The World Nuclear Industry Status Report 2014

Free download at www.WorldNuclearReport.org

Mycle Schneider

International Consultant on Energy and Nuclear Policy, Paris, France
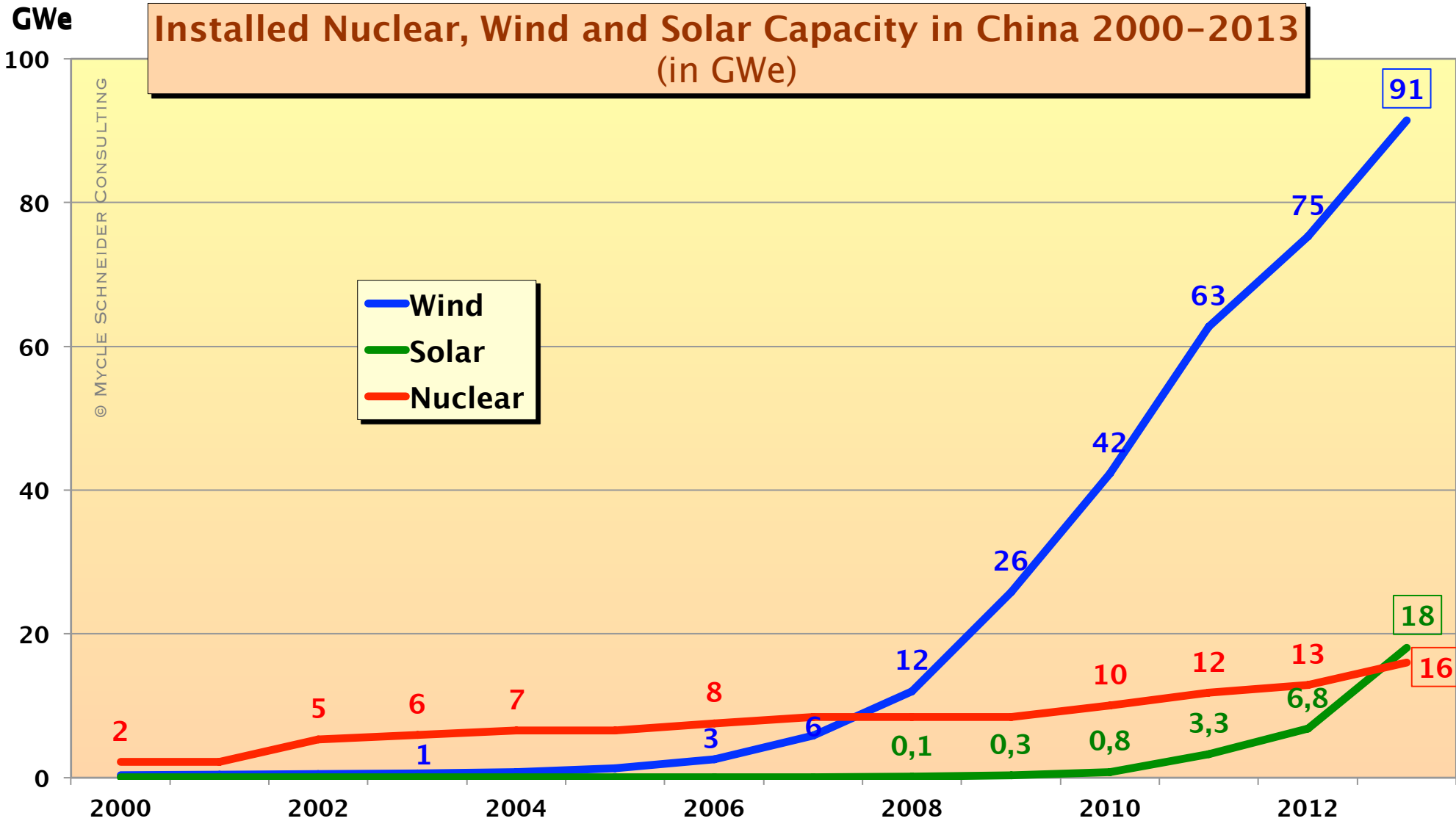
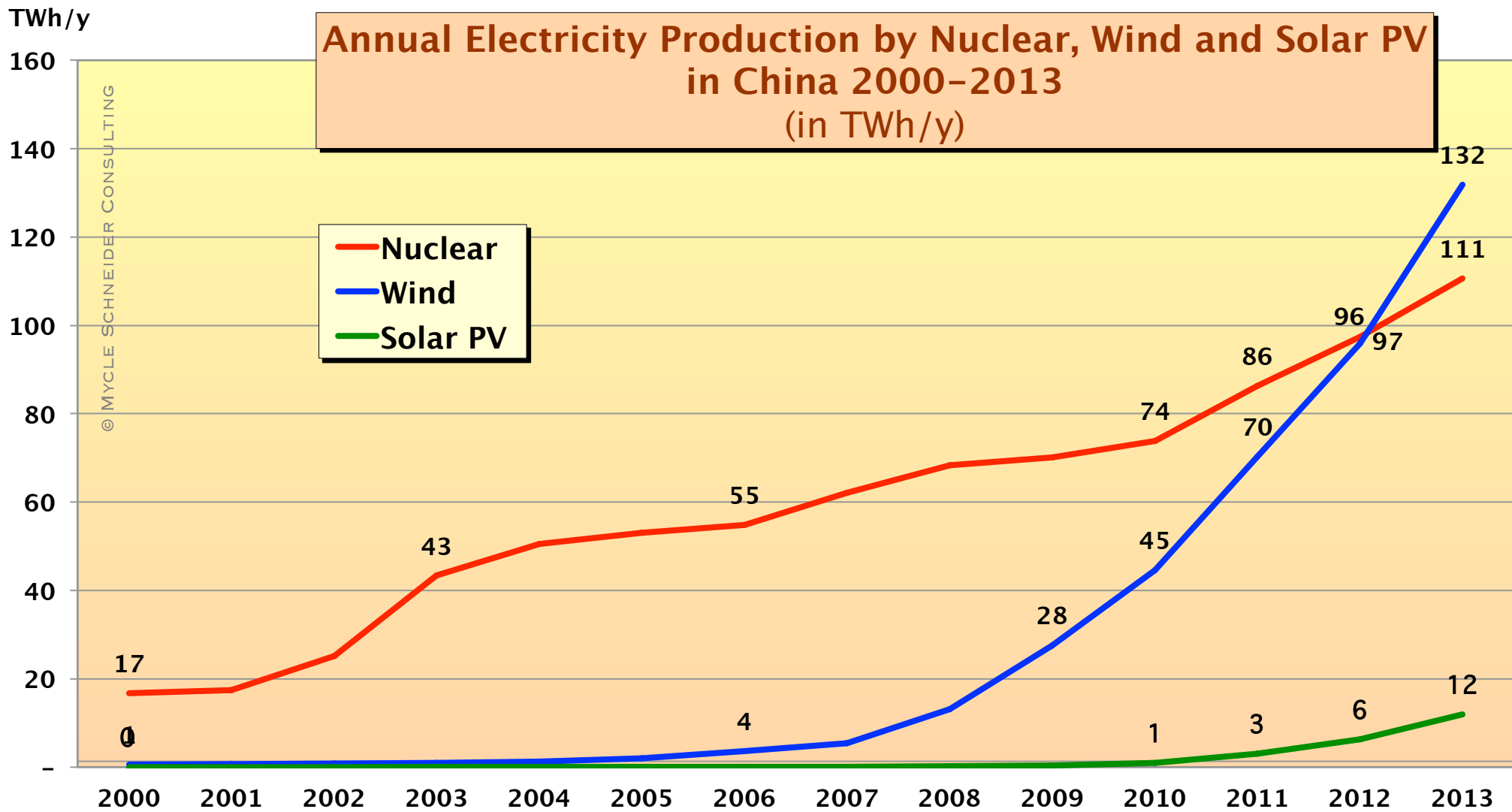*Convening Lead Author of the World Nuclear Industry Status Report (WNISR)*

Heinrich Böll Foundation, Warsaw, Poland, 27 October 2014

Global

In 2013, Spain generated more power from wind than from any other source, outpacing nuclear for the first time. It is also the first time that wind has become the largest electricity generating source over an entire year in any country.
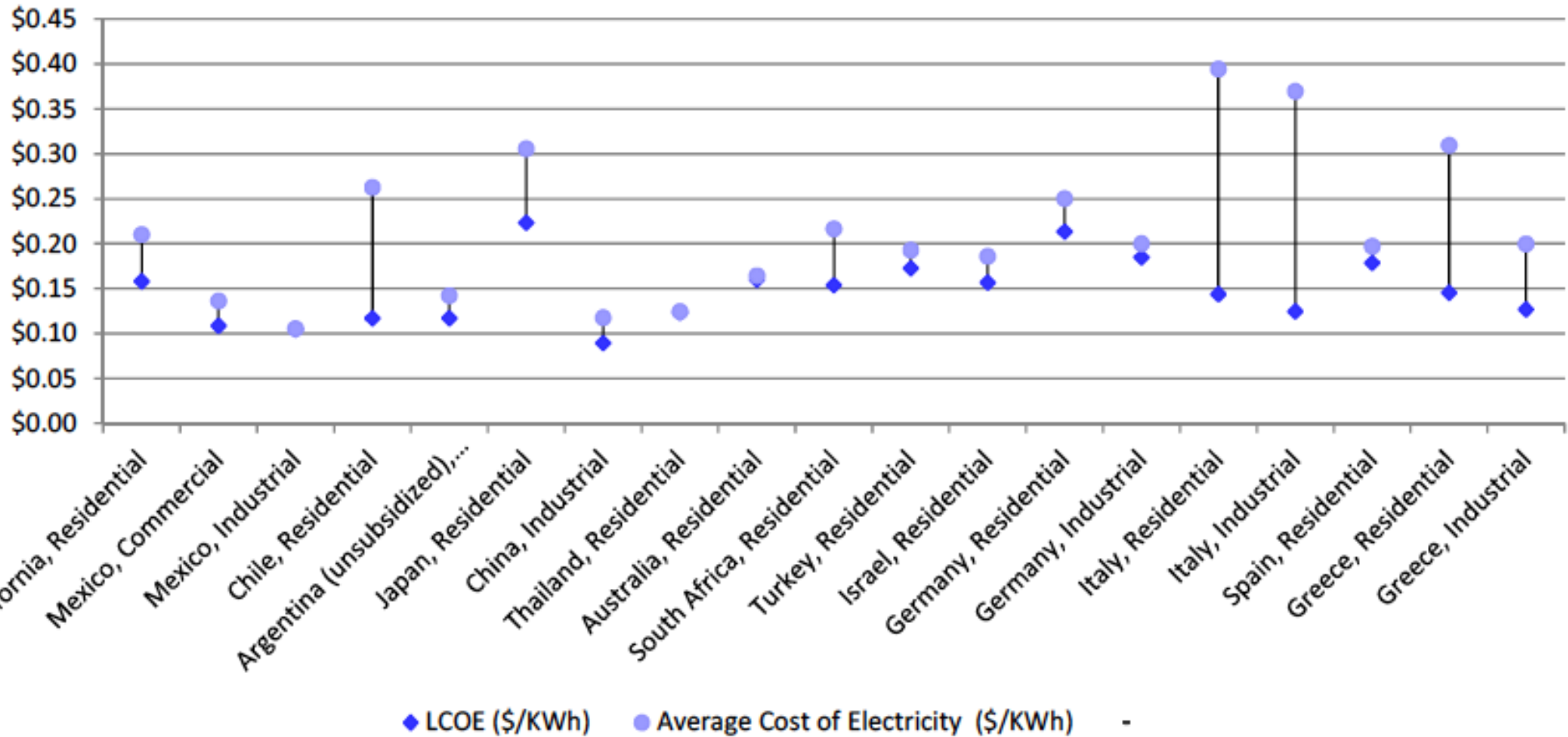
Spain has thus joined the list of nuclear countries that produce more electricity from new renewables—excluding large hydro-power—than from nuclear power that includes Brazil, China, Germany, India and Japan.

Installed Nuclear, Wind and Solar Capacity in China 2000–2013
(in GWe)

GWe

Legend:
- Wind
- Solar
- Nuclear

Wind values: 1, 3, 6, 12, 26, 42, 63, 75, 91

Solar values: 0,1 0,3 0,8 3,3 6,8 18

Nuclear values: 2, 5, 6, 7, 8, 10, 12, 13, 16

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Annual Electricity Production by Nuclear, Wind and Solar PV in China 2000–2013
(in TWh/y)

Source: BP 2014

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Warsaw, Poland, 27 October 2014

Markets at Solar Photovoltaics Grid Parity… More to Come

Legend: ◆ LCOE ($/KWh)   ● Average Cost of Electricity ($/KWh)

Categories (x-axis): California, Residential; Mexico, Commercial; Mexico, Industrial; Chile, Residential; Argentina (unsubsidized),…; Japan, Residential; China, Industrial; Thailand, Residential; Australia, Residential; South Africa, Residential; Turkey, Residential; Israel, Residential; Germany, Residential; Germany, Industrial; Italy, Residential; Italy, Industrial; Spain, Residential; Greece, Residential; Greece, Industrial

Source: Deutsche Bank, « 2014 Outlook—Let the Second Gold Rush Begin », 6 January 2014

"Austin's Super Cheap Solar Agreement (5¢/kWh) Goes To Recurrent Energy"

An unprecedentedly low price for a large solar project with 150 MW, 20-year Power Purchase Agreement.

Austin Energy's estimates natural gas at 7 cents, coal at 10 cents and nuclear at 13 cents.

Source: Greentechsolar, 21 May 2014

Solar Photovoltaics in the U.S.

By 2017, more than half of the States could have rooftop solar that is as cheap as local electricity prices.

THE **NUMBER OF HOUSEHOLDS WITH ROOFTOP SOLAR IS** SKYROCKETING
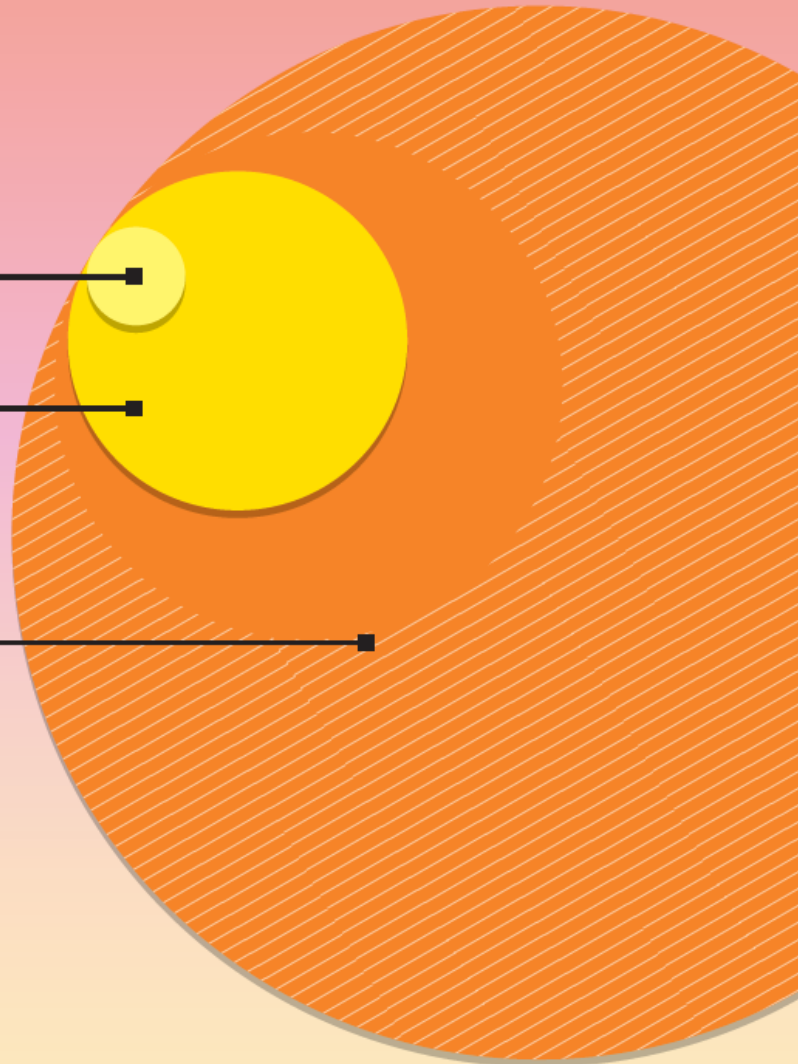
2006
30,000 homes

2013
400,000 homes

2020 projections
900,000 – 3.8 million homes

Projections assume 5 kilowatts per house;
U.S. DOE Annual Energy Outlook 2014
and SunShot Vision Study (2012) data.

New Players: Example Seoul

SEOUL METROPOLITAN GOVERNMENT

seoul

One Less Nuclear Power Plant, Phase 2

Seoul Sustainable Energy Action Plan

Target Phase 1: Saving or substituting 2 million TOE, achieved in 26 months (by June 2014, 6 months early) through:
- Energy savings: 44.5%
- Energy efficiency: 42.5%
- RE production: 13.0%

Key: Exceptional level of public involvement.

Target Phase 2: Saving or substituting +4 million TOE **by 2020**, reduce CO_2e emissions by 20.5% or 10 million tons (compared to 2011). Targets include:
- 100% LED equipment public bldgs.
- RE increase from 2—5%.
- Boost electricity self-reliance from 4—20%.

Final Report Brochure

Cities on Power

Projects and Strategies
for Boosting Green Energy
in Urban Areas.

www.citiesonpower.eu

Cities on power · **CENTRAL EUROPE** · **EUROPEAN UNION** EUROPEAN REGIONAL DEVELOPMENT FUND

This project implemented through the CENTRAL EUROPE Programme
co-financed by the ERDF

Lead Partner City Warsaw

"The main aim of the project was to develop and endorse *Local Action Plans* with innovative financial and organizational tools to trigger the application of renewable energy both by public and private investors in the four partner cities and regions. By realizing these activities, *Cities on Power* intended to mobilize citizens and local authorities to increase their interest in renewable energy, to foster renewable energy development in urban areas and, consequently, contribute to reducing greenhouse gas emissions in EU cities."
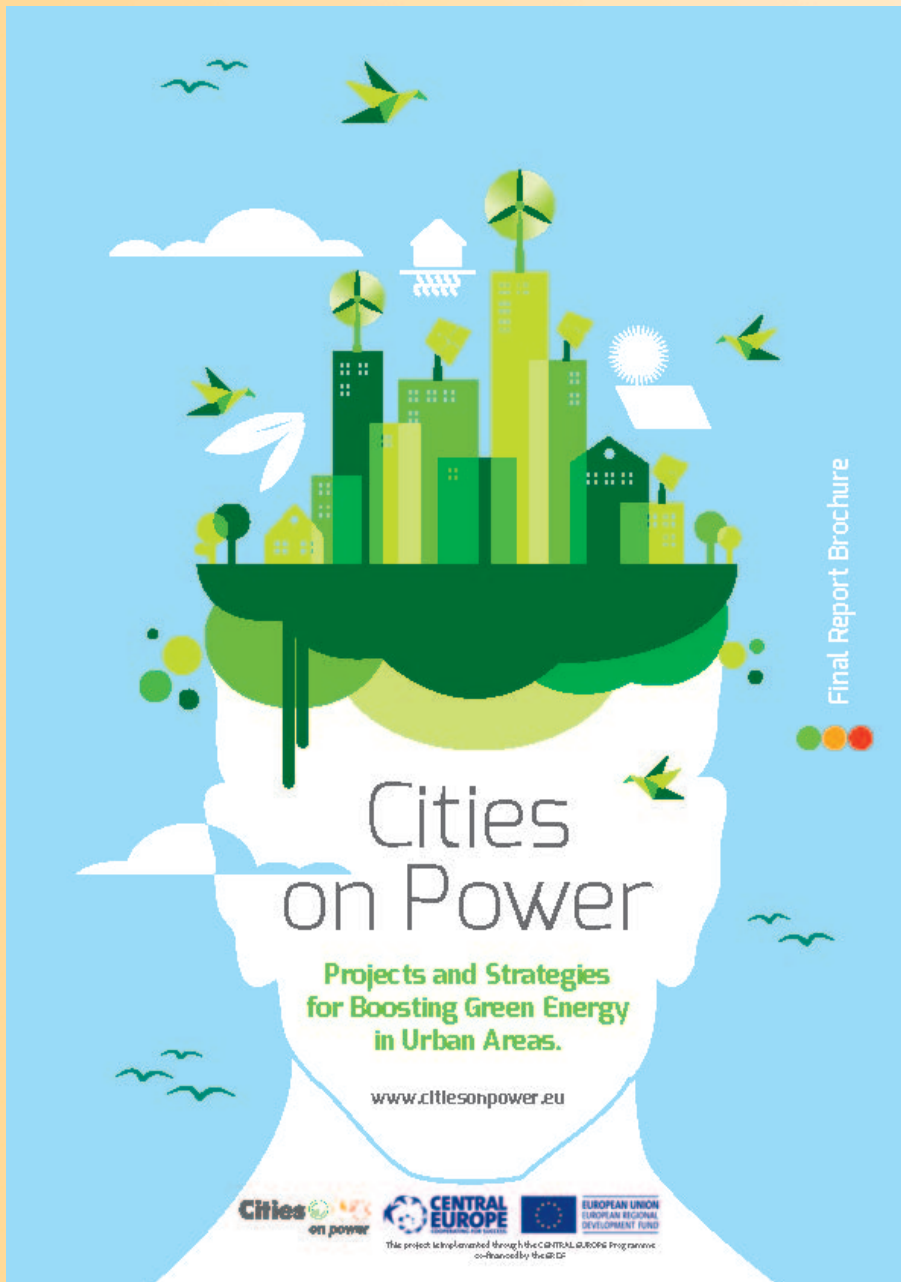
"Large-scale power generation, however, will be the dinosaur of the future energy system: Too big, too inflexible, not even relevant for backup power in the long run."

Thank You!

Contact: mycle@orange.fr
Phone: +33-1-69 83 23 79

www.WorldNuclearReport.org - online now!

About the Author

Mycle Schneider works as independent international consultant on energy and nuclear policy. He is the initiator and Convening Lead Author of the World Nuclear Industry Status Reports and the Coordinator of the Seoul International Energy Advisory Council (SIEAC). He is a member of the International Panel on Fissile Materials (IPFM), based at Princeton University, USA. In 2010-2011, he acted as Lead Consultant for the Asia Clean Energy Policy Exchange, implemented by IRG, funded by USAID, with the focus of developing a policy framework to boost energy efficiency and renewable energies. Between 2004 and 2009 he has been in charge of the Environment and Energy Strategies Lecture of the International Master of Science for Project Management for Environmental and Energy Engineering at the *Ecole des Mines* in Nantes, France.

From 2000 to 2010 he was an occasional advisor to the German Environment Ministry. 1998-2003 he was an advisor to the French Environment Minister's Office and to the Belgian Minister for Energy and Sustainable Development.

Mycle Schneider has given evidence or held briefings at national Parliaments in 14 countries and at the European Parliament. He has advised Members of the European Parliament from four different groups over the past 26 years. He has given lectures or had teaching appointments at 20 universities and engineering schools in 10 countries.

Mycle Schneider has provided information and consulting services to a large variety of clients including international institutions and organizations, think tanks and NGOs.

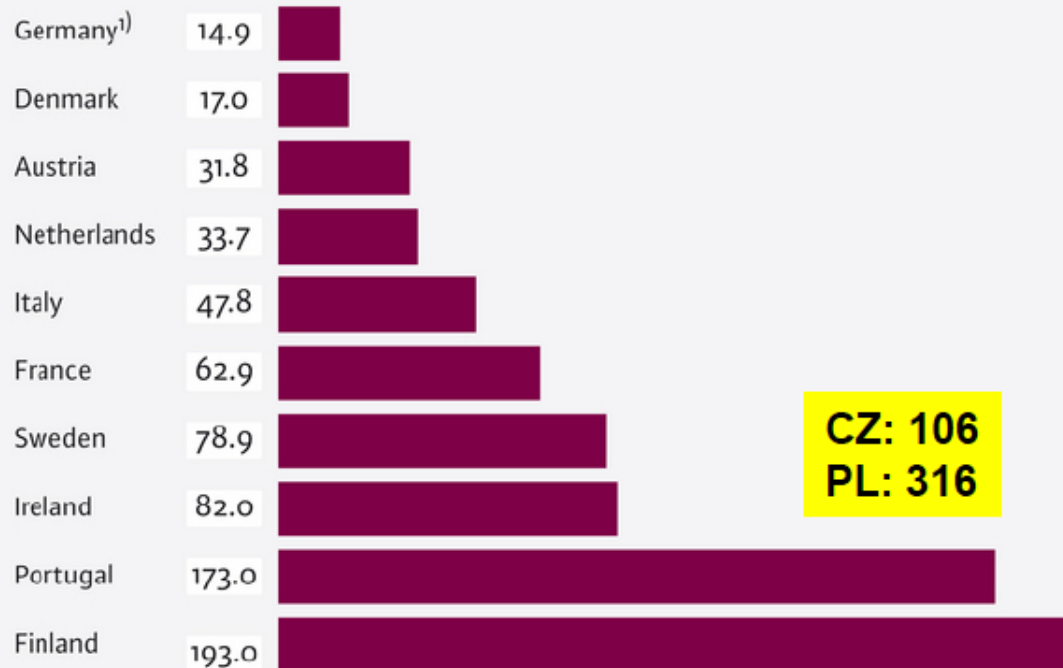In 1997 he was honoured with the *Right Livelihood Award* ("Alternative Nobel Prize").

Annexes

Neighbors Save French Electricity Grid, 9 February 2012 (in MW)

2 000

1 700

3 000

844

485

1 000
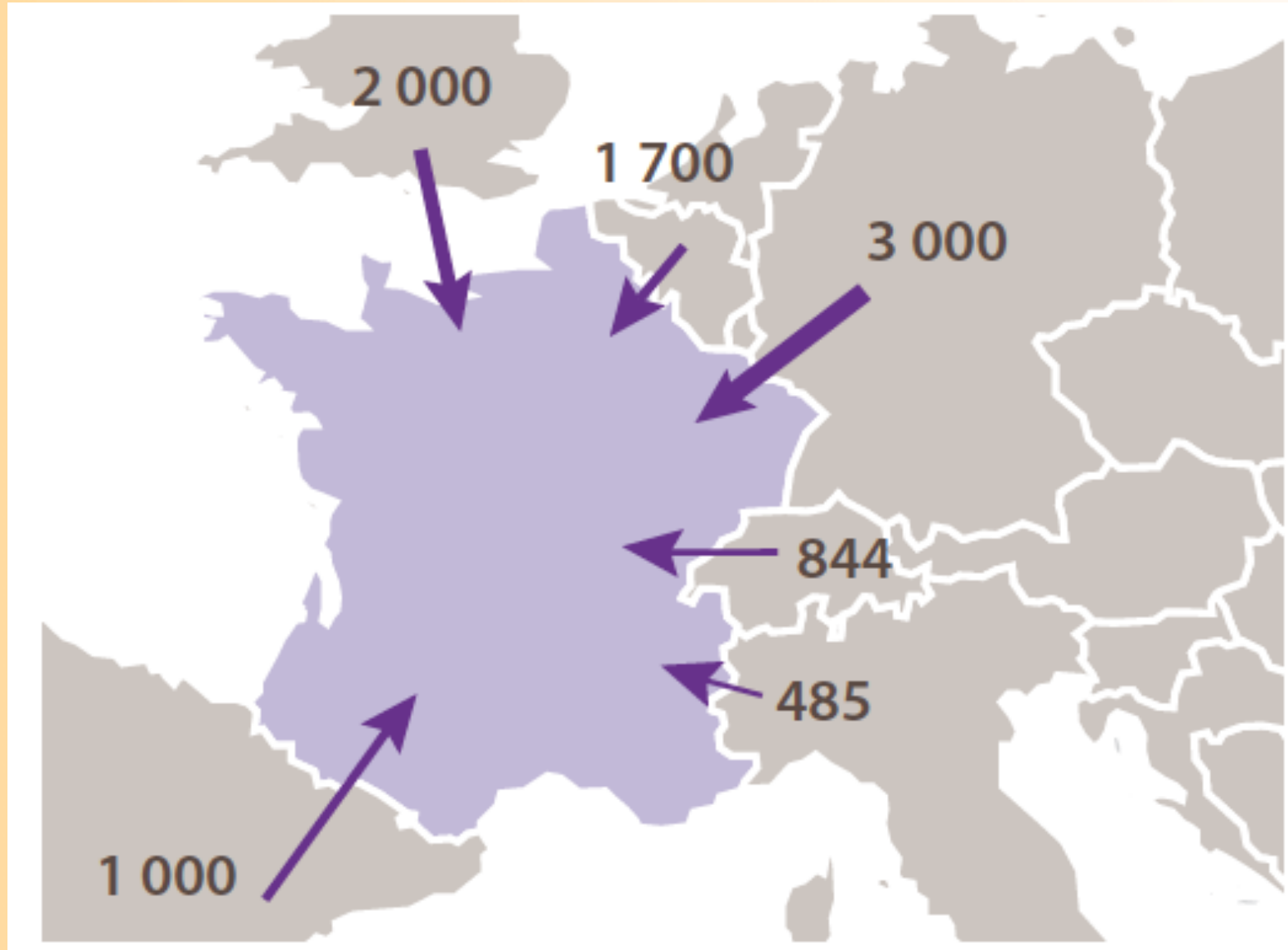
Source: RTE, "La vague de froid de février 2012", April 2012

Agora
Energiewende

System Reliability remains unhurt

Average duration of interruption of electricity supply in 2010 per customer (minutes) [2]

Germany [1]	14.9
Denmark	17.0
Austria	31.8
Netherlands	33.7
Italy	47.8
France	62.9
Sweden	78.9
Ireland	82.0
Portugal	173.0
Finland	193.0

CZ: 106
PL: 316

SAIDI for DE

2011: 15.31

2010: 14.90

2009: 14.63

2008: 16.89

2007: 19.25

2006: 21.53

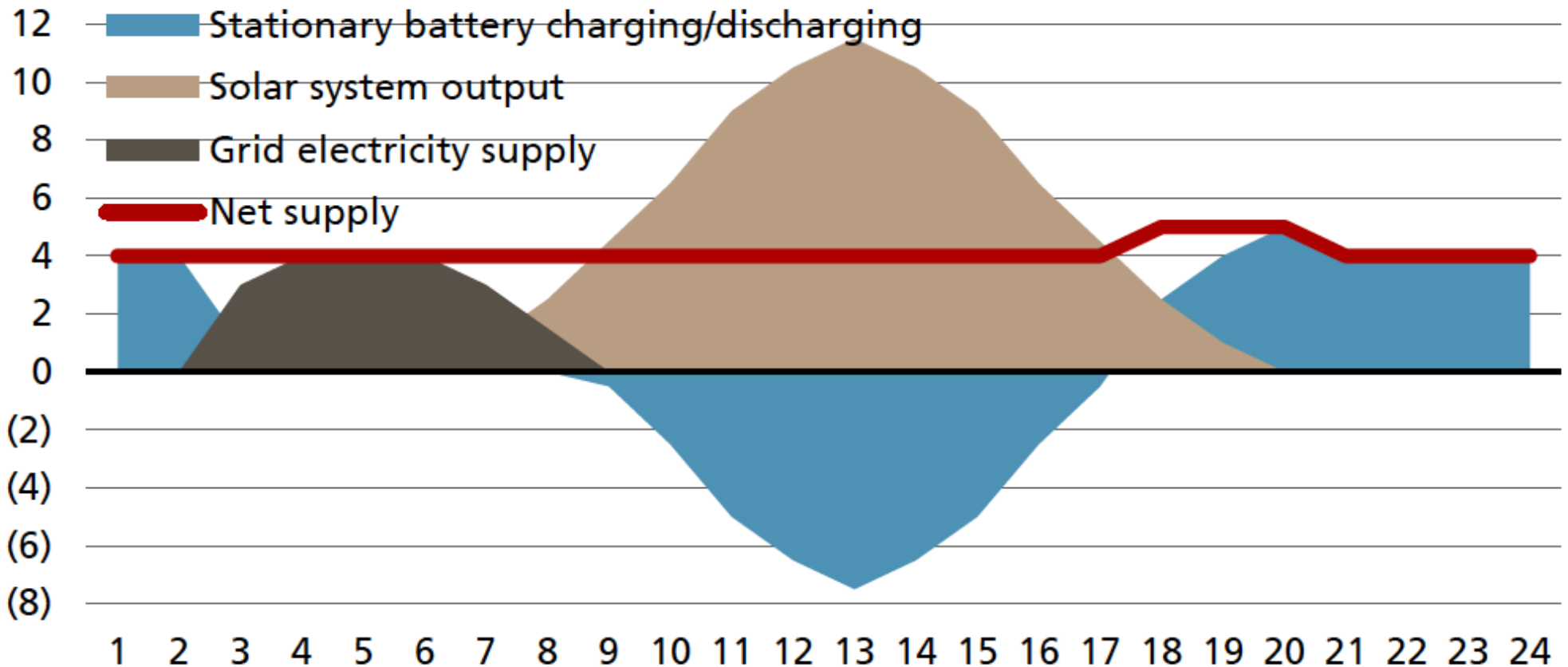**SAIDI = System Average Interruption Duration Index (in minutes)**

Sources: 5th CEER Report on the Quality of Electricity Supply 2011; FNN; Fingrid Oyj Power System Planning

[1] FNN value: 16.1
[2] forced interruptions without exceptional events (force majeure)

Source: Markus Steigenberger, Prague, 14 May 2013

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UBS: "Daily supply profile can be (almost) perfectly matched"

Legend:
- Stationary battery charging/discharging
- Solar system output
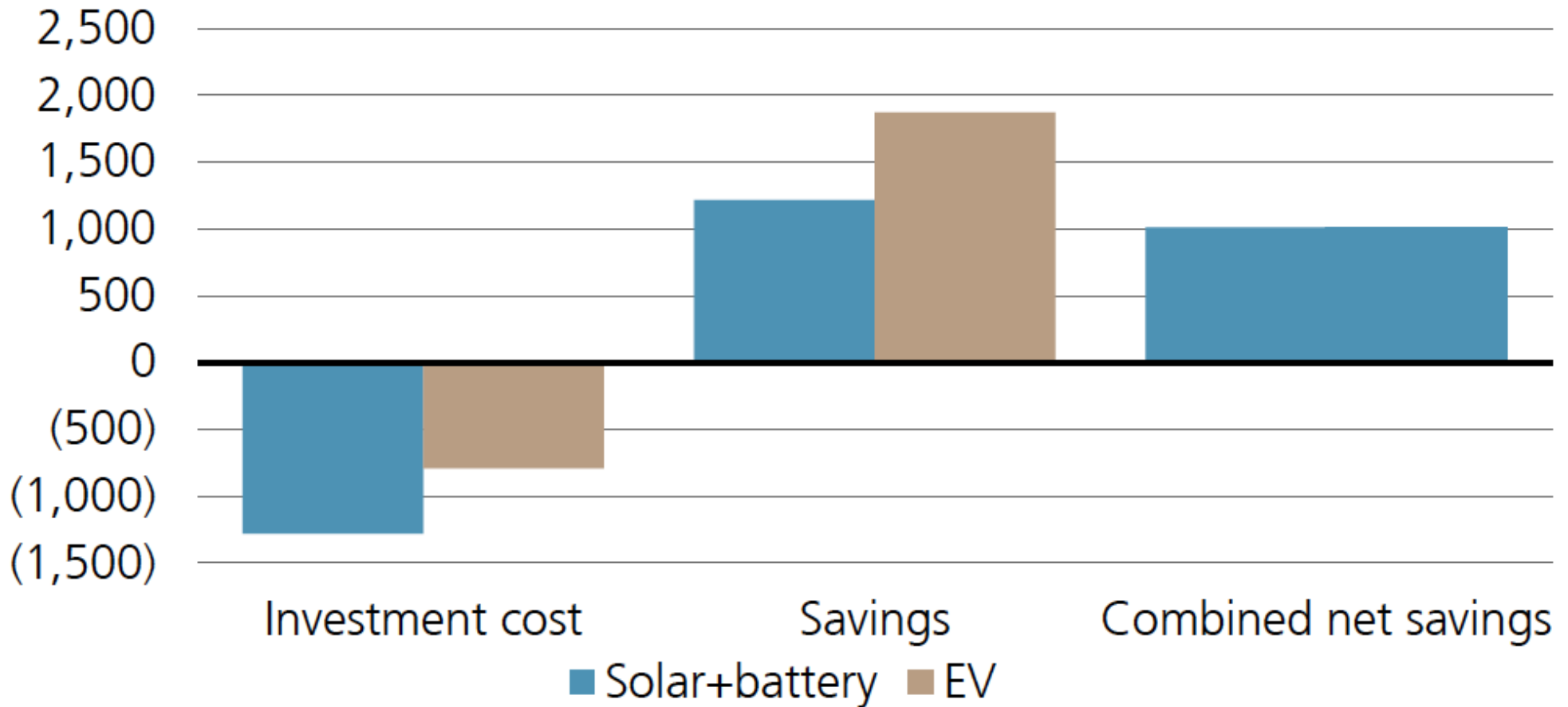- Grid electricity supply
- Net supply

Source: UBS estimates (schematic illustration of a typical working day)

UBS: "Solar + battery + EV already pays off, but economics to further improve dramatically"

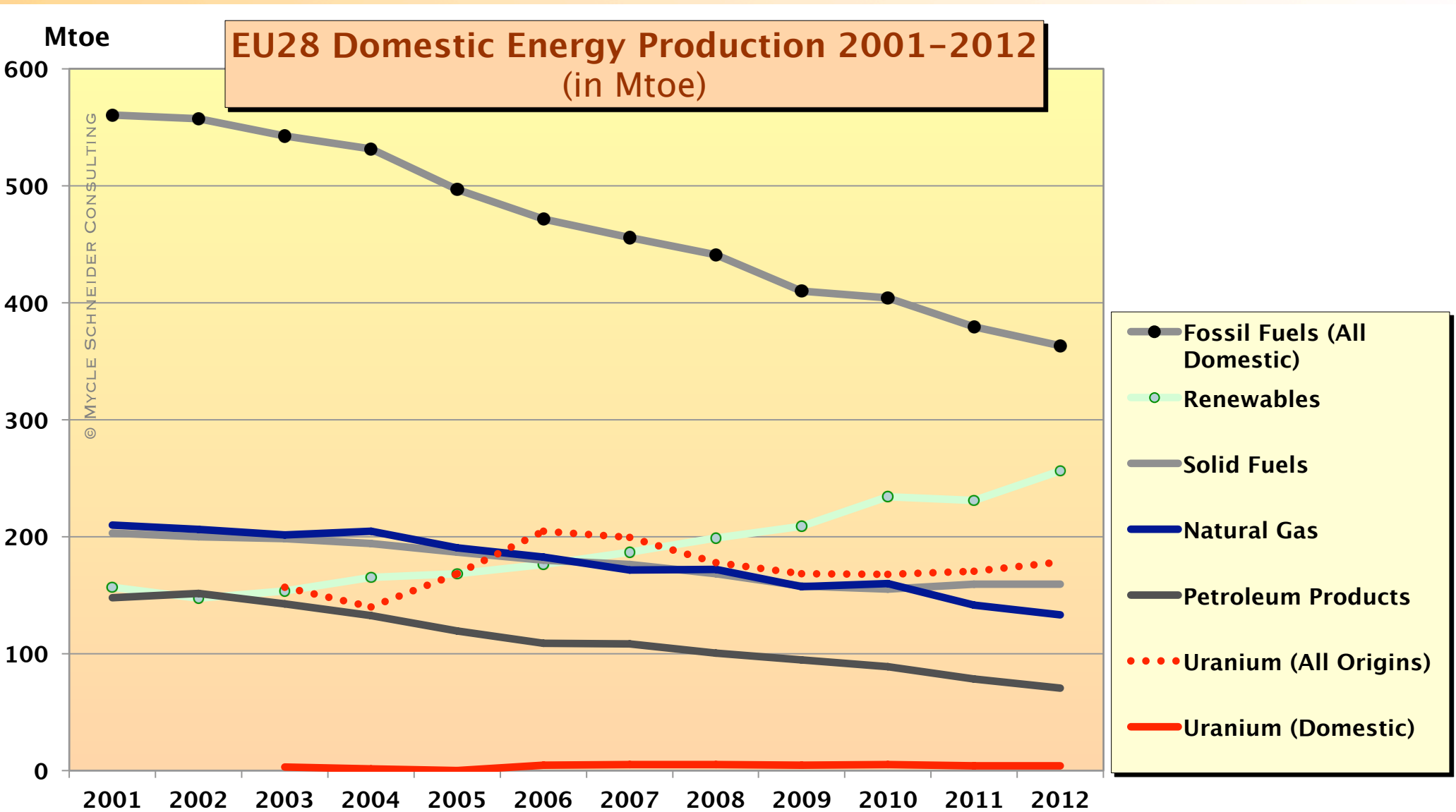ROI (pre-interest) — Payback time (# of years) — 2020
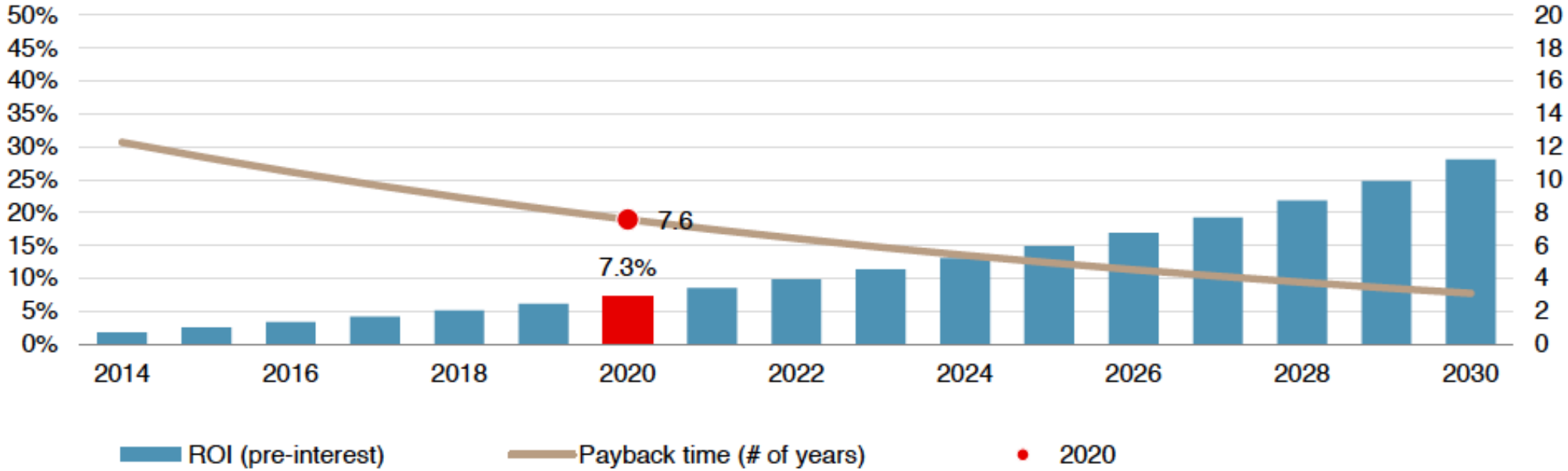
Source: UBS estimates
Note: Chart shows economics in Germany.

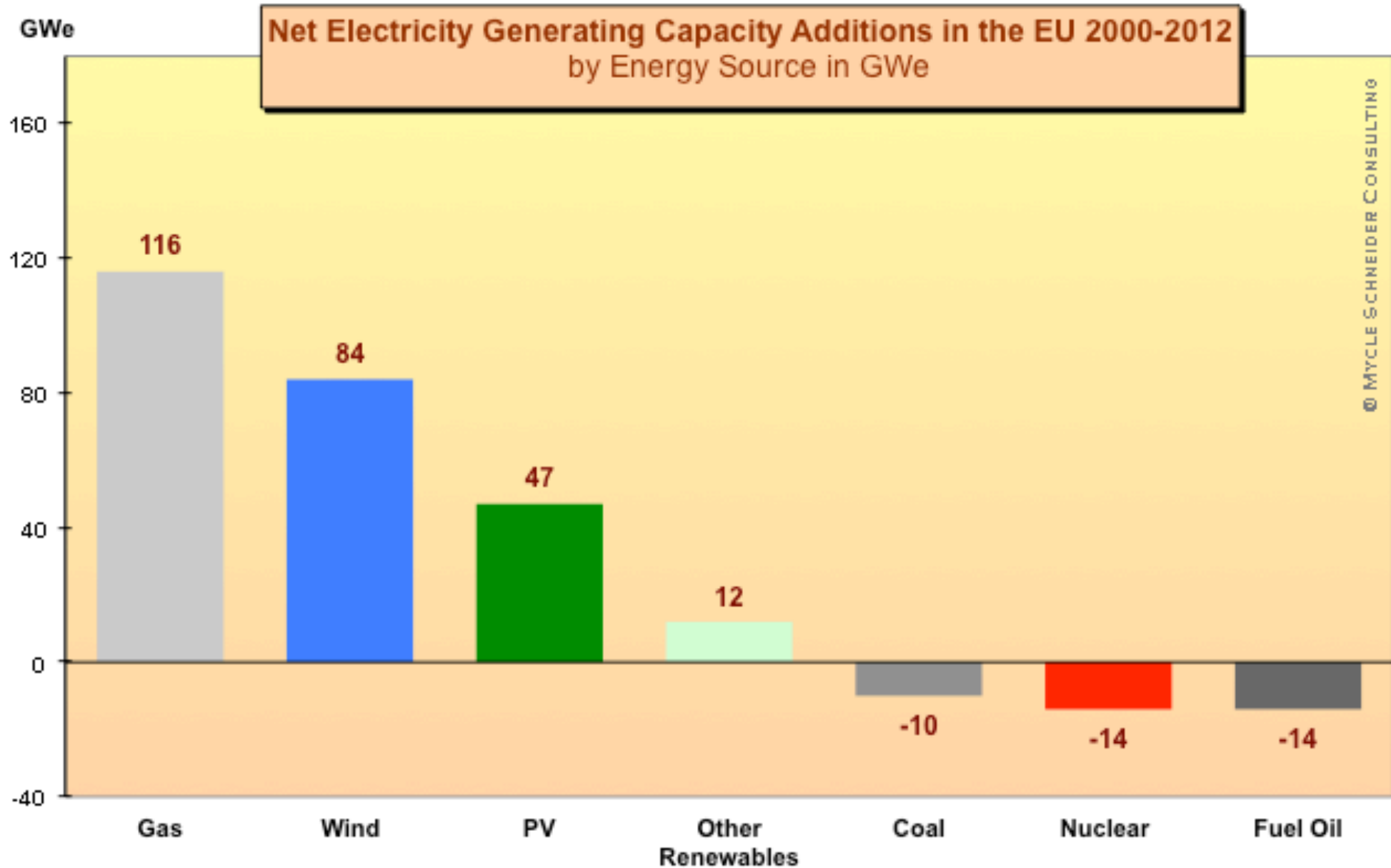# Annual Balance of EV + Solar + Battery = €1,000 Savings Per Year

Source: UBS estimates
Note: Based on purchase in Germany in 2017; assumes EV is charged with self-generated solar power.

EU28 Domestic Energy Production 2001–2012
(in Mtoe)

Mtoe

Legend:
- Fossil Fuels (All Domestic)
- Renewables
- Solid Fuels
- Natural Gas
- Petroleum Products
- Uranium (All Origins)
- Uranium (Domestic)

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Source: Sources: Eurostat, Euratom Supply Agency, BEE/Raffaele Piria, 2014

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Net Electricity Generating Capacity Additions in the EU 2000-2012 by Energy Source in GWe

Source: EWEA 2013

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Startup and Shutdown of Electricity Generating Capacity in the EU 2013
by Energy Source in GWe

GWe

Source: EWEA 2014

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Energy Source	Startup	Shutdown
Wind	11,2	−0,3
PV	11,0	
Gas	7,5	−10,1
Other Renewables	3,3	−0,8
Coal	1,9	−7,7
Fuel Oil	0,2	−2,8
Nuclear	0,2	

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Example 3: Heat/Cold + Communication

New Competitive Concepts: Example Qarnot Computing

Heating with waste heat from processors placed in peoples' homes, rather than implementing expensive cooling for digital servers in huge data centers.

Source: http://www.qarnot-computing.com

HPC customers

Heating customers
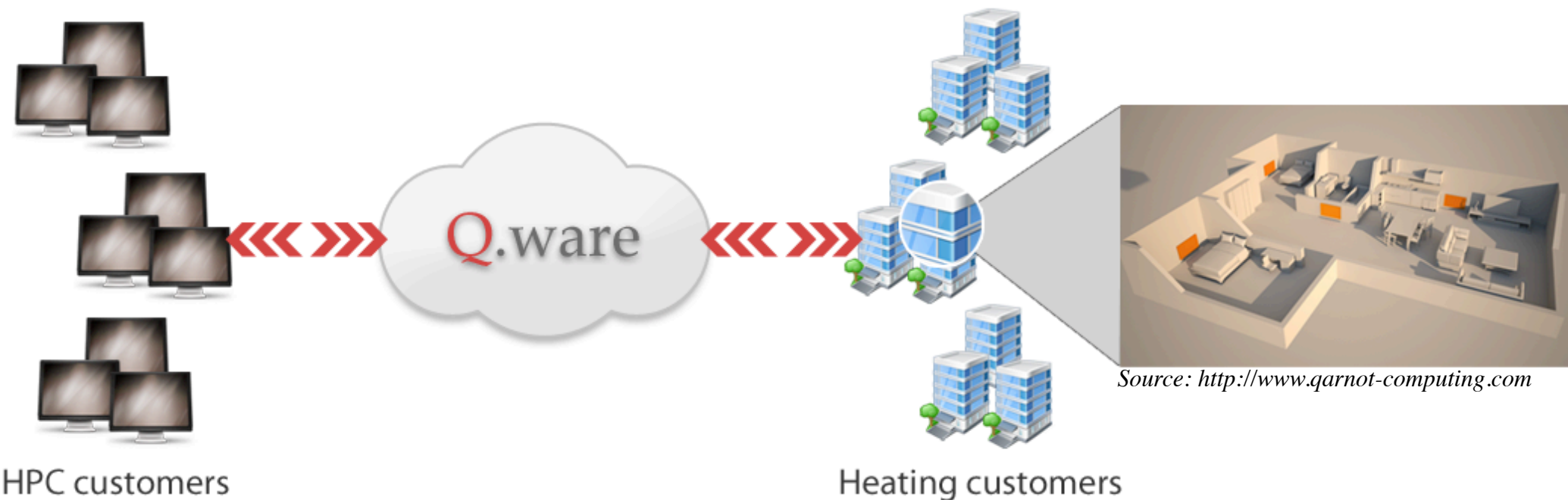
Within two years, Qarnot Computing has built up a network of thousands of processors that are heating several hundred homes and offices in Paris <u>for free</u> and is providing commercial computing services far below market price.