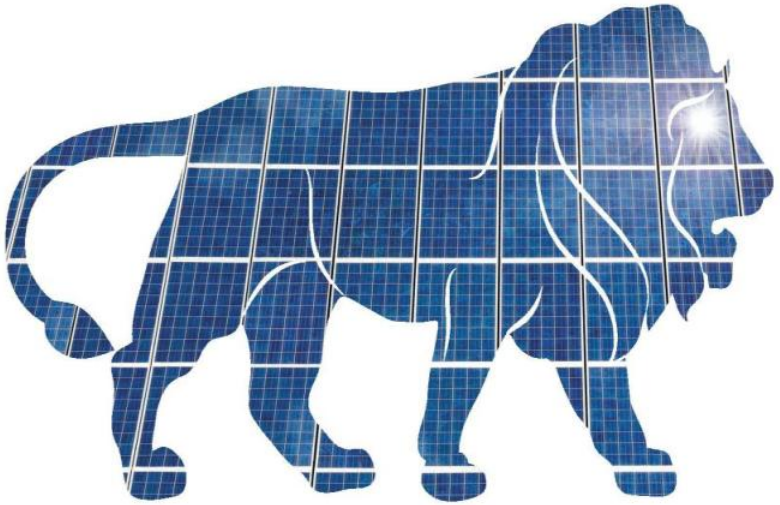
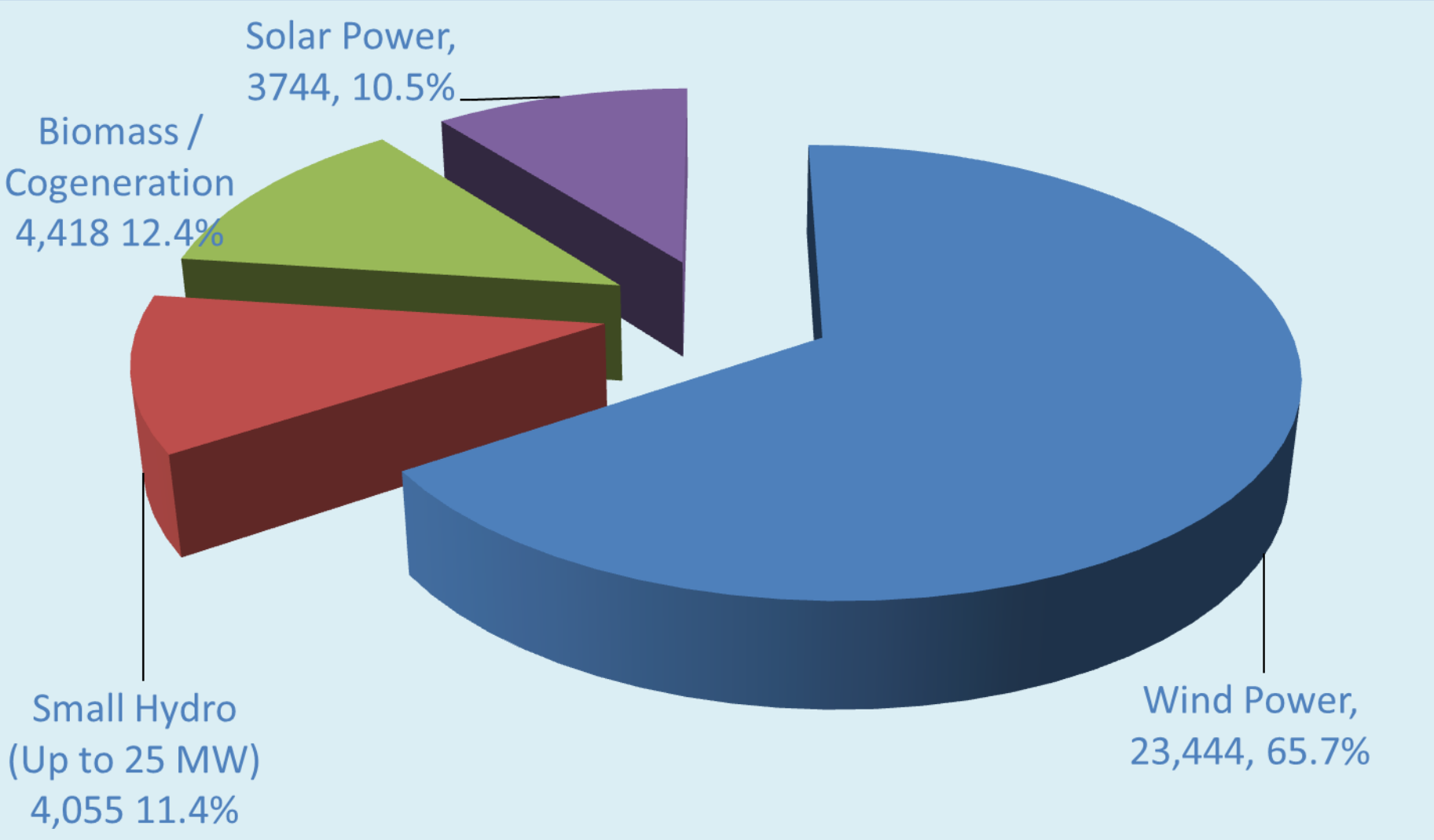
Wind Power in India

RENEWABLE ENERGY

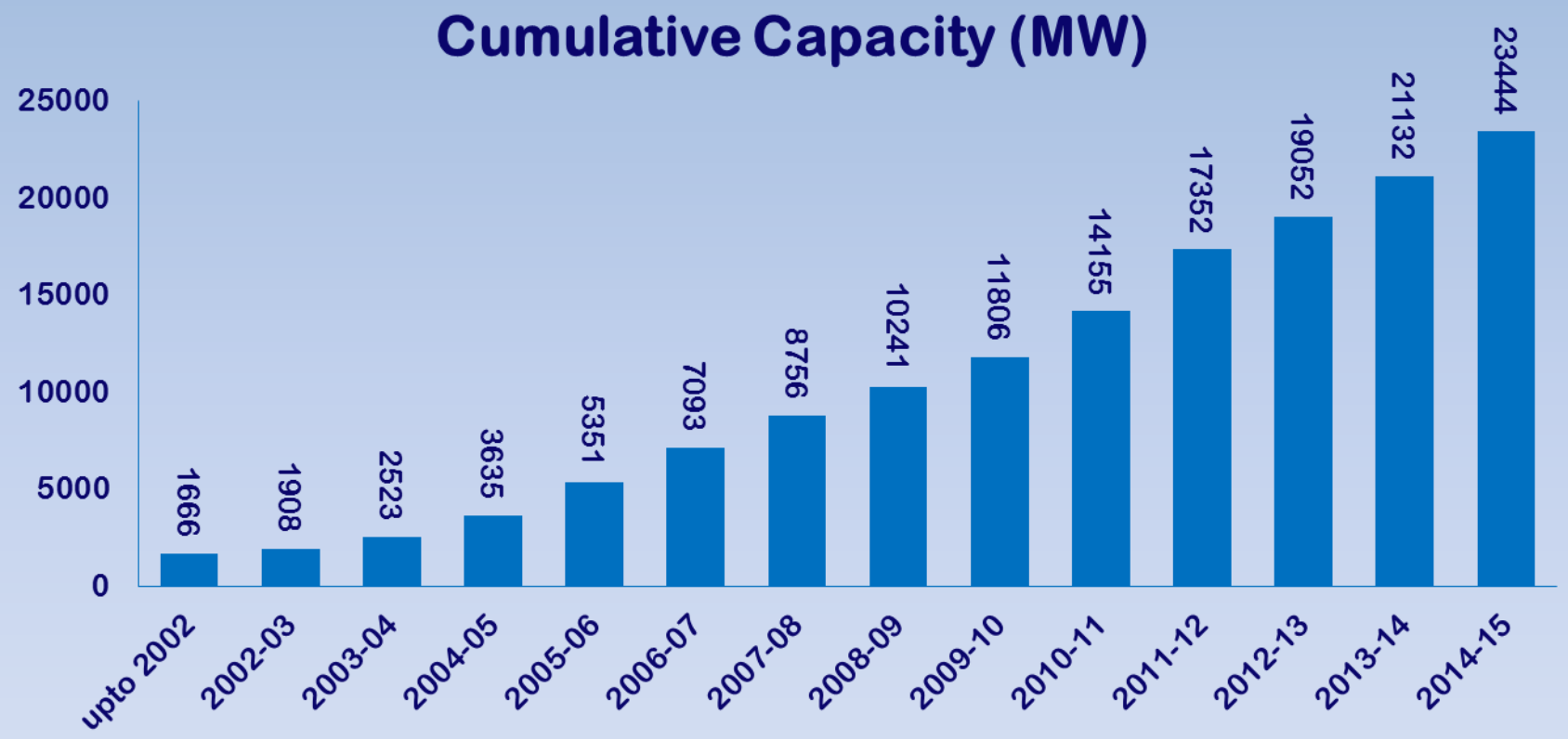


Present Status

Total Installed Capacity 35,661MW



Wind Power – Progress



Wind Power – Development

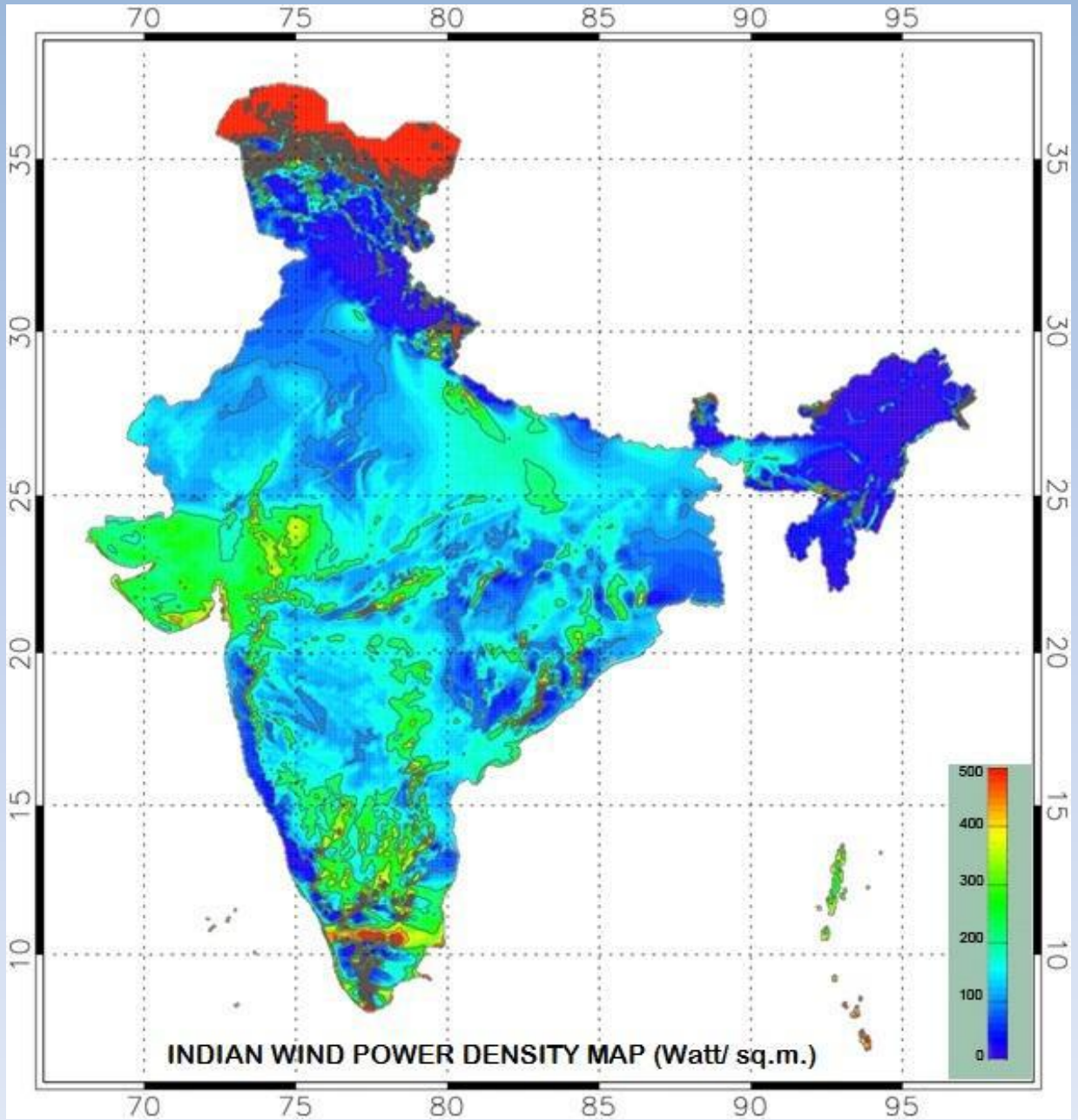
- Potential (at 80 m) : 1,02,788 MW
- Total Achievement : 23,444 MW
- India ranks 5th globally after China, US, Germany and Spain

Period	Target (MW)	Achievement(MW)
11th Plan	9,000	10,260
12th Plan	15,000	6,091 (3yrs/5)
2012-13	3,000	1,700
2013-14	2,500	2,079
2014-15	2,000	2,312

Wind Power – the Indian Experience

- **A commercial and market oriented approach**
- **Conducive policy framework for private sector investment**
  - Policy stability provided for orderly growth of the sector
  - States introduced policies on wheeling, banking, and buy–back/third party sale
- **Technology development at par with international standards with private sector participation**
  - Foreign companies allowed to have their subsidiaries and joint ventures
  - Private sector was allowed to develop turbines suitable for Indian wind regime and grid conditions
  - Self certification (up to 2011) allowed and then prototype machines allowed to develop new turbines
- **Quality assurance by introducing necessary policies**
  - Machines with Type Approval were allowed
  - Manufacturing base in India essential
  - ISO certification necessary
- **Extensive wind resource assessment to identify suitable sites**
  - Actual field measurements of wind data gave confidence to investors

Wind Map of India



State-wise break-up of Potential & Achievements

S.No.	State	Potential in MW @ 80m (^#*)	Installed Capacity (MW) as on August 2014
1.	Andhra Pradesh	14497	878
2.	Gujarat	35071	3520
3.	Karnataka	13593	2532
4.	Kerala	837	35
5.	Madhya Pradesh	2931	494
6.	Maharashtra	5961	4141
7.	Rajasthan	5050	2845
8.	Tamil Nadu	14152	7372
9.	Others	10696	4
Total		1,02,788	21,821

* Wind potential is yet to be validated with actual measurements.

\# Estimation is based on meso scale modeling (Indian Wind Atlas).

^ As actual land assessment is not done, on a conservative consideration, 2% land availability for all states except Himalayan & Northeastern states, Andaman Nicobar Islands and poor windy states has been assumed. In other areas, 0.5% land availability has been assumed.

Wind Resource Assessment

- 800 monitoring stations commissioned, 155 in Operation
- 75 new stations at 100 m height under installation (73 installed) in 7 states
- Eight handbooks on Wind Energy Resource Data published
- Indian Wind Atlas launched
- New scheme of WRA at 100m in 24 States (500 stations)
  - Project cost : $27 million
- Re-assessment of wind potential at higher heights under consideration of a committee

India – IEA vs GWEO Scenarios

- IEA New Policies Scenario (2011): 32 GW (2020)
- GWEO (2012) Moderate Scenario: 31.4 GW (2015) and 59 GW (2020)
- GWEO Advanced Scenario: 89 GW (2020) and 124 GW (2030)
- Target of Government: 60 GW by 2022

Technology Status in India

- Capacity: 250 – 2500 kW
- Hub heights: 41– 110 m
- Rotor Diameter: 28 – 120 m
- Gear and gearless type turbines
- State-of-the-art technology available through 20 manufacturers with 58 models of turbines
- Export to USA, Europe, South America and Asian countries
- Indigenization: about 70% (in machines up to 500 kW)
- Vendor development – parts and components, including rotor blades, gear boxes, yaw components, nacelle cover, raw material for blades, being manufactured
- Cost of Indian wind turbines lowest in the world

RE Incentives

TAX	NON TAX
Investment Tax Credits Investment Allowances Accelerated Depreciation Tax Holidays Exemptions/Deductions	Feed in Tariff Capital Grants Production Linked Incentives R&D Funding Support Rebates on Equipment Land Facilitation Low Cost Financing

Generation Based Incentive

- GBI over and above the Feed-in Tariff
- GBI and AD available in mutually exclusive manner
- GBI - Rs.0.50/kWh subject to max Rs. 1.00 crore/MW
- Duration: > 4 years and < 10 years
- Captive producers allowed but open access (merchant power) not allowed.
- Effective retrospectively from 01.04.2012
- 4,900 MW installed through GBI

Offshore Wind Power Development

Background

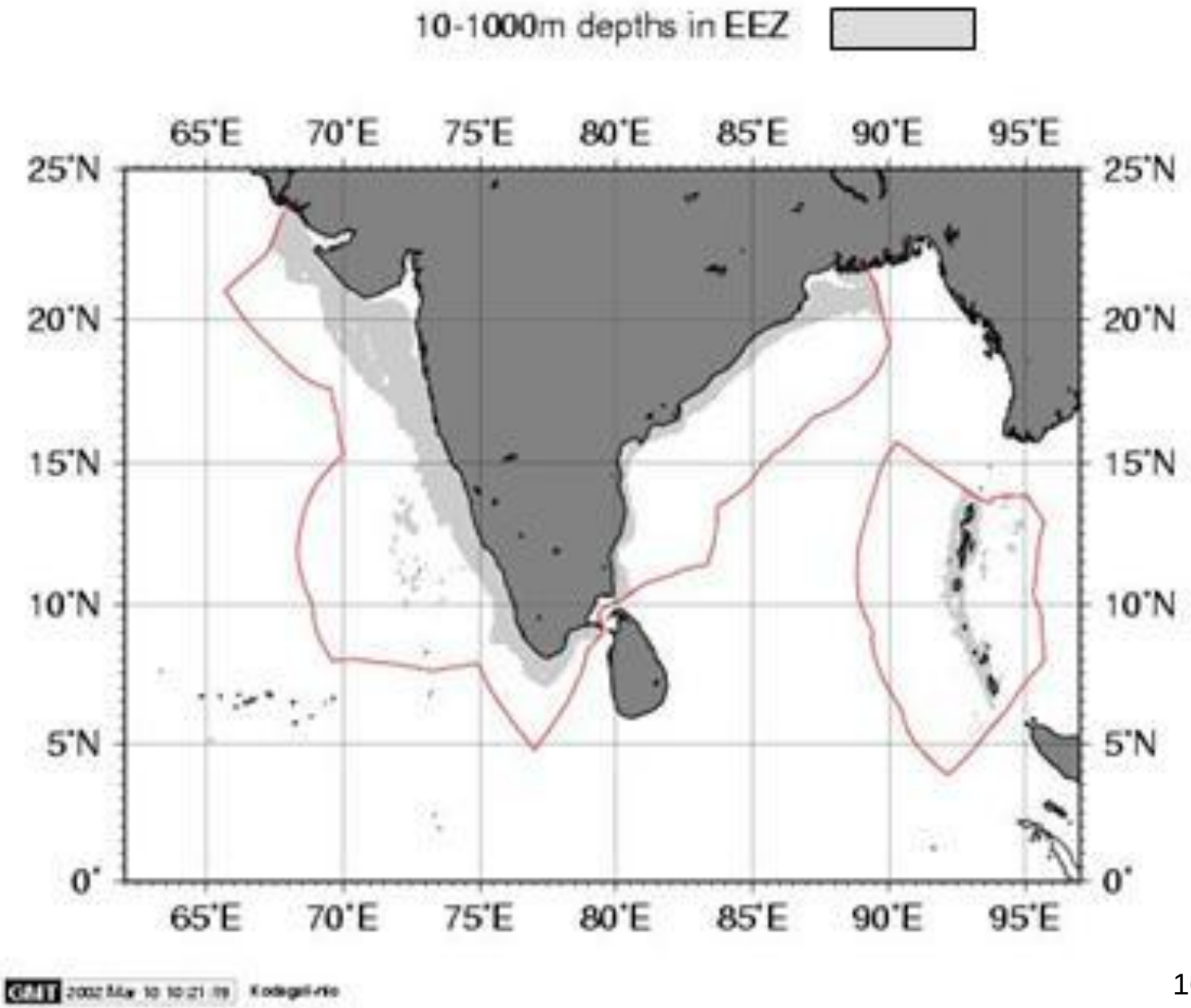
- India’s coastline of 7600 KM and Exclusive Economic Zone of over 2.3 million sq. km provides good potential for offshore wind power development.

- Off-shore Wind Energy Steering Committee (OWESC) was constituted in 2012 to suggest policy frame work and inter-agency coordination.

- National Consultation to discuss draft policy and its provisions with investors, manufacturers, PSUs and related Ministries & Agencies from Union and State Governments organized by MNRE on 14th August 2013.

- Ministry of New & Renewable Energy (MNRE) has prepared and issued draft National Offshore Wind Energy Policy.

India's Exclusive Economic Zone



Main Features of Proposed Policy

- National Institute of Wind Energy (NIWE)- single window agency
- NIWE to coordinate with CERC and SERCs for tariff setting and regulatory issues
- EIA study of proposed offshore wind farms regarding aquatic life, fisheries, avian life, archaeological remains, etc. to be conducted by the developer
- Oceanographic studies to determine construction costs for special foundations, special vessels for construction and O&M requirements.
- Sea Bed Lease Arrangements.
- Fiscal and Financial Incentives

Key Initiatives

- Tentative sites identified in coastal states – Gujarat and Tamil Nadu for possible offshore wind power projects.

- A 100 m level wind monitoring station installed and commissioned at Dhanuskodi in Tamil Nadu by NIWE in September, 2013.

- Data being collected remotely through modem and its analysis for the six months i.e. October to December, 2013 and January to March, 2014 have revealed an average monthly wind speed of 8.3 m/sec at 100 m.

Demonstration Offshore Wind Power Project - proposed

- Potential sites, i.e., Porbander & Cambay Basin (Gujarat) and Rameswaram & Kanyakumari (Tamil Nadu) are being considered for demonstration project.

- Parameters being considered are
  - Within 20 km from sea coast/port
  - Average water depth < 25 m
  - Average wind speed > 6.5 m/sec at 50 m height
  - Outside oil and gas activity zone, marine protected areas, submarine power and communication channels, air traffic, free from security considerations, cyclone zone and in low risk earthquake zone.
  - Within 20 km from onshore substation

- MoU for setting up of Joint Venture Company for first demonstration wind power project signed with NTPC, POWERGRID, PFC, PTC, GPCL, NIWE and IREDA on 01.10.2014

National Wind Energy Mission

TARGET: 60 GW by 2022

- Utility Scale On-shore Wind: 58000 MW
- Offshore Wind: 1500 MW
- Distributed Power: 500 MW

Need an additional 37 GW in next 7 years

Investment and Financing Scenario

- 100% FDI
- $12.3 billion invested in India in 2011-12
- Highest in wind - $4.6 billion in 2011 (though solar is catching up)
- Financing available through diverse mix of debt and equity options; asset financing
- Also through IREDA, PFC, REC
- Advent of IPPs helping establish project financing as an avenue
- Domestic banks considering non-recourse financing

4.2 MW Wind Farm Project set up in Chitradurga District, Karnataka

Thank you

I invite you to

“Make in India”

- Prime Minister Narendra Modi