

E A C

■ INTERNATIONAL CONSULTING

“INSIGHTS AND OPPORTUNITIES IN INDIAN
WIND ENERGY MANUFACTURING VALUE-CHAIN”

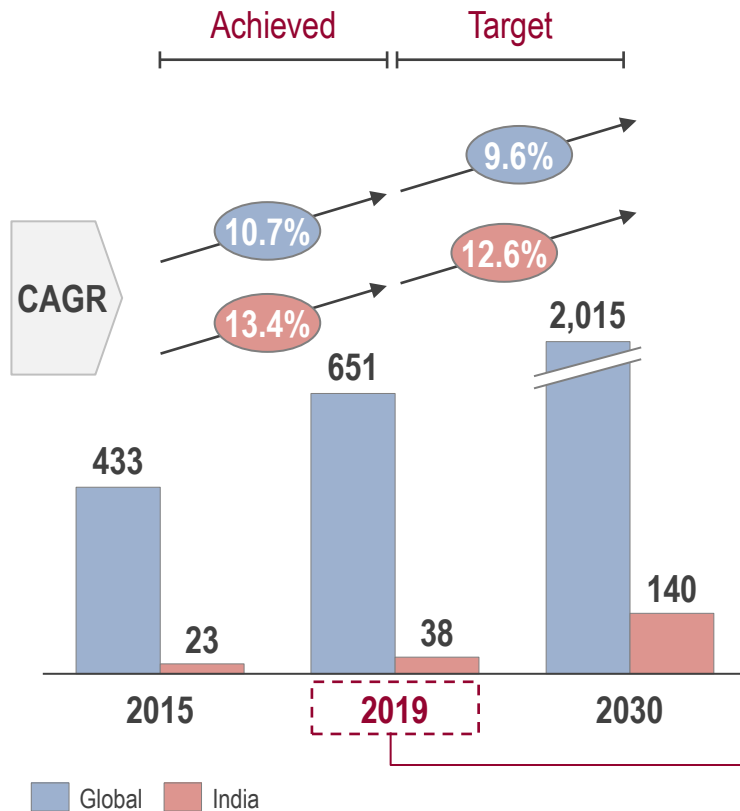
MIIM WEBINAR

23RD SEPTEMBER 2020

GLOBAL WIND ENERGY DEVELOPMENT – OVERVIEW

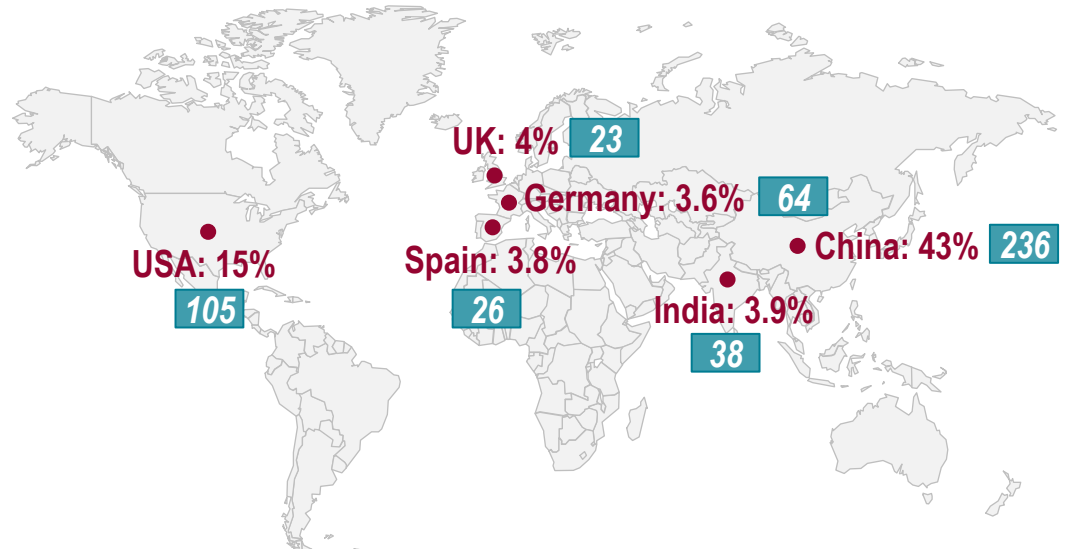
India, with 38 GW capacity, has the 4th largest wind energy installed capacity growing at 13.4% CAGR from 2015-19; India is amongst the top 5 countries for new capacity addition in 2019

WIND ENERGY INSTALLED CAPACITY (GW)



GLOBAL NEW CAPACITY ADDITION IN 2019 – 60.5 GW

Top 6 countries accounted for 70% global wind energy capacity addition in 2019

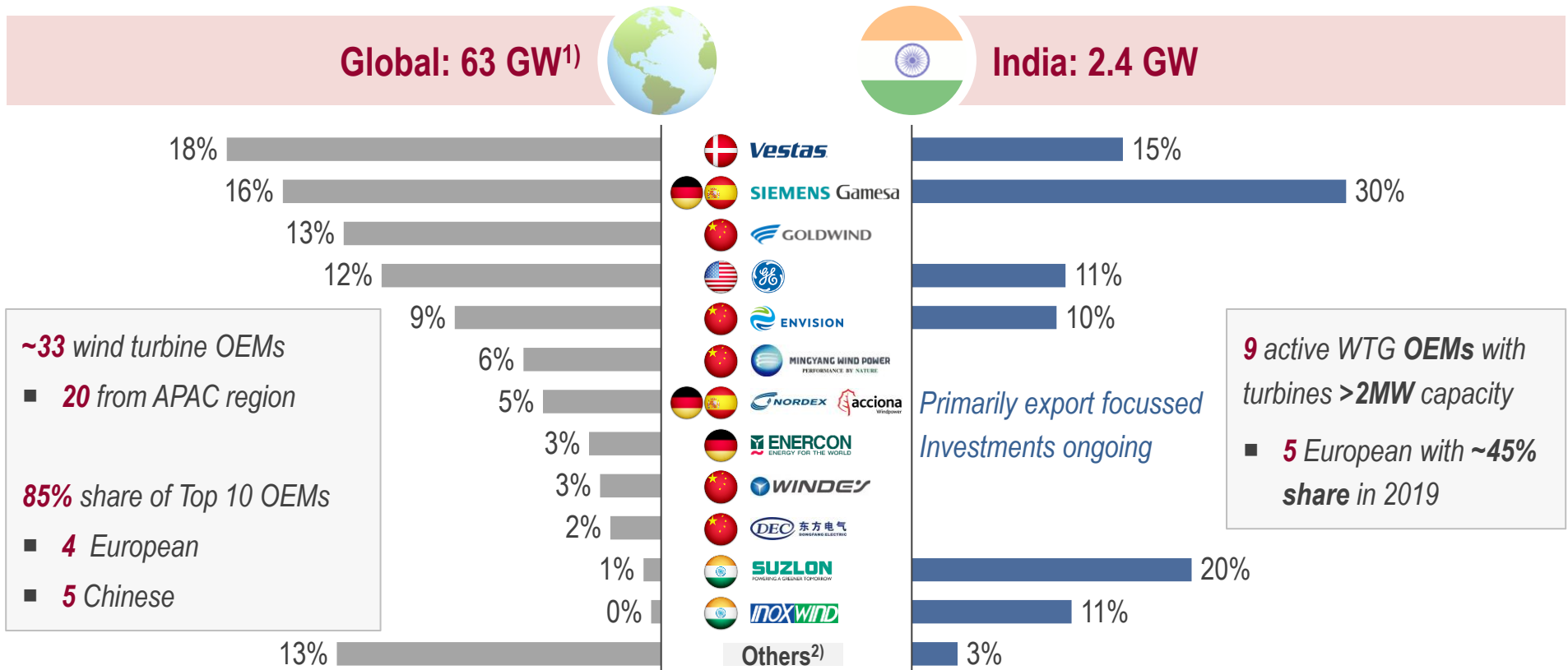


● % share of Global new Wind Energy capacity addition in 2019 **XX** Total Installed capacity in GW

GLOBAL WIND TURBINE OEM LANDSCAPE – OVERVIEW

~33 WTG OEMs globally wherein top 10 OEMs had 85% share; Indian market dominated by European OEMs with domestic manufacturing capabilities – currently 4 with 1 OEM’s investment ongoing

WTG NEW INSTALLATIONS BY OEMS IN 2019

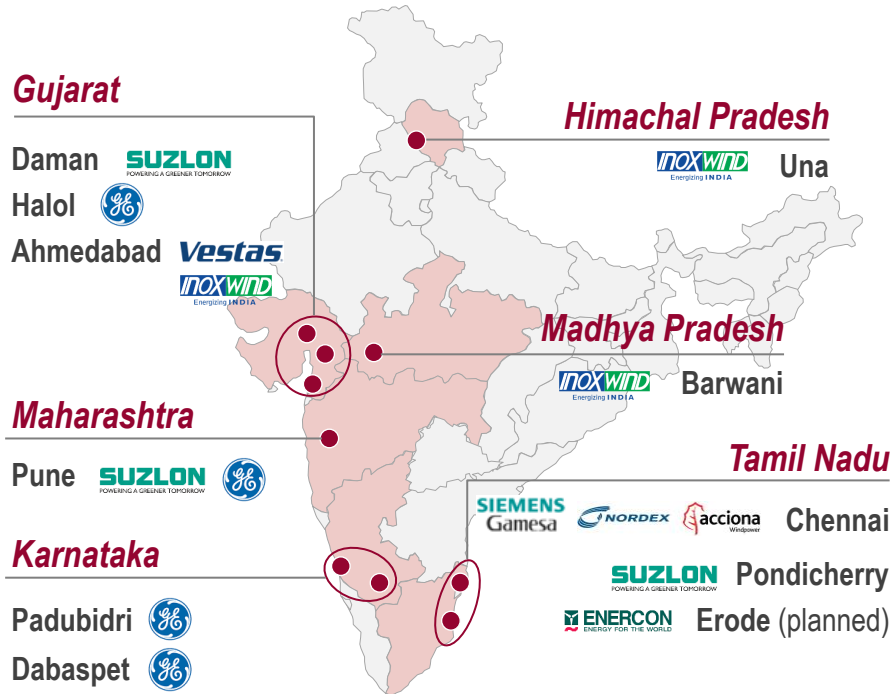


1) As per GWECs supply side analysis: total capacity of wind turbines that have been delivered and installed 2) Others include Chinese (Sewind, CSIC, United Power), German (Senvion), Japanese (Hitachi, Toshiba, MHI Vestas), Korean (Unison), India (Regen Powertech, RRB Energy), etc.

INDIA WIND TURBINE OEM LANDSCAPE

Wind Turbine manufacturing concentrated in Western and Southern states – key wind markets; 2-2.5 MW WTGs most popular in India while OEMs are developing 3 MW class WTGs; localization levels over ~80%

WIND OEM LOCATIONS



WTG¹⁾ CAPACITY (MW)

OEM	Approved ²⁾	Planned	Localisation
SUZLON POWERING A GREENER TOMORROW	2.1 - 2.6	3.5 - 4.5	>95%
SIEMENS Gamesa	2.0 - 2.1	3.4	70 - 95%
INOXWIND Energizing INDIA	2.0	3.3	
Vestas	2.0 - 2.2	3.3	
GE	1.7 - 2.7	3.0	
ENVISION	2.3 - 2.5	-	
ENERCON ENERGY FOR THE WORLD	-	3.5	~70% (Planned)

Total WTG capacity in India: ~10 GW

1) Wind Turbine Generator 2) WTG Approved by NIWE

WIND TURBINE GENERATOR – MANUFACTURING COMPETENCE OVERVIEW

Tower, generators and blades exhibit medium to high manufacturing competence whereas competencies across bearings, forgings, castings, gearbox and E&E¹⁾ are fast developing


Bearings



OEM: ~80%

WIND TURBINE GENERATOR

Gear box



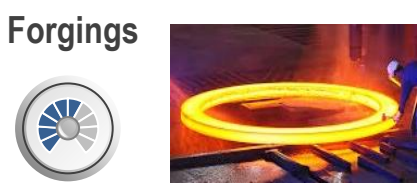
Blade




Generator



Forgings



Tower



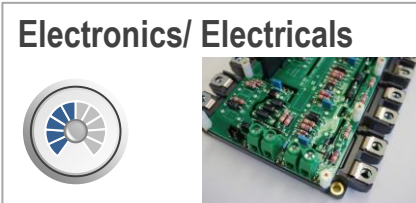
Castings



KEY COMPONENTS

Tier 1: >60%

Electronics/ Electricals



1) Electronics/ Electricals

WIND TURBINE COMPONENTS – MANUFACTURING ECOSYSTEM (1/4)

Limited capabilities for manufacturing bearings for >2MW WTG with large MNCs being assembly focussed; blade manufacturing dominated by global players with ~20% exports of domestic output



BEARINGS



BLADES



Domestic Manufacturing	<ul style="list-style-type: none"> Limited availability of sophisticated technologies required for bearings >2 MW Large MNCs present with focus on bearing assembly 	<ul style="list-style-type: none"> OEMs have inhouse blade manufacturing capabilities Dominated by global players
Technology Depth		
Import/ Export	<ul style="list-style-type: none"> High import dependence for large bearings' components such as rings, rollers, cage etc. India's share of global bearings exports estimated to be <5% 	<ul style="list-style-type: none"> >50% raw material imported including sub parts of blades ~15-20% of domestically manufactured blades are exported
Key Suppliers¹⁾		
Opportunity		

1) Tier I WTG component suppliers producing in India

Manufacturing Competence >> Low High

High Medium Low

WIND TURBINE COMPONENTS – MANUFACTURING ECOSYSTEM (2/4)

Limited presence of local manufacturers for heavy casting and forging operations; forging is usually outsourced to large players or imported; ~20% and ~40% of forgings and castings exported, respectively



FORGING



CASTING



Domestic Manufacturing

- **Limited presence** of active **local manufacturers** for **heavy forgings**
- OEMs outsource forgings to local large players or dependent on imports

- **Limited presence** of active **manufacturers** of **heavy castings** for wind turbines
- **High presence** of local manufacturers for **other castings**

Technology Depth



Import/ Export

- **High import dependency** for **large size forging components**
- **~20% exports** of **finished forged products**

- **~20% import dependency** for **large castings**; **need based imports** of steel, catalysts and resin
- **~40% export by OEM's**; India export hub for finished castings (hubs and main frame)

Key Suppliers¹⁾



Opportunity



1) Tier I WTG component suppliers producing in India

Manufacturing Competence >> Low High

WIND TURBINE COMPONENTS – MANUFACTURING ECOSYSTEM (3/4)

High presence of global gearbox manufacturers as well as generator manufacturers in India; import dependent for key components and with operations mainly being assembly focused



GEARBOX



GENERATOR



<p>Domestic Manufacturing</p>	<ul style="list-style-type: none"> OEMs are dependent on global gearbox manufactures present in India – which are import dependent Operations are assembly focused 	<ul style="list-style-type: none"> Generator manufacturing is well established with presence of major global generator suppliers Few OEMs with own generator manufacturing facility
<p>Technology Depth</p>		
<p>Import/ Export</p>	<ul style="list-style-type: none"> High import dependency for sub-components 	<ul style="list-style-type: none"> High import dependency for doubly-fed induction generator (DFIG) and sub-components
<p>Key Suppliers¹⁾</p>		
<p>Opportunity</p>		

1) Tier I WTG component suppliers producing in India

Manufacturing Competence >> Low High

■ High
 ■ Medium
 ■ Low

WIND TURBINE COMPONENTS – MANUFACTURING ECOSYSTEM (4/4)

>80% tower manufacturing is indigenized with ~20% of towers exported; high capabilities in electrical components while electronic components are largely assembly focussed



TOWER



ELECTRONICS/ ELECTRICALS



<p>Domestic Manufacturing</p>	<ul style="list-style-type: none"> ~80-100% of tower is indigenized Presence of major players along with small share of local players 	<ul style="list-style-type: none"> High proficiency and capabilities in electrical systems (transformers, cables, panels etc.) Electronics manufacturing operations in India are limited to assembly
<p>Technology Depth</p>		
<p>Import/ Export</p>	<ul style="list-style-type: none"> Low import dependency >20% exports of towers 	<ul style="list-style-type: none"> Import dependency for controllers, convertors and electronic sub-components Low exports
<p>Key Suppliers¹⁾</p>		
<p>Opportunity</p>		

1) Tier I WTG component suppliers producing in India

Manufacturing Competence >> Low High

SUMMARIZING INDIAN WIND TURBINE ECOSYSTEM OPPORTUNITIES

Significant domestic demand (140 GW wind targets including 30 GW off-shore), focus on higher capacity WTGs and export potential exhibits huge opportunities for WTG component manufacturing in India

DOMESTIC OPPORTUNITIES



- Gov targets **100 GW of new capacity additions** until 2030
 - Includes **30 GW** of off-shore installations

LARGE SIZE COMPONENT



- OEMs planning/ launching **>3 MW class wind turbines** in India
 - Requires **large size component** manufacturing

EXPORT HUB



- **De-risking** of existing global supply chain
- High **export** potential for **Asia/ Africa**


Component Manufacturing

Research and Development

India as a Sourcing Hub

OUR EXPERTISE – 25 YEARS OPERATING EXPERIENCE

EAC International Consulting was one of the first management consultancies to specialize on Asia with strategy development and globalization solutions for mid-cap and multinational companies

<p>OFFICES IN MUNICH SHANGHAI MUMBAI MOSCOW</p>	<p>> 100 EXPERTS</p>	<p>FUNCTIONAL COMPETENCIES STRATEGY M&A OPERATIONAL EXCELLENCE</p>	<p>INTERNATIONAL CONSULTING ANALYSIS SOLUTION IMPLEMENTATION</p>
<p>SINCE 1993</p>	<p>EMERGING MARKETS CHINA INDIA SOUTH EAST ASIA NORTH EAST ASIA RUSSIA CEE</p>	<p>INDUSTRY COMPETENCIES MOBILITY INDUSTRIALS & TECHNOLOGY BUILDING & CONSTRUCTION ENERGY & ENVIRONMENT PHARMA & HEALTHCARE CHEMICALS CONSUMER GOODS EXHIBITION</p>	<div> <p>25 YEARS EAC INTERNATIONAL CONSULTING</p> </div> <p>YOUR PARTNER FOR EMERGING MARKETS</p> <div>  <p>Anup Barapatre Managing Consultant EAC, Mumbai</p> <p>+91 99670 29339</p> <p>Anup.Barapatre@eac-consulting.de</p> </div>

WHERE YOU CAN FIND US – EAC AROUND THE GLOBE



EAC MUNICH

EAC - Euro Asia Consulting PartG
Widenmayerstraße 29
80538 München
Phone +49 89 92 29 93-0
eac-muc@eac-consulting.de

EAC MOSCOW

EAC - Euro Asia Consulting OOO
Melnitskiy Per. 1
105120 Moscow / Russia
Phone +7 495 6401 013
eac-mos@eac-consulting.de

EAC MUMBAI

EAC - Euro Asia Consulting Pvt. Ltd.
306-310 Peninsula Plaza
A/16, Veera Industrial Estate
Andheri (West), 400053 Mumbai / India
Phone +91 22 26 74 24 91
eac-mum@eac-consulting.de

EAC SHANGHAI

EAC - Euro Asia Consulting
Sunyoung Centre, Rm. 801
398 Jiangsu Road
200050 Shanghai/ China
Phone +86 21 63 50 81 50
eac-sha@eac-consulting.de

Find out more about EAC - www.eac-consulting.de