UNIVERSITY OF TWENTE

Sustainable Innovations Academy

Renewable energy business and policy in US and Europe

Yoram Krozer, University Twente - CSTM and Sustainable Innovations Academy, Enschede/Amsterdam, 13-10-2014

"to be sure of hitting the target, shoot first and call whatever you hit the target" (rabbi Peter Tarlow).

Advertisement

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- 2 500 faculty, 8 000 students on campus
- World top as the Entrepreneurial university
- Human Touch: Policy, Business, Behaviour
- CSTM: Sustainable development department

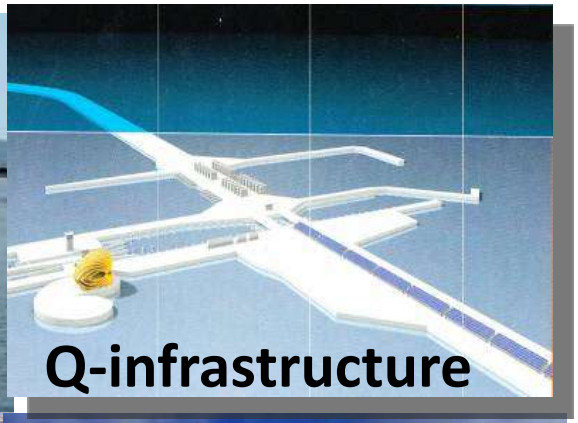


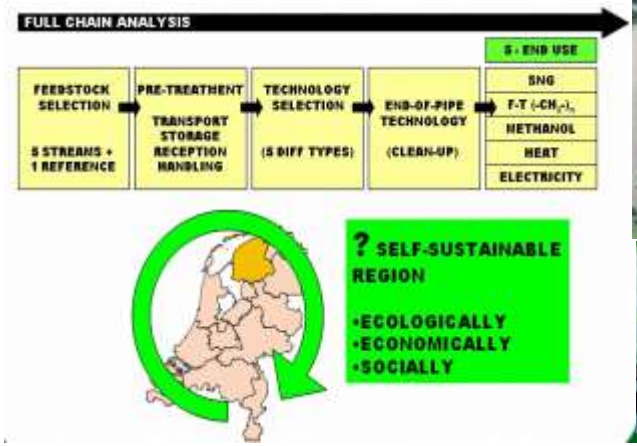
myself: economics common goods

Renewable energy

Water use

Spatial quality





Waste to biofuel

Water economy

End of advertisement

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- Barriers for renewable energy
- The US and EU policy support
- Business opportunity
- Distributed energy systems
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Introduction

- Energy review indicates: Belarus aims at more energy production.
- Belarus policy envisions a few nuclear plants :
  - Is it cost-effective?
  - Risks of Harrisburg, Chernobyl, Fukushima?
- Belarus policy envisions little renewable energy and unclear how to do it.
- Here, postulate: renewable energy is a profitable business opportunity and saves public money

What is renewable energy?

Renewable energy

Plenty of the renewable energy potential

Annual energy in EJ (it is 10^18 J or 2.7*10^14 kWh)	
Solar	3,850,000
Wind	2,250
Biomass	3,000
Consumption	500
Out of which electricity	60

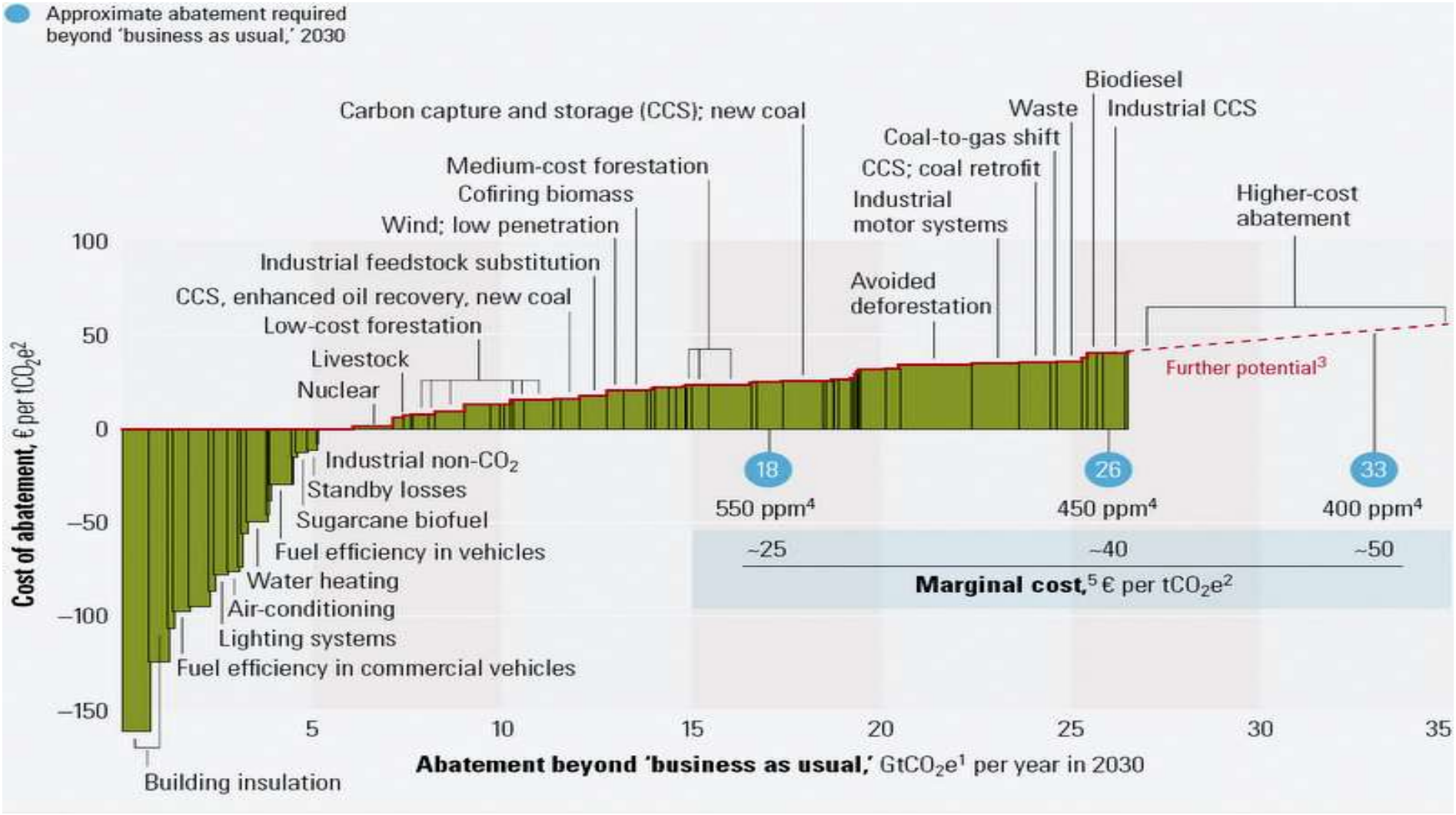
Uses are obstructed by the common good paradox: private gains at social risks e.g. insecurity, environment

Renewable energy resources

- Biomass: e.g. wood to ethanol, rapeseed to diesel
- Waste: e.g. manure to methane, grease to oil
- Hydro: e.g. mechanic to electric, salt-sweet to power
- Geothermal: heat exchange, deep earth heat
- Solar: electric (PV) and thermal
- Wind: sales, windmills, kytes
- Energy efficiency: insulation (heat loss), storage (batteries), distribution (power) co-generation (heat to power), process (combustion), and others.

Energy-efficiency is economic

McKinsey, "Reducing U.S. Greenhouse emissions, how much at what cost," 2007



Global renewable energy business

- € 372 billion cleantech (about all car sales): 45% of it is renewable energy and 14% energy efficiency.
- Annual 30% investment growth during 2004 – 2010 (higher than ICT).
- Scenario's: from 19% renewable energy now to dominant system in 30 years (5-6% growth/year).
- Nearly 50% of the present use is biomass & waste, future use is diversity of energy sources

Barriers for renewable energy

Business barriers and drivers in the EU

- Correlations renewable energy with factors in production and consumption (all per person)
- Main barriers are: large space use (e.g. biomass) and large energy sector (e.g. vested interests)
- Main drivers are: Research and Development (R&D) and available Venture capital (VC).
- Government support is important but indirect, mainly for more R&D and VC

Factors assessed statistically

1998-2008 (- barrier, + drivers)	Production	Consumption
Scarce space	**- -**	**-**
GDP	0	+
Energy output	**-**	**-**
Government spending	0	+
Subsidies	0	+
Environment protection	0	0
R&D expenditure	**++**	**++**
Students in population	+	0
Venture capital	**++**	**++**

Price and Tax policy in the EU

Price discount and tax exemption for the large users; nearly all fossil fuel resources.

More discount and less tax for larger use €/kWh	Aver. Price	Max. discount	Aver. Tax	Max. exemption
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%

Tax exemptions (up to 80%): obstruct innovators, trigger market discounts and energy-inefficiency.

Total EU tax support

Annual average in the EU € 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%

- Yearly average tax exemptions are € 118 bln euro for € 641 bln sales (above energy business profit)
- Abolishing tax support foster is efficient and fair

In addition subsidies in the EU

Subsidies in € billion

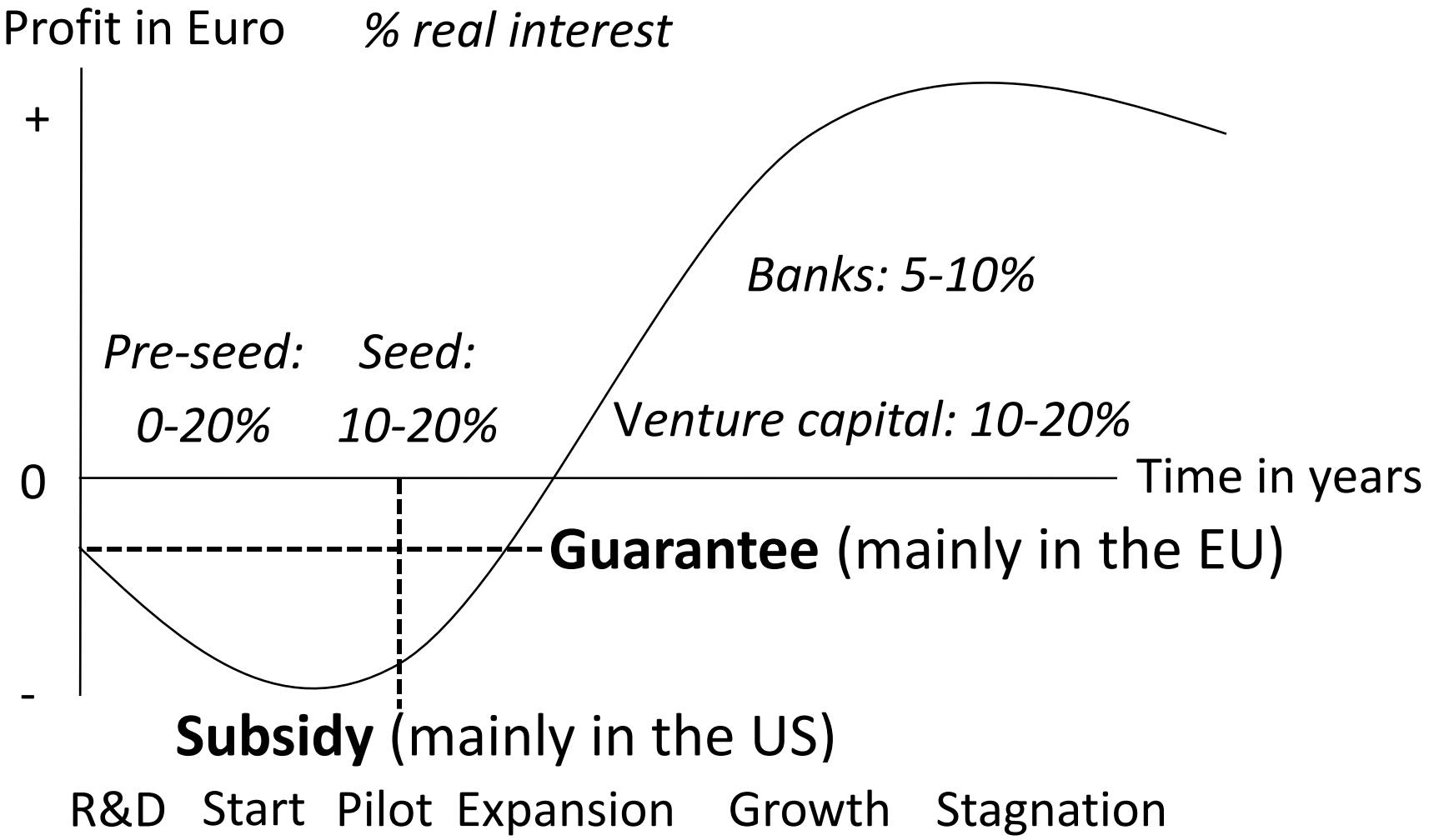
	2001 (1)	2008	2010
Fossil fuels	23.9	34.9 (2)	25.0 (2)
Renewable energy	5.3	36.7	36.8

(1) European Environmental Agency
(2) Excluding nuclear energy & international uses (air, ships)

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

US and EU policy financial support

Policy support of innovations



Supporting policies in US and EU

- Options are: subsidies for the R&D (US), and risk reducing guarantees (EU feed-in)
- Hundreds various policy instruments world wide based on these options
- Post 2008 crisis action: US (€ 70 bln) support larger than in EU (€ 53 bln) (both 2008);
- US for fossil fuels support is also smaller
- US conditions for renewable energy are better

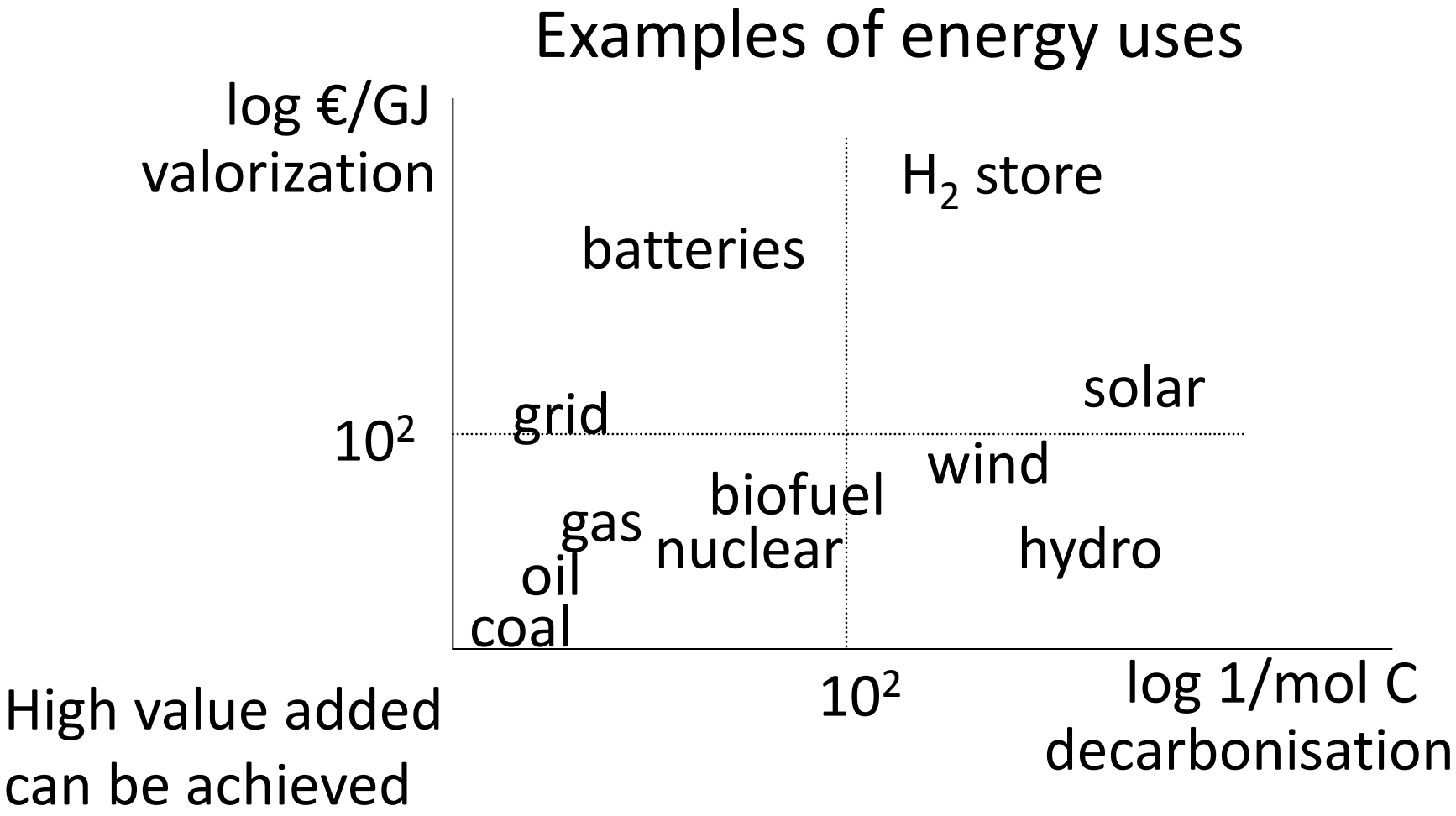
Effects of the US and EU support

- US businesses are larger and more innovative mainly due to the larger R&D subsidies
- EU business and employment in total and growth are higher due to lower risks.

		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%

Business opportunity

Value of energy uses



EU Renewable energy opportunities

- Total EU energy consumption is: 26% homes, 43% business, 25% passengers, 6% freight
- Stable total energy consumption; decline on-site, growth transport <1%
- In it 6% growth renewable energy consumption
- Opportunity: substitution renewables for fossils
  - Biomass, waste, hydro are the largest markets
  - Geothermal, wind, solar are fastest growers

EU Energy-efficiency opportunities

- High value added: low fuel cost high sales price
- Large market volume: large gross margin
- High market growth, if high gross margin increase
- High preferences, if high sales price increase

Gross margin, sales – fuel purchase (FOB prices):

EU gas and electricity market, average 2004 – 2011; total market is € 135,424 million				
Annual averages FOB	Euro / kWh	Total € million	Annual increase	
gas price 21% growth	Fuel/sale price	Gross margin	Gross margin	Sales prices
gas business	75%	17,415	50%	2%
gas residential	23%	12,312	8%	5%
electricity business	26%	62,222	4%	5%
electricity residential	7%	43,474	2%	1%

Market opportunities on-site

- Residents electricity -high value products- e.g. lights, “smart” products, local grid, games
- Business electricity –large volume- e.g. capacitors, co-generation, direct for alternated current
- Residents and business gas use –low value large volume- insulation, heat exchange, heat transfer
- Residents and business price increase (demands is price inelastic): energy audits and management

(Excluded transport though many opportunities)

Policies to create opportunities

- Key is capability due to knowledge spillover
- Some underline proximity; pulling R&D to industry or pushing industries to R&D with funding, but
- Making clusters is costly to public and business must be competitive and innovative
- Some underline diversity; generating networks through incubators, awards, scouting but
- networks needs good entrepreneurial conditions to generate start-up businesses

Distributed energy systems

Citizens initiatives and smart grid

- Citizens energy initiatives grow despite little support , e.g. about 720 in Germany with 80 mln people and much support and 280 in the Netherlands with 16 mln people without support
- Growing distributed energy system (e.g. Navarra (Spain), North Jutland (Denmark).
- Enterprises create smart grid: downscaling of energy system for homes, buildings, districts.

Smart grid enterprises

In the EU average 2008 - 2011	number	growth a year
All enterprises	23,509,766	0%
ICT	954,807	3%
Energy	85,237	24%
Employees	1,281,465	2%
Per enterprise	16	-18%

- Growth of energy enterprises is spectacular
- 2% annual average jobs increase despite crisis
- Capital grows for technologies and services (not only research and consultancy)

An example of a regional process

Frisian energy program

- Region in North Netherlands: 0.8 million persons
- Economic periphery, mainly agriculture & tourism
- Aim: 20% energy saving, 20% renewable in 5 years
- Proposals in workshops, +/- 70 mostly local experts
- Hardly national subsidies, mostly locally supported
- Small coordination, a few experts with students
- Implementation is ongoing but too slow

Many and diverse actions envisaged

Italic: only energy efficiency; ( ) investment

Users

Households
- *Isolation existing houses (447),*
- Heat-exchange & storage (98),
- Sun boilers (56),
- *Micro co-generator (63),*
- Photovoltaic energy (157),
- *Light economy* (17),
- CO_2 low/neutral houses (168).

SME's
- Wind on industry parks (70)
- Greenhouses (68)
- Others (11)

Mobility & producers

Transport * *total arbitrarily divided*
- *Fifty bio-fuel & gas stations (15),*
- Hybrid cars (81),
- *Natural gas for fossil fuel (244),* (*)
- SNG for fossil fuels (244), (*)
- CBG for fossil fuels (244), (*)
- Bio-diesel for diesel (49),
- *EU CO2 standard (98).*

Biowaste to bio-fuel production
- Incinerator: electricity& heat (150)
- Digester, Pyrolysis, Gasifiers (331)
- Others (5)

Costs and Revenues of the actions

Potential: 800 million euro for the local business with 27 000 jobs; net revenue if low interest (low risk)

€ million a year	15% interest & subsidy		5% interest & no subsidy	
	Capital	Revenue	Capital	Revenue
Housing	179	-117	102	-41
Mobility	194	13	126	81
Industry	14	-3	9	14
Greenhouse	14	-15	9	-10
Subtotal	400	-122	246	44
Bio-waste	77	-56	39	-18
Total	477	-178	285	26

Many regional instruments possible

Financial incentives

- regional infrastructure, e.g. de-central grid network
- press on public enterprises, e.g. sludge processing
- differentiate local taxation, e.g. house property
- regional development companies, e.g. low interest
- grants for social groups, e.g. dissemination know-how
- funds vocational schooling, e.g. upgrading work skills

Social mechanisms

- strict criteria for procurement, e.g. in public utilities,
- services specifications, e.g. public transport, lease
- contests and awarding, e.g. sustainable entrepreneurs
- differentiate local fees, e.g. park fees, clean properties
- promotional activities, e.g. labels, quality scans
- public education and marketing, e.g. campaigns

Conclusions

- Renewable energy is a huge, growing business
- Create R&D funds and foster Venture capital entry
- Reduce tax and subsidies for the vested interests
- Innovators support with R&D and Feed-in policies
- Promote energy-efficiency & renewable production
- Attract entrepreneurial capabilities for start-ups
- Empower start-ups with regional energy portfolio

Conclusions

- Citizens energy initiatives revive energy markets
- Innovations versus vested interests rent-seeking
- EU tax and subsidies policies cause economic deficit, social losses and environmental damage
- Cut exemptions and subsidies but how to do it?
- Empowering: making regional energy portfolio's
- Opportunities in smart grid: renewable energy, value adding energy products and management.

Thank you for your patience