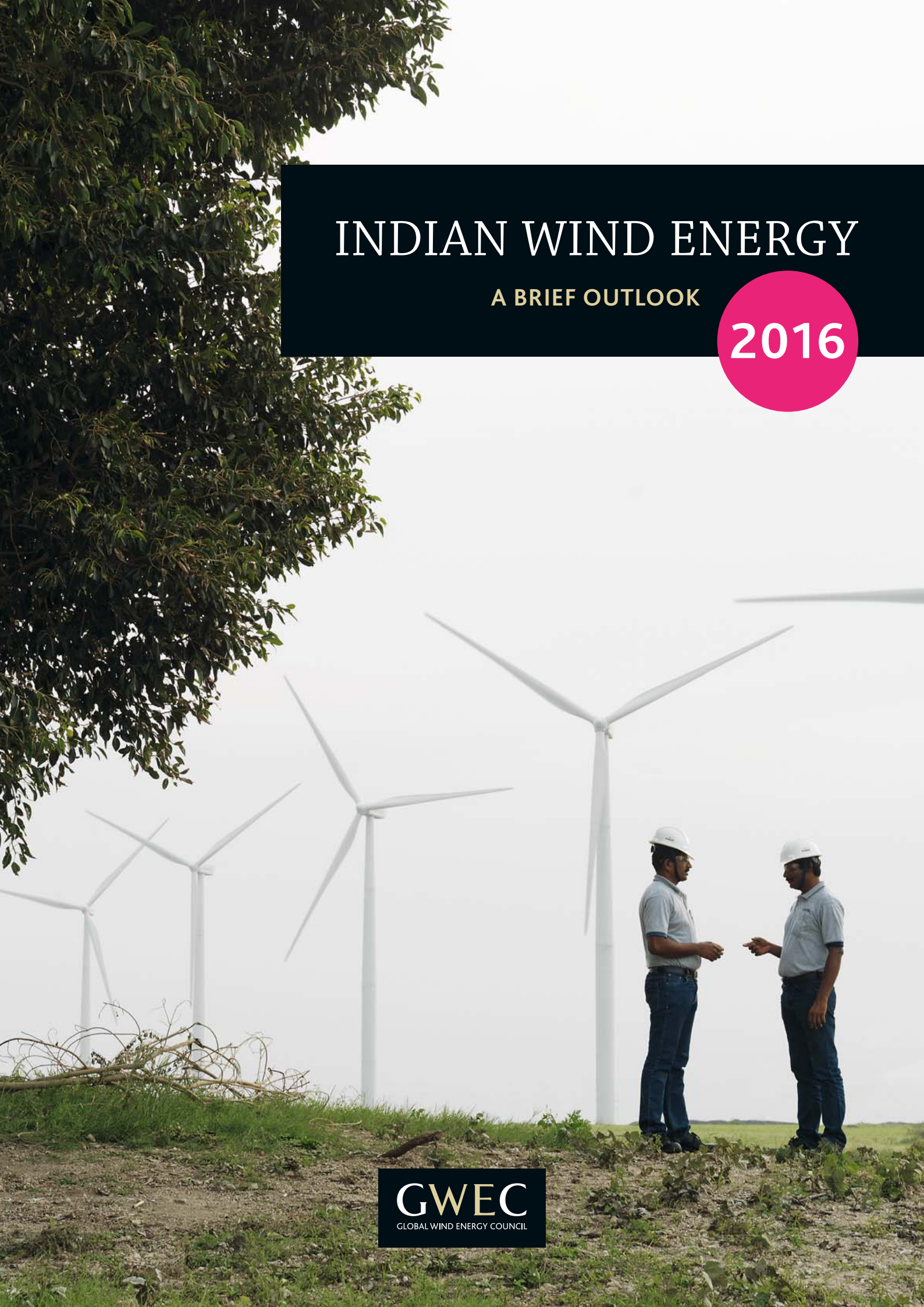


INDIAN WIND ENERGY

A BRIEF OUTLOOK

2016



GWEC
GLOBAL WIND ENERGY COUNCIL

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FOREWORD

We are very pleased to release this summary report 'Indian Wind Energy – A Brief Outlook' produced jointly by GWEC and IWTMA in time for the Windergy 2017 conference and exhibition in New Delhi. This report is an attempt to summarise the current state of the Indian Wind market for members of the industry, policy makers and participants alike to understand the market opportunities. In addition, it gives us insights into the challenges going forward and offers suggestions for overcoming remaining hurdles for wind power development. We invite you to attend the conference sessions and various networking events during Windergy to get your own opportunity to know more about this exciting industry.

The Indian wind industry is nearly thirty years old, and now holds the 4th position in the world with installations of over 31 GW (28.7 GW at the end of calendar year 2016), with almost 90% of the investment coming from the private sector.

The Indian manufacturing sector has developed state-of-the-art technology, a strong supply chain with 75 percent localization, championing the government's *Make in India* campaign. Manufacturing capacity is about 10 GW which can be ramped up to 15 GW.

The Indian government has been committed to exploring the country's vast renewable energy resources for several decades, and the time is here to work towards delivering on the political will through concrete action, both by policy makers and industry actors, to reap the domestic benefits from wind power development, and to build on India's growing leadership internationally in resolving both the energy and climate challenges.

In this, the work done by the Ministry of New and Renewable Energy under the guidance of the Hon'ble Minister Shri Piyush Goyal is praiseworthy. We look forward to working closely with all stakeholders to strengthen the role that the Indian wind industry can play in driving wind power development not just domestically but also globally.

This *Indian Wind Energy – A Brief Outlook* is the industry's contribution to these discussions, and the wind energy sector looks forward to continuing the dialogue with decision makers in order to allow India to reap the full benefit of this indigenous and clean energy source.

Sarvesh Kumar
Chairman
IWTMA

Steve Sawyer
Secretary General
GWEC



INDIAN WIND ENERGY – A BRIEF OUTLOOK

1.25 MW Gadag, Karnatak

India is growing at a rapid pace. Energy is key to achieving India's development goals, to support a rapidly developing economy, to bring electricity to those who remain without it, and to develop the infrastructure to meet the needs of what is soon expected to be the world's most populous country.

India is surely and steadily moving towards complying with its climate change commitments under the Paris Agreement (COP21). India's pledge at the climate summit stated the country's intention to follow "a cleaner path than the one followed hitherto by others at a corresponding level of economic development". To this end, India has established goals to expand its use of renewable energy and more efficient technologies.

India's well-developed wind power industry has the capability and experience to help meet the country's climate and energy security goals. Today India is the 4th largest wind market globally, with total installations having crossed the 31GW mark at the end of March 2017. The industry is firmly on track to meet the short-term national target of 60GW by 2022.

India has made great strides in improving access to modern energy in recent years. Since 2000, India has more than halved the number of people without access to electricity and doubled rural electrification rates. Nonetheless, around 240 million people, or 20% of the population, remain without access to electricity¹. Wind power can play an important role in the coming decade to bring a clean and indigenous source of power to the people.

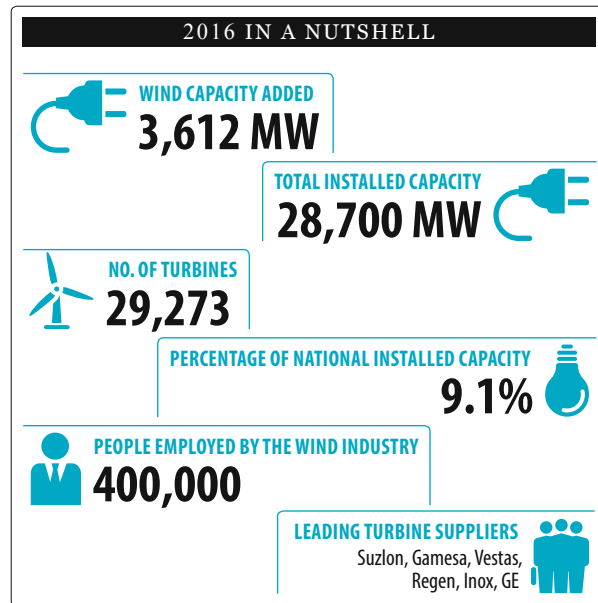
To date, the growth of the Indian wind sector has largely been led by private sector investment. The policy and fiscal support from the government has helped the industry to take the necessary business risks to advance the sector and galvanize investment in more and more states. In 2015, when the 60GW target was announced, the wind industry took on the challenge to meet this goal in a timely fashion. In 2016, the industry installed over 3.6 GW of new capacity, breaking all previous records in terms of annual installations. Following the Indian fiscal year 2016-17 reporting timeline, annual installations crossed 5.4 GW at the end of March 2017, bringing total installed capacity to over 31 GW².

Further, the government's vision of promoting a diversified manufacturing sector in India through the 'Make In India' initiative has had the wholehearted support of the wind power industry. The move to put manufacturing at the heart of India's growth model means a large rise in the energy needed to fuel India's development. The wind industry can not only provide much needed high-skilled jobs but also bring abundant clean and cheap power generation into the energy mix of the future.

The next five years would require wind power installations of well over 5GW annually to meet the 2022 target. To meet this goal the policy and regulatory framework needs clarity and long-term stability. The direction that India's national and state renewable energy policies take, and the rigour and effectiveness with which they are implemented, will naturally play a critical role in India's energy outlook. Clarity of vision for the energy sector must be achieved in India, so as to prevent structural bottlenecks from preventing the industry's growth given the dual nature of the country's institutional arrangements with respect to the power sector.

1 This estimate for India's electrification rate is derived from the 68th National Sample Survey published in June 2014.

2 Press Information Bureau, MNRE Press Release ID 160413 Date 02-April-2017 <http://pib.nic.in/newsite/erelease.aspx>



WIND ENERGY IN INDIA

India had a record year and was the fourth largest market globally both in terms of cumulative capacity and annual additions last year. 3,612 MW of new wind power was added to reach a total of 28,700 MW at the end of December 2016. This total has risen to 31,177 MW at the end of March 2017³.

The total renewable energy capacity installed in the country crossed the 50 GW mark at the end of 2016. Among renewables, wind power accounted for over 57 percent of the installed capacity.

India's wind power installations accounted for a 6.6 percent share of the global market in 2016. Wind power capacity accounted for over 9.1 percent of total domestic installed capacity⁴.

In February 2015, India committed to installing 60 GW of wind and 100 GW of solar by 2022. Further, India made a commitment at COP21 to raise the share of non-fossil-fuel power capacity in the country's power mix to 40% by 2030.

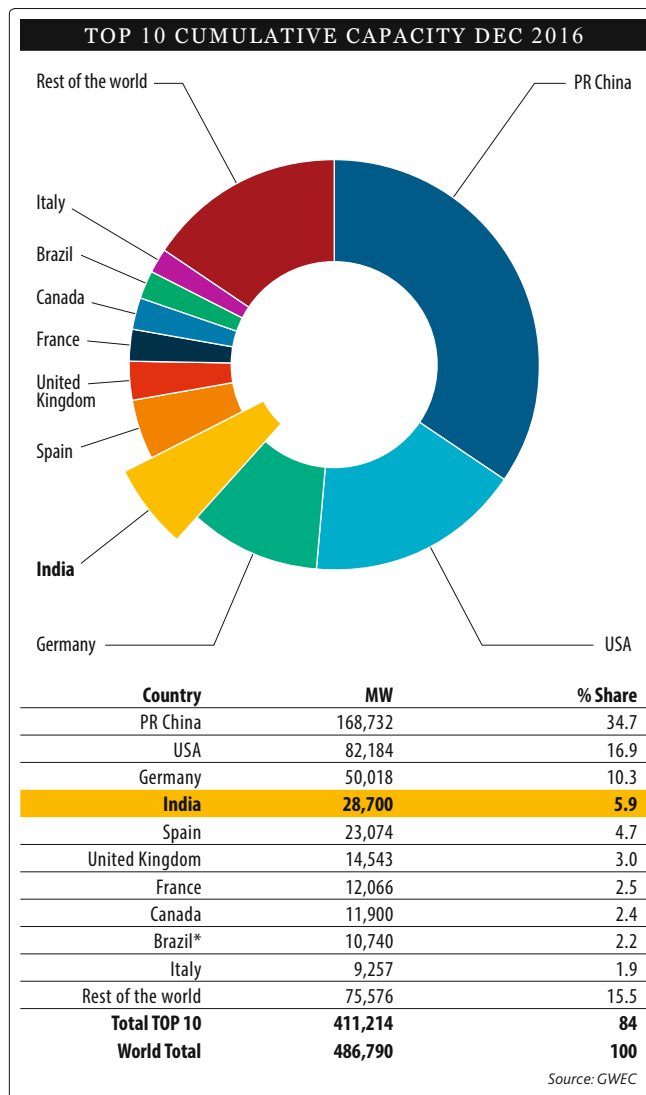
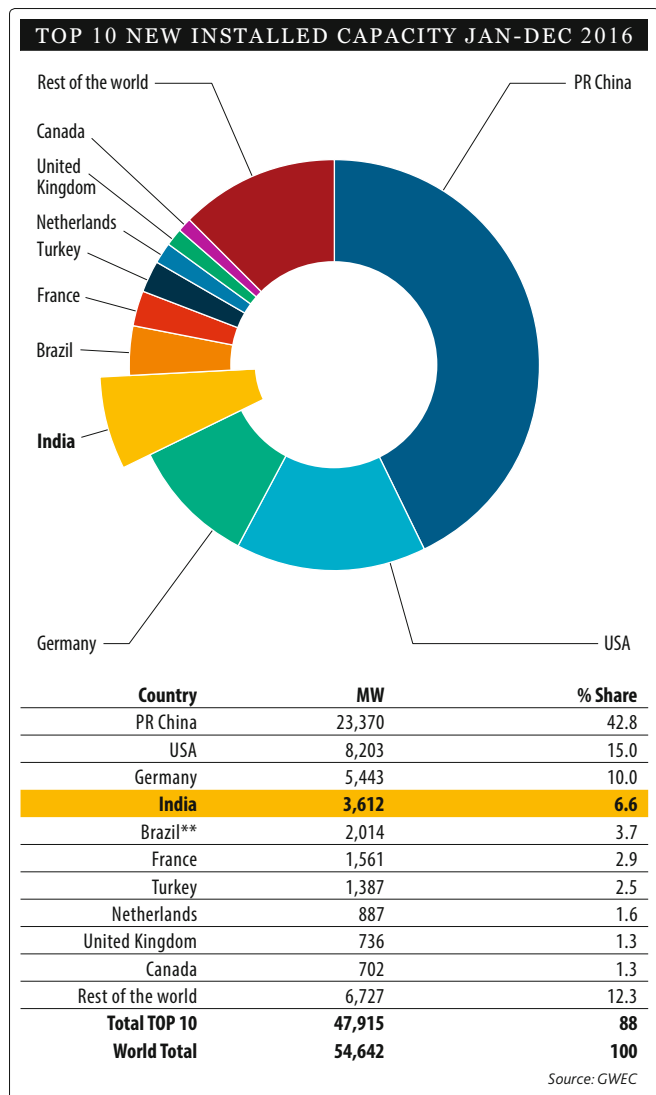
WIND POWER RESOURCES IN INDIA

The National Institute for Wind Energy's (NIWE) latest estimate for India's wind power potential is 302 GW at 100 meters. The major wind power states are Tamil Nadu, Gujarat, Karnataka, Maharashtra and Rajasthan. To exploit the vast 7,600 km coastline for offshore wind energy in the Indian Exclusive Economic Zone, the National Offshore Wind Energy policy has been released.

India's Integrated Energy Policy projects 800 GW installed capacity in 2031-32. Around 40 per cent of this, or 320 GW, will come from renewable energy as per currently announced plans of the government. Considering the renewable energy potential in India, a rapid push is needed to meet this goal.

3 <http://www.domain-b.com/industry/power/20170403windpower.html>

4 http://www.cea.nic.in/reports/monthly/installedcapacity/2016/installed_capacity-12.pdf



* Projects fully commissioned, grid connections pending in some cases

Wind power technology is evolving fast and the industry is involved in bringing new products to market that meet the needs of the local conditions across the country. However, in India R&D needs further support from the public sector and funds need to be made available to dedicated government agencies and universities for creating the necessary ecosystem for industry-specific projects. A public-private model for this purpose would be welcomed by the industry if a research agenda is jointly developed to meet the current challenges being faced by the national industry. This will further enhance the capacities of our technical institutions and create a robust research community.

The NIWE is a good example of this practice. It's mandate and capacity can be further strengthened to promote excellence in wind power development activities. NIWE published the latest Wind Atlas in 2015. The Table on page 9 shows the potential across sixteen states.

Gujarat leads the Wind Resource Assessment with an estimated potential of 84.4 GW, followed by Karnataka (55.85GW), Maharashtra (45.39 GW), AP (44.22 GW), Tamil Nadu (33.79 GW) Rajasthan (18.77 GW) and Madhya Pradesh (10.48 GW).

WIND MARKET IN 2016

2016 was a record breaking year for wind power in India. During 2016 wind power development grew at an unprecedented pace and the majority of wind farms have come up in the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh and Rajasthan. These projects were built by large IPPs such as Renew Power, Hero Future, Continuum, Mytrah, Oriental Green Power, CLP and others.

Cumulative installed capacity by state (End of 2016)

State	Total installed capacity (MW)
Andhra Pradesh	2,092.5
Gujarat	4,441.5
Karnataka	3,154.2
Kerala	43.5
Madhya Pradesh	2,288.6
Maharashtra	4,666.1
Rajasthan	4,216.6
Tamil Nadu	7,694.3
Telangana	98.7
Other	4.3
Total	28,700.4

Wind power potential in India at 100m AGL (MW)				
STATE	Rank I: Waste land	Rank II: Cultivable land	Rank III: Forest land	Total
Andaman & Nicobar	4	3	1	8
Andhra Pradesh	22,525	20,538	1,165	44,229
Chhattisgarh	3	57	16	77
Goa	0	0	1	1
Gujarat	52,288	32,038	106	84,431
Karnataka	15,202	39,803	852	55,857
Kerala	333	1,103	264	1,700
Lakshadweep	3	3	1	8
Madhya Pradesh	2,216	8,259	9	10,484
Maharashtra	31,155	13,747	492	45,394
Odisha	1,666	1,267	160	3,093
Puducherry	69	79	4	153
Rajasthan	15,415	3,343	13	18,770
Tamil Nadu	11,251	22,153	395	33,800
Telangana	887	3,348	9	4,244
West Bengal	0.03	2.04	0	2
Total (in MW)	153,020	145,743	3,489	302,251
Total (in GW)	153	146	3	302

NIWE Indian Wind Atlas 2015: Re-assessment of wind potential at 100m AGL. Assessment carried out at spatial resolution of 500m. The resolution in the previous Atlas published in 2010 was 5km.

Wind power producers opted for the tax-based Accelerated Depreciation (AD) incentive (originally 80 percent depreciation in the first year of installation) or the Generation Based Incentive (GBI) of INR 0.5/kWh for at least four years and up to ten years with a cap of INR 10 million. The AD will be available at a reduced rate of 40 percent from April 2017 and the GBI could be discontinued. The new regime of GST may pose a challenge in the escalation of capital costs if it is not 'zero' rated.

INDUSTRY DEVELOPMENTS

The top-five OEMs in terms of cumulative installed capacity in India are Suzlon (35.4%), WindWorld (18%), Gamesa (10.1%), Vestas (7.6%), Regen (7.3%) and Inox (5.68%). LM Wind Power set up its second blade factory in Vadodra, Gujarat. Senvion, an established European player, started up its operations in India and acquired the Kenersys manufacturing facility. Gamesa set up new factory at Nellore in Andhra Pradesh; Acciona entered the market last year, and Envision and Sany Global are expected to enter the market soon. Vestas opened their blade manufacturing unit in Gujarat. The current manufacturing capacity in the country is around 10 GW.

Support framework for wind energy

28 states and union territories have defined a Renewable Purchase Obligation (RPO) for renewables. However, the renewable energy certificate (REC) framework linked to the RPO, which was introduced for inter-state purchase and sale of renewables-based power, has not been a great success. This is largely due to the non-compliance and weak enforcement of the RPO by the states and market regulators.

Wind power producers can either opt for preferential tariffs decided by the state regulator, or tradable certificates to add to the average power purchase price from the utility.

TARIFF DETERMINATION AND LATEST POLICY DEVELOPMENTS

The State Electricity Regulatory Commissions determine the tariff for wind projects. However, the Central Electricity Regula-

tory Commission comes up every year with a tariff guideline for the entire country based on wind power density in five zones.

To address grid integration challenges, the government has initiated the Green Corridor programme. The objective is to improve linkage between India's regional grids with its national grid. This will facilitate interstate transmission.

The government's *Green Energy Corridor* initiative to facilitate the transfer of power from the high renewable energy installation states to other parts of the country, consists of 765 kV and 400 kV high voltage transmission lines and an associated 765/400kV substation and associated equipment; and four HVDC terminals (two at 800 kV and two at 320 kV) as part of the increased inter-regional connectivity between India's western and southern regional power grids.

2016 saw a number of new policies for promoting wind power including the draft *wind-solar hybrid policy*, Guidelines for Development of Onshore Wind Projects, Guidelines for Prototype Wind turbines, and the Proposal for Evaluation of Small Wind Energy and Hybrid Projects.

Further, in November 2016, the Ministry of New and Renewable Energy (MNRE) issued Guidelines for a transparent bidding process for 1000 MW of wind, to be connected to the interstate transmission system. The results were announced in March 2017⁵, with winning bids coming in at INR 3.46 (USD 0.052/EUR 0.049)/kWh.

⁵ <http://pib.nic.in/newsite/PrintRelease.aspx?relid=153212>

The tariff for FY 2016-17			
	Levelised total tariff (FY 2016-17) INR / kWh	Benefit of accelerated depreciation (if availed) INR / kWh	Net levelised tariff (adjusted for AD benefit, if availed) INR / kWh
Wind Energy			
Wind Zone -1 (CUF 20%)	6.61	0.70	5.90
Wind Zone -2 (CUF 22%)	6.01	0.64	5.37
Wind Zone -3 (CUF 25%)	5.29	0.56	4.72
Wind Zone -4 (CUF 30%)	4.40	0.47	3.94
Wind Zone -5 (CUF 32%)	4.13	0.44	3.69

CUF: Capacity Utilization Factor

OFFSHORE WIND

The MNRE announced India's Offshore Wind Policy in October 2015. India's NIWE was designated as the nodal agency for implementing the policy and creating the necessary ecosystem for the sector.

The first comprehensive assessment of offshore wind potential in two key coastal states is being undertaken by the FOWIND (Facilitating Offshore Wind in India) project⁶. This is a four-year European Union co-financed project, implemented by a GWEC-led consortium. Gujarat Power Corporation Limited is also providing co-finance for FOWIND, as is industry partner ReNew Power. NIWE is the knowledge partner to FOWIND.

FOWIND is undertaking the first offshore wind resource measurement in the Gulf of Khambhat, off the coast of Gujarat. India's first offshore wind research platform is being installed under this project. FOWIND, the Indian Ministry of New and Renewable Energy, and the NIWE have developed the platform jointly. Further to this, NIWE is in the process of finalising the first geo-physical surveys along the Gujarat coast. Another offshore platform is in the works for the coast along Tamil Nadu.

The Offshore Wind Policy outlines an international competitive bidding mechanism for the sector. The first tender is likely to be announced in 2019.

BARRIERS TO WIND ENERGY DEVELOPMENT

While there is strong support from the central government for increased uptake of renewable energy, there remain a number of barriers to wind power reaching its full potential and the fulfillment of the ambitious targets for 2022 and beyond. A part of this is due to the fact that in local parlance the power sector is a 'concurrent' subject, meaning that both central and state governments exercise control. The reality is that it is often the states and local utilities which play the larger role.

Most of the state level power sector utilities in India are not in good financial health and are unable to comply with the National RPO announced in 2016. Delayed payments of up to six months or more by certain state utilities (DISCOMs) are also an on-going concern. The government has floated the idea of a Performance Based Initiative (PBI) which would be of particular use to financially distressed DISCOMs, where the DISCOM would receive payments from central government for the timely payment of tariffs and other performance related issues.

Further, recent interconnections between key southern states in India have at least created the wires which would facilitate the transfer of power from windy states to other parts of the country. More are needed, but in addition to wires there needs to be both a mechanism and an incentive to trade renewable power, to assist with overall system reliability as well as load balancing. A truly effective interstate market, properly incentivized, would be major boost to the renewables sector and the Indian power system as a whole.

⁶ www.fowind.in



© LM Wind Power

Land acquisition and title-clearing continues to be a challenge for most onshore installations in India, and the reform of this sector is long overdue.

Sourcing affordable debt finance remains a challenge. High interest rates and limited availability of affordable debt are challenges for developers as well as OEMs in the country. Until now, equity investors have filled the gap sufficiently, but there are limits, and having a healthy mix of debt and equity will put projects in a stronger position.

TOTAL INSTALLED CAPACITY



Source: GWEC



OUTLOOK FOR 2017 AND BEYOND

The government, in its latest budget announcement for FY 2016-17 reduced the AD from 80% to 40%. Furthermore, the GBI could come to an end at the end of the 2016/17 financial-year. These two factors contributed to a rush of installations at the end of the 2016-17 fiscal year. However, the first auctions for wind power were held in early 2017 successfully. We expect installations during 2017 to reach approximately 5,000 MW. A further 4-5 GW tender is expected during 2017, a positive step towards reaching the 2022 target of 60 GW.

Potential state-wise break-up of renewable energy target of 60,000 MW by 2022

State/union territories	Wind installation (MW)
Northern region	
Rajasthan	8,600
Western region	
Gujarat	8,800
Madhya Pradesh	6,200
Maharashtra	7,600
Southern region	
Andhra Pradesh	8,100
Telangana	2,000
Karnataka	6,200
Tamil Nadu	11,900
Other	
(New States)	600
Total	60,000

Source: MNRE <http://mnre.gov.in/file-manager/UserFiles/Tentative-State-wise-break-up-of-Renewable-Power-by-2022.pdf>



**GWEC GROWTH SCENARIOS
FOR THE INDIAN WIND
MARKET**



GLOBAL WIND POWER SCENARIOS FOR 2020 AND 2030

There are several published scenarios examining the future role of wind power globally as a part of system transformation necessary for a clean energy future. GWEC developed its scenarios in collaboration with the German Aerospace Centre (DLR) and the Institute for Sustainable Futures at the University of Technology Sydney. These scenarios are updated biennially, the latest update *Global Wind Energy Outlook 2016* (GWEO) presents scenarios out to 2020, 2030 and 2050.

The GWEO 2016 uses the International Energy Agency's New Policies Scenario from the World Energy Outlook as a baseline; and the IEA's 450 Scenario has been included as the climate consequences of different energy pathways have once again risen up the international political agenda. The two original scenarios are the GWEC Moderate Scenario and the GWEC Advanced Scenario.

GLOBAL WIND ENERGY OUTLOOK 2016 SCENARIOS

IEA New Policies Scenario

The IEA's New Policies Scenario (NPS) is based on an assessment of current directions and intentions of both national and international energy and climate policy, even though they may not yet have been incorporated into formal decisions or enacted into law. Examples of this would include the emissions reduction targets adopted in Paris in 2015, the

various commitments to renewable energy and efficiency at national and regional levels, and commitments by governments in such fora as the G-8/G-20 and the Clean Energy Ministerial. The New Policies scenario is now at the center of the IEA's World Energy Outlook analysis; and we have extrapolated it out to 2050 for comparison purposes.

IEA 450 Scenario

The 450 Scenario (450), first introduced in the IEA's World Energy Outlook in 2010, sets out an energy pathway consistent with the goal of having about a 50% chance of limiting the global increase in average temperature to 2 C, which would require the concentration of greenhouse gases (GHG) in the atmosphere to be limited to around 450 parts per million of carbon-dioxide equivalent (ppm CO₂-eq) in

the long-term. The basis of the 450 Scenario is, however, different. Rather than being a projection influenced by policy actions, it deliberately selects a plausible energy pathway to achieve the desired goal. Near-term policy assumptions for the period to 2020 draw on measures that were outlined in the WEO Special Report on Energy and Climate.

GWEC Moderate Scenario

GWEC's Moderate Scenario (MS) has many of the same characteristics as the NPS, taking into account all policy measures to support renewable energy either already enacted or in the planning stages around the world, and at the same time assuming that the commitments for emissions reductions agreed by governments at COP21 (Paris, 2015) will be implemented, although on the modest side. At the same time it takes into account existing and planned national and regional targets for the uptake of renewable energy in general and wind energy in particular, and assumes that they are in fact met.

Through the period out to 2020, the MS is very close to our annual five-year market forecast, based on industry orders and planning as well as intelligence from our global network about new and emerging markets. After 2020 it is difficult to make a precise forecast given the current set of global uncertainties, but at that stage we assume that an even broader range of governments will begin to respond to essential asks of national energy security and long-term price stability offered by wind energy. Further the cost of wind continues to come down and the price of conventional generation continues to go up.

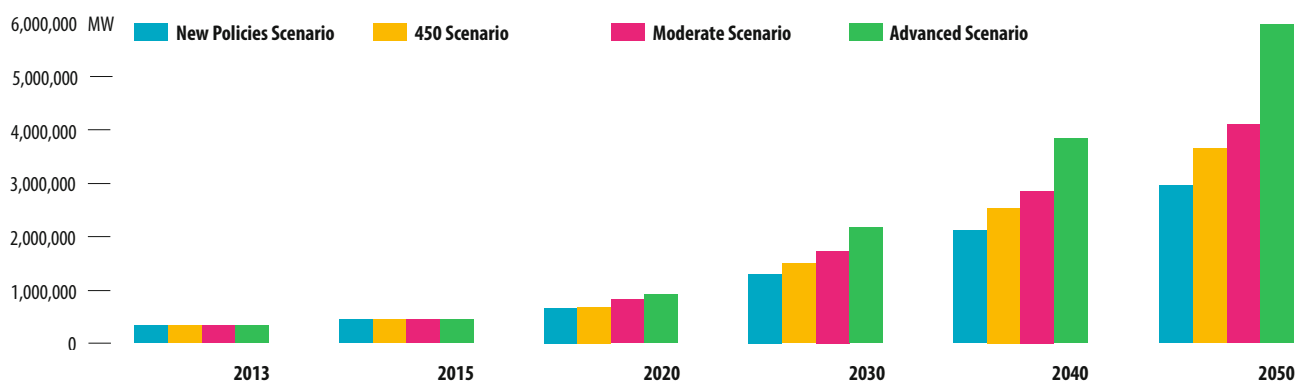
GWEC Advanced Scenario

GWEC's Advanced Scenario (AS) is the most ambitious, and outlines the extent to which the wind industry could grow in a best case 'Wind Energy Vision'. It assumes an unambiguous commitment to renewable energy in line with industry recommendations, the political will to commit to appropriate policies and the political stamina to stick with them. Further, it does NOT assume massive new-build nuclear or a large take up of carbon capture and storage technologies, as is the case in the IEA scenarios.

The AS also assumes that governments enact clear and effective policies on carbon emission reductions in line with the now universally agreed objective of keeping global mean temperature rise below 2C above pre-industrial temperatures. Wind power is critical to meeting the first objective in that battle - which is getting global emissions to peak and begin to decline before the end of this decade



GLOBAL CUMULATIVE WIND POWER CAPACITY



	2013	2015	2020	2030	2040	2050
New Policies Scenario						
MW	318,354	432,656	639,478	1,259,974	2,052,583	2,869,611
TWh/a	714	868	1,569	3,311	5,394	7,541
450 Scenario						
MW	318,354	432,656	658,009	1,454,395	2,458,757	3,545,595
TWh/a	714	868	1,614	3,822	6,462	9,318
Moderate Scenario						
MW	318,354	432,656	797,028	1,675,624	2,767,351	3,983,995
TWh/a	714	868	1,955	4,404	7,273	10,470
Advanced Scenario						
MW	318,354	432,656	879,446	2,110,161	3,720,919	5,805,882
TWh/a	714	868	2,157	5,546	9,779	15,258

Source: GWEC

Scenario Results

The IEA New Policies Scenario (NPS) projects that annual wind energy markets will match the stellar results from 2014 and cross the 50GW mark in 2016 as well; and then shrink to just under 38 GW/annum by the end of the decade. It then projects an increase to near 2015 levels in the middle of the next decade, gradually decreasing to 43 GW/annum by 2030 and essentially stays in the mid-30s in terms of GWs installed per annum, remaining flat for the rest of the period out to 2050 in net terms. On the basis of this, cumulative installed capacity would still reach 639 GW by 2020, and 1,260 GW by 2030. The latter is almost 300 GW higher than the NPS projections two years ago. By 2050, the NPS foresees global wind installations reaching 2,870 GW.

The 450 Scenario also sees 2016 at 2014 levels, but is substantially higher than NPS installations out to 2020, for a total of 658 GW. It then projects a marked increase in installations with installed capacity reaching 1,454 GW by 2030, which is almost 200 GW higher than the NPS projections. By 2050, this scenario foresees global wind installations reaching 3,546 GW.

The GWEC Moderate Scenario (MS) follows our short term market projections prepared for our annual market update out to 2020¹, with annual market size reaching almost 80 GW/annum by 2020 for a total installed capacity of 792 GW. We expect robust growth in the period after 2020. By 2030 total

¹ <http://www.gwec.net/publications/global-wind-report-2/>

installed capacity would reach nearly 1,676 GW. By 2050, this scenario foresees global wind installations reaching 3,984 GW.

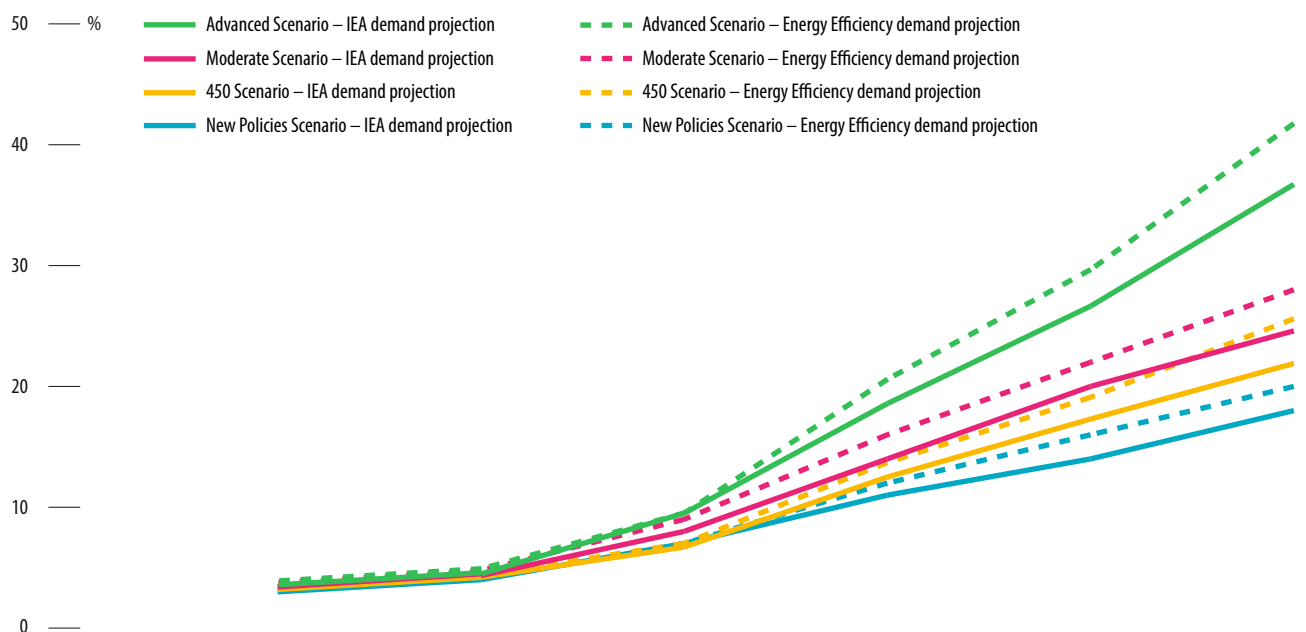
The GWEC Advanced Scenario (AS) maintains ambitious growth rates throughout this decade, assuming that a broad, clear commitment to the decarbonisation of the electricity sector emerges quickly with the ratification of the 2015 Paris Climate Agreement. Annual market size would top 100 GW by the end of the decade, bringing total installed capacity to just over 879 GW by 2020, and to 2,110 GW by 2030, which could only occur with comprehensive and robust climate action globally and essential political will to tackle the climate challenge. By 2050, this scenario foresees global wind installations reaching 5,806 GW. This is almost 3,000 GW higher than the current baseline scenario of the long-term NPS projections for the wind sector.

The GWEC Scenarios for India

India continues to be the second largest wind market in Asia, with wind energy installations crossing 28.7 GW in 2016. India has committed to a target of 175 GW of renewables by 2022. This target includes achieving 60 GW of cumulative wind power capacity by 2022.

Under the NPS, India's wind power market would reach 50 GW by 2020 and 102 GW by 2030. Wind power would then produce close to 105 TWh every year by 2020 and 294 TWh by 2030, and help save 63 million tons of CO₂ in 2020 and 177 million tons in 2030. Under the 450 Scenario, the Indian wind power market would reach 67 GW by 2020 and 155.7 GW by 2030.

WIND POWER SHARE OF GLOBAL ELECTRICITY DEMAND



	2013	2015	2020	2030	2040	2050
New Policies Scenario						
IEA demand projection	3%	4%	7%	11%	14%	18%
Energy Efficiency demand projection	3%	4%	7%	12%	16%	20%
450 Scenario						
IEA demand projection	3%	4%	7%	13%	17%	22%
Energy Efficiency demand projection	3%	4%	7%	14%	19%	25%
Moderate Scenario						
IEA demand projection	3%	4%	8%	14%	20%	25%
Energy Efficiency demand projection	3%	4%	9%	16%	22%	28%
Advanced Scenario						
IEA demand projection	3%	4%	9%	18%	26%	36%
Energy Efficiency demand projection	3%	4%	9%	20%	29%	41%

Source: GWEC

INDIA – CUMULATIVE CAPACITY UP TO 2050

Total Capacity in MW	2013	2014	2015	2020	2030	2040	2050
New Policies Scenario	20,150	22,465	25,088	50,063	111,938	184,838	256,789
450 Scenario	20,150	22,465	25,088	67,098	155,736	254,827	358,314
Moderate Scenario	20,150	22,465	25,088	44,734	116,257	227,137	372,830
Advanced Scenario	20,150	22,465	25,088	56,297	163,473	294,184	452,197

Under the MS, the total installed capacity would reach 44.7 GW by 2020 and 116.2 GW by 2030. The wind industry will see investments of €5 billion per year by 2020 and €10.4 billion per year by 2030. Employment in the sector would grow to over 74,000 jobs by 2020 and over 128,000 jobs ten years later.

The AS shows that the wind development in India could go much further: by 2020 India could have almost 56 GW of wind power in operation. By 2030 wind power would generate over 400 TWh per year and avoid the emission of 258 million tons of CO₂ each year. Investment would have reached a level of €11.4 billion per year.

Which path shall India take? The higher-end scenarios will depend on increasingly sophisticated grid integration of

renewables in general, strictly enforced state RPOs, and the development of an effect intrastate and interstate power market, open to all, with low or no transmission fees. It will require the wind industry to step up its game on scheduling and forecasting, as well as allowing renewables to participate in balancing and ancillary services markets.

India's current installations are on a path towards meeting GWEC's Advanced Scenario projections for 2020. If the current pace of installations were sustained over the medium term, Indian wind power installations would be on a path to crossing the 300GW mark around 2040. Wind power can provide the much-needed cheap power for meeting India's development and environment agenda.



ABOUT GWEC

OPENING UP NEW MARKETS FOR BUSINESS

GWEC is a member-based organisation that represents the entire wind energy sector. The members of GWEC represent over 1,500 companies, organisations and institutions in more than 80 countries, including manufacturers, developers, component suppliers, research institutes, national wind and renewables associations, electricity providers, finance, insurance companies and law firms.

Our mission is to ensure that wind power establishes itself as the answer to today's energy challenges, providing substantial environmental and economic benefits.

GWEC works with national and international policy makers and industry associations to help open new markets for wind power i.e. UNFCCC, the IEA, international financial institutions, the IPCC and IRENA. GWEC has a proven track record of success in helping to build the wind power industry in emerging markets around the world, including Brazil, China, India, Mexico and South Africa.

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Find out more about GWEC's policy work, publications, events and other membership benefits on our website.



www.gwec.net

ABOUT IWTMA

Indian Wind Turbine Manufacturers Association (IWTMA) is 18 years old association of wind turbine and component manufacturers in India and was founded by the group of members from wind industry. It is headquartered in Chennai with an office in New Delhi. IWTMA plays a vital role in policy making both at Centre collaborating with the Ministry of New and Renewable Energy and at the States with all other allied ministries and departments such as Ministry of Power, Ministry of Finance, Ministry of Environment and Forests, Central Electricity Regulatory Commission, Central Electricity Authority, National Load Dispatch Centre etc.

IWTMA is invited in the various committees of NIWE, which includes the robust certification process and also on the Governing Council of NIWE. The mission of IWTMA is to promote and harness wind energy for an all inclusive sustained growth – now and in the future. IWTMA also aggressively cam-

paigns for this "Green Revolution" (Clean Energy) to encompass the economy, business, rural employment and contribute towards self reliance to meet the growing need of power.

Indian Wind Turbine Manufacturers Association

- Strives towards high efficiency in energy generation through the best technologies and cost efficiency through large volume
- Strives to achieve prominence of wind energy in the energy mix to conserve depleting fossil fuels
- Spreads the message on the utilization of green power to lessen the adverse effect of global warming and climate change

For more information, please contact:

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