



Clarksons Platou
Offshore



Shippingforum

Shippingforum

Clarksons Platou Offshore Renewables

31st October 2017

Presented by:
Frederik Colban-Andersen
Divisional Director - Renewables

+47 23 11 27 38 / +47 91 82 28 04

fca@clarksons.com

Prepared by:
Jens Egenberg
Analyst

+47 23 11 21 10 / +47 92 02 01 70

jens.egenberg@clarksons.com



This is what we do well in Norway.....

Shipping

Oil & Gas / Oil services

Fishery / aqua farming



Clarksons Platou
Offshore



....in addition, this is what we should be targeting: OFFSHORE WIND



Fred.Olsen Windcarrier



Clarksons Platou
Offshore



History and background

Fred.Olsen Windcarrier



Clarksons Platou
Offshore

It started with environmental concerns and politics in Europe, but solar and wind increasingly competitive and soon subsidy free



International politics and “tree huggers”



Clarksons Platou
Offshore

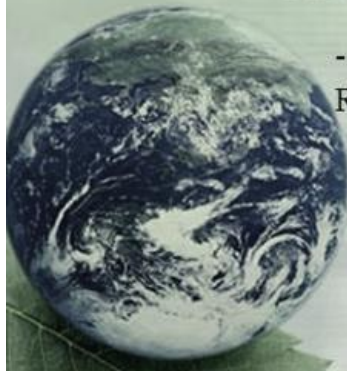


Thank you EU and your “2020 vision” - 20% renewables within year 2020

The Problem

“The challenges of transforming Europe’s energy system remain urgent and daunting: the EU currently imports approx. 55% of its energy – and might reach 70% in the next 20 to 30 years. In 2030 the EU will be importing 84% of its gas, 59% of its coal and 94% of its oil. In these circumstances, it is obvious that the challenge to satisfy our energy needs is big.”

- The European Renewable Energy Council, “RE-Thinking 2050: A 100% Renewable Energy Vision for the European Union”





Renewable energy is not for idealists only...



News > World > Asia

India to make every single car electric by 2030 in bid to tackle pollution that kills millions

Technology will be introduced 'in a very big way', says minister

Harriet Agerholm | @harrietaagerholm | Monday 1 May 2017 11:15 BST | 236 comments

f t e

Click to follow

Like

Sysla MARITIM

Kabelleggingsfartøyet Siem Aimagy og Siem Moxie har fått vindparkjobb. Foto: Siem Offshore.

Norske redere dro inn over fire milliarder fra havvind i fjor

DONG Energy AS + Add to myFT

Dong Energy breaks subsidy link with new offshore wind farms

Danish group to build German schemes without financial aid in groundbreaking deal

© Bloomberg

Twitter Facebook LinkedIn

APRIL 14, 2017 by **Piña Clark**, Environment Correspondent

The green power industry has hit a milestone after the world's largest offshore wind farm company said it would build two German schemes without any subsidies.

Sample the FT's top stories for a week

You select the topic, we deliver the news.

Select topic

Enter email address

In an advance for what has been one of the most heavily subsidised types of renewable power, Denmark's Dong Energy said it would rely on wholesale market prices instead of extra government support for the projects in the German North Sea.

Bloomberg Markets Tech Personal Politics Opinion Businessweek

New Record Set for World's Cheapest Solar, Now Undercutting Coal

by **Anna Hertenstein**
May 3, 2016, 6:20 PM GMT+2

- 2.99 U.S. cents per kilowatt-hour is 15% lower than old record
- Cheaper than new coal-fired electricity in the Gulf emirate

Solar power set another record-low price as renewable energy developers working in the United Arab Emirates shrugged off financial turmoil in the industry to promise projects costs that undercut even coal-fired generators.

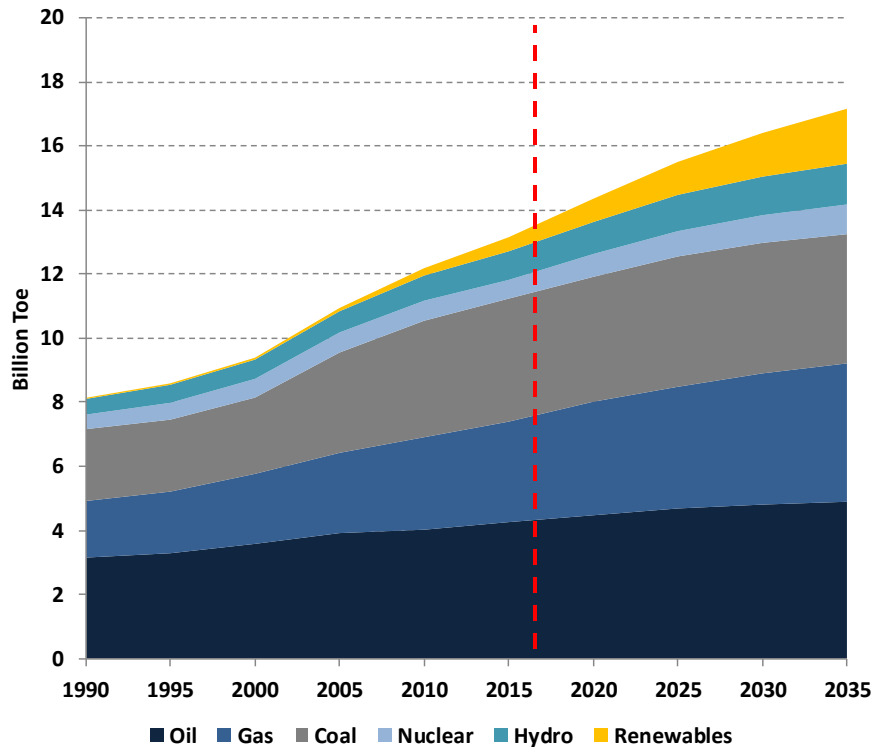
Developers bid as little as 2.99 cents a kilowatt-hour to develop 800 megawatts of solar-power projects for the Dubai Electricity & Water Authority, the utility for the Persian Gulf emirate, announced on Sunday. That's 15 percent lower than the previous record

Oil in perspective – Oil consumption expected to continue to grow longer term, but share of primary energy to decline

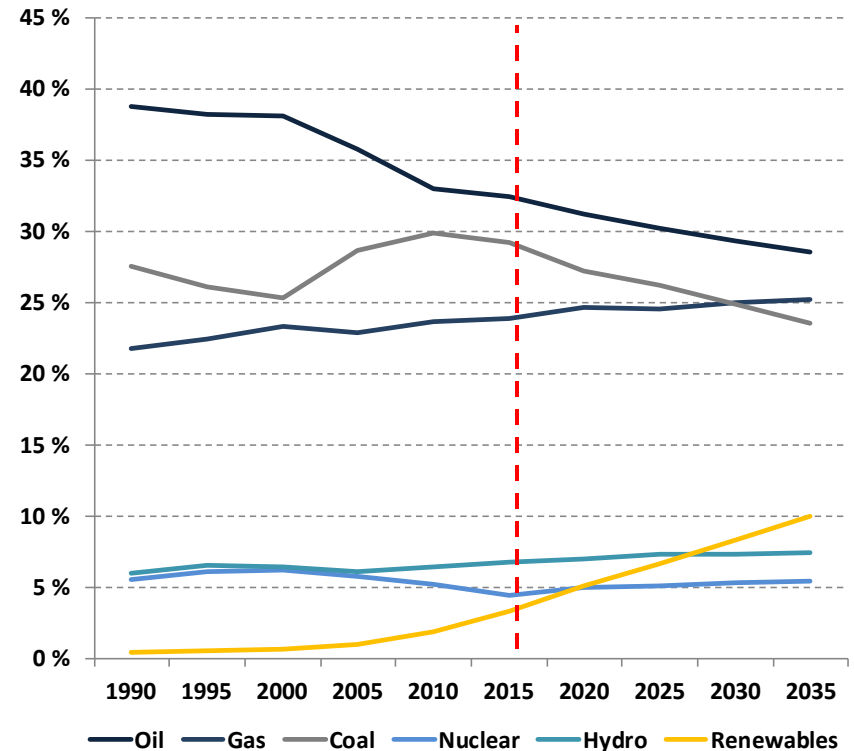


Renewables growing strongly

Primary energy consumption by fuel



Shares of primary energy



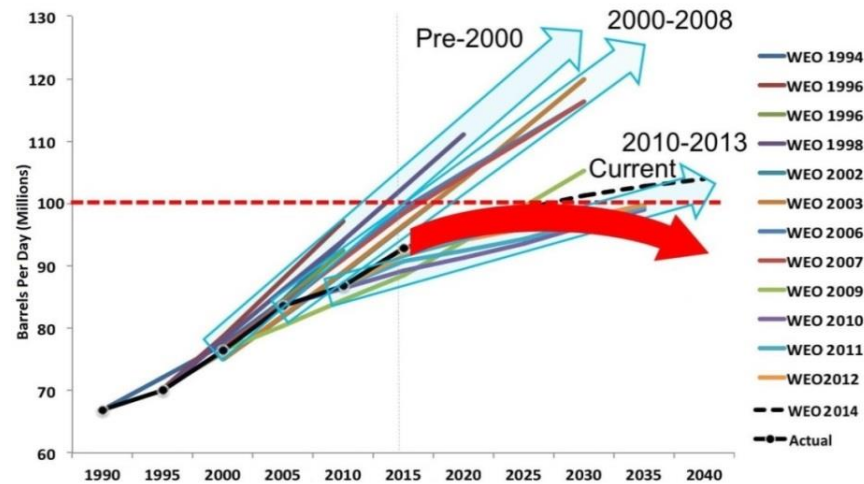
Note: Renewables includes wind, solar, geothermal, biomass and biofuels
Source: BP Energy Outlook 2017; Clarksons Platou



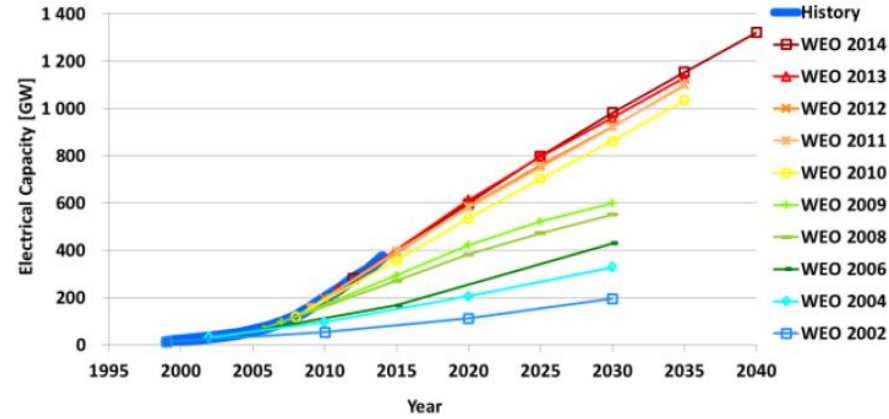
What has history told us?

Energy estimates have consistently underestimated the power in the renewables sector

Oil demand estimates historically



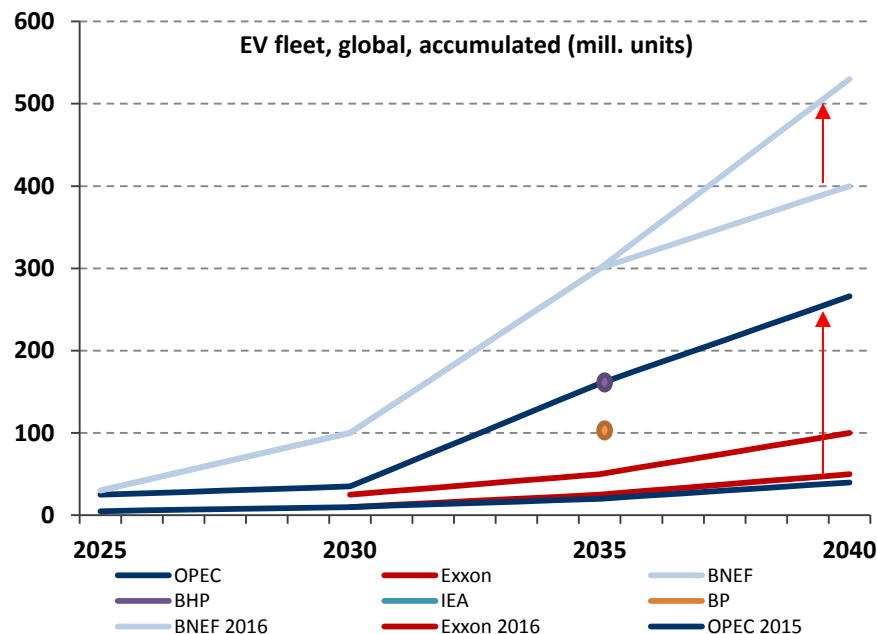
Renewables estimates historically



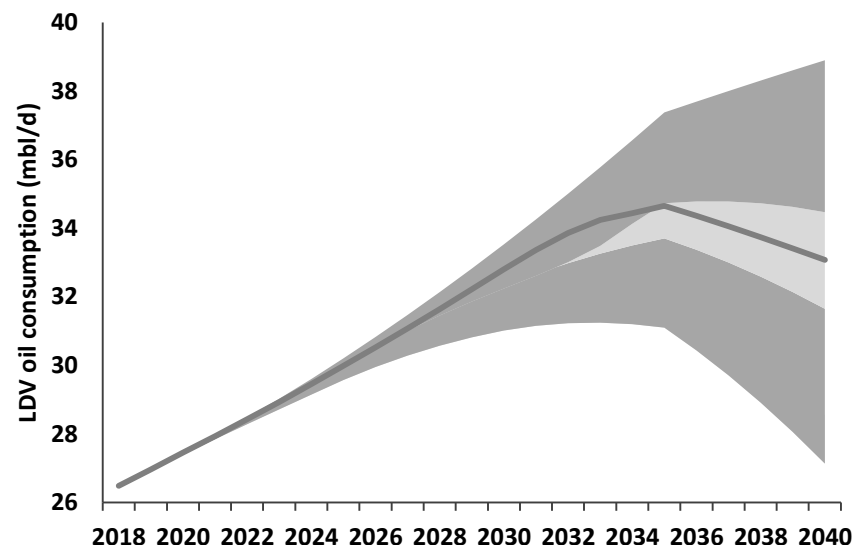
EVs have no impact in the short term, but longer term disruptive potential could impact psychology and decision making



Substantial spread in EV-adoption estimates...



...implying wide outcome range for LDV oil consumption



- EV adoption estimates have generally been revised upwards lately
- Developments are rapid both on the technology and design front, and in terms of policies (UK, France, China, India)
- EVs are still far from competitive (cost of ownership), and multiple questions remain unanswered. Also, a substantial shift to «electrified personal transportation» needs to go hand-in-hand with green energy constituting a large share of the primary energy mix

Source: Exxon; OPEC; BHP Billiton; IEA; BP; Bloomberg New Energy Finance; RethinX; Clarksons Platou



What is it all about?

Fred.Olsen Windcarrier

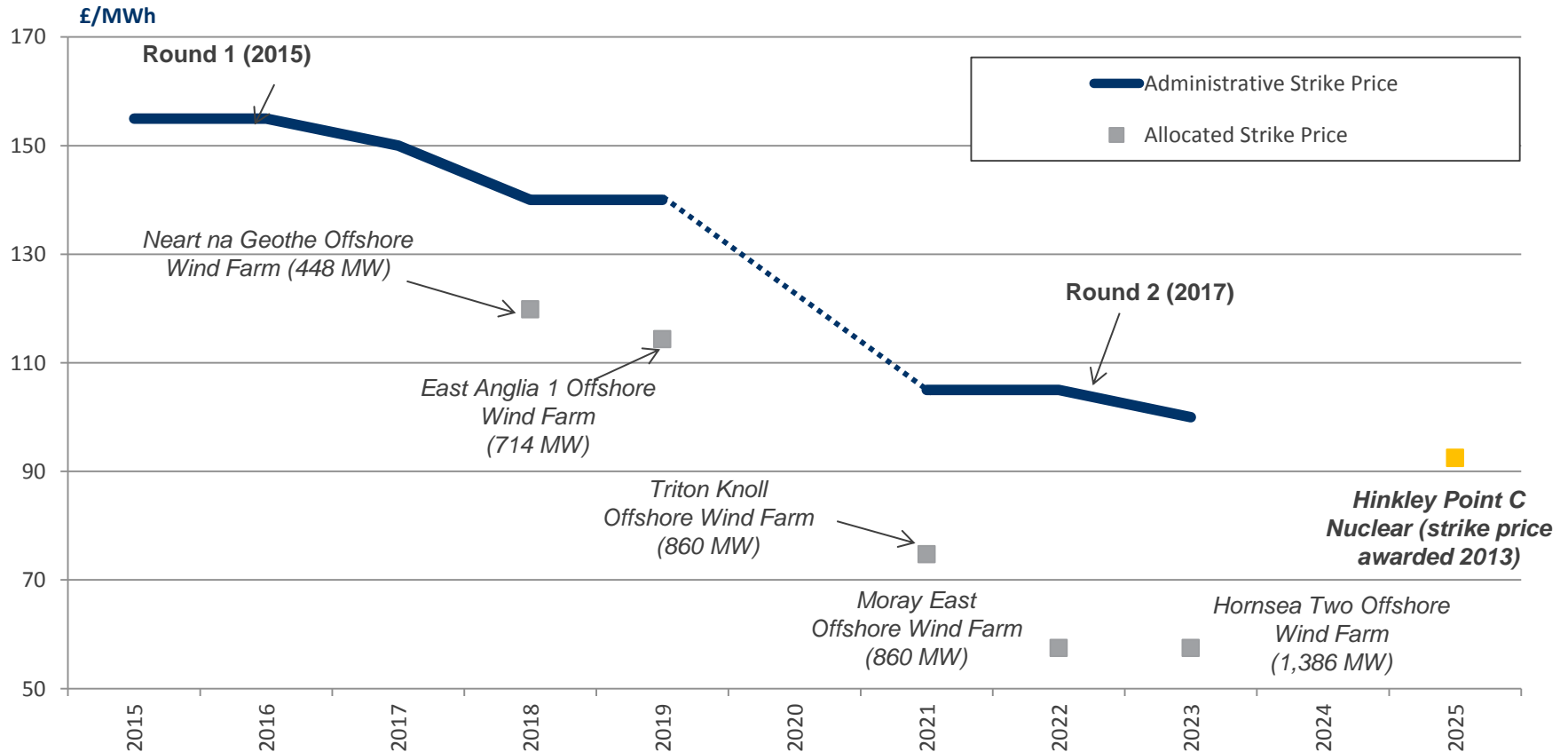


Clarksons Platou
Offshore



Latest developments in the UK show improving cost picture

UK CfD Offshore Wind Strike Price



Data Source: Clarksons Research



Size going up, cost coming down

From 35 meters to 164 meters...and growing

Bigger. Cheaper. Greener.

Boeing 747-8
Length: 76m



DONG
energy



Clarksons Platou
Offshore



What is an offshore windfarm - Complicated business....

- **Size:** 300 – 500 MW I.e. Sheringham Shoal 317MW (= 88x3.6WTG)
- **Capital investment:** Eur 1.5 – 2bn
- **Maintenance budget:** MEur 30-50 per year
- **Project time:** 4 years to develop – 2 years to build
- **3.6 MW turbine:**
 - Nacelle at +80m
 - 107+m rotor diameter
- **Marine operation:**
 - 100,000 t of steel / 25,000 t eq. mnt
 - Over 300 people working offshore
 - 5,000 vessel days, up to 30 vessels
 - 30,000 offshore lifts – 1,500 large lifts
- **Powering capacity:** Sheringham Shoal power approximately 220,000 average UK homes

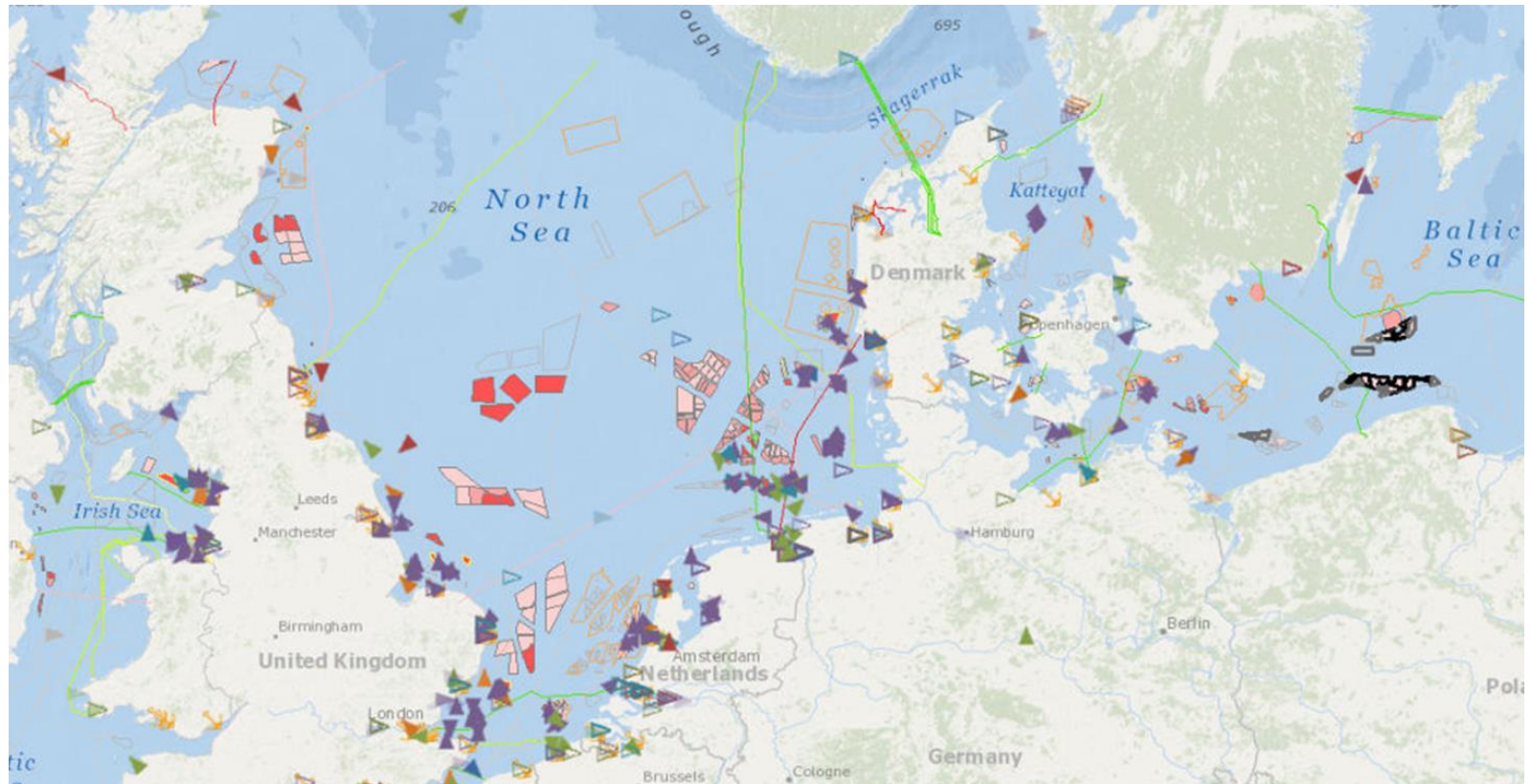


Source: Statoil. Pictures from various stages of the Sheringham Shoal development and operation. Source: respective web pages



Wind Industry Market Overview

Europe leads globally

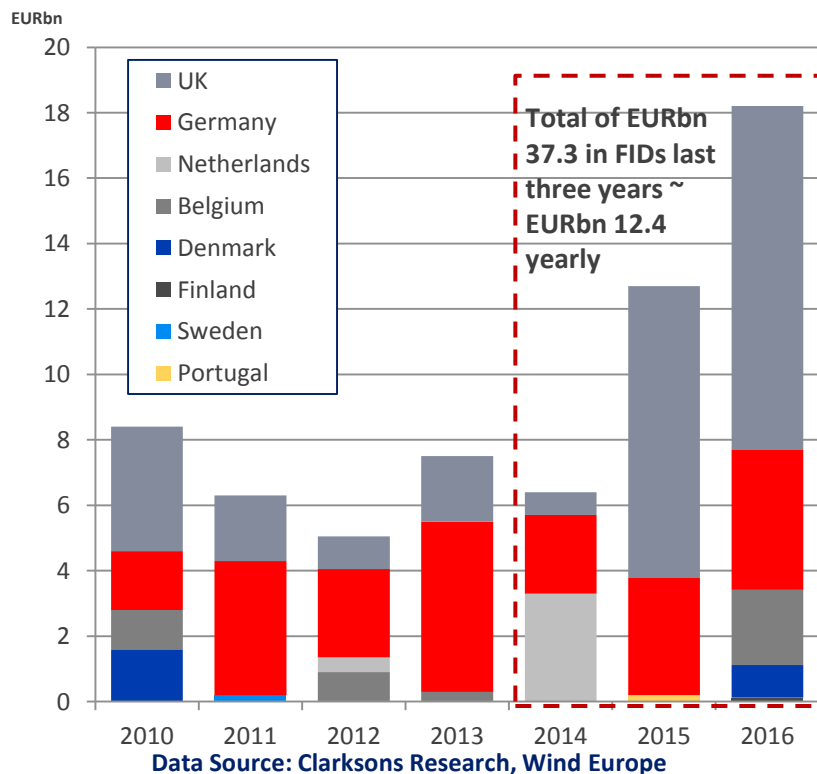


But when comparing offshore wind investment in Europe to UK and Norwegian oil and gas markets, they are comparable in size



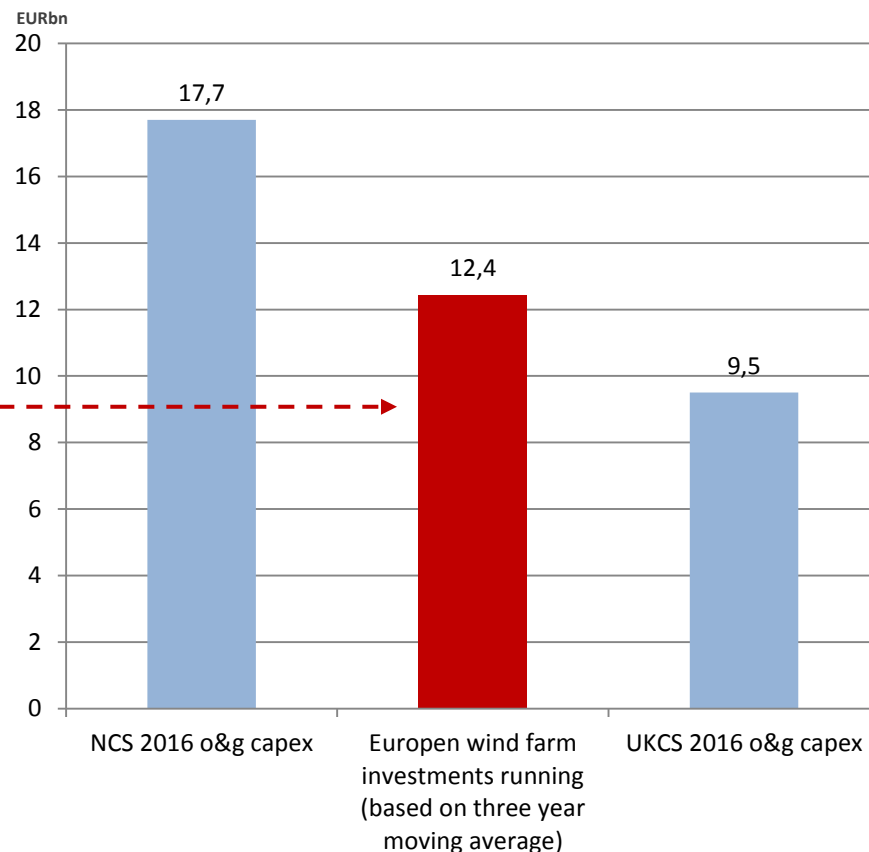
Sanctioned investment in Offshore Wind Farms (m€)

- Investment in offshore wind in Europe rose to a record for the second year in succession during 2016
- 13GW installed / over 3589 WTG connected. A total of 5 GW reached FID in 2016
- €18.2bn was invested (FID), up 39%



Comparison of investment levels

- Assuming FIDs spent over next three years, offshore wind capex will be around EURbn 12.4 in 2017
- Looking at the rise in investments from 2014-2016, this is likely to low as new projects will be sanctioned in 2017-2018



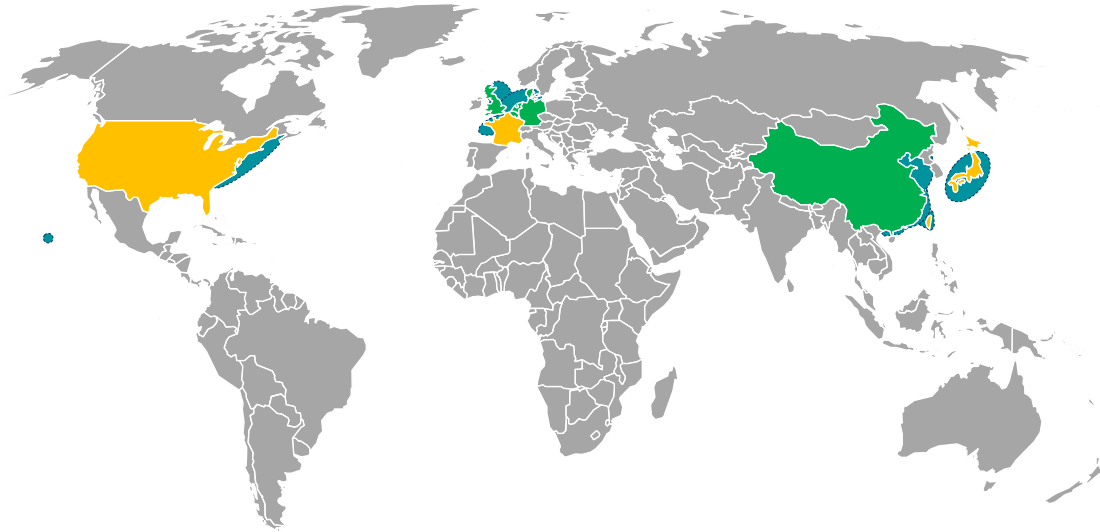
Source: Wind Europe; Clarksons Research; Clarksons Platou Offshore



Clarksons Platou
Offshore



The offshore wind market is moving beyond North Western Europe



Established markets

Denmark
UK
Germany
The Netherlands
China
Belgium

Emerging markets

USA
Taiwan
Japan
France
+++

Established markets

- Denmark, UK, Germany, the established markets
- The Netherlands and Belgium also building out capacity
- Excitement in the industry for Japan, Taiwan and the United States

Emerging markets

- Taiwan Power has opened up a dedicated department for Offshore Wind Construction
 - aim to reach 14 GWs by 2030
- IEEFA estimates 10 GWs by 2030 in Japan
- Government decision to install 3 GW of offshore wind by 2023 in France, but this was initially 6 GW by 2020. Post 2023 target however raised to 6 GW

Countries in green are the early movers and/or with high goals. Countries in orange are countries to watch out for going forward, later in the report usually referred to as Emerging Markets.
Source: Clarkson's Platou Offshore Renewables



Vessels and operations

Fred.Olsen Windcarrier



Clarksons Platou
Offshore

Global tier one utilities companies and investors involved, with major manufacturers and vessel providers providing services



Investor base	Electricity producers ⁽¹⁾	Turbine producers ⁽¹⁾	Engineering and/or Foundations ⁽¹⁾	WTG/Foundation installers ⁽²⁾	Service vessels owners ⁽²⁾	CTV owners ⁽²⁾
PensionDanmark ADIA دھابا اؤطومي للاستثمار Abu Dhabi Investment Authority Green Investment Bank PGGM Voor een waardevolle toekomst Industriens Pension Blackstone LEGO Marubeni MACQUARIE AMPCAPITAL BLACKROCK	DONG energy VATTENFALL RWE — innogy e-on centrica wpd think energy Statoil NORTHLAND POWER IBERDROLA Statkraft EnBW 	SIEMENS Adwen AN AREVA GAMESA COMPANY SENVION wind energy solutions	Ballast Nedam MTHøjgaard Van Oord Boskalis 	 seaTacks GeoSea mpi OFFSHORE Van Oord SEAFOX CONTRACTORS Seaway Heavy Lifting 	ESVAGT BERNHARD SCHULTE C-bed FLOATING HOTELS CHEVALIER FLOATELS VROON Acta Marine	 O.P.U.S Offshore Projects Unique Solutions Turbine Transfers Ltd mpi Powering the future SureWind
Pure Investors	O&G company	X-tree/SURF producers	EPCI contractor	SURF/Vessel providers	IMR Vessel operators	Low end PSV vessel operators

Source: Clarksons Platou Offshore



Clarksons Platou
Offshore

GRAY BOXES: Oil and Gas industry sector "peers"

(1) Potential Vessel Charterers

(2) Vessel providers

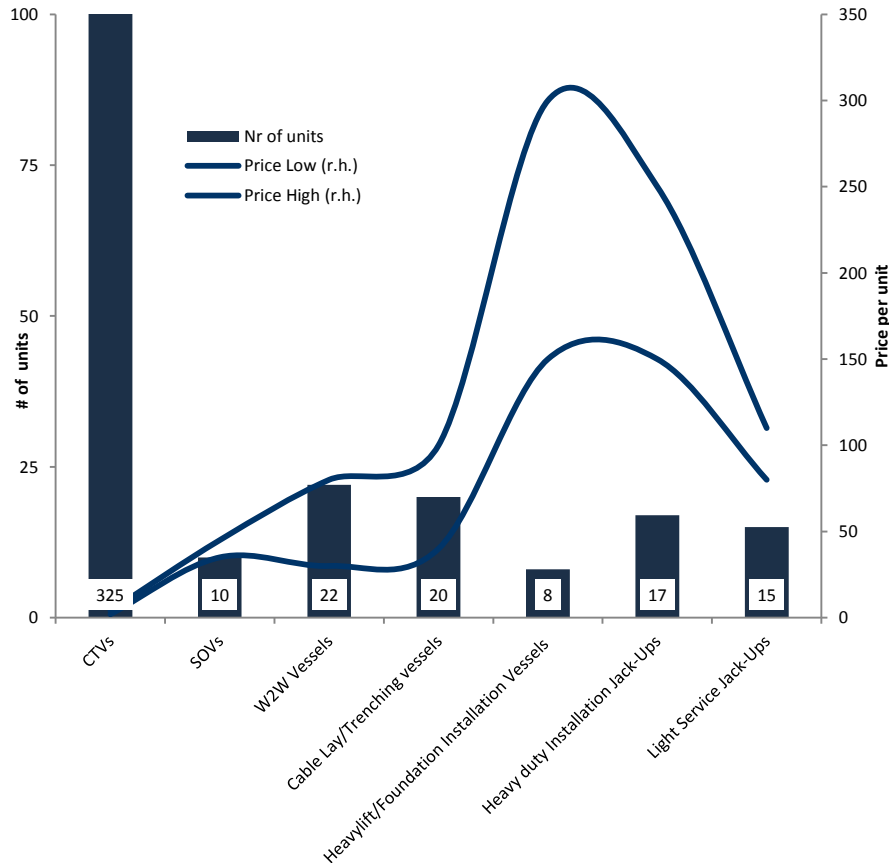
Source: Clarksons Platou Offshore Research



The OWF Installation and Support Vessels

Nr of vessels and value

Vessel overview



Estimated value of offshore wind vessel fleet

- CTVs: about 325 units. Typically 18-28 meter LOA.
 - N/B cost: Eur 2-4 million
 - Dayrate: Eur 2.200-5.000
- SOVs: about 10 vessels + W2W/SOV currently under construction.
 - N/B cost Eur 35-45 million
 - Dayrate: Eur 20-25.000
- W2W Vessels – ad-hoc/V.o.o. from the spot market. Approx. 22 vessels currently offering their services
 - N/B cost Eur 30-70 million
 - Dayrate: Eur 22.5-40.000
- Cable Lay / Trenching vessels – 20 units
 - N/B cost Eur 40-100 million
 - Dayrate: Eur 40-100.000+
- Heavylift/Foundation Installation Vessels - 8 vessels
 - N/B cost Eur 150-300 million
 - Dayrate: Eur 200-500.000
- Heavy duty Installation Jack-Ups: 15 units
 - N/B cost Eur 140-250 million
 - Dayrate: Eur 115-185.000
- Light Service Jack-Ups: 10-15 units
 - N/B cost Eur 70-110 million
 - Dayrate: Eur 30-50.000

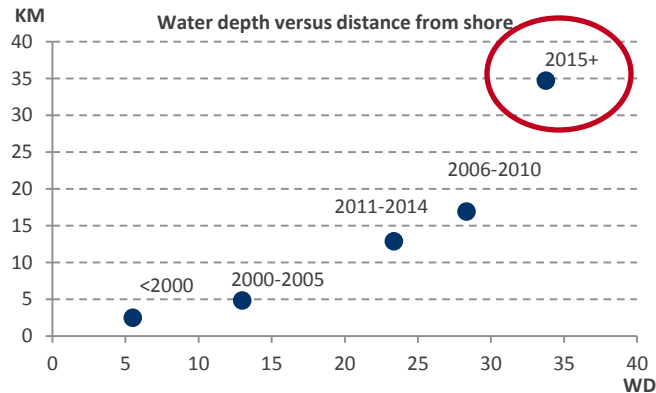
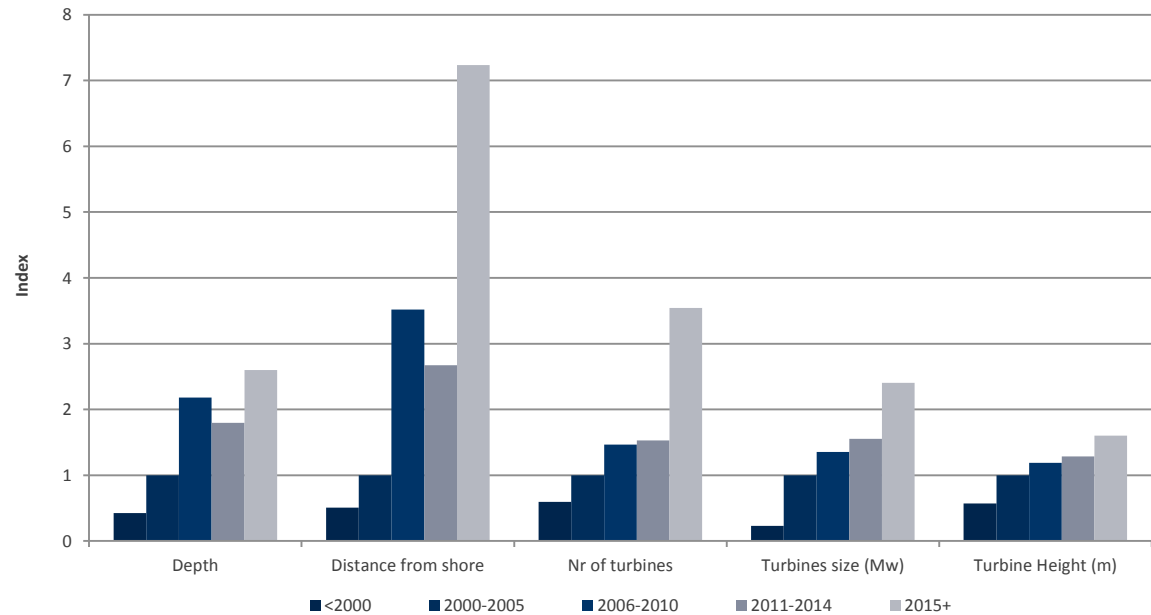
Source: Clarksons Platou Offshore



Wind farms becoming increasingly more complex

General trends:

- Average depth ~ 3x last 10 years
- Distance from shore ~ 7x last 10 years
- Area per farm ~ 20x last 10 years
- Nr of turbines per farm ~ 4x last 10 years
- Turbine MW effect ~ 2x last 10 years
- Turbine height ~ 2x last 10 years



Year	Depth	Distance from shore	Nr of turbines	Turbines size (Mw)	Turbine Height (m)	Area Sq (Km)
<2000	6	2	12	0.5	62	1
2000-2005	13	5	20	2.3	108	4
2006-2010	28	17	29	3.1	129	18
2011-2014	23	13	30	3.5	139	25
2015+	34	35	69	5.5	173	89

Numbers including windfarms which are: Consent Application Submitted; Consent Authorised; Fully Commissioned; Partial Generation/Under Construction; Under Construction
Source: 4Coffshore; Clarksons Platou Offshore Research



GREEN
IS THE NEW
BLACK





Disclaimer

Important Information

The material and the information (including, without limitation, any future rates) contained herein (together, the "Information") are provided by Clarksons Platou AS ("Clarksons Platou") for general information purposes. The Information is based solely on publicly available information and is drawn from Clarksons Platou's database and other sources. Clarksons Platou advises that: (i) any Information extracted from Clarksons Platou's database is derived from estimates or subjective judgments; (ii) any Information extracted from the databases or information services of other maritime data collection agencies may differ from the Information extracted from Clarksons Platou's database; (iii) whilst Clarksons Platou has taken reasonable care in the compilation of the Information and believes it to be accurate and correct, data compilation is subject to limited audit and validation procedures and may accordingly contain errors; (iv) the provision of the Information does not obviate any need to make appropriate further enquiries; (v) the provision of the Information is not an endorsement of any commercial policies and/or any conclusions by Clarksons Platou and its 'connected persons', and is not intended to recommend any decision by the recipient; (vi) shipping is a variable and cyclical business and any forecasting concerning it may not be accurate. The Information is provided on "as is" and "as available" basis. Clarksons Platou and its 'connected persons' make no representations or warranties of any kind, express or implied about the completeness, accuracy, reliability, suitability or availability with respect to the Information. Any reliance placed on such Information is therefore strictly at the recipient's own risk.

The opinions and estimates contained herein represent the view and judgment as of the dates specified (and in absence of such, as of the date of the report), and are subject to change without notice. Delivery of this report shall not create any implication that Clarksons Platou assumes any obligation to update or correct the Information.

This Information is confidential and is solely for the internal use of the recipient. Neither the whole nor any part of the Information may be disclosed to, or used or relied upon by, any other person or used for any other purpose without the prior written consent of Clarksons Platou. Especially, the information is not to be used in any document for the purposes of raising finance whether by way of debt or equity. All intellectual property rights are fully reserved by Clarksons Platou, its 'connected persons' and/or its licensors.

To the extent permitted by law, Clarksons Platou and its 'connected persons' shall not be liable to the recipient or any third party for any loss, liability or damage, cost or expense including without limitation, direct, indirect, consequential loss or damage, any loss of profit, loss of use, loss of or interruption in business, loss of goodwill, loss of data arising out of, or in connection with, the use of and the reliance on the Information whether in contract, tort, negligence, bailment, breach of statutory duty or otherwise, even if foreseeable. These exclusions do not apply to the liability of Clarksons Platou and its 'connected persons' for fraud or fraudulent misrepresentation.

In this disclaimer 'connected persons' means, in relation to Clarksons Platou, its ultimate holding company, subsidiaries and subsidiary undertakings of its ultimate holding company and the respective shareholders, directors, officers, employees and agents of each of them.

This disclaimer shall be governed by and construed in accordance with Norwegian law.

H. CLARKSON & CO. LTD, COMMODITY QUAY, ST. KATHARINE DOCKS, LONDON, E1W 1BF