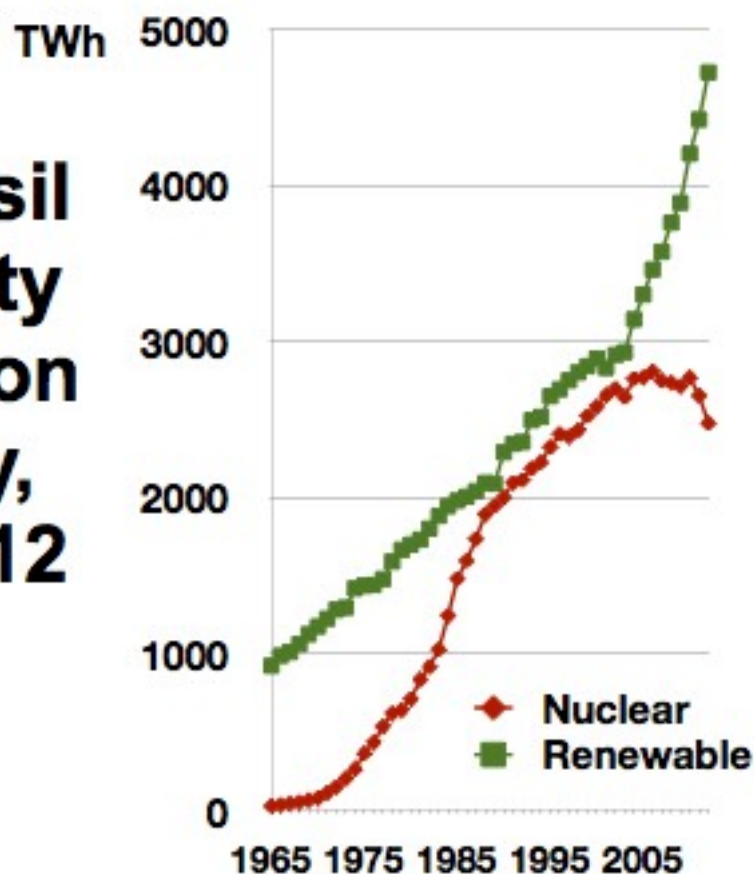


The economics of abundant solar- and wind-electricity
or:

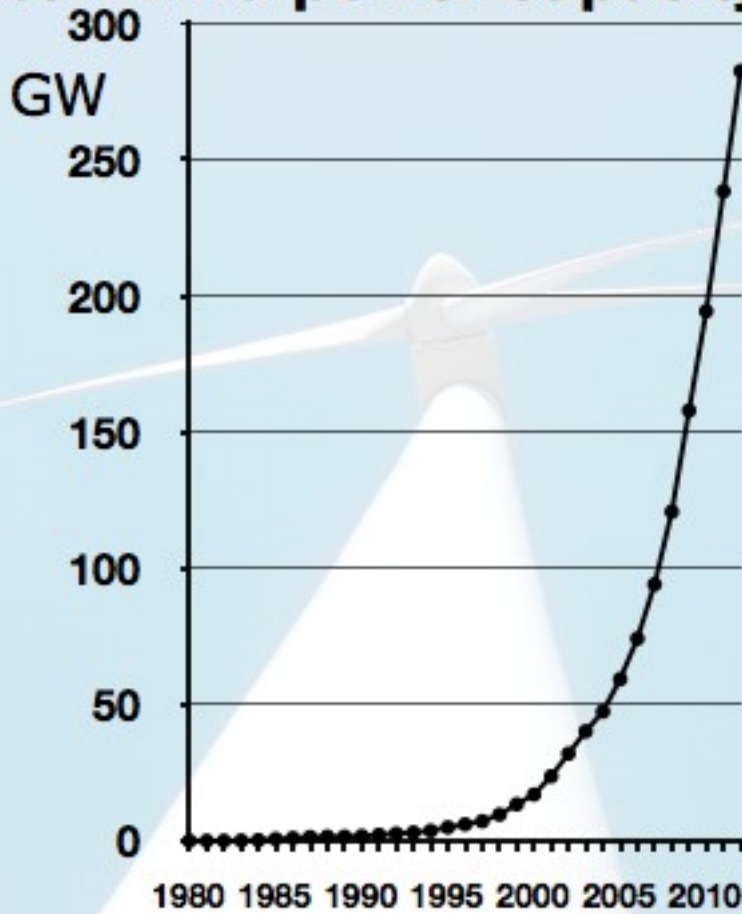
Future electricity markets

Tomas Kåberger
Professor Chalmers University of
Technology, Zhejiang University
2013-08-29

**Non-fossil
electricity
generation
globally,
1965-2012**

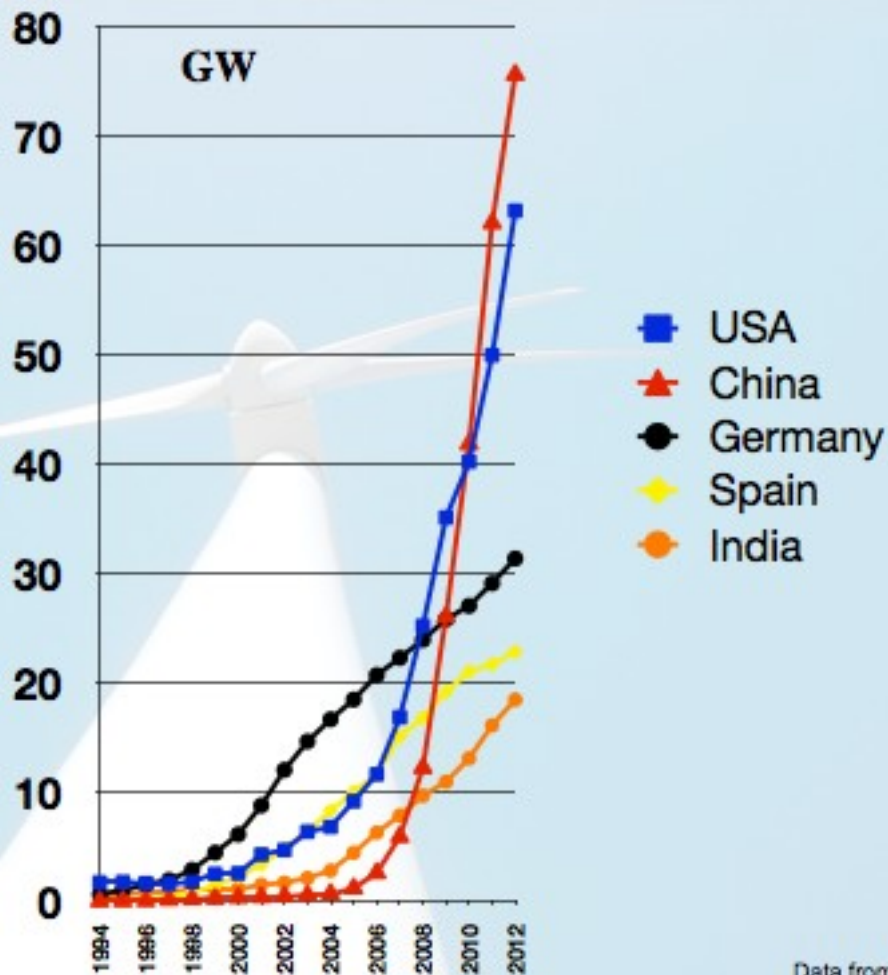


Global Wind power capacity 1980-2012



Data from GWEC

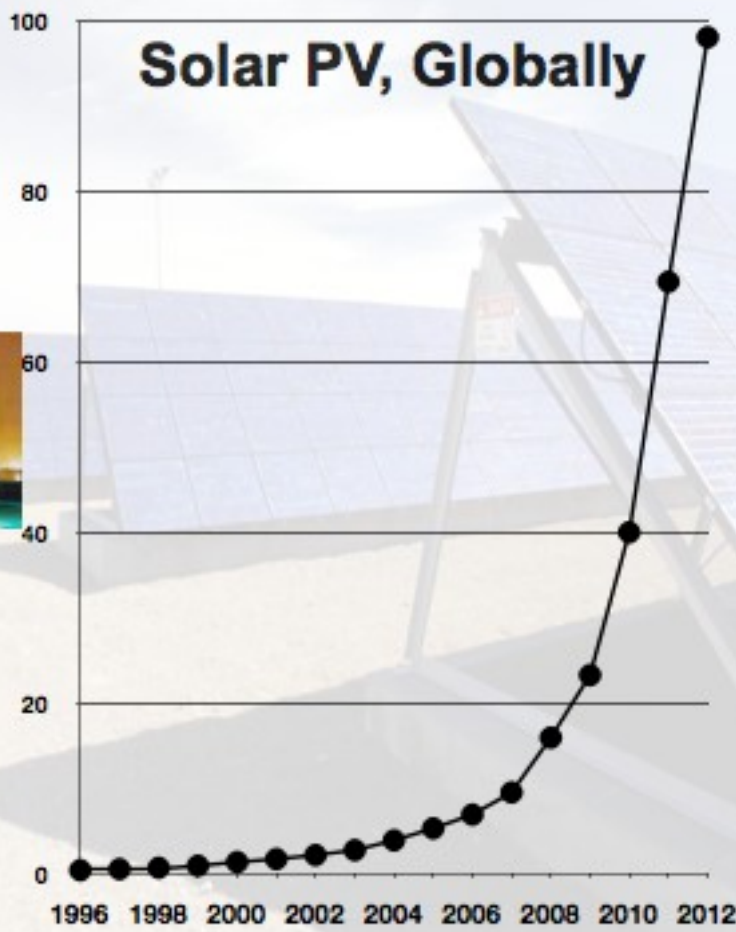
Wind power in leading countries



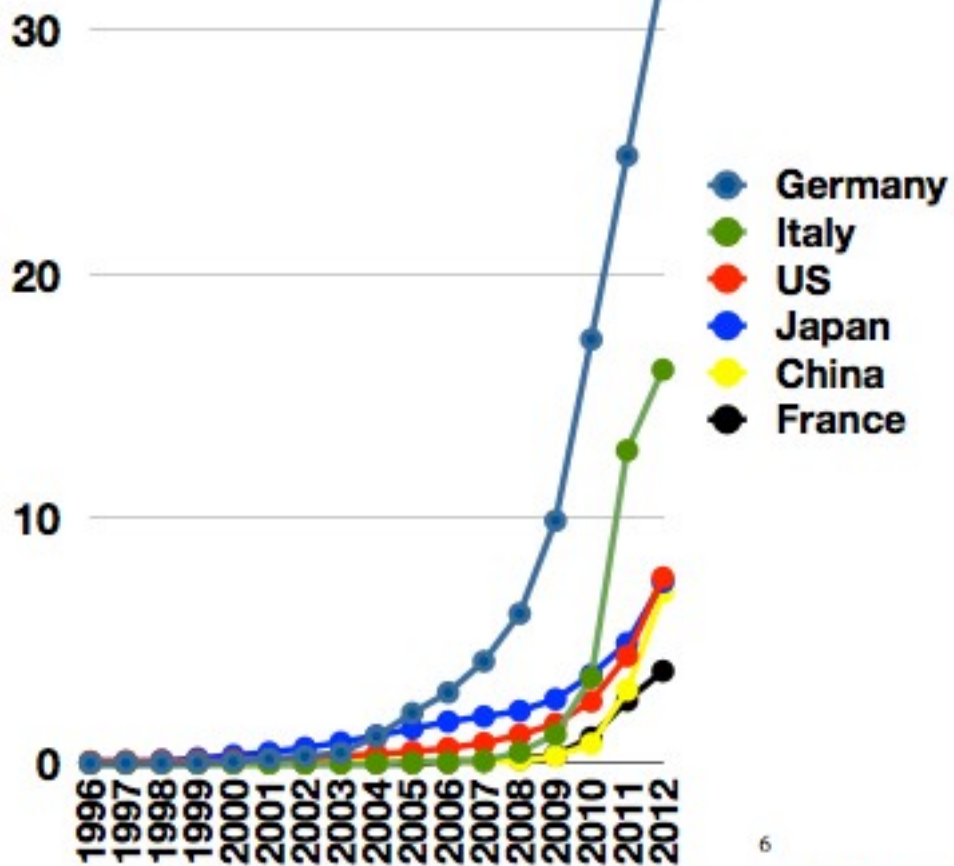
Data from GWEC



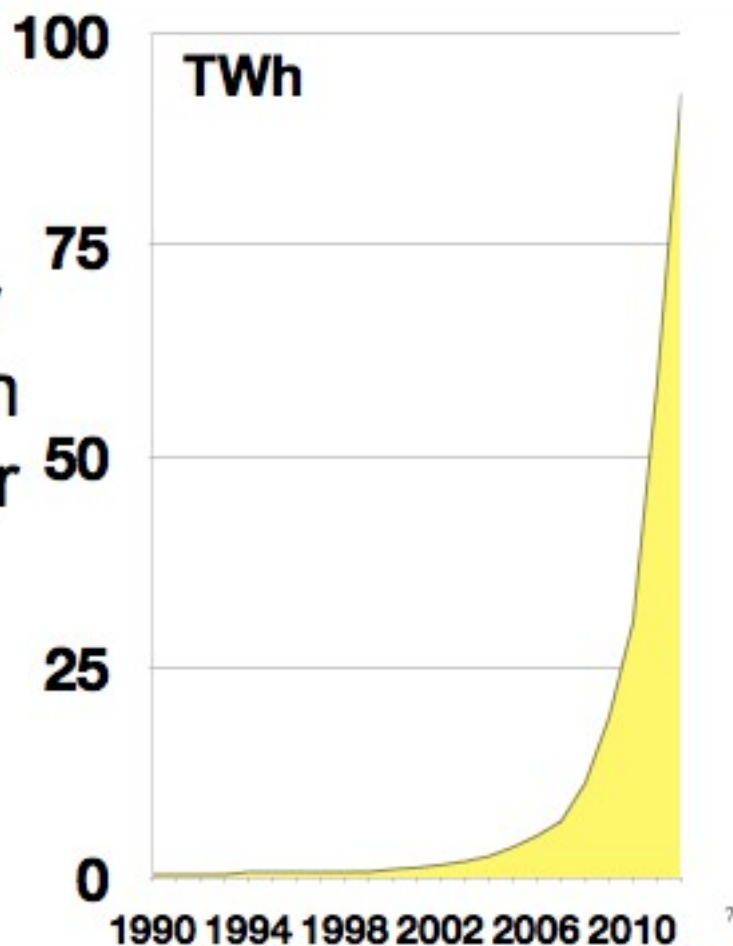
GW_p



Solar PV- installations leading countries GW

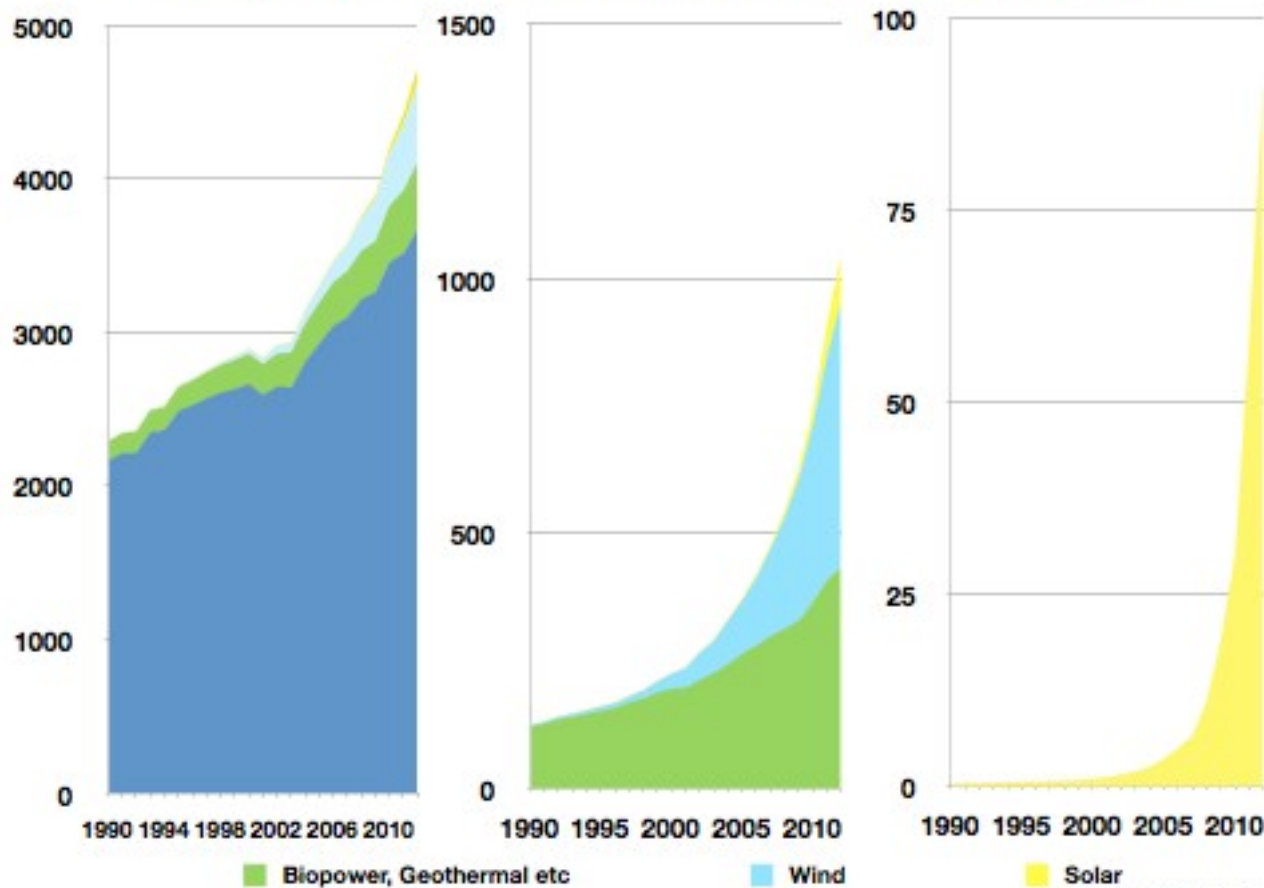


Global electricity production from Solar PV



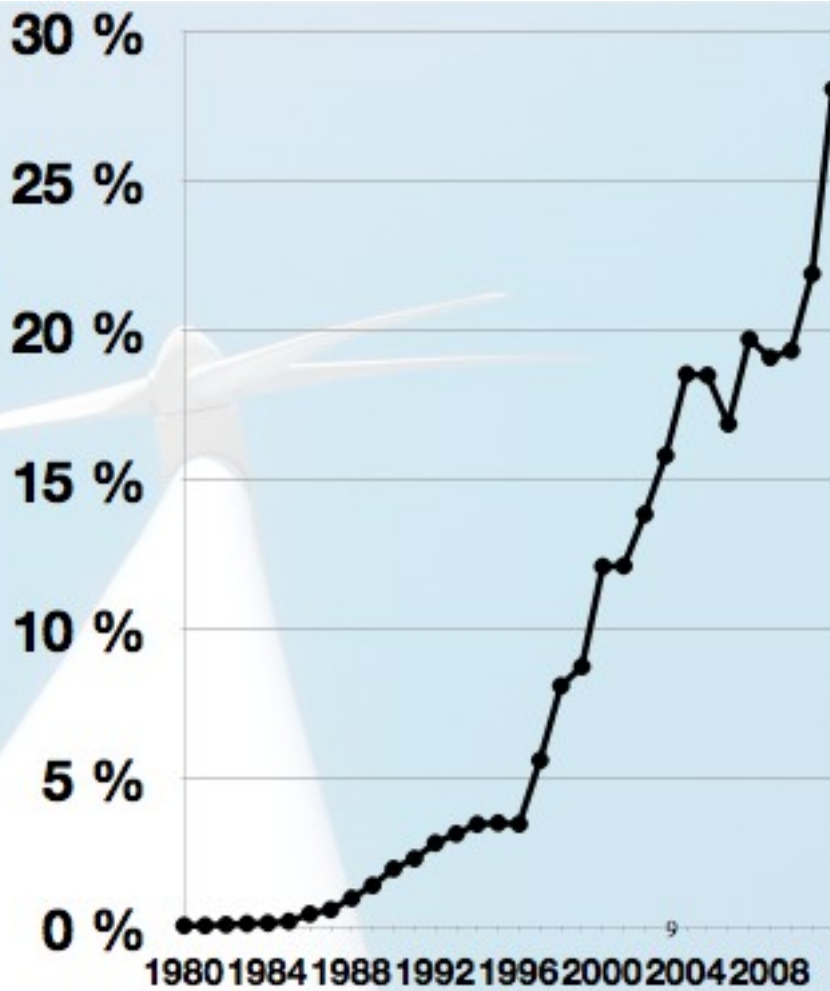
Data from BP Statistical Review 2013

Global Renewable Electricity Production, TWh



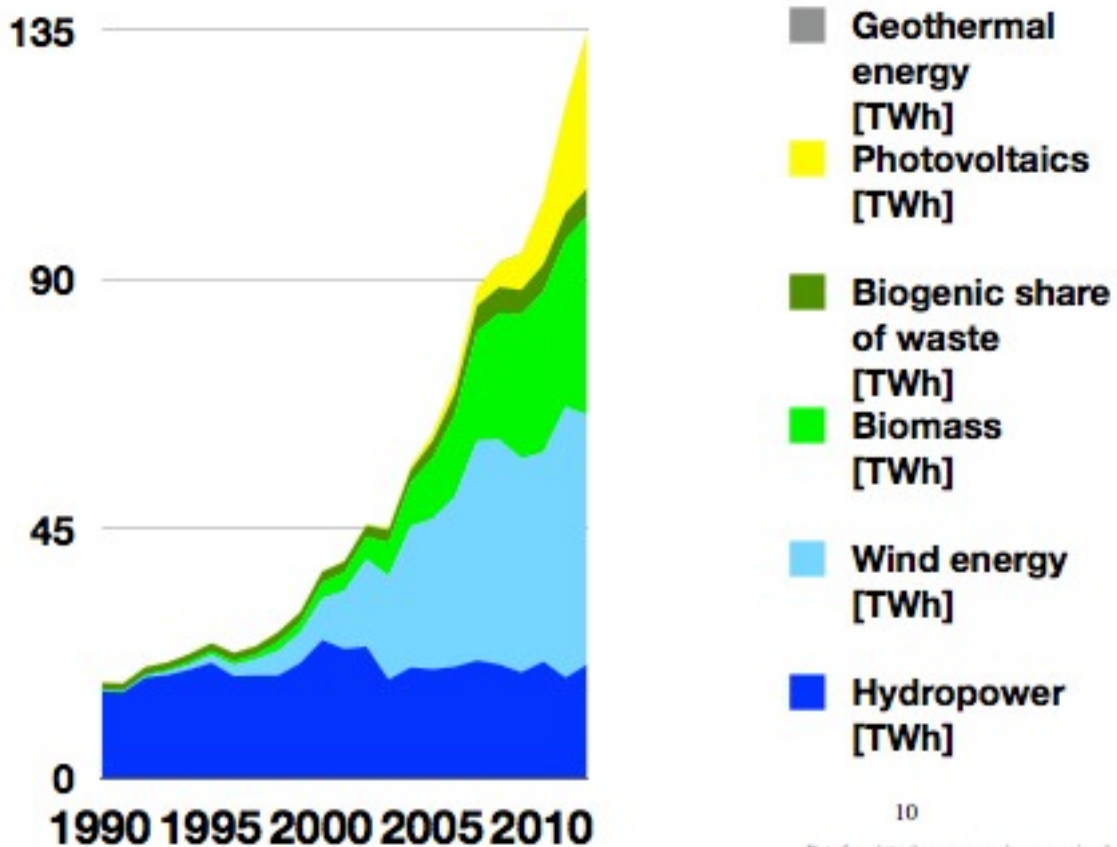
Data from BP Statistical Review 2013

Windpower in Denmark Share of total Electricity production 1980-2011



Data from Danish Energy Agency

German renewable electricity, TWh



August 8, 2013 6:12 pm

Renewables: A rising power

By Pilita Clark, Environment Correspondent

Plunging prices are finally making solar power competitive with conventional sources of energy



11

UBS: Boom in unsubsidised solar PV flags energy revolution

13

By Giles Parkinson on 23 January 2013

(ED: See also the second story from this report, [Why subsidy-free solar is a no brainer for households](#)).

 Print

The revolution in energy markets caused by the growing impact of rooftop solar PV is about to take a dramatic leap in scale.

According to analysts from the global investment banking giant UBS, the arrival of socket parity – where the cost of installing solar is cheaper than grid-sourced supplies – is about to cause a boom in un-subsidised solar installation in Europe, and the energy market may never be quite the same again.

12

US Wind Power Prices Down To \$0.04 Per kWh

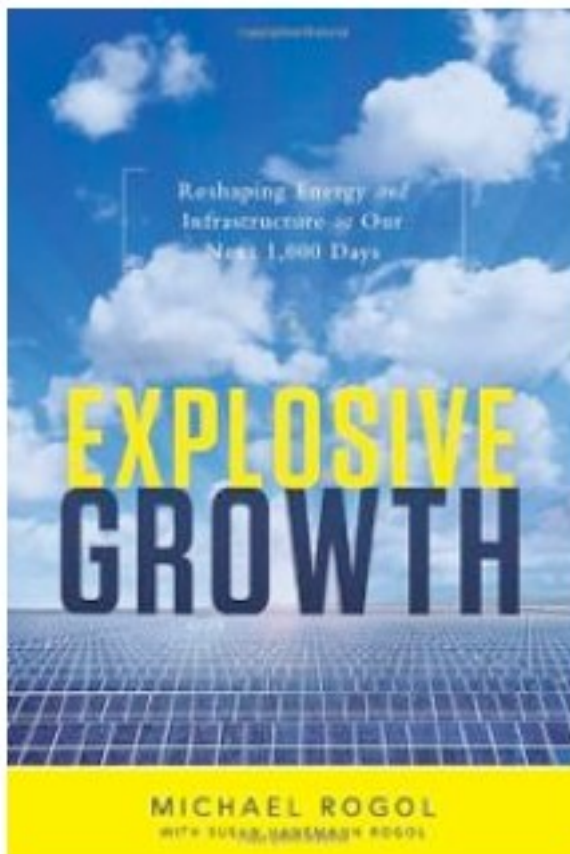
Print

rp repost

Anyone who tells you wind power is expensive is bad-shit crazy. Wind power is the cheapest option for new electricity generation in many if not most places in the world, including much of the US. That would indeed help to explain why the **US installed more wind power capacity** than power capacity from any other source in 2012, 42% (or 43%?) of all new power capacity in the country.



13



Negative network effects will transform the economics and operations of our infrastructure within 1,000 days. Are you prepared to benefit from the massive value creation that will come with game-changing shifts in energy and other industries? In this comprehensively researched economic analysis, noted consultant Michael Rogol shows how to rapidly build small and midsize companies into hundred-million-dollar enterprises within a thousand days. If you do not adjust to market conditions, you put your business at substantial risk including possible annihilation. The clock is ticking.

14

NRG Skirts Utilities Taking Solar Panels to U.S. Rooftop

By Christopher Martin & Naureen S. Malik - Mar 25, 2013 2:38 PM GMT+0100

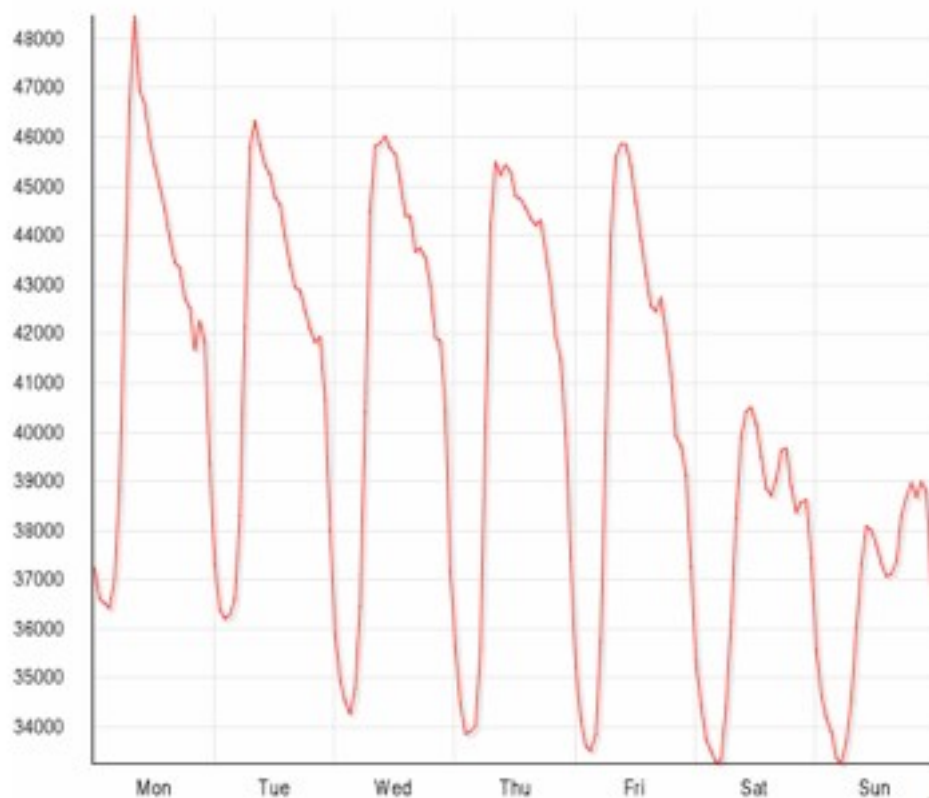


David Crane/Bloomberg

NRG Energy Inc. Chief Executive Officer David Crane said, consumers are realizing “they don’t need the power industry at all.”

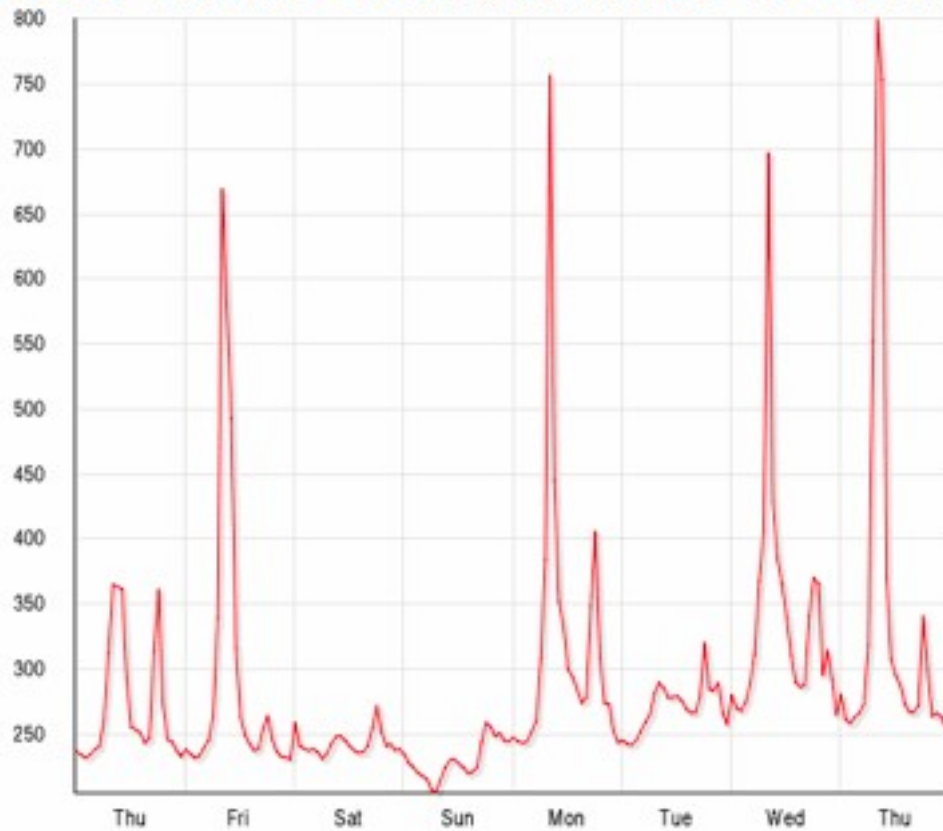
15

Electricity consumption in the Nordic countries last week



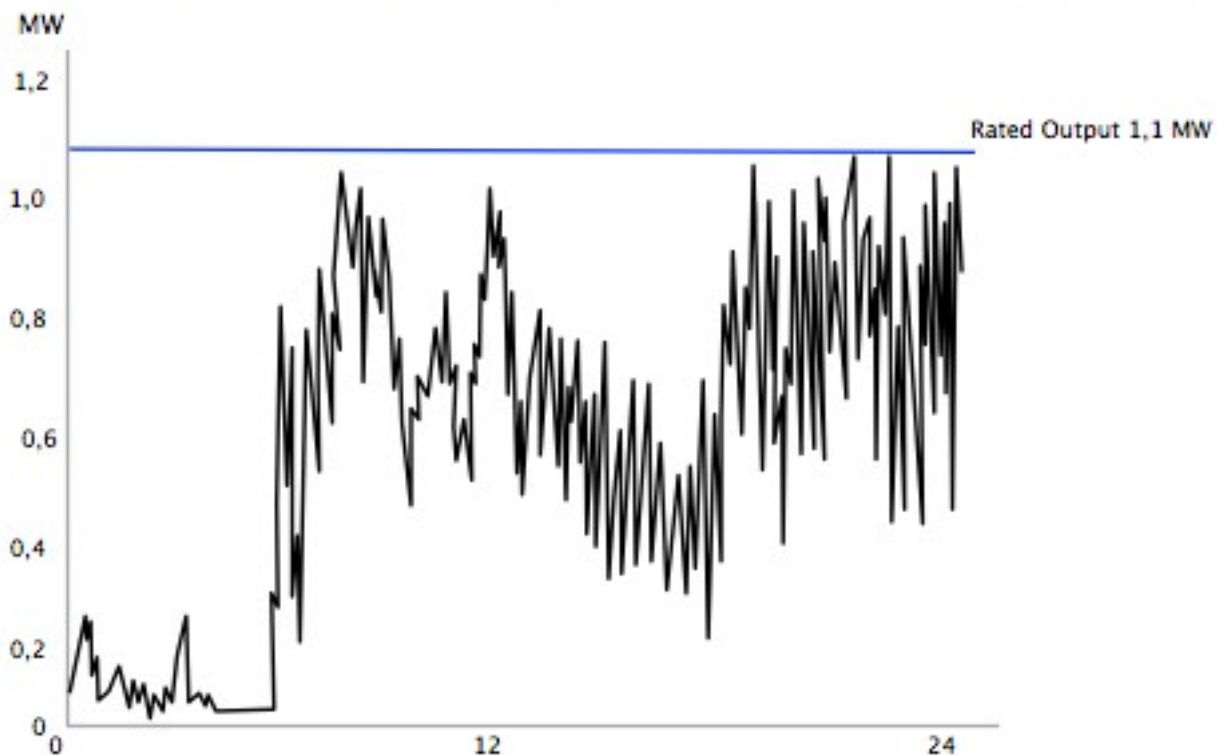
Data from Nordpool spot

Prices have sometimes been high



Data from Nordpool spot

Output Fluctuation of Wind Power Generation



Electricity price west Denmark 2012-12-25

Elspot prices

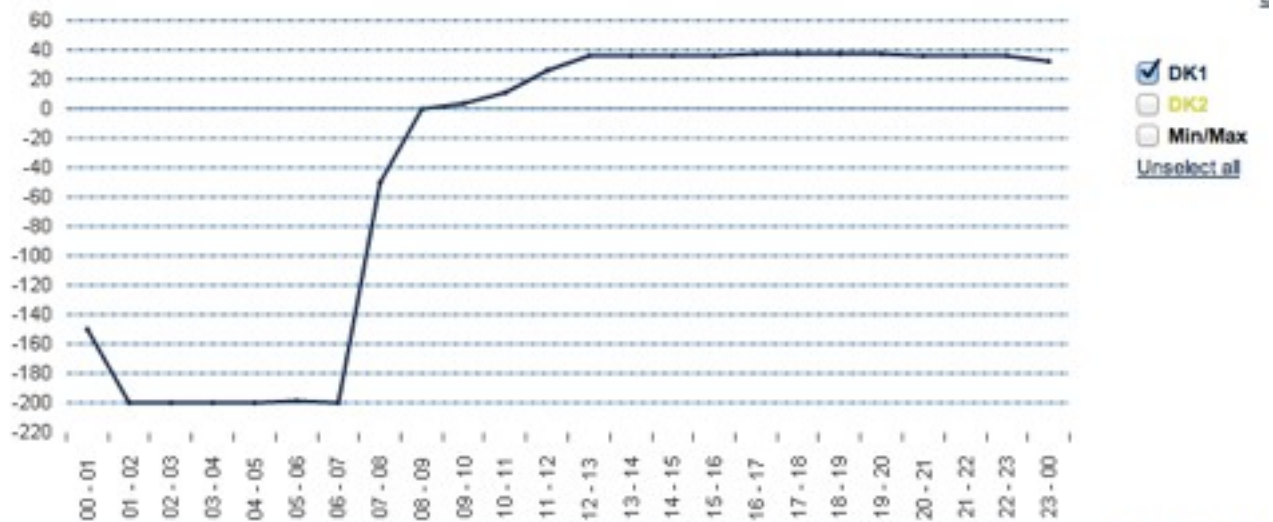
ALL SYS NO SE FI DK EE LT

Hourly Daily Weekly Monthly Yearly

25-12

- further details

EUR



from Nordpool spot

25-12-2012 Resolution Whole Day Currency EUR Capacities Flow Area Prices
ITVC ITVC

Elspot volumes

	Buy	Sell
NO1	129 731,9	73 545,0
NO2	98 079,2	125 422,2
NO3	60 773,6	24 547,7
NO4	49 950,9	66 949,1
NO5	42 448,6	30 724,0
DK1	37 272,5	77 317,6
DK2	30 916,1	40 817,3
SE1	33 798,7	61 108,1
SE2	45 458,7	100 476,9
SE3	249 221,9	248 926,5
SE4	61 668,6	31 504,4
FI	172 049,2	133 815,6
EE	7 066,7	8 734,8
ELE	7 301,2	1 848,6
LT	19 995,0	19 995,0



from Nordpool spot

Competing

- Transmission
- batteries
- electrofuels
- more and less electric heating

21

The economics of abundant solar- and wind-electricity

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