Offshore Wind in Ireland

IWEA Conference

March 2019

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Agenda

1. Overview of Delivery Frameworks

2. Summary of East Coast Study

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1. Overview of Delivery Frameworks

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Rapidly Decreasing Costs….

- At the sector's inception, offshore wind construction and operation risks included weather risk, a lack of experience, and the absence of sector-specific technology
  - In return for taking these high risks, investors were rewarded with high returns
- Today, weather risk remains prevalent but construction and technology risks have reduced
  - Attracting wider pool of investors
- Reflected in rapidly dropping results of auctions in Europe
  - Germany, Netherlands has seen successful bids of 0 €/MWh
  - Denmark of 49.9 €/MWh
  - Great Britain of 55 to 75 £/MWh
- Advancement in turbine technology will drive down costs further
  - Largest turbine available currently 8 MW; expected to be 13-15 MW by 2025

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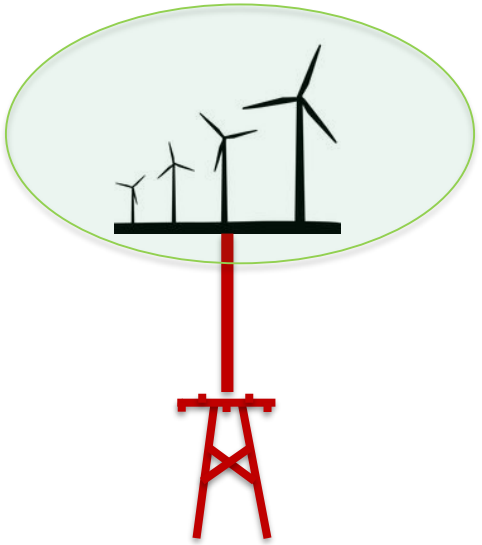
International Delivery Models

Offshore windfarm delivery models:



1. Centralised model – Denmark & Netherlands
   - TSO builds transmission and carries out permitting; developer builds windfarm
   - Germany moving towards this model

2. Decentralised model – Great Britain, US
   - Developer builds transmission, carries out permitting and builds windfarm

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High Level Assessment




Centralised Model

- Plan led model
- State identifies suitable offshore locations for development
- State carries out permitting
- State auctions capacity at preferable sites
- Developers compete to build at each site
- State Builds, Owns and Operates offshore transmission infrastructure

Key Advantages:

1) **Wider investor pool given "simplicity"**
2) **Facilitates optimum development of transmission network**

Decentralised Model

- Developer led model
- Developers lead offshore plan
- State facilitate connections on case-by-case basis
- Offshore grid delivered by 'Generator'
- State ownership when required
- Built to 'Transmission Standards'

Key Advantages:

1) **Experienced developers more adept at identifying sites**

2. Summary of East Coast Study

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East Coast Study

Capacity for offshore wind
Up to 800MW tested

Spare Bays / Space for bays

Capacity for large thermal
Up to 450MW tested

East Coast Generation Opportunity Assessment

February 2019

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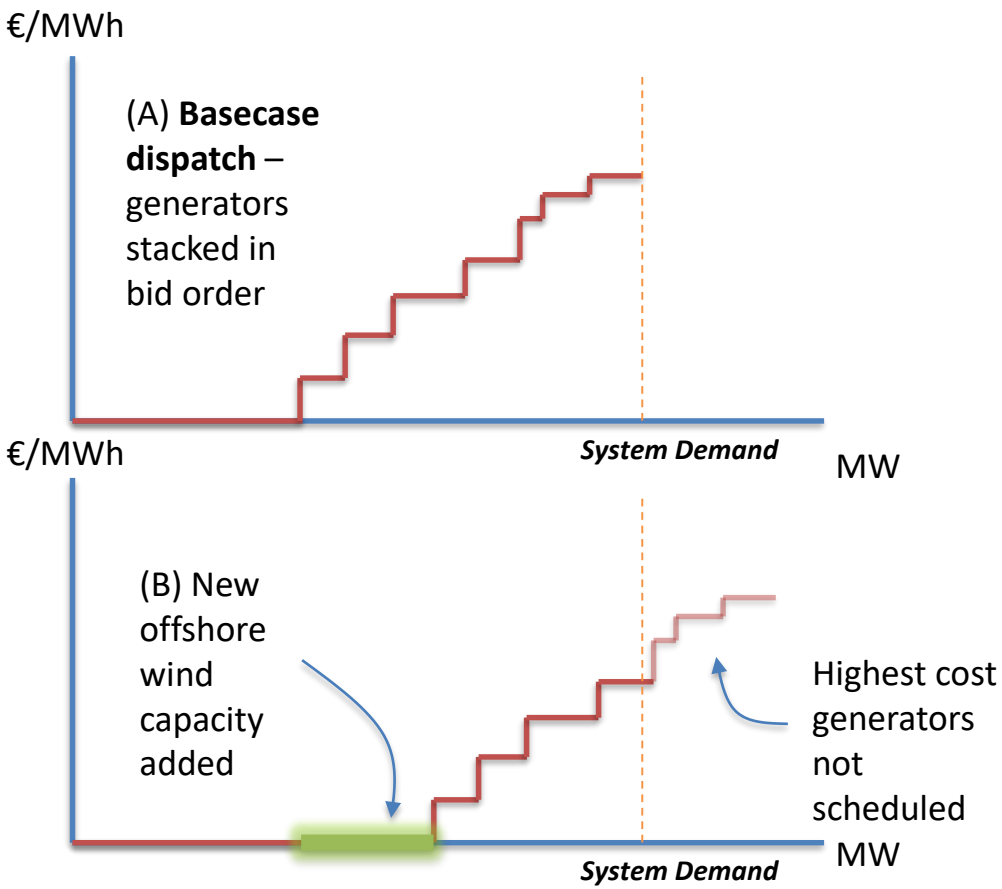
Methodology for Offshore Wind

- 800MW offshore wind added at each node
- Other generation reduced by 800MW in bid order
- Load flow and contingency analysis done
- Thermal loadings checked
- Other generation re-dispatched to minimise constraint
- Offshore wind capacity reduced until all loadings within standards



Offshore Opportunities North of Dublin

Location	Capacity MW		Bays
Louth	450	in existing network	Space for 4 x bays
	650	with North South, CP996 & Louth-Woodland uprate	
	800	plus Sliabh Bawn-Lanesboro uprate	
"Oriel"	400	in existing network	*New Station*
	650	with North South, CP996 & Louth-Woodland uprate	
	800	plus Sliabh Bawn-Lanesboro uprate	
Woodland	800	in existing network	Space for 2 x bays

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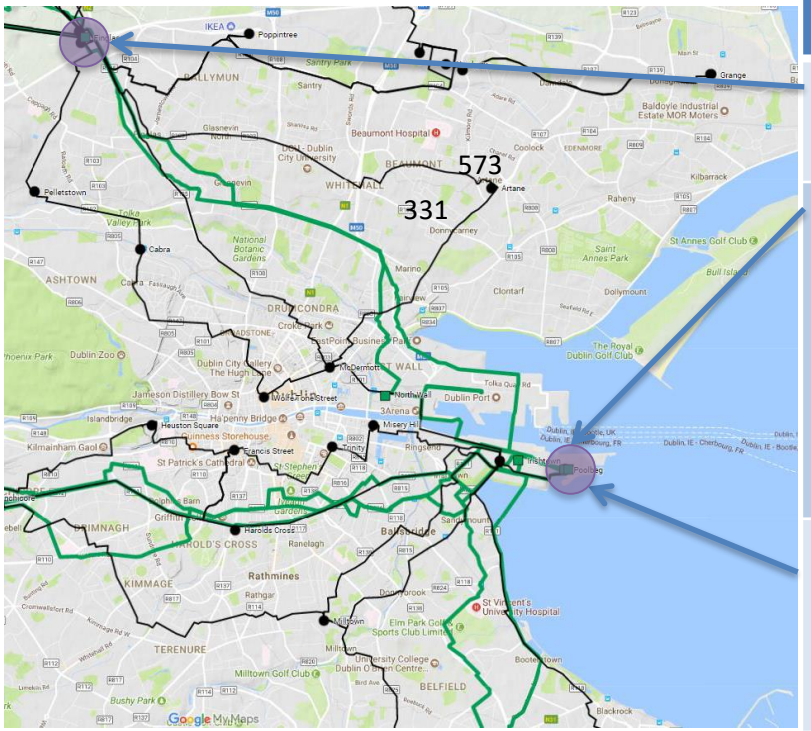
Offshore Opportunities near Dublin



Location	Capacity MW		Bays
Finglas	800	in existing network	1 x bay
Poolbeg North	600	in existing network	0 bays
	800	if we uprate Finglas – North Wall Cable	
Poolbeg South	800	in existing network	2 x bays

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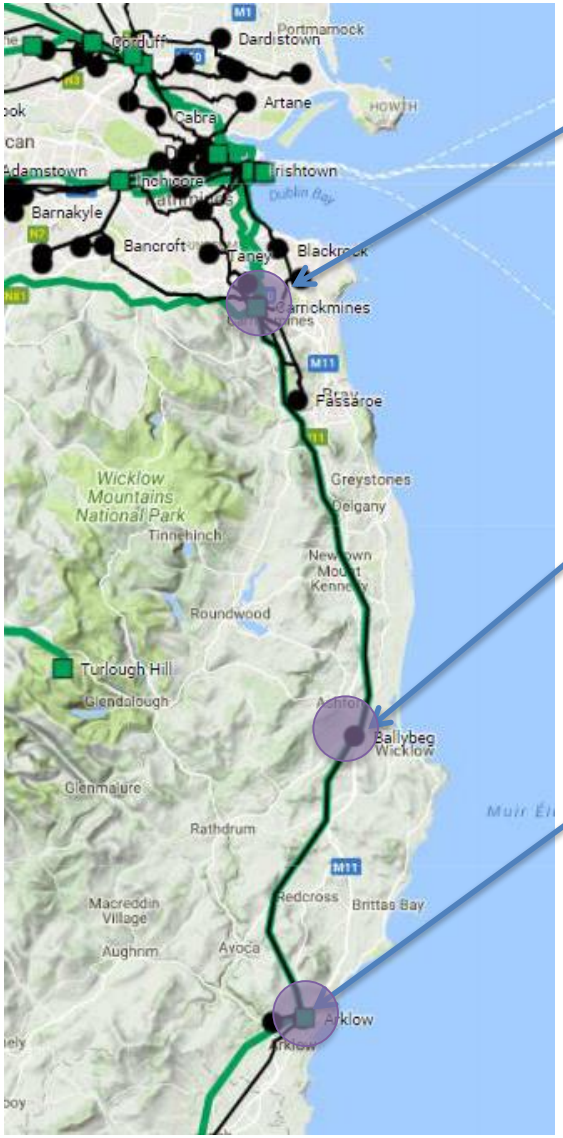
Offshore Opportunities South of Dublin



Location	Capacity MW		Bays
Carrickmines	650	in existing network	3 x bays
	350	if 350 also connected at Arklow	
	800	If new Carrickmines- Poolbeg circuit added	
Ballybeg	500	if we upvoltage Ballybeg-Carrickmines 1	*New 220kV station*
	700	if we also uprate Ballybeg-Carrickmines 1 and 2	
Arklow	350	in existing network	Space for 2 x bays
	500	if we upvoltage Arklow-Carrickmines 1	
	800	If we also uprate Arklow-Carrickmines 1 and 2	

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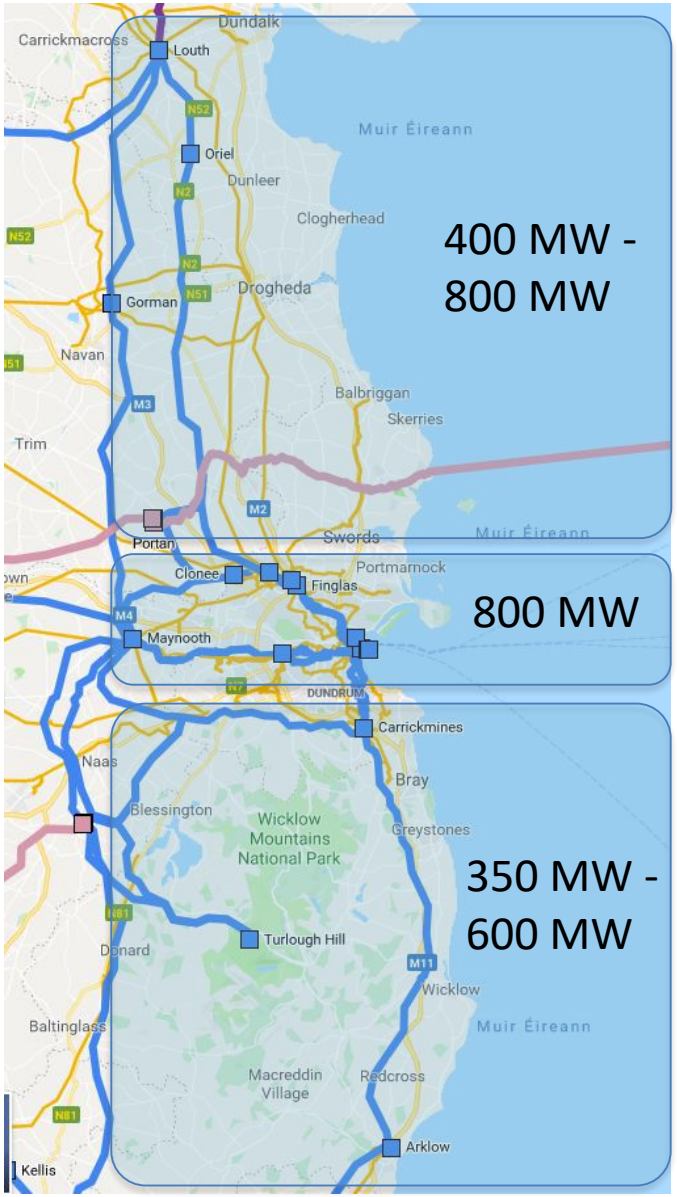
Summary of Capacity



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Conclusion

- Significant increase in renewable energy sources required to meet 2030 targets

Variables	Today	Steady Evolution	Low Carbon Living	Slow Change	Consumer Action	National Trends	NECP (Scenario 2) High Oil	NECP (Scenario 4) Low Oil
Wind (Onshore) (MW)	3,424	5,140	5,500	4,640	5,380	5,858	6,435	6,952
Wind (Offshore) (MW)	25	700	3,000	250	1,000	857	1,800	1,800
Solar (MW)	20	500	2,500	200	1,500	1,500	1,500	1,500

- Spectrum of offshore delivery models in operation in Europe / US
- East Coast Generation Opportunity Assessment
  - Significant grid capacity is available for off-shore wind generation along the east coast; better closer to Dublin

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