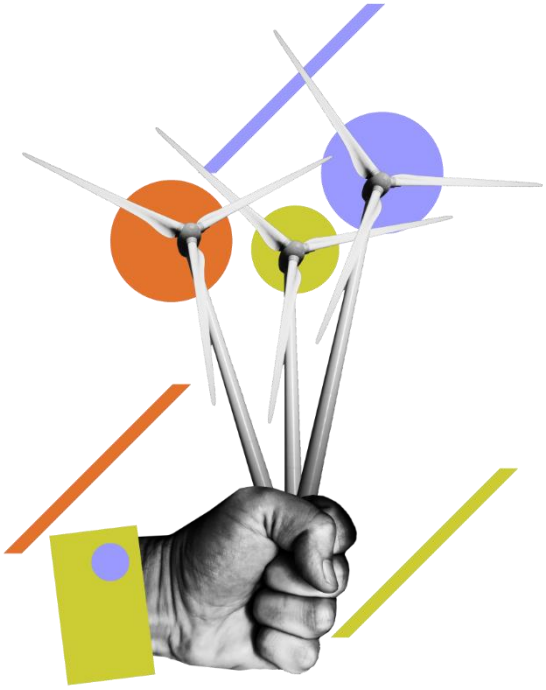
ECCO

THE ITALIAN CLIMATE CHANGE THINK TANK

POLICIES FOR A DECARBONISED ITALIAN ELECTRICITY SYSTEM IN 2035

JUNE 2023



Contents

1 Presentation of the project

The incomprehensible polarisation of the public debate about the transition to a climate-neutral energy sector (and its inevitable knock-on effect on energy-hungry industries) is beginning to cast doubts on the feasibility of an electricity system entirely based on renewable energy, just when the cost trend has made these resources competitive and when the consequences of such changes are becoming obvious to all.

And yet renewables have helped mitigate the damage during the fossil fuel price crisis. In its recent Renewables 2022 report, the IEA estimates that the price of global electricity would have been 8% higher in 2022 without renewables. In Europe this is even higher due to regulations (new and already in place in Italy) requiring renewables to pass on part of their revenues when the electricity spot price exceeds certain thresholds.

This project by ECCO was commissioned by Greenpeace, Legambiente and WWF Italy. ECCO then commissioned Artelys to create simulations using its proprietary dispatching model Crystal. It is the first Italian scenario to put into practice the G7 commitments, showing the natural development of an electricity system that will already be considerably decarbonised by 2030, thanks to the EU's goal of reducing EU emissions by at least 55%.

The project aims to show the production technology, enabling technology and enabling policies required to comply with Italian energy regulations that an essentially decarbonised electricity system in 2035 will need to have in place in 2030 and 2035. The system will be the most economical of all those guaranteeing decarbonisation and security while complying with certain hypotheses (or policy choices applied to the model) summarised in section 4.1. below.

The end products of the project are the ECCO-Artelys report "Development of a transition pathway towards a close to net-zero electricity sector in Italy by 2035" and this document "Policies for a Decarbonised Italian Electricity System in 2035".

2 Executive summary

In May 2022, when Germany held the presidency, **the G7 countries signed a commitment to a predominantly decarbonised electricity sector by 2035.** This commitment was further reinforced on 27 May 2023 under a Japanese presidency, to achieve a fully or predominantly decarbonised power sector by 2035.

For advanced economy nations, achieving zero emissions in electricity systems by 2035 is one of the steps of the IEA 1.5° scenario, which aims to keep global warming below 1.5°.

At the same time, **achieving 2030 goals without compromising the 2035 goals is crucial, and requires the new PNIEC (2030 Integrated National Energy and Climate Plan) to quantify them in a sufficiently detailed, exacting manner**.

The ECCO-Artelys study focused on simulating the most economical electricity system capable of achieving these goals.

This is a focal point for the decarbonisation of the entire economy. In fact, although electricity consumption is only a part of total energy consumption, the decarbonisation of electricity supplies – and of the correlated production of green hydrogen that is one of its enablers – accelerates the decarbonisation of all sectors in which consumption will be electrified or use hydrogen in chemical or thermal processes. These include climate control including in the winter (from boilers to heat pumps), transport (from fossil fuel-powered to electric endothermic engines), and some areas of industry that consume significant amounts of energy (secondary steel already produced using electric furnaces in Italy, and primary steel that will need to replace coal with green hydrogen).

Whereas on the one hand the simulations aimed to produce a system that not only guaranteed reliable supplies, but was also as economical as possible, on the other we imposed certain technology and investment choices (described in more detail in section 4.1):

- **No use of carbon capture and storage**, a technology which still has high costs and also synergies with the oil and gas industry that will reduce as the industry becomes less important.
- **Limit on the quantity of imported energy** to avoid the system being abnormally based on decarbonisation outside of Italy and on the effective availability of decarbonised energy in systems outside of our jurisdiction.
- Achievement **of a level of investment in storage** (including batteries) no lower than the requirements estimated by the European grid managers.
- **Maximum threshold on the capacity for biomass** electricity generation (in view of the goal to improve air quality).
- **Sufficient production of green hydrogen for industry.**

In light of the goals and restrictions set out, the study produced an electricity system with the following main characteristics (the details and all the figures are provided in the ECCO-Artelys study and in part in this document in section 4.2.)

- There needs to be a significant change of direction with respect to the current number of annual renewable electricity generation plant installations (there needs to be approximately eight times as many) in order to achieve

approximately 250 GW of installed capacity **by 2035** (approximately 160 in 2030), for more than 400 TWh of national production (more than 250 TWh in 2030).

- In order to achieve the 2035 goal, **by 2030 we need more than 90 GW more renewable generation capacity** than is currently installed. This is just over the 85 GW already calculated by Elettricità Futura[1].
- **Flexibility** will play a decisive role in various timescales (daily, weekly and seasonally) and will require a mix of technologies that include demand response**, accumulators** and **electrolysers** in addition to imports.
- The contribution of gas generation in 2035 will be practically zero (54 TWh in 2030), but some thermal generation plants will still be powered by hydrogen and biomethane.
- **The extent to which we rely on imports** is decisive in terms of the need for generation capacity. By increasing the net import limit from 40 to 60 TWh, photovoltaic production decreases from 234 to 187 TWh.

Some fundamental enabling policies (among those described in section 5) are **necessary choices** for the decarbonised electricity system by 2035 with the characteristics described here and below to be feasible at the lowest possible cost. These are:

- **Consistency of the PNIEC** with the goals and their effective monitoring
- **Interventions in the process of authorising** renewable generation plants and enabling infrastructure
- **Halting regulated investments in fossil fuel infrastructure** (from the capacity market to the development of networks and regasification plants), including abandoning the aim to finally supply methane gas to Sardinia
- Urgent and in-depth application of the new electricity dispatching with **integration of all the flexibility sources** (including demand response by means of aggregators and non-programmable renewable sources within the limits of technical possibilities)
- Facilitation of the roll-out of **long-term contracts** selling energy from new renewable plants
- **Enabling energy efficiency and demand response** on the part of industrial, commercial and domestic consumers by means of dynamic pricing and clear signals in bills, including the elimination of subsidies for fossil fuels and incentives to waste energy
- Updating of the grid managers' incentive systems to exploit demand flexibility rather than relying on subsidies on fossil generation
- Mitigation of SNAM's incentive to promote investments that are not consistent with decarbonisation and will become an unreasonable cost for users.

[1] https://www.elettricitafutura.it/News-/News/Rinnovabili-obiettivo-80-al-2030-con-85-GW-di-nuova-potenza_4818.html

3 Context

3.1 The fossil reaction to the energy crisis

In Italy the medium to long-term reactions to the energy crisis have generally involved a limited vision of the concept of safety that does not include the damaging secondary effects on climate of energy policy based on fossil fuels. This is surprising given that the energy crisis was partly brought about by drought caused by climate change. A lack of water means hydroelectric energy is not available, while also limiting the use of certain thermoelectric power stations due to the lack of water for cooling certain types of plant.
One of the problems of this short-sighted vision is connected to the tendency to match energy security solutions with technology from the past rather than cost-effective technology now available.

3.2 Acceleration of the Repower EU and G7 climate goals (and implementation of Repower EU)

With its Fit For 55 and Repower EU programmes, in April 2023 the European Union agreed a goal of 42.5% of final energy consumption from renewable sources by 2030, a goal that at the time of writing has yet to be ratified by the European Parliament and Council.

With respect to electricity systems, at G7 2022 the Italian Government had already indicated that more than 70% of electricity should be produced by renewables in 2030, up from the previous goal of 40% under the European Green Deal. This new goal is in line with the 72% indicated by the PITE – the plan of the Draghi Government's Inter-ministerial Committee for the Environmental Transition.

3.3 The European Commission's proposal for updating the electricity markets and comparison with the situation in Italy

On 14 March 2023 the EC published document 2023/0077 (COD) containing a proposal to amend the Regulations and Directives regulating the electricity markets (including balancing) and the REMIT Regulation on Wholesale Energy Market Integrity and Transparency.

The proposal aims to introduce continuity into the energy markets but reinforces or introduces a series of elements already partly present in Italian law (although not always implemented) primarily in order to encourage:

- Forward contracts and support for financing renewable energy
- The development of systems and technologies that complement renewables in order to ensure a secure electricity system
- Demand becoming responsible for and participating in the efficiency of electricity systems.

3.3.1 Tools for contracts and to aid the financing of renewables

- A stronger role for Governments in providing (and promoting) guarantees to facilitate PPAs (Power Purchase Agreements)
- Public guarantees on wholesale PPAs

- Benefits/incentives for renewables projects with transfer of part of the capacity through PPAs.
- Setting up of regional virtual hubs in the forward market and related instruments for the long-term procurement of interconnection capacity between the market areas and the virtual hubs

3.3.2 Development of systems and technologies that are complementary to renewables

- Centralised mechanisms for the procurement of electric accumulator capacity
- Peak shaving contract procurement by network managers.

3.3.3 Demand becoming more responsible for and participating in making electricity systems more efficient

- Use of dedicated meters for demand response settlement
- Systems to support participation in the dispatching resources markets by "non-fossil" forms of flexibility, including demand-side. This may or may not be provided within existing capacity remuneration mechanisms
- Enabling all customers to access energy offers at flexible prices, or fixed prices for at least a year
- Right of sharing: all customers must be able to exchange energy peer-to-peer including directly, and benefit from netting with respect to the network within the balancing rules and without damaging the tax system
- Restriction of bill subsidies to no more than 70% of consumption history in order not to compromise the incentive to save.

3.4 Updating the Integrated Electricity Dispatching Law

The Commission's proposal does not revolutionise the operating logic of the electricity markets in Europe. At the same time, it is in line with some of the innovations currently being introduced in Italy, particularly those in the short note (685/22) that introduces the process of updating the Integrated Electricity Dispatching Law (TIDE). ARERA (the Italian Regulatory Authority for Energy, Networks and Environment) has made it a key point to expand participation of the electricity system balancing resources, each "as far as they can", starting with demand. As ARERA appropriately puts it, "In order to preserve the right to switch a light on whenever we want, we have to build a new world in which switching it off is an opportunity".

This process will involve (finally) introducing a context also in Italy that is open to balancing service providers, and therefore aggregators, i.e. operators specialised in contracting customers able (thanks also to technology innovations in their consumption machinery) to provide balancing capacity to sell to the Transmission System Operator (TSO) and on which to pass back to the Balancing Responsible Party (BRP) the energy lots handled and to the end customer part of the remuneration from the balancing (a distinction that is not in fact that obvious).

4 The ECCO-Artelys study "Development of a transition pathway towards a close to net-zero electricity sector in Italy by 2035" - Principal scenarios and results

4.1 Main policy scenarios (choices imposed on the model)

- **No new Carbon Capture** Usage and Storage plants (which implies no new plants full stop, given that the only example in Italy of CCS applied to electricity generation has never fully taken off and was then abandoned without a public analysis of the experience).
- **Limit on the quantity of imported energy** of 40 TWh/a, to avoid the system being abnormally based on decarbonisation outside of Italy and on the effective availability of decarbonised energy in systems outside of our jurisdiction
- Potential for wind and photovoltaic power assumed on the basis of international studies as described in section 4.2.2 of the ECCO-Artelys report "Development of a transition pathway towards a close to net-zero electricity sector in Italy by 2035".
- Achievement **of a level of investment in batteries** no less than the ERAA requirement estimates (ENTSO-E, 2022).
- **Maximum ceiling on the** electricity generation **capacity** from **biomass** based on ERAA values (ENTSO-E, 2022).
- **Demand for hydrogen for industry imposed on the system** and based on the sEEnergies research consortium project data described in section 4.1.2 of the ECCO-Artelys report "Development of a transition pathway towards a close to net-zero electricity sector in Italy by 2035".

4.2 Main results of the ECCO-Artelys model

The Artelys-ECCO study, which simulates an essentially decarbonised Italian electricity system in 2035[2] (presented in detail in the ECCO-Artelys report "Development of a transition pathway towards a close to net-zero electricity sector in Italy by 2035") produced the following results, among others:

- The necessary **installed power for electricity production from renewable sources** requires a decisive change of direction with respect to the current annual installations (approximately eight times as many), in order to achieve **approximately 250 GW** of installed capacity **in 2035**, almost 450 TWh of production nationally – and almost 350 TWh in 2030).
- In order to achieve the 2035 goal, **by 2030 over 90 GW more renewable generation capacity** is required with respect to the current installed capacity. This is a little over the 85 GW already forecast by Elettricità Futura[3].
- The contribution to generation from the various market areas (and areas of Italy) will be highly unequal, as will that of the demand response technology. This is

2 The simulations forecast less than 2 million tCO2 total emissions by the electricity sector in 2035 (5 gCO2/MWh) compared with the current more than 50 million tCO2.
3 https://www.elettricitafutura.it/News-/News/Rinnovabili-obiettivo-80-al-2030-con-85-GW-di-nuova-potenza_4818.html

due to the varied production of renewables and the availability of flexible industrial demand.

- **Flexibility** will play a key role in various timescales (daily, weekly and seasonally) and will require a mix of technologies including importing, demand response, accumulators and electrolysers for subsequent use of hydrogen mainly in thermal machines for reconversion into electricity. **In 2030 the Artelys-ECCO model estimates 15 GW of installed batteries, rising to 17 (for 39 TWh) in 2035.** In terms of total **flexibility energy**, the model quantifies more than **120, 40,** and **30 TWh** respectively for **daily**, **weekly** and **annual** flexibility by 2025.
- The contribution of gas generation is practically zero by 2035 (whereas it is 70 TWh in 2030), but some thermal generation plants will still be used and will be powered by hydrogen
- **The level of reliance on imports** is crucial in terms of the need for generation capacity. By increasing the net import limit from 40 to 60 TWh, photovoltaic production will fall from 234 to 187 TWh.

Renewable installed capacity (GW)	2025	2030	2035
Solar PV – Utility scale	21	65	136
Solar PV – Rooftop	18	31	32
Wind power – Offshore	1	6	10
Wind power – Onshore	14	26	41
Biomass power plants	4	4	4
Hydro reservoirs	10	10	10
Run-of-the-river hydro	6	6	6
Pumped-hydro storage	8	11	11

Figure 1 – Renewable installed capacity in Italy (from the ECCO-Artelys report)

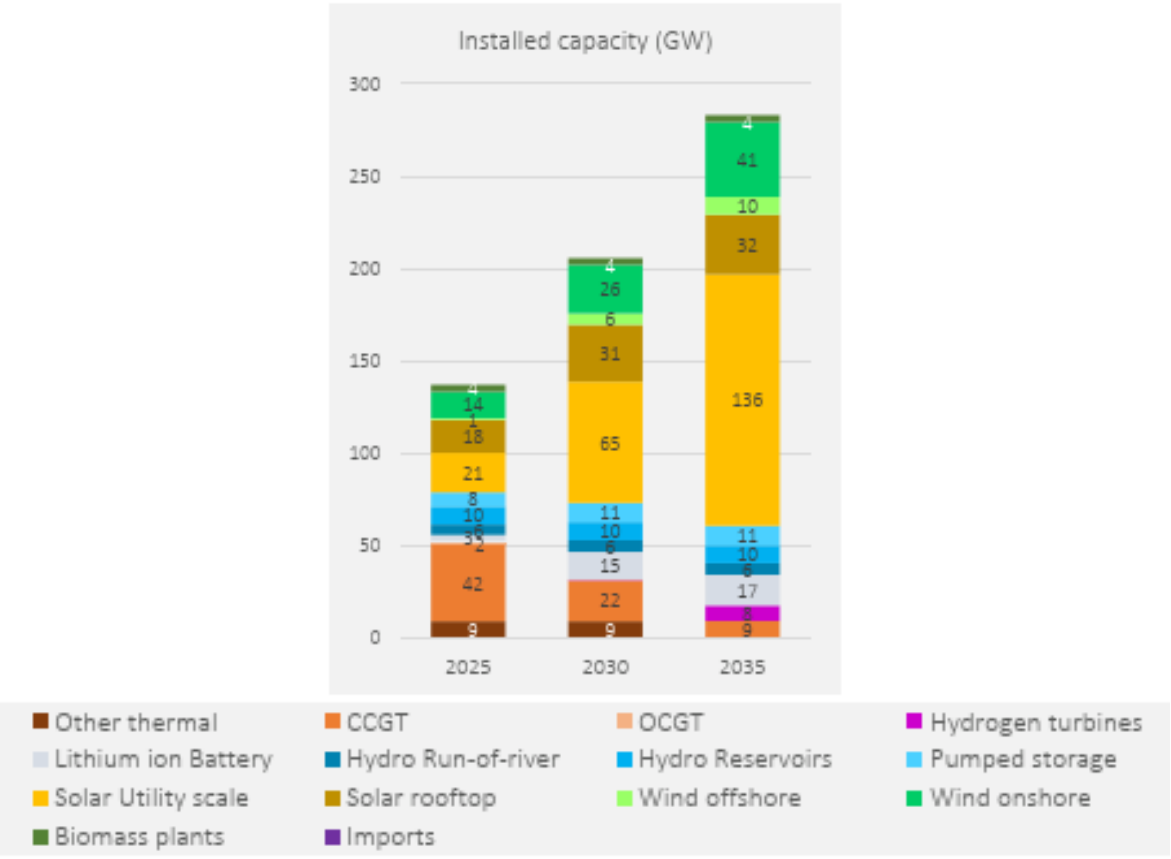


Figure 2 – Total installed capacity

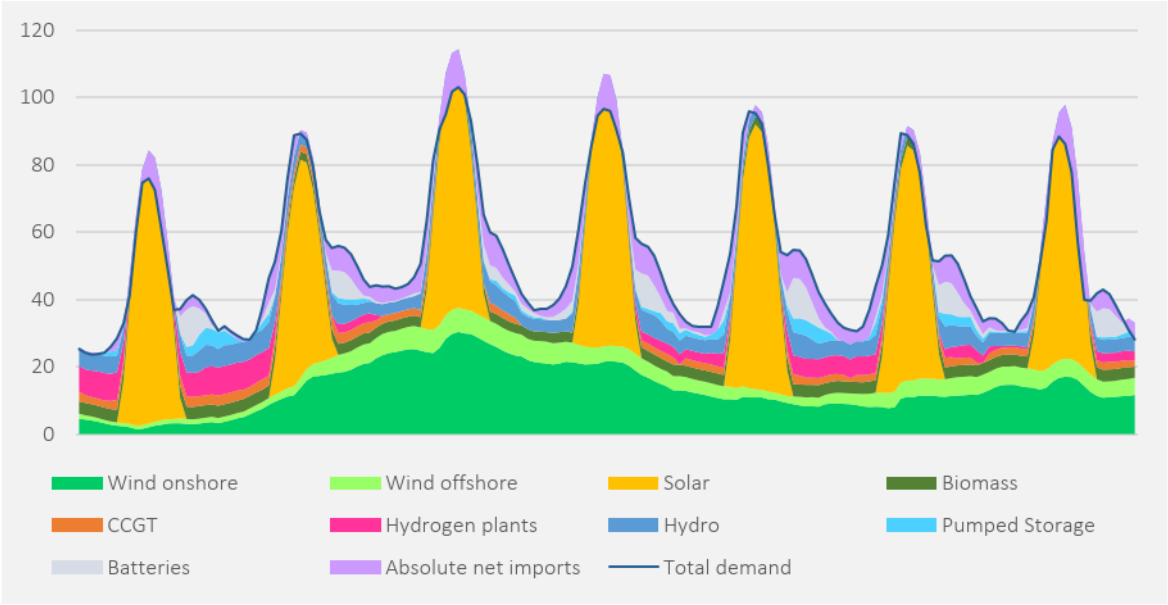


Figure 3 – Role of flexibility in production (batteries, pumped storage and hydrogen) in the sample week of early February 2035

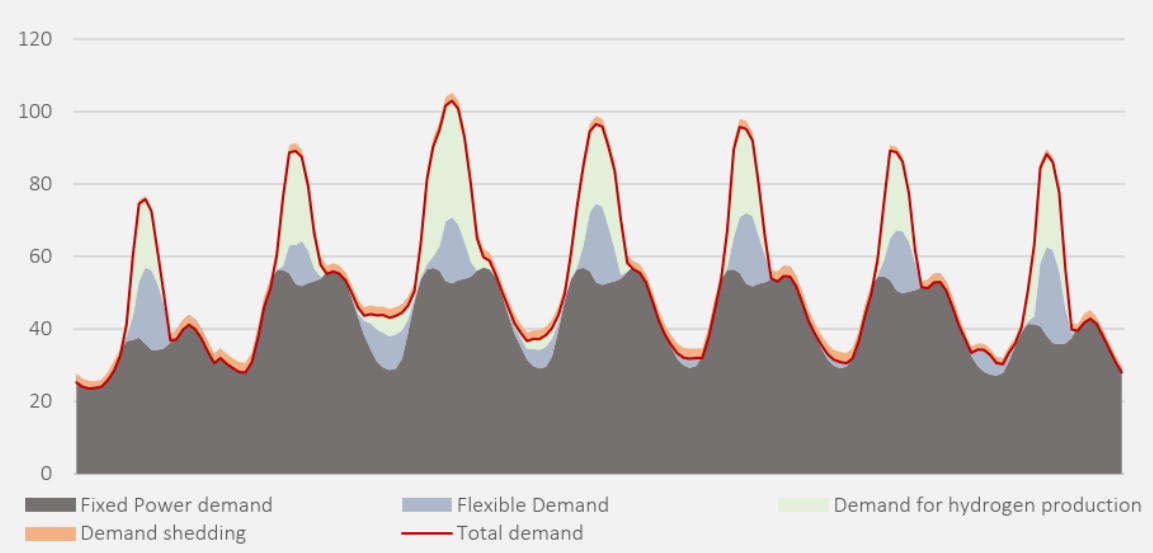


Figure 4 – Role of demand response in the sample week in early February 2035

5 Policies required in Italy

5.1 Introduction

Regulation of the energy sector, including the market's sphere of action, must be subject to **climate safety goals as much as it is to energy security and industry efficiency**.

It is also important to consider **synergies between the transition of the electricity sector** to renewables (and to their complementary technologies) **and the decarbonisation of other sectors** (such as industry and transport), as well as achievement of the aforementioned goal of **reducing pollution**, which is still a major issue in Italy, despite recent improvements.

5.2 Relevance, integration and monitoring of the PNIEC

In order for the updated PNIEC to become a document that is not only about EU compliance but also a cornerstone of climate policy in its main enabling sector, the following needs to happen:

- It needs to be approved as primary legislation
- It needs to be efficiently integrated with other planning instruments, especially when using EU public funds
- It must involve efficient and transparent tracing of the progress of its application
- It must integrate with the permitting of renewables and offer an overhaul of the regulatory framework, clarifying policies, roles, responsibilities of those involved in the process and their method of involvement

5.2.1 Monitoring implementation of the PNIEC

It is important to identify the key quantitative and qualitative key indicators accompanying the implementation of every area of the Energy Union and more. These indicators should:

- Guarantee more efficient monitoring of the implementation and identification of control mechanisms able to trigger corrective measures, to allow the plan to be implemented in a dynamic and efficient manner
- Be defined within the scope of the "multi-level dialogue" on energy and climate which ensures that local authorities responsible for certain implementing instruments, policies and measures of the plan are aware, responsible and proactive from the start and can play an active role in monitoring the plan's progress.

Examples of indicators:

- Development of networks (for example in terms of non-evacuated energy or lack of separation in zonal pricing)
- Monitoring of the issue of authorisations (if not in line with goals this must involve retroactive possibilities)
- Enabling and development of resources complementary to electricity generation from renewable sources (e.g. storage and demand response) (goals in terms of integrating the resources distributed in the dispatching services market).

The indicators should take into account the permanent or temporary nature of the actions taken and not just the short-term effect on climate-altering emissions. For example, actions to make consumption more efficient by means of long-term investments (such as renovating buildings to improve their energy category) are more efficient than emergency measures.

5.2.2 Governance of the process of requesting the connection of new renewable generation plants to the networks

Under the current system network connection requests involve payment of a non-refundable sum that is a small part of the project development costs, and therefore not enough to create a virtuous pre-selection process for the proponents, nor a realistic indication to the TSO and other institutional bodies as to which projects have the best economic prospects and are therefore the most likely to be brought to completion.

The following innovations could be introduced to resolve the issue:

- A higher financial commitment when requesting connection (which could be reimbursed once the project is completed) to ensure a guaranteed connection.
- Modulation based on the logic/urgency of developing capacity of a given type and in a given location in accordance with PNIEC guidelines and the status of capacity building set out therein.

5.3 Governance of renewable energy authorisations

5.3.1 New tools for the governance of permits, suitable areas and administrative responsibilities

Integration between the role of national planning and regional prerogatives is positive and must be pursued, as must the identification of areas suitable for renewables in the country.

However, rather than changes to the regulations governing permissions, it is crucial that regional and municipal governments take the necessary administrative actions to follow up on the various laws enabling interventions. In this sense taking responsibility is essential, to avoid bureaucracy becoming a barrier to transforming the energy sector.

5.3.2 Role of the Ministry of Culture

As far as the central government process of authorising renewables is concerned, it is common for wind farm projects to be blocked by Cultural Heritage Departments, which come under the Ministry of Culture. **The Ministry's responsibilities with respect to central government's energy transition goals must be formally agreed**. Either that or it must be made simpler for the Council of Ministers to overcome objections where necessary.

Furthermore, there should be less discretion in decision making based on formally accepted national criteria.

One element that is never taken into account when assessing impacts on local areas is their reversibility. **Unlike installations of other technologies, even when renewable plants are utility scale they can always be removed** at the end of their life span

without permanent damage, and they do not require the complex and costly remediation processes typical of fossil fuel plants, the costs of which are almost always paid for by the taxpayer. This factor should also be taken into account by the Ministry of Culture.

5.3.3 Title V of the Constitution and energy exchange between regions

It is unthinkable that application of Title V of the Italian Constitution, which introduces the regimen of concurrent power between central and regional governments in the energy sector, should instead **result in a mere aspiration for the regions to achieve energy autonomy.**

A system based on renewables has to support the production potential of the various areas by generating net import and export areas (which could potentially change at various times of the day or seasonally). It therefore requires mutual support and complementarity between the regions, rather than micro-autocracies. In a system in which European if not Mediterranean-wide network interconnection is a cornerstone, it is unimaginable that regional governments should think in terms of their own self-sufficiency.

5.3.4 Managing the regional freeze on the authorisation of renewables

On several occasions authorisation processes have been "frozen", effectively signalling a refusal on the part of local governments to carry out their duties as State's officers– most recently in early April [2023] when the President of the regional government in Sicily Schifani tried to obtain the transfer of more funds to the region to compensate for the amount of local energy production.

As Francesco Arecco and Lucia Bitto of the Arecco law firm wrote in Rienergia on 18 April 2023[4], **procedural suspensions without grounds for an unspecified period of time are constitutionally unlawful** according, inter alia, to Contitutional Court decisions 221/2022 and 177/2018.

Legal action should be considered against local government administrators who suspend authorisation processes for the fiscal damage to national energy customers.

5.3.5 Empowerment of regional governments and local bodies

Regional governments and local bodies need to put together the necessary competences to manage the authorisation processes for which they are responsible. **Training** and **if necessary adaptation of the staff** involved in them is an objective that the State as a whole should set itself.

5.3.6 Maritime space planning and wind power development

Maritime space planning is both strategic and necessary for the harmonious development of renewables in marine areas (starting with offshore wind power). Current planning is absolutely lacking in both method and merit. Not only has such planning been unjustifiably delayed, but in operational terms it does not even provide the actual tools needed to be able to practically plan the expansion of renewables in marine areas. A reading of the paperwork reveals an absolutely vague picture which is not fit for purpose.

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4 https://rienergia.staffettaonline.com/articolo/35211/Sicilia:+si+tratta+di+una+moratoria+al+fotovoltaico/Francesco+Arecco+e+Lucia+Bitto

5.4 Policies for incorporating renewables into the electricity system

5.4.1 Context: Update of the Integrated Electricity Dispatching Law and wider participation in balancing services

One update to the fundamental regulations for the operation of the electricity sector involving critical markets such as the reserve and balancing markets was the Integrated Electricity Dispatching Law, which was presented with the short note (ARERA 685/22). A key point is the goal of achieving **expanded participation of the electricity system balancing resources, each "as far as they can", starting with demand**.
As ARERA appropriately puts it, "In order to preserve the right to switch a light on whenever we want, we have to build a new world in which switching it off is an opportunity".

This process will involve (finally) introducing a context also in Italy that is open to balancing service providers, and therefore **aggregators**.

They are operators specialised in contracting customers' ability (thanks also to technology innovations in their consumption machinery) to provide balancing capacity.

As we have seen, the ECCO-Artelys study estimates **the energy time shifted thanks to demand response will be 39 TWh in 2035 (26 TWh in 2030).** This process of focusing on flexibility has also been supported by the latest European laws. REPowerEU asks for the national energy and climate plans (PNIEC) to be treated as a useful framework for freeing member states from fossil fuels. The guidelines for revising the PNIEC, already mentioned in REPowerEU in 2022, emphasise the importance of increasing the flexibility of the energy system, energy storage and demand response. It should be noted that in the framework of the proposals for reforming the electricity market of March 2023 the member states are asked to define an indicative national goal for demand side response and storage that needs to be reflected in the PNIEC (article 19d).[5] In addition, member states with a capacity mechanism must consider demand side response when developing this mechanism.

5.4.2 Centralised procurement of accumulation capacity

Primary legislation in 2021 and subsequent regulatory instruments provide for a centralised accumulation capacity procurement process. The providers will be given paid contracts in exchange for energy time shift services in a special market managed by the Italian Power Exchange (GME).

This is an appropriate process for avoiding likely failures of the market in providing storage in suitable timescales and quantities, and for limiting the risk of "cannibalisation" of the price perceived by photovoltaic system developers.

What needs to happen:

5 "Based on the report of the regulatory authority pursuant to Article 19c(1), each Member State shall define an indicative national objective for demand side response and storage. This indicative national objective shall also be reflected in Member States' integrated national energy and climate plans as regards the dimension 'Internal Energy Market' in accordance with Articles 3, 4 and 7 of Regulation (EU) 2018/1999 and in their integrated biennial progress reports in accordance with Article 17 of Regulation (EU) 2018/1999".

- Storage quantity needs to be consistent with requirements (the ECCO-Artelys study predicts 15 GW only from batteries as early as 2030, in addition to 11 GW of pumped storage);
- The procurement process needs to be accelerated (including with a rapid go-ahead from the EU for the regulation of state aid);
- The participation of entities other than Terna needs to be encouraged;
- Terna needs to be kept as an impartial storage manager even when it builds the storage itself.

5.5 Financial practicability of new renewables

5.5.1 Introduction: The risk of cannibalisation and role of the PNIEC as a guarantee of support or of consistent regulation

The transition to renewable power sources is also a transition to a cost structure based mainly on fixed costs, most of which are sustained for construction of the plants. The prospect of remuneration for the fixed costs for plants from renewables by means of energy prices is a decisive factor in such investments. So the reasonable certainty that there will be sufficient storage to make sure that the expansion of photovoltaic power does not make the energy price collapse in the hours of sunlight (known as price cannibalisation) is important to encourage investments in this form of power generation.

The new PNIEC must be the document that provides the guarantee that the regulatory choices and the choices supporting the transition and renewables will be in line with climate goals.

5.5.2 Correction of the windfall profit regulations

The first version of the law to recover windfall profits in Italy (see Article 15-*bis*) was extremely poor because:

- It does not take into account derivative positions and therefore the effective exposure to the prices of the producers' revenue from renewable sources (many of which were in fact pre-determined or in any case limited as a result of forms of hedging)
- Solely affected (part of the) renewable sources
- Had a much lower strike price level than the one proposed by the EU (approximately €180 /MWh)

Setting a **threshold on inframarginal revenue from generation plants (without excluding fossil fuel sources as the EU did) makes sense, but the threshold must be:**

- **High enough to leave a reasonable margin for repaying the fixed costs of renewables**
- **Fixed beforehand** and for a sufficiently long period to be integrated into project assessments without risk. The possibility of retroactive laws on windfall profits also risks compromising the credibility of PPAs on renewables.

5.5.3 Participation of non-programmable renewables in dispatching services

Within the context of the reform of the TIDE mentioned above, renewables are among the resources that should be able to provide stability services to the electricity system. It is already the case that in some cases the network law calls for technology requirements (such as grid-forming inverters in photovoltaic power) that can enable network services for non-programmable renewables that it was not possible to provide in the past.

5.6 The role of consumers (households, SMEs and energy-hungry industry)

5.6.1 Correction to bill subsidies

The more than €100 billion public money spent on subsidising energy bills was indiscriminate up to the first quarter of 2023. This means that it did not reward more efficient energy use or energy saving. It was also not tied to the effective need of the beneficiary, except in the case of the "bonus energia" for domestic customers, which was not linked to consumption but rather was based on the recipient's financial circumstances.

When revising such mechanisms – which may be needed for possible future temporary energy price increases – it is important to ensure that they do not encourage behaviour that is not in line with decarbonisation and more efficient energy consumption, and therefore that they comply with the following goals:

- Subsidies on lower consumption levels than previous ones, or on the industry best available techniques (BAT) for those with the same potential requirements. For example, in the case of air-conditioning consumption the area, and possibly the energy class and size of the building will be taken into account. In this sense the recently introduced fixed subsidy for gas end consumers differentiated by area is a move in the right direction. Whereas in the case of consumption for manufacturing processes, reference will be made to product/technology tables such as those used when designing efficiency improvements under the "white certificate" scheme.
- Subsidies to businesses based on their exposure or otherwise to competitors with energy supplies in places where prices differ considerably from ours. If there is not such exposure in the relevant market, it is reasonable to suppose that the higher energy costs may be passed downstream without compromising margins, and if anything the problem is the effect on the end consumer and on inflation.

5.6.2 Removal of barriers to passive demand response (dynamic pricing)

The Italian retail energy electricity system has electronic meters – distributed in part by Enel Distribuzione and in part by other distributors – which are not only able to interact with load management systems beyond the meter, but also to receive signals from the distribution system operators (DSO) including timely controlled power reductions, even partial ones. These features, together with the availability of dynamic pricing tariffs (currently by the hour, but soon to be by the quarter-hour in line with the expected reforms of the spot energy markets) have the potential to develop passive demand

response (i.e. merely in reaction to prices) and active demand response (i.e. called on by the network managers), not currently being exploited.

5.6.3 Development of retail instruments to provide prosumer purchase options to all end customers regardless of their supplier

The 2022 crisis showed that our dependency on fossil fuels is not only a problem of price levels, but also of price volatility, and it is almost a given that this volatility will remain an issue as long as we are significantly dependent on gas. Today, the only way for an electricity customer to be completely free from gas-related volatility is to go off grid by installing a photovoltaic system with plenty of storage. A solution whose high cost offset the potential savings on network.

In our view, the fact that virtual solutions for being fully free of the gas price component are not available to retail electricity customers is a failure of the market. In fact, with payment of the costs needed to procure energy solely based on fixed costs and modulation capacity based on storage rather than peaking fossil plants, it should be possible to obtain this result by means of contractual instruments, even only financial ones, provided the seller contracts adequate wholesale PPAs with capacity from renewable sources.

In this sense, it is not only reasonable for institutions to reduce the risks involved in entering into wholesale PPAs for energy from renewable sources, but also for energy retailers – even when not vertically integrated with generation – to be put in a position to cover the supplies they sell with quotas covered by wholesale PPAs, in order to be able to offer tariffs effectively free from the cost of gas. These offers would require

- A retail system of distribution of the rights over PPAs contracted by the national issuer of the tender to electricity retailers
- Updating the rules for selling to retail customers, enabling the introduction of reasonable exit costs for customers that have entered into prosumer contracts linked to the average costs of renewable sources and not to the energy spot price.

Within the context of the Italian regulations that already require energy sellers to offer certain tariff structures, it would be appropriate to add the option of a tariff that is totally free from spot prices (linked to gas). This would in turn encourage the emergence of wholesale instruments to cover the relative risks.

5.6.4 Practicability of plug and play photovoltaic systems

The installation of residential rooftop photovoltaic systems is far more labour-intensive than utility scale installation, or even only commercial or industrial rooftop installations. Facilitating do-it-yourself plug and play solutions (for example, by guaranteeing a permanent right to energy exchange with the grid) even for relatively small power requirements would help reduce the current bottleneck in the installation of residential rooftop photovoltaic systems.

5.6.5 Policies for energy efficiency and the electrification of consumption

Energy efficiency is considered an essential measure within the decarbonisation process in order to guarantee secure supplies by means of greater energy independence. Efficiency measures must be a priority of energy policy, which is why

the current support framework needs to be reformed to consolidate them and make them structural.

In the industrial sector the white certificates system - which has been having problems for some time - needs to be revised, and funds from the National Recovery and Resilience Plan (NRRP) and REPowerEU need to be redirected to guarantee the necessary resources for funding efficiency measures.

In the construction industry there needs to be an efficient mechanism to consolidate energy efficiency in homes. The current Eco-Super Bonus scheme needs to become a permanent framework in order to accompany home renovations in line with the new goals of the EU directive on energy efficiency (2012/27/UE) and the Energy Performance of Buildings Directive (EPBD) (2010/31/EU on "Green Houses") currently being debated. The energy efficiency requirements of the incentive scheme need to be improved, and must exclude gas technologies from the permitted projects. If well constructed, this could also be a way to combat energy poverty.

Finally, it is important to encourage the transition of demand towards electric vehicles. Government and other forms of taxation on tariffs must be revised to bring them in line with the goals of safeguarding consumers without neglecting energy system security and decarbonisation. The *Decreto Bollette* (Bill Decree) approved by the Government on 28 March is an instrument that supports the consumption of gas, and has the counterproductive effect of slowing down the electrification of final uses (such as the switch to heat pumps in domestic heating), increasing the existing gap in government and other forms of taxation that favours gas over electric vehicles.

5.6.6 Rebalancing of administered charges in gas and electricity bills

A major process in decarbonisation is the electrification of final consumption. This means that a large part of civil and transport energy consumption will gradually rely on electricity. Currently electricity tariffs have more administered charges than gas, and this constitutes a barrier to electrification.

In ordinary market conditions, i.e. before the energy crisis, a domestic user's electricity bill would include government and other taxation of €22.9 €/GJ compared with €7.7 €/GJ in their gas bill. The result has been little penetration of electric-powered technology despite important incentives in the civil and transport sectors. Taxation, particularly on energy products, therefore needs to be made consistent and virtuous as far as the integration of energy systems (electric, heat and transport) is concerned, in order to support households and businesses in their efforts to achieve decarbonisation, efficiency and energy independence. In addition, the introduction of the ETS 2 emissions trading system also on civil heat consumption and transport from 2027 is another reason for the integration of taxation with market mechanisms in order to avoid putting an excessive burden on consumers and to ensure the overall consistency of the various cost levels.

5.7 A level playing field in electricity generation

5.7.1 A solution to stranded assets and protection for investors in the current regulated gas assets

Today gas network management companies have an essentially guaranteed remuneration system for investments in the regulated perimeter. This means that they have a vested interest in maximising the value that falls within that perimeter.

The result is that also the managers of assets that will be scaled back by the decarbonisation of energy and the economy have an interest in continuing their investment business as usual.

The context is one in which the Government and the regulator do not have the necessary ability to carry out an in-depth analysis of the technical assessments of network managers with respect to technical alternatives and the quantification of security needs. For the reasons discussed in point 5.9.3., in order to avoid the risk of structurally excessive investments in assets that are not consistent with decarbonisation policies, the incentive to construct assets that will be stranded from a climate viewpoint (and from an economic one, once the climate policies are complied with) must be changed.

If resolving the conflict of interest mentioned in point 5.9.3 certainly goes some way towards finding a solution to the problem, it might also be necessary to consider ways to safeguard investments that have already been made and are not recoverable, and to migrate capital still available, even when belonging to regulated gas operators, towards infrastructures consistent with a decarbonised electricity industry (such as electricity networks and techniques for integrating renewables on which there are expected to be regulated support packages).

5.7.2 Correction of the incentive for the capacity market to use new gas rather than existing gas

The Italian capacity market is not consistent with the EC reform, with the ARERA goals on which the reform of the TIDE are supposed to be based or with decarbonisation policies, including the first version of the PNIEC. In fact:

- It only involves the participation of demand resources in a “negative” sense, i.e. with exemption from the payment of the capacity market costs, rather than remuneration for investments in capacity to provide services to the network.
- It excludes those already receiving other incentives (such as renewables), even when such incentives have been designed to remunerate external factors that have nothing to do with network services. But there is no reason why a power plant that does not damage the climate or the air and is capable – if partially – to provide reliable capacity services should be prevented from selling such services on the capacity market.
- It involves extremely high levels of discrimination between existing power plants (1 year of remuneration) and new power plants (contract of up to 15 years). In the tenders carried out so far, new power plants have received remuneration comparable with the entire capital expenditure involved in constructing the new plant, which has acted as an incentive for the development of new combined cycle gas power plants that will accelerate the exit from the market by previous-generation plants which are only slightly less efficient but just as flexible and to a

large extent already paid for. A problem which is paradoxically cited as a reason for new capacity market auctions, in a clearly vicious circle.

The capacity market must not be extended under existing rules, but replaced by electricity storage capacity procurement auctions and demand response infrastructure.

Existing contracts will have to be changed as shown below, using acceptable forms of renegotiation:

- Introduction of the **direct participation of Demand Response (DR)** (directly remunerated or, in the case of new capacity, with contracts with the same term as those for new electricity capacity).
- Introduction of the **zero-emissions requirement for new power plants**, or at least of requirements in line with the reduction of emissions to meet the goals for 2030. **Fossil fuel plants not yet built that have already received a remuneration contract should be converted into storage.**
- **Elimination of the incompatibility between subsidies for renewable sources and remuneration by the capacity market** (these are two independent values – decarbonisation and system security - both deserving of long-term remuneration)

5.7.3 Elimination of must run plants

"Must run plants" (mainly thermal and large hydro) are currently remunerated by means of different mechanisms involving the reimbursement of costs, which are (to a greater or lesser extent) lacking in transparency and not integrated with the capacity market. Every form of "special island" in this type of regulation goes in the opposite direction to that of free competition and the inclusion of all services (particularly the most innovative and widespread).

The must run power plant regimen must be ended and redirected towards other spot and forward energy availability and electricity generation capacity procurement markets.

5.8 Command & control electricity system decarbonisation measures

5.8.1 Effective abandonment of coal throughout Italy

The abandonment of thermoelectric coal by 2025 in all regions of Italy is not up for discussion, and all consequent actions must take this objective as inescapable, starting with Terna's planning. **The security of the electricity system must be pursued with instruments in line with the energy transition regulations and objectives**.

5.8.2 Phase-out of the use of oil derivatives in electricity generation

Closure of the oil-powered thermoelectric power stations not subject to the use of refinery sub-products must be established by legislative instruments in the same way as coal-fired power stations.

5.8.3 Limits on the use of biomass especially in the more polluted areas

Also in light of the latest scientific evidence, the use of biomass must be managed with extreme caution. Biomass has always been considered a renewable source of energy with zero emissions, but the problem is that its carbon neutrality is not that evident

given its production cycle, and especially the differential between CO2 absorption/storage times during the plant growing processes and the atmosphere release times relating to the different combustion processes.

It should also be highlighted that also in thermal uses of biomass (which are the most efficient), it is important to exercise caution as the emission levels of polluting substances (such as PM, VOCs, etc.) may tend to penalise this type of fuel, a fact that should direct its use particularly to areas where the air quality plans allow it.

Some types of low carbon content, low impact bioenergy will play a limited, targeted role in the transition to zero emissions. We are referring in particular to the use of agricultural waste, both on farms and in industries for which there are currently no alternatives, as in the case of aviation. However, such waste must not be imported from abroad.

5.8.4 Elimination of the maximisation of electricity production from fossil fuels and biomass

In May 2023 the law transforming coal-fired plants, oil products and biomass into must run power plants with reimbursement of documented fuel costs was re-proposed and extended. This is happening when storage is fuller than the same period in any other year. **The measure must be cancelled given its indisputable negative impact on the climate**, and given that in the event of scarcity, gas prices make the other fossil fuel plants competitive, as we saw during the energy crisis.

5.9 Network governance

5.9.1 Incentives to TSOs (including gas)

Today Terna has an incentive to limit the costs of purchasing balancing resources in the relative markets, but there is no incentive to be selective about investments, except in the role of ARERA and the Government in monitoring the two-year development plan. In this respect the capacity of the relevant institutions to play a critical role has always been limited (not only in Italy – see the dramatically opposing views of ENSTO-E and ACER).

It is necessary to **redefine the financial incentives to the TSO in order to ensure that they produce effective competition between investment solutions on its network and the purchase of dispatching services** (possibly forward purchases and with continuity) from third parties.

5.9.2 Management of connection requests by the TSO

While it is true that requests for connection to the grid (currently around 350 GW) are a multiple of the capacity of renewables that will be effectively delivered, and can lead to apparent bottlenecks in connection capacity, it is also true that **Terna is not using its right to attribute confer its "technical approval" on such requests**.

Ensuring the TSO takes responsibility in such a way that it also provides discriminating signals in a virtuous manner with respect to connection requests would play a useful role of direction and selection in the project pipeline.

5.9.3 Conflict of interest

This capacity for assessment of Governments and independent authorities is hindered by the fact that the TSO has both the incentive to invest in network assets (which can wrong-foot demand-side technologies) and the technical information about the network necessary for making a detailed analysis of its security and adequacy.

A perfect example: for the purposes of adequacy an objective statistic of a lack of power cuts (three hours per year in the case of Italy) is taken as given while it realistically has (or will soon) be superseded by the increase in the capacity of demand to move its loads in time.

Part of the grid security assessment activity should be transferred from Terna to the independent authority (ARERA) in order to enable the latter to play an effective monitoring role (also to support the Government).

There are also adequacy resources with respect to which Terna plays a part in determining the decisions about procurement quantity and quality but with respect to which it has no interest in being efficient or in carrying out cost-benefit analyses, as in the case of the capacity market as mentioned in point 5.7.2.

5.9.4 Coordination between Terna and Snam

For some time the two TSOs have been jointly carrying out scenario analyses. One would expect that this would have led to an outcome that takes into account the fact that huge-scale electrification of the energy systems should also translate into less need to develop gas networks. However this does not appear to be the outcome, and Italian policies are currently promoting faster investments in both the electricity and the gas grid.

We believe that **cooperation between Terna and Snam** is interesting, but **needs to be integrated and regulated so that it concentrates its energies in a consistent direction rather than in a cross-eyed fashion**.

5.9.5 Guarantee of the performance of connection operations and solution to anomalies in renewables connected to the distribution networks

It is crucial for the distributor to have an efficient commercial assistance service which the plant manager can contact during the phase of connection with the network or in the event of technical anomalies in the connection. It is necessary to develop quality monitoring systems and prompt technical service for plant managers as is the case for users of the points of consumption.

THE ITALIAN CLIMATE CHANGE THINK TANK

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