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How to reconcile energy independence and decarbonization goals: key challenges and possible solutions

EsadeEcPol Insight #37 June 2022

EXECUTIVE SUMMARY

The new goal of ending EU reliance on Russian energy is in addition to and must be reconciled with the existing goal of decarbonising the Spanish economy. This reconciliation seems obvious in the very long term, but in the short and medium terms, it poses challenges for Spain and other countries:

1. The immediate upward pressure on inflation, accentuated by disconnecting from Russia, may lead (and is leading) to decisions that encourage emissions.
2. The costs of the transition, like those of the immediate pressures, are considerable and not distributed symmetrically amongst the population: they tend to affect the most vulnerable socio-economic groups.
3. The mechanisms and decisions necessary to implement an energy mix that can ensure decarbonisation and self-sufficiency are not integrated well enough into either the new circumstances or the differential and asymmetrical costs that may arise, particularly in the very long term (from the next decade onwards) and at the territorial level.

To tackle these challenges, we suggest the following lines of action:

→ **Avoid using price caps and subsidies** in order to maintain the signal that the prices of products that cause pollution and make us rely on other countries (fossil fuels) are a reflection of these issues, and leave the control of inflation in the hands of central banks as far as possible.

This should make us evaluate the cost of indexing massive transfers, such as linking pensions to the consumer prices index (CPI), this being a measure that encourages price caps and subsidies.

→ **Improve the design of the electricity market** to ensure that it offers a combination of incentives for the shift towards non-polluting energies, safeguards for the most vulnerable, and increased energy self-sufficiency.

- The 'Iberian exception' designed and agreed upon by the Spanish and Portuguese governments could work in this respect, but only if the final price after capping gas prices is sufficiently high to continue encouraging the transition. Price changes after implementation must be monitored closely.
- Another option would be to use windfall profits to fund direct transfers to the citizens affected. This would respect the price signal and sidestep the risk of ceasing to incentivise the transition. However, since this might entail certain legal uncertainties, the possibility of transfers similarly funded by tax should also be contemplated, or other mechanisms.

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Line of research:

Green transition

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- → **Reduce asymmetrical impact by making compensatory payments to the most vulnerable sectors of society.** Before increasing such payments or implementing new schemes, however, steps must be taken to ensure and broaden access to them and make them effective for households in the lowest half or third of income brackets.
- → **Give demand more clout by creating a European gas-buying cartel in addition to other measures (tariffs or disconnection from Russia)** to maintain greater downward pressure on prices. The respective savings (or part of them) could be invested in renewables.
- → **Define a realistic, fair energy mix** that retains renewables together with the possibility of exploiting synergies between gas and the drive for hydrogen, establishing a gradual shift from the former to the latter, in which Spain has a part to play thanks to its regasification capacity. Spain's current nuclear policy should also be reassessed in view of what it could contribute to the new goal of energy self-sufficiency.
- → **Invest more in rationalizing demand and energy efficiency**, particularly by means of well-targeted, progressive taxation, better information available to consumers, and housing refurbishment schemes.

Introduction

The invasion of Ukraine is having a huge economic and social impact on the European Union as a whole and on each of its member countries. Russia is the EU's main supplier of fossil fuels, particularly oil and gas. But, as EC President Ursula von der Leyen told the press on March 8, "When it comes to something as essential as energy, we shouldn't rely on a partner we can't trust." The EU agreement signed before these declarations set a political goal for all member states – an end to reliance on Russia for energy – and put in place "a plan to end Europe's reliance on Russian fossil fuels well before 2030, starting with gas, in response to Russia's invasion of Ukraine", according to the press release about the launch of the RePowerEU initiative that same month.

This broad (but clear) political goal had to, and must, be aligned with decarbonization goals, more specifically with the energy transition goals set forth in the European Green New Deal, the main mechanism of the EU (and its countries, of course) for decarbonizing its economy. The mid-May RePowerEU press release said, "The urgency for transforming the European energy system is two-fold: (a) to put an end the EU's reliance on Russian fossil fuels, which are used as an economic and political weapon and cost European taxpayers almost €100bn a year, and (b) to tackle the climate crisis."

The pandemic prompted a response channel within the EU and its member states that must be used again in this new crisis. Coordinated responses and the framing of these responses in a common goal must define the economic response of the 27 to this new challenge. The aim of this response – which must provide very short-term, medium-term and long-term measures – must be to minimize the economic fallout of the invasion whilst strengthening our position in the coming decades.

However, reconciling these two aims is no easy matter. This paper offers an overview of the main challenges of combining decarbonization and self-sufficiency, whilst considering possible measures to deal with them. We adopt a Spain-centered approach with regard to a problem that is obviously and inevitably European but also deeply rooted in and conditioned by the circumstances of each member state.

The main bottle necks

The new goal of energy self-sufficiency is undoubtedly an opportunity for decarbonization, but only in certain conditions outlined below:

- → Availability and willingness to invest in the energy transition
- → A clear understanding of the energy generation tools that will enable both goals to be met at the same time
- → A progressive balance in the costs arising during and after transition.

It is not clear whether these conditions are met at present. There are in fact at least three immediate problems that interfere with these conditions needed to achieve reconciliation:

1. Given the abovementioned conditions, reconciliation is much easier to achieve in the medium and long term. In the short term, however, the upward pressure on inflation could have the opposite effect because countries inevitably adopt mechanisms to reduce the price of fossil fuels.
2. The gap between long and short term, affected by inflation, casts more doubt on the energy mix best for both goals in the new scenario. Renewables are the obvious option, and also the option mooted most often for combining the goals of decarbonization and energy self-sufficiency. There are, however, at least two crucial barriers to consolidating this option which are particularly relevant today:
    - Theoretically, renewables can fulfil the supply expectations for the coming decade, but there are doubts about how feasible or reasonable it would be to increase those expectations (due to the new goal of energy independence, which will increase the demand for renewables). This is particularly the case when there are specific barriers to the rollout of renewables associated with specific issues, often seen to have an asymmetrical impact at the territorial level.
    - In the very long term (more than a decade), to ensure that technology is or will soon be at the stage necessary to build the generating systems and, above all, the storage systems necessary for renewables to become the main source of energy, the EU will have to import certain critical raw materials. Interdependence would, therefore, seem inevitable, to a certain extent at least. More generally, we must not forget that free trade remains a key political instrument for European countries and is regarded as a good thing in itself, unlike nationalism or sovereignty-centric approaches. In other words, in both practical and political terms, there will always be a limit to the degree of energy self-sufficiency that all European nations can enjoy.
3. The transition risks associated with decarbonization are well known, the main one being energy-driven inflation. The possible costs will not be distributed evenly across society, nor will the current inflationary cycle across Spain and Europe (Collado and Martínez, 2022). The combination of decarbonization and self-sufficiency may heighten these risks, or at least the perception of them, and the unequal impact will firstly have social costs, but also political costs, thereby reducing potential support for achieving both aims.

In addition, the contribution and impact of these three challenges will vary from one country to another depending on the conditions at the outset, with the ensuing risk of imbalance across the EU. This is why a careful analysis of the intra-national situation is essential in order to remedy any impasses.

In this respect, Spain is an almost perfect example for observing the possible impact of these obstacles: upward pressure on the international prices of fossil fuels brought both citizens and public decision-makers face to face with immediate pressures that called for responses charged with risks of misalignment. We will now compare what was done with what should perhaps have been done.

Safeguard the price signal

Of all the front-line measures taken by the Spanish government to tackle the immediate impact of Russia's invasion of Ukraine upon energy prices, two stood out: the subsidy of €0.20 per liter on fuel of any kind and the capping of gas prices in the electricity market. Considering the subsidy first, as we explain in Hidalgo et al (2022) no matter how effectively the subsidy achieved its original aim, it severely damaged the price signal regarding one of the most polluting forms of energy. The same would have happened with more radical alternatives such as price controls.

One could argue that managing inflation was, in the current scenario, a policy of greater public interest and therefore worth the sacrifice. But according to the estimates given in Hidalgo et al (2022), the impact of this measure on inflation was a reduction of barely one percentage point. It is not clear that this benefit offsets the damage done to the decarbonization cause. It may, however, give the European Central Bank yet another reason for taking a decisive stance against inflation: to avoid or discourage this type of policy amongst member states.

Furthermore, as we also stated in Hidalgo et al (2022), it is reasonable to assume that one of the main reasons for implementing this measure was to stop or minimize any increase in the consumer price index (CPI) because this would cause anything linked to the CPI to increase too, starting with pensions. Perhaps the current debate about how pensions are calculated should include the cost of linking them to CPI against a backdrop of high inflation caused by energy prices. The application of fuel subsidies shows that indexing payments such as pensions increases the damage to the price signals of polluting energies, and this affects the decarbonization goal.

In any case, if emission-reduction policies are completely necessary, they should be put in place for a very limited period of time. In this respect, the suggestions already floated by the Spanish Government about extending the subsidy for a longer period give cause for concern because they cast doubts about the priority of decarbonization goals. The dates already set should be abided by, or at least be realistic from the outset so that the parties involved do not change their expectations or have more reasons for keeping this type of policy in force.

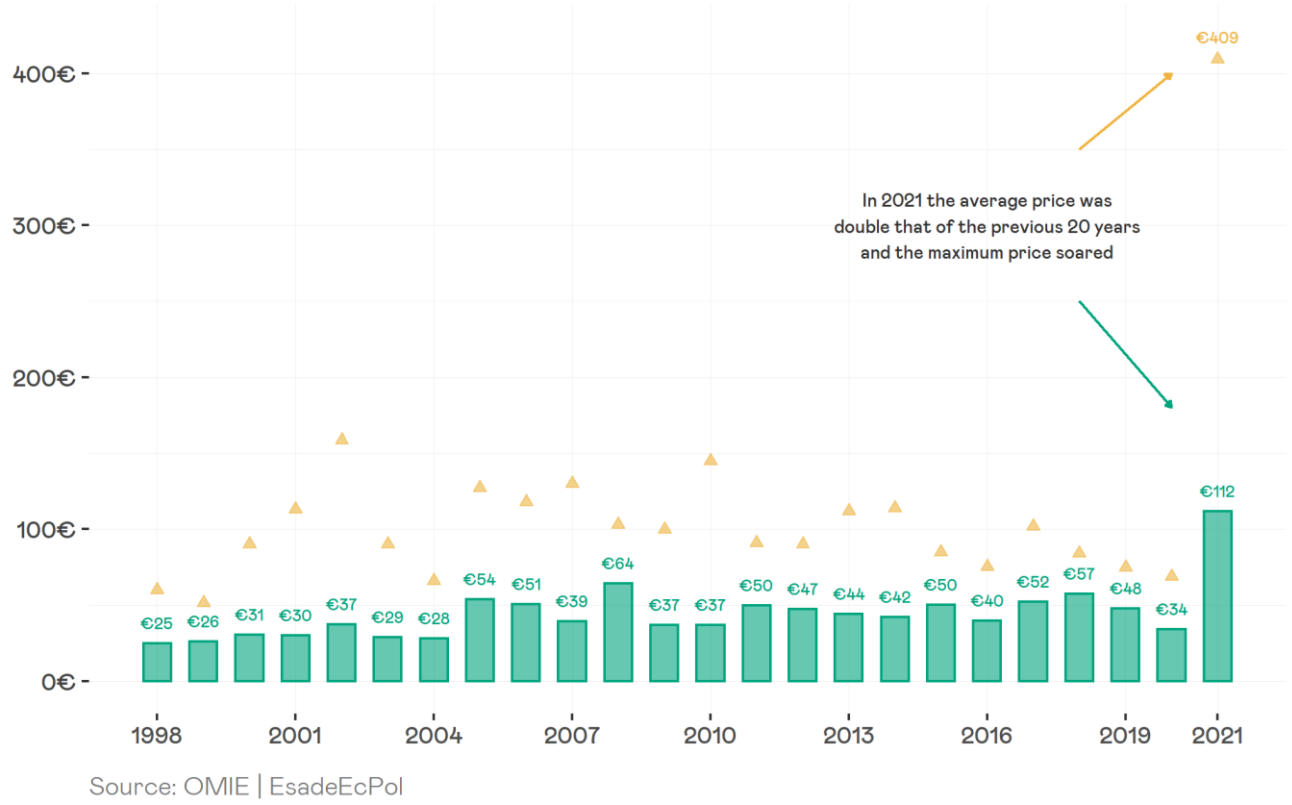
Improve the design of the electricity market

Since mid-2021, the increase in the price of electricity and the need to overhaul the electricity market have been recurring issues in public debate – not only in Spain but also the rest of the European Union. However, due to the relative isolation of the Iberian Peninsula from the rest of the continent and the uneven impact of this increase across society, Spain is the country most in favor of overhauling the market and implementing exceptional measures to bring prices down. We will now analyze the problems involved in the current design of the electricity market against the backdrop of reconciling decarbonization and energy self-sufficiency goals, and evaluate whether the measure taken to stop price increases – the 'Iberian exception' as it is known – is the best answer to the problem in today's scenario, and we will propose several ways of improving the current equilibrium.

Throughout the EU, electricity is sold on a marginal market in which the most expensive technology determines the final price charged by all technologies. Logically enough, in theory at least, this market design has been championed for several reasons as the best possible design for remunerating the generation of electricity. The main reason, according to the basic theoretical concepts of how a market works, is that a marginal design (in which the marginal cost of the last company to enter the market determines the market price) would send appropriate signals and incentives. How? By rewarding the most efficient companies and thus incentivizing the technology transition and consequently, long-term growth. The problem, obviously enough, is that implementing these ideas in an electricity market like the existing one is complicated, to say the least. Let's see why.

Historically, this design achieved its aim and enabled renewables to be developed at relatively steady, low prices on the Spanish market. As the following graph shows, the marginal price has averaged some €50/MWh with maximum prices of some €100-150/MWh. In 2021, however, the average match price doubled to €112/MWh, casting doubts over the suitability of the marginal design. The reasons for this increase were higher gas prices and, to a lesser extent, CO_2 emission allowances. At first sight, it might seem that these factors in themselves have no bearing on the price of electricity. However, they are crucial when determining the price of electricity. Because not enough renewable energy is yet generated to meet all demand, other sources of energy are needed to ensure supply. Such sources include combined-cycle power plants that run on gas and need emission licenses to operate. Any increase in the production costs of these companies due to higher prices of gas and/or emission permits is immediately transferred to the wholesale market. The outcome is an almost perfect correlation between the price of gas and the price of electricity, even though this source of energy only accounted for slightly more than 10% of total production in 2021. In addition, because the other technologies charge the price set by gas, they receive extraordinarily high windfall profits.

Graph 1
Average price and maximum price on the daily market



Source: OMIE | EsadeEcPol

Furthermore, we are well aware that the wholesale electricity market is far from being a free, open market, the basic tenet that justifies marginal markets being identified with efficiency. Although the mechanisms designed to determine the demand and supply of electricity seek to combine what is by definition an oligopoly, i.e., few producers, with a more competitive market, it is impossible to guarantee that this will happen.

Another issue is that in a scenario of oligopolistic competition, the marginal design could create incentives for companies to diversify instead of competing against each other. This could maximize returns and be an opportunity to obtain greater profits in divisions using cheaper technologies.

This design might also affect the retail distribution market because it provides opportunities to get rid of companies whose main job is simply to distribute energy to end users. Big companies that have generating and sales divisions have a competitive edge. Such companies can temporarily run their retail divisions at a loss and fund them by the windfall profits of their generating units by offering their customers prices that are occasionally lower than costs but higher in the long term (they recoup the profits in the long term). Electricity retailers with no generating capacity, however, cannot afford to buy at high prices and sell cheaply for a long time. This could cause companies in this market segment to go under, leading to greater concentration, less competition and higher prices for consumers, all of which could have been avoided if retailers had hedged themselves against this risk in due time.

Additionally, certain demand factors weaken the validity of this system. First of all, it must be remembered that the demand for electricity is very inelastic, i.e., fluctuations in the price of

electricity do not cause great variations in consumption. This facilitates the increase of commercial margins and, therefore, a shift in returns from consumers to producers when prices are high. Secondly, and paradoxically, systems in which prices vary according to the time of day hinder transparency because it is difficult for much of society to adapt to them, unless behavior determined by the time of day becomes the norm and, a priori, consumers know the best times to use electricity. Basically, the combination of imperfect information about hourly tariffs, the inability to store electricity efficiently and inelastic demand adds up to captive demand in this market.

Finally, this system sends confusing messages to consumers about the necessary electrification of the economy. If we really want to move towards environmentally responsible consumption, we must send out the right messages. With gas costing €200 we will be unable to do so, paradoxically, because the consumer only sees that electricity is expensive, not the underlying gas.

In addition, the present-day increase does not impact all citizens equally. The retail market in Spain has two types of tariffs: a regulated tariff and the tariff charged by electricity retailers on the open market. The first type, known as PVPC (voluntary price for small consumers) accounts for approximately 40% of households and is indexed to wholesale prices therefore wholesale fluctuations are automatically reflected in the consumer's invoice. The other type spans a great many tariffs, including those with set prices that shield consumers from market fluctuations for the length of the contract. When contracts are renewed, tariffs are adjusted to match new market conditions. The first group includes vulnerable consumers because eligibility for the government subsidy on electricity bills is tied to having the PVPC tariff. This takes us to the next contradiction: the most vulnerable segments are the ones affected by higher prices immediately. In addition to the negative impact this has on the economy, there is also the discontent and pressure on households less able to deal with the situation. This is why it is necessary to implement a measure or policy that acts like a firewall between electricity tariffs and gas tariffs or that compensates the consumers hit hardest.

One option would be to transfer any surplus from the producer to the consumer: this would reduce costs for the latter without making the market too inefficient. Just as companies practice price discrimination to exploit consumer surplus, a mechanism could be implemented to do the same to companies. It must be remembered that these surpluses are obtained simply due to the high cost of a single technology that only accounts for slightly more than 10% of those necessary to generate electricity. The proposal finally implemented by the Spanish and Portuguese governments is moving in that direction. Rather than simply controlling prices, a maximum price is designed for the margin which, when appropriately defined, does not necessarily eliminate the benefits of other technologies, whilst suitable surcharges on consumers' bills would ensure the profitability of divisions or generating companies dealing with gas. Generally speaking, this design should not affect appropriate incentives if the price paid in the end remains higher than the costs of the other technologies, thereby ensuring them a minimum return and preventing gas-fueled generating companies from slipping into the red. In short, the transfer of revenue between consumers and companies would be limited and the increase in inflation would be reduced.

This measure does, however, have inherent risks. Gas and coal subsidies, for example, might drive an increase in the supply of these technologies if the final price is lower than the cost, in which case they would be practically entitled to such subsidies. There would, therefore, be no incentive to save in this scenario. As a result, whilst in force, incentives to use (invest in) cheaper technologies might be eliminated. Secondly, a final capped price that is not high enough could affect investment in technologies situated between those with the lowest marginal cost and those, such as coal and gas, whose profits are subsidized. Finally, lower electricity bills, despite perhaps being justified by the foregoing, should not encourage savings, even though the price is artificially high due to the increase in the marginal technology, i.e., gas. This must be taken into account when calculating the net benefits of the measure. Finally, the price difference caused by this system will encourage exports to France because the European Commission requires the capped price to be applied to exports.

Alternatively, windfall profits could be used to fund direct payments to the affected consumers, as in Italy. This measure, despite entailing certain implementation difficulties and possibly a legal challenge, would not harm the price signal, would make it possible to avoid the risks mentioned in the previous paragraph, and would require no outlay from the state's general budget. Other possibilities along the same line include drawing up medium-term contracts indexed to the price of gas as a mechanism for extracting income whilst not affecting the price signal, or contracts for difference (CFD) applicable to hydroelectric and nuclear energy production.

In the medium term, we must weigh up whether a market overhaul is necessary. It must not be forgotten that doing away with fossil fuels goes hand in hand with the shift towards an electricity-powered economy, something which, due to current prices, could elicit a negative response from society and jeopardize the acceptance of decarbonization goals.

Make impact less asymmetrical

The possibility of using windfall profits to offset impacts is just one example of transfer policies that could be implemented to minimize the differences in the costs linked to decarbonization and energy self-sufficiency. It must be said that these costs will hit the lowest-income groups hardest: directly because energy costs are a higher proportion of their household outlays, and indirectly because they are also hit harder by higher prices of any other goods or services. It could be argued that in the long run they will also be the ones to benefit most once the transition is completed because these segments are exposed more often to the damaging effect of emissions. In addition, the technological expectation is that energy will be cheaper in the decarbonized world once the overheads of the transition have been paid off. But this is too far away to not start paying close attention and make the investment needed for a fair transition (and also a disconnection now), as already contemplated in the European Green New Deal.

In terms of specific decisions, this means that even before any increase in direct payments, those already in existence should be reconsidered in order to facilitate and guarantee access to them. In Spain, for example, the government temporarily increased the benefits of the electricity subsidy for low-income households and also the benefits of the minimum living

income, but the considerable access barriers and restrictive eligibility criteria of these subsidies hugely reduce the scope of these compensatory measures (Hidalgo et al, 2022). Therefore, it is essential to improve the scope of existing schemes before adding new ones. To do so, it would be useful to reconsider (1) the requirements on paper, taking into account the possibility (put forward in Hidalgo et al, 2022) of making these measures available by default instead of benefits that households must actively apply for; (2) the actual paperwork for receiving them; and (3) the specific format. As regards point (3), it must be admitted that discount schemes, such as the electricity subsidy, are always less effective for vulnerable groups than a cheque, like the ones given to the same segments at present to help with their heating costs.

Direct payments, like any other increase in household disposable income, can undoubtedly cause inflation: a risk to be taken into account when implementing and encouraging them. Keeping them non-index-linked and focusing on reducing access barriers should help reduce, but not eliminate, this risk.

Make demand more powerful

So far, we have analyzed measures that take energy demand for granted but it is essential to turn this constant into a variable. One main driver of any upsurge in energy prices is the concentration of supply in comparison with dispersed demand. If there is just one supplier or if suppliers are in a cartel whilst consumers are dispersed and uncoordinated, it is much easier for suppliers to set prices, leaving consumers no option other than to accept the prices.

This is what makes proposals that aim to coordinate the European demand of energy sources, such as the recent proposal by Cramton *et al* (2022), so interesting. It focuses on offsetting Russia's current power (even today) as regards the EU. As a mechanism in addition to a tariff on Russian gas, these authors suggest an ultimatum agreement based on a specific price below the current price for the Russian government, leaving part of the respective reduction (up to all of it) in a security deposit account if the intention is to tie the discount to a specific political objective (such as the complete withdrawal of Russian troops from Ukraine). The European cartel would then buy gas. The price could change from one month to another, and the countries (the cartel) would act on behalf of the public or private companies seeking to buy at any time.

Whether applied specifically to Russia or more generally, coordinating European demand by means of this model or a similar one would contribute considerably to levelling a playing field that is currently heavily skewed in favor of supply. In fact, the Russian invasion and the self-sufficiency goal are hardly an unprecedented window of political opportunity for something that could have been helping European countries, their companies and consumers, for decades now.

It could be argued that increasing the clout of demand would damage the price signals associated with a fossil fuel and, contradictorily, would encourage higher demand. To prevent or reduce this risk, the creation of the cartel should be tied to a project that redefines the energy mix leading to decarbonization. The guaranteed account, instead of offsetting or

encouraging Russia's exit from Ukrainian territory, as suggested by the authors of the original idea, could be earmarked completely or partly for funding investment in new energies.

Define a realistic mix, knowing that total self-sufficiency is not feasible

Eliminating Russian fossil fuels from our energy mix means increasing energies of other sorts or other origins. To do so, we must bear in mind that renewables must be rolled out, that this is an expensive process, that the role of nuclear energy must be given serious thought, and that we will need to exploit the synergies between gas and renewable hydrogen.

Roll-out of renewables

According to Spain's 2021-2030 PNIEC (integral energy and climate plan) the decarbonization of the electricity industry will be achieved by adopting renewables. To be precise, the aim is for renewables to generate 74% of all electricity by 2030 by means of a three-prong strategy: the promotion of large generating projects, the roll-out of self-consumption and distributed generation, and measures to integrate renewables into the electricity system and market.

According to Red Eléctrica data, the capacity of installed renewables was 65GW in May, about 60% of the total. According to the scenario put forward in the PNIEC, the capacity of installed renewables will be 120GW by 2030, meaning that every year for the next 8 years 7GW generated by renewables must be incorporated into the electricity system. In 2021, not even 5GW was installed, so the pace must be accelerated in order to meet the target outlined in the plan. Many voices in this sector have been heard saying that the problem is not one of investor appetite but rather red tape when applying for permits. In this respect, in the framework of the REPowerEU plan published recently, the Commission has drawn up recommendations for speeding up permit applications for renewable energy projects.

One of the measures recommended to speed up permits is for impact assessments to be no longer compulsory. This might, however, be counterproductive and increase the opposition to wind farms that is already happening in some areas of Spain and becoming the main obstacle to their development. It is undeniable that these facilities have an impact on the area and that this must be addressed to prevent it from slowing its development down considerably. As Linares (2021) points out, it would be necessary to strengthen local dialogue, involve the community in decision-making and make information available. In addition, the population should be involved in the benefits of the project. According to Fabra et al. (2022), it may have little impact in terms of local employment, and thought should be given to compensating towns in order to distribute benefits more fairly. How? The different alternatives the authors propose include promoting local energy communities, reducing electricity tariffs for local residents, establishing quotas for local projects in nationwide renewable energy auctions, and giving priority grid connection to projects that promise to provide greater local benefits. The last two options have already been launched in Spain last year.

Another obstacle to the roll-out of renewables that should be considered is the availability of the raw materials needed (lithium, cobalt, copper, rare earths...) for building renewable energy facilities and storage. These critical materials are only produced by a few countries, so a strategy for ensuring supply must be established. Judging by the experience of buying gas, one good option would be to establish a procurement cartel at the European level to minimize the vulnerability of buying individually.

Even so, perhaps not all demand will be covered, or the expectations of self-sufficiency might be too high to be covered by renewables. So we must not disregard the short- and medium-term availability of resources or sideline the possibility of gas-hydrogen or nuclear power plants.

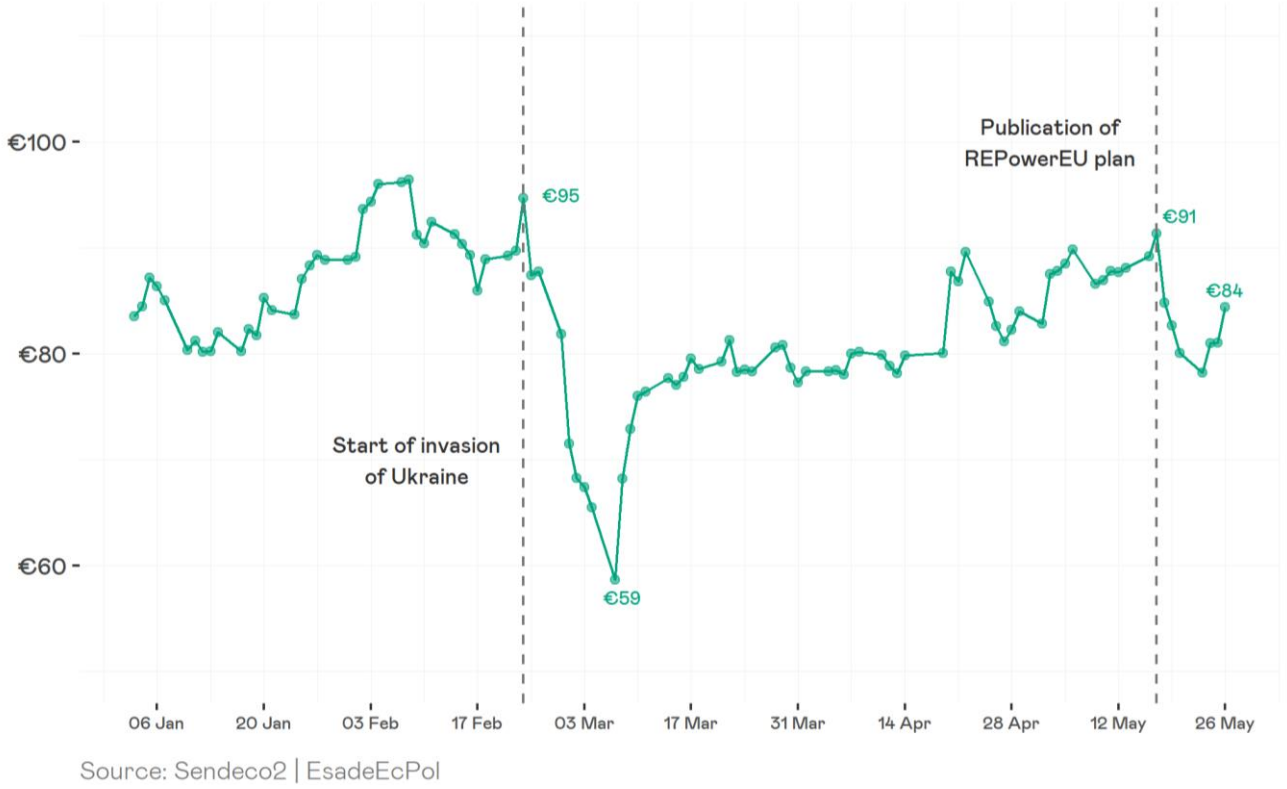
Availability of necessary resources

From an economic viewpoint, first we must realize that member states rely on Russian energy exports to varying degrees therefore the impact of the current crisis is asymmetrical. Whereas Russian gas accounts for about 10% of all the gas imported by Spain, it accounts for more than 50% in central and eastern European countries. As a result, weaning themselves off Russian energy will hit central and eastern European countries harder. The line of action should, however, be similar to that taken during the coronavirus crisis and be underpinned by solidarity and coordination.

This is precisely the fabric of the REPowerEU plan, the roadmap for quickly reducing our reliance on Russian fossil fuels and speeding up the energy transition. According to this plan, the European Commission reckons that €210 bn of investment will be needed by 2027. Taking advantage of the architecture implemented during the pandemic, the funds will hail mainly from the Recovery and Resilience Mechanism, which has some €225bn of untapped loans, plus up to €20bn of subsidies from income generated by the sale of CO_2 emission permits in the strategy reserve. This last point, however, strays somewhat from the decarbonization goals established in the Green New Deal because it increases the number of permits in circulation. The market responded quickly and following the publication of the plan, the price of CO_2 fell by almost 8%.[1] The evolution of this market should be monitored closely, and this type of funding should be reconsidered because it removes the inherent incentives for the decarbonization of sectors subject to emissions trading.

[1] According to figures available up to 26 May, the date of this publication.

Graph 2
Price of CO_2 emission permits



Source: Sendeco2 | EsadeEcPol

Harnessing synergies between gas and the hydrogen drive

Russian has been the EU's main gas supplier in recent years and the development of gas infrastructures has followed this tendency: the most recent example being the construction of NordStream 2. Since the conflict broke out, however, the main steps taken to reduce Russian imports have consisted of diversifying our portfolio of suppliers. These new import routes and new intra-EU gas flows require a certain level of gas infrastructures, such as liquefied natural gas terminals, gas pipelines, etc., currently lacking in the European Union. Another difficulty is that gas will disappear from our energy mix in the medium/long term. In this scenario, Spain may play an important part on account of its considerable regasification facilities and commitment to the development of hydrogen.

In the throes of the energy transition and from an economic viewpoint, it makes little sense to build a new infrastructure simply for gas. The European Commission is committed to creating infrastructures compatible with transporting renewable hydrogen. This intention could give the Midcat project, a gas pipeline between France and Spain, a new lease of life by making it an infrastructure of prime importance on the Mediterranean hydrogen corridor: one of three envisaged by the EU executive as part of the REPowerEU plan. In addition, the laying of a new pipeline between Barcelona and Livorno is being considered in order to supply Italy and countries in central and northeastern Europe.

Why is the peninsula the target for the construction of new pipelines? Because Russian gas will be replaced to a great extent by LNG and Spain has six regasification plants running at half capacity. Other states have announced the construction of new regasification plants,

but they will not be available in the short term. In this respect, Spain is emerging as one of the main distributors of gas and, in the near future, of hydrogen to Europe. Moreover, the fact that Spain is chosen for one in every five hydrogen projects around the globe suggests that it will become an exporting power in the midterm and the leader of the energy transition on the continent. However, a commitment to decentralized hydrogen production facilities would make it difficult to exploit synergies with gas.

Nonetheless, to prevent gas becoming anything more than a springboard towards hydrogen, this possible drive must be accompanied by a system of incentives to ensure that those involved take the right path when the time comes.

Nuclear energy?

At present, nuclear energy generates 20% of Spain's electricity. In countries such as France, the percentage is even higher. This source of energy has several advantages (it produces no emissions and does not fluctuate like renewables) and disadvantages (it produces radioactive waste and is expensive to build). During decarbonization and because of the energy crisis in the last year, nuclear power plants have emerged as a realistic alternative until the stability and availability of energy from renewable sources can be guaranteed. However, in the wake of the invasion of Ukraine, this analysis must take a new factor into account: Russia is one of the main exporters of uranium. Against this backdrop, it seems more reasonable to think about extending the life span of existing nuclear power plants than contemplating the construction of new facilities.

The disaster at the Fukushima nuclear power plant in 2011 was a watershed in the use of this technology and now, in the midst of the energy transition, we find ourselves at another crossroads.

More emphasis on policies to rationalize energy efficiency and demand

Levelling up segments of demand, as per Linares et al (2022), the need to reconcile the goals of decarbonization and ending reliance on Russian energy is also increasing the need for policies to rationalize our energy consumption. The huge advantage of this approach, if designed well, is that it would achieve both goals in the short term to the long term and might perhaps not be regressive. The reason why it is not at the top of this list is because its aggregate impact would probably be more limited than the impact of those mentioned previously.

According to the systematic assessment put forward in Linares et al (2022), the most promising policies for rationalizing demand are those that affect the price of energy by means of taxation and the like, because (we insist yet again) they respect the price signal and thus maintain the incentive to save for longer whilst avoiding rebound effects on consumption.

They must, however, be accompanied by direct payments and, whenever possible, be implemented gradually to avoid the risk of regression. In addition, they have a considerable political cost and so they should be used with caution in circumstances like the present-day scenario. The implementation of standards and regulations, on the other hand, is a useful instrument proven to be effective, according to available evidence, particularly when applied to housing, a sphere in which Spain still has a long way to go. It is also more politically feasible than price interventions. However, it may in itself prompt less savings than the previous measures and may also be regressive.

The best approach is to implement it together with far-reaching, progressive housing renovation schemes, such as the one proposed in Sweatman (2022), aimed at dealing with the most achievable aspects of home renovation in Spain, always based on the need to link goals of decarbonization and energy self-sufficiency to reductions in energy poverty. Unlike other direct payments such as those mentioned above, this investment in renovation does not have much risk of a rebound effect on consumption (but it does have some).

Finally, making better information available to consumers to help improve their decisions is also a promising sphere of action whose impact is less noteworthy but undoubtedly significant and has growth potential, particularly when well designed and long-lasting, and specifically if it is about consumption for households and (to a lesser extent) about products, providing it is clear, accessible and comprehensive.

In any case, there is little doubt that more efficient demand would make us more resilient and self-sufficient, and would contribute to decarbonization, upholding (providing that the policies described above are retained) analyses of both costs and benefits and the expected redistributive effects.

Conclusion

Europe's new goal of ending its reliance on Russian energy is in addition to, and must be reconciled with, the existing goal of decarbonizing our economy. This reconciliation seems obvious in the very long term, but in the short and medium terms it poses three challenges for Spain and the other countries that can be summed up as follows: (1) the immediate upward pressure on inflation, greater due to the disconnection from Russia, may lead (and is leading) to decisions that encourage emissions; (2) the implementation process to consolidate the mix must be more robust and realistic; and lastly (3) the costs of said transition, like those of the immediate pressures, are considerable and are not distributed symmetrically amongst the population, and tend to impact the most vulnerable socioeconomic groups.

This paper contemplates several lines of action to tackle these challenges and has compared the measures taken by the Spanish government with what we regard as an enhanced version of said measures, plus others not yet considered: always from a national viewpoint, but with the European mindset so essential when facing a challenge of this ilk. Respect for the price signal; a watchful improvement of the electricity system not unlike the "Iberian exception" proposal but with the addition of greater redistributive capacity, and in fact, emphasizing said redistribution factor more in all the measures taken or to be assessed with a view to reducing

the asymmetric impacts of the expected costs of the two-fold goal of decarbonization and self-sufficiency; an increase in the power of European demand; a realistic, fair energy mix; and a greater commitment to the rationalization of consumer demand. These are the factors we have analyzed: pieces of a jigsaw that must be put together by many hands.

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