



**Delivering on the promise of cost reduction**

**Jasper Vis**  
Country manager NL

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**DONG**  
energy

# International perspective: DONG Energy Wind Power overview before the 5<sup>th</sup> of July 2016

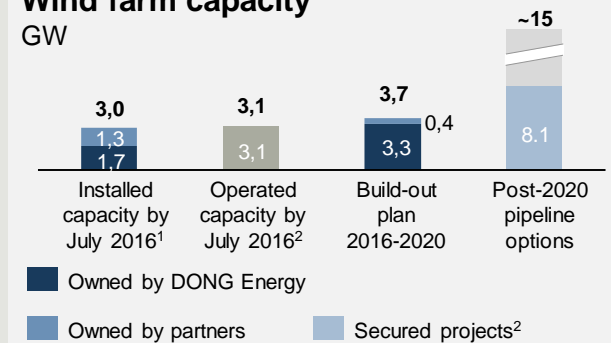
## DONG Energy Wind Power asset portfolio, build-out plan and pipeline options 2016-2025



## DONG Energy Wind Power at a glance

- The largest offshore wind portfolio globally in attractive offshore wind markets
- Differentiated competitive position resulting from integrated business model
- At the forefront of reducing cost of electricity from offshore wind
- Solid track-record in delivering large and complex projects
- Robust and highly visible 3.7 GW build-out plan leading to 6.7 GW installed capacity in total by 2020
- Numerous and attractive pipeline options post-2020 with 8.1 GW of secured project rights

## Wind farm capacity GW



Source: Bloomberg New Energy Finance (BNEF)

1. Excluding small-scale demo sites

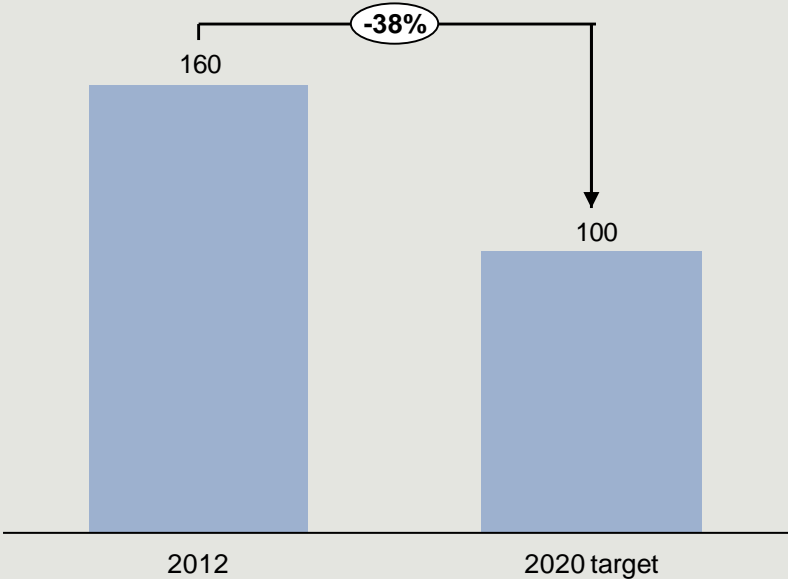
2. Wind farms where DONG Energy provides operations and maintenance

# Target of €100/MWh for costs of electricity from offshore wind was set in 2012 in UK context (full scope incl. grid connection)

## Costs of offshore wind

Year of final investment decision, EUR/MWh, 2012/ 2016 prices<sup>1</sup>

Levelised cost target for 2020 set in 2012



1: Target originally communicated in 2012 prices (corresponds to 165 and 103 EUR/MWh in 2016-prices, respectively).

# Dutch Energy Agreement (2013): 4.5 GW offshore wind in 2023

The national energy agreement was negotiated in the Social Economic Council (SER) and signed on the 6<sup>th</sup> of September 2013 by more than 40 organisations

## Key points in the energy agreement

### Renewable targets

- 14% renewable energy in 2020 (binding EU target) and 16% in 2023

### Offshore wind targets

- Ambitious target of 4450 MW offshore wind capacity in 2023

### Cost reduction path

- Maximum average cost price for offshore wind of €150/MWh in 2014
- Linear cost reduction by €5/MWh for the next annual tender

### Competitive tenders

- Projects with lowest price will win the tenders

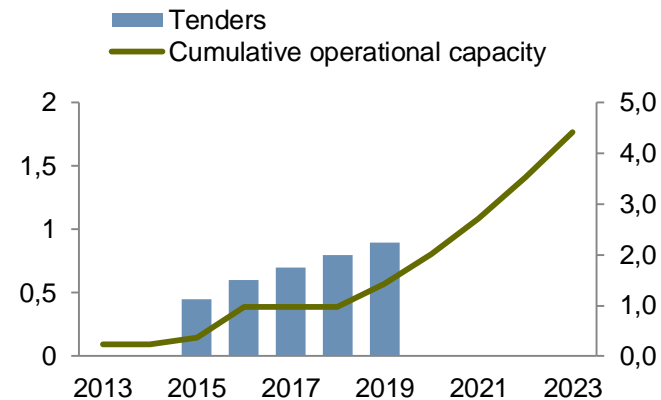
### Offshore grid

- National TSO to develop offshore grid where this is more efficient than direct grid connections

### New concessions

- Government will issue new (flexible) concessions

## Dutch Energy Agreement offshore wind timeline GW



Tender in year	Capacity (MW)	Operational by
2015	450	2019
2016	600	2020
2017	700	2021
2018	800	2022
2019	900	2023

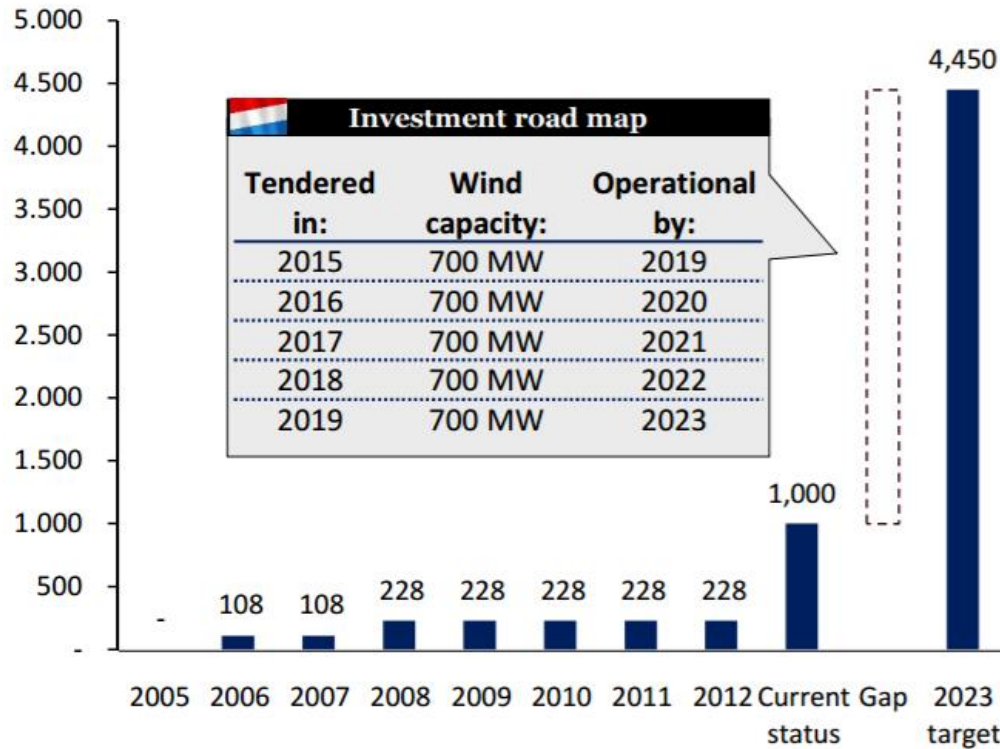
- Conditional to achievement of cost reduction path



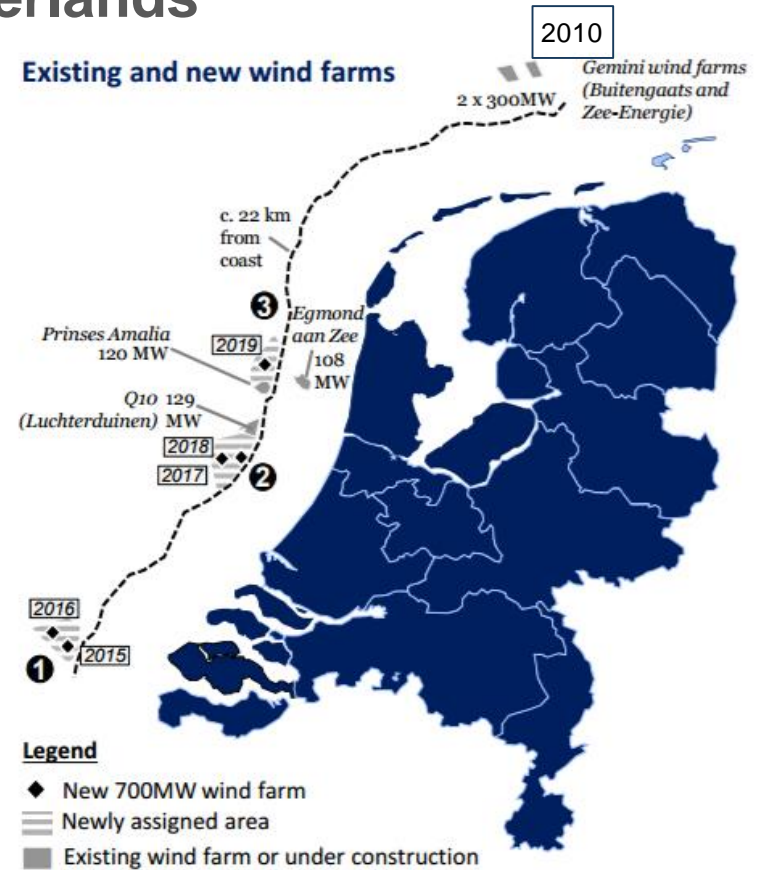
# Roll-out plan offshore wind in the Netherlands

(Figures: TKI Wind op Zee)

Offshore wind - capacity development (MW)



Existing and new wind farms

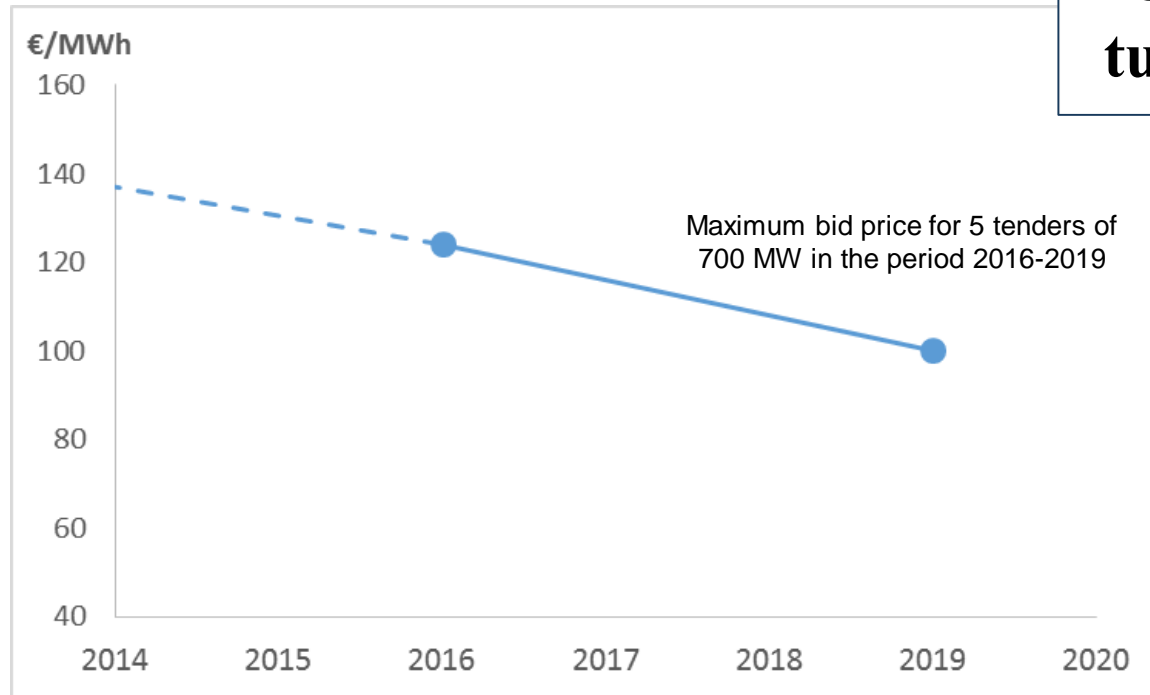


Tender zone	Year of tender	Distance to coast	Water depth	Wind farms
Borssele 1	2015	30	18-38	2 x 350MW
Borssele 2	2016	38	18-38	2 x 350MW
ZH Kust 1	2017	26	18-22	2 x 350MW
ZH Kust 2	2018	26	18-22	2 x 350MW
NH Kust	2019	25	19-24	2 x 350MW
Test sites	A small part per sites is reserved as test site			

Source: RVO, Ministry of Economic Affairs

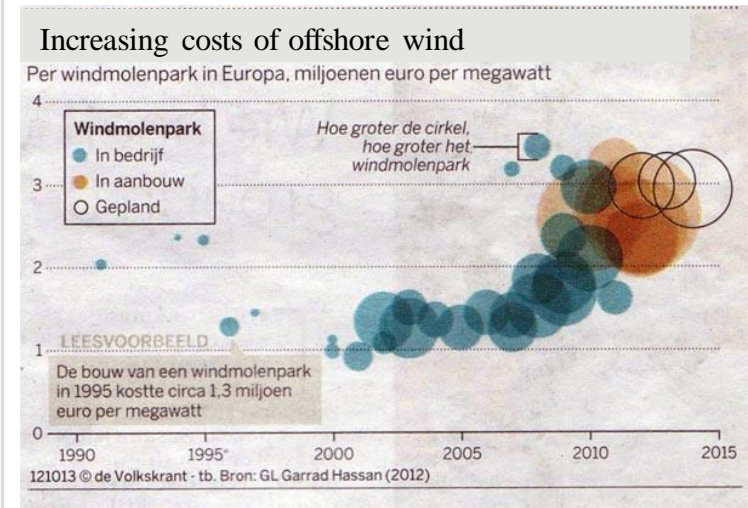
# Scepticism in 2013-2015 about the cost reduction in the Dutch Energy Agreement

Maximum bid price excluding offshore grid costs



Nieuws Cultuur & Leven **de Volkskrant**

## ‘Cheaper offshore wind turbines are not likely’



# While the Dutch were working on the new offshore wind policy, the technology developed rapidly in the surrounding countries

FIG 11: CUMULATIVE AND ANNUAL OFFSHORE WIND INSTALLATIONS (MW)

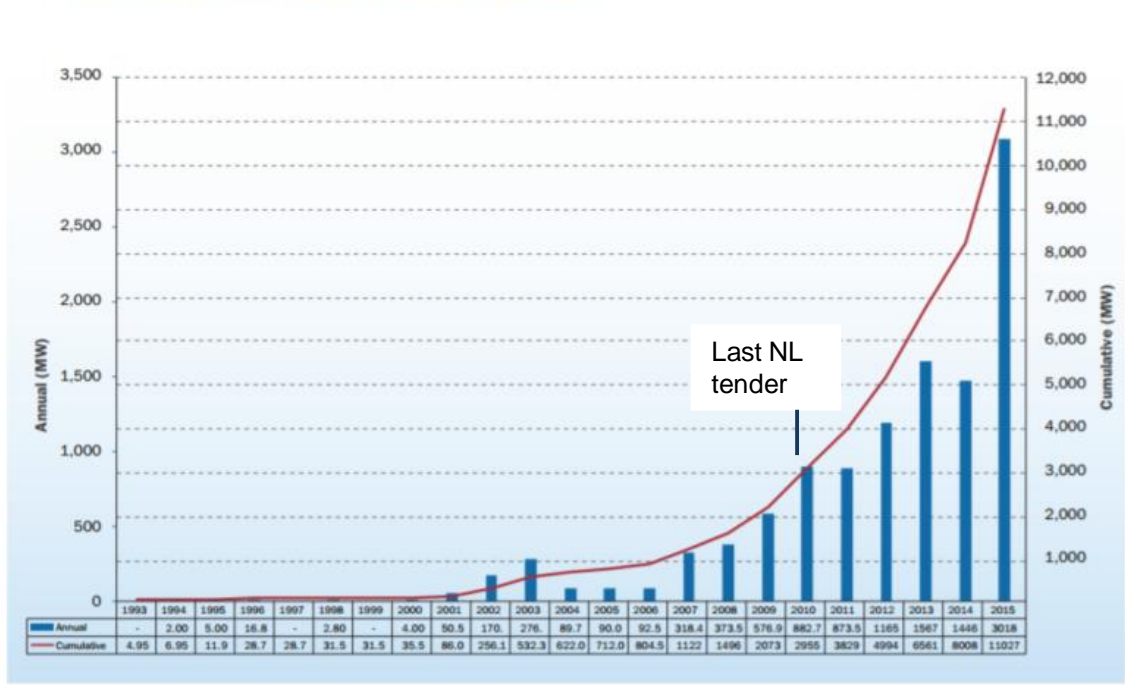
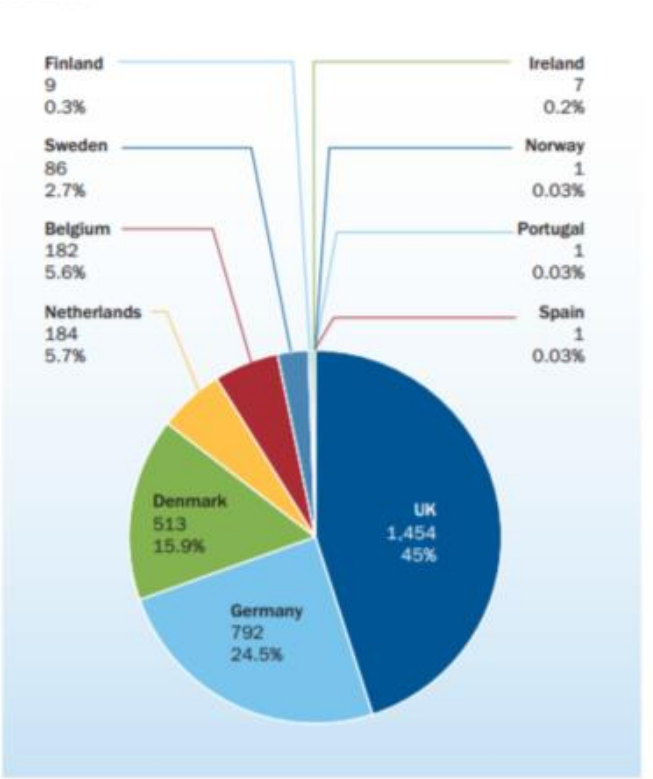


FIG. 13: INSTALLED WIND TURBINES - CUMULATIVE SHARE BY COUNTRY



Source: Wind Europe statistics

# With rapidly declining costs across all markets as a result

## Offshore wind costs incl. transmission costs over lifetime<sup>1</sup>

Estimated at the year of contracting, EUR/MWh, 2016 prices



<sup>1</sup>: Average price for the electricity over the lifetime of the plant used as proxy for the levelised costs of electricity. It consists of a subsidy element for the first years and a market income for the remaining years of the 25 years lifetime. Discount rate of 3,5% used to reflect society's discount rate. Market income based on country specific wholesale market price projections at the time of contracting

**Note:** Exchange rate on July 7 2016 has been used. Adjustment of costs to account for the fact that the 2012 target was set for a UK project which primarily incl. costs of transmission and extra development costs.

**Source:** DECC; Danish Energy Agency; Energinet.dk; NEV



# DONG Energy Wind Power overview after the 5<sup>th</sup> of July 2016

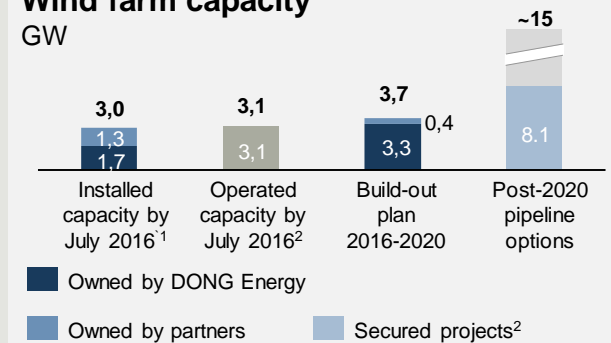
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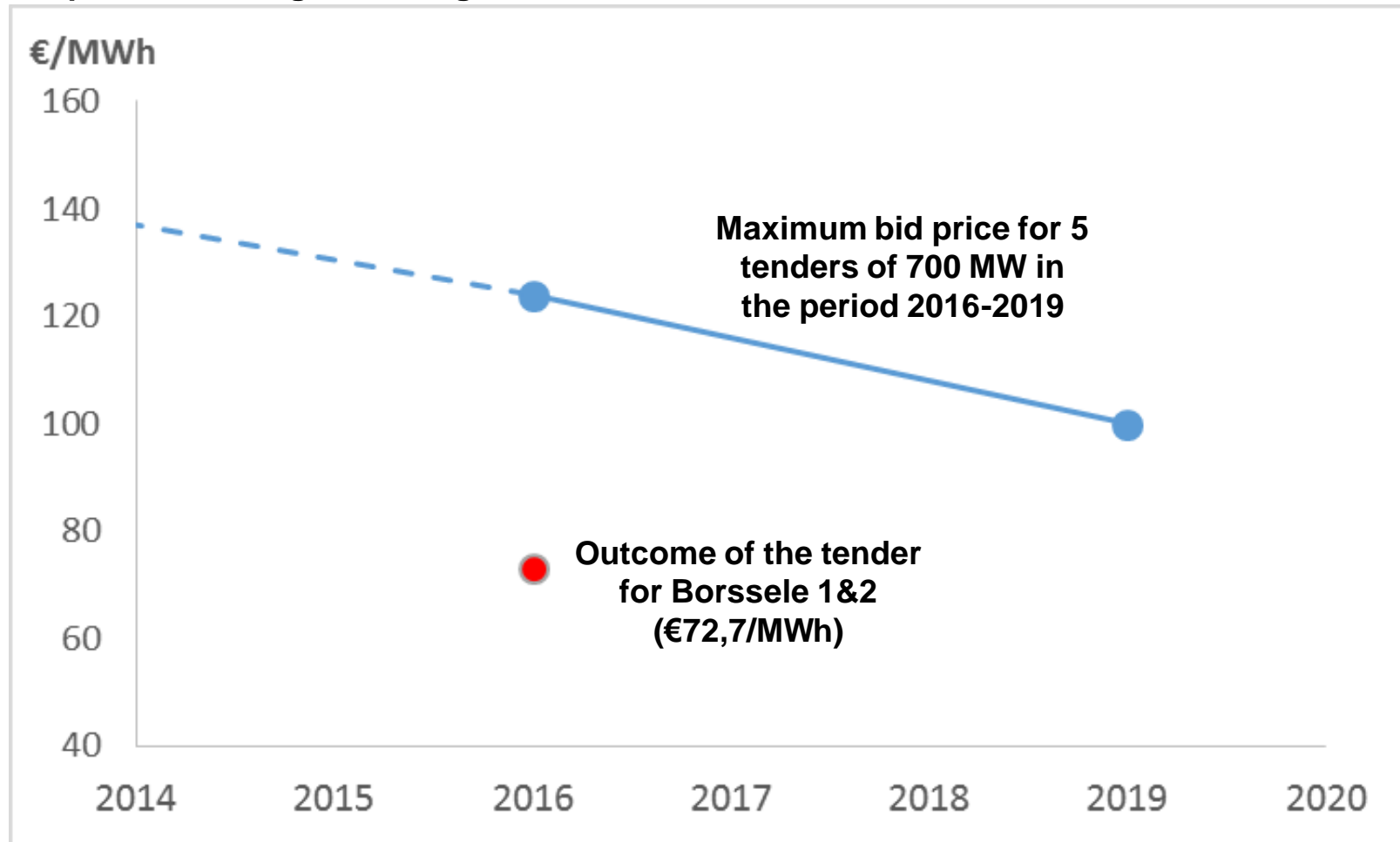
Source: Bloomberg New Energy Finance (BNEF)

1. Excluding small-scale demo sites

2. Wind farms where DONG Energy provides operations and maintenance

# Planned cost reduction trajectory offshore wind in the Netherlands and the outcome of the Borssele 1&2 tender

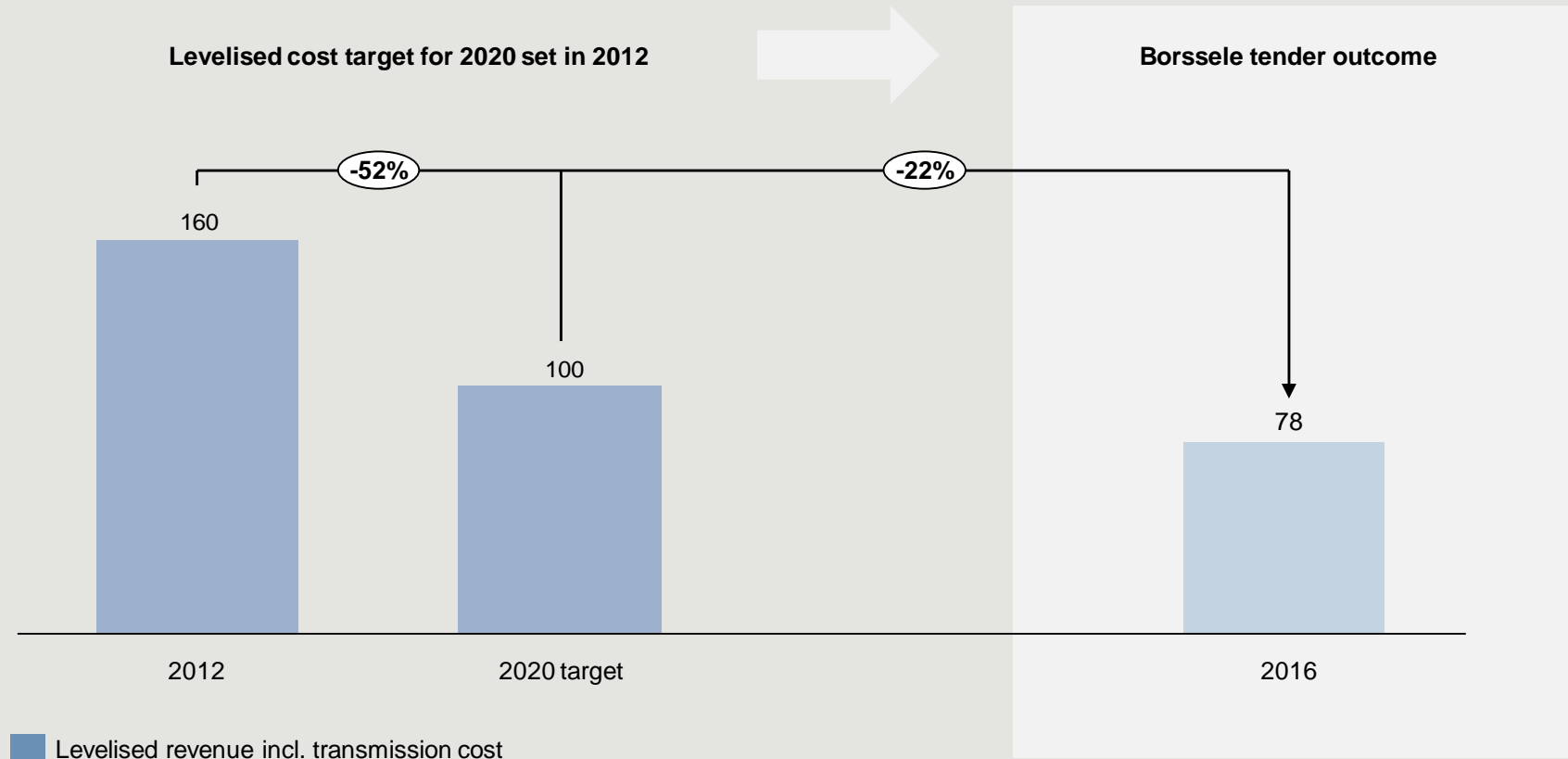
Bid price excluding offshore grid costs



# International 2020 cost target reached 3 years ahead of schedule: Borssele tender cuts 52% of the 2012 starting point

## Costs of offshore wind incl. transmission costs

Year of final investment decision, EUR/MWh, 2012/ 2016 prices<sup>1,2,3</sup>



1: Target originally communicated in 2012 prices (corresponds to 165 and 103 EUR/MWh in 2016-prices, respectively).

2: Average price for the electricity over the lifetime of the plant used as proxy for the levelised costs of electricity. It consists of a subsidy element for the first 15 years and a market income for the remaining 10 years. Discount rate of 3,5% used to reflect society's discount rate. Market income based on PBL Dutch National Energy Outlook (NEV) 2015. Strike price 72,70 EUR/MWh & contract length 15 years.

3: Adjustment of costs to account for the fact that the 2012 target was set for a UK project which primarily incl. costs of transmission and extra development costs.



# The whole European supply chain is contributing to make the technology cost competitive

## Multiple levers to drive down cost in offshore wind

1

### Scale

- Turbines and rotor size
- Sites
- Vessel size
- Cable capacity



2

### Innovation

- Foundation design (e.g. monopiles)
- Electrical



3

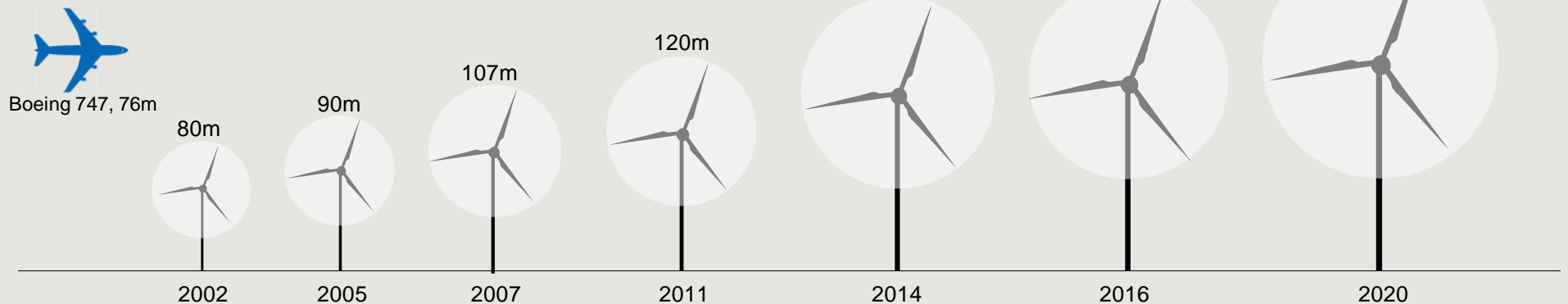
### Industrialisation

- Transition from single supply to multiple global suppliers



## Rapid technological development

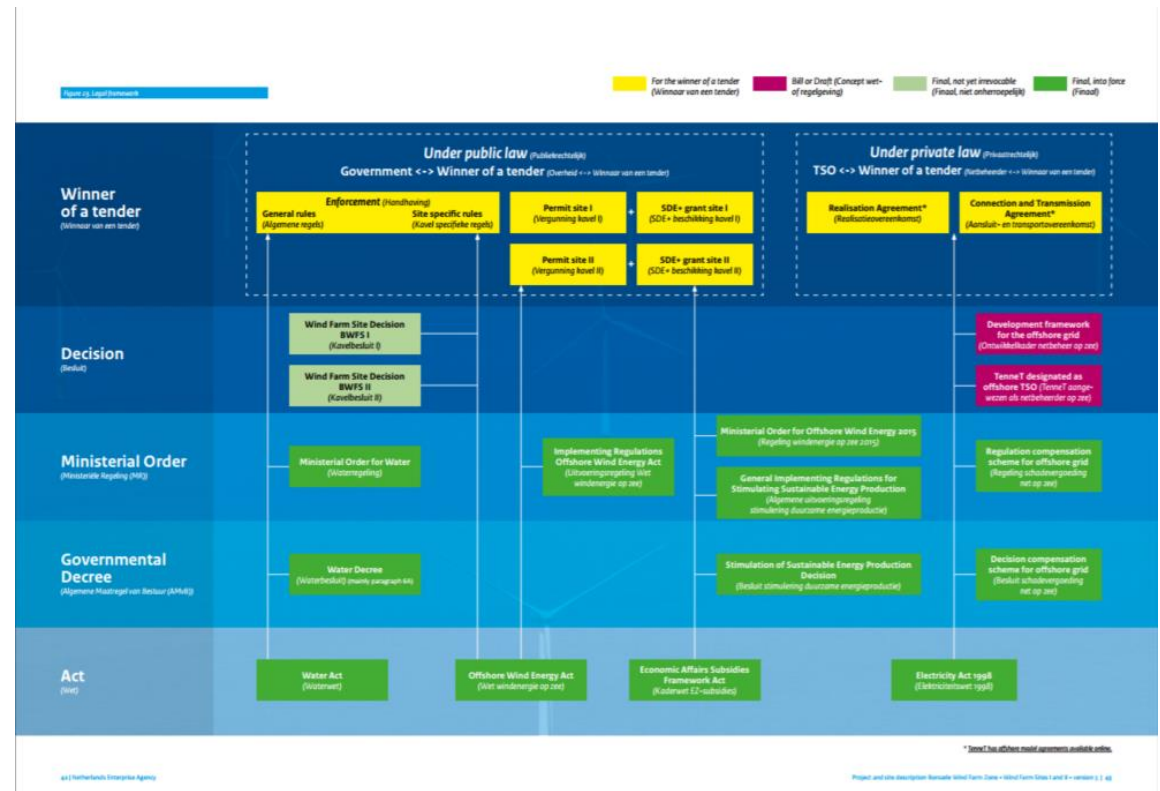
Wind turbine rotor diameter, year of commissioning





# Success factors of the Dutch offshore wind tender system from the perspective of a developer

- **Visibility of market volume with long term roll-out plan**
- **Clear and predictable policy with 5 tenders of 700 MW each**
- **Development of the new policy in close dialogue with the sector**
- **Scale:** the tender allowed development of a 700 MW wind farm which creates economies of scale. Wind turbines up to 10 MW are allowed
- **Flexibility in the site decisions (consent) as well as timing**
- **Little debate about the site decisions**

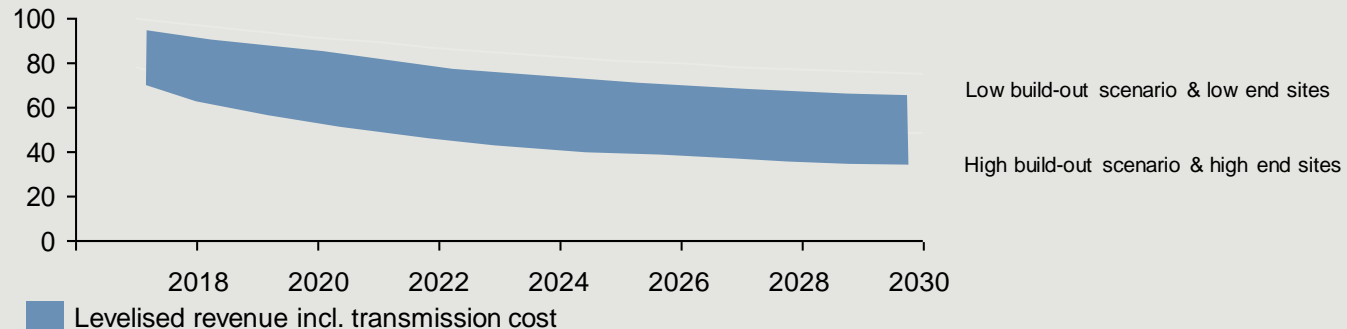


Overview of the Dutch legal framework for offshore wind

# Volume in the international offshore wind market will enable further cost reductions

## Expected levelised costs at final investment decision<sup>1</sup>

EUR/MWh, 2016 prices



## Regulation, supply chain and site conditions influence price level

### Site conditions

- Wind speed
- Distance to shore
- Water depth
- Project size

### Grid connection

- Clarity on responsibilities, timing, technical and legal specifications

### Regulation

- Different length of subsidy period
- Flexibility for the developer to optimize all possible levers

### Supply chain conditions

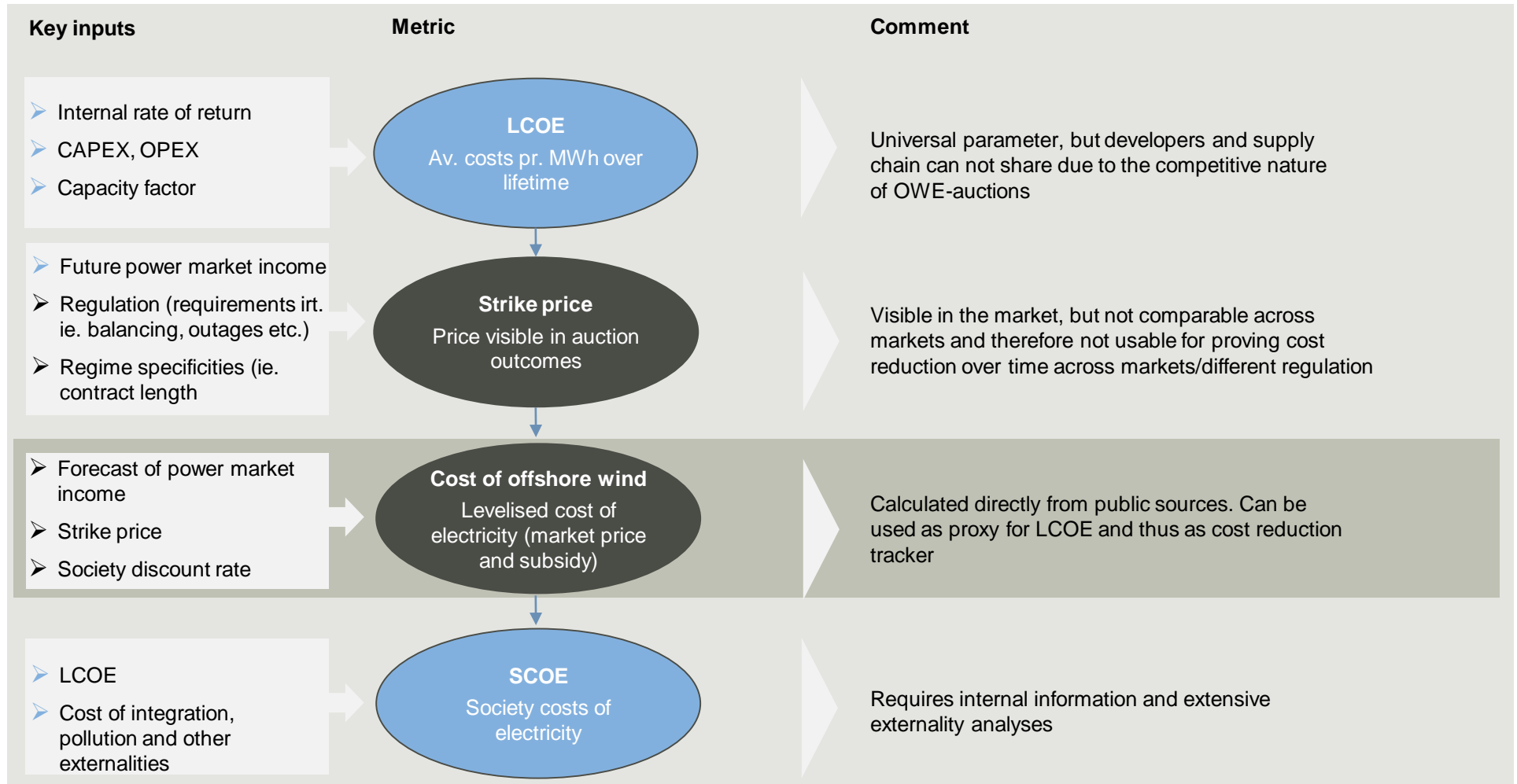
- Competition within the supply chain
- Commodity prices, especially steel

<sup>1</sup>: Projections of offshore wind energy cost reductions based on public sources and simple learning rate approach assuming 14% cost reduction for each doubling of installed capacity. Market volume projection based on BNEF base case for 'world w/o China' with sensitivities of +/- 50% year on year build out.



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# Winning bids for subsidies and public market price forecast reveal the cost for consumers and provide best proxy for cost reductions



- Internal parameter
- External parameter