

## 11. ITALY'S ENERGY SYSTEM

Italy uses less energy per unit of output than most of the other industrial countries, but in the last twenty years this long-standing advantage has diminished. Italian energy consumption has increased at basically the same pace as GDP, while in other countries it has grown much more slowly than output. Italy's very heavy reliance on fossil fuels, practically all imported, makes energy costs for the economy especially sensitive to world oil prices. In relation to GDP, spending on energy has risen by an average of 0.8 percentage points in the last five years and in 2008 was equal to 3.8 per cent.

Energy prices to final users are higher than the EU average. The cost of electricity generation depends largely on the price of natural gas, which accounts for half of Italy's electricity output as against a quarter in the EU overall, and this price has risen sharply in the last decade. Despite liberalization, production and markets are still dominated by a very few corporations and limited by inadequate infrastructure, especially in the South. Energy taxes are among the highest in Europe. The ratio of taxation to total energy consumption is more than 40 per cent higher in Italy than in the EU overall.

To curb greenhouse gas emissions and improve energy security, early in 2009 the European Union approved a climate and energy package, which sets objectives for raising the share of renewable energy sources and reducing emissions by 2020. To work towards the objectives, incentives for renewable sources and energy efficiency have been adopted at national level and guidelines drafted for the resumption of nuclear power generation. By setting medium and long-term targets, the formulation of the National Energy Strategy will provide a framework for the coordination of local and national action and confer greater certainty on the planning of public and private investment.

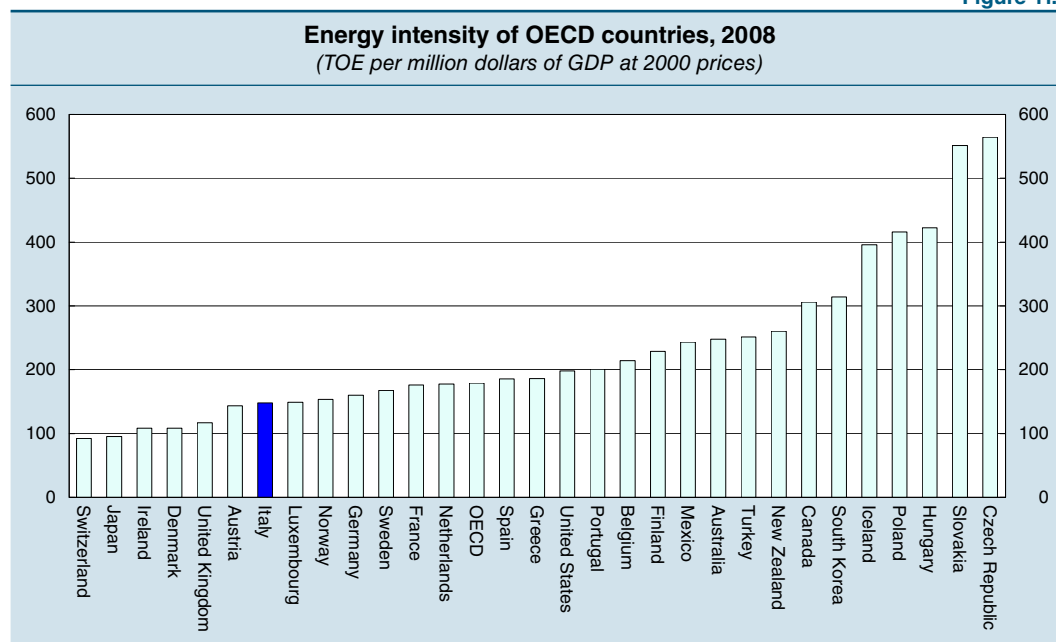
### *Energy supply and transformation*

In 2008 gross inland energy consumption in Italy came to 191.3 million tons of oil equivalent (MTOE), with more than 86 per cent coming from fossil fuels (oil 41.4 per cent, natural gas 36.3 per cent, coal and other solid fuels 8.8 per cent). The rest came from renewable sources and electricity imports (8.9 and 4.6 per cent respectively). According to preliminary estimates, gross energy consumption decreased by about 6 per cent in 2009, owing chiefly to the decline in industrial demand as a consequence of the recession. Energy utilization per unit of output is still lower in Italy than in most of the OECD countries (Figure 11.1), but in the last fifteen years it has been reduced much less than in the other leading European countries.

Domestic production of crude oil covered 2.7 per cent of gross energy consumption in 2008, that of natural gas 4 per cent, and renewable sources 8.5 per cent. Imports

provided the remaining 85 per cent or so. Italy's main suppliers of energy raw materials, except for solid fuels, are all outside the OECD.

Figure 11.1



Source: International Energy Agency, *Energy Balances of OECD Countries* (2009 ed.), 2009.

By comparison with most other countries, Italian electricity generation depends heavily on natural gas. In 2008 gas-fired thermal generation accounted for 54.4 per cent of the country's total production of electricity, compared with 22 per cent for the OECD. In Europe, the figures were 4 per cent for France, 14 per cent for Germany and 46 per cent for the United Kingdom, which is a major gas producer.

### Energy demand

Subtracting from gross energy consumption the amount dissipated in transformation, we get the amount of energy going to final users (141.1 MTOE in 2008).

Between 1990 and 2008 energy demand in industry (just over a quarter of the total) remained broadly unchanged, curbed both by more efficient use of resources as a result of price trends and stricter environmental regulations and by structural factors such as the decreasing incidence of heavy industry. In the service sector, however, which accounts for 11 per cent of final energy use, energy consumption rose at a much faster pace of over 3 per cent per year, despite a slowdown in recent years. Factors in the increase were stepped-up electricity use for air conditioning and the growth of large-scale retailing.

Based on Istat's survey of energy purchases by industrial enterprises, the census of industry, and the ASIA archive of firms, it is estimated that in 2007 the energy costs of industrial firms (excluding the energy sector) amounted to €21.3 billion, or about

€5,000 per employee. These costs increased by 22 per cent between 2000 and 2007, but their incidence on output value remained practically unchanged at just over 2 per cent. The energy cost per employee rose by an average 32 per cent and by 45 per cent in firms with fewer than 100 workers.

Household energy consumption (for heating, transport and electricity) accounts for more than 30 per cent of final energy use. In 2008 the energy intensity of consumer spending was 63 TOE per million euros at 2000 prices, compared with an average of 88 TOE in the 1970s.

According to Istat's household budget survey, spending for energy products came to almost €300 a month per household in 2008, and its share of total consumer expenditure, which had held practically constant at 11 per cent from 1997 through 2007, rose to almost 12 per cent. Half of this spending goes for transport fuel, nearly a third for heating and a fifth for electricity.

Final energy use for transport, about 40 per cent of which is estimated to be by households, accounts for 30 per cent of total final energy use; it has risen at an average annual rate of 1.5 per cent since 1990. Nearly 90 per cent of this energy goes for road transport of persons and goods. Italy has a very large number of vehicles per capita (598 per thousand inhabitants in 2007, compared with an EU average of 464) but comparatively low fuel consumption per vehicle (17.5 per cent less than the European average in 2007). Italy's fleet of industrial vehicles, by contrast, is relatively energy-inefficient and very large. Merchandise transport is overwhelmingly by road (86 per cent, against an EU average of 73 per cent), and the lorry fleet is older and uses less of its load capacity than in the other main European countries.

### *The prices of energy products*

Italy's heavy reliance on oil and gas imports makes domestic energy prices dependent on world markets, and in particular on the price of crude oil, which has risen substantially over the past decade. As a consequence energy costs rose from 2.3 per cent of GDP in 2000-04 to 3.1 per cent in 2005-09. They peaked at 3.8 per cent in 2008, when oil went as high as \$140 a barrel, before falling to 2.8 per cent in 2009.

The average level of energy prices to final users tends to be higher than in other European countries. According to our estimates, between January 2008 and June 2009, Italian firms paid about the same price for natural gas as their European competitors, but much more (31 per cent) for electricity. Households, by comparison, paid 16 per cent more for natural gas and 27 per cent more for electricity. Based on consumption in 2008, the average difference between Italian and European prices corresponds to an extra cost of €5.6 billion for industrial firms (0.51 per cent of the average value of industrial output) and €4.4 billion for households (0.47 per cent of total consumer spending).

These price differentials depend on the structure of energy supply, the degree of competition, the adequacy of infrastructure and the level of taxation. Given the predominance of natural gas in power generation, costs in this sector are largely determined by the variable component of fuel prices. Fuel accounts for 70 per cent of the total operating costs of gas-fired generating plants, against 28 per cent for coal-fired

plants and 16 per cent for nuclear reactors. As a result, trends in electricity production costs are affected by the price of natural gas, which is generally purchased under long-term contracts indexed to the price of oil and has gone up particularly rapidly in the last decade.

The markets in petroleum products are competitive, but those in gas and electricity are conditioned by transport networks, which in some phases of the product chain constitute a natural monopoly. In the mid-1990s the European Community began a process of liberalization of potentially contestable activities (the purchase and sale of gas and electricity) and regulation of the others (network distribution).

The number of electricity producers in Italy has increased, and installed generating capacity expanded by more than 21 per cent between 2003 and 2009, thanks in part to incentives for the exploitation of renewable sources. The price of electricity, set at national level on the basis of an average of prices in different zones determined by trading on the electricity exchange, nevertheless suffers from a structural shortage of supply in some parts of the country, such as the South, owing to insufficient network interconnectivity.

The possibility of switching to the competitive market, introduced in 2003 for gas and 2007 for electricity, has been exploited by only a limited number of users. According to the third survey of the electricity and gas market, more than one fifth of Italian households are unaware of the liberalization of the markets and about half are uninformed about the offers available.

Taxation is higher than in most other EU countries. In 2007 energy taxes amounted to around €32 billion, equivalent to €170 per TOE. This was one of the highest figures in Europe, 42 per cent above the EU average of €121. Energy taxation serves both the need to generate revenue (in 2007 these taxes accounted for nearly 5 per cent of total tax and contribution revenue) and the need to send a price signal that can curb energy consumption. High taxation may have helped to moderate the energy intensity of the Italian economy. Energy taxation is also an environmental policy tool for correcting the negative externalities of energy use.

### *Energy policies to curb greenhouse gas emissions*

The fourth report of the UN Intergovernmental Panel on Climate Change calculates that since the start of the twentieth century greenhouse gas emissions in connection with the production and consumption of energy have accounted for 0.7 degrees Celsius of the increase in the temperature of the Earth's surface. The International Energy Agency projects that in the next twenty years emissions will bring the concentration of greenhouse gases to a level consistent with a temperature increase of more than 6 degrees.

The European Union's Emissions Trading System (EU ETS), launched in 2005, puts a cap on the total emissions of some 12,000 energy-intensive plants in the energy production and manufacturing sectors. The participants in the System are given an initial endowment of emissions permits, which they can then buy or sell on a regulated exchange, depending on whether their current emissions are over or under the cap. By ratifying the Kyoto Treaty (with Law 120/2002), Italy is committed to lowering its

average greenhouse gas emissions in 2008-12 by 6.5 per cent compared to 1990. Under its EU commitments, by 2020 the emissions of the most energy-intensive sectors (those subject to the ETS caps) have to be cut by 21 per cent compared with 2005, those of other sectors by 13 per cent.

By international standards Italy has a low level of CO<sub>2</sub> emissions per unit of output (370 grams per dollar of GDP at 2000 prices, compared with an EU average of 400 grams and an OECD average of 430 grams). But emissions have risen steadily in recent years and in 2008 were 4.7 per cent higher than in 1990. They are estimated to have declined by 9 per cent in 2009, owing to the recession-induced contraction in energy use. To achieve the Kyoto targets, Italian emissions will have to fall in 2010-12 by a further 6 per cent on average from the 2009 level.

To meet these targets, Italy will need measures to increase the energy efficiency of final uses and to reduce greenhouse gas emissions in the energy sector itself. As for final users, firms will have to adapt their plant and households will need to tailor their durable goods purchases to energy saving (for instance, to improve the energy efficiency of buildings). Measures to improve energy efficiency have the advantage that they eventually pay for themselves, at least in part, out of the savings from reduced consumption.

The cost of cutting down emissions in power generation varies with the technology used (nuclear power, coal-burning plants with carbon capture and storage, renewable sources). The costs of adapting production structures will be borne by the producers themselves. The climate and energy package places special emphasis on the development of renewable sources. Italy has undertaken to expand their share to 17 per cent of gross final energy uses by 2020, from 5.2 per cent in 2005. An intermediate objective is to increase the amount of electricity from renewable sources to 22.55 per cent of consumption in 2010 (from 15.1 per cent in 2005). Thanks in part to the steep decline in total consumption owing to the recession, this objective appears to have been nearly attained in 2009 (21.2 per cent, according to provisional data from the grid operator Terna).

Gross electricity production from renewable sources increased by 13 per cent in 2009, with very sharp gains in photovoltaic (289 per cent) and wind power (25 per cent). However, the lion's share is still accounted for by hydroelectric (16.4 per cent of total electricity generation), far ahead of production from biomass and urban waste (2.7 per cent), wind (2.1 per cent), geothermal (1.8 per cent), and photovoltaic (0.3 per cent). The addition of installed capacity from renewable sources has been fostered by a series of incentives considered to be among the most advantageous in Europe. These incentives have been necessary so far because the cost of generation from renewable sources is higher than that from conventional ones. The need for incentives will diminish as these technologies mature, as fossil fuel prices rise, and as the cost of reducing greenhouse gas emissions is counted as a production cost.

In the medium term the resumption of generation by nuclear power plants should make some contribution to curbing CO<sub>2</sub> emissions. Italy had renounced nuclear power after a popular referendum in 1987. Law 99/2009 sets out a new energy strategy in which nuclear power should cover 25 per cent of electricity demand by 2020 (estimated on the basis of installed capacity of 13 gigawatts and annual production of about 100 TWh).

Containing emissions should also attenuate Italy's external energy dependency and, given the long-term projections of oil prices, the costs of energy procurement. Emission curbs should also encourage the development of renewable sources. About 70 per cent of Italian investment in renewable energy consists in imports of technology and equipment. While Italy can boast a significant presence in such traditional renewable energy technologies as hydroelectric, biomass and geothermal power, most of the components for wind and solar power generation are produced abroad. A positive impact in terms of job creation could come not only from the development of domestic production in these sectors but also from the upgrading of buildings for energy efficiency, which the National Action Plan for energy efficiency sees as one of the areas with the greatest potential for energy savings. The measures' effectiveness can be enhanced by an overall action plan, as the IEA's latest policy review recommends. Italy's National Energy Strategy, envisaged by Law 133/2008, represents an instrument for setting medium and long-term energy objectives and establishing a framework for the coordination of energy plans and initiatives at local and national level.