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Italy's energy dependence: how much energy Italy imports, and from whom

Gas, oil, electricity and raw materials: the official 2025 figures

Science in the news

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Introduction

Whenever an international crisis makes the news, the same question comes back in Italy: how much do we depend on other countries for our energy? The short answer is: **a lot**. In 2025 about **three quarters** of the energy available in the country came from abroad [1].

The short answer, however, hides the more interesting questions. Three quarters *of what*, exactly? Bought from *whom*? And is the situation getting better or worse? To answer them we need only a few tools: a clear definition, a couple of units of measurement and some care in reading percentages. They are the same tools we use in mathematics: first define, then count.

1. Before counting

Energy is not just electricity

When people talk about energy, they often think of the electricity bill. But electricity is only part of the energy we use. There is the gas that heats homes and powers factories, the petrol and diesel used in transport, aviation fuel, the coal still burned in a few industrial plants. To compare such different sources we need a common unit.

Definition — The tonne of oil equivalent (toe)

It is the energy released by burning one tonne of oil: by convention 1 toe = 41.868 GJ ≈ 11.63 MWh. National energy balances use its multiples: 1 ktoe = 10^3 toe and 1 Mtoe = 10^6 toe.

The toe makes it possible to add up cubic metres of gas, tonnes of coal and kilowatt-hours of electricity, measuring them all with the same yardstick.

How dependence is measured

Definition — Energy import dependency rate

It is the share of a country's available energy that is covered by **net imports**, that is, imports minus exports:

$$d = \frac{\text{imports} - \text{exports}}{\text{gross available energy}}$$

Gross available energy is all the energy that enters the system: domestic production, plus net imports, plus (or minus) changes in stocks. This is the definition used by Italy's Ministry of the Environment and Energy Security (MASE) and by Eurostat [1, 6].

Why *net* imports? Because Italy does not only buy energy: it also sells some of it. In 2025 the country imported 132 Mtoe and exported about 28, mostly as fuels refined in Italy from imported crude oil [1]. Counting only what comes in would inflate the dependence.

The 2025 figure

From MASE's national energy balance [1]:

	2024	2025	Change
Net imports (numerator)	105.0 Mtoe	103.6 Mtoe	**−1.4%**
Gross available energy (denominator)	142.2 Mtoe	139.8 Mtoe	**−1.7%**
Import dependency rate	**73.9%**	**74.1%**	+0.2 points

In 2025 Italy imported *less* energy than in 2024, yet the imported share *rose*. How is that possible? Because the dependency rate is a fraction, and in 2025 both the numerator and the denominator decreased, but the denominator a little more. The arithmetic shows it:

$$\frac{d_{2025}}{d_{2024}} = \frac{103.6/105.0}{139.8/142.2} \approx \frac{0.986}{0.983} \approx 1.003,$$

so dependence grew by 0.3% of its value: from 73.9% to about 74.1%. In practice, in 2025 Italy needed about 2.4 Mtoe less energy. Of these, 1.4 Mtoe are lower purchases from abroad; the rest comes from the "home" side (domestic production and draws on stocks), which fell proportionally more: about −2.6% against −1.4%.

Remark — Let's check the arithmetic

The text of MASE's report on 2025 states that dependence rose "from 73.5% in 2024 to 75.2% in 2025" [1, p. 36]. Applying the report's own definition to the data in its Table BE-1, however, gives 73.9% and 74.1%, in agreement with Eurostat for 2024 [6] and with ENEA's estimates for 2025 [3]. The 75.2% figure is obtained by dividing net imports by a different quantity, gross inland consumption, which excludes the fuel supplied to ships on international voyages. It is a good example of a general rule: when you see a percentage, always ask *a percentage of what*.

2. What the energy we use is made of

In 2025 Italy's gross available energy was about **140 Mtoe**. Figure 1 shows how it is split among the different sources and, for each one, how much of it comes from abroad.

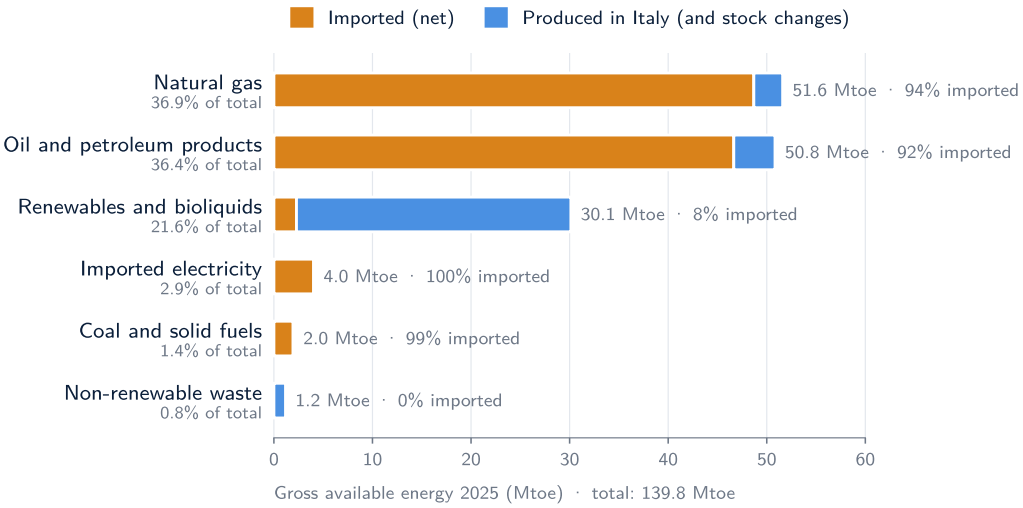

Figure 1. Italy's gross available energy in 2025, by source (139.8 Mtoe in total). In orange the imported part (imports minus exports), in blue the part produced in Italy, including stock changes. Source: elaboration on MASE data, Table BE-1.

Gas and oil together account for almost three quarters of the total (73.3%). It is no coincidence that the dependency rate is also close to three quarters: these two sources are almost entirely imported, gas at 94.3% and oil at 91.8%. Coal is 98.8% imported, renewables only 7.6% [1].

What about domestic production? In 2025 Italy produced about 35.7 Mtoe of energy. Of this, **about 78% is renewable** (hydro, solar, wind, geothermal, biomass); gas and oil extracted in Italy together amount to less than 7 Mtoe [1]. In other words, the little energy we produce at home is mostly renewable, while fossil fuels are almost all bought abroad.

3. Electricity: the dependence you don't see on the bill

In 2025 electricity demand in Italy was **312 TWh** [1]. Almost half of the electricity generated in Italy (48%) came from renewable sources. That sounds like very good news for self-sufficiency, and partly it is. But to understand how much electricity depends on other countries we need to distinguish two ways of depending.

- **Direct dependence.** Part of the electricity arrives ready-made from abroad, through the lines connecting Italy to its neighbours. In 2025 the balance between imported and exported electricity was **46.9 TWh**, about **15%** of demand [1, 4].
- **Indirect dependence.** Another part is generated in Italy, but in power plants that burn imported gas. In 2025 gas-fired plants supplied about **40%** of electricity [1].

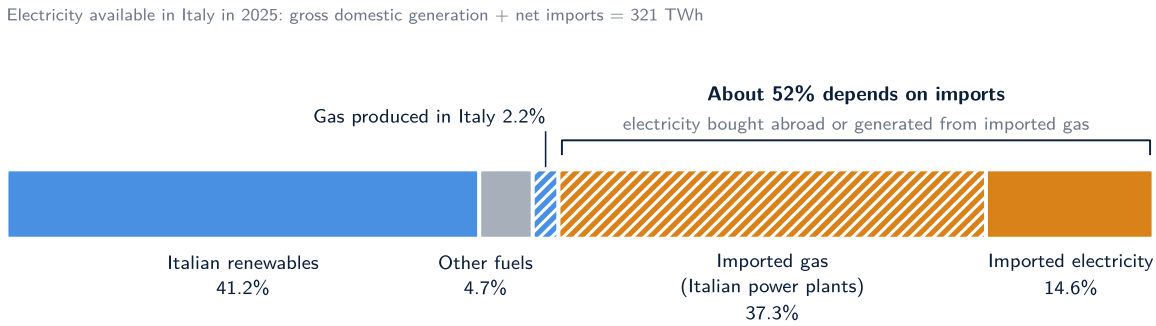

Figure 2. Where the electricity available in Italy in 2025 came from: gross domestic generation plus net imports, 321 TWh in total. Hatching marks electricity generated in gas-fired plants; the gas burned in power plants has been split between domestic and imported according to the overall dependence on gas imports in 2025 (94.3%). The total also includes the energy used by the power plants themselves and the energy lost in pumped storage. Source: elaboration on MASE data, Tables BE-1 and BE-2.

Adding the two together, more than half of Italy's electricity depends, one way or another, on energy bought abroad. An analysis by Terna and Snam for 2024 reaches a similar conclusion: 41% from renewables, 16% imported directly, 43% imported indirectly through fuels [5].

Remark — 2025 and the missing water

The weight of the two components changes from year to year. In 2025 hydropower produced about 11 TWh less than in 2024 (−20%), and imported electricity also fell by about 4 TWh. The gap was filled mostly by gas-fired plants, which burned about 1.5 billion cubic metres more gas (+7%) [1, p. 43]. So in a drier year, part of the energy produced at home and part of the electricity imported ready-made are both replaced by electricity generated with imported gas.

The neighbours' nuclear power

The electricity that Italy imports directly comes mainly from the north. In 2024 Switzerland and France together accounted for more than 80% of incoming flows [12]. In Switzerland the main source is hydropower, which in 2024 generated 59.6% of the country's electricity, followed by nuclear with 28.4% [16]; in France almost two thirds of the electricity generated in 2024 (67%) came from nuclear power plants [7].

Italy has not generated nuclear electricity since 1987. Of its four plants, Garigliano (Sessa Aurunca) had been shut down since 1978; Latina, Trino and Caorso, which stopped between late 1986 and 1987, were never restarted after the referendums of 8–9 November 1987, in which about 80% of voters opposed the rules that encouraged the construction of new plants [17, 20]. A second referendum, on 12–13 June 2011, repealed the rules adopted that year for a return to nuclear power [21]. Part of the electricity Italy consumes, however, comes from countries that do use nuclear power: the absence of plants on Italian soil does not mean that no nuclear electricity is consumed in Italy.

The operating nuclear power plants closest to Italy are just over a hundred kilometres from the border [18]:

Plant	Country	Straight-line distance from the Italian border
Gösgen	Switzerland	≈ 105 km (from the Gries Pass, Val Formazza)
Bugey	France, east of Lyon	≈ 120 km (from the Col de la Seigne, Aosta Valley)
Krško	Slovenia	≈ 130 km (from the Karst plateau near Trieste)

Distances are straight-line distances computed from the plants' coordinates and rounded to the nearest 5 km. All three plants are in operation; Gösgen, offline for maintenance since May 2025, was cleared to restart in March 2026 [18, 22].

The nuclear debate has returned in Italy too. Law no. 169 of 29 September 2026, published in the Official Gazette on 30 September 2026, delegates to the Government, within twelve months, the rules for a possible return to nuclear power (new-generation fission and fusion): licensing procedures, siting, management of radioactive waste and spent fuel, decommissioning of existing facilities, research and training [19]. The law does not by itself authorise the construction of any plant, which would require further decrees, a national programme and long construction times.

4. Gas: a map redrawn in four years

Gas is the source with the largest weight in Italy's energy balance, and also the one whose map of suppliers has changed the most. In 2025 Italy imported **61.6 billion cubic metres** (bcm) of gas and produced about 3 bcm [1].

Gas arrives in two ways:

- **by pipeline**: from Algeria to Sicily (Mazara del Vallo), from Azerbaijan to Apulia (Melendugno, Trans Adriatic Pipeline, TAP), from northern Europe through Switzerland (Passo Gries);
- **by ship**, as **liquefied natural gas (LNG)**: cooled to about −160 °C, it travels on LNG carriers and is turned back into gas at Italian regasification terminals. In 2025 LNG accounted for about a third of imports [1, 2].

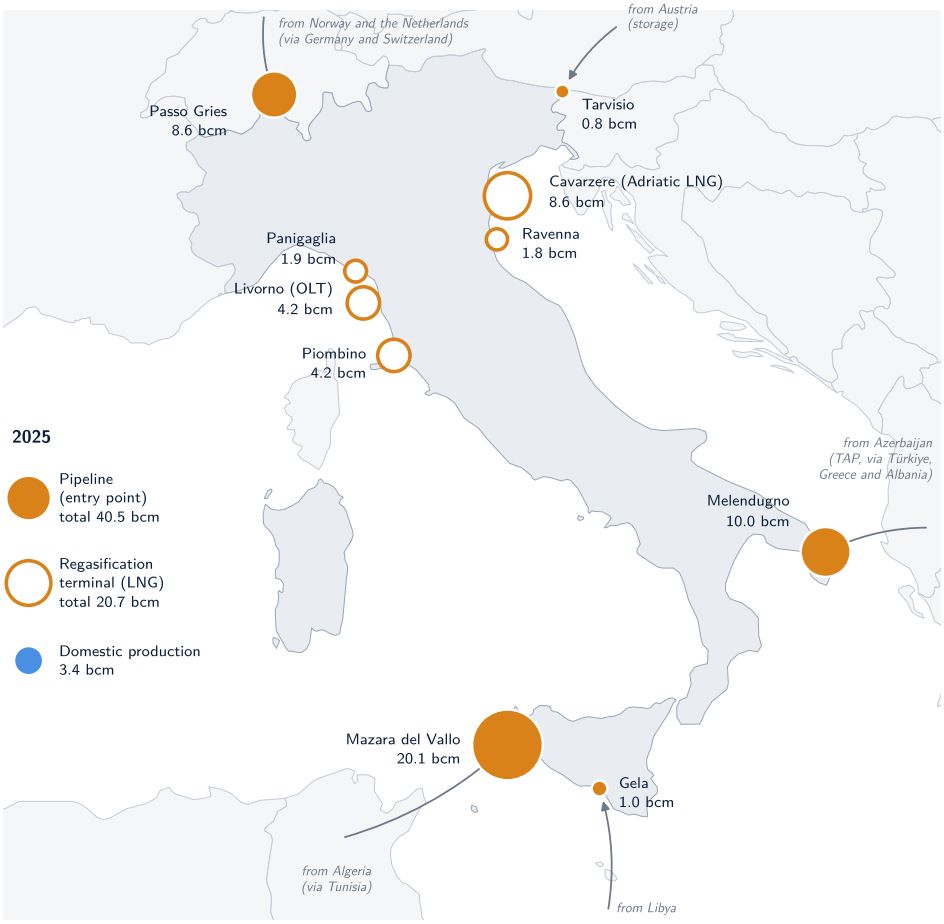

Figure 3. Gas entry points in Italy in 2025, with the volumes imported. The area of each circle is proportional to the volume; the blue circle in the legend shows domestic production for comparison. Source: MASE, *La situazione energetica nazionale nel 2025*, section 2.3.2.

Figure 4 shows how the main suppliers have changed since 2021, the last year before the war in Ukraine.

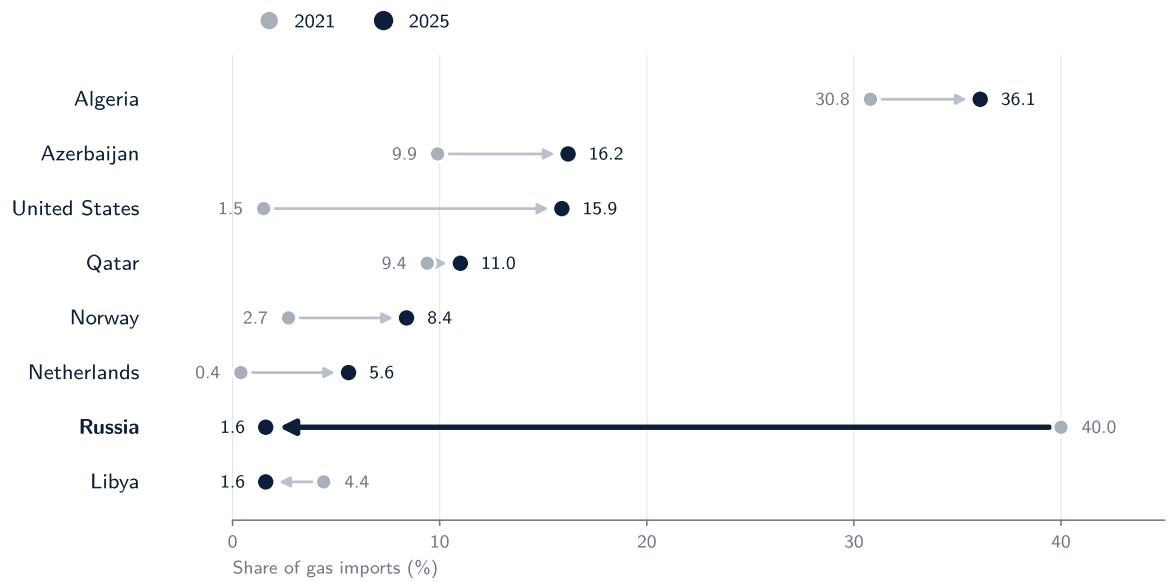

Figure 4. Shares of the main suppliers in Italy's gas imports, 2021 and 2025. The 2021 data are attributed to the country of origin, the 2025 data to the country of physical provenance of the gas (see the remark below). Sources: MASE, SISEN series "Importazioni di gas naturale per Paese di origine" 2021; MASE, *La situazione energetica nazionale nel 2025*, Table BE-10.

In 2021 four cubic metres out of ten came from Russia; in 2025, fewer than two out of a hundred. The gap was filled from three directions: more Algerian and Azerbaijani gas by pipeline, more gas from northern Europe and, above all, much more LNG. In 2025, 46% of the LNG arriving in Italy came from the United States, 32% from Qatar and 10% from Algeria [1].

Remark — Two ways of counting the same gas

Statistics can attribute gas to its country of *origin* or to its country of *physical provenance*. In 2024, for example, gas withdrawn from storage in Austria and entering Italy at Tarvisio was attributed to Russia by statistical convention [1]. This is why different sources may give slightly different shares: when comparing years, it is best to look at the broad trends, which are the same in all series.

5. Oil: many suppliers, almost all imported

Oil is the second-largest source in Italy's balance and is used mainly in transport. Domestic production covers about **9%** of demand [1]; the rest arrives in Italy as crude oil, which is processed in Italian refineries.

In 2025 Italy imported **57.1 million tonnes** of crude oil from about thirty countries [1].

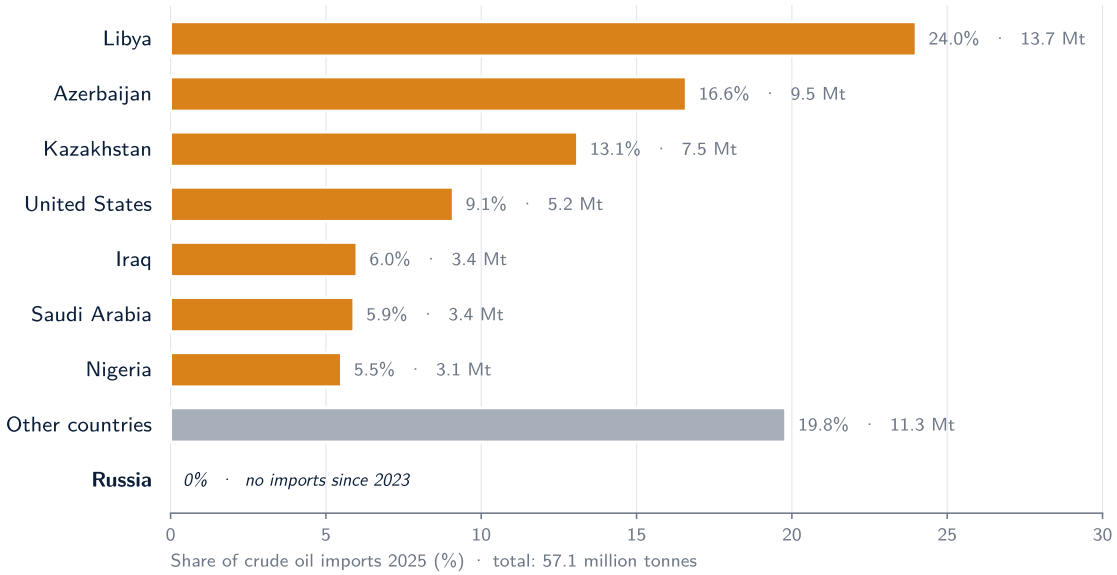

Figure 5. Origin of the crude oil imported into Italy in 2025. Source: MASE, *La situazione energetica nazionale nel 2025*, Table BE-3.

By region, over 41% of crude comes from Africa and almost 30% from Central Asia (Azerbaijan and Kazakhstan); the Middle East has fallen to 12% [1]. No crude oil has been imported from Russia since 2023.

6. Coal: almost all imported, but now marginal

Coal is the one source Italy imports practically in full (98.8%), but its weight has shrunk considerably. Imports fell from 7.2 million tonnes in 2023 to 3.1 in 2025; the largest supplier is the United States [1]. In 2025 coal-fired plants generated just over 3 TWh, about 1% of electricity demand [1].

7. How self-sufficient are we?

If dependence is 74%, self-sufficiency, the share of energy produced at home, is about **26%**. How does Italy compare with the other large European countries? The most recent Eurostat data covering all countries refer to 2024 [6].

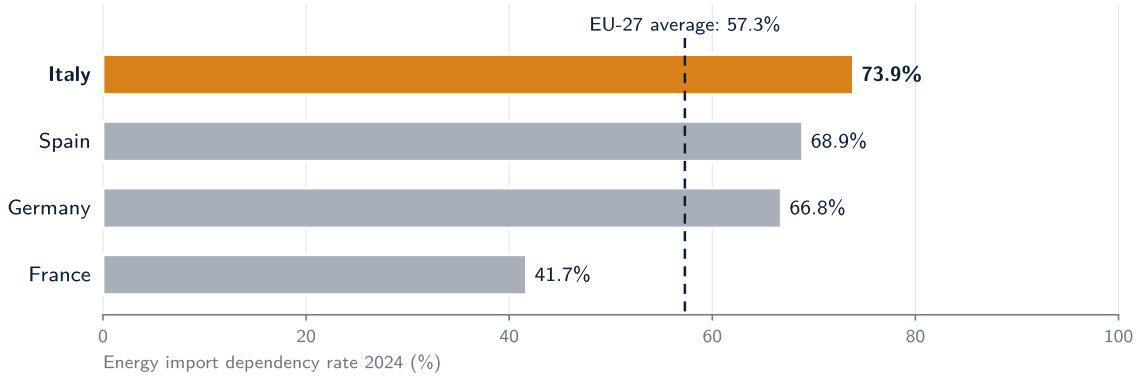

Figure 6. Energy import dependency rate of the four largest economies of the European Union in 2024: net imports divided by gross available energy. Source: Eurostat, dataset `nrg_ind_id`.

Among the large European economies, Italy is the one that depends most on other countries. France has the lowest value: according to Eurostat, in 2024 nuclear power covered 40% of its available energy [7]. Looking further back, Italy's dependence peaked at 85.5% in 2006 and had fallen to 75.1% by 2020 [8]; since then it has hovered around three quarters.

Diversifying is not the same as depending less

Since 2021 Italy has changed its gas suppliers, but the share of imported gas has stayed around 94–95%. These are two different things: **how much** we depend on other countries and **on how many** countries we depend. The second can be measured with a single number.

Definition — Supplier concentration index

If $q_1, q_2, \ldots, q_n$ are the suppliers' percentage shares, the concentration index (known as the Herfindahl–Hirschman index) is

$$H = q_1^2 + q_2^2 + \cdots + q_n^2.$$

With a single supplier $H = 100^2 = 10\,000$. With n suppliers of equal weight, each with a share of $100/n$, we get $H = 10\,000/n$. This is why the ratio $10\,000/H$ can be read as an **equivalent number of suppliers**: how many equally sized suppliers would give the same concentration.

Squaring the shares gives much more weight to large suppliers: one supplier at 40% contributes 1,600, while four suppliers at 10% contribute 400 in total.

Key figures — How concentrated our suppliers are

- Gas 2021: $H \approx 2\,760$, about **3.6** equivalent suppliers.
- Gas 2025: $H \approx 2\,050$, about **4.9** equivalent suppliers.
- Oil 2025: $H \approx 1\,250$, about **8** equivalent suppliers.

Calculations based on MASE data [1] and the SISEN 2021 series.

So for gas there has been real diversification: Italy has gone from about three or four to about five equivalent suppliers. But the amount of gas bought abroad has stayed almost the same. Diversifying reduces the risk tied to any single supplier; depending *less* requires producing more energy at home or using less of it.

8. Less visible dependencies

Energy dependence is not only about fuels. The technologies needed to produce energy at home, such as solar panels, wind turbines and batteries, are also largely bought abroad.

Key figures — The technologies we import

- In 2024, **98%** of the solar panels imported into the European Union came from China [9].
- In 2025 Italy imported photovoltaic panels worth about **€1.1 billion** and exported €57 million worth; it imported lithium-ion batteries worth €1.35 billion and exported €261 million worth [3].
- Wind turbine generators are also almost entirely imported [3].

There is, however, an important difference between the two kinds of dependence. A fuel is imported and burned: to have energy tomorrow you have to buy more. A solar panel or a turbine is imported once and then produces energy for many years without further supplies. A disruption in gas supplies has immediate effects; a disruption in panel supplies slows down new installations, but does not switch off those already running.

Behind the technologies lie **critical raw materials**: lithium, cobalt, graphite, rare earths, silicon and other elements essential for batteries, motors and solar cells, whose extraction and refining are concentrated in a few countries. To reduce this exposure, in 2024 the European Union adopted Regulation (EU) 2024/1252, which sets targets to be reached by 2030 for each strategic raw material [10]:

- at least **10%** of EU consumption extracted in Europe;
- at least **40%** processed in Europe;
- at least **25%** coming from recycling;
- no more than **65%** of consumption imported from a single non-EU country.

The last target is, in essence, a cap on supplier concentration: the same idea as the index H.

2026 so far *(provisional data, updated to October 2026)*

- **Gas.** In March the crisis in the Persian Gulf led to the blockade of the Strait of Hormuz, through which Qatar's LNG passes [3]. On 5 March QatarEnergy notified force majeure to Edison, which receives Qatari LNG at the Rovigo terminal, "due to the hostilities in the area", for deliveries from April onwards [13]. The notice was then extended several times: by the end of September it covered 35 cargoes, about 4.6 bcm, until early December 2026. Edison stated that it could replace them with alternative supplies [13]. In the first half of the year Italy still imported 10.5 bcm of LNG, 32% of the gas entering the country, unloaded from 110 ships [11]; at the Rovigo terminal alone, 28 ships arrived from the United States and 13 from Qatar [14]. Gas demand was almost unchanged (+0.4%) [11].
- **Electricity.** In the first half of the year net imports covered about 16% of demand, 7% more than in the same period of 2025 [4]. Solar generation grew by 19% and wind by 16%.
- **Oil.** In the first four months crude oil imports were 18.6 million tonnes, 3.4% more than in 2025 [15].
- **Costs.** According to an estimate by the industry association UNEM, Italy's spending on imported energy could rise from €48.7 billion in 2025 to €57–58 billion in 2026, assuming an average oil price of 90 dollars a barrel [23].

Let's recap

- In 2025 Italy imported, net of exports, about **74%** of its available energy; self-sufficiency is around 26%.
- Gas and oil account for almost three quarters of energy needs and are more than 90% imported. The little energy produced at home is mostly renewable.
- Electricity depends on other countries in two ways: about 15% arrives ready-made through the lines with neighbouring countries, about 40% is generated in Italy from imported gas.
- Between 2021 and 2025 Russia's share of Italy's gas fell from 40% to less than 2%, replaced by Algeria, Azerbaijan, northern Europe and LNG, mainly from the United States.
- Among the large European economies, Italy has the highest dependence; the EU average is 57%.
- Diversifying suppliers reduces risk, but not the amount imported. And the technologies to produce energy at home, from panels to batteries, are also largely bought abroad.

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