REPowerEU: Empowering energy consumers for a more sustainable and resilient Europe

A 10-point action plan to make Europe digital and electric by 2027

Views from Schneider Electric
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Life Is On | Schneider Electric

Together, we can drive efficiency with digital, electrify heat, decentralize energy and build better.

Executive Summary

Schneider Electric welcomes the European Commission's REPowerEU Action Plan, published on May 18, 2022. The document addresses the current energy crisis in Europe and outlines a plan to rapidly reduce Europe's dependence on Russian fossil fuels. We particularly welcome the EU Save Energy Plan and the high ambition of the EU Solar Energy Strategy. At a time when the climate emergency and the energy transition have already begun, we are spending a billion euro a day importing fossil fuels. It is essential, therefore, that measures adopted to lessen the EU's dependency on Russian fossil fuels (which comprise about a third of our energy imports) reinforce and accelerate longer-standing efforts to reduce greenhouse gas (GHG) emissions by at least 55% by 2030.

REPowerEU puts forward strong proposals to diversify our gas supply, invest in renewable energy and deliver energy savings. Further opportunities remain to catalyze systemic, bottom-up action. Energy consumers are driving the transition to a new world of energy that is sustainable, digital and electrified. This is a new world of energy, Electricity 4.0. Key technologies are significantly transforming energy demand and providing services to energy consumers. Investing now in a smart and decentralized energy system would create structural change long before 2027. The opposite of carbon lock-in is consumer empowerment. Households could improve their lives and make habit changes stick; industry and non-residential buildings could systematize good practice, move up the value chain, and access new services and new data. With this in mind, the following report details 10 concrete actions the EU can take to achieve both immediate returns and longer-term benefits.

The most rapid gains will be made with **digital efficiency**, both in buildings (with monitoring and controls; Action 1) and in industry (with energy management systems; Action 2). Every additional percentage point of energy savings is equivalent to 2.6 percentage points of Russian gas imports. As major energy consumers, buildings and industry should save 46 and 17 billion cubic meters (bcm) of gas imports respectively. The renovation of non-residential buildings to incorporate digitally enhanced energy efficiency is a "no-brainer" due to the short-term return on investment.

Digitalization synergizes with **electrification,** especially of heat in buildings (with connected heat pumps; Action 3) and in industrial processes (Action 4) are other no-regret options. Today's technologies could electrify 90% and 78% of heat in those sectors, respectively. The remainder can provide niches for green hydrogen and biogas (Action 5).

We must **decentralize our energy**, with self-consumption of rooftop solar (Action 6), demand-side flexibility (Action 7), microgrids (Action 8) and smart EV charging (Action 9). While the REPowerEU Plan rings very positive proposals on some of those issues, we believe it could be a much higher priority at an EU and national level. These will largely require ambitious regulatory incentives and strong signals, such as mandating a 10% reduction in peak energy consumption and obliging that 20% of large non-residential car parks provide access to EV charging points.

Finally, instead of retrofitting to compensate for prior mistakes, we need to **build right from scratch**, with digital tools guiding the design of new buildings (Action 10). Building information modelling reduces the error rate by over 60%, while making the building more sustainable and more energy-efficient once in use.

I. Drive energy efficiency with digital technologies

Our energy systems must become smarter and more connected. For decades, energy efficiency measures were static, component-level technologies that produce energy savings. Digital is a game changer. Through connected devices, edge control and related software and services, digital energy efficiency enables building devices to connect to the entire energy system. Therefore, it integrates distributed energy and provides up to 30% energy savings with quick return on investment (approx. five years, see below). Most important is the time factor: digital solutions can be deployed in the short term as they are available now and can be quickly installed without any permitting process. They also prevent rebound effects on thermal energy renovations, which are important but on a longer time cycle[1].

Making our buildings and industries more energy efficient will yield rapid results. The International Energy Agency (IEA) has long argued that every additional percentage point in energy savings is a 2.6 percentage point reduction in imported gas[2]. Today, the Regulatory Assistance Project believes that Europe can reduce Russian gas imports by 101 billion cubic meters (bcm) just through energy efficiency and the expansion of clean energies[3]. This would reduce our current gas imports from Russia by 66%.

ACTION 1: Drive energy efficiency in buildings with digital monitoring & control

Action 1: Drive energy efficiency in buildings with digital (monitoring and control)

The building sector is the bedrock of Europe’s decarbonization efforts. It currently represents more than 40% of Europe’s emissions. REPowerEU proposes reducing this in the short term with behavioral change via information campaigns. However, more than 220 million existing buildings are energy inefficient. In order to create a win-win scenario for consumers, we need to look at two critical issues. Firstly, what technologies can combine a quick return on investment with enduring systemic value? And, secondly, what are the building segments with the highest energy efficiency potential?

The most innovative and cost-effective way to boost energy efficiency in buildings is to equip them with connectable solutions such as monitoring tools, sensors, controls, and building management systems (BMS). Those enable building occupants and managers to optimize energy use based on real-time information. The installation of BMS, or home controls, requires a comparatively small upfront investment, with an average of 30€/m² in non-residential buildings, and 12€/m² in residential buildings[4]. The cost of the investment is also generally recouped much faster – in less than five years with monitoring and control technologies, compared to more than 15 years for traditional solutions. When fully deployed, an ambitious transposition of the BMS-related measures included in the revised Energy Performance in Building Directive (EPBD 2018/844) could lead to savings equivalent to 14% of total building final energy consumption. Concretely, in 2038, the EU would save the equivalent of 46bcm of fossil gas, 64 metric tonnes (mt) of CO_2 and €36 billion.

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1 Vermorel (2020): “340 milliards d’euros investis en 10 ans et aucune baisse de consommation d’énergie” for WattSense blog
2 European Commission (2014): “Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy”
3 The Regulatory Assistance Project (2022): “EU can stop Russian gas imports by 2025”
4 Minier (2020): “Payback of Investments for Active versus Passive Energy Efficiency Solutions in Buildings and Residential”; SE internal paper

Furthermore, according to the IEA, installing smart heating controls is a simple process that can be scaled up quickly. For instance, it is calculated that tripling the current installation rate of about one million homes per year would reduce the EU's annual gas demand for heating homes by an extra 0.2bcm at a total cost of €1 billion.

In this regard, it is noteworthy that non-residential buildings have a higher decarbonization potential compared to residential buildings at a lower cost. In terms of absolute savings, the average energy renovation within the EU is estimated to reduce a non-residential building's specific primary energy consumption by 47 kWh/(m².y) compared to 14 kWh/(m².y) for residential buildings[5]. This is equivalent to 23% of CO2 emissions by the EU's building stock and 9% of all EU emissions. According to our own calculations, we need investment of approximately €6 billion to decarbonize private non-residential buildings in the EU[6].

In 2021, the Schneider Electric Sustainability Research Institute™ estimated the energy saved from installing building management systems and the associated payback time. For example, European retail buildings saved ≈23% of energy and recovered the investment in two to four years[7]. The tables below provide a detailed breakdown of our results across representative EU countries. The calculations are predicated upon a standard building from 1980 or 2006, paying 2019 retail energy prices and installing "category A" measures (advanced controls such as building management systems or home automation, as opposed to just a thermostat on the boiler).

Figure 1: Energy saved by country and sector in % (with category A BMS)

	Hospital	Hotel	Office	Resid.	Retail	School	Average
Denmark 1980 building	-22.5%	-21.6%	-27.9%	-23.5%	-39.3%	-24.2%	**-26.5%**
Denmark 2006 building	-19.1%	-20.0%	-21.3%	-21.7%	-34.1%	-17.8%	**-22.3%**
France 1980 building	-23.0%	-20.7%	-27.6%	-22.8%	-36.4%	-22.7%	**-25.5%**
France 2006 building	-19.0%	-19.3%	-20.2%	-20.8%	-31.2%	-16.4%	**-21.2%**
Germany 1980 building	-22.5%	-21.6%	-27.9%	-23.5%	-39.3%	-24.2%	**-26.5%**
Germany 2006 building	-19.1%	-20.0%	-21.3%	-21.7%	-34.1%	-17.8%	**-22.3%**
Italy 1980 building	-23.0%	-20.0%	-27.2%	-21.3%	-31.7%	-25.0%	**-24.7%**
Italy 2006 building	-18.5%	-19.1%	-19.2%	-19.0%	-28.7%	-19.8%	**-20.7%**
Netherlands 1980 building	-22.4%	-18.2%	-23.9%	-21.7%	-34.2%	-23.6%	**-24.0%**
Netherlands 2006 building	-17.9%	-17.0%	-16.6%	-19.2%	-24.9%	-16.8%	**-18.7%**
Spain 1980 building	-23.0%	-20.7%	-27.6%	-23.0%	-36.4%	-25.5%	**-26.0%**
Spain 2006 building	-19.0%	-19.3%	-20.2%	-21.1%	-31.2%	-19.7%	**-21.7%**
Average	**-20.7%**	**-19.8%**	**-23.4%**	**-21.6%**	**-33.5%**	**-21.1%**	**-23.4%**

[5] Esser et al. (2019): "Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU", https://ec.europa.eu/energy/sites/ener/files/documents/1.final_report.pdf for EU Commission.

The total number of non-residential buildings is ~11.8 million buildings with a total floor area of ~7 billion m2 in Europe. Wholesale and retail buildings account for about half of the building stock, followed by 27.6% for offices, 10% hotels and restaurants, 7.2% education and 5.2% health care. Specific data breakdown for non-residential buildings by vintage are available for only Austria, Hungary, Belgium and Germany, averaging 64.2% for pre-1980, 18.3% for 1980- 1990, 19.1% for 1990-2010 and 3.6% post 2010. Commercial/tertiary buildings represent between one quarter to one third of the building surface.

[6] Deprez et al (2021): "Further prioritize private non-residential buildings in the context of in the EU recovery Plan", SE internal paper

[7] SSI (2021): "Cracking the energy efficiency case in buildings" https://www.se.com/ww/en/insights/tl/schneider-electric-sustainability-research-institute/ssr-ee-paper

Figure 2: Payback time by country and sector in years (with category A BMS)							
	Hospital	**Hotel**	**Office**	**Resid.**	**Retail**	**School**	**Average**
Denmark 1980 building	1.10	3.60	3.60	3.27	1.36	4.69	**2.94**
Denmark 2006 building	2.78	4.69	4.13	4.17	2.21	7.25	**4.20**
France 1980 building	1.56	5.56	4.83	5.79	2.34	8.23	**4.72**
France 2006 building	3.92	7.02	6.07	7.39	3.34	12.23	**6.66**
Germany 1980 building	1.06	3.57	3.55	3.95	1.46	4.98	**3.09**
Germany 2006 building	2.95	4.70	4.08	5.06	2.26	7.18	**4.37**
Italy 1980 building	1.17	4.08	3.53	5.15	2.00	2.95	**3.15**
Italy 2006 building	2.97	4.93	4.61	6.10	2.37	4.87	**4.31**
Netherlands 1980 building	1.60	6.51	6.62	7.05	2.79	5.92	**5.08**
Netherlands 2006 building	4.72	7.68	7.26	9.78	4.59	9.27	**7.22**
Spain 1980 building	1.18	4.22	3.63	4.23	1.85	3.14	**3.04**
Spain 2006 building	3.10	5.34	4.57	5.21	2.55	5.43	**4.37**
Average	**2.34**	**5.16**	**4.71**	**5.60**	**2.43**	**6.34**	**4.43**

Policy Recommendations

- **Accelerate MEPS to renovate non-residential buildings from 2025:** We propose accelerating some of the EPBD's Minimum Energy Performance Standards (MEPS) requirements. For example, non-residential buildings must move from class G and D before 2025 (instead of 2027 for residential). Subsidies should support investment in those segments as soon as possible.
- **Deploy BMS:** The European Commission should ensure compliance of existing provisions on building automation and control in the current EPBD. In addition, it should fast-track agreement on lowering the threshold from 290kw to 70kw (which advances the requirement from 2029 to 2026).
- **Monitor ex-ante and ex-post renovation:** The EPBD recast should impose monitoring of energy consumption when upgrading MEPS. Power monitoring in buildings must become an integral part of technical buildings systems in the new EPBD.
- **Create an Energy Efficiency Accelerator:** With the objective to triple the current installation rate of smart heating controls of one million buildings per year.
- **Grant subsidies:** Encourage member states to subsidize heating controls (homes and BMS). This could include VAT exemptions similar to those the Commission authorized on retail energy.
- **Leverage utility obligation schemes:** Oblige utilities providers to prioritize the deployment of building management systems.

ACTION 2: Digitalize energy efficiency in industry with energy management systems

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According to the IEA, 65% of energy used in industry is derived directly from fossil fuels (27% from gas)8. Industrial players are, therefore, major stakeholders in a fast reduction of Europe’s dependency on Russian gas. Some regions, such as Germany and Eastern Europe, will be particularly heavily impacted by such a shift.

Collecting, analyzing, and automatically acting in response to data combines decarbonization and cost-effectiveness. In addition, companies capable of precisely measuring, controlling, and optimizing their energy consumption will be more resilient against external shocks. Industrial automation systems range from smart sensors and connected devices to advanced process controls with software analytics and are major enablers in reducing energy consumption and GHG emissions. Combined, this range of digital technologies and software applications can bring up to 30 energy savings according to the IEA[9]. Most potential savings have payback periods of less than two years, with greater savings possible over longer periods[10].

The benefits of digitalization increase when combined with electrification. Electrification displaces fossil fuels, but it is also more measurable and more precise. Additionally, electricity is more cost-effective and available today, especially in light industry. While light industry has a lower energy footprint than its heavier counterpart, it also stands to benefit more from electrification. A recent IEA study estimates that electrification has the capacity to provide 70% of total potential energy savings in the sector[11].

Policy Recommendations

- **Deploy Energy Management Systems (EMS):** We support the new revision of the Energy Efficiency Directive (EED), which deploys energy management systems. However, we favor going further, lowering the threshold down to 10 terajoule (TJ) instead of 100TJ, as outlined in the Commission’s initial proposal, so as to capture a wider scope.
- **Scale national energy efficiency programs,** including high quality energy audits. We welcome the Commission proposal to encourage SMEs to engage in heat audits. We support the Energy Trading Scheme (ETS) proposal to tie the allocation of free allowances to EMS or the implementation of recommendations arising from mandatory energy audits.
- **Include energy efficiency targets in corporate emission reduction plans.** Article 15 of the proposed corporate sustainability due diligence directive outlines criteria according to which major companies may be required to publish emission reduction plans. These plans must include energy efficiency targets.

[11] IEA report (2021): Energy efficiency. P77. https://www.iea.org/reports/energy-efficiency-2021

II. Electrify end-uses and rethink heat

The recent International Panel on Climate Change (IPCC Report spells out the expert consensus on the need to electrify across all sectors[13.] An all-society approach is needed to achieve carbon neutrality by 2050. Buildings account for 40% of final energy consumption and industry another 38%[14]. They are, therefore, top priority for electrification, especially in the context of the extremely energy-hungry process of creating heat. However, we must recognize that some specific industrial processes are out of reach of direct electrification, which struggles to push above 700°C.

ACTION 3: Electrify heating in buildings with connected heat pumps and smart controls

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Presently in Europe, heating in households and non-residential buildings is mostly provided through gas heating. Typically, gas heating fuels 38% of space heating, 41% of water heating, and 31% of cooking in EU homes[15]. Electric heat pumps could easily supply 90% of heating needs in buildings globally yet, in 2020, they still met no more than 7% of them[16.] Heat pumps have obvious advantages over gas boilers: they're more efficient; they have lower running costs (especially when unfair government subsidies on gas are excluded (such as differing taxation levels for gas and electricity) [17], and can be reversed to replace air conditioning.

The REPowerEU communication recognizes this potential and states clear objectives. It plans for 10 million heat pumps to be deployed by 2027 and a total of 30 million by 2030. It estimates this will save 1.5bcm of gas in 2022 and 35bcm saved in 2030[18.]

We welcome the priority afforded to heat pumps in the REPowerEU plan. However, it is of paramount importance to promote 'smart' heat pumps. Specifically, today's smart pumps use a combination of Variable Frequency Drives (VFDs, sensors and Internet of Things (IoT capabilities to manage the flow of energy based on demand. These sensors automatically adjust operations through the VFD or collect and share data supplied by building or utility management systems to analyze demand performance over time[19.] This results in great system efficiency by reducing energy usage and reducing the total cost of ownership for the pump system. Conversely, system operation of traditional pumps relies on valves opening and closing to vary the flow rates, while the pump remains at maximum speed. Smart pumps can reduce speeds to meet system demand.

Policy Recommendations

Heat pump deployment alone is inefficient and so RePowerEU must support the following enabling measures.

12 McWilliams, B., Sgaravatti, G., Tagliapietra, S. and G. Zachmann (2022) *'Preparing for the first winter without Russian gas'*, Bruegel Blog, 28 February https://www.bruegel.org/2022/02/preparing-for-the-first-winter-without-russian-gas/

13 IPCC (2022): "Mitigation of Climate Change: Summary for Policy Makers", C3 (carbon reduction), C4 (end-uses), C5 (industry), C6 (cities), D1 (development), E1 (mitigation) and E2 (health co-benefits) https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf

14 https://www.iea.org/reports/tracking-industry-2021

15 Eurostat (2019), "Energy Consumption of Households", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households

16 https://www.iea.org/reports/heat-pumps

17 Schneider Electric Sustainability Research Institute (2021): "Building Heat Decarbonization" https://www.se.com/ww/en/insights/sustainability/sustainability-research-institute/building-heat-decaronization.jsp?stream=sustainability-research-institute

18 EU Commission (2022): "REPowerEU: Joint European Action for more affordable, secure and sustainable energy", p6

19 Michaud (2022): "Smart Pumps Lead the Way to Energy Efficiency and Sustainability Goals", https://www.facilitiesnet.com/hvac/article/Smart-Pumps-Lead-the-Way-to-Energy-Efficiency-and-Sustainability-Goals--19528

- **Ban new fossil fuel boilers.** We support the REPower proposal to remove all subsidies by 2025 and to then ban them by 2029, either through action by member states or ecolabelling.
- **Promote smart heat pumps** as much as possible (the more efficient the products, the more connectable they will be to the energy system). These will more easily enable consumers to become prosumers using solar panels because the production-consumption integration will already be provided. Flexibility-based business models would benefit from the transposition of the Electricity Market Design Directive into national law, which is overdue since 31/12/2020.
- **Train installers.** A shortage of skilled installers limits scale[21.] Identify the countries with the greatest skill gaps and leverage the NextGenerationEU (NGEU) fund to invest accordingly in training programs. We support the REPower proposal to leverage the Skills Pact and call to include installers of EMS and other efficiency systems.
- **Align energy taxation rates.** To meet 2030 targets, the EU must at least align natural gas and electricity taxation rates in the forthcoming revision of the Energy Taxation Directive. On average, coal is taxed €2.9 per megawatt hour while natural gas is taxed €7/MWh. Electricity, by comparison, is taxed €32.1/MWh according to the European Court of Auditors[22.]Progressively, the situation must then be reversed, with preferential taxation for electricity.

ACTION 4: Electrify industry with better industrial processes

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As outlined in Action 2, European industry is heavily reliant on fossil fuels. Despite this, the current rate of electrification is too slow. Unless accelerated, electrification of the energy system will fail to even rise to 25% by 203023. McKinsey estimates that, using only technologies available today, almost 50 percent of all fuel used for energy by industrial companies could be replaced with electricity[24.]

Electricity has intrinsic process-related capabilities which make it a superior solution. Thanks to the many electric heating techniques, heat can be delivered at precise temperatures, focused at point of use, and better controlled and automated[25] . Direct electrification enables greater digitalization which, in turn, facilitates greater resilience through microgrids, and enhanced system efficiency through demand response services (see Action 8). The REPowerEU communication has a section dedicated to "decarbonizing industry", but it places direct electrification on par with indirect electrification via hydrogen.

According to a recent, comprehensive bottom-up analysis of energy use in 11 industrial sectors (accounting for 92% of the EU's industry CO2 emissions), 78% of energy demand is electrifiable with existing technologies. Furthermore, 99% electrification can be achieved with the addition of technologies currently under development[26]. Figure 3, below, illustrates which sectors can be electrified with common technologies ("stage 1"), which with existing tailored technologies ("stage 2") and which require technological maturation ("stage 3").

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20 IEA (2021): "Net Zero by 2050", p19, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

21 Delta-EE (2022): "Getting into the decarbonisation of heat: an energy retailer perspective", https://www.delta-ee.com/podcasts/getting-into-the-decarbonisation-of-heat-an-energy-retailer-perspective/

22 https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=60760

23 https://electrification-alliance.eu/wp-content/uploads/Electrification-Alliance-Fit-for-55-Package-Joint-Position.pdf

24 https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/plugging-in-what-electrification-can-do-for-industry

25 Beyond Zero Emissions (2018): "Electrifying Industry", https://bze.org.au/research_release/electrifying-industry/

26 Silvia Madeddu et al (2020): "The CO2 reduction potential for the European industry via direct electrification of heat supply (power-to-heat)" https://iopscience.iop.org/article/10.1088/1748-9326/abbd02/pdf

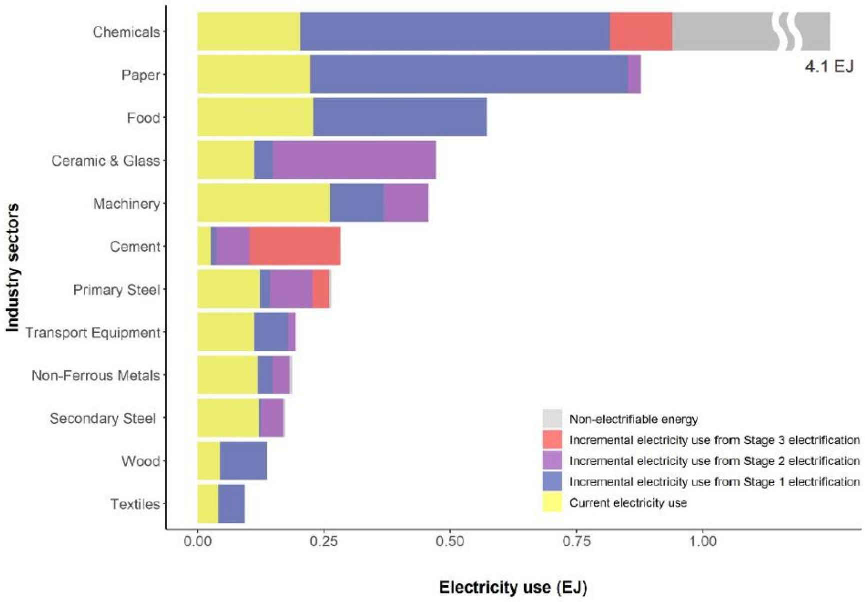

Figure 3: https://doi.org/10.1088/1748-9326/abbd02

A perfect mix of factors prime the generation of heat for electrification, with the very highest marketreadiness in low temperature processes. A wide number of technologies are available already, allowing electrification to be tailored to the process at hand[27] for maximal efficiency. Electric options are also shown to be more efficient than their combustion-based equivalents[28].

Policy Recommendations

The REPowerEU Plan must, therefore, explicitly prioritize electrification and renewable generation, spending money on the most efficient technologies first. For example, the Innovation Fund should not spend on hydrogen projects in instances when solar projects or electricity interconnectors could benefit from the same financing.

- **Leverage Renewable Energy Directive (RED) III:** The revision of the RED must incorporate mandatory sub-targets regarding renewable energy for industry, subject to a cost-efficiency analysis.
- **Develop an "Electrification Accelerator"** similar to the "Hydrogen Accelerator" already proposed by RePowerEU. It should provide a toolbox for member states and encourage tax incentives for electrification at end-use.
- **Further develop the "Industry 5.0' strategy**[29] to encourage smart and digital electrification as part of the digital transformation agenda of the industry across Europe. Concretely, it must be transposed into new sustainable indicators for manufacturing that include end-use electrification.

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27 https://librairie.ademe.fr/energies-renouvelables-reseaux-et-stockage/105-premiere-analyse-du-potentiel-technique-d-electrification-des-procedes-industriels-thermiques-par-des-technologies-matures.html

28 Mahmoud, M., et Al. 2021, *The road to energy efficiency*, Publication for the committee on Industry, Research and Energy (ITRE), Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695480/IPOL_STU(2021)695480_EN.pdf

29 https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/industry-50_en

ACTION 5: Decarbonize remaining industrial processes with green hydrogen and biogas

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Both biogas and green hydrogen can provide solutions for decarbonizing heat in industry. But because quantities of both resources will remain limited, it is of utmost importance to focus their application where direct electrification cannot succeed.

Green hydrogen: The EU priority is to develop renewable hydrogen, produced mainly through electrolysis with wind and solar energy[30]. The Fit for 55 package aims to produce 5.6 million tonnes of renewable hydrogen, saving 9-18.5bcm of gas. In addition, the Commission proposed to draw on an additional 10mt of imported hydrogen and 5mt of hydrogen produced in Europe.

Hydrogen has the potential to play a role in reducing emissions in some hard-to-abate sectors[31]. There are today limited alternatives for heavy industrial heat demand, and this could provide an important role for hydrogen (mainly in respect of steel production). However, hydrogen represents a modest fraction of the global and EU energy mix and is today still largely produced from fossil fuels.

Biogas: Biomethane production in Europe is currently tiny. The combined biogas and biomethane production in 2020 amounted to 18bcm, of which 16bcm was biogas and 2bcm was biomethane, a small fraction of total EU gas consumption. There is also a limited potential to scale up biogas and biomethane supply in the short term due to the lead times for new projects.

Given the limited potential production and the challenges of transportation[32], biogas and biomethane usage should target applications with no other solutions. As such, they have obvious value in high temperature industrial processes which cannot easily be electrified.[33] They can also play an important role in the production of biogenic carbon feedstock.

Policy Recommendations

We must ensure industry can access green hydrogen and biogas. To do so, we encourage the Commission to:

- **Decarbonize existing hydrogen production:** support a rapid decarbonization of existing hydrogen production for industrial purposes
- **Subsidize local biogas usage.** The Common Agricultural Policy (CAP) can help farmers producing biomethane derived from sustainable biomass sources (such as agricultural wastes and residues) to be used at local level only and where direct electrification is not feasible.
- **Prioritize direct renewable electrification over hydrogen buildings.** Exclude hydrogen from the RED Recast sub-targets, notably those aimed at achieving 49% renewable energy in buildings by 2030, and an annual increase of 1.1% of renewable energy in heating and cooling.
- **Prioritize direct renewable electricity over biomethane crops.** Exclude crop-based biomethane as an eligible pathway in the REDIII, as it results in high land-use change emissions.

30 European Commission, Hydrogen Strategy, 2020: https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf

31 Liebreich M., Separating Hype from Hydrogen – part 1, 2020: https://about.bnef.com/blog/liebreich-separatinghype-from-hydrogen-part-one-the-supply-side/ : "*Hydrogen's role in the final energy mix of a future net-zero emissions world will be to do things that cannot be done more simply, cheaply and efficiently by the direct use of clean electricity and batteries*".

32 Ibid.

33 IEA, The outlook for biogas and biomethane: Prospects for organic growth, 2020: https://www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth/the-outlook-for-biogas-and-biomethane-to-2040

III. Decentralize the energy system

Decentralizing energy means producing energy near where it is being consumed. It allows for more optimal use of renewable energy, better use of combined heat and power units, reduced fossil fuel consumption, and increased eco-efficiency – which is why experts have long called for EU action on the subject[34]. Sourcing local energy generation will be one of the most powerful tools we can leverage to reduce our dependency on foreign sources of energy. In addition to enhancing resilience, decentralized energy production helps to reduce system inefficiencies and associated economic and environmental costs.

ACTION 6: Deploy renewables with rooftop solar and self-consumption

Action 6: Deploy renewables with rooftop solar and self-consumption

The REPowerEU Plan includes strong solar ambitions, carried by the EU Solar Energy Strategy, the Solar Rooftop Initiative and precise legislative proposals to improve permitting of renewables. This is highly welcome, especially considering accelerating the rollout of rooftop solar photovoltaic (PV) systems by up to 15TWh in 2022 is estimated to result in an additional 2.5bcm of savings in gas[35]. Wind energy is also listed as a priority sector, but since wind energy projects require much longer to set up, this paper only focuses on solar.

According to Solar Power Europe, solar PV is already the fastest growing energy source in the EU[36] and, according to the EU's Joint Research Centre, rooftop solar arrays could economically provide a quarter of the electricity currently being consumed by the EU while creating jobs[37]. Our own latest research estimates a potential supply in the range of 560-1000TWh for Europe by 2050[38]. As can be observed in other geographies, such as California in the USA, mandatory rooftop solar deployment in new buildings is economically viable and can provide a rapid return on investment[39].In the words of the Commission, it is low-hanging fruit with huge untapped potential.

Distributed generation is a true game changer for the building stock and the supporting grid infrastructure[40]. Distributed generation can offer a key alternative to slow and expensive grid upgrades, helping to accelerate the electrification of the stock. This is obviously dependent on the ability to decentralize, harnessing and storing energy locally. As such, the deployment of self-consumption capacities at the building level is paramount. In Germany it is estimated that more than half of existing rooftops could host solar[41].

In many areas, we are likely to see buildings turning into energy sources, i.e., producing more energy than they consume over the course of a day (even after including storage provisions for optimized self-consumption). With this transition, the role and design of distribution grids will significantly evolve. They will develop to be more like a platform than the traditional distribution delivery system we have known for decades. Existing efforts to detail characteristics of this type of grid through the deployment of a Smart Grid Indicator should be recognized.

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34 Altman et Al. 2010, *Decentralized Energy Systems*, Publication for the committee on Industry, Research and Energy (ITRE), Policy Department for Economic and Scientific Policies, European Parliament https://www.europarl.europa.eu/document/activities/cont/201106/20110629ATT22897/20110629ATT22897EN.pdf

35 European Commission, Communication REPowerEU: Joint European Action for more affordable, secure and sustainable energy, 8 March 2022, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN.

36 Solar Power Europe (2022): "Raising Solar Ambition for the European Union's Energy Independence", https://api.solarpowereurope.org/uploads/SPE_Raising_Solar_Ambition_EU_Solar_Strategy_Re_Power_EU_9e825040bf.pdf

37 Jäger-Waldau, Arnulf. (2020): "The Untapped Area Potential for Photovoltaic Power in the European Union". Clean Technologies. 2. 440-446. doi.org/10.3390/cleantechnol2040027

38 Schneider Electric Sustainability Research Institute (2022): "The unexpected disruption: Distributed generation", https://www.se.com/ww/en/insights/sustainability/sustainability-research-institute/the-unexpected-disruption.jsp

39 BloombergNEF (2021): "Realizing the Potential of Customer-Sited Solar" , https://assets.bbhub.io/professional/sites/24/BNEF-Schneider-Electric-Realizing-the-Potential-of-Customer-Sited-Solar_FINAL.pdf

40 Ibid.

41 BloombergNEF & Schneider Electric, "Realizing the Potential of Customer Sited Solar", 2021 p. 8 https://www.se.com/ww/en/insights/sustainability/sustainability-research-institute/realizing-the-potential-of-customer-sited-solar.jsp?stream=sustainability

Beyond the pure rooftop solar deployment, a broader energy perspective is key to the success of a highly renewable system. Integration of building management systems, smart mobility, and connected heating will enable the combination of on-site self-consumption and local energy optimization. In any case, this will require a robust digital transformation, coupling existing supply technologies with new demand-side flexibilities and appropriate market design. So, in a nutshell, it is important to promote the co-deployment of solar rooftop capacity, with self-consumption, and local management systems. The full potential of rooftop solar cannot be achieving if it is not accompanied with its support cast: heat pumps, building managements systems and smart charging electric vehicles.

Policy Recommendations

We suggest focusing efforts on two fronts. First, boost the adoption of rooftop solar; and second, couple it with the digitalization of networks and infrastructure:

- **Deploy rooftop solar:** We welcome making rooftop solar compulsory for public and commercial buildings and encourage leveraging the recast of the RED and the EPBD to do this.
- **Accelerate the digitalization of networks and infrastructure** by requiring the use of a Smart Readiness Indicator (SRI) which incentivizes "smart-ready" solar rooftops. This means giving the highest score to solar PV which can be connected and used for self-consumption.
- **Encourage smart energy tariffication** that supports the combination of storage and PV solar panels, as it is encourages flexibility and resilience.

ACTION 7: Invest in demand-side flexibility sources

Action 7: Invest in demand-side flexibility sources

The REPowerEU action plan must build around the concept of energy system flexibility, a converged digital and electrical system. This flexibility is essential to resolving the challenges posed by the variability of renewables and to reducing the cost of decarbonization and electrification of more areas of Europe's economy.

The addition of substantial amounts of solar and wind generation, combined with coupled electrical loads on the demand side that can help manage the variability of renewables, creates a huge opportunity for greater resilience. Demand-side optimization and its dynamic management will reduce the burden on the electrical the grid through digitization. This will further enable greater electrification at end-use, namely through the deployment of heat pumps and EV charging stations. However, these will all need to be connected and smart.

In 2013, the European Commission estimated that only around one tenth of the EU's total demand-response potential was used. Demand-side flexibility goes beyond the potential of a traditional demand-response program and could be powerful in addressing the shortage of gas at a low cost and in a very short timeframe. However, these benefits will only materialize if millions of energy prosumers are able to monetize their flexibility through market arbitrage opportunities.

Policy Recommendations

Europe's grid must move to decentralized green generation (on site solar), decentralized distribution (distributed management systems) and smart consumption (EV charging and heat pumps, enabled by energy management systems). This requires reconfiguring Europe's energy markets, to level the playing field for demand-side stakeholders.

- **Set a reference of 10% peak demand reduction.** The EU has already set a non-binding target of 10% for interconnection; similarly, the Commission should propose a reference of 10% peak demand reduction for EU member states, with a 5% milestone for 2025. This would serve as an explicit metric of demand-side flexibility.
- **Accelerate implementation of the EU Electricity Market Design.** The energy market design of the clean energy package already regulates equal and non-discriminatory access to distributed energy resources (DERs). However, member states have delayed transposition. This must be addressed.
- **Make Smart Grid Indicators mandatory** as part of the revision of the RED. This will encourage utilities providers to better value the importance of flexibility at grid level.

ACTION 8: Develop micro-grids

Action 8: Develop micro-grids

A microgrid is a self-contained electrical network that enables end-users to generate their own electricity on-site and use it when it is the most needed. A microgrid is thus a type of DER. DERs support flexibility and efficiency and include solar and storage, EV batteries, and dispatchable loads.

Microgrids can incorporate battery systems to store electricity and deploy it during outages or when grid demand spikes. In 2019, there were around 4,500 microgrid projects around the world, according to a report from Navigant Research. Asia Pacific has the world's biggest microgrid capacity, followed by North America, the Middle East and Africa. In Europe, micro-grids are underdeveloped despite their important potential to strengthen the EU's security of supply. Commercial and industrial microgrids can provide local employment opportunities, both directly at the site and through increased economic activity provided by additional power supply.

There are three main benefits to microgrids. First, they maintain access to power even during grid outages. This is a form of resilience which is particularly valued by end-consumers. In February 2021, grid outages in Texas killed hundreds and left millions unable to access heat or electricity[42]. Second, they are a form of flexibility, enabling the local energy community to store electricity and sell it back to the grid during peak demand. Third, microgrids integrate on site renewables, such as wind and solar, making them an obvious part of the energy transition.

Microgrids are made of technologies currently available on the market, such as PV, storage systems and energy management systems. However, uptake suffers because of regulatory barriers impeding their deployment. For instance, non-residential customers (e.g., those connected to commercial, industrial, and non-residential buildings) are not yet allowed to contribute to energy sharing in communities or in renewable energy communities.

42 Buchelle (2022): "The Disconnect: Power, Politics and The Texas Blackout"

The RED should extend the scope of "renewables self-consumers" and of "jointly acting renewables self-consumers" to create the conditions for collective consumption. To that end, charges and fees to renewable self-consumers should be removed for self-generated electricity, including for installations with a total installed capacity of more than 30 kW.

Policy Recommendations

- **Modify the legislative definition of a renewable energy community.** The definition of a renewable energy community needs to be modified to include all types of prosumers, including legal entities which are corporations, companies, and large enterprises. This will enable the active participation of all types of prosumers, for the benefit of the renewable energy community.
- **Reform RED II to encourage microgrids.** In article 21.4 of the REDII, the obligation for self-consumers to be located in the same building should be removed. This will facilitate the collective sharing of renewable electricity generation within a community of prosumers. Furthermore, in article 21.3(c) of the REDII, the 30kW threshold should be increased to avoid disproportionate charges on all types of prosumers.
- **Develop a longer-term strategy.** Finally, the European Commission must develop a strategy for micro-grids. This should focus on identifying the market barriers that need to be lifted to improve uptake, as well as and highlighting areas for potential development to encourage the construction of micro-grids.

ACTION 9: Deploy electric vehicles and smart charging

Action 9: Deploy electric vehicles and smart charging

Both EVs and smart charging are key to reducing reliance on oil imports. Despite the surge in oil prices hitting EU citizens hard, their roll-out has not been addressed in REPowerEU.

Some are concerned at the burden EV charging could place on grid infrastructure. For example, the French transmission system operator RTE estimates that if more than 60% of charging was not controllable in 2035, the winter peak load could grow by 6 to 8GW. However, if well managed, smart charging, by the nature of its optimization, can actually help to smooth grid demand[43].

More importantly, charging at a building level provides cost benefits compared to public charging. Smart EV charging can generate savings of up to 70% for consumers, when compared to public EV charging costs, especially if paired with time-of-use tariffs, demand charges and the implementation of distributed power generation infrastructure (such as on-site solar)[44]. This potential is magnified when combined with distributed generation resources and flexibility strategies within a building (flexible loads, local energy storage, both electric)[45].

[43] Schneider Electric Sustainability Research Institute (2021) "Electric Vehicle Smart Charging in Buildings", https://www.se.com/ww/en/insights/tl/schneider-electric-sustainability-research-institute/httpreaduberflipcomi1418885-electric-vehicle-se-sustainable-research-institute-gma-whitepaper-qa4

[44] Ibid.

[45] IRENA (2019): "Electric-vehicle smart charging: Innovation landscape brief", https://www.irena.org/publications/2019/Sep/Electric-vehicle-smart-charging

Policy Recommendations

- **Prescribe smart functionalities in EV charging stations** as part of the Alternative Fuels Infrastructure Regulation (AFIR) revision. Smart charging capabilities should integrate:
  - ✓ connectivity features
  - ✓ bi-directionality components, giving the vehicle the ability to interact with an electrical energy network or a local energy network
  - ✓ a minimum level of control, such as shifting the start time of charging in response to price signals; intermittent recharging; or recharging with power modulation to optimize the use of those distributed energy resources.
- **Set targets for smart EV charging:** all existing non-residential buildings should be ready for smart EV charging by 2035, with intermediate targets for 2025 and 2030.
- **Increase the EV ambition of the EPBD** by increasing the proportion of EV parking to one in five parking spaces in large non-residential car parks. This is all the more important given REPowerEU proposals to increase the number of EVs and to green large corporate fleets.
- **Channel the Innovation Fund** toward the roll-out of smart EV charging at private level, for both residential and non-residential buildings.

IV. Build right from scratch

It is easier to make new buildings energy efficient than to retrofit an old building to meet new standards. The most efficient and effective tactic is to build right the first time, which is why architects and builders must modernize. Greater forethought and integration between the different phases of a building's lifecycle (design, development, construction, usage, disassembly) can have important downstream benefits.

ACTION 10: Build better with digital designs and development

Action 10: Build better with digital designs and development

The REPowerEU communication lists energy efficiency measures of homes as one of the focus areas to reduce gas consumption and foster an affordable and sustainable energy transition. While this is obviously true for existing buildings, it is equally important to consider how we can best future-proof new buildings. Fundamental to this process is ensuring the deployment of the right decarbonization and digitalization technologies.

Our recent research[46] demonstrates that implementing the right technologies for new buildings (such as digital energy efficiency, heat pumps for end-use electrification, local renewable solar and clean grid technologies) can provide by 2030:

1. 80-90% CO_2 abatement across the entire stock;
2. 20-30% energy savings in commercial buildings, and over 50% in residential (even divided by three or more for new residential builds);
3. a limited additional cost for new build, below 5-6% across commercial and residential segments.

[46] Petit (2022): "Net Zero Carbon Buildings: A practical pathway", Schneider Electric research, publication in June 2022

For large retrofits, paybacks are less than five years for commercial buildings, while more support is needed in respect of lower-end residential development.

Beyond these advantages, efficiency in usage is limited by how well-planned a building was for its actual use. Digital technologies can help deliver a zero-emissions building segment.

The way a building is designed and constructed directly impacts the costs and carbon emissions required to operate and maintain that building over its entire life cycle. Digital technologies, such as Building Information Modelling (BIM), can accurately record, assess, simulate, measure, track and cut emissions over the entire life cycle of a building. This allows architects, builders, engineers, and, ultimately, the building investors and owners to work towards a more energy-efficient building design with lower energy consumption right from the start.

BIM cuts the error rate in the planning phase of a building by 61% and sustainably reduces the costs for corrections by around one third[47]. BIM should, therefore, be considered as a strategic asset to optimize the energy efficiency of new builds by delivering cost savings, improved construction, and management as well as better environmental performance and quality. Coupled with artificial intelligence, BIM software collects and processes a variety of useful data that helps identify and mitigate problems that might arise in the future. Finally, BIM enables ecodesign, making it easier to plan for the end of a building's lifecycle.

Policy Recommendations

Establishing the correct framework is essential to accelerate the implementation of low-carbon and digital solutions in new buildings

- **Deploy appropriate subsidies** from the outset by mandating digital energy efficiency (with BMS), rooftop solar and heat pumps in all new builds, and supporting these deployments with subsidies.
- **Promote the adoption of digital technologies** like BIM and Digital Twin in public procurement.
- **Encourage public-private partnerships** for digital reskilling and upskilling projects.
- **Pass an ambitious recast of the EPBD.** This includes:
  - ✓ upgrading energy performance certificates to reflect the importance of digital tools (mandate digital logbooks; base energy performance on final instead of primary energy, and include CO2 emissions)
  - ✓ mandating the Smart Readiness Indicator for large and new non-residential buildings
  - ✓ incentivizing the Digital Product Passport for buildings
  - ✓ encouraging the deployment of digital technologies, as well as requiring training of the workforce.

[47] Schneider Electric, "BIM: The intelligent asset and building management", https://www.se.com/de/de/about-us/contests/local/outlook/solutions/building/bim.jsp, accessed on 22 April 2022

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