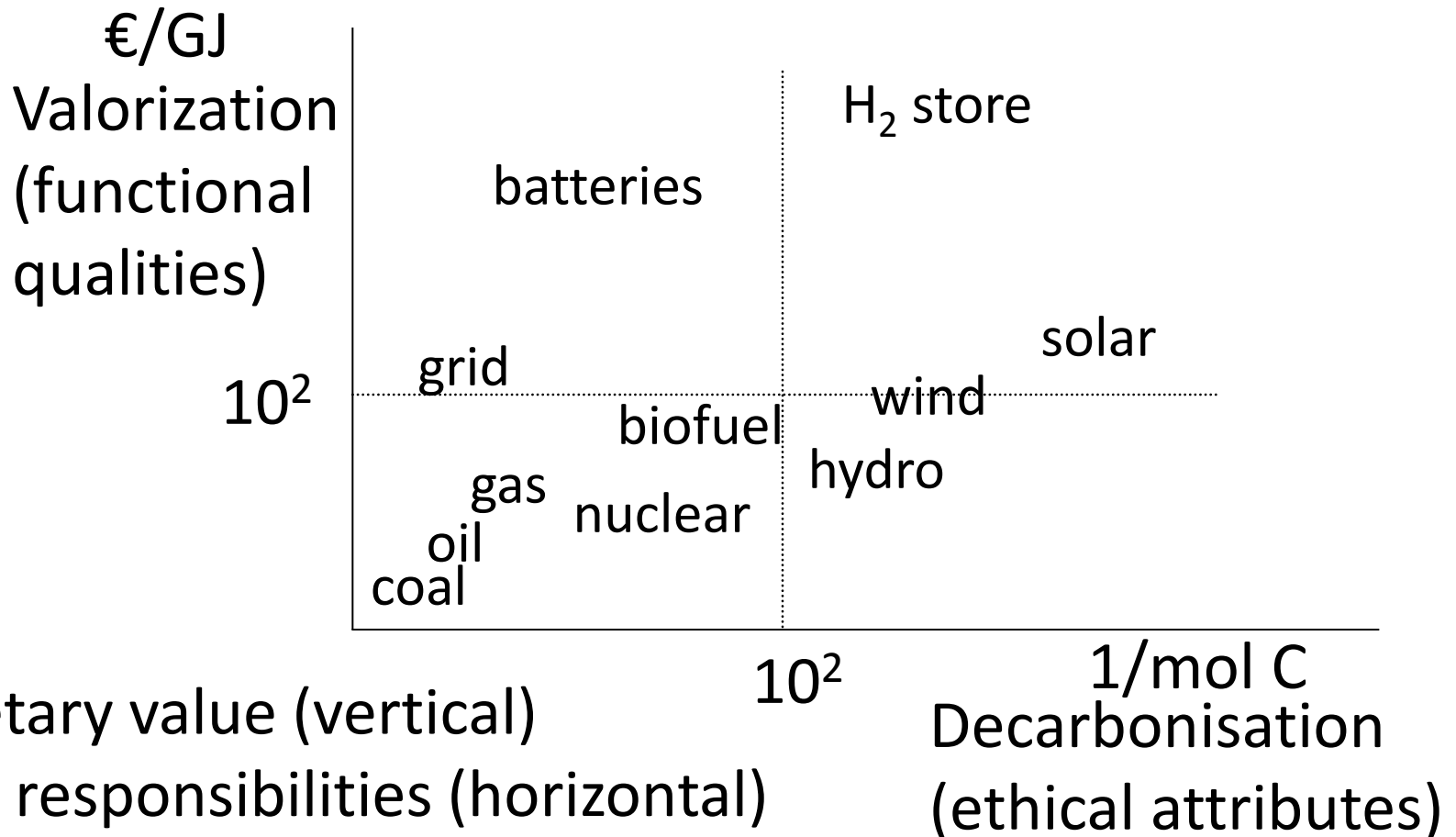
- **Clean** (2 – 4 Earth now for pollution absorption, WWF)
- **Inclusive** (the curse of the natural resources, J. Sachs)
- **Stability** (globalisation of local conflicts, T. Friedman)
- **Availability** (energy poverty of 1.6 billion people, IAE)

Effects are changing energy systems:

- **Distributed (renewable) systems**
- **Customers-specific products and services**

# Energy from bulk to products

## Value of energy uses



# Energy market in the EU

# Energy consumption

- Free On Board (FOB) prices fluctuate
- EU market reduces by energy units,
  - decline on-site, (26% residential, 43% business),
  - growth <1% transport (25% passengers, 6% freight)
- Steady growth in renewable energy
  - Renewable energy 16% of all consumed energy with 6% annual average growth (1998 – 2012)
  - Biomass, waste, hydro are the largest markets, geothermal, wind, solar the fastest growers

# Energy markets

EU energy market grows by value

- The largest market is electricity (high value)
- The fastest growing is gas (EU policy driven)

EU annual average 2004 – 2011	Value added FOB in sale *	Market size Gross margin**	Market growth Margin grow	Consumer preference Prices grow
gas business***	75%	17,415	50%	2%
gas residents	23%	12,312	8%	5%
electricity business	26%	62,222	4%	5%
electricity residents	7%	43,474	2%	1%

\* € 135 billion, \*\* = Sales-FOB price x volume \*\*\* FOB gas price grows 21% annual average

# Market opportunities on site (\*)

- Residents electricity - high value products: e.g. lights, “smart” products, local grid, challenges
- Business electricity - large volume, capacitors, co-generation, direct for alternated current, low voltage
- Residents and business gas, low value big volume: e.g. insulation, heat exchange & transfer, ESCO

\* demands price inelastic except for business electricity, transport not considered,

# Newcomers on the EU market

- During economic crisis expansion of energy firms on average per year
  - 3 600 new energy firms with 18 000 jobs,
  - 24% growth in energy compared to 3% for the ICT and 0% for all firms
- Capital per job grows (more technologies are used)

The EU annual average 2008 - 2011	number	growth a year
All enterprises	23,509,766	0%
ICT	954,807	3%
Energy	85,237	24%



# Distributed energy systems

- Local citizens energy initiatives emerge, e.g. 720 Germany, 280 Netherlands
- Citizens initiatives evolve into firms and co-ops, e.g. Ecopower coop with 24 000 members
- Local energy production, e.g. wind in Navarra Spain, bio on Samsø Denmark, solar in Freiburg Germany
- Energy services companies (ESCO's) expand: customers-size supply for buildings, districts, regions

# Barriers and drivers in the EU

# Given FOB main factors

- Barriers: large space use and energy sector;
- Drivers: R&D and venture capital

Correlations 1998-2008	Ren. Energy Production	Ren. Energy Consumption
<b>Scarce space</b>	--	-
GDP	0	+
<b>Energy output</b>	-	-
Government spending	0	+
Subsidies	0	+
Environment protection	0	0
<b>R&amp;D expenditure</b>	++	++
Students in population	+	0
<b>Venture capital</b>	++	++

# Price and Tax barriers

- Globally, USD 1 900 billion policy support of energy, of it USD 1 600 for fossil fuels (IMF, 2013)
- Price discount and tax reduction for large users impede innovators and energy-efficiency

More discount & lower tax larger user €/kWh	Market		Policy	
	Aver. Price	Max. reduce	Aver. Tax	Max. reduce
gas, residential	0.068	-40%	0.016	-28%
gas, business	0.063	-44%	0.012	-63%
electricity residential	0.209	-29%	0.053	-29%
electricity business	0.141	-23%	0.015	-80%

# Support of vested interests

- Tax reduction for users about € 118 billion given € 641 billion sales a year
- Percent-wise the largest tax reduction is for the gas consumption, i.e. for a low value product

Annual EU average, € million	Sales	Tax exemption	Percent
gas, residential	90,021	19,072	21%
gas, business	90,021	37,565	42%
electricity residential	142,514	31,632	22%
electricity business	318,618	29,335	9%
Total	641,175	117,603	18%

# In addition, subsidies for producers

- Subsidies cover: grants (on-budget) and credits, rebate, allowance, infrastructure, etc. (off budget).
- Fossil fuels got more support until 2008 (crisis)

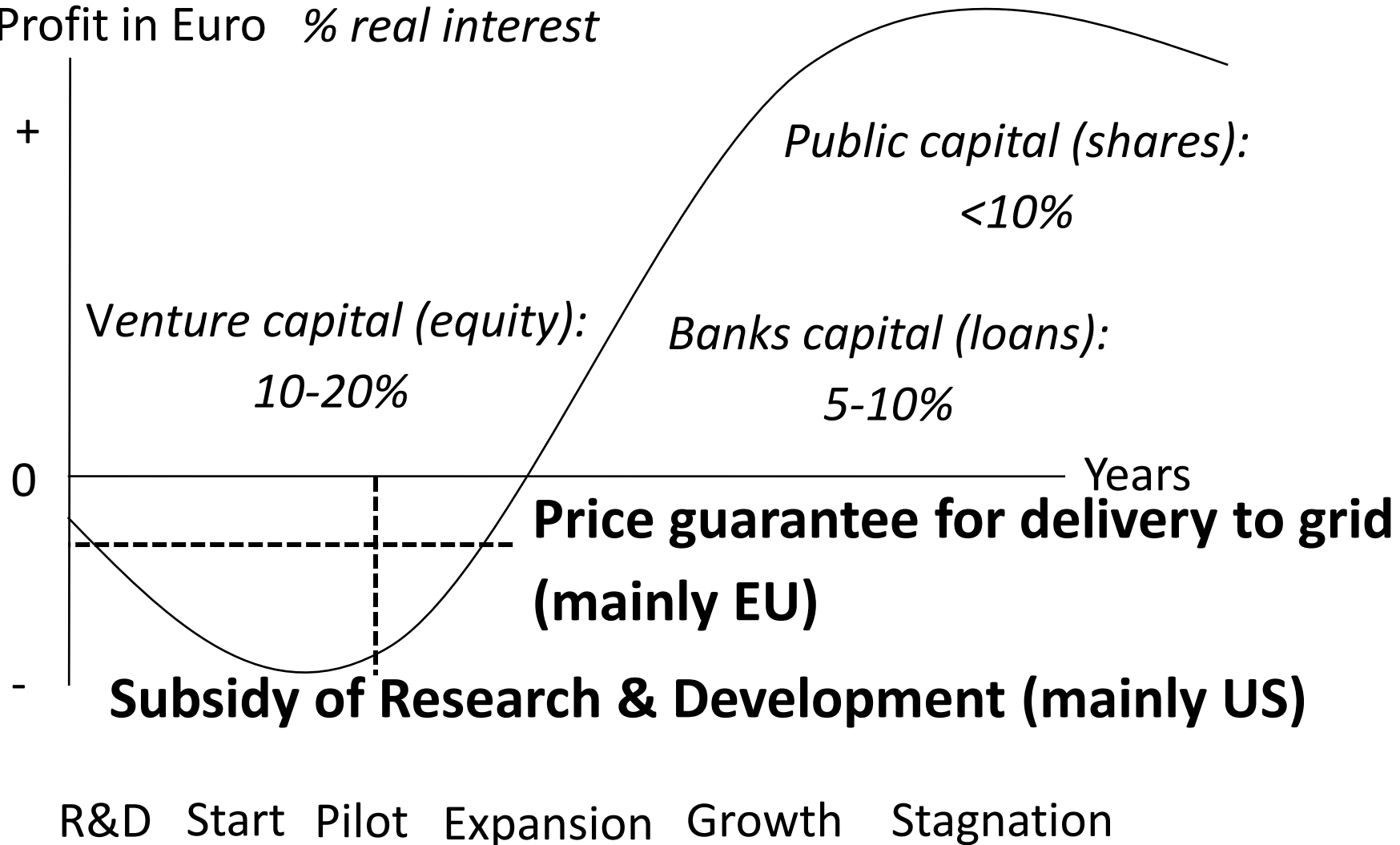
## Subsidies in € billion

	2001 *	2008	2010
Fossil fuels	23.9	34.9 **	25.0 **
Renewable energy	5.3	36.7	36.8

\*European Environmental Agency, \*\* Data on nuclear energy and the international uses (e.g. air, ships) not available

# Policy support of renewable energy

Profit in Euro % real interest



# Renewable energy support, US and EU

- Many instruments based on subsidy and guarantee
- In US € 70 billion mainly R&D subsidies, in EU € 53 billion mainly price guarantees (2008 – 2012)
- US firms large & innovative, EU many jobs & firms

		average 2008 - 2011	annual change
US	Number enterprises	12,634	1.9%
	Employees	599,114	0.1%
	Employees/enterprise	47	-1.8%
EU	Number enterprises	85,237	24%
	Employees	1,281,465	1.8%
	Employees/enterprise	16	-18%



# Conclusions and recommendations

- Many renewable energy resources and high value technologies are available and in pipeline.
- Shifts ahead from large-scale bulk to customer-specific services based on renewable energy.

## Recommendations:

- Shift policy support of the vested interests onto guarantees and subsidies for innovations.
- Enhance the renewable energy business start-ups with education, R&D, seed money (incubation).

Thank you for your patience