

A decade of expansion ahead

Winter Wind 2020-01-31

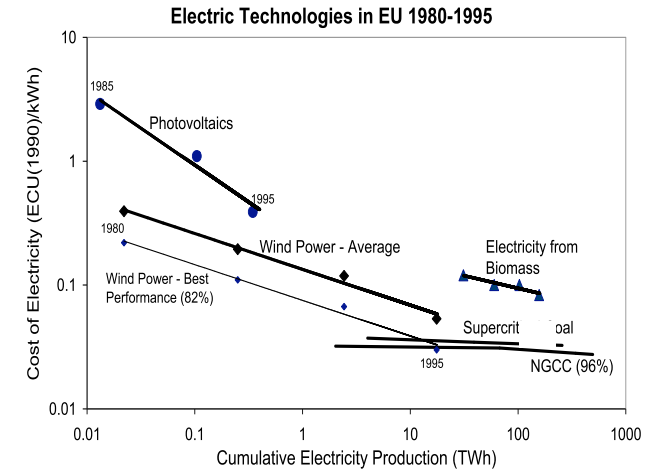
Tomas Käberger

Executive Board Chair of Renewable Energy Institute, Tokyo
 Affiliate professor Chalmers University of Technology
 Industrial Growth Executive InnoEnergy
 Executive Board Chair Renewable Energy Institute
 Member of the Swedish Climate Policy Council
 Member of the Swedish Royal Academy of Engineering Sciences

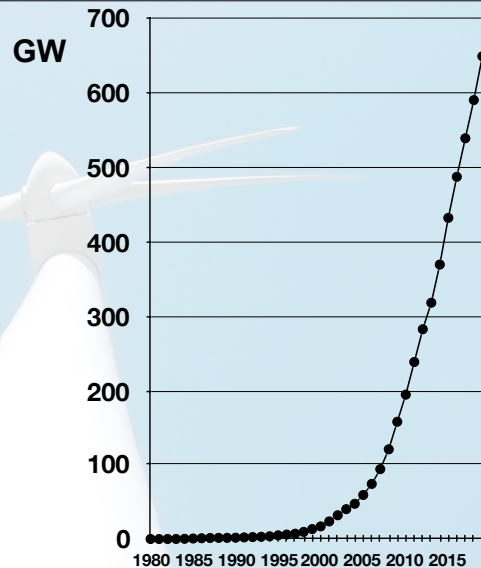
Industrial learning by experience



Prof. Clas-Otto Wene, Chalmers Univ. of Technology, 2000

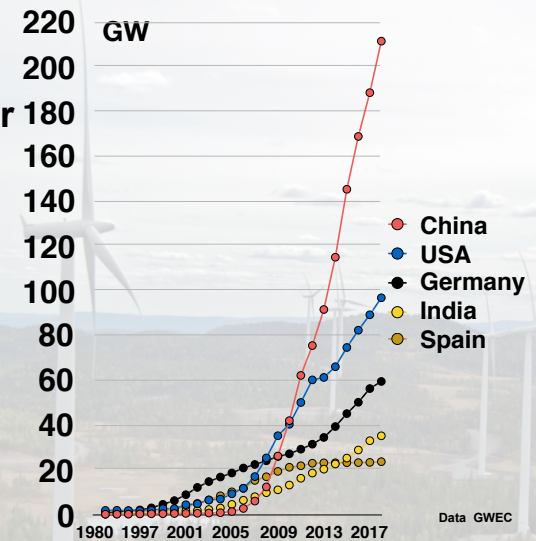


Global Wind power capacity 1980-2019



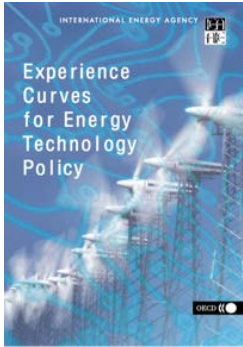
Data: GWEC, 2019 (2019 inspired guess)

Wind power capacity leading countries 1980-2018

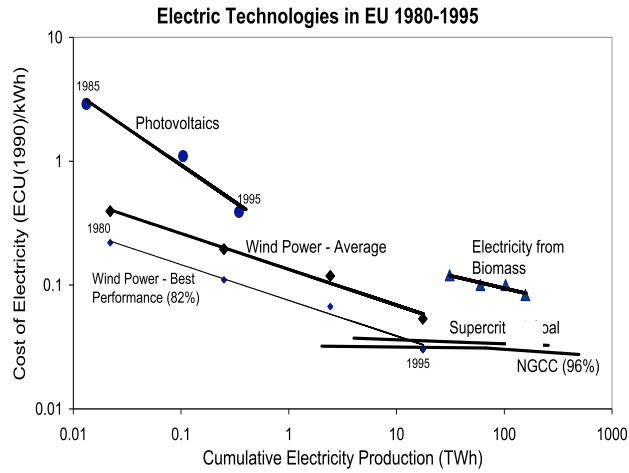


Data GWEC

Industrial learning by experience



Prof. Clas-Otto Wene, Chalmers Univ. of Technology, 2000



New low for wind energy costs: Morocco tender averages \$US30/MWh

By Giles Parkinson on 17 January 2016

The north African country of Morocco has achieved a new low for wind energy costs, securing average bids of just \$US30/MWh from its tender for 850MW tender of large-scale wind energy projects, with the lowest at around \$US25/MWh.

The pricing – revealed by its energy ministry at a ministerial round table at the International Renewable Energy summit in Abu Dhabi on Saturday – sets a new low for wind energy pricing in the world, and is boosted by the remarkable wind energy resource sourced from Atlantic trade winds, and some concessional finance.

Abderrahim El Hafidi, vice minister of energy and environment, described the result as “extraordinary” and “amazing” and said it pointed to a “real revolution” in the means of producing energy. Some bids in the US have been in and around \$US25/MWh, although these have been boosted by a 30 per cent production tax credit.



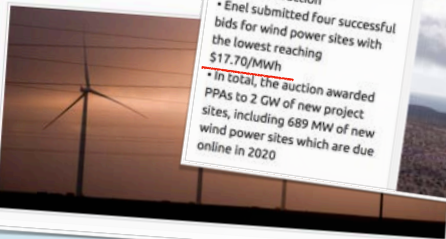
New low for wind energy Morocco tender averages

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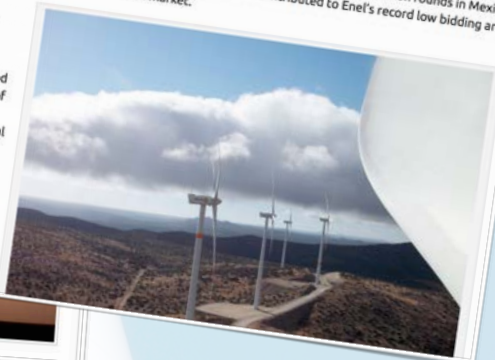
Enel sets a new world wind record in Mexico, below \$18/MWh

November 29, 2017 Paul Dvorak - 0 Comments

This Flash Note from [Make Consulting](#) examines the results of Mexico's third long-term power auction held in November 2017. The note evaluates the event and its bidding within the context of previous auction rounds in Mexico as well as within the Latin American region. It analyses the dynamics that contributed to Enel's record low bidding and positions dynamics that favor low bidding in the Mexican market.

Key points:

- Mexico hosted a long-term power auction in November 2017 which awarded offtake agreements to wind power and PV projects totaling 5.5 TWh of annual production
- Enel submitted four successful bids for wind power sites with the lowest reaching \$17.70/MWh
- In total, the auction awarded PPAs to 2 GW of new project sites, including 689 MW of new wind power sites which are due online in 2020



Offshore wind costs hit record low

1k Shares



Published on 06/07/2016, 10:57am

Two 350MW arrays in the Netherlands will supply power at €87/MWh, beating the next cheapest project by miles

By Megan Darby

Dong Energy has set a record low price for offshore wind power in a winning bid to build two arrays off the coast of the Netherlands.

The Danish company committed to supply electricity at €72.70/MWh (US\$80.40), not including transmission costs. The cables will add about €14/MWh, experts say.

That beats an industry goal of bringing costs below €100/MWh by 2020. The closest any rival had previously come was €103/MWh by Vattenfall in Denmark last year.

“It was a result that was well beyond anyone's expectations,” said Oliver Joy, spokesperson for the European Wind Energy Association.

Offshore wind record low

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Published on 06/07/2016, 10:57am

Two 350MW arrays in the North Sea, heating by miles

By Megan Darby

Dong Energy has set a new record for wind power in a winning bid on the coast of the Netherlands.

The Danish company comes in at €72.70/MWh (US\$80.40), a new low for the industry. The cables will add to the cost.

That beats an industry average of €100/MWh by 2020. The current average is €103/MWh per year.

"It was a result that went far below expectations," said Olof Johansson, CEO of European Wind Energy.

New record for cheapest offshore wind farm

share



The costs of offshore wind have fallen significantly in recent years

CREDIT: BLOOMBERG

By Emily Gosden, ENERGY EDITOR

14 SEPTEMBER 2016 • 7:35AM

The cost of building offshore wind farms has fallen to a new low, with Sweden's Vattenfall winning contracts to build two projects in Danish waters for just over €60 (£51) per megawatt-hour (MWh).

Offshore wind record low

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VATTENFALL

7.33 AM CET / 9-Nov-2016 / Vattenfall (STO:ONOT)

Vattenfall wins tender to build the largest wind farm in the Nordics

Today, Vattenfall has won the tender to build Danish Kriegers Flak, a 600 MW offshore wind farm in the Baltic Sea. The winning bid was EUR 49.9 per MWh, which is among the lowest costs in the world for offshore wind power.

"The announcement is an essential milestone for our ambition to increase our production of renewable power. We are already the second largest offshore player globally. The winning bid of EUR 49.9 per MWh proves that Vattenfall is highly competitive and brings down the costs for renewable energy", says Magnus Hall, CEO Vattenfall.

Kriegers Flak will be Denmark's largest offshore wind farm and can supply 600,000 Danish households with renewable energy – corresponding to 23 percent of all households in Denmark. Vattenfall's investment in Kriegers Flak will be EUR 1.1 – 1.3 billion, pending a final investment decision.

"This is exciting news. I'm very proud of our people in the Wind organisation who once again delivered a winning bid. Vattenfall has won the three latest offshore wind tenders in Denmark; Horns Rev 3, Danish Near Shore and Kriegers Flak, equivalent to the energy consumption of 55 percent of the Danish households", says Gunnar Groebler, Head of Vattenfall Wind.

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First Subsidy-Free Offshore Wind Deal In German Offshore Wind Auction, DONG Energy & EnBW Win Big

April 14th, 2017 by Joshua S Hill

Germany's first competitive auction for offshore wind projects has not only delivered an average bid price that was "far below expectations" according to the Bundesnetzagentur, but also included what is likely one of the world's first subsidy-free offshore wind projects.

CleanTech news & analysis


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Vattenfall awarded Dutch zero-subsidy site

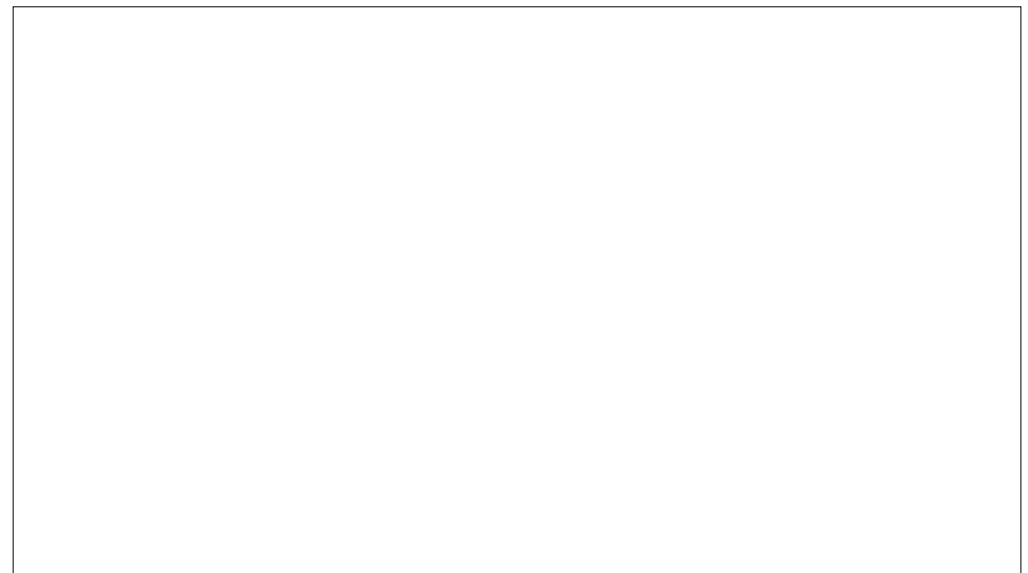
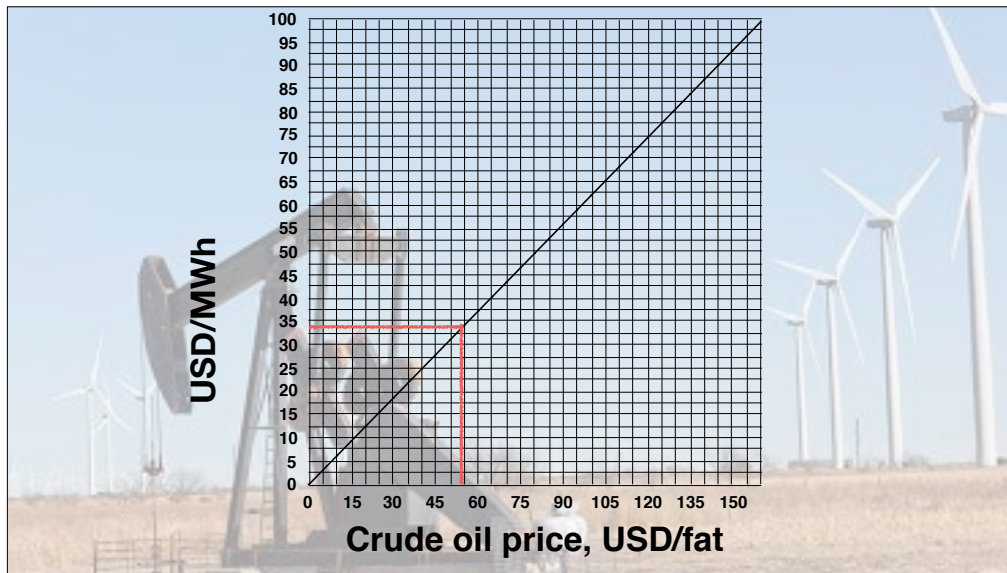
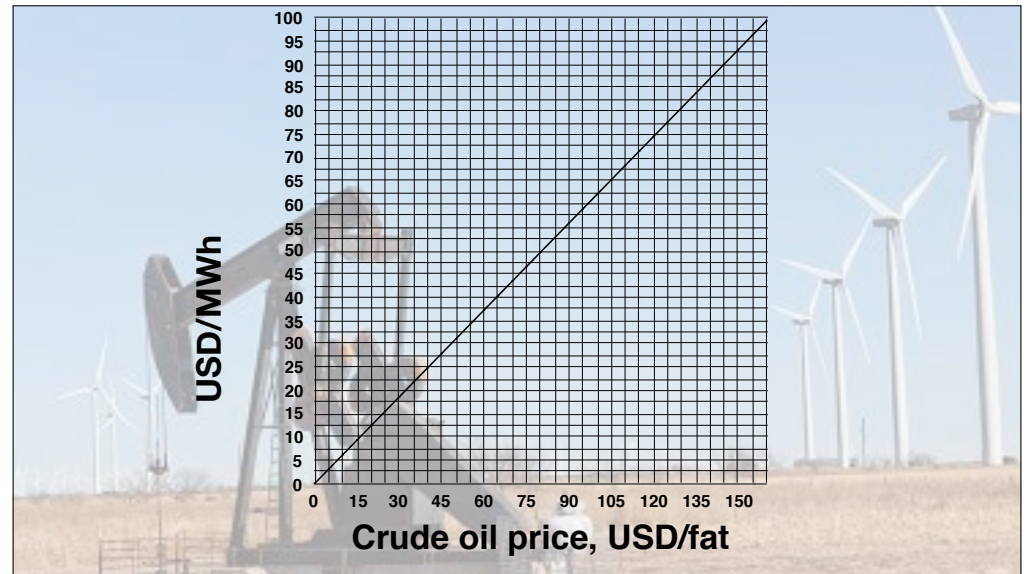
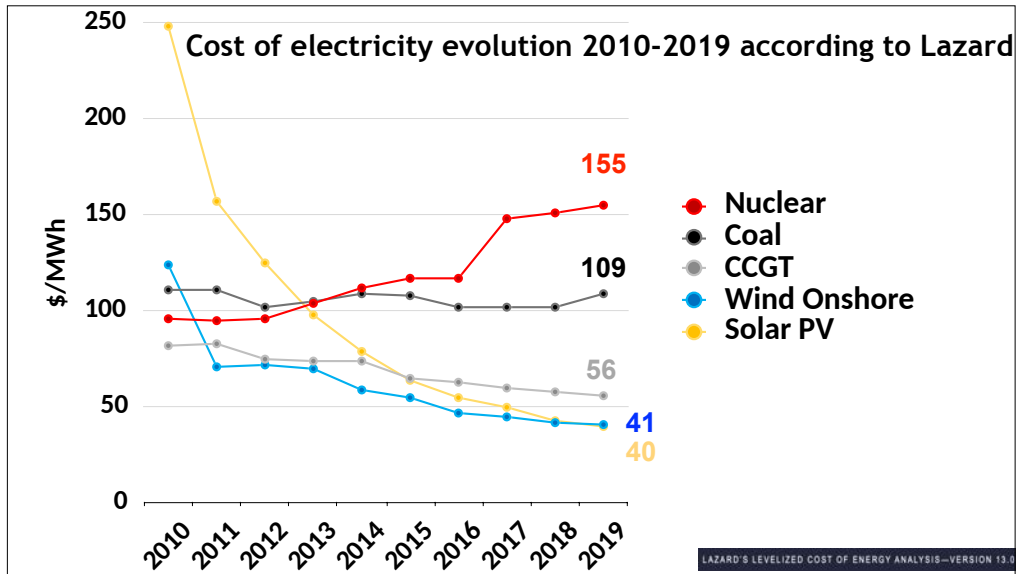
19 March 2018 by David Weston, Be the first to comment

NETHERLANDS: Developer Vattenfall has been granted the licence to build the 700MW Hollandse Kust Zuid offshore wind project in the latest Dutch offshore tender round, without subsidy.



Vattenfall, through its Dutch subsidiary Nuon, built Egmond aan Zee, the Netherlands' first offshore wind project

The site, located 22.2km off the Dutch coast, will require €1.5 billion in investment from Vattenfall, the developer said. It comprises two 350MW projects and due online in 2022.



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 Company Sold 1,493 Electric Model S Sedans to Norwegians in March

By JOHN D. STOLL
 April 2, 2014 11:37 a.m. ET



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Aussies Introduce 1000 Kilometer Electric Bus
 November 1st, 2015 by Steve Hanley



Australian company Brighsun, headquartered in Melbourne, has developed an electric bus with a certified range of 1,004 kilometers — enough to make the trip from Melbourne to Sydney without stopping to recharge and with more than 100 kilometers of range left over.

THE WALL STREET JOURNAL

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Aussies Introduce 1000 Kilometer Electric Bus
 November 1st, 2015 by Steve Hanley

How Did Shenzhen, China Build World's Largest Electric Bus Fleet?
 by Lu Lu, Lulu Xue and Weimin Zhou - April 04, 2018

Comments Add Comment Print

Diesel buses—and the choking smog they spew—are a common sight in most cities. But not in Shenzhen, China.


The southeastern city, which connects Hong Kong to mainland China, **announced** at the end of last year that all of its **16,359** buses had gone electric. **The city's buses are the world's first 100 percent electrified bus fleet, and its largest—bigger than New York's, Los Angeles's, New Jersey's, Chicago's and Toronto's electric bus fleets combined.**

Electric buses have replaced diesel ones in Shenzhen, China. Photo by Lu Lu/WRI China

Electromobility

Setting a Course for Carbon-Free Shipping



In conjunction with Fjellstrand, a Norwegian shipyard, Siemens has developed the technology for the world's first electrically-powered car ferry. The fact that the electric ship, which will enter service in 2015, causes no carbon dioxide emissions is in part due to the electricity mix in Norway.

As silently as a crocodile, the white giant approaches the shore. It opens its "mouth," which is several meters across. Suddenly the silence is broken by the roar of engines as a stream of trucks and people emerge from the opening. Odd Moen, an engineer who is responsible for ship solution sales at Siemens Norway, smiles. If everything goes as planned, this vision of an electrically-powered ferry sailing across Norway's fjords will become a reality at the beginning of 2015. Stating hardly a sound and producing absolutely no emissions, it will be the first and only ferry of its kind in the world.

A Century of Battery-Powered Service
 For more than 100 years, there have been battery-powered submarines that run solely on electricity.

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ABB powers world's largest emission-free electric ferries

Tue 21 Jun 2016 by Paul Fanning

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In conjunction with technology electric ship is in part

As silently motors and energy fr Siemens selling ad and prod

Tycho Brahe – along with Aurora – will operate completely on battery power between Helsingør (Denmark) and Helsingborg

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ABB CHINADAILY 中国日报

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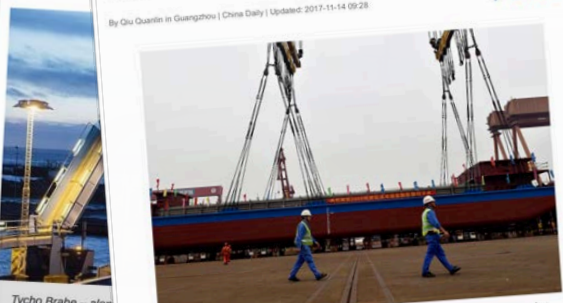
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Tue 21 Jun 20

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Fully electric cargo ship launched in Guangzhou

By Qiu Quanlin in Guangzhou | China Daily | Updated: 2017-11-14 09:28



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Two technicians pass by the world's first 2,000-metric-ton all-electric cargo ship during its debut in Guangzhou, capital city of Guangdong province. The ship can run 80 kilometers after being fully charged. XIA

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World's largest all-electric ferry sets sail in Denmark

By Alice Tidey · 21/08/2019

Comments

Ellen is the world's largest all-electric ferry. Copyright Leclanché

The world's largest all-electric ferry completed its first voyage with passengers last week in Denmark.

Two technicians pass by the world's first 2,000-metric-ton all-electric cargo ship during its debut in Guangzhou, capital city of Guangdong province. The ship can run 80 kilometers after being fully charged. XIA

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SHYAN-CHINA DAILY

ACTIA CENTAURUS | ACTIA MARINE | FINLAND | HYBRID SHIPS | NETHERLANDS | OFFSHORE WINDPARKS | WÄRTSILÄ

The Finnish technology group Wärtsilä will be converting the Acta Centaurus, a Construction Support Vessel for offshore wind farms with a hybrid drive. This should reduce CO2 emissions by up to 15 per cent.

The Dutch owner of the ship, Acta Marine, has made public that they commissioned the conversion in May 2019 and that the installation is now scheduled for the fourth quarter of 2019. The Wärtsilä solution includes the hybrid drive, batteries and an energy management system and the Finnish company will also install, test and commission the hybrid system. Wärtsilä will also upgrade the Acta Centaurus' onboard systems for the hybrid drive.

"Hybrid propulsion is becoming an increasingly adopted trend for meeting the challenges faced by today's maritime industry," says Joel Knif, General Manager Sales Marine Projects at Wärtsilä.

The special feature of the Construction Support Vessel is that they have to maintain their position as precisely as possible during work regardless of weather conditions, currents and waves. This "positioning load" leads to fluctuating power requirements. According to Wärtsilä, it can operate these more efficiently with the fast-reacting electric motors than with the more sluggish ship diesel. Wärtsilä did not provide any information on propulsion power, battery capacity or electrical range in their announcement.

Just last month, the first ship with a Wärtsilä hybrid drive went into operation. This vessel is an escort tug at the Swedish port of [unclear] with passengers last week in [unclear].

Copyright Leclanché



AIRBUS PUTS ELECTRIC E-FAN TRAINER INTO PRODUCTION IN PAU

▲ Dave Calderwood May 1, 2015

Airbus is to put its two-seat E-Fan powered by electric motors into serial production in Pau, France. Construction on a new plant will start in 2016 and Airbus has set a target for entry-into-service for the E-Fan 2.0 of the end of 2017 or beginning of 2018.

LE BOURGET (Reuters) - An all-electric commuter plane and a small Airbus-backed hybrid are among aircraft programs being touted at the Paris Airshow, as the industry tries to convince a skeptical public it can deliver on a pledge to halve carbon emissions by 2050.



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Israeli Eviation Alice electric aircraft is seen on static display, at the eve of the opening of the 53rd International Paris Air Show at Le Bourget Airport near Paris, France, June 16 2019. REUTERS/Pascal Rossignol

LE BOURGET (Reuters) - An all-electric commuter plane and a small Airbus-backed hybrid are among aircraft programs being touted at the Paris Airshow, as the industry tries to convince a skeptical public it can deliver on a pledge to halve carbon emissions by 2050.

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Air >

Aug 31, 2019 - 10:59 am

Quantum Air orders 26 e-aircraft from Bye Aerospace

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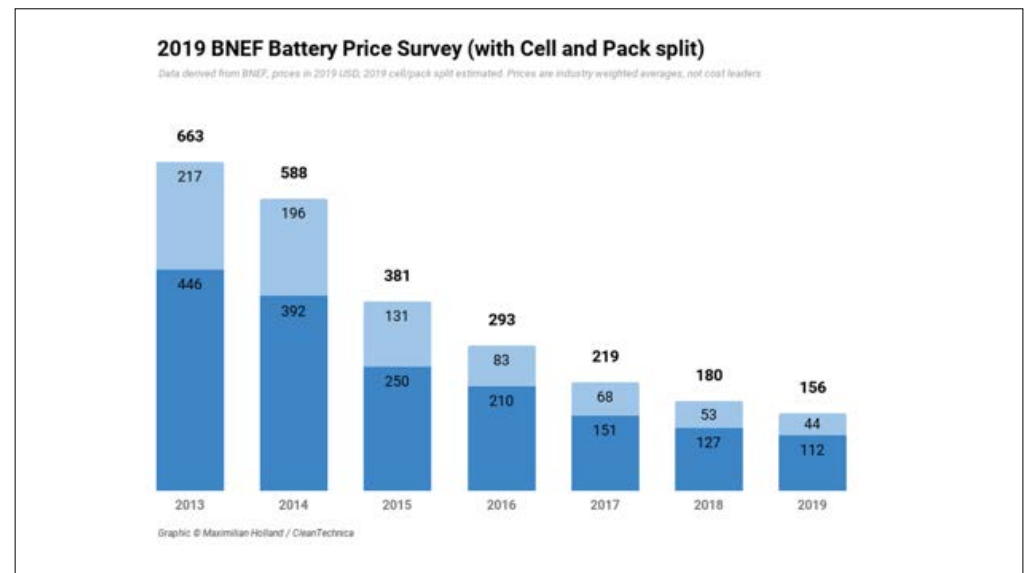


Quantum Air of Los Angeles has ordered 26 small electric aircraft from Bye Aerospace. This includes 22 units of the four-seater eFlyer 4, two two-seater eFlyer 2 and two electric planes still in development.

With the eFlyers, Quantum Air intends to establish an air taxi service in Los Angeles – and, according to the announcement by the CEO, to make it significantly cheaper than current private flights. “With the arrival of electric aircraft, we are entering a new Golden Age in aviation,” said Tony Thompson, CEO of Quantum Air. “Since the dawn of flight, point to point air travel has been a luxury available only to a privileged few. Quantum’s groundbreaking air taxi service will finally make point to point air travel widely available.”

In the announcement, Bye Aerospace also announced that founder and CEO George Bye would join a Quantum advisory board. “With George Bye on our board of advisers, Quantum will tightly integrate with Bye Aerospace, producing a superior flight experience for our customers,” Thompson said. His chief pilot, Scott Akina, is convinced: “Electric aircraft are safer, quieter, and more efficient than legacy aircraft, and they are more fun, more comfortable, and do not pollute.”

The Colorado-based manufacturer had already won two major orders from OSM Aviation for 60 electric planes, while Blackbird was tasked with providing 110 electric aircraft a few months ago. Bye Aerospace is also working with Oxis Energy to develop lithium-sulfur cells for battery packs in future electric aircraft.



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PacifiCorp to add 7 GW renewables + storage, close 20 of 24 coal plants



Credit: iStockmedia/Comstock

AUTHOR
Bobadi_Rubio
@TeamVerdug

Dive Brief:

- PacifiCorp plans to add nearly 7,000 MW of renewable generation and storage capacity by 2025 and will shut down 20 of its 24 coal-fired units by 2038, the company announced Thursday when it unveiled a draft of its 20-year *Interacted*

PUBLISHED
Oct 3, 2019

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NIPSCO to replace coal with 2.3 GW of solar, storage in latest RFP



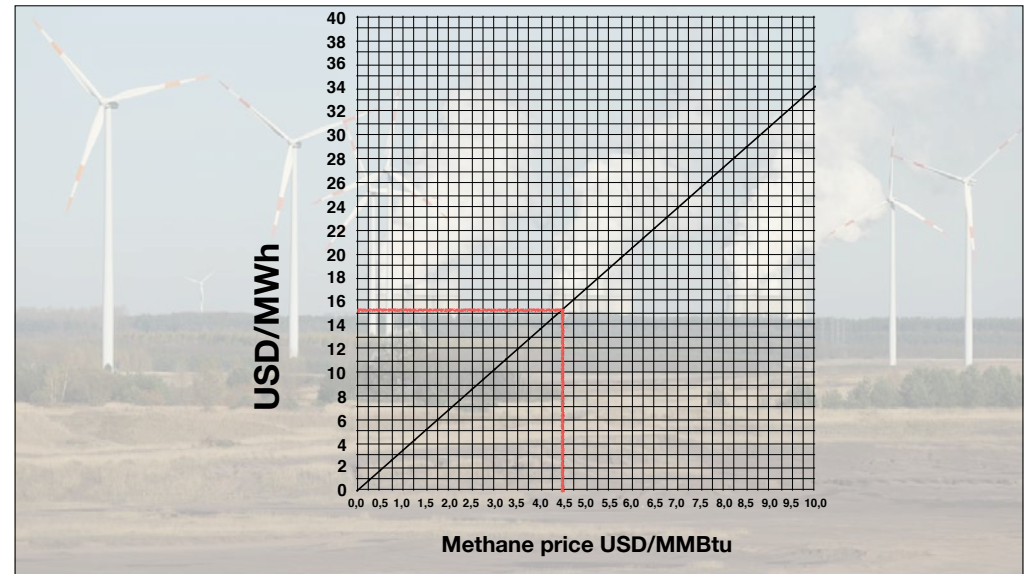
Credit: iStockmedia/Comstock

AUTHOR
Inda_Sherrod
@WISherrod

Dive Brief:

- The Northern Indiana Public Service Company (NIPSCO) announced on Oct. 1 a request for proposals (RFP) for 300 MW of wind, 2,300 MW of solar and solar-plus-storage projects, as well as an undefined amount for other capacity resources.

PUBLISHED
Oct 9, 2019




Orsted

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Ørsted and partners secure funding for renewable hydrogen project

20.12.2019 08:23

Seven industrial partners have been awarded for a demonstration project in Denmark using wind power to produce renewable hydrogen transport.



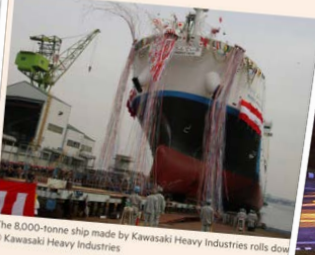
Avedøre Power Station on Avedøre Høje

FINANCIAL TIMES

Renewable energy + Add to myFT

Japan launches first liquid hydrogen carrier ship

'Hydrogen Frontier' is part of strategy to create carbon-neutral fuel supply chain



The 8,000-tonne ship made by Kawasaki Heavy Industries rolls down
© Kawasaki Heavy Industries


Robin Harding in Tokyo DECEMBER 11 2019

Hydrogen Council

Path to hydrogen competitiveness

A cost perspective

20 January 2020



7 July 2017

Nuon, Statoil and Gasunie join forces using hydrogen in future CO2-free energy plants



ISPT has previously brought together various parties, one of them being Nuon, to do a feasibility study into the storage of electricity in Ammonia (NH₃). Now Nuon, Gasunie and the Norwegian Statoil announce their collaboration in a joint venture that aims to use hydrogen as fuel for the Magnus power plant in the Eemshaven in Groningen. They will start available units fully transferred to hydrogen starting 2023. This is a very important step on the way to a 100% CO₂-free energy supply. This also brings the 'super battery', that Nuon has been working on a step closer to reality.

UAE mulls hydrogen as a renewable energy source
 Business Desk | Dubai
 Filed on February 3, 2019

7 July 2017
 Nuon, Statoil forces using CO2-free electricity

Solar-powered hydrogen plant breaks ground

ISPT has previously announced that it is planning to build a 100MW power plant in Norway. The production of hydrogen using renewable forms of energy such as solar and wind, and its subsequent use to generate electricity, will put the UAE on the global map, experts said at the ground breaking ceremony of the region's first solar-powered Green Hydrogen project.

The solar-driven hydrogen electrolysis facility will be located at the Mohammed Bin Rashid Al Maktoum Solar Park and is the first of its kind in the Middle East and North Africa (MENA) region. Sheikh Ahmed bin Saeed Al Maktoum, chairman of the Dubai Supreme Council of Energy and chairman of the Expo 2020 Dubai Higher Committee, broke ground for the project on Sunday.

The project will be implemented in collaboration with the Dubai Electricity and Water Authority (Dewa), Expo 2020 Dubai and Siemens.

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German energy grids say plans ready for 100MW hydrogen plant
 AFRICATECH | FEBRUARY 11, 2019 | 4:29 PM | 2 DAYS AGO

3 MIN READ

- * Amprion, OGE say have completed plans for 100 MW plant
- * Follows hot on heels of national coal exit plan by 2038
- * Could start 2023 to help usher in alternative fuels

FRANKFURT, Feb 11 (Reuters) - German power and gas grid firms Amprion and Open Grid Europe (OGE) said on Monday they would shortly apply to build the country's first large hydrogen plant that can convert windpower to alternative fuels that are easier to store and transport.

The 100 megawatt (MW) power-to-gas (ptg) plant to be called "hybridge" can start operations from 2023 at Lingen in Germany's windy north-west, the firms said in statements presented at a Berlin news conference.

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- * Follows hot on heels of national coal exit plan by 2038
- * Could start 2023 to help usher in alternative fuels

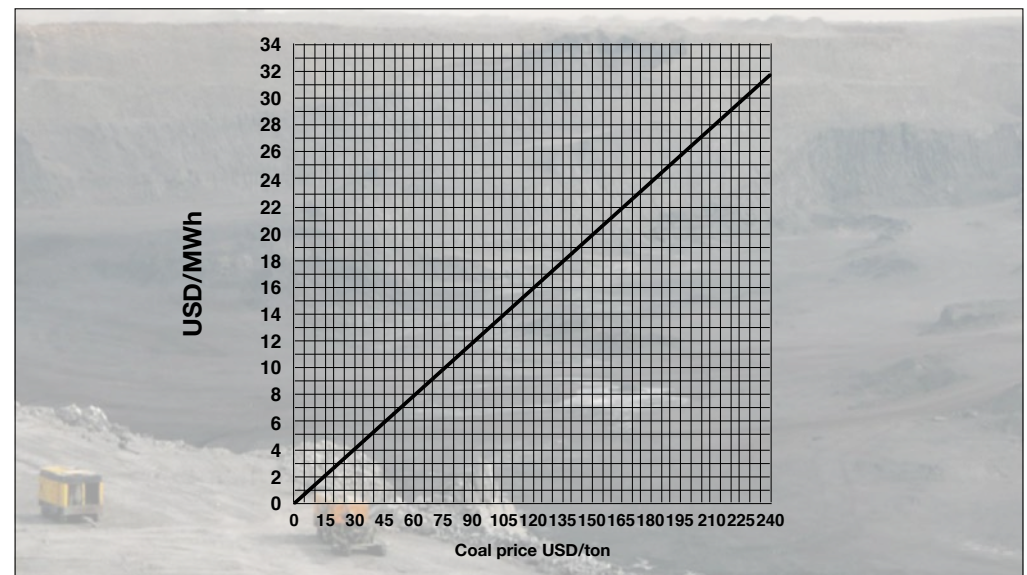
FRANKFURT, Feb 11 (Reuters) - German power and gas grid firms Amprion and Open Grid Europe (OGE) said on Monday they would shortly apply to build the country's first large hydrogen plant that can convert windpower to alternative fuels that are easier to store and transport.

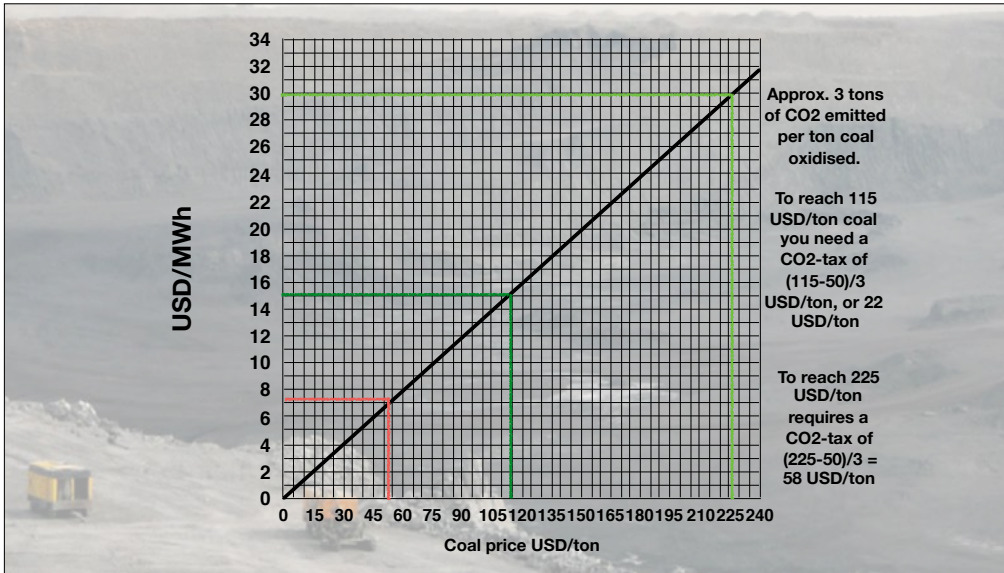
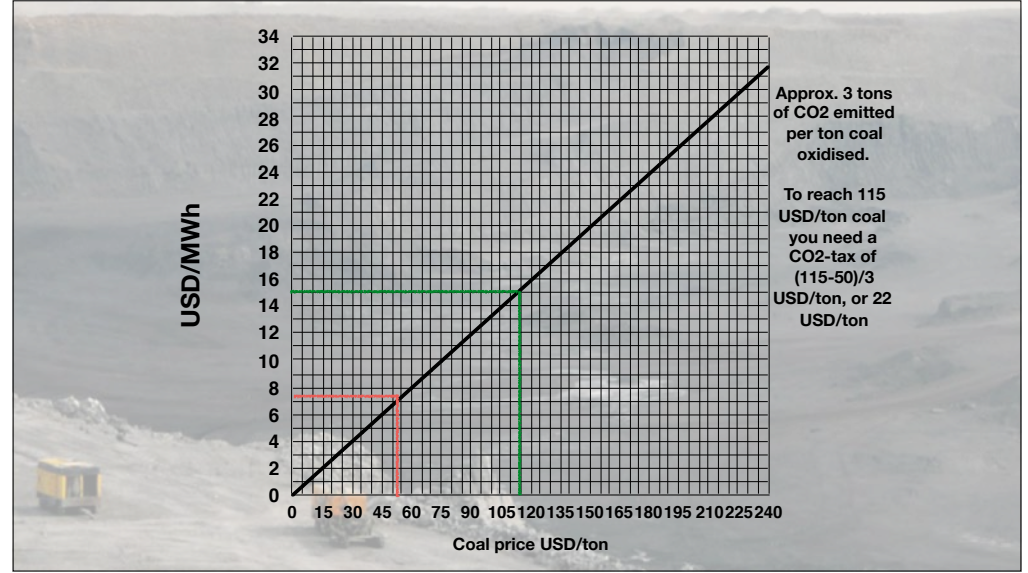
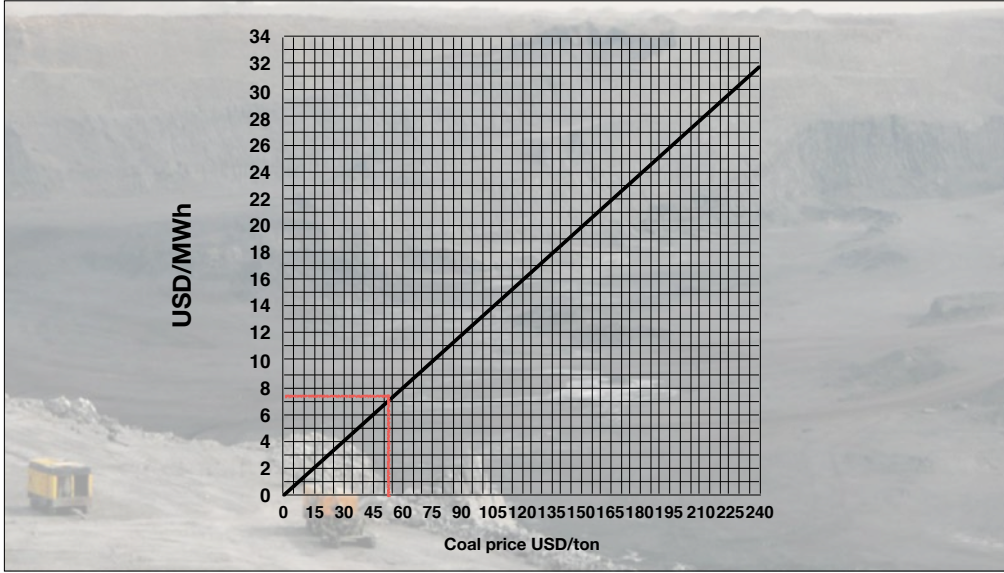
The 100 megawatt (MW) power-to-gas (ptg) plant to be called "hybridge" can start operations from 2023 at Lingen in Germany's windy north-west, the firms said in statements presented at a Berlin news conference.

Vattenfall-led consortium plans 50 MW power-to-gas project in Germany
 APRIL 4, 2019 | SANDRA ENKHARDT | UTILITY SCALE STORAGE | GERMANY

The energy company plans to build the "HySynGas" project in the Brunsbüttel Industrial Park with ARGE Netz and MAN Energy Solutions. The consortium wants to establish a power-to-gas hub for cross-sector decarbonization in northern Germany.

Green hydrogen can significantly contribute to the decarbonisation of the transport sector.





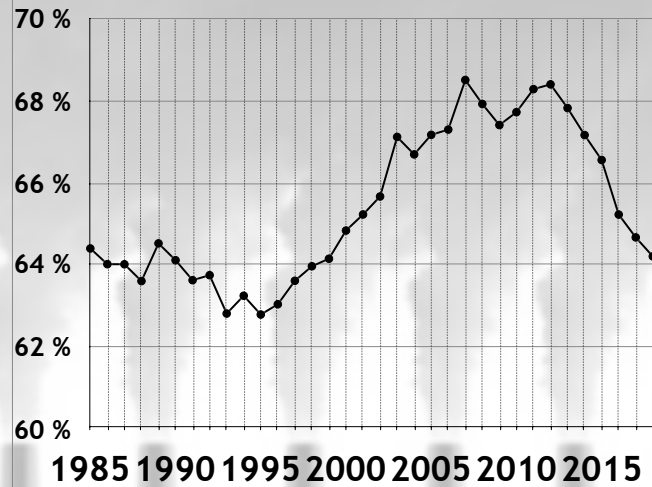
SSAB, LKAB and Vattenfall form joint venture company for fossil-free steel

SSAB, LKAB and Vattenfall announced today that they have formed a joint venture company to continue to work together effectively to eliminate the root cause of carbon dioxide emissions in the steel industry, which will seek to develop a steelmaking process that emits water instead of carbon dioxide.

"HYBRIT is a very important initiative for SSAB and a fossil-free Sweden by 2045. A joint venture company will enable us to work together effectively to eliminate the root cause of carbon dioxide emissions in the steel industry," said Martin Lindqvist, President and CEO of SSAB.

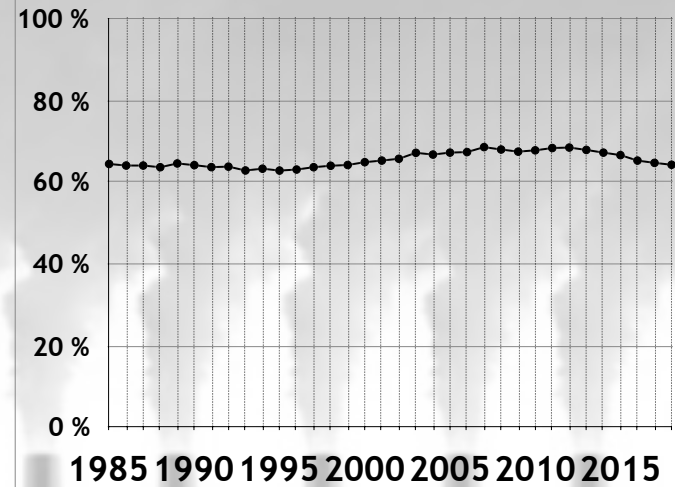
"Our establishment of a joint venture to develop HYBRIT indicates our conviction that it is possible to develop a fossil-free production chain all the way from the mine to the steelworks. If we're successful, this will be a technology breakthrough that can make a global contribution to significantly limiting climate change," said Jan Moström, President and CEO of LKAB.

Fossil Share of Global Electricity generation 1985-2018



Data: BP statistical review 2019

Fossil Share of Global Electricity generation 1985-2018



Data: BP statistical review 2019

A decade of expansion ahead

Winter Wind 2020-01-31

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