



# A Multi Stakeholder Perspective

# Agenda

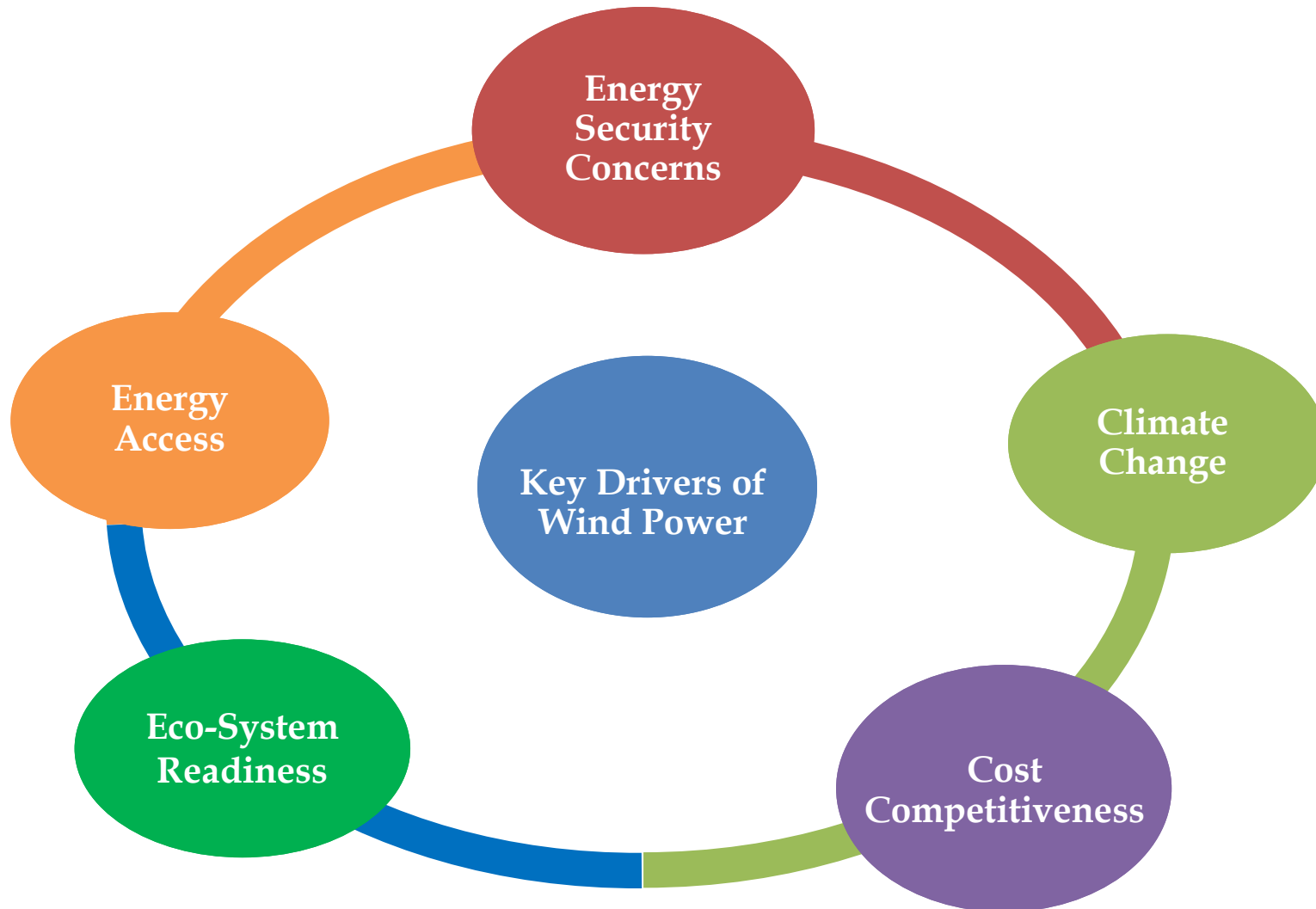
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- Wind Vision Initiative
- Setting up of Wind Vision : 200 GW by 2032
- Recommendations
  - Wind Project Development
  - Regulatory Incentives
  - Financing Wind Vision 2032
  - Grid Integration of Wind Energy in India
  - Wind Solar Hybrids,
  - Small Wind Turbines
  - Repowering
- Actions to Scale up Market to 200 GW by 2032



# Wind Vision Initiative

# Key Drivers of Wind Power in India...1/3



# Key Drivers of Wind Power in India...2/3

- **Energy Security:**
  - India ranks 4<sup>th</sup> and 6<sup>th</sup> globally as the largest importer of oil, and of petroleum products and LNG, respectively
  - Oil import bill: USD 64 billion in FY2016 (19.6% of Gross Imports)
  - India's Oil imports dependency is 81% of total consumption
- **Climate Change:**
  - India targets to reduce the emissions intensity of its Gross Domestic Product (GDP) by 33%-35% by 2030
  - This would require generating 40% of the electricity through non-fossil fuel sources including Wind
- **Increasing Cost Competitiveness:**
  - Wind Energy is moving towards Grid Parity
  - INR 4.16 - 4.82 per unit of Wind Energy as compared to fossil fuel-based generation of INR 4 - 5 per unit

# Key Drivers of Wind Power in India...3/3

- **Eco-System Readiness:**

- Manufacturing capacity already exists
- FIT Policy regime is in place
- Capital cost\* (1.08 USDm/MW) among the lowest in the world [as compared to Germany: 1.36 MnUSD/MW, China: 1.60 MnUSD/MW, USA: 1.83 MnUSD/MW]

- **Poor Energy Access:**

- At 620 kgoE, India's per capita energy consumption is one of the lowest in the world (1,807-China, 1,361-Brazil & 4,927- Russia)
- Per Capital Electricity consumption is lowest among BRICS (Brazil - 2.5 times; Russia - 6.5 times, China - 3 times; South Africa - 4 times)
- Significant population still without access to electricity
- India has wind energy resources in abundance, can be tapped & used locally

*\*World Energy Perspective from WEC*

# Setting of Wind Vision Target

Define  
Target  
Year

Identify  
Electricity  
Requirement  
per annum  
based on 18<sup>th</sup>  
EPS of India

Develop RE  
contribution  
trajectory  
based on  
NAPCC  
Targets

Identify  
Wind  
Generation  
Requirement

Calculate  
Equivalent  
Capacity  
based on  
Generation  
Requirement  
and set it as a  
Target

# Deriving Wind Vision Target

Particulars	12th FYP (FY 2016-17)	13th FYP (FY 2021-22)	14th FYP (FY 2026-27)	15th FYP (FY 2031-32)
Projected electricity requirement per annum (@ power station bus bars) based on 18th EPS (billion units)	1,355	1,905	2,710	3,710
RE contribution based on NAPCC targets (%)	12%	17%	22%	27%
RE generation requirement (billion units)	163	324	596	1,002
Wind generation requirement in billion units (BUs) (assuming 40% of total RE requirement)	65	130	238	401
Cumulative wind installed capacity required in GW (assuming average capacity utilisation factor [CUF] of 23%)	32	64	118	199 (approx. 200 GW)

1. *Contribution of Renewable Energy is projected to be in the range of 27% by 2032*
2. *It is important that Wind Sector should contribute significantly*

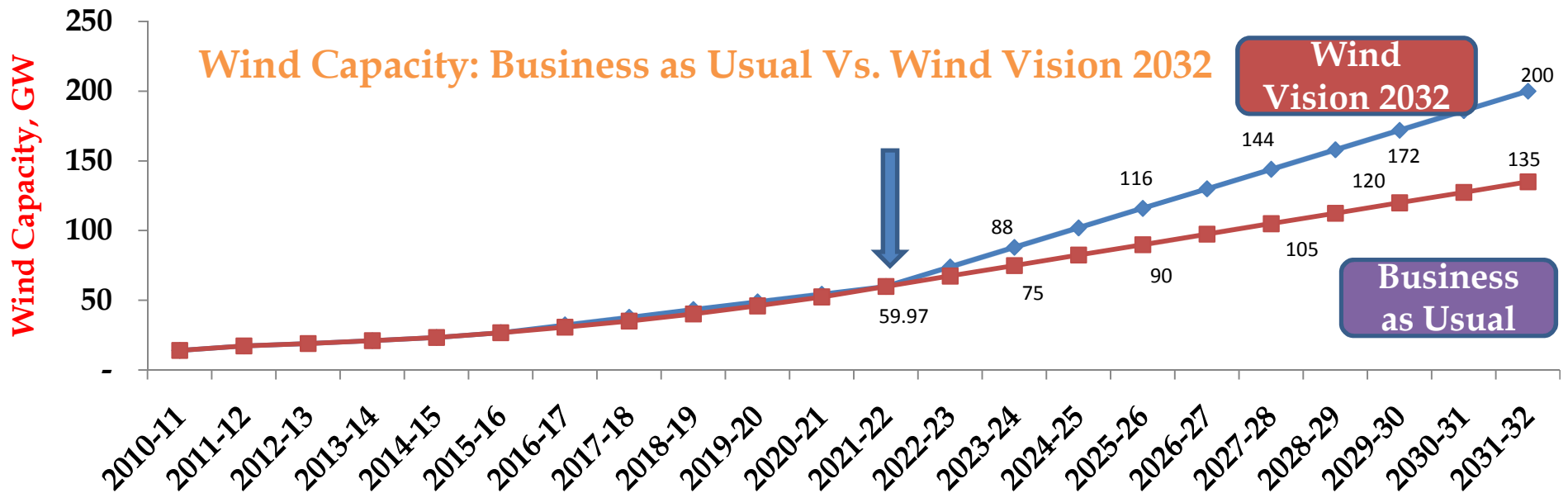


# Segment wise Targets

(All figures in Giga Watt)	12th FYP (FY 2016-17)	13th FYP (FY 2021-22)	14th FYP (FY 2026-27)	15th FYP (FY 2031-32)
<b>Wind Vision Target</b>	<b>32</b>	<b>64</b>	<b>118</b>	<b>200</b>
Offshore Wind (10% of Wind Vision)		6	12	20
Small Wind				0.10
Repowering	1	4	9	20
Onshore Capacity	31	54	97	160

- Address both current and future issues
- Scale up the annual capacity addition from present 3 GW to 12-15 GW

# Wind Capacity: Business as Usual Vs. Wind Vision 2032



- Important to identify changes in Policies, Regulations, Business Models, Structures, to scale up the annual capacity addition from present 3 GW to 12-15 GW
- In order to scale up capacity addition, new business models need to be explored for:
  - Reducing Wind Power Costs - Cost improvements and advancements in Technologies
  - Deploying wind in such a way that it is no longer considered as a variable source. Eg. Battery Storage and better scheduling and forecasting system
  - Long Term Sustainable Development- Consistency and long term vision in policies

# Potential Benefits of Wind Capacity Scale-up

## Emission Reduction Potential

- Considering emission factor (0.79 tCO<sub>2</sub>/MWh), GHG emission reduction over useful life works out to 6158 Million tons of CO<sub>2</sub> equivalent by FY 2031-32
- This translates to about 2.5 times of today's annual GHG emissions

## Job Creation Potential

- Estimation based on average direct long term job creation of 4 persons/MW as per MNRE HRD report
- Total job creation potential is estimated to be **8.7 lakh till FY 2031-32**
- This translates to an approx. 48k annual job creation potential

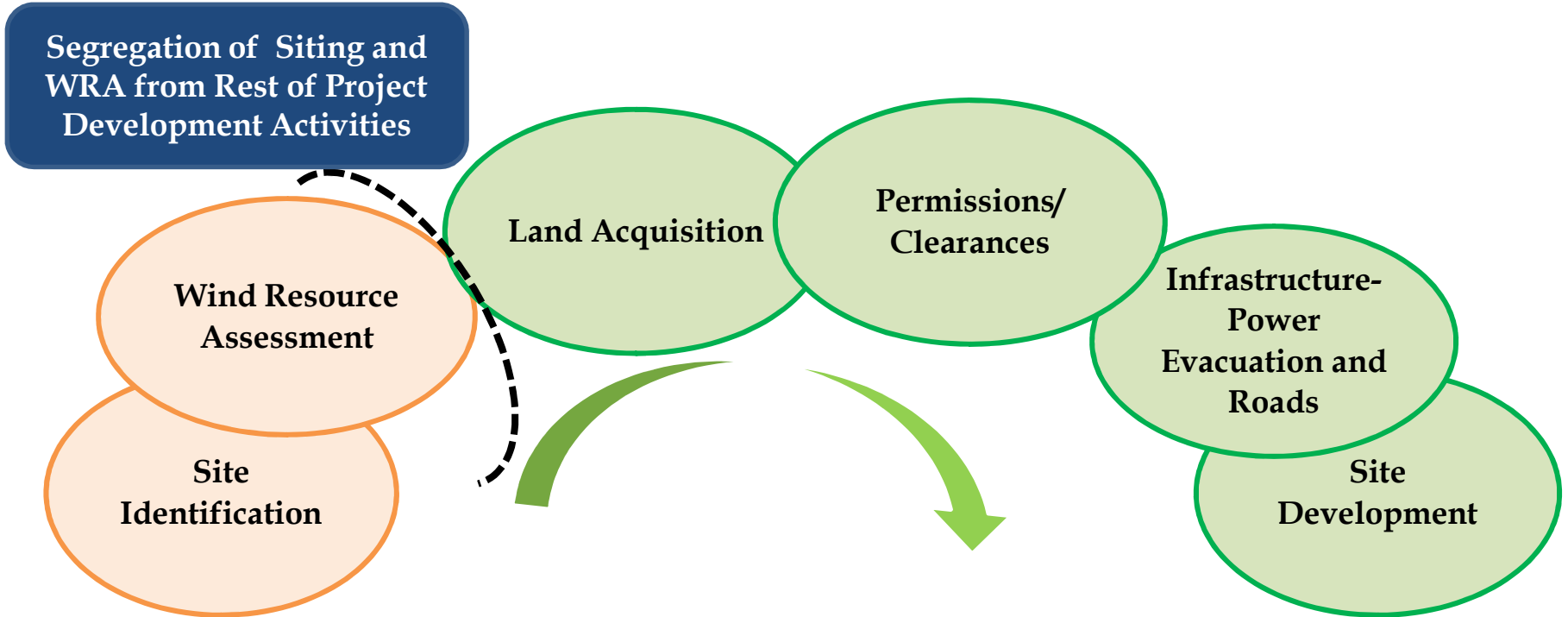
## Import Bill Reduction Potential

- Landed cost of imported coal -Rs 6000/ton with GCV of 5,500kCal/kg and Heat rate of 2,172 kcal/kWh as per CERC
- Cumulative import bill reduction potential over the useful life of wind projects is estimated at around Rs 18.4 lakh crore



# Recommendations on various issues

# Wind Project Development

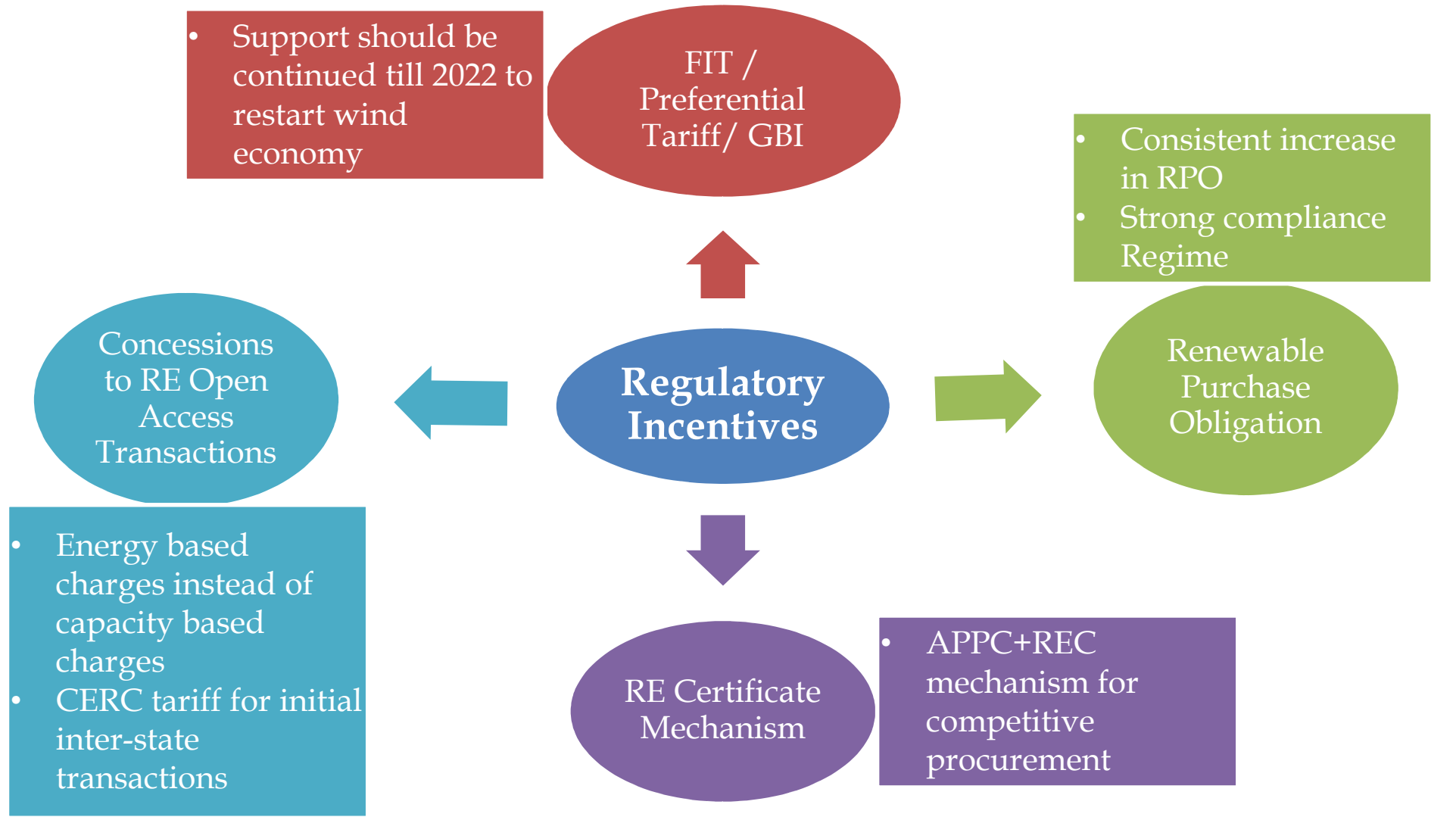


- Manufacturers, IPPs, PSUs and WRA entities would be at par (Level playing field for all)
- Multiple project development initiatives in parallel → increase project pipeline, share business risks, reduce timelines
- SNA to be responsible for WRA, DPR quality and land matters
- Power evacuation to be planned at high voltage on MW/GW scale
- Confidence to the Project Developers/Investors

# Mega Wind Projects

- Significant investment required to achieve ~12 to 15 GW/annum.
- Private capital may not be able to bear such a huge risk
- Government involvement will be critical for risk mitigation if not as a direct investor
- “Solar Park” concept need to be introduced in Wind Sector
- Govt. should take up GW scale wind park development till clearance stage for multiple developers with well defined selection criteria
- Involvement of private investors for WRA as a separate activity
- Government could offer either entire Mega Wind Project or parts through bidding route to developers

# Regulatory Support Instruments

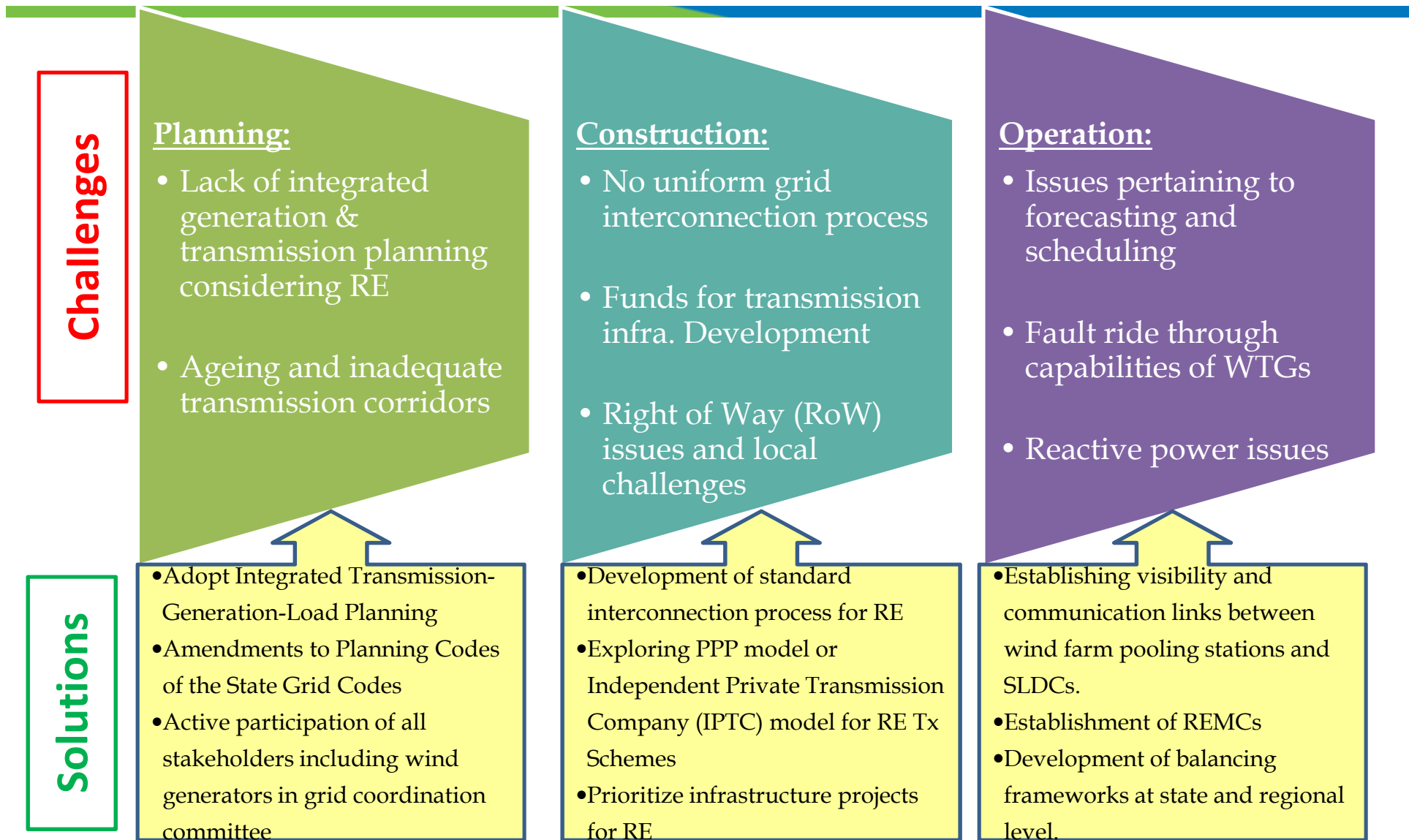


# Financing Wind Vision 2032

- Investment required to achieve the target is INR 17.08 lakh crore by FY 2031-32, translates to INR 1.07 lakh crore per annum from FY 2016-17
- Developing a longer term bond market - New products to be introduced, appetite of long-term investors need to be increased
- Development of refinancing market, under which an apex refinancing body to be established for better governance of market
- RBI to modify its asset classification norms to bring more consistency and similarity in NPA definition for bank and NBFC
- RBI to promote foreign currency long term deposits in banks from NRIs and foreigners
- Introduction of New Financing Structures, **primarily** Yieldcos & REITs



# Grid Integration of Wind in India



# Forecasting and Scheduling

- **Need for visibility:**
  - Additional IT infrastructure to be established for visibility of pooling stations
- **Robust communication facility:**
  - Need for establishing communication facility for tracking real-time generation of pooling station at SLDC
  - Who would install? Who would bear the cost for establishing the communication network
- **Need for uniform settlement mechanism:**
  - Different practices for generator payment exist in different States.
  - Institutional Set up and deviation Settlement mechanism.

## Implementation Roadmap



# Wind-Solar Hybrids

- Introduction of RE Hybrid Policy at National level
- Funding support/Fiscal benefits for Wind-Solar Hybrid Projects
- Amendments in Metering, Energy Accounting and other procedures
- Preference in State/Central Transmission Utility and Evacuation planning
- Separate measurement of wind and solar generation and separate treatment in respective RPOs
- Modification in RPO and Renewable Energy Certificate (REC) Regulations for RE Hybrid Projects

## Small Wind Turbine (SWT)

- In-depth assessment of the market for small wind power/solar-wind hybrid systems (both off-grid & grid connected)
- R&D Support to identify and commercialize technologies suitable for Indian environment
- With dropping storage prices, SWTs are expected to become financially viable
- Regulatory support for connecting small wind turbines to grid through net/gross metering is required
- FIT/ GBI for gross generation from SWT, irrespective of location of small wind turbine

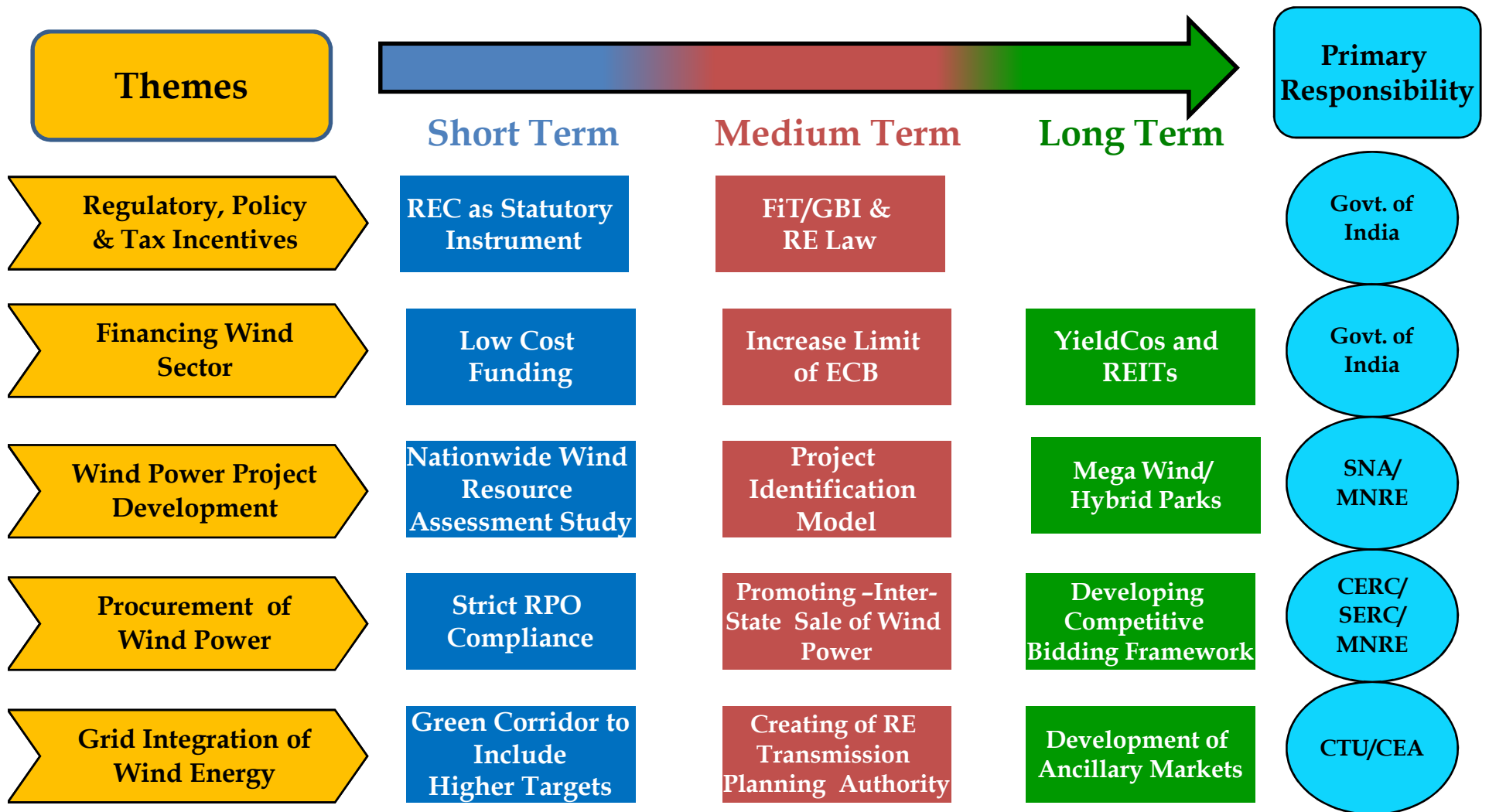
# Repowering of old WTGs

- Government should initiate the continuous repowering program.
- For permitting re-powering, existing project should have maximum balance life of 10 years and wind turbine capacity of each WTG < 1 MW
- All captive, third party sale and sale to State Discom projects to be considered for re-powering,
- MoP Rules for Captive Generating Station should be relaxed in case of repowering as more than 60% of old WTGs are in captive mode
- Micro-siting criterion may be relaxed in case of repowering project
- Appropriate re-powering ratio to ensure more energy yield
- Generation linked re-powering incentive for period upto 10 years



# Actions to Scale up the Market to 200 GW by 2022

# Actions to Scale Up the Market to 200 GW by 2032





# Thank You