INDIA and the States of Gujarat, Maharashtra and Tamil Nadu

MARKET OVERVIEW

India is one of the five largest wind energy markets in the world today. Renewable energy sources (excluding large hydro) represent 12.2% of India's installed capacity, with 70% of this contribution coming from wind energy[88].

In 2011 USD 10.3 billion were invested in clean energy in the country, which accounted for 4% of global investment in the sector (McCrone, 2012). In 2011, India installed a record 3 019 MW of new wind capacity (Global Wind Energy Council (GWEC), 2011). In 2012, the country installed 2 336 MW of new wind capacity (GWEC, 2013).

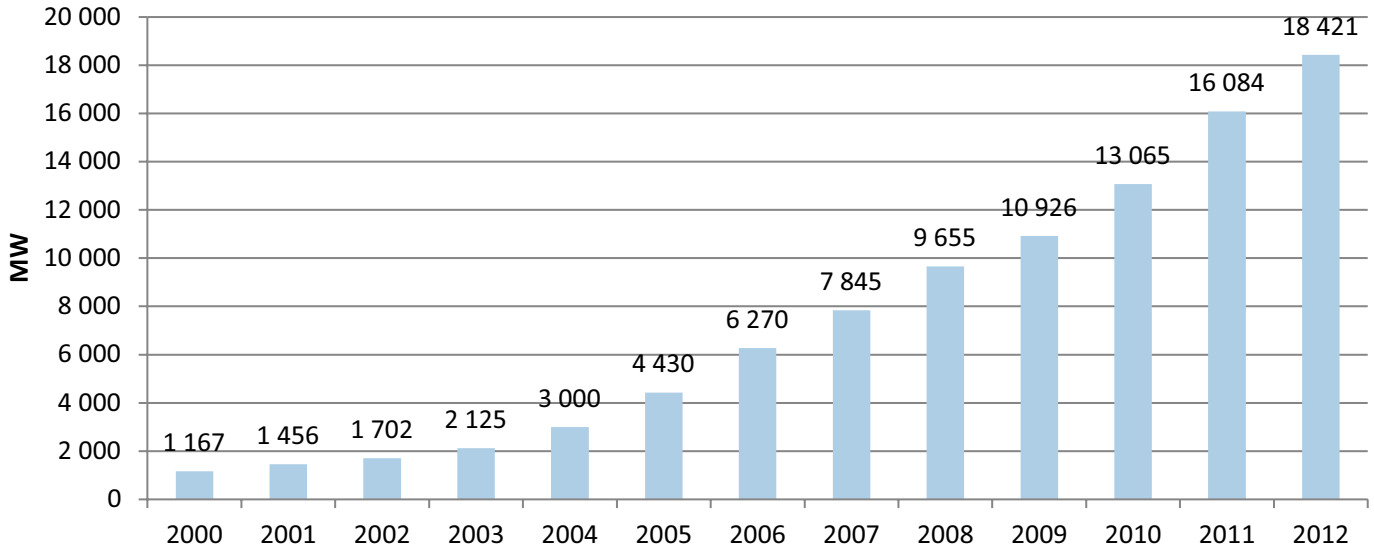

Figure 10: Cumulative Wind Installation (MW) of India (GWEC, 2013)

HISTORY AND EVOLUTION OF POLICY AND REGULATORY FRAMEWORK FOR WIND ENERGY (1980-2011)

The desire for energy self-sufficiency was a major driver for the development of new and renewable energy after the two oil crises of the 1970s. The sudden increase in the price of oil, uncertainties associated with its supply, and the adverse impact on the balance of payments eventually led to the establishment of the Commission for Additional Sources of Energy (CASE) under the Department of Science & Technology in 1981[89].

Phase 1:

Technology demonstration and R&D (1981-1990)

The erstwhile Commission for Additional Sources of Energy was charged with formulating programmes for the development of new and renewable energy, in addition to coordinating and intensifying R&D in the wind technology sector. In 1982 an independent Department of Non-conventional Energy Sources (DNES) was constituted under the Ministry of Energy (Ministry of Non-conventional Energy Sources (MNES, n.d.). The

[88] Ministry of New and Renewable Energy (website accessed on 1 October 2012): The installed capacity increased from a modest base of 41.3 MW in 1992 to 17 967 MW by 31 August 2012. Wind turbine generator capacity addition in India has taken place at a Compound Annual Growth Rate (CAGR) of 24.67% for the period of 1992-2010 (GWEC, 2011).

[89] MEfforts to harness wind energy in India can be traced back to 1973 when attempts to develop water-pumping windmills were made at the National Aeronautical Laboratory.

Department commissioned the Indian Institute for Tropical Meteorology to publish the first assessment of the wind resource available in the country[90] (Mani and Mooley, 1983).

The government realised the importance of private sector participation in wind power. Subsequently in 1984, DNES supported the construction of the first grid-connected wind turbine, which was privately owned. It was set up and commissioned in Verawal, Gujarat as a collaborative project[91] in 1985.

DNES initiated a wind farm demonstration programme in 1986 that offered substantial grants to five projects of 550 kW each across four states[92]. In conjunction, a national programme was initiated during the 7th Five-Year Plan (1985-1990) to exploit the estimated potential of 20 GW (revised in 1990 to 45 GW[93], to 49 GW in 2010 and further revised to 102 GW in 2012[94]) by adopting a market-oriented strategy (Mizuno, 2005). These policy initiatives gave the private sector a good incentive to set up wind projects. The major fiscal incentives provided were:

- 100% accelerated depreciation on investment on capital equipment in the first year of installation (later reduced to 80% and then to 15%[95] in 2012, likely to be phased out after introduction of Direct Tax Code in 2013).
- Five-year tax exemption on income from sale of power generated by wind energy.
- Mandatory purchase of electricity by the states' Electricity Boards at specified tariff rates.
- Industry status given to SMEs and large-scale producers of wind equipment, enabling them to benefit from tax holidays, relief from customs and excise duty, and liberalised foreign investment norms.
- Some states allowed third-party sales[96] of power generation from wind projects
- Banking and wheeling facility[97].

These incentives led to significant commercial deployment of wind power technology and substantial additions to power generation capacity in the country. The national programme led to the setting up of some 550 kW and 1 MW projects by the Department of Non-conventional Energy Sources across the country. Wind power generation capacity rose from 2.2 MW to 37 MW during the 7th Five-Year Plan (1985-1990), and approximately 70 million units of wind power was fed into the respective state grids (Cherail, 1992).

Further commercial-scale development of the sector was supported by external cooperation[98] between the Indian government and the Danish aid agency (DANIDA). The Danish contribution was significant in the initial stages of wind power development in India.

In 1988, DANIDA supported plans to develop two commercial projects of 10 MW each in the states of Gujarat and Tamil Nadu. These DANIDA-sponsored projects were the first demonstrations of large-scale grid-connected wind farms. In fact, it was largely the success of these demonstration projects that helped provide real data on the techno-economic feasibility of wind energy generation in India. These demonstration projects, along with favourable policy initiatives taken by the government, led to the initial expression of interest by the private sector in producing wind energy.

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[90] The book presented data on surface winds at 343 observatories and upper winds at 65 stations. A detailed analysis for 37 wind-monitoring stations was also presented. The data had its limitations as it had initially been collected for aviation and meteorological purposes.

[91] This project was a joint venture between Gujarat Energy Development Agency (GEDA) and JK Synthetics Limited. It involved setting up a 40 kW imported Dutch turbine. This was the first-ever technical demonstration of a modern grid-connected wind turbine in India (Pillai (eds.), 2006).

[92] Okha in Gujarat, Devgad in Maharashtra, Tuticorin in Tamil Nadu and Puri in Orissa (Pillai(eds.), 2006).

[93] Based on analysis carried out by Jami Hussain at Tata Energy Research Institute in 1988-89 (Pillai (eds.), 2006).

[94] The estimated potential of 102 GW at 80 metres by Centre for Wind Energy Technology needs to be validated.

[95] Central Board of Direct Taxes Notification No. 15/2012 [F.No.149/21/2010-SO (TPL)] S.O.694 (E), dated 30 March, 2012, states that all the new wind farms commissioned after March 31, 2012 shall only claim a standard depreciation rate of 15% (Income Tax Department, 2012).

[96] Direct sales to third parties were permitted so as to attract investments from industries that needed more power. Open access is nevertheless currently restricted to each state; a resolution was yet to be reached by the end of 2011. A manufacturer or industry plant can therefore only get electricity from wind farms set up in the same state.

[97] Through the Electricity Regulatory Commissions Act of 1998, Electricity Act of 2003, National Electricity Policy of 2005 and Integrated Energy Grid Code 2010 (GWEC, 2012)

[98] An agreement was signed in the year 1987 for Danish tied grant of DKK 180 million (USD 58.99 million) for supply of wind turbines, erection, commissioning and monitoring of wind farm projects at Lamba (10 MW) in Gujarat, Kayathar (6 MW) and Muppundal (4 MW) in Tamil Nadu.

Furthermore, a dedicated public sector financing arm called the Indian Renewable Energy Development Agency (IREDA) was incorporated as a government-owned public limited company under the aegis of the Department of Non-conventional Energy Sources in 1987. The agency was set up to provide term soft loans for renewable energy and energy-efficiency projects in the country.

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Phase 2:

Economic liberalisation and institutionalisation (1991- 2000)

By 1991, under broader economic reforms the government implemented policy directives that encouraged private investment in the wind sector[101]. Under these economic reforms joint ventures, financial and technical collaboration with foreign entities were permitted in several sectors, including wind. An important change came after the introduction of a new trade policy, in particular a change in custom duties.

The Indian electricity market was opened to private investors, both domestic and foreign. Import duties and taxes were reduced for Independent Power Producers (IPPs) and secured rates of return were offered to foreign investors through cost-based tariffs. These changes were all enacted as part of the broader national economic liberalisation strategy (Loy and Gaube (eds.), 2002).

Creation of the Ministry of Non-conventional Energy Sources (MNES), 1992

In 1992, the Department of Non-conventional Energy Sources was upgraded into a full-fledged ministry called the Ministry of Non-conventional Energy Sources (MNES). During this phase detailed policy guidelines for promotion of power generation from renewable energy sources were developed. Encouraged by the results of the previous demonstration projects, MNES put up a target of 500 MW for wind energy through private sector participation during the 8th Five-Year Plan (1992-97).

As part of the economy-wide reform process, MNES put in place fiscal incentives and policies to increase the private sector participation in the renewable energy sector. This included detailed guidelines for the states to design their market-oriented incentive programmes for promoting renewable energy[102]. MNES released its strategy document on September 13, 1993. This included new and revised provisions of the former incentives: accelerated depreciation, concessions related to the banking, wheeling and third-party sales, among others.

Among other benefits of the policy framework announced by the Ministry was the provision of a power purchase price of INR 2.25/kWh(USD 0.18/kWh), with an escalation of 5% every year. This scheme created price certainty for renewable energy project developers. Prior to these guidelines, there was no specific tariff for purchase of power generation from renewable sources. The tariff was uniformly applicable to all renewable energy technologies without discriminating for cost or maturity of any of the options.

By the end of 1993, India had installed 40 MW of wind power capacity, set up mostly by private entrepreneurs with support from the Ministry of Non-conventional Energy Sources and international grant assistance.

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[99] IREDA was established on 11 March 1987 as a Public Limited Government Company under the Companies Act, 1956.It promotes, develops and extends financial assistance for renewable energy and energy efficiency/conservation projects.

[100] DNES became the Ministry for Non-conventional Energy Sources, which became the MNRE in October of 2006.

[101] This economic reform of 1991 greatly changed the wind energy policy situation. It shifted the focus of wind energy policy from state-funded R&D and pilot projects to a stronger private sector involvement.It extended public finance to private sector wind-power projects and provided fiscal and financial incentives to encourage private investments. Investment assistance with soft loans and tax benefits for wind project investments started in 1992 by the central government, although these tax benefits and the interest rates on soft loans changed frequently over the years.

[102] A number of other national institutions were now involved in promoting renewable energy technologies, namely the Planning Commission, the Ministries of Agriculture and Rural Development; Science and Technology; Biotechnology: and Environment and Forests. Most of these government institutions are also represented at the state level. Wind power projects were now also subject to the Central Electricity Authority, which is responsible for setting national policy and planning objectives for the power sector and to the Ministry of Power, which establishes the rules by which these are carried out (Amin, 1999).

In 1994 the Ministry, with support from IREDA, worked on identifying sites of high wind potential to provide plots for the installation of wind turbines by individual investors as a joint public-private partnership. Starting from a USD 4 million base in 1987, IREDA had sanctioned renewable energy projects worth approximately USD 3.6 billion by way of soft loans (IREDA, 2012) by February 2012[103].

The first technology quality standards and certificates and project procedure guidelines were introduced in 1995 only after a large number of abuses of the existing incentives had been reported between 1992 and 1995 (Mizuno, 2005). In the late 1990s the wind sector experienced a slowdown. Analysts believe the underlying reasons were delays in securing land approval, poor installation practices and lowering of tax benefits by the government (Lewis, 2011).

However, up until then there was no long-term industrial strategy for research in wind energy. Scientific R&D activity in India remained limited to the collection of wind speed data. Domestic manufacturing was set in motion by a series of licensing agreements between 1990 and 2005 with Danish (Vestas, Micon) and German (Enercon, Nordex, DeWind, Sudwind GmbH[104]) firms among many others from the global wind energy industry[105].

The role of international cooperation in supporting early market development

Between 1993 and 1999 World Bank's Renewable Resources Development (RRD) project[106] of USD 195 million was implemented through IREDA's Wind Power Programme. The RRD project supported commercial-scale renewable energy development. Until then, the renewable energy programme was run by government agencies using government procurements and subsidies to support local industry. The private sector's role was limited to supplying equipment, design and installation services.

Phase 3:

Passing of Electricity Act, provision of tariffs by the states (2000-2008)

Until the passing of the pivotal Electricity Act of 2003, there was no dedicated legal framework in India to promote renewable energy. The development of the Electricity Act was based on a number of policy instruments, in particular the Electricity Regulatory Commission Act of 1998.

The Electricity Act subsequently led to the introduction of defined tariffs for wind energy. Prior enactments had no specific provisions that could promote renewable energy sources. The Electricity Act introduced provisions that accelerated the development of grid-connected and stand-alone (off-grid) renewable energy generation.

The Electricity Act also provided for time-bound policy formulation by the central and state governments, by mandating State Electricity Regulatory Commissions (SERC) to take steps to promote renewable energy. This legislation accorded significant responsibilities to the Electricity Regulatory Commissions in setting tariffs for (grid-connected) renewable energy-based electricity generation, and setting quotas for renewable energy as a percentage of total consumption of electricity in the area of distribution licensing.

Under Section 61(h) of the Electricity Act of 2003, promotion of generation of electricity from renewable sources of energy has been made the explicit responsibility of SERCs, which are bound by law to take these considerations into account while drafting their terms and conditions for tariff regulations. Nearly all SERCs incorporated suitable clauses into their tariff regulations, which will enable them to provide preferential treatment to renewable energy during the tariff determination process.

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[103] Cumulative Sanctioned amount = INR 17 806.44 Crore and Actual Disbursement amount = 9 283.12 Crore. Converted to USD at the rate of USD 1= INR 49.

[104] Sudwind Energiesysteme GmbH and Suzlon (India) entered into an agreement to share technical know-how relating to 0.27 MW, 0.30 MW, 0.35 MW, and 0.60 MW and 0.75 MW turbines in 1996. In this regard, Suzlon's approach was markedly different from other Indian players like RRB (Vestas) and NEPC (Micon). Suzlon evolved into a company with a turnkey business model. By 2000 the company had set up wholly owned subsidiaries in Germany and Netherlands that functioned as technology development centres. In 2005 Suzlon made a public offering and was listed on the Bombay Stock Exchange. Today it is one of the top ten manufacturers of wind turbines in the world.

[105] Over 24 Indian companies had formed collaborations with companies from Austria, Denmark, Germany, the Netherlands, Belgium, Sweden and the USA. Many of these collaborations had ended by the turn of the century.

[106] The RRD project of the World Bank supported the development of commercial renewable energy. It became operational in 1993, following recommendation from the Energy Sector Management Assistance Programme (ESMAP). The RRD included a technical assistance component from the Global Environment Facility, with bilateral donors.

Under Section 86 (1) (e) of the Electricity Act of 2003, the SERCs were made responsible for the following:

i) Ensuring suitable measures for connectivity of renewable power to the grid.
ii) Sale of renewables-based electricity to any person.
iii) Requiring purchase of a certain percentage of total energy consumption from renewables.

As mandated under Section 86 1(e) of the Electricity Act of 2003, SERCs have to fix quotas (in terms of percentage of electricity being handled by the power utility) to procure power from renewable energy sources. The mandate is called a Renewable Purchase Specification (RPS).

The state regulators were now required to determine the tariff for all renewable energy projects and ensure connectivity to the grid for project sites that are generally in remote locations and away from major load centres.

Section 3 of the Electricity Act of 2003 mandated the formulation of the National Electricity Policy (2005), the National Tariff Policy (2006) and the Rural Electrification Policy[107] (2006). These policies emphasised the importance of setting renewable energy quotas and preferential tariffs for renewable energy; stipulated several conditions to promote and harness renewable energy sources and their procurement by the states. The Ministry of Non-conventional Energy Sources (MNES) was renamed the Ministry of New and Renewable Energy (MNRE) in 2006.

Phase 4:

New incentives and reinforcement of tariff scheme (2009-2012)

In 2009, the Government of India implemented a Generation-Based Incentive (GBI) scheme for grid-connected wind power projects[108]. GBI was introduced to promote more wind power generation. The GBI is over and above the tariff approved by the Electricity Regulatory Commissions and disbursed on a half-yearly basis through IREDA.

The GBI scheme attempts to build a business case for Independent Power Producers. The GBI was limited to cover a maximum capacity addition of 4 000 MW during the 11th Five-Year Plan period (2007-2012). The GBI and accelerated depreciation benefits are mutually exclusive. This scheme was applicable to wind power projects commissioned before 31 March 2012.

State Electricity Regulatory Commissions have specified the RPSs for their distribution companies as required under section 86(1)(e) of the Electricity Act[109]. These renewable energy purchase obligations vary across the Indian states. There is also wide divergence in the tariffs of different technologies set by different Electricity Regulatory Commissions. As of June 2012, 26 SERCs had set RPSs, which vary from 0.5% to 10% in various states over the fiscal year 2012-13.

As of March 2012, 13 of the 25 SERCs had issued preferential feed-in tariffs for purchase of electricity generated from wind power projects. All the states adopted a "cost plus" methodology to fix the feed-in tariff, which varies across the states depending on the resources, project cost and other tariff-computing parameters for each state (GWEC, 2012).

Given the variation in natural resources across different states, in 2010 the Central Electricity Regulatory Commission proposed a complementary mechanism to allow less-endowed states to meet their RPSs through tradable Renewable Energy Certificates (REC). All renewable energy projects commissioned after March 2010 became eligible to register under the REC framework. For wind power generation, this range was

[107] In compliance with Sections 4 and 5 of the Electricity Act, 2003, the central government prepared the Rural Electrification Policy (REP) published in August 2006. The policy under its Section 3 (3.3) for the first time provided a policy framework for decentralised distributed generation of electricity based on either conventional or non-conventional generation, thereby providing the relevant regulatory direction for off-grid/stand-alone small-scale wind farms.

[108] A GBI of INR 0.50 (approximately USD 0.01) per kWh, with a cap of approximately USD 29 000 per MW per year, totaling approximately USD 116 000 per MW over 10 years of a project's life was offered under this scheme. Wind power projects selling power to a third party/merchant power plant are excluded from the GBI incentives. Implementation of the incentives and progress on the ground has been much slower than expected. According to IREDA, between March 2010 and October 2012, 2 021 MW capacity of wind projects had availed themselves of the GBI benefit of a total allocation of 4 000 MW (GWEC, 2012).

[109] Section 86 (1) (e) of the Act mandates SERCs to specify RPS for obligated entities, which include distribution licensees, open access consumers and captive consumers. Accordingly, various SERCs have specified RPO targets applicable to all these entities consuming power in the area of the distribution licensees.

[110] Registered Renewable Energy Generators as on 15 November 2012: Total of 3 588 MW from 697 units of which wind accounted for 2 019 MW from 526 units. One Renewable Energy Certificate = 1 MWh of electricity generated and fed to the grid (Renewable Energy Certificate Registry of India, n.d.b).

set at INR 1 400 to INR 3 480 (USD 26 to USD 65) per certificate. Some 3 761 754 non-solar certificates were issued till mid-November 2012 (Renewable Energy Certificate Registry of India, n.d.a). Wind energy made up over half of the projects registered for the certificates[110].

In the following section, the development of policy framework for the key states of Gujarat, Maharashtra and Tamil Nadu are discussed in some detail[111].

EVOLUTION OF REGULATORY FRAMEWORK FOR WIND IN THE STATE OF GUJARAT

The western State of Gujarat is an example of industrial hub in India[112]. In the 1980s power shortages had a massive impact on the ability of small and medium-sized enterprises across the state to operate normally.

In 1986 Gujarat was the first Indian state to install a wind power project, and currently has the third-highest installed capacity of any state. In 1986, through a joint venture with the Natural Energy Processing Company and the Department for Non-conventional Energy Sources (DNES), a 1.1 MW demonstration wind project was set up in Mandvi, Gujarat. DANIDA's continued support in 1988 for the 10 MW wind farm near the coastal town of Porbundar brought the latest grid-connected wind technology at that time to the notice of the government.

Gujarat benefitted from the early support from DNES and its collaboration with the Gujarat Energy Development Agency (GEDA) to set up demonstration projects along with private sector partners. However the market for wind energy did not witness continuous growth. It saw a dip in 1997, due to reduced tax benefits to the sector, and also due to wider structural and regulatory bottlenecks such as inadequate grid capacity, siting and permitting issues, and inadequate technical expertise.

In summary the Government of Gujarat introduced policies for offering incentives to the wind sector in 1993, 2002 and in 2007[113]. In January 2010, the Gujarat Electricity Regulatory Commission (GERC) passed the second tariff order for wind energy generation[114]. The GERC also allowed third-party sales without any cross-subsidy to take place in the state.

In the context of the Central Electricity Regulatory Commission's regulation on Renewable Energy Certificates, GERC was the first commission in the country to incorporate the provisions of REC in its regulations[115]. According to MNRE by 31 March 2012, Gujarat had installed 2 966 MW of wind power and has the second-highest state-wise installed capacity.

EVOLUTION OF REGULATORY FRAMEWORK FOR WIND IN MAHARASHTRA

The State of Maharashtra along the western coast of India had a chronic shortfall of electricity supply of about 20% in the mid 1990s. As a direct measure to increase the uptake of renewables Maharashtra introduced incentives (largely in the form of sales tax benefits) that supplemented the fiscal and regulatory benefits from the central government. This was done to encourage its private sector (mostly small and medium-sized enterprises) to set up captive power units to make up the power supply deficit[116] (Wind Power Monthly Magazine, 1996).

Maharashtra saw a dramatic rise in wind power projects only after 1998 when it augmented the central government support with state-wide sales tax benefits. As a result of this scheme, any industry operating a wind farm would be exempted from sales tax. This incentive was phased out in March 2003. From 1999 to 2003, Maharashtra developed the second highest number of wind energy installations in the country (400 MW).

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[111] The state government earlier followed a forward-looking policy for promotion of captive generation and as a result, Gujarat is one of the front-runner states to have a large capacity of captive power plants. As on 31 March 2010, 60 captive power plants, with an aggregate capacity of 3 337 MW, were operating in parallel to the state network.

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[113] New Wind Energy Policy 2007 in accordance with the Electricity Act of 2003. Energy and Petrochemicals Department of the Government of Gujarat passed resolution No. EDA1020013054B on 13 June 2007. The wind policy order of 2007 was to be in effect till 30 June, 2012.

[114] The Commission revised the tariff from INR 3.37 (USD 0.079) per unit to INR 3.56 (USD 0.083) per unit.

[115] The Commission has revised the RPO percentage from 2 to 5, 6 and 7 respectively for the years 2010-11, 2011-12 and 2012-13.

[116] Within six weeks of the introduction of incentives for renewable energy development in the state of Maharashtra, NEPC (Micon) installed two 225 kW turbines at its wind farm in the Chalkewadi district. The two wind turbines were the first to be privately owned in the state (Wind Power Monthly Magazine, 1996).

Another important development was the establishment of the Maharashtra Electricity Regulatory Commission (MERC) in August 1999, under the provisions of the Electricity Regulatory Commission Act of 1998. The MERC had the powers to determine tariffs, regulate power purchase, and promote competition, efficiency and economy in the activities of the electricity sector.

The three-member MERC was fully constituted in September 1999 and, as part of its obligations under the Electricity Act of 2003, went on to issue the first legally binding feed-in tariff order for wind, in November 2003 (MERC, 2003). The 2003 Tariff Order of the MERC became a reference for the rest of the states in their process for tariff determination[117].

MERC has set the RPS (non-solar[118]) percentage at 6.75% and 7.75% respectively for the years 2011-12 and 2012-13 (MERC, 2010). According to the MNRE, by 31 March 2012 the state had installed 2 733.2 MW of wind power and currently has the third-highest state-wise installed capacity.

EVOLUTION OF REGULATORY FRAMEWORK FOR WIND IN THE STATE OF TAMIL NADU

The southern State of Tamil Nadu has some of the best wind resources in India. It has been a leader in harnessing its wind energy potential since 1985, when a demonstration programme for grid-connected wind farms was introduced with support from the former Department of Non-conventional Energy Sources. In 1988, DANIDA's 10 MW demonstration project was implemented at two sites in the state.

Based on early successful demonstration projects, the Tamil Nadu Electricity Board (TNEB) was able to attract private investment to the wind sector by identifying potential sites and developing the initial infrastructure for setting up wind turbines.

The TNEB undertook proactive efforts to establish the techno-economic feasibility of wind farms, which led to the addition of 19.4 MW of wind capacity between 1986 and 1993. This was supported by attractive state-level policies (wheeling, banking and option for third-party sales).

In the early 1990s federal fiscal and financial incentives, coupled with soft loans from IREDA, further supported the growth of wind power in Tamil Nadu. However, the real wind power developments in Tamil Nadu started with the establishment of the Ministry of Textile's Technology Upgradation Fund Scheme[119] (TUFS) in 1999 to catalyse investments in all the sub-sectors of textiles and jute industry.

The owners of textile units could avail this capital subsidy to either set up captive power plants, or to sell it on to third-party buyers. The textile industry was allowed to set up wind farms under this scheme. Furthermore, under TUFS the Tamil Nadu Industrial Corporation Limited (a state-owned company) financed efforts to purchase and erect wind turbines for local energy consumption. By September 2002, the installed wind power capacity was 895 MW, which was equivalent to 53% of India's installed capacity in the wind sector at the time (Source: MNRE).

Tamil Nadu is also host to the prestigious Centre for Wind Energy Technology (C-WET), a national institution under the aegis of the MNRE, which provides wind resource assessments, along with standardisation and certification support to the wind industry in India[120].

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[117] Subsequently, the Commission, through its Renewable Purchase Obligation Order dated August 16, 2006, (Case No. 6 of 2006), extended the validity of the tariff orders of all the renewable energy sources up to March 31, 2010.

[118] Non-solar REC includes wind; non-fossil fuel (including bagasse) based co-generation projects; biomass power; small to micro hydro plants; and municipal waste plants. There is no sub-classification by technology. kW turbines at its wind farm in the Chalkewadi district. The two wind turbines were the first to be privately owned in the state (Wind Power Monthly Magazine, 1996).

[119] The Government of India operated a Technology Upgrade Fund Scheme for Textile and Jute Industries (operational from 1999 till 31 March, 2012) for upgrading the technology and modernising the production facilities in the textile units. Under the scheme, the Government of India gives an interest subsidy of 5%. The subsidy will be reimbursed to the units every quarter, as and when received from the Government of India. The scheme was initially approved from April 1999 to March 31, 2004.

Subsequently, the scheme was extended in 2004 and again in 2007 to 2010 and then with modifications up to 31 March, 2012. In 2003 IREDA was co-opted by the Industrial Development Bank of India (IDBI) for the operation of the TUF Scheme for installation of captive wind energy plants by non-SSI (small-scale industry) textiles units to enable them to receive 5% interest incentive from the Ministry of Textiles.

[120] C-WET offers services and seeks to find solutions for the entire spectrum of the wind energy sector. It also provides support to the wind turbine manufacturing industry in achieving and sustaining quality, and supports the wind turbine industry in promoting export of products and services (CWET, n.d.).

Te Rere Hau wind farm, Manawatu, New Zealand ©Windflow Technology

The R&D unit within C-WET was established in 1999 with support from DANIDA to provide generic information and knowledge to innovate wind turbine components and sub-systems suited for India's specific conditions.

Correspondingly, the National Wind Resource Assessment Programme continued under the aegis of C-WET, constantly updating data and wind development potential while considering the impact of technical upgrades. In the context of the CERC's notification on Renewable Energy Certificates (REC) in 2009, Tamil Nadu Electricity Regulatory Commission set a renewable purchase specification of 8.95% for 2011-12. According to MNRE, by 31 March 2012 Tamil Nadu had installed 6 987.6 MW, about 40% of India's total wind power capacity.

CURRENT CHALLENGES

The historical growth of India's wind sector is unusual, in the sense that for more than two decades a significant majority of the investment has come from the private sector. By August 2012, over 17.8 GW of wind power capacity was installed in India, with the support of various fiscal and regulatory incentives, provisions of the Electricity Act of 2003 and other complementary national policies for power generation (MNRE).

The policy and regulatory framework for renewables is varied, due to the dual mandate of the individual state governments and the central government to define the legal framework for the energy sector. Unlike some other

India's Varied Policy and Regulatory Environment for Wind and Other Renewable Energy Sources

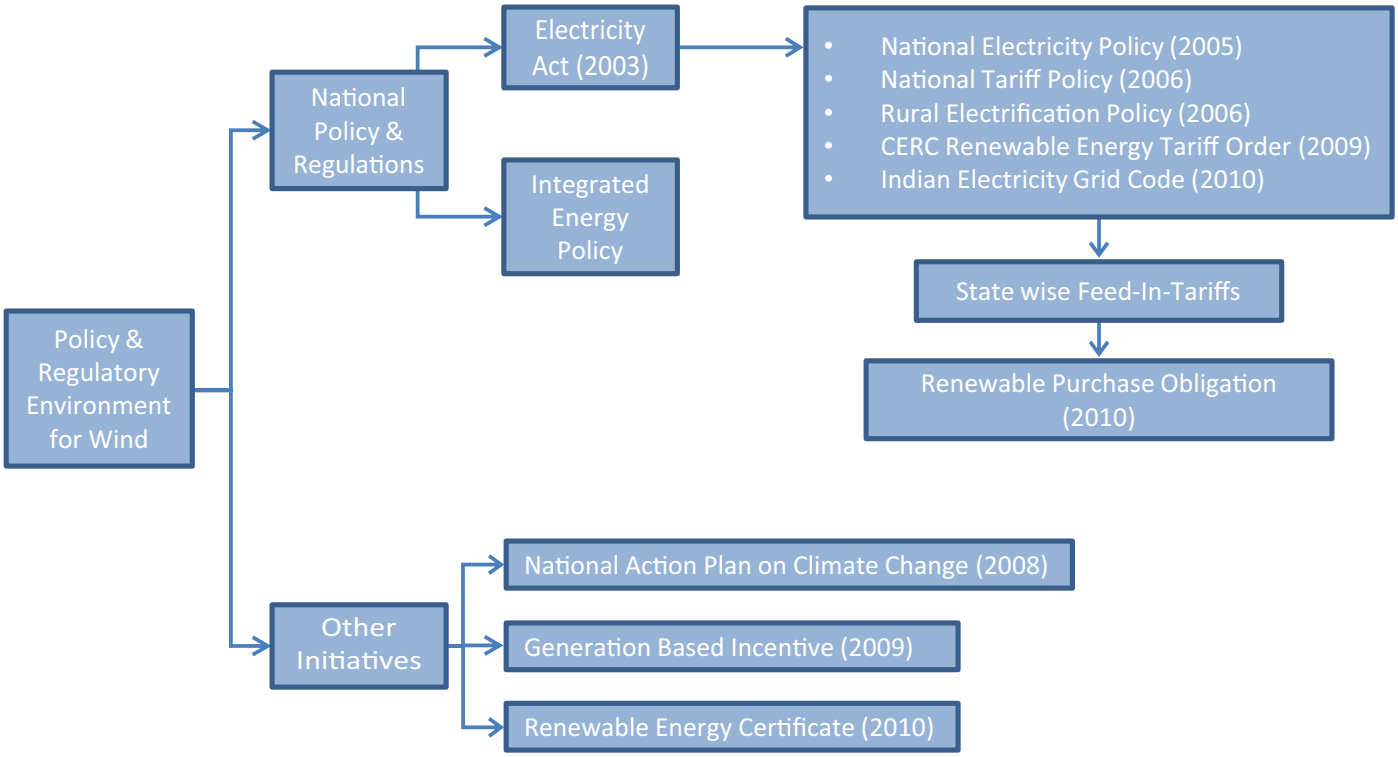

Figure 11: India's varied policy environment for renewable energy (GWEC, 2011)

[121] More than 5 000 MW of new capacity was installed during the fiscal years 2010/11 and 2011/12 in India, and more than two-thirds of the projects commissioned during this time opted for accelerated depreciation benefits instead of the Generation-Based Incentive. Only about 2 000 MW of projects applied for the GBI.

[122] On 30 June 2008, the Prime Minister's Council on Climate Change approved the National Action Plan on Climate Change. The plan stipulates that a dynamic minimum renewable purchase target of 5% (of total grid purchase) may be prescribed in 2009-2010 and this should increase by 1% each year for a period of 10 years. That would mean that by 2020, India should be procuring 15% of its electricity from renewable energy sources.

[123] The Planning Commission brought out the "Integrated Energy Policy: Report of the expert committee (IEP)" in October 2006, which provided a broad overarching framework for the multitude of policies governing the production, distribution, usage etc. of different forms of energy from various sources (conventional and non-conventional).

mature markets, India does not as yet have a dedicated renewable energy law.

The issues of grid integration, forecasting and scheduling are becoming critically important to the health of India's wind energy sector. The power sector is plagued with structural inefficiencies and reliability problems that create a challenging environment for sustained wind power growth. There is an urgent need for modernisation of the transmission networks to improve the grid's ability to absorb higher levels of variable power. While the policy environment for wind power in India has improved in recent years, until recently the industry was heavily dependent on tax incentives that tended to attract a narrower range of private investors[121].

Besides that, there are a number of contradictions between existing policy guidelines and frameworks. For example the National Action Plan on Climate Change[122] (NAPCC) and the Integrated Energy Policy[123] (IEP) of the Government of India are in opposition to each other on the issue of renewable energy.

The NAPCC stipulates that by 2020, India should be producing 15% of its energy needs from renewable energy sources (other than large hydro). This provision conflicts with the IEP, which visualises only 5% renewable energy penetration by 2032.

CONCLUSION

Wind energy is seeing a high level of commitment from the Ministry of New and Renewable Energy and several state governments. This has translated into medium-term policy certainty for the wind energy sector. The domestic and global wind industry has taken advantage of the variety of support mechanisms available to deepen its engagement in the Indian market especially post 2003.

The Indian government has been supporting R&D in wind power technology since the 1980s. Tax exemptions, preferential feed-in tariffs, in addition to the RPS offered by various states and a generation-based incentive, have been key to the sector's growth in recent years.

The government set a target for renewable energy to contribute 10% of total power generation capacity by 2012. By August 2011 that target had already been exceeded and today India's energy mix includes 11.5% of renewable energy capacity. This achievement is largely due to wind energy installations.

Kutch, Gujarat, India ©Wind Power Works

India has developed a strong manufacturing capability, which is driven by strong domestic demand and the potential for export to foreign markets. The Indian wind industry has also benefitted strongly from the Clean Development Mechanismof the Kyoto Protocol under the United Nations Framework Convention on Climate Change.

The key factors for the success of the wind sector in India were early interest by entrepreneurs to invest and work towards indigenisation of the technology to suit Indian conditions; early institutional support from the central and some of the state governments; tax benefits for a sustained period of time; the passing of the Electricity Act in 2003 and the subsequent stipulation of state-wise Renewable Purchase Obligations supported by the development of a national Renewable Energy Certificate scheme.

Other factors that helped the sector were initial support from international development banks and bilateral donor agencies for wind energy demonstration plants; early tax-based incentives and the recent move towards diversifying from a support mechanism led by tax benefits to generation-based incentives.

The most important requirement for India is to develop an integrated energy policy framework, which has a vision, a plan and an implementing mandate to accelerate deployment of all renewable energy technologies. Such a framework, if adopted, can help to reduce concerns of investors related to long-term regulatory certainty and associated market risks.

The next steps for promoting a long-term and sustainable future for the wind sector in India are the enactment of a comprehensive renewable energy law and large-scale grid modernisation. The lessons from India's efforts to promote its wind energy sector could be replicated across most countries, especially those with a similar socio-economic profile.

ANALYSIS OF ENABLING CONDITIONS FOR WIND ENERGY

Effective rule of law; and transparency in administrative and permitting processes	The policy framework is complex and varied. The lack of an overarching policy framework reduces the long-term market visibility for the industry. A long-term policy framework is desirable for all renewables. The administrative and permitting processes vary from state to state, which delays the projects. Several states have recently introduced the mechanism of "Single Window Clearances" for obtaining various approvals and permits for developing wind farms. Improvements are possible.
A clear and effective pricing structure	Tax breaks (accelerated depreciation) are likely to be modified by the introduction of a new Direct Tax Code. The fiscal year 2012-13 saw a downward revision from 80% to 15% for the depreciation rates. There is limited clarity on the nature and timeline for the introduction of the new Direct Tax Code. The certificates market is increasing and an upward revision of the GBI is possible in the future.
Provisions for access to the grid (incentives and penalties for grid operators)	Increasing incidence of curtailment of electricity from wind farms across key States. A joint working group, composed of the MNRE, the Ministry of Power, the Central Electricity Authority and the Power Grid Corporation of India, was constituted to look at the issue of transmission in early 2012
An industrial development strategy	Relief from customs and excise duty has been provided since the 1990s. However, the domestic wind turbine-manufacturing sector is yet to be granted a priority sector status, in order to achieve and sustain long-term and predictable growth.
A functioning finance sector	Public finance support through IREDA is available. The Indian market is maturing and provides medium-term policy certainty to investors and is hence able to attract both domestic and foreign investment.
Expression of political commitment from government (e.g. targets)	The National Action Plan on Climate Change has renewable energy targets but these have not been inscribed into the Five-Year Plans. The targets for the Integrated Energy Policy document differ. MNRE sets five-yearly targets as part of its work plan, which the wind sector has met and exceeded in the past two plan periods.
A government and/or industry-led strategy for public and community buy-in.	Not Applicable
An employment development strategy	Not Applicable

NOTE	**India has had renewable energy programmes since the early 1980s. The wind energy development has been mostly financed by private investments. The next steps for promoting a long-term and sustainable future for the wind sector in India include the enactment of a comprehensive renewable energy law and modernisation of the grid infrastructure.**

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