

Renewable Electricity Incentives in the OECD, China and India 2011/12: Investment and Operating Support Programmes





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London Research International

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List of Abbreviations

AD	Anaerobic digestion (biogas)
BAPV	Building-attached photovoltaic
BIPV	Building-integrated photovoltaic
CDM	Clean Development Mechanism of the Kyoto Protocol
CER	Certified Emissions Reduction certificate (part of the CDM)
CHP	Combined heat and power
CSP	Concentrated solar-thermal power
DSO	Distribution system operator
EU	European Union
FIT	Feed-in tariff
FY	Fiscal year
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gases
IEA	International Energy Agency
IMF	International Monetary Fund
OECD	Organisation for Economic Cooperation and Development
PV	Photovoltaic
RE	Renewable energy
RPS	Renewable Portfolio Standard
TGC	Tradable green certificates
TSO	Transmission system operator
UNDP	United Nations Development Programme
UNFCCC	UN Framework Convention on Climate Change
VAT	Value added tax

Introduction

Renewable Electricity Incentives in the OECD, China and India, 2011/12 provides an update to the 2010/11 report. All changes made to renewable electricity incentive systems in 2011 in the 33 countries covered are included, and a comparison with incentives in 2010 is also provided.

The energy sector is responsible for a third of global anthropogenic GHG emissions. One of the key strategies OECD member countries have been implementing to manage emissions is to substantially increase the generation of power from renewable energy sources, such as wind, solar, marine and geothermal energy. In many cases, the production of renewable electricity has been encouraged by significant government incentives.

There are two types of subsidies relevant to power generation: *operating support incentives*, which are offered per unit of electricity produced; and *investment support*, which is usually awarded in the form of direct aid, soft loans or tax exemptions. Although investment support incentives are often substantial, they offer less security to prospective investors as the availability of funding often depends on lodging an early application, and the amount offered may not be known until after project details are presented.

As a conclusion, the report compares and ranks the operation compensation levels of the various nations through the analysis of two theoretical examples: a 499 kW building-attached commercial solar PV installation; and a 5.1 MW onshore wind power project.

Operating Support Incentives

The specifics of operating support schemes vary extensively across countries; however, most are based on three types of support structures—*feed-in tariffs*, *premiums*, and *tradable green certificates*. In addition, *tender schemes* are used in some countries for specific types of projects.

Feed-in Tariffs

A feed-in tariff (FIT) system is an incentive framework that guarantees a fixed price and buyer for electricity generated by renewable sources. It requires electricity network operators and utility companies to purchase all the output that renewable electricity generators supply to the grid at a set rate, regardless of whether or not the output is needed to satisfy demand at the time—this is known as an *obligatory purchase*. FIT rates and duration vary among countries and are specific to each renewable electricity generation technology employed. In some countries, generators can even receive FITs for electricity that is not supplied to the grid but consumed for their own use.

The FIT rates are, in most cases, subject to adjustments over time. In some countries, the tariff rates are periodically re-evaluated, while in others they are set for a period and thereafter lowered at a predetermined annual rate. The latter is termed a *degression rate*. In both instances, these adjustments seek to accurately correlate fixed tariff prices with the projected declines in generation costs as renewable power technologies and component

supply chains mature.

The use of a FIT system is considered to be a relatively good incentive for driving investment in renewable development as it offers a degree of predictability to income through predetermined prices and guaranteed buyers. The use of FITs has increased in recent years, likely based on recent trends in the European Union (EU) where the largest growth in renewable electricity investment and development has occurred in countries using FITs as the primary support system.

The FIT incentive system, however, is seen as less market-oriented than other incentive schemes as it shields renewable electricity generators from the variability in the open wholesale electricity market. Given that grid operators are obliged to absorb all renewable electricity generated, there is some concern about the effect of large amounts of intermittent renewable power on the integrity grid and the electricity spot market.

Fixed and Variable Premiums

A variation on the FIT model is the premium incentive, also known as a green bonus scheme. Under the premium system, electricity generators sell their output on wholesale electricity markets at the same prices and under identical conditions as all other electricity generators. There is no purchase guarantee as found under the FIT system, although in some countries renewable electricity is given priority for purchase. To cover the costs of generating power from renewable energy sources under the premium system, generators are entitled to receive a supplementary amount, or “premium,” in addition to the market price of electricity for every MWh of electricity they sell. The premium is paid for by the relevant government agency or network operator, and the cost is recovered through a tax on electricity sales or from the government’s general budget.

There are two types of premiums: fixed and variable. Under a fixed premium, the generator receives a set premium for each unit of output sold on the open market regardless of the market price of electricity.

With a variable premium, the generator receives a variable amount, calculated as the difference between the market price at the time of sale and a predetermined higher price, normally set by a government agency. To illustrate the difference between fixed and variable premiums, hypothetical examples of both types of premium are provided below.

Under the fixed premium system, a spot market electricity price of 55 EUR/MWh and a fixed premium of 33 EUR/MWh provide a generation compensation of 88 EUR/MWh. If the market price falls to 45 EUR/MWh, the fixed premium remains 33 EUR/MWh and hence the generation compensation drops to 78 EUR/MWh.

Under the variable premium system, if the predetermined guaranteed income is 88 EUR/MWh, and the market price then falls from 55 EUR/MWh to 45 EUR/MWh, the premium is adjusted from 33 EUR/MWh to 43 EUR/MWh to compensate for this drop.

If there was an increase of 5 EUR/MWh in the wholesale electricity price to 60 EUR/MWh, under the fixed premium, then generation compensation would also increase by 5 EUR/MWh to 93 EUR/MWh. Under the variable premium system, the premium would fall 5 EUR/MWh to 38 EUR/MWh to maintain the generation compensation at 88 EUR/MWh.

Tradable Green Certificates

Under a Tradable Green Certificate (TGC) incentive system, renewable electricity generators sell their output on the wholesale market at the same prices and under identical conditions as all other electricity generators. For every MWh of renewable electricity supplied to the grid, one TGC is awarded to the renewable electricity generator. The TGC can then be sold by the generator to a supplier or distributor, either directly or through an independent TGC market. Demand for TGC's is created through a quota obligation, whereby electricity suppliers or distributors are obliged to present a set number of TGC's to the regulator every year according to their sales volume. If suppliers fall short of their quota obligations, they need to pay a penalty for each outstanding TGC. In most TGC systems, certificates can be banked for use in later obligation periods.

The TGC system is generally considered more market-driven than other systems because both the TGC and electricity prices fluctuate according to supply and demand. The need for generators to improve efficiency, and in the longer term, align their generation costs to those of non-renewable electricity providers, thus becomes increasingly critical.

There are, however, concerns regarding the TGC system. One concern is that it does not adequately distinguish between more-established renewable electricity technologies with comparatively low generation costs, and emerging technologies with higher generation costs. Therefore, only mature and established technologies can be effectively supported and the ability of the TGC system to promote broader renewable electricity generation development is limited. There is a system known as "technology banding" in some countries where certain technologies, such as solar PV, receive a greater number of TGC's for each MWh of electricity supplied than established and more cost efficient technologies such as landfill gas.

Another concern relates to the stability of the TGC market. The TGC system relies on the demand for TGC's created by the quota system to drive the market price to a point at which their sale by renewable electricity generators can adequately cover the relatively high generation costs of renewable electricity. Should the TGC quota obligations on electricity suppliers or distributors be too low, the TGC supply would exceed demand and as a result the price of the TGC's could collapse. This susceptibility to fluctuations in the TGC price creates a considerable long-term investment risk.¹

To reduce this risk, some TGC schemes, such as those found in Belgium and Italy, provide a support mechanism for the TGC market in the form of a "market maker." Generally, the market maker is established and supported by the country's transmission system operator (TSO), which commits to buying and selling TGC's at a minimum or "reference" price. In practice, the minimum price set by the market maker usually falls below the average price of the TGC's sold on the open market.

Tender Schemes

Renewable electricity tender schemes employ a form of competitive tendering whereby an electricity supply contract is offered. Under this contract, the government or a network operator guarantees to purchase a predetermined amount of electricity generated using a

¹ Robert Gross, Philip Heptonstall, and William Blyth, *Investment in Electricity Generation: The Role of Costs, Incentives and Risks*, UKERC, May 2007. Available at www.ukerc.ac.uk/Downloads/PDF/07/0705TPAInvestmentReport/0705InvestmentReport.pdf.

specific renewable electricity generation technology. Developers submit tenders for the project concerned, competing according to the lowest price at which they are able to supply the renewable electricity output. In theory, this scheme should drive the output price of renewable electricity to its lowest possible level. In practice, however, this incentive scheme can lead to renewable electricity generators providing unrealistic generation cost estimates in their tenders that they may be unable to achieve.

Tender schemes were used extensively in the past, but they have become less popular as more sophisticated incentive schemes such as FIT systems have been introduced. Some countries, such as France and Denmark, still use the tender system for certain large projects, particularly offshore wind farms. On the whole, however, tender schemes are not considered to be a particularly successful incentive system and have been ineffective at increasing renewable electricity generation.²

Investment Support Incentives

Investment support incentive schemes are normally defined as financial assistance that covers a part of the initial capital investment cost of a project. They usually take the form of capital grants, soft loans, tax reductions or exemptions on the purchase of goods, and are generally applied as a secondary incentive scheme following an operating incentive scheme.³

Identifying the full range of investment support programmes in a country at a point in time can be time-consuming, as they are funded and managed by different government or quasi-government offices often at the national, regional and local levels. Investment support programmes often have a cap as they are generally funded under the government budget. When the fund is disbursed, the programme ends and it is not certain when a similar programme will next be created. Eligibility for a programme is not necessarily clear until the details of a project are presented to the concerned authority. This report, for reasons of conciseness, accuracy and simplicity, will focus primarily on the investment support schemes provided by national or federal governments.

² OPTRES, Assessment and Optimisation of Renewable Energy Support Schemes in the European Electricity Market, February 2007, pp. 1–17. Available at <www.optres.fhg.de/OPTRES_FINAL_REPORT.pdf>.

³ Commission of the European Communities, The Support of Electricity from Renewable Energy Sources. Available at <ec.europa.eu/energy/climate_actions/doc/2008_res_working_document_en.pdf>.

Chapter 1: Australia

1.1 Government Targets

Under the Kyoto Protocol, Australia is committed to limit its increase of average emissions between 2008 and 2012 to 8 per cent from 1990 base levels. In 2009, GHG emission levels were 2.69 per cent higher than the 1990 base year. Under the Copenhagen Accord, the country has a target to reduce emissions by between 5 and 15 per cent from 2000 levels by 2020 (20 per cent if an international agreement can be reached), and 60 per cent by 2050.¹ In July 2011, the government announced it would introduce a carbon tax of AUD 23 per tonne of CO₂ from July 2012, with a plan to move to a cap-and-trade system in 2015. Half of the revenue raised from this carbon tax will be used to reduce other household taxes. It was not announced when this legislation will be introduced in the parliament.² Australia has a national target to meet 20 per cent of total electricity consumption from renewable electricity by 2020.

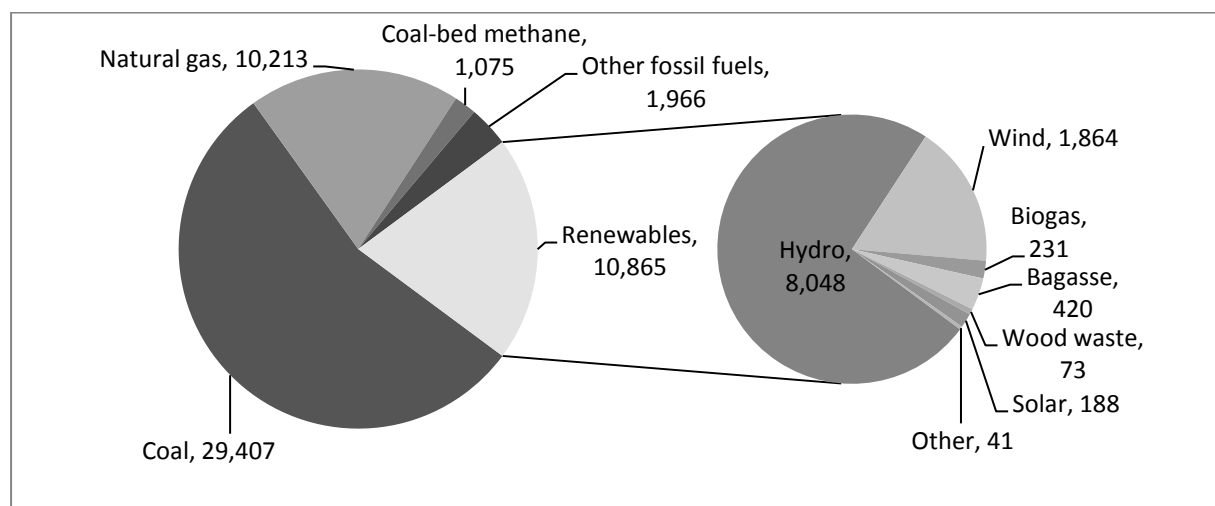
Table 1.1: Australian government commitment summary

GHG emissions	A Kyoto Protocol target to limit the increase of average emissions between 2008 and 2012 to 8 per cent above 1990 base levels. A Copenhagen Accord target for a 5 to 15 per cent reduction from 2000 levels by 2020 (20 per cent if an international climate change treaty can be agreed), and 60 per cent by 2050.
Renewable energy (RE)	No target set.
Renewable electricity	A national target of 20 per cent of total electricity consumption from renewable energy sources by 2020, equalling an additional 45,000 GWh of renewable electricity relative to 1997 levels.

Source: Department of Climate Change, National Targets. Available at <www.climatechange.gov.au>.

1.2 Electricity Generation Mix

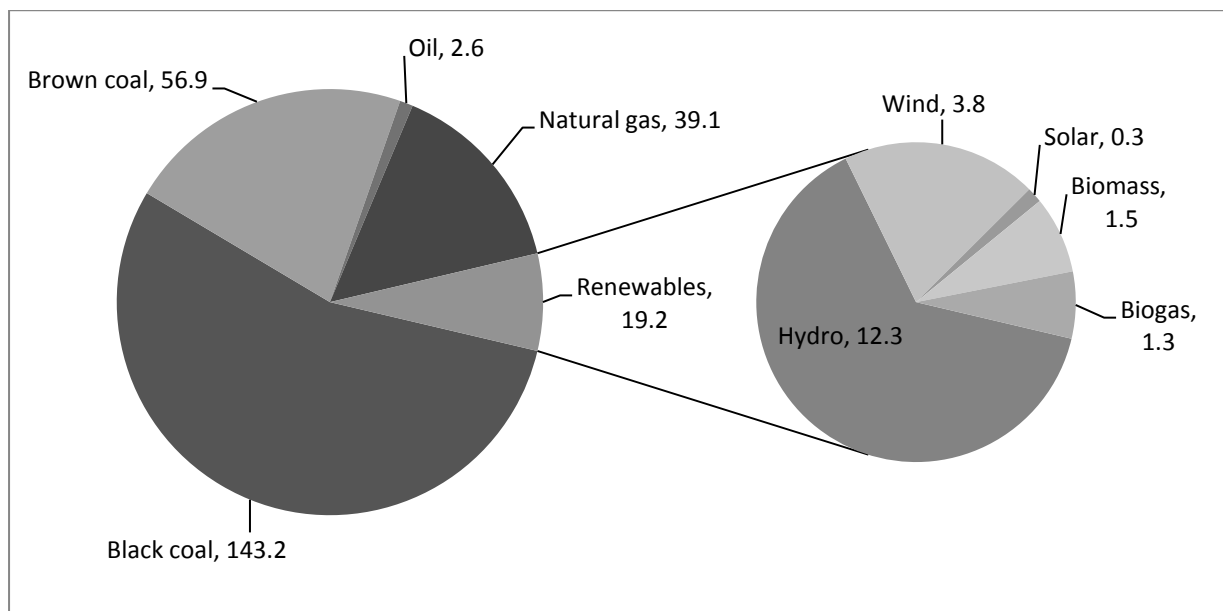
Figure 1.1: Total installed generating capacity in Australia in 2010 (MW): 53,526 MW



Source: Department of Resources, Energy and Tourism, Energy in Australia 2011. Available at <www.ret.gov.au/energy/Documents/facts-stats-pubs/Energy-in-Australia-2011.pdf>.

¹ Department of Climate Change, Reducing Australia's Emission. Available at <www.climatechange.gov.au/en/government/reduce.aspx>.

² Government of Australia, Clean Energy Future, July 2011. Available at <www.cleanenergyfuture.gov.au>.

Figure 1.2: Electricity generation mix in Australia in 2009 (TWh): Total 265 TWh

Source: Department of Resources, Energy and Tourism, Energy in Australia 2011. Available at www.ret.gov.au/energy/Documents/facts-stats-pubs/Energy-in-Australia-2011.pdf.

1.3 Operating Support Incentives

1.3.1 Tradable Green Certificates

Australia currently operates a tradable green certificate (TGC) programme at the federal level as well as six incentive schemes administered by states and territories. The key legislation is the Renewable Energy Act 2000, which started a TGC system known as the Mandatory Renewable Energy Target (MRET). In 2008, the MRET was extended and renamed as the Renewable Energy Target (RET).

On 1 January 2011, the RET scheme was separated into two schemes, the Large-Scale Renewable Energy Target (LRET) for large-scale projects, and the Small-Scale Renewable Energy Scheme (SRES) for small-scale projects. The two schemes create different certificates, called Large-Scale Generation Certificates (LGCs) and Small-Scale Technology Certificates (STCs). Demand for the LGCs and STCs comes from an obligation for wholesale electricity purchasers to acquire sufficient certificates to proportionately contribute towards the annual target amount of renewable electricity. Both the LRET and SRES are administered by the Office of the Renewable Energy Regulator (ORER). All previous participants of the RET system were automatically transferred into the new system.

1.3.1.1 The Small-Scale Renewable Energy Scheme (SRES)

A separate market for TGCs deriving from small-scale generation—Small-scale Technology Certificates (STCs)—was created at the start of 2011 and the following facilities will be deemed eligible to receive STCs:

- The following micro-generators:
 - Wind power: Capacity under 10 kW and annual generation under 25 MWh
 - Solar PV: Capacity under 100 kW and annual generation under 250 MWh

- Small hydro with annual generation under 25 MWh
- Solar thermal installations—which can receive STCs for the amount of electricity displaced by their use
- Waste coal-mine gas power stations.

The demand for STCs is created by the imposition of a quota called the Small-scale Technology Percentage (STP) which was decoupled from the LRET, and is set every year by the ORER. Electricity suppliers have to produce the required number of STCs to meet their obligation, or pay a penalty of AUD 65 (EUR 44.97³) for each outstanding certificate.⁴

In 2011, electricity suppliers were required to provide STCs equivalent to 14.8 per cent of their total sales from the previous year. The percentage has not been finalised for subsequent years, but is expected to be 16.75 per cent in 2012, and 10.62 per cent in 2013. The STP is set to decline in 2013 due to the phasing out of the Solar Credits Scheme.⁵

Small-scale generators can sell their STCs directly to electricity suppliers under a bilateral contract or they can sell them to the Renewable Energy Clearing House, which will purchase all STCs at AUD 40 (EUR 27.67), inclusive of sales tax. The Renewable Energy Clearing House will then auction off the STCs to electricity suppliers needing to meet their quota.

With the transition to the new TGC system, the Solar Credits Scheme, which provides additional incentives for residential and small commercial micro-generation with solar PV, small wind, and micro-hydropower, was integrated into the SRES and is now scheduled to be phased out by 2014, compared to 2015 before the SRES was launched. Key eligibility requirements for the Solar Credits Scheme include:

- A maximum size of 100 kW for solar PV, 10 kW for wind power, and 6.4 kW for micro-hydropower
- The system must be installed at eligible premises, such as houses, townhouses, residential apartments and shops
- The system must be a new and complete unit, and they must have been installed no more than 12 months prior to the date of application for Solar Credits
- The incentive is not applicable to projects that are receiving funding from the Solar Homes and Communities Plan, the Renewable Remote Power Generation Program (RRPGP), or the National Solar Schools Program (NSSP)
- Solar Credits may be created only once for a particular installation, irrespective of whether the certificates are created for a 1-year, 5-year or 15-year deeming period.

The Solar Credits Scheme incentivises small-scale generation of renewable power by applying a multiplier of 5 to the amount of STCs created by the generation of 1 MWh of renewable electricity. Therefore, for each MWh generation, 5 STCs will be issued (see Table 1.2).⁶ This multiplier will gradually be reduced until it is phased out altogether on 1 July 2014.

³ The AUD-EUR conversion rate used throughout this report is EUR 1 = AUD 1.4455 (the average in 2010).

⁴ Government of Australia, Renewable Energy Act, Amendments 2010. Available at <www.comlaw.gov.au/Details/F2010L03206>.

⁵ ORER, Small Scale Technology Percentage. Available at <www.orer.gov.au/stp/index.html>.

⁶ Department of Climate Change and Energy Efficiency, Renewable Energy Target, 2010. Available at <www.climatechange.gov.au/government/initiatives/renewable-target.aspx>.

Table 1.2: The multiplier rates for STCs received by eligible micro-generation systems between 2009 and 2014 in Australia

Year	9 June 2009 – 30 June 2010	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014
Multiplier	5	5	4	3	2

Source: The Parliament of the Commonwealth of Australia, Renewable Energy (Electricity) Amendment Bill 2010 (No 8). Available at <www.comlaw.gov.au/Details/F2010L03206>.

1.3.1.2 The Large-Scale Renewable Energy Target (LRET)

The LRET will work in an essentially identical manner to the RET scheme which preceded it. One Large-Scale Generation Certificate (LGC) will be awarded per MWh of renewable power generated from large-scale renewable power-generating facilities installed after 1997, or from additional renewable power generated from facilities built before 1997. ORER accredits and validates certificates created for the generation of eligible electricity. Wholesale purchasers of electricity are then required to acquire and annually surrender certificates equivalent to a set percentage of their purchases in the previous calendar year—this is dictated by the the Renewable Power Percentage (RPP).

The RPP was revised in 2010 to take into account the contribution of the SRES in meeting the government's target. This quota is set by the ORER and revised on a yearly basis based on renewable electricity generated the year before to ensure a target amount of renewable electricity generation (in GWh) is reached (see Table 1.3). For example, based on the government's generation target, the RPP was 5.62 per cent in 2011. Therefore, a liable party purchasing 100,000 MWh of electricity in 2011 would have to surrender 5,620 RECs to achieve compliance for that year.

Table 1.3: The yearly Large-Scale Renewable Electricity Target in Australia

Calendar year	Renewable power generation in GWh
2010	12,500
2011	10,400
2012	12,300
2013	14,200
2014	16,100
2015	18,000
2016	22,600
2017	27,200
2018	31,800
2019	36,400
2020-2030	41,000

Source: Renewable Energy (Electricity) Act 2000, Act No. 174 of 2000 as amended (2010), 1 January 2011, Division 2, Part 40. Available at <www.comlaw.gov.au/Details/C2011C00012>.

Eligible generation sources for LGC creation include:

- Renewable power stations such as wind, small hydro, landfill gas, solar, wave and tidal power, biomass, biogas and bagasse
- Existing waste coal-mine gas power stations.

The penalty for failing to supply sufficient RECs to discharge a company's quota obligation is currently set at AUD 65 (EUR 44.97) per missing certificate.⁷

Support in meeting the quota is available for companies that engage in areas considered to be Emissions-Intensive Trade Exposed (EITE). This is a provision that was introduced to allay fears that imposing green levies on exporters could shift production to countries with less onerous regulations, adversely affecting the Australian economy whilst having little or no impact on global emissions. Eligibility for EITE status is based on emissions intensity and a trade exposure test which assesses the level of emissions per million dollars of value-added revenue, as well as difficulties faced by the company in increasing the costs of their products due to international competition.⁸ Free LGCs are awarded at two levels depending on the outcome of this test, with highly emissions-intensive firms receiving 94.5 per cent aid in meeting their quota, and moderately emissions-intensive firms receiving 66 per cent. The generosity of both rates is scheduled to decrease at a rate of 1.3 per cent per annum, starting in 2012.⁹

1.3.2 Price of Green Certificates

The price of LGCs is not regulated, but rather determined by supply and demand with a ceiling of AUD 65 (EUR 44.97) per certificate. As ORER will purchase STCs for AUD 40 (EUR 27.67), this effectively forms a floor price for STCs.

On the spot market, green certificates in Australia were worth between AUD 27 and AUD 42 (EUR 18.68 and 29.06) in the period 01/12/2002 - 31/01/2007, with an average of approximately AUD 31 (EUR 21.45) per certificate.¹⁰ In October 2009, the price plunged to a low of AUD 23 (EUR 15.91)—representing a fall of 54 per cent relative to its level four months earlier. The surge in certificate creation caused by the Solar Credits scheme was cited as the reason behind the oversupply and consequent price collapse, ultimately prompting the division of TGC system into the SRES and the LRET.¹¹ For 2011, the ORER estimated the volume weighted average market price for LGCs would be AUD 38.39 (EUR 26.56).¹² Tables 1.4 and 1.5 estimate the total compensation to renewable power generators in 2011 under the SRES and LRET.

⁷ ORER, LRET the basics. Available at <www.orer.gov.au/publications/lret-sres-basics.html>.

⁸ ORER, EITE. Available at <www.orer.gov.au/eites/index.html>.

⁹ ORER, EITE. Available at <www.orer.gov.au/eites/index.html>.

¹⁰ McLennan Magasanik Associates, Review of REC Market, October 2007. Available at <www.orer.gov.au/publications/pubs/modelling-2007.pdf>.

¹¹ Department of Climate Change and Energy Efficiency, Renewable Energy Target, 2010. Available at <www.climatechange.gov.au/government/initiatives/renewable-target.aspx>.

¹² ORER, 2011 volume weighted average market price for a REC. Available at <www.orer.gov.au/eites/2011-REC-VWAP-methodology.html>.

Table 1.4: Estimated generation compensation of small-scale renewable power in Australia under the SRES system in 2011

Region	Estimated average regional price of electricity in 2011 (AUD/MWh) ^b	Purchase price of STCs through the Renewable Energy Clearing House (AUD)	Total compensation ^a per MWh	
			AUD	EUR
Queensland	34.85	40	74.85	51.78
New South Wales	39.98	40	79.98	55.33
South Australia	52.28	40	92.28	63.84
Victoria	43.05	40	83.05	57.45
Tasmania	60.48	40	100.48	69.51
Western Australia	42.54 ^c	40	82.54	57.10
Northern Territory	42.54 ^c	40	82.54	57.10

Notes: These figures exclude potentially applicable state-level incentive payments.

^aAssumes a rate of STC generation of 1 STC per MWh. This will be higher in the case of installations that qualify for the Solar Credits Scheme.

^bThe volume weighted average market price in 2010 was used, with an assumed 2.5 per cent inflation rate.

^cRegional market prices were not available for Western Australia and the Northern Territory. An average of the other mainland states (excluding Tasmania) was used.

Source: ^bDepartment of Resources, Energy and Tourism, Energy in Australia 2011. Available at <www.ret.gov.au/energy/Documents/facts-stats-pubs/Energy-in-Australia-2011.pdf>.

Table 1.5: Estimated generation compensation of large-scale renewable power in Australia from 1 January 2011

Region	Estimated average regional price of electricity in 2011 (AUD/MWh) ^a	Estimated spot price of LRECs in 2011 ^c	Total compensation per MWh	
			AUD	EUR
Queensland	34.85	38.39	73.24	50.67
New South Wales	39.98	38.39	78.37	54.22
South Australia	52.28	38.39	90.67	62.73
Victoria	43.05	38.39	81.44	56.34
Tasmania	60.48	38.39	98.87	68.40
Western Australia	42.54 ^b	38.39	80.93	55.99
Northern Territory	42.54 ^b	38.39	80.93	55.99

Notes: These figures exclude potentially applicable state-level incentive payments.

^a The volume weighted average market price in 2010 was used, with an assumed 2.5 per cent inflation rate.

^bRegional market prices were not available for Western Australia and the Northern Territory. An average of the other mainland states (excluding Tasmania) was used.

Sources: ^aDepartment of Resources, Energy and Tourism, Energy in Australia 2011. Available at <www.ret.gov.au/energy/Documents/facts-stats-pubs/Energy-in-Australia-2011.pdf>; ^cORER, 2011 volume weighted average market price for a REC. Available at <www.orer.gov.au/eites/2011-REC-VWAP-methodology.html>.

1.3.3 State-level Incentive Schemes

1.3.3.1 Australian Capital Territory

The Australian Capital Territory has operated a micro-generation FIT scheme since 1 March 2009 for solar and wind power up to 30 kW in capacity. Households and small businesses with new or existing solar PV or wind power installations are eligible, while other technologies may be included in the future. In 2011, the government introduced a FIT scheme for medium-scale systems of up to 200 kW. A total of 15 MW will be supported under this

medium-scale generation FIT scheme and another 15 MW under the micro-generation scheme.

The FIT rate for micro-generators (≤ 30 kW) installed in 2011 is 457 AUD/MWh (316 EUR/MWh) and 342.7 AUD/MWh (237.08 EUR/MWh) for installations between 30 and 200 kW. The FIT rate for new projects is set each year. When a generator enters into a purchase agreement with a supplier, the existing FIT rate is guaranteed for the full 20 years of the agreement. Operators of renewable projects in the Australian Capital Territory can take advantage of both state and federal RET schemes. The rates are paid for power consumed on-site as well as power fed to the grid.¹³

1.3.3.2 New South Wales

In June 2009, the New South Wales government announced the introduction of a new FIT system for solar power up to 10 kW, called the Solar Bonus Scheme. Only customers whose annual consumption is less than 160 MWh can apply.

The scheme was reviewed by the New South Wales government after 50 MW was installed, and, as a result, in October 2010 the government significantly reduced the FIT rate for new installations to 200 AUD/MWh (138.36 EUR/MWh), from 600 AUD/MWh (415.08 EUR/MWh), and total support was capped at 300 MW. The FIT scheme will run until 31 December 2016, at which point all FIT payments will end. The FIT rate is paid for electricity consumed both on-site and exported to the grid.¹⁴

1.3.3.3 Queensland

Queensland began operation of a FIT system known as the Solar Bonus Scheme on 1 July 2008. The FIT applies only to small-scale solar PV generators of less than 10 kW of installed capacity for single-phase power, and 30 kW for three-phase power. Only customers whose own yearly consumption does not surpass 100 MWh of electricity may apply to receive the FIT tariff.

Queensland's FIT system offers a rate of 440 AUD/MWh (304.39 EUR/MWh) for electricity fed into the grid. The FIT will be offered until 2028 to customers who sign up to the scheme prior to 2018, or when a capacity cap of 8 MW is reached, whichever occurs first. Operators of renewable power projects in Queensland can take advantage of both state and federal (RET) incentive schemes.¹⁵

1.3.3.4 South Australia

The state government of South Australia implemented a FIT scheme for solar PV systems of up to 10 kW on 1 July 2008, which will operate until June 2028. Only customers whose own annual electricity consumption does not surpass 160 MWh may apply.

¹³ ACT Department of the Environment, Feed-in Tariff Scheme. Available at <www.environment.act.gov.au/energy/fit>.

¹⁴ NSW Department of Trade and Investment, Regional Infrastructure and Services, Solar Bonus Scheme for NSW. Available at <www.industry.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme>.

¹⁵ Queensland Office of Clean Energy, *Solar Bonus Scheme*, 2010. Available at <www.cleanenergy.qld.gov.au/solar_bonus_scheme.cfm>.

In 2010, the FIT rate was raised to 540 AUD/MWh (373.57 EUR/MWh) from 440 AUD/MWh (304.39 EUR/MWh) for electricity fed into the grid, which is twice the tariff for households. For systems of 7.5 kW or larger, only the first 54 kWh of electricity fed into the grid every day is eligible to receive the FIT rate. Excess generation beyond 54 kWh is not compensated. Applications to receive the FIT rate ended in October 2011 and it is not known what system, if any, will replace the FIT scheme. Operators of renewable power projects in South Australia can take advantage of both state and federal (RET) incentive schemes.¹⁶

1.3.3.5 Tasmania

In December 2009, the Tasmanian government announced their intention to introduce a FIT system in their energy policy statement. However, deliberations concerning the generosity of the tariff concluded that there would be no subsidy to customers wishing to feed renewable electricity into the grid. The tariff is thus the same as the household retail tariff, that is, 193 AUD/MWh (133.52 EUR/MWh).¹⁷

1.3.3.6 Victoria

The State of Victoria operates two FIT systems for microgeneration: a standard FIT and a premium FIT. Operators of renewable projects in Victoria can take advantage of both state and federal incentive schemes.

The standard FIT was established in 2004 for wind power of less than 100 kW, and in 2007 it expanded to cover solar, hydro and biomass of less than 100 kW. The scheme mandates electricity suppliers with more than 5,000 customers to purchase the excess electricity generated by microgenerators and supplied to the power grid, and to publish the FIT rate they offer with the government. The rate may vary among suppliers, although legislation ensures that microgenerators are offered a 'fair and reasonable price'.¹⁸ The rate offered to microgenerators may be referred to the Essential Services Commission if it is not thought to be fair and reasonable. The standard FIT does not have a time limit and is considered ongoing.

The premium FIT is in place for solar PV systems in households, community organisations and small businesses with energy consumption of less than 100 MWh a year. Both new and existing solar PV systems of up to 5 kW are eligible to receive a tariff rate of at least 600 AUD/MWh (415.08 EUR/MWh) for electricity fed into the grid until 2024.¹⁹ For both FIT systems, the rates are only paid for power fed into the grid.

1.3.3.7 Western Australia

A new FIT system for residential consumers came into force on 1 August 2010, offering a tariff rate of 400 AUD/MWh (276.72 EUR/MWh) for surplus electricity fed into the grid. Solar PV, wind and micro-hydropower of up to 5 kW for Synergy residential customers or 30 kW for Horizon Power residential customers are eligible. The FIT system will be reviewed every three years or when 10 MW has been installed. Existing customers enrolled in the

¹⁶ Renewables SA, Solar Feed-in. Available at <www.renewablessa.sa.gov.au/news/solar-feed-in-enquiries>.

¹⁷ Government of Tasmania, Energy Policy Statement. Available at <www.dier.tas.gov.au/__data/assets/pdf_file/0005/47246/Energy_Policy_Statement.pdf>.

¹⁸ For further information on what is considered a "fair price", see <[www.dpi.vic.gov.au/DPI/dpinenergy.nsf/LinkView/0D6A69DB0F82172ACA257456001BCF464CAC723B1D538D66CA25740C000D2004/\\$file/Feed-in Tariff Fair and Reasonable Criteria.pdf](http://www.dpi.vic.gov.au/DPI/dpinenergy.nsf/LinkView/0D6A69DB0F82172ACA257456001BCF464CAC723B1D538D66CA25740C000D2004/$file/Feed-in%20Tariff%20Fair%20and%20Reasonable%20Criteria.pdf)>.

¹⁹ Department of Primary Industries, Feed-in Tariffs in Victoria, July 2009. Available at <www.dpi.vic.gov.au>.

scheme are guaranteed the same FIT rates for 10 years. Operators of renewable power projects in Western Australia can take advantage of both the state incentives and the federal RET scheme.²⁰

1.4 Investment Support Incentives

The Australian federal government has a number of investment support programmes which are part of the government's Clean Energy Initiative (CEI), an AUD 5 billion (EUR 3.5 billion) programme. The CEI includes the Renewable Energy Future Fund announced in 2010.²¹

As part of the CEI, a total of AUD 1.5 billion (EUR 1 billion), reduced from AUD 1.6 billion in 2010, has been allocated up to 2015/16 to the Solar Flagships program, which will support a total of 1,000 MW of solar PV and concentrated solar-thermal power projects (CSP). It is envisaged that a total of four projects will be supported, two solar PV and two CSP projects. In stage one of the program, seven proposals were submitted in December 2010 to build one 150 MW solar PV plant and one 150 MW CSP plant. A decision on the successful applicants was made in June 2011, with Areva and BP Solar announced as winners in their consortium, Solar Dawn.²²

Another programme is the AUD 150 million (EUR 104 million) Australian Solar Institute (ASI), which supports research and development of solar power. ASI has a commitment to spend AUD 50 million of its budget on joint projects with the United States.²³

The Australia Centre for Renewable Energy (ACRE) is also part of the CEI. ACRE runs the following active investment programmes:

- The AUD 50 million (EUR 35 million) Geothermal Drilling Program (GDP), through which seven projects were each allocated AUD 7 million (EUR 5 million) in funding
- The AUD 100 million (EUR 69 million) Renewable Energy Venture Capital Fund, which will provide early-stage equity investments in emerging renewable technologies
- The Emerging Renewables programme, which will provide support for technologies that are potential future sources of renewable power
- Other research projects, such as the establishment of the Australian Biofuels Research Institute (AUD 20 million, EUR 14 million) and a project to examine renewable power grid connections (AUD 2 million, EUR 1.4 million).²⁴

²⁰ Government of Western Australia, Office of Energy, Feed-in Tariff: Residential. Available at <www.energy.wa.gov.au/2/3654/64/residential_pm>.

²¹ Department of Resources, Clean Energy Initiative. Available at <www.ret.gov.au/energy/energy_programs/cei/Pages/default.aspx>.

²² Ministry of Resources, Solar Flagships. Available at <www.ret.gov.au/resources/resources_programs/cei/sfp/Pages/default.aspx>.

²³ Department for Resources, CEI. Available at <www.ret.gov.au/Department/Documents/cei/CEI_Fact_Sheet.pdf>.

²⁴ Department for Resources, CEI. Available at <www.ret.gov.au/Department/Documents/cei/CEI_Fact_Sheet.pdf>.

Chapter 2: Austria

2.1 Government Targets

Under the Kyoto Protocol, Austria is committed to reduce average emissions between 2008 and 2012 by 13 per cent from 1990 base levels. In 2009, GHG emission levels were 1.3 per cent higher than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 20 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Austria also has an EU target of meeting 34 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 28.5 per cent of final energy consumption was met with renewable energy sources.¹

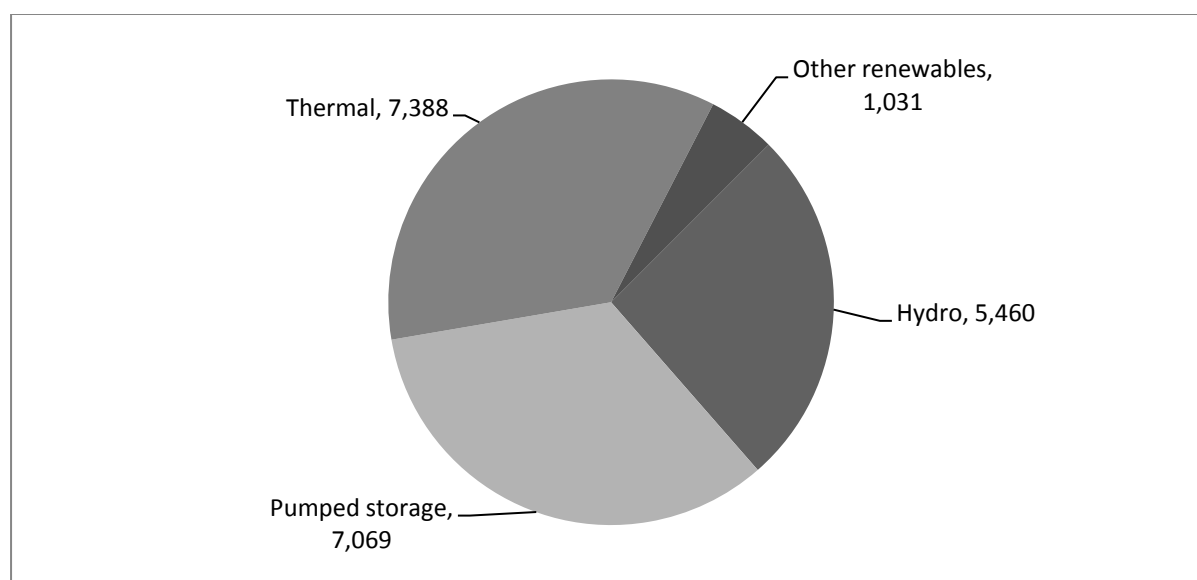
Table 2.1: Austrian government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 13 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 20 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 34 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	No target set.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

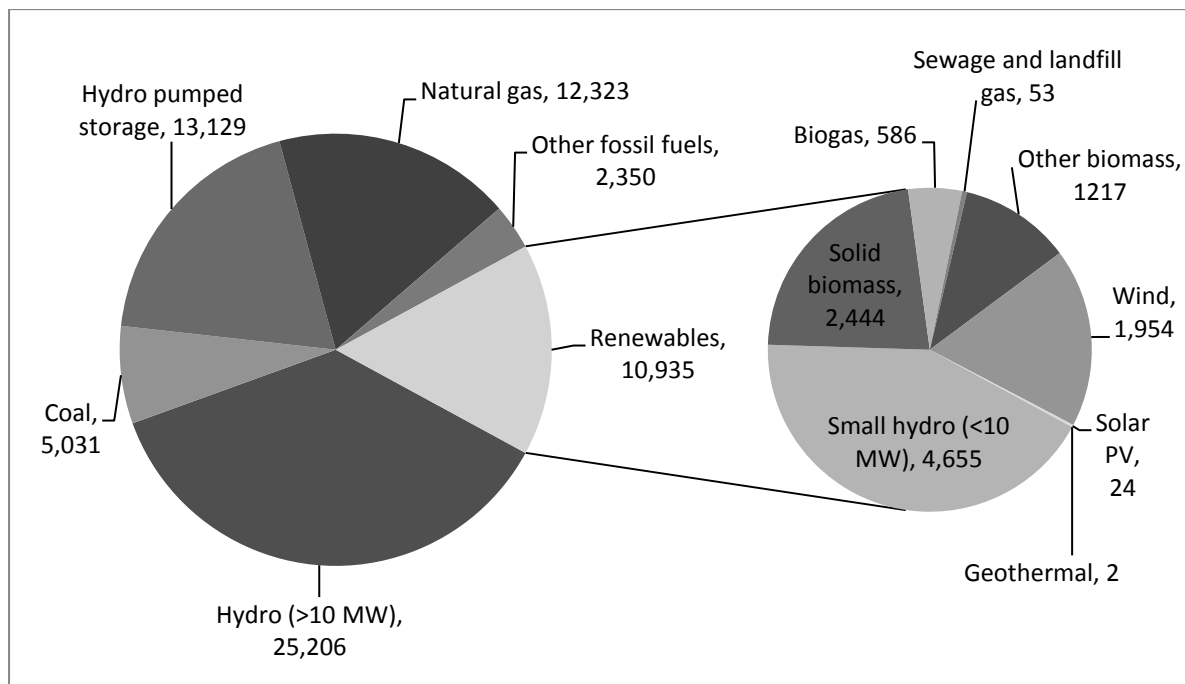
2.2 Electricity Generation Mix

Figure 2.1: Total installed generating capacity in Austria in 2009 (MW): 20,948 MW



Source: E-Control, Statistikbroschüre 2010, December 2010. Available at <www.e-control.at/portal/page/portal/medienbibliothek/publikationen/dokumente/pdfs/e-control-statistikbroschuere-2010.pdf>.

¹ European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>.

Figure 2.2: Electricity generation mix in Austria in 2009 (GWh): Total 68,974 GWh

Source: E-Control, Statistikbroschüre 2010, December 2010. Available at <www.e-control.at/portal/page/portal/medienbibliothek/publikationen/dokumente/pdfs/e-control-statistikbroschuere-2010.pdf>.

2.3 Operating Support Incentives

Austria has a feed-in tariff (FIT) scheme as its primary support mechanism for renewable power development. The FIT was initially introduced in 2002 and subsequently revised in 2006, 2007, 2009, and 2010. The duration of the current FIT varies depending on the technology (see Table 2.2). All renewable electricity eligible to receive the FIT has to be purchased by the local grid operator.

According to recent legislation, the annual allocated budget supporting new renewable electricity generation (including the budget for the FIT) has been set at EUR 17 million through 2011. This yearly budget is allocated among different types of renewable power (30 per cent biomass, 30 per cent biogas, 30 per cent wind, and 10 per cent for solar PV and other technologies).² Within these categories, funds will be given on a ‘first-come, first-served’ basis. Once the budget is exhausted, projects will have to wait for future funding rounds to qualify for the FIT scheme. The FIT rate for small hydropower is fixed annually by the energy regulator based on the national settlement price. The FIT rate for small hydro was 64.4 EUR/MWh in 2010.

² European Commission, Austrian Renewable energy Fact Sheet, 2009. Available at <ec.europa.eu/energy/energy_policy/doc/factsheets/renewables/renewables_at_en.pdf>.

Table 2.2: The feed-in tariff in Austria for new installations starting operation in 2011 (EUR/MWh)

Category		FIT rate	Duration
Solid biomass ^a	< 500 kW	149.8	15 years
	500kW < 1 MW	135.4	
	1 MW < 1.5 MW	131.0	
	1.5 MW < 2 MW	129.7	
	2-5 MW	122.6	
	5-10 MW	120.6	
	> 10 MW	100.0	
Liquid biomass ^b		58	13 years
Biomass from agricultural products ^{b,c}	< 250 kW	185.0	
	250-500 kW	165.0	
	> 500 kW	130.0	
Sewage gas		60.0	
Landfill gas		50.0	
Geothermal		75.0	
Wind power		97.0	
Solar PV (building integrated)	< 5 kW	Only investment subsidy	13 years
	5-20 kW	380.0	
	> 20 kW	330.0	
Solar PV (free standing)	< 5 kW	Only investment subsidy	
	5-20 kW	350.0	
	> 20 kW	250.0	

Notes: ^a A penalty rate of 25 per cent for using wood/sawdust, and 40 per cent for chipboard and particle board waste is applicable to the tariff.

^b A supplement of 20 EUR/MWh is payable for efficient cogeneration facilities.

^c A penalty tariff of 20 per cent is applicable for cofermentation biogas with waste.

Source: E-Control, Einspeisetarife für neue Ökostromanlagen 2010 / 2011, January 2011. Available at <www.e-control.at/portal/page/portal/medienbibliothek/oeko-energie/dokumente/pdfs/Einspeisetarife%202010%20und%202011_0.pdf>.

2.4 Investment Support Incentives

The Austrian Research Promotion Agency (FFG) issues periodic tenders for grants in aid for new renewable energy projects through the Climate Change and Energy Fund (KLI.EN).³ The following technologies were able to receive grants in 2011:

- Solar PV: Grants of 1,300 EUR/kW (1,700 EUR/kW for building-integrated solar PV), up to a maximum of 30 per cent of investment costs, for households to install solar PV systems up to 5 kW. A total of EUR 35 million was allocated for the grants.
- Solar-thermal power: Grants of up to 40 per cent of costs for environmental impact assessments of new plants.
- Building-integrated solar PV: Grants of up to 1,450 EUR/kW, up to a maximum of EUR 7,250, for the purchase of a new housing unit with a building-integrated solar PV system.⁴

Additional financial support for projects is occasionally available from the *Länder* (individual Austrian states) for up to 66 per cent of investment costs.

³ See the Klimafonds website. Available at <www.klimafonds.gv.at/>.

⁴ Klimafon, Project Pipeline. Available at <www.klimafonds.gv.at/home/foerderguide.html>.

Chapter 3: Belgium

3.1 Government Targets

Under the Kyoto Protocol, Belgium is committed to reduce average emissions between 2008 and 2012 by 7.5 per cent from 1990 base levels. In 2009, GHG emission levels were 14.6 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 15 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Belgium also has an EU target of meeting 13 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 3.3 per cent of final energy consumption was met with renewable energy sources.

While the federal government assumes responsibility of the EU-set targets on GHG emissions reduction and renewable energy use, the regional governments assume responsibility of renewable energy development; with the exception of offshore wind power development, which is under federal control. As a result, different regions have different renewable energy targets, which may not be consistent with the federal targets.

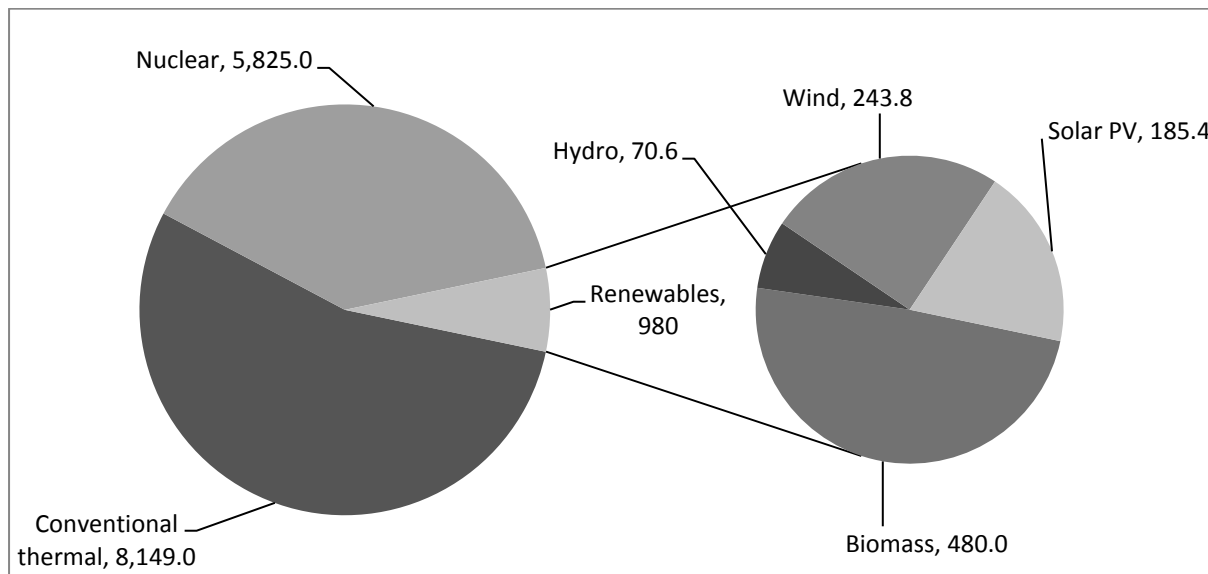
Table 3.1: Belgian federal and state commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 7.5 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for 15 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 13 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	Wallonia: The target for renewable electricity is 8 per cent by 2010. There is a supplemental target of 4,100 GWh from biomass and 370 GWh from wind by 2010. Flanders: The target for renewable electricity is 6 per cent by 2010 (13 per cent by 2020). There is a supplemental target of 1,000 GWh from wind power by 2010.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

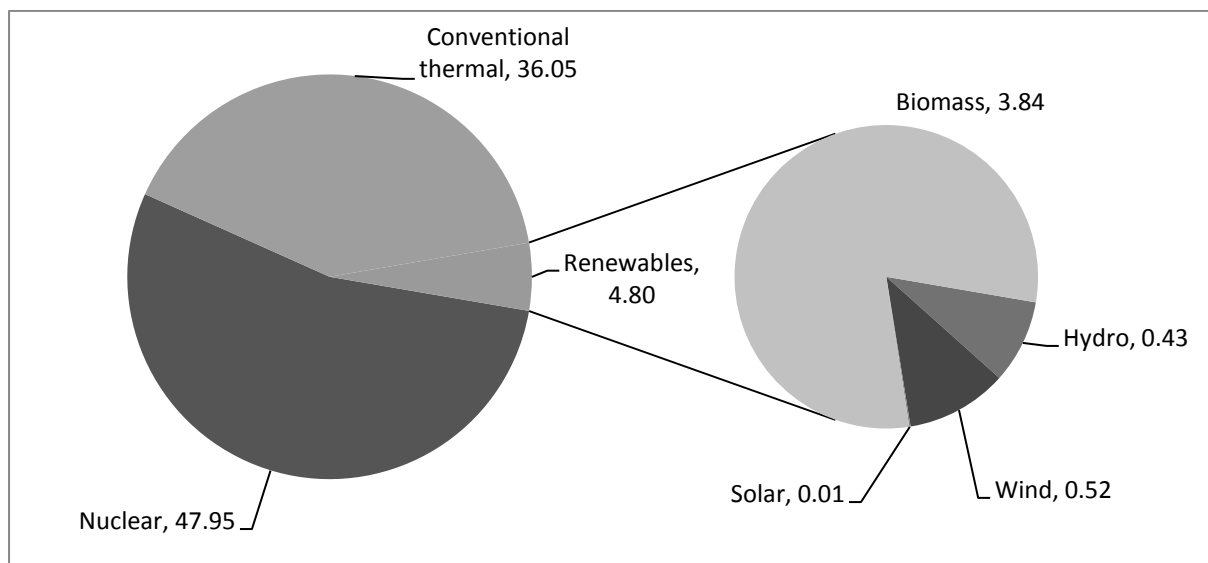
3.2 Electricity Generation Mix

Figure 3.1: Total installed generating capacity in Belgium in 2008 (MW): 14,953.7 MW



Source: EIA and IEA data, Wallonian Energy Commission, VREG

Figure 3.2: Electricity generation mix in Belgium in 2009 (TWh): Total: 88.8 TWh



Source: EIA and IEA data, Wallonian Energy Commission, VREG

3.3 Operating Support Incentives

Belgium uses a tradable green certificate (TGC) system as its primary support mechanism for the deployment of renewable power technologies. The system varies in price and conditions among the regions. There are four different TGCs, including:

- Federal green certificate
- Flemish green certificate
- Walloon green certificate
- Brussels green certificate.¹

Renewable power generators can choose which certificate they wish to receive—either regional or federal, although the federal certificates cannot be used to meet the regional quotas.

Apart from the income from the sale of TGCs, renewable power generators also generate income from the sale of electricity on the wholesale market. In 2010, the average wholesale spot price at the European Power Exchange (EPEX), the power exchange linked with Belgium, was 47.495 EUR/MWh.²

Demand for the TGCs is created through regional quotas, whereby suppliers in Flanders, Wallonia, and Brussels must present to the regional energy regulator a certain number of TGCs per year based on the amount of electricity supplied. The quotas are administered separately by each region, and certificates can only be traded in the region in which the certified renewable electricity was produced. Federal certificates are not recognised in any of the regions for meeting the quotas. They are used only for revenue from the sale to Elia, the transmission system operator (TSO).

3.3.1 Federal Certificates

The federal government issues green certificates through the federal energy regulator, the *Commissie voor de Regulering van de Electriciteit en het Gas* (CREG). Under the federal TGC system, Elia, the TSO, is committed to purchasing federal TGCs at a minimum price, thus providing an equal base and purchase guarantee throughout the entire country (see Table 3.2).

In the regions of Flanders and Wallonia, high electricity and TGC prices have led to most renewable power generators selling their TGCs on the regional markets rather than taking the federal minimum-price option. The federal system is, however, especially important for offshore wind power as this is not covered by the regional systems.

Table 3.2: Minimum purchase price for federal TGCs in Belgium

	Technology	Price (EUR/MWh)
Offshore wind	First 216 MW of capacity	107
	Over 216 MW	90
Onshore wind		50
Hydropower		50

¹ As the Brussels region is very small, no data are shown for the region in this report.

² PowerNext. Available at <www.powernext.fr>.

Solar PV	150
Other renewables (including biomass)	20

Source: CWaPE, Groene Elektriciteit. Available at <www.creg.be/nl/greenelec4.html>.

3.3.2 Walloon Certificates

In Wallonia, the Walloon Energy Commission (*Commission Wallonne pour l'Energie*, CWaPE) is responsible for enforcing the TGC system, including setting the quota obligations for suppliers.

The Walloon TGC is called the *Certificat Vert* (CV) and equivalent to one MWh. All electricity retailers in Wallonia are required to submit CVs on a quarterly basis equal to a percentage of their total retail volume. Only certificates issued in Wallonia can be used to meet the quota. Starting from 7.0 per cent in 2007, the quota has increased by 1 per cent, year upon year. Resultantly, the 2011 quota was 11.0 per cent, and the 2012 quota will be 12.0 per cent.

The penalty per missing certificate is currently set at EUR 100 by the Walloon government. Revenue generated from fines is used to support regional renewable energy programmes. Generators receive the TGCs for as long as the plant continues to operate. The quota from 2012 onwards is expected to be set in 2012.³

The final quantity of CVs awarded to a renewable power plant (with the exception of solar PV installations) is based upon the emission reductions achieved by the renewable power plant relative to a gas-fired combined cycle turbine producing the same amount of electricity.⁴ A multiplier, τ , is applied to the amount of generation in a given quarter (in MWh) to determine the number of CVs created in that period. The equation governing the multiplier is:

$$\tau = G \div E_{\text{ref}}$$

where:

- **G** (gain) is equal to the difference in CO₂ emissions between F (the emissions of the renewable power installation in kg of CO₂/MWh) and a reference level of emissions—(**E_{ref}**)⁵
- **E_{ref}** is a reference level of emissions based on a combined cycle gas turbine operating at 55 per cent efficiency (in kg of CO₂/MWh).

For green energy involving combined heat and power plants, **G** is calculated slightly differently as:

$$G = E_{\text{ref}} + Q - F$$

where:

- **F** is the CO₂ (in kg of CO₂/MWh) emitted by the installation concerned
- **Q** is the CO₂ (in kg of CO₂/MWh) emitted by a reference boiler, as defined by the regulator, producing the same amount of heat.

³ CWaPE, Quota da CV. Available at <www.cwape.be/?dir=3.4.02&title=Quota+de+CV+en+RW>.

⁴ CWaPE, Le Regime de Certificats Vertes, 2003. Available at <www.cwape.be/servlet/Repository?IDR=587>.

⁵ Guideline reference and emission levels are available at <www.cwape.be/servlet/Repository?IDR=587>.

Each CV is valid for five years from the date of its creation. Walloon renewable power producers have three potential sales outlets for the CVs which they create. They can sell them to the regional arm of the Belgian grid operator Elia for a fixed price of EUR 65, or to the federal government arm according to the pricing scheme laid out in section 3.3.1. Finally, holders of Walloon CVs may choose to sell their CVs on spot markets to electricity suppliers wishing to fulfil their mandated quota in Wallonia. The average spot price of a Walloon CV was EUR 84.75 in 2010.⁶

The creation of certificates from solar PV is subject to a multiplier which is applied depending on the installed capacity of the plant in question. Table 3.3 outlines the range of possible rates of CV creation in Wallonia.

Table 3.3: CV creation rates and remuneration in Wallonia in 2011

Technology	Technology banding (CV per MWh)	Minimum remuneration for CVs created per MWh (EUR) ^a	Theoretical maximum remuneration for CVs created per MWh (EUR) ^b
Wind	1	65	100
Hydro (≤ 20 MW)	1	65	100
Biomass (≤ 20 MW) ^d	0.1-0.4	6.5-25	10-40
CHP biomass (≤ 5 MW)	0.1-2.0	6.5-130	10-200
Solar PV ≤ 10 kW ^c	6-7	390-455	600-700

Notes: ^a Based on a minimum price of EUR 65 per certificate and the technology banding.

^b As the penalty fine is EUR 100, it is assumed that the ceiling price of the certificate is EUR 100.

^c Above 10 kW technology banding is not applied to solar PV and it is optimal for producers to sell CVs under the federal system where the guaranteed minimum price is EUR 150.

^d For biomass power plants, certificate creation has been limited to the first 20 MW of installed capacity.

Source: CWaPE, 2009 Rapport Annuel Spécifique sur 'l'évolution du marché des certificats verts'. Available at <www.cwape.be/?dir=0.2&ref=3.4&docid=114>.

3.3.3 Flemish Certificates

In Flanders, the Flemish electricity regulatory agency (*Vlaamse Reguleringsinstantie voor de Electriciteits en Gasmarkt*, VREG) is responsible for enforcing the TGC system. Suppliers need to sell a certain percentage of renewable electricity to end-users every year, which they can either purchase from generators or generate themselves. In 2002-03, the first year of the TGC system, the quota level for TGCs was calculated at 0.8 per cent of total electricity supply. For 2011-12, the TGC level will be 7.0 per cent (see Table 3.4).⁷

Only TGCs issued by VREG in the Flanders region may be accepted to meet the quota, and a penalty fine of EUR 125 is applicable for every missing certificate. One TGC is awarded for each MWh of renewable power generated. The price of the Flemish TGCs has historically been very stable and in 2010 the average price of a TGC was EUR 106.67.⁸

Under the minimum-price TGC system, Elia, which is also the distribution system operator (DSO) in Flanders, is obliged to purchase Flemish TGCs at a predetermined price set by VREG (see Table 3.5). The price of solar PV TGCs is higher than the standard TGC in Flanders and is shown in Table 3.6. As these minimum prices are higher than those offered by

⁶ CWaPE, Prix. Available at <www.cwape.be/?dir=3.4.08&title=Statistiques+et+Prix>.

⁷ Federal Department for Economics and Energy. *Verslag van België inzake de uitvoering van de doelstellingen*. (Report on the Realisation of Renewable Energy Targets in Belgium) 18 May 2004, p. 37.

⁸ VREG, Statistiek Groen Stroom. Available at <www.vreg.be/statistiek-groene-stroom>.

the federal legislation, Flemish generators using solar PV are likely to sell their certificates through the Flemish system. Elia then sells these TGCs on the open TGC market. These minimum prices are guaranteed for 10 years for all renewable electricity plants installed in 2011, with the exception of solar PV for which prices are guaranteed for 20 years if installed before 2012-13. For all technologies, renewable power generators are able to choose to receive federal TGCs instead of Flemish ones, as described in Section 3.3.1, or to sell the TGCs on the wholesale market.

Table 3.4: Renewable electricity quota in Flanders

Annual TGC submission deadline	Quota (%)
31 March 2008	3.75
31 March 2009	4.50
31 March 2010	5.25
31 March 2011	6.00
31 March 2012	7.00
31 March 2013	8.00
31 March 2014	9.00
31 March 2015	10.00
31 March 2016	10.50
31 March 2017	11.00
31 March 2018	11.50
31 March 2019	12.00
31 March 2020	12.50
31 March 2021	13.00

Source: VREG, Green Certificates. Available at <www.vreg.be>.

Table 3.5: Guaranteed minimum price for Flemish TGCs from 2010 (excluding solar PV)

Source	Minimum price per TGC (EUR)	
	Installed before 01/01/2010	Installed after 01/01/2010
Hydro, tidal and wave, and geothermal	95	90
Wind	80	90
Biomass and non-waste derived biogas	80	90
Waste-derived biogas	80	60
Other technology (excluding solar PV)	N/A	60

Source: VREG, Minimum Steun. Available at <www.vreg.be/minimumsteun>.

Table 3.6: Guaranteed minimum price for Flemish solar power TGCs

Commissioning year	Minimum price per TGC (EUR)	Duration of eligibility for TGC creation
Before 2006	150	10 years from the commission date of the plant.
2006-2009	450	20 years from the commission date of the plant
2010	350	
2011	330	
2012	310	
2013	290	
2014	250	15 years from the commission date of the plant.
2015	210	
2016	170	
2017	130	
2018	90	
2019	50	
2020	10	

Source: VREG, Welk Bedrag. Available at <www.vreg.be/welk-bedrag>.

3.4 Investment Support Incentives

3.4.1 Federal Investment Support Incentives

For energy-saving or renewable energy systems, a tax exemption for 13.5 per cent of investment costs is applicable in all regions, including Brussels. For solar and geothermal power, 40 per cent of expenses can be offset against income tax.⁹

3.4.2 Walloon Investment Support Incentives

Since 2005, Wallonia has operated a system of investment subsidies and partial exemptions from real estate taxation targeted at firms investing in sustainable energy use. Eligible renewable generating sources include hydro, wind, solar, geothermal, and biomass energy. The overall amount of subsidy and the level of exemption from taxation depends on the size of the firm and the objectives of the investment programme.¹⁰

Small and medium enterprises (under 250 employees)

- A power plant built by a small enterprise is exempt from real-estate taxation for five years, or exempt for four years, if built by a medium enterprise
- The combined value of investment subsidies and exemption from real estate taxation is roughly equivalent to 50 per cent of investment costs and cannot exceed EUR 1 million.

Large enterprises

- A power plant built by a large enterprise is exempt from real-estate taxation for three years
- The combined value of investment subsidies and exemption from real estate taxation is between 20 and 30 per cent of investment costs (depending on the region), and cannot exceed EUR 2 million.

Subsidies of 50 per cent for pre-feasibility reports are also available for wind farm and anaerobic digestion-based biomass projects, for costs up to a maximum of EUR 5,000 and EUR 2,500, respectively.

3.4.3 Flemish Investment Support Incentives

Small or medium enterprises in Flanders are eligible for a grant of 20 per cent of their eligible¹¹ investment costs for renewable electricity project development, to a maximum of EUR 1.5 million.¹² Large enterprises are eligible for an investment grant of 10 per cent of their eligible investment costs, also to a maximum of EUR 1.5 million. Additionally,

⁹ Income Tax Code of 1992, Article 69, § 1, 2, b and c. Available at <www.fiscus.fgov.be>.

¹⁰ Walloon Ministry of Economics 2010. Available at <economie.wallonie.be/02Databases/Prog_Midas/index.cfm?fuseAction=details&num_aide=324.0>.

¹¹ i.e. Those which are essential to the project. Full definition is provided at <ewbl-publicatie.vlaanderen.be/Uploads/EP-call%20Algemene%20infoteksten%2020100115,0.pdf>.

¹² Investment Incentives in Flanders. Available at <www.investinlanders.com/en/doing_business/incentives/investment_incentives/>.

municipal authorities offer various grants specific to their jurisdiction, particularly for micro-generation. Flanders maintains an internet portal that details the particular features of each local authority's incentive programme.¹³

¹³ Available at <www.energiesparen.be/subsidies/subsidiemodule>.

Chapter 4: Canada

4.1 Government Targets

Under the Kyoto Protocol, Canada is committed to reduce average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. In 2009, GHG emission levels were 29.6 per cent higher than the 1990 base year. Under the Copenhagen Accord, the country has a target to reduce emissions by 17 per cent from 2005 levels by 2020.¹ Some provincial governments have their own GHG emissions reduction and renewable energy targets.²

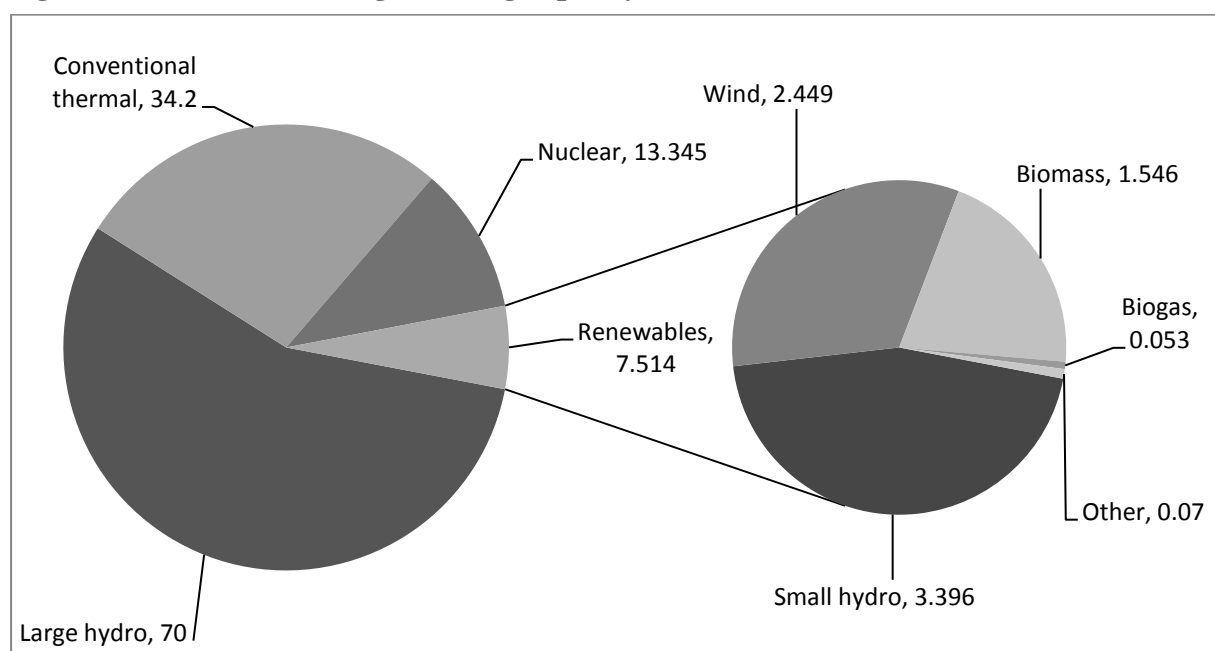
Table 4.1: Canadian government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. A Copenhagen Accord target for a 17 per cent reduction from 2005 levels by 2020.
Renewable energy (RE)	No federal target set.
Renewable electricity	No federal target set. Some provinces have targets.

Source: See Environment Canada, Climate Change. Available at <www.climatechange.gc.ca>.

4.2 Electricity Generation Mix

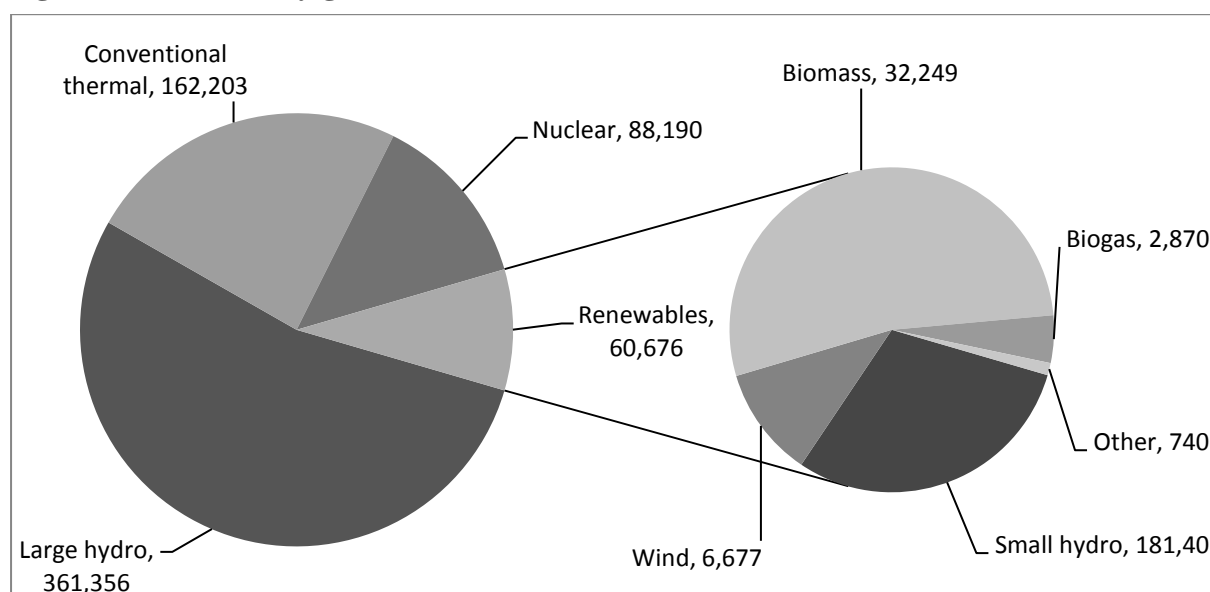
Figure 4.1: Total installed generating capacity in Canada in 2008 (GW): 125.1 GW



Source: Statistics Canada, Electric Power Generating Stations, 2008. Available at <www.statcan.gc.ca>.

¹ Environment Canada, Canada's Greenhouse Gas Target and Emissions Projection. Available at <www.climatechange.gc.ca/default.asp?lang=En&n=DC025A76-1>.

² See Greenpeace, Energy Revolution Canada, 2009. Available at <www.greenpeace.org>.

Figure 4.2: Electricity generation mix in Canada in 2008 (GWh): Total 672,425 GWh

Source: Statistics Canada, Electric Power Generating Stations, 2008. Available at <www.statscan.gc.ca>.

Table 4.2: Installed generating capacity of renewable power by province and territory in Canada in 2008 (MW)

Province	Renewable power generating capacity	Installed generating capacity	Share of renewable power in regional generating capacity	Share of renewable power in total national renewable power capacity
Alberta	1,572.814	11,850.68	13.3%	2.0%
British Columbia	1,2803.58	1,4832	86.3%	16.5%
Manitoba	5,118.573	5,627.423	91.0%	6.6%
New Brunswick	1,168.762	4,534.508	25.8%	1.5%
Newfoundland and Labrador	6,989.885	7,352.535	95.1%	9.0%
Nova Scotia	574.93	2,463.935	23.3%	0.7%
Northwest Territories	56.02	151.078	37.1%	0.1%
Nunavut	0.233	54.275	0.4%	0.0%
Ontario	9,470.03	32,166.19	29.4%	12.2%
Prince Edward Island	55.28	201.11	27.5%	0.1%
Quebec	38,531.61	41,017.82	93.9%	49.7%
Saskatchewan	1,088.485	3,878.79	28.1%	1.4%
Yukon	77.818	110.96	70.1%	0.1%
Total:	77,508.02	124,241.3	62.4%	100%

Source: CIEEDAC, A Review of Renewable Energy in Canada 2008. Available at <www2.cieedac.sfu.ca/media/publications/Renewables%20Report%202010%20Final-1.pdf>.

4.3 Operating Support Incentives

Operating support for renewable energy in Canada is mainly determined and administered at the provincial rather than the federal level. The federal government operates various programmes which provide grant funding for renewable energy development as shown in 4.3.1. For comparison, support programmes in two provinces, British Columbia (BC) and Ontario, are shown in 4.3.2 and 4.3.3.

4.3.1 Federal Operating Support Incentives

The only federal operating support incentive, The ecoENERGY for Renewable Power Program, which started in September 2008, was closed to new applicants in March 2011. As of July 2011, the federal government had yet to introduce a new operating support incentive.³ The previous ecoENERGY programme was a CAD 1.5 billion (EUR 1.1 billion⁴) initiative that aimed to achieve an extra 14.3 TWh of new electricity and 4 GW of extra installed capacity—all from low impact renewable sources (as defined in Environment Canada's Environmental Choice Program Criteria Document CCD-003).⁵ Projects over 1 MW received a 10 CAD/MWh (7.33 EUR/MWh) bonus for a maximum period of 10 years under the programme. Generators receive the bonus on top of the income from the sale of electricity on the wholesale market. Wholesale electricity prices in Canada vary greatly depending on the region. For example, in Ontario, winter wholesale prices in 2010 were between 35-45 CAD/MWh (25.64-32.95 EUR/MWh), while in Alberta, prices ranged between 50-60 CAD/MWh (36.63-43.95 EUR/MWh).⁶

4.3.2 British Columbia Operating Support Incentives

The legal framework for British Columbia's (BC) energy strategy was established in the Clean Energy Act of April 2010. Key features of the Act include an upper limit on electricity generation from non-renewable sources as well as a goal for self-sufficiency in electricity supply for the province. Beyond the hydropower dam planned for site C on the Peace River, future power requirements must be met by exploiting low-impact renewable sources of energy. Renewable energy (including large hydro) continues to provide 90 per cent of the electricity consumed and is intended to help the province become self-sufficient in electricity supply by 2016.⁷

British Columbia introduced a feed-in tariff (FIT) scheme called the Standing Offer Program (SOP) in 2009, subsequently revised in January 2011. The programme only applies to installations with a generating capacity of between 0.05 MW to 15 MW (increased from 10 MW in January 2011). Remuneration is determined by a base rate, which is augmented or diminished by a multiplier based on grid demand. The base rate offered for renewable electricity is provided in Table 4.3, and the time-of-use multipliers which apply to the base rate is given as adjustments in Table 4.4. In the revisions to the SOP made in 2011, an environmental attribute bonus is no longer added to the base rate. All rates are indexed to the Canadian consumer price index.⁸ The provincial government is studying the possibility of replacing the SOP with a technology-specific FIT system and is expected to announce its decision in 2012.⁹

In addition to the Standing Offer Program, the state-owned utility BC Hydro holds occasional Clean Power Calls—a tender process for new renewable power stations. Independent power

³ Communication with Natural Resources Canada.

⁴ The CAD – EUR conversion rate used is 1 CAD = 0.7325 EUR (The average in 2010).

⁵ Environmental Choice. Available at <www.environmentalchoice.com>.

⁶ National Energy Board, Energy. Available at <www.neb.gc.ca>.

⁷ Province of British Columbia, Clean Energy Act. Available at <www.leg.bc.ca/39th2nd/1st_read/gov17-1.htm>.

⁸ BC Hydro, Standing Offer Program Rules, Version 2, January 2011. Available at <www.bchydro.com/etc/medialib/internet/documents/planning_regulatory/acquiring_power/2011q1/20110125_sop_program.Par.0001.File.20110125-SOP-ProgramRules.pdf>.

⁹ BC Hydro, Feed-in Tariff. Available at <www.bchydro.com/planning_regulatory/acquiring_power/feed_in_tariff.html>.

producers are able to compete for a long-term bilateral contract with BC Hydro on the basis of proposing the lowest tariffs. Following the Clean Energy Act, all new generating facilities built in BC need to be based on renewable energy sources, and all tenders need to demonstrate that the technology proposed has been used in at least three projects with operations of three years or more. Due to the financial crisis, however, BC Hydro reduced a 2008 call for 5,000 GWh/year to 3,000 GWh/year and then delayed a decision on successful tenders until the summer of 2010. Since then, there have been no subsequent Clean Power Calls, and as of September 2011, no more have been scheduled.¹⁰

Table 4.3: Generation compensation for renewable power under British Columbia's Standing Offer Program in 2011

Region	Base rate	
	CAD/MWh	EUR/MWh
Vancouver Island	104.30	76.40
Lower Mainland	105.77	77.48
Kelly/Nicola	98.97	72.49
Central Interior	101.25	74.17
Peace Region	96.77	70.88
North Coast	98.10	71.86
South Interior	100.97	73.96
East Kootenay	104.23	76.35

Source: BC Hydro, Standing Offer Program Rules, Version 2, January 2011. Available at <www.bchydro.com/etc/medialib/internet/documents/planning_regulatory/acquiring_power/2011q1/20110125_sop_program.Par.0001.File.20110125-SOP-ProgramRules.pdf>.

Table 4.4: Demand-determined adjustments to Standing Offer Program base rate prices in 2011

Time of delivery (month)	Adjustment to base price (per cent)	
	Heavy load hours ^a	Light load hours ^a
January	125	106
February	126	110
March	114	106
April	103	95
May	92	76
June	90	72
July	91	72
August	95	81
September	96	88
October	108	97
November	109	102
December	122	102

Note: ^aHeavy load hours is between 06:00 and 22:00 Monday through Saturday inclusive but excluding statutory holidays. Light load hours are all other times.

Source: BC Hydro, The BC Energy Plan. Available at <www.bchydro.com/etc/medialib/internet/documents/info/pdf/info_-_20090224_sop4.Par.0001.File.20090226_SOP_Program_Rules_Clean.pdf>.

¹⁰ See BC Hydro website at <www.bchydro.com/planning_regulatory/acquiring_power/clean_power_call.html>.

4.3.3 Ontario Operating Support Incentives

In October 2009, the Ontario government announced a new feed-in tariff (FIT) system. Solar PV (up to 10 MW), wind power, small hydro (up to 50 MW), biogas and biomass are eligible for the FIT. New installations can receive the FIT rates for 20 years (40 years for hydropower). The FIT rates are shown in Table 4.5. The FIT rate for ground-mounted solar PV was reduced from 802 CAD/MWh to 642 CAD/MWh in August 2010. In February 2011, the government also announced that offshore wind power plants would not be permitted to receive FIT payments, and that solar power plants could not be built on high-quality agricultural land. If the projects are located on aboriginal land or are community-based, the rates will increase.

Biomass, biogas, landfill gas or hydropower generators are paid a rate that is 35 per cent higher during peak hours (11:00 to 19:00 on working days) and a rate that is 10 per cent lower at all other times. This multiplier is applied to the base rates set out in Table 4.5.

Table 4.5: Feed-in tariff base rates for renewable power projects in Ontario in 2011

Category		FIT rate (CAD/MWh)	FIT rate (EUR/MWh)
Wind (onshore)		135	98.89
Ground-mounted solar PV	≤ 10 kW	642	470.27
	> 10 kW - ≤ 10 MW	443	324.50
Rooftop solar PV	≤ 10 kW	802	587.47
	> 10 - ≤ 250 kW	713	522.27
	> 250 kW ≤ 500 kW	635	465.14
	> 500 kW	539	394.82
Hydropower	≤ 10 MW	131	95.96
	> 10 MW ≤ 50 MW	122	89.37
Solid biomass	≤ 10 MW	138	101.09
	> 10 MW	130	95.23
Biogas	≤ 500 kW	160	117.20
	> 500 kW ≤ 10 MW	147	107.68
	> 10 MW	104	76.18
Agricultural biogas	≤ 100 kW	195	142.84
	> 100 kW - ≤ 250 kW	185	135.51
	Over 250 kW: The rates for biogas rates above are applied		
Landfill gas	≤ 10 MW	111	81.31
	> 10 MW	103	75.45

Source: Ontario Power Authority, FIT Rules, 8 December 2010. Available at <fit.powerauthority.on.ca/Storage/11196_FIT_Rules_Version_1.4.pdf>.

For solar and wind power projects over 10 kW, a set percentage of the equipment used in construction must be manufactured in Ontario to be eligible for the FIT (see Table 4.6).

Table 4.6: Domestic content requirements in Ontario to receive the FIT

Category		Commissioning Date	Minimum domestic content level (%)
Wind power (> 10 kW)		2009-2011	25
		2012 and later	50
Solar power	≤ 10 kW	2009-2010	40
		2011 and later	60
	> 10 kW	2009-2010	50
		2011 and later	60

Source: Ontario Power Authority, Feed-in Tariff Program. Available at <fit.powerauthority.on.ca>.

4.4 Investment Support Incentives

The federal government's Office of Energy Research and Development (OERD) is responsible for administering the Program of Energy Research and Development (PERD), the ecoENERGY Technology Initiative, and the Clean Energy Fund. PERD provides funding only to federal departments and agencies; however, these organisations may collaborate with the private sector and other funding agencies in order to deliver their projects.¹¹

The Clean Energy Fund programme is a CAD 795 million (EUR 582 million) initiative to advance Canadian leadership in clean energy technologies, of which CAD 200 million is earmarked for small-scale renewable energy demonstration projects. In January 2010, 19 successful projects were announced in response to a call for proposals under the Renewable and Clean Energy portion of the Fund. There is not currently a call for proposals and PERD does not expect any in the near future.¹²

Clause 43.2 in Schedule II of the Income Tax Act gives taxpayers the option of accelerated write-offs of certain types of equipment designed to generate renewable power, thereby reducing the tax liability. The rate of accelerated depreciation can be as high as 50 per cent per annum, relative to the standard rate of 4 to 20 per cent. Energy efficiency equipment receives an accelerated depreciation rate of 30 per cent.

Certain expenditures, known as Canadian Renewable and Conservation Expenses (CRCE), which are incurred in the development and start-up of renewable energy projects, are also 100 per cent deductible against the tax liabilities of developers. These include the costs of feasibility studies, site preparation, and grid connection. To qualify, at least 50 per cent of total development costs must be capital costs.¹³

Electrical generation projects qualifying for CRCE and Class 43.2 include:

- Cogeneration and waste-fired power plants (municipal waste, wood waste, landfill gas or digester gas)
- Small-scale hydropower plants (< 15 MW)
- Wind farms
- Solar PV systems (> 3 kW)
- Geothermal generators
- Test wind turbines.¹⁴

There is also a 50 per cent accelerated capital cost allowance currently applicable for investments in clean energy generation.¹⁵

¹¹ For more information see <www.ic.gc.ca/eic/site/mib-dgif.nsf/eng/h_hu00001.html>.

¹² Natural Resources Canada, Clean Energy Fund. Available at <nrcan.gc.ca/eneene/science/ceffep-eng.php>.

¹³ Natural Resources Canada, Incentives for Industry. Available at <oee.nrcan.gc.ca/industrial/financial-assistance/tax-incentives.cfm>.

¹⁴ Natural Resources Canada, Incentives for Industry. Available at <oee.nrcan.gc.ca/industrial/financial-assistance/tax-incentives.cfm>.

¹⁵ Invest in Canada, Renewable Energy. Available at <investincanada.gc.ca/eng/industry-sectors/renewableenergy.aspx>.

Chapter 5: Chile

5.1 Government Targets

Chile's energy strategy for 2010-2015 envisions a significant role for renewable energy (RE) in diversifying Chile's energy mix and security of supply, two areas of pressing concern for the government, particularly in light of recent restrictions on natural gas imports from Argentina and droughts in the south which have affected the performance of hydro projects. Chile, as a non-Annex I country, has no target under the Kyoto Protocol. Under the Copenhagen Accord, the country has a target to reduce emissions by 20 per cent from business-as-usual (BAU) projections by 2020. The government also has a target to meet 20 per cent of total energy consumption by 2020 with RE, and for 10 per cent of total generation capacity to be sourced from RE installations by 2024.

Table 5.1: Chilean government commitment summary

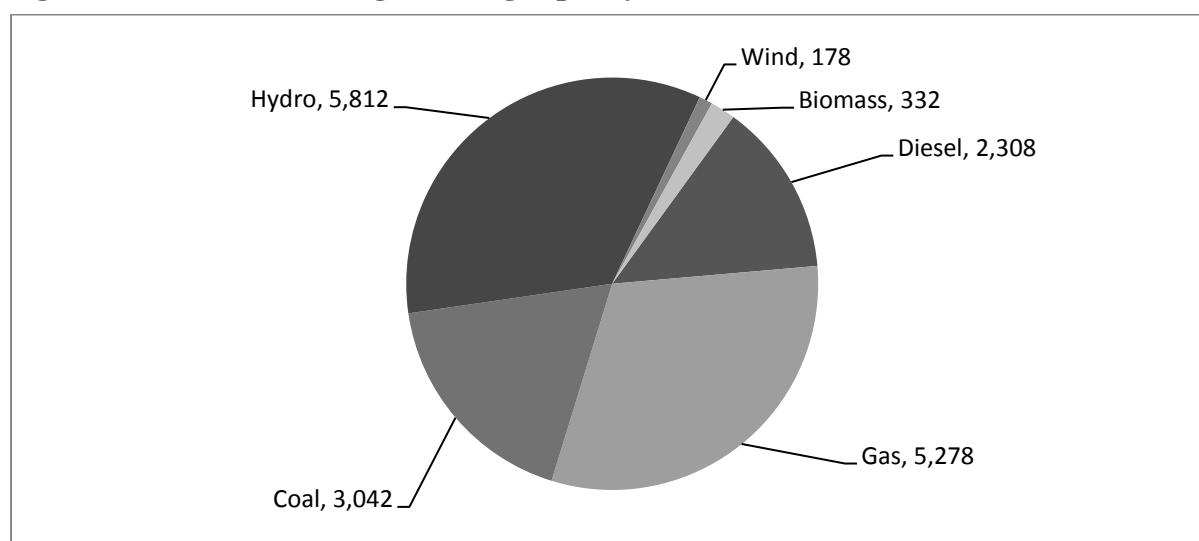
GHG emissions	As a non-Annex I country, does not have an obligation to reduce emissions under the Kyoto Protocol. A Copenhagen Accord target for a 20 per cent reduction from BAU projections by 2020.
Renewable energy (RE)	A government target for 20 per cent of energy consumption to come from renewable energy sources by 2020
Renewable electricity	A government target for 5 per cent of electricity generation to come from renewables by 2014, rising to 10 per cent by 2024

Source: Letter to the UNFCCC, 23 August 2010. Available at <unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/chilecphaccord_app2.pdf>; Ministry of Energy. Available at <www.minenergia.cl>.

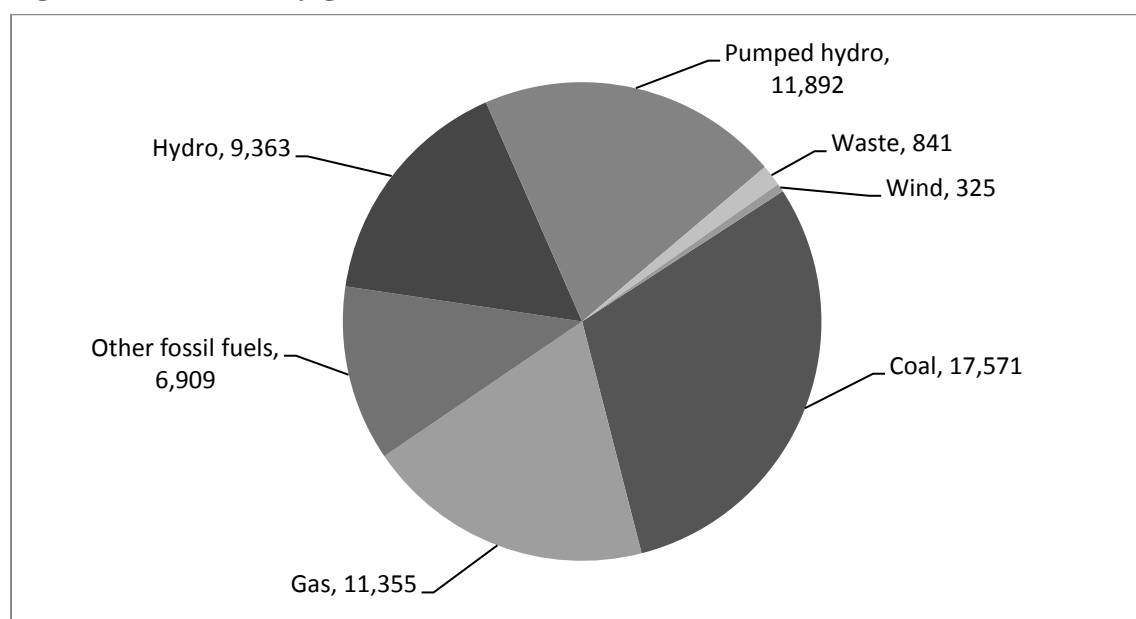
5.2 Electricity Generation Mix

The Chilean power system consists of four transmission systems: Sistema Interconectado del Norte Grande (SING), Central Interconnected System (SIC), Aysén, and Magallanes. These four grids are not connected and operate independently of each other.

Figure 5.1: Total installed generating capacity in Chile in 2011 (MW): 16,950 MW



Source: Comisión nacional de Energía, Energy Statistics. Available at <cne.cl>.

Figure 5.2: Electricity generation mix in Chile in 2010 (GWh): Total 58,257 GWh

Note: Only includes the SIC and SING transmission zones.

Source: Comisión nacional de Energía, 2008 Energy Statistics. Available at <cne.cl>.

Table 5.2: Total installed generating capacity in Chile by transmission system in 2011 (MW)

Category	Sistema Interconectado Central (SIC)	Sistema Interconectado del Norte Grande (SING)	Magallanes	Aysen	Total
Conventional thermal	6,715	3,788	97	28	10,628
Hydro	5,778	13	0	21	5,812
Biomass	332	0	0	0	332
Wind	174	0	3	2	179
Total	12,999	3,801	100	51	16,951
Percentage share of renewables in total capacity	48.34%	0.34%	3.00%	45.10%	37.30%

Source: CNE, Statistics. Available at <www.cne.cl>.

5.3 Operating Support Incentives

Chile's 2008 law on Non-Conventional Renewable Energy (NCRE) lays the framework for its incentive strategy. The focus of the law is the encouragement of geothermal, wind, solar, tidal, biomass, and small hydro (≤ 20 MW) power. Effective from the beginning of 2010, the law obliges electricity producers with an installed capacity of greater than 200 MW to source at least 5.0 per cent of their production from renewable sources. From 2015, this quota will increase by 0.5 per cent annually, until it reaches 10 per cent in 2024.

The penalty fine for non-compliance with this regulation is UTM¹ 0.4 per MW of renewable power capacity below the quota. For example, in 2010 an electricity producer would need to pay CLP 14,849 (EUR 21.93²) for each MW of their quota that was missing. If in the following three years the electricity producer continued below their annual quota, the penalty fine payable would rise to UTM 0.6 (EUR 33.38) per MW.³

Renewable energy plants under 9 MW receive an obligatory connection to the transmission grid and grid operators must sign a power purchase agreement.

5.4 Investment Support Incentives

Since 2004, Chile's economic development agency (*Corporación de Fomento de la Producción de Chile*, CORFO) has been involved in incentivising renewable energy development in partnership with other government bodies and institutions. There are two main channels of development support—the All-Chile Attracting Investment Programme, and the Development and Pre-Investment NCRE Programme.

The All-Chile Attracting Investment Programme offers grants of up to USD 60,000 for pre-investment feasibility studies for renewable energy projects located outside of the Metropolitan region with a project value greater than USD 400,000.

CORFO will also contribute up to 50 per cent of the total cost of studies or advice for projects within the Metropolitan Region, up to a maximum of 2 per cent of the total project value or UF⁴ 1,700 (EUR 53,158).

Another CORFO initiative, the Development and Innovation Fund (FDI), awards grants in three focus areas: development and adaptation of new technologies, diffusion and information transference between Chilean companies and institutions, and the development of technological capacity to take advantage of innovation.

In addition to these financing avenues, Chilean power projects are eligible to apply for financing through the Clean Development Mechanism (CDM) of the Kyoto Protocol, a programme which is administered by the National Environment Commission (*Comisión Nacional del Medio Ambiente*, CONAMA).⁵

¹ Aka 'Monthly Tax Units' an index-linked unit of account designed by the government to avoid fiscal drag in the tax code. In 2010, the average UTM rate was UTM 1 = CLP 37,112. Information available at <valorutm.cl>.

² The CLP – EUR conversion rate used is EUR 1 = CLP 677.067 (The average in 2010).

³ NCRE Law 2008. Available at <www.cne.cl/cnewww/opencms/08_Normativas/02_energias/renovables.html>.

⁴ Unidad de foment is an index-linked Chilean unit of account. In 2010, the average UF was UF 1 = CLP 21,171.80.

⁵ Chilean National Energy Commission, Factsheet. Available at <www.cne.cl/cnewww/opencms/05_Public_Estudios/publicaciones.html>.

Chapter 6: Czech Republic

6.1 Government Targets

Under the Kyoto Protocol, the Czech Republic is committed to reduce average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. In 2009, GHG emission levels were 31.6 per cent lower than the 1990 base year due to a policy of replacing older coal-fired plants with modern equivalents and nuclear power plants. As part of the Copenhagen Accord, the country has a target to reduce emissions by 9 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The Czech Republic also has an EU target of meeting 13 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 7.2 per cent of final energy consumption was met with renewable energy sources. The government has introduced a national target of meeting 17 to 18 per cent of total electricity consumption from renewable sources by 2030, compared to 4 per cent in 2009.

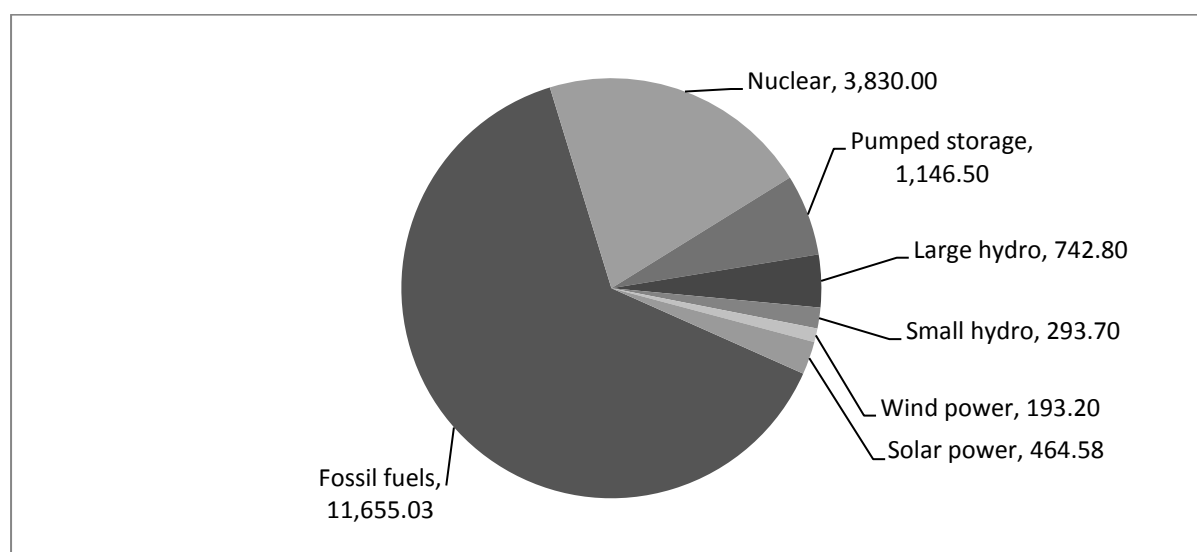
Table 6.1: Czech Republic government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 9 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 13 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A government target for 17–18 per cent of total electricity consumption to come from renewable sources by 2030.

Source: Commission of the European Communities, Energy. Available at <www.energy.eu>; European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <ec.energy.eu>.

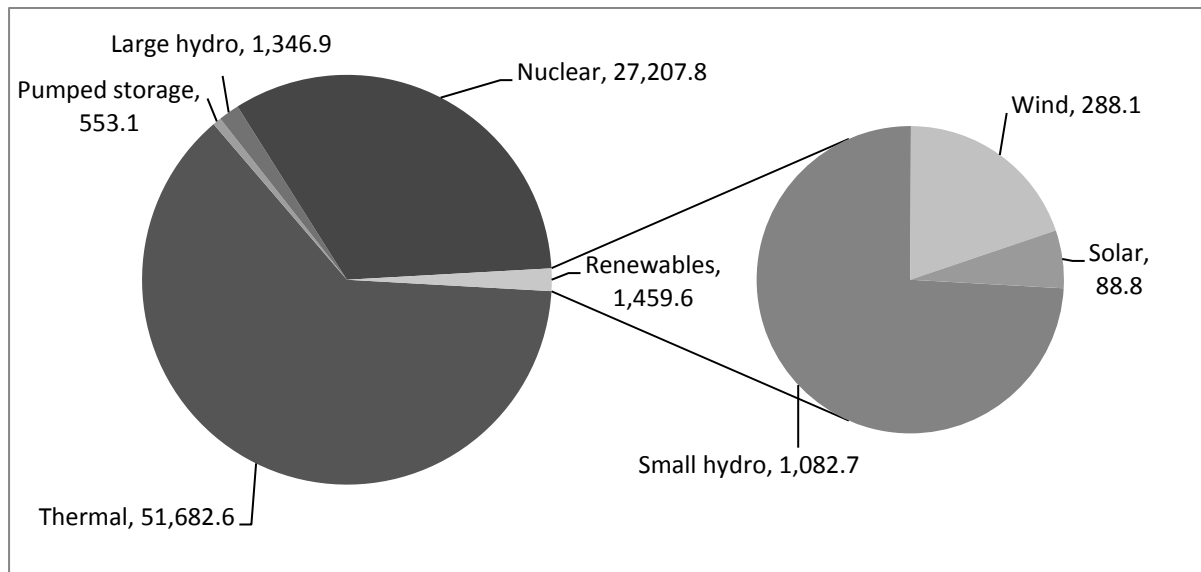
6.2 Electricity Generation Mix

Figure 6.1: Total installed generating capacity in the Czech Republic in 2009 (MW): 18,325 MW



Source: ERU, Roční zpráva o provozu ES ČR 2009. Available at <www.eru.cz/user_data/files/statistika_elektro/rocní_zprava/2009/index.htm>.

**Figure 6.2: Electricity generation mix in Czech Republic in 2009 (GWh):
Total 82,250.0 GWh**



Source: ERU, Roční zpráva o provozu ES ČR 2009. Available at www.eru.cz/user_data/files/statistika_elektro/rocní_zprava/2009/index.htm.

6.3 Operating Support Incentives

The Czech Republic adopted a feed-in tariff (FIT) as its primary support mechanism for renewable power development in 2002. In 2005, the government introduced a new incentive system offering renewable power generators the choice between a FIT and a fixed green premium.

Renewable power generators choose between these two incentive schemes on an annual basis; mid-year switching is not allowed. The grid operator providing the connection is obliged by law to pay accredited renewable power producers either the value of the currently applicable FIT, or the spot price of electricity plus the green premium. Both incentive schemes are index-linked to inflation, and guaranteed for 15 years from the time of initial connection to the grid. Annual downward adjustments to FIT rates for new projects are limited to 5 per cent below those of the preceding year by Act 180/2005,¹ although concerns over grid stability and the expense of subsidies have led to calls to statutorily increase the rate of degression.²

The FIT rates for new solar power installations for 2011 were reduced by between 40 and 50 per cent, depending on the installed capacity. In addition, the income that solar power generators receive from the FITs will be subject to a proposed tax of between 26 and 28 per cent. This new tax will be applied to all solar PV installed from 2009. As of May 2011, the

¹ Energy Regulatory Agency, Act of 31 March 2005 Promotion of Electricity Production from Renewable Sources, no. 180/2005. Available at

portal.gov.cz/wps/portal/_s.155/701/.cmd/ad/.c/313/.ce/10821/.p/8411/_s.155/701?PC_8411_number1=180/2005&PC_8411_1=180/2005&PC_8411_ps=10.

² 'Czech Renewable Energy Exceeds Grid Safety Limit', Reuters, 2010. Available at www.reuters.com/article/idUSTRE6293D520100310.

new tax law was under appeal by developers in the courts.³ Tables 6.2 through 6.8 show the FIT and premium rates in the Czech Republic for projects up to 2011. FIT rates for 2012 had yet to be released as of July 2011.

Table 6.2: Feed-in tariff rates and premiums for small hydro projects (< 10 MW) in the Czech Republic

Commissioning date	FIT rate		Premium	
	CZK/MWh	EUR/MWh	CZK/MWh	EUR/MWh
01/01/2011-31/12/2011	3,000	118.59	2,030	80.25
01/01/2010-31/12/2010	3,060	120.96	2,090	82.62
01/01/2008-31/12/2009	2,820	111.48	1,850	73.13
01/01/2006-31/12/2007	2,660	105.15	1,690	66.81
01/01/2005-31/01/2005	2,400	94.87	1,430	56.53
Before 2005	1,870	73.92	900	35.58

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.3: Premiums for parallel combustion and co-firing with biomass projects in the Czech Republic in 2011

Type ^a	Premiums	
	CZK/MWh	EUR/MWh
Co-firing category S1	1,370	54.16
Co-firing category S2	700	27.67
Co-firing category S3	50	1.98
Parallel firing category P1	1,640	64.83
Parallel firing category P2	970	38.34
Parallel firing category P3	320	12.65

Note: ^a Category S1, P1 applies to rapid-growing plants grown for biomass purposes.

Category S2, P2 applies to logging byproducts, including leaves, bark, and tree needles.

Category S3, P3 applies to sawdust and shavings, biofuels created from solid biomass and other biomass.

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, , 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.4: Feed-in tariff rates and premiums for dedicated biomass projects in the Czech Republic

Type of biomass ^a	Incentive	Currency	Commissioning date	
			2008-2011	Before 2008
O1 Grade biomass	FIT rate	CZK/MWh	4,580	3,900
		EUR/MWh	181.05	154.17
	Premium	CZK/MWh	3,610	2,930
		EUR/MWh	142.71	115.82
O2 Grade biomass	FIT rate	CZK/MWh	3,530	3,200
		EUR/MWh	139.54	126.50
	Premium	CZK/MWh	2,560	2,230
		EUR/MWh	101.20	88.15
O3 Grade biomass	FIT rate	CZK/MWh	2,630	2,530
		EUR/MWh	103.97	100.01
	Premium	CZK/MWh	1,660	1,560
		EUR/MWh	65.62	61.67

Note: ^a Category O1 applies to rapid-growing plants grown for biomass purposes.

³ For more information see the Czech Solar Power Association at <czepho.cz>.

Category O2 applies to logging byproducts, including leaves, bark, and tree needles.

Category O3 applies to sawdust and shavings, biofuels created from biomass and miscellaneous biomass.

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.5: Feed-in tariff rates and premiums for biogas projects in the Czech Republic in 2011

Description	FIT rate		Premium	
	CZK/MWh	EUR/MWh	CZK/MWh	EUR/MWh
Biogas from energy crops (AF1 class)	4,120	162.87	3,150	124.52
Biogas from agricultural wastes (AF2 class)	3,550	140.33	2,580	101.99
Landfill/sludge gas commissioned after 1/06/2006	2,470	97.64	1,500	59.30
Landfill/sludge gas commissioned between 01/01/2004 and 31/12/2005	2,790	110.29	1,820	71.95
Landfill/sludge gas commissioned before 01/01/2004	2,900	114.64	1,930	76.29
Coalbed methane	2,470	97.64	1,500	59.30

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.6: Feed-in tariff rates and premiums for wind power projects in the Czech Republic

Commissioning date	FIT rate		Premium	
	CZK/MWh	EUR/MWh	CZK/MWh	EUR/MWh
01/01/11 - 31/12/11	2,230	88.15	1,830	72.34
01/01/10 - 31/12/10	2,280	90.13	1,880	74.32
01/01/09 - 31/12/09	2,440	96.45	2,040	80.64
01/01/08 - 31/12/08	2,670	105.55	2,270	89.73
01/01/07 - 31/12/07	2,740	108.31	2,340	92.50
01/01/06 - 31/12/06	2,790	110.29	2,390	94.48
01/01/05 - 31/12/05	3,050	120.57	2,650	104.76
01/01/04 - 31/01/04	3,210	126.89	2,810	111.08
before 2004	3,550	140.33	3,150	124.52

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.7: Feed-in tariff rates and premiums for solar PV projects in the Czech Republic

Commissioning date		FIT rate		Premium	
		CZK/MWh	EUR/MWh	CZK/MWh	EUR/MWh
01/01/11 - 31/12/11	< 30 kW	7,500	296.48	6,500	256.95
	30-100 kW	5,900	233.23	4,900	193.70
	> 100 kW	5,500	217.42	4,500	177.89
01/01/10 - 31/12/10	< 30 kW	12,250	484.25	11,280	484.25
	≥ 30 kW	12,150	480.30	11,180	480.30
01/01/09 - 31/12/09	< 30 kW	13,150	519.83	12,180	481.48
	≥ 30 kW	13,050	515.88	12,080	477.53

01/01/08 - 31/12/08	14,010	553.82	13,040	515.48
01/01/06 - 31/12/07	14,370	568.06	13,400	529.71
Before 01/01/06	6,850	270.79	5,880	232.44

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

Table 6.8: Feed-in tariff rates and premiums for geothermal power projects in the Czech Republic in 2011

Description	FIT rate		Premium	
	CZK/MWh	EUR/MWh	CZK/MWh	EUR/MWh
Geothermal	4,500	177.89	3,530	139.54

Source: ERU, Cenové rozhodnutí Energetického regulačního úřadu č. 2/2010 ze dne 8. listopadu 2010, kterým se stanovuje podpora pro výrobu elektřiny z obnovitelných zdrojů energie, kombinované výroby elektřiny a tepla a druhotných energetických zdroj, 8 November 2010. Available at <www.eru.cz/user_data/files/cenova%20rozhodnuti/CR%20elektro/2_2010_OZE-KVET-DZ%20final.pdf>.

6.4 Investment Support Incentives

The Ministry of Industry and Trade announces tenders annually for its *Efekt* programme, which is designed to encourage the adoption of renewable energy and efficient energy usage. A subsidy of up to 100 per cent of investment costs is available, up to a maximum of CZK 200,000 (EUR 7,782). The total budget available for Efekt in 2011 was CZK 30 million. The deadline for project submission is always at the end of February.⁴

Companies planning to develop renewable energy projects in the Czech Republic can access EU programmes such as the Operational Programme or the Intelligent Energy programmes for 2007-2013. In addition, a total of EUR 673 million will be made available for renewable energy development in the Czech Republic from the EU structural funds in the fiscal years between 2007 and 2013. Wind, small hydro, geothermal and biomass (for electricity and heat production) are eligible to receive funding of up to EUR 300,000, or a maximum of 90 per cent of project costs.⁵

Various regional authorities offer grants for research and development.⁶

⁴ MPO, Efekt 2011 - Státní Program Na Podporu Úspor Energie A Využití Obnovitelných Zdrojů Energie Pro Rok 2011. Available at <www.mpo-efekt.cz/cz/programy-podpory/24918>.

⁵ Operační program Životní prostředí, Prioritní osa 3: Dotace na udržitelné využívání zdrojů energie. Available at <www.opzp.cz/sekce/369/prioritni-osa-3/>.

⁶ See Enterprise Europe CZ for a list of available funding opportunities in research and development. Available at <www.enterprise-europe-network.cz/transfer/technologicke-sektory/alternativni-energetika>.

Chapter 7: Denmark

7.1 Government Targets

Under the Kyoto Protocol, Denmark is committed to reduce average emissions between 2008 and 2012 by 21 per cent from 1990 base levels. In 2009, GHG emission levels were 12 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 20 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Denmark also has an EU target of meeting 30 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 18.8 per cent of final energy consumption was met with renewable energy sources. Denmark has a national goal to be independent of imported fossil fuels by 2050.

Renewable energy deployment has increased dramatically in Denmark, and in 2009, 27.4 per cent of electricity generated in Denmark came from renewable sources. This growth can be seen with offshore wind, which experienced an average annual growth rate of approximately 70 per cent in the five years to 2009. The growth in renewable energy has been aided by the Green Tax Package scheme, which includes energy, carbon, and sulphur taxes, and helps fund renewable energy development.¹

Table 7.1: Danish government commitment summary

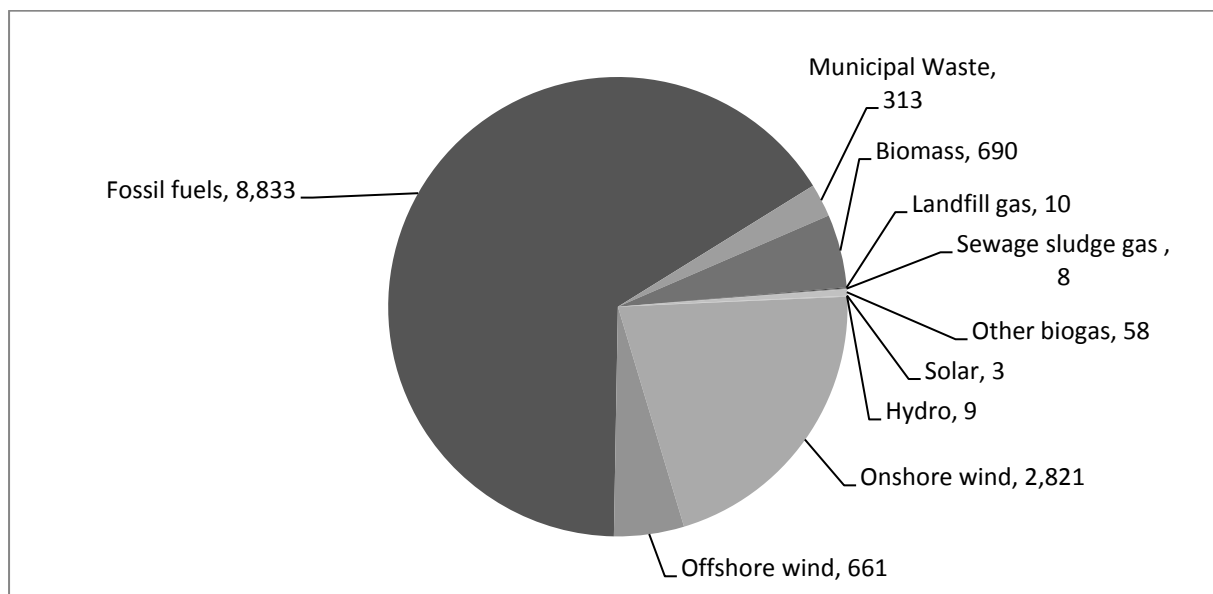
GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 21.0 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 20 per cent from 2005 levels by 2020 in areas not covered by the Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 30 per cent of final energy consumption to come from renewable energy sources by 2020. Domestic interim target of 20 per cent by 2011, and a goal to be independent of imported fossil fuels by 2050.
Renewable electricity	No target set.

Source: Danish Energy Agency, Danish Plan 1970-2010. Available at <www.ens.dk/en-us/Sider/forside.aspx>.

¹ Danish Energy Agency 2010, The Green Tax Package. Available at <www.ens.dk/EN-US/CONSUMPTIONANDSAVINGS/INDUSTRY/Sider/TheGreenTaxPackageforIndustry.aspx>.

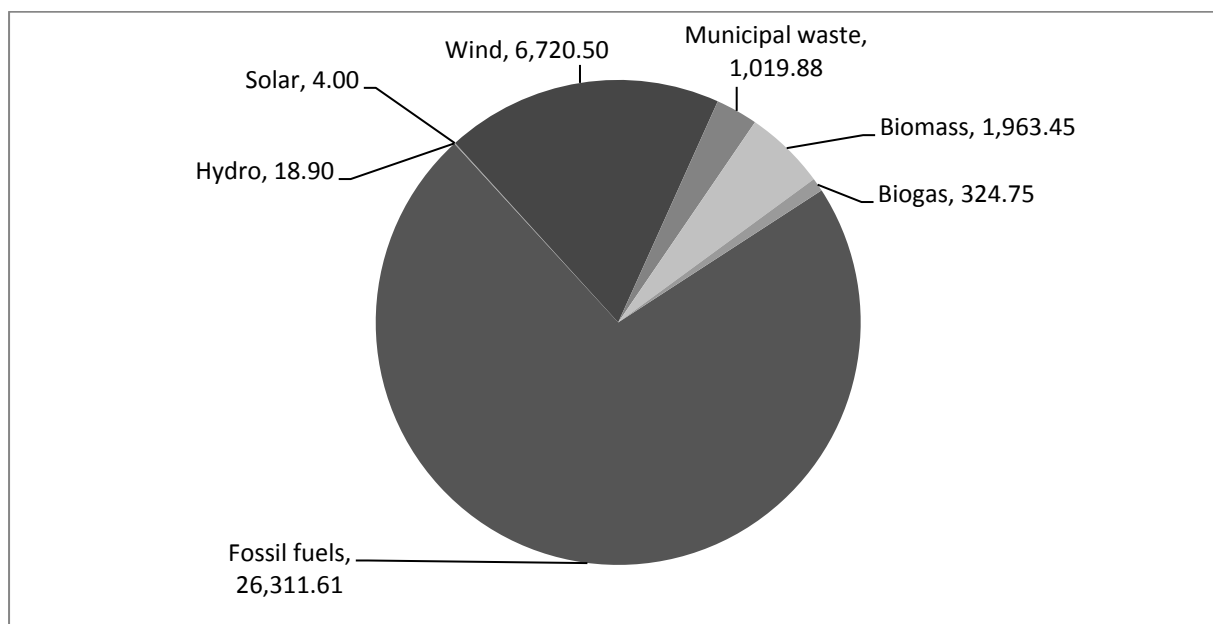
7.2 Electricity Generation Mix

Figure 7.1: Total installed generating capacity in Denmark in 2009 (MW): 13,409 MW



Source: Danish Energy Agency, Energy Statistics 2009. Available at <www.ens.dk>.

**Figure 7.2: Electricity generation mix in Denmark in 2009 (GWh):
Total: 36,363.03 GWh**



Source: Danish Energy Agency, Energy Statistics 2009. Available at <www.ens.dk>.

7.3 Operating Support Incentives

Denmark's operating support policy for renewable electricity is a combination of feed-in tariffs (FITs), premiums, and a tender scheme for offshore wind farms. The type of incentive applicable depends on the technology in question and the year the installation was connected to the grid, as well as the rated capacity in certain cases. The government guarantees that the remuneration rate will be fixed over the life of a project.

All renewable power generated in Denmark is purchased by the transmission system operator (TSO), Energinet.dk, which then sells the power on the wholesale market. The FIT rates are generally guaranteed for 20 years, although for some technologies there are limits placed on the total generation for which the incentives can be awarded. These limits are based on full load hours, or in other words, the number of operating hours at full capacity (see Table 7.2). For onshore wind power over 600 kW, the incentive system operates as a fixed premium rather than an FIT since the remuneration is a set amount added on top of the wholesale market price of electricity—this was 56.61 EUR/MWh in 2010.² There is, however, still a compulsory purchase obligation for onshore wind power.³

The installation of offshore wind power is incentivised separately from the FIT scheme by government tender, which settles FIT rates through competitive negotiation. The most recent tender was the 400 MW Anholt offshore wind farm, awarded to DONG Energy in 2010. DONG will receive 1,051 DKK/MWh (141.13 EUR/MWh⁴) for the first 20 TWh of production.⁵ This amount was much higher than for earlier offshore wind farm tenders. For instance, Horns Rev 2 has a FIT rate of 518 DKK/MWh (69.56 EUR/MWh), while Rødsand 2 has a FIT rate of 629 DKK/MWh (84.46 EUR/MWh). These subsidies apply only for the first 10 TWh of electricity produced, and are payable within 20 years from connection. After the subsidy period ends, the projects will be expected to compete unaided in the free market.⁶

Maximum compensation limits are placed on renewable power projects owned by utilities. Utility-owned onshore wind power projects can receive a maximum of 600 DKK/MWh (80.57 EUR/MWh) for their output, including the wholesale price of power and the premium, and utility-owned biomass plants can receive a maximum of 400 DKK/MWh (53.71 EUR/MWh), including the price of power and the premium.

Additional supplements are available for developers that replace older wind power turbines with more modern turbines. The supplements are available for the replacement of the following:

- A wind turbine 150 kW or less replaced in the period between 03/03/1999 and 31/12/2003
- A wind turbine of 450 kW or less replaced in the period between 01/01/2005 and 31/12/2010.

The supplement is 120 DKK/MWh (16.11 EUR/MWh) for replacing turbines installed before 2008, and 80 DKK/MWh (10.74 EUR/MWh) for those installed after 2008. The supplement is available only for the first 12,000 full-load hours for the new turbines, and the total compensation received by the project under this arrangement—the wholesale price of power, the incentive, and the supplement—cannot exceed 480 DKK/MWh (64.45 EUR/MWh).⁷

² Nordpool Spot, Area Price. Available at <www.nordpoolspot.com>.

³ Bekendtgørelse af lov om elforsyning 1115/2006 (Act on Electricity Supply), article 27C, April 2005. Available at <www.retsinformation.dk/Forms/R0710.aspx?id=22613>; interview with Danish Energy Agency.

⁴ The DKK – EUR conversion rate used is EUR 1 = DKK 7.4472 (The average in 2010).

⁵ Danish Energy Authority, Anholt Tender. Available at <www.ens.dk/en-US/supply/Renewable-energy/WindPower/offshore-Wind-Power/anholt_tender/Sider/Forside.aspx>.

⁶ Danish Energy Authority, Invitation to tender for a new offshore wind farm at Rødsand, Denmark, 25 April 2008. Available at <www.ens.dk/sw63828.asp>.

⁷ Law Amending the Electricity Supply Law, 2008. Available at <www.retsinformation.dk/Forms/R0710.aspx?id=120361>.

Table 7.2: Denmark's incentive rates for renewable electricity generation in 2011

Category	Capacity	Type of incentive	FIT/premium rate		Notes
			DKK/MWh	EUR/MWh	
Onshore wind connected since 21/02/2008	Any	Fixed premium	250	33.57	For the first 22,000 hours of full load generation
	Any	N/A	23	3.09	Supplement compensating for balancing fees. Valid for the lifetime of the project
Onshore wind connected before 20/02/2008	Any	Fixed premium	360	48.34	For the first 22,000 hours of full load generation
	Any	N/A	23	3.09	Supplement for 20 years from connection
Wind connected before 2002	< 200kW	FIT	600	80.57	For the first 25,000 hours of full load generation
	201-599 kW	FIT	600	80.57	For the first 15,000 hours of full load generation
	> 600kW	FIT	430	57.74	For the first 12,000 hours of full load generation
Biogas and biomass gasification	Any	FIT	772	103.66	For 20 years (adjusted yearly)
Co-firing with biogas	Any	FIT	405	54.38	Payable only on the proportion of electricity generated by the renewable fuel
Solid biomass (including co-firing)	Any	Fixed premium	150	20.14	
Combined heat and power supplement	Any	Fixed premium	150	20.14	Extra supplement paid for biomass-based CHP plants
Solar connected before 21/04/2004	Any	FIT	600	80.57	For 20 years from connection
Solar (> 6 kW)/wave/ hydro connected since 21/04/2004	Any	FIT	600	80.57	First 10 years of operation
			400	53.71	Next 10 years
Hybrid systems	Any	Fixed premium	260	34.91	Only paid on renewable power portion for first 10 years
Other connected since 21/04/2004	Any	FIT	700	94.00	First 10 years of operation
			500	67.14	Next 10 years

Source: Danish Parliament, *Lov om fremme af vedvarende energi (Act on the Promotion of Renewable Energy)*, 27 December 2008. Available at <www.retsinformation.dk/Forms/R0710.aspx?id=122961>.

7.4 Investment Support Incentives

A number of investment support incentives were introduced in Denmark in the late 1990s which offered grants covering 15 to 50 per cent of construction and machinery cost of renewable energy projects.⁸ Many of these grants were abolished in 2002, and Denmark's current renewable electricity support is now focused on operating incentives.

The 2009 Promotion of Renewable Energy Act (VE-Lov), lays down provisions for the support financing of feasibility studies for wind projects. Denmark's TSO, Energinet.dk, can also provide loan guarantees for wind turbine owners' associations or other local initiative

⁸ World Resources Institute *Government Incentives for Renewable Energy in Europe – Denmark*. Available at: <thegreenpowergroup.org/pdf/renewable_policy_denmark.pdf>

groups. Eligible projects include siting studies and technical and financial considerations, as well as surveys in support of applications with a view to installing one or more wind turbines. The installed turbines must not be for self-generation. A maximum guarantee of DKK 500,000 (EUR 67,000) may be granted per project.⁹

Development and demonstration of new energy technologies is also supported by the Energy Technology Development and Demonstration Programme (EUDP) fund which distributed DKK 750 million (EUR 100.8 million) in 2009 and will distribute DKK 1 billion (EUR 134.8 million) in 2010 and each year onwards.¹⁰

⁹ Danish Energy Agency, Danish Electricity Reform Bills. Available at <www.ens.dk/EN-US/INFO/LEGISLATION/DANISH_ELECTRICITY_REFORM/Sider/Forside.aspx>.

¹⁰ Danish Energy Agency, Overview of Support Schemes in Denmark. Available at <www.energistyrelsen.dk/en-US/supply/Electricity/Conditions_for_production_plants/Subsidies_for_generation_of_electricity/Documents/Overview%20of%20support%20schemes%20in%20DK.doc>.

Chapter 8: Finland

8.1 Government Targets

Under the Kyoto Protocol, Finland is committed to maintain average emissions between 2008 and 2012 at 1990 base levels. In 2009, GHG emission levels were 6.6 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 16 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Finland also has an EU target of meeting 38 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 30.5 per cent of final energy consumption was met with renewable energy sources. The government has introduced a further target to meet 40 per cent of final energy consumption from renewable energy sources by 2025, with an interim target of 25 per cent in 2015. The government also has a target for 6 TWh of wind power generation and 25 TWh of biomass-fired power generation by 2020.

Energy taxes are a key policy instrument in Finland, with levies scaled according to the carbon content of the respective fuel. These taxes raise over EUR 3 billion annually, with tax rates rising further by 20 per cent at the start of 2011.¹ According to the country's development plan, a total of 2,000 MW is projected to be added to the grid between 2010 and 2013, with the expectation that most of this additional capacity will come from nuclear power.²

Table 8.1: Finnish government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target to maintain average emissions between 2008 and 2012 at 1990 base levels. As part of the Copenhagen Accord, an EU target for a 16 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 38 per cent of final energy consumption to come from renewable energy sources by 2020. A government target of increasing RE use by 25 per cent by 2015 and 40 per cent by 2025.
Renewable electricity	A government target of 6 TWh of wind generation by 2020, which requires approximately 2.5 MW of extra capacity, and 25 TWh for biomass.

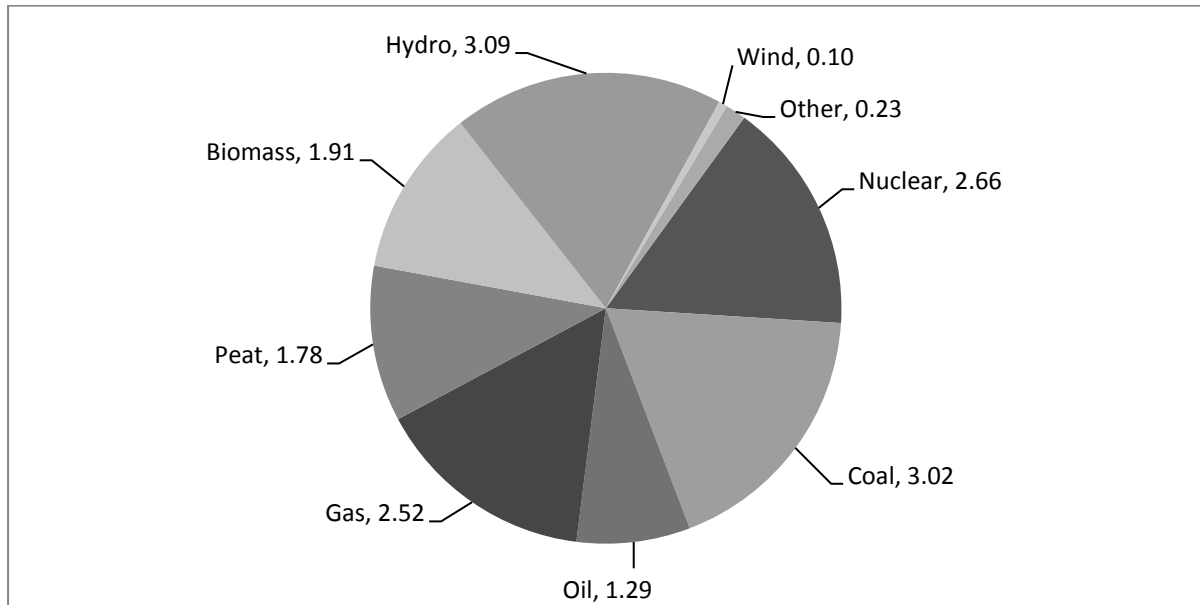
Source: European Environment Agency, GHG Trends and Projections, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

¹ Ministry of the Environment, Environmentally Friendly Taxation in Finland. Available at <www.environment.fi/default.asp?contentid=147208&lan=en>.

² Emvi, Annual Report 2010. Available at <www.emvi.fi/files/AnnuaReport2010_SuomenVK.pdf>.

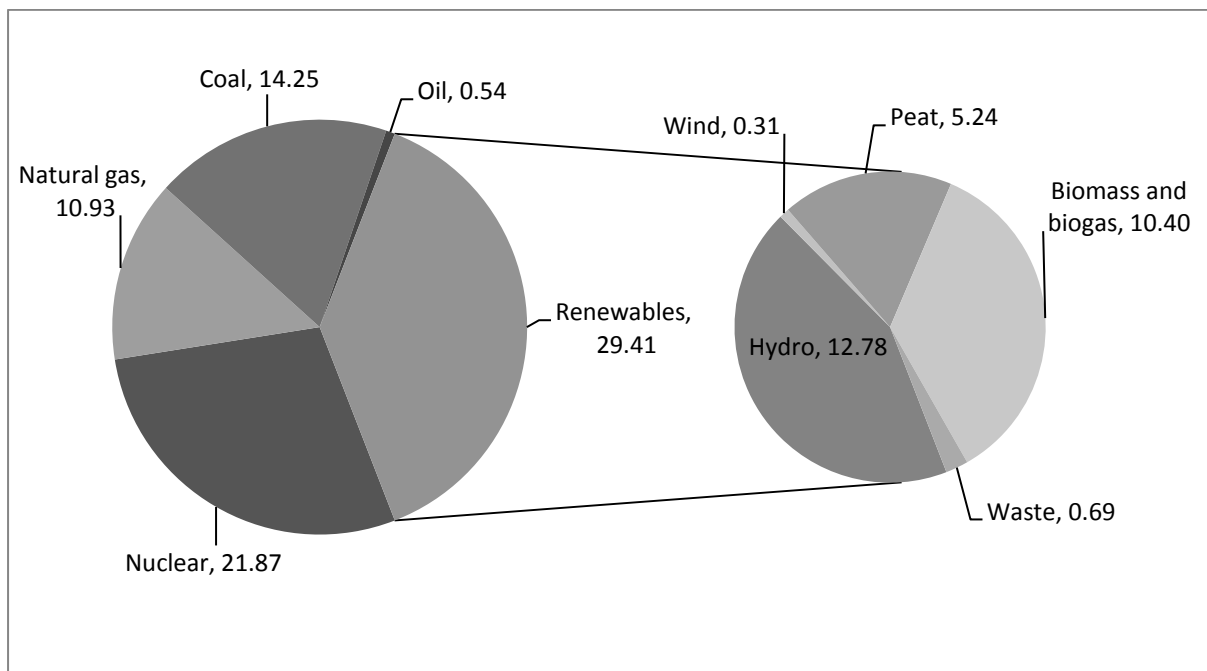
8.2 Electricity Generation Mix

Figure 8.1: Total installed generating capacity in Finland in 2009 (GW): 16.62 GW



Source: Emvi, Annual Report 2010. Available at <www.emvi.fi/files/AnnuaReport2010_SuomenVK.pdf>.

Figure 8.2: Electricity generation mix in Finland in 2010 (TWh): Total 77.0 GWh



Source: Energiategollisuus ry (Finnish Energy Industries), Energy Year 2010. Available at <www.energia.fi/en/news/electricity%20year%202010.html>.

8.3 Operating Support Incentives

On 25 March 2011, the government introduced a feed-in tariff (FIT) system for wood-fired solid biomass, biogas and wind power. The FIT rates are guaranteed for 12 years and there is a minimum capacity cut off. The FIT rates include a base rate, and supplements are available for biomass and biogas projects under certain conditions (see Table 8.2). The FIT is available

until a cumulative capacity cap is reached. The government expects to review the current FIT system before 2014.

Table 8.2: Feed-in tariff rates in Finland in 2011

Category			Minimum capacity (kVA)	EUR/MWh	Capacity cap (MW)
Wind power			500	105	2,500
Wood-fired solid biomass	Base rate		100	83.50	150 (total 50 plants)
	Supplements	Combined heat and power	N/A	20	
		Forest chip	N/A	18	None
Biogas	Base rate		100	83.50	19
	Supplement	Combined heat and power	N/A	50	

Source: Ministry of Employment and Economy, Sähköntuotannon uusien tukijärjestelmien valmistelu etenee, June 2011. Available at <www.tem.fi/files/27170/143_uusiutuvan_tuki-ehdotus_100610.pdf>.

In the government's 2011 budget, a total of EUR 55.35 million was appropriated for the FIT scheme as follows:

- Wind power: EUR 22.6 million
- Biogas: EUR 2 million
- Wood-fired plants: EUR 3.75 million
- Forest chip-fired plants: EUR 27 million.³

Wind, biomass, biogas and small hydro power generators that do not receive the FIT rates for generation are compensated instead with a fixed electricity production subsidy that replaces earlier tax subsidies. Generators receive the subsidy in addition to the income from the sale of the electricity in the wholesale market (see Table 8.3). The average spot price of electricity in the wholesale market in Finland was 56.64 EUR/MWh in 2010.⁴

Table 8.3: Finland's subsidies for renewable power generation outside the FIT system in 2011

Category	Tax subsidy (EUR/MWh)
Wind power	6.9
Forestry biomass	6.9
Waste	2.5
Biogas	4.2
Small hydro (< 1 MW)	4.2

Source: Ministry of Employment and Economy, Sähköntuotannon uusien tukijärjestelmien valmistelu etenee, June 2011. Available at <www.tem.fi/files/27170/143_uusiutuvan_tuki-ehdotus_100610.pdf>.

³ Ministry of Employment and Economy, Sähköntuotannon uusien tukijärjestelmien valmistelu etenee, June 2011. Available at <www.tem.fi/files/27170/143_uusiutuvan_tuki-ehdotus_100610.pdf>.

⁴ Nordpool. Elspot Prices at Nordpool Spot in 2010. Available at <www.nordpoolspot.com/reports/areaprice>.

8.4 Investment Support Incentives

Effective from 1998, investment projects and studies that promote energy conservation, efficiency or the production of renewable energy have been eligible for grants according to maximum limits of:

- 40 per cent for energy audits, or for renewable energy and energy conservation projects using new energy technology
- 30 per cent for other renewable energy and energy conservation projects
- 25 per cent for investment projects promoting the security and versatility of energy supply.⁵

⁵ Act on Discretionary Government Transfers, 2001. Available at <www.finlex.fi/en/laki/kaannokset/2001/en20010688.pdf>.

Chapter 9: France

9.1 Government Targets

France has ambitious RE and GHG emissions reduction targets that have been set by the EU, international agreements and in its 2007 environmental consultation *Le Grenelle d'Environnement*. Under the Kyoto Protocol, France is committed to maintain average emissions between 2008 and 2012 at 1990 base levels. In 2009, GHG emission levels were 8.3 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 14 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The government has a national target to reduce emissions by 50 per cent from 2005 levels by 2050. France also has an EU target of meeting 23 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 11 per cent of final energy consumption was met with renewable energy sources. By 2020, the government has a target to have an total installed generating capacity of 25,000 MW for wind power and 3,000 MW for solar power.

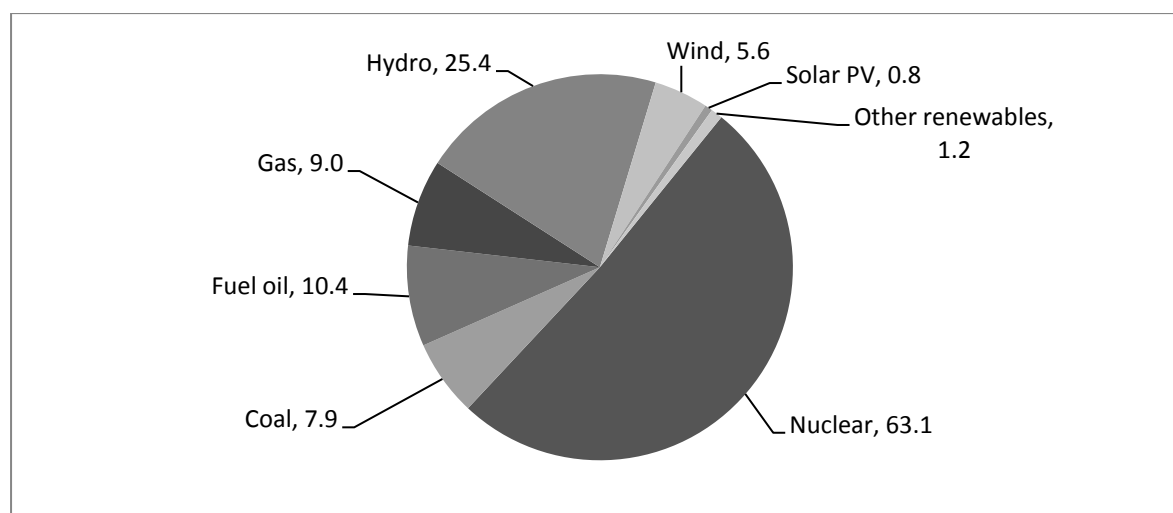
Table 9.1: French government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target to maintain average emissions between 2008 and 2012 at 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 14 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme (ETS). A government target of 50 per cent total GHG reduction from 2005 levels by 2050.
Renewable energy (RE)	An EU target for 23 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	Wind power: a government target of 25,000 MW installed capacity by 2020 Solar power: a government target of 3,000 MW installed capacity by 2020

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>; Government of France, Le Grenelle Environnement, Framework Policy. Available at <www.legrenelle-environnement.fr/grenelle-environnement/>.

9.2 Electricity Generation Mix

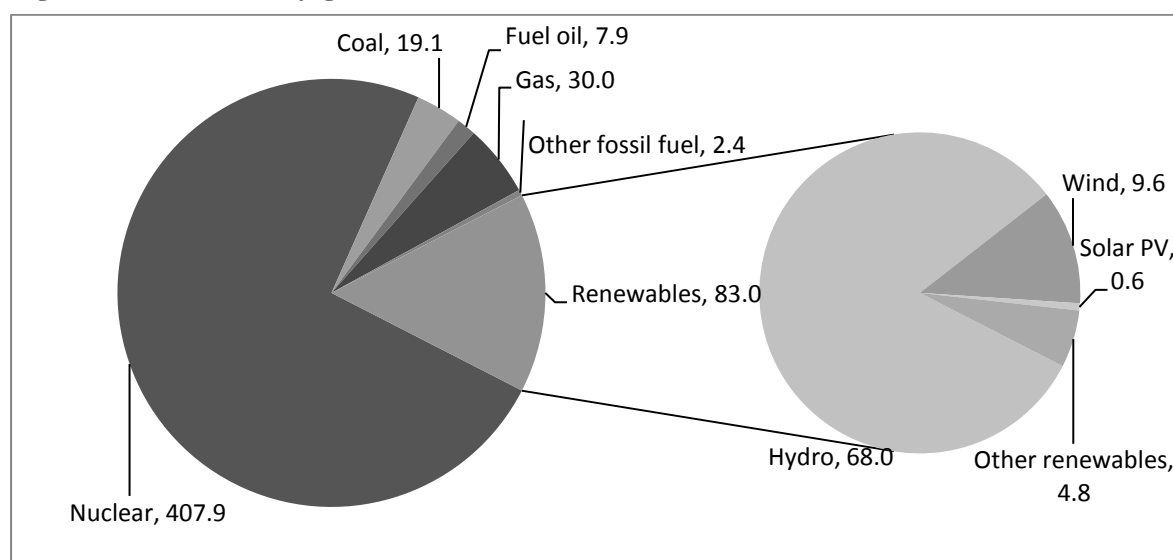
Figure 9.1: Total installed generating capacity in France in 2010 (GW): 123.5 GW



Source: Réseau de Transport d'Electricité, Electrical Energy in France: Provisional Numbers in 2010, January

2011. Available at <www.rte-france.com>.

Figure 9.2: Electricity generation mix in France in 2010 (TWh): Total: 550.3 TWh



Source: Réseau de Transport d'Electricité, Electrical Energy in France: Provisional Numbers in 2010, January 2011. Available at <www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/energie_electrique_en_france_2010_VA.pdf>.

Table 9.2: Growth in grid-connected solar and wind capacity in France between 2006 and 2010 (MW)

Source	2006	2007	2008	2009	2010
Solar PV	34	70	175	443	1,162
Wind	1,737	2,455	3,404	4,620	5,660

Source: EurObserv'ER, Wind Power Barometres. Available at <www.energies-renouvelables.org>.

9.3 Operating Support Incentives

9.3.1 Feed-in Tariff (Other than Solar PV)

The primary operating incentive support scheme in France is a feed-in tariff (FIT), known as the *l'obligation d'achat de l'électricité produite* (mandatory generation purchase requirement). The FIT was introduced in 2001 and has been updated many times, most recently in 2011 (see Table 9.3). The rates received by the generator under the FIT system vary greatly according to several factors, including the technology employed, size of the installation, regularity of generation (load hours) and location (particularly whether it is located in metropolitan France or overseas France¹).

All of the FIT rates are indexed annually based on estimated labour and capital costs at the time, and in general, change by only a small percentage. In addition to the FIT system, France also has a public tendering scheme for certain large installations, such as offshore wind farms or large biomass plants. In the public tendering scheme, the government awards a contract for

¹ France is divided into 26 administrative regions, 22 are in metropolitan France (including Corsica) and 4 are overseas regions (French Guiana, Guadeloupe, Martinique and Reunion). The regions are further divided into departments, with 96 in metropolitan France (*France métropolitaine*) and four departments in the overseas regions (DOM, *départements d'outre-mer*). (Other French overseas territories and collectivities are not included as departments).

a set amount of renewable electricity output at a pre-determined electricity purchase price.² The first tenders for offshore wind farms were held in May 2011. The tenders were expected to reach EUR 10 billion and five areas were selected by the government for initial development, Tréport, Fécamp, Courselles-sur-Mer, Saint-Brieuc, and Saint-Nazaire. It is expected that the tenders will be awarded at the end of 2011 or early 2012.³

Table 9.3: Feed-in tariff rates for non-solar PV technologies in France in 2011

Category	Commissioning date	Duration (years)	FIT Rate (EUR/MWh)
Hydro	03/2007-present	20	60.7 with a bonus of 5-25 for small plants, and a bonus between 0 and 16.8 in winter, depending on regularity of production
	06/2001 - 03/2007	20	54.9-61 with a bonus between 0 and 15.2 in winter depending on regularity of production
Wave, tidal	03/2007-present	20	150
Geothermal	July 2006	15	France/Overseas Territories: 120/100, plus bonus of up to 30 for efficiency
	03/2002-07/2006	15	76.2 plus bonus of up to 30 for efficiency
Onshore wind	07/2006-present	15	82 for first 10 years, 28-82 for next five dependent on site
	06/2001-07/2006	15	83.8 for first 5 years, 30-83.8 for next 10, dependent on site
Offshore wind	07/2006-present	20	130 for first 10 years, 30-130 for next 10, dependent on site
	06/2001-07/2006	15	83.8 for first 5 years, 30-83.8 for next 10, dependent on site
Solid biomass	01/2011-present	20	43.4 with a bonus of between 77.1 and 125.3 based on project capacity, efficiency, and feedstock
	12/2009-12/2010	20	45 with a bonus of between 80 and 130 based on project capacity, efficiency, and feedstock
	04/2002-12/2009	20	49 with a bonus of between 0 and 12 based on project capacity, efficiency, and feedstock
Animal waste	01/2011-present	20	43.4 with a bonus of between 77.1 and 125.3 based on project capacity, efficiency, and feedstock
	12/2009-12/2010	20	45 with a bonus of between 80 and 130 based on project capacity, efficiency, and feedstock
	03/2002-12/2009	15	45-50 plus energy efficiency bonus of up to 30
Solid waste	10/2001-present	15	45-50 plus energy efficiency bonus of up to 30
Biogas	05/2011-present	15	111.9 - 133.7 depending on capacity, plus energy efficiency bonus of up to 40 and a bonus for <125 kW installations using manure.
	07/2006-05/2011	15	75 - 90 depending on capacity, plus energy efficiency bonus of up to 30
	10/2001-07/2006	15	45 - 57 depending on capacity, plus energy efficiency bonus of up to 30
Anaerobic digestion	07/2006-present	15	75 - 90 depending on capacity, plus energy efficiency bonus of up to 30
	04/2002- 07/2006	15	46 plus energy efficiency bonus of up to 12

Note: Metropolitan France is the part of France located in Europe (including Corsica). Overseas France are the French departments and territories located outside of Europe.

Source: DGEMP, DIDEME, Les tarifs d'achat de l'électricité produite par les énergies renouvelables et la cogénération. Available at <www.developpement-durable.gouv.fr/Les-tarifs-d-achat-de-l-12195.html>; and <www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000024042984&fastPos=1&fastReqId=8539655&categorieLien=id&oldAction=rechTexte>.

² DGEMP, DIDEME, Les tarifs d'achat de l'électricité produite par les énergies renouvelables et la cogénération. Available at <www.industrie.gouv.fr/energie/renou/f1e_ren.htm>.

³ Ministère de l'Écologie, du Développement durable, des Transports et du Logement, Consultation sur l'éolien en mer, 14 February 2011. Available at <www.developpement-durable.gouv.fr/Focus-Coup-d-envoi-de-l-eolien-en.html>.

9.3.2 Feed-in Tariff for Solar PV

In March 2011, the French government modified the FIT system for solar PV, which was introduced in 2010.⁴

In the FIT system introduced in 2010, there were four different types of FIT rates for different applications and locations:⁵

- Building-integrated PV (BIPV): This rate applied to solar PV installations which were integrated into the building to the extent that the building would be functionally unusable if the solar component was removed
- Building-attached PV (BAPV): This rate applied to solar PV installations which were integrated to a lesser extent (e.g. solar panels which are fitted over roof tiles)
- Ground-based PV in Metropolitan France
- Ground-based PV in the Overseas Departments (including Corsica).

Table 9.4 shows the FIT rates for systems commissioned in 2010. These rates are modified by regional multipliers based on solar irradiation levels.⁶

Table 9.4: Feed-in tariff rates for small-scale solar PV systems commissioned in France in 2010

Category		FIT rate (EUR/MWh)
BIPV (≤ 250 kW)	Installed on a building used for health and education less than 2 years after building was completed	580
	Installed on a house used solely for residential purposes	580
	Other	500
BIPV (> 250 kW)		420
Building-attached PV (BAPV)		420
Ground-based in Metropolitan France (≤ 250 kW)		314
Ground-based in Overseas France		400

Source: Le ministère du Développement durable, Tout ce qu'il faut savoir sur l'énergie solaire photovoltaïque: Tarifs d'achat. Available at <www.developpement-durable.gouv.fr/Presentation-generale,13614.html>.

For installations commissioned after March 2011, a new FIT system is in place. Under the new system, only roof-top systems up to 100 kW are supported with a FIT. For systems larger than 100 kW or ground-based systems, public tenders will be held. In addition, an annual capacity cap for new solar PV installations has been introduced. Under the capacity cap, a total of 500 MW for new installations will be supported in 2011 (see Table 9.5). The cap will be reviewed in 2012 with a possibility of extending it to 800 MW.

⁴ Le ministère du Développement durable, Énergie solaire photovoltaïque : le nouveau dispositif, March 2011. Available at <www.developpement-durable.gouv.fr/Quel-est-le-nouveau-dispositif-de.html>.

⁵ For more information on the definition of BIPV and BAPV in France, see Le ministère du Développement durable, Détail des conditions tarifaires introduites par l'arrêté du 12 janvier 2010. Available at <www.developpement-durable.gouv.fr/IMG/pdf/100623_JM_PV_Annexe_circulaire_nouveaux_tarifs_final.pdf>.

⁶ Arrêté du 12 janvier 2010 fixant les conditions d'achat de l'électricité produite par les installations utilisant l'énergie radiative du soleil telles que visées au 3° de l'article 2 du décret n° 2000-1196 du 6 décembre 2000, Annexe 3, March 2010. Available at <www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000021673951#LEGIARTI000021706672>.

Table 9.5: Feed-in tariff rates for solar PV systems commissioned in France in 2011

Category			FIT rate (EUR/MWh)	Capacity cap in 2011 (MW)	
Location	Type	Capacity			
Residential roof-top (≤ 100 kW)		BIPV	0-9 kW	460	100
			9-36 kW	402.5	
		BAPV	0-36 kW	303.5	
			36-100 kW	288.3	
Other roof-top (≤ 100 kW)	Education or health	BIPV	0-9 kW	406	100
			9-36 kW	406	
		BAPV	0-36 kW	303.5	
			36-100 kW	288.3	
	Other	BIPV	0-9 kW	352	
			0-36 kW	303.5	
		BAPV	0-36 kW	303.5	
			36-100 kW	288.3	
Large-scale roof-top		100-250 kW	Tender	120	
		> 250 kW		20	
Ground-based installations					160
			TOTAL	500	

Source: Le ministère du Développement durable, É Quels sont les nouveaux tarifs d'achats?, March 2011. Available at <www.developpement-durable.gouv.fr/Quels-sont-les-nouveaux-tarifs-d.html>; Arrêté du 4 mars 2011 fixant les conditions d'achat de l'électricité produite par les installations utilisant l'énergie radiative du soleil telles que visées au 3° de l'article 2 du décret n° 2000-1196 du 6 décembre 2000. Available at <www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000023661449&dateTexte=&categorieLien=id>.

From July 2011, a degression rate will be applied to the FIT rates for solar installations on residential roof-tops and other roof-tops (≤ 100 kW). The degression rate will be based on the amount of new capacity installed in each segment (residential and other) in the preceding three months. The greater the amount of new capacity installed in the three-month period, the higher the degression rate (see Table 9.6).

Table 9.6: Solar PV FIT degression rates in France based on cumulative new installed capacity in a three-month period

Cumulative installed capacity in a three-month period for each segment	Degression rate (%)
5-0 MW	0
5-15 MW	1.56
15-23 MW	2.08
23-27 MW	2.6
27-35 MW	3.38
35-45 MW	4.42
45-50 MW	5.98
> 50 MW	9.62

Source: Arrêté du 4 mars 2011 fixant les conditions d'achat de l'électricité produite par les installations utilisant l'énergie radiative du soleil telles que visées au 3° de l'article 2 du décret n° 2000-1196 du 6 décembre 2000. Available at <www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000023661449&dateTexte=&categorieLien=id>.

9.4 Investment Support Incentives

Renewable energy equipment and services for residential buildings are charged a reduced VAT rate of 5.5 per cent (2.1 per cent in the Overseas Departments). For solar power up to 3 kW there was not a sales tax until the end of 2010.⁷ In addition, through the *Crédit d'impôt* programme, 50 per cent of the purchase cost of equipment for residential buildings can be deducted from the individual's income tax. This programme, which runs until the end of 2012, applies only to primary residences and for a maximum of 3 kW for solar PV, although there is no restriction on other technologies.⁸ Various local and regional authorities have also developed policies to promote solar PV use.⁹

⁷ Code Genél des Impôts, Section 279. Available at <www.legifrance.gouv.fr/affichCodeArticle.do?sessionId=A3A25BF47508074DCFA9282EB8C2E83F.tpdjo09v3?idArticle=LEGIARTI000006304368&cidTexte=LEGITEXT000006069577&dateTexte=20080118>.

⁸ Introduction Instruction fiscale 5 B-10-09 N°38. Available at <www11.minefi.gouv.fr/boi/boi2009/5fpub/textes/5b1009/5b1009.pdf>.

⁹ For more information on the various regional incentives available, see the Enerplan, the Association of Solar Energy Professionals, Website. Available at <www.enerplan.asso.fr>. Only available in French.

Chapter 10: Germany

10.1 Government Targets

Under the Kyoto Protocol, Germany is committed to reduce average emissions between 2008 and 2012 by 21 per cent from 1990 base levels. In 2009, GHG emission levels were 25.4 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 14 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The government has also introduced a national target to reduce GHG emissions by 40 per cent from 1990 levels by 2020. Additionally, Germany has an EU target of meeting 18 per cent of final energy consumption with renewable energy sources by 2020. In 2008, 9.1 per cent of final energy consumption was met with renewable energy sources. The government has a target of meeting 20 per cent of total electricity consumption from renewable electricity by 2020, rising to 80 per cent by 2050.

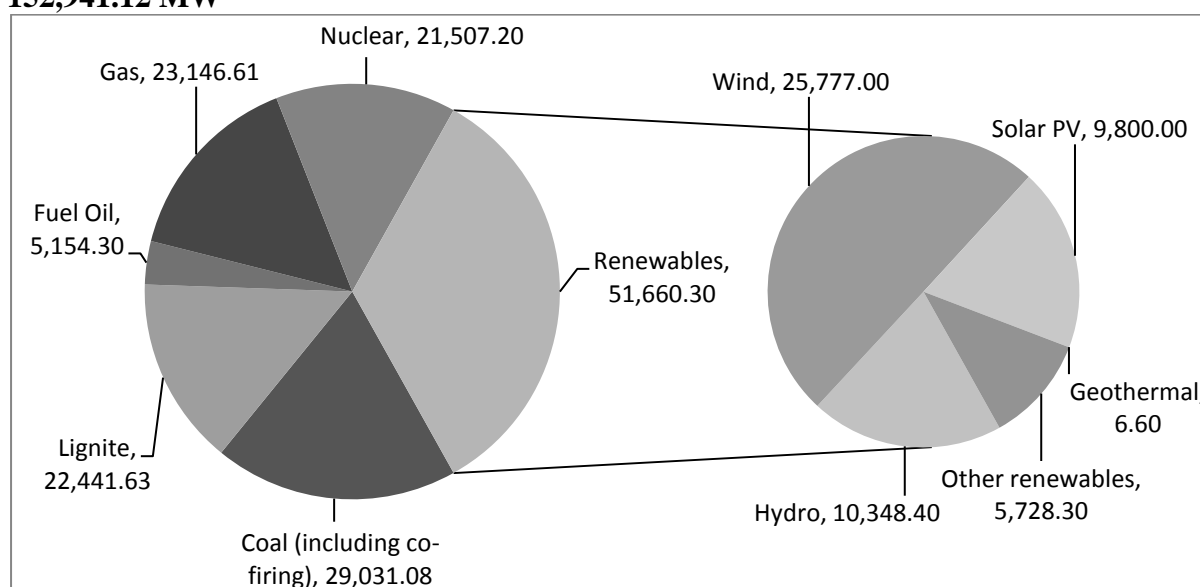
Table 10.1: German government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 21.0 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 14 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme (ETS). A government reduction target of 40 per cent from 1990 levels by 2020.
Renewable energy (RE)	An EU target for 18 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A government target of 20 per cent by 2020, rising to 80 per cent by 2050.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

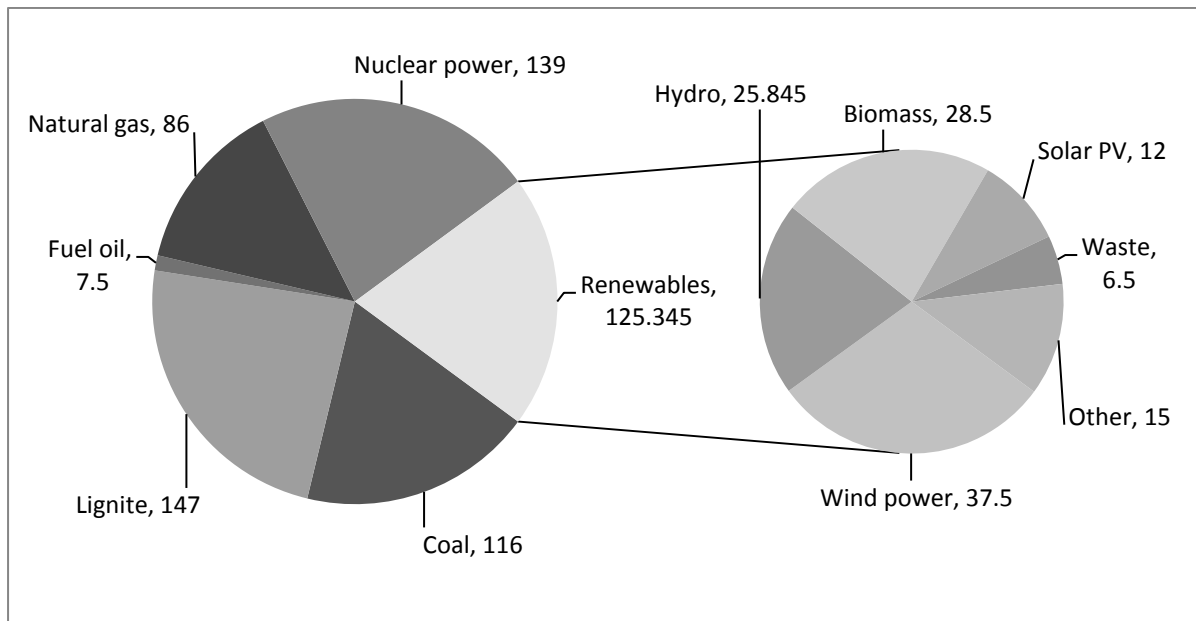
10.2 Electricity Generation Mix

Figure 10.1: Total installed generating capacity in Germany in 2009 (MW): 152,941.12 MW



Source: BmWi, Aufkommen und Verwendung von Strom, 5 January 2011. Available at <www.bmwi.de/BMWi/Navigation/Energie/Statistik-und-Prognosen/Energiedaten/energietraeger.html>.

Figure 10.2: Electricity generation mix in Germany in 2010 (TWh):
Total: 620.85 TWh



Source: Bundesministerium für Wirtschaft und Technologie, Aufkommen und Verwendung von Strom, 5 January 2011. Available at <www.bmwi.de/BMWi/Navigation/Energie/Statistik-und-Prognosen/Energiedaten/energietraeger.html>.

10.3 Operating Support Incentives

The German renewable power incentive system is administered at the federal level where the main policy instrument is a feed-in tariff (FIT). The German FIT scheme consists of two elements: a base tariff calculated for each technology according to the capacity of an installation, and bonuses¹ for using innovative technologies or highly efficient specifications in a given installation. FIT rates are payable for a duration of 20 years, except for hydro projects of over 5 MW which qualify for only 15 years. Tariff rates are scaled, so that higher tariff rates apply to installations with lower-rated capacity. A new renewable energy law is expected to be introduced by 2012, and the government has indicated that it will review the FIT rates for biogas in the new law as it considers that the current rate is too high.²

Current FIT and bonus rates for renewable power, excluding solar power, as well as degression rates are set out in Table 10.2 and Table 10.3.

¹ The term “bonus” as used in Table 10.2 is not to be confused with “green bonus” as used in the definition of the premium incentive scheme. In this instance “bonus” refers to a supplementary payment made above the FIT.

² Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Bundeskabinett bestätigt Anpassung bei Solarförderung und Grünstrom-Privileg, February 2011. Available at <www.erneuerbare-energien.de/inhalt/46971/4596/>.

Table 10.2: Feed-in tariff rates for renewable power (excluding solar PV) in Germany in 2011

Technology	Category		FIT rate (EUR/MWh)	Bonus (EUR/MWh)	Total compensation (EUR/MWh)
	Description	Capacity (MW)			
Onshore wind	Base rate	N/A	50.2	0	50.2
	Rate for the first 5 years	N/A	92.0	0	92.0
	System services bonus (commissioned prior to 1 January 2014)	N/A	50.2	5.0	55.2
	Re-powered wind	N/A	50.2	5.0	55.2
Offshore wind	Base rate	N/A	35.0	0	35.0
	Rate for the first 12 years	N/A	130.0	0	130.0
	Installations commissioned prior to 1 January 2016	N/A	35.0	20.0	55.0
Biomass and biogas	N/A	< 0.15	116.7	0	116.7
	N/A	0.15 – 0.5	91.8	0	91.8
	N/A	0.5 – 5.0	82.5	0	82.5
	N/A	5.0 – 20.0	77.9	0	77.9
	Combined heat and power	< 0.15	116.7	30.0	146.7
		0.15 – 0.5	91.8	30.0	121.8
		0.5 – 5.0	82.5	30.0	112.5
		5.0 – 20.0	77.9	30.0	107.9
Landfill gas	N/A	< 0.5	90.0	0	90.0
	N/A	0.5 - 5	61.6	0	61.6
	If produced gas is of natural gas quality	< 0.5	90.0	20	110.0
		0.5-5.0	61.6	20	81.6
Sewage treatment gas	N/A	< 0.5	71.1	0	71.1
	N/A	0.5 - 5	61.6	0	61.6
	If produced gas is of natural gas quality	< 0.5	71.6	20	91.6
		0.5-5.0	61.6	20	81.6
Mine gas	N/A	< 1	71.6	0	71.6
	N/A	1 - 5	51.6	0	51.6
	N/A	>5	41.6	0	41.6
	If eligible for innovative technology bonus	< 1	71.6	20.0	91.6
		1 - 5	51.6	20.0	71.6
		> 5	41.6	20.0	61.6
Geothermal	N/A	< 10	160.0	0	160.0
	N/A	> 10	105.0	0	105.0
	Installations commissions prior to 1 January 2016	< 10	160.0	40.0	200.0
		> 10	105.0	40.0	145.0
	Heat use bonus	< 10	160.0	30.0	190.0
		> 10	105.0	30.0	135.0
	If eligible for petrothermal technology bonus	< 10	160.0	40.0	200.0
		> 10	105.0	40.0	145.0
Hydro	Capacity of up to 5 MW	< 0.5	126.7	0.0	126.7
		0.5 – 2.0	86.5	0.0	85.5
		2.0 – 5.0	76.5	0.0	76.5
	Re-modernised	< 0.5	116.7	0.0	116.7
		0.5 – 5.0	86.5	0.0	86.5
	Capacity of over 5 MW	< 0.5	72.9	0.0	72.9
		0.5 – 10.0	63.2	0	63.2
		10 – 20	58.0	0	58.0
		20 – 50	43.4	0	43.4
		> 50	35.0	0	35.0

Source: BMU, EEG – The Renewable Energy Sources Act (2009). Available at <www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/eeg_2009_en.pdf>.

To account for the fact that costs decrease as generation technologies mature, each FIT rate (and bonus) is reduced every year according to a government-set degression schedule (see Table 10.3). The degression takes into account the cost structure of the relevant technology and the anticipated rate of cost-reduction improvements. In 2008, the government revised both the FIT and degression schedules—increasing offshore wind tariffs, and increasing the degression rates for solar PV.

Table 10.3: Annual degression rates for the FIT for installations commissioned in 2011 excluding solar PV in Germany

Category	Annual degression rate (%)
Offshore wind (from 2015)	5
Onshore wind	1
Hydro power (<5 MW)	1
Geothermal	1
Landfill	1.5
Biomass	1
Sewage	1.5
Coal mine gas	1.5

Source: BMU, EEG – The Renewable Energy Sources Act (2009). Available at <www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/eeg_2009_en.pdf>.

After the installation of more than 7,000 MW of new solar PV systems in 2010, the government reduced the FIT rates for new solar PV in January 2011. The latest FIT rates would have been reduced in July 2011 if more than 1,750 MW of new solar PV had been installed to date. Installations in the first five months of 2011, however, amounted only to 1,000 MW. As a result, the government did not reduce the FIT rates in July 2011. The next revision is scheduled for January 2012.³ Power from roof-top installations of up to 30 kW that is consumed onsite and not exported to the grid continues to receive a payment of 250 EUR/MWh.

The 2004 Renewable Energy Sources Act (*Erneuerbare-Energien-Gesetz*, EEG) obliges grid operators to give renewable power plants priority access to the grid as well as to purchase and transmit all electricity they generate. Installation owners are, however, responsible for the costs of connecting to the grid.

³ Bundesnetzagentur, Kurth: "Daten verschaffen allen Marktakteuren Klarheit", 16 June 2011. Available at <www.bundesnetzagentur.de/cln_1932/SharedDocs/Pressemitteilungen/DE/2011/110616_PhotovoltaikZahlen.html?nn=65116>.

Table 10.4: Solar PV feed-in tariff rates and degression rates in Germany in 2011 and 2012

Date	Amount installed	Degression rate (%)	Roof-top				Ground-based	
			< 30 kW	30-100 kW	100 – 1,000 kW	>1,000 kW	Open-field	Brown-field or former military base
01/2010	N/A	N/A	430.1	409.1	395.8	330.0	319.4	
01/2011	N/A	N/A	287.4	273.3	258.6	215.6	211.1	220.7
01/2012	Total in 2011	1,500	1.5	283.1	269.2	254.7	212.4	207.9
		2,000	4.0	275.9	262.4	248.3	207.0	202.7
		2,500	6.5	268.7	255.5	241.8	201.6	197.4
		3,500	9.0	261.5	248.7	235.3	196.2	192.1
		4,500	12.0	252.9	240.5	227.6	189.7	185.8
		5,500	15.0	244.3	232.3	219.8	183.3	179.4
		6,500	18.0	235.7	224.1	212.1	176.8	173.1
		7,500	21.0	227.0	215.9	204.3	170.3	166.8
		>7,500	24.0	218.4	207.7	196.5	163.9	160.4
							160.4	167.7

Source: Formulierungshilfe für einen Änderungsantrag zu dem Gesetzentwurf der Bundesregierung – Drucksachen 17/3629, 17/4233, February 2011. Available at <www.erneuerbare-energien.de/inhalt/46976/4596/>.

10.4 Investment Support Incentives

10.4.1 Grants

There are two major schemes for investment grants in Germany. One scheme is the Joint Task Programme, administered by the Ministry of Economics and Technology, which awards non-repayable grants of up to 30, 40, and 50 per cent for large, medium and small enterprises. The precise amount depends on the geographical area where the investment is targeted. The other scheme applies to the former East Germany, where investment grants are complemented by the Investment Allowance, which is usually provided in the form of a tax-free cash payment, but which can also be awarded as a tax credit.⁴ Considerable research and development (R&D) funding in the renewable energy sector is also available—both at the national and EU levels. The government spent EUR 120 million in 2010 and has budgeted EUR 128 million in 2011 for this purpose.⁵

10.4.2 Preferential Loans

KfW Mittelstandsbank administers a long-term soft loan programme for renewable energy projects; solar PV, solar thermal, biomass (< 5 MW), biogas, wind, hydro and geothermal energy installations can qualify. Up to 100 per cent of project costs can be financed with the facility (excluding VAT), to a maximum of EUR 10 million. Interest rates are between 2.63 and 3.49 per cent, depending on the technology used. Small- and medium-sized enterprises can receive a lower rate.⁶

⁴ Germany Trade and Invest 2010, Cash Incentives for Investment. Available at <www.gtai.com/homepage/investment-guide-to-germany/incentives-programs/cash-incentives-for-investments/>.

⁵ Ministry of Economics and Technology, Röttgen baut Forschungsförderung für erneuerbare Energien weiter aus, January 2011. Available at <www.erneuerbare-energien.de/inhalt/46898/4595/>.

⁶ KfW, Erneuerbare Energien. Available at <www.kfw.de/kfw/de/Inlandsfoerderung/Foerderberater/Erneuerbare_Energien/index.jsp>.

Chapter 11: Greece

11.1 Government Targets

Under the Kyoto Protocol, Greece is committed to limit the increase of average emissions between 2008 and 2012 to 25 per cent from 1990 base levels. In 2009, GHG emission levels were 14.5 per cent higher than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 4 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Greece also has an EU target of meeting 18 per cent of final energy consumption from renewable energy sources by 2020. In 2009, 7.8 per cent of final energy consumption was met with renewable energy sources.¹ The government has a target of meeting 40 per cent of total electricity consumption from renewable electricity by 2020 and a target for the installation of new renewable power generating technologies (see Table 11.1).

Table 11.1: Greek government commitment summary

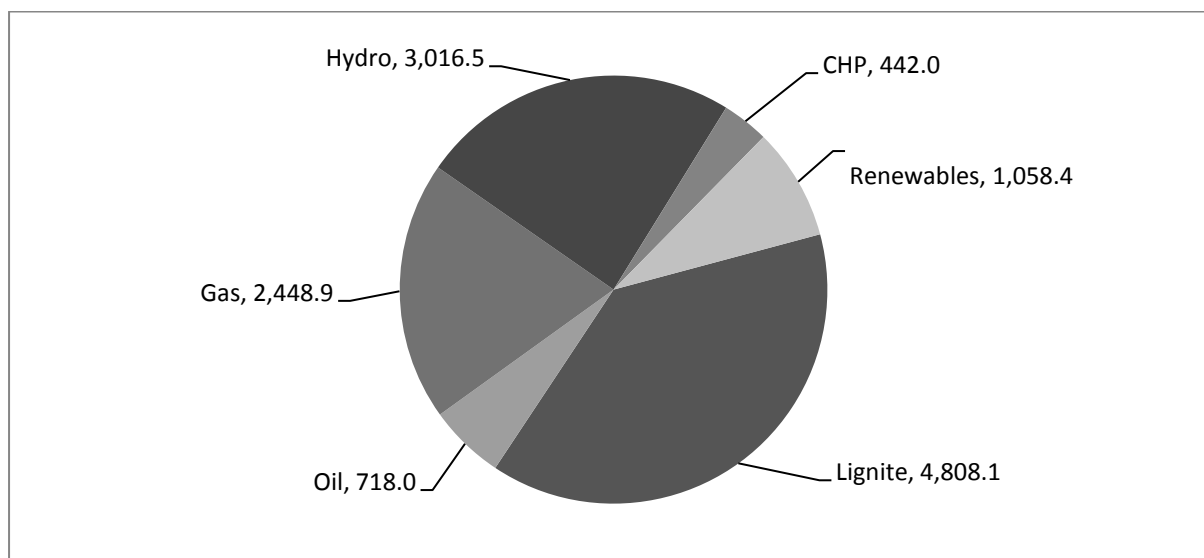
GHG emissions	A Kyoto Protocol burden-sharing target of limiting the increase of average emissions between 2008 and 2012 to 25 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 4 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 18 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A government target of 40 per cent of electricity consumption to come from renewable sources by 2020. A government target of an increased capacity for renewable power for the following to be installed by 2020: <ul style="list-style-type: none"> • Small hydro (< 15 MW): 350 MW • Solar PV: 2,200 MW • Concentrated solar thermal: 250 MW • Wind: 7,500 MW • Biomass: 350 MW

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; RAE, φημερις Της Κυβερνησεως Της Ελληνικης Δημοκρατίας Τευχος Δευτερο Αρ. Φύλλου 1630, October 2010. Available at <www.rae.gr/site/file/categories_new/global_regulation/global_national/global_national_laws/FEKB1630_2010?p=file&i=0>.

¹ Government of Greece, National Action Plan 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_greece_en.pdf>.

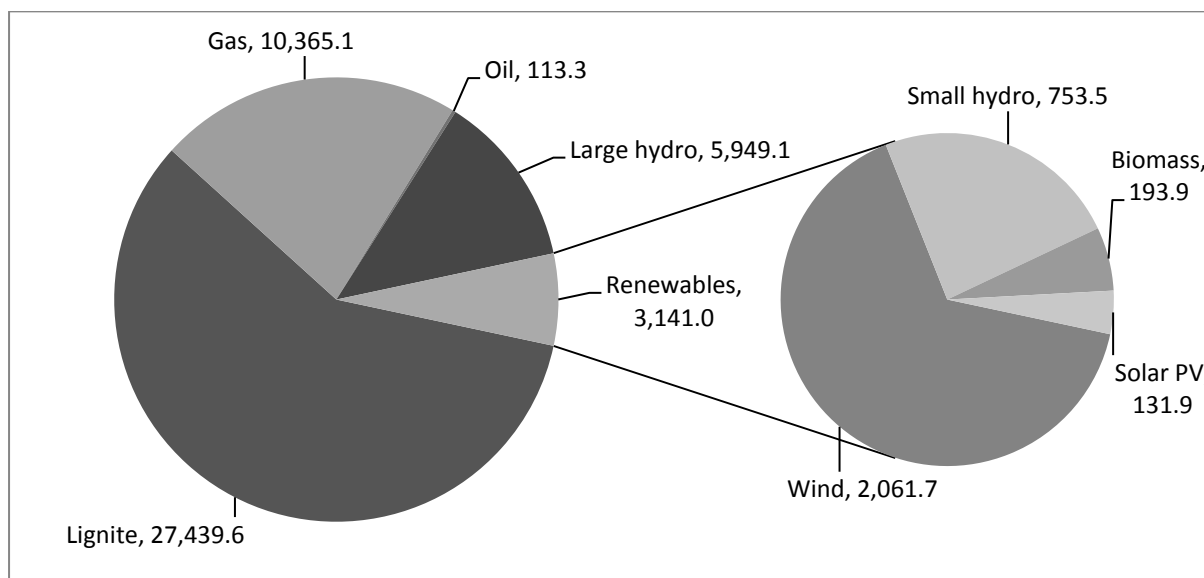
11.2 Electricity Generation Mix

Figure 11.1: Total installed generating capacity of the interconnected Greek grid in December 2009 (MW): 12,491.9 MW



Source: RAE, 2010 National Report to the EC, November 2010. Available at <www.energy-regulators.eu>.

Figure 11.2: Electricity generation mix in Greece in 2010 (GWh): Total 47,008.1 GWh



Source: Hellenic Transmission System Operator, Energy Balance Report, December 2010. Available at <www.desmie.gr>.

11.3 Operating Support Incentives

Greece uses a feed-in tariff (FIT) system as its primary support mechanism for renewable power development. The FIT system was introduced in 1994 and last revised in 2010. Solar PV tariff rates were last modified in March 2009. There are two sets of tariff rates, one for installations on the mainland and interconnected islands, and the other for those on islands which are not interconnected with the mainland grid system (see Table 11.2).

Table 11.2: Feed-in tariff rates in Greece for new installations in 2011 (EUR/MWh)

Category		FIT rates for mainland and interconnected islands	FIT rates for non-interconnected islands
Onshore wind > 50 kW		87.85	99.45
Onshore wind < 50 kW		250.00	
Offshore wind		104.84	
Solar PV	≤ 100 kW	419.46	466.03
	> 100 kW	372.83	419.43
Building-integrated PV	≤ 10 kW	550	
Solar thermal	Regular	264.85	
	With storage	284.85	
Small hydro	≤ 15 MW	87.85	
Geothermal	Low temperature	150	
	High temperature	99.45	
Biomass	≤ 1 MW	200	
	≤ 5 MW	175	
	> 5 MW	150	
Biogas from wastes and sewage	≤ 2 MW	120	
	> 2 MW	99.45	
Biogas from biomass and agricultural wastes	≤ 3 MW	220	
	> 3 MW	200	
Other		87.85	99.45

Source: Ministry of Environment, Energy and Climate Change, Law 3851/2010: Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change. Available at <www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3d&tabid=37>; Law 3734/2009, Promotion of co-generation of two or more energy sources, regulation of issues related to Mesochora hydroelectric plant and other provisions. Available at <www.ypeka.gr/LinkClick.aspx?fileticket=t8OWD9SCE9U%3D&tabid=295&language=el-GR>.

In addition, projects without EU funding can receive a FIT rate between 15 and 20 per cent higher than the rates given in Table 11.2 (except solar PV). Additional incentives are given for combined heat and power (CHP) plants.

From August 2010, degression rates were introduced and applied to the FIT rates for new solar PV installations (excluding building-integrated solar PV (BIPV)). Table 11.3 shows the future FIT rates for solar PV up to 2015. After February 2015, the FIT rate will be based on the average cost of a solar PV system in the previous year. For BIPV, a degression rate of 5 per cent a year will be applied from 2012.

The local grid operator is legally obliged to enter into a 20-year power purchase agreement with the owners of all new and accredited renewable power installations, under which the FIT rate is guaranteed for all electricity delivered to the grid. For BIPV systems and solar-thermal power plants, the FIT rate is guaranteed for 25 years.²

² Ministry of Environment, Energy and Climate Change, Law 3851/2010: Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change. Available at <www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3d&tabid=37>.

Table 11.3: Feed-in tariff rates for solar PV from 2009 to 2014 (EUR/MWh)

Date rate starts		FIT rates for mainland and interconnected islands		FIT rates for non-interconnected islands	
Year	Month	≤ 100 kW	> 100 kW	≤ 100 kW	> 100 kW
2009	February	450.00	400.00	500.00	450.00
2010	August	441.05	392.04	490.05	441.05
2011	February	419.43	372.83	466.03	419.43
2011	August	394.88	351.01	438.76	394.88
2012	February	375.53	333.81	417.26	375.53
2012	August	353.56	314.27	392.84	353.56
2013	February	336.23	298.87	373.59	336.23
2013	August	316.55	281.38	351.72	316.55
2014	February	302.56	268.94	336.18	302.56
2014	August	293.59	260.97	326.22	293.59

Source: Law 3734/2009, Promotion of co-generation of two or more energy sources. Available at <www.ypeka.gr/LinkClick.aspx?fileticket=t8OWD9SCE9U%3D&tabid=295&language=el-GR>.

11.4 Investment Support Incentives

Greece's Law 3299/2004 on 'Incentives of Private Investments for Financial Development and Regional Convergence' provides substantial incentives for investments (including those in renewable energy projects) that exceed the following levels:

- Large enterprises: EUR 500,000
- Medium enterprises: EUR 250,000
- Small enterprises: EUR 150,000
- Micro enterprises: EUR 100,000.

Subsidies vary according to the region where the investment is targeted (see Table 11.4).

Table 11.4: Investment incentives offered by the Greek government

	Zone	Capital subsidy	Labour subsidy	Tax exemption
A	The prefectures of Attica and Thessaloniki (except islands and industrial estates)	20 per cent	20 per cent	60 per cent
B	Other (including industrial estates in Zone A)	30 per cent	30 per cent	100 per cent
C	Regions of Eastern Macedonia and Thrace, the Peloponnese, Epirus, Greece and western North Aegean islands	40 per cent	40 per cent	100 per cent

Source: Centre for Renewable Energy Studies, 'Source of Financing and Financial Incentives for Energy Investment.' Available at <www.cres.gr/kape/epixeiriseis_ependites.htm>.

Renewable power generators are exempt from Greek VAT, which is currently charged at the rate of 23 per cent.³ In addition to these incentives, EUR 2.8 billion (including EUR 450 million from the Greek government) is provided under the EU's National Strategic Reference Framework Sectoral Operation Programme for Sustainable Development between 2007 and 2013. Renewable energy and environmental sustainability projects are eligible for grants. Calls for application for funding are made throughout the year.⁴

³ Centre for Renewable Energy Studies, 'Source of Financing and Financial Incentives for Energy Investment.' Available at <www.cres.gr/kape/epixeiriseis_ependites.htm>.

⁴ Ministry of Economy, Environment and Sustainable Development. Available at <www.espa.gr/en/Pages/staticOPEnvironment.aspx>.

Chapter 12: Hungary

12.1 Government Targets

Under the Kyoto Protocol, Hungary is committed to reduce average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. In 2009, GHG emission levels were 42.2 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 10 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Hungary also has an EU target of meeting 13 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 6.6 per cent of final energy consumption was met with renewable energy sources. There is a government target to for renewable energy to comprise 14.6 per cent of primary energy supply by 2020.

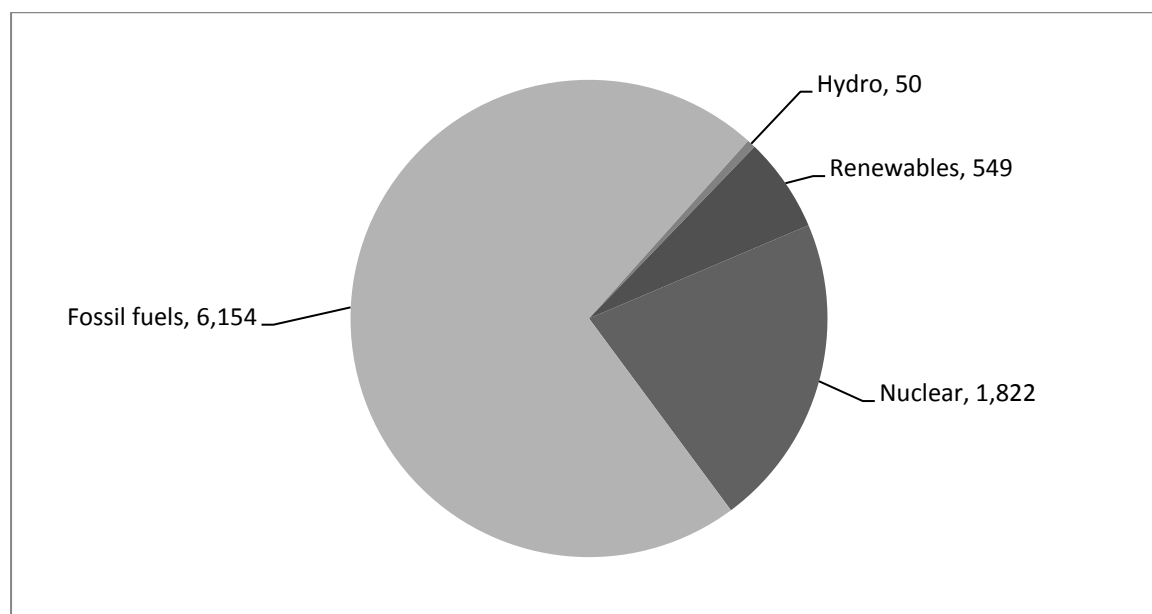
Table 12.1: Hungarian government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU reduction target of 10 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 13 per cent of final energy consumption from renewable energy sources by 2020. A government-set target for a 14.6 per cent share of renewable energy in total primary energy supply by 2020.
Renewable electricity	No target set.

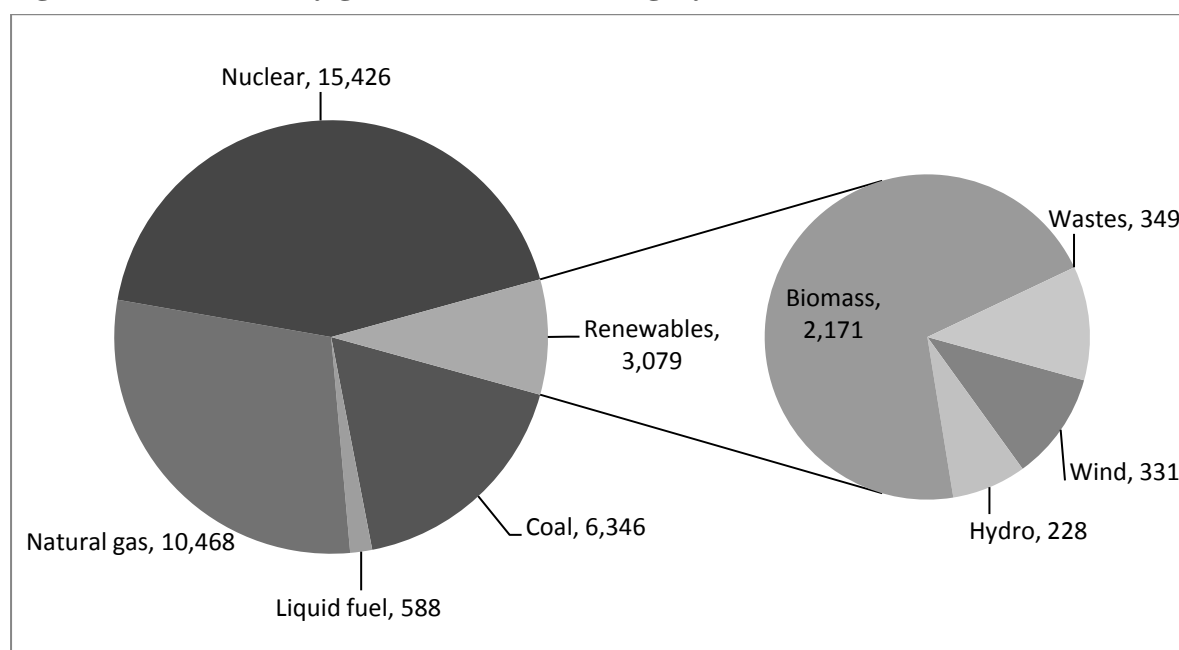
Source: Government of Hungary, National Reform Programme, April 2011. Available at <[www.kormany.hu/download/3/a1/30000/Hungary's National Reform Programme.pdf](http://www.kormany.hu/download/3/a1/30000/Hungary's_National_Reform_Programme.pdf)>.

12.2 Electricity Generation Mix

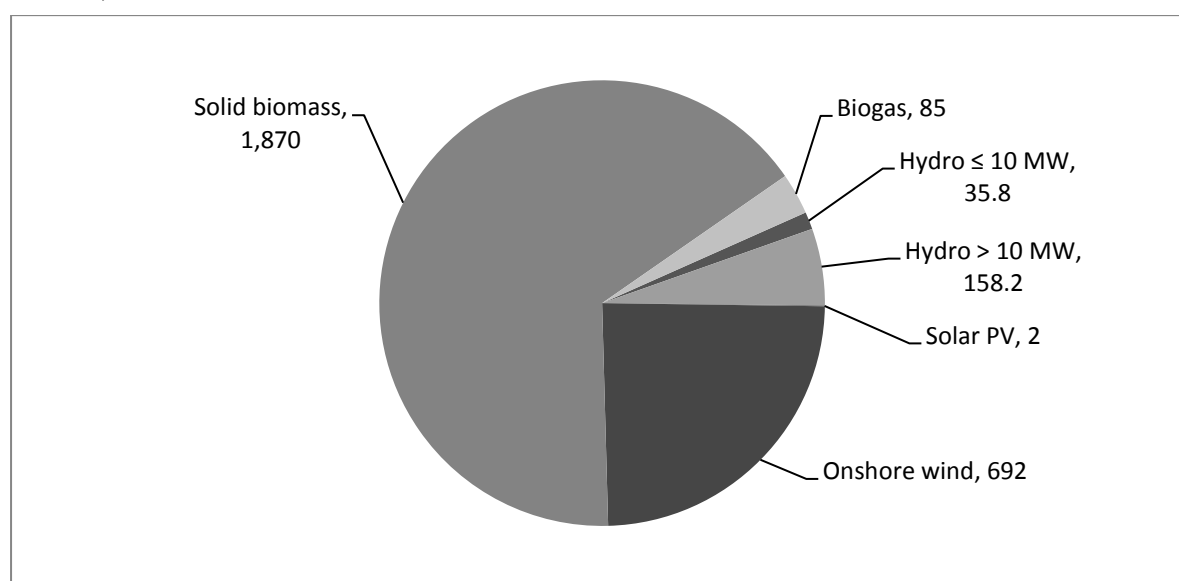
Figure 12.1: Total installed generating capacity in Hungary in December 2009 (MW): 8,575 MW



Source: MAVIR, Statistics Data of the Hungarian Power System, 2009. Available at <www.mavir.hu>.

Figure 12.2: Electricity generation mix in Hungary in 2009 (GWh): Total 35,907 GWh

Source: MAVIR, Statistics Data of the Hungarian Power System, 2009. Available at <www.mavir.hu>.

Figure 12.3: Renewable electricity generation in Hungary in 2010 (GWh): Total 2,843 GWh

Source: Government of Hungary, Hungary's Renewable Energy Utilisation Action Plan on Trends in the Use of Renewable Energy Sources until 2020, December 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_hungary_en.pdf>.

12.3 Operating Support Incentive

The primary support mechanism for renewable electricity generation in Hungary is a feed-in tariff (FIT) system. The system is funded by levies on electricity consumers and approximately two-thirds of all production supported under the system comes from biomass-

fired combined heat and power (CHP) plants.¹ A revised FIT was introduced on 1 January 2008, updated in 2009, and is applicable for all new installations commissioned from that date. The energy regulator (*Magyar Energia Hivatal*, the Hungarian Energy Office) changes the FIT rates for all renewable power plants every year based on inflation. Table 12.2 gives the FIT rates for all renewable power plants in Hungary in 2011 that were commissioned after 1 January 2008. Table 12.3 gives the FIT rates for all renewable power plants in Hungary in 2011 that were commissioned prior to 1 January 2008. The government has indicated that the FIT system in Hungary will be revised in late 2011 but details of the revision had not been announced as of July 2011.²

Table 12.2: Feed-in tariff rates for renewable power projects in Hungary in 2011 commissioned after 2008

Plant capacity/technology	Time of generation ^{a,b,c}	HUF/MWh ^d	EUR/MWh ^d
Solar	Peak	29,840	108.39
	Off-peak rate I	29,840	108.39
	Off-peak rate II	29,840	108.39
Other renewable sources < 20 MW	Peak	33,350	121.14
	Off-peak rate I	29,840	108.39
	Off-peak rate II	23,880	86.74
Other renewable sources of capacity 20 MW-50 MW (except wind)	Peak	26,670	96.88
	Off-peak rate I	23,880	86.74
	Off-peak rate II	9,740	35.38
Wind up to 50 MW	Peak	33,350	121.14
	Off-peak rate I	29,840	108.39
	Off-peak rate II	12,180	44.24
Large hydro (> 5 MW), other plants over 50 MW	Peak	20,740	75.34
	Off-peak rate I	13,270	48.20
	Off-peak rate II	13,270	48.20
Waste-fired	Peak	31,280	113.62
	Off-peak rate I	21,550	78.28
	Off-peak rate II	11,250	40.86
CHP from renewable sources up to 50 MW supplying district heating	Peak	29,600	107.52
	Off-peak rate I	19,180	69.67
	Off-peak rate II	3,000	10.90
CHP from renewable sources of capacity 50 MW – 100 MW supplying district heating	Peak	20,200	73.37
	Off-peak rate I	12,610	45.80
	Off-peak rate II	3,000	10.90
CHP from renewable sources up to 20 MW not supplying district heating	Peak	20,200	73.37
	Off-peak rate I	12,610	45.80
	Off-peak rate II	3,000	10.90

Notes:

^a “Peak” hours are on working days from 06.00 to 22.00. During the summer period the time is moved forward one hour for all categories.

^b “Off-peak rate I” hours are 22.00 to 01.00 and 05.00 to 06.00 on working days and 06.00 to 01.30 on non-working days.

^c “Off-Peak rate II” hours are 01.30 to 05.00 on working days and 01.30 to 06.00 on non-working days.

^d The HUF – EUR conversion rate used is EUR 1 = HUF 275.303 (The average rate in 2010).

Source: MEH, Feed-in Tariffs 2008-11. Available at eh.gov.hu/home/html/index.asp?msid=1&sid=0&lng=2&hkl=399.

¹ MEH, KAT Report 2010. Available at www.eh.gov.hu/gcpdocs/201009/2010_1_kat_jelentes__2_en__2_.pdf.

² Government of Hungary, Hungary’s Renewable Energy Utilisation Action Plan on Trends in the Use of Renewable Energy Sources until 2020, December 2010. Available at ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_hungary_en.pdf.

Table 12.3: Feed-in tariff rates for renewable power projects in Hungary in 2011 commissioned prior to 2008

Plant capacity/technology	Time of generation ^{a,b,c}	HUF/MWh ^d	EUR/MWh ^d
Solar and wind	Peak	30,710	111.55
	Off-peak rate I	30,710	111.55
	Off-peak rate II	30,710	111.55
Large hydro (> 5 MW), plants over 50 MW	Peak	20,740	75.34
	Off-peak rate I	13,270	48.20
	Off-peak rate II	13,270	48.20
Waste-fired	Peak	31,280	113.62
	Off-peak rate I	21,550	78.28
	Off-peak rate II	11,250	40.86
Other	Peak	34,310	124.63
	Off-peak rate I	30,720	111.59
	Off-peak rate II	12,540	45.55
CHP from renewable sources up to 50 MW supplying district heating	Peak	30,020	109.04
	Off-peak rate I	19,180	69.67
	Off-peak rate II	3,000	10.90
CHP from renewable sources of capacity 50 MW – 100 MW supplying district heating	Peak	20,200	73.37
	Off-peak rate I	12,610	45.80
	Off-peak rate II	3,000	10.90
CHP from renewable sources of capacity 20 MW – 50 MW not supplying district heating	Peak	20,200	73.37
	Off-peak rate I	12,610	45.80
	Off-peak rate II	3,000	10.90

Notes:

^a “Peak” hours are on working days from 06.00 to 22.00. During the summer period the time is moved forward one hour for all categories.^b “Off-peak rate I” hours are 22.00 to 01.00 and 05.00 to 06.00 on working days and 06.00 to 01.30 on non-working days.^c “Off-Peak rate II” hours are 01.30 to 05.00 on working days and 01.30 to 06.00 on non-working days.^d The HUF – EUR conversion rate used is EUR 1 = HUF 275.303 (The average rate in 2010).

Source: MEH, Feed-in Tariffs 2008-11. Available at

<eh.gov.hu/home/html/index.asp?msid=1&sid=0&lng=2&hkl=399>.

12.4 Investment Support Incentives

EU-financed investment support is available through the Operational Plan for Environment and Energy (KEOP) programme. The KEOP programme is scheduled to run from 2007 to 2013, with a total of EUR 253 million available to assist in a range of areas for the development of renewable energy projects in Hungary. Eligible costs include those for site preparation, project management, services and assets, with the grant amount capped at HUF 1 billion, or 60 per cent of project costs—whichever is smaller. Biomass, waste, biogas, geothermal, solar PV and solar thermal projects are all eligible for grants.³

In 2010, the government started the Green Investment Scheme (GIS), which is funded from the sale of ETS emissions allowances, and which offers grants to homeowners and businesses to install small-scale renewable energy systems. In 2011, the government announced that it would introduce an agricultural energy programme that would help develop the biomass industry.⁴

³ Government of the Republic of Hungary, *Environment and Energy Operational Plan (KEOP) 2007-2013*. Available at <nfu.hu/download/1783/KEOP_070628_ENG.pdf>.

⁴ Hungary's RE Utilisation Action Plan on Trends in the Use of RE Sources until 2020, December 2010. Available at <ec.europa.eu/energy/renewables/>.

Chapter 13: Iceland

13.1 Government Targets

Under the Kyoto Protocol, Iceland is committed to limit the increase of average emissions between 2008 and 2012 to 10 per cent from 1990 base levels. In 2008, GHG emission levels were 43 per cent higher than the 1990 base year.¹ Under the Copenhagen Accord, the country has a target to reduce emissions by 15 per cent from 1990 levels by 2020. The government has a target to reduce emissions by between 50 and 75 per cent from 1990 levels by 2050. Due to the fact that approximately 80 per cent of primary energy consumed comes from hydro and geothermal energy, and that almost all electricity generated comes from renewable energy (RE) sources, the Icelandic government does not have renewable energy or electricity targets.²

Table 13.1: Icelandic government commitment summary

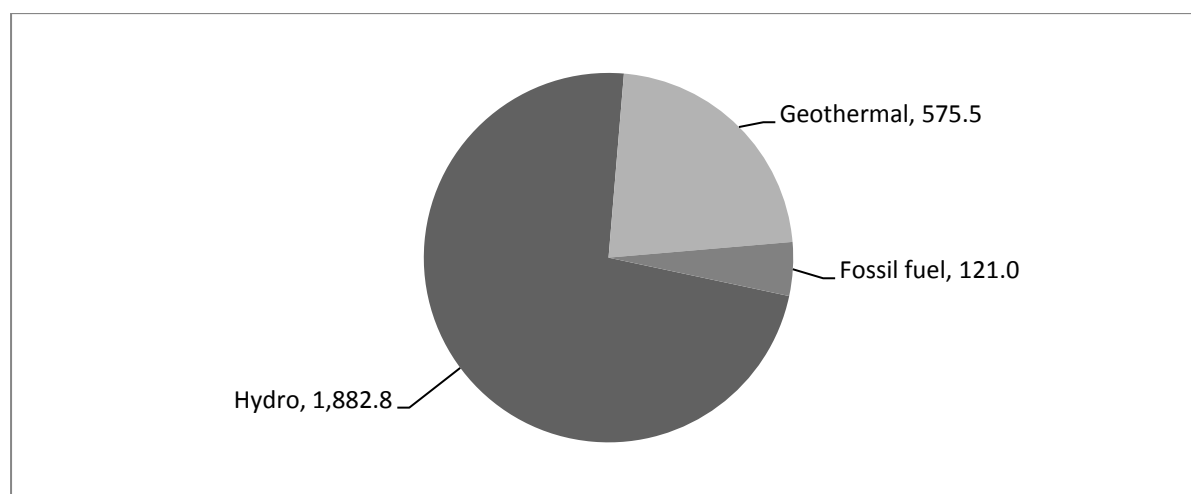
GHG emissions	A Kyoto Protocol target of limiting the increase of average emissions between 2008 and 2012 to 10 per cent from 1990 base levels. A Copenhagen Accord reduction target of 15 per cent from 1990 levels by 2020. A government target for a 50-75 per cent reduction from 1990 levels by 2050.
Renewable energy (RE)	No target set.
Renewable electricity	No target set.

Source: Ministry of Environment, Iceland's Target under the Copenhagen Accord, February 2010. Available at <unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/icelandcphaccord_app1.pdf>; Ministry of Environment, 2010 Report to the UNFCCC. Available at <unfccc.int/resource/docs/natc/isl_nc5_resubmit.pdf>.

13.2 Electricity Generation Mix

All grid-connected generation capacity in Iceland is powered by hydroelectric or geothermal sources. A few small-scale diesel generators exist but are typically used only for emergency generation or on the non-grid-connected islands of Grimsey or Flatey.

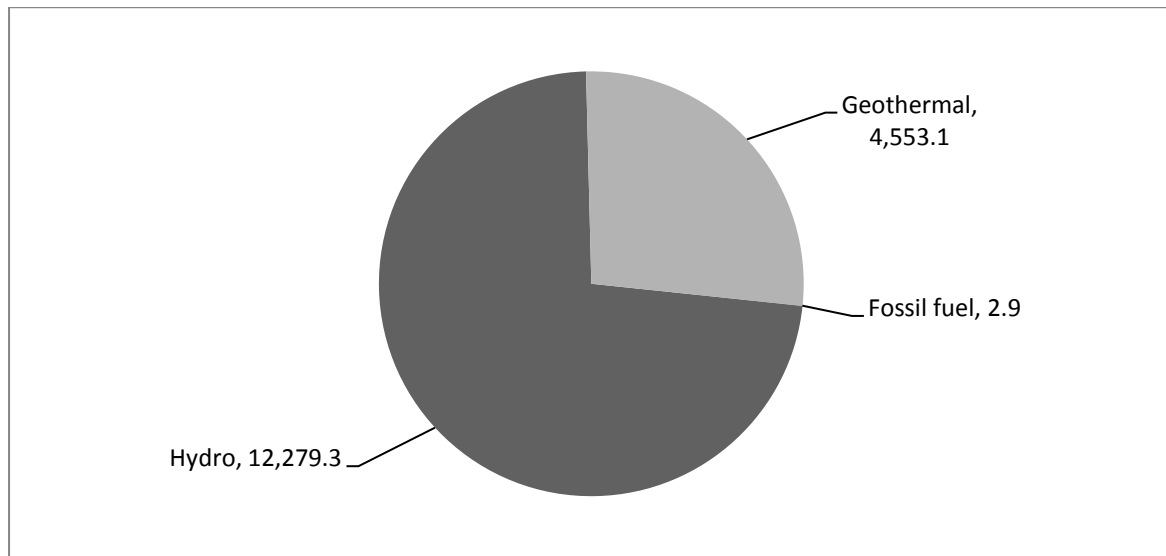
Figure 13.1: Total installed generating capacity in Iceland in 2009 (MW): 2,579.3 MW



Source: Statistics Iceland, Energy. Available at <www.statice.is>.

¹ Statistics Iceland, Emissions. Available at <www.statice.is>.

² Ministry of Environment, 2010 Report to the UNFCCC. Available at <unfccc.int>.

Figure 13.2: Electricity generation mix in Iceland in 2009 (GWh): Total 16,835.3 GWh

Source: Statistics Iceland, Energy. Available at <www.statice.is>.

13.3 Operating and Investment Support Incentives

Since the electricity generated in the country is almost entirely based on renewable sources, there is little need to promote renewable electricity and no incentive schemes exist. In an attempt to reduce emissions, the government is in the process of introducing a carbon tax, joining the EU ETS, and improving land-use and forestry.³

³ Ministry of Environment, Aðgerðaaætlun í loftslagsmálum (Climate Action), October 2010. Available at <www.umhverfisraduneyti.is/media/PDF_skrar/Adgerdaaetlun-i-loftslagsmalum.pdf>.

Chapter 14: Ireland

14.1 Government Targets

Under the Kyoto Protocol, Ireland is committed to limit the increase of average emissions between 2008 and 2012 to 13 per cent from 1990 base levels. In 2009, GHG emission levels were 12.2 per cent higher than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 20 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Ireland also has an EU target of meeting 16 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 3.8 per cent of final energy consumption was met with renewable energy sources. The Irish National Renewable Energy Action Plan has a target of satisfying 40 per cent of total electricity consumption with renewable electricity by 2020. In 2009, 14.4 per cent of electricity generated came from renewable sources.¹

Table 14.1: Irish government commitment summary

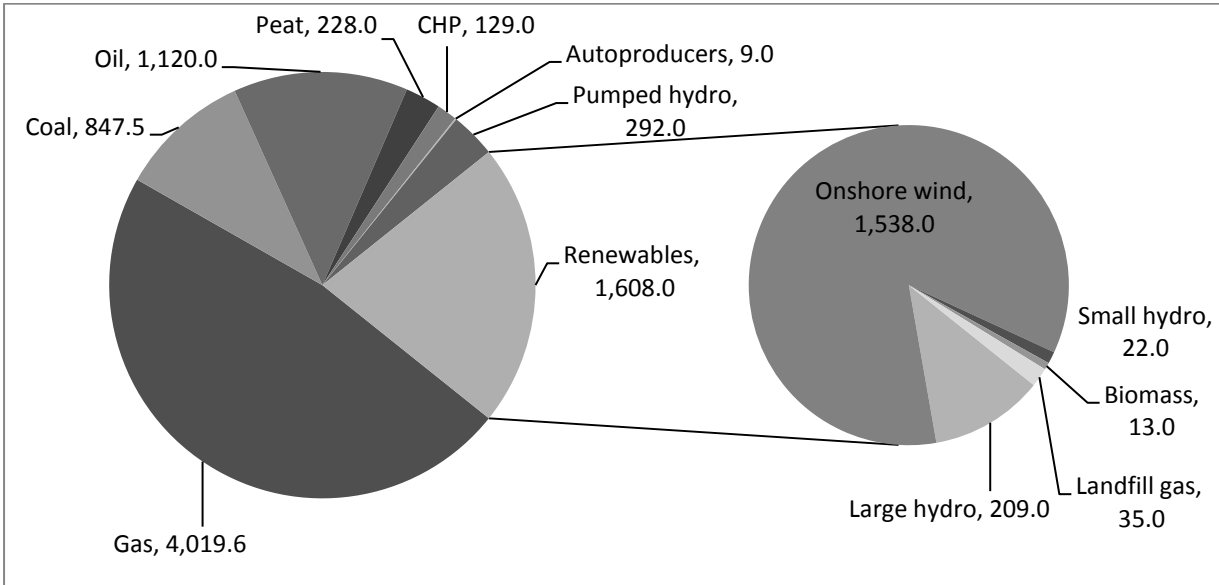
GHG emissions	A Kyoto Protocol burden-sharing target of limiting the increase of average emissions between 2008 and 2012 to 13 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 20 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme (ETS).
Renewable energy (RE)	An EU target for 16 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A government target for 40 per cent of electricity consumption from RE by 2020. <ul style="list-style-type: none"> • 500 MW installed capacity of tidal electricity by 2020 • To convert three state-owned peat power stations to use renewable biomass for 30 per cent of total fuel use by 2015 • 800 MW of CHP installed by 2020, with emphasis on biomass CHP.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

¹ Department of Energy, Communications and Natural Resources, National Renewable Energy Action Plan. Available at <www.dcenr.gov.ie>.

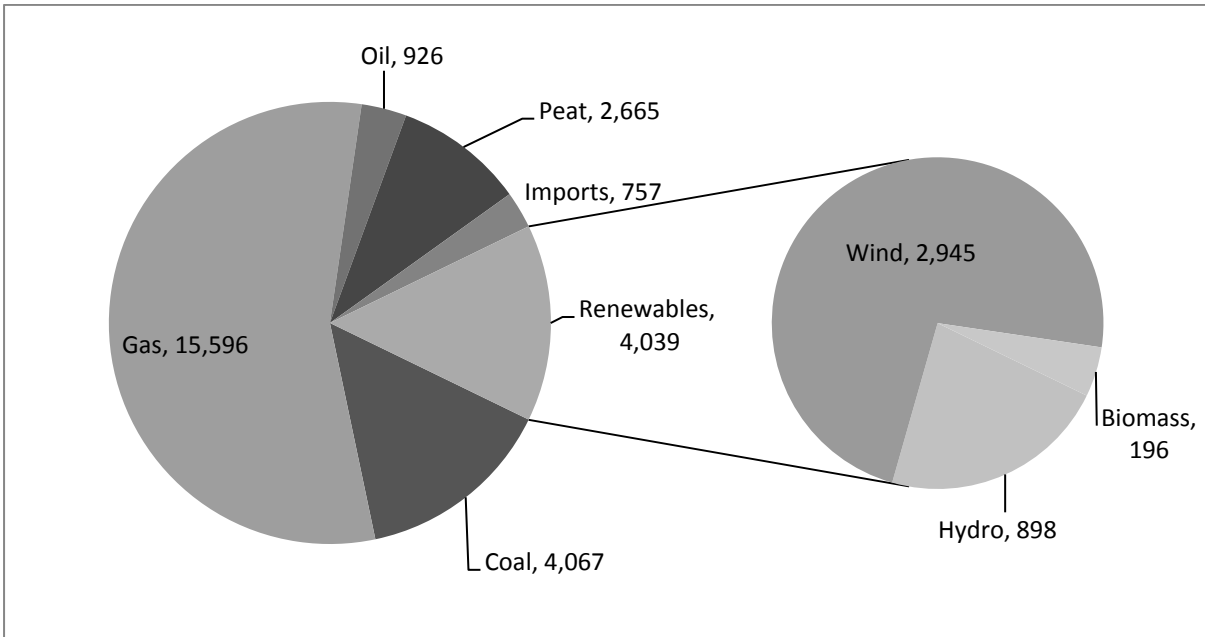
14.2 Electricity Generation Mix

Figure 14.1: Total installed generating capacity in Ireland in 2010 (MW): 8,462.1 MW



Source: EirGrid, Generation Capacity Statement 2011-2020. Available at <www.eirgrid.com>.

Figure 14.2: Electricity generation mix in Ireland in 2009 (GWh): Total 28,050 GWh



Source: Sustainable Energy Authority of Ireland, Renewable Energy 2010 Update. Available at <www.seai.ie/Publications/Statistics_Publications/SEI_Renewable_Energy_2010_Update/>.

14.3 Operating Support Incentives

Between 1995 and 2003, a tender scheme called the Alternative Energy Requirement (AER), was the primary support mechanism used in Ireland. In 2006, the government switched to a feed-in tariff (FIT) system called the Renewable Energy Feed-in Tariff (RE-FIT), which is operated by the Department of Communications, Marine and Natural Resources.

The RE-FIT is a scheme which aims to make power purchase agreements (PPAs) between electricity suppliers and renewable power producers more attractive by compensating the supplier for the higher price of the renewable power they purchased. It differs from other FITs as the supplier of renewable electricity, not the producer, receives compensation from the scheme.

Responsibility for calculating RE-FIT tariff rates lies with the Commission for Energy Regulation, which uses two criteria to set rates for different types of renewable generation: opportunity cost and technology cost. The former component is calculated using the difference between the cost per MWh of generation from a reference wind farm, and a benchmark price of purchasing electricity on the Irish Single Electricity Market. The technology cost component is a payment which aims to reflect the differing costs of generation from technologies other than wind. RE-FIT rates for 2011 are given in Table 14.2. These rates are received by suppliers for 15 years from the signing of the PPA, and are index-linked to the Irish Consumer Price Index. RE-FIT payments are not extended after 2030 under current legislation.²

Table 14.2: Reference prices for renewable electricity generation in Ireland in 2011

Category	EUR/MWh
Large-scale wind (> 5 MW)	66.353
Small-scale wind (\leq 5 MW)	68.681
Offshore wind	162.972
Hydro (< 5 MW)	83.814
Marine (wave and tidal)	220
Biomass combustion (including co-firing)	85
Biomass combustion (including co-firing) with energy crops	95
Biomass with CHP \leq 1,500 kW	140
Biomass with CHP > 1,500 kW	120
Anaerobic digestion without CHP \leq 500 kW	110
Anaerobic digestion without CHP > 500 kW	100
Anaerobic digestion with CHP \leq 500 kW	150
Anaerobic digestion with CHP > 500 kW	130

Sources: DCENR, Electricity from REFIT. Available at www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/Electricity+from+Renewables+inc+REFIT+and+AER.htm.

14.4 Investment Support Incentives

The Sustainable Energy Authority of Ireland piloted its Sustainable Energy Incubator programme in 2007. The fund pays for course fees at one of Ireland's accredited business incubation centres. Up to two years' financial support for the payment of fees is available (up to a maximum of EUR 10,000 in the first year and EUR 5,000 in the second). Additional grant support for supplementary business support (e.g. management development and business networking) is available on a discretionary basis, but this support is capped at a maximum of EUR 8,000 and EUR 4,000 for management development activities in years one and two, respectively, and EUR 2,000 and EUR 1,000 for business networking in years one and two. Total grant funding cannot exceed EUR 22,000 in any given year. The next invitation for funding applications is due to be issued in 2012.³

² Energy Ireland, Energy Yearbook 2010. Available at www.mop.ie/publications/Revisiting-RE-FIT.htm.

³ Sustainable Energy Ireland, Incubator Programme. Available at www.seai.ie/Grants/Sustainable_Energy_Incubator_Programme/.

The Combined Heat and Power (CHP) Deployment programme provides assistance to small (< 1 MW) fossil fuel- and biomass-fired CHP systems, and provides support for feasibility studies and investments. Up to 40 per cent of eligible feasibility study costs and 30 per cent of the investment outlay can be covered by the scheme.⁴

⁴ Sustainable Energy Ireland, CHP Deployment Programme. Available at <www.seai.ie/Grants/CHP>.

Chapter 15: Italy

15.1 Government Targets

Under the Kyoto Protocol, Italy is committed to reduce average emissions between 2008 and 2012 by 6.5 per cent from 1990 base levels. In 2009, GHG emission levels were 5 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 13 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Italy also has an EU target of meeting 17 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 6.8 per cent of final energy consumption was met with renewable energy sources.¹

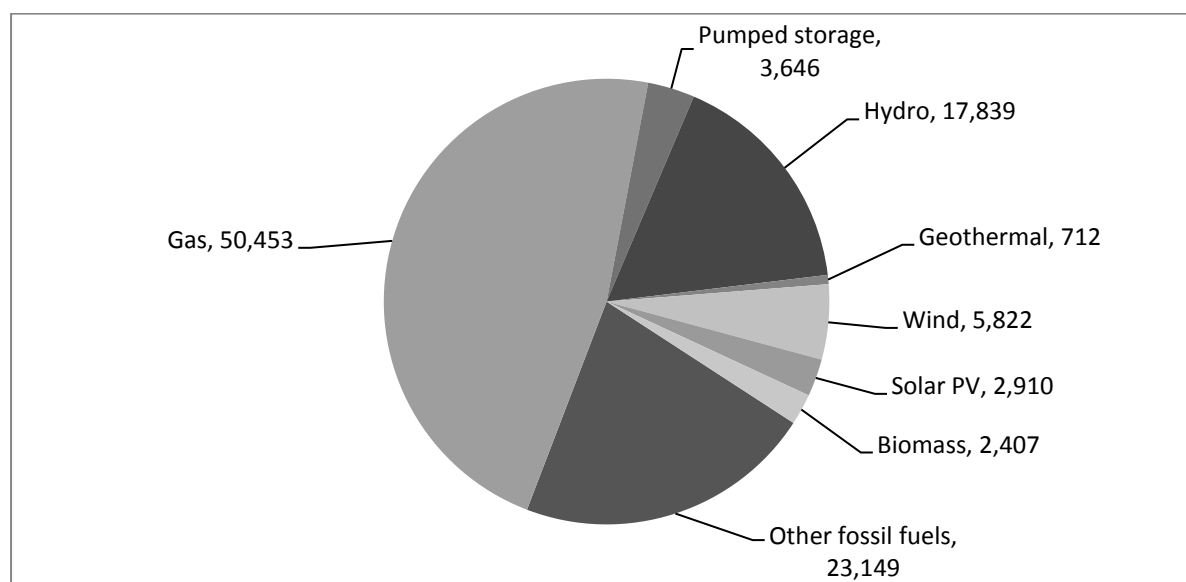
Table 15.1: Italian government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 6.5 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 13 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 17 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	No target set.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

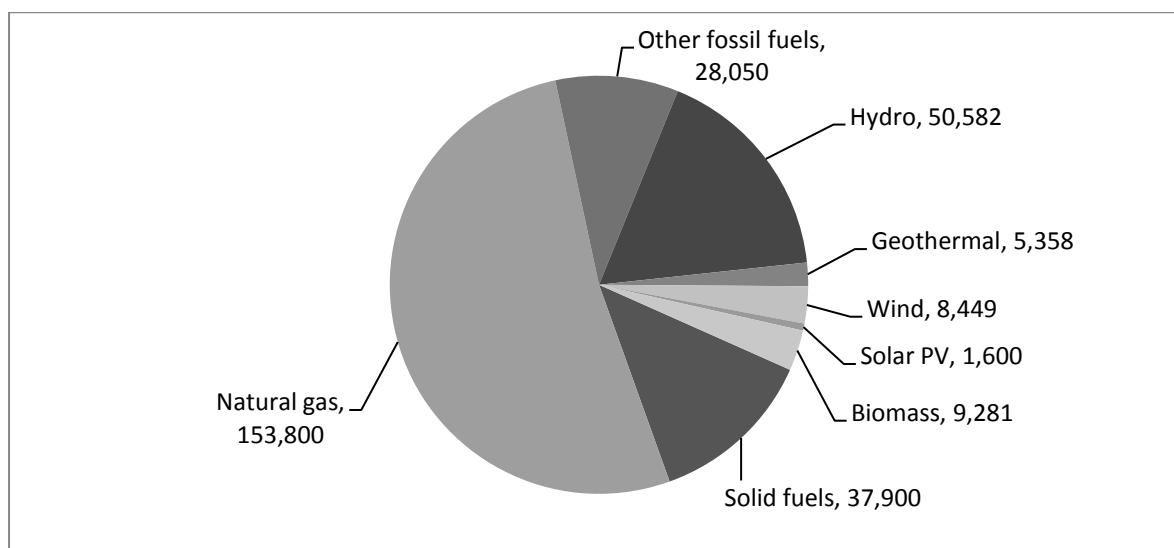
15.2 Electricity Generation Mix

Figure 15.1: Total installed generating capacity in Italy in 2010 (MW): 106,938 MW



Source: Terna, Dati Statistici Sull'energia Elettrica in Italia 2010: Quadro di sintesi al 11 marzo 2011. Available at <www.terna.it/LinkClick.aspx?fileticket=zuvz3fV0FiQ%3d&tabid=649>.

¹ Eurostat, Share of Renewable Energy in Gross Final Energy Consumption. Available at <epp.eurostat.ec.europa.eu>.

Figure 15.2: Electricity generation mix in Italy in 2010 (GWh): Total 295,020 GWh

Source: Terna, Dati Statistici Sull'energia Elettrica in Italia 2010: Quadro di sintesi al 11 marzo 2011. Available at <www.terna.it/LinkClick.aspx?fileticket=zuvz3fV0FiQ%3d&tabid=649>.

15.3 Operating Support Incentives

The Italian government's main policy instrument for supporting renewable power development is a tradable green certificate (TGC) scheme. The government also offers a combination of fixed premiums and feed-in tariffs for solar power and other renewable projects with a capacity of less than 1 MW.²

Renewable power plants cannot receive operating support incentives if they have received investment support from national or regional governments, or from international organisations. Exceptions are made for plants that use local biomass and microgenerators, which can then receive incentives for up to 40 per cent of total investment cost in addition to the operating incentives.³

15.3.1 Tradable Green Certificates

Since 2002, all generators and importers of electricity over 100,000 MWh per year have been obliged to present a number of TGCs equivalent to a percentage share of their sales volume. This was set at 3.8 per cent in 2008 and will increase annually by 0.75 per cent until it reaches 7.55 per cent in 2012. In 2011, the quota was 6.80 per cent.

All renewable power plants commissioned after 2002 (or those refitted with new generation machinery after 1999) are eligible to receive TGCs for the renewable electricity they generate. The eligibility period is 12 years if they entered into operation before 31 December 2007, and 15 years if they entered into operation thereafter.⁴ Generators were originally awarded one certificate for every 50 MWh of renewable electricity they generated; however, from 31 December 2007, generators received TGCs based on technology banding per MWh (see

² Ministry of Environment, Renewables and the Market. Available at <www.minambiente.it/opencms/export/sites/default/archivio/biblioteca/fonti_rinnovabili_e_mercato.pdf>.

³ Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (legge finanziaria 2008), Federal Budget 2008, articles 144-157. Available at <tesoro.it/web/apri.asp?idDoc=18666>.

⁴ Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (legge finanziaria 2008), Federal Budget 2008, articles 144-157. Available at <tesoro.it/web/apri.asp?idDoc=18666>.

Table 15.2). For example, every MWh from onshore wind power generation is eligible for one TGC; whereas every MWh generated with landfill gas is eligible only for 0.8 TGCs.

The 2008 Italian Budget Law⁵ introduced a requirement obliging the energy regulator, the *Gestore Servizi Energetici* (GSE), to buy TGCs at the average spot market price of the certificates over the previous three year period. The intended purpose of this measure was to create a price floor in the market for Italian TGCs that would reduce uncertainty and encourage investment in renewable energy.

Renewable electricity producers that wish to apply for support under the TGC system thus have two components to their compensation payments—the price of the TGCs which their installation creates, and the price of the electricity which is sold to the grid. Renewable power generators sell their output through bilateral contracts or on the wholesale market. In 2010, the average spot market price of Italian green certificates was EUR 83.55 (excluding VAT), and the average spot market price of electricity in Italy in 2010 was 64.12 EUR/MWh.⁶ These figures form the basis for estimates of total generation compensation in Table 15.2.

Small renewable power generators (≤ 1 MW) that are not part of the FIT system and receive TGCs for their output can sell their output either through bilateral contracts or through a system known as dedicated withdrawal (*Ritiro dedicato*), whereby the GSE purchases all output at annually set prices. For renewable power, the GSE purchases the power at higher tariff rates if the generator produces less than 2,000 MWh annually (see Table 15.3). If the generator produces more than 2,000 MWh, then only the wholesale market price is given.

In addition, GSE sells green certificates to companies that fail to meet their quota at EUR 180 each minus the average wholesale price of electricity of the previous year. In 2010, GSE was selling green certificates for EUR 112.82, which was EUR 29.27 above the average market price for TGCs.⁷

Table 15.2: Estimated total generation compensation for renewable electricity supported under the Italian TGC scheme in 2010

Category	Green certificates issued per MWh of output	Total compensation in EUR/MWh ^a
Onshore wind	1.0	147.67
Offshore wind	1.5	189.445
Geothermal	0.9	139.315
Wave and tidal	1.8	214.51
Hydro	1.0	147.67
Biomass and biogas from agricultural or forestry waste	1.8	214.51
Landfill or sewage gas	0.8	130.96
Other biomass or biogas	1.3	172.735

Notes: ^a Based on an average spot market price for green certificates of EUR 83.55 in 2010, and the average yearly spot market price of 64.12 EUR/MWh in 2010.

Source: Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (legge finanziaria 2008), Federal Budget 2008, articles 144–157. Available at <tesoro.it/web/apri.asp?idDoc=18666>.

⁵ Law no. 244 of December 24, 2007

⁶ The website of Gestore Mercati Energetici is available at <www.mercatoelettrico.org/En/Default.aspx>.

⁷ GSE, Certificati Verdi: Fissati, per l'Anno 2010, Il Prezzo Di Offerta Dei Cv Del Gse E Il Prezzo Di Ritiro Dei Cv Di Cui All'articolo 15, Comma 1 Del Dm 18/12/2008, 2010. Available at <www.gse.it/GSE%20Informa/Pagine/CERTIFICATIVERDIFISSATI.aspx>.

Table 15.3: Obligatory purchase price by the market operator for renewable power (≤ 1 MW) in Italy in 2011

Annual production	Purchase price (EUR/MWh)
≤ 500 MWh	103.4
500 to 1,000 MWh	87.20
1,000 to 2,000 MWh	76.20
$> 2,000$ MWh	Market price

Source: GSE, Ritiro dedicato dell'energia elettrica. Available at www.gse.it/ATTIVITA/RITIRO%20DEDICATO/Pagine/default.aspx.

15.3.2 Microgeneration Feed-in Tariff

Since 31 December 2007, the government has given renewable power microgenerators (installations with a total capacity of 1 kW to 50kW and wind power with a capacity of 1 kW to 200 kW) the choice of receiving either the TGCs or a special technology-based FIT (see Table 15.4). The incentives are given for 15 years and can be revised every three years by government decree. The FIT payments are made only for power exported to the grid.

Table 15.4: Feed-in tariff rates for renewable power microgeneration (1 kW - 1 MW) in Italy, effective from 1 January 2008 (EUR/MWh)

Category	FIT rate
Wind (1 - 200 kW)	300
Geothermal	200
Wave and tidal	340
Mini-hydro	220
Biomass, biogas and waste	280
Landfill and sewage gas	180

Source: Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (legge finanziaria 2008), Federal Budget 2008, articles 144–157. Available at tesoro.it/web/apri.asp?idDoc=18666.

15.3.3 Solar Power Operating Incentives

The 2007 *Conto Energia* scheme for solar-powered generation offers fixed FIT rates to solar PV installations, and premiums to concentrated solar-thermal power (CSP) installations. The scheme was changed in January 2008, August 2010, and most recently in May 2011. The FIT rates and the premiums are paid for 20 years from the commissioning date. The level of the incentives depends on the capacity of the installations and the technology used. The FIT is paid only for power exported to the grid.

In May 2011, the government made significant changes to the incentive system for solar PV. In addition to reducing the FIT rates by between 10 and 19 per cent, the national capacity cap was removed and instead a budgetary cap was introduced (see Table 15.5). From 2013, the system will be changed again so that power consumed onsite will qualify for a separate tariff. Tables 15.6 and 15.7 show the FIT rates for solar PV systems from June 2011 through to the first half of 2013, and Table 15.8 shows the FIT rates for new concentrated solar PV installations. Degression rates, which will apply from the second half of 2013, are shown in Table 15.9. The government expects to end the solar PV FIT system in 2016, believing that by then a grid parity will have been reached and incentives will no longer be required.

The FIT rates for building-integrated solar PV (BIPV) apply only to those installations of up to 5 MW. Installations of up to 5 MW that use new technologies (such as thin-film modules) also receive the BIPV tariff. Solar PV installations with capacity over 1 kW are eligible to receive the FIT rates.

Table 15.5: Budgetary cap and projected new capacity under the solar PV feed-in tariff in Italy from June 2011 to December 2016

Description	June-Dec 2011	January-June 2012	July-December 2012	2013-2016
Budgetary cap (EUR millions)	300	150	120	1,361
Projected new capacity (MW)	1,200	770	720	9,770

Source: Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

Table 15.6: Feed-in tariff rates for new solar PV installations in Italy from July 2011 to December 2012 (EUR/MWh)

Capacity (kW)	July-December 2011			January-June 2012			July-December 2012		
	BIPV ^a	BAPV	Other	BIPV	BAPV	Other	BIPV	BAPV	Other
1-3	427	387	344	418	274	240	410	252	221
3-20		356	319		247	219		227	202
20-200	388	338	306	380	233	206	373	214	189
200-1,000	359	325	291	352	224	172	345	202	155
1,000-5,000		314	277		182	156		164	140
> 5,000	N/A	299	264	N/A	171	148	N/A	154	133

Note: ^aThe use of innovative technology is also included.

Source: Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

Table 15.7: Feed-in tariff rates for new solar PV installations in Italy from January to June 2013 (EUR/MWh)

Capacity (kW)	BIPV ^a		BAPV		Other	
	Self-consumption	Exported to the grid	Self-consumption	Exported to the grid	Self-consumption	Exported to the grid
1-3	398	543	230	375	201	346
3-20			207	352	184	329
20-200	361	464	195	299	172	276
200-1,000	334	432	183	281	141	239
1,000-5,000			149	227	127	205
> 5,000	N/A	N/A	140	218	121	199

Note: ^aThe use of innovative technology is also included.

Source: Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

Table 15.8: Feed-in tariff rates for new concentrated solar PV installations in Italy from July 2011 to June 2013 (EUR/MWh)

Capacity (kW)	July-December 2011	January-June 2012	July-December 2012	January-June 2013	
				Own use	For grid
1-200	359	352	345	334	437
200-1,000	310	304	298	289	387
1,000-5,000	272	266	261	253	331

Source: Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

Table 15.9: Degression rate for new solar PV installations in Italy from January 2013 to December 2016

Year	BIPV and concentrated PV		BAPV and other	
	January-June	July-December	January-June	July-December
2013	N/A	3%	N/A	9%
2014	4%	4%	13%	13%
2015	TBD ^a	TBD	15%	15%
2016	TBD	TBD	30%	30%

Note: ^aTBD: To be determined. Degression rates for BIPV and concentrated solar PV from 2015 will be based on efficiency gains in the technology.

Source: Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

The FIT rates given are increased if the installation meets certain criteria. These increases are:

- Up to 30 per cent for roof-top systems when the building can show an improvement in energy efficiency
- 5 per cent, if the system is built on a contaminate industrial, mining or landfill site
- 5 per cent, for small ground-based systems owned by municipalities with a population under 5,000
- 50 EUR/MWh, if the system replaces a roof that contained asbestos
- 10 per cent, if 60 per cent of paid equipment costs were associated with equipment produced in the EU.⁸

There are limits to the quantity of capital grants a project can receive and still qualify for the FIT payments. New installations can receive the FIT payments as long as the project was not awarded capital grants for investment costs up to the following amounts:

- 30 per cent, for systems of up to 20 kW installed on buildings
- 60 per cent, for systems installed on public buildings
- 30 per cent, for systems installed on buildings owned by non-profit societies
- 30 per cent, for systems installed on contaminated land
- 30 per cent, for concentrated solar PV systems or installations using new technology.⁹

⁸ Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

⁹ Ministry of Economic Development, Decreto-legge 25 gennaio 2010, n. 3, convertito, con modificazioni, dalla legge 22 marzo 2010, n. 41. Available at www.sviluppoeconomico.gov.it/images/stories/normativa/DM_PV_firmato.pdf.

Solar thermal power installations commissioned after 18 July 2008 are eligible to receive a fixed premium for 25 years. This premium is based on the ratio of electricity produced by solar energy sources to non-solar energy sources in the installation (See Table 15.10). Starting in 2013, a 2 per cent degression rate will apply to the premium.

Table 15.10: Fixed premiums and estimated generation compensation for solar thermal power generation in Italy in 2011

Share of the solar fraction in generation	Premium (EUR/MWh)	Total compensation (EUR/MWh) ^a
> 85%	280	344.12
85% > 50%	250	314.12
< 50 %	220	284.12

Note: ^aBased on the premium plus the 2010 average spot market price of 64.12 EUR/MWh.

Source: Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (leg ge finanziaria 2008), Federal Budget 2008, articles 144–157. Available at <tesoro.it/web/apri.asp?idDoc=18666>.

15.4 Investment Support Incentives

An Interregional Operational Plan for Energy is in place to support investment in renewable energy in the following regions: Sicily, Calabria, Apulia, Campania, Basilicata, Molise, Abruzzo and Sardinia. The programme is jointly funded by the EU and the Italian government.¹⁰

Companies and individuals are allowed to deduct 55 per cent of expenses related to the installation of solar panels from their gross taxable income for accounting purposes, and the maximum deduction possible is EUR 60,000.¹¹

Residential building owners are entitled to a reduced property tax if they accommodate or utilize a renewable-energy based installation. The reduction amount varies between municipalities.¹² Some regional governments offer capital subsidies and other benefits for BIPV schemes.¹³

¹⁰ Ministry of the Environment, National Renewable Energy Strategy, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_italy_en.pdf>.

¹¹ Minambiente 2010. Available at <www.minambiente.it/opencms/export/sites/default/archivio/biblioteca/fonti_rinnovabili_e_mercato.pdf>.

¹² Disposizioni per la formazione del bilancio annual e pluriennale dello Stato (legge finanziaria 2008), Federal Budget 2008, Table 3. Available at <www.tesoro.it/web/apri.asp?idDoc=18666>.

¹³ Salvatore Castello, Anna De Lillo, et al. National Survey Report on PV Power Applications in Italy 2007, May 2008. Available at <www.iea-pvps.org/countries/download/nsr07/NSR IT 2007.pdf>.

Chapter 16: Japan

16.1 Government Targets

The Japanese ‘Law Concerning the Promotion of the Measures to Cope with Global Warming’ provides the framework for Japan’s renewable energy (RE) strategy.¹ Together with the Basic Policy on Economic and Fiscal Reform 2009, the law outlines initiatives to reduce GHG emissions and encourage greater use of power from renewable sources, keeping in line with Japan’s Kyoto Protocol and national commitments.²

Under the Kyoto Protocol, Japan is committed to reduce average emissions between 2008 and 2012 by 6.0 per cent from 1990 base levels. For the year 2009-10, GHG emission levels were 4.1 per cent lower than those in the 1990 base year.³ Under the Copenhagen Accord, the country has a target to reduce emissions by 25 per cent from 1990 levels by 2020, provided that an international agreement is reached among all Accord signatories. Outside of international negotiations, the government has its own target to reduce emissions by between 60 and 80 per cent from 1990 levels by 2050.⁴ The government also has a target of meeting 20 per cent of final energy consumption from renewable energy sources by 2020; and it has a target of including 16,000 GWh of renewable electricity in total electricity consumption by 2014 (excluding large hydropower) under the government’s Renewable Portfolio Standard.

Due to the large-scale earthquake and tsunami on 11 March 2011 and the subsequent closure of nuclear power plants, the Japanese Environment Minister has announced that the national emission target of 25 per cent and the national renewable target of 20 per cent will need to be reviewed.⁵

Table 16.1: Japanese government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 6.0 per cent from 1990 base levels. A Copenhagen Accord target for a 25 per cent reduction from 1990 levels by 2020, provided that an international agreement is reached, and a government target to reduce emissions by between 60 and 80 per cent from 1990 levels by 2050.
Renewable energy (RE)	A target for 20 per cent of final energy consumption to come from renewable sources by 2020; 50 per cent of new cars sold to be ‘Eco-Cars’ by 2020.
Renewable electricity	A target to include 16,000 GWh of renewable electricity in total electricity consumption (excluding large hydropower) by 2014 under the government’s Renewable Portfolio Standard.

Source: The Cabinet Office, Keizai Zaisei Kaikaku No Kihon Hoshin, 9 June 2009.

Available at <www.kantei.go.jp/jp/singi/keizai/kakugi/090623kettei.pdf>.

¹ EIC Net, Kaisei Chikyuu Ondanka Taisaku no Suishin ni Kansuru Houritsu (Partial Amendments to the Law Concerning the Promotion of the Measures to Cope with Global Warming), September 2003. Available at <www.eic.or.jp/ecoterm/?act=view&serial=3224>.

² Ministry of Environment, Law Concerning the Promotion of the Measures to Cope with Global Warning. Available at <www.env.go.jp/en/laws/global/warming.html>.

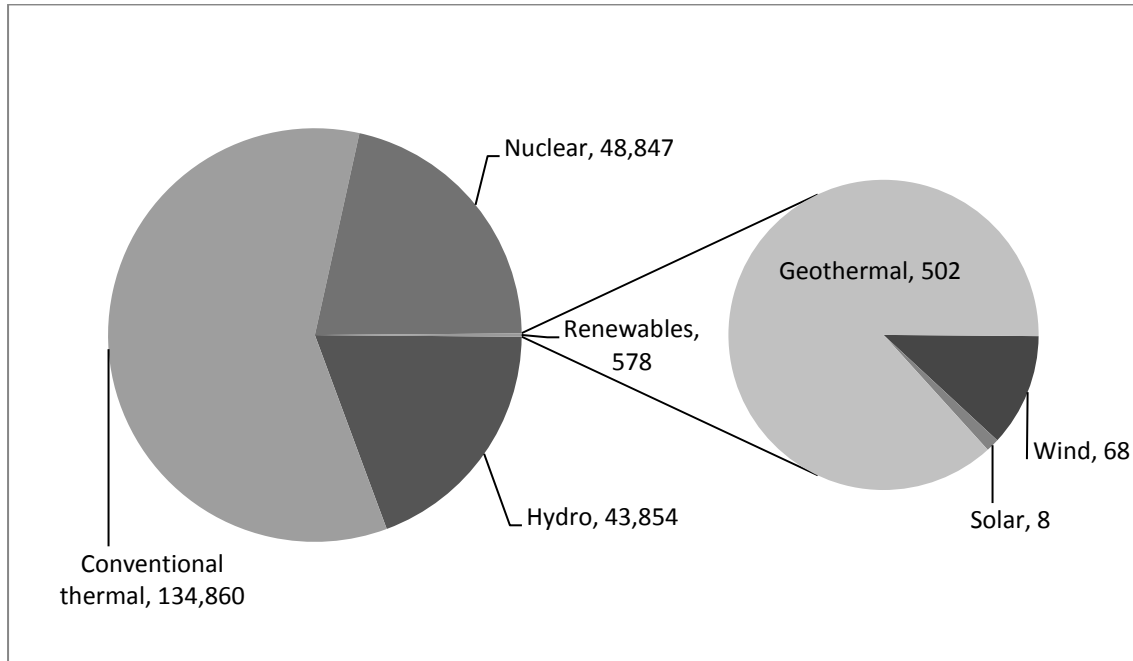
³ The dates refer to the financial year of 2009, starting 1 April 2009, and ending on 31 March 2010. Ministry of Environment, 2009 Nendo no Onshitsu Kouka Gasu no Haishutsuryou (Sokuhouchi). Available at <www.env.go.jp/earth/ondanka/ghg/2009sokuho_gaiyo.pdf>.

⁴ Japanese Embassy in Germany, Letter to the UNFCCC, 26 January 2010. Available at <unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/japanccphaccord_app1.pdf>.

⁵ Matsumoto Kankyoso mo Minaoshi Shisa, Onshitsu Kouka Gasu 25% Sakugen Mokuhyo, Asahi News, 5 April 2011. Available at <www.asahi.com/eco/TKY201104050191.html>.

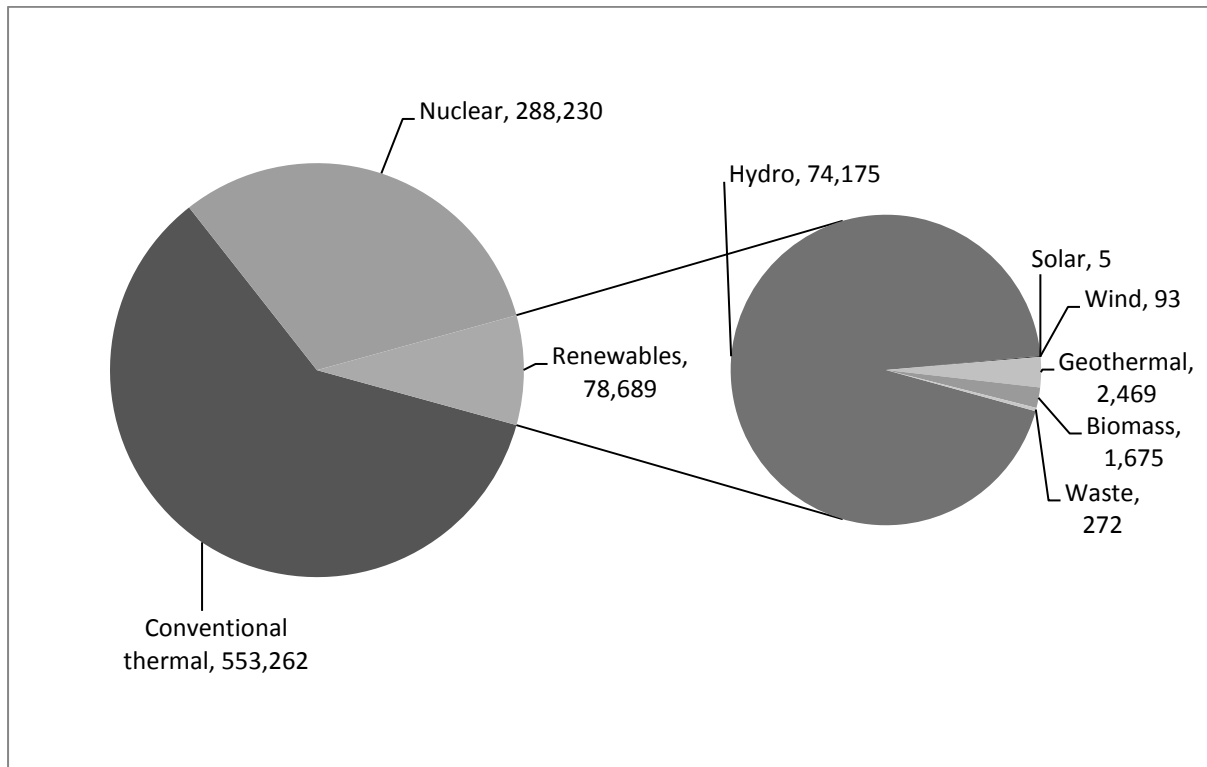
16.2 Electricity Generation Mix

Figure 16.1: Total installed generating capacity in Japan in December 2010 (MW): 228,264 MW



Source: METI, Heisei 22 Nen: Hatsudenjo Ninka Shutsuryoku Hyou (Certified Electricity Generation Output 2010). Available at <www.enecho.meti.go.jp/info/statistics/denryoku/result-2.htm>.

Figure 16.2: Electricity generation mix in Japan in 2010 (GWh): Total 920,181 GWh



Source: METI, Heisei 22 Nen: Hatsudenjo Ninka Shutsuryoku Hyou (Certified Electricity Generation Output 2010). Available at <www.enecho.meti.go.jp/info/statistics/denryoku/result-2.htm>.

16.3 Operating Support Incentives

The Japanese government administers two operating support incentives: a tradable green certificate (TGC) scheme called the Renewable Portfolio Standard (RPS), and a feed-in tariff (FIT) for solar PV.

16.3.1 Tradable Green Certificates

The RPS was launched in 2003. Under this scheme, renewable power facilities accredited by the Ministry of Economy, Trade and Industry (METI) receive TGCs, called New Energy Certificates (NECs), for their output. The renewable generation sources eligible to receive NECs are: solar power, wind power, biomass, small hydro (< 1 MW), and geothermal⁶

Demand for renewable electricity and NECs is created by a stipulation of the RPS law that obliges electricity suppliers (regional power utilities) to make up a percentage of their sales volume from renewable energy sources.⁷ The size of this percentage depends on the ratio of the government targets for renewable electricity consumption in the year concerned to the total volume of electricity consumed in the previous year. Government-set targets for renewable electricity consumption are given in Table 16.2. Total electricity supply in Japan in 2010 was 953,565 GWh. The 2011 quota obligation for electricity suppliers is therefore the ratio of the annual target for 2011 (13,150 GWh) to total electricity supply in 2010, which is 1.4 per cent.

Suppliers can fulfil their quota either by generating the renewable electricity themselves or purchasing NECs from another party. The deadline to demonstrate compliance is 1 June in any given year, and 20 per cent of the annual obligation can be transferred to the following year. Suppliers who fail to meet their obligation by the stated deadline will face fines of up to JPY 1 million (EUR 8,600⁸) by the Japanese Ministry of Economy, Trade, and Industry (METI). In 2010, utilities companies as a whole fell short of the national target by 755 MWh.

Table 16.2: Renewable electricity targets in Japan from 2010 to 2014

Year	Government target for renewable electricity consumption (GWh)
2010	12,200
2011	13,150
2012	14,100
2013	15,050
2014	16,000

Source: Government of Japan, The RPS law. Available at <www.rps.go.jp/RPS/new-contents/pdf/rpsjoubun.pdf>.

⁶ Agency for Natural Resources and Energy, 'Outline of RPS System'. Available at <www.rps.go.jp/RPS/new-contents/top/toplink-english.html>.

⁷ Government of Japan, The RPS law. Available at <www.rps.go.jp/RPS/new-contents/pdf/rpsjoubun.pdf>.

⁸ All conversions done at the rate of EUR 1 = JPY 116.24 (Average rate in 2010).

The quota of renewable power electricity that suppliers are required to meet under the Japanese TGC system is low compared to the quotas of other TGC systems, and the supply of certificates has consistently exceeded the amount required by quota obligations. For this reason, there is no spot market for NECs, and no readily-available pricing information. In 2004, just a year after the operation of RPS began, the supply of certificates exceeded the stated obligation by 57 per cent.⁹ To encourage the adoption of solar power, METI stated in 2010 that NECs from solar power would count as double in fulfilling energy suppliers' renewable energy quotas.¹⁰

16.3.2 Solar PV Feed-in Tariff

In November 2009, the government launched a solar PV-specific FIT system, which was modified in April 2011 (see Table 16.3).¹¹ The FIT rates are fixed for 10 years from the commissioning date of the installation, and since April 2011 the system has been funded by a surcharge paid by all electricity consumers.¹² The FIT rate varies depending on whether the installation is based solely on solar PV, or whether a small domestic natural gas-fired generator, known as an *Ene-Farm* or *Eco-Will*, was installed along with the solar PV generator, a system referred to as *Double Generation*.¹³ FIT rates for systems with capacities greater than 500 kW are negotiated between the generator and the regional power utility companies.

Table 16.3: Feed-in tariff rates for solar PV in Japan installed in 2011

Category	Capacity	FIT rate (JPY/MWh)	FIT rate (EUR/MWh)	Duration
Solar PV installed by households ^a	Up to 10 kW	42,000	361.32	10 years
	10 to 500 kW	40,000	344.12	
Double Generation installed by households ^a	Up to 10 kW	34,000	292.50	
	10 to 500 kW	32,000	275.29	
Solar PV installed by non-households	Up to 500 kW	40,000	344.12	
Double Generation installed by non-households	Up to 500 kW	32,000	275.29	

Note: ^aDefined as 'Houses lived in by family or individuals, including collective houses and houses also used as a commercial property'.

Source: Agency for Natural Resources and Energy, the Ministry of Economy, Trade and Industry, Kaitori Seido no Gaiyo. Available at <www.enecho.meti.go.jp/kaitori/2011april_kaisetsu.pdf>.

In August 2011, a new FIT law was passed to cover other renewable power technologies besides solar PV. The new law will come into effect from July 2012, and will require power utilities to purchase all power generated from renewable sources at set rates for 20 years. The government intends to set up an independent committee which will decide the FIT rates, and it is not known when the tariff rates will be finalised.¹⁴

⁹ Nihon No Saiseikanou Enerugi Poto Forio Kijyun Seido No Syoki Hyoka' Ritsumeikan Kokusai Kenkyu, Vol 19-2, October 2006. Available at <www.ritsumei.ac.jp/acd/cg/ir/college/bulletin/vol19-2/kimura.pdf>; Tetsuya Iida, Keisansyo RPS An no Mondai Ten To Arubeki Seisaku Syudan No Teian, Shizen Enerugi Suishin nettowa-ku. Available at <www.meti.go.jp/report/downloadfiles/g11219g01j.pdf>.

¹⁰ Government of Japan, The RPS law. Available at <www.rps.go.jp/RPS/new-contents/pdf/rpsjoubun.pdf>.

¹¹ Agency for Natural Resources and Energy, 'Taiyoko Hatsuden No Aratana Kaitori Saito.' (New buying system for Solar generation). Available at <www.enecho.meti.go.jp/kaitori/index.html>.

¹² Agency for Natural Resources and Energy, Taiyoko Hatsuden Sokushin Hukakin. Available at <www.enecho.meti.go.jp/kaitori/surcharge.html>.

¹³ Double Hatsuden. Available at <www.gas.city.sendai.jp/wizgas_house/w/w.html>.

¹⁴ Feed-in tariff law a boon to renewable energy markets, Asahi, 2 September 2011. Available at <www.asahi.com/english/TKY201109010284.html>; Ministry of Economy website.

16.4 Investment Support Incentives

Grant aid initiatives and tax breaks are periodically launched by NEDO (New Energy and Industrial Technology Development Organization), METI, the Ministry of the Environment and MAFF (the Ministry of Agriculture, Forestry and Fisheries).¹⁵ In 2011 there were four grant aid programmes, namely:

- *Shin Enerugi Tou Dounyuu Kasokuka Shien Taisakuhi Hojokin* ('Grant Aid for Measures to Accelerate the Introduction of New Energies')
- *Saisei Kanou Enerugi Netsu Riyou Kasokuka Shien Hojokin* ('Grant Aid for Measures to Accelerate the Use of Renewable Heat')
- *Jutakuyou Taiyoukou Hatsuden Dounyuu Shien Taisakuhi Hojokin* ('Grant Aid for Measures to Support the Introduction of Household Solar Generation')
- *Minseiyou Nenryo Denchi Dounyuu Shien Hojokin* ('Grant Aid to Support the Introduction of Fuel Cells for Private-Sector Use').¹⁶

The first two, 'Grant Aid for Measures to Accelerate the Introduction of New Energies' and 'Grant Aid for Measures to Accelerate the Use of Renewable Heat', are administered by the New Energy Promotion Council (NEPC). Under these programmes, public sector organisations can receive grants for up to half the total costs of installing renewable energy systems of up to 10 kW (maximum 400,000 JPY/kW). Private sector organisations can receive grants for up to a third of total costs of installing systems of over 50 kW (up to 250,000 JPY/kW and a maximum of JPY 1 million). The application period for both ended on 27 June 2011.¹⁷

The 'Grant Aid for Measures to Support the Introduction of Household Solar Generation' is administered by the Japan Photovoltaic Expansion Centre (J-PEC). Grants of 48,000 JPY/kW (413 EUR/kW) are awarded for systems with a capacity of up to 10 kW installed at residential properties. Systems with a capacity of over 10 kW are not eligible for this grant. The cost of the system must also be below JPY 600,000 (EUR 5,000), excluding installation costs. The programme will run until December 2011.¹⁸

The 'Grant Aid to Support the Introduction of Fuel Cells for Private-Sector Use' is administered by the Fuel Cell Association (FCA) and provides funding for the installation of new and innovative fuel cells. Applications for this grant aid will be accepted between 8 April 2011 and 31 January 2012. By 6 May 2011, 1,751 applications had been submitted. Grant aid is given for up to half the installation cost of the fuel cell, up to a maximum of JPY 1,050,000 (EUR 9,033). Grant aid is also provided for up to half the difference in equipment cost between qualified innovative fuels cells and conventional fuel cells.¹⁹

¹⁵ NEF, Bio-Nenryo no Ima (Bio Fuel Now). Available from <www.nef.or.jp/pamphlet/index.html>.

¹⁶ METI, Heisei 23 Nendo Shin Enerugi Tou Hukyu Sokushin Shisaku ni kakawaru Hojo Jigyousha no Koubo Kekka nit suite. Available at <www.enecho.meti.go.jp/info/tender/tenddata/1103/110308d/110308d.htm>.

¹⁷ Information from the NEPC website at <www.nepc.or.jp/>.

¹⁸ JPEC, Jutakuyou Taiyoukou Hatsuden Dounyuu Shien Taisakuhi Hojo Jigyo Seido ni Tsuite. Available at <www.j-pec.or.jp/subsidy_system/>.

¹⁹ FCA, "Heisei 23 Nendo Minseiyou Nenryo Denchi Dounyuu Shien Hojokin Seido no Gaiyo ni Tsuite" Available at <www.fca-enefarm.org/news20110304.html>. A list of eligible fuels cells is available at <www.fca-enefarm.org/subsidy/outline/page03.html>.

Chapter 17: Republic of Korea (South Korea)

17.1 Government Targets

South Korea is a signatory to the Kyoto Protocol; however, it is not an Annex 1 country and hence does not have specific GHG emissions reduction targets specified in the agreement. Under the Copenhagen Accord, the government set a target to reduce GHG emission levels by 30 per cent from 2009 'business-as-usual' (BAU) projections for emission levels in 2020. The government has targets to meet 11 per cent of primary energy consumption from renewable energy sources by 2030, and to meet 5 per cent of total electricity consumption from renewable energy sources by 2011, increasing to 10 per cent by 2022.

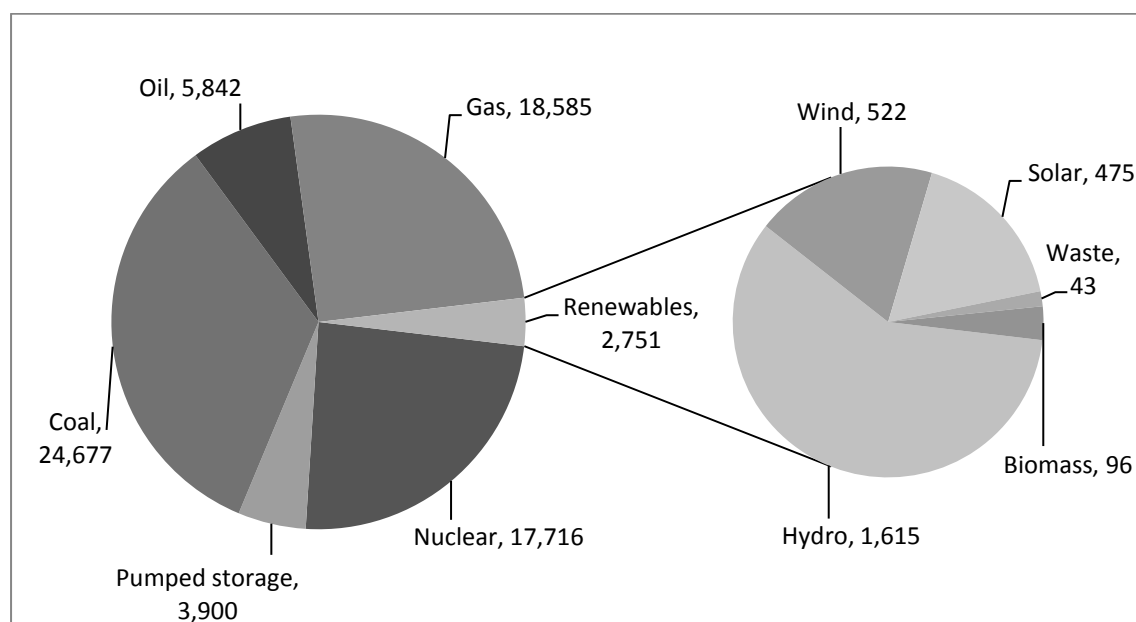
Table 17.1: The Republic of Korea government commitment summary

GHG emissions	A Copenhagen Accord target for a 30 per cent reduction from 2009 BAU projections for emission levels in 2020.
Renewable energy (RE)	A government target to secure 11 per cent of primary energy consumption from renewable sources by 2030.
Renewable electricity	A government target for 5 per cent of total electricity consumption to come from renewable sources by 2011, increasing to 10 per cent by 2022.

Source: Korean Ministry of the Environment. Available at <eng.me.go.kr>.

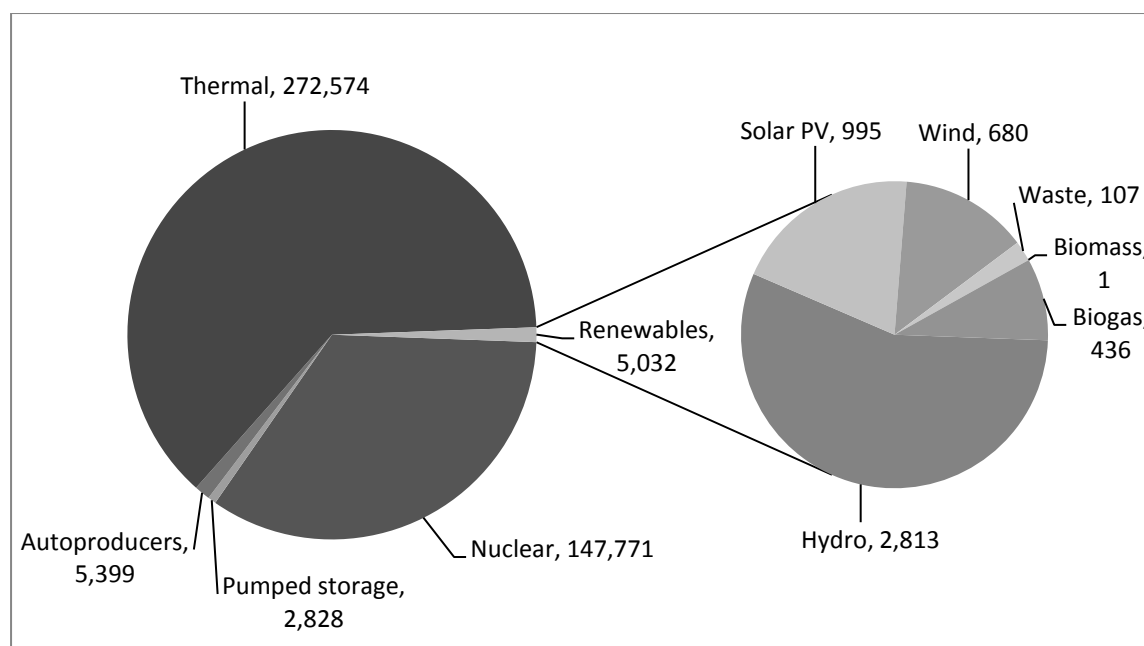
17.2 Electricity Generation Mix

Figure 17.1: Total installed generating capacity in the Republic of Korea in December 2009 (MW): 73,471 MW



Source: Adapted from Korea Energy Economics Institute, Year Book of Energy Statistics 210. Available at <www.keei.re.kr>; IEA, Renewables Information 2010.

**Figure 17.2: Electricity generation mix in the Republic of Korea in 2009 (GWh):
Total 433,604 GWh**



Source: Adapted from Korea Energy Economics Institute, Year Book of Energy Statistics 210. Available at <www.keei.re.kr>; IEA, Renewables Information 2010.

17.3 Operating Support Incentives

South Korea currently uses a feed-in tariff (FIT) system as outlined in the 2002 Electricity Business Law. This denotes a fixed price tariff for renewable electricity of varying sources. Renewable electricity generators sell their output on the Korean Power Exchange (KPX) and the government compensates eligible renewable power generators for any shortfall between the market price and the feed-in tariff. In 2006, the government set an upper threshold of support for electricity at 250 MW for wind and 20 MW for solar.¹ In 2012, the FIT system will be replaced with a tradable green certificate (TGC) system.

17.3.1 Feed-in Tariff

The government guarantees fixed rates for five years for small hydro, biomass and waste, and 15 years for wind power. Developers have a choice of receiving either 15 or 20 years of support for solar PV. The government controversially changed its tariff regime in 2009, reducing subsidies for large-scale solar PV, and capping feed-in tariff support at 50 MW in 2009, 70 MW in 2010, and 80 MW in 2011. From 2009, a degression rate of 4 per cent per annum was applied to the solar PV tariffs, and from 2010 a degression rate of 2 per cent per annum was applied to wind power.² Tables 17.2 to 17.3 show the FIT rates for renewable power in South Korea.

Given its replacement in January 2012 by a new TGC system, FIT regulators will stop accepting new applicants at the end of 2011.

¹ For more information see the Ministry of Knowledge Economy's website at <www.mke.go.kr>.

² IEA, Korea's Electricity Business Law. Available at <www.iea.org/textbase/pm/?mode=re&id=1686&action=detail>.

Table 17.2: Feed-in tariff rates for non-solar PV renewable power in the Republic of Korea in 2011

Category	Capacity	KRW/MWh	EUR/MWh ^a
Wind	> 10 kW	103,037	67.16
Small hydro	< 1 MW	94,640	61.69
	1-5 MW	86,040	56.08
Landfill gas	< 20 MW	74,990	48.88
	20-50 MW	68,070	44.37
Biogas	< 150 kW	85,710	55.87
	150 kW - 50 MW	72,730	47.41
Biomass	< 50 MW	68,990	44.97
Tidal	> 50 MW	90,500	58.99

Note: ^aThe KRW-EUR conversion rate used is EUR 1 = KRW 1,534.17 (the average in 2010).

Source: Renewable Energy Characteristics of the Korean Electricity Market, 2007. Available at <www.ieadsm.org/Files/Tasks/Task XVII - Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources/Seoul Workshop/Yun.pdf>.

Table 17.3: Feed-in tariff rates for solar PV generated electricity in the Republic of Korea in 2011 (KRW/MWh)

Commissioning date		Period (years)	Capacity				
			< 30 kW			> 30 kW	
Up to 30/09/2008		15	711,250			677,380	
01/10/2008-26/08/2009		Period	< 30 kW	30-200 kW	200 kW – 1 MW	1-3 MW	> 3 MW
		15	646,960	620,410	590,870	561,330	472,700
		20	589,640	562,840	536,040	509,240	428,830
From 26/08/2009 onwards	Ground-based	15	544,282	519,763	490,339	465,821	392,275
		20	493,766	471,523	444,835	422,592	355,872
	Building-attached	15	582,374	556,147	524,659	N/A	N/A
		20	528,326	504,528	475,978	N/A	N/A

Source: Renewable Energy Characteristics of the Korean Electricity Market, 2007. Available at <www.ieadsm.org/Files/Tasks/Task XVII - Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources/Seoul Workshop/Yun.pdf>.

Table 17.4: Feed-in tariff rates for solar PV generated electricity in the Republic of Korea in 2011 (EUR/MWh)

Commissioning date		Period (years)	Capacity				
			< 30 kW			> 30 kW	
Up to 30/09/2008		15	463.61			441.53	
01/10/2008-26/08/2009		Period	< 30 kW	30-200 kW	200 kW – 1 MW	1-3 MW	> 3 MW
		15	421.70	404.39	385.14	365.89	308.11
		20	384.34	366.87	349.40	331.93	279.52
From 26/08/2009 onwards	Ground-based	15	354.77	338.79	319.61	303.63	255.69
		20	321.85	307.35	289.95	275.45	231.96
	Building-attached	15	379.60	362.51	341.98	N/A	N/A
		20	344.37	328.86	310.25	N/A	N/A

Note: Currency converted by LRI.

Source: Renewable Energy Characteristics of the Korean Electricity Market, 2007. Available at <www.ieadsm.org/Files/Tasks/Task XVII - Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources/Seoul Workshop/Yun.pdf>.

17.3.2 Tradable Green Certificates

Under the new TGC system beginning in January 2012, all suppliers of electricity with a generating capacity of 500 MW are required to produce a minimum amount of renewable electricity that will increase from 2.0 per cent in 2012 to 10.0 per cent in 2022 (see Table 17.5). At these thresholds, thirteen companies will thus be required to submit TGCs to the energy regulator to fulfil their quota. In addition, these companies will have to install a minimum amount of solar PV capacity every year to reach a total of 1,200 MW by 2016 (see Table 17.6).

Table 17.5: Annual renewable power quota in the TGC system in the Republic of Korea

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Percentage	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0

Source: EPSIS, RPS to 10% by 2022. Available at <epsis.kpx.or.kr>.

Table 17.6: New solar PV capacity required under the TGC system in the Republic of Korea

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
New (MW)	200	220	240	260	280	0	0	0	0	0	0
Cumulative (MW)	200	420	660	920	1,200	1,200	1,200	1,200	1,200	1,200	1,200

Source: EPSIS, RPS to 10% by 2022. Available at <epsis.kpx.or.kr>.

The price of a TGC in January 2012 has been set by the government at 40 KRW/kWh (equivalent to 40,000 KRW/MWh, or 26.07 EUR/MWh), after which TGCs will then be traded on the open market. Technology banding is used to determine the amount of TGCs a generator receives for their output. Under this system, each type of generating technology will qualify for a certain number of TGCs per kWh of electricity supplied (see Table 17.7). For instance, onshore wind will receive 1 TGC per kWh generated while building-integrated PV (BPIV) will receive 2 TGCs per kWh generated. In addition to the price of the TGCs, generators will also receive the market price of electricity, which averaged at 66,470 KRW/MWh (43.33 EUR/MWh) in 2009.³ Details of the TGC system in South Korea will become available in late 2011.

Table 17.7: Technology bands for TGCs in the Republic of Korea

Technology		Band
Wind	Onshore	1.0
	Offshore	2.0
Biomass		1.0
Hydro		1.0
Tidal		1.0
Solar	On sites previously developed	0.7
	≤ 30 kW	1.2
	> 30 kW	1.0
	Building-integrated PV	2.0
Fuel cells		2.0

Source: Overview of New and Renewable Energy in Korea, June 2010. Available at <www.usea.org/Publications/Documents/fuel_cells_june_21_2010/USEA_POSCO_0621.pdf>.

³ Korea Energy Economics Institute, Year Book of Energy Statistics 2010. Available at <www.keei.re.kr>.

17.4 Investment Support Incentives

In October 2010, the government announced that a total of KRW 40 trillion (EUR 25 billion) would be invested in renewable energy production between 2010 and 2015 by both public and private sector organisations. This includes KRW 22 trillion to be invested by large industry. The government invested KRW 800 million (EUR 520,000) in 2010 and earmarked KRW 1 trillion (EUR 648 million) for 2011.

Companies receive a 5 per cent tax credit on their purchases of renewable energy production equipment. Import duties on equipment have been halved from 2009. The government also offers subsidies to local government of up to 60 per cent of the investment costs for renewable power installations.⁴ Low interest loans are available from Korean Energy Management Company (KEMCO), including a five-year grace period for payment followed by a ten-year repayment period.⁵

For microgeneration, the government has a 'One Million Green Home Programme' that provides grants for up to 60 per cent of capital costs for a single-family dwelling and up to 100 per cent for multi-family rental accommodation to install small-scale solar, wind and biomass. The government also provides funding for up to 60 per cent of capital costs for solar power systems with a capacity of up to 50 kW on public buildings.⁶ As part of a recent economic stimulus package, USD 7 billion in grants is to be provided for new technological developments in renewable energy.⁷

⁴ South Korea Pumps Up Support for Renewable Energy, Reuters, January 2011. Available at <www.reuters.com/article/2011/01/06/us-renewable-korea-idUSTRE7050M420110106>.

⁵ Young Il Choung, Quick Look: Renewable Energy Development in South Korea, Renewable Energy World, 28 December 2010. Available at <www.renewableenergyworld.com/rea/news/article/2010/12/quick-look-renewable-energy-development-in-south-korea>.

⁶ Kyung-Hoon Yoon, Korea Institute of Energy Research (KIER), National Survey Report of PV Power Applications in Korea, 2009, International Energy Agency Co-operative Programme on Photovoltaic Power Systems, May 2010. Available at <www.iea-pvps.org/countries/download/nsr09/NSR-Korea-2010.pdf>.

⁷ UNEP, Global Trends in Sustainable Energy Investment, 2009. Available at <www.unep.org/pdf/Global_trends_report_2009.pdf>.

Chapter 18: Luxembourg

18.1 Government Targets

Under the Kyoto Protocol, Luxembourg is committed to reduce average emissions between 2008 and 2012 by 28 per cent from 1990 base levels. In 2009, GHG emission levels were 11.3 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 20 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Luxembourg also has an EU target of meeting 11 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 2.1 per cent of final energy consumption was met with renewable energy sources.¹

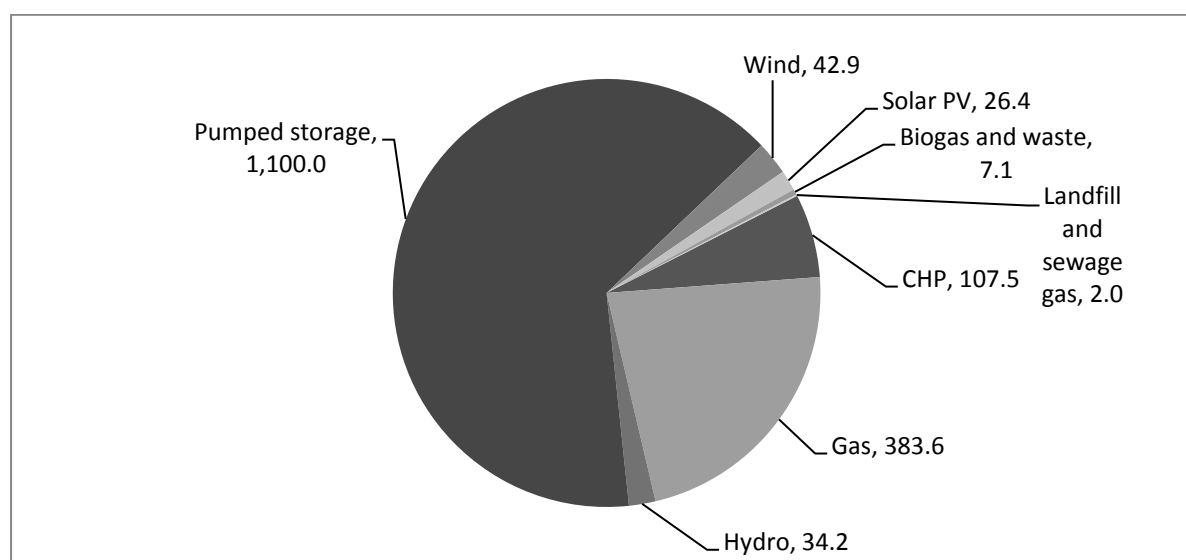
Table 18.1: Luxembourg government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 28 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 20 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 11 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	No target set.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

18.2 Electricity Generation Mix

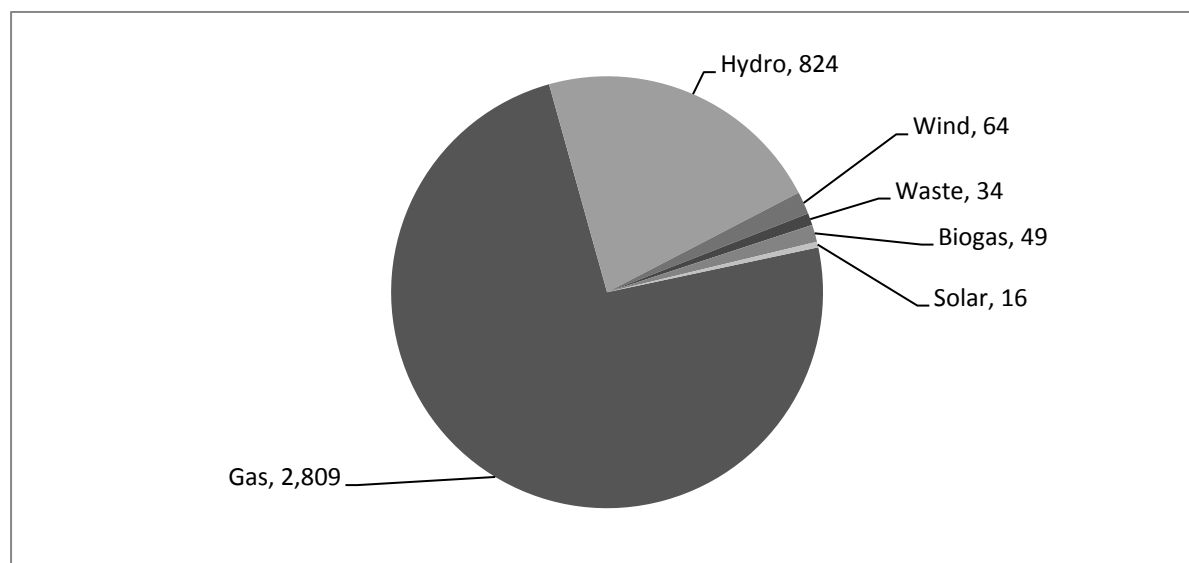
Figure 18.1: Total installed generating capacity in Luxembourg in 2009 (MW): 1,703.7 MW



Source: Ministre de l'Economie, Rapport de l'Institut Luxembourgeois de Régulation sur l'évolution des marchés de l'électricité et du gaz naturel au Grand-Duché du Luxembourg Année 2009, August 2010. Available at <www.energy-regulators.eu>.

¹ Eurostat, Share of Renewable Energy in Gross Final Energy Consumption. Available at <epp.eurostat.ec.europa.eu>.

**Figure 18.2: Electricity generation mix in Luxembourg in 2009 (GWh):
Total 3,796 GWh**



Source: ENTSO-E, Statistical Handbook 2009. Available at <www.entsoe.eu>; Creos, Annual Report 2009. Available at <www.creos-net.lu/index.php?id=253&0=>>.

18.3 Operating Support Incentives

Luxembourg uses a feed-in tariff (FIT) system as its operating incentive for renewable power. The tariffs are paid by Creos Luxembourg, which is the transmissions system operator (TSO) as well as the largest distribution systems operator (DSO) in Luxembourg. The FIT was changed in February 2008 with simpler administration, new tariff rates, and a 15-year guarantee (see Table 18.2). The new tariff rates apply to all projects that started after January 2008, and include an annual degression rate of 0.25 per cent for every technology except solar PV, which has a degression rate of 3 per cent.

Table 18.2: Feed-in tariff rates in Luxembourg in 2011

Category		EUR/MWh
Wind power		82.08
Solar PV	≤ 30 kW	382.20
	31 kW – 1,000 kW	336.70
Small hydro	≤ 1 MW	104.21
	1-6 MW	84.36
Biogas	≤ 150 kW	148.88
	151 kW – 300 kW	138.95
	301 kW – 500 kW	129.03
	501 kW – 2,500 kW	119.10
Sewage gas		64.51
Solid biomass	≤ 1 MW	143.91
	1-5 MW	124.06
Waste Wood	≤ 1 MW	129.03
	1-5 MW	109.18

Source: Règlement grand-ducal du 8 février 2008 relatif à la production d'électricité basée sur les sources d'énergie renouvelables. Available at <www.eco.public.lu/documentation/legislation/reglements/2008/02/energies.pdf>.

18.4 Investment Support Incentives

In January 2008, the Ministry of Environment announced a package of incentives aimed at encouraging the adoption of renewable energy by households and small businesses.

- For solar PV, grant aid for 30 per cent of installation costs is offered, with a ceiling of EUR 1,650 per kW of installed capacity
- For micro-cogeneration with a generating capacity of 1-6 kW, grant aid of 25 per cent of installation costs is available, up to EUR 3,000
- For households awarded grants for solar PV or micro-cogeneration units, an consulting fees subsidy of EUR 50 per hour, for up to a maximum of EUR 800 per individual residence.²

Investment grants of up to 45 per cent are available to companies investing in renewable power installations, including solar, wind, biomass and geothermal. Small- and medium-sized enterprises can receive grants for up to 55 and 65 per cent of investment costs. Grants are also available for up to 33 per cent of investment costs for biomass and biogas combined heat and power plants.³

² Ministry of the Environment, Aides Financiers. Available at www.environnement.public.lu/energies_renouvelables/publications/regime_aides_financieres_tc/brochure-subsidien-F-final.pdf.

³ Government of Luxembourg, Regime Environnement. Available at www.mcm.public.lu/fr/aides/regimes/environnement/index.html.

Chapter 19: Mexico

19.1 Government Targets

The government of Mexico ratified the Kyoto Protocol in 2000, but as a non-Annex I country has no GHG emissions targets under the treaty. Per the Copenhagen Accord, Mexico does have target for a 30 per cent reduction to 2020 ‘business-as-usual’ (BAU) emission level projections, with a further 50 per cent reduction by 2050 to corresponding BAU emission projections.¹ The government also has a target of 35 per cent of total generating capacity to be based on non-fossil fuel energy sources (including nuclear) by 2024,² compared to 26 per cent in 2010.

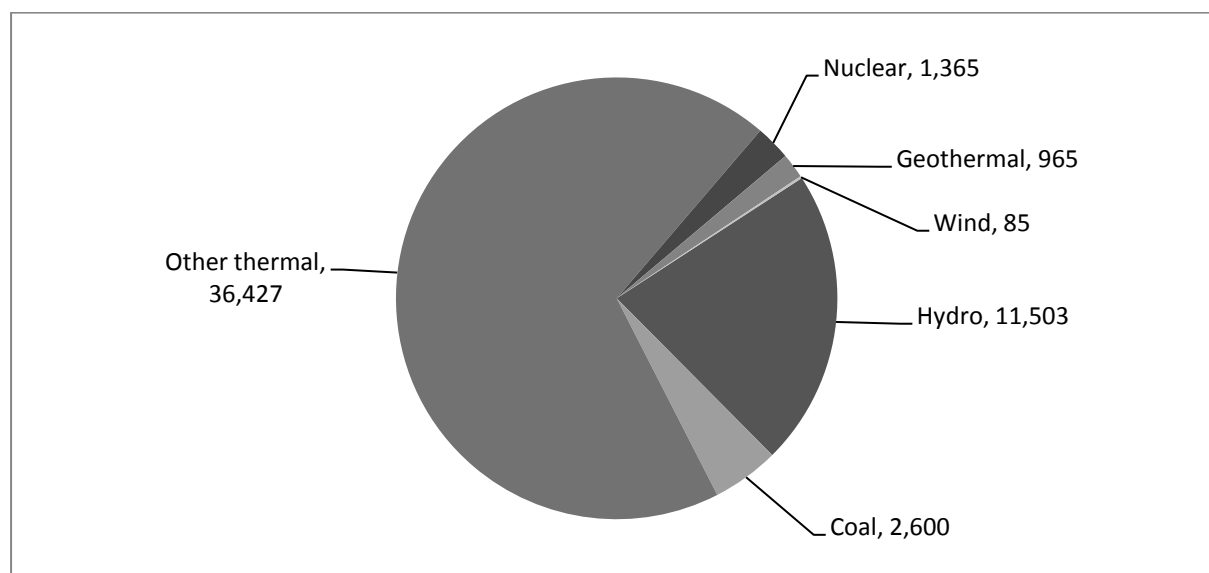
Table 19.1: Mexican government commitment summary

GHG emissions	A Copenhagen Accord reduction target of 30 per cent reduction compared to 2020 BAU projections, with a 50 per cent reduction to BAU projections for 2050.
Renewable energy (RE)	No target set.
Renewable electricity	A government target for 35 per cent of total generating capacity to be based on non-fossil fuel energy sources by 2024.

Source: Ministry of Energy, National Energy Strategy 2024, February 2010. Available at <www.sener.gob.mx/webSener/res/0/EstrategiaNacionaldeEnergia.pdf>; Mexico’s Letter to the UNFCCC, January 2010. Available at <unfccc.int/meetings/cop_15/copenhagen_accord/items/5265.php>.

19.2 Electricity Generation Mix

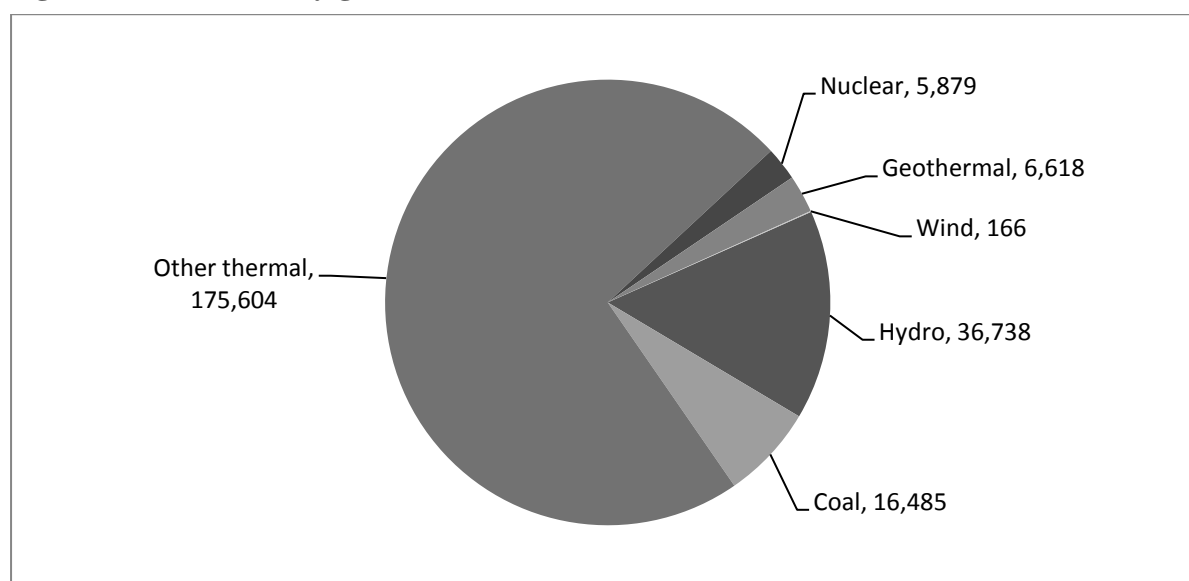
Figure 19.1: Total installed generating capacity in Mexico in 2009 (MW): 52,945 MW



Source: Ministry of Energy, SENER, Electricity Statistics. Available at <www.sener.gob.mx/>.

¹ Ministry of the Environment, Programa Especial de Cambio Climático 2009 – 2012, October 2009. Available at <www.semarnat.gob.mx/temas/cambioclimatico/Paginas/pecc.aspx>.

² Ministry of Energy, National Energy Strategy 2024, February 2010. Available at <www.sener.gob.mx/webSener/res/0/EstrategiaNacionaldeEnergia.pdf>.

Figure 19.2: Electricity generation mix in Mexico in 2010 (GWh): Total 241,491 GWh

Source: Ministry of Energy, SENER, Electricity Statistics. Available at www.sener.gob.mx/portal/Default.aspx?id=1430.

19.3 Operating Support Incentives

As of June 2011, there was no feed-in tariff system for renewable power in Mexico. Under the 2008 Law on the Use of Renewable Energy and the Financing of the Energy Transition (*Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento de la Transición Energética*), the federal government and the individual states are empowered to hold public tenders for renewable power development.³

In 2009, the state electricity corporation, *Comisión Federal de Electricidad* (CFE), launched two tenders for large wind power projects.⁴ The developers will receive a fixed premium for five years, paid for from a USD 25 million grant from the Global Environment Facility (GEF). One project, the 101.5-MW La Venta III windfarm, will receive a premium of 11 USD/MWh (8.28 EUR/MWh⁵) for five years above the purchase price of electricity agreed between the developers and the CFE by tender. However, the price at which the CFE will purchase power from the wind farm is not known.⁶ The *Comisión Reguladora de Energía* is the nationwide energy regulator.⁷

³ Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento de la Transición Energética, September 2008. Available at www.diputados.gob.mx/LeyesBiblio/pdf/LAERFTE.pdf.

⁴ Ministry of Energy, Renewable Energies for the Sustainable Development of Mexico, 2009. Available at www.sener.gob.mx/webSener/res/0/RE_for_Sustainable_Development_Mx_2009.pdf.

⁵ The USD-EUR conversion rate used is EUR 1 = USD 1.3278 (the average in 2010).

⁶ World Bank, Project Appraisal. Available at www.sener.gob.mx/webSener/res/PE_y_DT/pe/Mexico_GEF_LSRDP_PAD_7_June_20061.pdf.

⁷ See website at www.cre.gob.mx.

19.4 Investment Support Incentives

In 2009, the government created the Fund for Energy Transition and the Sustainable Use of Energy. The Fund, which is expected to start operating in late 2011, will provide loans or credit guarantees for projects that comply with the government's renewable energy and energy efficiency policy. Initially, USD 60 million will be allocated.⁸ In addition, accelerated depreciation (100 per cent in the first year) is offered for all investments in renewable energy equipment.⁹

Loans are available for renewable energy projects from international financial institutions. The Inter-American Development Bank has provided USD 101 million in loans for wind power development and has helped build partnerships between Mexico and foreign companies in the sector.¹⁰ In 2009, the World Bank authorised a USD 1,054 million 17-year Green Growth Development Loan to Mexico. The loan will be used by the Mexican government to finance low-carbon transportation and energy projects as well as energy efficiency improvements.¹¹ Mexico also received a USD 49.3 million loan from the Global Environment Facility (GEF) in May 2010 to construct a hybrid concentrated solar-thermal and natural gas-fired power plant, the Agua Prieta II thermo-solar hybrid power plant. Tenders are expected to be finalised in late 2011 and the plant should be completed in 2012.¹² Renewable energy projects in Mexico are also able to benefit from receiving Clean Development Mechanism (CDM) credits.¹³

⁸ World Bank, Framework for a Green Growth Development Loan, 16 September 2009. Available at <www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/10/16/000350881_20091016091956/Rendered/PDF/494910PGD0REVI101Official0Use0only1.pdf>.

⁹ Juan Mata, Mexico Large-Scale Renewable Energy Development Project, 2006. Available at <siteresources.worldbank.org/EXTENERGY/Resources/336805-1137702984816/2135734-1142019089614/JuanMata.ppt>.

¹⁰ IDB, IDB to Finance Historic Expansion of Wind Power in Mexico, December 2009. Available at <www.iadb.org/news-releases/2009-12/english/idb-to-finance-historic-expansion-of-wind-power-in-mexico--6118.html>.

¹¹ World Bank, Framework for a Green Growth Development Loan, 16 September 2009. Available at <www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/10/16/000350881_20091016091956/Rendered/PDF/494910PGD0REVI101Official0Use0only1.pdf>.

¹² World Bank, Hybrid Solar Thermal Plant. Available at <web.worldbank.org/external/projects/main?Projectid=P066426>.

¹³ See the UNFCCC website at <unfccc.int>.

Chapter 20: The Netherlands

20.1 Government Targets

Under the Kyoto Protocol, the Netherlands is committed to reduce average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. In 2009, GHG emission levels were 6.6 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 16 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The government has introduced its own target to reduce emissions by 30 per cent from 1990 levels by 2020. The Netherlands also has an EU target of meeting 14 per cent of final energy consumption from renewable energy sources by 2020. In 2010, 3.8 per cent of final energy consumption was met with renewable energy sources, down from 4.2 per cent in 2009. The government has introduced its own target of meeting 20 per cent of final energy consumption from renewable energy sources by 2020.¹

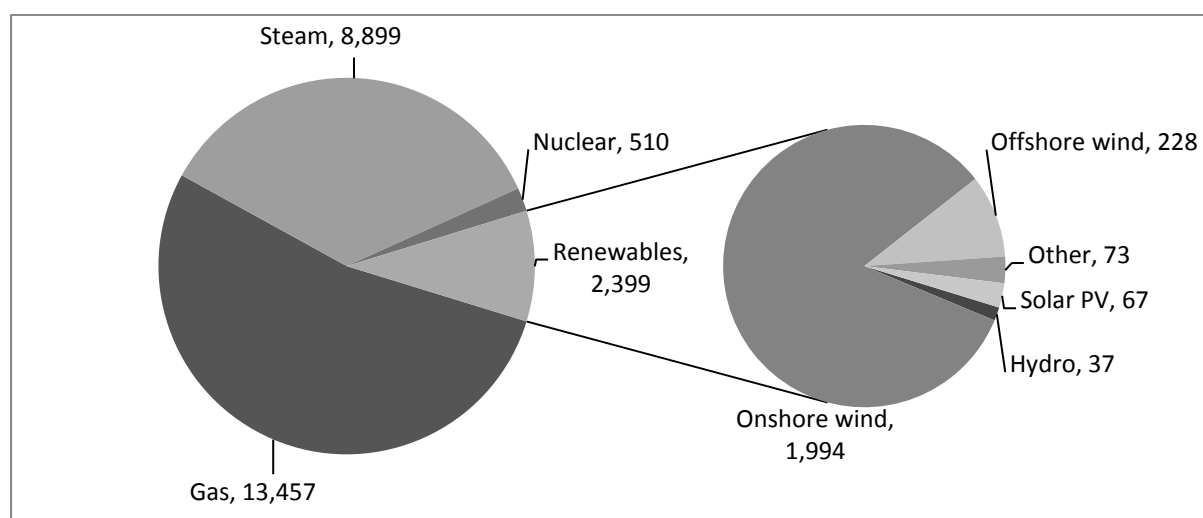
Table 20.1: The Netherlands government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 16 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The government's target is a 30 per cent reduction from 1990 levels by 2020.
Renewable energy (RE)	An EU target for 14 per cent of final energy consumption to come from renewable energy sources by 2020. A government target of 20 per cent by 2020.
Renewable electricity	No target set.

Source: Government of the Netherlands, Renewable Energy Action Plan, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>. Commission of the European Communities, Energy. Available at <www.energy.eu>.

20.2 Electricity Generation Mix

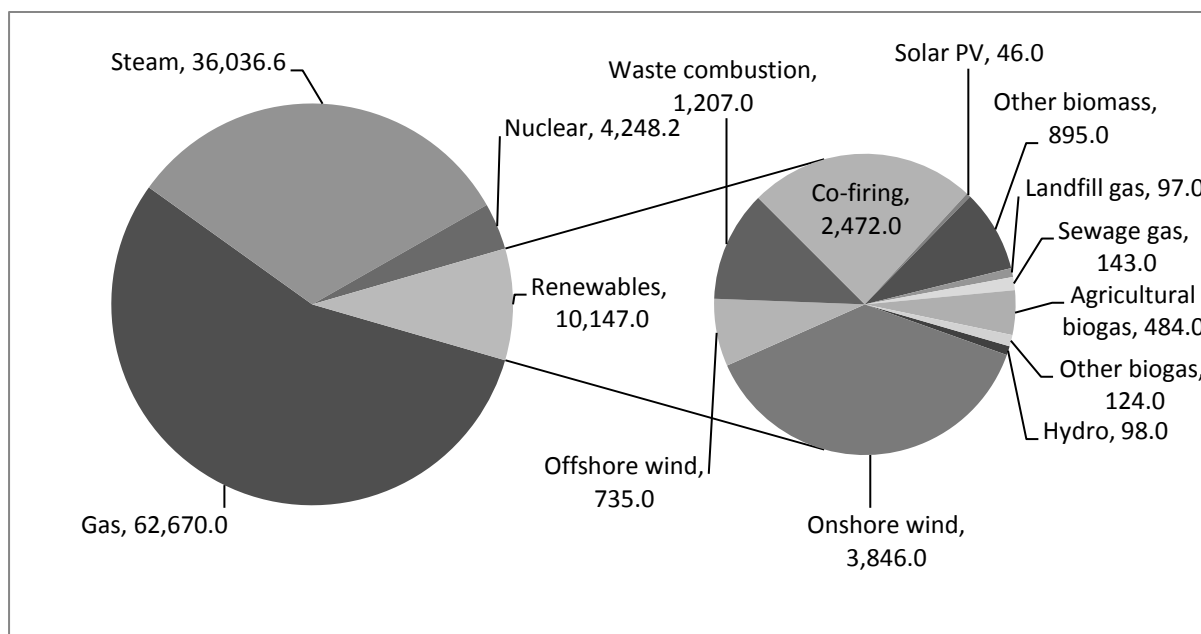
Figure 20.1: Total installed generating capacity in the Netherlands in 2009 (MW): 25,264 MW



Source: CBS Statline. Available at <statline.cbs.nl>.

¹ CBS, Aandeel hernieuwbare energie dealt, 27 April 2011. Available at <www.cbs.nl/nl-NL/menu/themas/industrie-energie/publicaties/artikelen/archief/2011/2011-3381-wm.htm>.

**Figure 20.2: Electricity generation mix in the Netherlands in 2009 (GWh):
Total 113,098.8 GWh**



Source: CBS Statline. Available at <statline.cbs.nl>.

20.3 Operating Support Incentives

In 2008, the government introduced the *Stimulerende Duurzame Energie* (Stimulation of Sustainable Energy, SDE), a variable premium, as the primary operating support incentive in the Netherlands. The SDE was cancelled on 1 January 2011, and a revised variable premium system, called the SDE+, was introduced in July 2011.

In variable premium systems like SDE+, the operating support given to the generator varies with the market price of electricity, so that the combination of the income from the sale of the electricity on the open wholesale market and the government's operating incentive equals a reference premium, called the 'basic amount' in the Netherlands. However, unlike the previous premium system, the revised SDE+ system does not have a set 'basic amount' based on generating technology. Instead, there will be a maximum 'basic amount' level of 150 EUR/MWh for all technologies and an annual budget cap for all new generators entering the SDE+ system.

In the revised SDE+ system, the government will hold four application openings a year for new generators. For each opening, there will be a maximum premium, starting at 90 EUR/MWh, and increasing each time until the final application opening has a maximum premium of 150 EUR/MWh (see Table 20.2). The project developer submits a proposal to the energy regulator that includes the amount of incentive required to develop the project. The developer can propose any premium level they believe is appropriate, as long as it is below or equal to the maximum premium for that opening. For some generating technologies, the government has set separate maximum premiums regardless of the round in which they apply (see Table 20.3). The premium will be available for up to 15 years. For solar PV systems, only installations over 15 kW can receive premiums.

In 2011, there will be a fixed annual budget of EUR 1.5 million for new renewable power developments. Proposals by new generators are accepted on a 'first-come, first-served' basis. Once the budget for 2011 is fully allocated, no new applications will be accepted until 2012. Support is also available for biogas projects to connect into the regular natural gas network.²

Table 20.2: Maximum 'basic amounts' and application openings under the SDE+ premium system in the Netherlands in 2011

Description	Application openings			
	One	Two	Three	Four
Maximum 'basic amount' for renewable power (EUR/MWh)	90	110	130	150
Opening of applications	1 July 2011	1 September 2011	1 October 2011	1 December 2011

Source: Ministry of Economic Affairs, Agriculture, and Innovation, Betreft Openstelling SDE+ 2011, 22 April 2011. Available at < www.agentschapnl.nl/nieuws/invulling-sde-2011-steeds-concreter>.

Table 20.3: Maximum 'basic amount' available in the SDE+ premium system for selected generating technologies in the Netherlands in 2011

Technology		Maximum 'basic amount'
Sewage and landfill gas		60
Onshore wind		96
Hydro	Fall < 5m	122
	Fall ≥ 5 m	71
Combined heat and power		96
Solid biomass combustion		122

Source: Ministry of Economic Affairs, Agriculture, and Innovation, Betreft Openstelling SDE+ 2011, 22 April 2011. Available at < www.agentschapnl.nl/nieuws/invulling-sde-2011-steeds-concreter>.

20.4 Investment Support Incentives

The Energy Investment Allowance (*Energie Investerings-Aftrek*, EIA) allows Dutch companies to deduct 41.5 per cent of their investment in RE equipment and sources from their before-tax operating profit for accounting purposes (capped at EUR 151 million a year in 2011). In order to qualify, companies have to make these investments from a list of government-approved products and technologies.³ The intent of this support mechanism is to encourage entrepreneurial activity in the RE sector. Five general categories of investments qualify for the EIA; these are:

- Energy-efficient buildings
- Energy-efficient equipment
- Renewable fuel transport
- Renewable electricity generation equipment
- Energy advice.⁴

Both the Environmental Investment Allowance (*Milieu-investeringsaftrek*, MIA) and the

² Ministry of Economic Affairs, Agriculture, and Innovation, Betreft Openstelling SDE+ 2011, 22 April 2011. Available at < www.agentschapnl.nl/nieuws/invulling-sde-2011-steeds-concreter>.

³ Agenschap NL, Energy Investment Allowance. Available at < www.agentschapnl.nl/nl/programmas-regelingen/energie-investeringsaftrek-eia>.

⁴ For more information, see *Energie Investerings-Aftrek*. Available at < regelingen.agentschapnl.nl/sites/default/files/bijlagen/Brochure%20Energie%20en%20bedrijven%202011.pdf>.

Random Depreciation of Environmental Investments (*Willekeurige afschrijving milieu-investeringen*, VAMIL) allow for tax depreciations on investments in renewable energy production and energy efficiency improvement. The MIA exempts up to 36 per cent of investment against taxable income. The VAMIL allows for a one-year, 75 per cent depreciation on investments made in renewable energy production and energy efficiency improvement. Both the MIA and the VAMIL can be used on the same investment.⁵

Grants and low-interest loans are available for homeowners under the Green Fund programme for energy efficiency improvements and equipment, and for renewable energy installations.⁶

⁵ Belastingdienst, Environmental investment (MIA) / Random depreciation of environmental investments (VAMIL). Available at <www.belastingdienst.nl/zakelijk/investeringsregelingen/investeringsregelingen-04.html#P92_7248>.

⁶ See website at <www.agentschapnl.nl/nl/programmas-regelingen/groen-beleggen-en-financieren>.

Chapter 21: New Zealand

21.1 Government Targets

Under the Kyoto Protocol, New Zealand is committed to maintain average emissions between 2008 and 2012 at 1990 base levels. In 2009, GHG emission levels were 19.4 per cent higher than the 1990 base year. Under the Copenhagen Accord, the country has a target to reduce emissions by between 10 and 20 per cent from 1990 levels by 2020. In 2011, the government introduced an additional national target to reduce emission levels by 50 per cent from 1990 base levels by 2050, as well as a goal to meet 90 per cent of total electricity generation from renewable sources by 2025.¹ In 2010, 74 per cent of total generation came from renewable energy sources. On 1 July 2010, the domestic power sector became part of the New Zealand's emissions trading scheme and is required to purchase emissions credits.²

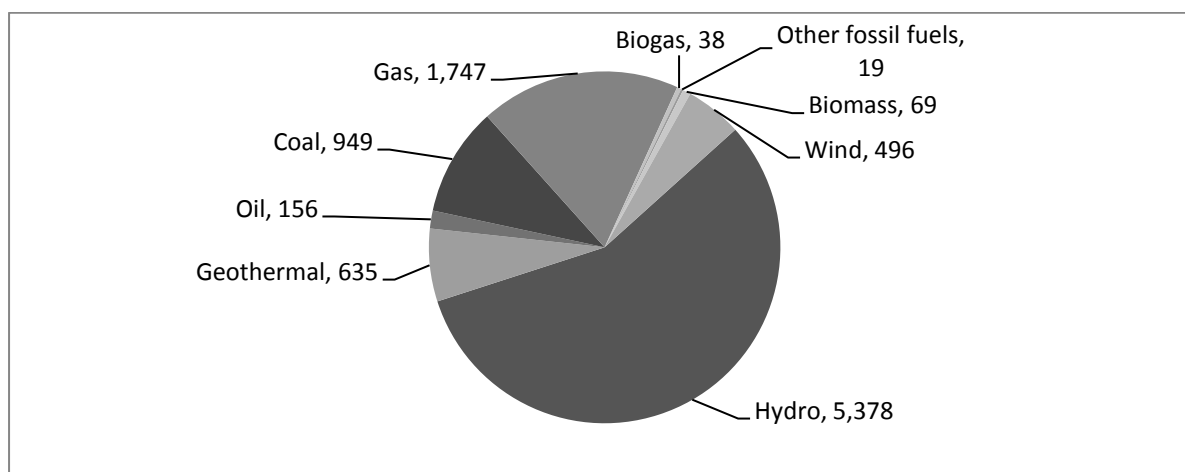
Table 21.1: New Zealand government commitment summary

GHG emissions	A Kyoto Protocol target to maintain average emissions between 2008 and 2012 at 1990 base levels. A Copenhagen Accord target for a 10 to 20 per cent reduction from 1990 levels by 2020. A government target for a 50 per cent reduction from 1990 levels by 2050.
Renewable energy (RE)	No target set.
Renewable electricity	A government target for 90 per cent of total generation to come from renewable sources by 2025.

Source: Information from Ministry of the Environment, Climate Change. Available at <www.climatechange.govt.nz>.

21.2 Electricity Generation Mix

Figure 21.1: Total installed generating capacity in New Zealand in December 2009 (MW): 9,380 MW

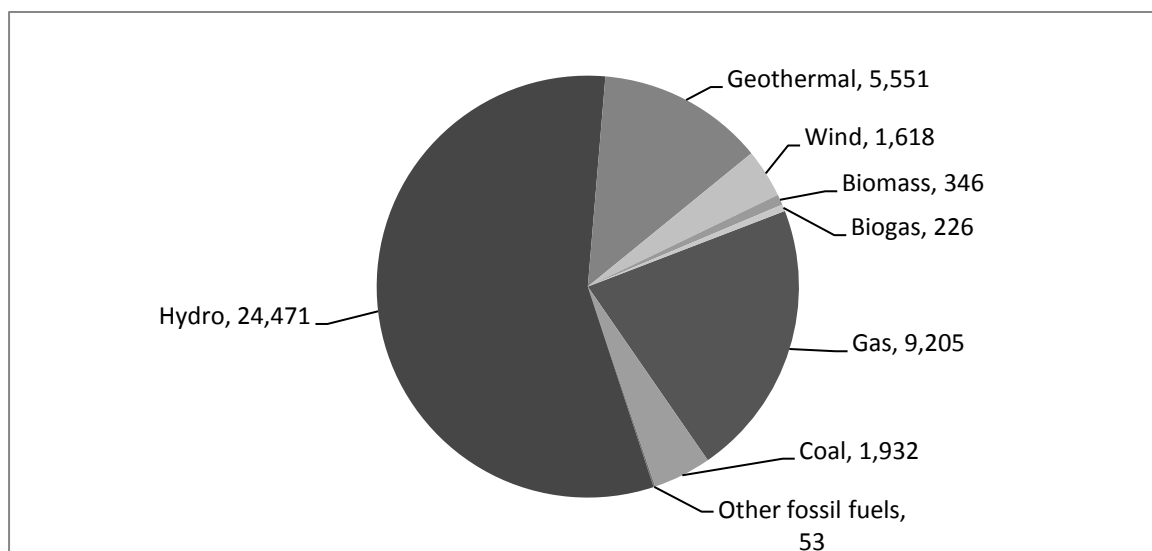


Source: Ministry of Economic Development, Estimated Generating Capacity by Fuel Type December 2009 (MW). Available at <www.med.govt.nz/templates/ContentTopicSummary____46120.aspx>.

¹ Ministry of the Environment, Government Policies. Available at <www.climatechange.govt.nz/reducing-our-emissions/government-policies.html>.

² Ministry of the Environment, Emissions Trading. Available at <www.climatechange.govt.nz/emissions-trading-scheme/>.

**Figure 21.2: Electricity generation mix in New Zealand in 2010 (GWh):
Total 43,402 GWh**



Source: Ministry of Economic Development, New Zealand Energy Quarterly, December 2010. Available at www.med.govt.nz/templates/ContentTopicSummary___46120.aspx.

21.3 Operating Support Incentives

There are no operating support incentives for renewable power in New Zealand. However, the government expects that the emission trading scheme in New Zealand will provide the support necessary for further renewable power development.³ The authority overseeing this area of policy is the Energy Efficiency and Conservation Authority (EECA).⁴ The average wholesale price for electricity in all of New Zealand in 2010 was 62.27 NZD/MWh (33.82 EUR/MWh⁵), compared to 41.27 NZD/MWh (22.41 EUR/MWh) in 2009.⁶

21.4 Investment Support Incentives

In October 2007, the government established a NZD 8 million (EUR 4.3 million) Marine Energy Deployment Fund to promote wave and tidal power. The programme, which will last until 2012, was closed to new applicants as of November 2010.⁷

³ See Ministry of Economic Development at www.med.govt.nz, and GWEC, Wind Power Report 2009. Available at www.gwec.net.

⁴ See website at www.eeca.govt.nz.

⁵ The NZD-EUR conversion rate used is EUR 1 = NZD 1.8414 (the average in 2010).

⁶ Electricity Authority, Market Operation. Available at www.ea.govt.nz/industry/market/statistics-reports/market-operation-monthly-reports/.

⁷ EECA, Marine Energy Development Fund. Available at www.eeca.govt.nz/node/1300.

Chapter 22: Norway

22.1 Government Targets

Under the Kyoto Protocol, Norway is committed to limit the increase of average emissions between 2008 and 2012 to 1 per cent from 1990 base levels. In 2009, GHG emission levels were 3.1 per cent higher than the 1990 base year.¹ Under the Copenhagen Accord, Norway has committed itself to a 30 to 40 per cent reduction in GHG emissions from 1990 levels by 2020 (two-thirds of the target is to be met domestically, with the remainder through carbon offsets) and to a longer-term goal of carbon neutrality by 2050.² As Norway is a member of the European Economic Area (EEA), the EU's 2020 target of supplying 20 per cent of final energy consumption from renewable energy does apply, nevertheless a specific target has yet to be assigned.

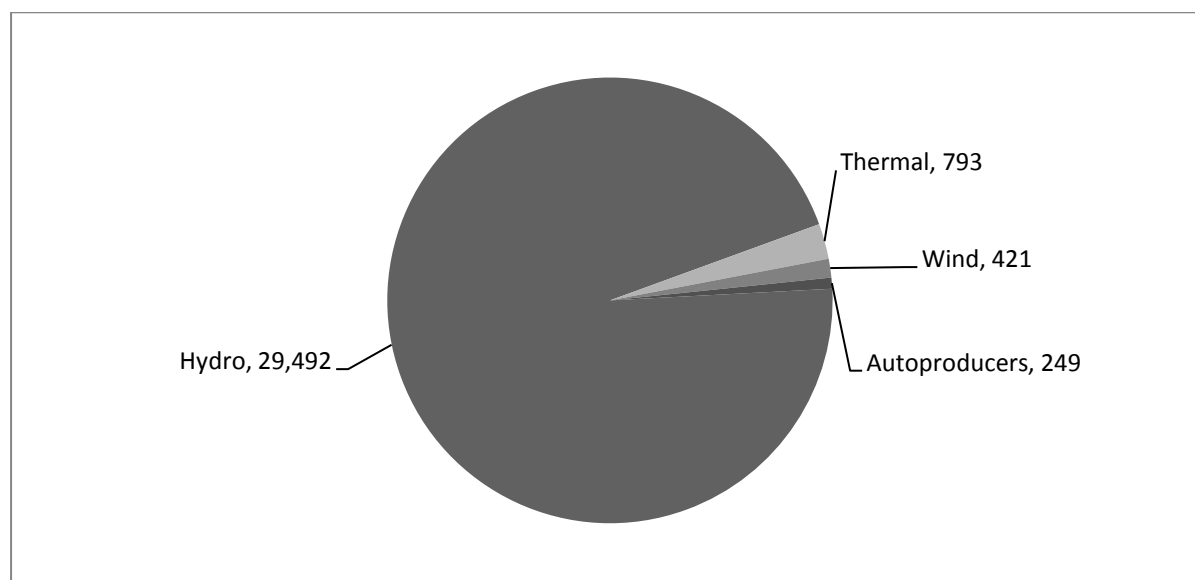
Table 22.1: Norwegian government commitments

GHG emissions	A Kyoto Protocol target of limiting the increase of average emissions between 2008 and 2012 to 1 per cent from 1990 base levels. A Copenhagen Accord target for a 30 to 40 per cent reduction in emissions from 1990 levels by 2020, and a national government target to be carbon neutral by 2050.
Renewable energy (RE)	No target set.
Renewable electricity	No target set.

Source: Ministry of the Environment. Available at <www.regjeringen.no>.

22.2 Electricity Generation Mix

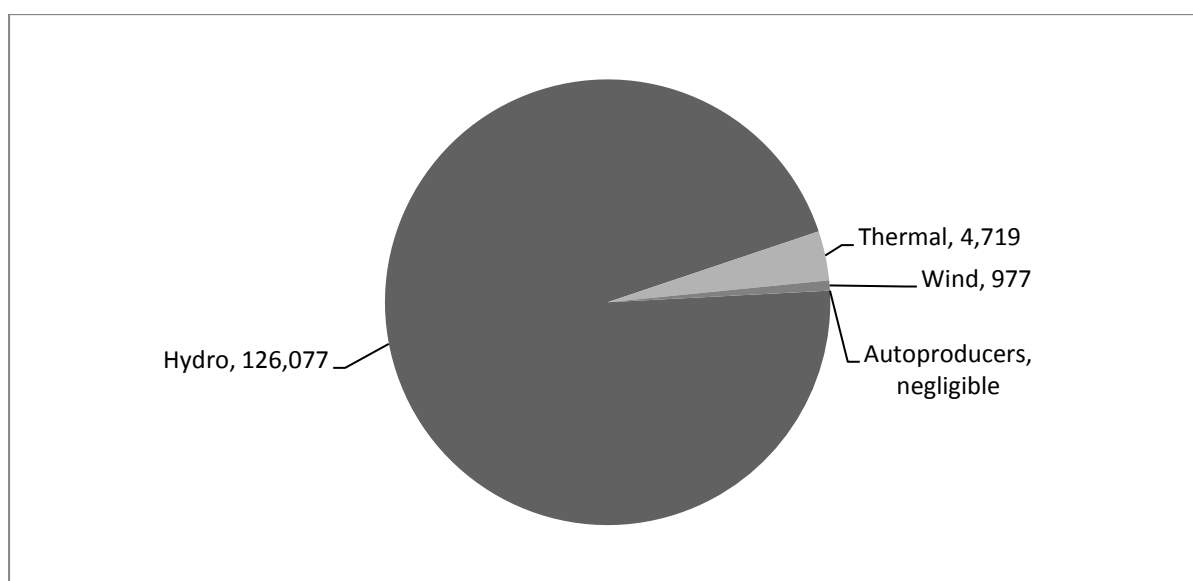
Figure 22.1: Total installed generating capacity in Norway in 2009 (MW): 30,955 MW



Source: Statistics Norway, Electricity Statistics 2009. Available at <www.ssb.no/elektrisitetar_en/>.

¹ European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>.

² Norway Ministry of the Environment. Available at <www.regjeringen.no>.

Figure 22.2: Electricity generation mix in Norway in 2009 (GWh): Total 131,773 GWh

Source: Statistics Norway, Electricity Statistics 2009. Available at <www.ssb.no/elektrisitetaar_en/>.

22.3 Operating Support Incentives

In 2011, the government of Norway signed an agreement to join Sweden's tradable green certificate (TGC) system from 1 January 2012. Under the combined Norwegian-Swedish TGC system, 26.4 TWh of new renewable electricity between the two nations, half in Norway and half in Sweden, is expected to be generated annually by 2020. All renewable power plants commissioned after 7 September 2009 (1 January 2004, for hydropower under 1 MW) will be able to receive TGCs for all their output for 15 years. TGCs issued in one country can be used to meet certificate quotas in the other. The TGC system is expected to end in 2035. The TGC quota for Norwegian power suppliers in 2012 is expected to be finalised in late 2011.³ The price of each certificate is difficult to predict until the TGCs start trading. The average price of a TGC in Sweden in 2010 was SEK 294.70 (EUR 30.86).⁴ In addition to the income from the sale of TGCs, power generators will also receive the income of the electricity sale on the wholesale market, which had an average price of 54.45 EUR/MWh in 2010.⁵

22.4 Investment Support Incentives

Enova, a company established by the government in 2004, with funding for 10 years totalling NOK 5 billion (EUR 624 million⁶), provides funding for companies in the early stages of deploying renewable energy. Enova has numerous calls for renewable energy and energy efficiency funding throughout the year.⁷

³ Ministry of Petroleum and Energy, Prop. 101 L (2010–2011) Proposisjon til Stortinget (forslag til lovvedtak): Lov om elsertifikater, 15 April 2011. Available at <www.regjeringen.no/nb/dep/oed/dok/regpubl/prop/2010-2011/prop-101-l-2010-2011.html?id=640977>.

⁴ Svenska Kraftnat, Elcertifikat. Available at <elcertifikat.svk.se>. The SEK-EUR conversion rate used is EUR 1 = SEK 9.54973 (the average in 2010). See Chapter 27 for more details.

⁵ Nordpool Spot price for all regions of Norway. Available at <www.nordpoolspot.com/reports/areaprice>.

⁶ The NOK-EUR conversion rate used is EUR 1 = NOK 8.0121 (the average in 2010).

⁷ See the Enova website for more information at <www.enova.no>.

Chapter 23: Poland

23.1 Government Targets

Poland's industry is heavily dependent on coal as an energy source, which constitutes a major source of national emissions. Under the Kyoto Protocol, Poland is committed to reduce average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. In 2009, GHG emission levels were 33.2 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 14 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Poland also has an EU target of meeting 15 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 7.9 per cent of final energy consumption was met with renewable energy.¹

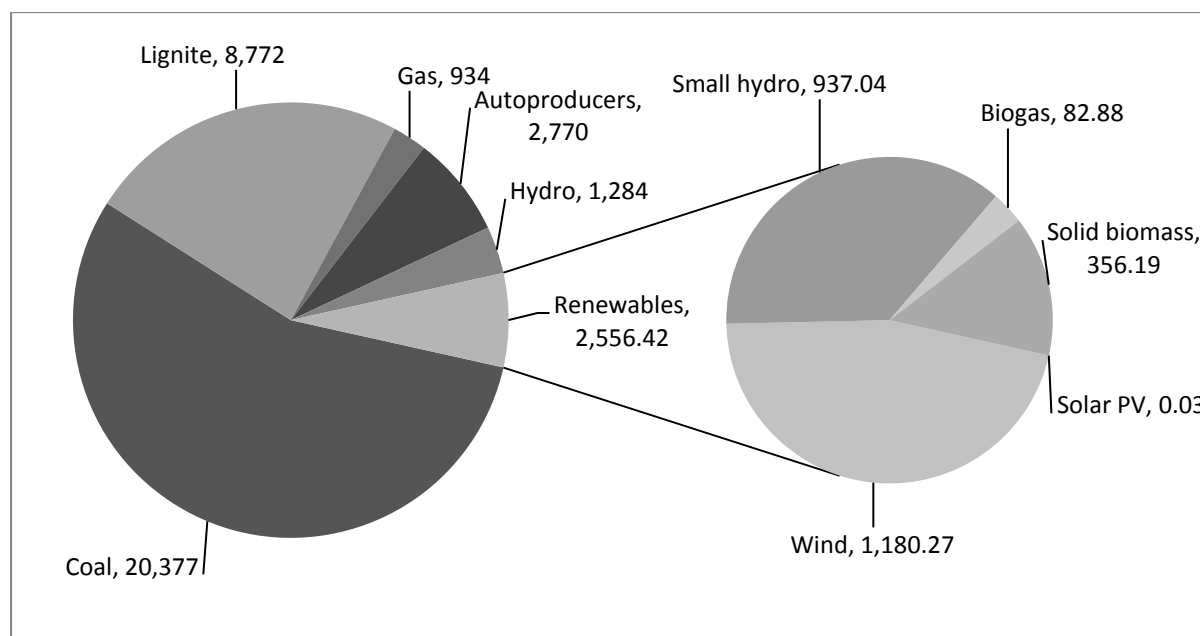
Table 23.1: Polish government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 6 per cent from 1990 base levels. From the Copenhagen Accord, an EU target for a 14 per cent reduction in emissions from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target to secure 15 per cent of final energy consumption from renewable energy sources by 2020.
Renewable electricity	No target set.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Commission of the European Communities, Energy. Available at <www.energy.eu>.

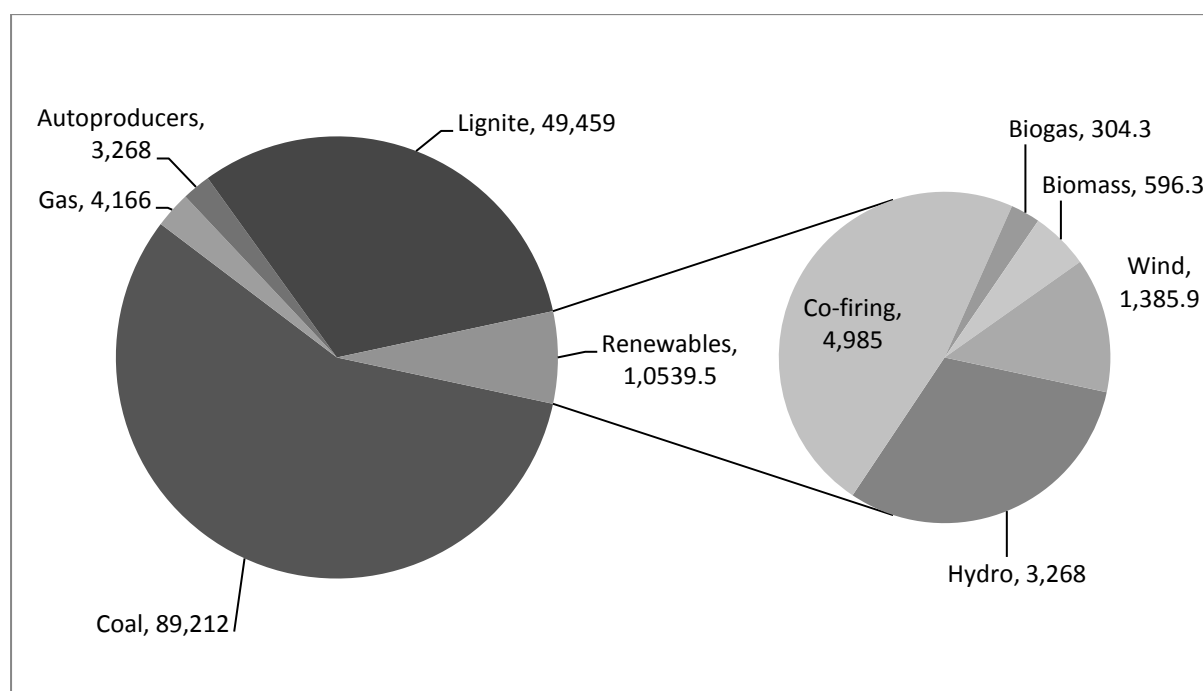
23.2 Electricity Generation Mix

Figure 23.1: Total installed generating capacity in Poland in 2010 (MW): 35,756 MW



Source: Energy Regulatory Office, Sprawozdanie z działalności Prezesa URE 2010. Available at <[www.ure.gov.pl/ftp/Biuletyny_URE/2011/2010_03_01-biuletyn_nr1\(2\).pdf](http://www.ure.gov.pl/ftp/Biuletyny_URE/2011/2010_03_01-biuletyn_nr1(2).pdf)>.

¹ Eurostat, Share of Renewable Energy in Gross Final Energy Consumption. Available at <epp.eurostat.ec.europa.eu>.

Figure 23.2: Electricity generation mix in Poland in 2010 (GWh): Total 156,644 GWh

Source: Energy Regulatory Office, Sprawozdanie z działalności Prezesa URE 2010. Available at <[www.ure.gov.pl/ftp/Biuletyny_URE/2011/2010_03_01-biuletyn_nr1\(2\).pdf](http://www.ure.gov.pl/ftp/Biuletyny_URE/2011/2010_03_01-biuletyn_nr1(2).pdf)>.

23.3 Operating Support Incentives

Poland uses a tradable green certificates (TGC) scheme as its primary support mechanism. Renewable electricity producers receive 1 TGC per MWh of generation. There is no statutory time limit for how long projects can receive TGCs. In addition, the grid operator providing the connection to a renewable power installation is obliged to purchase all electricity supplied to the grid.²

A quota obligation requires electricity suppliers selling to end-users to purchase TGCs equivalent to a certain percentage of their total sales. The yearly evolution of the quota from 2010 to 2017 is set out in Table 23.2.

Table 23.2: The renewable electricity quota obligation in Poland from 2010 to 2017

Year	Required percentage of energy from renewable sources (%)
2010	10.4
2011	10.4
2012	10.4
2013	10.9
2014	11.4
2015	11.9
2016	12.4
2017	12.9

Source: Ministry of the Economy, OJ 2008 No 156 item. 969. Available at <isip.sejm.gov.pl/DetailsServlet?id=WDU20081560969>.

² Prawo energetyczne, stawa z dnia 10 kwietnia 1997 r. Available at <www.ure.gov.pl/download.php?s=1&id=1373>.

Electricity suppliers are obliged to present an amount of TGCs to the energy regulator (*Urząd Regulacji Energetyki*, URE) sufficient to fulfil their quota obligation. The penalty for failure to present an adequate number of certificates was set at PLN 274.92 (EUR 68.83³) per missing certificate in 2011. The substitution fee is determined by URE, using a formula which takes into consideration the spot market price of electricity on Polish markets and end-user prices.⁴

Grid operators are required to purchase all renewable power output at prices set by the URE, which in 2010 was set at 197.02 PLN/MWh (49.33 EUR/MWh).⁵ In comparison, the average wholesale electricity price in the open market in 2010 was 195.32 PLN/MWh (48.91 EUR/MWh).⁶ The average price of a Polish TGC was PLN 258.28 (EUR 64.67) in 2010.⁷ Therefore, with the income from the sale of the power to the grid operators and the income from the sale of the TGC, the overall average generation compensation for renewable power was 455.30 PLN/MWh (114.00 EUR/MWh) in 2010.

23.4 Investment Support Incentives

Poland is the largest recipient of EU structural funds for the current 2007-2013 spending round,⁸ with an allocation of approximately EUR 780 million for renewable power projects. Subsidies of up to 70 per cent of project costs are available, up to a maximum of PLN 40 million (EUR 10 million) per project—with special emphasis on under-developed regions and small investors.⁹

The National Fund for Environmental Protection and Water Management (*Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej*) manages EUR 1.5 billion in EU funding for the period between 2007 and 2013 for low-interest loans for environmental, energy efficiency, and renewable energy projects. This funding is provided under the EU's Operational Programme for Infrastructure and Environment. By April 2011, 49 renewable energy projects received funding totalling PLN 349 million. To qualify for funding, projects must have a minimum total cost of EUR 10 million, and the maximum amount of project costs covered by the loan is 75 per cent. The interest rate offered is fixed at 6 per cent, and part of the funding can be disbursed in the form of a grant under certain conditions.¹⁰

The Bank of Environmental Protection (*Bank Ochrony Środowiska*, BOS) specializes in providing soft loans to investment projects that contribute to environmental protection and water management such as sewage treatment and renewable heat and power projects.¹¹

³ All currency converted at the rate of EUR 1 = PLN 3.9939 (average rate in 2010).

⁴ Polish Wind Energy Association, *Wartość Opłaty Zastępczej W 2011 R.* Available at <psew.pl/wartosc_oplaty_zastepczej_w_2011_r.htm>.

⁵ Ministry of Economy, *Renewable Energy Action Plan*, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_poland_en.pdf>.

⁶ URE, *Średnia cena sprzedaży energii elektrycznej na rynku konkurencyjnym za rok 2010*, 31 March 2011. Available at <www.ure.gov.pl>.

⁷ Information derived from the Polish Power Exchange. Available at <www.tge.pl>.

⁸ EU, *Cohesion Policy 2007-2013: Indicative Financial Allocations*. Available at <ec.europa.eu/regional_policy/policy/fonds/pdf/annexe-recto.pdf>.

⁹ International Network for Sustainable Energy, *Evaluation – Poland Structural Funds 2007-13*. Available at <www.inforse.org/europe/Structuralfunds/SF_Poland_07-13.htm>.

¹⁰ For more information see the website at <pois.nfosigw.gov.pl/>.

¹¹ For information see the website at <www.bosbank.pl>.

Another source of financing was the Eco Fund (*Ekofundusz*). The Eco Fund was founded by the Ministry of Finance in 1992 to disburse capital derived from an agreement by a consortium of international sovereign creditors that forgave part of Poland's international debt, on the condition that the freed up funds would be used to support environmental protection projects, such as renewable energy projects. Investment support typically took the form of grant funding for up to 45 per cent of project costs. No new applications have been accepted since November 2010 and financing for all projects will be completed by the end of 2011. Between 1992 and April 2011, the Eco Fund financed 97 renewable power projects, 70 of which were biomass or biogas projects.¹²

¹² For more information see the website at <www.ekofundusz.org.pl>.

Chapter 24: Portugal

24.1 Government Targets

Under the Kyoto Protocol, Portugal is committed to limit the increase of average emissions between 2008 and 2012 to 27 per cent from 1990 base levels. In 2009, GHG emission levels were 24.0 per cent higher than the 1990 base year. As part of the Copenhagen Accord, the country has a target to limit the increase in emissions by 1 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Portugal also has an EU target of meeting 31 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 23.2 per cent of final energy consumption was met with renewable energy sources.¹

In 2010, the Portuguese government approved its national energy strategy, the *Estratégia Nacional de Energia 2020* (ENE 2020), in order to meet EU targets.² The ENE 2020 has a target for 60 per cent of electricity generation to be from renewable sources by 2020.³ By 2010, this target had already been achieved, with 62 per cent of electricity generation coming from renewable sources that year, compared to 48 per cent in 2009. This was accomplished, however, mainly because there was an 88 per cent increase in large hydro generation due to weather conditions.⁴ The share of renewable electricity in gross consumption varies greatly depending on variable hydropower generation levels.⁵

Table 24.1: Portuguese government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of limiting the increase of average emissions between 2008 and 2012 to 27 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a maximum 1 per cent increase from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 31 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A national target for 60 per cent of electricity generation to come from renewable energy sources by 2020.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Government of Portugal, National Renewable Energy Action Plans for Portugal, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

¹ Eurostat, Share of Renewable Energy in Gross Final Energy Consumption. Available at <epp.eurostat.ec.europa.eu>.

² Ministry of Economy, Trade and Innovation, ENE 2020, 2010. Available at <www.renewable.pt>.

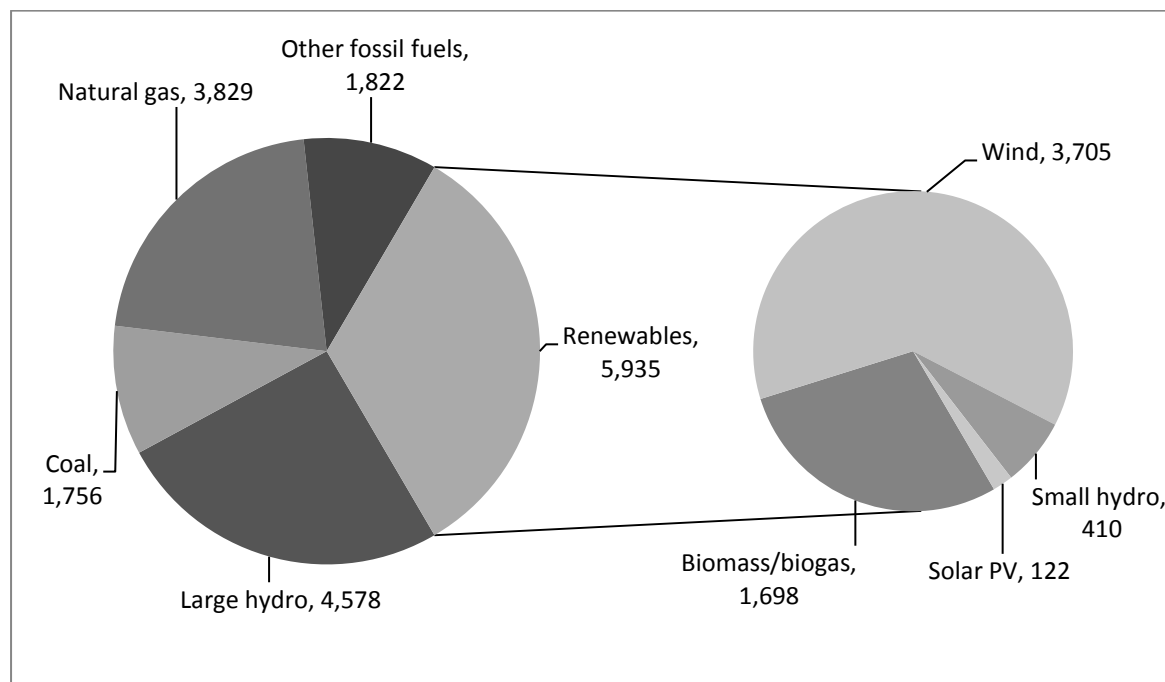
³ Government of Portugal, National Renewable Energy Action Plans for Portugal, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

⁴ REN, Technical Data 2010. Available at <www.centrodeinformacao.ren.pt/PT/InformacaoTecnica/DadosTecnicos/DadosTecnicos%202010vf.pdf>.

⁵ DGGE, Renovaveis estatisticas rapidas, February 2009. Available at <www.dgge.pt>.

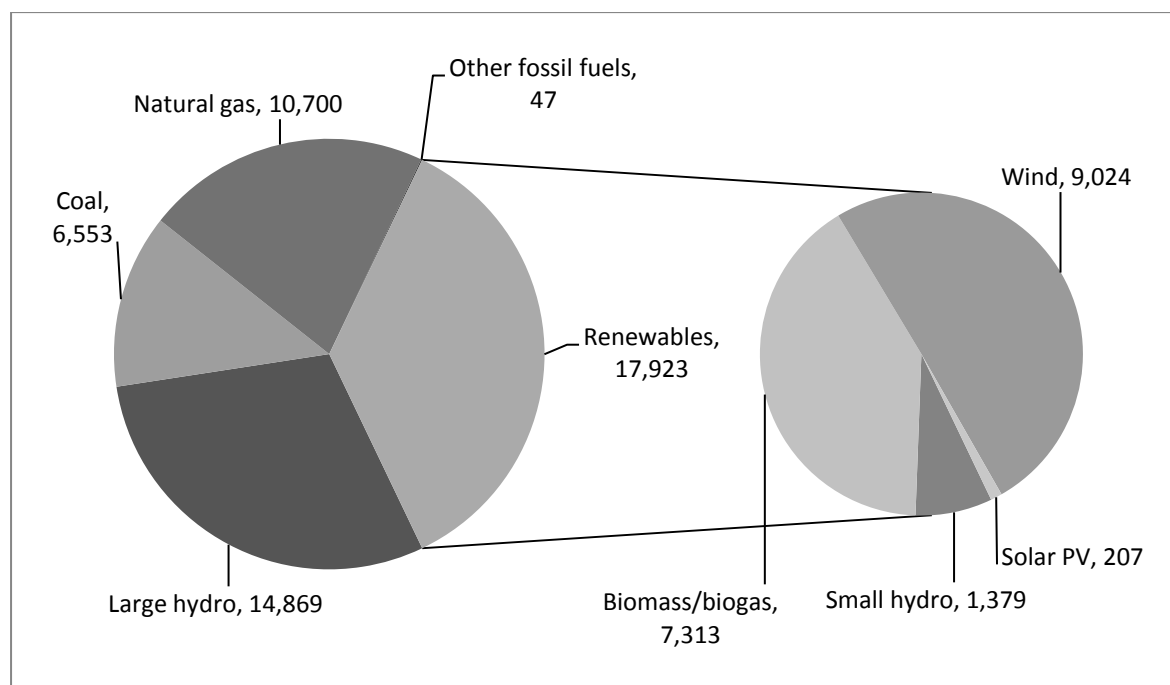
24.2 Electricity Generation Mix

Figure 24.1: Total installed generating capacity in Portugal in 2010 (MW): 17,920 MW



Source: REN, Technical Data 2010. Available at www.centrodeinformacao.ren.pt/PT/InformacaoTecnica/DadosTecnicos/DadosTecnicos%202010vf.pdf.

Figure 24.2: Electricity generation mix in Portugal in 2010 (GWh): Total 50,092 GWh



Source: REN, Technical Data 2010. Available at www.centrodeinformacao.ren.pt/PT/InformacaoTecnica/DadosTecnicos/DadosTecnicos%202010vf.pdf.

24.3 Operating Support Incentives

Portugal uses a feed-in tariff (FIT) system as its primary incentive for renewable power development.⁶ The FIT was originally introduced in 1998 and the current scheme applies to installations commissioned in 2008 and thereafter. In the ENE 2020, the government announced its intention to review the FIT in the second half of 2010 to reflect development in technologies.⁷ This has yet to take place as of May 2011. However, on 5 May 2011, the government reached an agreement with the International Monetary Fund (IMF) and the EU as part of a EUR 78 billion economic bailout package. The resulting agreement included a review of the FIT system with the possibility of reducing the tariff rates for both new and existing generators. Such a review is expected to be conducted by the end of 2011.⁸

The FIT rate that each renewable power project receives is based on a formula that takes into account a base tariff, which is adjusted according to the capacity of the installation, the amount of electricity generated, the time of generation (off-peak or peak), and the market price of electricity. Table 24.2 shows the average indicative tariff rates for renewable power in Portugal since 2008. Renewable power generators will receive the FIT rate for their output either for a set number of years or a stipulated quantity of total operation hours (electricity output per MW of capacity). A total capacity cap is set for each technology except wind power and small hydropower. Once the cumulative capacity in all of Portugal reaches the cap for a particular technology, new installations of that technology will no longer qualify for the incentive system. Every year the government reduces the FIT rate by 5 per cent for each 10 MW installed. Each installation can receive the FIT rates for output of up to a maximum of 2.4 MWh of electricity a year. The FIT rate is not given for any excess output.

Combined heat and power (CHP) plants also receive operating incentives. There is a special FIT in place for microgeneration installations with capacities of up to 3.68 kW that produce both electricity and heat (see Table 24.3). Large wind, hydro and biomass plants are set up through public tender where the sale prices of electricity to be generated in a plant concerned are submitted by developers. In November 2010, the government announced a tender call for 75 solar PV plants of 2 MW each and five concentrated solar PV plants of 1 MW each. Results of the tender were not available as of July 2011.⁹

All renewable power generators in Portugal that receive the FIT are considered 'special regime generators', while traditional fossil-fuel and other generators are 'ordinary regime generators'. Special regime generators do not participate in the electricity market, and their generated electricity is purchased by EDP-Serviço Universal, an electricity supply company created from the former state-owned power monopoly EDP (Energias de Portugal).¹⁰

⁶ Portugal is geographically split into three areas: the mainland of Portugal and the two autonomous island regions of the Azores and Madeira. This report covers renewable energy in mainland Portugal and not in the island markets, which are relatively small and contribute little to national energy consumption or generation.

⁷ National Renewable Energy Action Plans for Portugal, 2010. Available at <ec.europa.eu/energy/>.

⁸ Expresso revela documentos com programa do FMI/BCE/CE, Expresso, 4 May 2011. Available at <aeiou.expresso.pt/expresso-revela-memorando-com-programa-do-fmibcece=f646842>.

⁹ EPIA, Global Market Outlook for Photovoltaics until 2015, May 2011. Available at <www.epia.org>.

¹⁰ REN, National Electricity System. Available at <www.ren.pt/vEN/Electricity/NationalElectricitySystem/Pages/electricidade_national-electricity-system.aspx>.

Table 24.2: Average indicative FIT rates in Portugal 2008 to 2011 (EUR/MWh)

Category		Average indicative tariffs	Duration	National capacity caps
Wind power		74-75	15 years or first 33 GWh of output per MW of capacity	None
Small hydro (≤ 10 MW)		75-77	20 years or first 52 GWh of output per MW of capacity	None
Solar PV	≤ 5 kW	450	15 years or first 21 GWh of output per MW of capacity	50 MW
	> 5 kW	310-317		
Solar thermal power	≤ 10 MW	267-273		
	> 10 MW	150-200 ^a		
PV roof-top	≤ 5 kW	470	15 years for installation in residential, commercial, service or industrial buildings	50 MW
	> 5 -150 kW	355		
Solid biomass	Forestry waste	107-109	25 years	250 MW
	Animal waste	102-104		
Biogas	Anaerobic digestion	115-117	15 years	150 MW
	Landfill gas	75	15 years	20 MW
Municipal solid waste	≤ 5 MW	53-54	25 years	150 MW
Wave power (Pre-trade)	Demonstration	260	15 years	4 MW
	Pre-commercial projects	191		20 MW
Wave power (commercial)	First 100 MW	131	15 years	300 MW
	Next 150 MW	101		
	Next MW	76		

Note: ^aThe FIT rate is determined by the minister responsible for the area of energy concerned.

Source: Ministry of Economy and Innovation, Decreto-Lei n.o 225/2007 de 31 de Maio 2007. Available at <www.iapmei.pt/iapmei-leg-03.php?lei=5499>; National Renewable Energy Action Plans for Portugal. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

Table 24.3: Feed-in tariff rates for those microgeneration installations of up to 3.68 kW that produce both heat and electricity in Portugal in 2011

Category	Capacity (MW)	FIT rate (EUR/MWh)
Solar power (up to 3.68 kW)	For the first 10 MW of national installed capacity	380
Wind power (up to 3.68 kW)	For the first 10 MW of national installed capacity	266
Biomass CHP (up to 3.68 kW)	For the first 10 MW of national installed capacity	114
Hydro (up to 3.68 kW)	For the first 10 MW of national installed capacity	114

Source: Ministry of Economy and Innovation, Decreto-Lei n.o 363/2007 de 2 de Novembro 2007. Available at <dre.pt/pdf1sdip/2007/11/21100/0797807984.PDF>; Despacho DGEG, de 30 de Dezembro de 2010. Available at <www.renovaveisnagora.pt/c/document_library/get_file?uuid=383f7e42-3876-4229-ad3b-4f3791b3b2d4&groupId=13360>.

24.4 Investment Support Incentives

Since 2009, renewable electricity generation pilot projects are eligible for funding under the national strategic reference framework (*Quadro de Referência Estratégico Nacional*, QREN), which is designed to encourage research and development, and is funded partly through the European Regional Development Fund. Under this scheme, selected pilot projects can receive subsidies for 35 to 55 per cent of eligible expenditures.¹¹

In 2007, the government passed a new law for small- and medium-sized enterprises (SMEs) regarding investment and fiscal incentives for renewable energy. Capital subsidies for SMEs

¹¹ Government of Portugal, National Renewable Energy Action Plans for Portugal, 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

are available for up to 35 per cent of investment costs, with a maximum of EUR 250,000 per project. This subsidy programme will end in 2013. SMEs can also receive subsidies equal to a 35 per cent reduction on interest loan payments for RE projects, up to a maximum of EUR 75,000. The VAT on renewable energy equipment was also reduced to 12 per cent from 21 per cent in 2008.¹²

¹² Portuguese Government. Portaria 1463/2007. Available at <www.qren.pt/download.php?id=440>.

Chapter 25: Slovak Republic (Slovakia)

25.1 Government Targets

Under the Kyoto Protocol, the Slovak Republic is committed to reduce average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. In 2009, GHG emission levels were 39.8 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 13 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The Slovak Republic also has an EU target of meeting 14 per cent of final energy consumption from renewable energy sources by 2020. In 2008, 8.4 per cent of final energy consumption was met with renewable energy sources.¹

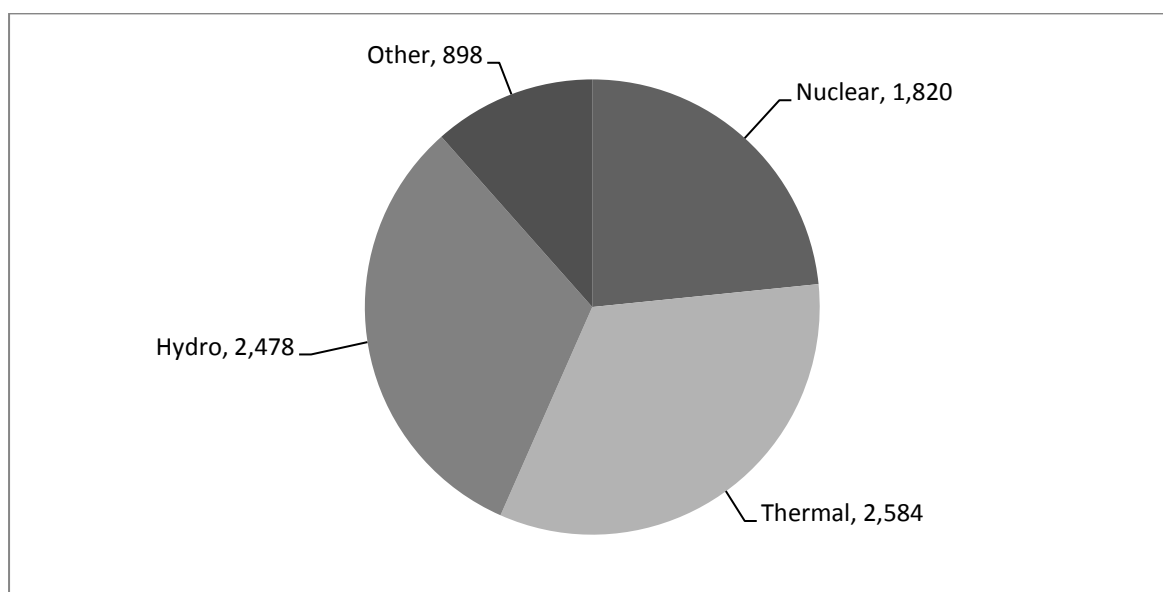
Table 25.1: Slovak Republic government commitment summary

GHG emissions	A Kyoto Protocol target of reducing average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 13 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 14 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	No target set.

Source: European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>; Government of the Slovak Republic, National Renewable Energy Action Plan, October 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

25.2 Electricity Generation Mix

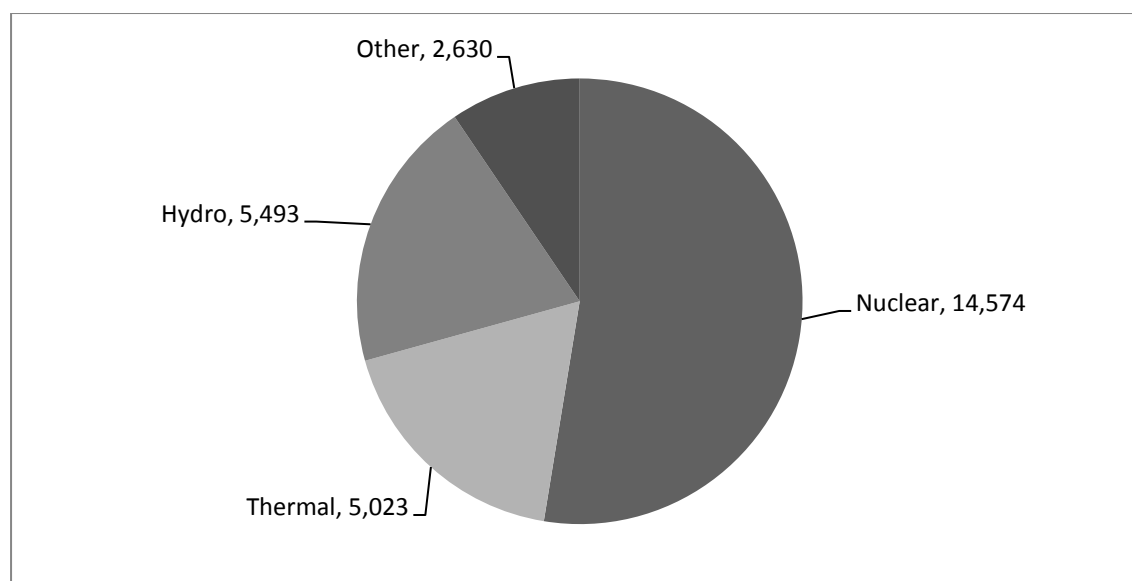
Figure 25.1: Total installed generating capacity in the Slovak Republic in 2010 (MW): 7,780 MW



Source: SEPS, Annual Report 2010, 2011. Available at <www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf>.

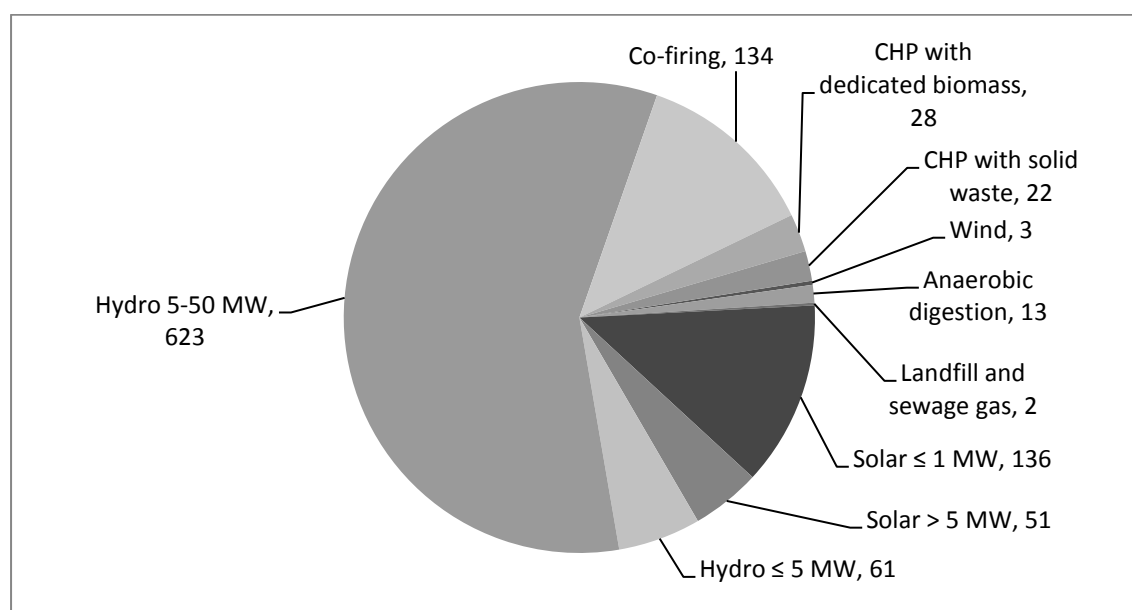
¹ Eurostat, Share of Renewable Energy in Gross Final Energy Consumption. Available at <epp.eurostat.ec.europa.eu>.

Figure 25.2: Electricity generation mix in the Slovak Republic in 2010 (GWh): Total 27,720



Source: SEPS, Annual Report 2010, 2011. Available at www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf.

Figure 25.3: Total installed generating capacity of renewable electricity in the Slovak Republic in 2010 (MW): 1,074 MW



Source: URSO, Prehľad o zariadeniach na výrobu elektriny z obnoviteľných zdrojov energie a vysoko účinnou kombinovanou výrobou. Available at www.urso.gov.sk/doc/dokumenty/Prehľad_vyroba_elektriny_OZE_VUKVET_2010.pdf.

25.3 Operating Support Incentives

The Slovak Republic has been using a feed-in tariff (FIT) scheme as its primary operating support mechanism since 2005. In 2009, the government introduced a completely overhauled FIT system, with further revisions made in 2010. Under this latest scheme, renewable power producers have preferential access and use of the grid. Distribution systems operators (DSOs) are obliged to purchase all of the electricity produced by renewable power plants and highly

efficient CHP plants with capacities of up to 10 MW (15 MW for wind) at fixed rates (see Table 25.2).

DSOs are also required to purchase electricity produced by renewable power plants with capacities of up to 125 MW at the same rate that they purchase electricity for system and grid balancing, except not at the FIT rates. Renewable power generators with up to 125 MW in installed capacity can choose to receive the FIT rates for the output of a 10-MW portion of their plant (15 MW for wind) as if it were a free-standing project, although the rest of their capacity will not qualify.

The FIT rates for new generators are set annually by the regulator, *Urad pre Reguláciu Sietových Odvetví* (URSO), and apply for 15 years. For generators already in the FIT system, the rates may be adjusted for inflation at the discretion of URSO.² In February 2011, FIT support for solar PV plants over 100 kW was cancelled by the government.³ The government is also examining the possibility of using public tenders for large wind and solar plants.⁴ For RE projects, the tariff rate on investment costs is available to be reduced according to the proportion of EU or state funds applied to the project (see Table 25.3).

Table 25.2: Feed-in tariff rates for renewable power generators ≤ 10 MW in 2011 in the Slovak Republic

Category		EUR/MWh
Solar PV	≤ 100 kW	387.62
Wind (≤ 15 MW)		80.91
CHP with solid biomass	From dedicated energy crops	113.10
	From waste	125.98
Co-firing with solid biomass		126.14
Biomass gasification		159.85
Biogas	Regular	114.88
	Landfill or sewage gas	96.36
	Anaerobic digestion ≤ 1 MW	148.72
	Anaerobic digestion > 1-10 MW	132.45
Hydro	≤ 1 MW	109.08
	> 1-5 MW	97.98
	> 5-10 MW	61.72
Geothermal		195.84

Source: URSO, Výnos Úradu pre reguláciu sietových odvetví z 23. júna 2010 c. 2/2010, ktorým sa mení a doplna výnos Úradu pre reguláciu sietových odvetví z 28. júla 2008 c. 2/2008, ktorým sa ustanovuje regulácia cien v elektroenergetike v znení neskorších predpisov, June 2010. Available at <www.urso.gov.sk/doc/legislativa/vynos_02-2010_sk.pdf>.

² URSO, Výnos Úradu pre reguláciu sietových odvetví z 23. júna 2010 c. 2/2010, June 2010. Available at <www.urso.gov.sk/doc/legislativa/vynos_02-2010_sk.pdf>.

³ ZÁKON z 15. decembra 2010, ktorým sa mení a doplna zákon č. 309/2009 Z. z. o podpore obnoviteľných zdrojov energie a vysoko účinnej kombinovanej výroby a o zmene a doplnení niektorých zákonov a ktorým sa doplna zákon č. 276/2001 Z. z. o regulácii v sieťových odvetviach a o zmene a doplnení niektorých zákonov v znení neskorších predpisov, 15 December 2010. Available at <www.urso.gov.sk/doc/legislativa/z_558-2010_sk.pdf>.

⁴ Government of the Slovak Republic, National Renewable Energy Action Plan, October 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

Table 25.3: Reduction in tariff levels based on EU or state funding in the Slovak Republic

Amount of funding	Tariff reduction
Up to 30%	4%
Up to 40%	8%
Up to 50%	12%
Over 50%	16%

Source: URSO, VÝNOS Úradu pre reguláciu sieťových odvetví z 9. septembra 2009 č. 7/2009 Available at <www.urso.gov.sk/doc/legislativa/vynos_07-2009_sk.pdf>.

25.4 Investment Support Incentives

The European Regional Development Fund offers grants to renewable power developers in regions of the Slovak Republic where the GDP per capita is lower than the national average.⁵ The level of subsidy varies between EUR 20,000 and EUR 5 million, or up to 50 per cent of total project costs, depending upon the region where the project is located. Projects based on any type of renewable energy except wind power are eligible for this funding, which is available until 2013.⁶

A separate but similar subsidy scheme was started in the Bratislava region, whereby local small- and medium enterprises can apply for subsidies of up to EUR 200,000 for a project utilising any source of renewable energy, including wind power.⁷ Renewable power generators are also exempt from the energy consumption tax of 1.32 EUR/MWh, which has been constant since 2010.⁸

⁵ Operational Programme Slovakia, Schéma ŠP OPBK. Available at <www.opbk.sk>.

⁶ Ministry of the Economy, Schéma DM – 7/2008 Schéma na podporu trvalo udržateľného rozvoja. Available at <www.sea.gov.sk/strukturalne_fondy/schemy_07_13/schemy/schema_2_1_dm.pdf>.

⁷ Ministry of Regional Development, Programový manuál pre Operacný program Bratislavský kraj (Implementing document). Available at <www.opbk.sk>.

⁸ Ministry of Finance, Act No. 609/2007 on the Excise Duty on Electricity, Coal, and Natural Gas supplementing Act No. 98/2004 on the Excise Duty on Mineral Oil... Article IX of Act No. 465/2008. Available at <www.finance.gov.sk/en/Documents/Material/2009/7/73/Sobot190209/Electricity/Electricity_Coal_Natural_Gas_465_2008_Art_IX.pdf>.

Chapter 26: Spain

26.1 Government Targets

Under the Kyoto Protocol, Spain is committed to limit the increase of average emissions between 2008 and 2012 to 15 per cent above 1990 base levels. In 2009, GHG emission levels were 26.8 per cent higher than the 1990 base level. As part of the Copenhagen Accord, the country has a target to reduce emissions by 10 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Spain also has an EU target for meeting 20 per cent of final energy consumption with renewable energy sources by 2020. In 2008, 10.7 per cent of final energy consumption was met with renewable energy sources.¹ Under Spain's National Renewable Energy Action Plan 2011-2020, renewable electricity production is set to comprise 38.2 per cent of total generation by 2020.

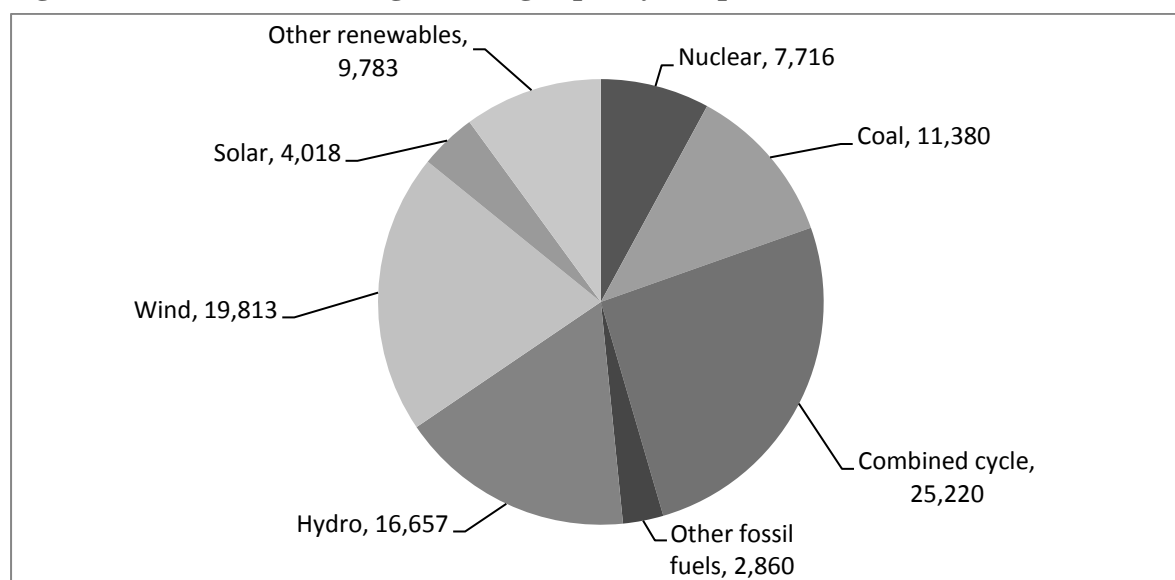
Table 26.1: Spanish government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of limiting the increase of average emissions between 2008 and 2012 to 15 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 10 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.
Renewable energy (RE)	An EU target for 20 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	A target of 38.2 per cent of power generation from renewables by 2020.

Source: MITY, National Renewable Energy Action Plan 2011-2020, June 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

26.2 Electricity Generation Mix

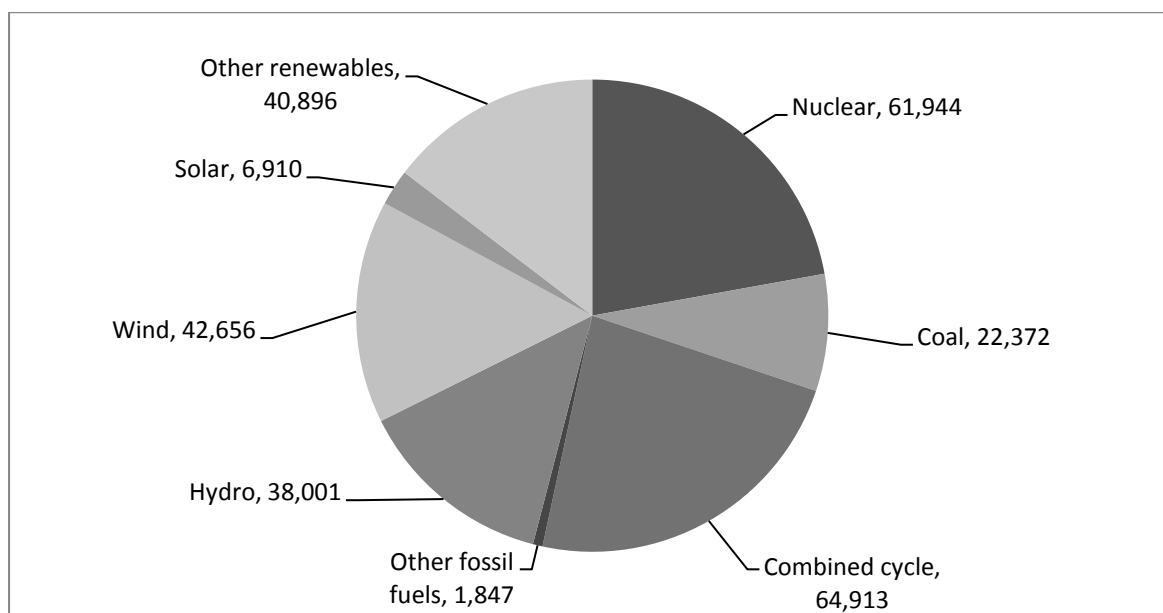
Figure 26.1: Total installed generating capacity in Spain in 2010 (MW): 97,447 MW



Note: Numbers are for peninsular Spain and do not include islands not connected to the main power grid.

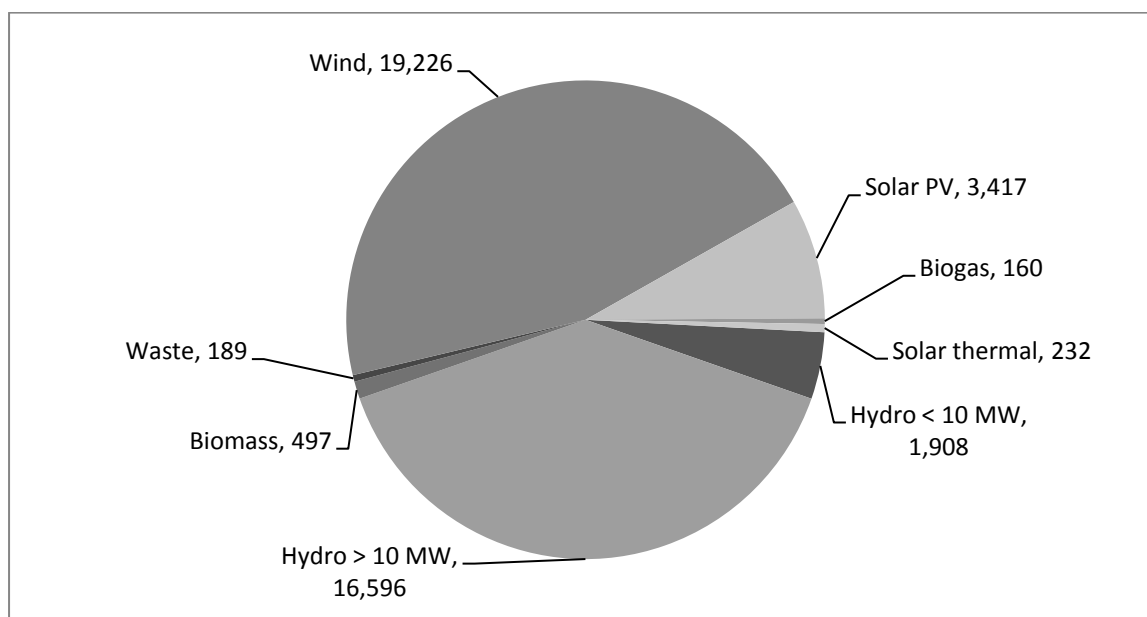
Source: REE, Preliminary Report 2010. Available at <www.ree.es>.

¹ Eurostat. Available at <epp.eurostat.ec.europa.eu>.

Figure 26.2: Electricity generation mix in Spain in 2010 (GWh): Total 279,539 GWh

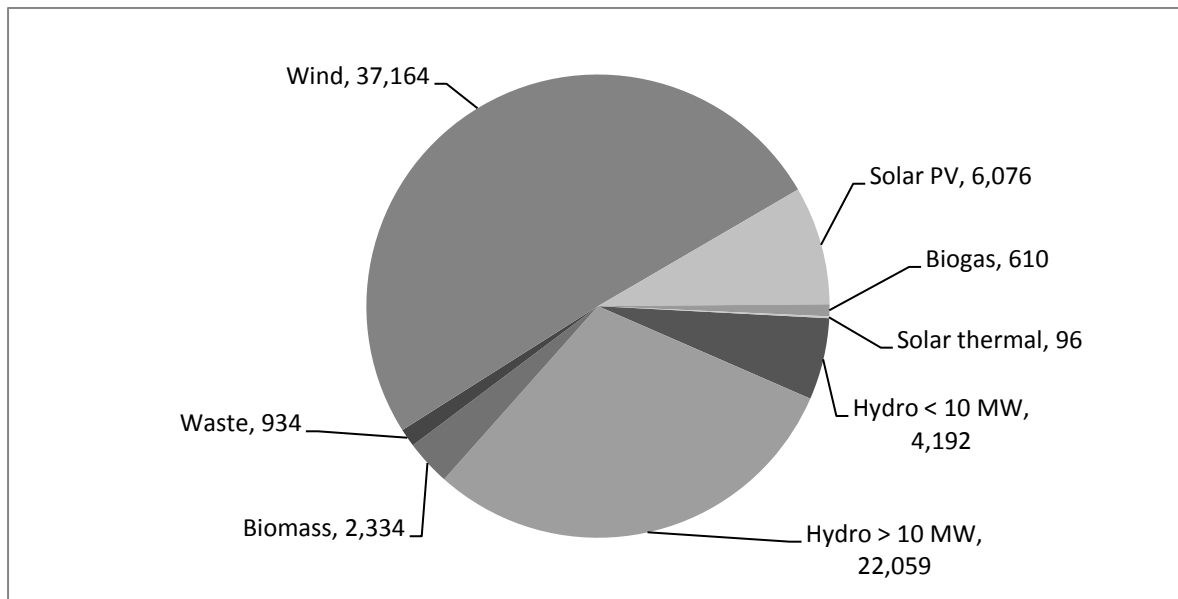
Note: Numbers are for peninsular Spain and do not include islands not connected to the main power grid.

Source: REE, Preliminary Report 2010. Available at <www.ree.es>.

Figure 26.3: Total installed capacity of renewable power in Spain in 2008 (MW): 39,040 MW

Source: Ministry of Industry, Tourism and Commerce, La Energia en Espana 2009. Available at <www.mityc.es/energia/balances/Balances/LibrosEnergia/Energia_2009.pdf>.

**Figure 26.4: Renewable electricity generation in Spain in 2009 (GWh):
Total 73,465 GWh**



Source: Ministry of Industry, Tourism and Commerce, La Energia en Espana 2009. Available at www.mityc.es/energia/balances/Balances/LibrosEnergia/Energia_2009.pdf.

26.3 Operating Support Incentives

26.3.1 Feed-in Tariff and Premiums

The current system of renewable power incentives was first introduced in 2007, with revisions made in 2008 and 2010. Under this system, renewable power generators with a capacity of up to 50 MW (except solar PV) have two options for incentives: a feed-in tariff (FIT) system, where distribution system operators (DSOs) purchase all output at set rates; and a premium system, where generators sell their output on the wholesale electricity market and receive an additional premium to the regular electricity price (see Table 26.2).

Under the premium system, there is a 'reference premium' that varies depending on the generation technology used and the wholesale market price. The premium is adjusted to ensure that total generation compensation falls within government-set maximum and minimum levels. For example, the reference premium for onshore wind power was 20.142 EUR/MWh in 2011. If the wholesale price of electricity were 60 EUR/MWh, the generator would receive 80.142 EUR/MWh as total generation compensation. If the wholesale electricity price decreased to 40 EUR/MWh, the generation compensation would be only 60.142 EUR/MWh, which is below the government-set minimum compensation level. Therefore, the premium would increase to 36.975 EUR/MWh to make the total generation compensation 76.975 EUR/MWh—the minimum generation compensation. In the same manner, if the wholesale electricity price increased, the premium would be reduced to ensure that total generation compensation did not exceed the maximum total compensation. The reference premiums, as well as maximum and minimum total compensation amounts for different categories of generating technologies are given in Table 26.2. Renewable power generators with a capacity of between 50 and 100 MW can only participate in the open market with the premium system, and the value of the premium is proportionally reduced

depending on how large the capacity is. No incentives are given to hydro projects over 50 MW or to other technologies with capacities over 100 MW.²

The choice between the FIT and the premium is made annually by each generator (with the exception of solar PV, for which only the FIT applies). After the first 15 to 25 years of installation operation, the FIT rates and premiums given to the generator will generally fall to a lower value for the remainder of the installation's lifetime. For most technologies, once total installed capacity reaches a pre-determined amount, new generators of the same technology will not qualify to receive incentives, unless the government amends its policy on the cap. The Spanish government is also examining the possibility of holding public tenders for offshore wind and solar-thermal power plants.

Table 26.2: Feed-in tariff and premium rates for renewable power installations (excluding solar PV) commissioned in Spain in 2011 (EUR/MWh)

Category ^c			Period of operation	FIT rate	Premium		Capacity cap (MW)	
					Reference premium	Maximum total compensation		Minimum total compensation
Solar thermal (b.1.2)			First 25 years	290.916	274.312	371.483	274.353	500
			Thereafter	232.731	219.449			
Wind	Onshore (b.2.1)		First 20 years	79.084	20.142	91.737	76.975	20,155
		Thereafter	66.094	0.000				
	Offshore (b.2.2.)		First 20 years	N/A	91.041	177.115	N/A	
Geothermal, wave and tidal (b.3)			First 20 years	74.410	41.518	N/A	N/A	N/A
			Thereafter	70.306	33.047			
Small hydro	< 10 MW (b.4)		First 25 years	84.237	27.047	92.013	70.414	2,400
			Thereafter	75.814	14.519			
Large hydro	10-50 MW (b.5)		First 25 years	Note ^a	22.727	86.397	66.094	N/A
			Thereafter	Note ^b	14.519			
Biomass (b.6)	Energy crops (b.6.1)	≤2 MW	First 15 years	171.596	129.361	179.599	166.423	250
			Thereafter	127.362	0.000			
		>2 MW	First 15 years	158.312	113.885	162.967	154.111	
			Thereafter	133.344	0.000			
	Agri-cultural or garden waste (b.6.2)	≤2 MW	First 15 years	135.763	93.527	143.744	130.568	
			Thereafter	91.529	0.000			
		>2 MW	First 15 years	116.140	71.712	120.848	112.090	
			Thereafter	87.110	0.000			
	Forestry waste (b.6.3)	≤2 MW	First 15 years	135.763	93.527	143.744	130.568	
			Thereafter	91.529	0.000			
>2 MW		First 15 years	127.754	83.333	132.404	123.548		
		Thereafter	87.111	0.000				
Manure or biogas (b.7)	Landfill gas (b.7.1)		First 15 years	86.311	45.652	96.765	80.350	250
			Thereafter	70.306	0.000			
	An-aerobic digestion (b.7.2)	≤500 kW	First 15 years	141.141	110.355	165.559	133.376	
			Thereafter	70.306	0.000			
		>500 kW	First 15 years	104.541	67.241	119.120	103.137	
			Thereafter	70.306	0.000			
	Manure (b.7.3)		First 15 years	57.886	38.158	89.961	55.078	
			Thereafter	57.886	0.000			

² Article 45, Royal Decree 661/2007, of 25 May, Regulating the Activity of Electricity Production under the Special Regime. Available at <www.cne.es/cne/doc/publicaciones/NE004_09.pdf>.

Biomass from industrial waste (b.8)	From agricultural industry (b.8.1)	≤2 MW	First 15 years	135.763	93.527	143.744	130.568	250
			Thereafter	91.529	0.000			
		>2 MW	First 15 years	116.140	71.712	120.849	112.090	
			Thereafter	87.111	0.000			
	From forestry sector (b.8.2)	≤2 MW	First 15 years	100.221	57.996	108.213	94.929	
			Thereafter	70.306	0.000			
		>2 MW	First 15 years	70.248	25.857	74.950	66.094	
			Thereafter	70.284	0.000			
	Black liquor (b.8.3)	≤2 MW	First 15 years	100.221	60.677	108.213	94.929	
			Thereafter	70.306	0.000			
		>2 MW	First 15 years	86.397	39.621	97.197	80.998	
			Thereafter	70.284	0.000			
Combustion of municipal waste (c.1)			N/A	67.351	34.364	N/A	N/A	N/A
Other combustible waste (c.2)			N/A	67.351	34.364	N/A	N/A	N/A
Combined heat and power from biomass and biogas (a.1.3)	Energy crops (b.6.1)	≤2 MW	First 15 years	172.917	130.780	N/A	N/A	N/A
			Thereafter	128.343	0.000			
		>2 MW	First 15 years	158.313	113.885			
			Thereafter	133.344	0.000			
	Agricultural waste (b.6.2)	≤2 MW	First 15 years	138.233	96.258			
			Thereafter	87.110	0.000			
		>2 MW	First 15 years	116.140	71.712			
			Thereafter	87.110	0.000			
	Forestry waste (b.6.3)	≤2 MW	First 15 years	138.233	96.258			
			Thereafter	93.195	0.000			
		>2 MW	First 15 years	127.754	83.333			
			Thereafter	87.110	0.000			
	Landfill gas (b.7.1)		First 15 years	88.884	48.897			
			Thereafter	72.402	0.000			
	An-aerobic digestion (b.7.2)	≤500 kW	First 15 years	144.147	113.753			
			Thereafter	71.803	0.000			
		>500 kW	First 15 years	107.563	70.735			
			Thereafter	72.337	0.000			
	Manure (b.7.3)		First 15 years	57.887	38.158			
			Thereafter	57.887	0.000			
	Biomass from agricultural industry (b.8.1)	≤2 MW	First 15 years	138.233	96.258			
			Thereafter	93.195	0.000			
		>2 MW	First 15 years	118.253	73.772			
			Thereafter	88.695	0.000			
	Biomass from forestry sector (b.8.2)	≤2 MW	First 15 years	102.385	60.564			
			Thereafter	71.824	0.000			
		>2 MW	First 15 years	77.053	37.202			
			Thereafter	88.695	0.000			
	Black liquor (b.8.3)	≤2 MW	First 15 years	102.385	63.374			
			Thereafter	71.824	0.000			
		>2 MW	First 15 years	100.437	58.398			
			Thereafter	81.705	0.000			

Notes: N/A: Not applicable.

^a For large hydro (up to 50 MW), the regulated FIT rate for the first 25 years is calculated using the formula $6.60 + 1.20[(50 - P)/40]$, where P is the capacity of the installation.

^b For large hydro (up to 50 MW), the regulated FIT rate for 26+ years after the installation started generating is calculated using the formula $5.94 + 1.080[(50 - P)/40]$, where P is the capacity of the installation.

^c Generating technology is grouped into three categories under Spanish law: “a” for CHP, “b” for renewable energy sources and “c” for waste. Only renewable fuel for CHP plants is included here

Source: MITY, Orden ITC/3353/2010, de 28 de diciembre, 28 December 2010. Available at www.omel.es/files/orden_its_3353-2010_de_28_de_diciembre.pdf; MITY, Corrección Abril 2011. Available at

www.mityc.es/energia/electricidad/Tarifas/Instalaciones/Documents/categoria_b_abril_2011_correccion.pdf.

In 2010, following negotiations with renewable energy associations, the government modified the incentive system for wind and concentrated solar-thermal power to reduce operating incentives. Under the agreement, all onshore wind power plants commissioned after 1 January 2008 will have their FIT and reference premium rates reduced by 35 per cent until 2013. Also, onshore wind power plants will receive incentives only for the first 2,589 full-load hours a year (equivalent to a 30 per cent load factor), and then the wholesale market price of electricity for the remaining output. Wind power plants that were registered in the incentive system before May 2010 but were not operational by that date will only receive the market price of electricity until 2012, after which they will receive pertinent FIT or premium payments.³

Concentrated solar-thermal power (CSP) plants will be able to receive the FIT rate or premiums only for a set number of full-load operating hours each year, after which they will receive the electricity market price for any remaining output. The rate will vary based on the technology used in the plant (see Table 26.3).

Table 26.3: Annual full-load operating hours for which solar-thermal power plants receive operating incentives in Spain

Technology	Amount of full-load hours a year for which a plant can receive the FIT or premium	Equivalent load factor
Parabolic trough without storage	2,855	32.6%
Parabolic trough with 9 hours of storage	4,000	45.7%
Parabolic trough with 7 hours of storage	3,950	45.1%
Parabolic trough with 4 hours of storage	3,450	39.4%
Tower without storage	2,750	31.4%
Tower with 15 hours of storage	6,450	73.6%
Fresnel rough	2,450	28.0%
Stirling dishes	2,350	26.8%

Source: Real Decreto 1614/2010, de 7 de diciembre, por el que se regulan y modifican determinados aspectos relativos a la actividad de producción de energía eléctrica a partir de tecnologías solar termoelectrica y eólica, 7 December 2010. Available at <www.boe.es/aeboe/consultas/bases_datos/doc.php?id=BOE-A-2010-18915>.

26.3.2 Feed-in Tariff for Solar PV

Solar PV generators are eligible for support only under through the FIT scheme. A new FIT system was introduced on 29 September 2008 as a result of a greater-than-expected drain on the budget caused by the previous solar PV FIT. In November 2010, the FIT rates were subsequently reduced by 45 per cent for ground-based installations, 20 per cent for large roof-top installations, and 5 per cent for smaller roof-top installations. According to the European Photovoltaic Industry Association, the new FIT system is sufficient only for the development of roof-top installations.⁴

There are yearly capacity caps for new solar power installations that are eligible to receive operating incentives. For 2011, the total cap for all types of solar PV was 487 MW. In the next few years, the government plans to reduce the capacity cap for ground-based installations and increase the cap for smaller BIPV installations. Capacity cap figures that will apply after 2011 were not available as of June 2011.

³ Real Decreto 1614/2010, de 7 de diciembre, por el que se regulan y modifican determinados aspectos relativos a la actividad de producción de energía eléctrica a partir de tecnologías solar termoelectrica y eólica, 7 December 2010. Available at <www.boe.es/aeboe/consultas/bases_datos/doc.php?id=BOE-A-2010-18915>.

⁴ EPIA, Global Market Outlook for Photovoltaics until 2015, May 2011. Available at <www.epia.org>.

Table 26.4 shows the FIT rates for solar PV installations commissioned between September 2008 and December 2010, and those commissioned from January 2011, as well as the annual capacity caps up to 2011. Degression rates will depend on the amount of new capacity installed every three months. If 75 per cent of the capacity cap is reached in any three-month period, then the FIT rates will decline by 2.5 per cent and the cap will increase by 2.5 per cent. The FIT rates can decline by a maximum of 10 per cent a year if the cap for the entire year is filled.

Table 26.4: Feed-in tariff rates for solar PV in Spain for installations commissioned from 2008 to 2011

Category		Period of validity	FIT rate (EUR/MWh)		Capacity cap (MW)		
			09/2008-12/2010	From 01/2011	2009	2010	2011
Type 1 (Roof top)	Type 1.1: ≤ 20 kW	28 years	340	288.821	27	30	33
	Type 1.2: > 20 kW		320	203.726	240	265	292
Type 2 (Other)	Up to 50 MW		320	134.585	233	207	162

Source: Real Decreto 1578/2008, de 26 de septiembre 2008. Available at <www.cne.es/cne/doc/legislacion/RD-fotovoltaica-Sept08.pdf>; Real Decreto 1565/2010, de 19 de noviembre, por el que se regulan y modifican determinados aspectos relativos a la actividad de producción de energía eléctrica en régimen especial. Available at <www.boe.es/aeboe/consultas/bases_datos/doc.php?id=BOE-A-2010-17976>; MITY, Registro de pre-asignación de retribución para instalaciones fotovoltaicas. Available at <www.mityc.es>.

26.4 Investment Support Incentives

Operating incentives are the primary method the government uses to promote renewable energy development in Spain. A tax rebate scheme for investments in renewable electricity development, introduced in 2006, ended on 1 January 2011. Several of the regions have their own funding programmes for solar PV development.⁵

⁵ MITY, National Renewable Energy Action Plan 2011-2020, June 2010. Available at <ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>.

Chapter 27: Sweden

27.1 Government Targets

Under the Kyoto Protocol, Sweden is committed to limit the increase of average emissions between 2008 and 2012 to 4 per cent above 1990 base levels. In 2009, GHG emission levels were 16.9 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 17 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. Sweden has a separate government target of reducing emissions by 40 per cent by 2020 and a long-term objective of becoming carbon neutral by 2050.¹ Sweden also has an EU target of meeting 49 per cent of final energy consumption from renewable energy sources by 2020, which was subsequently raised by the government to 50 per cent. In 2008, 44.9 per cent of final energy consumption was met with renewable energy sources.² The government has a target to increase renewable power generation by 25 TWh a year by 2020 compared to 2002 levels.

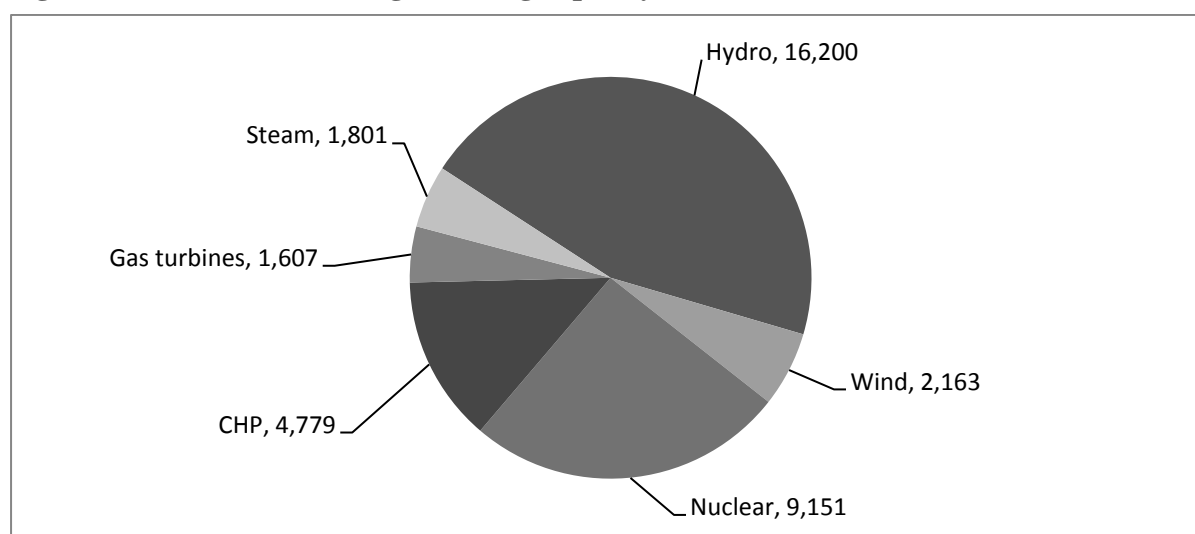
Table 27.1: Swedish government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of limiting the increase of average emissions between 2008 and 2012 to 4.0 per cent from 1990 base levels. As part of the Copenhagen Accord, an EU target for a 17 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emission Trading Scheme. Government targets for a 40 per cent reduction from 1990 levels by 2020 and carbon neutrality by 2050.
Renewable energy (RE)	An EU target for 49 per cent of final energy consumption to come from renewable energy sources by 2020, which the government raised to 50 per cent.
Renewable electricity	Increase renewable power generation by 25 TWh a year by 2020, compared to 2002 levels.

Source: Swedish Energy Agency. Energy in Sweden 2010. Available at <energimyndigheten.se>.

27.2 Electricity Generation Mix

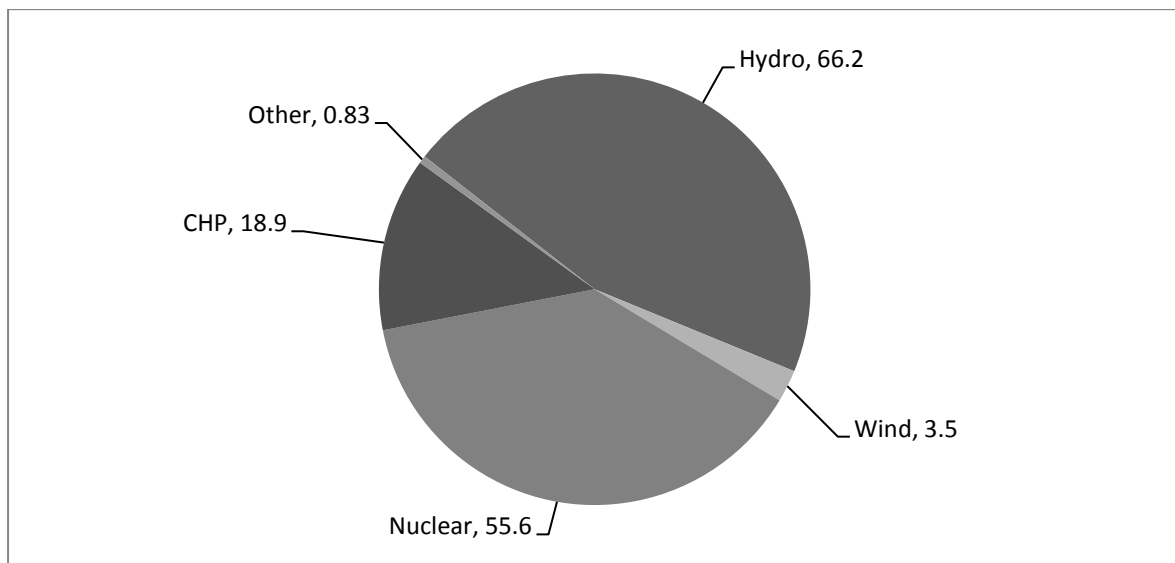
Figure 27.1: Total installed generating capacity in Sweden in 2010 (MW): 35,701 MW



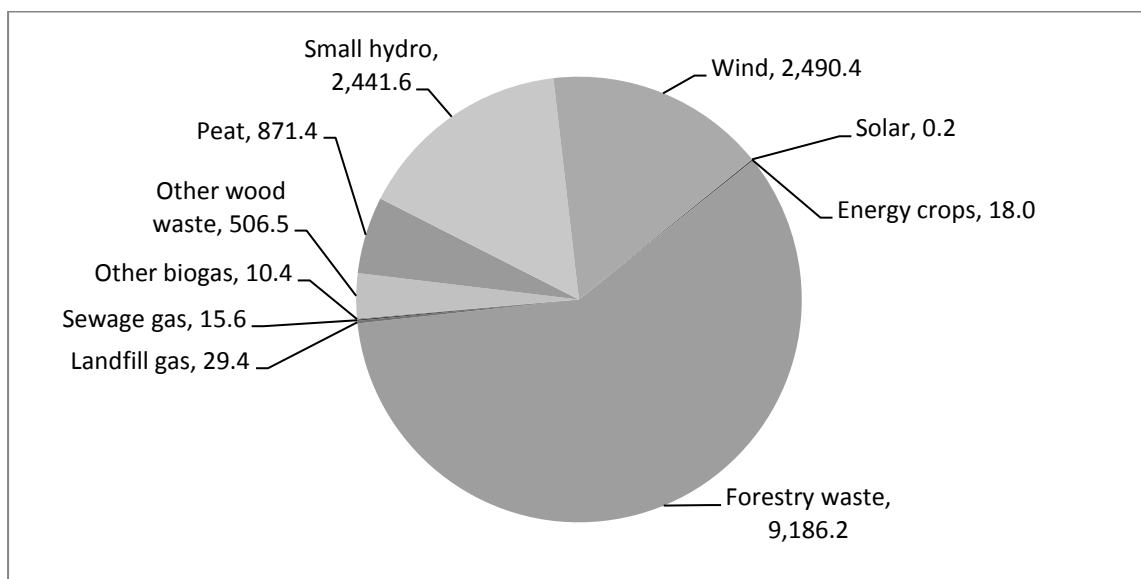
Source: Svensk Energi, Elåret 2010, 11 April 2011. Available at <www.svenskenergi.se/>.

¹ European Environment Agency, GHG Inventory, May 2011. Available at <www.eea.europa.>.

² Swedish Energy Agency, Energy in Sweden 2010. Available at <www.energimyndigheten.se>.

Figure 27.2: Electricity generation mix in Sweden in 2010 (TWh): Total 145.03 TWh

Source: Svensk Energi, Elåret 2010, 11 April 2011. Available at <www.svenskenergi.se/sv/Om-el/Statistik/Elaret/>.

Figure 27.3: Renewable electricity generation in Sweden in 2009 (GWh): Total 15,569.7 GWh

Note: Only the plants that receive the tradable green certificate are included.

Source: Swedish Energy Agency, The Electricity Certificate System 2010. Available at <www.energimyndigheten.se>.

27.3 Operating Support Incentives

Sweden uses a tradable green certificate (TGC) scheme as its primary renewable electricity support mechanism. The current TGC system was introduced in 2003 and is scheduled to end in 2035. In 2010, the government raised the target for the TGC system by increasing the level of generation of new renewable power from 17 TWh by 2016 to 25 TWh by 2020, all relative to 2002 levels. Also in 2011, the Norwegian and Swedish governments agreed that Norway would join the Swedish TGC scheme on 1 January 2012. Under the agreement, TGCs awarded for production in one country can be used to satisfy quota requirements in the other,

with each country adopting a target for 13.2 TWh of new renewable power generation by 2020. Details on the administration of the new TGC system, and the quota levels for each country, are expected to be published in late 2011.

Under the Swedish TGC system, eligible renewable power installations receive TGC certificates for 15 years. Those plants commissioned before 2003 can receive TGCs only until the end of 2012. Electricity generated from renewable sources, including wind, solar, wave, geothermal, biomass, and peat for CHP plants are covered in the scheme. Hydropower plants are eligible to receive TGCs if they:

- Began operation by April 2003 with a capacity of up to 1.5 MW
- Were built after 1 January 2003
- Were decommissioned before 1 July 2001 and brought back online after 2002
- Have increased output by rehabilitation or repowering (TGCs are awarded only up to a maximum of 15 MW of increased capacity)
- Are defined as ‘concession plants’ (no longer commercially viable due to public authority restrictions or the need for extensive refurbishment).³

Power suppliers and some large industrial end-users are required to purchase sufficient certificates to meet a government-set quota of their electricity sales or consumption. The quota for 2011 was 17.9 per cent (of total electricity sales or consumption). In 2013, this quota will be reduced to 13.5 per cent as the renewable power plants that were commissioned before 2003 will no longer be eligible to receive TGCs. The quota will then be increased to 19.5 per cent in 2020 (see Table 27.2). The quota system is, however, set to change in 2012 when Norway joins the Swedish TGC system. As of June 2011, it was not known what the quota levels would be under the Norwegian-Swedish TGC system.⁴

The price of the TGC fluctuates yearly. In 2010, the average price of a TGC in Sweden was SEK 294.70 (EUR 30.86).⁵ In addition to the income from the sale of TGCs, power producers receive income from the wholesale market electricity price, which in 2010 was 56.82 EUR/MWh. Renewable power generators therefore received 87.68 EUR/MWh in total in 2010; an increase from 67.71 EUR/MWh in 2009 due mainly to higher wholesale electricity prices. Table 27.3 shows the changes in the price of the TGCs since 2003, when the system started, as well as the average generation compensation in those years.

³ Department of Industry, Ladda ner En ny lag om elcertifikat-regelförenkling och en gemensam elcertifikatmarknad med Norge, 17 March 2011. Available at <www.regeringen.se/sb/d/14218/a/163707>.

⁴ Department of Industry, Ladda ner En ny lag om elcertifikat-regelförenkling och en gemensam elcertifikatmarknad med Norge, 17 March 2011. Available at <www.regeringen.se/sb/d/14218/a/163707>.

⁵ The SEK-EUR conversion rate used is EUR 1 = SEK 9.54973 (the average in 2010).

Table 27.2: Renewable electricity quota obligation in Sweden between 2010 and 2035

Year	Quota (%)	Projected cumulative additional renewable power output (TWh)
2010	17.9	10.81
2011	17.9	11.84
2012	17.9	12.94
2013	13.5	14.80
2014	14.2	16.26
2015	14.3	17.71
2016	14.4	19.17
2017	15.2	20.63
2018	16.8	22.09
2019	18.1	23.54
2020	19.5	25.00
2021	19.0	25.00
2022	18.0	25.00
2023	17.0	25.00
2024	16.1	25.00
2025	14.9	25.00
2026	13.7	25.00
2027	12.4	25.00
2028	10.7	25.00
2029	9.2	25.00
2030	7.6	25.00
2031	6.1	25.00
2032	4.5	25.00
2033	2.8	25.00
2034	1.2	25.00
2035	0.8	25.00

Source: Swedish Energy Agency, The Electricity Certificate System 2010. Available at <www.energimyndigheten.se>.

Table 27.3: Tradable green certificate prices and generation compensation in Sweden from 2003 to 2010

Description		2003	2004	2005	2006	2007	2008	2009	2010
Electricity certificate price	SEK	201.01	230.98	216.01	190.96	195.00	247.21	293.20	294.70
	EUR	21.05	24.19	22.62	20.00	20.42	25.89	30.70	30.86
Nordpool spot market price (EUR/MWh)		36.49	28.08	29.76	48.12	30.25	51.12	37.01	56.82
Total generation compensation (EUR/MWh)		57.54	52.27	52.38	68.12	50.67	77.01	67.71	87.68

Note: The SEK-EUR conversion rate used is EUR 1 = SEK 9.54973 (the average in 2010).

Source: Electricity certificate prices from Svenska Kraftnat, Elcertifikat. Available at <elcertifikat.svk.se>; Nordpool spot price is the EUR yearly average for the Swedish area. Available at <www.nordpoolspot.com>.

27.4 Investment Support Incentives

Between 2009 and December 2011, grants for installing roof-top solar PV installations were available from the Swedish Energy Agency that covered 60 per cent (55 per cent for commercial enterprises) of total investment costs, up to a maximum of SEK 2 million (EUR 210,000) per building.⁶

⁶ Swedish Energy Agency, Stöd till solceller. Available at <www.energimyndigheten.se/sv/Hushall/Aktuella-bidrag-och-stod-du-kan-soka/Stod-till-solceller/>.

Wind farm operators receive various tax breaks. Property tax on wind farms is 0.2 per cent of the value of the plant compared to 0.5 per cent for other power plants.⁷ Wind power also benefits from a reduced energy tax. The amount of tax relief varies depending on whether the producer is a commercial or non-commercial establishment, where the wind farm is located, and the identity of the electricity's end-consumer. Small, non-profit-making wind farms and offshore wind power are subject to a lower rate than other wind farms. Out of the various renewable power technologies, only wind power is eligible for this energy tax reduction.⁸

Total investment in energy research was SEK 1,250 million (EUR 130 million) in 2011 and it is expected to be SEK 900 million (EUR 94 million) in 2012. The funding focuses on research in all forms of renewable energy, with an overall aim for creating a national research network for wind power generation and biomass development.⁹

⁷ Lag (2006:2) om fastighetsskatt avseende vissa elproduktionsenheter vid 2007-2011 års taxeringar (Lag 2006:2) (Act (2006:2) on the real estate tax regarding certain electricity generation systems in the tax assessment years 2007-2011). Available at <www.riksdagen.se/webbnav/index.aspx?nid=3911&bet=2006:2>.

⁸ Lag (1994:1776) om skatt på energi (Lag 1994:1776) (Energy Tax Act 1994). Available at <www.riksdagen.se/webbnav/index.aspx?nid=3911&bet=1994:177>.

⁹ Swedish Energy Agency, Energy in Sweden 2010. Available at <www.energimyndigheten.se>.

Chapter 28: Switzerland

28.1 Government Targets

Under the Kyoto Protocol, Switzerland is committed to reduce average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. In 2008, GHG emission levels were 2.7 per cent lower than the 1990 base year.¹ Under the Copenhagen Accord, the country has a target to reduce emissions by 30 per cent from 1990 levels by 2020, contingent on other countries agreeing to further emission reductions.² The government has also introduced a national target to increase renewable electricity generation by 5,400 GWh from 2010 levels.

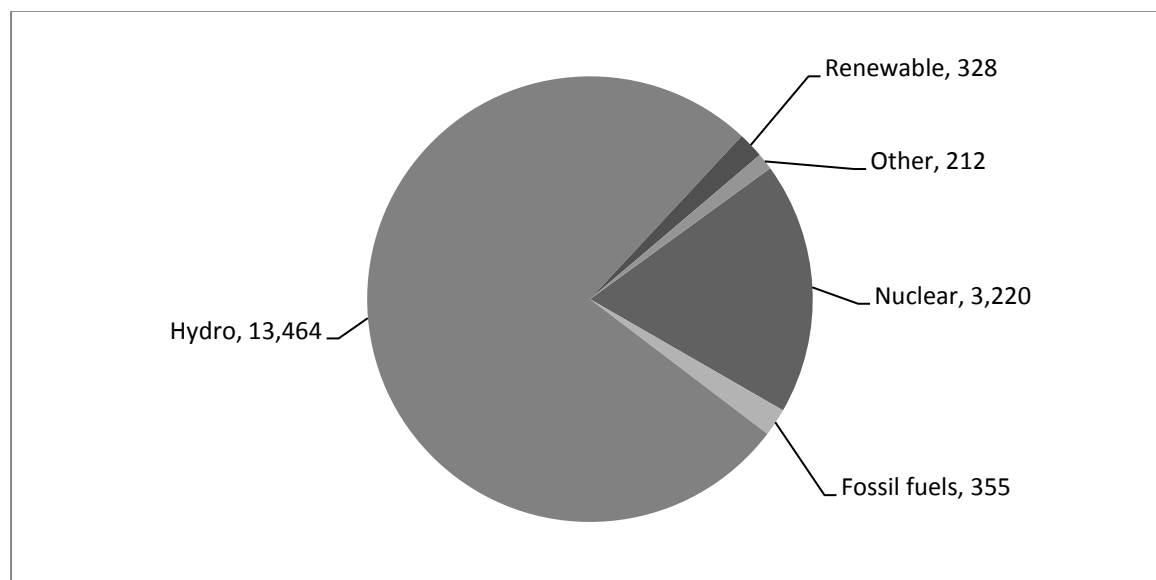
Table 28.1: Swiss government commitment summary

GHG emissions	A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 8 per cent from 1990 base levels. A Copenhagen Accord target for a 30 per cent reduction from 1990 levels by 2020.
Renewable energy (RE)	No target set.
Renewable electricity	A target of 5,400 GWh additional electrical generation from renewable sources by 2030; equivalent to 10 per cent of total consumption in 2010.

Source: Federal Energy Office. Available at <www.bfe.admin.ch>.

28.2 Electricity Generation Mix

Figure 28.1: Total installed generating capacity in Switzerland in 2009 (MW): 17,579 MW

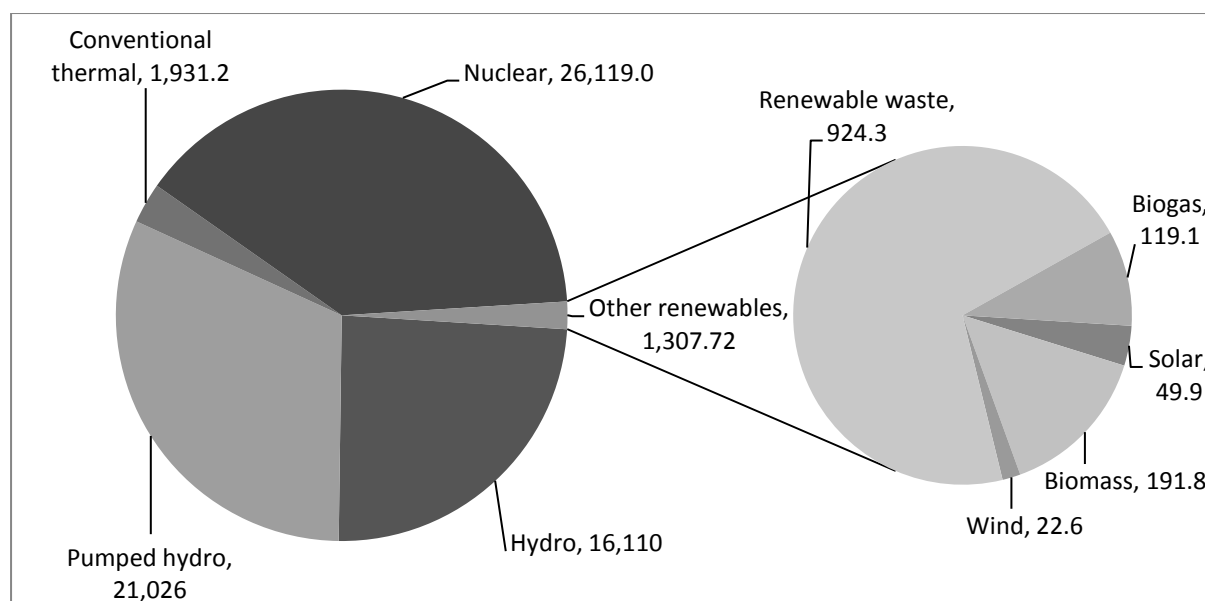


Source: ENTSO-E, Statistical Yearbook 2009, 2010. Available at <www.entsoe.eu/fileadmin/user_upload/_library/publications/entsoe/Statistical_Yearbook/101124_SYB_2009.pdf>.

¹ Federal Environment Office, Swiss Climate Policy, 2010. Available at <www.bafu.admin.ch/publikationen/publikation/01530/index.html?lang=en>.

² United Nations Framework Convention on Climate Change. Available at <unfccc.int/meetings/cop_15/copenhagen_accord/items/5264.php>.

**Figure 28.2: Electricity generation mix in Switzerland in 2009 (GWh):
Total 66,494 GWh**



Source: Energy Office, Schweizerische Statistik der erneuerbaren Energien, October 2010. Available at www.bfe.admin.ch/themen/00526/00541/00543/index.html?lang=en&dossier_id=00772.

28.3 Operating Support Incentives

In 2008, Switzerland introduced a feed-in tariff (FIT) system for the promotion of renewable electricity deployment. Table 28.2 sets out the compensation rates for different categories of installation, as well as the annual depreciation rate, and the year in which depreciation starts to impact base FIT rates.

The level of compensation for wind generation depends on the reference yield of a 'typical' wind farm, as determined by the government. All wind farms are eligible to receive FIT rates for 20 years from their commissioning date, but those that produce above the 80 per cent reference yield are eligible to receive the standard rate only for a fixed period, after which a lower tariff rate applies for the remaining balance of the 20-year lifetime. The FIT rates for all renewable electricity generating technologies are evaluated every five years. The FIT rate for solar PV was reduced by 18 per cent in January 2011.³

Because of the large number of applications under the new FIT system, the available funds for new renewable power installations were completely allocated as of February 2009, merely a month after applications were first accepted. New applicants have since been added to a waiting list, which is expected to be cleared by 2013.⁴

³ BFE, Kostendeckende Einspeisevergütung: Vergütung für Solarstrom sinkt - „Deckel“ steigt, December 2010. Available at www.bfe.admin.ch/energie/00588/00589/00644/index.html?lang=de&msg-id=36702.

⁴ BFE, Kostendeckende Einspeisevergütung: Vergütung für Solarstrom sinkt - „Deckel“ steigt, December 2010. Available at www.bfe.admin.ch/energie/00588/00589/00644/index.html?lang=de&msg-id=36702.

Table 28.2: Feed-in tariffs in Switzerland in 2011

Category		Years valid	FIT rate		Annual depression rate	Degression starting year
			CHF/MWh	EUR/MWh ^a		
Small wind power (≤ 10 kW)		20	200	144.90	1.50%	2013
Large wind power (> 10 kW)	60% Reference yield	20	200	144.90	1.50%	2013
	70% Reference yield	20	200	144.90		
	80% Reference yield	20	200	144.90		
	90% Reference yield	18.3	200	144.90		
	100% Reference yield	16.1	200	144.90		
	110% Reference yield	13.9	200	144.90		
	120% Reference yield	11.7	200	144.90		
	130% Reference yield	9.4	200	144.90		
	140% Reference yield	7.2	200	144.90		
	150% Reference yield	5	200	144.90		
	After premium period	To year 20	170	123.16		
Solar PV	Ground-mounted				8%	2010
	≤ 10 kW	25	437	316.60		
	≤ 30 kW		388	281.10		
	≤ 100 kW		357	258.64		
	> 100 kW		332	240.53		
	Rooftop				8%	2010
	≤ 10 kW	25	504	365.14		
	≤ 30 kW		459	332.54		
	≤ 100 kW		430	311.53		
	> 100 kW		406	294.14		
	Building integrated				8%	2010
	≤ 10 kW	25	605	438.31		
	≤ 30 kW		534	386.87		
	≤ 100 kW		476	344.85		
	> 100 kW		422	305.73		
Geothermal	≤ 5 MW	20	400	289.79	0.50%	2018
	≤ 10 MW		360	260.81		
	≤ 20 MW		280	202.85		
	> 20 MW		227	164.46		
Small hydro (≤ 10 MW)	≤ 10 kW	25	260	188.36	0%	N/A
	≤ 50 kW		200	144.90		
	≤ 300 kW		145	105.05		
	≤ 1 MW		110	79.69		
	≤ 10 MW		75	54.34		
	Pressure bonus (for the head of the penstock)				N/A	N/A
	≤ 5 metres		45	32.60		
	≤ 10 metres		27	19.56		
	≤ 20 metres		20	14.49		
	≤ 50 metres		15	10.87		
	> 50 metres		10	7.24		
	Maximum tariff			350	253.57	0%

Biomass	Sewage gas maximum	20	240	173.88	0%	N/A
	Waste gas maximum		200	144.90		
	Other					
	≤ 50 kW	20	280	202.85	0%	N/A
	≤ 100 kW		250	181.12		
	≤ 500 kW		220	159.39		
	≤ 5 MW		185	134.03		
	> 5 MW		175	126.78		
	Wood burning bonus		30	21.73	0%	N/A
	Power bonus from agricultural wastes					
	≤ 50 kW	20	180	130.41	0%	N/A
	≤ 100 kW		160	115.92		
	≤ 500 kW		130	94.18		
	≤ 5 MW		45	32.60		
	> 5 MW		0	0.00		

Note: ^a The CHF-EUR conversion rate used is EUR 1 = CHF 1.3803 (the average in 2010).

Source: Adapted from Energieverordnung (EnV) vom 7. Dezember 1998 (Stand am 1. Januar 2010). Available at <www.admin.ch/ch/d/sr/7/730.01.de.pdf>.

28.4 Investment Support Incentives

The federal government relies upon the FIT system to promote renewable energy development. Solar PV developers on the waiting list for the FIT system are eligible for investment grants of between 2,500 and 3,500 CHF/kW (2,020-2,828 EUR/kW)⁵, up to a maximum of CHF 35,000 (EUR 28,280).⁶ In addition to these grants, some of the regional governments have initiated their own incentive programmes to encourage the adoption of renewable power amongst households, which includes, for example, grants for biomass-fired combined heat and power systems, and small hydro and solar power installations.

⁵ Assuming exchange rate to be 1 CHF = 0.808 EUR

⁶ BFE, Solar Grants. Available at <www.bfe.admin.ch/energie/00588/00589/index.html?lang=en>.

Chapter 29: Turkey

29.1 Government Targets

Turkey ratified the Kyoto Protocol in 2009, but as a non-Annex I country does not have a GHG emissions reduction target. Due to economic and demographic developments, GHG emissions almost doubled between 1990 and 2008, rising in every sector except agriculture.. In May 2010, the government produced a National Climate Change Strategy 2010-2020, which stated that Turkey would work towards a 20 per cent reduction of emissions intensity against GDP from 2008 levels by 2023. Turkey has not submitted a target under the Copenhagen Accord. The government has a domestic target to meet 30 per cent of its total electricity generation from renewable energy sources by 2023, with separate targets for wind, geothermal and hydro power development.

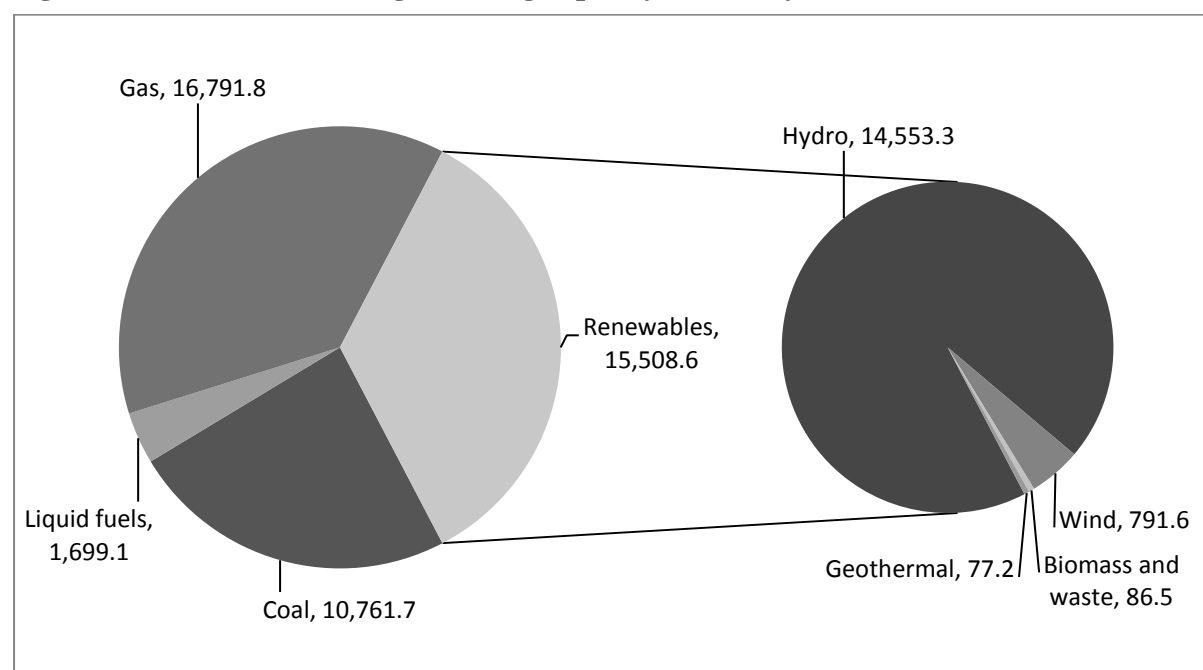
Table 29.1: Turkish government commitment summary

GHG emissions	Reduce GHG emissions per unit of GDP by 20 per cent from 2008 levels by 2023.
Renewable energy (RE)	No target set.
Renewable electricity	30 per cent of total electricity generation to come from renewable energy sources by 2023. Included in this target are: <ul style="list-style-type: none"> • Total installed capacity of 20,000 MW of wind power • Total installed capacity of 600 MW of geothermal power • Exploitation of all commercially viable hydropower sites in the country.

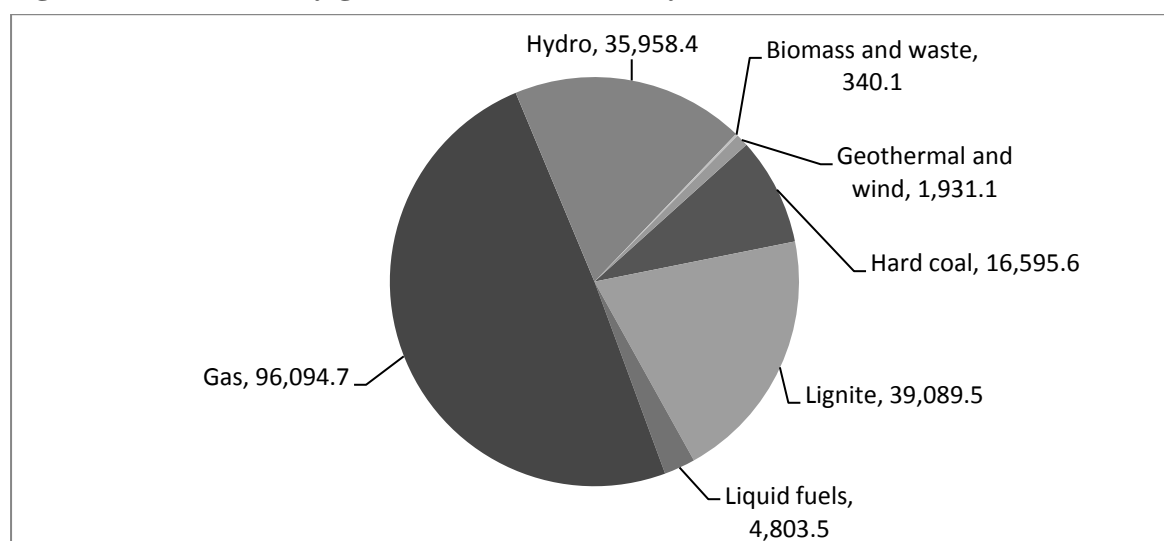
Source: Ministry of the Environment, National Climate Change Strategy 2010-2020, May 2010. Available at <iklim.cob.gov.tr/iklim/Files/Stratejiler/National%20Strategy.pdf>.

29.2 Electricity Generation Mix

Figure 29.1: Total installed generating capacity in Turkey in 2009 (MW): 44,761.2 MW



Source: TEIAS, Istatikler. Available at <www.teias.gov.tr/istatistik2009/index.htm>.

Figure 29.2: Electricity generation mix in Turkey in 2009 (GWh): Total 194,812.9 GWh

Source: TEIAS, İstatikler. Available at <www.teias.gov.tr/istatistik2009/index.htm>.

29.3 Operating Support Incentives

Turkey first introduced a feed-in tariff (FIT) system for the promotion of renewable electricity development in 2005, and in December 2010, the government introduced a new FIT system. Under the new FIT system, renewable power generators receive fixed tariff rates (in USD) for 10 years of operation (see Table 29.2). In addition to the FIT rates, bonus payments will be available for the first five years of operation if the equipment used is domestically produced (see Table 29.3). More than one bonus payment can be added to the FIT rate. For example, a solar PV system with all the eligible equipment made and assembled in Turkey will qualify for five bonus payments in addition to the FIT rate of 133 USD/MWh (100.32 EUR/MWh), increasing compensation to 199 USD/MWh (150.11 EUR/MWh¹).²

A maximum total of 600 MW of solar power can be supported in the FIT system until 2013. The entire FIT system will be reviewed by 2015. Grid operators are required to purchase all output from renewable power installations.³

Table 29.2: Feed-in tariff rates in Turkey in 2011

Category	Rate	
	USD/MWh	EUR/MWh
Wind	73	55.07
Hydro	73	55.07
Geothermal	105	79.20
Solar	133	100.32
Biomass and landfill gas	133	100.32

Source: Kanun No. 6094 Yenilenebilir Enerji Kaynaklarının Elektrik Enerjisi Üretimi Amaçlı Kullanımına İlişkin Kanunda Değişiklik Yapılmasına Dair Kanun, 29/12/2010. Available at <www2.epdk.org.tr>.

¹ The USD-EUR conversion rate used is EUR 1 = USD 1.3257 (the average in 2010).

² Ministry of Energy, Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy, Law No. 5346, 2005. Available at <www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyResources.pdf>.

³ Ministry of Energy, Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy, Law No. 5346, 2005. Available at <www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyResources.pdf>.

Table 29.3: Bonus payments for domestically-produced equipment in Turkey

Equipment		Bonus	
		USD/MWh	EUR/MWh
Hydro	Turbine	13	9.81
	Generator and power electronics	10	7.54
Wind	Blades	8	6.03
	Generator and power electronics	10	7.54
	Tower	6	4.53
	All mechanical parts	13	9.81
Geothermal	Turbine	13	9.81
	Generator and power electronics	70	52.80
	Steam injector or gas compressor	70	52.80
Solar PV	Panel integration	8	6.03
	Modules	13	9.81
	Cells which make up the modules	35	26.40
	Inverter	5	3.77
	Tracking system	5	3.77
Concentrating solar	Heat tubes	24	18.10
	Mirrors	6	4.53
	Tracking system	6	4.53
	Mechanical components of heat storage	13	9.81
	Mechanical components of heat collection	24	18.10
	Stirling engine	13	9.81
	Panel integration and mechanical construction	60	45.26
Biomass and landfill gas	Bearings with steam boiler	8	6.03
	Liquid or gas-fuelled steam boiler	4	3.02
	Gasification or gas cleaning equipment	6	4.53
	Steam or gas turbine	20	15.09
	Internal combustion engine or Stirling engine	9	6.79
	Generator and power electronics	5	3.77
	Cogeneration equipment	4	3.02

Source: Kanun No. 6094 Yenilenebilir Enerji Kaynaklarının Elektrik Enerjisi Üretimi Amaçlı Kullanımına İlişkin Kanunda Değişiklik Yapılmasına Dair Kanun, 29/12/2010. Available at <www2.epdk.org.tr>.

29.4 Investment Support Incentives

Since 2001, the initial license fee payable by developers of new renewable installations has been reduced 99 per cent. The annual license fee payable by generating installations is also waived for eight years for those installations relying on renewable energy sources. For land which is leased from the state for the purposes of exploiting a source of renewable energy, a discount of 85 per cent is available on the permission, rent, and exploitation rights fees which would normally apply. However, the facility has to be completed before 31 December 2015 in order to qualify. Renewable energy plants can also be built in protected nature reserves, if approved by the Ministry of the Environment.⁴

In 2010, the European Bank for Reconstruction and Development (EBRD) announced a EUR 900 million Sustainable Energy Financing Facility, partially financed by the World Bank's Clean Technology Fund, which will provide private sector financing to energy efficiency improvements and renewable energy projects in Turkey.⁵

⁴ Kanun No. 6094, 29/12/2010. Available at <www2.epdk.org.tr>.

⁵ EBRD, EBRD and Turkey Sign Sustainable Energy Plan, March 2011. Available at <www.ebrd.com/pages/news/press/2011/110316.shtml>.

Chapter 30: United Kingdom

30.1 Government Targets

Under the Kyoto Protocol, the UK is committed to reduce average emissions between 2008 and 2012 by 12.5 per cent from 1990 base levels. In 2010, GHG emission levels were 25.2 per cent lower than the 1990 base year. As part of the Copenhagen Accord, the country has a target to reduce emissions by 16 per cent from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme. The government passed a legally binding GHG emissions reduction target of 80 per cent from 1990 levels by 2050, with an interim target of 34 per cent by 2020.¹ The devolved governments of Scotland, Wales and Northern Ireland have set their own GHG emission reduction targets.

The UK has an EU target of meeting 15 per cent of final energy consumption with renewable energy sources by 2020. In 2009, 3.0 per cent of final energy consumption was met with renewable energy sources.² The devolved governments of Scotland, Wales and Northern Ireland have set their own renewable electricity targets.

Table 30.1: UK government commitment summary

GHG emissions	<p>A Kyoto Protocol burden-sharing target of reducing average emissions between 2008 and 2012 by 12.5 per cent from 1990 base levels.</p> <p>Through the Copenhagen Accord, an EU reduction target of 16 per cent reduction from 2005 levels by 2020 in areas not covered by the EU Emissions Trading Scheme.</p> <p>A UK national target for an 80 per cent reduction from 1990 levels by 2050, with an interim target of 34 per cent by 2020.</p> <p>The devolved governments of the UK have self-declared targets:</p> <ul style="list-style-type: none"> • Scotland: 42 per cent reduction from 1990 levels by 2020 • Wales: 40 per cent reduction from 1990 levels by 2020 • Northern Ireland: 25 per cent reduction from 1990 levels by 2025.
Renewable energy (RE)	An EU target for 15 per cent of final energy consumption to come from renewable energy sources by 2020.
Renewable electricity	<p>The devolved governments of the UK have self-declared targets:</p> <ul style="list-style-type: none"> • Scotland: 80 per cent of electricity consumption with renewable energy sources by 2020 • Wales: 100 per cent of electricity to come from renewable energy sources by 2025 • Northern Ireland: 40 per cent of electricity consumption with renewable energy sources by 2024.

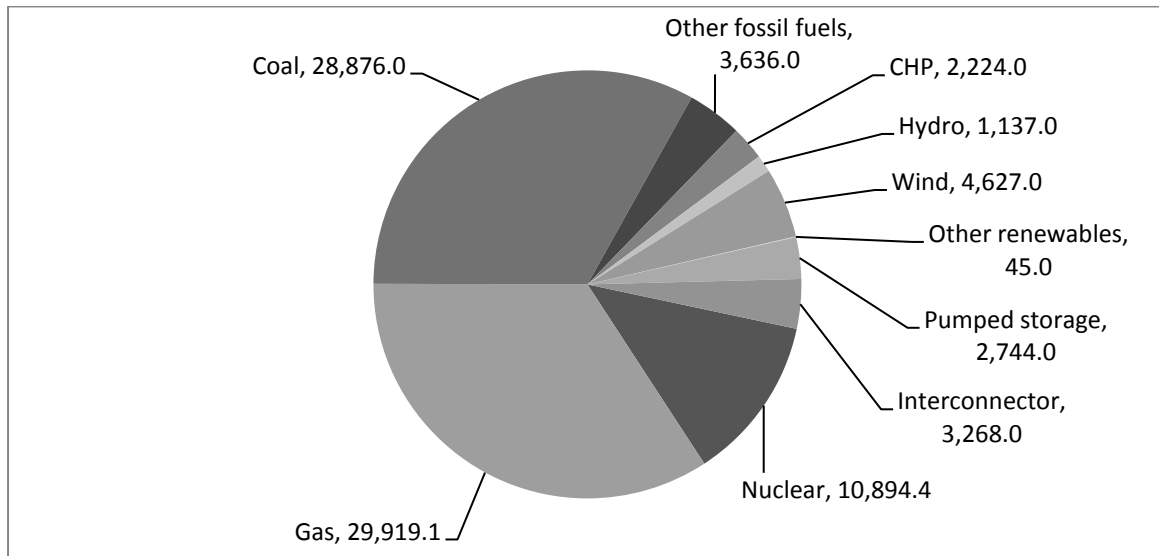
Source: Information from DECC, Targets. Available at <www.decc.gov.uk>.

¹ DECC, UK Greenhouse Gas Emissions 1990-2010 (provisional), 31 March 2011. Available at <www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2010_prov/2010_prov.aspx>.

² DECC, Statistics. Available at <www.decc.gov.uk>.

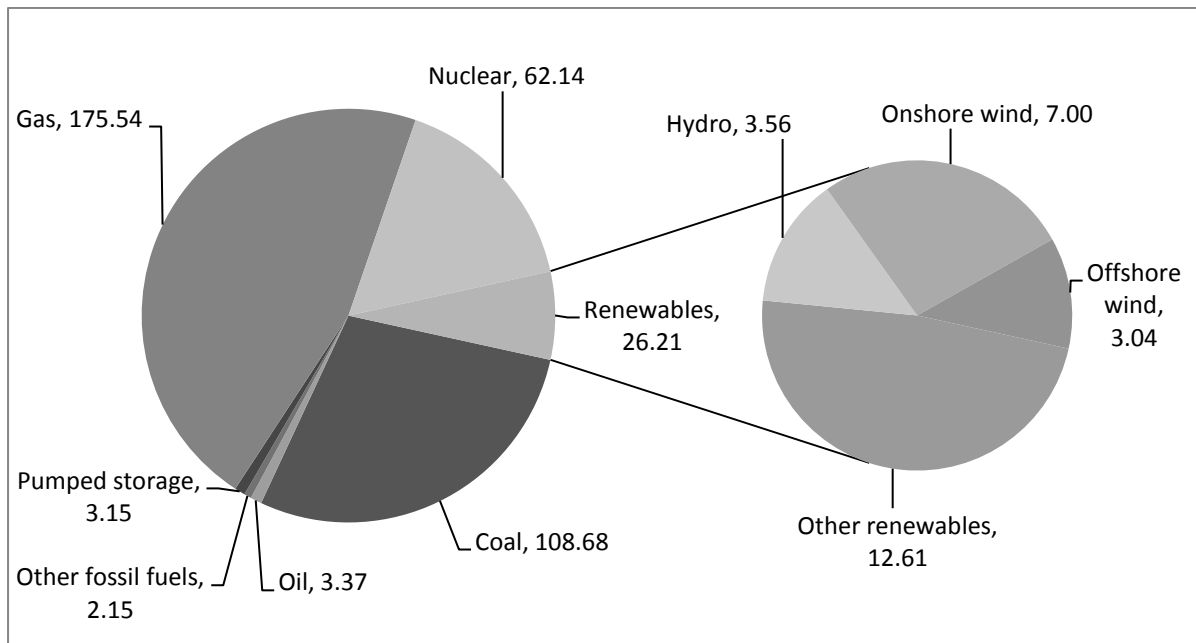
30.2 Electricity Generation Mix

Figure 30.1: Total installed generating capacity in the UK in 2010-2011 (MW): 84,102.5 MW



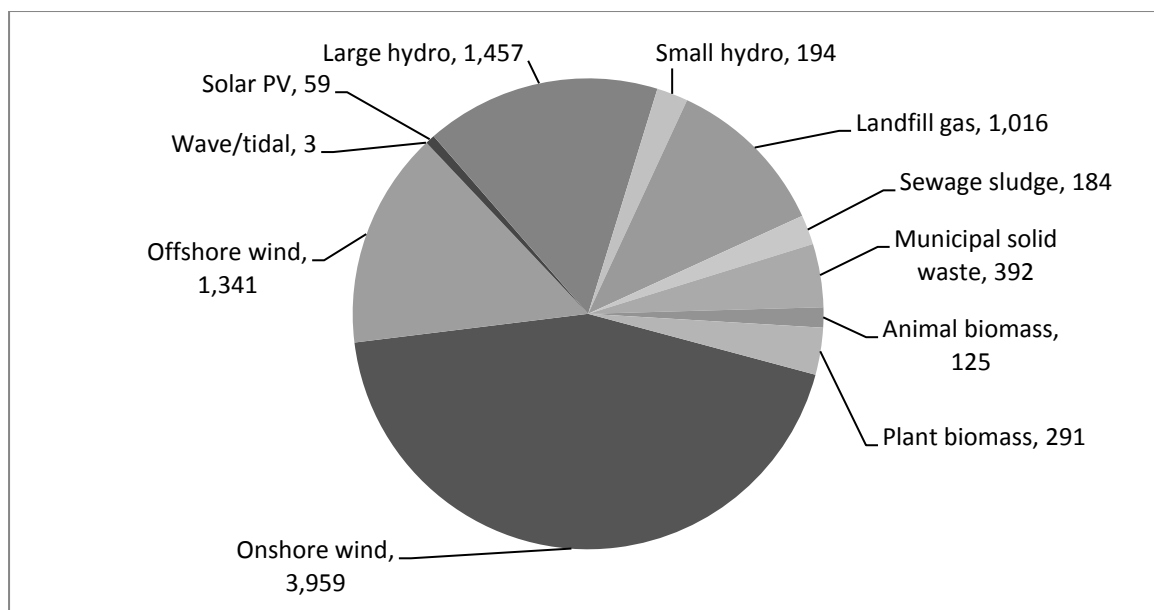
Source: National Grid, Seven Year Statement 2010/11. Available at www.nationalgrid.com/uk/Electricity/SYS/current/.

Figure 30.2: Electricity generation mix in the UK in 2010 (TWh): Total 381.25 TWh



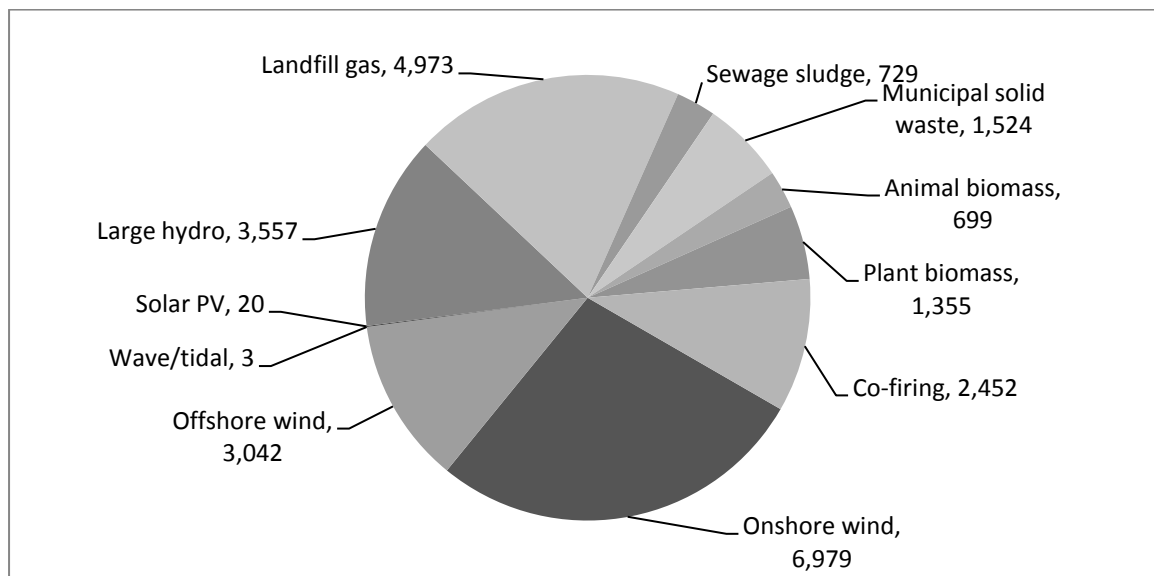
Source: DECC, Energy Trends, March 2011. Available at www.decc.gov.uk.

Figure 30.3: Total installed generating capacity of renewable power in the UK in 2010 (MW): 9,021 MW



Source: DECC, Energy Trends, March 2011. Available at <www.decc.gov.uk>.

Figure 30.4: Renewable electricity generation in the UK in 2010 (GWh): Total 25,335 GWh



Source: DECC, Energy Trends, March 2011. Available at <www.decc.gov.uk>.

30.3 Operating Support Incentives

30.3.1 Tradable Green Certificates

The UK has a tradable green certificate (TGC) system, called the Renewables Obligation (RO), as its primary renewable power support mechanism. The RO Order for England and Wales and the RO Order for Scotland initially came into effect in April 2002, and the RO Order for Northern Ireland came into effect in April 2005.

Under the RO system, renewable power plants commissioned between 1990 and 2008 receive Renewable Obligation Certificates (ROCs) for renewable electricity either supplied to the grid or consumed onsite (e.g., in a factory) for 20 years or until 2027. Renewable power plants built after April 2008 are entitled to receive ROCs for 20 years or until 2037 (2033 in Northern Ireland)—whichever comes first. Demand for the ROCs is created through the imposition of a quota obligation by the government. Prior to 1 April 2009, one ROC was issued for every MWh of renewable electricity supplied to the grid. On 1 April 2009, the government introduced technology banding to provide additional support for technologies that are currently further from commercial deployment. The technology banding will apply to all installations that were commissioned after July 2006.

Under this new system of technology banding, each generating technology will qualify for a certain number of ROCs per MWh of electricity supplied (see Table 30.2). For instance, from April 2009, landfill gas received only 0.25 ROCs/MWh, while tidal power received 2 ROCs/MWh. In April 2009, Scotland unilaterally increased the number of ROCs issued to wave (5 ROCs/MWh) and tidal (3 ROCs/MWh) installations in order to further promote these technologies. The use of the RO system is under review by the government in its energy market reform proposals (see section 30.3.4 below). Northern Ireland has a different banding system.

Table 30.2: The technology banding of Renewable Obligation Certificates in Great Britain (England, Scotland and Wales)

Band	Technology	ROC/MWh
Established 1	Landfill gas	0.25
Established 2	Sewage gas	0.5
	Co-firing with biomass	
Reference	Hydropower (≤ 20 MW)	1
	Onshore wind	
	Geopressure	
	Energy from waste with CHP	
	Co-firing with energy crops	
	Co-firing with CHP	
Post-demonstration	Co-firing with CHP using energy crops as fuel	1.5
	Dedicated biomass	
Offshore wind	If commissioned before 1 April 2014	2
	From 1 April 2014	1.5
Emerging	Wave power	2
	Tidal stream	
	Tidal barrage	
	Tidal lagoon	
	Solar PV	
	Geothermal	
	Gasification/pyrolysis (conversion of biomass into a gas or liquid)	
	Anaerobic digestion from material which is neither sewage or landfill	
	Biomass combustion from dedicated energy crops	
	Dedicated biomass with CHP	
Wave and tidal power in Scotland	Wave power in Scottish waters (no grants)	5
	Tidal power in Scottish waters (no grants)	3

Sources: Ofgem, Renewables Obligation: Guidance for Generators, 1 April 2010. Available at <www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=236>.

The quota that suppliers of electricity are required to meet is defined in terms of ROCs per 100 MWh of supplied generation. There is one quota for Great Britain (England, Scotland

and Wales) and another for Northern Ireland (see Table 30.3). In both cases, suppliers are required to present the required number of certificates to the relevant administrator of the RO system (Ofgem, the Office of Gas and Electricity Markets, in Great Britain; and NIAUR, the Northern Ireland Authority for Utility Regulation, in Northern Ireland). ROCs awarded for generation in one region can be redeemed to meet the quota in another, and up to 25 per cent of a supplier's annual quota can be met with ROCs that were issued in the previous year; although for ROC's derived from co-firing biomass can only be used to meet 10 per cent of a supplier's quota. In 2009-10, 71 per cent of the government's quota was met with ROCs.

To ensure that there is always a demand for ROCs in the market, from 2011 the government will guarantee that every year the quota will be set so that the implied amount of ROCs needed to discharge the obligations of all suppliers will be at least 10 per cent higher than the expected amount of ROCs created in the coming year.³

Table 30.3: Renewable electricity quota obligation in Great Britain (England, Scotland and Wales) and Northern Ireland

Obligation period (April-March)	Number of ROCs needed for each 100 MWh supplied in Great Britain (England, Scotland and Wales)	Number of ROCs needed for each 100 MWh supplied in Northern Ireland
2002-2003	3.0	N/A
2003-2004	4.3	
2004-2005	4.9	
2005-2006	5.5	2.5
2006-2007	6.7	2.6
2007-2008	7.9	2.8
2008-2009	9.1	3.0
2009-2010	9.7	3.5
2010-2011	10.4	4.0
2011-2012	11.4	5.0
2012-2013	12.4	6.3
2013-2014	13.4	6.3
2014-2015	14.4	6.3
2015-2016	15.4	6.3
2016-2037 (2033 in Northern Ireland)	Obligation will rise to at least 20 per cent on a 'headroom' ^a basis, depending on the state of RE in the UK at the time.	

Note: N/A: Not Applicable. ^a 'Headroom' implies that the 20 per cent target increase in the quota will apply to the number of ROCs created in 2016.

Source: Ofgem, Renewables Obligation: Guidance for Licensed Electricity Suppliers, April 2010. Available at <www.ofgem.gov.uk>.

In the event of the supplier failing to present the required quota of ROCs to the regulator, a penalty fine is payable for each missing certificate, officially referred to as the 'buyout price'. In 2010-2011, the buyout price was set at GBP 36.99 per certificate (EUR 43.12⁴). The revenues from these fines are pooled and then recycled to all suppliers in proportion to how large their submission of ROCs was as a share of total ROC submissions. By returning the proceeds in such a manner, the ROC system penalises suppliers who did not purchase sufficient ROCs whilst lowering the effective total cost of the ROC to suppliers who did.

³ Ofgem, RO Annual Report 2009-10, February 2011. Available at <www.ofgem.gov.uk>.

⁴ The GBP-EUR conversion rate used is EUR 1 = GBP 0.85784 (the average in 2010).

The average ROC price at auction between April 2010 and March 2011 was GBP 48.67⁵ (EUR 56.75)—a figure which is higher than the buyout price. Nonetheless, if it is assumed that the income from the buyout fund divided by presented ROCs was the same as in 2009-10 (GBP 15.17 per ROC), thus the effective price of a ROC to a supplier was GBP 33.50 (EUR 39.05), which is below the buyout price for 2010/11.⁶

The average wholesale market price for base-load electricity in the UK was 41 GBP/MWh (47.80 EUR/MWh) in 2010.⁷ Based on the average ROC price of GBP 48.67 in 2010-11, Table 30.4 shows the average total generation compensation in 2010 based on the technology banding.

Table 30.4: Generation compensation for renewable electricity under the RO system in Great Britain (England, Scotland and Wales) in 2010

Technology	Banding	Income from ROC sale (GBP/MWh) ^a	Income from electricity sale (GBP/MWh)	Total generation compensation in 2010	
				GBP/MWh	EUR/MWh ^b
Landfill gas (in Great Britain)	0.25	12.17	41	53.17	61.98
Co-firing with biomass	0.5	24.34	41	65.34	76.16
Sewage gas	0.5	24.34	41	65.34	76.16
Small hydropower	1	48.67	41	89.67	104.53
Onshore wind power	1	48.67	41	89.67	104.53
Co-firing in CHP with energy crops	1.5	73.01	41	114.01	132.90
Dedicated biomass combustion	1.5	73.01	41	114.01	132.90
Offshore wind power (commissioned before 2014)	2	97.34	41	138.34	161.27
Anaerobic digestion (not sewage or landfill gas)	2	97.34	41	138.34	161.27
Dedicated biomass using energy crops	2	97.34	41	138.34	161.27
Gasification	2	97.34	41	138.34	161.27
Wave and tidal power (in England, Wales and NI)	2	97.34	41	138.34	161.27
Wave power in Scotland	5	243.35	41	284.35	331.47
Tidal power in Scotland	3	146.01	41	187.01	218.00

Notes: ^aBased on the average ROC price of GBP 48.67 in 2010;

^bThe GBP-EUR conversion rate used is EUR 1 = GBP 0.85784 (the average in 2010).

30.3.2 Microgeneration Feed-in Tariff

In April 2010, the government introduced a feed-in tariff (FIT) system for small-scale generation of up to 5 MW in Great Britain (England, Scotland and Wales; there is not a FIT system in Northern Ireland). All suppliers with more than 50,000 customers are obliged to pay the FIT to eligible renewable installations.

⁵ Non-Fossil Fuel Purchasing Agency, E-Roc. Available at <eroc.co.uk/trackrecord.htm>.

⁶ Ofgem, RO Annual Report 2009-10, February 2011. Available at <www.ofgem.gov.uk>.

⁷ RWE, Annual Report 2010, p. 63. Available at <www.rwe.com/web/cms/mediablob/en/543512/data/543274/4/rwe/investor-relations/Annual-report-2010-PDF-Download-.pdf>.

Under the FIT system, rates are calculated to offer a return of between 5 and 8 per cent on the initial investment, and are adjusted for inflation. Rates vary according to the generation source and the rated capacity of the installation. The FIT rate in Great Britain (England, Scotland and Wales) is composed of: a 'generation tariff' (see Table 30.5), which is paid for all output, including output which is used on site; and an 'export tariff' that is paid on top of the 'generation tariff' for any output that is fed into the grid. In 2011, the 'export tariff' for all technologies is 31 GBP/MWh (34.97 EUR/MWh).

For illustrative purposes, a 250 kW wind power system installed in 2011 that feeds all of its output to the grid would receive 228 GBP/MWh (the 197 GBP/MWh generation tariff plus 31 GBP/MWh export tariff), or 195.59 EUR/MWh. Generators with over 50 kW in capacity will be able to choose between the FIT system and the RO system when the installation is commissioned. Once a choice has been made, switching is not allowed.

When introduced in 2010, the government planned to review the FIT system in 2013; however in March 2011, due to a large number of applications for large-scale solar power facilities, the government launched an early review of the tariff rates for solar PV over 50 kW and for anaerobic digestion (AD). In June 2011, the government announced that the FIT rates for solar PV over 50 kW would decrease, and those for AD would increase, effective from 1 August 2011. These tariff rate changes apply only to new systems and not to generators that already receive FIT payments.⁸

The FIT is guaranteed for 20 years (25 years for solar PV) and the rates for all generators are adjusted yearly for inflation. Existing microgenerators, however, that were permitted to transfer from the RO system are only entitled to receive FIT rates until 2027. Furthermore, the export tariff for electricity fed into the grid can be changed by the government every year. The government is also launching a micro-CHP pilot scheme which will be reviewed when 30,000 installations have been completed.⁹

⁸ DECC, New Feed-In Tariff Levels for Large Scale Solar and Anaerobic Digestion Announced Today, 9 June 2011. Available at <www.decc.gov.uk/en/content/cms/news/pn11_046/pn11_046.aspx>.

⁹ Ofgem, Feed-in Tariff Scheme: Information for Licensed Electricity Suppliers, 14 May 2010. Available at <www.ofgem.gov.uk> and Statutory Instruments 2010 No. 678 Electricity: The Feed-in Tariffs (Specified Maximum Capacity and Functions) Order 2010, 1 April 2010. Available at <www.opsi.gov.uk/si/si2010/pdf/uksi_20100678_en.pdf>.

Table 30.5: Feed-in tariff generation rates for grid-connected generators commissioned from 2010 to 2012 in Great Britain (England, Scotland and Wales)

Category		Rate			
		GBP/MWh		EUR/MWh	
		2010-2011	2011-2012 ^a	2010-2011	2011-2012
Wind power	≤ 1.5 kW	345	362	402.17	421.99
	> 1.5-15 kW	267	280	311.25	326.40
	> 15-100 kW	241	253	280.94	294.93
	> 100-500 kW	188	197	219.16	229.65
	> 500 kW – 1.5 MW	94	99	109.58	115.41
	> 1.5 MW – 5 MW	45	47	52.46	54.79
Solar PV	≤ 4 kW (new building)	361	378	420.82	440.64
	≤ 4 kW (retrofit on existing building)	413	433	481.44	504.76
	> 4-10 kW	361	378	420.82	440.64
	> 10-50 kW	314	329	366.04	383.52
	> 50-100 kW		190		221.49
	> 100-150 kW	293	190	341.56	221.49
	> 150-250 kW		150		174.86
	> 250 kW – 5 MW		85		99.09
	All ground based		85		99.09
Anaerobic digestion	≤ 250 kW	115	140	134.06	163.20
	< 250-500 kW		130		151.54
	> 500 kW	90	121	104.91	141.05
Small hydro	≤ 15 kW	199	209	231.98	243.64
	> 15-100 kW	178	187	207.50	217.99
	> 100 kW – 2 MW	110	115	128.23	134.06
	> 2 MW – 5 MW	45	47	52.46	54.79
Micro CHP pilot (biomass) ≤ 2 kW		100	105	116.57	122.40
Existing microgenerators transferring from the RO		90	94	104.91	109.58

Notes: For power fed into the grid, add GBP 31/ EUR 34.97 to the figures given.

^aThe FIT rate for solar PV was effective from 1 August 2011.

Source: Ofgem, Feed-in Tariff Payment Table, 1 April 2011. Available at <www.ofgem.gov.uk>; DECC, New Feed-In Tariff Levels for Large Scale Solar and Anaerobic Digestion Announced Today, 9 June 2011. Available at <www.decc.gov.uk/en/content/cms/news/pn11_046/pn11_046.aspx>.

30.3.3 Climate Change Levy

Electricity produced at renewable power plants and highly efficient CHP plants is exempt from the Climate Change Levy (CCL), which is a tax on all non-domestic energy users, excluding the transport sector, that seeks to promote energy efficiency and reduce related GHG emissions. Nuclear installations are also subject to the tax. Since 2009, the CCL rate for electricity was 4.85 GBP/MWh (5.65 EUR/MWh) and the levy is collected by power suppliers.

Renewable power and CHP installations can receive CCL Exemption Certificates issued by Ofgem, the energy regulator, together with ROCs. The Certificates are then sold to suppliers that can redeem the certificates to reduce the amount of the levy they are liable for. This sales income is thereby an additional incentive for renewable power generators. The CCL is due to run until 2013.¹⁰

¹⁰ HMRC, Climate Change Levy. Available at <customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageVA T_ShowContent&propertyType=document&columns=1&id=HMCE_PROD1_029570>.

30.3.4 Proposed Changes to the UK Incentive System

In July 2011, the UK government introduced a set of proposals for the reform of the electricity market. Under the proposed changes, the current RO system will be replaced with a premium system for all renewable power generation. The preference of the government is for a variable premium system. The government is expected to introduce legislation to reform the electricity market in 2012, with any changes to the incentive system effective from 2014. The RO system would be continued until 2017 to avoid disruption.¹¹

30.4 Investment Support Incentives

In April 2008, the government introduced an Environmental Transformation Fund (ETF), a three-year GBP 1.2 billion programme for renewable energy projects in the UK and overseas. All the following existing government capital investment schemes were incorporated in the ETF:

- Hydrogen Fuel Cell and Carbon Abatement Demonstration Programme
- Marine Renewables Deployment Fund
- Bio-energy Capital Grants and Bio-energy Infrastructure Schemes
- Offshore Wind Capital Grants programme
- Selected Carbon Trust innovation programmes
 - Research accelerators, technology accelerators, and incubators
 - Investments in low carbon technology businesses
 - Energy efficiency loans scheme for small- and medium-sized enterprises (SMEs).

The ETF issues regular calls for funding proposals. Generally it provides a capital grant of between 25 and 50 per cent of the total cost of a project. Spending for the ETF will be approximately GBP 20 million in 2011-12.¹²

The Carbon Trust, an independent organisation created by the government in 2001, also has a subsidiary that invests up to 50 per cent into projects and companies, typically in the range of GBP 250,000 to GBP 4 million. The selection of projects is based on the potential return on investment.¹³

In 2010, the government proposed establishing a Green Investment Bank (GIB). In the 2011 Budget, the current government announced that the GIB will begin operation in 2012-2013 and its initial capitalisation will be GBP 3 billion. The GIB will not be able to borrow money on its own, by issuing bonds for example, until at least 2015-2016, and thus will rely upon government funding until then. The GIB will help fund all types of green and environmental projects. Details on availability of funding for projects under the GIB will not be finalised until 2012.¹⁴

¹¹ DECC, Electricity Market Reform. Available at www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx.

¹² For more information see the ETF website at www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/lc_business/lc_economy/env_trans_fund/env_trans_fund.aspx.

¹³ Carbon Trust, Venture Capital. Available at www.carbontrust.co.uk/emerging-technologies/venture-capital/pages/venture-capital.aspx.

¹⁴ BIS, Green Investment Bank. Available at www.bis.gov.uk/greeninvestmentbank.

For research and development, a public-private initiative called the Energy Technologies Institute, an organisation funded by the government and six private sector companies (BP, Caterpillar, EDF Energy, E.ON, Rolls-Royce and Shell), is funding development and deployment of new low-carbon technologies. The initial stage of funding focussed on offshore wind power, marine energy, carbon capture and storage, and electric vehicles.¹⁵

If adhering to specified tax guidelines surrounding environmental technologies and services, companies can also receive tax benefits for investment in research and development, either as a credit or cash payment depending on the size of the company.¹⁶

¹⁵ See the Energy Technologies Institute website, Available at <www.energytechnologies.co.uk>.

¹⁶ For more information see HMRC, Research and Development Tax Credits, available at <www.hmrc.gov.uk/randd/>.

Chapter 31: United States of America

31.1 Government Targets

The USA did not ratify the Kyoto Protocol, nor has it set any enforceable national GHG emissions reduction targets. In 2009, GHG emission levels were 7.3 per cent higher than 1990 levels.¹ Under the Copenhagen Accord, the US government proposed a GHG emissions reduction target of 17 per cent from 2005 levels by 2020, subject to the final passage of relevant legislation in the US; however, as of September 2011, such legislation had not been passed. An earlier bill that aimed to set GHG reduction targets was unable to pass in the Senate, although it was passed in the House of Representatives.² In January 2010, the federal government instructed all federal government institutions to reduce their emissions by 28 per cent from 2005 levels by 2020 and to source 5 per cent of total electricity consumption from renewable energy sources.

Some states have set their own GHG emissions reduction targets. On 1 January 2009, the Regional Greenhouse Gas Initiative (RGGI), a regional cap-and-trade system, was introduced by 10 states in the northeast, with the goal to reduce emissions 10 per cent below 2005 levels by 2018. Another regional cap-and-trade system is the Western Climate Initiative, which comprises six western states and four Canadian provinces and will be introduced in 2012 with a target to reduce emissions 15 per cent below 2005 levels by 2020. In total, 21 states had set GHG emissions reduction targets by the end of 2010.³

There is no enforceable federal renewable energy target in the USA. In 2011, the Obama Administration signalled a new policy direction with a proposal to set a target of 80 per cent of electricity generation to come from low-carbon sources, including renewable sources, nuclear, and clean coal, by 2035. The government has also proposed establishing a quota-based system, called the Clean Energy Standard, to compel utilities to invest in clean energy.⁴ It is not known if or when the proposal will become law. By the end of 2010, 30 states and the District of Columbia had passed legislation requiring a minimum quota of renewable power (known as the Renewable Portfolio Standard, or RPS), and seven states had introduced voluntary targets.

Table 31.1: US government commitment summary

GHG emissions	A federal proposal for a 17 per cent reduction from 2005 levels by 2020. Many states have their own targets.
Renewable energy (RE)	No federal target set.
Renewable electricity	No federal target set. Thirty states and the District of Columbia have established mandatory renewable electricity targets.

Source: Environmental Protection Agency, US Climate Action Report 2010, June 2010. Available at <unfccc.int/resource/docs/natc/usa_nc5.pdf>; A list of state-level and federal emissions targets is available at Pew Climate at <www.pewclimate.org/what_s_being_done/targets>.

¹ EPA, 2011 Greenhouse Gas Inventory Report. Available at <www.epa.gov>.

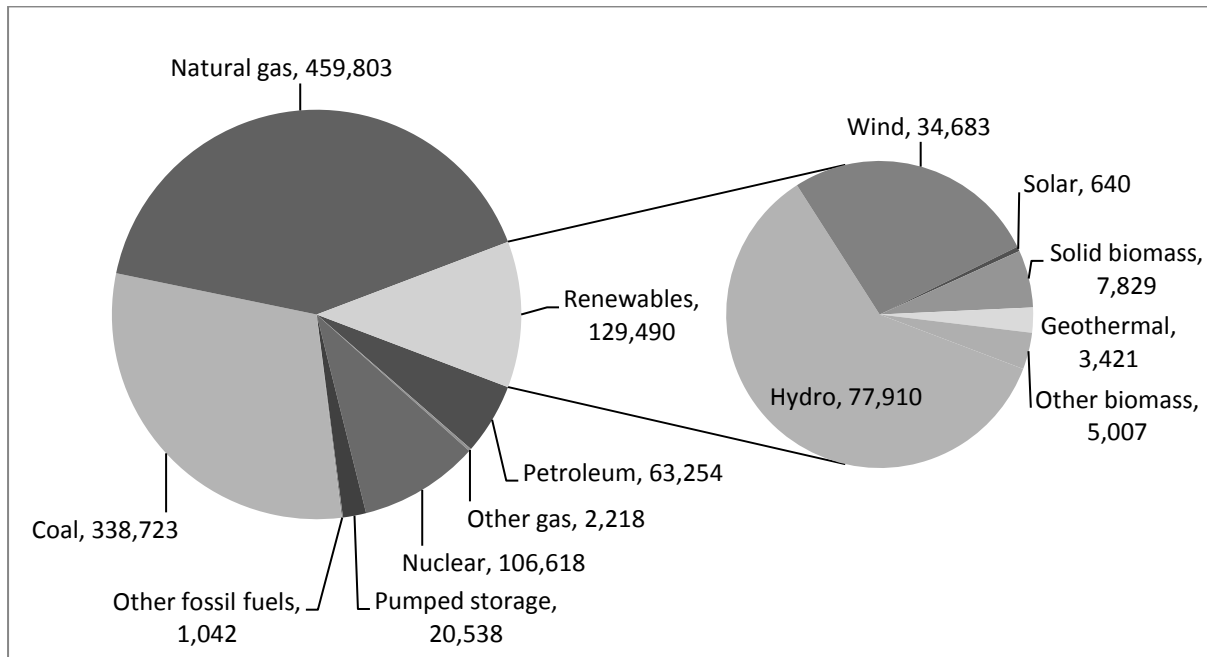
² Communication of the US to the UNFCCC, 28 January 2010. Available at <unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/unitedstatescphaccord_app.1.pdf>.

³ A list of state-level and federal emissions targets is available at Pew Climate at <www.pewclimate.org/what_s_being_done/targets>.

⁴ Executive Office, Blueprint for a Secure Energy Future, 31 March 2011. Available at <www.whitehouse.gov/sites/default/files/blueprint_secure_energy_future.pdf>.

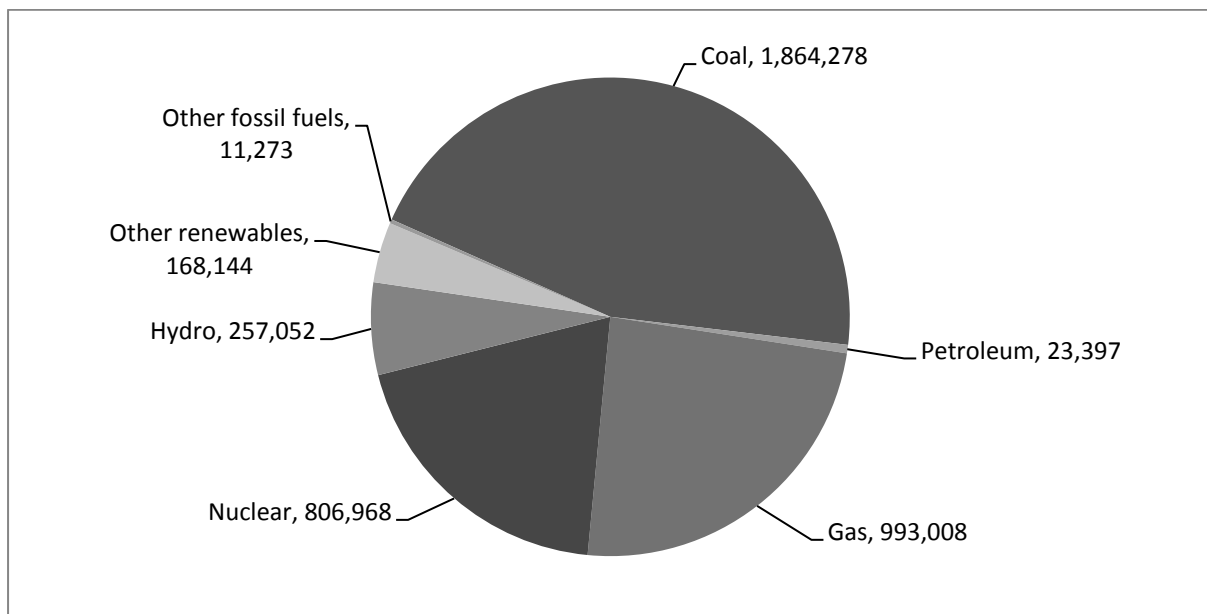
31.2 Electricity Generation Mix

Figure 31.1: Total installed generating capacity in the USA in 2009 (MW): 1,121,686 MW



Source: EIA, Annual Electric Generator Report 2009, November 2010. Available at www.eia.gov/electricity/data.cfm.

Figure 31.2: Electricity generation in the USA in 2010 (GWh): Total 4,124,120 GWh



Source: EIA, Power Plant Report, May 2011. Available at www.eia.gov/electricity/data.cfm.

31.3 Incentives

Incentive systems have traditionally been set at the state level. The federal government and the states are not currently working together to standardize energy policy; therefore, incentive systems vary greatly from state to state.

31.3.1 Federal Incentives

31.3.1.1 Operating Support Incentives

The main federal operating incentive is the Production Tax Credit (PTC). The PTC is a transferable tax credit issued for electricity generated by renewable power installations. It is typically used by the owners of installations to reduce their tax liability, but can also be sold to other taxpayers. The PTC was first introduced in 1992, but had subsequently lapsed. The most recent PTC was signed into law in November 2008, and revised again in January 2009 (see Table 31.2). Renewable power installations are eligible to receive the PTC for 10 years from their commissioning date.

Table 31.2: Production tax credit for renewable power facilities in the US

Technology	In-service deadline ^a	Amount	
		USD/MWh	EUR/MWh ^b
Wind power	31 December 2012	22	16.57
Closed-loop biomass	31 December 2013	22	16.57
Open-loop biomass	31 December 2013	11	8.28
Geothermal power	31 December 2013	22	16.57
Landfill gas	31 December 2013	11	8.28
Municipal solid waste	31 December 2013	11	8.28
Hydropower	31 December 2013	11	8.28
Marine (wave/tidal, over 150 kW)	31 December 2013	11	8.28

Notes: ^a The in-service deadline is the date before which renewable power installations must have entered into commercial operation in order to receive the PTC. ^b The USD-EUR conversion rate used is EUR 1 = USD 1.3278 (the average in 2010).

Source: IRS, Renewable Electricity, Refined Coal, and Indian Coal Production Credit, 2009. Available at <www.irs.gov/pub/irs-pdf/f8835.pdf>.

Renewable power generators receive the PTC in addition to the income they receive from the sale of electricity on the wholesale market price. There are several power exchanges in the US; hence the wholesale price of electricity varies greatly depending upon the location.

Taking the 2010 off-peak spot price of electricity in California of 29.52 USD/MWh (22.23 EUR/MWh)⁵ as a reference price, wind, geothermal and closed-loop biomass generators would, on average, have received generation compensation of 51.52 USD/MWh (38.80 EUR/MWh) in 2010. Other renewable power generators would have received 40.52 USD/MWh (30.52 EUR/MWh).

31.3.1.2 Investment Support Incentives

Investment Tax Credit

The Business Energy Investment Tax Credit (ITC) can be given to new generators in lieu of the PTC, however the applicant needs to be a tax-paying body. Until September 2016, the

⁵ FERC, Regional Spot Prices: 2008-2010, January 2011. Available at <www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-3yr-regional-elec-pr.pdf>.

following tax credits will be available:

- For solar power, 30 per cent of total purchase and installation costs with no maximum limit
- For fuel cells, 30 per cent of total purchase and installation costs, with a maximum of USD 1,500 per 0.5 kW
- For small wind turbines (≤ 100 kW), 30 per cent of total purchase and installation costs with no limit (until 2013)
- For geothermal power, 10 per cent of total purchase and installation costs with no maximum limit
- For combined heat and power (CHP) (≤ 50 MW), 10 per cent of total purchase and installation costs with no maximum limit.⁶

Federal Grant Programme

Developers who are eligible to obtain the ITC or the PTC can also receive grant aid in lieu of the PTC or the ITC. Construction has to begin before 31 December 2011 in order to receive the funding. The following funding limits apply:

- For solar power, 30 per cent of total equipment purchase and installation costs with no maximum limit
- For fuel cells, 30 per cent of total equipment purchase and installation costs, with a maximum of USD 1,500 per 0.5 kW
- For small wind turbines (≤ 100 kW), 30 per cent of total equipment purchase and installation costs, with a maximum of 200 USD/kW
- For CHP (≤ 50 MW), 10 per cent of total capital costs with no maximum limit
- For other technologies, up to 10 per cent of total capital costs with no maximum limit.⁷

Clean Energy Renewable Bonds

Clean Energy Renewable Bonds (CERB) can be used to finance public sector renewable energy projects. The borrower pays on interest on the bond, and the bondholder receives a federal tax credit in lieu of the interest they would normally receive on the bond. Developers using these types of bonds are not eligible to receive the PTC or the ITC.

The interest rate in June 2011, which corresponded to the value of the ITC, had an annual return of 4.39 per cent for a 10 year bond. CERB is administered by the Internal Revenue Service (IRS)⁸

⁶ IRS, Energy Provisions in ARRA, 2009. Available at <www.irs.gov/newsroom/article/0,,id=206871,00.html>; DSIRE, ITC. Available at <www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=1&ee=1>.

⁷ Treasury, Grant Aid 1603. Available at <www.treasury.gov/initiatives/recovery/Pages/1603.aspx>.

⁸ US Treasury, Clean Renewable Energy Bond Rates. Available at <www.treasurydirect.gov/GA-SL/SLGS/selectCREBDate.htm>.

Rural Energy for America Program Grants

Rural Energy for America Program (REAP) provides grants and loan guarantees to agricultural industries and rural small businesses for energy efficiency and renewable energy projects. The system must be located in a rural area and owned by the applicant. Grants are allocated on a competitive basis and are limited to 25 per cent of a project's total cost (maximum USD 500,000). The loan guarantee component may not exceed 75 per cent of total project costs. The programme will be funded until 2012 and is administered by the US Department of Agriculture (USDA).⁹

US Department of Energy Loan Guarantees

The Department of Energy (DoE) guarantees loans to low-carbon energy projects. As of June 2011, USD 30.7 billion worth of loans were guaranteed.¹⁰

31.3.2 State-level Incentives

As federal support for renewable energy has historically been weak, the manner in which individual states implement federal programmes and combine them with additional incentives of their own is of great importance. Nearly all states have implemented programmes and policies towards the support of the development of renewable power. The constitutional power distribution between the states and the federal government accords the states great authority in dealing with many important political issues, including electricity regulation and the tax system. As the states vary greatly in terms of their geography and economic situation, different approaches have been taken towards encouraging the development of renewable power.

As of December 2010, 30 states and the District of Columbia had introduced legally mandated quota systems for renewable power (known as Renewable Portfolio Standards, or RPS), and a further seven states had introduced voluntary quotas (see Table 31.3).

Table 31.3: State-level renewable energy targets (binding and voluntary) as of December 2010

State	Renewable energy target share	Year specified in target	Notes	Regulatory Authority
Legally binding targets				
Arizona	15%	2025	30 per cent of this target to come from microgeneration. Hydro \leq 10 MW is included. Bonus for projects using technology produced in the state.	Arizona Corporation Commission
California	33%	2020	Hydro \leq 30 MW is included. Incineration of waste not included	California Public Utilities Commission
Colorado	20%	2020	Applies to large private utilities. 4 per cent of this target must come from solar. Hydro \leq 10 MW is included.	Colorado Public Utilities Commission
	10%	2020	Applies to municipal and rural utilities.	
Connecticut	27%	2020	20 per cent of the target must come from advanced renewable (wind, solar, small hydro, biomass, wave/tidal). Hydro up to 5 MW only.	Connecticut Department of Public Utility Control
District of Columbia	20%	2020	By 2020, all output must come from	DC Public Service

⁹ For more information see the website at <www.rurdev.usda.gov/rbs/busp/9006grant.htm>.

¹⁰ See website at <www.lgprogram.energy.gov>.

Columbia			advanced renewables (solar, wind, some biomass, geothermal, marine or fuel cells).	Commission
Delaware	20%	2019	2 per cent of total energy consumption to come from solar. Bonus for offshore wind installed before 2017. Hydro ≤ 30 MW is included.	Delaware Energy Office
Hawaii	40%	2030	Wind, solar, ocean thermal, wave, and biomass are all eligible.	Hawaii Strategic Industries Commission
Illinois	25%	2025	75 per cent of target to be from wind power. Hydro is not included.	Illinois Commerce Commission
Kansas	20%	2020	Target refers to peak demand capacity. Only hydro ≤ 10 MW is included.	Kansas Corporation Commission
Maine	10%	2017	All non-wind sources must come from facilities under 100 MW.	Maine Public Service Commission
Maryland	20%	2022	18 per cent to come from advanced renewables, including 2 per cent from solar PV. Hydro (< 30 MW) and waste are eligible until 2018.	Maryland Public Service Commission
Massachusetts	15%	2020	Only advanced renewables eligible (wind, solar, marine, geothermal, small hydro). Increases by 1 per cent a year after 2020. Hydro ≤ 25 MW is included.	Massachusetts Division on Energy Resources
	5.0%	2020	Alternative energy portfolio: Includes CHP, waste, storage, and efficient steam technology. Increases by 0.25 per cent a year after 2020.	
Michigan	10%	2015	Target includes renewable energy, clean energy (CHP and clean coal) and energy efficiency. Detroit Edison and Consumers Energy are to construct 600 MW and 500 MW of new renewable power respectively.	Michigan Public Service Commission
Minnesota	25%	2025	All suppliers other than Xcel Energy, the largest regional utility.	Minnesota Department of Commerce
	30%	2030	Target applies to Xcel Energy. 25 per cent of target to come from wind power.	
Missouri	15%	2021	0.3 per cent of total generation to come from solar, the remainder from other renewables. Hydro ≤ 15 MW is included.	Missouri Public Service Commission
Montana	15%	2015	Public utilities must purchase at least 75 MW from community RE projects. Hydro ≤ 15 MW is included.	Montana Public Service Commission
New Hampshire	23.8%	2025	16 per cent: biomass, biogas, marine, solar and wind installed since 2006 0.3 per cent: solar installed before 2006 6.5 per cent: biomass installed before 2006 1 per cent: hydro installed before 2006.	New Hampshire Office of Energy and Planning
New Jersey	22.5%	2021	17.88 per cent of target to come from advanced renewables, 2.12 per cent from solar and 2.5 per cent from hydro. Hydro ≤ 30 MW is included.	New Jersey Board of Public Utilities

New Mexico	20%	2020	For privately-owned utilities. Of the target, minimum 20 per cent from wind, 20 per cent from solar, 10 per cent other renewable, and 3 per cent microgeneration. No hydro can be included.	New Mexico Public Regulation Commission
	10%	2020	For co-operatively owned utilities.	
Nevada	25%	2025	6 per cent of total electricity consumption to come from solar. Up to 25 per cent can be met with energy efficiency improvements. Hydro \leq 30 MW is included.	Public Utilities Commission of Nevada
New York	30%	2015	7 per cent of target is to be met through distributed generation.	New York Public Service Commission
North Carolina	12.5%	2021	For privately-owned utilities. Up to 25 per cent of quota can be met with renewable power generated outside the state or energy efficiency improvements.	North Carolina Utilities Commission
	10%	2018	For cooperatives and municipal utilities. Only 30 per cent of quota can be met with hydro, and 25 per cent with renewable power generated outside the state.	
Ohio	12.5%	2025	At least 50 per cent of the target to be met with renewable power generated in the state. All hydro eligible if built after 1998.	Public Utilities Commission of Ohio
Oregon	25%	2025	Large utilities	Oregon Department of Energy and Oregon Public Utility Commission
	10%	2025	Small utilities	
	5%	2025	Local utilities	
Pennsylvania	18%	2020	8 per cent of target to be met with advanced renewables (wind, solar, AD), 10 per cent with other renewables and clean coal. All hydro is included.	Pennsylvania Public Utility Commission
Rhode Island	16%	2019	Less than 2 per cent can come from facilities built prior to 1997. Hydro \leq 30 MW is included.	Rhode Island Public Utility Commission
Texas	5,880 MW	2015	500 MW from non-wind power. A voluntary target of 10,000 MW by 2025.	Public Utility Commission of Texas
Vermont	20%	2017	Priority given to new construction. Hydro up to 200 MW can qualify.	Vermont Public Services Board
Washington	15%	2020	Priority given to facilities constructed after 2005 and microgeneration.	Washington Utilities and Transportation Commission
West Virginia	25%	2025	Priority given to microgeneration. Only run-of-the-river hydro is included.	West Virginia Public Service Commission
Wisconsin	10%	2015	Only hydropower up to 60 MW is included. Large state institutions will meet 20 per cent of their power consumption with renewables starting at the end of 2011.	Public Services Commission of Wisconsin
Voluntary Targets				
Alaska	50%	2025	Only voluntary.	Alaska Energy Authority
Iowa	2,015 MW	2015	Wind power only.	Iowa Utilities Board

North Dakota	10%	2015	Only facilities constructed after 2007 qualify, or increased generation after that date.	North Dakota Public Service Commission
Oklahoma	15%	2015	25 per cent of target can be met with energy efficiency improvements.	Oklahoma Corporation Commission, Public Utility Division
South Dakota	10%	2015	Energy efficiency measures also qualify.	South Dakota Public Service Commission
Utah	20%	2025	Target applies to total energy consumption.	Utah Public Service Commission
Virginia	15%	2025	Priority given to wind and solar.	Virginia Department of Mines, Minerals and Energy

Source: Pew Center on Global Climate Change, Detailed Tables of State Policies, December 2010. Available at <www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm>. Cited with permission.

Each state has its own unique mix of operating and investment incentives to meet the RPS quota. The full range of operating incentives in the United States is vast and changes frequently, and it is therefore difficult to give up-to-date detailed information. DSIRE, the Database of State Incentives for Renewables and Efficiency, offers a complete summary of all state and local incentives offered in the USA.¹¹

31.3.2.1 Examples of State-level Incentives

An indicative sample of the incentives offered by 12 states is provided below to introduce the range of state-level operating incentives offered in the USA.

California

California has a number of incentive systems for the promotion of renewable electricity, for both large-scale projects for utility companies and for micro-generation.

The three privately-owned utilities that have regional monopolies (Pacific Gas and Electricity, PGE; Southern California Edison, SCE; and San Diego Gas and Electric, SDGE) are required to collectively source 33 per cent of their electricity from renewable sources by 2020 under the state's Renewable Portfolio Standard (RPS). The RPS only applies to utilities that are privately owned and have a regional monopoly. The three utilities (PGE, SCE and SDGE) receive Renewable Energy Credits (RECs) when they purchase renewable electricity. These credits are in turn presented to the regulator, the California Public Utility Commission (CPUC), to show compliance. Since January 2011, a maximum of 25 per cent of the utilities' quota can be met with Tradable RECs (TRECs), which are sold on the open market. The 25-per cent limit will expire in 2013 when utilities will be able to purchase as many TRECs from independent power producers as required. Until December 2011, there is a cap on the price of TRECs of 50 USD/MWh (37.66 EUR/MWh), and from 2012 the price will be set through the open market.¹² Developers of large-scale renewable power projects generally negotiate a purchase price which includes both the sale of the electricity and the sale of the RECs directly with the utility. The negotiated price must be approved by the CPUC.

¹¹ See website at <www.dsireusa.org>.

¹² CPUC, CPUC Approves the Use of TRECS, January 2011. Available at <docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/129475.htm>.

For facilities up to 3 MW, a feed-in tariff (FIT) system was introduced in September 2006. Under the FIT system, the three privately-owned regional power utilities (PGE, SCE and SDGE) have to offer fixed tariff rates for renewable power until a total of 750 MW is installed in the state. The FIT system was subsequently updated in 2007, and again in October 2009. Under the latest system, which took effect on 1 January 2010, renewable power producers can receive the FIT rates for 10, 15 or 20 year periods, depending upon the utility they deal with and the type of renewable power project.

These FIT rates are based on CPUC's market price referent (MPR) table, which is set every year (see Table 31.4). The utilities are required to set time of use adjustments to the MPR to reflect the increased value of the electricity to the utility during peak periods and its lower value during off-peak periods. These tariff rates are approved by the CPUC, and vary according to the utility company. For illustrative purposes, Table 31.5 lists the FIT rates that would apply to a hypothetical renewable power facility with the three electricity purchasing utility firms in California for a 10-year power purchase agreement starting in 2011. For different contract lengths and contract start dates, a different entry from Table 31.4 would have to be substituted for the MPR of 88.43 USD/MWh used in Table 31.5, and the calculations performed accordingly. As the FIT system is meant to help the utilities meet California's RPS, the RECs earned by a generator under the FIT are transferred to the utility and are not sold separately. Any customer-generator who sells power to the utility under this tariff is not allowed to participate in other state incentive programmes.

Table 31.4: Market Price Referent for renewable power purchase agreements in California from 2011 to 2021

Contract start year	10 year contract		15 year contract		20 year contract		25 year contract	
	USD /MWh	EUR /MWh	USD/ MWh	EUR/ MWh	USD/ MWh	EUR/ MWh	USD/ MWh	EUR/ MWh
2011	88.43	66.60	94.65	71.28	100.98	76.05	104.42	78.64
2012	92.08	69.35	98.52	74.20	105.07	79.13	108.52	81.73
2013	95.43	71.87	102.23	76.99	108.98	82.08	112.45	84.69
2014	98.72	74.35	105.93	79.78	112.86	85.00	116.36	87.63
2015	101.68	76.58	109.44	82.42	116.47	87.72	120.02	90.39
2016	104.88	78.99	113.13	85.20	120.2	90.53	123.78	93.22
2017	108.34	81.59	116.95	88.08	124.04	93.42	127.66	96.14
2018	112.04	84.38	120.9	91.05	128	96.40	131.65	99.15
2019	115.98	87.35	124.99	94.13	132.09	99.48	135.75	102.24
2020	120.18	90.51	129.22	97.32	136.3	102.65	139.94	105.39
2021	124.65	93.88	133.59	100.61	140.64	105.92	144.24	108.63

Source: CPUC, Resolution E-4298, 17 December 2009. Available at docs.cpuc.ca.gov/PUBLISHED/FINAL_RESOLUTION/111386.htm.

Table 31.5: Feed-in tariff rates in California for a renewable power facility up to 3 MW starting operation in 2011 with a 10-year contract

Time of generation		Time-of day multiplier	10-year MPR in 2011 (USD/MWh)	Rate in 2011	
				USD/MWh	EUR/MWh
Pacific Gas and Electricity (PGE)					
June-September	Peak (13-20 weekdays)	2.20490	88.43	194.98	146.84
	Mid peak (7-12, 20-23 weekdays, 7-23 weekends)	1.12237		99.25	74.75
	Off peak (all other times)	0.68988		61.01	45.95
October-February	Peak	1.05783		93.54	70.45
	Mid peak	0.93477		82.66	62.25
	Off peak	0.76384		67.55	50.87
March-May	Peak	1.14588		101.33	76.31
	Mid peak	0.84634		74.84	56.37
	Off peak	0.64235		56.80	42.78
Southern California Edison (SCE)					
June-September	Peak (12-18 weekdays)	3.13	88.43	276.79	208.45
	Mid peak (8-12, 18-23 weekdays)	1.35		119.38	89.91
	Off peak (All other)	0.75		66.32	49.95
October-May	Peak (12-18 weekdays)	1.00		88.43	66.60
	Mid peak (8-12, 18-23 weekdays)	0.83		73.40	55.28
	Off peak (All other)	0.61		53.94	40.63
San Diego Gas and Electric (SDGE)					
July-October	Peak (11-19, weekdays)	1.6411	88.43	145.12	109.30
	Mid peak (6-11 weekdays, 7-22 weekends)	1.0400		91.97	69.26
	Off peak (other times)	0.8833		78.11	58.83
November-June	Peak (13-22 weekdays)	1.1916		105.37	79.36
	Mid peak (6-13 weekdays, 21-22 weekends)	1.0790		95.42	71.86
	Off peak (other times)	0.7928		70.11	52.80

Note: Weekends include bank holidays.

Source: CPUC, Resolution E-4298, 17 December 2009. Available at docs.cpuc.ca.gov/PUBLISHED/FINAL_RESOLUTION/111386.htm.

For solar PV there is a separate incentive system, the California Solar Initiative (CSI), which has two component schemes:

- The Expected Performance-based Buydown (EPB), which offers investment subsidies per watt of capacity for installations smaller than 50 kW
- The Performance-based Incentive (PBI), which offers five-year set tariff rates for installations of 50 kW or greater.

Both elements of generation compensation are paid for by the participating regional Californian utilities (PGE, SCE and SDGE). The level of compensation for both components depends on the current level of installed solar PV capacity in each of the utilities' region for each target group of applicants—residential and non-residential—where 'residential' refers to households, and 'non-residential' refers to commercial, government, and not-for-profit participants.

Each utility is targeting 350 MW installed capacity in each category—residential and non-residential. As the installed capacity of solar PV increases in each utility, both the EPB and the PBI rates reduce accordingly.¹³ The threshold capacities and corresponding rates on offer are given in Table 31.6 in USD and Table 31.7 in EUR. As of June 2011:

- PGE had over 250 MW installed in both its residential and non-residential programmes
- SCE had over 190 MW installed in its residential programme and over 250 MW in its non-residential programme
- SDGE had over 250 MW installed in both its residential and non-residential programmes.¹⁴

A household therefore applying for support for a 50 kW solar PV installation with SCE would currently receive an investment grant of USD 55,000 (EUR 45,650) or an operating incentive of 150 USD/MWh. Instead of the operating incentive, and for installations under 50 kW, the customer can alternatively receive the consumer consumption tariff rate for their output exported to the grid, a system known as *net metering*.

Table 31.6: Solar power incentives in California (USD)

Total installed capacity in each region (MW)	Expected Performance-based Buydown (USD/W)			Performance-based Incentive (USD/MWh)		
	Residential	Non-residential	Non-profit	Residential	Non-residential	Non-profit
130	1.90	1.90	2.65	260	260	370
160	1.55	1.55	2.30	220	220	320
190	1.10	1.10	1.85	150	150	260
215	0.65	0.65	1.40	90	90	190
250	0.35	0.35	1.10	50	50	150
285	0.25	0.25	0.90	30	30	120
350	0.20	0.20	0.70	30	30	100

Source: California Solar Initiative website. Available at <www.csi-trigger.com/>.

Table 31.7: Solar power incentives in California (EUR)

Total installed capacity in each region (MW)	Expected Performance-based Buydown (EUR/W)			Performance-based Incentive (EUR/MWh)		
	Residential	Non-residential	Non-profit	Residential	Non-residential	Non-profit
130	1.43	1.43	2.00	195.81	195.81	278.66
160	1.17	1.17	1.73	165.69	165.69	241.00
190	0.83	0.83	1.39	112.97	112.97	195.81
215	0.49	0.49	1.05	67.78	67.78	143.09
250	0.26	0.26	0.83	37.66	37.66	112.97
285	0.19	0.19	0.68	22.59	22.59	90.38
350	0.15	0.15	0.53	22.59	22.59	75.31

In addition to the above programmes, the Self Generation Incentive Program (SGIP) is an investment support programme for wind, biogas and fuel cell projects of up to 5 MW. The SGIP is for the customers of PGE, SCE, SDGE, and the Southern California Gas Company (SoCalGas). The programme offers investment subsidies for projects up to 5 MW. The

¹³ CPUC, California Solar Initiative. Available at <www.cpuc.ca.gov/PUC/energy/Solar/aboutsolar.htm>.

¹⁴ California Solar Initiative website. Available at <www.csi-trigger.com/>.

amount of the subsidy decreases for larger projects.¹⁵ In 2010/11, funding for the SGIP amounted to USD 83 million.¹⁶

Kentucky and Tennessee

The Tennessee-based Tennessee Valley Authority (TVA), a regional development agency and regional power utility, launched a new incentive programme for renewable power in October 2010 called the Renewable Standard Offer. Under this programme, the TVA will enter into 10-15 year power purchase agreements with wind, solar, biomass (including co-firing), biomass gasification, and biogas power projects between 200 kW and 20 MW to purchase all output of the project at set rates. The rates the generators receive vary depending on time of generation, but not on generating technology (see Table 31.8). The programme will run until a total of 100 MW has been installed.

For power development projects larger than 20 MW, TVA holds public tenders. For projects under 200 kW, there is the Green Power Switch Generation Partners programme, where local power distributors purchase all electricity exported to the grid at the consumer rate of electricity plus a premium of 120 USD/MWh (90 EUR/MWh) for solar PV and 30 USD/MWh (23 EUR/MWh) for all other forms of renewable energy for 10 years. Payment is made in the form of a credit issued on the monthly power bill for the home or business where the generating system is located. The local power distributors retain sole rights to any renewable energy credits. New participants will also receive a USD 1,000 grant to offset installation costs.¹⁷

Table 31.8: Renewable power operating incentives in Kentucky and Tennessee

	Time of day	USD/MWh	EUR/MWh
July-August	Weekdays 12.00-20.00	159.66	120.24
	Weekdays 06.00-12.00, 20.00-00.00	64.20	48.35
	Weekends 06.00-12.00	64.20	48.35
	Other	40.78	30.71
June and September	Weekdays 12.00-20.00	81.39	61.30
	Weekdays 06.00-12.00, 20.00-00.00	52.63	39.64
	Weekends 06.00-12.00	52.63	39.64
	Other	39.63	29.85
January-February	Weekdays 06.00-22.00	59.37	44.71
	Weekdays 22.00-00.00	48.68	36.66
	Weekends 06.00-12.00	48.68	36.66
	Other	42.78	32.22
December and March	Weekdays 06.00-22.00	55.96	42.14
	Weekdays 22.00-00.00	47.17	35.52
	Weekends 06.00-12.00	47.17	35.52
	Other	41.51	31.26
April, May, October and November	Weekdays 06.00-22.00	56.16	42.30
	Weekdays 22.00-00.00	44.31	33.37
	Weekends 06.00-12.00	44.31	33.37
	Other	37.93	28.57

Source: TVA, Renewable Standard Offer. Available at <www.tva.com/renewablestandardoffer/index.htm>.

¹⁵ See CPUC, SCGIP Handbook, May 2010. Available at <www.cpuc.ca.gov/NR/rdonlyres/F47DC448-2AEB-473F-98D8-CC0CC463194D/0/2010_SGIP_Handbookr4100506.pdf>.

¹⁶ CPUC, Decision Adopting Self-Generation Incentive Program Budget for 2010 and 2011. Available at <docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/111738.htm>.

¹⁷ TVA, Green Power Switch. Available at <www.tva.com/greenpowerswitch/>.

Nevada

Under the state's Renewable Portfolio System (RPS), utilities have to source a certain percentage of electricity consumption from renewable sources. The target is for a 25 per cent renewable share by 2025, including 6 per cent from solar power. Utilities must purchase Portfolio Energy Credits (PEC), which are awarded to renewable power installations, to meet their yearly target. One PEC is issued for every kWh generated from a renewable source (including energy efficiency). For solar power, however, 2.40 PECs are issued for every kWh generated.

PECs are not sold on an open market, but are negotiated with NV Energy, the sole power utility in Nevada. For small systems, NV Energy offers an incentive investment per watt of installed capacity in exchange for the PECs created. Where larger systems are concerned, NV Energy negotiates bilateral contracts with developers following a public tender that includes the purchase of the output as well as the PECs.¹⁸

The government also offers sales tax reductions, the rates of which vary depending on the region of the state in which the project is undertaken, as well as a 35 per cent reduction on property tax for locations where renewable power projects are developed.¹⁹

New Jersey

Since 2001, New Jersey has operated a tradable green certificate (TGC) system, called Renewable Energy Credits (RECs), as part of its Renewable Energy Incentive Program (REIP). New Jersey is working towards achieving 30 per cent of electricity generation from renewable sources by 2020. Of the 30 per cent total, 2.2 per cent will come from solar power, with hydropower (maximum 30 MW) limited to a 2.5 per cent share.

Utilities are obliged to present RECs to the energy regulator to meet their quota. These RECs are usually provided from renewable power generation by the same utility or they can be purchased from an independent renewable power producer. There is no market for RECs and the state encourages suppliers to develop bilateral relationships with generators. For meeting the solar power quota, there is a separate certificate known as the Solar Renewable Energy Credits (SRECs) which are sold at auction. The average price of an SREC was 608 USD/MWh (457.90 EUR/MWh) between July 2010 and April 2011.²⁰

Tax rebates on investment costs are available for wind, solar and biomass projects, primarily for small residential systems.²¹

New York

In 2004, New York's Public Service Commission first introduced a Renewable Portfolio Standard (RPS) with the vision of increasing the share of renewables in total power consumption to 25 per cent by 2013, and potentially 30 per cent by 2015. Power utilities in New York were required to raise USD 714.5 million from customers by 2013 through a surcharge, the revenues of which would be transferred to the New York State Energy

¹⁸ For more information see The Nevada State Office for Energy at <energy.state.nv.us> and the website of NV Energy <www.nvenergy.com>.

¹⁹ See <renewableenergy.state.nv.us/TaxAbatement.htm>.

²⁰ NJ Clean Energy. Available at <www.njcleanenergy.com/renewable-energy/programs/solar-renewable-energy-certificates-srec>.

²¹ See the Renewable Energy Incentive Program Incentives at <www.njcleanenergy.com/re>.

Research and Development Authority (NYSERDA) to promote renewable power development. To meet the targets, NYSERDA has held six competitive tenders for the construction of new utility-sized renewable electricity generators to supply power under the RPS programme. Within the terms of these tenders, developers submit bids specifying the minimum premium required for the facility to be feasible. The premium is generally offered for 20 years.²²

The sixth and most recent tender, known as the Sixth Main Tier, was held in June 2011. Under the Sixth Main Tier, the average premium for generators was USD 22.01 for each RPS attribute; in other words, generators receive 22.01 USD/MWh (16.58 EUR/MWh) for power supplied under the RPS programme in addition to the sale of electricity on the wholesale market. The amount received will vary based on the number of installations and the results of the tender. The average premium received for the Sixth Tier was higher than the average for the Fifth Tier (USD 21.17) held in May 2010, the Fourth Tier (USD 19.76) held in October 2009, and for the Third Tier (USD 14.92) held in November 2007. In the Sixth Main Tier, 17 facilities received contracts—four wind farms, three hydropower projects (two repowering of existing plants), seven landfill gas plants, and two anaerobic digestion from agricultural waste plants—collectively adding 315 MW of new renewable power capacity.²³ Future tenders are expected to be held at least once a year until 2013.²⁴

All the environmental attributes (i.e., the certificates) of the electricity supplied under the RPS programme are transferred to NYSERDA, and the developers cannot make use of federal incentives such as the PTC. In addition to the Main Tier, there is a Customer-sited Tier that supports small-scale microgeneration through development grants and subsidies.²⁵

Oregon

In 2010, Oregon introduced a feed-in tariff (FIT) system for solar PV. Up to 25 MW of solar power will be supported under the system, and all installations will receive the tariff rates for 15 years. Solar power installations up to, and including, 100 kW have a defined tariff (see Table 31.9). This tariff is inclusive of the consumer price of electricity, therefore self-generators will receive the rate shown, minus their price of electricity; installations of a capacity between 100 kW and 200 kW will be supported via recourse to a tender process. In a tender held in the second half of 2010, the successful bids for 100 kW to 200 kW projects were between 350 USD/MWh and 390 USD/MWh.²⁶

Oregon also offers a Business Energy Tax Credit (BETC) that allows Oregon-based businesses to receive a tax credit towards investment in renewable energy projects. The amount of the tax credit varies depending on the technology and the size of the project. The programme was due to end in June 2011.²⁷

²² NYSERDA, RPS Programme Review 2009, May 2009. Available at <[www.nyserda.org/Energy_Information/NY_Renewable_Portfolio_Standard_Program_Evaluation_Report_\(2009_Review\)-FINAL.pdf](http://www.nyserda.org/Energy_Information/NY_Renewable_Portfolio_Standard_Program_Evaluation_Report_(2009_Review)-FINAL.pdf)>.

²³ NYSERDA, Main Tier Solicitations. Available at <www.nyserda.org/rps/PastSolicitations.asp>.

²⁴ NYSERDA, Solicitation Schedule. Available at <www.nyserda.org/rps/PastSolicitations.asp>.

²⁵ NYSERDA, New York State Renewable Portfolio Standard, September 2008. Available at <www.nyserda.org/rps/RPSPerformanceReportWEB.pdf>.

²⁶ PUC, Solar Photovoltaic Volumetric Incentive Rate Pilot Program: Report to the Legislative Assembly, January 2011. Available at <www.puc.state.or.us/PUC/123010finalsolarreport.pdf>.

²⁷ For more information see Oregon Department of Energy, BETC. Available at <www.oregon.gov/ENERGY/CONS/BUS/tax/BETC-Renewables.shtml>.

Table 31.9: Feed-in tariff rates in Oregon for solar power up to and including 100 kW from April 2011

Counties	Electric companies in areas	FIT rate for capacity ≤ 10 kW		FIT rate for capacity 10-100 kW	
		USD/MWh	EUR/MWh	USD/MWh	EUR/MWh
Benton, Clackamas, Clatsop, Columbia, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill	Pacific Power and PGE	468	352.46	396	298.24
Coos, Douglas, and Hood River	Pacific Power and PGE	432	325.35	396	298.24
Gilliam, Jackson, Josephine, Klamath, Morrow, Sherman, Umatilla, Wallowa, and Wasco	Pacific Power	432	325.35	396	298.24
Baker, Crook, Deschutes, Jefferson, Lake, Malheur, and Harney	Pacific Power	396	298.24	396	298.24

Source: Public Utility Commission of Oregon, Incentive Rate Pilot Program for Solar PV Systems, January 2011. Available at <www.puc.state.or.us/PUC/solar/solarincentive.pdf>.

Texas

Since 2008, Texas has operated a tradable green certificate (TGC) system, called tradable renewable energy credits (RECs). Each REC is equivalent to one MWh of renewable power generation. The total quota in Texas is expressed in generating capacity, (see Table 31.10), with the yearly state target divided among electricity suppliers based on the percentage of total retail sales in Texas provided by the supplier. As there is not any public trading of RECs in Texas, the value of the certificates is not entirely clear. However, in 2009, it was estimated that RECs sold for an average of between 2 and 5 USD/MWh.²⁸ As the value of RECs is considered too low to drive investment in Texas, the federal PTC and the considerable resources of Texas have largely driven investment.²⁹

Business owners can, in addition, deduct the total cost of the system from the company's taxable capital or take 10 percent of the system's cost off the company's income. The state also offers a 100 percent property tax exemption on the appraised value of an on-site solar, wind or biomass power generating project.³⁰

Table 31.10: Renewable power quota in Texas until 2015

Calendar year	Capacity target (MW)	Generation (MWh) ^a
2007	2,280	19,972,800
2009	3,272	28,662,720
2011	4,264	37,352,640
2013	5,256	46,042,560
2015	5,880	51,508,800
After 2015	5,880	51,508,800

Note: ^aThe generation target is calculated as capacity target multiplied by 8,760 hours.

Source: PUC, Goal for Renewable Energy, Section 25.173, 2 January 2009. Available at <www.puc.state.tx.us>.

²⁸ ERCOT. Available at <www.ercot.com>.

²⁹ Center for Energy Economics, Lessons Learned from REC Trading in Texas, July 2009. Available at <www.beg.utexas.edu/energyecon/transmission_forum/CEE_Texas_RPS_Study.pdf>.

³⁰ State Energy Conservation Office Texas Tax Code Incentives for Renewable Energy. Available at <www.seco.cpa.state.tx.us/re_incentives-taxcode-statutes.htm>.

Washington State

Washington State has a target to meet 15 per cent of electricity consumption from renewable sources by 2020. In 2006, the state instituted an incentive programme for renewable power production from solar PV, wind and biogas from anaerobic digestion. The three main utilities in the state (Avista, PacifiCorp, and Puget Sound Energy) were required to introduce feed-in tariffs (FIT) schemes to purchase renewable power from customers (participants need to be regular consumers of the utility and not primarily generators). The utilities can then deduct the amount they spent to purchase the renewable power against their taxes and use the electricity they purchase to meet their state quotas. Table 31.11 shows the FIT rates at which utilities purchase renewable electricity, with more generous rates for installations using components which have been manufactured in-state. The programme runs until 2014.³¹ Power utilities generally enter bilateral long-term contracts with renewable power producers to meet their quota.³²

Table 31.11: Operating incentives in Washington State for renewable power

Technology		USD/MWh	EUR/MWh
Solar PV	Modules and inverters manufactured in Washington State	540	406.69
	Modules manufactured in Washington State	360	271.13
	Inverter manufactured in Washington State	180	135.56
	No components manufactured in Washington State	150	112.97
Wind	Inverter manufactured in Washington State	180	135.56
	Blades manufactured in Washington State	150	112.97
	No components manufactured in Washington State	120	90.38
Biogas from anaerobic digestion		150	112.97

Source: Renewable Energy Cost Recovery, WAC-458-20-273. Available at apps.leg.wa.gov/WAC/default.aspx?cite=458-20-273.

West Virginia

In June 2009, West Virginia introduced a law that required all electric power utilities with more than 30,000 customers to source 25 per cent of retail electricity sales from alternative and renewable energy sources by 2025. In West Virginia, alternative energy sources include: clean coal technology, coal bed methane, natural gas, fuel produced by coal gasification or liquefaction facilities, synthetic gas, integrated gasification combined cycle technologies, waste coal, tire-derived fuel, and pumped storage hydropower projects. There is no set proportion of the 25 per cent target that has to come from renewable energy. Between 2010 and 2015, electricity suppliers will need to supply 10 per cent of retail sales from alternative and renewable energy sources, rising to 15 per cent between 2015 and 2019, until reaching 25 per cent in January 2025.

Utilities can meet their quota by presenting alternative energy credits to the regulator. These credits are earned by generating installations on the following basis:

- One credit for power supplied from alternative energy sources (only 10 per cent of suppliers' quota can be met with natural gas)
- Two credits for power supplied from renewable energy sources

³¹ Washington State Legislature, Renewable Energy Cost Recovery, WAC-458-20-273. Available at apps.leg.wa.gov/WAC/default.aspx?cite=458-20-273.

³² WUTC, Energy. Available at wutc.wa.gov.

- Three credits for power supplied from renewable energy sources located on reclaimed mine sites in West Virginia.

Utilities can also receive credits for energy efficiency projects.³³

Wind power plants also receive a reduced tax rate of 12 per cent, compared to 40 per cent for other types of power plants, and a 25 per cent reduction in property taxes.³⁴

Wisconsin

State institutions are required to supply 10 per cent of their power consumption, for a combined total of 92,400 MWh, from renewable sources. By the end of 2011 this requirement will rise to 20 per cent. To meet this target, the state enters into power purchase agreements with renewable power generators using a public tender. On average, the state agrees to pay an additional 'adder', or supplement, of 10 USD/MWh.³⁵ The state also offers grants of up to 25 per cent of investment costs for small-scale non-commercial renewable power systems (≤ 20 kW) and for biomass development.³⁶

³³ West Virginia Legislation, Alternative and Renewable Energy Portfolio Standard. Available at <www.legis.state.wv.us/WVCODE/ChapterEntire.cfm?chap=24&art=2F>.

³⁴ Business and Generating Electricity. Available at <www.legis.state.wv.us/WVCODE/ChapterEntire.cfm?chap=11&art=13§ion=2O#13#13>.

³⁵ Wisconsin Department of Administration, Press release. Available at <www.wisgov.state.wi.us/docview.asp?docid=14241>.

³⁶ Office of Energy Independence, Financial Incentives for the Production of Clean Energy. Available at <energyindependence.wi.gov/docview.asp?docid=14070&locid=160>.

Chapter 32: China

32.1 Government Targets

China is a signatory to the Kyoto Protocol, but as a non-Annex I country does not have an emissions reduction target under the agreement. In January 2010, the government introduced a Copenhagen Accord target of reducing its GHG emissions intensity per unit of GDP by 40 to 45 per cent from 2005 levels by 2020. In addition, in its 12th Five-Year Plan, the government has a target to meet 15 per cent of primary energy consumption from non-fossil fuel sources by 2020 (compared with 9 per cent in 2008), with an interim target of 11.4 per cent by 2015. Under its Renewable Portfolio Standard (RPS) regulation, all generators in China with more than 5 GW of installed capacity are required to have 8 per cent of total generating capacity from non-hydroelectric renewable power sources by 2020.

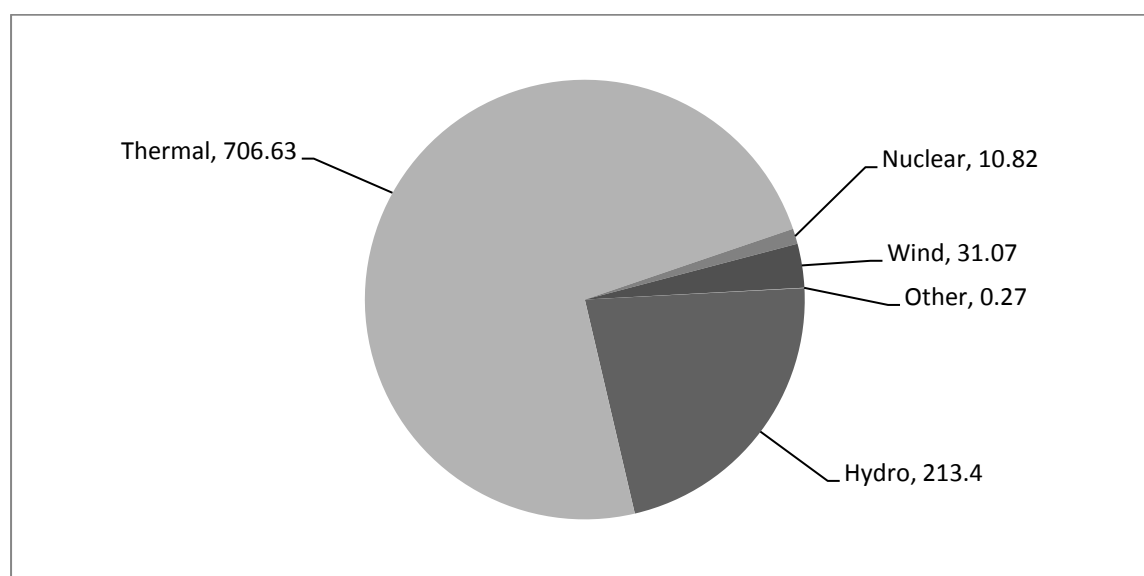
Table 32.1: Chinese government commitment summary

GHG emissions	A Copenhagen Accord target to lower intensity per unit of GDP by 40 to 45 per cent from 2005 levels by 2020.
Renewable energy (RE)	A target of 15 per cent of total energy consumption to be met from non-fossil fuel sources by 2020.
Renewable electricity	Generators with more than 5 GW of installed capacity are required to have 8 per cent of total generating capacity from non-hydroelectric renewable power sources by 2020.

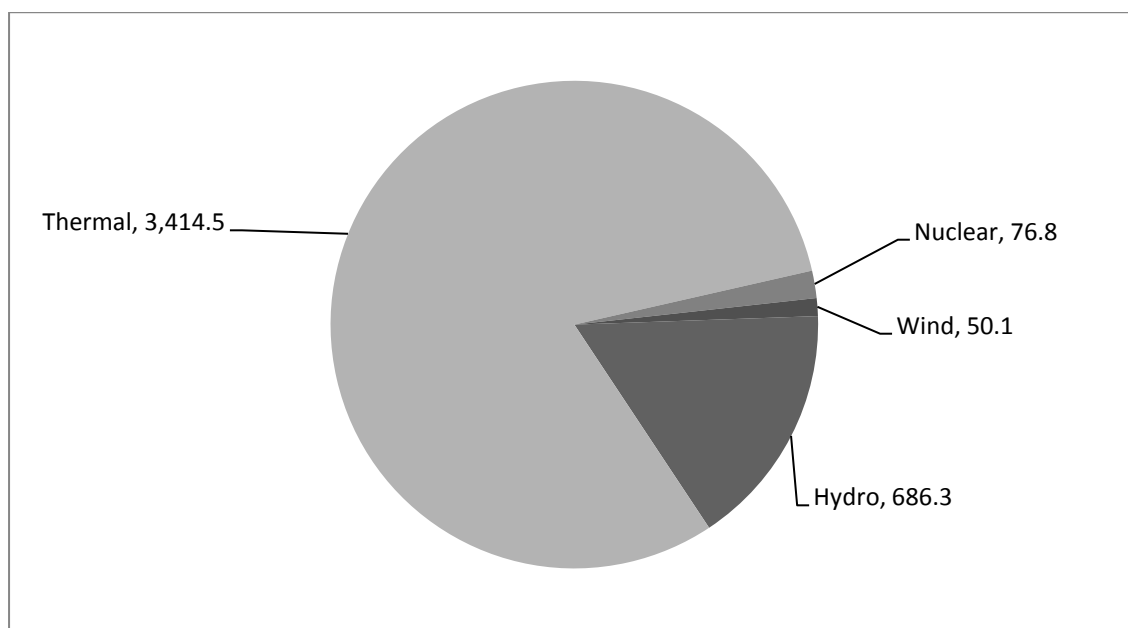
Sources: NRDC, Letter to the UNFCCC, January 2010. Available at unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/chinacphaccord_app2.pdf; Medium and Long-Term Development Plan for Renewable Energy in China 2007. Available at www.chinaenvironmentallaw.com/wp-content/uploads/2008/04/medium-and-long-term-development-plan-for-renewable-energy.pdf.

32.2 Electricity Generation Mix

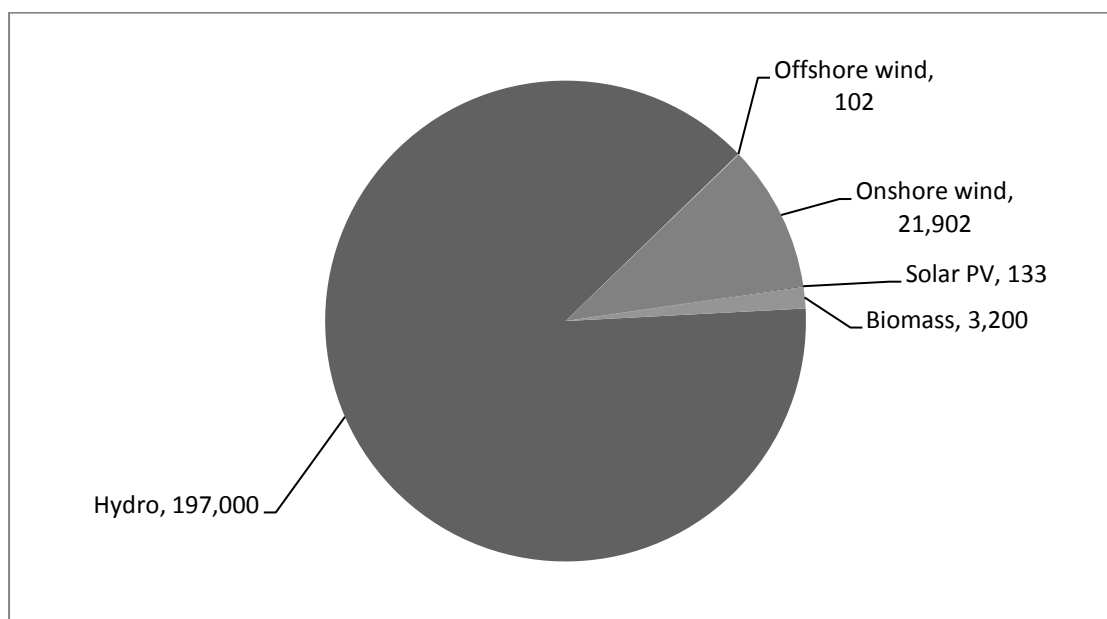
Figure 32.1: Total installed generating capacity in China at the end of 2010 (GW): 962.19 GW



Source: State Electricity Regulatory Commission, 电力监管年度报告 (2010). Available at www.serc.gov.cn/zwgk/jggg/201105/W020110505560626456619.pdf.

Figure 32.2: Electricity generation mix in China in 2010 (TWh): Total 4,227.7 TWh

Source: State Electricity Regulatory Commission, 电力监管年度报告 (2010). Available at www.serc.gov.cn/zwgk/jggg/201105/W020110505560626456619.pdf.

Figure 32.3: Total installed generating capacity of renewable power in China in June 2010 (MW): 222,337 MW

Source: Ren21, Global Renewable Energy Status Report. Available at www.ren21.net/pdf/Background_Paper_Chinese_Renewables_Status_Report_2009.pdf; SERC, 风电、光伏发电情况监管报告. Available at www.serc.gov.cn/ywdd/201102/W020110211528940195724.pdf.

Table 32.2: Growth in electricity consumption from 2001 to 2010 in China

Year	Consumption (TWh)	Growth rate (%)
2001	1,463.35	9.3
2002	1,633.15	11.8
2003	1,903.16	15.6
2004	2,197.14	15.4
2005	2,494	13.5
2006	2,858.8	14.6
2007	3,271.18	14.4
2008	3,426.8	5.23
2009	3,658.7	6.44
2010	4,192.3	14.6

Source: National Bureau of Statistics of China, China Statistical Yearbook 2008. Available at <www.stats.gov.cn/tjsj/ndsj/2008/indexee.htm>; State Electricity Regulatory Commission, 电力监管年度报告 (2010). Available at <www.serc.gov.cn/zwgk/jggg/201105/W020110505560626456619.pdf>.

32.3 Operating Support Incentives

The basis of the Chinese government's support for renewable power development is the 2006 Renewable Energy Law, which was revised in 2009. Under the 2006 law, and until the amendment was passed in December 2009, all renewable power output needed to be purchased by the local grid operators at a 'fair price'; however, unlike a typical feed-in tariff (FIT) system, there was no set tariff rate at which renewable electricity produced was purchased. Instead, once a developer was awarded the rights to a project, the developer and the National Development and Reform Commission (NDRC) negotiated the purchase price on a case-by-case basis, similar to a tender system, where developers compete on the purchase price for their output. The rates agreed are guaranteed, usually for 20 years.

In the December 2009 amendments to the 2006 Renewable Energy Law, the government was given the power to introduce fixed FIT rates for renewable electricity, and it subsequently introduced benchmark FIT rates for wind power, differentiated by region, and guaranteed for 20 years. In July 2011 the government introduced a national benchmark FIT rate for solar PV. Public tenders are also held for the development of wind and solar power projects. The FIT rates do not apply for wind or solar PV projects built under a public tender, in which case the final agreed price has to be less than the corresponding benchmark FIT rates.¹

For biomass- and biogas-based power plants, the government has established a minimum purchase price of 750 CNY/MWh (83.60 EUR/MWh²), which will be valid for 15 years.³ Table 32.3 compares the benchmark FIT rates for wind power and solar PV, and the aforementioned biomass-based incentive.

¹ National Development and Reform Commission, 全国风力发电标杆上网电价表 (Benchmarks for National Wind Power Rates), 2009. Available at <www.sdpc.gov.cn/zfdj/jggg/dian/W020090727546284276176.pdf>.

² The CNY-EUR conversion rate used is EUR 1 = CNY 8.9712 (the average in 2010).

³ CREIA, 国家发展改革委完善农林生物质发电价格政策, July 2010. Available at <www.creia.net/?Infors/detail/t/0/id/489.html>.

Table 32.3: Comparison of tariff rates/income for renewable electricity by technology

Description		CNY/MWh	EUR/MWh
Benchmark FIT rates for wind power ^a	Inner Mongolia, some cities in Xinjiang Uighur Autonomous Region	510	56.85
	Some parts of Hebei province, four cities in Inner Mongolia, and three cities in Gansu Province	540	60.19
	Two cities in Jilin Province, five cities in Heilongjiang Province, Ningxia Hui-Muslim Autonomous Region, and most parts of Gansu Province and Xinjiang Uighur Autonomous Region	580	64.65
	Other and offshore	610	68.00
National benchmark FIT rate for solar PV ^b		1,150	128.19
Minimum purchase price for biomass and biogas ^c		750	83.60

Source: ^aNational Development and Reform Commission, 全国风力发电标杆上网电价表 (Benchmarks for National Wind Power Rates), 2009. Available at <www.sdpc.gov.cn/zfdj/jggg/dian/W020090727546284276176.pdf>; ^bNational Development Reform Commission, 国家发展改革委关于完善 太阳能光伏发电上网电价政策的通知 (Improving PV National Price Policy), 24 July 2011. Available at <www.ndrc.gov.cn/zcfb/zcfbtz/2011tz/t20110801_426501.htm>; ^cCREIA, 国家发展改革委完善农林生物质发电价格政策, July 2010. Available at <www.creia.net/?Infors/detail/t/0/id/489.html>.

In the 2006 Renewable Energy Act, the government introduced its capacity-based RPS, which states that all power generators with more than 5 GW of installed capacity need to meet a requirement that at least 3 per cent of their installed capacity should be non-hydro renewable power capacity by 2010, with this requirement being raised to 8 per cent in 2020. In addition, all grid operators must ensure that at least 1 per cent of the electricity carried on their networks is non-hydro renewable electricity in 2010, rising to 3 per cent in 2020.⁴

32.4 Investment Support Incentives

32.4.1 Solar Power Subsidies

The government provides investment subsidies for the development of solar PV power. Under the Solar Roofs Programme, per generating capacity, the government offered up to 6 CNY/W (0.67 EUR/W) for roof-top solar PV installations in 2011.⁵

For large ground-based solar power installations, the government has introduced the Golden Sun Programme. Under this programme, the government offers subsidies that cover up to 50 per cent of the investment costs for solar PV installations of 300 kW or larger for a maximum total of 20 MW in each province (for off-grid applications, the subsidy is reduced to 70 per cent.) In November 2009, the government announced that 294 projects, totalling 642 MW, had been approved. Of the total, 232 projects (290 MW) were at industrial and commercial locations and the output was intended for their own consumption, 27 projects (46 MW) were

⁴ Medium and Long-Term Development Plan for Renewable Energy in China 2007. Available at <www.chinaenvironmentallaw.com/wp-content/uploads/2008/04/medium-and-long-term-development-plan-for-renewable-energy.pdf>; NRDC, 刘琦副局长在《可再生能源法》(修订) 实施座谈会上的讲话 (Liu Qi, deputy director on the "Renewable Energy Law" (revised): Speech at the Forum on the Implementation, 16 March 2010. Available at <nyj.ndrc.gov.cn/nygz/t20100427_343167.htm>.

⁵ Ministry of Finance, 加快实施“金太阳”示范工程 促进光伏发电产业发展 (Accelerating the Implementation of the Golden Sun Programme), 13 November 2010. Available at <www.mof.gov.cn/pub/mof/zhengwuxinxi/caizhengxinwen/200911/t20091113_232469.html>; Solar PV Sources. Available at <www.solarpvsources.cn/Chain/Chain60716970.html>.

to supply power to off-grid areas, and the remaining 35 projects (360 MW) were to supply power to the grid. All the projects will be completed by 2013.⁶ In addition to the above, the government provides project-based grants for rural electrification. In July 2011, the government announced surprising new FIT rates. All installations approved prior to 1 July or completed before the end of the year are eligible for a FIT of 1.15 CFY/ kWh (0.13 EUR/kWh), while those approved after 1 July may receive 1 CFY/kWh (0.11 EUR kWh).⁷

China has the largest number of Clean Development Mechanism (CDM) projects in the world. As of late 2011, 1,693 initiatives (46.55 per cent of all CDM projects) were located in China.⁸

32.4.2 Tax Incentives

VAT charged on the purchase of electricity generated from wind power is 50 per cent lower than that from other sources.⁹ In addition, enterprises engaged in projects involving renewable power can claim a three-year exemption from corporation tax, plus another three years of tax reduction at 50 per cent.¹⁰ Customs duties on imported renewable energy technology have been reduced to between 1 and 5 per cent and can be waived entirely if it can be demonstrated that the technology is essential to the project concerned.¹¹ Few local governments charge wind power plants land-use tax.

⁶ Ministry of Finance, 加快实施“金太阳”示范工程 促进光伏发电产业发展 (Accelerating the Implementation of the Golden Sun Programme), 13 November 2010. Available at <www.mof.gov.cn/pub/mof/zhengwuxinxi/caizhengxinwen/200911/t20091113_232469.html>; Solar PV Sources. Available at <www.solarpvsources.cn/Chain/Chain60716970.html>.

⁷ Environmental Finance, China surprises with solar tariff announcement, 3 August 2011. Available at <<http://www.environmental-finance.com/news/view/1895>>.

⁸ UNFCCC, CDM in Numbers. Available at <cdm.unfccc.int/Statistics/index.html>.

⁹ 尽快出台可再生能源税收优惠细则, New Policies on Renewable Energy Incentives, August 2009. Available at <www.nengyuan.net/200908/26-202290.html>.

¹⁰ Renewable Energy World, A New Revolution, October 2009. Available at <www.renewableenergyworld.com/rea/news/article/2009/10/a-new-revolution-china-hikes-wind-and-solar-power-targets>.

¹¹ 财政部关于“我国风电事业亟待发展”提案的答复 (摘要) Ministry of Finance on Renewable Energy, December 2007. Available at <unn.people.com.cn/GB/134673/141758/141760/8567045.html>.

Chapter 33: India

33.1 Government Targets

Under the Copenhagen Accord, India has a target of reducing its GHG emissions intensity per unit of GDP by 20 to 25 per cent from 2005 levels by 2020. The government has set a target for 6 per cent of primary energy consumption to come from renewable sources by 2022 in its *Strategic Plan for New and Renewable Energy for the Period 2011-17*, published in February 2011. The Strategic Plan also sets out annual targets to install a total of 21,700 MW of grid-connected renewable power generating capacity between 2011 and 2017, and a goal for off-grid renewable power facilities to total 6,000 MW by 2017; 2,000 MW of which should be solar power.

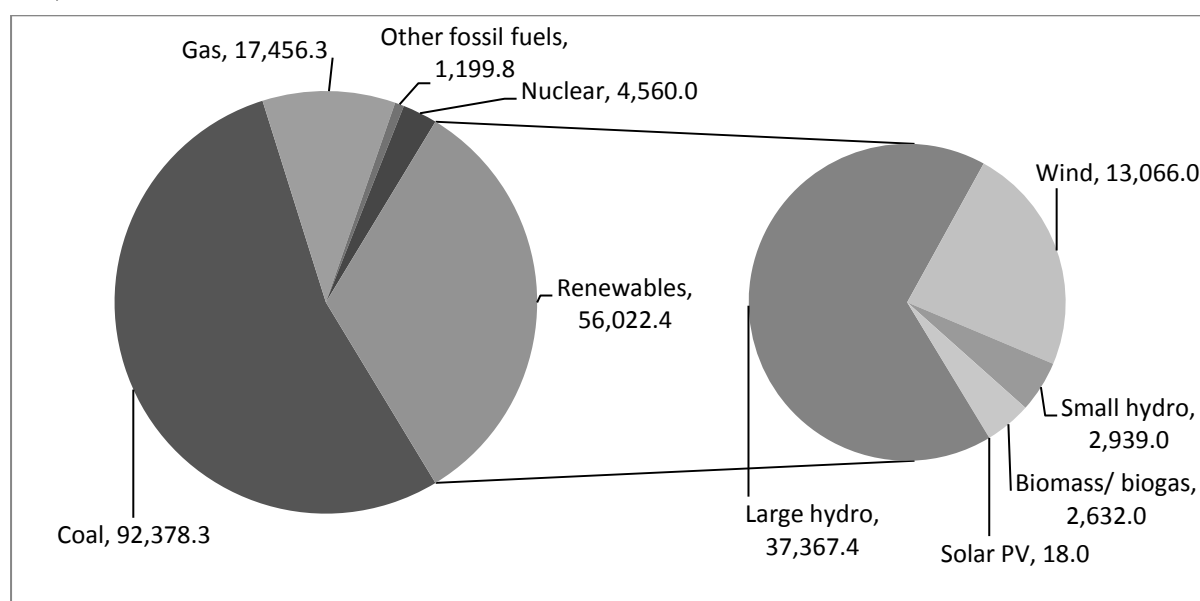
Table 33.1: Indian government commitment summary

GHG emissions	A Copenhagen Accord target to reduce intensity per unit of GDP by 20 to 25 per cent of 2005 levels by 2020.
Renewable energy (RE)	A government target of 6 per cent of primary energy consumption to come from renewable energy sources by 2022.
Renewable electricity	A government target to install 21,700 MW of grid-connected renewable generation capacity between 2011 and 2017, and for off-grid renewable power facilities to total 6,000 MW by 2017; 2,000 MW from solar

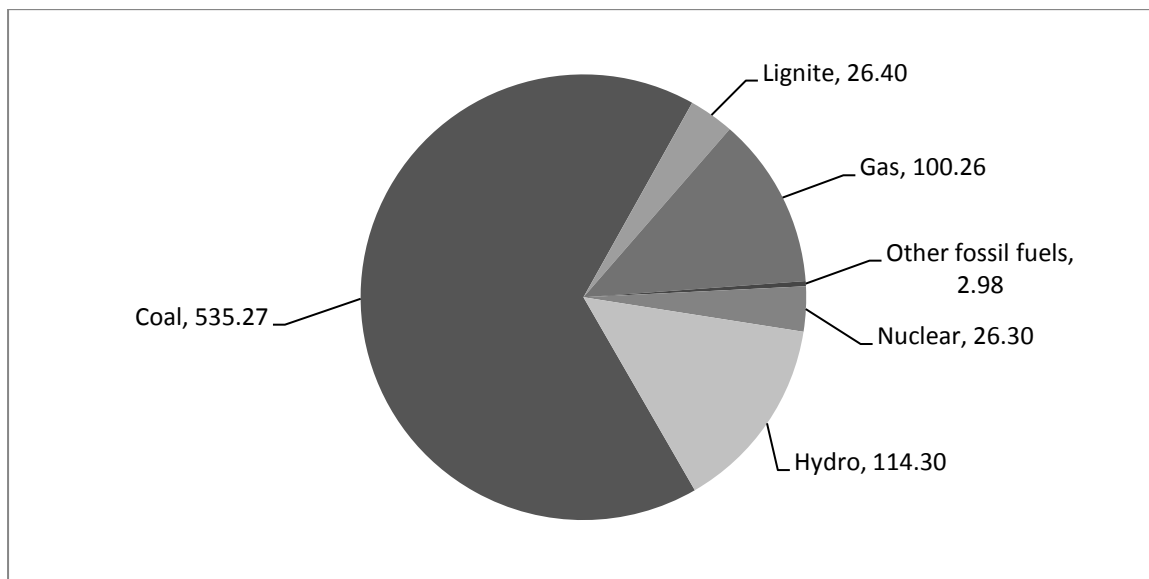
Source: Ministry of the Environment, Letter to the UNFCCC, January 2010. Available at <unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/indiacphaccord_app2.pdf>; MNRE, Strategic Plan for New and Renewable Energy Sector for the Period 2011-17. Available at <www.mnre.gov.in/policy/strategic-plan-mnre-2011-17.pdf>.

33.2 Electricity Generation Mix

Figure 33.1: Total installed generating capacity in India in December 2010 (MW): 171,616.8 MW



Source: Central Electricity Authority, Installed Generating Capacity in India. Available at <www.cea.nic.in>; MNRE, Strategic Plan for New and Renewable Energy Sector for the Period 2011-17. Available at <www.mnre.gov.in/policy/strategic-plan-mnre-2011-17.pdf>.

Figure 33.2: Electricity generation mix in India in 2008 (TWh): Total 774.38 TWh

Note: Only generators above 25 MW are included.

Source: Central Electricity Authority, Operation Performance of Generating Stations in the Country During the Year 2010-11. Available at <www.cea.nic.in/reports/yearly/energy_generation_10_11.pdf>.

33.3 Operating Support Incentives

33.3.1 Federal Feed-in Tariffs

In 2009, the federal Central Electricity Regulatory Commission (CERC) issued guidelines to states for developing feed-in tariffs (FIT) systems. The guidelines are as follows:

- All renewable power technologies will be included
- The rates will last for 13 years except:
 - Solar PV and solar thermal: 25 years
 - Small hydro (≤ 5 MW): 35 years
- The final tariffs will be decided by the state power regulators
- FIT rates will be reviewed after one year for solar power, and three years for other sources of renewable power.¹

CERC released guideline FIT rates which the states are free to modify (see Table 33.2). For the fiscal year (FY) 2010-2011 (1 April to 31 March), CERC introduced new base tariffs which are reduced if developers take advantage of accelerated depreciation options (80 per cent depreciation on 50 per cent of the project costs in the first year). Most developers take advantage of accelerated depreciation and hence receive the lower rates.²

¹ Central Electricity Regulatory Commission, RE Tariff Regulations. Available at <www.cercind.gov.in/Regulations/Final_SOR_RE_Tariff_Regulations_to_upload_7_oct_09.pdf>.

² CERC, Petition No. 256/2010 Determination of generic levelled generation tariff (FY 2011-12) under Regulation 8 of the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009 and Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2010, 21 November 2010. Available at <www.cercind.gov.in/2010/November/Signed_Order_256-2010_RE_Tariff_FY_11-12.pdf>.

Table 33.2: Federal guideline tariffs for renewable power generation in India

Description			FY 2009-2010 ^a	FY 2010-2011 ^a	FY 2011-2012			
					Reference tariff	Reduction for accelerated depreciation	Total	
							INR/MWh	INR/MWh
Wind	20 per cent load factor		5,630	4,290	5,330	800	4,530	74.78
	23 per cent load factor		4,900	3,730	4,630	690	3,940	65.04
	27 per cent load factor		3,750	2,860	3,950	590	3,360	55.47
	≥ 30 per cent load factor				3,550	530	3,020	49.85
Small hydro	In Himachal/ Uttarakhand/ North eastern State	< 5 MW	3,900	3,900	3,780	470	3,310	54.64
		5-25 MW	3,350	3,350	3,220	420	2,800	46.22
	Other	< 5 MW	4,620	4,620	4,490	550	3,940	65.04
		5-25 MW	4,000	4,000	3,840	500	3,340	55.13
Solar PV			18,440	18,440	15,390	2,450	12,940	213.61
Solar thermal			13,450	13,450	15,040	2,340	12,690	209.48
Biomass			3,930-5,520	3,160-4,430	3,780-4,940	190	3,590-4,740	59.26-78.25
Cogeneration with non-fossil fuels			3,930-5,520	3,160-4,430	3,930-5,210	250-330	3,650-4,940	60.25-81.55

Notes: The INR-EUR conversion rate used is EUR 1 = INR 60.5878 (the average over 2010).

^aTariffs for FY 2009-10 and 2010-11 include reduction for the use of accelerated depreciation.

Source: CERC, Petition No. 256/2010 Determination of generic levelled generation tariff (FY 2011-12) under Regulation 8 of the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009 and Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2010, 21 November 2010. Available at <www.cercind.gov.in/2010/November/Signed_Order_256-2010_RE_Tariff_FY_11-12.pdf>.

In November 2009, the federal government approved the 'Jawaharlal Nehru National Solar Mission' (JNNSM), which has an aim of installing a total of 20,000 MW of grid-connected solar power by 2022. Under the JNNSM, CERC will not adjust the FIT rate for solar power until 2013.³ In 2010, the government held a public tender for large grid-connected solar power projects. A total of 37 projects were awarded contracts, seven concentrated solar-thermal power (CSP) projects totalling 470 MW and 30 solar PV projects totalling 150 MW. The projects will receive the following tariff rates for their output for 25 years:

- CSP: 11,360 INR/MWh (187.50 EUR/MWh)
- Solar PV: 11,850 INR/MWh (195.58 EUR/MWh).⁴

In 2008, the federal government introduced an additional premium, called the Generation Based Incentive, or GBI, for independent power producers to develop wind or solar power plants to help meet the renewable power quotas in various states (see Table 33.3). For wind power, projects over 5 MW are eligible, and the generators receive the income from the sale of the electricity on the wholesale market as well as the GBI premium. For solar power, projects between 1 and 5 MW are eligible, and the generators are able to receive the GBI on top of other state or federal incentives, although the maximum incentive developers can

³ Ministry of New and Renewable Energy, Jawaharlal Nehru National Solar Mission. Available at <mnre.gov.in/pdf/mission-document-JNNSM.pdf>.

⁴ MNRE, Jawaharlal Nehru National Solar Mission, Annual Report 2010-11. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%206/chapter%206.htm>.

receive is 13,000 INR/MWh (214.57 EUR/MWh). Depending on the state and the power purchase agreement, the premium for solar PV will be available for between 4 and 10 years, and the output must be sold to the grid. The GBI is expected to conclude acceptance of new applications in December 2011.⁵

Table 33.3: Federal incentives for wind and solar power generation in India

Technology	INR/MWh	EUR/MWh
Wind power fixed premium	500	8.19
Solar PV variable premium	12,410	204.83
Concentrated solar-thermal power variable premium	10,000	163.86

Source: Ministry of New and Renewable Energy, GBI. Available at <mnre.gov.in>.

33.3.2 Tradable Green Certificates

In November 2010, India launched a tradable green certificate (TGC) programme, called the Renewable Energy Certificate (REC) system. Renewable power generators receive RECs for their output, which are then sold to utilities that have to meet state-set renewable power quotas, which are called Renewable Purchase Obligations (RPOs). If the state has a FIT system, generators have a choice of receiving the FIT rates or RECs.⁶

Once accredited, generators can start receiving RECs from the federal Renewable Energy Certificate Registry for every MWh of renewable electricity supplied to the grid. The RECs can be sold directly to utilities or at power exchanges approved by CERC. For the first year, 2011-12, CERC established minimum and maximum prices for RECs (see Table 33.4). In subsequent years, the price of the RECs will be set by the market. In addition to the price of the REC, the generator will also earn income from the sale of the electricity on the wholesale market. RECs issued in one state can be used to meet the RPO in any other state.

Table 33.4: Maximum and minimum REC prices in India: 2011-2012

Description	RECs for solar power		RECS for other	
	INR/MWh	EUR/MWh	INR/MWh	EUR/MWh
Maximum Price	17,000	280.58	3,900	64.37
Minimum Price	12,000	198.06	1,500	24.76

Source: CERC, Determination of Forbearance and Floor Price for the REC Framework. Available at <www.recregistryindia.in/index.php/general/publics/ReferenceDocuments>.

As of May 2011, 71 generators, with a total generating capacity of 446 MW, were accredited to receive RECs. The majority were wind power generators, followed by small hydro, biomass, and biomass cogeneration. There are currently no solar power generators accredited to receive RECs.⁷

33.3.3 State Operating Support Incentives

As of June 2011, 18 of India's 29 states had introduced state-level Renewable Purchase Obligations (RPOs) in compliance with a federal law obliging all states to set an RPO (see Table 33.5). Four other states, Kerala, Punjab, Tamil Nadu and Uttarakhand, were in the

⁵ MNRE, Policy Incentives for Wind and Solar Power. Available at <mnre.gov.in/gbi/Amulya%20Charan.pdf>.

⁶ Information from the Renewable Energy Certificate Registry of India. Available at <www.recregistryindia.in/index.php/general/publics/ProcedureRegistration>.

⁷ Renewable Energy Certificate Registry of India, Accredited Generators. Available at <www.recregistryindia.in/index.php/general/publics/accredited_regens>.

process of drafting a state-level RPO as of June 2011. The RPO provides the regulatory framework for creating demand for the RECs (see section 33.3.2 above).

Table 33.5: Renewable Purchase Obligation in Indian states as of June 2011

State		Source	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Assam		Solar	0.05	0.10	0.15	0.20	0.25	
		Other	1.35	2.70	4.05	5.40	6.75	
		Total	1.40	2.80	4.20	5.60	7.00	
Bihar		Solar	0.25	0.50	0.75	1.00	1.25	
		Other	1.25	2.00	3.25	3.50	3.75	
		Total	1.50	2.50	4.00	4.50	5.00	
Chhattisgarh		Solar	0.25	0.25	0.25			
		Biomass	3.75	3.75	3.75			
		Other	1.00	1.25	1.75			
		Total	5.00	5.25	5.75			
Gujarat		Solar	0.25	0.50	1.00			
		Wind	4.50	5.00	5.50			
		Other	0.25	0.50	0.50			
		Total	5.00	6.00	7.00			
Haryana		Solar	0.25	0.50	0.75	1.00		
		Other	1.25	1.00	1.25	2.00		
		Total	1.50	1.50	2.00	3.00		
Himachal Pradesh		Solar	0.10	0.10	0.10			
		Other	10.00	11.00	12.00			
		Total	10.10	11.10	12.10 (continues until revised)			
Jammu and Kashmir		Solar	0.02	0.10	0.25			
		Other	0.98	2.90	4.75			
		Total	1.00	3.00	5.00			
JERC (Goa and UT)		Solar	0.25	0.30	0.40			
		Other	0.75	1.70	2.60			
		Total	1.00	2.00	3.00 (continues until revised)			
Jharkhand		Solar	0.25	0.50	1.00			
		Other	1.75	2.50	3.00			
		Total	2.00	3.00	4.00			
Karn- ataka (based on utility)	BESCOM/ MESCOM / CESC	Solar	0.25					
		Other	10.00					
		Total	10.25 (continues until revised)					
	HESCOM/ GESCOM/ Hukkeri	Solar	0.25					
		Other	7.00					
		Total	7.25 (continues until revised)					
Madhya Pradesh		Solar	0.00	0.40	0.60	0.80	1.00	
		Other	0.80	2.10	3.40	4.70	6.00	
		Total	0.80	2.50	4.00	5.50	7.00	
Maharashtra		Solar	0.25	0.25	0.25	0.50	0.50	0.50
		Other	5.75	6.75	7.75	8.50	8.50	8.50
		Total	6.00	7.00	8.00	9.00	9.00	9.00
Manipur		Solar	0.25	0.25	0.25			
		Other	1.75	2.75	4.75			
		Total	2.00	3.00	5.00			
Mizoram		Solar	0.25	0.25	0.25			
		Other	4.75	5.75	6.75			
		Total	5.00	6.00	7.00			

Meghalaya	Solar	0.20	0.30	0.40			
	Wind	0.10	0.15	0.20			
	Other	0.20	0.30	0.40			
	Total	0.50	0.75	1.00 (continues until revised)			
Nagaland	Solar	0.25	0.25	0.25			
	Other	14.75	15.75	16.75			
	Total	15.00	16.00	17.00			
Orissa	Solar	0.00	0.10	0.15	0.20	0.25	0.30
	CHP	3.50	3.70	3.95	4.20	4.45	4.70
	Other	4.00	1.20	1.40	1.60	1.80	2.00
	Total	4.50	5.00	5.50	6.00	6.50	7.00
Rajasthan	Biomass	1.75	2.00				
	Wind	6.75	7.50				
	Other	0.00	0.00				
	Total	8.50	9.50				
Uttar Pradesh	Solar	0.25	0.50	1.00			
	Other	3.75	4.50	5.00			
	Total	4.00	5.00	6.00 (continues until revised)			

Source: Renewable Energy Certificate Registry of India. Renewable Purchase Obligation and its compliance (RPO Regulations) by SERCs. Available at www.recregistryindia.in/index.php/general/publics/ReferenceDocuments.

Wind Power

At the end of 2010, 11 states were offering preferential tariff rates for wind power (see Table 33.6). Most of these states also offer reduced transmission charges, energy charges, and wheeling (distribution) charges.⁸

Table 33.6: Feed-in tariff rates for wind power in selected states in India

State	FIT rates		Transmission, wheeling and energy charges	Notes
	INR/MWh	EUR/MWh		
Tamil Nadu	3,390	55.95	A reduction of 5 per cent (for HV/EHV) or 7.5 percent (for LV)	Fixed for 5 years
Gujarat	3,560	58.76	A reduction of 4.4 per cent (≥ 66 kV) or 10 per cent (< 66 kV) of the transmission tariff	Fixed for 20 years
Rajasthan	3,870 – 4,080	63.87 – 67.34	A reduction of 50 per cent of the transmission tariff	None
Karnataka	3,700	61.07	A reduction of 5 per cent of the energy charge	Fixed for 10 years
Madhya Pradesh	4,350	71.80	A reduction of 2 per cent of the energy and transmission tariffs	Reduced by 170 INR/MWh a year
West Bengal	Up to 4,870	Up to 80.38	A reduction of 1/3 of the wheeling charges or 7.5 per cent of the energy charge (whichever is higher), and 2/3 of the transmission tariff	
Kerala	3,140	51.83	A reduction of 5 per cent of the energy charge	Fixed for 20 years
Maharashtra	3,500	57.77	A reduction of 7 per cent of the transmission tariff	Increases by 150 INR/MWh a year
Andhra Pradesh	3,500	57.77	A reduction of 5 per cent of the transmission tariff	Fixed for 10 years
Haryana	4,080	67.34	A reduction of 2 per cent of the energy charge	Increases by 1.5 per cent a year
Punjab	3,660	60.41	A reduction of 2 per cent of the transmission tariff	Increases by 5 per cent until 2012

Source: MNRE, Policies Introduced by the State Governments for Wind Power, December 2011. Available at www.mnre.gov.in/annualreport/2010_11_English/Chapter%205/chapter%205.htm.

⁸ Ministry of New and Renewable Energy, Annual Report 2010-2011. Available at www.mnre.gov.in/annualreport/2010_11_English/Chapter%205/chapter%205.htm.

Solar PV

Apart from the federal solar power programme, there are no state-level support systems. However, the state government in Orissa gave an additional 3,000 IRN/MWh to a 5-MW project under development (in addition to the federal 12,000 IRN/MWh). The total premium for the project is thus 15,000 IRN/MWh (247.57 EUR/MWh).⁹ Most projects take advantage of the federal incentives offered under the Jawaharlal Nehru National Solar Mission (See Section 33.4.4 below).

Biomass

As of 31 March 2011, 16 states offered specific FIT rates for biomass power generation and for combined heat and power (CHP) based on non-fossil fuel sources (see Table 33.7).

Table 33.7: Feed-in tariff systems in selected states in India for biomass power and CHP based on non-fossil fuel sources as of 31 March 2011

State	Technology	Tariff		Notes
		INR/MWh	EUR/MWh	
Andhra Pradesh	Biomass	4,280	70.64	Sales to a third party not allowed
	CHP	3,480	57.44	
Chattishgarh	Biomass	3,930	64.86	
Gujarat	Biomass	4,440	73.28	Tariff with use of accelerated depreciation. Valid for 20 years
	CHP	4,550	75.10	Tariff with use of accelerated depreciation.
Haryana	Biomass	4,000	66.02	Tariffs increase by 3 per cent a year
	CHP	3,740	61.73	
Karnataka	Biomass	4,130	68.17	For 10 years
	CHP	4,140	68.33	
Kerala	Biomass	3,300	54.47	Tariffs increase by 5 per cent a year
Maharashtra	Biomass	4,980	82.19	For 15 years
	CHP	4,790	79.06	
Madhya Pradesh	Biomass	3,330-5,140	54.96-84.84	For 20 years
Punjab	Biomass	5,050	83.35	Tariffs increase by 5 per cent a year
	CHP	4,570	75.43	
Rajasthan	Water-cooled	4,720	77.90	None
	Air-cooled	5,170	85.33	
Tamil Nadu	Biomass	4,500-4,740	74.27-78.23	Tariffs increase by 2 per cent a year
	CHP	4,370-4,490	72.13-74.11	
Uttaranchal	Biomass	3,060	50.51	None
	CHP	3,120	51.50	
Uttar Pradesh	Existing	4,290	70.81	None
	New	4,380	72.29	
West Bengal	Biomass	4,360	71.96	For 10 years
Bihar	Biomass	4,170	68.83	
	Existing CHP	4,250	70.15	
	New CHP	4,460	73.61	
Orissa	Biomass	4,090	67.51	None

Source: MNRE, Biomass Power, 31 March 2011. Available at <www.mnre.gov.in/prog-biomasspower.htm>.

⁹ Orissa Electricity Regulation Authority. Available at <www.orierc.org/Orders/2009/C-97-2009.pdf>.

33.4 Investment Support Incentives

33.4.1 General Tax and Investment Incentives

Developers can take advantage of accelerated depreciation (80 per cent depreciation on 50 per cent of total project costs in the first year) for renewable energy projects. If accelerated depreciation is used, generally the FIT rate received by the project is reduced.¹⁰

The Indian Renewable Development Agency (IREDA) offers soft loans to developers and will finance up to 70 per cent of total project costs with interest rates between 1.75 and 10.50 per cent for investments in: hydro power, wind power, biomass-fired CHP, grid-connected solar power, energy efficiency improvements.¹¹

The Power Finance Corporation (PFC), Rural Electrification Corporation (REC), and National Bank for Agricultural and Rural Development (NABARD) also offer financial support, mainly for off-grid and rural projects.¹² In 2010, the government announced the establishment of a National Clean Energy Fund, which is funded by an INR 50 surcharge on each tonne of coal used for power generation. In 2010-11, the government collected INR 31.2 billion from the surcharge; however, as of June 2011, the government has not announced how the fund will provide support for renewable energy.¹³

The Ministry of New and Renewable Energy also introduced the Special Area Demonstration programme in 2010. Under this programme, renewable energy demonstration projects at locations of national and international importance, such as heritage sites and religious locations, can receive grants of up to INR 10,000,000 (EUR 165,000). In 2010-2011, 20 projects at four world heritage sites were given grants.¹⁴

India has the second largest number of Clean Development Mechanism (CDM) projects in the world after China. As of late 2011, 748 (20.57 per cent of all CDM projects) were located in India.¹⁵

33.4.2 Wind Power Investment Incentives

Import taxation on wind turbines and battery chargers of up to 30 kW is levied at only 5 per cent instead of the usual 30 per cent tax. In some states, there is a reduction or exemption on

¹⁰ CERC, Petition No. 256/2010 Determination of generic levlised generation tariff (FY 2011-12) under Regulation 8 of the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009 and Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2010., 21 November 2010. Available at <www.cercind.gov.in/2010/November/Signed_Order_256-2010_RE_Tariff_FY_11-12.pdf>.

¹¹ REN21, India Renewable Energy Status Report, October 2010. Available at <www.ren21.net/Portals/97/documents/Indian_RE_Status_Report.pdf>; See the website at <www.ireda.in/incentives.asp>.

¹² MNRE, Financing of Renewable Energy Project, January 2011. Available at <pib.nic.in/newsite/pmreleases.aspx?mincode=28>.

¹³ Government of India, Proactive Environment Responses, April 2011. Available at <pib.nic.in/newsite/erelease.aspx?relid=58419>.

¹⁴ MNRE, Annual Report 2010-2011. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%2010/chapter%2010.htm>.

¹⁵ UNFCCC, CDM in Numbers. Available at <cdm.unfccc.int/Statistics/index.html>.

sales tax for wind power generation components.¹⁶ Investment grants for wind power projects are available in the states of Tamil Nadu, West Bengal, Gujarat and Rajasthan.¹⁷ The subsidy usually amounts to a certain percentage of project costs (generally 15-30 per cent) with a maximum total of INR 30 million (EUR 492,000) for special category states such as the Northeast Region, Sikkim and Uttaranchal, and INR 25 million (EUR 410,000) for other states.¹⁸ In addition, it is possible to receive an exemption on electricity tax for five years.

33.4.3 Biomass Power Investment Incentives

Biomass power plants receive the following incentives:

- Income tax exemption (5 year tax exemption, 30 per cent reduction for the following 5 years)
- Concessional customs and excise duty exemption for machinery and components for initial project construction
- In certain states, there is an exemption on the general sales tax.¹⁹

Biomass-fired CHP installations located at agricultural processing plants can receive investment grants of up to 20 million INR/MW (330,000 EUR/MW). If bagasse is used as fuel for these CHP installations, the grant can be increased to 30 million INR/MW (490,000 EUR/MW). Preference is given to cooperatively-owned agriculture processing plants.²⁰

Support is also available for power plants based on biomass gasification using locally available biomass resources such as wood chips, rice husks, arhar stalks, cotton stalks and other agricultural residue (maximum 2 MW). The support varies from between 1,500 and 15,000 INR/kW depending on the size of the project and whether it is an electricity-only or a CHP plant.²¹

Grid-connected biogas-based power generation units of up to 250 kW can also receive the following grants for up to 40 per cent of the capital costs:

- Installations of 3-20 kW: 40,000 INR/W (660 EUR/W)
- Installations of 20-100 kW: 35,000 INR/W (578 EUR/W), up to a maximum of INR 20,000
- Installations of 100-250 kW: 30,000 INR/W (495 EUR/W), up to a maximum of INR 100,000.

Grid-connected biogas from waste can also receive funding for biogas sources from the following:

¹⁶ Wind Power India. Available at <www.windpowerindia.com/govtcentinc.html>; MNRE, Annual Report 2010-2011. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%2010/chapter%2010.htm>.

¹⁷ For information see the Ministry of New and Renewable Energy website. Available at <mnes.nic.in> and the Indian Renewable Energy Development Agency at <www.ireda.in/incentives.asp>.

¹⁸ Ministry of New and Renewable Energy, CFA Finance Available. Available at <www.mnre.gov.in/cfa-schemes-programmes.htm>.

¹⁹ Ministry of New and Renewable Energy. Available at <www.mnre.gov.in>.

²⁰ MNRE, Annual Report 2010-2011. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%204/chapter%204.htm>.

²¹ MNRE, Annual Report 2010-2011. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%204/chapter%204.htm>.

- Animal waste in urban areas: 30 million INR/MW (490,000 EUR/MW) for up to 50 per cent of capital costs
- Animal and agricultural wastes in non-urban areas: 20 million INR/MW (330,000 EUR/MW) for up to 30 per cent of capital costs
- Sewage treatment plants: 20 million INR/MW (330,000 EUR/MW) for up to 40 per cent of capital costs.²²

The National Biogas and Manure Management Programme supports off-grid biogas installations at the household level. Support is limited to INR 4,000 (EUR 66) for most installations, increasing to INR 10,000 (EUR 146) for installations 2-3 m³ in size. Support is also higher in the north-eastern states and Sikkim (INR 14,700, EUR 214), and the plain area of Assam (INR 9,000, EUR 131). A bonus of INR 1,000 is given if the installation is linked to a new sanitary toilet.²³

33.4.4 Solar Power Investment Incentives

In 2009, the government launched the Jawaharlal Nehru National Solar Mission (JNNSM). Under the JNNSM, 20,000 MW of solar power is to be connected to the grid by 2022, in addition to 2,000 MW of off-grid solar power.

Solar power and heating equipment is exempt from customs and excise duty as well as sales tax. For grid-connected solar PV systems, operating incentives are the primary method for increasing deployment.²⁴ Off-grid solar power facilities such as solar-home systems, solar street lighting and mini-grids are supported with investment grants. The grants differentiate between two kinds of support depending on location: facilities in general India for which up to 50 per cent of capital costs can be covered; and facilities in the north-east, including Sikkim, and areas that are not as wealthy as others, known as special areas, for which up to 90 per cent of capital costs are covered.

Solar PV water pumping systems are also supported through the Solar PV Programme. The cash subsidies are for non-commercial enterprises only. The support also encompasses low interest loans, and the maximum amount for a loan is 90 per cent of the system after deducting the subsidy. The loans can have a duration of up to five years, and operate on an interest rate of between 5-7 per cent. Table 33.8 outlines the financial assistance offered by the central government for solar PV.

²² MNRE, Opportunities: Policy Development Requirements for Biogas Upscaling in India, October 2010.

Available at

<www.direct2010.gov.in/pdf/Policy%20Development%20Requirements%20for%20Biogas%20Upscaling%20in%20India.pdf>.

²³ India Development Gateway, National Biogas and Manure Management Programme. Available at <www.indg.in/rural-energy/schemes/national-biogas-and-manure-management-programme-nbmmp>.

²⁴ MNRE, Jawaharlal Nehru National Solar Mission. Available at <mnre.gov.in/pdf/mission-document-JNNSM.pdf>.

Table 33.8: Central government financial assistance provided in India for solar PV

Solar PV technology	Subsidy
Lanterns	INR 2,400 for the northeast and special areas; 0 for other
Home lighting systems	INR 4,500 to 8,600 for NE and special areas, and INR 2,500 to 4,800 for other areas, depending on model
Street lighting systems	INR 17,300 for NE and special areas INR 9,600 for other areas
Standalone power plant of capacity >1 kW	2,25,000 INR/kW for NE and special areas 1,25,00 INR/kW for other areas
Standalone power plant of capacity >10 kW	2,70,000 INR/kW for NE and special areas 1,50,000 INR/kW for other areas
Solar PV applications in urban areas:	
Streetlight control systems	25 per cent of costs, up to INR 5000
Street/public garden lights (74 or 75 W modules)	50 per cent of cost subject to a maximum of INR 10,000 or INR 12,000 for 11 W and 18 W rated lights, respectively
Power packs (maximum 1 kW module)	50 per cent of costs, up to 100,000 INR/kW.

Source: Ministry of New and Renewable Energy, CFA Finance Available. Available at <www.mnre.gov.in/cfa-schemes-programmes.htm>.

33.4.5 Small Hydro Investment Incentives

Investment support for small hydro power projects (≤ 25 MW) is also available. Support is higher in the special category states, which includes the north-eastern states of Sikkim, Jammu and Kashmir, Himachal Pradesh, and Uttarakhand (see Table 33.9). Additional incentives are offered for micro-hydro projects with capacities under 100 kW.

Table 33.9: Investment incentives for small hydro projects in India

Type	Location	100-1,000 kW	1-25 MW	Maximum
New state-owned plants	Special category states	50,000 INR/kW (825 EUR/kW)	<ul style="list-style-type: none"> 500 million INR/MW (8.3 million EUR/MW) for first MW 5 million INR/MW (83,000 EUR/MW) for each additional MW 	90 per cent of investment costs
	Other	25,000 INR/kW (422 EUR/kW)	<ul style="list-style-type: none"> 250 million INR/MW (4.2 million EUR/MW) for first MW 4 million INR/MW (66,000 EUR/MW) for each additional MW 	
New privately owned plants	Special category and NE states	20,000 INR/kW (400 EUR/kW)	<ul style="list-style-type: none"> 200 million INR/MW (3.3 million EUR/MW) for first MW 3 million INR/MW (50,000 EUR/MW) for each additional MW 	50 per cent of investment costs
	Other	12,000 INR/kW (211 EUR/kW)	<ul style="list-style-type: none"> 120 million INR/MW (2 million EUR/MW) for first MW 2 million INR/MW (415,000 EUR/MW) for each additional MW 	
Repowering of public sector plants	Special category and NE states	25,000 INR/kW (412 EUR/kW)	<ul style="list-style-type: none"> 250 million INR/MW (4 million EUR/MW) for first MW 5 million INR/MW (83,000 EUR/MW) for each additional MW 	50 per cent of investment costs
	Other	15,000 INR/kW (248 EUR/kW)	<ul style="list-style-type: none"> 150 million INR/MW (2.5 million EUR/MW) for first MW 3.5 million INR/MW (58,000 EUR/MW) for each additional MW 	

Source: MNRE, Power from Renewables, Annual Report 2010-2011. Available at <www.mnre.gov.in/annualreport/2010_11_English/Chapter%205/chapter%205.htm>.

Chapter 34: Country Ranking

The focus of this report has been the financial incentives awarded to renewable power developers by the national governments in 31 OECD countries as well as China and India. As a conclusion to this report, a comparison of these 33 countries is made with respect to expected compensation obtained via national incentives. As an illustration, compensation is compared for two representative projects: a 499 kW building-attached commercial solar PV installation; and an 5.1 MW onshore wind power project. The results are set out in Table 34.1. The calculations assume projects enter into commercial operation in 2011.

A 499-kW building-attached commercial solar project was chosen for analysis on the basis that a project of such capacity would not be for domestic use and would require the roof of a large commercial premise. A building-attached project was selected for comparison rather than a ground-based project as building-attached projects were more widely supported in the countries studied. For the other example, a 5.1 MW onshore wind power project was chosen for its comparable scale to for the minimum size for commercial grid-connected projects. Additionally, some governments classify projects under 5 MW as microgeneration technologies = By using a 5.1 MW project, the figures given are indicative of the incentives available for larger projects.

The government incentives reviewed in this report are essentially of two types: incentives offered for each unit of electricity produced (operating incentives) and the incentives for an approved project given at the time of investment (investment incentives or support). In most countries, if not all, operating incentives are far larger than investment incentives, as they are awarded over a long period of operation—usually 20 years. Although investment support can be significant in reducing the overall investment cost, these types of support programmes can often be withdrawn or become oversubscribed at short notice—sometimes within a few months from their introduction. They are thus likely to be less important than the operating incentives in shaping an investment decision. For this reason, we have considered only operating incentives in our comparison.

As previously discussed, there are three main types of operating incentives: feed-in tariffs, premiums and tradable green certificates. In countries which operate feed-in tariff (FIT) systems, FIT rates are all that a project can earn, therefore these rates are used for the purposes of comparison. In countries which operate a premium system, the premium amount is either a fixed amount in addition to the wholesale market price of electricity (a fixed premium), or it is adjusted to meet a government-set rate (variable premium). The rate used for comparison is the combination of premium and the average wholesale electricity price for 2010 in that country. In countries which operate a tradable green certificate (TGC) system, the combination of the average or representative prices of the TGC for 2010 and the average wholesale electricity price of 2010 are compared (for more information on the figures used, see the relevant country chapters).

Continuing with our two theoretical examples, Figures 34.1 and 34.2 set out a by-country comparison of generation compensation in 2010 and 2011. The country with the highest generation compensation for solar power in 2011 was Canada (Ontario), followed by Belgium (Flanders). Belgium (Flanders) also had the highest 2011 generation compensation

for wind power. There was generally no overlap in the countries that had high generation compensation for wind power as well as solar power; with the exception of Belgium (Flanders), which scored highly in both.

Compensation levels for wind power did not change dramatically between 2010 and 2011. The exception was those countries whose incentives are based on TGCs, such as Belgium, Sweden and Australia, where the increase was largely due to jumps in the 2010 wholesale price of electricity in those countries. With regard to large-scale solar power installations, however, there have been substantial incentive cuts in countries with FIT systems. The largest incentive cuts were seen in the UK (64 per cent reduction), the Czech Republic (55 per cent reduction), Spain (36 per cent reduction), and Germany (22 per cent reduction). On top of these reductions, most of these countries introduced some form of annual cap and/or high depreciation rates. An extreme example is Slovakia, where support was removed entirely for solar PV over 100 kW. The reduction in solar power tariff rates were generally applied to projects over 50 kW. The FIT rates for smaller systems and for building-integrated PV were not reduced to such an extent, if at all.

The reduction in generation compensation for solar power has been reflected in the growth rate of new capacity within these countries. The shift in the solar market in Germany in particular shows how influential the tariff regime was for driving domestic investment. Following the solar PV FIT rate reduction in January 2011, it is projected that 2,800 MW of solar PV power will be installed in 2011, a 59 per cent reduction from the 7,000 MW installed in 2010.

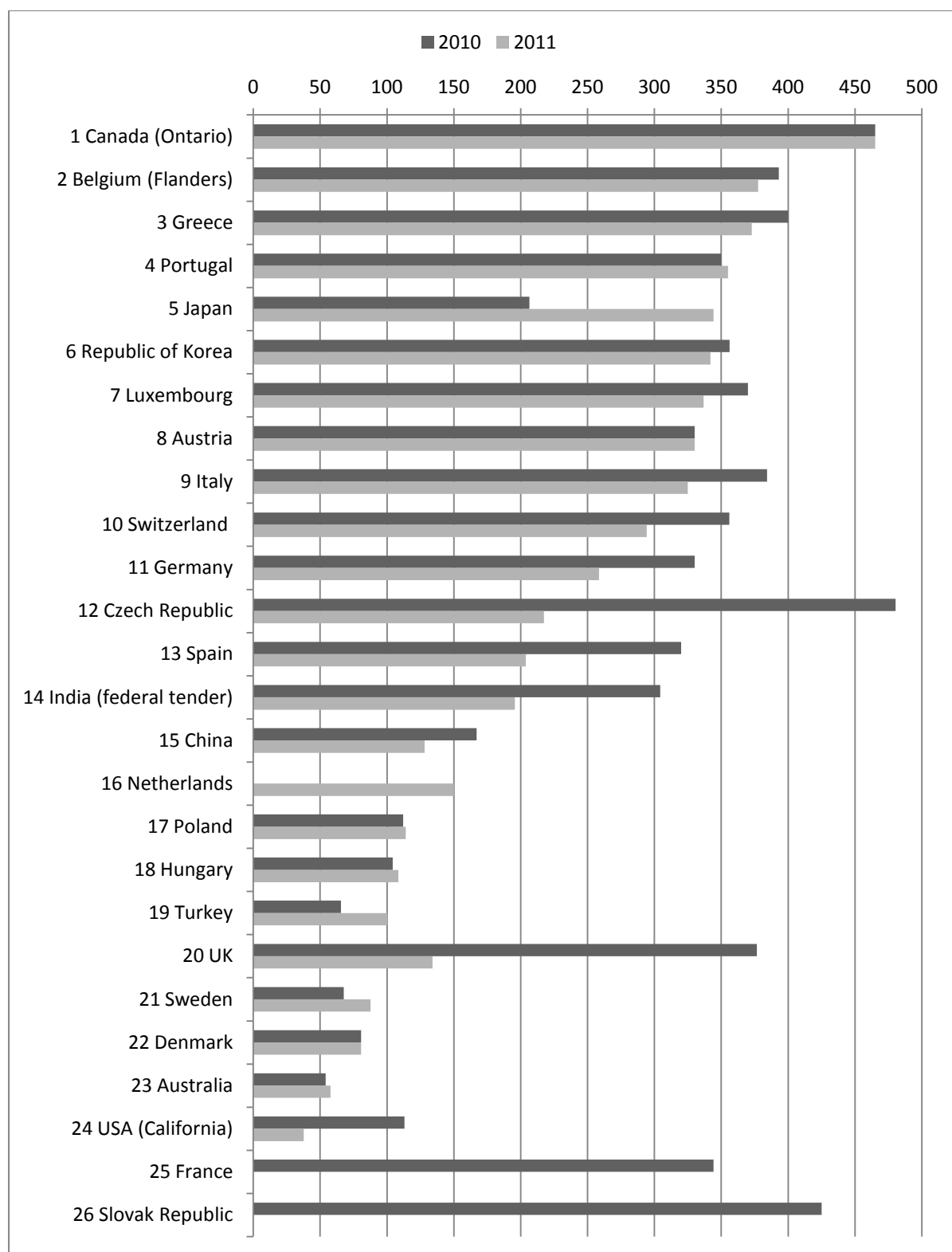
In closing, it is interesting to note that several countries ranked among the top-10 in the solar power example (Figure 34.1) were having difficulty accommodating the demand from developers wanting to install new systems. Greece and Switzerland both have a backlog of solar PV power projects awaiting approval, and grid capacity constraints are likely to lead to more restrictions and delays imposed on new projects in the Czech Republic. These delays and restrictions demonstrate the overarching point that, although important, operating incentives are only one factor amongst many that jointly determine the investment attractiveness of a country with regards to renewable energy.

Table 34.1: Comparison of generation compensation for solar PV and wind power in OECD countries, China and India in 2011 (EUR/MWh)

Country		Whole sale power price	Solar PV (building attached, 499 kW)		Onshore wind power (5.1 MW)		Type of incentive
			Incentive	Total	Incentive	Total	
Australia		31.20	26.56	57.76	26.56	57.76	TGC
Austria		N/A	330	330	97	97	FIT
Belgium	Flanders	47.50	300	377.50	106.67	154.17	TGC
	Wallonia	47.50	150	197.50	84.75	132.25	
Canada	Federal	35.05	0	35.05	0	35.05	No incentive
	Ontario	N/A	465.14	465.14	98.89	98.89	FIT
	BC	N/A	74.20	74.20	74.20	74.20	FIT
Chile		N/A	N/A	N/A	N/A	N/A	No incentives
Czech Republic		N/A	217.42	217.42	88.15	88.15	FIT
Denmark		N/A	80.57	80.57	33.57	80.57	FIT (solar), maximum premium (wind)
Finland		N/A	N/A	N/A	105	105	FIT
Germany		N/A	258.6	258.6	92	92	FIT
Greece	Connected to main grid	N/A	372.83	372.83	87.85	87.85	FIT
	Non-connected island		419.43	419.43	99.45	99.45	
Hungary		N/A	108.39	108.39	121.14	121.14	FIT (peak time)
Iceland		N/A	N/A	N/A	N/A	N/A	No incentives
Ireland		N/A	N/A	N/A	66.35	66.35	FIT
Italy		64.12	325	325	83.55	147.67	FIT (solar), TGC (wind)
Japan		N/A	344.12	344.12	N/A	N/A	FIT
Republic of Korea		N/A	341.98	341.98	67.16	67.16	FIT
Luxembourg		N/A	336.70	336.70	82.08	82.08	FIT
Mexico		N/A	N/A	N/A	N/A	N/A	No incentives
Netherlands		N/A	N/A	150	N/A	96	Variable premium
New Zealand		N/A	N/A	N/A	N/A	N/A	No incentives
Norway		N/A	N/A	N/A	N/A	N/A	No incentives
Poland		49.33	64.67	114.00	64.67	114.00	TGC
Portugal		N/A	355	355	74	74	FIT
Slovak Republic		N/A	N/A	N/A	80.91	80.91	FIT. No support for solar over 100 kW
Spain		N/A	203.73	203.73	79.08	79.08	FIT
Sweden		56.82	30.86	87.68	30.86	87.68	TGC
Switzerland		N/A	294.14	294.14	144.90	144.90	FIT
Turkey		N/A	100.32	100.32	55.07	55.07	FIT (no bonuses added)
UK		47.78	99.09	99.09	56.75	104.53	FIT (solar), TGC (wind)
USA	Federal	22.23	N/A	N/A	16.57	38.80	Tax credit
	California	22.23	37.66	37.66	16.57	38.80	FIT (solar), federal (wind)
	New Jersey	27.65	457.90	485.55	N/A	N/A	TGC
China		N/A	128.19	128.19	61.58	61.58	Benchmark FIT rate for solar and wind
India	Federal	N/A	195.58	195.58	55.47	55.47	Tender for solar PV, National benchmark FIT for wind
	Tamil Nadu	N/A	N/A	N/A	55.95	55.95	State FIT

Note: For more details on figures, please see the relevant country chapters.

Figure 34.1: Comparison of generation compensation for 499 kW building-attached solar PV in the OECD countries, China and India in 2010 and 2011 (EUR/MWh)

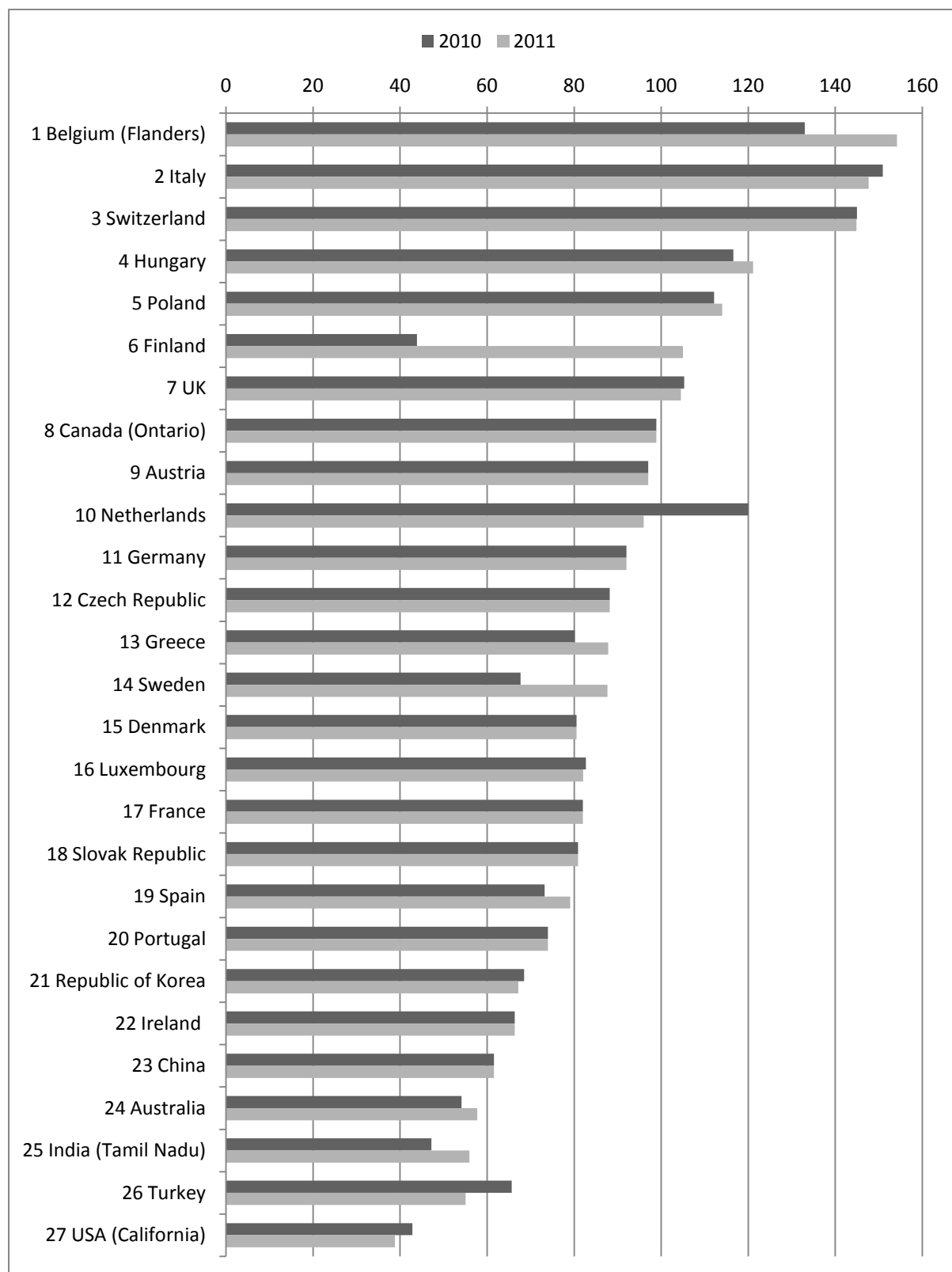


Notes: Countries that do not have operating incentives are not included. All currency conversions done at the average rate in 2010.

Ontario, Flanders and California represent Canada, Belgium and the USA respectively. In India federal support is provided as state operating support is limited for solar power.

Source: See Table 34.1 for details of figures.

Figure 34.2: Comparison of generation compensation for 5.1 MW onshore wind power in the OECD countries, China and India in 2010 and 2011 (EUR/MWh)



Note: Countries that do not have operating incentives are not included. All currency conversions done at the average rate in 2010.

Ontario, Flanders, Tamil Nadu, and California represent Canada, Belgium, India and the USA respectively.

Source: See Table 34.1 for details of figures.

Glossary

Anaerobic digestion for biogas	The process of the breakdown of biodegradable material in the absence of oxygen to produce biogas suitable for use in energy production. Generally used on wastewater sludge and organic wastes.
Bagasse	Bagasse is the fibre left over after the juice has been squeezed out of sugarcane stalks in the production of sugar.
Biogas	Any form of methane gas produced from organic sources. Biogas generally comes from sewage or landfill sites.
Biomass	A generic term for all organic material used as an energy source. Biomass includes 1) solid biomass, such as wood or municipal waste (biowaste), and 2) biogas.
Capacity	The rated output of a power generation unit.
Concentrated solar-thermal plant	An electricity-generating plant that uses mirrors or lenses to focus the heat from sunlight onto a small area to generate electricity.
Concentrated solar PV	Use of mirrors or lenses to focus the sunlight onto a PV array. This can be a more efficient way to use solar PV panels.
Combined cycle power plants	Power plants with gas and steam turbine generators. The waste heat from gas turbine generators is used to produce steam for steam turbine generators.
Combined heat and power plant (CHP)	A power plant that generates both electricity and heat. CHP plants may use renewable energy sources such as biomass. Renewable electricity generated at CHP plants is included in the statistics of renewable electricity generation. Sometimes referred to as a <i>cogeneration</i> plant.
Co-firing with biomass	The combustion of biomass and fossil fuels (generally coal or natural gas) together. This is less polluting than the use of fossil fuels alone. It has the advantage that it can be done in conventional power plants without large-scale redevelopment.
Cogeneration plant	See <i>combined heat and power plant</i> .
Degression	Successively lower rates or amounts. In this report, it is applied to electricity tariffs that decrease at a set amount every year.

Distribution system operator (DSO)	The DSO manages the low- and medium-voltage power network that transmits and distributes electricity from the high-voltage grid run by the transmission system operator to customers. Smaller generators can be directly connected to the low- or medium-voltage grid. According to EU regulations, DSOs must be run independently of generators and suppliers, in other words they must be legally unbundled.
European Union Emissions Trading Scheme (EU ETS)	The EU ETS is a programme in which countries are allocated emission allowances that are in turn allocated to greenhouse-gas-emitting installations. These allowances can then be used to cover their greenhouse gas emissions or be traded with others that exceed their emission allowance.
Feed-in tariff (FIT)	A primary support mechanism used by governments to promote renewable electricity development. It generally offers price guarantees for a set period of time and a system of obligatory purchase of all power by a network operator. See <i>premium</i> and <i>tradable green certificates</i> for comparison.
Final energy consumption	Energy supplied to the final consumer's door for all uses, including industry, transport, households, services, agriculture, forestry, and fisheries. In the electricity sector this includes the losses in electricity production and distribution. Generally measured in tonnes of oil equivalent (toe). The EU's renewable energy targets are based on final energy consumption. See also <i>primary energy consumption</i> .
Fixed premium	A fixed premium, sometimes called a Green Bonus, is a set value that renewable electricity generators receive in addition to the sales price (or market price) of electricity. Therefore, the net generation compensation is the sales or market price of electricity plus this fixed premium. See <i>variable premium</i> for comparison.
Generation	In this report, it refers to the production of electricity.
Generating capacity	See <i>capacity</i> .
Generation compensation	The total amount of compensation that a generator receives for their power output. In this report, this includes, where appropriate, the market price of electricity plus operating incentives.
Greenhouse gases (GHG)	Those gases that contribute to global warming through the greenhouse effect. These include carbon dioxide, methane, nitrous oxide, etc.
Hydro (electric) power plants	Any power plant that uses the flow of water to generate electricity. There are "large hydro" (or simply "hydro"), "small hydro" and "mini-hydro". Although there are no official definitions, small hydro and mini-hydro are generally defined as having a capacity under 10 MW and 1 MW, respectively.
Incentives	Government programmes to promote the development of renewable energy. See also <i>primary support mechanism</i> .

Installed capacity	Power generating capacity measured in Watts. See also <i>generation</i> .
Interconnector	A physical connection between separate grids (in general between different countries) to allow for the import and export of electricity.
Load hours	The amount of hours for which a generator delivered electricity. Full load hours refers to the amount of time for which a generator is delivering its fullest possible load of electricity. For example, a 1 MW wind turbine that generates 1 MWh of electricity has 1 full load hour.
Lignite	The lowest grade of coal, often referred to as brown coal. It tends to be more polluting than black or hard coal.
Mineral oils	Fossil-fuel liquids, such as petrol, diesel, heating oil and kerosene.
Microgeneration	Small-scale electricity generation, usually for private use, although if surplus electricity is created it can be sold to the network. In the UK it is defined as having a maximum capacity of 50 kW.
Net metering	Net metering is a programme offered by power utilities for customers that install renewable electricity systems to generate their own electricity that can be used to offset a portion of the electricity provided by the utility. Any excess electricity generated by the customer is sold to the utility company, generally at the retail tariff rate.
Obligatory purchase	In this report, the policy that a network operator or utility has to purchase all the output of a renewable electricity generating installation regardless of demand. Generally found with a <i>feed-in tariff</i> incentive.
Off-peak hours	The period of day when demand for power is at the lowest (generally at night).
Peak hours	The period of day when demand for power is the highest.
Premium	An operating incentive where renewable electricity generators receive a government-set supplement in addition to the sales or market price of electricity per unit of output sold. Unlike the FIT there is no system of obligatory purchase. There are generally two types: <i>fixed</i> and <i>variable premiums</i> .
Primary energy consumption	Sometimes referred to as gross inland consumption of energy. The quantity of all energy consumed within the borders, including imports. It is a measure of all energy sources before they are converted into energy. Generally measured in tonnes of oil equivalent (toe).
Pumped storage hydro (electric) power plants	These plants are for peak load use. Water which is pumped up to an upper reservoir during the off-peak hours and is discharged during the peak hours to generate electricity.

Renewable electricity	Electricity generated from a renewable energy source.
Renewable energy	Renewable energy is any form of energy (electricity, heat, transportation fuels, etc.) produced by renewable energy sources such as hydro, wind, biomass, wave and tidal, solar, and geothermal.
Solid biomass	Solid organic material that can be used for energy production, generally realised through combustion. For example, wood waste.
Solid fuels	Generally forms of coal or their derivatives.
Solar PV (photovoltaic)	The direct conversion of sunlight into electricity.
Suppliers	Those who sell electricity to end users.
Thermal power plant	Power plants that generate electricity by combustion. They include gas-, coal- and oil-fired power plants. National statistics sometimes include plants of solid biomass and biogas combustion and the co-firing of biomass and fossil fuels, as well as combined heat and power plants. If this is the case, a note is made in the report.
Thin-film	A new type of solar PV panel that uses less silicon than traditional PV panels.
Tradable green certificates	A primary support mechanism in which renewable electricity generators are awarded certificates for their power generation from renewable sources. Suppliers or distributors have a quota obligation for renewable energy and need to buy the certificates to prove they have met their quota.
Variable premium	A premium system in which the generation compensation is capped at a set amount. The variable premium fills in the gap between the market price of electricity and the set amount and hence the variable premium will change with the market price of electricity.
Wholesale electricity market	The purchase and sale of electricity from generators to resellers on the open market.

Sources: For a detailed glossary see the Energy Information Administration, Glossary of Electricity Terms. Available at <www.eia.gov/cneaf/electricity/epav1/glossary.html>.