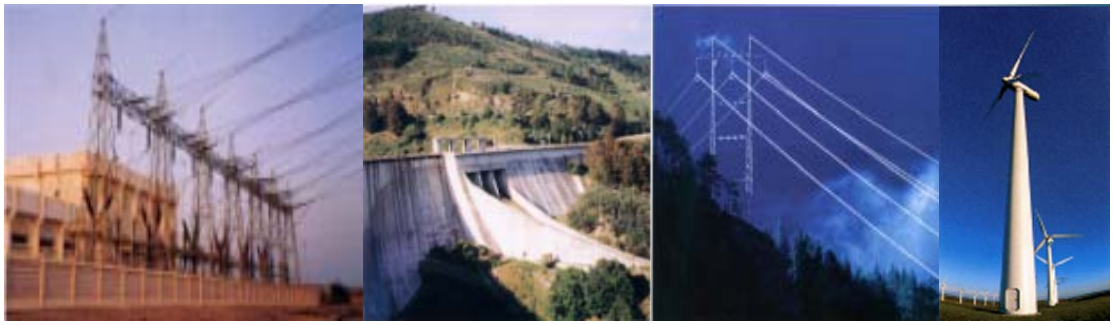
Italy Country Report



Innovative Electricity Markets to Incorporate Variable Production

to

IEA – Renewable Energy Technology Deployment

May 2008

IPA Energy + Water Consulting

COWI A/S

SGA Energy

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1 MARKET MECHANISMS

This section provides an overview of the operation of variable renewable generation within the Italian market.

1.1 Renewable Generation Capacity

In 2005, Italian gross electricity demand was 330 TWh. Italy runs in large part on natural gas and oil, having outlawed nuclear power plants in 1987 after the Chernobyl disaster. In 2005 37% of electricity came from gas, 21% from liquid fuel, 16% from renewables and 12% from coal. Generation by renewables reached 50 TWh. The major contributor was hydro generation (36 TWh), followed by biomass and waste (6 GWh), geothermal (5 GWh) and wind (2 GWh).

There are increasing concerns about imports of natural gas within Italy. Italy produces only 14% of the natural gas it consumes. Of its imports, 37% came from Algeria in 2005 and 32% from Russia through a network of pipes across Belarus and Ukraine. A Russian-Ukrainian standoff over prices in 2005-6 led to a brief reduction in supplies to Europe, including Italy.

Table 1: Electricity balance for 2000-2005 and projections for 2006 (TWh) [1]

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gross production	**276.6**	**279.0**	**284.4**	**293.9**	**303.3**	**302.4**				
Conventional thermoelectric	***218.5***	***216.8***	***227.6***	***238.3***	***240.5***	***246.3***				
Solid fuels	*26.3*	*31.7*	*35.4*	*38.8*	*45.5*	*43.9*				
Natural gas	*97.6*	*95.9*	*99.4*	*117.3*	*129.8*	*148.9*				
Oil products	*85.9*	*75.0*	*77.0*	*65.8*	*47.3*	*35.9*				
Other sources(A)	*8.8*	*14.1*	*15.8*	*16.4*	*17.9*	*17.6*				
Hydroelectric	***50.9***	***53.9***	***47.3***	***44.3***	***49.9***	***42.5***				
From natural input	*44.2*	*46.8*	*39.5*	*36.7*	*42.7*	*35.9*				
From pumping	*6.7*	*7.1*	*7.7*	*7.6*	*7.2*	*6.6*				
Other renewables	***7.2***	***8.3***	***9.5***	***11.3***	***12.9***	***13.6***				
Geothermal	*4.7*	*4.5*	*4.7*	*5.3*	*5.4*	*5.3*				
Biomass and waste	*1.9*	*2.6*	*3.4*	*4.5*	*5.6*	*6.1*				
Wind	*0.6*	*1.2*	*1.4*	*1.5*	*1.8*	*2.1*				
Solar	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*				
Auxiliary service production	**13.3**	**13.0**	**13.6**	**13.7**	**13.3**	**12.7**				
Net production	**263.3**	**266.0**	**270.8**	**280.2**	**290.0**	**289.7**				
Electricity for pumping	**9.1**	**9.5**	**10.7**	**10.5**	**10.3**	**9.4**				
Electricity for consumption	**254.2**	**256.5**	**260.1**	**269.7**	**279.7**	**280.3**				
Net imports	**44.3**	**48.4**	**50.6**	**51.0**	**45.6**	**49.2**				
Electricity demand on the grid(B)	**298.5**	**304.8**	**310.7**	**320.7**	**325.4**	**329.4**	**339.0**	**346.9**	**354.0**	**362.3**

(A) Other sources include gas derivatives and other forms of energy.

(B) Excludes network losses

Legislative Decree 387 of 29 December 2003 confirmed the previous target of 76 TWh/yr to be achieved in 2008–2012 from RES. The target stated that Italy would increase the contribution of RES to gross electricity consumption from 16% in 1997 to 22% in 2010. The Government's current target is to have 25% of electricity from RES by 2011. The formal wind target is 2,500 MW by 2008–2012. Such a capacity target is now likely to be achieved in mid-2007.

According to the Regulatory Authority for Electricity and Gas, the biggest contribution to power generation from renewable sources in coming years will be from wind power plants, with no substantial developments expected on the hydroelectric front. Practically all of the wind power due to come into operation over the next few years (like that already in operation) will be located in the southern regions and the islands.

It is difficult to identify future developments for wind power plants. Applications for connection to the national transmission grid and distribution networks currently equate to around 10 GW, but actual installed power is in fact less than this. This situation can be explained by authorisation problems and by the fact that the technical regulations governing connections are not yet complete. The projection of 1,200 MW shown in the table below refers to authorised plants, whose operators have also made financial commitments covering connection costs.

Table 2: Projections for new power coming into operation 2006 – 2009 (MW) [2]

Year	Thermoelectric	Wind	Total
2006	3,795	520	4,315
2007	3,110	473	3,583
2008	6,440	226	6,666
2009	1,600	15	1,615
TOTAL	14,945	1,233	16,178

1.2 Renewable Generation Size

Article 11, para. 1 of the Integrated Electricity Market Rules [4] provides that "producers are admitted to the Electricity Market in respect of generating units with a power rating equal to or greater than 10 MVA". With regard to the technical requirements for participation of power plants in the energy markets (Day-Ahead Market-MGP and Adjustment Market-MA), fulfilment of the above requirement is sufficient.

Generators below 10MW cannot participate in the power exchange. Instead, they sell their power through bilateral trades or directly to the local grid operator. In the latter case the price they get is fixed by the Energy Regulator

The remainder of this document focuses on the arrangements for larger renewable generation.

1.3 Renewable Generation and Power Markets

In case of wind generation, producers can opt for a “regulated access” system managed by GSE. Those plants benefit from special treatment for dispatching and grid transport. The electricity is appreciated by applying the average monthly price and not the hourly one.

- Market Operator

  The day ahead, adjustment and balancing electricity markets are operated by GSE.

- Traded Market

  Generators can enter into bilateral contracts or they can sell on the power exchanges (futures, day ahead, adjustment and balancing market). The adjustment and balancing markets are not open to renewable generators.

- Despatch

  The GSE decides on despatch based on a merit order of bids into the power exchange as well as other bilateral contracts. Renewables get priority despatch.

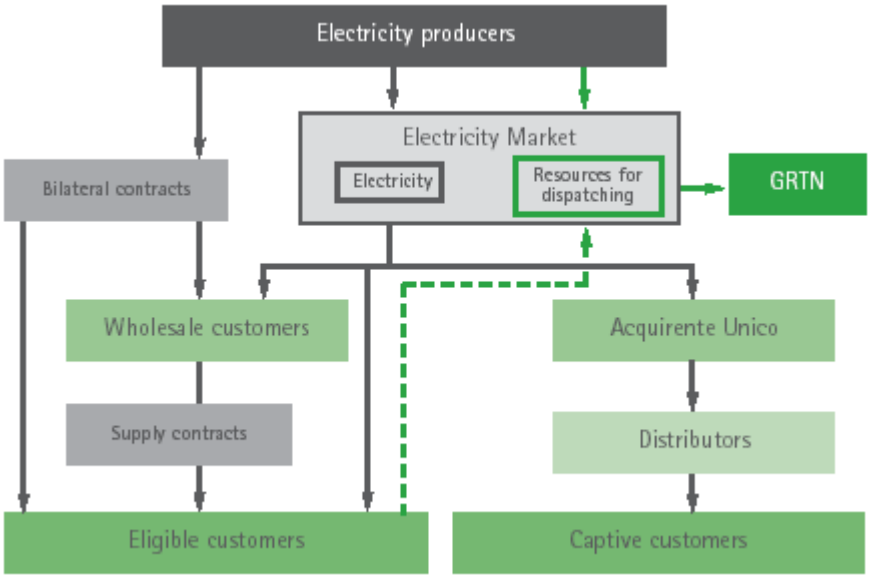
- Notification

  Price and despatch are notified by the system operator the day before real time.

- Balancing Settlement

  Balancing is carried out by the TSO through the despatching market (MSD). Variable generation does not participate in this market.

Figure 1: The Italian electricity market [3]



1.4 Degree of Centralisation

Generators have individual responsibility in terms of realisation of new power plants. Activities of production, import, export, purchase and sale of energy to eligible customers, as well of processing of energy source materials, are liberalised all over Italy. Article 8 of the Bersani Decree (Legislative Decree 79/99) remains in force: from 1 January 2003, no entity shall generate or import, directly or indirectly, more than 50% of the total electricity generated in or imported to Italy.

In this system, the State retains the following tasks: making decisions on electricity import and export; defining the planning framework for the sector; establishing principles for co-ordinated utilisation of regional, national and European Union financial resources. The State is also responsible for taking actions for ensuring a competitive Electricity Market, for defining general criteria for new electricity distribution concessions and for authorising construction and operation of thermal power plants exceeding 300 MW.

The strong presence of utilities on the market (one-third of total wind capacity) is mainly due to their obligation to comply with the RES quota established by the law (3.05% for 2007) and to their wish to demonstrate willingness to diversify energy production using a clean source. In Italy, unlike in some other countries, private citizens, farmers, and co-operatives have not entered the wind market so far. Instead, ownership is primarily by medium-sized wind energy companies and a few utilities. However, there are prospects that larger energy and insurance groups, too, may join in shortly.

1.5 Support Mechanisms

Italy currently has a green certificate and quota system. This is still strongly interlinked with their former feed in tariff system, CIP 6/92.

1.5.1 CIP 6/92

A good number of renewable generators still benefit from the feed-in tariffs granted by CIP Provision 6 of 29 April 1992. These tariffs are different for the various technologies and are updated every year. They are paid to entitled plants for all the energy they can feed into the grid and consist of two items:

- The avoided cost, granted over the full lifetime of the plant as a reward for avoiding production from conventional sources, and
- The incentive, granted over the first eight years of plant operation only.

In 2006, several wind plants were still within the eight-year term and therefore got the full feed-in tariff. In the most favourable case of plants yielding all their energy to the grid, the tariff was €149.4/MWh.

1.5.2 Green Certificates

New renewable generators come under the current support scheme, which is based on a compulsory quota for electricity from RES and on tradable green certificates (GCs). All renewable plants operational after April 1999 are eligible, this includes large hydro but from 2007 excludes new build waste to energy. This scheme was set up and regulated by Decree 79 of 16 March 1999 (restructuring the electricity market) and the subsequent Decree 387 of 29 December 2003 (implementing EU Directive 2001/77/EC on RES promotion). Further implementation measures were then taken in 2005 and 2006.

Since 2001, the RES electricity quota obligation has been laid on operators who have produced or imported electricity from non-renewable sources exceeding 100 GWh/yr (electricity from CHP plants, auxiliary service consumption, and exports of energy are excluded from this computation). These operators must feed into the Italian grid, before the end of the subsequent year, an amount of RES electricity equalling a minimum quota of this non-renewable electricity. The RES electricity quota was originally 2% but was subsequently raised by 0.35% a year to 2.35% in 2005, 2.70% in 2006, and 3.05% in 2007.

To reduce their obligation, they are also allowed to feed imported RES-generated electricity into the Italian grid, but this energy must be certified by a Guarantee of Origin. The market price of GCs should thus be determined on the basis of demand by obligated operators versus supply by

qualified producers. Qualified RES electricity producers get one GC for each 50 MWh of their production over a term that was formerly eight years but has, since 2006, been extended to twelve years of plant operation. The sale of GCs brings them income in addition to the proceeds from the sale of energy on the wholesale electricity market.

Green certificates are advantageous for renewable generators because of the duration of the support (12 years) and the high annual reference.

To avoid double benefit, GCs that would be due to plants already getting CIP 6/92 feed-in tariffs are retained by GSE (Gestore dei servizi elettrici, the body managing all RES support schemes). GSE must sell them at a price fixed every year on the basis of current CIP 6/92 feed-in tariffs, among other things. Since the number of these GCs is still fairly large, qualified renewable producers actually have to sell their own GCs at a price close to, but obviously not greater than, the price fixed for the GSE certificates. The Italian GC price is therefore not left to the mere interplay of supply and demand but is controlled. The price of GCs sold by GSE has been growing steadily in the past few years. Specifically, the price of GSE's GCs relating to 2006 RES production was fixed at €125.28/MWh.

The GSE price has kept up the GC market price as well, thus bringing a reasonably rewarding income to investors in addition to the sale of electricity on the wholesale market. This of course holds especially for more mature RES technologies, including wind, while other technologies such as photovoltaics have had to be granted special feed-in tariffs to help fund their development.

The certificate life is 3 years. The operators are also guaranteed by the fact that GSE will buy back unsold certificates.

In spite of these financial conditions, which look very favourable in principle, investors have still been complaining about the way some aspects of Italy's support policies have been implemented. Particularly, they have long been complaining of delays in issuing measures regarding the fixing of electricity quotas for RES to be produced from 2008 onward, the setting of regional targets, establishing a single national procedure for plant permitting, and other actions required by Decree 387 of 29 December 2003. Some investors have even stated they would be content with lower energy and GC prices in exchange for better-defined boundary conditions for their businesses in the long term.

Currently there is only one level of support, in the sense that all technologies are equally remunerated. A proposal to introduce variable support with respect to technology maturity is currently under discussion.

1.5.3 Photovoltaics

On 28 July 2005, jointly with the Ministry of the Environment and Land Protection, the Ministry of Productive Activities issued the Ministerial

Decree referred to in Art. 7, para. 1 of Legislative Decree no. 387 of 29 Dec. 2003. The Ministerial Decree defines criteria for incentivising electricity generation by photovoltaic solar plants.

On 14 Sept. 2005, the "Autorità per l'Energia Elettrica e il Gas" (AEEG - electricity & gas regulator) adopted its Decision 188/05, which identifies GSE as the "implementing body" in charge of granting incentivising tariffs. On 6 Feb. 2006, the second decree on photovoltaic solar generation, extending and supplementing the Ministerial Decree of 28 Jul. 2005, was enacted. The incentive scheme applies to photovoltaic (PV) solar plants or systems (new, renovated or repowered/upgraded) which have a capacity of 1 to 1,000 kW and which have become operational after 30 September 2005.

The PV projects which may be implemented and benefit from incentivising tariffs for twenty years fall under three capacity classes:

Table 3: Incentivising tariffs for PV

PV Plant or System	*Capacity (kW)*	*Incentivising Tariffs (€/kWh)*
Class 1	Between 1 and 20	0.445 "scambio sul posto" (net metering) 0.460
Class 2	Between 20 and 50	0.460
Class 3	Between 50 and 1,000	0.490 (maximum value subject to bidding procedure)

The incentivising tariffs are increased by 10% if the PV modules are used in new or renovated buildings. The incentive applies to electricity generated, measured at the output terminals of the direct current-alternating current converter.

For systems below 20 kW that have opted for "scambio sul posto" (net metering), the incentive only applies to electricity generated and consumed on site. GSE will assess the incentive applications in accordance with the provisions of the Ministerial Decrees of 28 Jul. 2005 and 6 Feb. 2006 and with AEEG's Decision 188/05. Ninety days prior to the expiration of each quarter, GSE will notify applicants of the approval or rejection of their application. GSE will grant the incentivising tariffs after the plants or systems have become operational within the timescales specified in the Ministerial Decree of 28 July 2005 and after verifying their compliance with the above legislation. A new Ministerial Decree incentivising PV solar generation is expected to be issued within a short time, based on the results of the latest meetings held between the representatives of the Ministries of the Environment and of Economic Development.

As of 15 October 2006, the PV plants or systems that have obtained incentivising tariffs and have notified GSE of the commencement of construction work amount to a little less than 2,000, whereas those that have already notified their entry into operation are 320, with an overall capacity of 2.14 MW.

For 155 of these plants or systems, with an overall capacity of about 1,258 kW, the next step will be the signature of the agreement on the granting of incentivising tariffs:

- 142 systems with an overall capacity of about 675 kW, belonging to the class of up to 20 kW;
- 11 systems with an overall capacity of about 455 kW, belonging to the class of 20-50 kW;
- 2 plants with an overall capacity of about 128 kW, belonging to the class of over 50 kW.

The tariffs were fixed until 2008, after which tariffs for new installations will decrease by 2% each year. The tariff for any particular installation is fixed for 20 years.

The legislation foresees that a revision of the reference tariffs will be made in the future, and would be applicable to those plants that go into operation after 2010.

1.6 Trading

Originally the Italian market was set up on the basis of a single buyer, Acquirente Unico SpA (AU). The parent company of AU is GSE. AU has the task of purchasing electricity in the market and selling it to distributors for supply to captive customers.

Gradually customers become eligible to choose their own supplier:

- From 1 July 2004, all non-household final customers (non-household customers as defined by Directive 2003/54/EC, art. 2, para.11) are eligible customers.
- From 1 July 2007, all final customers are eligible customers (thus including household customers).

Acquirente Unico will continue to procure electricity for final customers that have become eligible upon the above-mentioned date, until they exercise the right to choose their new distributor.

Italy has an optional central power exchange. In addition to the power exchange mechanism, bilateral contracts may also be entered into.

- There is a **forward market**, which wind and in general renewable can participate in. In this market (PCE – piattaforma in conto energia) the operator can make a proposal a maximum of 2 months before the closure day (D-1).
- The regulated market also known as the **Italian Power Exchange** (IPEX).

The market is highly liquid. In October 2007, liquidity on IPEX reached 67.3% [3]

Table 4: Trading on spot market compared to bilateral trading (TWh)

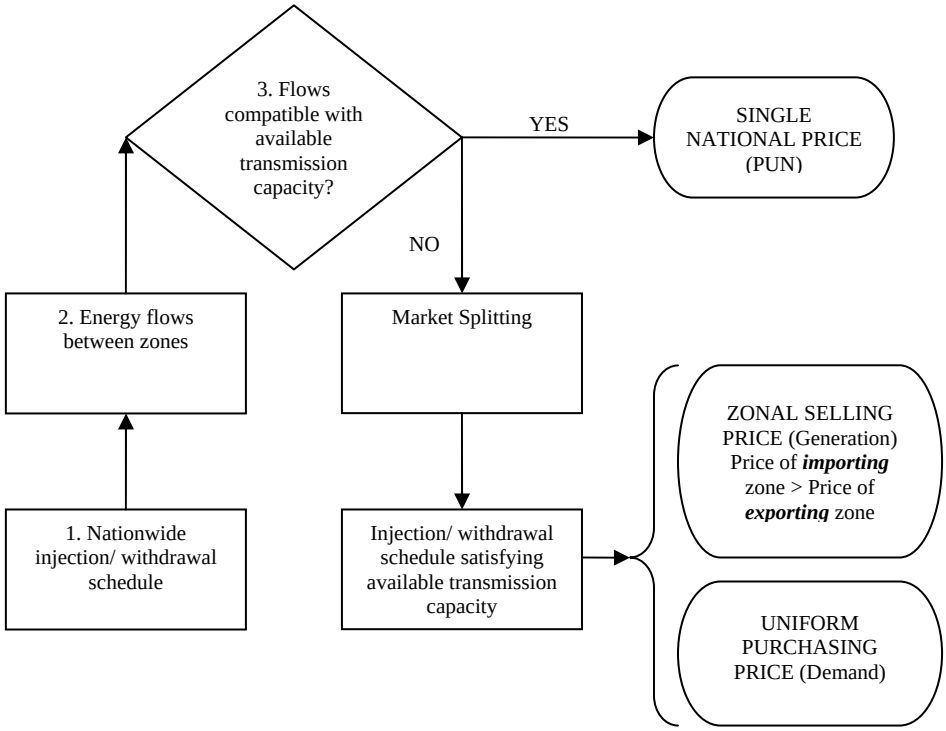
	Total consumption (net of pumping)	Trading on organised *spot day-ahead market* (net of pumping)	Trading on *forward market*	Bilateral trading – OTC and auto-consumption (net of pumping)
2002	310.7	0	0	310.7
2003	320.7	0	0	320.7
2004	325.4	65.3	0	260.1
2005	329.4	194.9	0	134.5

It is run by the Electricity Market Operator (Gestore del mercato elettrico S.p.A., GME) can be divided into two sub-markets:

- ***The day-ahead market*** *(Italian acronym MGP, for mercato del giorno prima) the MGP operates from D-9 till D-1 at 9 am. The minimum to be sold and bought is 1 kWh.*
- ***The adjustment market*** *(mercato di aggiustamento, MA). The MA opens at 10.30 after notification of the MGP results and closes at 14.00. It is not accessible to wind power or any other variable generation.*

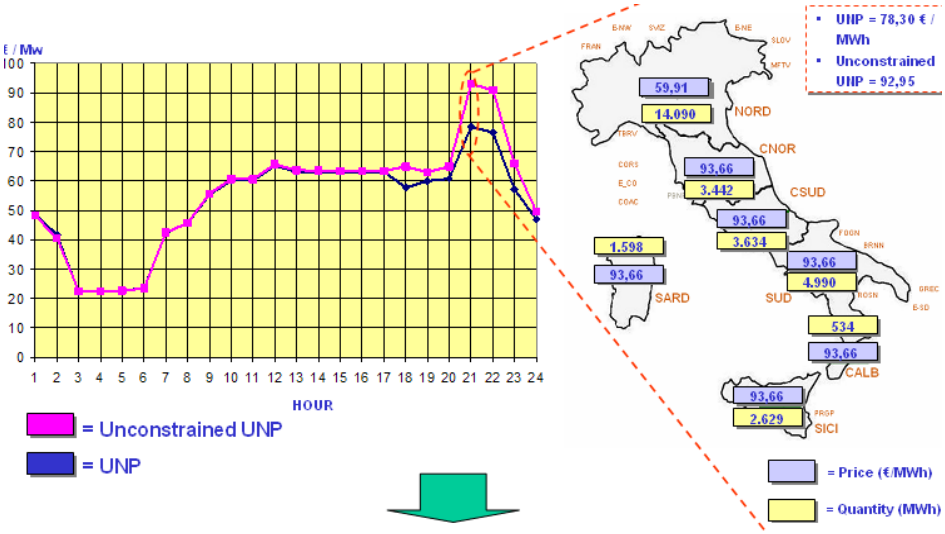
The offers/bids that GME receives are assessed only at the end of their submission. Then, they are processed and selected by GME on the basis of an economic merit order, so as to optimise the value of the transactions, while fulfilling the transmission constraints. The accepted offers/bids pay or receive a clearing price, the National Single Price (Prezzo unico nazionale, PUN). If there is no congestion, PUN is the same throughout Italy. When there is congestion, the price varies from one zone to the other, but only for generators. The market information system determines the value of each accepted offer/bid; this value is equal to the product between the accepted quantity, adjusted for transmission losses, and the price of the offer/bid.

Figure 2: Market Spliting in the Italian Electricity System



If there is congestion on the system, demand must buy electricity at the uniform purchasing price. This is likely to be higher than the unconstrained PUN due the effect of constraints on the merit order. The price generators receive becomes zonal if there is congestion, with higher prices in zones where demand exceeds generation. These zonal prices tend to be lower in the north and higher in the south (net flows are from north to south).

Figure 3: The example of hour 21 on 14th August 2007 (here UNP = PUN) [3]



- Finally, there is a balancing market, known as the **Dispatching Service Market** (mercato per il servizio di dispacciamento, MSD). This opens at 14.30 after notification of the MA results and closes at 16.00 on D-1.

Plants fed by non-schedulable renewable sources, or with installed capacity lower than 10MVA, can sell the energy they generate at the pool price, benefiting from a priority dispatch. Also, producers have he option to sell the product of the renewable energy plant directly to the grid operator managing the line to which the plant is connected through a "regulated access" system managed by GSE. Those plants benefit of special treatment for dispatching and grid transport. The electricity receives the average monthly price and not the hourly one.

1.7 Despatch

Rules are made by the TSO (Terna) for the high voltage and extra high voltage transmission network. Rules are made by the operators for the medium and low voltage grid. Production programs are made on hourly basis.

The exchanges of electricity that are notified to GME, together with the commitments arising from bilateral contracts or from purchases in the Electricity Market, determine the binding schedule of each withdrawal point.

Prioritized dispatching is given to variable renewable generators.

1.8 Notification

Gate closure for notifying traded & physical positions is at 9:00 am in D-1. The balancing market closes at 16.00 on D-1. By this point all planned dispatch will be decided and notified.

1.9 Imbalance Settlement

The balancing system doesn't affect "non predictable" energy sources such as wind farms, which cannot participate in the MSD.

The TSO will have decided on planned dispatch based on the MSD results soon after gate closure at 16.00 on D-1. Throughout the day of delivery in real time they will accept offers and bids in their merit order in order to balance the system

In case of plant with capacity < 10 MVA, the TSO assembles more power plants in each market zone assigning them only one dispatching point and appointing a unique referent responsible for the compliance with the grid operator requests.

1.10 System Balancing

MSD has been operating since April 2004. This market is intended to ensure the "physical" balancing of electricity demand and supply by addressing imbalances between scheduled and actual flows. In this market GSE and Terna procure the resources needed to solve congestion, ensure balance and provide an adequate system reserve. Balancing is carried out on a 15 minute basis.

The market is held in two sessions: the first, which takes place immediately downstream of the adjustment market, is where the TSO buys and sells electricity to generate reserve margins and solve any residual congestions (ex ante MSD); the second lasts for the whole of the following day and is used by the TSO to buy and sell electricity to balance the system in real time (ex post MSD).

The MSD has a very different nature to the other energy markets. The average prices of step-up and step-down offers/bids actually bear little relation to the prices recorded in the MGP. Operators' average sales prices are also considerably higher than the value attributed to electricity on the MGP, while purchase prices are lower, as a reflection of the diverse structure of this market and the different nature of the resources traded in it. In 2005 GSE/Terna's average purchase prices on the step-up MSD was €96.29/MWh, while the average sales price was €22.03/MWh.

The imbalance cost is split between generation and demand. There is an hourly price. The cost of balancing wind generation is socialised.

2 CROSS BORDER TRADING

Italy is connected with its direct neighbours France, Switzerland, Austria and Slovenia. Power exchange further takes place with Greece via submarine cables. This chapter covers all these interconnections except the French border which is dealt with in the chapter on France.

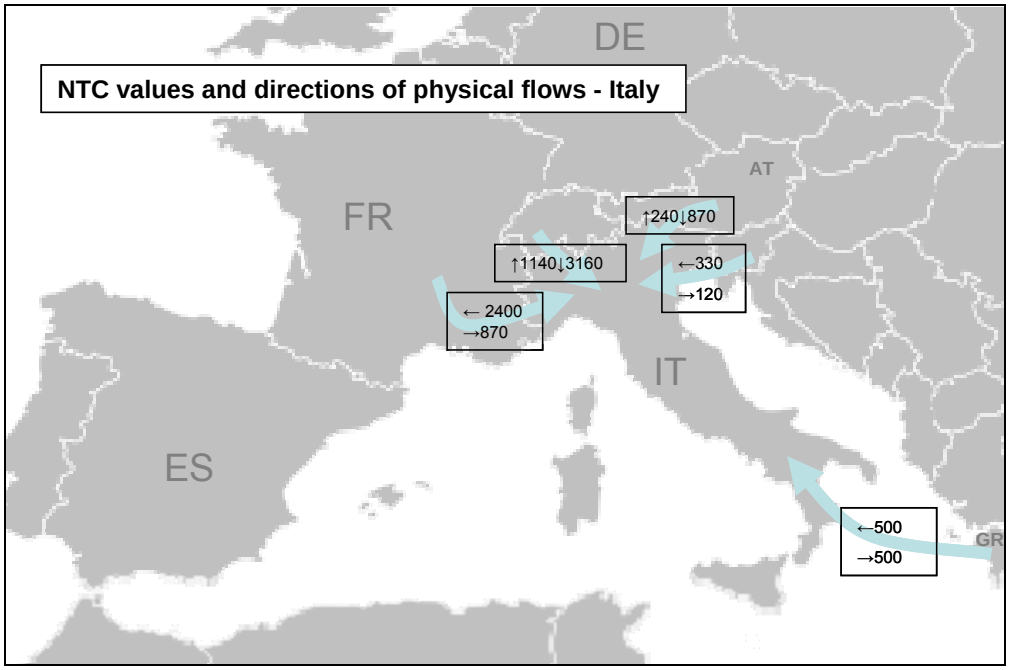
2.1 Current Cross Border Flows

A significant price differential still remains between IPEX and the other EU exchanges. In the period from January 2005 to June 2006 the IPEX showed the highest price for peak-load hours, with the average price as much as double that of the other European markets. Even in off-peak periods, the Italian price was one of the highest over the period as a whole. As a result of this price differential, interconnector flows were generally in the form of imports (50,264 GWh in 2005, i.e. 15.2% of national consumption) with occasional exports (1,109 GWh in 2005).

Despite high volumes of electricity trading with neighbouring countries, there is not yet true market integration, given the persistant congestion and transmission constraints which prevent alignment between the Italian price and prices in the other markets. The methodology applied until 2006 for congestion management was not compatible with EU rules;

The map below (Figure 4) depicts the NTC values as calculated by the Italian TSO TERNA and its neighbouring counterparties and also indicates the flow direction of average physical transfers in 2006.

Figure 4: NTC values and Average Physical Energy Flow direction in 2006[1]



The Italian transmission grid is interconnected to the rest of UCTE Power System by means of 18 interconnection lines: four with France, nine with Switzerland, one with Austria, two with Slovenia, one underwater direct current cable with Greece and one underwater direct current cable between Sardinia and Corsica. The cross border interconnectors can be summarised in three independent axes:

- North-occidental part: Italy-France; Italy-Switzerland
- North-oriental part: Italy-Austria; Italy-Slovenia
- Southern part: Italy-Greece

Through the interconnection lines along the Northern border - seven lines at 380 kV and nine lines at 220 kV - Italy imports approximately 16% of its requirement every year, a percentage that places Italy as the leading importer of electricity in Europe.

Table 5 summarises the destination of import capacity by border for the year 2007, indicating the different products sold, the available and allocated capacity. The prices shown are the price of the capacity and the price per MWh assuming full utilisation.

[1] Source: UCTE, ETSO

Table 5: Destination of import capacity by border for 2007 [2]

Border	Product	Available Capacity MW	Allocated Capacity MW	Price €/MWh	Price €/MW
France – Italy	Baseload	1,000	1,000	15.12	132,451
	Winter Baseload	-	-	-	-
	Baseload August excluded	600	600	16.16	129,539
Switzerland – Italy	Baseload	365	365	11.00	96,360
	Winter Baseload	305	305	6.25	31,800
	Baseload August excluded	520	520	10.58	84,809
Austria – Italy	Baseload	182	182	15.21	133,240
	Winter Baseload	-	-	-	-
	Baseload August excluded	-	-	-	-
Slovenia – Italy	Baseload	50	50	7.87	68,941
	Winter Baseload	-	-	-	-
	Baseload August excluded	100	100	8.02	64,288

2.1.1 Government Legislation

In 2007, the Ministry of Production Activities, with laid down the rules for electricity import and export [6]. The new cross border management discipline established in [6] foresees joint allocation of the interconnection capacity on the French, Greek and Austrian borders. The interconnection capacity referring to the Swiss and Slovenian borders was assigned by the respective national grid operators. However, auction mechanisms have also been introduced in the interconnector rules for 2008 [5].

Explicit auctions are used to allocate the available capacity, organised on an annual, monthly and daily basis, with execution procedures elaborated by the grid operators. The auctions assign the market operators titles denominated in Italian PTRs (Physical Transmission Rights), which authorise the import or export of energy in a quantity equal to the sum of the PTRs purchased. PTRs may be freely traded among dispatching users.

2.1.2 Potential Future Interconnector Capacity

New private crossborder lines previewed in the short to medium term will increase the NTC by about 1000-1500MW: a 380kV interconnection to Slovenia (Udine-Okroglo) and a 132kV interconnection to Austria (Prati di Vizze-Steinach).

A Sardinia-Italian mainland 1,000 MW, 420 km submarine link is under construction is expected to be completed in mid-2009.

Land line projects to neighbouring countries include building an additional 1,000 MW capacity interconnector to Slovenia and studies on increasing the Valchiavenna link to Switzerland.

Terna has signed a Memorandum of Understanding with its French counterpart RTE to increase interconnection capacity between the two countries by 60%. Joint projects for grid optimization and extension are to due to begin, including a feasibility study for a new 1,000 megawatt high voltage DC interconnector which will cross the border via a security passage in the Frejus tunnel, or an alternative equivalent solution.

Terna SpA is also studying possible interconnector links across the Adriatic sea to link Italy's electricity grid with those in Balkan countries via submarine cables. Links to the Balkan power market would give Italy access to power from its hydroelectric plants and coal-powered plants, costing 30 % less than electricity produced in Italy. Terna is cooperating with Balkan countries on technical assistance for their own grid networks, and in addition sees scope for identifying generation projects, in which other Italian companies could take stakes.

Interconnector studies concern two 300km submarine cables to Albania (Durazzo) and Montenegro and a 240km long link to Croatia (Konjsko). All three links would add either 500 or 1,000 MW in capacity. In particular Croatia is currently a net importer of electricity and Terna sees the country as playing a transit role in power exchange with Italy, with the possibility that the potential for this may increase in the light of Croatian investments in coal and gas-fired power plants. An agreement has therefore been signed with Croatian power grid operator HEP-OPS for a feasibility study.

Studies are also underway for links to North Africa with technical and economic conditions already examined for a 1,000 MW link between Sicily and Tunisia. To Algeria, two connection alternatives have been identified, both for 500 or 1,000 MW, to either Sardinia or the Campania mainland region. Terna is carrying out joint studies with the Libyan operator for a connection to Sicily via Malta with a capacity of 500 or 1,000 MW.

2.2 Cross Border Capacity Mechanisms

The ATC on each interconnection is offered by the respective Auction Operator in form of Physical Transmission Rights (PTRs).

At each interconnection, the neighbouring TSO has, together with Italian TSO TERNA, commissioned auction operators to allocate the available transfer capacity (ATC) each year, in both directions. The auction operator operates the auctions and the secondary PTR market.

Terna specifies access rules for cross border power exchange with neighbouring TSOs in its Capacity Auction Allocation Rules. A number of conditions apply equally across all borders, as stated below

Time blocks sold: Yearly Base, Yearly Base without August or maintenance period, Monthly Base, Monthly Peak (Mo-Fr, 8:00h-20:00h), Monthly Off-Peak (outside

	peaktime), Daily Hourly or Individual
Volume constraints:	1 PTR = 1MW
Method of initial sale:	Explicit auctions
On-sale allowed?	Yes, D-2 12.00h
Restrictions:	Bid file with max 10 bids

PTR holders can assign counterparties:

- As for capacity allocated in yearly and monthly auctions, for PTRs nomination the PTR holder can designate as his counterparty(ies) a legal entity(ies) allowed to make nominations to the neighbouring TSO.
- As regards daily nominations, the PTR holder shall be considered himself as counterparty.

2.3 Cross Border Trading

The following rules apply uniformly to all exchanges from Italy to a neighbouring country. Daily auctions for export capacity to Italy from neighbouring countries are subject to different time schedules and laid out below per border.

Capacity firmness:	firm
Notification of available capacity:	Yearly: D-5; Monthly: D-2 Daily: 7:50h on D-1
Latest auction:	Daily: 7:50-8:20h on D-1 (7 days/week)
Notification of allocation to user:	Yearly/Monthly: 2hrs after gate closure Daily: 8:30h on D-1
Notification of schedule to market system operator/TSO:	As set out per border.

Curtailment

Yearly and Monthly PTRs are offered on a firm basis except for cases where curtailments are necessary due to circumstances that constitute *force majeure* or due to network security reasons.

In case of PTR curtailments for network security reasons, the PTR holder is compensated at 100% of the clearing price paid corresponding to the hours of curtailed PTRs. However, PTR curtailment for network security reasons is allowed up to 35 equivalent days or 840 hours. PTRs acquired through Yearly and Monthly auctions are curtailed on a ‘pro rata’ basis. Beyond this limit, the PTRs are guaranteed.

Daily PTRs are offered on a firm basis except for cases where curtailments are necessary due to circumstances that constitute *force majeure*.

Ancillary Services

The TSO procures ancillary services from the MSD (the Ancillary Services Market).

Although this market closes on the day ahead of delivery, the process of acceptance of offers/bids takes place in two stages:

- immediately after gate closure, (i.e. as planned) when the accepted offers/bids are used to revise the injections and withdrawals scheduled to relieve any residual congestion not managed in the other markets and to create the reserve margins needed to guarantee the security of the system;
- throughout the day of delivery (i.e. in real time), when offers/bids are accepted in merit order to balance the system in real time.

"Non predictable" renewable energy sources (like wind) can not participate at the MSD.

2.3.1 Greece – Italy

Available capacity is notified for daily auctions between 6.45 and 7.15h on D-1. The daily auction then takes place until 8h, 7 days/week. The time slot for the auction for Greek imports is hence smaller (45min as opposed to one hour) and starts later but ends earlier (8h as opposed to 8.20h). Allocated capacity rights are notified to the auction participant between 8.05h and 8.30h after auction closure and schedules need to be notified for the next day by 14h. Schedules for capacity obtained in annual or monthly auctions needs to be notified by 6h on D-1.

The bid submission mechanism is based on the encryption of the submitted bid in two phases: a) submission of the encrypted bid and, b) submission of the encryption key, as described in detail in the "Electronic Web Offer Submission System - User's Manual", as follows:

- Gate opening for the submission of the encrypted bid: 07:15 - 07:45
- Silence period: 07:45 - 07:50
- Gate opening for the submission of the encryption key: 07:50 - 08:05

2.3.2 Slovenia - Italy

As for imports from Slovenia to Italy, available transfer capacity (ATC) is notified to the participants initially before 18h on the day before the auction. Final ATC is then announced at 7.45h while the latest auction for day-ahead capacity starts at 8h, Monday to Friday. Auction closure is at 8.30h and allocation is notified 30 minutes after. The successful participant then needs to notify its schedule for the next day before 14h; for annual and monthly capacity, usage has to be notified by 7h on D-1, hence enabling the announcement of ATC for the day-ahead auction. Nominations made in both directions for capacity allocated in yearly and monthly auctions are binding.

2.3.3 Austria – Italy

ATC is notified to the auction participants on D-1 before 8h but bids can be submitted between 7h and 8.05h. Participants are informed of the auction outcome 30minutes after auction closure and the schedule for the next day needs to be presented to the TSO by 14.30h the same day. For capacity from annual and monthly auctions, usage needs to be notified by 7.15 on D-1.

2.3.4 Italy – Switzerland

After ATC notification at 7.45h on the auction day, bids can be submitted between 7.45h and 8.15h. Results are announced 30minutes after the deadline and the schedule for next day's usage has to be presented by 13.30h. Annual and monthly capacity usage needs to be notified by 7h before the daily auction.

2.4 Renewable Support Mechanisms

2.4.1 Italy – Green Certificates

Generators and importers purchase 'green certificates' which certify that the power has been generated on their behalf by other generators (in Italy or abroad) [7].

GCs can be freely traded directly between private parties or, at least theoretically, on the Energy Stock Exchange. To date, national implementing legislation does not provide for any rules to limit or regulate the trade of GC in Italy. It is possible to export GC in order to sell them on foreign Energy Stock Exchanges or via private trading abroad, but only together with the renewable energy they represent [8].

2.4.2 Greece

Greece has introduced the following mechanisms to stimulate the growth of RES-E:

- Feed-in tariffs were introduced in 1994 and amended by the recently approved Feed-in Law. Tariffs are now technology specific, instead of uniform, and a guarantee of 12 years is given, with a possibility of extension to up to 20 years.
- Liberalisation of RES-E development is the subject of Law 2773/1999.

2.4.3 Slovenia

In Slovenia, the RES-E policy includes the following measures:

- RES-E producers can choose to receive either fixed feed-in tariffs or premium feed-in tariffs from the network operators. A Purchase Agreement is concluded, valid for 10 years. According to the Law on Energy, the uniform annual prices and premiums are set at least once a year. Between 2004 and 2006, these prices have stayed the same.
- Subsidies or loans with interest-rate subsidies are available. Most of the subsidies cover up to 40% of the investment cost. Investments in rural areas with no possibility of connection to the electricity network are eligible to apply for an additional 20% subsidy.

2.4.4 Austria

Austria also pays a feed-in tariff to RES installations, based on production costs, and gives RES connection priority to the grid. Concession to buy and sell RE is only given to companies who have residence and main administration within the Austrian federal area ("Bundesgebiet").[2]

2.4.5 Switzerland

Switzerland supports RES development by a feed-in tariff and prioritisation of RES in grid connection and construction of facilities.

2.5 Utilisation for Variable Generation

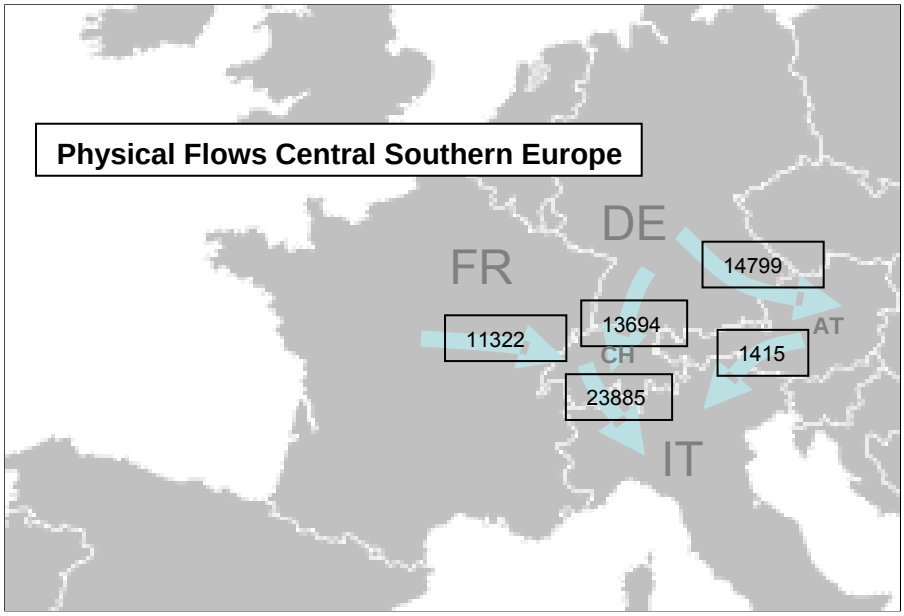
Italy is a net importer of electricity with weak interconnector capacities. It also has a large concentration of hydro capacity in the North. These bottlenecks may not necessarily constrain large wind power generation within Italy; however, they would probably constrain the import of wind energy from the North.

Nevertheless, consideration of average flow directions from Germany and France to Switzerland may suggest that Swiss exports to Italy are a result of combined flows from France and Germany and hence at least partially subject to wind production in Northern Germany, impacting on price levels in the South.

It has previously been stated (see country report on Germany) that markets South of Germany tend to converge with German price levels. Figure 5 isolates the physical flows from Germany and France across Switzerland to Italy.

[2] Austrian Oekostromgesetz Art.10 and Art.14b

Figure 5: Physical Flows across Central Southern Europe



3 GRID PLANNING

This section investigates some of the issues associated with integrating renewables within the transmission and distribution grid.

3.1 Grid Investment

Terna currently owns over 90% of the national transmission grid, while the remaining infrastructure is owned by 13 of municipally owned companies and electricity producers.

High Voltage electricity transmission (380 kV, 220 kV and 150 kV) is Terna's responsibility. Approximately 98% of High Voltage transmission lines are owned by Terna.

3.1.1 Mechanism for determining grid investment

Grid Development principles are set out in the Grid Code. The TSO (Terna) annually prepares the Development Plan for the transmission grid according to the following objectives and criteria:

- ***Development Objectives***

  The TSO aims for security, reliability, efficiency, continuity of supply of electrical energy and cost reduction. Grid planning aims to reach an appropriate level of quality of service and reduction of congestion, while complying with environmental and landscape law restrictions.

- ***Planning criteria for transmission system development***

  The planning process for development activities on the transmission grid begins with the analysis of:

  - forecast of electricity demand and its geographical distribution;
  - location and capacity of new generation plants;
  - forecasts of cross border energy exchanges; and
  - development of other grids with third party access that are interoperated with the national system.

  For the target year, one or more probable operational scenarios for the electrical system are identified and "reference cases" are created to identify possible critical states in grid operation. These scenarios also take into account forecasts for power dispatch which are based, among other factors, on the estimated costs of production,

differentiated depending on the type of fuel and the efficiency of the plants and market results.

The TSO verifies the security of the operating conditions using the ***"n-1 security criterion"***. This provides for adequate redundancy of the elements that make it up, so that:

- in typical load/production situations for the forecast (with all elements of the fully operational grid) supplies are guaranteed without violating the normal operating limits of the grid; and
- the unavailability of any single element of the transmission system does not cause it to exceed the permitted operating limits or cause load interruptions (except for interruptions that concern only the out-of-service element, i.e. for plant connected in antenna – see Section 3.3.1).

The n-1 analysis identifies grid problems and possible solutions for reinforcing the transmission system. The various alternatives are evaluated from a technical-economic point of view by comparing the estimated investment costs of the project with the related benefits in terms of reduction of overall system costs.[3]

Development of the transmission system is closely correlated to the connection of new users, even though the two processes are distinct, both in terms of when they are carried out and the method used.

- **Timing:** the analysis of connections to the transmission system is a continuous process, which is activated with every new connection request, while the planning process cycles annually (and comes after the phase when the connection solution is chosen, mainly in order to get a more reliable overview of programmes).
- **Method used to define the connection solutions:** the TSO analyses each connection project, deferring subsequent development of the transmission system. In the process of planning reinforcements, the TSO carries out analysis on the reference scenarios considering the power plants already existing and expected in future, in order to guarantee the security of the entire transmission grid. This phase defines the necessary NTG reinforcements, with the following objectives:
  - maintain n-1 security of the reference forecasting grid;
  - reduce any grid congestion caused by new plants; and
  - reduce restrictions for limited production centres.
- **Load flow analysis:** is generally carried out according to the n-1 criterion and includes evaluation of the probability of

[3] These evaluations take into account: costs of grid congestion, foreseeable trends in the electricity market, level of imports/exports with other countries, network losses and risk of non-supply to users.

production of these types of plant (in particular for plants running on renewable sources which cannot be scheduled).

Terena's development plan is checked and approved by the Ministry of Productive Activities (MPA) for verification of its compliance with the policies issued by the Ministry[4].

3.1.2 Strategic Environmental Assessment

The SEA (Strategic Environmental Assessment) is intended to promote grid development while respecting the environment and landscape. In consistence with EC Directive 2001/42/EC, the SEA aims at guaranteeing high levels of environmental protection and at promoting participation in decisions on the part of Regional and Local Bodies and local communities.

In recent years, Terna has launched an experimental SEA process applied to the electricity grid's Development Plan in order to promote close integration of planning measures with their effects. In particular, the experimental SEA process promotes the following:

- Coherence with programs, projects and international, national and regional policies
- Analysis of the social, environmental and financial conditions
- Sharing the motivations for implementing the projects
- Assessing and comparing project alternatives

The planned development activities are submitted to the authorities at national and regional level with the objective of selecting the most practical implementation alternatives and of reducing authorisation times. The SEA process actively involves various different administrative bodies, including the Ministry for the Environment and the Territory, the Ministry of Cultural Heritage, the Ministry of Economic Development and various different Regions.

3.1.3 Offshore

Italy's first offshore wind applications are being planned. A large project (around 300 MW) planned by Gamesa off the northern Apulia coast and other initiatives are under consideration in the Calabria and Sicily regions. Enel is also considering a new design for a wind platform off the Tuscany coast.

Offshore plants are subject to an authorization procedure:

[4] Required by Law no. 290/2003 (modified by Law no. 239/2004)

- The Italian Navigation Code (INC) and the Application Guide of INC (AGINC) are the reference legislation for the installation of offshore wind farms in Italian national waters[5]. Special permits are considered for offshore Wind Farms, because of the long impact they can have on navigation, fishing, marine sport, and others.
- Many other Administrations are involved in processing the installation permits: Ministry of Transport, of Defence, of Environment, of Industry, of Civil Works, of Sea and Terrestrial Resources (General Direction of Maritime Fishing) and others.
- The Environmental Impact Evaluation is expected to be necessary, even though no clear policy is applied today.
- Permits are issued by the Compartment of Maritime Transport and shown to local and regional authorities for public information.
- The installation of Offshore wind farms is under the control of the local Harbour Authorities via the Coast Guard.
- Safety features for navigation and aviation are required. Information on the offshore plants must be submitted for inclusion on the nautical charts.

3.1.4 Interconnectors

When planning grid developments the TSO considers projects which are aimed at increasing the transfer capacity on interconnections with the electrical systems of other countries, to fulfil the emerging needs for the running of the electricity market. The TSO also considers any new electrical interconnectors constructed or planned[6].

There are persistent congestion and transmission constraints between Italy and other markets. Terna is actively pursuing options for new connections to numerous jurisdictions, including the Balkans and North Africa, as well as options to strengthen existing connections, including those to France.

3.2 Planning & Security Standards

The Italian transmission system is relatively constrained, in part due to the significant imports from France and Switzerland, which alone account for around 15% of electricity on the Italian system and cause significant North-South flows. These constraints have been reflected in the zonal design of the power market, which result in a nodal price being set for power potentially in each of the seven Italian market nodes (zones).

When accounting for system security in grid planning, wind production is taken to be zero, due to the extreme unreliability of estimates of levels of wind generation.

[5] Specifically art.36 and following of INC and art.5 and following of AGINC (for the type and format of application documents)
[6] As required by article 1-quinquies, paragraph 6 of Law no. 290/2003 and by Directive 1228/2003/EC

Historically, developers have complained of difficulties connecting wind plants to the electrical grid. New rules were issued by the Regulatory Authority for Electricity and Gas at the end of 2005[7] concerning the economic conditions for connection to electricity grids by electricity generating plants using conventional and/or renewable sources. This gives renewable energy a favourable charging regime (see later). Despite this, the completion of several wind farms originally planned by the end of 2006 was subject to major unexpected delays in the grid-connection process [10]. Of course, the implementation of new procedures takes some time, so this position may improve.

3.2.1 Grid Code Requirements

The Transmission, Dispatching, Developing and Safety Code (Grid Code) [2] is applied in relations between Terna and grid users starting 1 November 2005. This document was drawn up in compliance with the provisions stated in the Prime Ministerial Decree of 11 May 2004 regarding unification between ownership and management of the grid.

The provision of some types of balancing and reserve power can be required from plants that have the ability to provide it. All plants have to meet certain technical standards. In addition to these general standards, CEI have produced a specific set of standards for the performance of wind generation [9].

3.3 Transmission Access & Charging

3.3.1 Transmission Connection

Difficulty connecting wind plants to the electrical grid has been a frequent complaint in years past.

It seems to have bothered some developers in 2006 [4] as well, despite new rules issued by the Regulatory Authority for Electricity and Gas at the end of 2005 (Provision 281, 19 December 2005). Actually, the completion of several wind farms originally planned by the end of 2006 has not yet happened due to major unexpected delays in the grid-connection process. Of course, the implementation of new grid-connection procedures takes some time, and some aspects of the authority's new provision still require clarification and fine-tuning.

Connection applications for plants with a connection power greater than or equal to 10 MVA, are submitted in writing to the TSO, Terna.

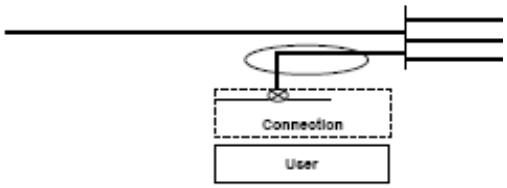
Terna examines the connection applications to determine the most suitable connection solution to guarantee the continuity and operating security of the grid, taking into account technical and economic aspects of the

[7] Provision 281, 19 December 2005

connection works. Terna also identifies any intervention on the existing electricity grid which is strictly necessary to satisfy the connection application as well as the transitory operating procedures to implement for the plant until the reinforcements are complete.

In general, connection solutions on parts of the grid which are less congested are preferred. Also, where possible, connections are made in antenna on existing stations (see figure below).

Figure 6: Connection on existing stations in antenna (Grid Code, [2])



Generally used if the distances between the connection stations are less than 20 km. For plants requiring high availability (such as base generation plants with total capacity of over 100 MVA), connection in antenna may be implemented with several lines.

The choice of connection solution may be influenced by the following:

- the type of power plant (thermoelectric, hydroelectric, wind power, etc.);
- the number and size of the generator groups;
- the presence and extent of proprietary loads, with particular regard to essential loads;
- the contribution to short circuit currents.

The TSO prepares the Minimum General Technical Solution (MGTS). To verify the suitability of the selected solutions, the TSO refers to the typical operating conditions assumed during planning of the NTG (such as forecasted peak or minimum load). Terna may specify a solution involving connection to a grid belonging to another operator. If this is the case, then the operator of that grid shall construct the grid connection.

Following a connection application, the Operator prepares the MGTS and notifies the applicant party of this within 90 days of the date of receipt. The MGTS is accompanied by construction times of the grid connection plant and the necessary interventions on the existing electricity grids and the costs of constructing the plants and the interventions.

The TSO may refuse connection applications, giving proper justification[8]. The TSO may also choose to implement technical solutions other than the minimum, in which case any further costs over and above the minimum technical solution are the responsibility of the TSO (socialised through transmission charging).

[8] pursuant to Article 3, paragraph 12, of Legislative Decree no. 79/99

For the connection of generation plants with thermal power less than 300 MW[9] or generation plants powered by non-renewable sources[10], the applicant has the right to request to directly conduct the grid connection procedure. In 2005, a decree [11] in compliance with the Regulation 1228/2003/EC, sets the conditions for issuing the exemption to third party access rules by private parties (so called Merchant lines). These third-party access obligations apply to the entire Italian transportation system—including transmission and distribution.

3.3.2 Connection Charging

A grid user builds their connection line and pays the shallow costs of this connection.

After obtaining all the authorisations necessary for the construction and operation of the grid connection assets and of any interventions on the existing electricity grids which are strictly necessary to satisfy the connection application, and at the same time as the MDTS request, the party applying for connection is required to pay the TSO (Terna) a fee.

Fee for connection in 2007 from Terna's grid code [2]:

- Fixed fee: €2,500
- Variable fee: €0.50/kVA
- Maximum ceiling: €50,000

For connection applications for production plants using renewable sources, the fee is reduced by 50%.

In all cases where the construction of the grid connection assets is carried out by the party applying for connection, the connection fee is zero. The TSO is required, in the case of plants running on renewable resources, to pay the party applying for connection the fee determined by the AEEG (Italian Authority for Electricity and Gas).

Payments by the TSO in 2007 if a renewable generator connects (up to a maximum number of km) from Terna's grid code [2]:

- PLC (parameter for underground cables): €100,000/km
- PLA (parameter for overhead lines): €40,000/km

Enhancements of the grid are socialized in the transmission tariff.

[9] not subject to law no. 55 of 9 April 2002
[10] not subject to legislative decree no. 387 of 29 December 2003

3.3.3 Transmission Access

Because the zones with a high concentration of renewable are more congested this determines the need of a dispatching reduction for those plants in order to guarantee the security of the grid.

- ***Payments if constrained down:***

  If the TSO has to partly or totally limit production, in order to make the quantities accepted on the energy markets compatible with the transmission limits of the grid, the corresponding changes apply[11]:

  - the price of the Mercato del giorno prima (MGP) for the zone where the unit is located for generators not enabled for the dispatching/ balancing service; or
  - the energy buying price of the unit on the Mercato per il servizio di dispacciamento (MSD), for generators enabled for the dispatching/ balancing service.

- ***Congestion Payments***

  Electricity units that act in the forward market will pay for or receive CCT (Corrispettivo Capacita di Transito) in the case of congestion. This is calculated for each hour and zone. If the zonal price is lower than the PUN, the generator is contributing to congestion and therefore pays CCT. If the zonal price is higher than the PUN the generator is reducing congestion and therefore receives CCT.

3.3.4 Generator Transmission Charging

The majority of transmission charging is borne by load. About 8% is borne by generators, and this charging is on a “postage stamp” basis and is charged purely based on energy rather than capacity. All generators pay transmission charges, regardless of their size.

Transmission charges are defined by the regulator and published in advance. The calculation is made on the basis of a price cap.

The transmission tariff is calculated as follows:

- Fee for use of system, calculated on the flow of energy on a postage stamp basis, regardless of the distance between the injection and the off-take point; and
- Fee for the assignment of rights to access the transmission grid, calculated on the transmission schedule (this fee may increase in

[11] This rule does not apply to generators whose programmes do not conform to their production constraints. It also does not apply to generators whose reentry into service after a planned unavailability period is brought forward, for any unavailability of grid due to maintenance decided based on their original planned schedule.

instances where market prices become zonal due to congestion, in order to offset the congestion costs caused by injection and off-takes scheduled in zones divided by grid bottle-necks).

In order to hedge the risk of volatility of the latter fee, a system of exchange of transmission rights between system operators has been implemented (called CCC).

3.3.5 Transmission Losses

In the market information system, Market Participants enter offers/bids specifying quantities in respect of offer points.[12]

The market information system divides losses into two categories:

a) losses due to transmission of electricity from the offer point to the applicable grid supply point with which the offer point is associated;

b) losses due to electricity transmission from the applicable grid supply point to the clearing point.

The quantities of some generating units are up-adjusted for losses and those of other generating units are down-adjusted for losses. This is because the injection in some points may have a positive effect (decrease) on overall system losses, while in other points it may have a negative effect (increase).

[12] an offer point is defined as one or a set of electricity grid points, where deviations from injection and withdrawal schedules are determined, for the purpose of applying the balancing charges rules

ANNEX A – ABBREVIATIONS

Acronym	Definition
ATC	Avaliable Transfer Capacity
AU	Former single buyer, Acquirente Unico SpA
CCT	Congestion Price (Corrispettivo Capacita di Transito)
CEE	Central Eastern Europe
CEI	Comitato Elettrotecnico Italiano, the Italian institution that prepares and publishes technical standards in the electrical, electronic and telecommunication fields
CfD	Contract for Difference
CWE	Central Western Europe
DC	Direct Current
EC	European Commission
ETSO	European Transmission System Operators: ETSO is an International Association of TSOs.
EU	European Union
EWIS	European Wind Integration Study, initiated by the European Transmission System Operators
GC	Green Certificate
GSE	The body managing all RES support schemes (Gestore dei Servizi Elettrici)
GW	Gigawatt = 1,000,000 kW (unit of power/ capacity)
GWh	Gigawatt hour = 1,000,000 kWh (unit of energy)
IEA	International Energy Agency
IPEX	Italian Power Exchange
kW	Kilowatt = 1,000 Watts (unit of power/ capacity)
kWh	Kilowatt hour = 1,000 Watt hours (unit of energy)
MA	Adjustment market (Mercato di Aggiustamento)
MGP	Day-ahead market (Mercato del Giorno Prima)
MGTS	Minimum General Technical Solution
MPA	Ministry of Productive Activities
MSD	Dispatching Service Market (Mercato per il Servizio di Dispacciamento)
MVA	Megavolt Ampere (unit of measurement of apparent power)
MW	Megawatt = 1,000 kW (unit of power/ capacity)
MWh	Megawatt hour = 1,000 kWh (unit of energy)

Acronym	Definition
NTC	Net Transfer Capacity
PCE	Forward Market Operator (Piattaforma in Conto Energia)
PTR	Physical Transmission Rights
RES	Renewable Energy Sources
RETD	Renewable Energy Technology Deployment
SEA	Strategic Environmental Assessment
SO	System Operator
TSO	Transmission System Operator
TWh	Terrawatt Hour = 1,000 MWh (unit of energy)
UCTE	Union for the Co-ordination of Transmission of Electricity. The association of transmission system operators in continental Europe.

ANNEX B – GLOSSARY

Term	Definition
Bilateral	Trades or other contracts between two participants, for example a generator and supplier.
Capacity	Cf. Energy, Power. The maximum ability of a generating station to generate an amount of electricity in a given time. Measured in units of power (kW). The actual energy generated is dependant on the load factor.
Clip Size	The minimum size of interconnection capacity contracts.
Credit Cover	The cash or other financial security that must be provided.
Day Ahead	The day prior to the day that is being traded for or balanced.
Deep Connection Costs	Cf. Shallow Connection Costs. The costs of reinforcing and upgrading the wider network to enable additional generation or demand to be connected.
Energy	Cf. Power, Capacity. Formally defined as the ability for a system to do work. In the case of an electrical energy this is measured in kWh. Energy cannot be stored in the transmission network, so at any given time the total energy generated must equal the total energy demand and total losses (due to heating of wires etc.) This is known as balancing the system.
Gate Closure	The last time at which energy can be traded before the markets are closed. Balancing trades may take place closer to real time on a separate balancing market.
Group Processing	This means that the grid operator puts applicants into a queue and groups them into areas or zones. Reinforcement is then carried out on selected zones to accommodate the applicants in that zone. There is no guaranteed timescale for connection.
Intraday	Within the day that is being traded for or balanced.
Load Factor	Also may be known as a capacity factor. The ratio of the actual energy output of a power plant over a period of time and its energy output if it had operated a full capacity of that time period. For example, an onshore wind farm might have a load factor of 30-40%. This means that on average it generates at 35% of its capacity, although at any given time it may be generating anywhere between 0% and 100% of its total capacity.
Locational	Cf. Postage Stamp. Differentiated by geographical location. For example, in the case of transmission charging, this typically will mean higher charges further from demand centres.
Long	Cf. Short. Where a participant has more generation than is required to balance their demand (including losses where applicable)
Main Price	Cf. Reverse Price. The balancing price where a participant is out of balance in the same direction as the market, for example a participant that is "short" when the market is "short".

Term	Definition
Merit Order	The order that a system operator will place generators in based on the costs to deliver a certain quantity of generation. Those generators that will allow the forecast demand to be met at the lowest costs (subject to system constraints) are described as being in the merit order and are despatched.
Postage Stamp	Cf. Locational. Uniform, equal throughout the network.
Power	Cf. Energy, Capacity. Power is the ability to create energy in a given time, and can be expressed in the following equation: $$Power(kW) = \frac{Energy(kWh)}{Time(h)}$$
Price Maker	Cf. Price Taker. In the context of an electricity pool, a price making generator will submit a number of bids/offers indicating how much electricity they would be prepared to despatch at a given price. The system operator will place the generators in order of cost to determine which plants will be despatched.
Price Taker	Cf. Price Maker. In the context of an electricity pool, a price taking generator will not submit a bid or will submit a bid at zero. This means it will always be despatched (subject to system constraints) and will receive the pool price. Price taking generators include variable generators with low marginal costs, such as wind.
Real Time	The actual time period that energy is being traded for or balanced.
Reverse Price	Cf. Main Price. The balancing price where a participant is out of balance in the opposite direction to the market, for example a participant that is "short" when the market is "long".
Shallow Connection Costs	Cf. Deep Connection Costs. The costs of physically connecting a generator to the nearest appropriate point in the transmission network, this may typically be the closest substation. This does not include costs associated with any required reinforcements to the wider transmission network.
Short	Cf. Long. Where a participant has less generation than is required to balance their demand (including losses where applicable)
Supplier	Normally used to describe a retail electricity supplier that sells electricity to final consumers, this can include domestic, commercial and industrial consumers
Vertical Integration	Vertical integration is the degree to which a firm owns its upstream suppliers and its downstream buyers. For example, within the electricity industry this can be used to describe the situation where a parent company owns both an electricity retail supplier and generator.

ANNEX C – REFERENCES

The authors wish to acknowledge the following persons for giving valuable information for the report: Natascia Falcucci (GSE) and Giuseppe Fiorentino (Terna)

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