UNITED STATES and the States of California and Texas

MARKET OVERVIEW

In 2012 the United States installed 13 124 MW of wind power capacity. This made it the largest annual market in 2012. The country is the second-largest market for wind with a cumulative installed capacity of just over 60 GW at the end of 2012. The record year for new wind power resulted in 28% annual market growth, in line with the five year average for the US wind industry of 29%. For the first time, wind energy was the leading source of new electricity generating capacity in the US, contributing 42% of all the megawatts the power sector installed.

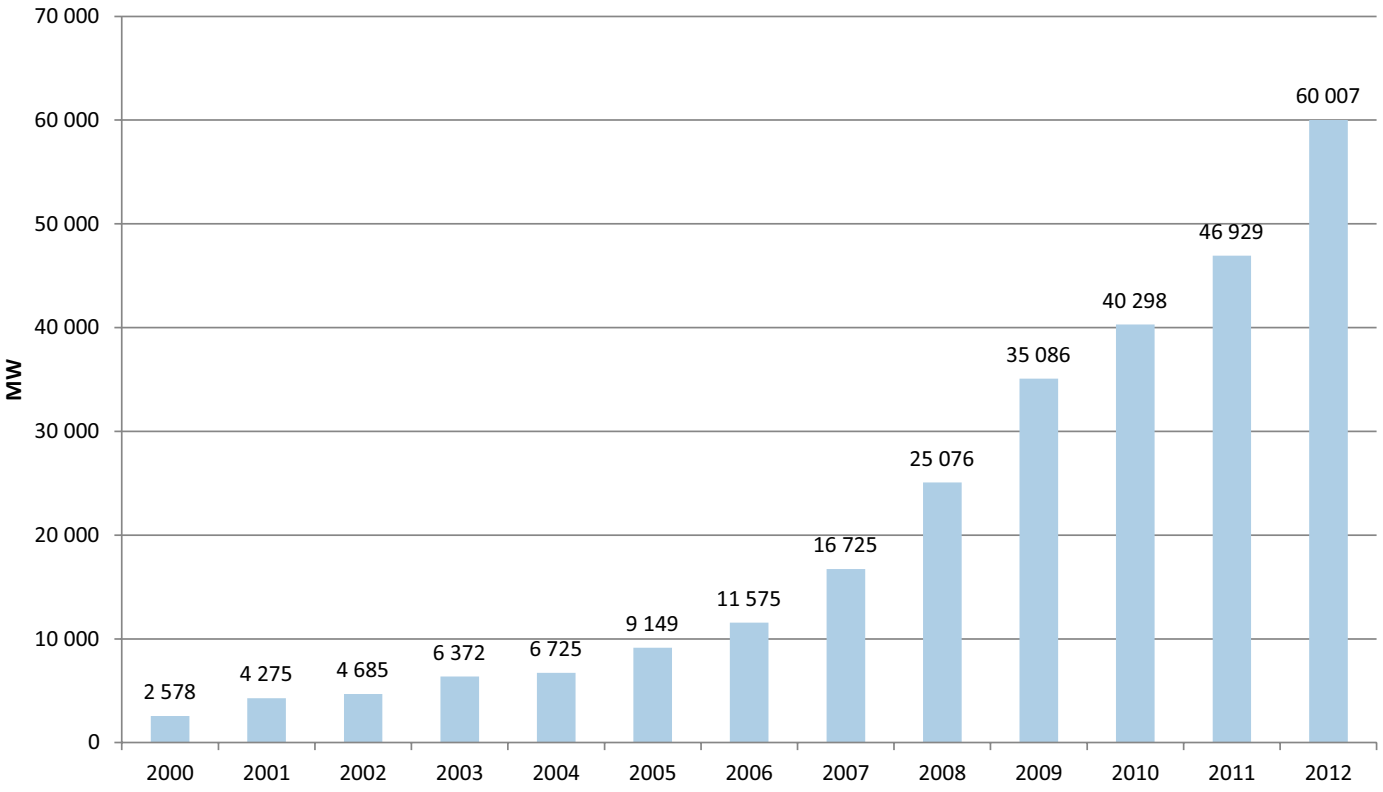

Figure 19: Cumulative Wind Installation (MW) of the US (GWEC, 2013)

HISTORY AND EVOLUTION OF POLICY AND REGULATORY FRAMEWORK FOR WIND ENERGY

The U.S. wind resource is among the best in the world, with an estimated potential of 10 500 GW at 80 metres[207]. In 2011 the U.S was the second-largest market for wind. It is also a market leader in the production of small wind turbines, which are defined as having rated capacities of 100 kW or less.

The growth of the wind sector has been intermittent, largely due to a lack of long-term policy certainty. The development of policy and regulatory framework for the wind energy market is described by three key phases (Martinot and Hamrin, 2006).

[207] At 100 metres the estimated resource is 12 000 GW (Elliott, *et al.*, 2010).

[208] Problems with administrative determinations of avoided cost, coupled with the abundance of QFs, persuaded some states to procure incremental QF capacity through a competitive procurement process. By the early 1990s, approximately 10 states had, or were using, bidding mechanisms to determine avoided costs and the QF projects that

UNITED STATES: ANNUAL AVERAGE WIND SPEED AT 80m

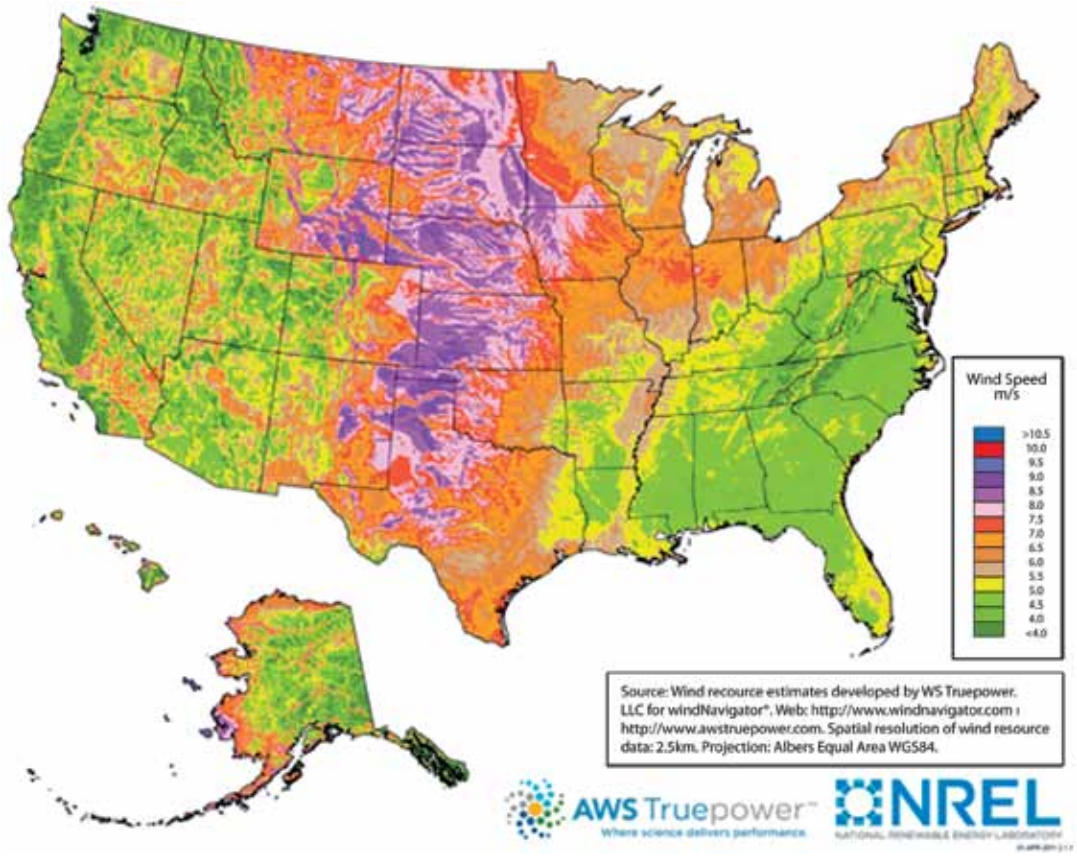

Figure 20: Annual Average Wind Speed at 80m in the US (U.S.Department of Energy, n.d)

Phase 1:
The PURPA era (1978 to 1990)

The oil crisis of 1973 caused an unprecedented escalation of energy prices accompanied by a major economic shock. A comprehensive federal energy programme was soon established to secure the country's long-term energy needs (Sissine, 2006). During the 1970s, the federal renewable energy programme included basic and applied R&D, demonstration projects in partnership with the private sector, commercialisation, and information dissemination. The federal government introduced market-based incentives, such as business and residential tax credits, and created a market for non-utility-produced electric power through the Public Utility Regulatory Policies Act (PURPA) in 1978.

PURPA was introduced to encourage more efficient generation development, and renewable energy sources were able to benefit from long-term contracts from utilities. Prior to 1978, electric utilities had no obligation to purchase power from third parties. PURPA required utilities to purchase power from qualifying third parties at the utility's "avoided cost", which is defined as the incremental energy and capacity cost the utility would have incurred[208].

PURPA faced early legal challenges that delayed its implementation until 1981. Once the scheme was in place, developers could secure financing for their projects under attractive contracts. The tariff was based on the projected wholesale cost of conventional (fossil-fuel) energy to the utility, and was intended to approximate the avoided costs to the Qualifying Facilities (QFs)[209].

The Federal Energy Regulatory Commission (FERC) issued regulations requiring utilities to purchase the energy produced by the QFs at rates equal to the utilities' avoided cost. However, the definition of avoided cost and

would be eligible for long-term contracts (Graves, Hanser and Basheda, 2006).

[209] Defined as co-generators (generating units that simultaneously produce electricity and steam) and small power producers (maximum size of 80 MW) that used a waste or renewable energy source as their primary fuel input.

implementation of the law varied from state to state, as illustrated later in this chapter by the example of California (Martinot and Hamrin, 2006). One of the most important effects of the act was to create a market for power generated by non-utility power producers.

Largely as a result of California's interpretation of PURPA (described in the following section) and favourable tax incentives, 12 GW of renewable power capacity was installed during the 1980s. This was supplemented by the federal incentive, the Investment Tax Credit (ITC) which offered incentives for the installation of wind turbines.

By the late 1980s, QFs had become a significant, and in some cases the primary, supplier of new generation capacity in some regions. Some concerns were raised about the methods for determining the avoided cost to QFs. Those concerns were largely solved by state retail markets and restructuring of PURPA[210] from the mid-1990s.

State and local governments also played an important role in the development of the renewable energy sector. For example, in the early 1980s, the state of California introduced an investment tax for wind energy which, combined with PURPA and the federal tax credit, helped in the development of the country's first utility-scale wind farms. The states of California and New York also invested state funds in R&D for renewable energy.

During this phase, renewable energy R&D funding grew from less than USD 1.0 million (USD_{2011} 2.73 million)[211] per year in the early 1970s to over USD 1.4 billion (USD_{2011} 3.8 billion) by 1980, and then declined steadily to USD 148 million (USD_{2011} 254.6 million) in 1990. R&D for renewable energy received approximately USD 14.6 billion (in 2003 constant dollars) (USD_{2011} 17.8 billion) from the U.S. federal government between 1973 and 2003 (Sissine, 2006).

Phase 2:

Stagnation and introduction of the Production Tax Credit (1990 to 1997)

Following the PURPA era, there was a period of stagnation from 1990-1997. Due to lower oil prices, and lower avoided costs, the attractiveness of investing in renewable energy was reduced under the PURPA regime. Very little overall capacity was added in the period 1990-1997[212]. At the same time several states developed other innovative incentives.

The post-Reagan era[213] saw a number of changes to the tax code with the most significant being the Energy Policy Act of 1992 (PL 102-486). Section 45 of the IRS code, enacted under the Energy Policy Act of 1992, provided for a Production Tax Credit (PTC) of USD 0.015/kWh (indexed) (USD2011 0.024/kWh) over ten years of the electricity generated from wind systems. This tax credit was gradually expanded to cover other renewable sources (in addition to wind and biomass). The tax credit has been extended and expanded over time and is currently only available until the end of 2012 (Metcalf, 2007), although there is a possibility of further extension.

The federal Renewable Energy Production Incentive (REPI) complemented the PTC. REPI provided USD 0.022/kWh (USD_{2011} 0.0352/kWh) for new eligible facilities owned by local, state and tribal governments; municipal utilities; rural electric cooperatives; and native corporations that had no tax liability. The incentive is paid subject to the availability of appropriations in each federal fiscal year of operation. The scale of programme funding is determined each year as part of the U.S. Department of Energy budget process.

The economics of wind equipment dictate that it is manufactured as close as possible to the market and point of delivery in order to keep transportation costs down and focus on quality control. During the 1990s the US attracted wind equipment manufacturing through its strong, stable growing market.

One noticeable feature of the programmes (PTC, ITC, or Treasury Grant) was that they did not impose any requirements on the sourcing or manufacturing of the equipment used in renewable energy projects. All wind energy equipment-manufacturing businesses were eligible under these programmes. In the early 1980s this approach was largely responsible for the growth of Danish wind turbine exports to the US.

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[210] Part of the U.S. has open retail markets, while the majority of the country does not. This creates a "split" industry structure of rate-regulated monopoly service providers and open retail markets. Recognition of this split industry structure figured prominently in the provisions of the Energy Policy Act (EPACT) of 2005 that modified Section 210 of PURPA. Section 1253 of EPACT 2005 eliminates a utility's requirement to purchase QF power only when the utility demonstrates that QFs can sell their power in a competitive wholesale market for energy and capacity.

[211] USD2011 indicates the indexed equivalent USD value for 2011.

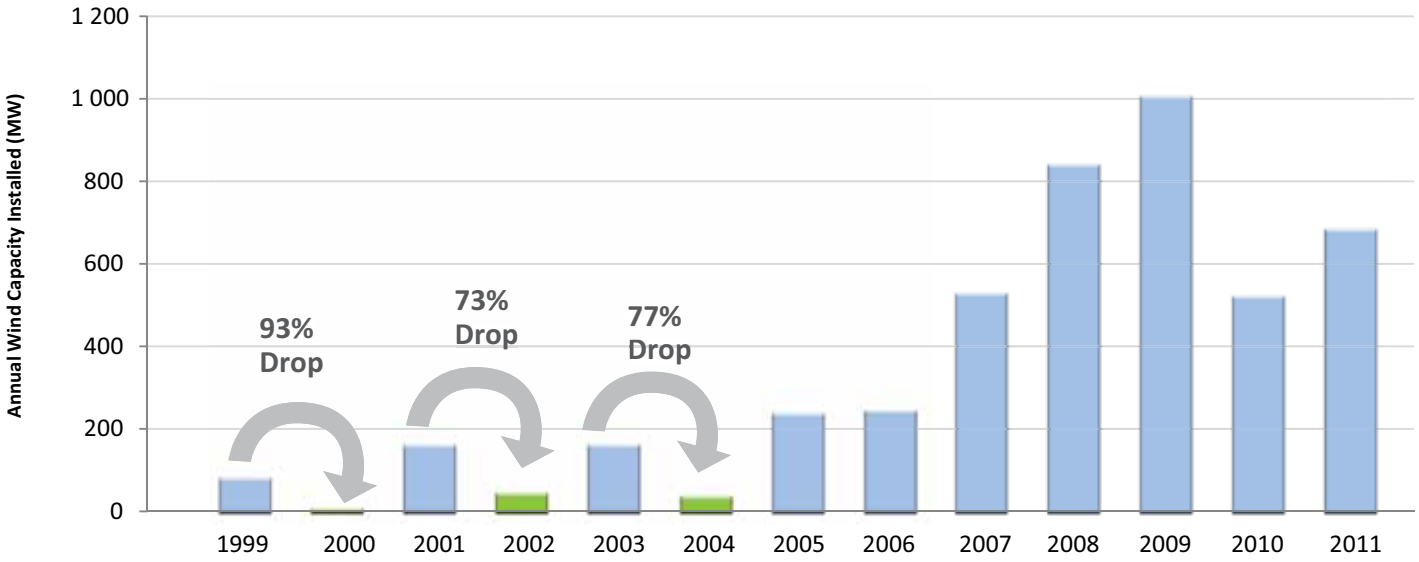

Figure 21:
Historic Impact of PTC Expiration on Annual Wind Installation (AWEA,2011)

Phase 3:

Market maturity, boom-bust cycle (1999 -2012)

In 1999, the US wind industry began a period of rapid expansion, occasionally slowed by expiring federal incentives. The installed capacity grew at a compound annual growth rate (CAGR) of 39% from 2004 to 2008 (FERC, 2009).

Most of this growth was due to a combination of state and local policies, along with federal support in the form of the Production Tax Credit (PTC), and cost reductions due to technology advances and economies of scale. Since the PTC was linked to electricity generation, it encouraged wind farm developers to maximise the wind farm output (Logan and Kaplan, 2008). The PTC was renewed in 2008 for one year, and in 2009 for a further three years. The 2009 extension period provided developers and equipment companies with better short-term assurance to invest in projects and manufacturing facilities.

The renewal of the PTC has had a direct impact on the wind industry. In 1999, 2001 and 2003, the PTC was suspended, causing strong declines in new installed capacity in the following years. This policy uncertainty caused loss of investor confidence, under-investment in manufacturing capacity, and variability in equipment and supply costs[214].

After 2002, however, costs rose again. Based on data collected by the Lawrence Berkeley National Laboratory, the average installed cost of wind projects in the US in 2006 was approximately USD 1 600/kW (USD_{2011} 1 792/kW), up from nearly USD 1 300/kW (USD2011 1 625/kW) in 2002. These increased prices may have been caused by the variable market cycle of important investment alternating with market collapse created by the one or two year extensions of the PTC between 1999 and 2006.

In 2002 an additional incentive was provided through the "Farm Bill". The Farm Security and Rural Investment Act of 2002 authorised USD 115 million (USD_{2011} 143.75 million) for the U.S. Department of Agriculture (USDA) to help farmers, ranchers and rural small businesses invest in renewable energy and energy-efficiency projects, including wind power.

[212] PURPA was relevant only until oil and natural gas prices became high or, in other words, PURPA only called for renewable energy sources if they were cost-competitive with conventional, polluting resources.

[213] President Ronald Reagan was in office from 1981-1989. His administration's policy focused on building a free market.

[214] Dr Ryan Wiser (2007).Work done by him at the Berkeley Lab.

To assist the USDA in interpreting Section 9006 of the Farm Bill, the US Government Accountability Office (GAO) published a detailed report (GAO, 2004), which examined various aspects of leasing land for wind turbines. The Farm Bill was revised in 2008, and will be in effect until 2012.

The most important piece of federal legislation during this period however was the Energy Policy Act of 2005 (EPACT05) which, among a variety of other provisions, extended and expanded coverage of Section 45 (production) and Section 48[215] (investment) tax credits.

Furthermore, in certain cases where transmission congestion existed, the Federal Energy Regulatory Commission (FERC) was authorised under EPACT05 to use its federal authority to site new transmission lines (Logan and Kaplan, 2008).

The FERC would approve funding plans for new transmission and charging the new generator for all costs associated with interconnection, rather than socialising the interconnection costs across all users of the transmission network. Finally, EPACT05 also directed FERC to establish incentive and norms for encouraging greater investment in the national transmission infrastructure, promote electric power reliability, and lower costs for consumers by reducing transmission congestion (DOE, 2005).

The 2008 Bill "Title IX: Energy" established a Rural Energy for America Program (REAP) under Section 9007. REAP was aimed at promoting energy-efficiency and renewable energy development for agricultural producers and rural small businesses through grants and other financial assistance.

The funds (approximately USD 1 billion or USD_{2011} 1.04 billion) (Capehart, 2007) were divided between:

» Section 9007(b): Energy Audits and Renewable Energy Development Assistance[216]; and

» Section 9007(c): Financial Assistance for Energy Efficiency Improvements and Renewable Energy Systems[217].

Wind project costs decreased substantially between the early 1980s and the early 2000s, demonstrating the success of public and private R&D investments and the commercial success of the technology by 2007. In 2008, 30 new manufacturing facilities were announced in the country.

The economic crisis of 2008 led to facility cutbacks, employee layoffs, project delays and equipment order postponements in 2009-10. In February 2009, the US Congress passed the American Recovery and Reinvestment Act (ARRA), which included several provisions to support wind energy. This Act enabled investments to be maintained at a consistent level until 2011.

An additional measure was the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (H.R. 4853). Under this Act, projects (including wind energy) in service or under construction by 2011 became eligible to the US Treasury grant programme. The Federal Financing Bank (under the US Treasury) supported domestic clean-energy projects equivalent to USD 10.1 billion in 2011 alone (Bloomberg New Energy Finance (BNEF), 2012).

The federal PTC provided a USD 0.022/kWh credit during 2010-2012 (adjusted for inflation) for all wind facilities in operation by the end of 2012. Additionally, through Section 1603 of the American Recovery and Reinvestment Act of 2009, wind project developers can choose to receive a 30% investment tax credit (ITC) in place of the PTC. For projects placed in service before 2013, and with construction beginning before the end of 2011, developers could choose to receive a cash payment from the Department of Treasury equivalent to the value of the ITC[218].

On average project costs reflected an upward trend between 2004 and 2009[219] (Wiser and Bolinger, 2011a). Among a sample of projects built in 2010, for example, the capacity weighted average installed cost was USD 2 155/kW (USD_{2011} 2 219.7/kW), which was 65% higher than the average cost of projects installed from 2001 through

[215] Sections 45 and 48 were originally enacted under the Energy Policy Act of 1992. The investment credit is equal to 30% of expenditures, with no maximum credit for small wind turbines placed in service after 31 December, 2008. Eligible small wind property includes wind turbines up to 100 kW in capacity (Database of Incentives for Renewables & Efficiency (DSIRE), 2011).

[216] Available to entities who provide assistance to agricultural producers and rural small businesses to become more energy-efficient and promote the use of renewable energy technologies and resources.

[217] Available to agricultural producers and rural business owners.

2004 (Wiser and Bolinger, 2011a). However, 2010 showed a plateau in project costs and a reversal of recent increases, which would be consistent with the decline in turbine prices globally. By 2011, US manufacturing capabilities grew to nearly 500 manufacturing facilities, producing 60% of the domestic market, thus lowering equipment transportation costs (AWEA, 2012).

Independent power producers owned 73% of all new wind power capacity installed in 2011, and 82% of the cumulative installed capacity (Wiser and Bolinger, 2012). The US wind turbine-manufacturing sector viewed the 2011-12 growth as short-term. The costly delays in the extension of the PTC, led to severe uncertainty and will result in a subdued market in 2013 and possibly in 2014.

Phase 3: Summary of key legislation passed between 2002 and 2010	
2002	Farm Security and Rural Investment Act of 2002, called the "Farm Bill". The Farm Bill was revised in 2008, and will be in effect till 2012.
2005	Energy Policy Act of 2005, which extended and expanded the coverage of production and investment tax credits.
2008	2008 Bill "Title IX: Energy" established a Rural Energy for America Program under Section 9007.
2009	American Recovery and Reinvestment Act, which included several provisions to support wind energy.
2009	Production tax credit renewal for three years (2010-2012).
2010	Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act. Under this Act, projects (including wind energy) in service or under construction by 2011 became eligible to the U.S. Treasury grant programme.

Role of State Regulations

Renewables Portfolio Standards (RPS) have, within the last decade, emerged as the most popular form of policy supporting the deployment of renewable energy technologies at the state level. An RPS is a state policy that requires electricity providers to obtain a minimum percentage of their electricity sales from renewable energy resources by a certain date. As of October 2010, 29 states and the District of Columbia had established binding RPS targets. Several other states (North Dakota, South Dakota, Utah, Virginia and Vermont) have non-binding goals for adoption of renewable energy instead of an RPS. There are 17 states with an RPS of 20% or above, including three which will have an RPS of 25% by 2025, with California reaching 33% in 2030. The highest RPS is currently prescribed by the State of Maine, with a 40% target by 2017 (Database of Incentives for Renewables & Efficiency (DSIRE), n.d.).

In addition to RPS, other state-level policies include renewable electricity funds and various tax incentives. About 67% of all wind power capacity added between 1999 and 2008 occurred in states with RPS policies, according to the Lawrence Berkeley National Laboratory. In addition to serving the near-term market, these standards were designed to stimulate significant new development (see figure 22 for the latest RPS targets of each state).

[218] Given the relative scarcity of tax equity in the wake of the financial crisis (and in particular during 2009), Section 1603 of the Recovery Act also enables wind power projects to select a 30% cash grant from the Treasury in lieu of either the ITC or the PTC. More than 70% of the new wind capacity installed in 2010 selected the Section 1603 grant. Under the Recovery Act, wind power projects would start construction by the end of 2010, apply for the grant by 1 October, 2011, and be operational by the end of 2012, in order to qualify for the grant. In mid-December 2010, however, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended two of these three deadlines by one year: in order to qualify for the grant, wind power projects had to be under construction by the end of 2011, apply for a grant by 1October, 2012, and be operational by the end of 2012.

[219] Wind power projects were not alone in seeing upward pressure on project costs – other types of power plants experienced similar increases in capital costs. For example, the IHS CERA Power Capital Cost Index of coal, gas, wind, and nuclear power plants showed a 115% capital cost increase from 2000 to 2010 (HIS, 2010).

U.S. WIND POWER INSTALLATION BY STATE

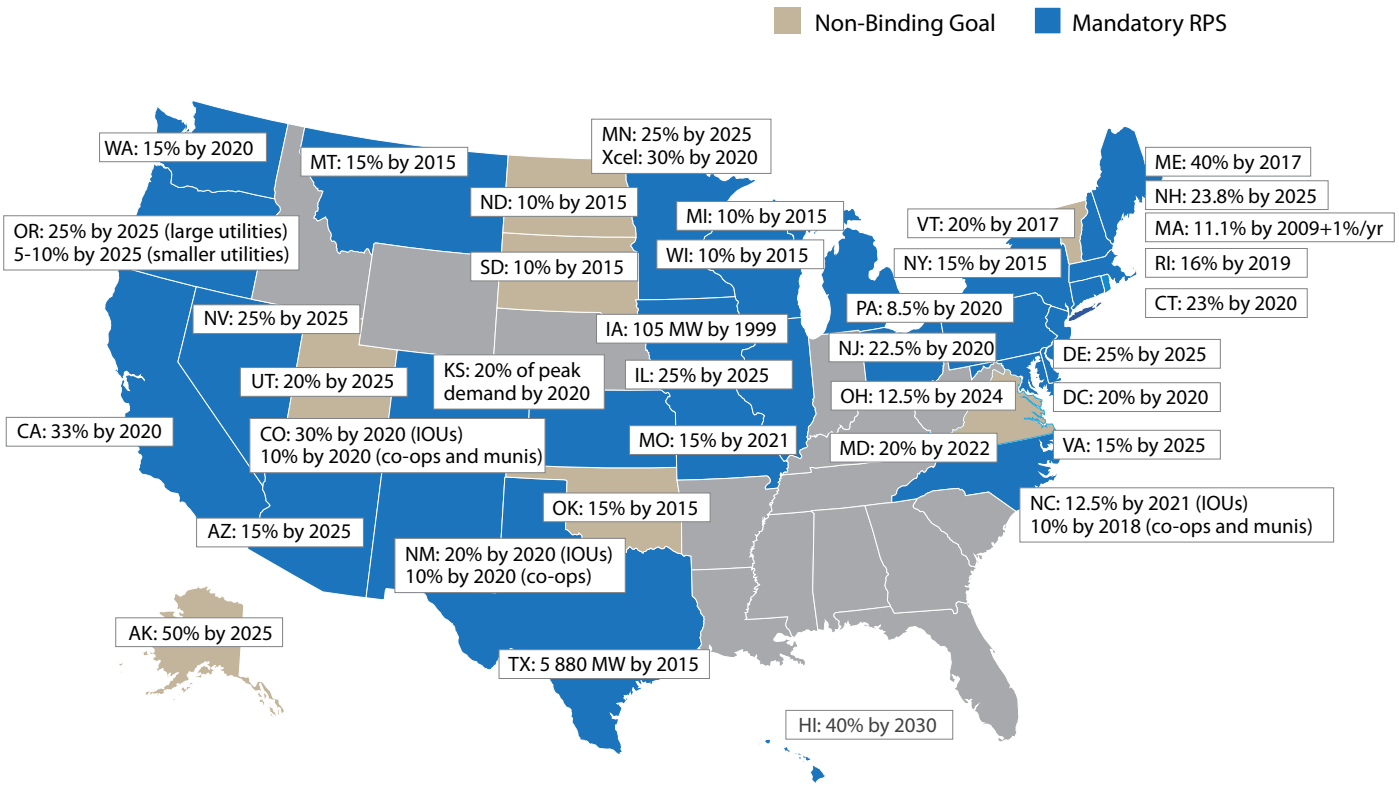

Figure 22: RPS targets declared by the US States as of 2011 (Wiser and Barbose, 2011b)

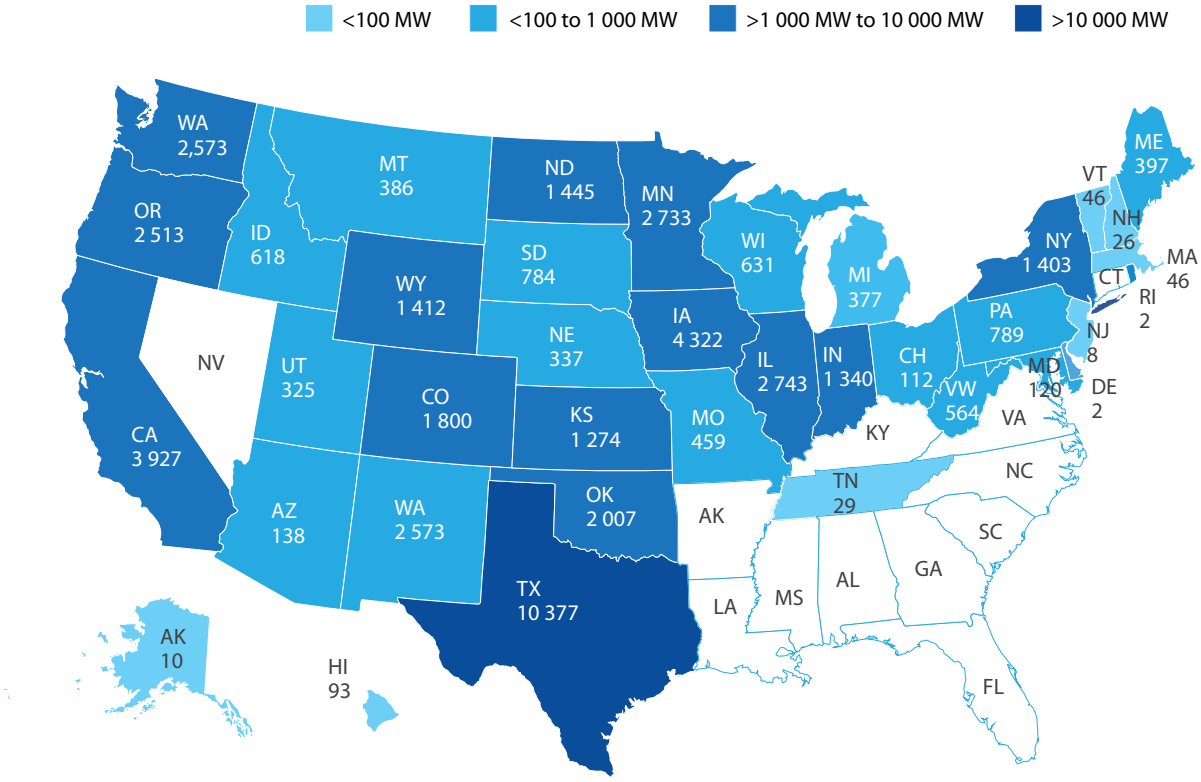

Figure 23: Wind power installations by US States as of December 2011 (AWEA, 2012)

The top five states in terms of cumulative wind capacity installed by the end of 2011 were Texas, Iowa, California, Illinois and Minnesota. The top five states with the fastest-growing markets were Ohio, Vermont, Massachusetts, Michigan and Idaho (AWEA, 2012).

The following sections discuss the policy framework in California and Texas. California was one of the first states to develop utility-scale wind farms, and until 2000 had more wind energy installed than the rest of the country combined. Texas's wind resource is ranked first in the country and it is the first state to have installed more than 10 000MW of wind energy. According to the National Renewable Energy Laboratory (NREL), Texas's wind resource would be approximately 1 900 GW at 80 meters, which could provide 19 times the state's current electricity needs. California's estimated wind potential is in excess of 34 GW and its wind resource could provide 39.4% of the state's current electricity needs (AWEA, 2012).

Evolution of policy framework for wind in the State of California

The interpretation of the Public Utility Regulatory Policy Act of 1978 was fundamental for the growth of renewable energy technologies in California. The implementation of PURPA offered long-term (15-30 year) contracts at a fixed tariff for the first ten years of a renewable energy facility's operation.

These contracts were the so-called "Standard Offer 4" contracts (Martinot, Wiser and Hamrin, 2006), which provided long-term certainty in the electricity market for renewable energy sources. In the beginning PURPA regulations helped on-site industrial and co-generation qualifying facilities (QFs) in getting access to the fixed tariff.

The wind sector growth that followed PURPA was supported by a 25% California state tax credit for investments in wind power from 1980-1983 and an equivalent level of federal tax credit.

The renewable energy programme was a strong pillar for the development of wind energy in California. The Energy Commission's Renewable Energy Program (REP), initiated in 1998, provided market-based incentives for new and existing utility-scale facilities powered by renewable energy. It also offered rebates to the consumer for installing new wind and solar renewable energy systems. REP also supported public education programmes on renewable energy.

From 1998 to 2006, REP financed small-scale grid-connected projects in wind energy, solar photovoltaic, fuel cell, and solar thermal[220]. The programme's spending during the period 1998-2001 was USD 540 million (USD_{2011} 685.8 million); USD 675 million (USD_{2011} 756 million) in the period 2002-2006; and USD 288 million during the period 2008-2011.

The first Renewable Portfolio Standard (RPS) required electric utilities to increase procurement from eligible renewable energy resources by 1% of their retail sales annually, until they reached 20% by the end of 2010. In March 2010, the California Public Utilities Commission authorised utilities to use tradable renewable energy certificates to meet up to 25% of their RPS requirement on period 2011-13, and 10% on the period 2014- 2016.

The penalty for not meeting annual procurement targets on time was set at USD 0.05/kWh (USD_{2011} 0.051/kWh), for a maximum of USD 25 million (USD2011 25.75 million) per utility per year (American Council on Renewable Energy (ACORE), 2011).

As of 2010, California provides a full exemption from the state's "sales and use" tax for expenses relating to the industrial design, manufacture, production, or assembly of renewable energy equipment.

In 2011, California adopted a revised RPS of 33% retail sales by 2020. This new RPS applies to all electricity retailers in the state including publicly owned utilities, investor-owned utilities, electricity service providers, and community choice aggregators. All of these entities must adopt the new RPS goals of 20% of retail sales from renewables by the end of 2013, 25% by the end of 2016, and 33% by the end of 2020.

[220] In 2007, the solar portion was transferred to several entities, under the "Go Solar" initiative.

Development Timeline of California's Renewables Portfolio Standard

- 2002: Senate Bill 1078 establishes the RPS programme, requiring 20% of retail sales from renewable energy by 2017.
- 2003: Energy Action Plan I accelerated the 20% deadline to 2010.
- 2005: Energy Action Plan II recommends a further goal of 33% by 2020.
- 2006: Senate Bill 107 codified the accelerated 20% by 2010 deadline into law.
- 2008: Executive Order S-14-08 requiring 33% renewables by 2020.
- 2009: Executive Order S-21-09 directing the California Air Resources Board, under its AB 32 authority, to adopt regulations by 31 July, 2010, consistent with the 33% renewable energy target established in Executive Order S-14-08.
- 2011: Senate Bill X1-2, signed by Gov. Edmund G. Brown, Jr., codifies 33% by 2020 RPS.

Source: California Energy Commission (2011a)

Development of the Renewable Energy Funding Program in California

Renewable Energy Program Funding 1998-2001: Assembly Bill 1890 **AB 1890** - Statutes of 1996, Chapter 854, was the initial electricity industry deregulation legislation and was signed into law by Governor Pete Wilson in September 1996. It required California's three major investor-owned utilities (Southern California Edison, Pacific Gas and Electric Company, and San Diego Gas & Electric) to collect USD 540 million (USD_{2011} 685.8 million) from their customers via a "public goods surcharge" on electricity use. Bear Valley Electric, another investor-owned utility, also participated in the REP. In addition, voluntary contributions from the public added nearly USD 20 000 (USD_{2011} 25 400) to the Renewable Resource Trust Fund in support of renewable energy. The following year, **Senate Bill 90** implemented the provisions of AB 1890 by creating the Renewable Resource Trust Fund (RRTF) as a depository for AB 1890 fund collections and directed the activities of the Energy Commission relating to renewable energy.

Renewable Energy Program Funding 2002 to 2006: In September 2000 the legislature adopted the Reliable Electric Service Investments Act, Assembly Bill 995 **AB 995**, Statutes of 2000; and Senate Bill 1194 **SB 1194**, Statutes of 2000. These two pieces of legislation mandated the three major investor-owned utilities to collect USD 135 million (USD_{2011} 151.2 million) annually for 10 years beginning in 2002 to support the REP. **Senate Bill 1038** signed in September 2002 incorporated the "Investment Plan" with changes. The bill directed the Energy Commission on implementation of the REP from 2002 through 2006. The funding allocations differed from the initial allocations with subsequent changes due to the discontinuation of the Customer Credit Program.

Renewable Energy Program Funding 2007 through 2011: Funding allocations for 2007-2011, legislated by **SB 107** and **SB 1250**, changed with the enactment of **SB 1036**, effective 1 January, 2008. **SB 1036** abolished the Energy Commission's authority to award supplemental energy payments and eliminated the New Renewable Resources Account effective 1 July, 2008. The Energy Commission was also directed to refund unused supplemental energy payment funds to the utilities whose ratepayers contributed funds to support the RRTF. Accordingly, beginning in 2008 and going through to 2011, **SB 1036** established new funding allocations for the remaining programmes: Existing Renewable Facilities Program (20%), Emerging Renewables Program (79%), and Consumer Education Program (1%).

Source: California Energy Commission (2011b)

Italy ©Daniele Cambria/GWEC

Evolution of policy framework for wind in the State of Texas

Texas has the second-best wind resource in the country, with an estimated 1 901 GW of wind potential. According to NREL estimates, wind power alone has the resource potential to deliver over 19 times the state's electricity consumption.

In 1995 the Texas legislature amended the Public Utility Regulatory Policy Act (PURPA) to deregulate the wholesale generation market. The Public Utility Commission of Texas (PUCT) expanded the mandate of the Electric Reliability Council of Texas (ERCOT) to enable wholesale competition and facilitate the use of the power grid by all market participants. ERCOT was made responsible for the Renewable Energy Credit (REC) trading programme, which enabled utilities to achieve the objectives set under the Renewable Portfolio Standard (RPS) by purchasing certificates.

The RPS was for 2 000 MW of new renewable energy capacity to be built in Texas by 2009, later increased to 10 000 MW by 2025; and allowed customers to have access to providers of renewable power. On 1 January 2002, ERCOT launched the competitive retail electric market allowing individuals and corporations in most cities across Texas to freely choose their power suppliers.

The target of 2 000 MW was met in 2005, four years earlier than anticipated. It was increased to 5 880 MW by 2015 and a long-range target was set for the state to have 10 000 MW of renewable energy capacity by 2025. This goal was reached in 2010.

At that point the main obstacle to the growth of renewable energy in Texas was the lack of transmission lines. The 2005 legislation (Senate Bill 20) streamlined the Public Utility Commission's ability to create Competitive Renewable Energy Zones (CREZ) for the construction of new transmission lines to meet the state's renewable goals (Public Utility Commission of Texas, n.d.)[221]. The Texas PUC estimates the cost for CREZ at around USD 5 billion (USD_{2011} 5.75 billion), collected from ERCOT customers.

Overall, Texas offers an attractive market for wind manufacturers, and is home to turbine manufacturers, tower manufacturers and blade manufacturers. To date, the RPS, along with federal incentives, has been the primary tool used in Texas to support wind energy development. Texas' achievement is due to a unique combination of minimal siting restrictions, lax environmental regulations,

[221] The PUC commissioned ERCOT to present various scenarios for wind transmission in 2008. It selected a transmission scenario that would eventually transmit a total of 18 456 MW of wind power from West Texas (where the majority of the installations are) and the Panhandle to metropolitan areas of the state (where the demand is higher) (Public Utility Commission of Texas, 2008).

and CREZ which incentivises and expedites construction of transmission lines for connection to renewable sources.

Similarities in the success factors for California and Texas:

» An ambitious medium-term target was set, giving the scale and ambition of the programme.

» The target can be matched by the individual utilities through a combination of direct investments and a certificate system.

» The electricity producer receives the electricity market price, the federal incentive, and the value of the certificate.

» The programme is supported by tax exemptions both at state and federal level, and/or subsidies for equipment.

» The extension of the electricity network is planned and organised by the state, but investments and operations are performed by the private sector.

CURRENT CHALLENGES

The window of eligibility for the Treasury Grant Program closed at the end of 2011 (though most projects built in 2012 are likely to qualify) and with federal tax credits due to expire at the end of 2012, the current growth perspectives beyond 2012 are highly uncertain.

The wind sector's growth beyond 2012 may be negatively impacted by the limited need for new electricity generation in the country, given limited demand. With fairly low prices and reduced near-term price expectations, natural gas – wind energy's primary competitor in the US – appears to be more economically viable than in past years. The significant wind energy growth in recent years has exceeded aggregate RPS demands in key states, resulting in lower demand from RPS markets in the near term.

The electricity grid is old and overloaded in some regions, and new investment is required to ensure reliable, efficient transmission. Wind power additions are increasingly constrained by inadequate transmission infrastructure and curtailment; especially since the high wind resource areas are often far away from load centres. Investment is needed to develop a new transmission infrastructure designed to access remote wind resources. Although work is being done to alleviate those constraints, overhaulling and upgrading the transmission infrastructure will take time. Siting and permitting procedures at the local, state, and national levels can also delay and constrain wind power development.

Finally, in California and the south-west parts of the country, wind energy is beginning to face competition from solar in meeting state renewable energy requirements, as the cost of solar energy has declined substantially in recent years.

CONCLUSION

By 2011, wind energy made up 2.9% of U.S. power generation, an increase from 1.8% in 2009. The key policy instruments for the support of renewables at the national level in the U.S. are

» Renewables Purchase Specification;

» Production Tax Credit; and

» Investment Tax Credit (or cash grant).

The U.S. has excellent wind potential with an onshore wind resource of more than 10 500 GW at 80 metres and an offshore wind potential of more than 4 150 GW (Elliott, D., *et al.*, 2010). A variety of policy drivers at both federal and state levels have been vital for the expansion of the wind sector. At the federal level, the most significant policy incentives in recent years have been the PTC, accelerated tax depreciation[222], and two Recovery Act provisions that enable wind power projects to elect, for a limited time only, either a 30% ITC or a 30% cash grant in lieu of the PTC.

Wind energy has become increasingly competitive with other power generation options in the U.S. However there is continued opposition to wind power for aesthetic reasons. Policy support will be essential in providing long-term certainty to the US wind industry.

[222] Accelerated tax depreciation enables project owners to depreciate their investments over a five- to six-year period for tax purposes. An even more attractive 50% first-year "bonus depreciation" schedule was in place during 2008 and 2009, and in September 2010 was extended retroactively for 2010 as well. The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 that was signed into law in mid-December 2010 increased first-year bonus depreciation to 100% for those projects placed in service between 8 September 2010 and the end of 2011, after which the first-year bonus will revert to 50% for projects placed in service during 2012.

ANALYSIS ON ENABLING CONDITIONS FOR WIND ENERGY

Effective rule of law; and transparency in administrative and permitting processes	A long-term policy framework is not available at federal level. Although the DOE published the "20% wind energy penetration by 2030" initiative administrative and permitting procedures vary from state to state, which can create some difficulties in the process of getting approval.
A clear and effective pricing structure	There is a range of incentives available for the industry both at the state and federal level, which would benefit from the support of long-term federal targets. The extension of the PTC makes it difficult for investors to get long-term certainty of price support mechanisms.
Provisions for access to the grid (incentives and penalties for grid operators)	Renewables have priority access to the grid. However curtailment is increasing across several states. There are no penalties on grid operators for curtailing wind for grid stability reasons. From the industry's point of view, the electricity system could be improved to more effectively integrate wind power into electricity markets, create larger power control regions, include wind forecasting, and increase investment in fast-responding generating plants.
An industrial development strategy	Not Applicable
A functioning finance sector	Since the 2009 financial crisis, it has been difficult to access commercial lending which, coupled with the discussions on the extension of the PTC beyond 2012, has created a difficult situation, at least over the 2013-14 period.
Expression of political commitment from government (e.g. targets)	A target of 20% by 2030 (Department of Energy) but this is not yet part of any legislation.
A government and/or industry led strategy for public and community buy-in.	States such as California have been at the forefront of creating high levels of community awareness about wind. This is not a widespread tendency, even though industry associations and industry players have engaged extensively with local communities to explain the nature and benefits of wind. Wind energy has become increasingly competitive with other power generation options in the US. However, there is opposition to wind power in some locations – largely based on aesthetic reasons.
An employment development strategy	Not Applicable
NOTE	**For wind energy to have a credible long-term future, a strong political support is needed, along with a long-term target supported by a stable and uniform remuneration scheme.**

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