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REPowerEU INITIATIVES: A PRELIMINARY APPROACH

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Abstract

Russia's invasion of Ukraine has raised the issues of energy security and availability in Europe. Around 30-45% of Europe's natural gas demand has been historically imported from Russia. REPowerEU initiative (March 8th, 2022) has been designed to implement the reduction on gas from the region in parallel with the decarbonisation process. In this paper, we present the initial EU plan rational, its short-term and long-term targets until 2030. The scenario of abrupt stop of Gazprom's pipeline exports is discussed. Constraints on gas supply could result in an increase of coal power generation over the short term. Renewables and nuclear energy options are practically long-term solutions and their impact on Europe's energy independence is discussed. The updated REPowerEU initiative (May 18th, 2022) is also presented. Its aims remain the rapid reduction of dependence on Russian fossil fuels, the acceleration of EU transition to a clean economy and the increase the resilience of the EU energy system. The key package of proposals and actions: save energy, diversify of energy imports, substitute fossil fuels through Europe's clean energy transition process and smartly combine investments and reforms is presented. Finally the merits and critical points of REPowerEU ambitious plan are discussed.

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REPowerEU INITIATIVES: A PRELIMINARY APPROACH

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Introduction

Russia's invasion of Ukraine is inflicting a terrible cost in terms of lives lost, human suffering and infrastructure damage. While the war is still ongoing, we study how its impact might reshape the EU initiatives for the energy landscape in the years to come. In the near term, the war creates a lot of uncertainty for the EU energy markets. In the long term, however, the ultimate effect of the war will be to catalyze or accelerate key prewar structural economic and market trends.

In the near term, tight energy markets precipitating a cost of living crisis will prove a setback for the transition to net zero emissions as governments put in place measures that prioritize energy security and price incentives to reduce fossil fuel consumption In the longer term, however, national security arguments bolster the case for EU economies to wean themselves off fossil fuels. Increased spending on the transition to net zero as well as on defense will result in structurally higher deficits and debt. All the above factors should make inflationary pressures more likely.

Fossil fuel dependence is the West's key geopolitical vulnerability. Prior to the invasion, the key long-term focus of investors and policy makers was the climate crisis. There is now a security crisis on top. These twin crises have a common origin: advanced economies' dependence on fossil fuels.

The US has been comparatively sheltered from the worst of the fallout, as it has its own hydrocarbon sources. For Europe, however, the war has dramatically shown up its dependence on imports of fossil fuels as its key geopolitical vulnerability. The attempt to wean itself off this dependence therefore requires the drive to net zero emissions to accelerate, as governments recognize that national security and arresting climate change are complementary goals.

War in Ukraine has highlighted EU's untenable dependence on Russia. Prices have soared and the risks of serious disruptions to flows are elevated, as the conflict persists into the summer. In the case of Gazprom pipeline exports were to come to a complete stop, there would be an annual volume of 155bcm of natural gas shortfall (approximately 13bcm per month). Persistent combination of high prices and gas shortfalls into the fall and winter, will lead to rationing and radical changes in consumption behavior. Europe has limited storage capacity to rely on, both for pipeline gas and LNG terminals.

In 2021, 16% of EU's electricity came from both coal and gas, 39% from renewables, 27% from nuclear and 2% from other. Constraints in gas supply could result in an increase in coal power generation over the short term. Taking into account that carbon intensity of coal is 2,25x higher than gas per produced electricity (in kWh), from every percentage point of power generation that switched from gas to coal, the average intensity of power generation for EU would increase by 2%.

New investment in gas and gas infrastructure will be needed in Europe. Germany has announced plans to build two LNG terminals on German soil, in order to import gas from US. However, new facilities have a 3-5 year lead-time to delivery plus US permitted projects awaiting time for long-term agreements.

Figure 2: Key gas pipelines from Russia to Europe, (ENTSOG, via BBC, 2022)

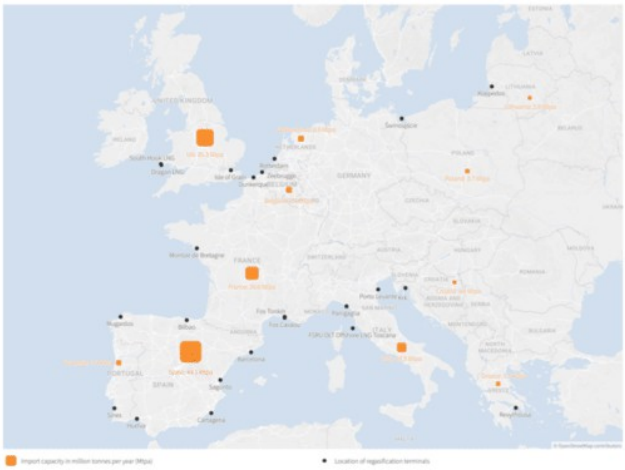


Figure 3: LNG import terminals and capacity in Europe, (GIE, via IENE, 2022)

The EU's climate goals are to cut greenhouse gas emissions at least 55% by 2030 vs. 1990 and achieve carbon neutrality by 2050. EU's focuses on direct emissions from the combustion of fossil fuels, as opposed to the extraction of high carbon commodities like gas. The change of source of fossil fuels is not contradictory to EU's climate goals.

In parallel renewable capacity is expected to double across EU between 2020-2050. The current energy security concerns may bring forward some of the investment projects over the next decade. Germany has brought forward by 15 years its plans to reach 100% renewable power (until 2035).

Once solar/wind capacity reaches 35-50% of the total power generation, there will need significant amount of investments in electricity grid to ensure sufficient stability. In addition storage facilities expected to grow rapidly in order to "balance out" the intraday supply imbalances caused by renewables.

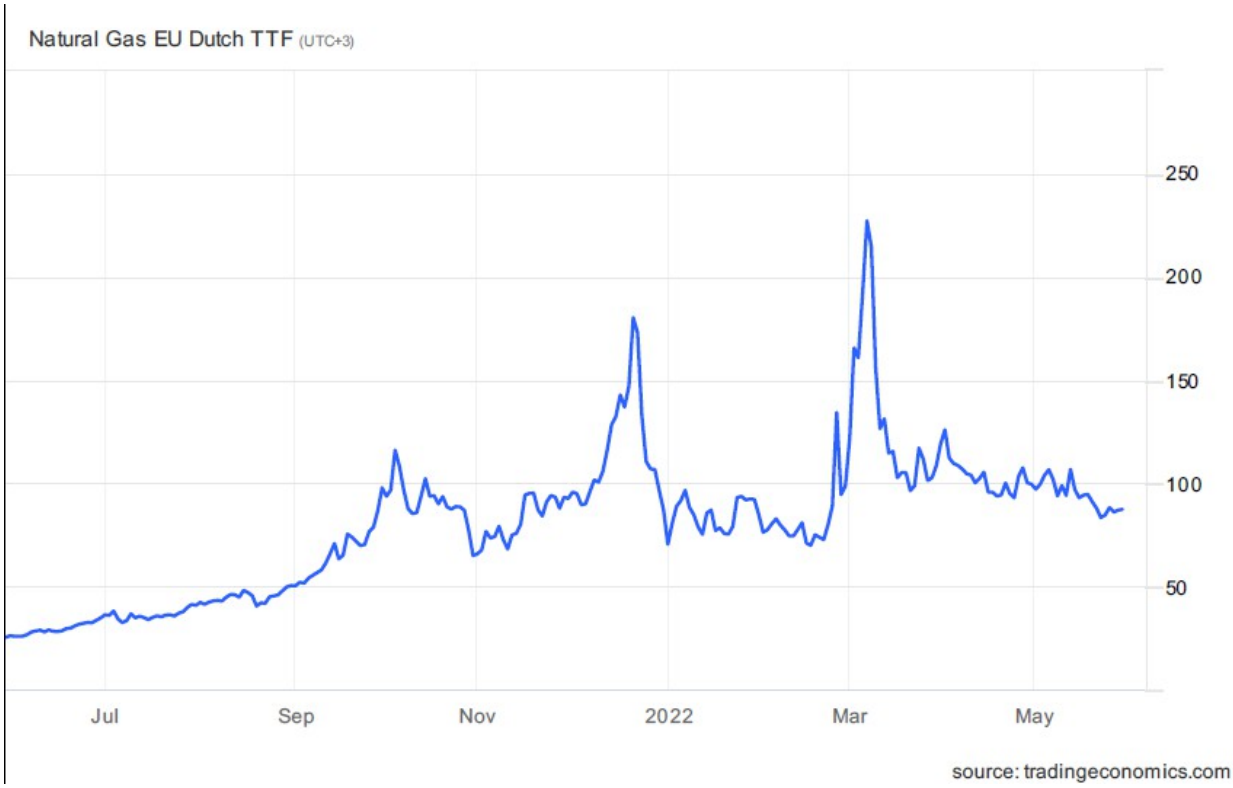
More investment is expected in nuclear reactors. France has announced plans to build up to 14 new reactors. Additionally some forms of nuclear energy are to be included in the EU taxonomy. But nuclear faces its challenges, with long lead times necessary and cost overruns and time delays evident in a number of projects globally.

EU outlines REPowerEU plan version #1

On March 8th, 2002 the European Commission proposed an outline to achieve independence from Russian fossil fuels "well before 2030" and security from supply concerns, in light of two significant developments:
- a market turmoil of high and volatile energy prices in recent months and
- a geopolitical shock from Russia's invasion of Ukraine

High energy prices are hurting EU economy. ECB has estimated before the invasion the energy price shocks will reduce GDP growth by 0.5% in 2022, increasing poverty and affecting business competitiveness. High energy prices also mean higher prices for transport, commodities and food.

For the record, just before invasion (February 2022), wholesale natural gas prices were ~200% higher than a year ago. Wholesale electricity prices had followed a similar pattern.
Historically, EU imports 90% of its natural gas consumption, with Russia providing 45% of those imports. EU remains dependent on crude oil imports (90% of consumption) with Russia the largest



supplier at 27%, while for hard coal consumption 70% is imported and Russia is a leading supplier at 46%.
Gas storage in EU covers its country members needs until the end of this winter heating period, even in the case of full disruption of Russian supplies. The storage filling level across EU in just under 30% (March 2022).

The plan outlines a series of measures to respond to rising energy prices and to replenish gas stocks for next winter. Short-term target is the reduction of EU demand for Russian natural gas by 2/3 until the end of 2022. REPowerEU also seeks in the long-term to diversify gas supplies, speed-up the introduction of renewable gases and replace natural gas in heating and electricity generation.

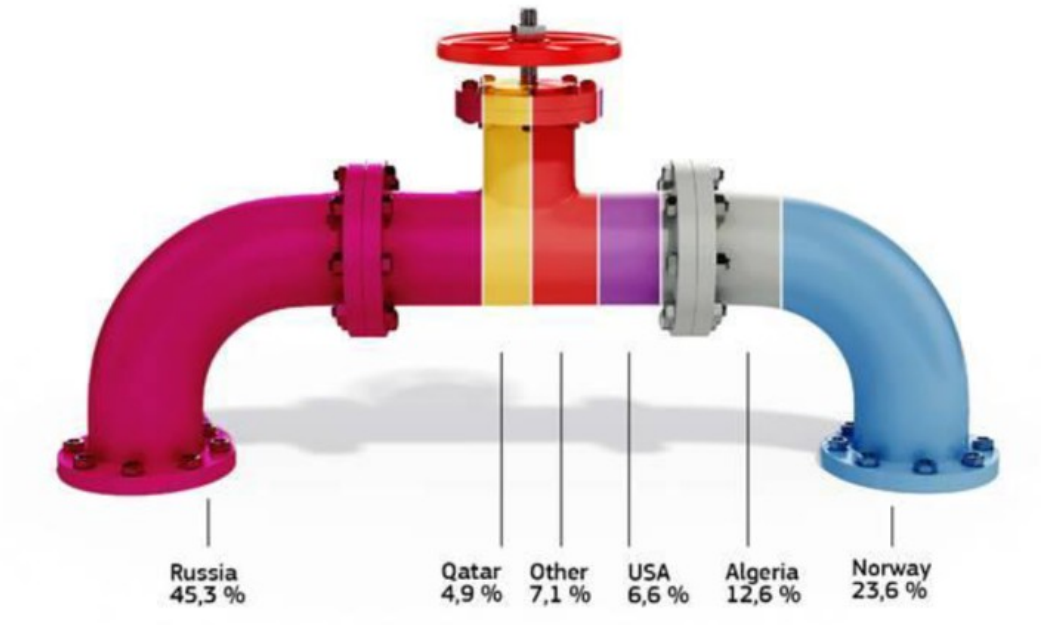
The Joint European action has two targets:
- "providing companies and households with affordable, secure and clean energy" and
- accelerating "a rapid clean energy transition under European Green Deal".

In the short-term urgent action (the Toolbox) on price fluctuations is needed by
- keeping retail energy costs for households and micro-enterprises in check through price regulation in these exceptional circumstances
- introducing temporary tax measures on windfall profits and use of emission trading revenues for redistribution to consumers
- granting aid to companies and farmers facing high energy costs (a new State Aid Temporary Crisis Framework) and
- assessing options to optimize electricity market design through the EU Emissions Trading System (EU ETS)

Plus urgent action on refilling gas storage for next winter is needed by
- legislating a minimum gas storage (90% filling target by October each year)
- supporting coordinated gas refilling operations through joint state procurement, collecting orders, matching supplies and

- investigating into the potential anti-competitive commercial behavior of gas operators (notably Gazprom operated storage ~16% vs. non-Gazprom storage at 44%)

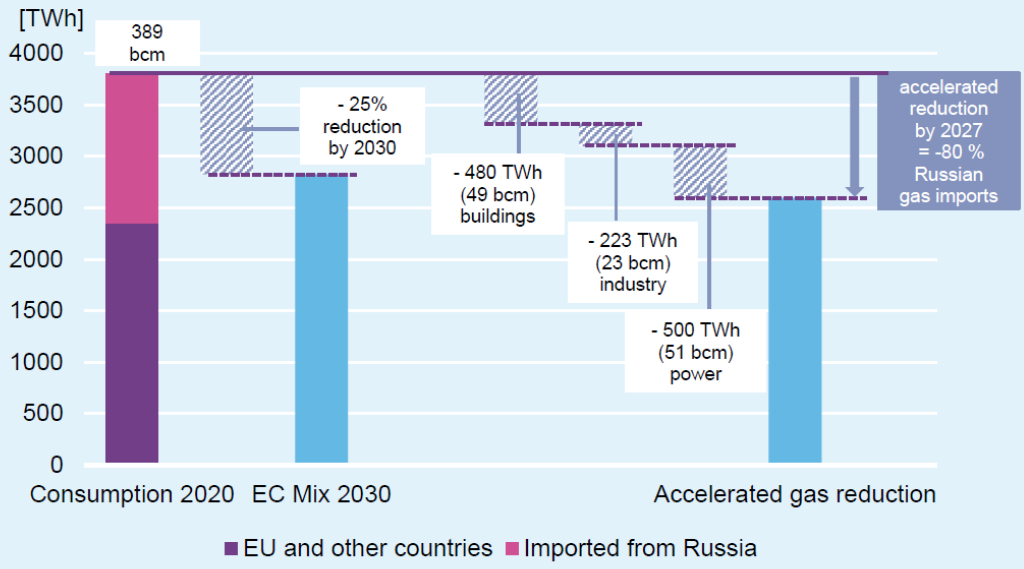
Share in EU natural gas imports, 2021



Source: European Commission

In the long term REPowerEU scheme target is to cut EU dependence on Russian gas by
- more rooftop solar panels (15TWh for 2022 saving 2.5bcm of gas), heat pumps (10 million for the next 5 yrs. saving 12bcm in gas) and energy savings
- speeding up renewables projects (doubling incremental capacity to 900GW by 2030) and electricity grid infrastructure improvements though reduction of lengthy administrative procedures (EU plans to release a recommendation in May)
- diversifying natural gas supplies via higher LNG and pipeline imports from non-Russian suppliers and investing in necessary infrastructure
- decarbonizing the industrial sector through switching to electrification and renewable hydrogen ("green hydrogen")
- reducing EU's annual natural gas consumption by 30% - equivalent to 100bcm by 2030 (Fit for 55 proposals) and gradually removing at least 155bcm of imported Russian volume natural gas as of 2021.
- doubling the EU ambition for biomethane production (35bcmpa by 2030) from agriculture waste and residues
- developing integrated infrastructure, storage and port facilities for importing (10mt) and domestically producing (5mt) renewable hydrogen (Hydrogen Accelerator scheme), on top of the original 5.6mtpa under Fit for 55 Guideline, in order to to replace 25-50bcmpa of imported Russian natural gas (15-30% of annual imports).

EU-27 fossil gas consumption and reduction potentials



Results EC mix scenario 2030 and Agora calculations based on Artelys, TEP, Wuppertal Institute

Out of the crisis: Temporary and Long-term measures

The Coal Option

Assuming EU gas storage should exit the winter at 25-30bcm this year, net injections of 7-8bcm per month would be needed to begin next winter with 80bcm in storage, the same as of last October 2021.

Natural gas demand averages 25-26bcm per month overall the storage refill season (April through October), bringing total demand to about 33bcm per month. On the supply side, domestic production averages around 4bcm per month, LNG imports almost 8bcm per month and non-Russia imports around 10bcm per month.

In the case of Russian pipeline flows shut-off, EU would be short on natural gas supplies over the summer around 11bcm per month. Due to limited regasification capacity at LNG terminals, LNG imports would not be enough to fill the gap. There is room for limited LNG imports increase (around 1-2 bcm per month), since the spare regas capacity is located in Spain with limited infrastructure to transport it north.

Therefore there would need the imposition of rationing of supplies to industries and significant switching to coal as short-term option, in order to ensure there is sufficient gas in storage before next winter. The enactment of EU coal-fired power stations up to 70% utilization (34% in 2020), would replace around 50% of all Russian gas imports (~78bcmpa). Sourcing the extra coal (190mtpa vs. 2020 demand of 456mt and 540mt in 2019) would be costly requiring a reversal of the 100mtpa decline in European domestic production over the last 5 years plus significant imports from US and Australia.

There is a huge constraint on recommissioning of coal fire generation plants, since this amount of carbon emitted is capped via EU Emissions Trading System (EU ETS) scheme for CO2 emission prices. The combination of gas shortage coupled with limited CO2 options in ETS will lead to continued power shortages and increasing electricity bills. In order to facilitate the process various

legislative amendments would have to be enacted and the suspension of EU Carbon Market would be inevitable. Polish government for example, have already called for this action.

The Renewables Option

Renewable power cannot ease the energy sock in the near future, as both solar and wind farms take years form planning to operation. On positive terms the rising demand for renewables is driven by three factors: 1) renewable energy is cheaper than than combined cycle gas turbines (CCGTs), 2) it provides & produces energy domestically in an unstable world and 3) it supports decarbonisation. On top of that, almost all European countries will have the ability to increase their renewables resources (wind/solar). The political consensus within EU is for the revision of energy strategy by building more new wind capacity that would reduce the demand for new gas-fired power plants. Germany has already declared accelerated plans for the country to derive 100% of its electricity from renewable resources by 2035. All the above, require the improvement of regulatory regime for new wind/solar farms.

In practice, from planning to commissioning for an onshore wind farm takes an average of 5 years, while for a large-scale off-shore wind farm up to 8 years. By improving the returns of projects through technological innovation, European governments would look into lowering planning and permission hurdles for new renewable farms. Another hurdle such as Germany public opposition to onshore wind/solar builds has been high historically.

The Nuclear Option

Nuclear power prospects are enhanced since it is relative clean and reliable source of electricity. But a much bigger contribution to the energy mix could be years away. At the moment nuclear power generation accounts around 25% of Europe's electricity mix. But there is a large divide between countries. France produces 70% of its electricity needs from nuclear, vs. Italy which closed all its plants in 1990s and Germany which is aiming to phase out nuclear power by 2022. The incorporation of nuclear power into EU taxonomy last year, resulted in a heated political debate, which continuous unabated this year.

In the context of escaping from Russian gas dependency combined with the greater reliability (higher load factors) and benefits of the energy transition (minimal emissions), countries such as Germany, Italy and Netherlands are rethinking nuclear option. Especially in carbon-heavy Eastern Europe (Slovakia, Bulgaria, Czech Re. Hungary, Poland and Romania) the trend for the construction of new nuclear plants is the only realistic option.

Assuming no phase-out from key participants (Germany and Belgium) and taking into account all new builds in France, UK, Finland and Slovakia, capacity will increase by 116GW by the end of decade. This additional capacity will generate an additional 10% of the equivalent current gas-fired generation (c.60TWh). Considering the long construction times for the new large-scale reactors and the projected increase in electricity demand over the next 10 years, a drastic shift in energy policies would be required for nuclear to support the transition from Russian gas. Therefore, in short term this necessitates the coal usage as one of the limited options for Europe.

Versailles Declaration- European Council 24-25 March 2022

In just one month, the course of European economy has changed. It has become absolutely clear that Europe is too dependent on Russia for its energy needs. The long-term answer for security reasons lies in renewable energy and diversification of supply.

On March 11th 2022, the Versailles Declaration called upon the Commission to put forward a detailed plan by the end of May to implement the REPowerEU measures, as well as proposing a

plan by the end of March to ensure the security of supply and affordable energy prices during the next winter season. The measures announced on March 8th were also be built on by member states at the meeting of the European Council on 24-25 March 2022.

At the European Council 24-25 March 2022 summit it was clear that coming up with a plan to tackle the rising energy prices would be divisive. Particularly, Southern EU Member States have demanded concrete actions at European level for a longer time.

Through the new REPowerEU initiative, the European Commission wants to start negotiations on behalf of EU countries with more reliable suppliers of gas via pipelines and LNG ships such as the United States, hoping to enforce larger contracts and better prices thanks to the collective power of EU Member States. Northern EU Member States have voiced skepticism about this proposal. The Commission's proposal also includes the option to replace gas with hydrogen in the future, which gives Europe the opportunity to accelerate the transition to the more sustainable renewables.

Southern EU Member States – primarily Spain and Portugal – advocated a price ceiling or an intervention in the functioning of the electricity market, an option that Northern Member States such as the Netherlands and Germany have voiced a dislike for. Member States can help companies with state aid. However, this costs governments a lot of money that goes into unproductive investments, they argue. The Commission announced that in this regard, it will release a new report in May with possible medium-term measures for the electricity price.

The discussion on price caps on gas was resolved by giving Spain and Portugal special concessions. Because of their specific energy situation, as the Iberian Peninsula is not fully integrated with the European power network, the two countries will be allowed to temporarily exercise a higher control on their domestic energy market. The Commission will, however, maintain the right to control the Spanish and Portuguese emergency measures in order to ensure they do not impede general European interests.

Lastly, the EU Member States announced their intention to pool together the purchasing power of the member states in the international energy market and will therefore explore the possibility of joint energy purchases, specifically for LNG, hydrogen and gas. This will also be coupled with more investments in gas storage facilities. For the long term, it was clearly confirmed that an end of European dependency to Russian energy will be the common strategic objective. A direct embargo on Russian energy products was not made concrete.

One of the first major announcements following the European Council summit was a commitment by President Biden to increase the American gas supply to Europe to support the EU in its effort towards energy in-dependency from Russia. He vouched the US could replace 10% of the Russian gas export to Europe.

Post European Council March 2022 summit expectations

An issue put on the table that remained unresolved is that of decoupling the gas price from the energy market. European Commission President Ursula von der Leyen announced this will be looked at more concretely in May 2022. This was expected as well as the REPowerEU agenda to remain in focus for the next months.

Furthermore, more precise information was expected on the German plan to quickly decouple from Russian energy and the Spanish and Portuguese governments werer expected to publish details on their emergency energy measures. Any initiatives regarding security and the energy crisis will be dealt with on top of the current legislative priorities.

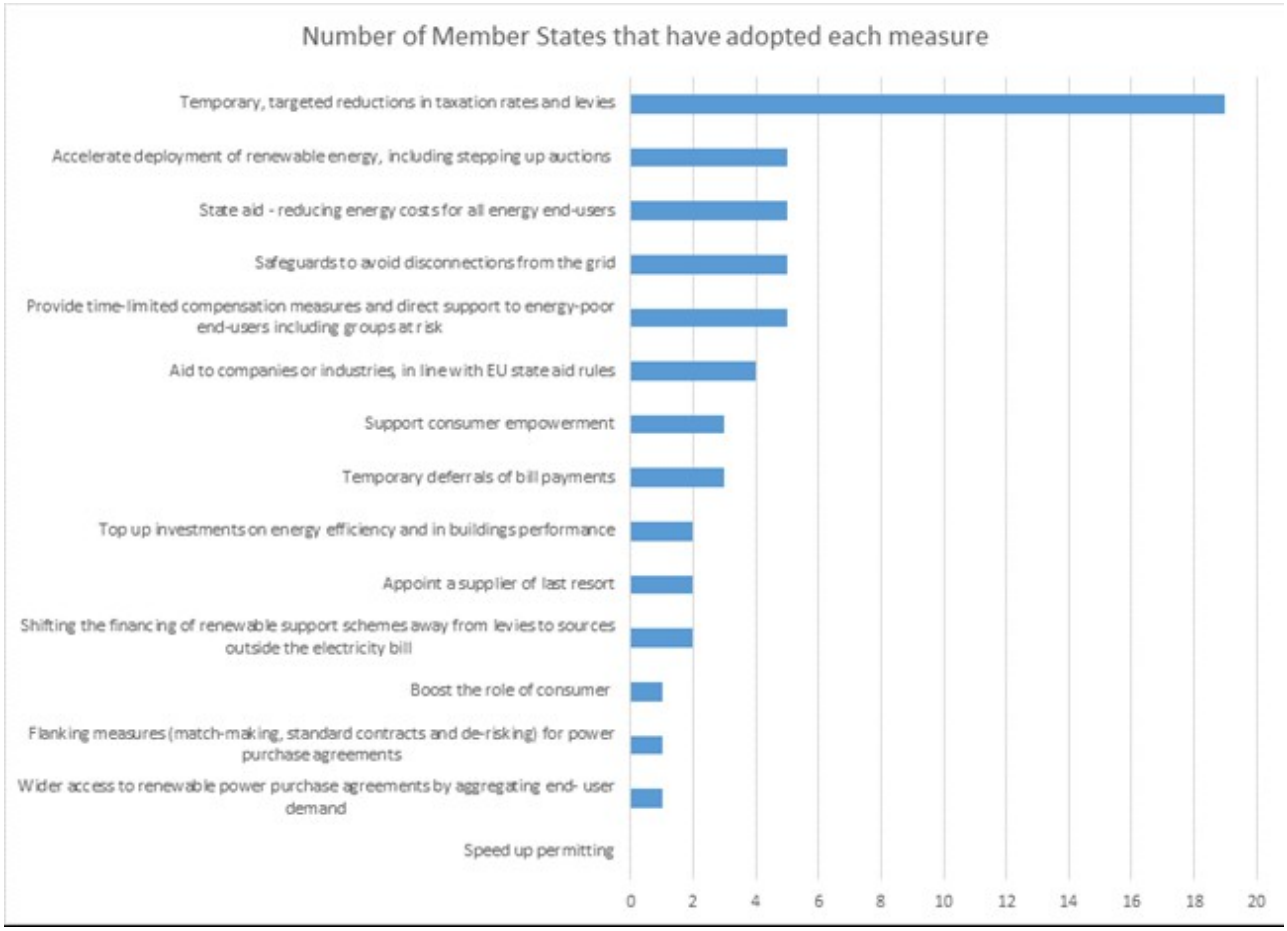
As of the end of April 2022, the Commission had not announced that any of the revisions and or proposals, such as those part of the 'Fit for 55' package, would be delayed. Finally, a proposal by the end of May was anticipated to phase out Russian gas dependency by 2027.

Summary of key initiatives from REPowerEU #1 plan

REPOWER EU TRACK	FOCUS	FF55 AMBITION BY 2030	REPOWEREU MEASURE	REPLACED BY THE END OF 2022 (BCM equivalent) estimate	ADDITIONAL TO FF55 BY 2030 (BCM equivalent) estimate
GAS DIVERSIFICATION	NON-RU NATURAL GAS	-	LNG diversification	50*	50
		-	Pipeline import diversification	10	10
	MORE RENEWABLE GAS	17 bcm of biomethane production, saving **17 bcm**	Boost biomethane production to 35bcm by 2030	3.5	18
		5.6 million tonnes of renewable hydrogen, saving **9-18.5 bcm**	Boost hydrogen production and imports to 20mt by 2030	-	25-50
ELECTRIFY EUROPE	HOMES	Energy efficiency measures, saving **38 bcm**	EU-wide energy saving, e.g. by turning down the thermostat for buildings' heating by 1°C, saving 10bcm	14	10
		Counted under overall RES figures below	Solar rooftops front loading – up to 15 TWh within a year	2.5	frontloaded
		30 million newly installed heat pumps installed in 2030, saving **35 bcm** in 2030	Heat pump roll out front loading by doubling deployment resulting in a cumulative 10 million units over the next 5 years	1.5	frontloaded
	POWER SECTOR	Deploy 480 GW of wind capacities and 420 GW of solar capacities, saving **170bcm** (and producing 5.6 Mt of Green Hydrogen)	Wind and solar front loading, increasing average deployment rate by 20%, saving 3bcm of gas, and additional capacities of 80GW by 2030 to accommodate for higher production of renewable hydrogen.	20	Gas savings from higher ambition counted under green hydrogen, the rest is frontloaded
TRANSFORM INDUSTRY	ENERGY-INTENSIVE INDUSTRIES	Front load electrification and renewable hydrogen uptake	Front load Innovation Fund and extend the scope to carbon contracts for difference	*Gas savings counted under the renewable hydrogen and renewables targets*	

**all figures are estimates*

As of February 16th 2022, 24 Member States have adopted measures in line with the Toolbox. These measures are easing energy bills for around 71 million household customers and several million micro, small and medium-sized enterprises and micro enterprises.



EU outlines REPowerEU Plan version #2

On 8 March 2022, the EU Commission proposed the outline of a plan to make Europe independent from Russian fossil fuels well before 2030, in light of Russia's invasion of Ukraine and supply interruptions to Bulgaria and Poland that demonstrated the urgency to address the lack of reliability of Russian energy supplies.

At the European Council in Versailles on 24-25 March, EU leaders agreed on this objective and asked the Commission to present the detailed REPowerEU Plan which has been adopted as of May 18th, 2022.

During the presentation of the Plan following its adoption at the meeting of Commissioners, Executive Vice-President Timmermans said: "In March we showed it could be done, European Council in Versailles decided it should be done, today we show how it will be done."

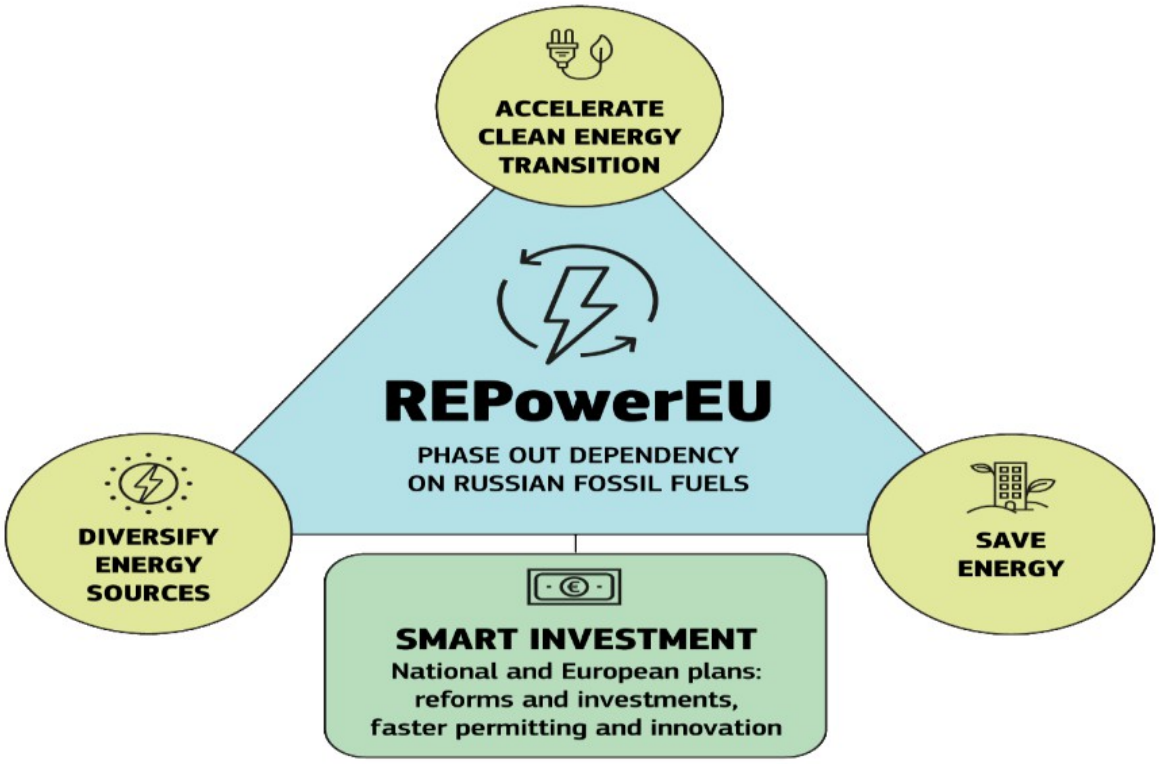
Until the end of May 2022, EU Commission has adopted 5 wide-ranging and unprecedented packages of sanctions in response to Russia's acts of aggression against Ukraine's territorial integrity:
- Coal imports are already covered by the sanctions regime (5th package of sanctions). As of August 2022, the exemption for existing contracts concluded before 9th April 2022 will expire, ending EU dependence on Russian coal.

- EU Commission has tabled proposals to phase out oil by the end of the year, which are now being discussed by Member States. For landlocked States without immediate viable alternatives more time may be necessary in order to replace Russian oil and upgrade refineries.
- Natural Gas dependence would be phase out well before the end of decade. Nearly 2/3 of the total reduction can be achieved by the end of 2022.

The aim: The plan's aims remain to rapidly reduce dependence on Russian fossil fuels, accelerate EU transition to a clean economy and increase the resilience of the EU energy system. EC aims to surpass the 30% reduction in Gas demand (120bcm on EU27 baseline of ~400bcm) envisaged under the 2021 'Fit for 55' Climate Plan.
Implementation of 'Fit for 55' framework and REPowerEU plan will save €80bn in gas imports, €12bn in oil imports and €2bn in coal imports per year by 2030.

The key pillars for the REPowerEU #2 plan are based on the Fit for 55 package of proposals and completing the actions on energy security of supply and storage, are outlined as:

- save energy
- diversify of energy imports;
- substitute fossil fuels through Europe's clean energy transition process
- smartly combine investments and reforms.



Main Differences between REPowerEU#$1 and REPowerEU#$2 proposals

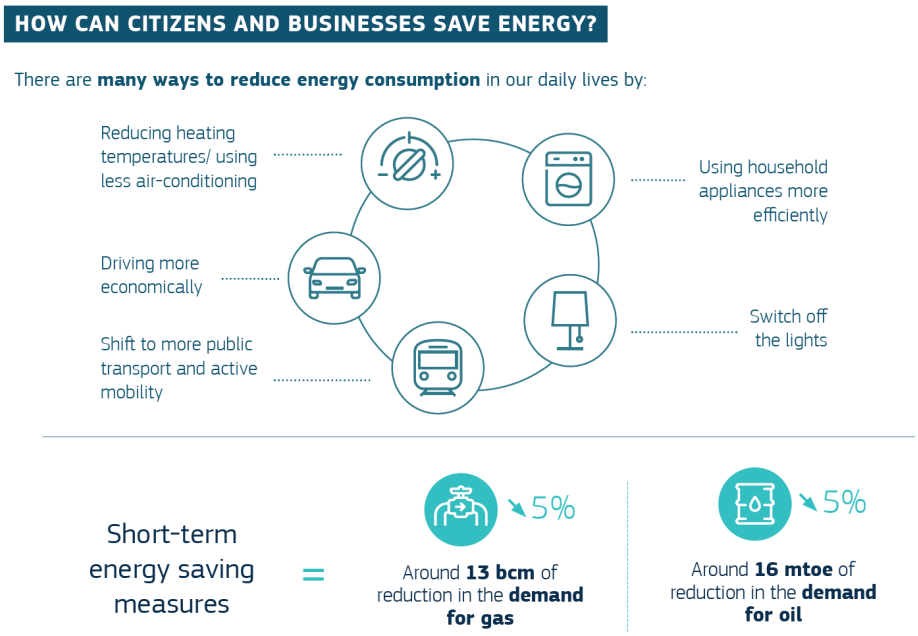
In the latest update, two changes could have an impact (over the long term) on the Building & Construction sector and Renewables sectors:
- increased binding Energy Efficiency targets should support demand for energy efficient heating systems (i.e. heat pumps) and light-side building materials like insulation, mortars and roofing.
- plans to fund the implementation of REPowerEU via selling EUAs (carbon credits) is bearish for EUA carbon prices and may reflect an aim to dampen carbon prices. This could have positive

implications for carbon intensive cement producers who should see a rising operating cost of carbon over the medium term.

Details on the specific proposals

The EC in its draft REPowerEU#$2 proposal offers more ambitious renewables capacity and penetration plans, notably in solar, and higher energy efficiency targets.

Energy efficiency target increased: Increasing the binding 'Energy Efficiency Directive (EED)' target to 13% from 9% under the 2021 'Fit for 55' Climate Plan to 13% (compared to the 2020 reference scenario). This translates into reduction of 13% in energy consumption by 2030, compared with a 9% cut in the previous energy efficiency directive proposal. The Fit for 55' Climate Plan implementation would lower total gas consumption by 30% (~100bcm) by 2030. More than 1/3 would come from meeting the EU energy efficiency target.
The document states this could save 5% reduction in oil & gas demand at 13bcm of gas and 16mtoe / 312kbpd of Oil in the short term, by reducing heating or raising cooling temperatures, driving less and more economically. These actions will enable to refill gas storage for next winter rapidly and reduce risk of supply disruption.
EC has published the 'EU Save Energy Communication' which details short-term behavioural changes that it thinks could cut gas and oil demand by 5% near term. The Commission however also encourages fiscal measures like reduced VAT rates on energy efficient investments.
Plans include (not an exhaustive list):
- stopping subsidies for fossil fuel technologies, including phasing out member state subsidies for fossil fuel based boilers by 2025 and encouraging incentives to be redirected to heat pumps instead.
- introduce bans for fossil fuel based boilers in new and existing buildings.
- strengthen energy and resource efficiency requirements for new buildings through heating system requirements and introducing zero- emission standards before 2030 (before 2027 in the case of public buildings) through 'Energy Performance of Buildings Directive (EPBD)'.
  - introduce additional Minimum Energy performance standards for buildings to boost renovations with a pathway to upgrade the worst-performing buildings (class G, bottom 15%) up to class D.



Renewables penetration increased: The EC increases the proposed headline target for 2030 penetration of Renewables energy across the economy (not just the power sector) from 40% under 'Fit for 55' to 45% (2020: 20%) in 'Amendment to the Renewable Energy Directive' i.e to speed up deployment of renewable energy, aiming for renewables to cover 45% of all energy demand by 2030, compared with a target until now of 40%. This requires more than doubling current capacity of 511 gigawatts to reach 1,236 GWh.
This includes a 169GW i.e 16% increase in previous plan Renewables capacity by 2030 from 1,067 GW to 1,236GW. Whilst the language regarding installed vs incremental capacity is somewhat ambiguous, it as implying new capacity of 730GW by 2030, up from 560GW new target previously. A key prerequisite for fulfilling this target is the speeding up of permit granting procedures, short as possible deadlines and long-term grid planning.

Additionally in real estate sector, EC doubles the number of heat pumps in use to 10 million over the next 5 years, including corresponding measures to utilize waste heat from industry and engage in community heating projects.

In particular regarding Solar Power development proposals, the document further increases targeted solar capacity, including rooftop. The 2025 target could mean 320GW installed by 2025, vs ~140GW end 2021, or 320GW incremental to a total of 460GW by 2025. That would translate to annual installation of 45-80GW p.a. in 2022-25e, up > 50% from 26GW solar installed in 2021.

The 2030 plan references 600GW of installed capacity is unclear as to whether this is current 140GW + 460GW new capacity (up from 420GW in 8th March plan) or whether it implies 600GW new capacity for total 2030 installed of 740GW. If it is the latter option, this would translate to annual installation of 51-67GW p.a. in 2022-30.

In the regulatory framework and life-cycle sustainability of solar PV, EC will establish tabling eco-design and energy labeling requirements in Q1 2023, as well as revising existing requirements for heat pumps by the same date.

Even though solar projects are short lead time at 1-2 years, the 2025 time-frame appears ambitious for adding 320GW, especially given current supply chain challenges relating to Solar originating from China.

In 2021, of China's 89GW solar modules exported, the EU was the single largest market and accounted for 46% (41GW, +54% yoy). Market experts see solar capacity in Europe increasing +50% yoy in 2022.

As China's exports to the US have been halted due to ongoing import tariff investigations, Europe has become the key-export market for Chinese solar modules. There are no significant trade duties/friction for Chinese solar to enter Europe. EU industrial sector will also play a key role in the production of solar panels. According to REPowerEU#2 plan solar power production capacity will reach 20GW by 2025.

Permitting for solar projects can take up to two years and wind farms can take up to nine, far too long under current conditions. There are three key measures targeting this problem.
- the introduction of the 'European Solar Rooftop Initiative' which aims to make rooftop solar infrastructure mandatory for commercial and public buildings by 2025, and residential buildings by 2029. This overcomes much of the permitting and planning issues associated with solar farms, as well as alleviating pressure on the transmission and distribution grids by localizing production.
- the identification and promotion of 'go-to areas' for renewable energy infrastructure, where fast-tracked permitting and planning time is reduced to less than one year without foregoing environmental due diligence. This is made possible by the recognition of renewable energy as in the 'overriding public interest'.

- the Commission is proposing a formal Recommendation on permitting procedures to support effective and timely administrative procedures through sharing of best practices, and regional cooperation.

Overall execution risk remains the key factor. Given the REPowerEU plan's ambitious scope, it looks more as of a political message at this stage. The market will remain skeptical regarding the ability to deliver on these specific targets until further details emerge and momentum is evident. For renewable acceleration, the key prerequisite as the speeding up of permit granting procedures while minimizing potential risks to the environment by identifying "go to" areas suitable for renewables.

Bearish Carbon EUA prices: The financing plan includes €20bn from selling EUAs in the ETS MSR (Emissions Trading Scheme Market Stability Reserve) inventory. At the current EUA price of ~ €85/ton, this implies 235m credits of additional supply, which represents 9% of the current MSR inventory of 2.64bn EUAs.

Such action may reflect a policy aim to dampen carbon prices. Selling MSR EUAs would increase the supply of EUAs available in the market, thus loosening supply/ demand tightness and lowering price. Furthermore, such a change might dilute market confidence in the ETS Supply/Demand framework underpinning EUA prices, which could reduce financial participation and add further downwards pricing pressure.

With the proposal envisaged through end-2026, the 235m credits represents a 4% increase in fundamental supply over the 2022-2026 period and a 7% increase in the supply into the traded market that forms the price. Furthermore, price weakness would mean more EUAs required to deliver the €20bn target, creating further negatives to the supply outlook.

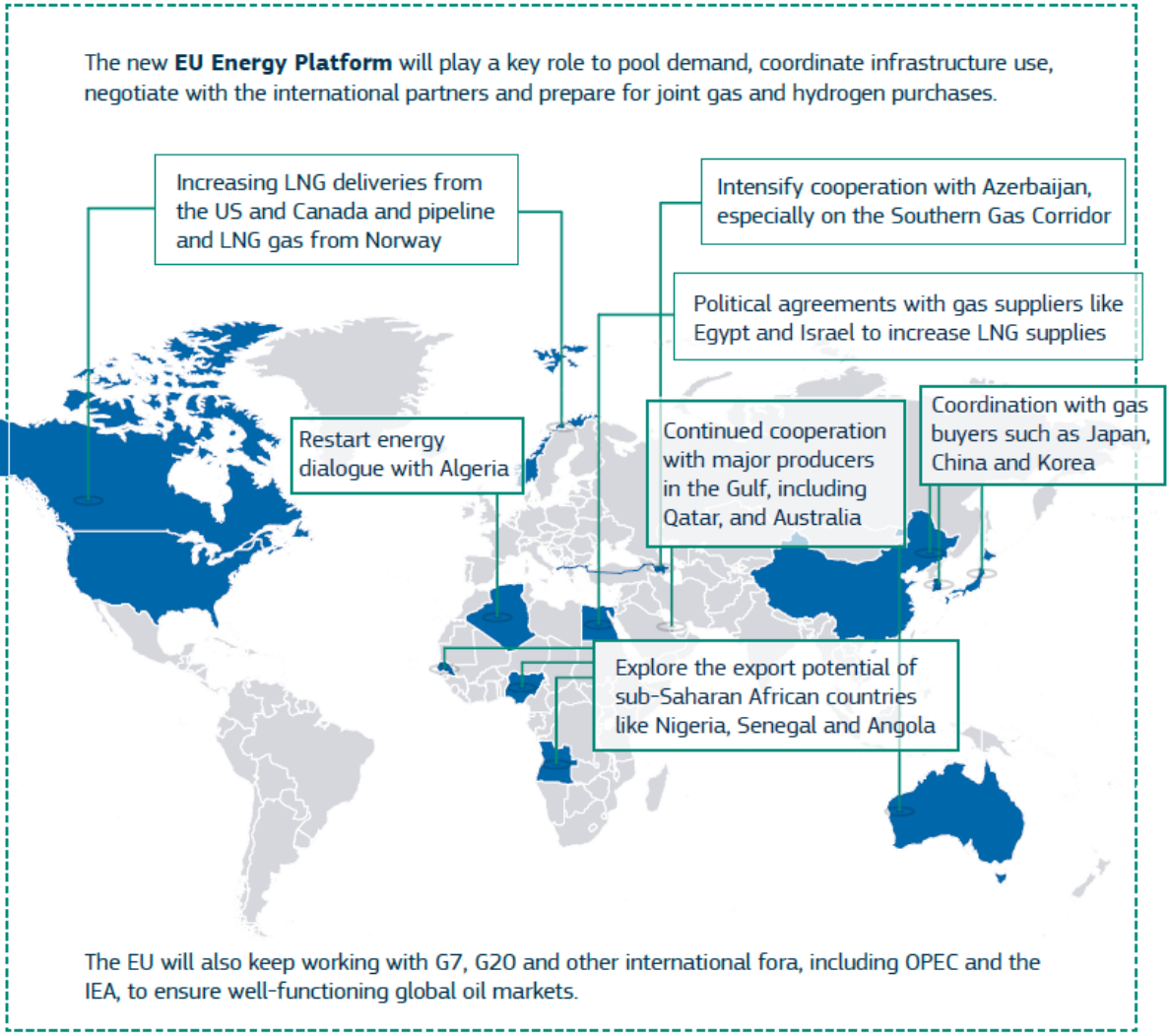
Short emergency measures: The EC confirms that a EU level gas price cap is possible on a temporary basis if gas supplies were to be disrupted and as long as this mechanism would not jeopardize attracting new gas supplies into Europe. This should prove a further positive, de-risking the outlook for Gas supply businesses. The plan also reiterates that windfall profits can be used to support customers, as well as a wider focus on SMEs. There is explicit approval for Spain's and Portugal's CCGT gas price cap for fuel cost subsidies in areas of poor interconnection (e.g. Iberia). Intervention remains the No.1 market concern, and the document's reference to windfall taxes seems likely to reinforce the persistence of this topic. Nevertheless, we continue to expect benign intervention relative to existing market concerns.

Green Gas plan unchanged: The targets for Hydrogen and Biomethane are unchanged vs the March 8th REPowerEU #1 plan. The targets for 10mt of green hydrogen production with 65GW of electrolyser capacity (up from vs 40GW before), 10mt of hydrogen imports and 35bcm of Biomethane by 2030 remain very ambitious. This plan further accentuates the positive Renewables outlook (for Green Hydrogen), as well as indicates that high gas prices will persist. Further details regarding financial framework, including incentives, is required.
Various initiatives have been enacted in parallel as follows:
Hydrogen Sector
- Align the sub-targets for renewable fuels of non-biological origin (RFNBOs) under the 'Renewable Energy Directive" (RED) for industry and transport with the REPowerEU ambition (75% for industry and 5% for transport).
- Double the number of hydrogen valleys through Hydrogen Joint Undertaking.
- Proposal of two Delegated Acts on (i) the definition of renewable hydrogen production as well as (ii) defining a methodology for calculating greenhouse gas emissions of different production methods.
- Regular reports on uptake of renewable hydrogen in key sectors starting in 2025.
- Mapping hydrogen infrastructure needs by March 2023.

- Scale-up of electrolyser manufacturing, details outlined in the 'Electrolyser Declaration'.

Biomethane Sector
- Establish biogas/biomethane partnership as well as corresponding incentives for its production, coupled with the preparation of infrastructure for its integration into the supply chain on a large - scale.
- Supporting research, development, and innovation.
- Release of 'Biomethane Action Plan' on May 18.

Gas infrastructure outlook: The vast majority of Russian gas consumed in the EU is delivered by a network of pipelines directly connecting the two territories, an inflexible form of infrastructure that doesn't allow for trade in flows with other exporters and importers.
There are 21 liquid natural gas (LNG) terminals in the EU, which can receive deliveries from anywhere in the world, effectively decoupling infrastructural build-out from the weaponisation of energy flows.
However, the distribution of LNG terminals in the EU is not consistently aligned with demand centres and are therefore constrained by the interconnection capacity of the grid in strategic places.



For example, the Iberian Peninsula hosts 1/3 of the terminals, and has considerably more capacity than the region requires for its own needs. However, there is only one gas interconnection between the Iberian Peninsula and the rest of the Continental grid, limiting the scope for sharing gas with key EU demand centres such as Germany – which currently has no LNG terminals at all.

The €10bn investment outlined for gas infrastructure appears uninspiring at first glance. This spend is related to expanding LNG import terminal capacity and transport pipelines. In that sense, €10bn over 8 years to 2030 is relatively minor – ~5% compared to the total gas-network assets base of €220bn, or 0.6% gross increase per year.

It is not yet clear whether this is all additive to existing plans, and if it were, it would represent only a ~10% increase in aggregate gas network capex. However, the Green Gas infrastructure references are more encouraging, with an incremental €28-38bn in intra-EU transport pipelines and €6-11bn in storage. This would represent 15-22% of installed base, or 2-3% annual gross growth. Nevertheless, this remains below the growth for electricity networks.

Raw materials shortages: Certain critical raw materials, many of which are necessary for the energy transition. REPowerEU takes both a short-term and long-term view as follows:

- in the short-term the EU is working to diversify its supply sources through strategic partnerships, including via ongoing Free Trade Agreements
- in the long-term EC proposes to prepare legislation on critical raw materials as well as ensuring circular economies are prioritized in the build-out of new infrastructure, and therefore materials can be recovered and reused multiple times.

Financing the plan: The EC outlines an additional investment of €210bn 2022-2027 and ~€300bn by 2030, on top of what is needed to implement 'Fit for 55' framework, broken down as per investment sector.
The €300bn plan (€210bn to be spent by 2027), that will need to be agreed by all member states, will consist of €75bn in grants and €225bn in loans. This is in addition to the existing €225bn of loans under the 'Recovery and Resilience Fund' (RRF).

REPowerEU will mostly be financed via money reshuffling, with €225bn coming from unused NextGenerationEU (NGEU) loans while the majority of the grants come from an EU budget reshuffling. However, only €20bn in grants out of €75bn will be new money from the sale of EU Emissions Trading System allowances (ETS), while the 55bn remaining grants should come from EU budget reshuffling. This is good news as the EU will not need to issue more debt but also for peripheral countries that will be able to ask for extra funds.

On national level, on REPowerEU, allows for greater borrowing by countries that need it, is yet another step towards more risk and debt sharing in Europe. This is fundamentally positive for the periphery countries (e.g, Italy, Greece, Spain, Portugal) and should help the ECB transition its bond market activity from net asset purchases to reinvestment.

Member states will be able to revise their previously adopted National Recovery and Resilience Plan (RRP) to add a REPowerEU line in order to request money from this fund for energy savings, diversify energy supply and clean energy transition.

Strings attached. To receive the funds specific milestones and targets will have to be met. Countries will be able to request grants and loans, and *"installment schedules of the REPowerEU contribution will be integrated with Member States' installment schedules for the already adopted financial support".*

Exceptionally, the amount of the loan support may be increased beyond the 6.8% Gross National Income (GNI) limit set under the RRF. Therefore, countries that have already requested their full allocation of loans under the RRF will be able to ask for additional money. For now, seven countries have requested RRF loans for a total €165,8bn but Poland's plan has not been endorsed by the EC yet so the €12bn loans are not confirmed.

As a result, the loan limit is effectively removed, allowing the full NGEU envelope to be used. More importantly, countries with a higher cost of funding than the EU (e.g., Italy, Greece, Portugal, Spain) will benefit from an alternative funding source at lower rates than capital markets, alleviating their funding pressure. However, while the lower cost of funding could limit the impact on debt, the loans will be added to the country's debt and will therefore matter for debt sustainability.

Allocation under RRF will be redefined. Initial RRF financial contributions will be revised by the EC before end June 2022. It is still unclear how the EC will decide to revise the contributions, so we will need to wait until end of June for more details. In our view:
- countries that have requested the full amount they were entitled to take under RRF, like Italy, could have higher contributions;
- while, on the contrary, countries with cheaper funding costs than the EU or countries less dependent on Russian energy could see their financial contribution reduced. The EC has said that *"to compensate for the reduced maximum financial contribution and address the REPowerEU objectives, besides relying on national funds, Member States facing a downward revision are encouraged to request a RRF loan".*

One question remains: What happens to countries that wanted to take RRF loans at a later stage? While some countries clearly stated that they will not take RRF loans, others preferred to wait before requesting loans in order to assess their financing needs. Spain, for example, was planning to ask for €70bn in loans later in the year, but now its allocation is going to be folded into the REPowerEU envelope. So, it is questionable whether Spain, or other countries, will rush to ask for their RRF loans (or more) to be able to secure this funding.

Beyond the financing details, it is not entirely clear how these funds are likely to be used and for what specific purpose. Roughly €12bn in fossil assets: €10bn earmarked for LNG and strategic pipeline gas infrastructure, with an additional €2bn for targeted oil developments. The document

claims the plan would save the EU ~€94bn in annual import costs by 2030 (€80bn on gas imports, €12bn in oil imports and €2bn in coal imports).

Financing the transition remains a key question. Energy renovation upgrades are expensive, and many carry long paybacks. The Commission sees investment (€67bn) put forward in national Recovery and Resilience Plans as a good starting point. However, this remains well below the €275bn annual investment the Commission has previously estimated will be required to double the renovation rate.

Private investment will be key to lifting energy efficiency investment meaningfully. To this end, the Commission states it will launch an *"a high-level European Energy Efficiency Financing Coalition with the financial sector"* and will also examine additional measures to trigger further private investments, e.g. through mortgage portfolio standards.

The clear message from these initiatives is that the EU is shifting the energy strategy focus from commodity costs towards infrastructural investments, with 95% of funding targeted at renewable infrastructure. This is a fundamentally different way of viewing costs associated with the current energy system.

For comparison, several EU governments have recently made direct relief payments to support consumers in the purchasing of fossil energy, for example Belgium provided relief measures to its citizens totaling €1.3bn. These are pure costs, and the money spent disappears with the combustion of the fuels. Spending on infrastructure that continues to harvest energy at near zero marginal cost for years and years is an investment. Both forms of measures may be required in the short to mid-term, but the overall direction of travel is clear.

Skills - no quick fix: The document provides little detail on how skills bottlenecks will be addressed, which we think is as important as funding (and potentially more difficult to "fix"). There are limitations on speed of implementation due to the unavailability of appropriately trained staff to install, manage and maintain the infrastructure for heat pumps as an alternative to gas boilers. The same problems are also evident at larger scales, such as for natural gas to hydrogen switching.

The "EU Save Energy Communication" calls for including energy-saving related skills in school curricula and promoting skills acquisition in the sectors that are crucial for achieving the REPowerEU plan. Also EU looks to target these bottlenecks through channelling resources into three training initiatives, the 'Pact for Skills', 'ERASMUS+' and 'Joint Undertaking on Clean Hydrogen'.

Conclusions, reflections and next steps

This study article comes only a few days after the publication of the REPowerEU#2 Plan (May 18th, 2022), which makes drawing definitive conclusions and reflections challenging and premature.

Nevertheless, it is imperative to acknowledge that the REPowerEU Plan confirms that the EC is taking very seriously the current geopolitical energy landscape. Concerted and detailed efforts are being made towards a complete reconfiguration of key energy routes. Although new and radical in many ways, the overall themes are consistent with established energy aims.

This new energy landscape reconciles the three long-standing pillars of European energy policy (i) affordability and accessibility, (ii) sustainability and (iii) security of supply, into one coherent long-term pathway.

There have been some critiques of the Commission's approach to fulfilling these aims in the short to mid-term, often revolving around risks of undermining priorities in other important sectors.

The incredibly short time frames set to achieve independence from Russian fossil fuels has raised the level of the short-term challenge, particularly as regards securing alternative fossil fuel sources in the immediate future. The greatest test for implementation will undoubtedly come in the first months and years and will require the combined efforts of all EU members at all levels.

The funding structure, where the opportunity cost of redirecting large quantities of, for example, RRP and Cohesion Policy funds could result in gaps elsewhere.

REPowerEU new targets for reducing energy consumption and increasing renewables will contribute to higher ambition in the 'Fit for 55' package negotiations, but support for new gas infrastructure will make the transition costlier than needed.

Selling additional emission permits as a means of financing REPowerEU sets a dangerous precedent and risks jeopardizing the EU's climate targets.

The plan aims to cut 30% of gas consumption by 2030, with the associated savings on gas import expenditures. However, the plan does not offer a tangible enough signal on the consistency of this diversification strategy with climate targets and future demand projections. Instead, it supports new gas infrastructure investments and unrealistic hydrogen and biogas targets.

The focus on green hydrogen in general is excessive in the absence of strong wording on additionality criteria, creating a meaningful risk of cannibalizing scarce renewable electricity resources and leading to higher overall emissions in the sector. Similarly, the import of large quantities of renewable hydrogen should be accompanied by strict and transparent standards for its production and transportation.

The planned aggressive ramp-up in biomethane production, it suggests that could pose a risk to food security through creating competition for crops.

The European Council in May and June, as well as the 'Fit for 55' negotiations on the Renewable Energy and Energy Efficiency directives, will have to accompany the new ambitions but also address the risks of lock-in and rising prices for consumers.

The modeling used by the Commission to devise new targets in 'Fit for 55' proposals was based on the energy landscape and pricing of 2021. The numbers are outdated and must be adapted to the new geopolitical and economic reality that is reflected in the EU Save communication.

REPowerEU also recognizes the huge, unleashed potential to reduce fossil gas use in industry: by 2030, 60% of gas consumption or almost a third of Russian imports, can be cut in industry alone. For that, government and industry actors need to incentivise and prioritize energy efficiency and direct electrification. The communication, however, falls short on setting out how this is to be delivered. Moreover, the proposal to raise revenues by auctioning Emissions Trading allowances currently held by the Market Stability Reserve sets a dangerous precedent that risks jeopardizing the EU's climate targets.

Additionally, there are question marks over how realistic it is to use LNG terminals for the import of renewable hydrogen or ammonia. This brings into doubt the credibility of assurances that investments in this area won't become stranded and that fossil fuel lock-in from this infrastructure can be effectively avoided.

Finally, the proposal to launch an EU energy platform for the voluntary common purchase of pipeline gas, LNG and hydrogen has been raising some legitimate questions concerning timing of implementation and its overall functioning.

The part of the package addressing EU's external engagement on energy is arguably its weakest link. Heavily focusing on securing non-Russian fossil fuel supplies, it does not match the domestic ambition to accelerate the implementation of 'Fit for 55'.

It has little concrete to offer on how a clean energy cooperation scale-up worldwide can ease gas markets and bring relief to partners suffering from high oil and gas prices – thereby fostering stronger global partnerships.

REPowerEU plan makes no mention at all of nuclear options. It focuses on "energy savings" as "the quickest and cheapest way to address the current energy crisis and reduce bills". The Commission proposes to enhance long-term energy efficiency measures with a publication detailing short-term behavioural changes which could cut gas and oil demand by 5% and encourages member states to use fiscal measures to encourage energy savings.

Doubling down on political and financial efforts to think through instruments and mechanisms for international action is key to enabling a global just energy transition. If cannot be accomplished at the EU level, will need to be taken forward by the Member States.

Broadly speaking, the REPowerEU Plan paints quite a comprehensive picture of EU energy policy long-term, and to a considerable extent assures the longevity of the now unified EU energy policy aims. This is achieved through ambitious proposals to accelerate investment and build-out of renewable electricity generation and value chain infrastructure, which are now on the table and awaiting implementation.

In conclusion, measures announced in REPowerEU come to a large extent from the EU Green Deal - a flagship initiative whose main goal is to make Europe climate neutral by 2050. An important enhancement is the accelerated time horizon, which gives the previously adopted legislative proposals under the 'Fit for 55' (December 21) package a new sense of urgency. While Member States and businesses are still struggling to understand the implications of these new policies on their fiscal space and operations respectively, they now need to incorporate a new dimension that arose under REPowerEU initiatives.

As we stand now on May 30th 2022, the next steps for REPowerEU implementation are the following:

- EC with European Investment Bank (EIB) will conclude by the end of 2022 an agreement on the financial structure that would be appropriate to promote renewable energy projects and Power Purchase Agreements (PPAs) in Europe, which is possible under InvestEU Programme, which promotes among other things the recovery and green growth initiatives in line with the current plan.

- EC aims to develop REPowerEU plan in cooperation with Member States by the end of the summer 2022. Member States such as Greece should draw up their revised national energy and climate plans (NECPs) as soon as possible in order to achieve the REPowerEU objectives at the lowest cost to the final consumer.

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