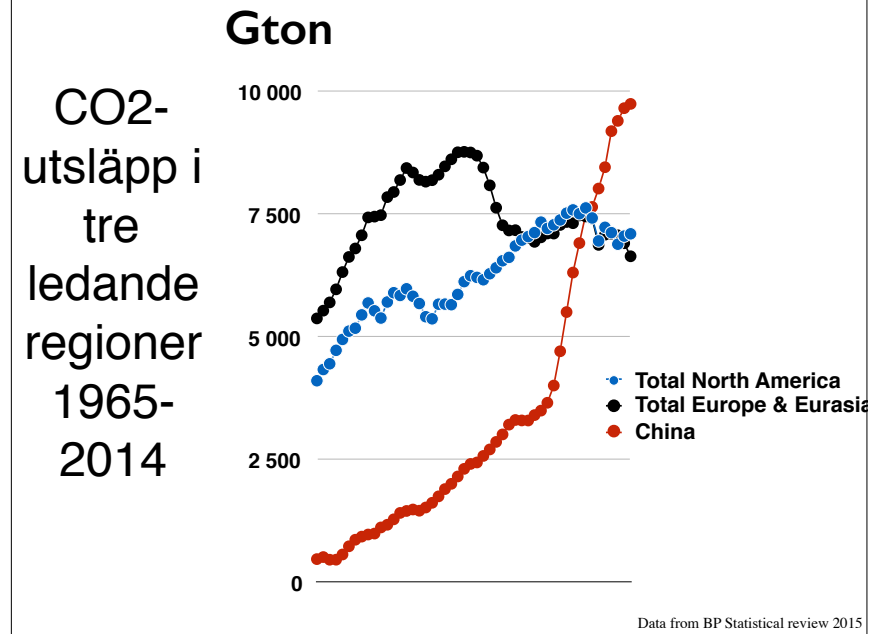


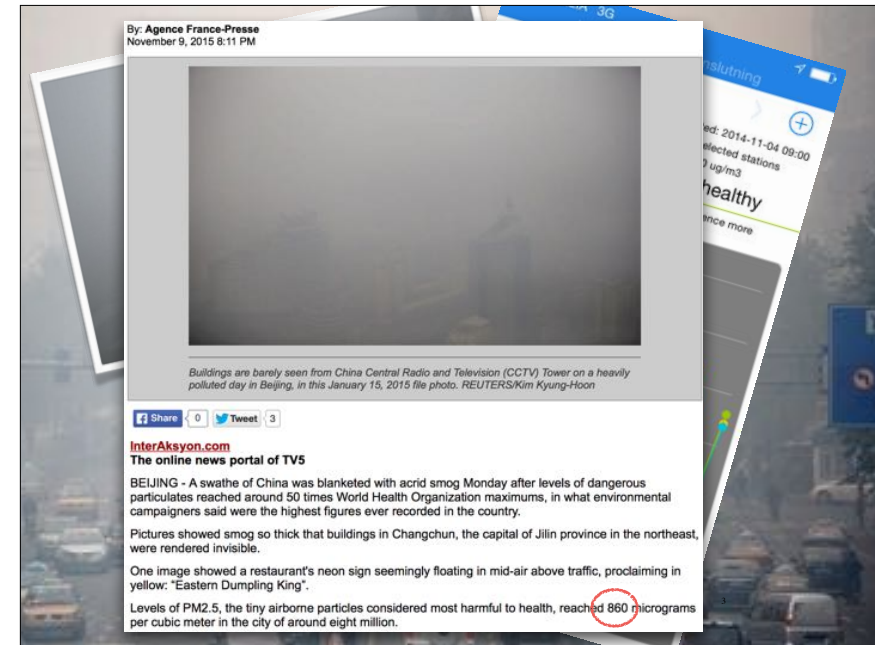
Vad händer i Energivärlden idag och imorgon?

Göteborg 2016-05-10

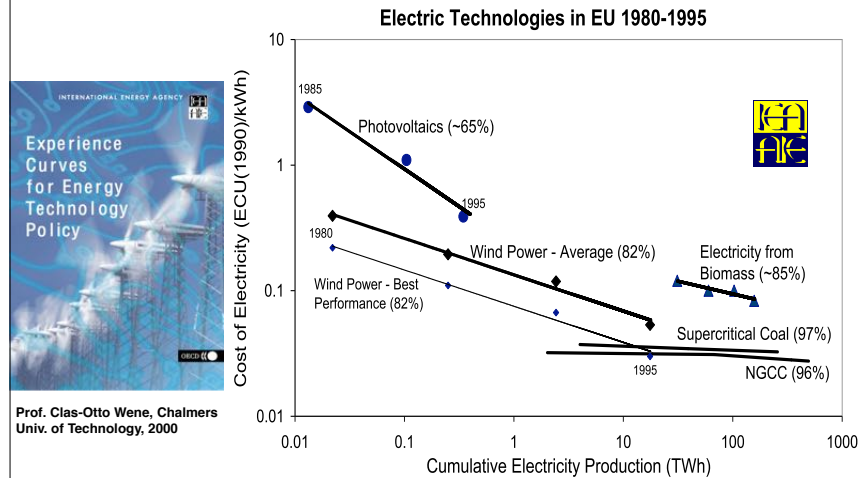
Tomas Kåberger

Professor, Chalmers University of Technology Energy Area of Advance
Executive board chair Renewable Energy Institute, Tokyo

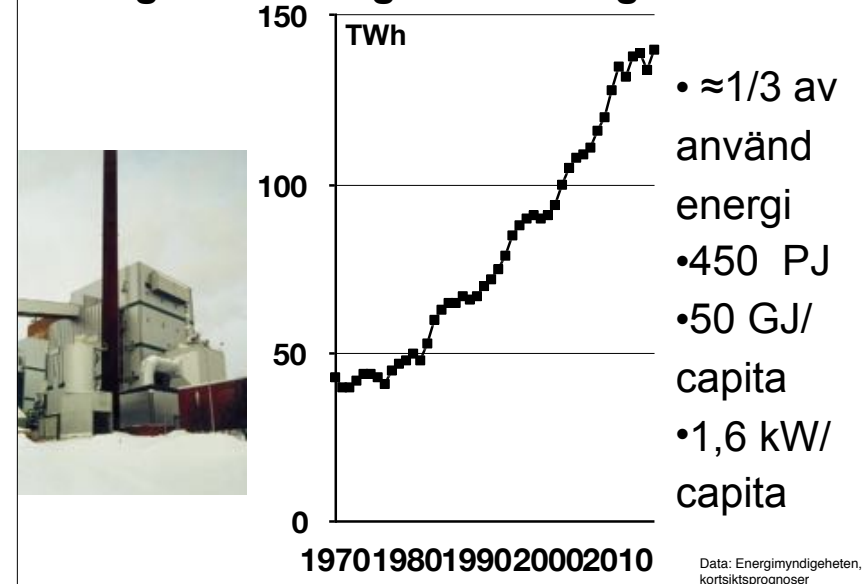




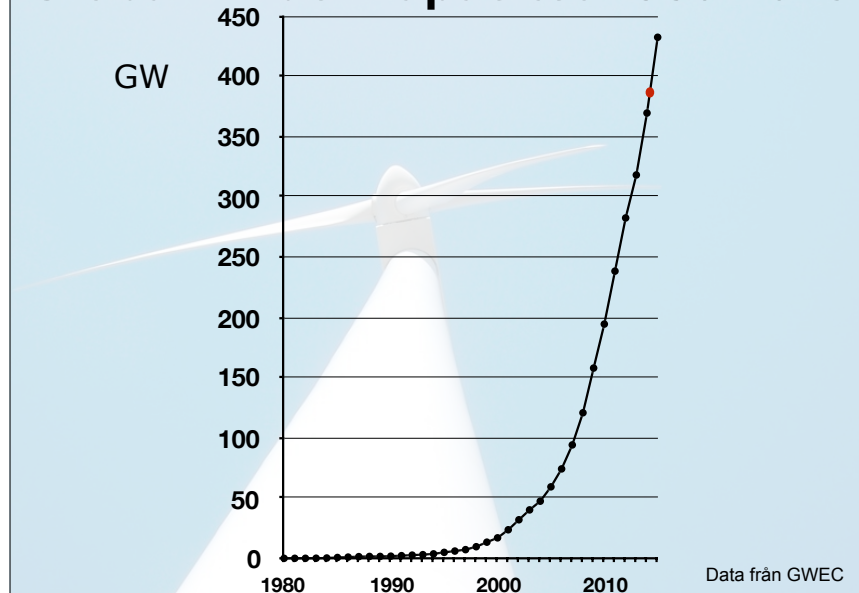
Industriell erfarenhet ger lägre kostnader



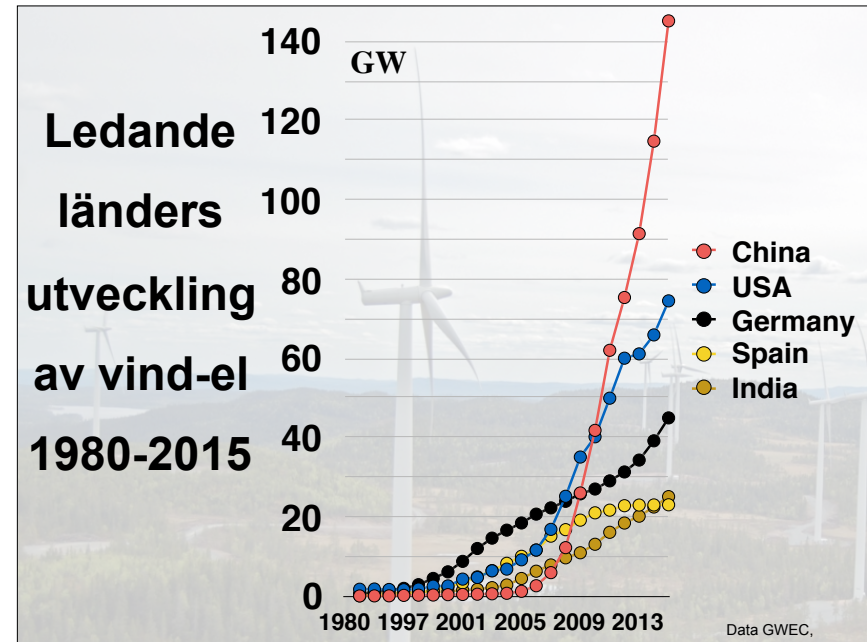
Sveriges Bioenergianvändning 1970-2015



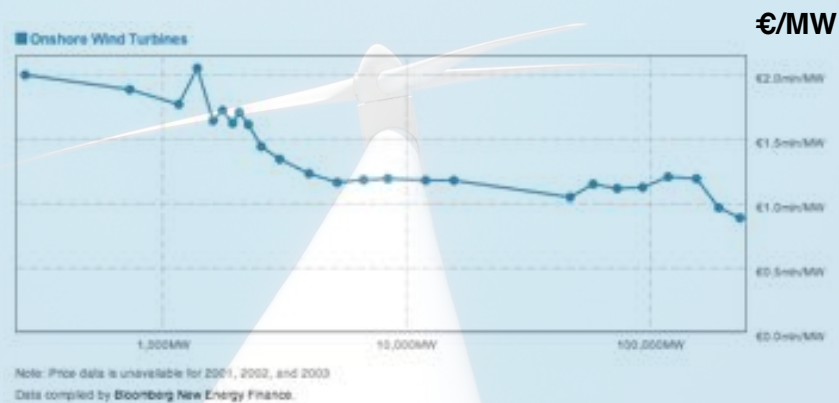
Global vindel-kapacitet 1980-2015



Ledande länders utveckling av vind-el 1980-2015

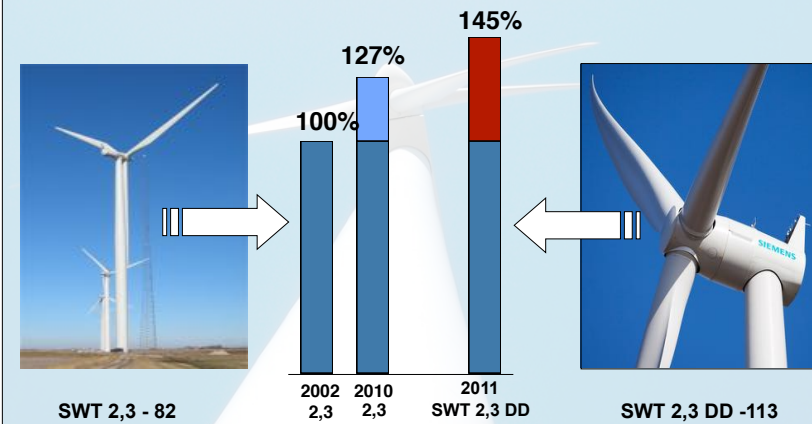


Experience of Onshore Wind Turbines



10

Electricity production @ 7,5 m/s



By courtesy

SIEMENS



12

2012
Average price of
new wind power
4 cent/kWh.

Taking into
account the
Production Tax
Credit, the price
was 6,2 cent/kWh
(43 öre/kWh)



13

2013
Average price of
new wind power
2,5 cent/kWh.

Taking into
account the
Production Tax
Credit, the price
was 4,7 cent/kWh



13

2014
Average price of
new wind power
2,35 cent/kWh.

Taking into
account the
Production Tax
Credit, the price
was 4,55 cent/kWh



2014 Wind Now Cost Competitive With Coal in India

By Katherine Tweed
Posted 23 Jul 2013 | 21:29 GMT

In India, the expiration of some federal incentives for renewable energy last year has not put a damper on the outlook for wind and solar power.

Wind power is now cost competitive with new coal-fired generation in India, according to a report from HSBC (<http://natgrp.files.wordpress.com/2013/07/india-renewables-good-bye-winter-hello-spring-hsbc-report.pdf>) [pdf]. Falling costs are just one reason for the increased interest in wind. For the first time, India has identified water as a scarce natural resource in its most recent five-year plan. Nearly 90 percent of India's industrial water demand comes from thermal power plants, according to the HSBC report.



August 2015

European utility says wind now cheapest form of generation

By Giles Parkinson

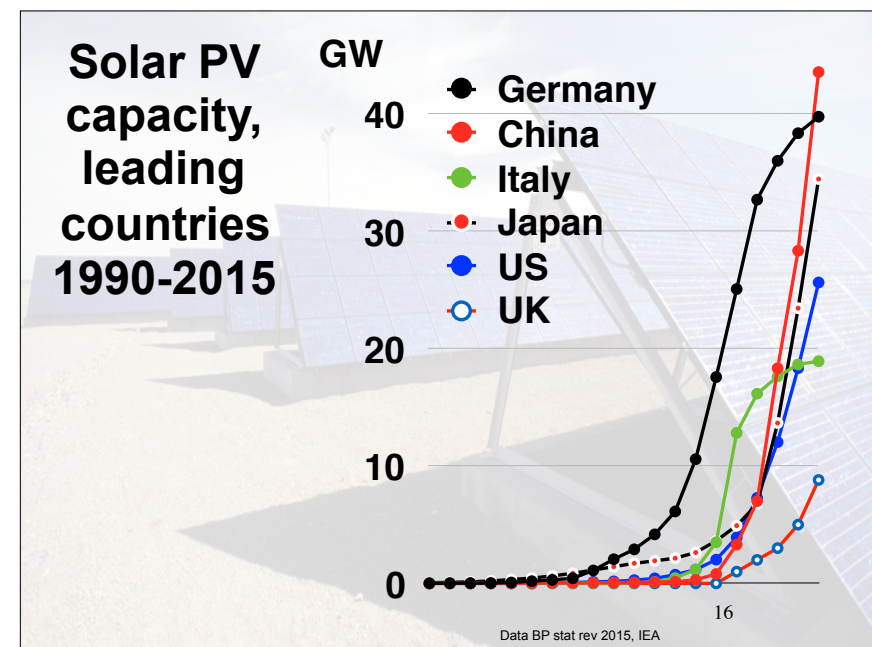
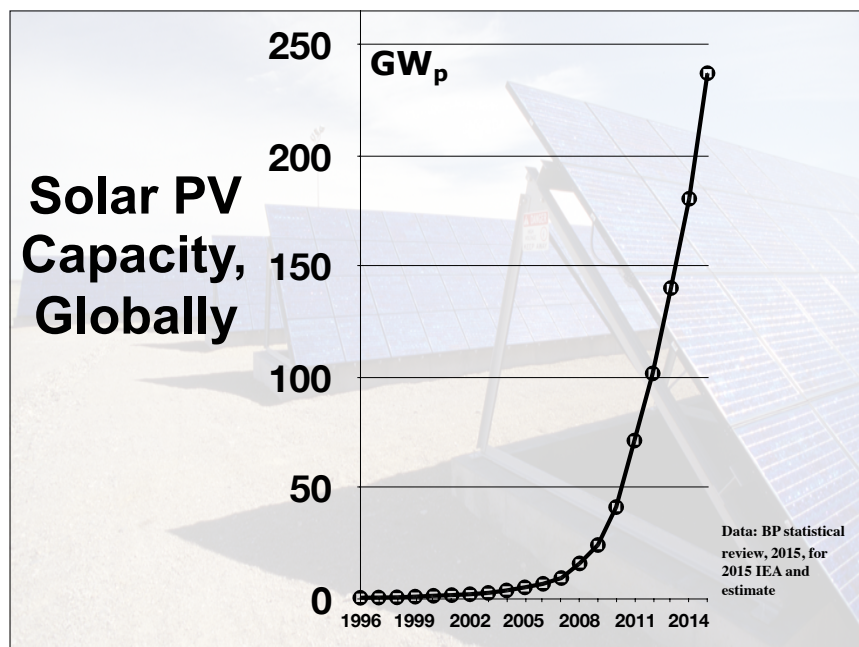
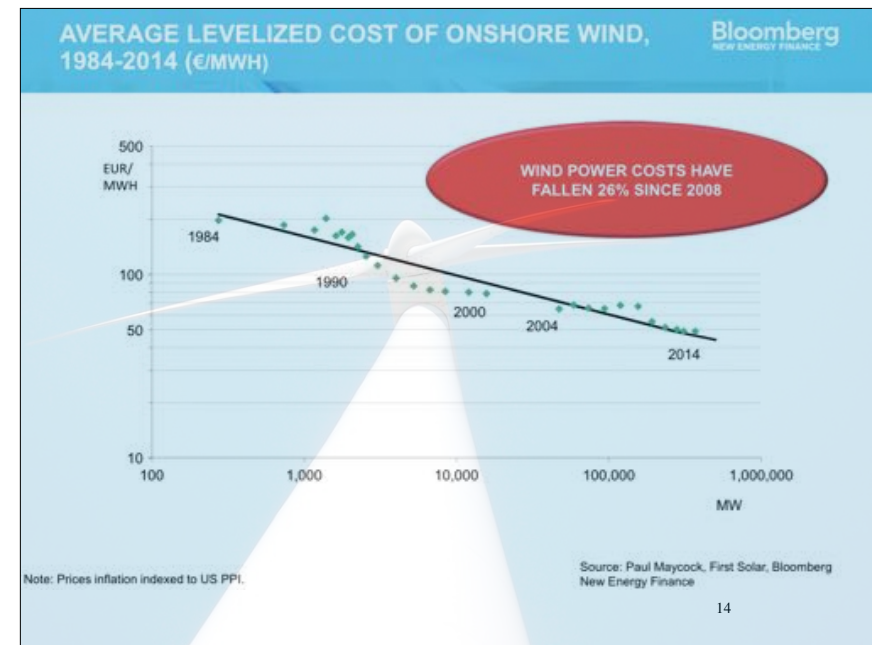
The falling cost of renewables is not news to those who have paid attention to analysis from green-focused think tanks, or groups like Bloomberg New Energy Finance. But it is when a major European utility, with equal exposure to fossil fuels, wind, and hydro, says that onshore wind is the cheapest of any new utility scale technology.

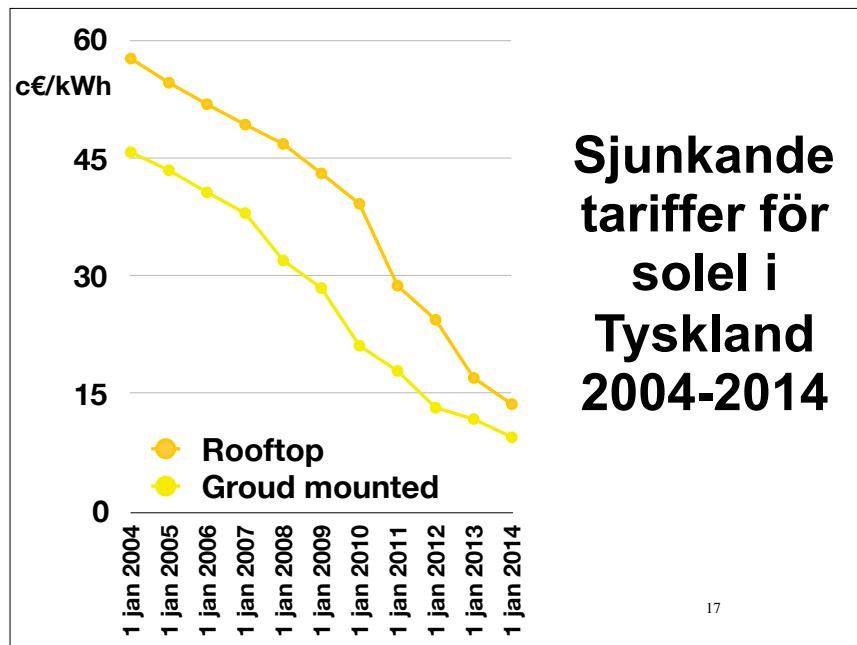
That is the assessment of Portugal's EDP, which has around 24GW of generation, of which around 8.7GW is in onshore wind.

In a recent presentation to analysts, EDP's head of renewables Joao Manso Neto presented this slide below, which shows that the levelised cost of electricity of onshore wind in Europe is 20 per cent cheaper than gas and one third cheaper than coal. (The figure assumes 25 per cent wind capacity factor).

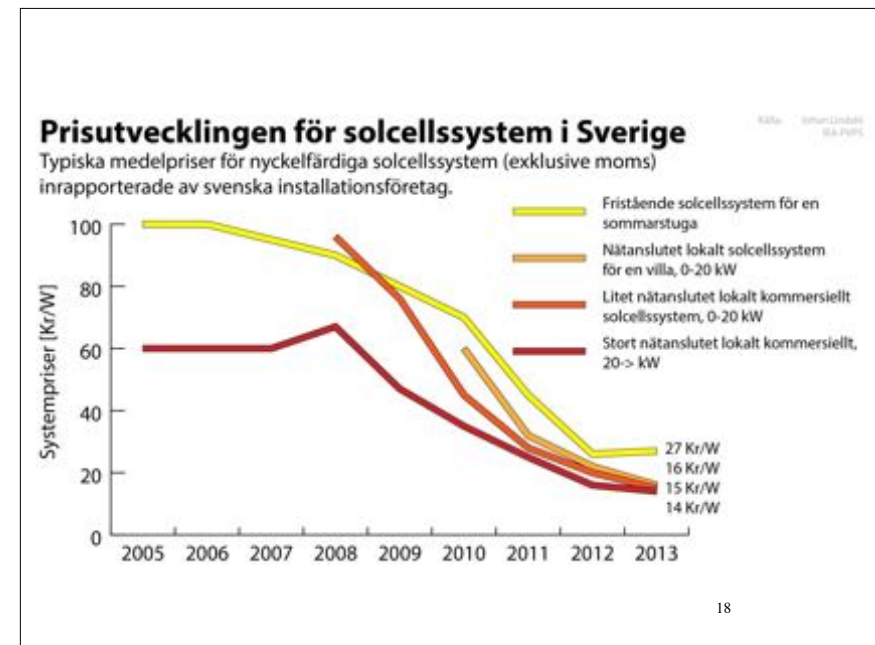
recent five-year
industrial water demand comes from
plants, according to the HSBC report.

August 2015





17



18



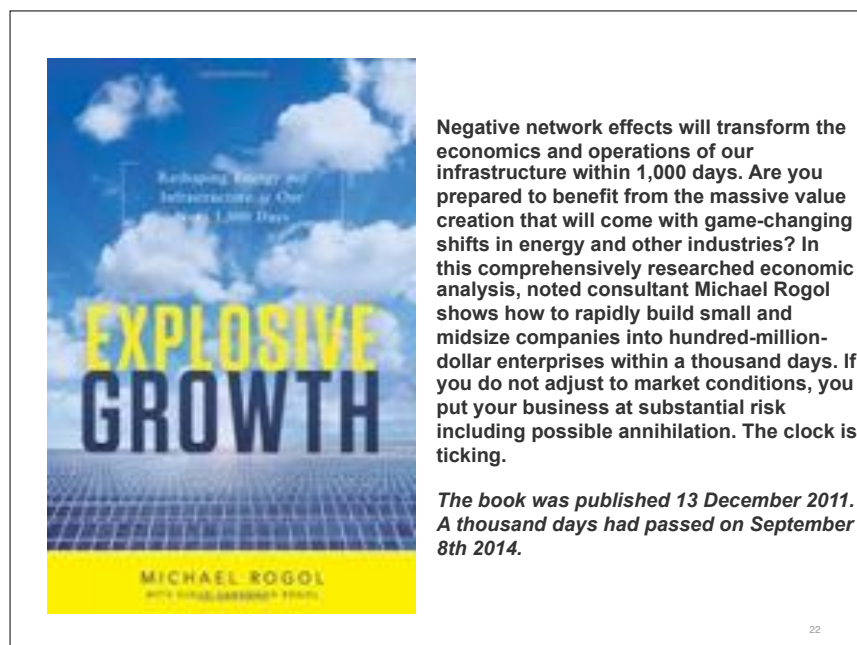


I Japan, läggs ett nytt solcellstak varannan minut!



I Bangladesh, läggs ett solcellssystem varje minut!





16

Brazil Brings In Low-Cost Solar Power (In Detail)

November 5th, 2014 by Anand Upadhyay

Last week Brazil entered the solar sector with a bang, after releasing contracts totalling 1048 MW spread over 31 solar parks. This would call for an investment of over \$1.66 billion. Most importantly, the average price of these solar projects was very low. In this piece, we take a look at the growth of solar power in Brazil and what might be in store for future.

A ceiling of \$106/MWh had been set on the solar electricity price. However, when the project developers started reverse bidding, the average price of electricity (for the 1048 MW worth of projects which will see the light of day, pun intended) came down to \$89/MWh. That's very low, lower than what fossil fuels or nuclear can offer.

89 USD/MWh ≈ 65 öre/kWh

Dubai Confirms 800 MW Expansion For Iconic Solar Power Project

April 27th, 2015 by Smriti Mittal

What do you think about this?

▲ Interesting 4 ▼ Not Interesting

The Dubai Electricity and Water Authority has initiated the third phase of its iconic Mohammed bin Rashid al Maktoum Solar Park.

The third phase of the solar park expansion will include a capacity addition of 800 MW. Dubai Electricity and Water Authority (DEWA) kick-started the tendering process for the expansion last week. The solar park will eventually be expanded to have an installed capacity of 3 GW.

The first phase of the solar park involved the installation of 13 MW capacity, and through the second phase tender, 100 MW capacity was famously auctioned to Saudi Arabia's ACWA. Power at record-low average tariff of 5.84¢/kWh. The capacity awarded to ACWA Power was subsequently doubled, while the debt financing deal for the second phase expansion has been closed and the capacity is expected to be commissioned by 2017.

the project W worth of at's very /kWh

Cheapest Solar Ever: Austin Energy Gets 1.2 Gigawatts of Solar Bids for Less Than 4 Cents

April 27th, 2015

Stephen Lacey June 30, 2015

"We expect to see prices out in the future that are possibly below \$20 a megawatt-hour."

A lot more cheap solar is coming for Austin, Texas.

The city's utility, Austin Energy, just released new data on developer bids for PV projects as part of a 600-megawatt procurement. The numbers show how far solar prices have come down over the last year -- and will continue to drop.

According to Khalil Shalabi, Austin Energy's vice president of resource planning, the utility received offers for 7,976 megawatts of projects after issuing a request for bids in

the project W worth of at's very /kWh

BloombergBusiness News Markets Insights Video

Solar Energy Is Cheapest Source of Power in Chile, Deutsche Says

by Vanessa Dezem November 4, 2015 - 10:13 PM CET

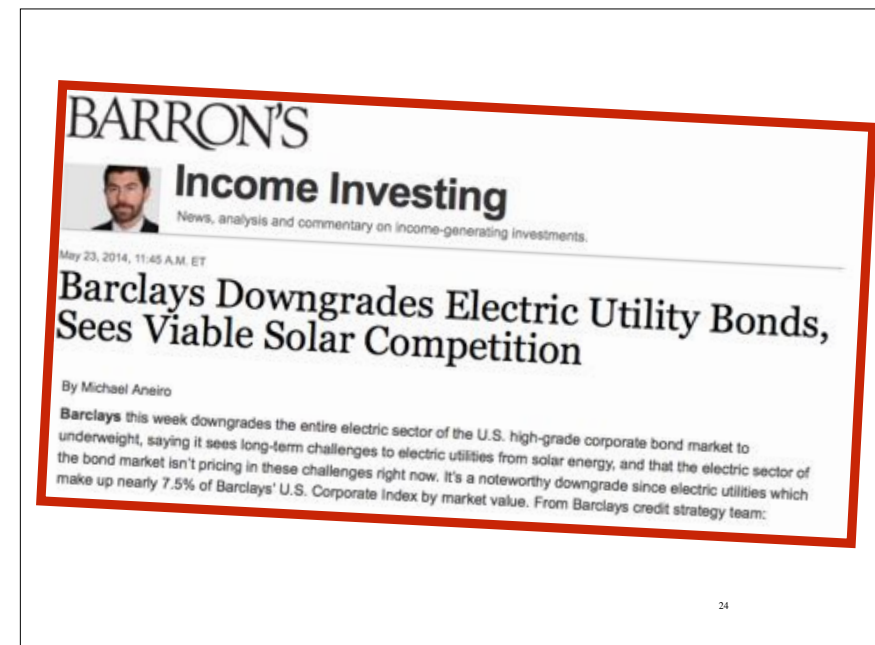
Three solar farms offered to sell power for \$65 to \$68 a megawatt-hour in the auction, Shah said. Two wind farms bid \$79 a megawatt-hour, and a solar-thermal plant with storage offered power at \$97. Coal power was offered for \$85 in the same event.

Country expected to install 1 gigawatt of solar this year

Solar and wind offered lowest prices in October energy auction

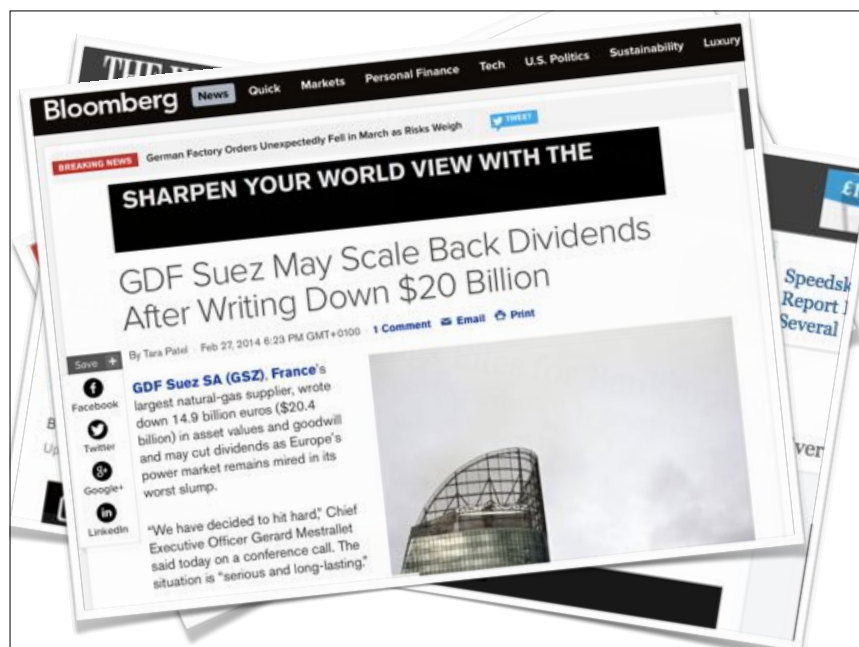
Solar power is now the cheapest source of electricity in Chile, according to Deutsche Bank AG.

the project W worth of at's very /kWh



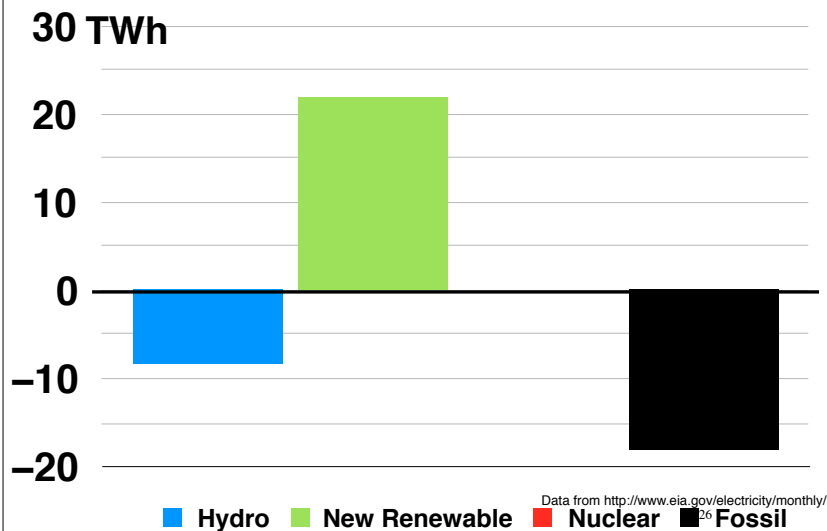


25

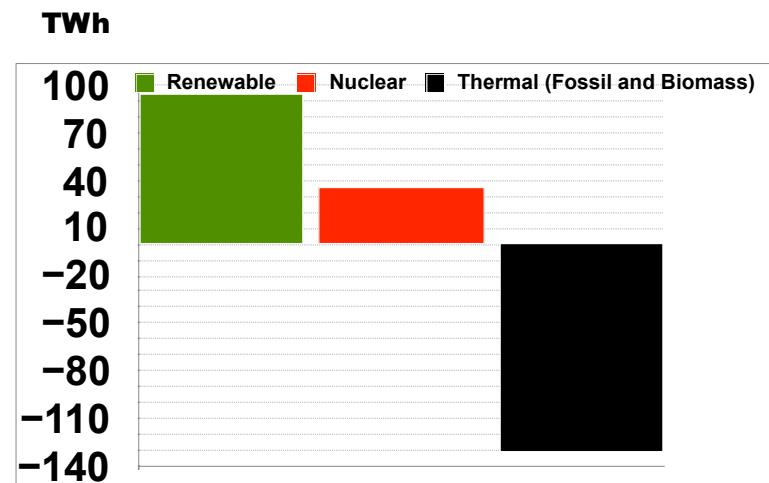


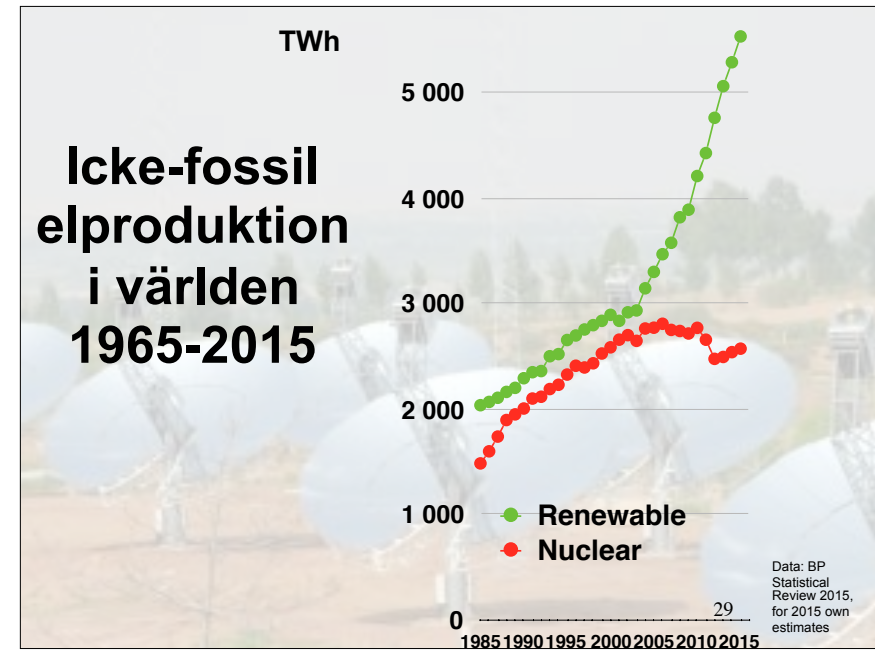
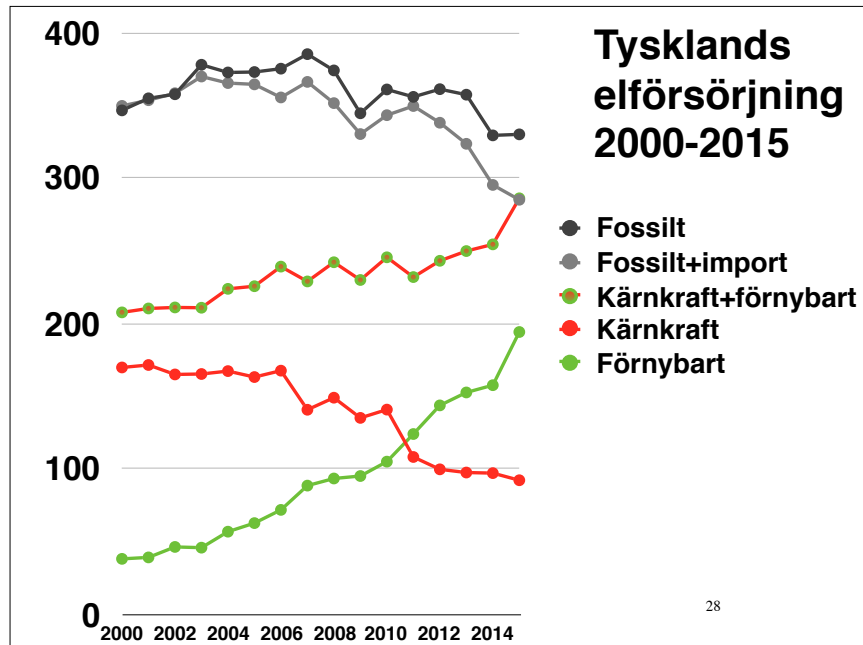


Change in US electricity generation 2014 to 2015



Increased electricity production 2014-2015 in China





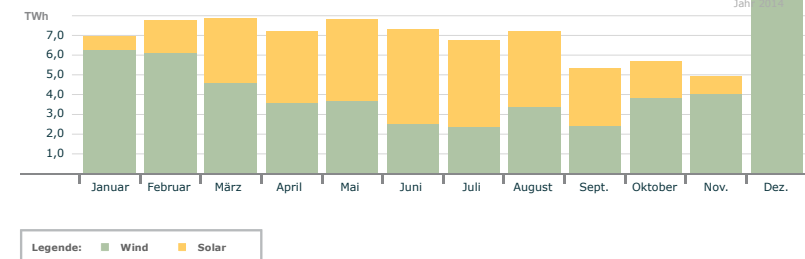
Dåliga invändningar

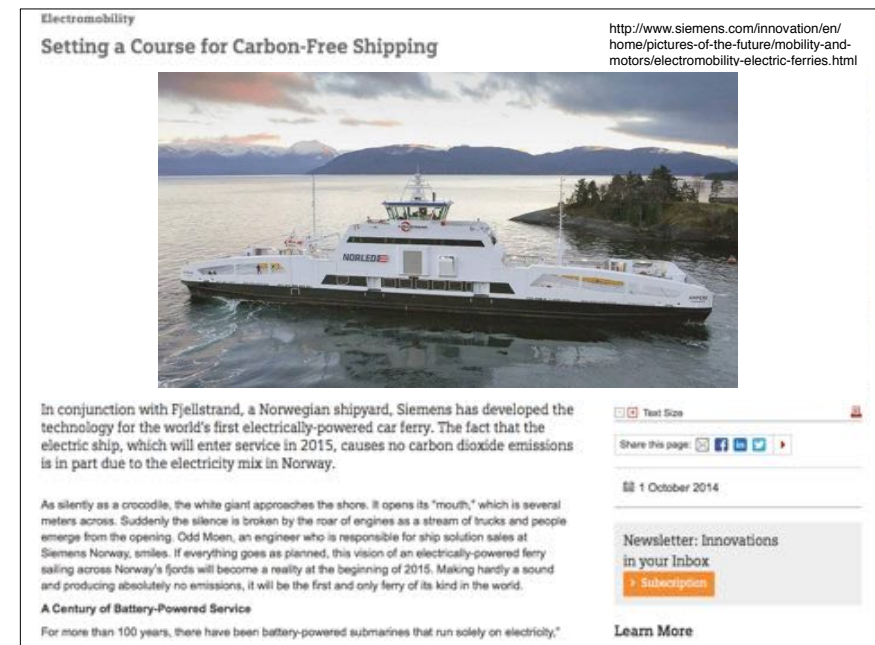
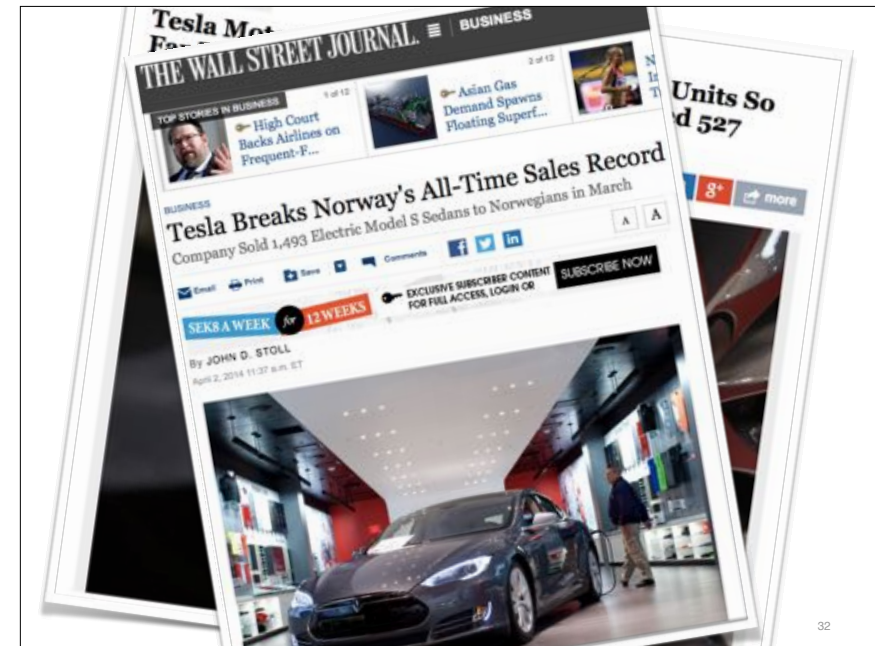
- Subventionsberoende...
- Intermittent...
- Bas kraft...
- Nätinvesteringar...

30

Monatliche Produktion Solar und Wind

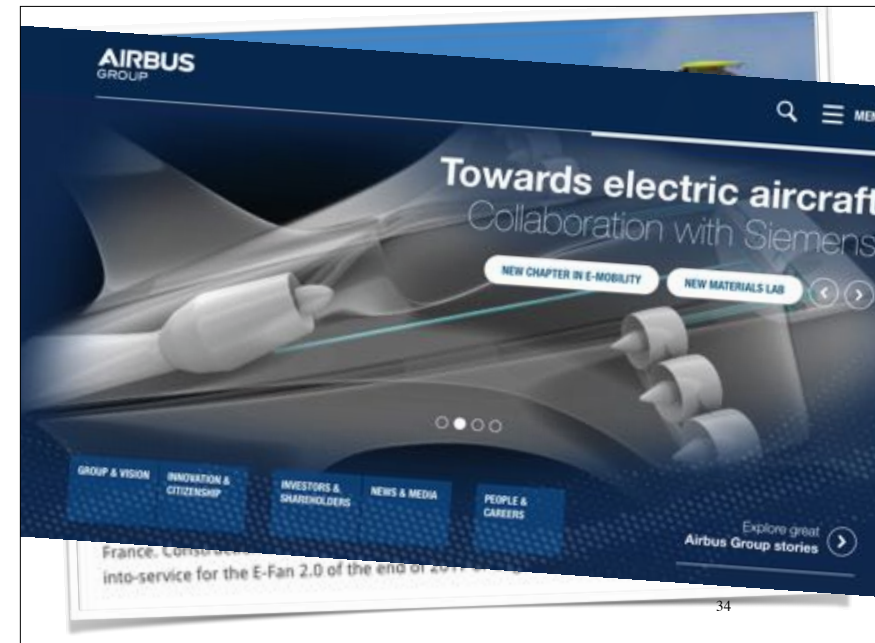
Monatliche Produktion Solar und Wind



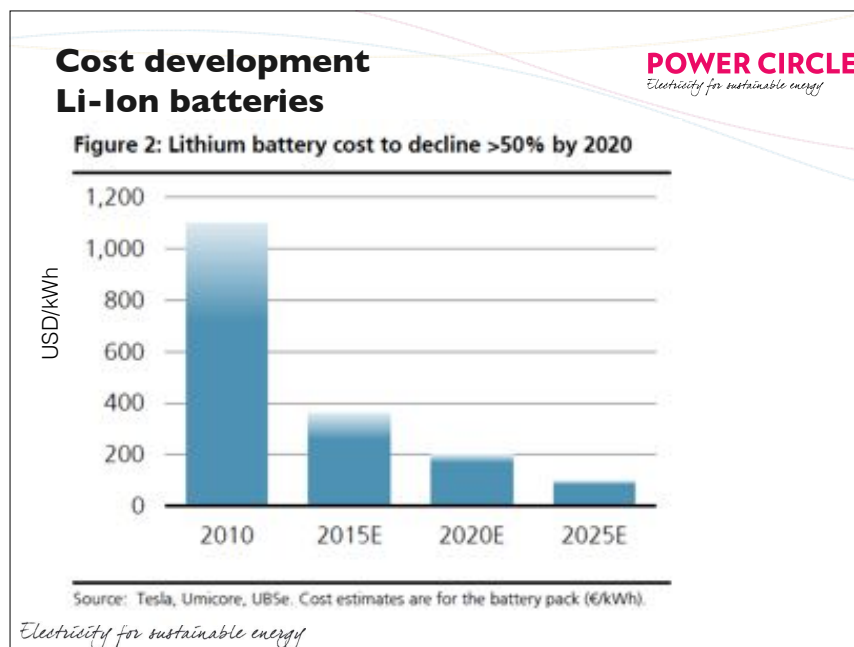




34



34



Specs

Technology
Wall mounted, rechargeable lithium ion battery with liquid thermal control.

Models
10 kWh \$3,500
For backup applications
7 kWh \$3,000
For daily cycle applications

Warranty
Ten year warranty with an optional ten year extension.

Efficiency
92% round-trip DC efficiency

Power
2.0 kW continuous, 3.3 kW peak

Voltage
350 – 450 volts

Current
5 amp nominal, 8.5 amp peak output

Compatibility
Single phase and three phase utility grid compatible.

Operating Temperature
-4°F to 110°F / -20°C to 43°C

Enclosure
Rated for indoor and outdoor installation.

Installation
Requires installation by a trained electrician. AC-DC inverter not included.

Weight
220 lbs / 100 kg

Dimensions
51.2" x 33.9" x 7.1"
130 cm x 86 cm x 18 cm

Certifications
UL listed

36

38,000 Tesla Powerwall Reservations In Under A Week!

May 7th, 2015 by Zachary Shahan

One of the huge pieces of news coming out of Tesla's conference call last night was that 38,000 reservations have been made for Tesla's Powerwall.

This has apparently even blown Tesla away, and looks to mean that Tesla is sold out through the middle of 2016. I don't think anyone can put it in better words than Tesla CEO and Product Architect Elon Musk himself, so here's a transcript from that portion of the conference call:

"The response has been overwhelming. Okay... like, crazy."

"In the course of less than a week, we've had 38,000 reservations for the Powerwall, 2,500 reservations for the Powerpack. The Powerpack, it should be noted, typically — this is bought by utilities or large industrial companies, for heavy industrial work. Typically, Powerpack, it's like at least 10 Powerpacks per installation, so if there's 2,500 reservations, there's actually 25,000 Powerpacks."

"Powerwall also, we suspect, is probably an average number of Powerpacks is probably 1½ to 2 per installation. So, you know, so, 30,000 reservations is more like 50,000 or 60,000 actual Powerwalls."

"I mean, there's like no way that we could possibly satisfy this demand this year. And we're basically, like, sold out through the middle of next year... in the first week. It's crazy."

36

38,000 Tesla Powerwall Reservations In Under A Week! Can Tesla's Battery Hit \$1 Billion Faster Than the iPhone?

May 7th, 2015 by

One of the huge pieces of news coming out of Tesla's conference call last night was that 38,000 reservations have been made for Tesla's Powerwall.

This has apparently even blown Tesla away, and looks to mean that Tesla is sold out through the middle of 2016. I don't think anyone can put it in better words than Tesla CEO and Product Architect Elon Musk himself, so here's a transcript from that portion of the conference call:

"The response has been overwhelming. Okay... like, crazy."

"In the course of less than a week, we've had 38,000 reservations for the Powerwall, 2,500 reservations for the Powerpack. The Powerpack, it should be noted, typically — this is bought by utilities or large industrial companies, for heavy industrial work. Typically, Powerpack, it's like at least 10 Powerpacks per installation, so if there's 2,500 reservations, there's actually 25,000 Powerpacks."

"Powerwall also, we suspect, is probably an average number of Powerpacks is probably 1½ to 2 per installation. So, you know, so, 30,000 reservations is more like 50,000 or 60,000 actual Powerwalls."

"I mean, there's like no way that we could possibly satisfy this demand this year. And we're basically, like, sold out through the middle of next year... in the first week. It's crazy."



36

<http://www.bloomberg.com/news/articles/2015-06-03/at-opec-the-saudi-oil-minister-mainly-wants-to-discuss-solar-power>

At OPEC the Saudi Oil Minister Mainly Wants to Discuss Solar Power

What does it say about oil when Saudi Arabia embraces solar?

by Timothy Coulter and Ryan Chilcote

June 3, 2015 — 6:15 PM CEST



Everybody wants to know what the oil minister for Saudi Arabia thinks. These days, it's all about solar power.

37

By AMY HARDER And LYNN COOK

162 COMMENTS

Updated Dec. 16, 2015 10:38 a.m. ET

WASHINGTON—In a move considered unthinkable even a few months ago, congressional leaders have agreed to lift the nation's 40-year-old ban on oil exports, a historic action that reflects political and economic shifts driven by a boom in U.S. oil drilling.

The measure allowing oil exports is at the center of a deal congressional leaders announced early Wednesday on spending and tax legislation. Both the House and Senate still must pass it and President Barack Obama must sign it into law.

The deal would lift the ban, a priority for Republicans and the oil industry, and at the same time adopt environmental and renewable measures that Democrats sought. These include extending and then phasing down wind and solar-tax credits; reauthorizing for three years a conservation fund; and excluding any measures that block major Obama administration environmental regulations.

38

Fossil Fuels Just Lost the Race Against Renewables

This is the beginning of the end.



by
Tom Randall

10:27 PM CEST
April 14, 2015



The race for renewable energy has passed a turning point. The world is now adding more capacity for renewable power each year than coal, natural gas, and oil combined. And there's no going back.

The shift occurred in 2013, when the world added 143 gigawatts of renewable electricity capacity, compared with 141 gigawatts in new plants that burn fossil fuels, according to an analysis presented Tuesday at the Bloomberg New Energy Finance annual summit in New York. The shift will continue to accelerate, and by 2030 more than four times as much renewable capacity will be added.

Vad händer i Energivärlden idag och imorgon?

Göteborg 2016-05-10

Tomas Kåberger

**Professor, Chalmers University of Technology Energy Area of Advance
Executive board chair Renewable Energy Institute, Tokyo**