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Introduction of Regional Energy Concepts

4.3.1 – 4.3.2 Clarification of regional energy supply chains – sectoral and grids



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Clarification of regional energy supply chains – sectoral and grids

MAIN PRIMARY ENERGY SOURCE

in Province of Torino natural gas is by far the most important source of energy supplied and in 2011 the dependency from it reached the 66% of total supply. As natural gas increased a lot its contribution to energy supply, on the other hand oil products decreased their supply in a very relevant way. This dependency increased in the second half of the past decade as few big CHP plants entered into force or were revamped so that local production of electricity overcame domestic consumptions, turning the Province of Torino from an importing Region to an exporting one. As it turned to be a self sufficient region for electricity, the dependency from natural gas raised even more.

Historically the province of Torino had an important production of electricity coming from hydropower plants and the amount of energy generated remained quite stable along the period, nowadays its contribution is around 20% of total electricity production.

As for renewable sources hydropower keep on being the most relevant (around 85%), while biomass and solar energy contribution for production is respectively 9% and 5,9% of total renewable electricity supply in 2011.

MAIN CONSUMER GROUPS

in Province of Torino the relevance of natural gas is very high in every sectors but in traffic, where oil products supply more than 84% of energy demanded.

If we consider the sectors where energy is supplied, we notice that Private Households keeps the same share of 35% in 2000 and 2011, whereas Trade and Service sector increased a lot (from 8% to 15%) to the detriment of Traffic and Industry.

Private Households

Private Households has a dependency from natural gas supply even higher than the total supply, as in 2011 it was up to 80% directly burned in end users boilers and by district heating, coming from the CHP plants fed by natural gas.

Renewable energy sources ranked as the second sources for importance with a share of 16%: biomass is the most important with more than 76% of total renewable energy supply, Solar energy has a marginal role (less than 3%), but it is foreseen its increase in the following years.

The use of oil is very limited (5% of total energy supplies) and it will disappear in the next few years whereas Liquid Petroleum Gas is the only oil product that keeps on growing and in 2009 it was more than 3 times higher than diesel, in those municipalities or areas not reached by the natural gas grid.

Trade and services

Total energy supply in Trade and Service increased by more than double (+230%) in the reference decade. The growth was driven by natural gas which increased by nearly 3 times and renewable energy sources which doubled, on the contrary oil products lost importance.

The overall trend of the sector is much higher than the average trend of total energy supply, as Trade and Service is the sector with the most fast growing demand of electricity.

The dependency from natural gas was, thus, in 2011 up to 83%

Renewable energy sources had in 2011 a share of 14% of total energy supply:

Industry

Total energy supply industry increased by 18% in the reference decade.

Industry has a dependency from natural gas supply even higher than other sectors, as in 2011 it was up to 90%. Also in this sector oil products lost importance.

Traffic

The total energy supply for mobility decreased by 16.5% in the reference decade.

Traffic sector has a dependency from oil products which was up to 99% in 2000 and decreased to 84% in 2011, as alternative fuels (natural gas) or energy carriers (electricity) were required by the market, whereas renewable energy sources are limited to 1% (at least 5% share of diesel supply must come by biological production. This is to say that the real share of renewable energy sources should be higher)

REGIONAL ENERGY SUPPLY CHAIN – GRIDS –

SECONDARY ENERGY PRODUCER

The energy generation system of the province of Torino is composed by several plants, most of which are quite small. Few CHP plants nearby the City of Torino give a mayor contribution to the overall production of electricity and are also feeding the large district heating system of the City of Torino and surrounding municipalities, which is on the way to be extended in the new few years with further important investments. Up to now, the district heating system of Torino is the largest in Italy and the extension planned will bring Torino as one of the leaders in Europe in this field.

Hereafter we highlight 3 examples of power generator.

1. The CHP system located in Moncalieri (800 MW el – 520 MW t) is the main provider of energy for the district heating system of the City of Torino, the system is made of 2 highly efficient CHP groups and one boiler that support the district heating system of the City in peak load demand. The plant is working with natural gas its electricity production is

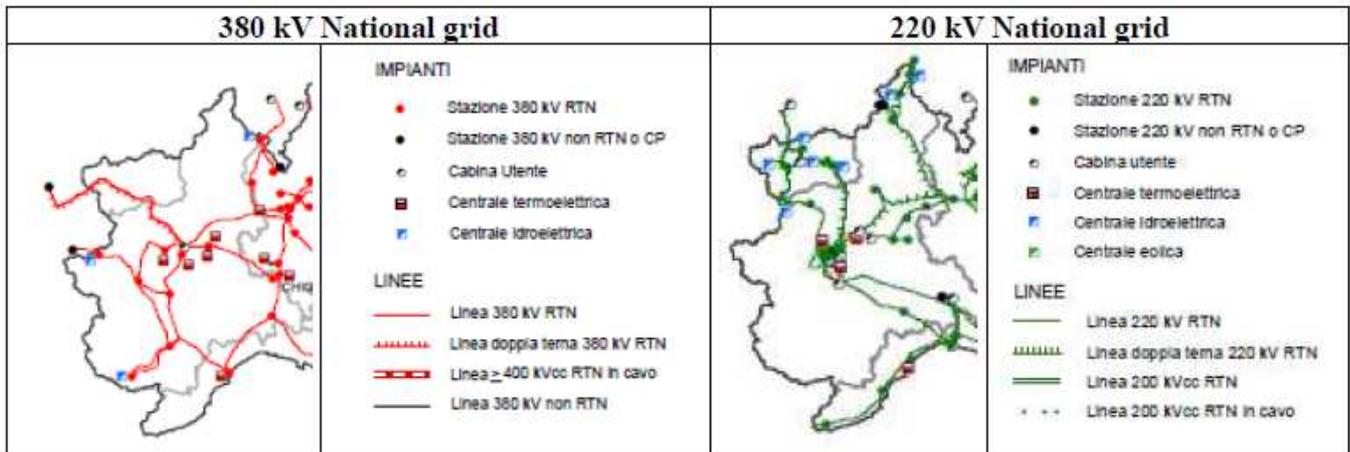
increasing over the years as this plant has a dispatching priority in comparison to other Power plant locally installed, as it supplies district heating. In 2010 this plant was able to provide more than 30% of all domestic production of electricity and in the last year its production was really close to its potential with around 8.000 working hours equivalent.

2. The Chivasso Power (1.179 MW el – from 2005 revamping) is the biggest of the province of Torino with more than 1 GW installed, it was built up in order to be able to combine heat and power, but up to now it has been operated only as electric generator. The plant is working only with natural gas and its consumptions and production was really very relevant between 2006 and 2008, when the plant was generating almost 45% of all domestic production of electricity. Nowadays the plant cannot work because without CHP generation it has not dispatching priority .
3. Airasca wood-chip power plant (13 MW el) is the biggest of these kinds in the province of Torino and gives a contribution of less than 1% of total domestic electric generation. The plant is CHP and provides heating for a neighbouring factory. The overall energy efficiency of the system is quite low (between 22% and 26%) but in line with similar plants.

SUPPLIERS AND DISTRIBUTORS – DISTRIBUTION PROCESS

Electricity Grids

The National electricity grid is wide spread with more than 311 km of high voltage grid and 487 km of 220 kV. The province of Torino is one of the cross border region of Italy and the exchange of electricity with France is one of the key point of the National electric system (more than 11.000 GWh are imported every year from France).



9 distributors are operating in the province of Torino: seven are very small utilities owned by Municipalities and are operating only in their own city, whereas Enel distribuzione is supplying 307 municipalities. The other big company is AEM Distribuzione which is supplying electricity mainly in Torino City and several areas belonging to neighbouring cities.

City grid is developed on 5000 km length, of which 2000 km operating under medium voltage (27kV, 22 kV e 6,3 kV), and the rest under low tension. On 2011 AEM distributed around 3.300 GWh of electricity.

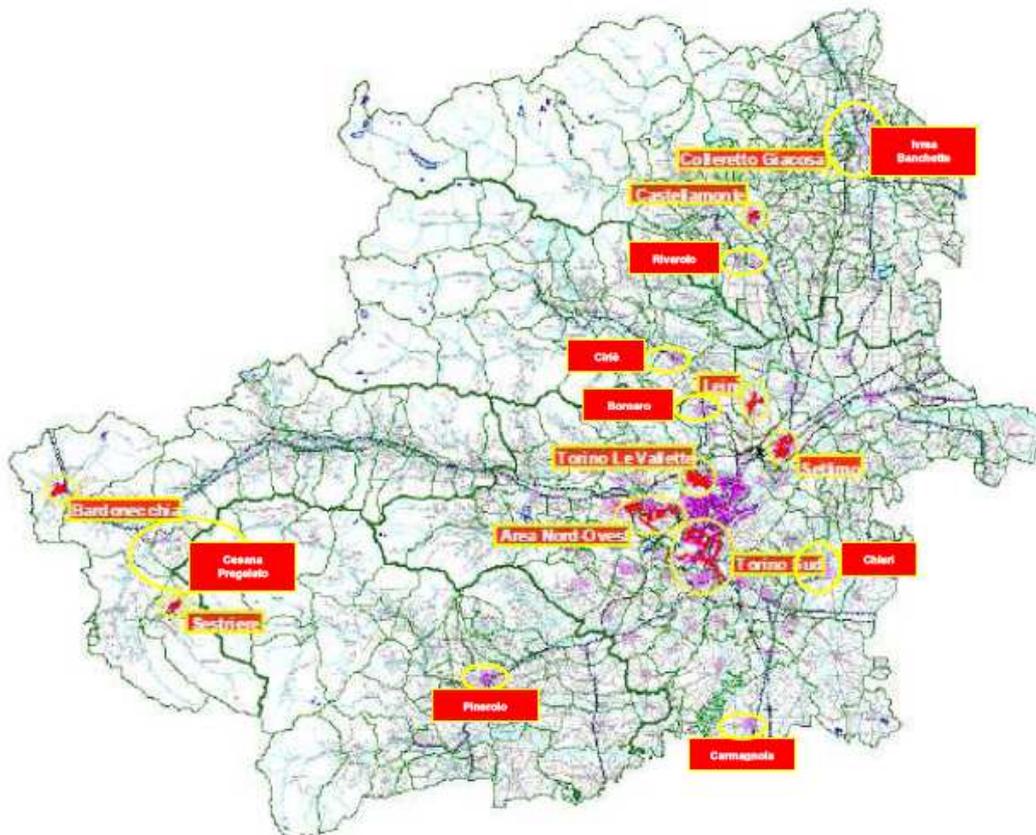
GAS Grids

The local gas grid of the Province of Turin (8.000 km of grid network and one million of customers) is operated by 15 gas distributors. The province has been divided into 6 areas and each area will have only one distributor. One of those, Italgas, is supplying 139 municipalities, more than half of the 264 Municipalities where the grid is in operation. 51 Municipalities have no gas grid (mountain area) but only 1% of the total provincial population is living there.

Distributors manage the local grid, but the total natural gas flowing in the province is carried by SNAM Rete Gas, which supplies either directly end users (such as power plants or industrial plants or filling stations) and local distributors grid. The total amount of natural gas transported in the province in 2011 was slightly more than 4 billion of cubic meters.

District heating grid

In the whole Province of Torino, as shown in the picture below, there are many different district heating grids, the oldest of them was built more than 30 years ago (in 1982 in the quarter of Turin named "Le Vallette" with a combined heat and power plant with Diesel engines), whereas many of them are actually developing, some others are still in project.



The most important part of district heating grids is located in the city of Turin and in the surrounding municipalities, where there is the highest density of buildings and population (about 1.300.000 inhabitants, more than half of the whole Province).

Also with consideration to air quality concerns, the city is developing the largest district heating grid in Italy for two decades, connecting three thermoelectric power stations and supporting boilers as shown in the picture below.

Almost all the heat in district heating grids (around 98%) is provided by natural gas, the rest part by biomass.

