First Offshore Windfarm Project in India (FOWPI) with EU-backing

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

Presentation at FOWPI Metocean Workshop

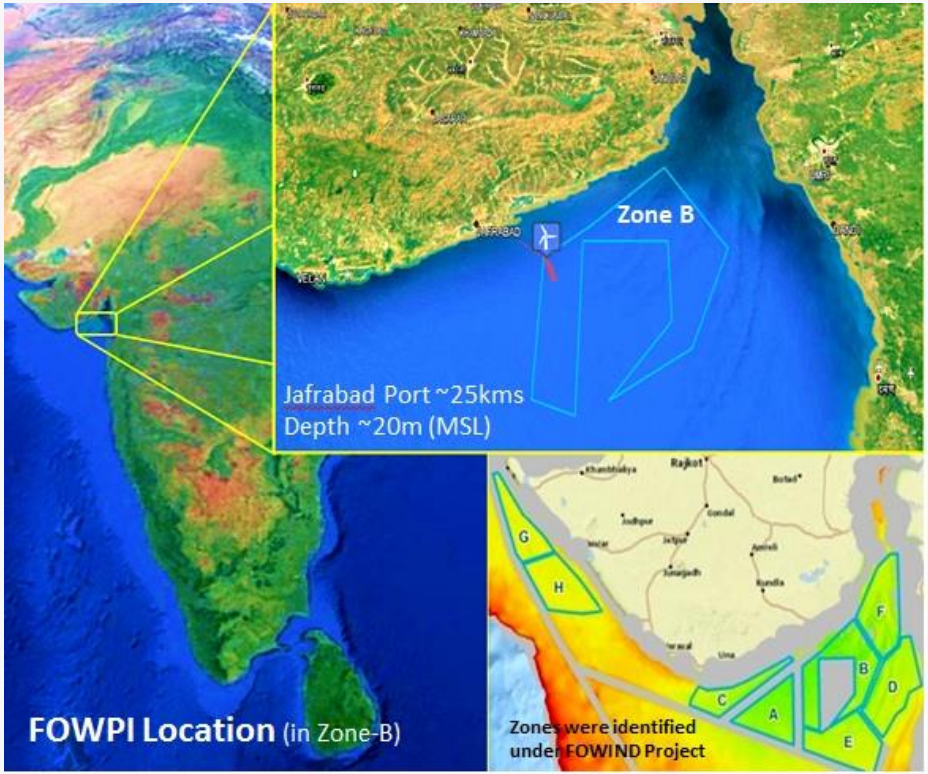
2 June 2017

Per Vølund, COWI

The Project is funded by The European Union

Agenda

1. Offshore Wind in General
2. FOWPI in brief
3. FOWPI's role in Indian Offshore Wind
4. Tentative time schedule of FOWPI
5. Status of FOWPI
6. Site selection
7. Preliminary layout
8. Design Basis
9. Images of Offshore
10. European OWF Tendering
11. Summary



1. Offshore Wind in General

- Offshore Wind is a rather new technology
- Installed Offshore Wind Capacity in 10 European countries is 13 GW
- China, USA and Taiwan also have offshore wind turbines
- Cost level so far has been high
- Prices are now going down
- April 2017 auction result in Germany winning result was market price, grid for free + 0 subsidy
- Indian Offshore Wind Resource is more than 100 GW
- 200 MW FOWPI demonstration project is planned for commissioning in 2022 – off Gujarat
- EU will assist India in kick-starting India's Offshore Wind exploitation

2. FOWPI in brief

- **Project implementation period :** Started in January 2016 – 3.5 years
- **Global objective of CECI:** enhancing India's capacity to deploy low carbon energy production and improve energy efficiency, thereby contributing to the mitigation of global climate change
- **Purpose of the contract:** Technical assistance and advisory services to the Ministry of New and Renewable Energies (MNRE) and National Institute of wind energy (NIWE) for setting up the **First 200 MW Offshore Windfarm Project in India**;
- **Implementation:** Contract awarded to COWI with WindForce as Indian sub
- **Funds:** The project is funded through the partnership instrument of the European Union

3. FOWPI's role in Indian Offshore Wind

- The project FOWIND has with EU-funding since 2014 worked to facilitate the exploration of Offshore Wind in India – by preparing a general basis of possibilities and challenges in exploring the resource, and how to overcome the challenges

- FOWPIs role is – on the basis of results from FOWIND – to prepare for a first 200 MW project to be tendered by NIWE

- After this NIWE will be ready to tender the vast Indian Offshore Wind Resource, and investors will be ready fairly to assess the risks involved in such investments

4. Tentative time schedule for 200 MW FOWPI

- Site Investigations and Tender Documents ready by Mid 2018 (MNRE, NIWE, FOWIND, FOWPI)

- Tender Phase 2nd Half 2018
- Selection of Winning Bid by End 2018

- Suppliers Manufacture 2020
- Construction/Installation 1st Half 2021
- Commissioning 2nd Half 2021

- Regular Operation 2022 - 2041

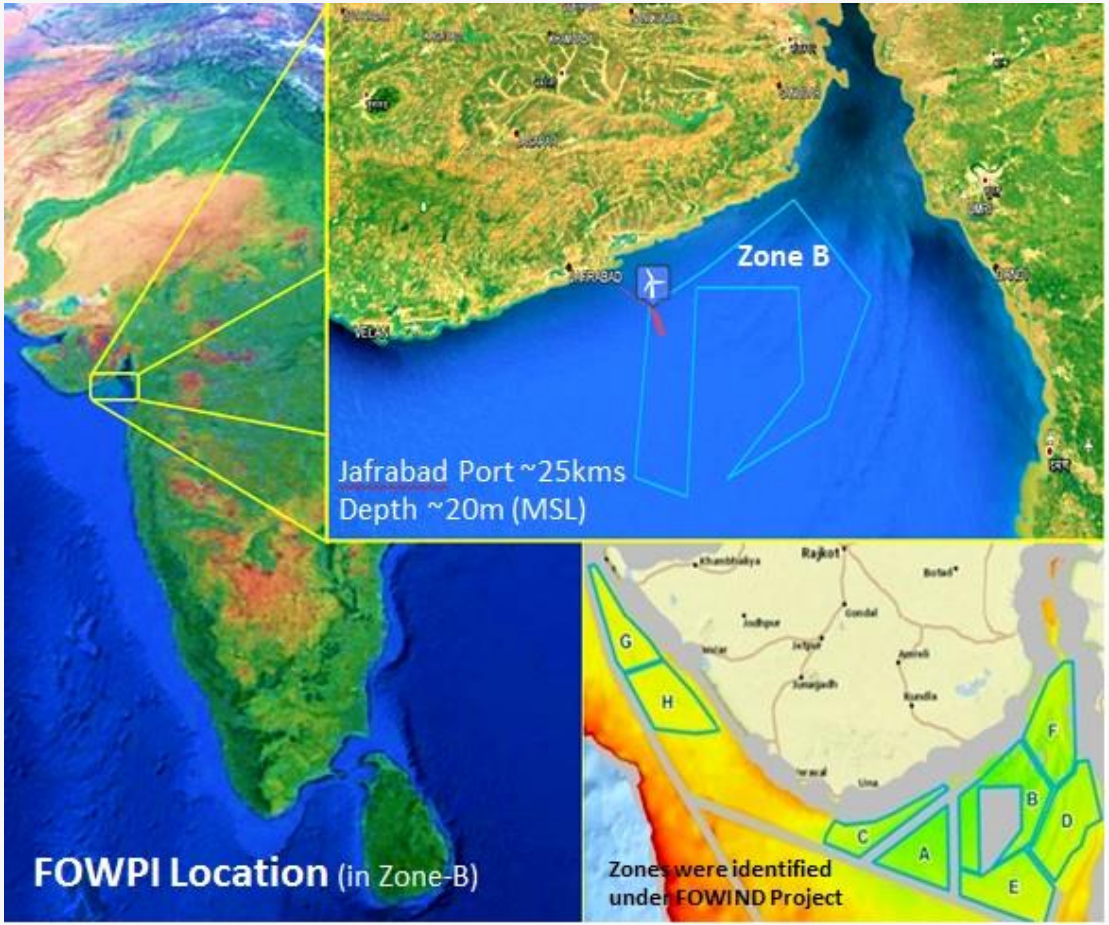
5. Status of FOWPI

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

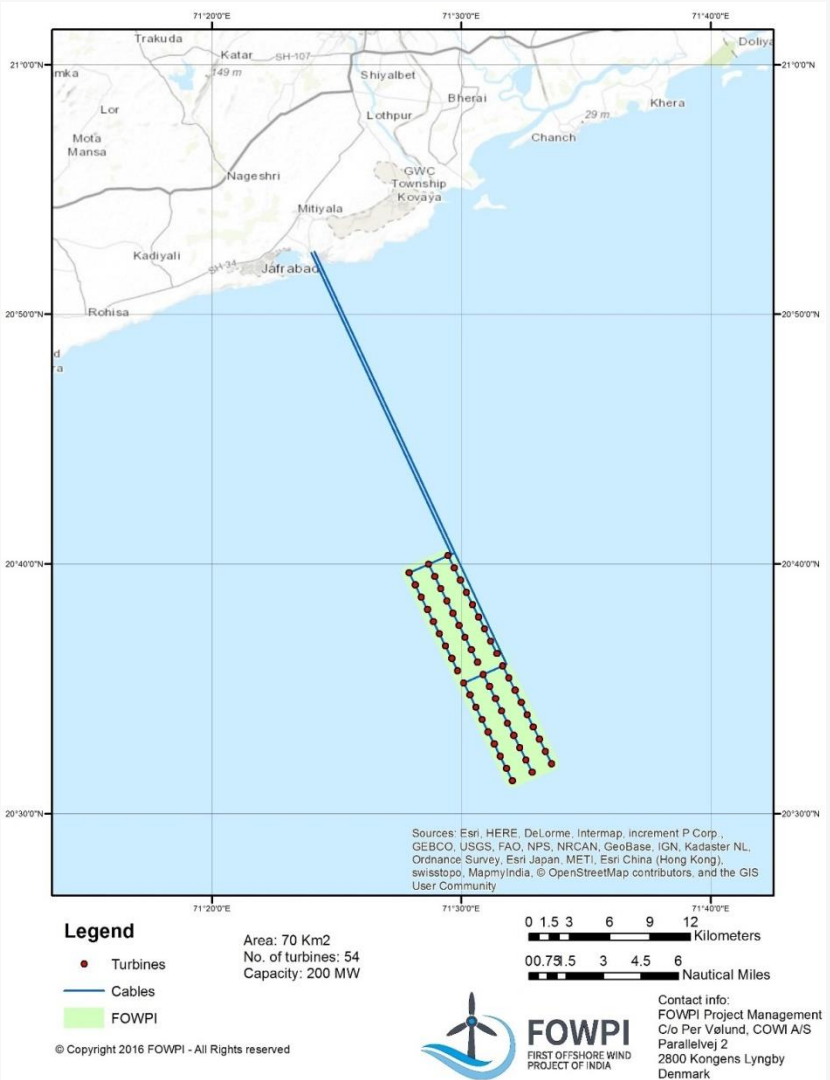
Work Package	Completion	Comments
1. – Technical WP's		
1.1 – Site Layout	30%	Site selected – Off Gujarat Preliminary Layout completed.
1.2 – Yield Estimate	0%	Not yet initiated – 3-4MW and 6-8MW
1.3 – Environment and Consenting	15%	EIA Scoping Report. Missing general guidelines for India Offshore Wind EIAs.
1.4 – Metocean Assessment	90%	Final Draft Reports Completed. Reports for review at NIWE and EU. Workshop planned at NIWE on (2 June 2017?).
1.5 – Soil Conditions	25%	Survey contractor contracted. Fugro India ltd. Permission Issue.
1.6 – Foundation Design	0%	Not yet initiated
1.7 – WTG Technology	0%	Not yet initiated
1.8 – Electrical Services	6%	Grid Connection. Substation. Export Cabling. Array Cabling.
1.9 – Coastal / Onshore	0%	Not yet initiated
2. – Non-Technical WP's		
2.1 – Knowledge Bank	80%	Web portal and knowledge Bank. Edition1 completed. Under review at NIWE. Knowledge Bank to be transferred to NIWEs portal.
2.2 – Financial Investment Model	5%	
2.3 – Procedures	5%	
2.4 – Capacity Building	12%	Study tour. Maybe during "WindEurope" conference in Amsterdam 28-30 November 2017. Coordinate with FOWIND. Know-ledge sharing workshop at RE-Invest 2017
2.5 – Secretariat Services	40%	Provided through WinDForce

6. FOWPI Site Selection

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA



7. FOWPI Preliminary Layout



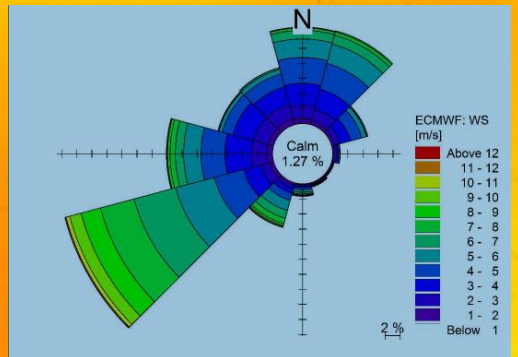
FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

Legend
Turbines
Cables
FOWPI

8. Design Basis

8.1 Harbours around FOWPI

8.2 Gujarat Offshore Wind Resource



NOTES:

- The wind speed values obtained from the modelling process have not yet been compared to any measured wind speed references. The wind speed values extracted from this map should therefore be considered as indicative only and are subject to high uncertainty.

Modelled mean wind speed [m/s]

5.5 6.0 6.5 7.0

fowind
FACILITATING OFFSHORE WIND IN INDIA

Offshore Site Identification Study of Gujarat

FOWIND - Offshore wind modelling
Gujarat: Wind Speed at 80 m height

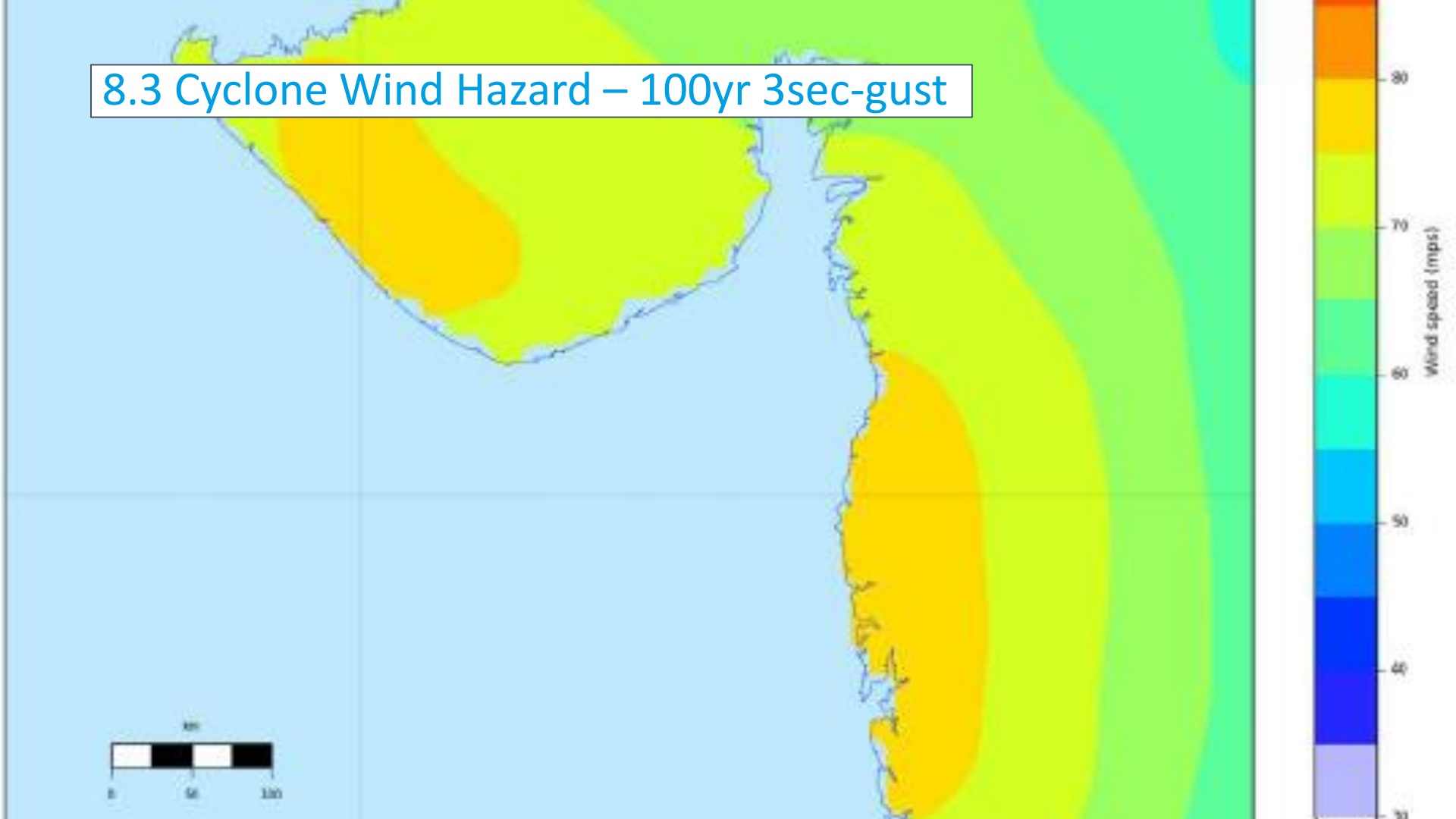
141027-NT

DNV·GL

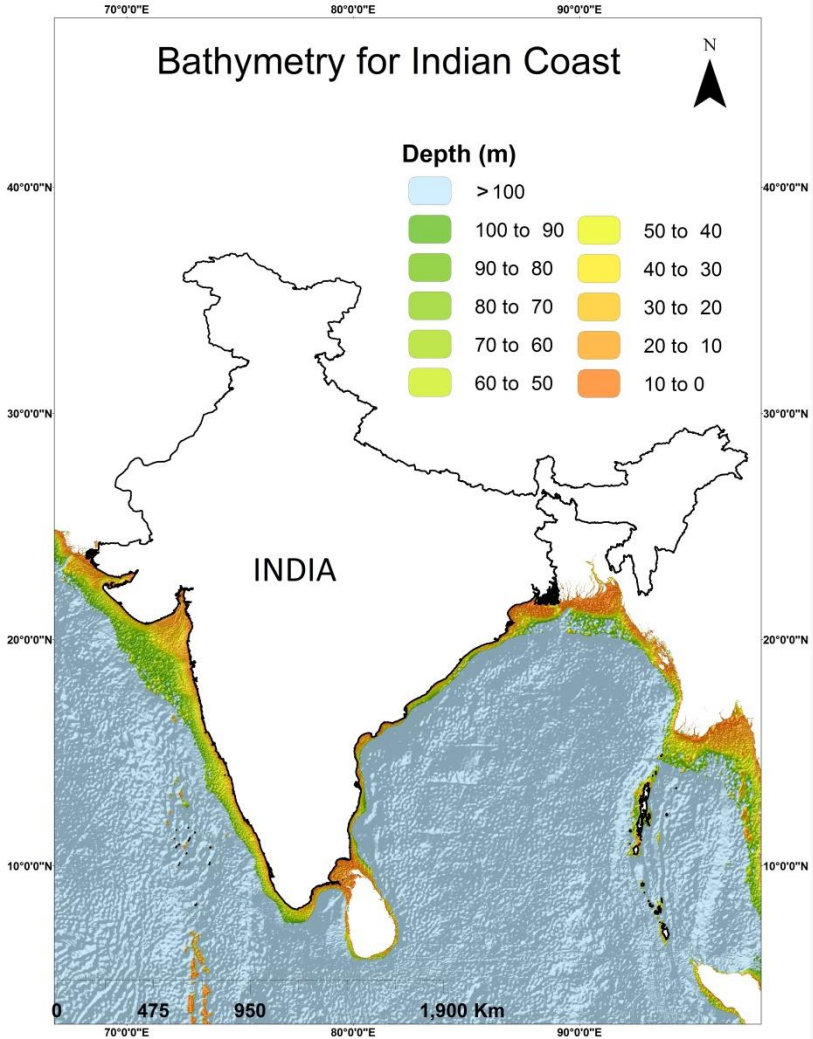
October 29, 2014

Projection: WGS84 World Mercator
GIS data sources: EEZ, GEBCO, SRTM

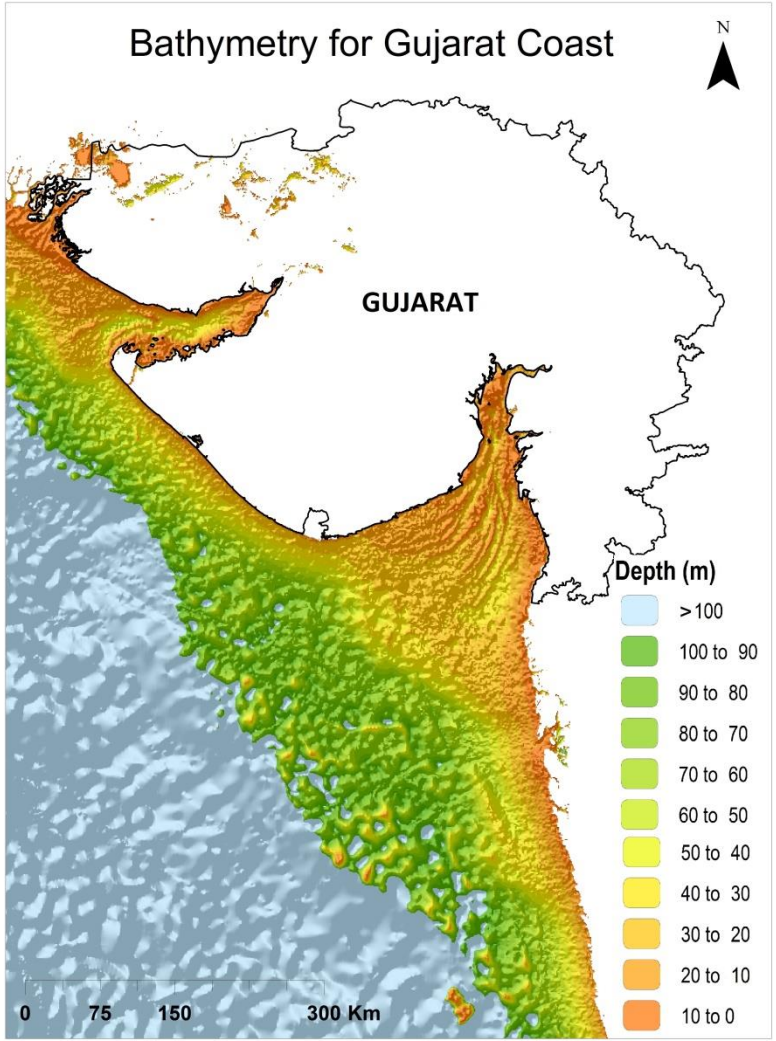
8.3 Cyclone Wind Hazard – 100yr 3sec-gust



8.4a Bathymetry Chart

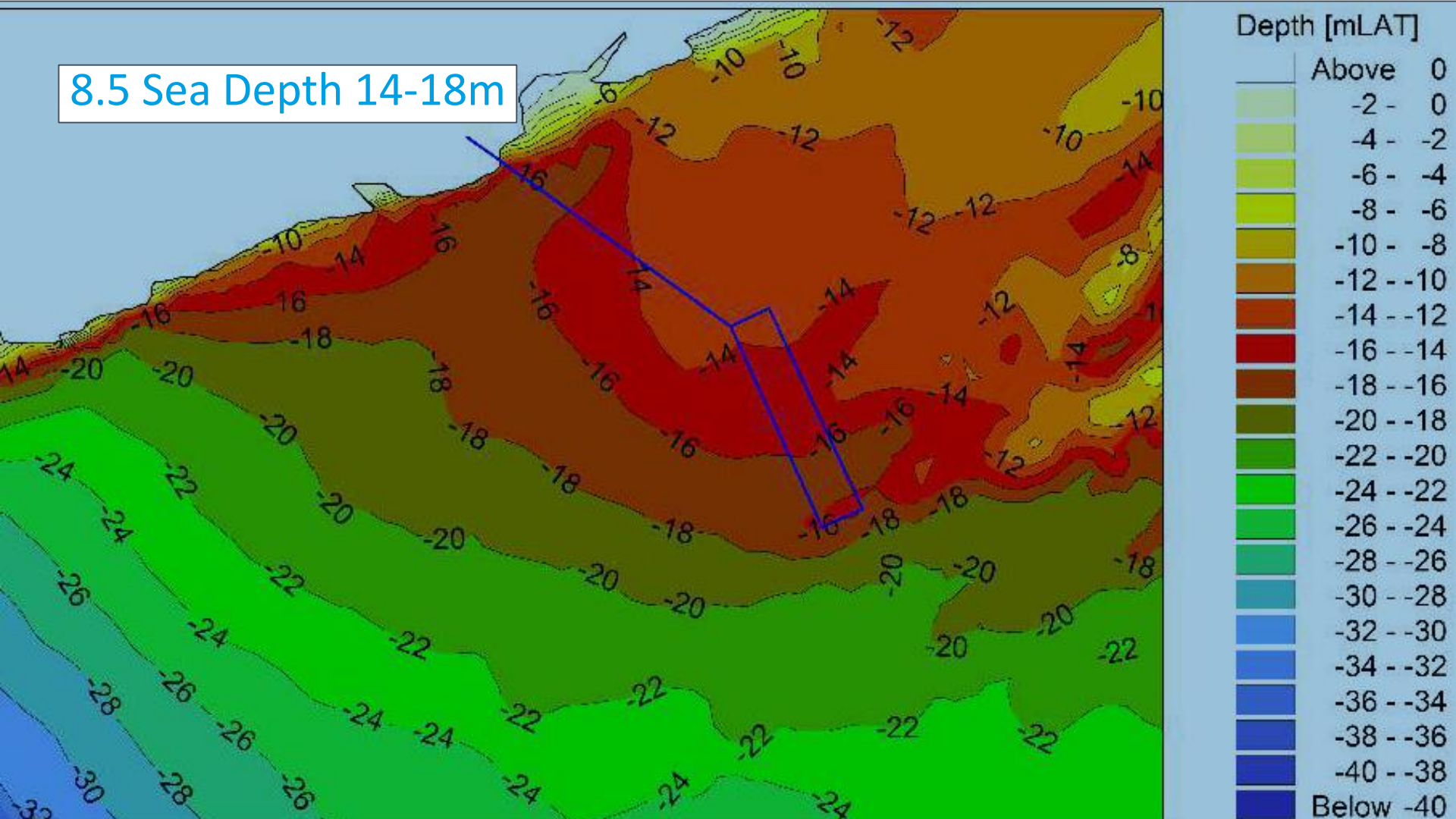


8.4b Bathymetry Chart



FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

8.5 Sea Depth 14-18m



8.6 Offshore Lidar Platform in Gulf of Khambat

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

8.7 Wind Measurements at Offshore Lidar Platform

9.1 An Offshore Windfarm

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

9.2 Large WTGs

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

9.3 Foundation Design is a Challenge for Engineers, Manufacturers and Installation

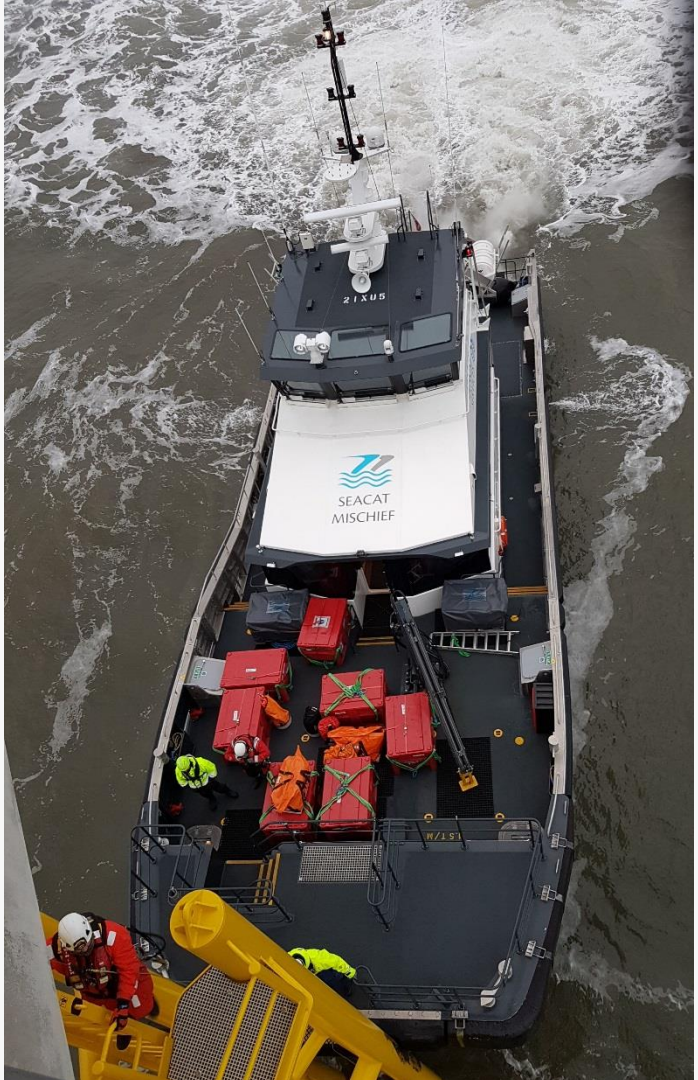
FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

9.3 Electrical Design for Offshore

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

9.4 Installation needs the Right Vessels

9.5 O&M is Very Costly



FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

10. Recent European OWF Tenders

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

- **Germany April 2017** (TSO provide offshore grid-point):
  - 3 winning projects offer to deliver at electricity market price from 2024 plus **subsidy of 0 Eurocent/kWh**.
  - 3 winning projects offer to deliver at electricity market price plus subsidy of 0-6 Eurocent/kWh.
  - Market Price 3 INR/kWh, Grid Cost 1 INR/kWh: Estimated price 4 INR/kWh

- **Denmark November 2016** (TSO provide offshore grid-point):
  - Winning 600 MW Kriegers Flak to deliver at **5.0 Eurocent/kWh** for 15 years, after that at market price.
  - Winning Price 3.5 INR/kWh, Grid Cost 1 INR/kWh: Estimated price 4.5 INR/kWh (15 years)

- **Netherlands July 2016** (TSO cover offshore transmission costs.):
  - Winning project of 700 MW to deliver at **7.3 Eurocent/kWh** for 15 year, after that at market price.
  - Winning Price 5 INR/kWh, Grid Cost 1 INR/kWh: Estimated price 6 INR/kWh

11. Summary

- India's potential for Offshore Wind is at least 100 GW+
- Offshore Wind costs in EU are presently rapidly decreasing
- Latest Winning Tender Price in EU around 4 INR/kWh
- EU subsidize preparation of the First Offshore Windfarm Project in India, FOWPI, to be tendered in 2018-19 - to kick start Indian offshore wind

FOWPI
FIRST OFFSHORE WIND PROJECT OF INDIA

You can find us at

www.FOWPI.in

Per Volund: pevl@cowi.com

Thank You!