



Sustainable Real Estate Roundtable: Member Briefing

# INTERNATIONAL MARKETS FOR RENEWABLE ENERGY CERTIFICATES (RECs)



**SUSTAINABILITY  
ROUNDTABLE, INC.**  
LEADERS CREATING VALUE

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## 1.0 Introduction

### REC'S

**Renewable energy certificates (RECs):** are credits that represent the environmental and other non-power attributes of renewable electricity generation and are a component of all renewable electricity products (**one REC for every 1 MWh or 1,000 kWh**). RECs are measured in single megawatt-hour increments and are created at the point of electric generation. Buyers can select RECs based on the generation resource (e.g., wind, solar, geothermal, etc), when the generation occurred, and the location of the energy source.

### CARBON OFFSETS

It is important to note that RECs cannot be purchased as a method of carbon offset, but only carry the environmental attributes of renewable energy. The two mechanisms are different and serve different purposes: **Carbon offsets** allow companies to reduce their liability for greenhouse gas emissions, with each carbon offset financing a one ton reduction in carbon dioxide (CO<sub>2</sub>e) emissions through a variety of projects. RECs account only for renewable energy generation—most often electricity—and thus represent a direct impact on the energy system (in effect reducing emissions associated with power consumption).

This *International Markets for Renewable Energy Certificates (RECs)* briefing supplements SR Inc's five-part report on *Managing Energy Procurement Risk*, with market overviews and guidance to support the procurement of RECs in major international markets. The briefing addresses requests from multiple SRER Member-Clients for information on how companies procure renewable energy and RECs in international markets, including the U.S., E.U. (and Member States), Australia, China, India and Brazil. It focuses on two methods of renewable energy procurement and verification: purchasing RECs, both bundled and unbundled, and participating in utility green programs. Most countries with established REC markets have two trading schemes: **compliance markets**, where utilities and energy suppliers issue or purchase RECs to comply with quotas for renewable energy; and **voluntary markets**, where RECs are bought and sold primarily by companies aiming to meet corporate goals for renewable energy and to reduce GHG emissions from electricity. The briefing provides an overview of the **chain of custody, certification, traceability and credibility, market size, and current REC prices within each country**.

According to the Global Corporate Renewable Energy Index (CREX), a survey-based research report by Bloomberg New Energy Finance and Vestas Wind Systems, companies that procure renewable energy do so largely through RECs. In 2010, due to ample supply from diverse sources and wide availability at reasonable prices, **over 70% of all renewable electricity purchased by CREX companies was via voluntary REC markets**. In contrast, only 5% of companies purchased renewable energy via utility green programs and 1% through projects that they directly financed. 23% of companies purchased carbon offsets to reduce their emissions liability, without procuring renewable energy.<sup>1</sup>

<sup>1</sup> [http://www.cleanenergycouncil.org/files/Corporate\\_Renewable\\_Energy\\_Index\\_2011.pdf](http://www.cleanenergycouncil.org/files/Corporate_Renewable_Energy_Index_2011.pdf)

CREX showed that technology companies lead in corporate procurement of renewable energy. Figure 1 below details the average ratio of renewable energy to total electricity use for five sectors, as reported by 2009 and 2010 CREX survey respondents. In 2010, CLP Holdings, Intel Corporation, Kohl's Corporation, Koninklijke KPN and Whole Foods Market led survey respondents with the largest total renewable electricity procurement (in absolute MWh purchased).<sup>2</sup> Figure 2 below shows that companies operating in Europe have a much higher average ratio than their North American (U.S. and Canada) counterparts, though both regions are ahead of Asia and Oceania.

Figure 1. Renewable energy procurement by sector.

Source: Bloomberg New Energy Finance & Vestas Wind Systems A/S.

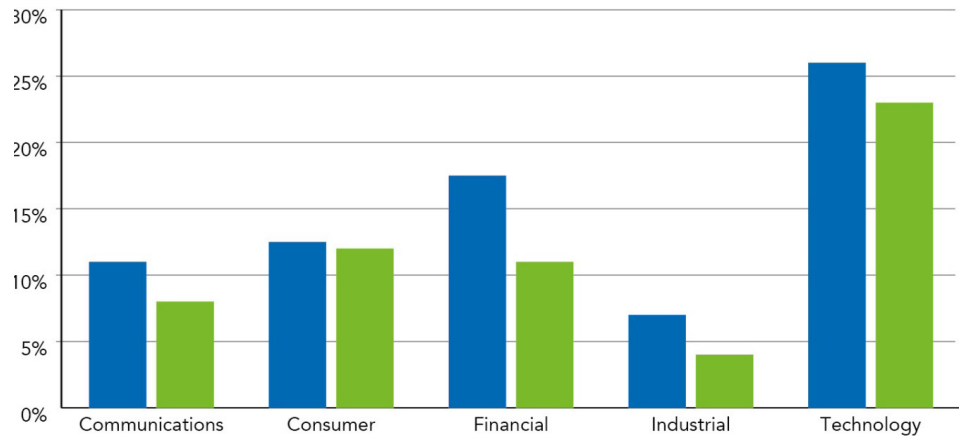


Figure 2. Renewable energy procurement by region.

Source: Bloomberg New Energy Finance & Vestas Wind Systems A/S.

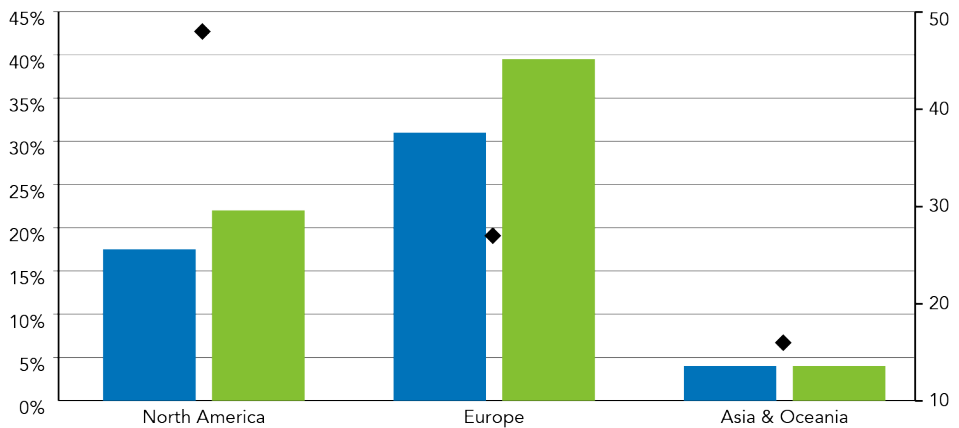


Table 1 provides a summary of the major markets detailed in this briefing. It lists the presence of a REC market, recent estimates of renewable energy demand and target generation levels, the certification scheme, and the regulatory bodies certifying and accounting for RECs.

<sup>2</sup> <http://www.cleanenergycouncil.org/node/6288>

Table 1. Renewable energy demand and targets per country.

Source: SR Inc analysis, REN21, and CDP.

Market	REC Market	Renewables as % of Energy Demand	Renewable Energy Targets	Certification Scheme or Regulating Body	Certification Type
<b>U.S.</b>	Yes	13% (2011)	State-level targets vary	Green-e, State Rating Schemes	Non-profit Government
<b>E.U.</b>		13% (2010)	20% by 2020	European Energy Certification System	Government
Germany	No	11% (2010)	18% by 2020	N/A	N/A
France	Yes	13% (2010)	23% by 2020	Observ'ER	Government
Denmark	Yes	23% (2010)	35% by 2020	Energinet.dk	Government
Spain	Yes	14% (2010)	21% by 2020	The Green Certificate Company	Government
U.K.	Yes	4% (2010)	15% by 2020	OFGEM, DEFRA	Government
Sweden	Yes	46% (2010)	50% by 2020	Grexel	Government
Italy	Yes	9% (2010)	17% by 2020	GSE	Government
Belgium	Yes	6% (2010)	13% by 2020	Brugel, VREG, CWaPE	Government
Poland	Yes	10% (2010)	15% by 2020	Scheme combined with a tradable GO	Government
<b>Asia</b>					
India	Yes	9% (2009)	State-level targets vary	State Electric Regulatory Commissions (SERCs)	Government
China	No	4% (2009)	15% by 2020	N/A	N/A
<b>Australia</b>	Yes	8% (2010)	20% by 2020	Clean Energy Regulator (CER)	Government
<b>Brazil</b>	No	9.8% (2009)	N/A	N/A	N/A

Energy demand forecasts indicate that all global regions will shift to cleaner fuels for electricity production, due largely to environmental policies. Projection data from three studies on international market growth show the following statistics:

- The International Energy Agency (IEA) predicts that demand **for renewable energy (wind, solar, geothermal) will grow by 597%**, representing 18% of total demand in 2035 (up from 13% in 2008).<sup>3</sup> Demand for all cleaner energy (including hydro, biomass, biofuels, and waste-to-energy) will grow by 58% over the same period.

<sup>3</sup> <http://www.iea.org/weo/>



- The U.S. Energy Information Administration (EIA) and IEA foresee **most growth in generation and demand happening in non-OECD countries, especially Brazil, China, and India.**<sup>4</sup>
- In terms of supply, **Europe will experience a significant increase in wind power generation** – from the current 5% of total generation to 20% by 2040 according to a study by ExxonMobil, or 18% of total generation in 2035 according to the IEA.<sup>5</sup>

For more on global energy trends, see Section 1 of SR Inc Report *Managing Energy Procurement Risk*, 2012.

## 2.0 REC Markets 2.1 U.S.

### Market Structure

In the U.S., RECs on the voluntary market are generally sold **unbundled**, or decoupled from the physical electricity delivered to the grid. Companies can also procure **bundled RECs** that are tied to their local grid or participate in **utility green programs** that fund renewable energy development and REC purchasing by the utility. Table 2 below summarizes the available means of procuring RECs in the U.S., and Figure 3 below illustrates the structure of the REC market.

Table 2. Three types of REC procurement in the U.S.

Source: SR Inc analysis.

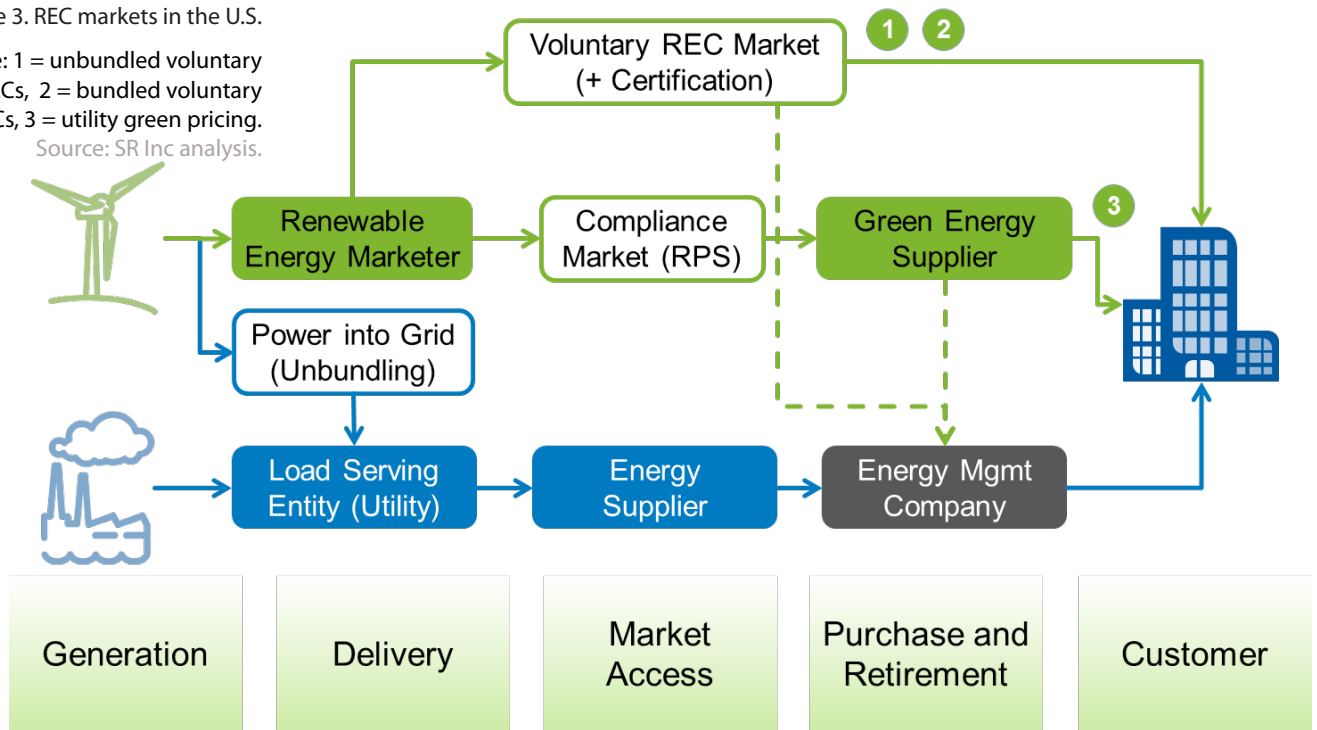
REC Type	Advantages	Disadvantages
1. Unbundled voluntary RECs	<ul style="list-style-type: none"> <li>• Often less expensive than other two options</li> <li>• Supply not limited to utilities</li> <li>• Multiple supply options</li> </ul>	<ul style="list-style-type: none"> <li>• Higher reputational risk (in case of low quality RECs)</li> <li>• Certification (ex: Green-e) may increase costs</li> </ul>
2. Bundled voluntary RECs	<ul style="list-style-type: none"> <li>• Directly tied to local grid</li> <li>• Lower reputational risk</li> </ul>	<ul style="list-style-type: none"> <li>• Generally higher cost</li> <li>• Limited supply in most markets</li> </ul>
3. Utility green pricing	<ul style="list-style-type: none"> <li>• Simplified procurement through utility or supplier</li> <li>• Tied directly to the local grid</li> <li>• Greater budget certainty</li> <li>• No additional cost in time or services</li> </ul>	<ul style="list-style-type: none"> <li>• Fees set by utility or supplier may be higher than market</li> <li>• Lack of control over quality and location of generation source</li> </ul>

<sup>4</sup> <http://www.iea.org/weo/>

<sup>5</sup> [http://www.exxonmobil.com/Corporate/Files/news\\_pub\\_eo2012.pdf](http://www.exxonmobil.com/Corporate/Files/news_pub_eo2012.pdf)

Figure 3. REC markets in the U.S.

Note: 1 = unbundled voluntary RECs, 2 = bundled voluntary RECs, 3 = utility green pricing.  
Source: SR Inc analysis.



### Regulatory Bodies

Electricity generation and distribution in the U.S. is regulated by the **Federal Energy Regulatory Commission (FERC)**, which oversees grid operation and distribution pricing by 10 **regional transmission organizations (RTOs)** or **independent system operators (ISOs)**. These ISOs and RTOs are used to track the generation and retirement of compliance RECs and quality of the generation source. The voluntary market is not regulated by any of these bodies, although the Department of Energy and the EPA do encourage the use of tracking systems to regulate generation and retirement and prevent double counting.

### Chain of Custody, Certification and Traceability

The **EPA's Green Power Partnership** requires that RECs used for qualification be generated and retired within the U.S. The EPA lists two means of verification of the location of generation and retirement: 1) purchasing RECs that are registered with a renewable energy tracking system (described below), or 2) entering into a contract for REC purchasing from a marketer or generator and requesting an audit of the entire chain of custody. Green-e, the predominant certification for voluntary RECs in the U.S., requires a chain of custody audit before certification. In general, executives find that RECs within the U.S. meet high standards for quality and traceability regardless of certification method.

There are **two major mechanisms for certification and REC traceability**:

**1. State rating schemes.** Several states with renewable portfolio standards (RPS) requirements rate RECs in a tier or class system, corresponding to the generation source and level of environmental impact:

- On the voluntary market, RECs sold from a certified generation source in one of these states and registered on the regional tracking system are often referred to as Tier 1, Tier 2, and Tier 3.
- In states such as Maryland, Pennsylvania, and Massachusetts, **Tier 1 RECs (Class 1 in Massachusetts) correspond to the cleanest newly generated resources**, such as solar and wind.<sup>6</sup>
- Sources like **biomass, waste-to-energy, and hydro power generally fall into lower tiers** and are considered less clean.
- **States or approved third-part auditors pre-certify REC marketers and renewable energy generators** selling to the compliance market to guarantee that RECs meet the tier requirements.
- **Tiers vary by state**, so executives should check DSIRE for the most up-to-date regulations: <http://www.dsireusa.org/summarytables/rrpre.cfm>.

**2. Green-e certification.** The most well-established rating system for RECs on the voluntary market is Green-e Energy, administered by the non-profit Center for Resource Solutions. Current Green-e standards require the following:

- **Only one certification level exists**, primarily to verify source and time of generation. Green-e certified RECs must have been generated within the last 12 years from wind, solar, small hydro, geothermal, biomass, or landfill gas sources; unlike state rating schemes there is no distinction based on cleanness of the generation source.
- **Third-party auditors** certify both the renewable attributes of the generation source and the accounting practices of REC sellers to prevent double counting.
- **Most certified RECs are sold by renewable energy marketers**, who buy RECs from a generation source and acquire certification, then sell the RECs directly to end users.<sup>7</sup>

The EPA's Green Power Partnership maintains an up-to-date, comprehensive list of local and national RECs available from marketers in each state:

<http://www.epa.gov/greenpower/pubs/gplocator.htm>.

<sup>6</sup> [http://www.dsireusa.org/incentives/incentive.cfm?Incentive\\_Code=MD05R&re=1&ee=0](http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MD05R&re=1&ee=0)

<sup>7</sup> [http://www.green-e.org/about\\_standards.shtml](http://www.green-e.org/about_standards.shtml)

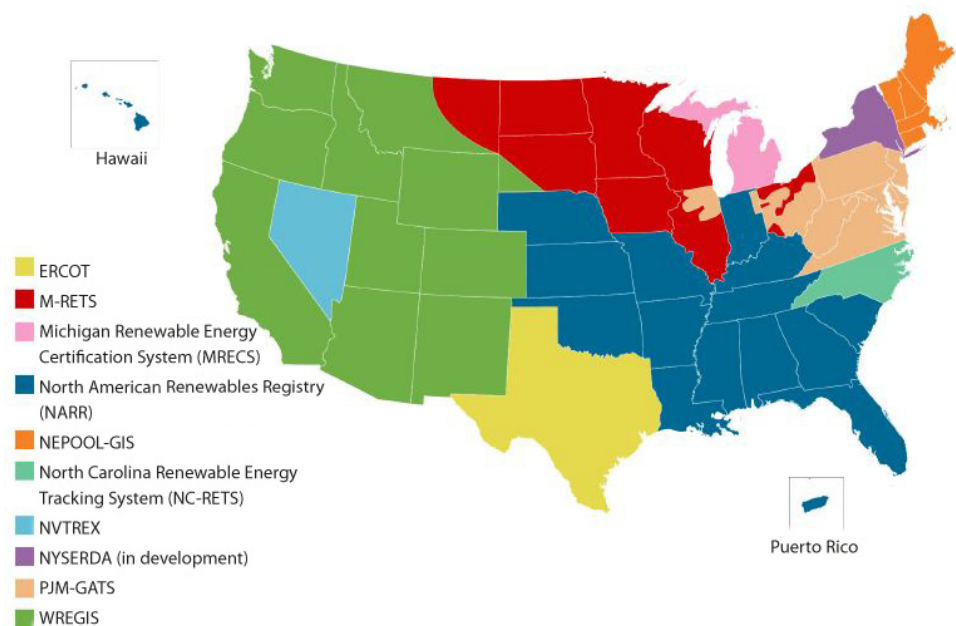


## Tracking Systems

Geography often plays a role in REC pricing. With some exceptions utility green pricing programs or marketers selling bundled electricity and REC products source their products from local or regional resources. In compliance markets, **Renewable Energy Tracking Systems** provide accounting of RECs, track credit retirements to prevent double-counting, and verify compliance with state RPS. Nine energy tracking systems are currently in use across the U.S., as shown in Figure 4 below.<sup>8</sup> Utilities use these systems to track their own renewable generation, transfer RECs to others (either utilities or other buyers), and ultimately demonstrate compliance with RPS requirements. Tracking systems are occasionally used to verify origination and chain of custody in the voluntary market, particularly for RECs that are Green-e certified (as described above).<sup>9</sup>

Figure 4. U.S. energy tracking systems for RECs.

Source : <http://apps3.eere.energy.gov/greenpower/pdfs/52925.pdf>, p 19.



RECs within compliance markets tend to have a premium because they can only be traded within their own tracking system or the limited number of other tracking systems with negotiated trade agreements.

<sup>8</sup> <http://www.wregis.org/system-operations.php>

<sup>9</sup> <http://apps3.eere.energy.gov/greenpower/pdfs/52925.pdf>, p 17

Table 3. Negotiated export and import agreements between tracking systems.

Source: <http://apps3.eere.energy.gov/greenpower/pdfs/52925.pdf>

Exporting From	Exporting To
NARR	NC-RETS
NC-RETS	NARR
MIRECS	NARR
MIRECS	PJM-GATS
M-RETS	NARR
M-RETS	NC-RETS
M-RETS	MI-RECS
PJM-GATS	MI-RECS
WREGIS	NARR
WREGIS	NC-RETS
ERCOT	NC-RETS

### Market Size and Pricing

Within the U.S., **the commercial and industrial sectors constitute most of the voluntary market for RECs**, with the residential sector's REC purchases accounting for only 1% of all REC sales. In 2009, the top states for total sales of voluntary RECs included California, Oregon, Washington, Colorado, New Mexico, Texas, Oklahoma, Minnesota, Wisconsin, New York, and Pennsylvania. According to the National Renewable Energy Laboratory (NREL), REC markets continue to drive much of the growth in renewable energy demand.<sup>10</sup>

While the voluntary and compliance markets typically operate separately, they can be complementary by providing developers of generation projects with multiple revenue streams that operate on different time tables. As a result, the growth of both markets has historically been closely linked.<sup>11</sup> The size of the voluntary market has since 2010 has been slightly larger than that of the compliance market. Figure 5 below shows that between 2005 and 2009 voluntary market demand slightly exceeded demand in the compliance market. In 2010 sales of compliance RECs outpaced voluntary REC sales for the first time as many states set increased renewable energy targets. Compliance demand in 2010 was approximately 55 million MWh, compared to 35.6 million MWh in voluntary market demand and the gap is expected to increase in the future years. NREL expects compliance demand to continue to outpace voluntary demand in the future, with **compliance demand growing to more than 150 million MWh by 2015** due to increasing RPS requirements; voluntary market growth rates would have to increase to keep pace.<sup>12</sup>

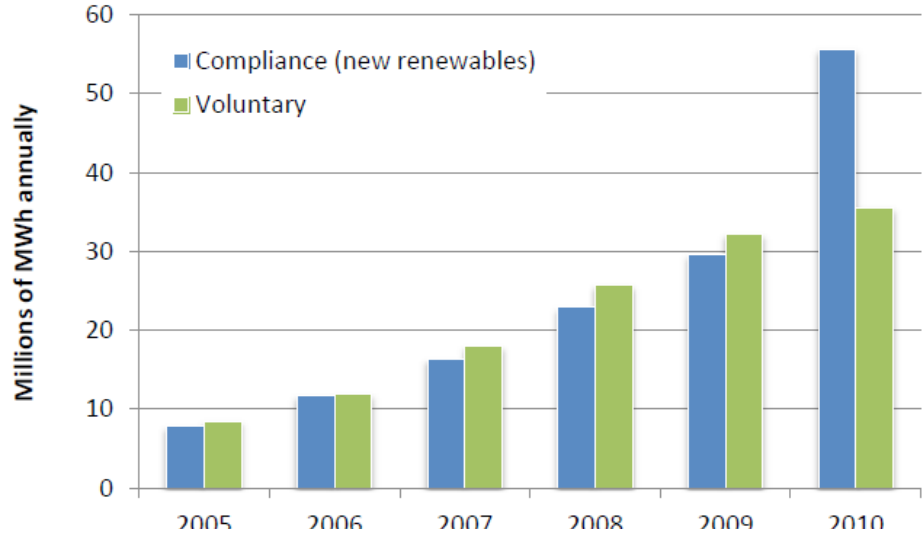
<sup>10</sup> <http://www.nrel.gov/docs/fy10osti/48158.pdf>

<sup>11</sup> <http://www.nrel.gov/docs/fy08osti/42096>

<sup>12</sup> <http://apps3.eere.energy.gov/greenpower/pdfs/52925.pdf>

Figure 5. Compliance and voluntary REC market demand, 2005-2010.

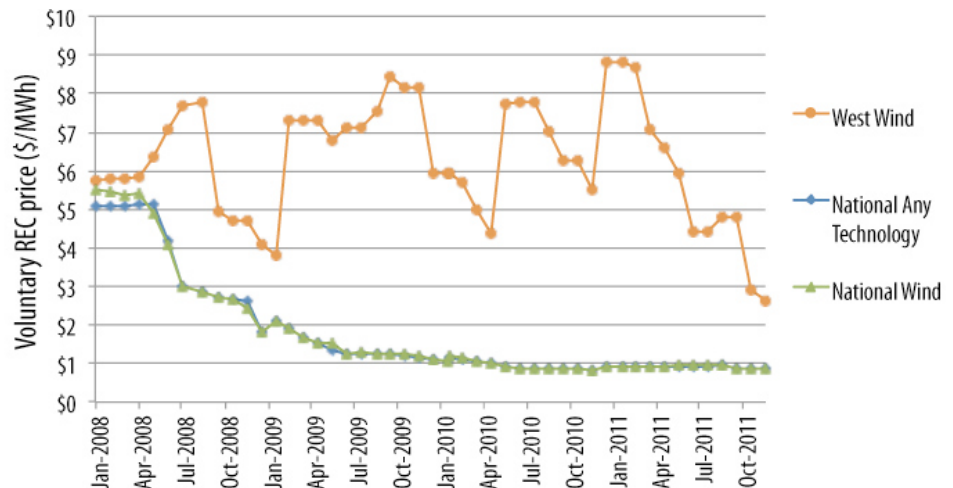
Source: NREL (<http://www.nrel.gov/docs/fy10osti/48158.pdf>).



As the market for RECs is relatively new, there is no unified electronic marketplace, and there is no published price index. In general, REC prices depend on a number of factors including supply and demand, regulations, the renewable energy technology, the vintage (year generated), the region in which the generator is located, whether the RECs are eligible for certification, and whether the RECs are bought to meet compliance obligations or serve voluntary retail customers. Natural gas prices can also affect the cost competitiveness of renewable energy generation which, in turn, is reflected in REC prices. Figure 6 below shows the most recent publicly-available averages for voluntary REC prices.

Figure 6. Average market-clearing voluntary REC prices, January 2008 to October 2011.

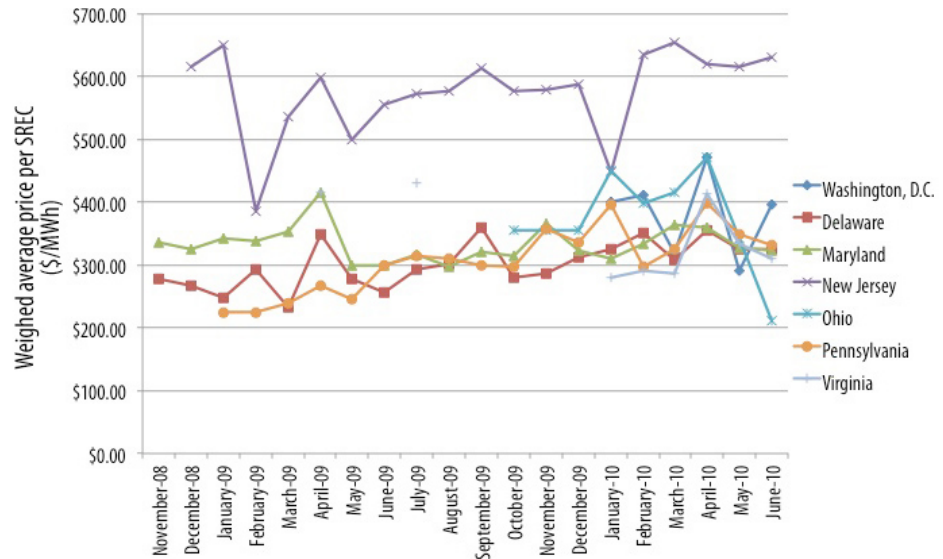
Source: <http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=5>



A few sources offer publicly available data on REC and Solar REC (SREC) pricing. In both compliance and voluntary markets, SRECs typically transact at higher prices than RECs from other types of renewable energy. Current spot prices for SRECs in most states with solar portfolio standards can be viewed at SRECTrade (<http://www.srectrade.com/>). Spot market prices for SRECs have been falling dramatically in New Jersey, Pennsylvania, and other states, due largely to over-supply. For more detail on spot price changes, see SR Inc's Report *Managing Energy Procurement Risk*, 2012.

Figure 7. Weighted average price per SREC, November 2008 to June 2010.

Source: <http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=5>



## 2.2 European Union

### Market Structure

#### GUARANTEE OF ORIGIN (GO)

**Guarantee of Origin (GO).** In the E.U. GOs and RECs fulfill the same function, and are of the same quality. Where they differ is that GOs are issued by E.U. governments and are recognized in all E.U. Member States (where available) under the “RES Directive” (2001/77/EC and its successor, 2009/28/EC), while RECs are issued by energy companies and are not accepted by all countries. GOs, as defined by Directives, enable producers of electricity from renewable energy sources or from high efficiency cogeneration to demonstrate that the electricity sold is produced from approved sources or technologies.<sup>13</sup> Each electronic GO or certified REC details the following for each MWh:

- the source of the electricity
- the source of the electricity
- the dates when it was produced
- the identity, location, type and capacity of the production facility
- whether the GO relates to electricity, heating, or cooling
- whether and to what extent the installation has benefited from outside support
- the date when the installation became operational
- the date and country of issue
- unique identification number

<sup>13</sup> <http://www.e-track-project.org/tracking.php>

## FEED-IN TARRIFF (FIT)

**Feed-in tariff (FIT):** A feed-in tariff is a policy mechanism designed to accelerate investment in renewable energy technologies. FITs typically offer renewable energy producers a guaranteed access to the grid and long-term contracts based on the cost of generation of each technology. For instance, producers using wind power receive a lower kWh price compared to producers using solar PV, who receive a higher price, reflecting higher costs. In addition, FITs often include “tariff degression”, a mechanism according to which the price (or tariff) ratchets down over time to track and encourage technological cost reductions. The costs incurred are included in the electricity price and thus, passed on to the final consumers via their electricity bills.

RECs were in place before GOs, which were introduced in E.U. only in 2001. RECs will be phased out in most countries by 2013 (see Figure 8 below). Currently traded volumes of obligatory GOs have overtaken RECs in many countries. Legislation requires that GOs are accepted in all EU countries but barriers to GO acceptance in some countries still exist. Functionally, GOs and RECs can both be traded internationally and are in some ways interchangeable, aside from the more direct government support for GOs.<sup>14</sup>

E.U. policy sets an overall target of 20% renewable energy in gross final energy consumption by 2020. Individual member states also set country-specific targets that contribute to this overall target, based on existing levels of renewable energy generation and potential for growth. Member states establish procedures and National Renewable Energy Action Plans (NREAPs) to reform infrastructure planning, electricity pricing and delivery systems, promoting energy from renewable sources. Member States can “exchange” an amount of energy from renewable sources using a statistical transfer or set up joint projects for the production of electricity and heating from renewable sources. Each Member State must be able to guarantee the origin of electricity, heating and cooling produced from renewable sources using GOs which are normalized for recognition in all Member States.<sup>15</sup>

### Regulatory Bodies

The Association of Issuing Bodies (AIB) has developed and guarantees a harmonized system called the **European Energy Certification System (EECS)**. AIB members, who are representatives from EU countries, are drawn from energy certificate system administrators across Europe and include transmission system operators, electricity regulators and energy market operators. Some members are NGOs and commercial organizations which have been appointed by market entities to administer energy certificate systems on their behalf. The EECS rules ensure that AIB member organizations’ registries are compatible across schemes. **The EECS framework allows the issue, transfer, and redemption of voluntary RECs.** The “issuing body”, unique to each country regime and commercially independent of certificate holders, establishes procedures to fol-

<sup>14</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/CERTIFICATION/C\\_FAQ/Types\\_of\\_certificate](http://www.aib-net.org/portal/page/portal/AIB_HOME/CERTIFICATION/C_FAQ/Types_of_certificate)

<sup>15</sup> [http://europa.eu/legislation\\_summaries/energy/renewable\\_energy/en0009\\_en.htm](http://europa.eu/legislation_summaries/energy/renewable_energy/en0009_en.htm)



low the EECS Rules.<sup>16</sup> The EECS currently handles both the RECs and the GOs.<sup>17</sup> There are currently 16 countries with a standardized certificate system and an issuing body as member of the AIB, listed at the AIB's website:

[http://www.aib-net.org/portal/page/portal/AIB\\_HOME/AIB\\_MEM](http://www.aib-net.org/portal/page/portal/AIB_HOME/AIB_MEM).

### Chain of Custody, Certification, and Traceability

EECS has two certification schemes: 1) **the GOs** and 2) the **Independent Certification Schemes (ICS)**. When the issuing body is government appointed, the scheme is called a GO system. GOs, issued by an entity that is government appointed, are standardized certificates within the EECS and the prices of the certificates vary depending on their type. The prices are not fixed, and depend upon market demand.<sup>18</sup> If, however, the issuing body is appointed by market players, the scheme is referred to as Renewable Energy Certificate (REC) system. Countries where the certificate issuer does not provide electronic and transferable GOs may accept RECs.<sup>19</sup> EECS recognizes select ICS, which offer independently-traded RECs and are governed by independent organizations that do not include energy suppliers. ICS RECs are verified for the type of renewable energy (i.e. fuels) or supplier product mix following the criteria specified by their governing bodies. **The GO is accepted by a REC system in certain cases, but a REC is never recognized as a GO.**

The most widely-accepted ICS is **RECS International's certificate scheme**, which certifies RECs and GOs according to EECS criteria and aims to serve as a cross-border REC trading framework for Europe. RECS International, an association of REC marketers, issuing bodies, and energy producers, among others, operates a voluntary system for international REC trading, similar to the Green-e scheme in U.S. but more rigorous in terms of certification standards. The association aims to develop a standard method of certification and a universal accounting standard for the REC market globally, enabling greater transparency and ease of access to the market. Currently, RECS International operates a market among E.U. Member States to facilitate the exchange of RECs. In 2010, the most recent year for which data was published, 231,000 and 211,000 RECs were issued and cancelled, respectively through RECS International.<sup>20</sup> Like in the U.S., RECs are retired upon trading. RECS International intends to incorporate equivalent certificates from markets outside the E.U. within its marketplace, but no timeline has been announced.<sup>21</sup> There are various national certificate systems that do not comply with the EECS and therefore the international trading of those certificates is more complicated.

<sup>16</sup> <http://www.aib-net.org>; a list of AIB members is available at: [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/FACTS/AIB%20Members/AIB%20Members](http://www.aib-net.org/portal/page/portal/AIB_HOME/FACTS/AIB%20Members/AIB%20Members)

<sup>17</sup> [http://www.recs.org/uploads/IM%2002\\_Difference%20RECS\\_GO.pdf](http://www.recs.org/uploads/IM%2002_Difference%20RECS_GO.pdf)

<sup>18</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/CERTIFICATION/Types\\_certificate/REGOs](http://www.aib-net.org/portal/page/portal/AIB_HOME/CERTIFICATION/Types_certificate/REGOs)

<sup>19</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/AIB\\_CER/FAQ/Types%20of%20certificate/FAQ\\_GO\\_RECS](http://www.aib-net.org/portal/page/portal/AIB_HOME/AIB_CER/FAQ/Types%20of%20certificate/FAQ_GO_RECS)

<sup>20</sup> <http://www.recs.org/content.php?IDPAGE=6>

<sup>21</sup> <http://www.recs.org/content.php?IDPAGE=6>

For each megawatt-hour of energy, EECS verifies the quality of its source and/or the method of production. The EECS rules ensure that EECS energy certificate systems across the members are reliable, secure, and inter-operable. These harmonized standards enable owners of EECS Certificates to transfer them to other domestic and international account holders.<sup>22</sup>

E.U. member-states require disclosure of relevant information about power generation to allow for informed consumer choice, based on more than electricity prices alone. Member states have implemented national legislation on disclosure in different ways, sometimes also allowing for disclosure of differentiated product information (e.g. a green power product and a standard product).<sup>23</sup> The following table summarizes, for each country, the acceptability of RECs as evidence for disclosure.

Table 4. Acceptability of RECs in EU Member States.

Source: [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/FACTS/Market%20Information/Accepted\\_certificates](http://www.aib-net.org/portal/page/portal/AIB_HOME/FACTS/Market%20Information/Accepted_certificates)

Country	Accepts RECs in addition to GOs	Comments
<b>Austria</b>	No	
<b>Belgium</b>	No	
<b>Denmark</b>	No	GOs and RECs treated differently. RECs need specific approval by Energinet.dk.
<b>Estonia</b>	Not known	
<b>Finland</b>	Yes	New laws under consideration refer only to GO, most likely will not accept RECs in future
<b>France</b>	No	New regulations specify that RECs are not accepted from 2012
<b>Germany</b>	Yes	Until January 2013
<b>Iceland</b>	Yes	
<b>Italy</b>	No	
<b>Luxembourg</b>	Yes	
<b>Netherlands</b>	No	
<b>Norway</b>	No	
<b>Portugal</b>	Yes	Energy Regulator's current recommendations do not mention use of RECs but market parties have used them for disclosure
<b>Slovenia</b>	Yes	
<b>Spain</b>	Yes	RECS certificates currently used to disclose fuel mix to consumers, but residual mix not adjusted accordingly
<b>Sweden</b>	Yes	New laws in preparation refer only to GO, so probably no RECs will be accepted/exist in the future
<b>Switzerland</b>	Yes	

<sup>22</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME](http://www.aib-net.org/portal/page/portal/AIB_HOME)

<sup>23</sup> [http://www.e-track-project.org/tracking.php#electricity\\_disclosure](http://www.e-track-project.org/tracking.php#electricity_disclosure)

### Tracking Systems

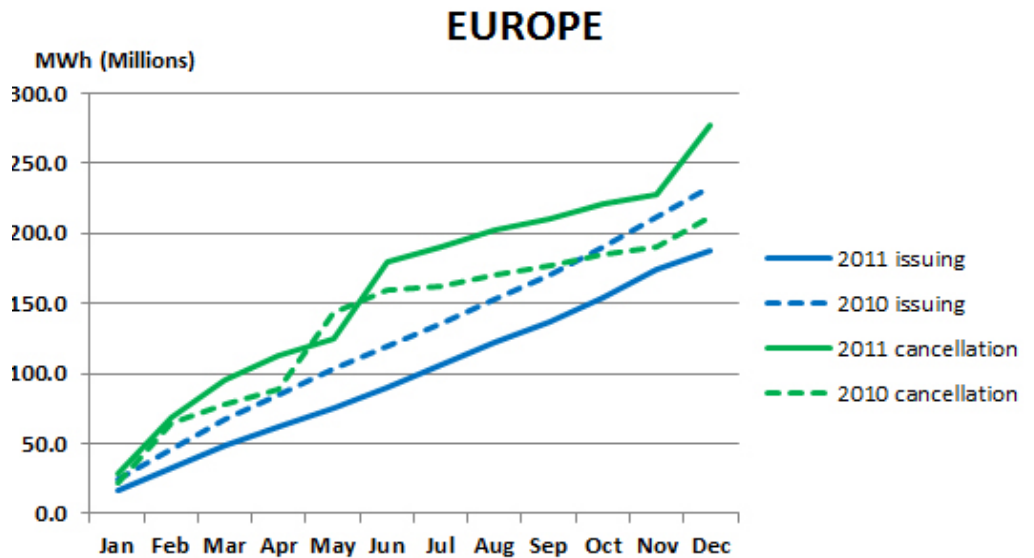
EECS Certificate issuance, transfer, and retirement are tracked via **each AIB member's national electronic certificate registry**, a register of exchanges between approved parties. The issuing bodies for the certificates are required to file documentation related to each transaction and notify the seller that a transfer has taken place, while a receiving issuing body notifies the buyer of the completed transaction. Certificates are retired in the registry by cancellation (based on consumption), expiration, or withdrawal from the registry. Under current regulations, **all GOs are cancelled one year after the energy is produced.**<sup>24</sup>

### Market Size and Pricing

The price of RECs and GOs is set by the market and is influenced by factors such as the time of energy production and source of energy. Larger trades usually involve lower prices per GO or REC compared to smaller trades.<sup>25</sup> Currently, unless requested by a member, the EECS does not support certificates issued by governments since their prices are set (or influenced) by these governments. Figure 8 illustrates the issued and cancelled certificates in the E.U., as well as Norway, Iceland, and Switzerland) for the years 2010 and 2011. Figure 9 shows annual EECS certificate activity for the full years 2008-2011 and Q1 of 2012.

Figure 8. Certificates issued and cancelled in Europe.

Source: [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/FACTS/Market%20Information/Statistics](http://www.aib-net.org/portal/page/portal/AIB_HOME/FACTS/Market%20Information/Statistics)

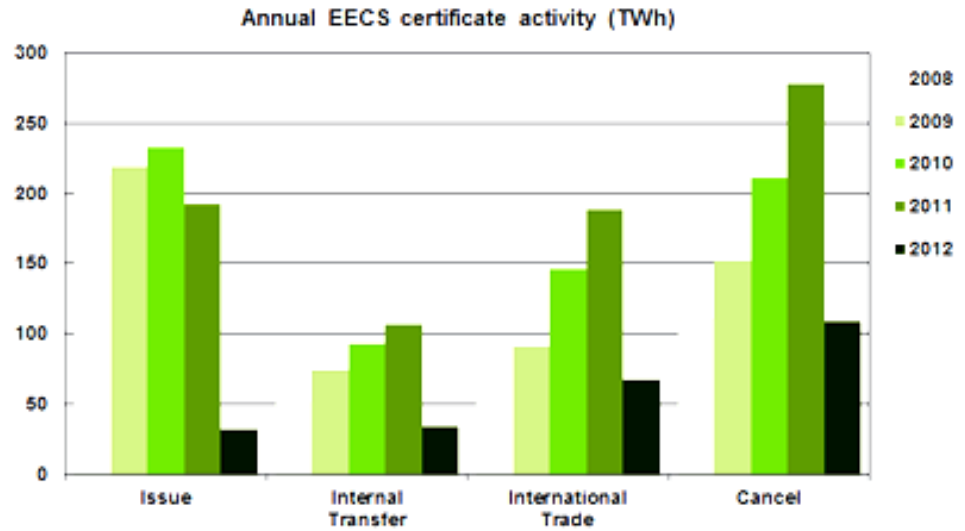


<sup>24</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/CERTIFICATION/Introduction/Life\\_cycle](http://www.aib-net.org/portal/page/portal/AIB_HOME/CERTIFICATION/Introduction/Life_cycle)

<sup>25</sup> [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/CERTIFICATION/C\\_FAQ/Market#651](http://www.aib-net.org/portal/page/portal/AIB_HOME/CERTIFICATION/C_FAQ/Market#651)

Figure 9. Annual EECS certificate activity.

Source: [http://www.aib-net.org/portal/page/portal/AIB\\_HOME/FACTS/Market%20Information/Statistics](http://www.aib-net.org/portal/page/portal/AIB_HOME/FACTS/Market%20Information/Statistics)



## United Kingdom

In the U.K., the generation of electricity from renewable sources is supported by a **feed-in tariff scheme and a certificate scheme tied to quotas**:

- **Renewables Obligation Certificates (ROCs)**, the equivalent of RECs in U.K., are issued by the Office for Gas and Electricity Markets (OFGEM) to operators of accredited renewable generating stations. Operators can trade ROCs with other parties and can trade online via e-auctions such as e-ROC.<sup>26</sup>
- Under the quota system, **electricity suppliers of more than 5 MW in capacity are obliged to supply a certain proportion of electricity from renewable sources** to their customers. A supplier's quota is met by retiring either U.K.-based ROCs or GOs from other countries.
- Leading U.K. energy suppliers, including Scottish Power, E.ON, EDF, British Gas, and others, offer **green power commitment rates**. These rate options represent a guarantee of the supply of renewable energy to meet a user's load. Currently, due to market conditions green power comes at little cost to most companies.<sup>27</sup>
- Additionally, commercial and industrial users of traditional energy sources are subject to a **Climate Change Levy, a tax on the consumption of fossil fuel energy**.<sup>28</sup>
- Executives should note that **the U.K. is considering phasing out ROCs in 2017**, focusing instead on feed-in tariffs which could lead to price volatility for ROCs as the transition occurs.<sup>29</sup>

<sup>26</sup> <http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx>

<sup>27</sup> <http://www.britishgas.co.uk/products-and-services/gas-and-electricity/our-energy-tariffs/sustainable-energy-tariff.html>

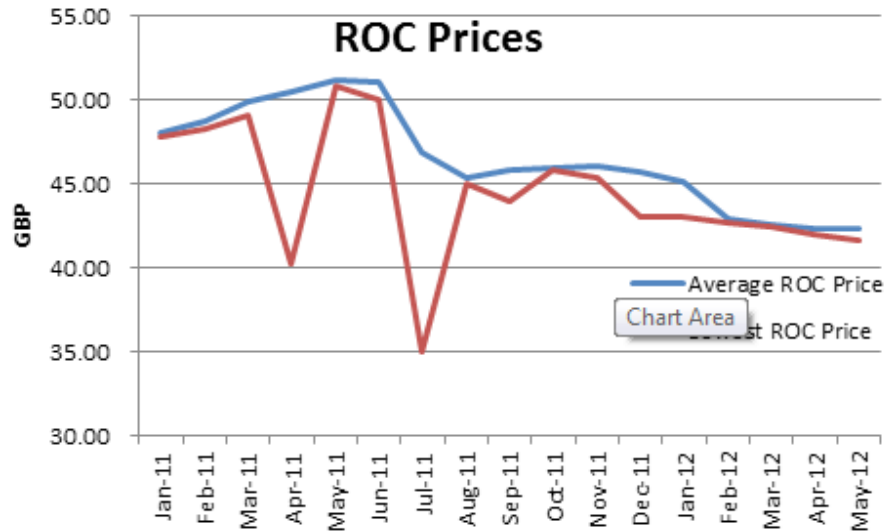
<sup>28</sup> <http://www.res-legal.de/en/search-for-countries/united-kingdom/more-about/land/vereinigtes-koenigreich/ueberblick/foerderung.html>

<sup>29</sup> <http://bnf.com/WhitePapers/view/45>

The prices and amount of ROCs traded on e-ROC from 2011 to 2012 are summarized in Figure 10:

Figure 10. ROC price trends on e-ROC Jan 2011 – May 2012.

Source: <http://www.e-roc.co.uk/trackrecord.htm>



## Belgium

Belgium's government oversees an EECS-approved **GO system**, which is tied to quota obligations for the federal grid operator.

- Each region (Wallonia, Flanders, and Brussels Capital) has its own certificate issuing body and renewable energy standards, based on a national policy framework.
- Electricity suppliers are obliged to present GOs to prove that a certain proportion of the electricity supplied to their final consumers was generated from renewable sources. This quota may differ by region.<sup>30</sup>
- Most major suppliers, including Electrabel, ECS, and EDF Luminus, offer a 100% green utility pricing option for electricity. Rates are fixed for one or two-year terms and are generally slightly higher than the default fixed rate, usually an additional 1-2 c€/kWh.<sup>31</sup>

<sup>30</sup> <http://www.res-legal.de/en/search-for-countries/belgium.html>

<sup>31</sup> Electrabel: <https://www.electrabel.be/fr/particulier/prices-and-conditions>; Luminus: <https://www.luminus.be/fr/wal-lonie/Particuliers/Mon-prix/Electricite/Eco.aspx>



## Denmark

In Denmark, the Danish Energy Regulatory Authority (DERA) promotes renewable energy generation through **a price regulation system based on net-metering and a variable bonus on top of market prices.**

- **RECs and GOs in Denmark are issued by Energinet.dk**, a grid operator and natural gas supplier.<sup>32</sup>
- Under net metering, renewable energy producers using all or part of the electricity produced for their own needs are **exempt from paying public service fees** on that electricity.<sup>33</sup>
- Most of Denmark's energy suppliers offer wind power as a part of their default rates, because of a **substantial supply of wind energy** nationally. Denmark's largest supplier, Dong Energy, for example, currently quotes wind pricing at 0.0 c€/kWh.<sup>34</sup>

## France

In France, the government oversees a price regulation system based on a **feed-in tariff and tax benefits.**

- EDF, the grid operator and default electricity supplier in France, offers **two green pricing options**: Equilibre and Equilibre+. Equilibre+ goes beyond Equilibre's 100% renewable sourcing to support further development of renewable energy projects in France. Other competitive suppliers offer 100% green pricing programs, generally an **additional 1.5-2.5 c€/kWh**.<sup>35</sup>
- Customers investing in renewable energy systems are eligible for an **income tax credit.**
- Companies that install **photovoltaic systems** on buildings are eligible for a reduced VAT rate.
- At the regional level, a **variety of additional subsidies** are available for on-site renewable energy projects that deliver to the grid.<sup>36</sup>

<sup>32</sup> <http://www.energinet.dk/EN/El/Detailmarked/Sider/default.aspx>

<sup>33</sup> <http://www.res-legal.de/en/search-for-countries/denmark.html>

<sup>34</sup> <http://www.dongenergy.dk/PRIVAT/EL/ELAFOTALER/Pages/Elafotaler.aspx>

<sup>35</sup> <http://entreprises.edf.com/offres-edf-entreprises/agir-en-faveur-de-l-environnement/choisir-une-electricite-dyorigine-renouvelable-46966.html>

<sup>36</sup> <http://www.res-legal.de/en/search-for-countries/france.html>

## Germany

Germany is in the process of implementing a system for REC trading for 2013, regulated by the Federal Environment Agency (*Umweltbundesamt*). The country currently supports electricity from renewable sources through a **feed-in-tariff**.

- Eligibility criteria and tariff levels are defined by the **Act on Granting Priority to Renewable Energy Sources (EEG)**. According to the act, operators of renewable energy systems are statutorily entitled to payments for electricity exported to the grid.
- The EEG also introduced a **market premium and the flexibility premium** for system operators who directly sell their electricity from renewable sources. The implementation of EEG is not managed or monitored by a special authority, as the EEG is a framework for private individuals, such as system operators and grid operators, rather than authorities.
- **Most German energy suppliers include renewable energy as a portion of total supply**, due to ample wind and solar generation in the country. Rates for 100% renewable energy will generally add 0.5-0.8 c€/kWh to the standard rate.<sup>37</sup>
- The EEG is evaluated by the **Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU)** on behalf of the Federal Government.<sup>38</sup>

## Italy

Italy's government promotes electricity from renewable sources mainly through a quota system. Electricity producers may satisfy this obligation by generating "green electricity," which is rewarded with tradable RECs (*certificati verdi*), or they may also satisfy the quota by purchasing GOs:

- Producers are obliged to prove to Electrical Service Manager (Gestore Servizi Elettrici (GSE)) that they have satisfied the quota. Certificates are then issued by the GSE, which regulates the market by purchasing excess certificates or selling additional certificates.
- Obligated entities may purchase green certificates either directly from private producers of electricity from renewable sources or in the market. Certificates are traded at the Manager of Electricity Markets (Gestore dei Mercati Energetici (GME)) every week. Only those certificates registered in the GSE's index may be purchased and sold.<sup>39</sup>

<sup>37</sup> <http://www.verivox.de/oekostrom-preisvergleich.aspx>

<sup>38</sup> <http://www.res-legal.de/en/search-for-countries/germany.html>

<sup>39</sup> <http://www.res-legal.de/en/search-for-countries/italy/single/land/italien/instrument/quota-system-2/ueberblick/foerderung.html?bmu%5BlastPid%5D=138&bmu%5BlastShow%5D=1&cHash=b36e66d4107a8771bcface08bdc9a208>

- The current quota system will be replaced by a tender scheme (starting 1/1/2013) for new plants (except biomass) with a capacity above determined thresholds.
- Certificativerdi.it offers services such as certificate databases and purchase agent listings: <http://certificativerdi.it/>.<sup>40</sup>
- The major electricity suppliers in Italy, including Enel and Edipower, offer green pricing programs to supply a portion or 100% of electricity through renewables. Rates for these programs are not published online.<sup>41</sup>

Grid operators are obliged to give priority access to renewable energy systems in the operation of their grids. System operators may request their grid operator to expand the grid if the connection of a system requires this expansion.<sup>42</sup> Under current regulations, **photovoltaic and wind energy systems are eligible for a reduced VAT of 10%** (instead of 20%), which applies to enterprises and private individuals.<sup>43</sup>

## Poland

In Poland, the Energy Regulatory Office (URE) monitors compliance with quota obligations for renewable energy generation:

- Electricity suppliers are obliged to acquire a **certain number of GOs to meet national renewable generation quotas**.
- Because of substantial development in wind and biomass generation in Poland, **most energy suppliers are able to offer green pricing programs at low or no cost** for their customers.
- The National Fund for Environmental Protection and Water Management grants **low-interest loans** to environmentally sustainable projects, which include on-site renewable generation.
- Generators and suppliers of electricity from renewable sources are **exempt from the tax on the sale and consumption of electricity**, which can reduce rates for their customers.<sup>44</sup>

<sup>40</sup> [www.certificativerdi.it](http://www.certificativerdi.it)

<sup>41</sup> <http://www.enel.it/it-IT/clienti/>

<sup>42</sup> <http://www.res-legal.de/en/search-for-countries/italy.html>

<sup>43</sup> <http://www.res-legal.de/en/search-for-countries/italy/more-about/land/italien/ueberblick/foerderung.html>

<sup>44</sup> <http://www.res-legal.de/en/search-for-countries/poland.html>

## Spain

Some Spanish energy suppliers disclose their renewable energy mix via RECS International, but there is currently no formal REC or GO market in the country. Spain's government promotes electricity from renewable sources primarily through **price regulation**:

- **System operators may choose between a feed-in tariff and a bonus**, which is paid on top of the electricity price achieved in the wholesale market. Furthermore, investments in systems and equipment required for the generation of electricity from renewable sources are tax deductible.
- At the end of every month, **the grid operator must prove that its additional income and additional expenses** (for the payment of tariffs to the system operators) balance out. If the operator's balance is negative, the deficit is covered by the National Energy Committee (CNE).<sup>45</sup>
- **Spanish energy suppliers generally do not offer green pricing programs**; executives with operations in Spain most often procure RECs from outside sources, e.g. RECS International.

## Sweden

Today, 45% of Sweden's energy supply comes from renewable energy, largely from hydro power and biofuels. Sweden has set a target to increase its share of renewable energy to 50% by 2020, promoting renewable energy through a **certificate trading system**.<sup>46</sup> Furthermore, Sweden regulates tax mechanisms and issues grant for research and development in wind energy and solar PV systems.<sup>47</sup>

- On January 1, 2012, **Sweden and Norway consolidated their electricity certificate markets**. The two countries aim to increase their production of electricity from renewable energy sources by 26.4 TWh by 2020. The joint market will permit trading in both Swedish and Norwegian certificates and issue certificates for renewable electricity produced in either country.
- **Both producers and others under quota obligations have accounts in the Sweden's electronic register**. Trading of certificates occurs through bilateral agreements between producers and those with quota obligations, usually through a third-party broker.
- The Swedish Energy Authority (Svensk Kraftmäkling (SKM)) estimates that **about 50% of certificates are traded via brokers** and the other half is traded directly between parties.

<sup>45</sup> <http://www.res-legal.de/en/search-for-countries/spain.html>

<sup>46</sup> <http://www.sweden.se/eng/Home/Society/Sustainability/Facts/Energy/>

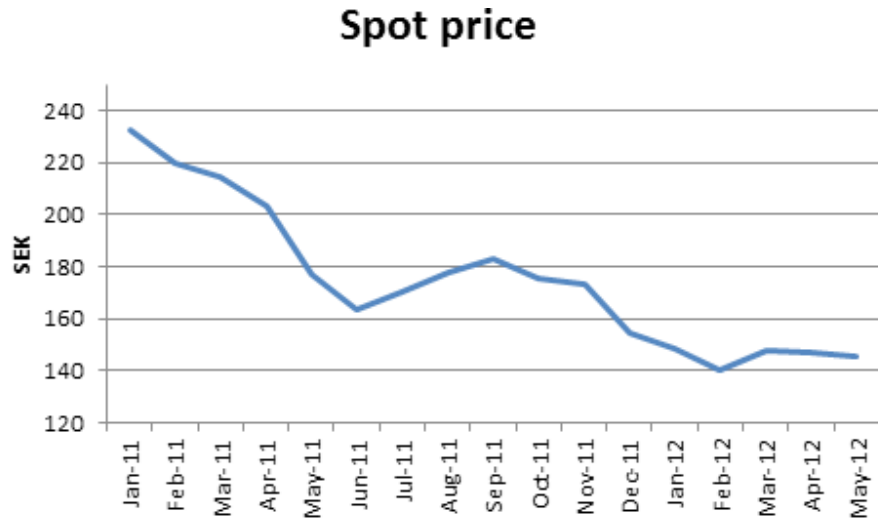
<sup>47</sup> <http://www.res-legal.de/en/search-for-countries/sweden.html>

- The largest Swedish electricity suppliers like Vattenfall Fortum or E-On offer green pricing programs for customers who choose to procure green energy, for a **surcharge fee that could range from 1.90 cents/kWh to 2.50 cents/kWh.**<sup>48</sup>

Figure 11 below illustrates recent spot price trends on the Swedish certificate market:<sup>49</sup>

Figure 11. Swedish electricity certificate prices January 2011 – May 2012.

Source: <http://skm.se/priceinfo/history/2012/>



<sup>48</sup> <http://www.vattenfall.se/sv/valj-energikalla.htm> and <http://www.fortum.com/countries/se/privat/el/elpriser-avtal/miljoval/vindkraft/Pages/default.aspx>

<sup>49</sup> <http://webbshop.cm.se/System/TemplateView.aspx?p=Energimyndigheten&view=default&id=cb792e3f76a348f5aa619ca56b612149>



## 2.3 Australia

### LGC's

**Large-scale Generation Certificates (LGCs):** LGCs are generated at dedicated renewable energy power stations and are based on the amount of renewable electricity produced. There are currently more than 17 types of eligible renewable energy sources for LGCs, including hydro, wave power, wind, solar, and waste-to-energy.<sup>50</sup>

### STC's

**Small-scale Technology Certificates (STCs):** The Small-scale Renewable Energy Scheme (SRES) supports government financial incentives for property owners to install eligible small-scale installations, such as solar water heaters, heat pumps, solar panel systems, small-scale wind systems, or small-scale hydro systems. STCs are tradable commodities generated by eligible installations, such as solar water heaters, air source heat pump water heaters and small generation units. While it is possible for owners of renewable energy installations to create and sell STCs themselves, in most cases installers of these systems offer lower-cost installations or upfront cash payment in exchange for ownership of the STCs. The number of STCs that generators may claim varies depending on the geographic location, the equipment installed, and the capacity of the system.<sup>51</sup>

### LIABLE ENTITIES

**Liable Entities:** The Renewable Energy (Electricity) Act 2000 places a legal liability on liable entities (usually electricity retailers) to purchase an amount of large-scale generation certificates (LGCs) and small-scale technology certificates (STCs) based on the amount of electricity they purchase each year. The amount of certificates to be purchased is determined by the Renewable Power Percentage (RPP) and the Small-scale Technology Percentage (STP).<sup>52</sup> If customers of an electricity retailer, which is considered to be a liable entity, choose to procure additional green power, the retailer will ensure that the additional amount of electricity will be generated by accredited renewable energy generators.<sup>53</sup>

### Market Structure

The Australian government's Renewable Energy Target (RET) aims for 20% of electricity in the country to be sourced from renewable energy by 2020. To reach that target, energy companies will have to deliver an estimated 45,000 GWh of renewable energy by 2020.<sup>54</sup>

The RET is split into two schemes: the **Large-scale Renewable Energy Target (LRET)** and the **Small-scale Renewable Energy Scheme (SRES)**. These schemes aim to encourage additional generation of electricity from renewable sources through the creation of online certificates based on the amount of electricity generated and displaced and by placing a legal obligation on liable entities to purchase and surrender a certain number of these certificates each year. The **Clean Energy Regulator (CER)** manages the internet-based **REC Registry**, where

<sup>50</sup> <http://ret.cleanenergyregulator.gov.au/Certificates/Large-scale-Generation-Certificates/about-lgcs>

<sup>51</sup> <http://ret.cleanenergyregulator.gov.au/Certificates/Small-scale-Technology-Certificates/what-is-stc>

<sup>52</sup> <http://ret.cleanenergyregulator.gov.au/For-Industry/RET-Liable-Entities/ret-liable-entities>

<sup>53</sup> [http://www.energyaustralia.com.au/nsw/residential/products\\_and\\_services/pure\\_energy](http://www.energyaustralia.com.au/nsw/residential/products_and_services/pure_energy)

<sup>54</sup> [http://www.nt.gov.au/d/Content/File/p/ks/simple\\_speak\\_renewable\\_energy\\_certificates.pdf](http://www.nt.gov.au/d/Content/File/p/ks/simple_speak_renewable_energy_certificates.pdf)

the certificates are created and monitored. By the end of 2011, total investment in large-scale renewable energy power generation stood at \$10.5 billion AUD with a generating capacity of over 13,000 GWh.<sup>55</sup>

### Regulatory Bodies

CER oversees the implementation of the LRET and the SRES to encourage additional generation of electricity from renewable energy sources by providing a mechanism by which small-scale systems and renewable energy power stations can create and sell certificates.<sup>56</sup>

### Chain of Custody, Certification, and Traceability

From 2001 to 2010, RECs in Australia were traded on a single, conventional market. RECs generated prior to 2011 remain tradable, but since 2011 all newly generated renewable energy must be sold in the form of two certificate types tied to the two RET schemes: LGCs or STCs.<sup>57</sup>

All LGCs and STCs must be certified by the CER, which pre-certifies all generators and tracks REC retirement to avoid double-counting. There are currently no tiers to distinguish the 'greenness' of LGCs or STCs but in both the LGC and STC markets there is full disclosure in the REC Registry of generation source (type of energy), issuing body or entity, time of generation, and more. There are three markets where liable entities and companies can purchase LGCs and STCs: the **LGC market**, **STC Clearing House**, and the **STC market**. The key difference between the LGC and STC markets is that the STC market's reliance on small scale generators limits how many STCs each individual seller can issue. Companies can more easily purchase large quantities of certificates from single suppliers in the LGC market rather than forming agreements with multiple suppliers in the STC market.

**In the LGC market**, renewable power stations (traditional power stations and large-scale generation sites) accredited by the CER are able to create LGCs in the REC Registry and sell them on the LGC market to liable entities or voluntary purchasers (companies). LGCs can be purchased **for further sale, mandatory surrender, voluntary surrender, or to encourage generation of renewable electricity**.<sup>58</sup> Companies can purchase LGCs directly from **renewable power stations, or from registered agents or brokers**. For large companies, LGCs are the most secure way of acquiring renewable energy, as the REC registry tracks each LGC from its generation source.

<sup>55</sup> <http://ret.cleanenergyregulator.gov.au/about-the-schemes>

<sup>56</sup> <http://ret.cleanenergyregulator.gov.au/For-Industry/Legislation>

<sup>57</sup> <https://www.rec-registry.gov.au/aboutRec.shtml>

<sup>58</sup> <http://ret.cleanenergyregulator.gov.au/Certificates/Large-scale-Generation-Certificates/Buying-LGCs/how-to>

Liabe entities and companies have two options for buying STCs:

- **STC Clearing House:** Registered generators may sell STCs through the STC Clearing House for a **guaranteed and fixed price of \$40AUD** (excluding tax). The clearing house provides a repository for the numerous small-scale STC generators to offer their certificates as individual units, reducing the complexity of purchasing a large number of STCs. Certificates are sold in the order in which they were registered, and all STCs remain in the clearing house until sold. Executives should note that purchasing from the STC clearing House limits their choices of STCs in terms of generation source, location, and other factors in exchange for a wider availability of STCs.<sup>59</sup> **No brokers are required** to use the STC Clearing House.
- **STC market:** The STC market describes all sales and trades that occur outside of the STC Clearing House, via individually negotiated contracts. The **CER does not set the price of STCs and does not mediate disputes between buyers and sellers** in this market. To negotiate for sale, companies or their brokers access the STC Registry and solicit bids from qualified STC suppliers. **Whether through a broker or directly**, the parties then negotiate quantity, price and payment method and enter into an agreement. The seller (usually a registered agent or the generator) then transfers the STCs to the buyer (liable or voluntary entity) in the STC Registry. While the open market allows companies greater certainty as to the STC source, location, and quality, STC generators can rarely sell a large number of STCs in any transaction due to the limited availability of STCs. Thus, multiple contract renegotiations may be necessary.<sup>60</sup>

The CER provides tools to accurately calculate the number of claimable STCs:

<http://ret.cleanenergyregulator.gov.au/Certificates/Small-scale-Technology-Certificates/what-is-stc>

<sup>59</sup> <http://ret.cleanenergyregulator.gov.au/Certificates/Small-scale-Technology-Certificates/STC-Clearing-House/stc-clearing-house>

<sup>60</sup> <http://ret.cleanenergyregulator.gov.au/Certificates/Small-scale-Technology-Certificates/selling-stcs>

Figure 12. Large-scale generation certificate (LGC) market.

Source: <http://ret.cleanenergyregulator.gov.au/About-the-Schemes/lret> and SR Inc Analysis

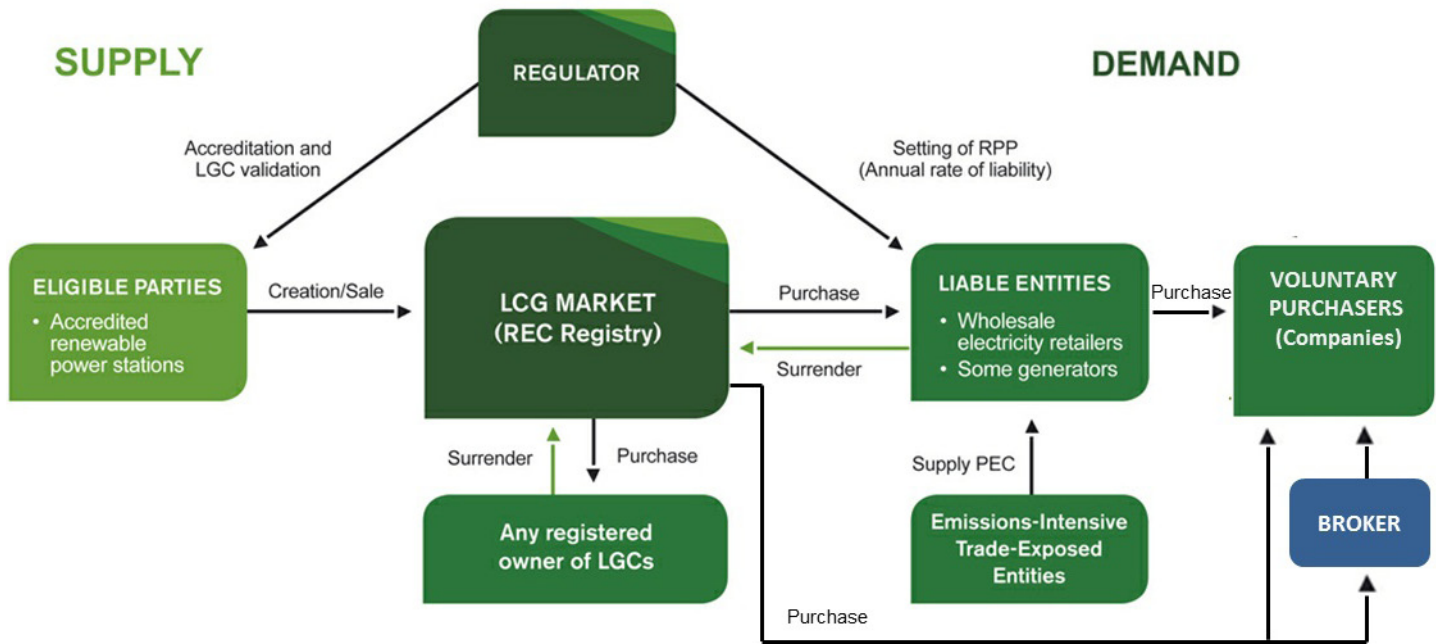
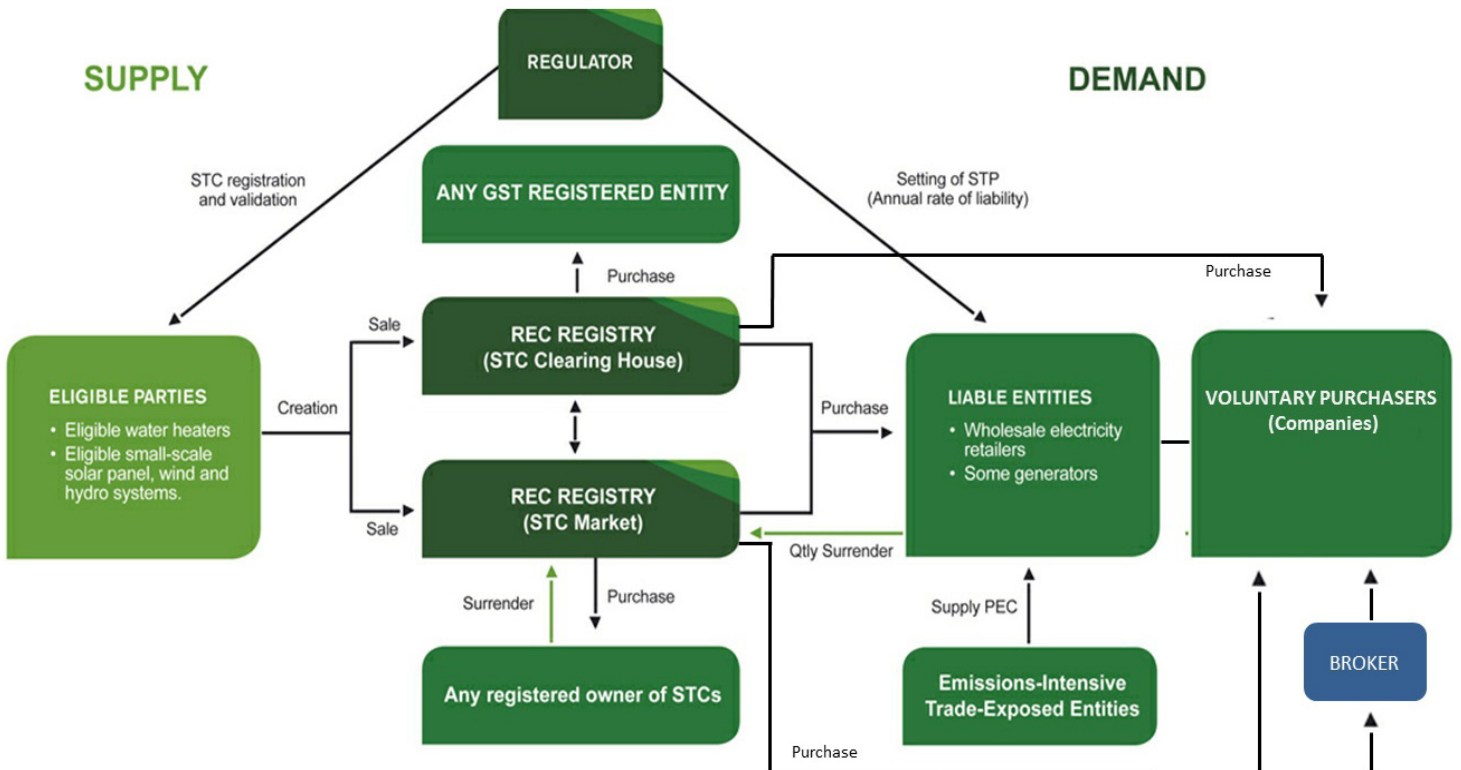


Figure 13. Small-scale technology certificate (STC) market.

Source: <http://ret.cleanenergyregulator.gov.au/About-the-Schemes/sres> and SR Inc Analysis



## Tracking Systems

The REC Registry, a national, internet-based registry system, provides access to the following public registers:

- Register of STCs
- Register of LGCs
- Registry of RECs (generated prior to 1/1/2011)
- Registries of Accredited Power Stations, Applications for Accredited Power Stations, Registered Persons and STC Clearing House Transfer list<sup>61</sup>

## Market Size and Pricing

While LGCs and STCs are available to companies, most LGCs and STCs are purchased by liable entities, which must meet quotas for both renewable power and small-scale technology.

The **market price of the LGCs** depends on supply and demand and its price has historically **varied in the range of \$10 AUD to \$60 AUD**.<sup>62</sup>

## 2.5 India

### Market Structure

State Commissions specify the **Renewable Purchase Obligations (RPOs)**, under which distribution companies, certain large commercial and industrial consumers, and “open access” users (customers with over 1MW loads who purchase power directly from a competitive generation company) are obligated to buy a certain percentage of their power from renewable sources of energy. These groups are collectively referred to as “obligated entities.”<sup>63</sup> Some Indian States also define a percentage of the RPO which must originate from solar sources.

Figure 14. State-level RPO targets for the most populated Indian States.

Source: [http://www.ixindia.com/state\\_rpo.htm](http://www.ixindia.com/state_rpo.htm)

RPO Targets per state as a % of total					
Year	Uttar Pradesh	Maharashtra	Bihar	West Bengal	Andhra Pradesh
2011 - 2012	5.0	7.0	2.5	10.0	5.0
2012 - 2013	6.0	8.0	4.0	n/a	5.0
2013 - 2014	n/a	9.0	4.5	n/a	5.0
2014 - 2015	n/a	9.0	6.2	n/a	5.0

<sup>61</sup> The Registries are accessible here: <https://www.rec-registry.gov.au/home.shtml>

<sup>62</sup> <http://ret.cleanenergyregulator.gov.au/about-the-schemes>

<sup>63</sup> <http://www.powerexindia.com/PXIL/recfaq.aspx>

Enforcement under the RPO scheme remains inconsistent.<sup>64</sup> If an obligated entity does not meet the RPO, **State Electricity Regulatory Commissions (SERCs)** may direct that entity to purchase the shortfall of RECs at forbearance price. However, if there is an undersupply of RPO certificates (i.e. insufficient sell bids), the obligated entity can approach the Commission to transfer the shortfall to the next year.<sup>65</sup>

### Regulatory Bodies

India's market for RECs trading opened on March 30, 2011.<sup>66</sup> RECs can be used by the obligated entities to demonstrate compliance with regulatory requirements.<sup>67</sup> As per **Central Electric Regulatory Commission (CERC)** guidelines, a generating company which produces renewable energy is eligible to apply for registration and issuance of RECs if it meets the following criteria:

- It has obtained accreditation from the state agency;
- It does not have any power purchase agreement for the capacity related to such generation to sell electricity at a preferential tariff determined by the appropriate commission; and
- It sells the electricity generated either:
  - To the distribution licensee of the area in which the eligible entity is located, at a price not exceeding the pooled cost of power purchase of such distribution licensee, or
  - To any other licensee or to an open access consumer at a mutually agreed price, or through power exchange at market determined price.<sup>68</sup>

### Chain of Custody, Certification, and Traceability

REC regulation and trading mechanisms in India, while in their infancy, are relatively simple. **Obligated entities and voluntary REC purchasers** enter into REC purchase agreements with generation entities, **sometimes through a broker**. The generator can then issue RECs through the REC Registry, in compliance with SERC policies and accounting. Purchasers are then responsible for retiring or redeeming the traded RECs upon consumption via the REC Registry. Each SERC verifies compliance with generation standards and monitors REC accounting. Aside from information contained in the REC Registry and the distinction between solar and non-solar RECs (described below), there is no system to distinguish between REC quality, time of generation, or other attributes. RECs are traded on the last Wednesday of every month on two exchanges: **Power Exchange India Limited (PXIL)** in Mumbai and **Indian Energy Exchange (IEX)** in Delhi.<sup>69</sup>

<sup>64</sup> <http://india.carbon-outlook.com/content/abc-renewable-energy-certificates-india>

<sup>65</sup> <http://www.iexindia.com/rec-faqs.htm>

<sup>66</sup> <http://www.eai.in/blog/2011/04/a-review-of-the-indian-renewable-energy-certificate-rec-trading-for-april-2011.html>

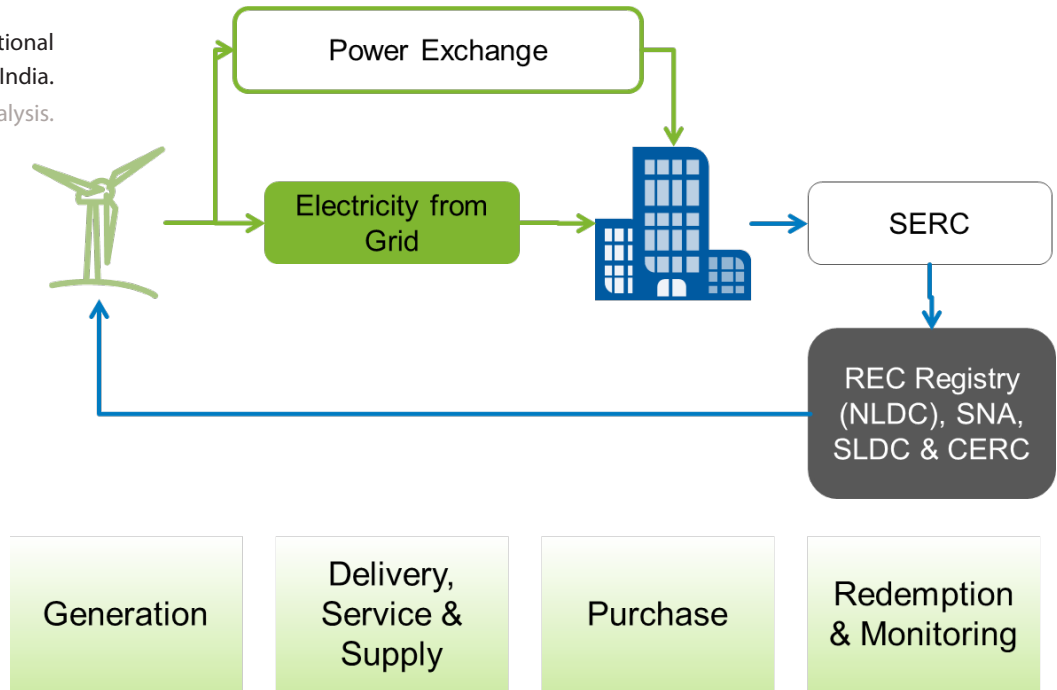
<sup>67</sup> <http://www.iexindia.com/rec.htm>

<sup>68</sup> <http://india.carbon-outlook.com/content/abc-renewable-energy-certificates-india>

<sup>69</sup> <http://india.carbon-outlook.com/content/abc-renewable-energy-certificates-india>



Figure 15. The institutional mechanism of RECs in India.  
Source: SR Inc analysis.



There are two categories of certificates: solar and non-solar RECs.<sup>70</sup> Non-solar RECs represent any renewable source other than solar, including wind, biomass, biofuel, and small hydro.<sup>71</sup> The following table summarizes the features of RECs in India, including the regulated procedures for REC trading, price setting, and buyer and seller protection.

Table 5. Key features of voluntary RECs in India.

Source: <http://www.iexindia.com/rec.htm#>

<b>Participation</b>	Voluntary
<b>REC Denomination</b>	1 MWh
<b>Validity</b>	365 days after issuance
<b>Categories</b>	1. Solar REC 2. Non-Solar REC
<b>Trading Platform</b>	Power Exchanges only
<b>Transfer Type</b>	Single transfer only, repeated trade of the same certificate is not possible
<b>Penalty for Non-compliance</b>	Forbearance Price (Maximum Price)
<b>Price Guarantee</b>	Through Floor Price (Minimum Price)
<b>Price Discovery Mechanism</b>	Closed Double-sided Auction (as advised by CERC)
<b>Trading Calendar</b>	Last Wednesday of the month (T day)
<b>Trading Period</b>	1pm - 3pm (T day)
<b>Market Clearing</b>	5pm (T day)
<b>Financial Settlement</b>	Buyers pay upfront (T day) and Sellers receive on T+day

<sup>70</sup> <http://www.iexindia.com/rec.htm>

<sup>71</sup> <http://www.climate-connect.co.uk/Home/?q=node/33>

## Tracking Systems

The procedure for issuance of compliance RECs is as follows:

1. **Accreditation.** The State Nodal Agency (SNA) thoroughly reviews the generation source and ensures compliance with low-emission requirements. It then endorses the renewable energy generator and recommends it for registration.
2. **Registration.** The National Load Dispatch Center (NLDC) registers the generator as an "Eligible Entity" in the REC Registry.
3. **REC Issuance.** Electricity from the generator is metered and recorded by NLDC. Upon receiving approval for its generation, the Eligible Entity applies to NLDC to issue the RECs equivalent to the amount of electricity deposited into the grid.
4. **REC trading.** Once the RECs are issued to the Eligible Entity, obligated entities may purchase its RECs through power exchanges. All RECs must be sold within 365 days of issuance.
5. **Surrender and Redeeming of RECs.** After purchasing RECs, obligated entities surrender to the SERC or another agency specified by the SERC to meet their RPO. The NLDC maintains records of RECs sold and purchased in the REC Registry.
6. **Compliance Reporting.** At each step in the process, compliance auditors monitor and report compliance with appropriate REC Regulations.

## Market Size and Pricing

Of the two REC exchanges in India, the IEX has held more than 85% of the REC market share since trading began in 2011.

From January 2012 through April 2012 there have been 700,000 sell bids for RECs. The average trading price for the period was \$52.33 USD per REC.<sup>72</sup> There were no solar REC trades during this period, as India's first solar RECs were generated in May 2012. Figure 16 below shows the clearing volumes for RECs for the period January through May 2012.<sup>73</sup>

During February 2012 on the PXIL, volumes peaked with 15,706 non-solar RECs traded at an average price of 56.94 USD/REC.<sup>74</sup> In March 2012, there were 51,401 buy bids and only 7,405 sell bids for non-solar RECs, with a market clearing volume of 7,383 RECs for an average price of 57.86 USD/REC (i.e., not all sellers were able to sell their RECs)<sup>75</sup> It is also important to note that, like in the IEX, there were no sell bids for solar RECs because until May 2012, no solar RECs were issued.<sup>76</sup>

<sup>72</sup> 2,804 INR/REC; conversion via [www.oanda.com](http://www.oanda.com) using spot rate of 04/30/2012

<sup>73</sup> <http://www.iexindia.com/rec.htm>

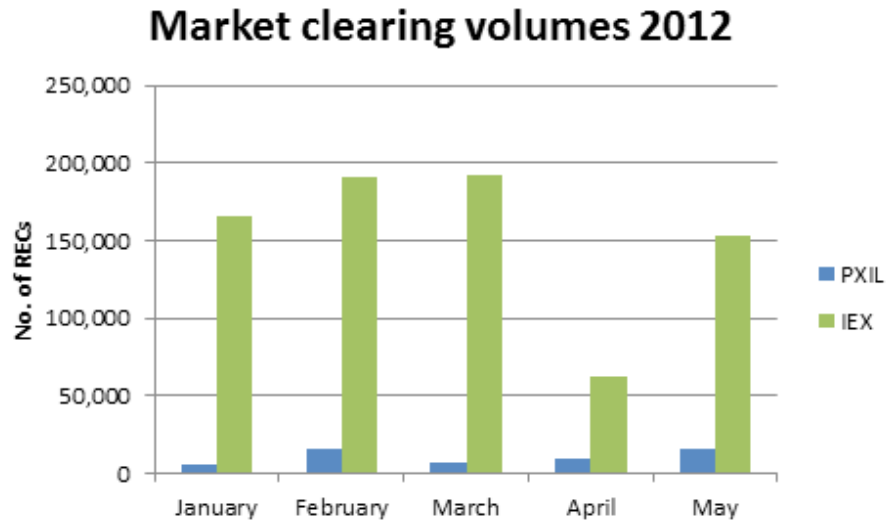
<sup>74</sup> 3,051 INR/REC; conversion using spot rate of 04/30/2012

<sup>75</sup> 3,100 INR/REC; conversion using spot rate of 04/30/2012

<sup>76</sup> <http://www.powerexindia.com/PXILReport/pages/RECMVPReport.aspx>

Figure 16. Market clearing volumes on the IEX and PXIL, January 2012 – May 2012.

Source: <http://www.powerexindia.com/PXILReport/pages/RECMCVReport.aspx>



RECs can be traded only at a price between the floor and forbearance prices set by the CERC. The price range for RECs (valid through March 2012) is summarized in Table 6 below.<sup>77</sup>

Table 6. CERC floor and forbearance prices for RECs, through March 2012.

Source: <http://india.carbon-outlook.com/content/abc-renewable-energy-certificates-india>

	Non-solar REC (USD/MWh)	Solar REC (USD/MWh)
Forbearance Price	73	317
Floor Price	30	224

In August 2011, CERC issued new forbearance and floor prices for RECs for the next five years (April 1, 2012 to March 31, 2017) as shown in Table 7 below.<sup>78</sup>

Table 7. CERC floor and forbearance prices for RECs, April 2012 – March 2017.

Source: <http://india.carbon-outlook.com/content/abc-renewable-energy-certificates-india>

	Non-solar REC (USD/MWh)	Solar REC (USD/MWh)
Forbearance Price	62	250
Floor Price	28	174

<sup>77</sup> Spot rates of 04/30/2012

<sup>78</sup> ibid

## 2.4 China

### Overview

Currently, there is no REC market in China. However, it is probable that RECs will evolve as the Chinese government continues to pursue large scale investments and policy requirements for renewable energy.

For example, China adopted aggressive renewable energy targets as part of the Renewable Energy Law (2005), with additional targets in 2009. China aims to install 500 GW of renewable electricity capacity by 2020: 300 GW from hydro, 150 GW from wind, 30 GW from biomass, and 20 GW from solar. This will increase the share of renewable energy in 2020 to 15%, up from 8% in 2006.<sup>79</sup>

According to a study by the Carbon Disclosure Project (CDP), very few companies purchase renewable electricity in China. The companies purchasing renewable electricity tend to do so because of government regulations, such as the Renewable Energy Law (2005) or the Medium and Long-term Development Plan for Renewable Energy (2007).<sup>80</sup>

Some companies operating in China purchase RECs through a **third-party, international REC marketer** such as Climate Friendly, a clean energy trading company based in Australia. Climate Friendly's GoldPower product is a global REC developed in association with WWF, supporting new renewable projects in developing countries. GoldPower matches a customer's electricity use in any country with certificates in megawatt hours (MWh) from renewable energy projects in non-OECD countries without Kyoto Protocol targets (including China). Before selling a GoldPower certificate, all projects are certified by independent, third-party auditors to meet Climate Friendly and WWF's Gold Standard for production quality.<sup>81</sup>

Leading companies also participate in the **Clean Development Mechanism (CDM)** emission reduction scheme. Under the CDM, which is administered by the United Nations and as part of the Kyoto Protocol, companies and other entities in developed countries receive carbon credits, called **Certified Emission Reductions (CERs)**, for investing in projects generating a reduction in GHG emissions in the developing world. Of all the registered projects under the CDM, 69% are related to the energy industries (renewable/non-renewable sources), 13% are related to waste handling and disposal, 5% in the manufacturing industries and the remaining projects are focused on other areas such as mining, transport, construction or afforestation and reforestation. CERs generated in China can only be purchased by companies in developed countries.

<sup>79</sup> <http://www.renewableenergyworld.com/rea/news/article/2010/07/renewable-energy-policy-update-for-china>

<sup>80</sup> <https://www.cdproject.net/CDPResults/Clean%20energy%20trends%20in%20emerging%20markets%20ENGLISH.pdf>

<sup>81</sup> [http://www.chinadaily.com.cn/bizchina/2011-05/27/content\\_12592530.htm](http://www.chinadaily.com.cn/bizchina/2011-05/27/content_12592530.htm)

As of October 2011 China had **1,613 registered CDM projects, of which 1,306 (81%) were dedicated to renewable energy**. In 2012 China alone is expected to **supply 64% of the world's CERs**, making it the number one source of carbon credits.<sup>82</sup> The top project types in China are hydropower, wind energy, coal mine methane, and landfill gas utilization.<sup>83</sup>

Third-party marketers can assist with the purchase of CERs originating in China. ClimateBridge, Climate Friendly, and Fern Capital Trading Ltd., among others, have experience sourcing Chinese CERs for multinational customers. A certain number of CERs are also traded on the Paris-based BlueNext Exchange, which has over 100 members.<sup>84</sup> In 2011 the World Bank completed an auction of 200,000 CERs at a price per ton of EUR 12.52 on BlueNex Exchange's platform. The auction generated strong interest, being 6.8 times oversubscribed.<sup>85</sup>

## 2.6 Brazil

### Overview

Currently, Brazil does not have an established REC market. Since 2004, Brazil's **Power Sector Model** has split electricity delivery into regulated and deregulated markets for producers and consumers. This allows for both public and private investment in new generation and distribution projects.<sup>86</sup> Brazil has a renewable energy capacity of 9.1 GW as of 2009, which represents 9.8% of total generation capacity.

Historically, Brazil focused on reduced emissions in energy generation, by increasing power generation from ethanol, biomass, and small hydro. Emerging regulations and incentive programs, however, favor wind and solar projects.<sup>87</sup> The installed wind capacity by the end of 2011 was 1.5 GW, with an additional 7 GW planned for installation by 2016.<sup>88</sup> In 2011, 80% of the bids at the National Electricity Agency's power auction were wind energy projects.<sup>89</sup> As of 2012, Brazil has one utility-scale solar plant, with new regulations (in early 2012) giving utilities an 80% discount on taxes paid for distributing electricity generated by large solar projects.<sup>90</sup>

<sup>82</sup> <http://cdm.unfccc.int/Statistics/Registration/AmountOfReductRegisteredProjPieChart.html>

<sup>83</sup> <http://www.chinacarbonfund.com/>

<sup>84</sup> <http://www.bluenext.eu/products/spotCER.html>

<sup>85</sup> <http://www.bluenext.eu/documents/AuctionPressReleaseMay182011Final.pdf>

<sup>86</sup> <http://www.eia.gov/emeu/cabs/Brazil/pdf.pdf>

<sup>87</sup> <https://www.cdproject.net/CDPResults/Clean%20energy%20trends%20in%20emerging%20markets%20ENGLISH.pdf>

<sup>88</sup> <http://www.brazilwindpower.org/en/>

<sup>89</sup> <http://cleantechnica.com/2012/03/16/new-rules-to-add-momentum-to-brazils-solar-energy-drive/>

<sup>90</sup> <http://www.bloomberg.com/news/2012-03-14/brazil-to-issue-regulations-supporting-solar-energy-aneel-says.html>

Even though there are no RECs, Brazil's government has various legislations that support the generation of green electricity. For example, all electric power distribution companies in Brazil must invest at least 0.5% of the company's net operational revenue in activities aimed at reducing inefficient use of electricity.<sup>91</sup> The **National Policy on Climate Change** included the creation of a voluntary national emissions reduction target to reduce projected emissions between 36% and 38% by 2020. **Electric Power Auctions for Biomass and Wind** establish that most new power projects enter into long-term power purchase agreements (PPAs) with energy distributors, via a reverse auction system.<sup>92</sup> The **Program of Incentives for Alternative Sources of Electric Energy (PROINFA)** aims to increase the share of wind, biomass and small hydroelectric plants in the National Electric System.<sup>93</sup> Finally, special taxation incentives approved by Commission of Infrastructure Services, the **Special Regime of Taxation (REINFA)**, which was approved in 2009, establishes measures to stimulate the production and consumption of clean energy. The REINFA provides several tax benefits such as exemptions of federal taxes, import tax, tax on industrialized products, among others, for the beneficiary companies of the program.<sup>94</sup>

<sup>91</sup> <http://www.aneel.gov.br/area.cfm?idArea=262&idPerfil=13>

<sup>92</sup> <https://www.cdproject.net/CDPResults/Clean%20energy%20trends%20in%20emerging%20markets%20ENGLISH.pdf>

<sup>93</sup> <http://projects.wri.org/sd-pams-database/brazil/programme-incentives-alternative-electricity-sources-proinfa>

<sup>94</sup> KPMG – Tax and Incentives for Renewable Energy

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Members should contact SR Inc with any questions or comments. Members who have experience with international REC trading that they wish to share with others are encouraged to do so for inclusion in future updates of this briefing.