

YES-EUROPE PRESENTS

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# FUTURE OF ENERGY REPORT

Youth leading by example: the new  
Decade of Transition in the  
European Energy Sector



YES - Europe  
Young leaders in  
Energy and  
Sustainability

# The Future of Energy Report 2021

Youth leading by example – the new  
Decade of Transition in the European  
Energy Sector

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# Preface

## What will the future of our energy sector look like?

The simple answer, familiar to everyone active or interested in the energy field, is:

**We do not know - yet.**

And if we would try to sketch a plan for what awaits us in the next few decades, we might try to predict the trajectory of investment and business decisions, the expected national regulatory guidelines, the development of disruptive technologies, and their effects on society. In addition to all these promising, yet rather unclear, parameters, we have to keep two megatrends in mind when making our calculations for the future.

First, the mitigation of climate change: our most significant task, as the sector emits three-quarters of all global carbon dioxide. Second, the digitalization of the whole sector, a process that affects everyone.

Even if all of these aspects strongly underline the dire need to find the best solutions, it is still hard to assess the direction in which the energy sector is headed. This is why we must take a step back to rephrase our initial question, adding a vital new component:

## What should the future energy sector look like from the perspective of the youth?

We believe that the perspective of the new, young generation is important, as they already actively shape the future of our European energy sector. To provide you with an answer to the question above, we collected the opinions of young energy professionals, aged 18 to 35, on current and upcoming trends. We gathered our data based on a survey, addressed to people across the continent with energy-related backgrounds, as well as multiple interviews with high-profile sector individuals. This mixed-method approach allowed us to sample unique insights on how today's energy youth assess trends, which actions they expect from established stakeholders, and their daily energy-related decision making.

Unfortunately, the reality within the energy sector is very different. Senior sector leaders still have their hands on the steering wheel, dominating the sector's future course. Yet it is on us - the youth - to shape the future of the energy sector, by bringing in new perspectives, ideas, and expertise. We, as Young leaders in Energy and Sustainability (YES), have written this report to take it upon ourselves to answer this urgent question, to move on from mere conjecture and speculation towards clear future scenarios and feasible strategies.

This report is based on the insights from various promising young professionals, who show distinctive leadership within the sector, using their current actions to shape the future of energy – from hydrogen policy research to business consulting in renewable energy to communal energy efficiency auditing. Having assembled and evaluated tangible takeaway learnings, we provide input to a vital discussion among young sector professionals enabling them to connect ideas, grow together and achieve their goals much faster. Additionally, this report aims to identify new best practices, sector trends, and cases to senior sector decision-makers who are eager to learn from next-stage approaches in research, business, and policymaking.

We hereby extend our gratitude to all of our respondents for their contributions. A special thanks are also in order for our inspiring interviewees, who are truly paving the way for the new generation by finding innovative ways of doing business, conducting research, and influencing policies within the energy sector.



# Executive summary

A new decade of transition starts in the European energy sector, and we – the youth – shape it by example. This report showcases views, decisions, and tangible actions of young professionals to educate junior and senior changemakers on their path of kickstarting new opportunities or transitioning established businesses.

We start by reproducing what trends the youth observes and resulting demands. The generation of renewable energy, storage, and efficiency are considered the most vital areas to meet the EU's energy objectives with slight faith shown into existing frameworks while expecting more decisive action. However, energy security concerns (e.g., the case of Nord Stream 2 on import dependencies) are still considered too little. This is one of the symptoms of what young professionals criticize as differently paced energy policies and actions across states, often even contradicting common union objectives.

Deep-diving through key sectors, advanced market consolidation and customer-centricity are crucial to ensure more solar sales are still fragmented, and therefore confusing, national markets. To unleash geothermal power after a stall of added capacity in recent years, operators-to-be needs to reduce high upfront costs and project risks by diversifying value streams beyond sole power generation and introducing new, more flexible project layouts – also takeaways learnings for other renewable energy sources. While opinions strongly differ on the use of nuclear energy, the majority of young professionals consider it less important to achieve carbon-zero ambitions. With blue hydrogen being sidelined, massive infrastructure build-ups for green hydrogen and streamlined strategies across Europe need to be achieved in this decade to be able to accommodate the storage of overhead renewable energy in the 2030s. More energy efficiency can be enabled, in industry, by data-driven process efficiency and, on the public municipal level, in bridging the implementation gap of already existing efficiency frameworks by employing young professionals who are motivated, committed to change, and locally experienced.

We continue by illuminating daily-life decision-making of the youth, proving that this critical mass can induce change i.a. by their preference to consider truly green electricity tariffs only and 60% willingness to accept comfort reductions for the sake of mitigating climate change.

Then proceeding to tangible action, young professionals especially raise awareness about energy efficiency actions to friends, family, and work colleagues, highlighting the key role of someone's immediate personal milieu as effect radius. Following the deep dive into pre-selected cases of young leaders in successful startups or projects, we identify and group key enablers and constraints of any youth initiative: e.g., early adopters & iterative problem solving for the former and greenwashing & silo thinking for the latter.

# Executive summary

Resulting from our interviewee's accumulated professional and entrepreneurial experience, we state and discuss strategic and operative takeaway learnings which uniquely showcase how successful energy businesses and projects emerge and sustain. Right at the start, focus efforts in high-growth industries. Then, investigate new value stream options and corresponding (alternative) business models as well to disrupt your technology. Once you arrive at a sound business case, test the market first before developing your product or service to ensure that you will meet market demands later. While an entrepreneur seeks to have a rapid growth story, keep the ability to exercise patience for your own or your partner's processes when appropriate. Furthermore, seek to embrace transparent processes to strengthen trust among your employees and, as a junior or senior energy leader, always consider and accommodate for the multifacetedness of energy, with lasting effects on society and the environment, in your actions.

We continue with an outlook on the next years given by young professionals. To open new doors for enabling larger youth impact, sector protagonists themselves can create clear diffusion paths for young professionals into public and private sectors to reach their full problem-solving potential. A red thread of action could include facilitating far more collaboration formats between companies and universities, creating new roles and attractive learning opportunities, and leading it by defining clear and executable roadmaps to follow. Going through this door, the next steps of the youth to increase their sector impact are to enter it in an employment driven by purpose while constantly educating themselves, by advanced training, and others by getting better and better in fostering public awareness for the energy transition.

We conclude our report with a brief outlook on three of the key technological developments in the energy sector. Enhanced Geothermal Systems (EGS) will further strengthen the case of geothermal power across Europe while CO<sub>2</sub> prices, passed down to customers, will drive extensive energy efficiency efforts. The key applicability of green hydrogen will likely be in non-electrifiable industry processes like steelmaking, ore melting, or running heavy-duty machinery. In contrast, it might not be relevant for decarbonizing heating and transport sectors. Surprisingly, the Applicability for grid balancing is likely to remain limited during this decade due to the rapid increase of competitiveness for batteries and the lack of large overhead renewable power capacity in Europe.

# 1 Trend observations and youth demands - *we think & we want*

## General youth perspective

### European level: energy policy & current sector developments

#### Context: EU energy policy in a nutshell

The European Green Deal embodies the European Union's ambition to evolve into a sustainable economic Union by 2050. The European Commission composed the concise document in 2019, laying the foundation for future legislative action. The Green Deal contains an action plan which aims to (1) realize resource efficiency by means of a clean, circular economic model, and (2) restore biodiversity and reduce pollution. Simply put, the Green Deal is our roadmap to achieve carbon neutrality by 2050. In the section dedicated to the energy sector, the EU commits to the decarbonization of the energy system as well as a cross-sectoral emphasis on energy efficiency. (A)

The Green Deal has already accelerated both national as well as transnational action regarding the clean energy transition. On the one hand, each member state will have to update its energy (and climate) strategies by 2023 in accordance with the new climate ambitions. On the other, the European level has committed to reviewing all energy legislation by June 2021. As the energy sector has always been at the heart of the EU – dating back from the foundation of its predecessor in 1952: the European Coal and Steel Community (ECSC) – this process will be as elaborate as it is necessary.

When looking back at the existing energy policies, two initiatives stand out: the Energy Roadmap 2050 and the Energy Union.

The former was published by the Commission in 2011 and paves the path for decarbonizing the energy sector between 2020 and 2050. It provides a variety of scenarios for the sector, ultimately proving that decarbonization is feasible by 2050. (B) The latter was published in 2015 and proposes itself as the primary policy tool to achieve the required sector change. The Energy Union Strategy elaborates on five interrelated dimensions:

- Energy security, solidarity & trust
- A fully integrated internal energy market
- Energy efficiency contributing to moderation of demand
- Decarbonizing the economy
- Research, innovation, and competitiveness

The adoption of the Energy Union Strategy (2015) was a priority for the Juncker Commission (2014-2019). The goal was – and remains – to establish a fully integrated Energy Union to counter fragmented markets, waste, and unfair pricing. (C) The most recent State of the Energy Union report was published in 2020, stating that the EU's economic recovery from COVID-19 will be spurred by green and digital transitions in a variety of sectors. The Von der Leyen Commission (2019-2024) affirms that the Energy Union's objectives are fully in line with those of the Green Deal. Important roadblocks remain to achieve energy efficiency on a broad scale, reduce fossil fuel subsidies, and secure both private and public R&I initiatives within member states. (D)

The current Commission has also committed to ensuring energy equality by means of the Just Transition Mechanism [1]. Furthermore, the previously mentioned reviewing process of the existing energy regulation by June 2021 has already yielded results. The Clean Energy for All Europeans package was adopted in May 2019 and provides a practical legal framework for the energy transition. In short, the package stimulates public and private R&I investment, while putting consumer rights and green growth at the heart of the economy. Miguel Arias Cañete (2019), the commissioner for Climate Action and Energy, stated that with the completion of the package, “we have made the EU’s Energy Union - one of the ten political priorities of the Juncker Commission - a reality.” (E)

### Young professional's faith in European energy policy

Our respondents tend to think that the existing European energy policy landscape (and respective national implementations) sets a sufficient and practicable framework to overcome the sector’s current barriers in the sustainable energy transition. In particular, 41.7% of young professionals feel quite positive towards European energy policy, as opposed to 26.7% who appear to be more cautious. Another 31.7% remain in the middle. When it comes to the European Green Deal (2019), the EU’s cross-sectoral action plan towards sustainability, it is perhaps too early to properly assess its effectiveness and implications.

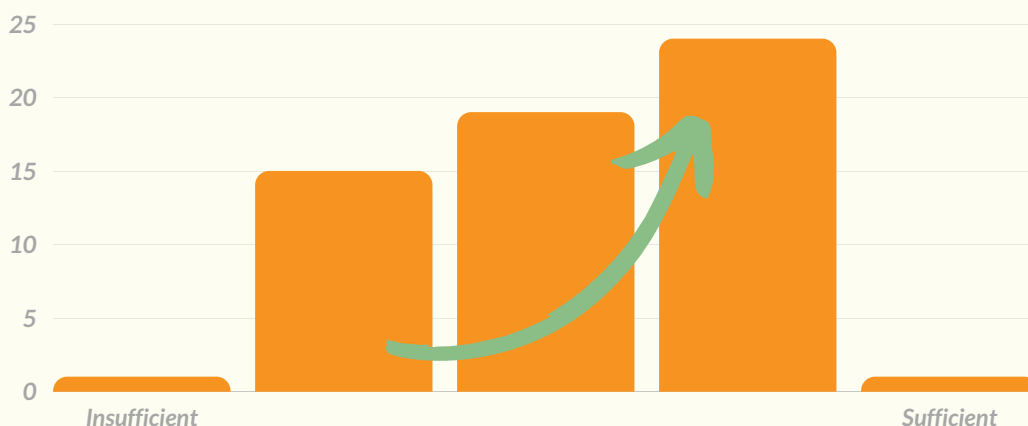
Unfortunately, regardless of good intentions, the EU’s sustainability discourse often contradicts the actions of its member states. This is best illustrated by the soon-to-be operational Nord Stream 2 pipeline, which will entail a significant increase in natural gas imports from Russia. The pipeline, which forms a direct connection between Russia and Germany, will provide a secure energy supply for years to come.

However, both internal (the European Commission), as well as external critics, have acknowledged that the Nord Stream project could diminish the urgency of internal R&I initiatives and funding for the clean energy transition. (F) When looking past the political spectacle surrounding this issue, the Nord Stream case proves that the EU still has a long way to go towards energy efficiency and self-sufficiency. As of 2021, the EU still imports more than half of its energy, the majority of which are from carbon-intensive sources [2]. (G)

[1] The Just Transition Mechanism (JTM) will “mobilize at least €150 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition.” (H)

[2] The EU mainly imports petroleum products (including crude oil), gas, and solid fossil fuels. Russia is by far the most important supplier in each category, accounting for nearly 30% of crude oil imports and roughly 40% of both natural gas and solid fuel imports in 2018. (G)

**To what extent do you agree with the following statement: “The existing European energy policy landscape (and respective national implementations) sets a sufficient and practicable framework to overcome the sector's current barriers in sustainable energy transition.”**





## The energy sector and the European Green Deal

Yet, the European Green Deal (EGD) has been no less than ground-breaking in its ambition. If the EU manages to fulfill its 2019 promises, its role as a global “climate leader” would be well-deserved. As the EGD is an all-encompassing policy promise, it is sometimes hard to find a real-life grounding in its immense scope. This is why we wanted to zoom in on 10 particular topics within the energy sector and ask our respondents which are important to achieve the EGD’s goals. The results are remarkably clear: the generation of renewable energy, electricity storage, and energy efficiency are vital to realizing carbon neutrality by 2050.

Furthermore, electric (decentralized and smart) grids, energy security, and energy-related digitalization are also key areas that have to be addressed within the energy sector. Important to a much lesser extent are: reducing dependency on energy imports, fossil fuel exploration (zero-carbon technologies and gasification), nuclear energy, and infrastructure for gaseous fuels.

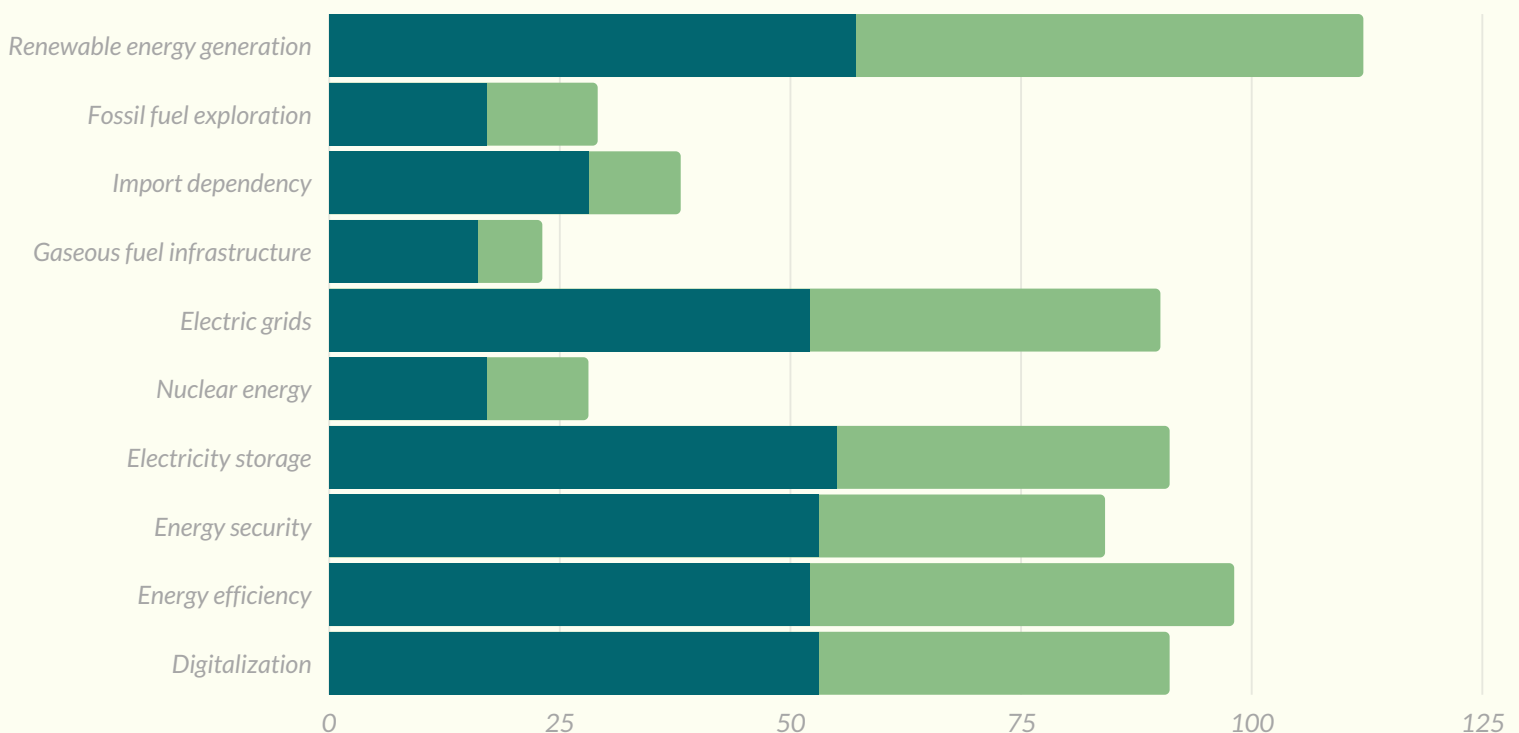
**Blue:** amount of people that believe this subsection is (very) important to achieve EGD goals.

## Developments in the energy sector

Moving beyond the policy sphere, we wanted to know the real-life developments within each of those 10 energy-related topics. Noteworthy is the fact that the subsections that were perceived as important for the EGD goals, now appear to experience the most positive development within the European energy sector. Once again, the most pronounced results belong to the generation of renewable energy, electricity storage, and energy efficiency; quickly followed by electric (decentralized and smart) grids, energy security, and energy-related digitalization.

Following this trend, our respondents are not particularly enthusiastic about developments in reducing dependency on energy imports, fossil fuel exploration (zero-carbon technologies and gasification), nuclear energy, and infrastructure for gaseous fuels. While the areas of imports, exploration, and gaseous fuels are perceived to have stagnated, nuclear energy shows the most profound tendency towards a negative development. Once more, the controversy around nuclear comes to the fore.

**Green:** amount of people that believe this subsection has been experiencing (very) positive developments.



## National level: the path towards carbon neutrality (2050)

While the European level is an important aspect of our research, it is far from a homogeneous energy entity. Therefore, we also require a national level of analysis, which is arguably more impactful on the daily functioning of our energy system(s). Below, we have summarized our respondents' opinions on both the most promising and most flawed aspects of their home country's path towards carbon neutrality by 2050 in a variety of energy-related fields. We used an open-answer approach for this part of the survey, allowing these young professionals to thoroughly elaborate on their answers.



### **Austria**

Our Austrian young professionals are proud of the country's current administration, which has moved up the target date for carbon neutrality to 2040. Besides this, there is a new law that focuses on the expansion of renewable energy production. This renewable expansion program will not only regulate tenders and feed-in tariffs but will also handle other energy-related topics such as grid connections. Austria already has a large amount of energy sourced from renewables, partially due to historic hydropower constructions. Furthermore, there appears to be a multitude of cooperation between large companies, combining resources to reduce carbon intensity.

Nonetheless, other respondents are concerned about the implementation of these ambitious plans in a variety of sectors. To reach the 2040 goal, improvements are urgent in sectors such as mobility, industry, transport, and heating. While Austria's electricity sector is often praised for its sustainability, some of our respondents are cautious about the security of supply and energy efficiency.

Their suggestions include implementing a national CO2 tax, more focus on PV and wind energy, improving government communication to educate the general public on the energy transition, and working on the intelligent connection of e-mobility with buildings to facilitate local energy grids.



### **Belgium**

Our Belgian respondents point out several weak spots in their country's ability to reach the 2050 goal. One respondent brought up the lack of sufficient sustainable energy sources in the country, which is currently struggling to compensate for its upcoming nuclear phase-out. Another criticized the complicated political landscape, which is an obstacle to an effective energy transition. Other perceived weak spots include the state of the electricity grid and the accessibility of information.



### **Finland**

Our Finnish respondents argue that the country's main advantages are its natural carbon sinks and abundance of biomaterials, as well as its nuclear safety. Traffic (mobility) and logistics are, in turn, in need of improvement.



### **France**

According to our French young professionals, France is doing well in regard to hydrogen and energy efficiency, which will significantly contribute to the 2050 carbon neutrality goal. Its current electricity mix is mainly produced from low-carbon energy sources, such as nuclear and hydro. However, respondents also criticize France for being a huge importer of foreign goods (causing a large carbon footprint), the detrimental impact of its agricultural sector, and its fossil-fuel-dependent mobility sector.



## Germany

German young professionals are proud of the German “Energiewende” (i.e. energy transition) initiative, which aims to both rapidly increase the number of renewables and update energy transmission infrastructure. Besides this, there have been significant efforts in improving housing insulation since the late ‘90s, as well as a gradual phase-out of coal power plants. The latter is confirmed by other respondents, as the current coal exit deadline is set for 2038. Several German respondents acknowledge the country’s increasing focus on renewable energy sources (mainly solar and wind technology), which will help pave the way for carbon neutrality by 2050.

A more critical respondent scrutinizes the pacing of both the coal phase-out and the production of renewable energy. Moreover, several respondents argue that the technology for nuclear, hydrogen, fuel cell, battery-electric, and hydro energy production requires improvement. Besides this, there also needs to be an increased focus on legal facilitation for sustainable infrastructure development. Other sectors that could use more support are mobility, transportation, energy storage and transmission, and housing.



## Greece

Some of our Greek respondents believe the country is doing well in regard to the decarbonization of the energy sector, as well as the phasing out of lignite. In contrast, other respondents are not satisfied with the current lignite phase-out developments, nor with Greece’s overall energy efficiency, energy storage, and e-mobility.



## Italy

Our Italian young professionals are happy with Italy’s focus on deploying energy community strategies at the local level, as well as the renovation of private and public buildings in line with energy efficiency standards. Industrial energy renovation, however, was pointed out to be a weak spot, along with energy security and mobility.



## Spain

Our Spanish respondents find the country’s energy transition to be an asset, especially in terms of decarbonizing the power sector. Nonetheless, support is needed when it comes to overall energy efficiency, carbon-free mobility, and heating.



## The Netherlands

Dutch respondents believe the Netherlands is doing well mainly in terms of circularity and embodied carbon in its building sector, as well as its renovation plans for government buildings. Nevertheless, they also state that the country lacks sufficient space for renewable energy production (wind, solar, biomass, hydro), which makes it dependent on other countries for its green energy supply.

## Other

To conclude this section, we will discuss the remaining answers belonging to several countries. Firstly, a Swedish respondent adds that Sweden needs support in regard to energy efficiency, consumption patterns, smart grids, and balancing services. Secondly, a Swiss respondent is happy with Switzerland’s 2050 energy strategy. However, they also criticize the liberalization of the gas market due to, for instance, hydrogen-related issues. Lastly, a British respondent compliments the UK’s mobility developments and the ongoing integration of renewable energy sources in the power system.

## In-depth sector insights

The perspective of our surveyed young professionals, outlined above, touched upon a variety of topics that are already prevalent in contemporary debates.

We will now give an overview of the more in-depth insights we gathered from our interviewees concerning supply, infrastructure, and demand within the European energy sector.

### **Supply-side perspective: renewables, renewables, renewables**

Our interviewee's observations on the supply-side steer our focus to both renewable energy sources as well as nuclear energy. For the former, the youth across Europe have taken a very clear position in further strengthening their disruption in electricity, heating, and transport systems. Nonetheless, regarding the latter, the discussion remains highly controversial and divergent based on the overall national public opinion on nuclear technology. To illustrate these national heterogeneities, we raise the following examples: Germany will phase out its remaining reactors until the end of 2022, driven by high consideration of the technological risks (J); while France derives about 70% of its electricity from nuclear power plants, stating its importance for national energy security and lower-carbon baseload provision. (I)

#### **Generating energy from the sun and the air**

The most prevalent renewable energy sources (RES) in European countries are solar and wind power, with solar, often being the cheapest and therefore preferred option, from grid-scale plants down to smart solar housing solutions. Although European solar power can be considered technologically mature and further support is available from various national subsidies, there are unfortunately still downturns that take their toll in hindering further applicability of a “mass-rollout” of solar.

We asked a youth-led solar energy startup, completing thousands of solar projects across Europe, about the most significant problems in the market.





The Italian residential solar market came up as one of the most promising today, despite it still being very fragmented. There are either numerous small developers or few large vertically integrated utilities, yet both often fail to be dynamic enough to optimize service quality and visibility on the market. As a result, despite many solutions to choose from, potential customers for solar energy are very confused about the right solar system to pick from available vendors.

Overcoming this massive lack of orientation in Italy and other countries will decrease the churn of potential solar solution customers and hence future advocates of the technology. New, more dynamic ways of approaching potential customers, enabled transparency in vending processes and improved service quality can also have a strong contribution while creating new market opportunities for new and established enterprises.



## Generating energy from the earth



Besides solar and wind taking the bulk in enabling the completion of SDG7 in Europe, other types of RES are also seriously considered by young professionals. As an example, for certain European regions with suitable geological conditions, geothermal energy is distinctively unique from other renewable power sources as it is able to provide baseline power to the local grid without the need of balancing storage capacity. While well and plant operations are emitting only little amounts of carbon dioxide, they also emit only very low amounts of sulfur dioxide and no nitrogen oxides, making the technology exceptionally clean. (K)

We asked a top-tier management consultant and co-founder of an Icelandic geothermal technology startup, that develops wellhead valves for high-temperature geothermal wells, about his observations on the current case for geothermal energy in Europe and how to make it stronger.

Despite the previously mentioned promising applicability of the technology (while considering the natural limitations to geologically suitable sites), it witnessed few added power capacities in the last years and is therefore stalled. Looking for solutions, two stated levers to overcome this hesitance in the expansion are coping with relatively high upfront costs and new measures to de-risk future projects.

Firstly, the required upfront costs can add up to as much as 30% of total project costs. This is due to the extensive energy planning needed to access the geothermal site potential, which requires an even more sophisticated area testing process in comparison to solar and wind plant sites. Besides advancements in area testing, potentially driven by synergic learnings from oil & gas extraction and sensor innovation, new financing models can enable project owners to cope with the initial costs and reignite the commissioning of new geothermal plant capacity within this decade.





Secondly, the predominant risks of geothermal operations, such as groundwater protection and effects of well-drilling on the environment and local communities, need to be addressed more thoroughly in order to boost geothermal applicability. A promising solution can be new and highly modular project layouts to limit these risks in an attempt to “divide and conquer” on a project scale – as one project bears much more risk than two adding up to the same scope. Due to his market experience, our Icelandic interviewee has witnessed many promising geothermal startups already operating accordingly. They have successfully set the compromise in ratio to the benefits, as the levelized cost of electricity (LCOE) of geothermal power is still slightly higher than for the standard layout. In the meantime, established large companies are still hesitant to adopt these more modular project layouts, which has created the strange contradiction that new de-risking approaches are not considered out of risk aversion.

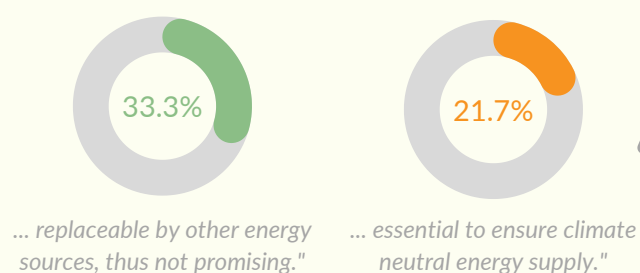
To dissolve it, more openness to new approaches and the readiness to question the risk profile of current project layouts can help established market players to limit the risk of their endeavors in geothermal power projects.

Besides power production, geothermal-based heat bears a huge untapped potential in decarbonizing space heating, which could be applied in geologically favorable regions of Europe. Here, this use case might be even more prevalent than its usage for power production, a statement that is reinforced by the rapid growth of geothermal-based heating in other parts of the world, such as China and the USA.

Expanding the view on geothermal energy to other use cases besides power is obviously also valid for any other renewable energy technology and creates a completely new perspective on its utility and applicability. Our Icelandic interviewee has witnessed first-hand in his own projects that the energy transition opens up completely new market opportunities. He emphasized the importance to lever the full utility of renewable energy technology for far more value streams than the focus on clean power generation.

For geothermal energy, one of the most promising examples of value stream diversification is the extraction of minerals such as silica from geothermal brines, a waste product in the power production process, recycling precious resources which otherwise would not be utilized. In colder climates, such as Iceland, selling geothermal heat directly to agribusinesses, operating large aquacultures, creates new supply chains for produced heat as well. Considering the regional proximity needs of heating networks, this trend can have a lasting impact on the diversification of regional business opportunities.

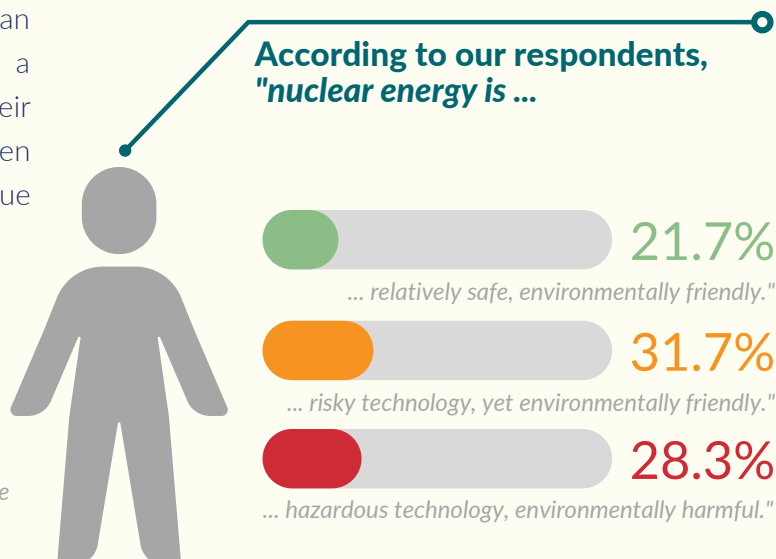
In conclusion, the incorporation of new diversified value streams in the economics of classical Return-on-Investment-driven project planning for power plants has been beyond beneficial for operators. This is because these developments will yield returns from multiple revenue streams rather than solely power production. By upscaling the benefits of innovative value stream diversification across all renewable and clean technologies, we young professionals witness a huge opportunity to further accelerate their market maturity, which might once have been hampered by the traditional “one-asset-one-value stream” mindset.



## Generating energy from the atoms

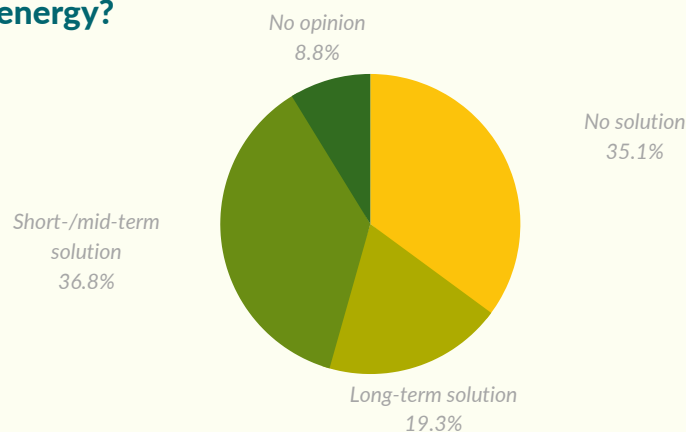
The topic of nuclear energy has been a controversial one as of late. As the devastating effects of climate change manifest themselves more frequently across Europe (in the form of floods, wildfires, droughts, ...), the transition to green energy becomes more and more urgent. The question remains, however, as to how we can achieve this transition. This is where the nuclear energy debate comes in. While this topic is highly controversial in policy and industry circles alike, we also noticed a similar division in our survey results. Young professionals are also divided on the role of nuclear energy in Europe, although there might be a tentatively positive outlook. In fact, 21.7% of respondents find nuclear to be a relatively safe and environmentally-friendly energy source, while 31.7% call it an environmentally-friendly energy source with certain risks, and 21.7% believe it to be essential in achieving a climate-neutral energy supply.

On the opposite side of the spectrum, 28.3% regard nuclear energy as highly hazardous and even environmentally harmful, thus nuancing the outlook of young professionals. Moreover, the largest group of respondents (33.3%) agree that nuclear is not a promising future perspective, and is replaceable by other – greener – energy sources. Additionally, several comments referred to the high cost of nuclear energy, necessitating huge government subsidies to be economically sustainable.



Furthermore, we inquired about the time span in which our respondents deem nuclear energy to be a reasonable and feasible option. Again, a near majority (35.1%) does not regard nuclear as a viable solution for our energy conundrum. 36.8% believe it can be used as a mid-term solution, while 19.3% have faith in its long-term applicability and effectiveness. We can thus conclude that our young professional respondents believe, albeit only a slight majority, that better options exist instead of nuclear energy, and that the existing nuclear supply should be phased out sooner rather than later. This also corresponds to our previous result on the lesser importance of nuclear energy to achieve the EGD's ambitions.

### What about the timeframe for nuclear energy?



### "Nuclear energy is also ..."

- ... the most efficient & manageable energy source."
- ... too time-intensive to make a difference within the next decade."
- ... not a competitive option."
- ... only possible with high government subsidies."
- ... the best short-term solution for a carbon neutral energy system."
- ... too expensive."

## Infrastructure-side perspective: the hydrogen hype

As we investigated the youth's perspective on energy infrastructure, we decided to limit ourselves to one of the most discussed clean fuel opportunities of our time: hydrogen. Classified as an energy carrier, hydrogen is produced either from primary energy sources such as hydrocarbons (i.e. called grey, brown, black, and, after carbon sequestration, blue hydrogen) or from renewables (i.e. called green hydrogen). With its potential to substitute classical hydrocarbons in hard-to-electrify or, if limited to green hydrogen, hard-to-decarbonize processes, hydrogen has received a lot of attention from industry leaders, policymakers, and governments alike. In short, there is currently a huge global hype for this promising technology.

Saying that young professionals overall strongly appreciate the current hype surrounding hydrogen, like many young entrepreneurs and industry experts actively take part in backing up the positive growth expectations. However, through the ranks, they appeal to all stakeholders to maintain a clear view on tangible next steps and, if necessary, to focus efforts on areas with the best technological applicability, as there is still a wide gap between expectations and deliverables as of now (2021).

The most prominent statement delivered by young professionals is that they clearly set their efforts towards green hydrogen, referring to RES-based production. Whereas some current contributions attempt to frame blue hydrogen (i.e. grey hydrogen cascaded with carbon sequestration) as a "green" or "carbon-neutral" technology, young professionals strongly reject this line of argument. This, and new, more sophisticated landmark studies [3], leaves us with the clear takeaway that blue hydrogen is a bridge to nowhere in green energy transition and should not be considered within green technology rationales.

[3] An example of this is the research conducted by Howarth and Jacobson (2021), which proves that blue hydrogen is actually much more harmful than burning natural gas. They, too, state the following: "Society needs to move away from all fossil fuels as quickly as possible, and the truly green hydrogen produced by electrolysis driven by renewable electricity can play a role. Blue hydrogen, though, provides no benefit."

**"Blue hydrogen is a bridge to nowhere in the green energy transition."**



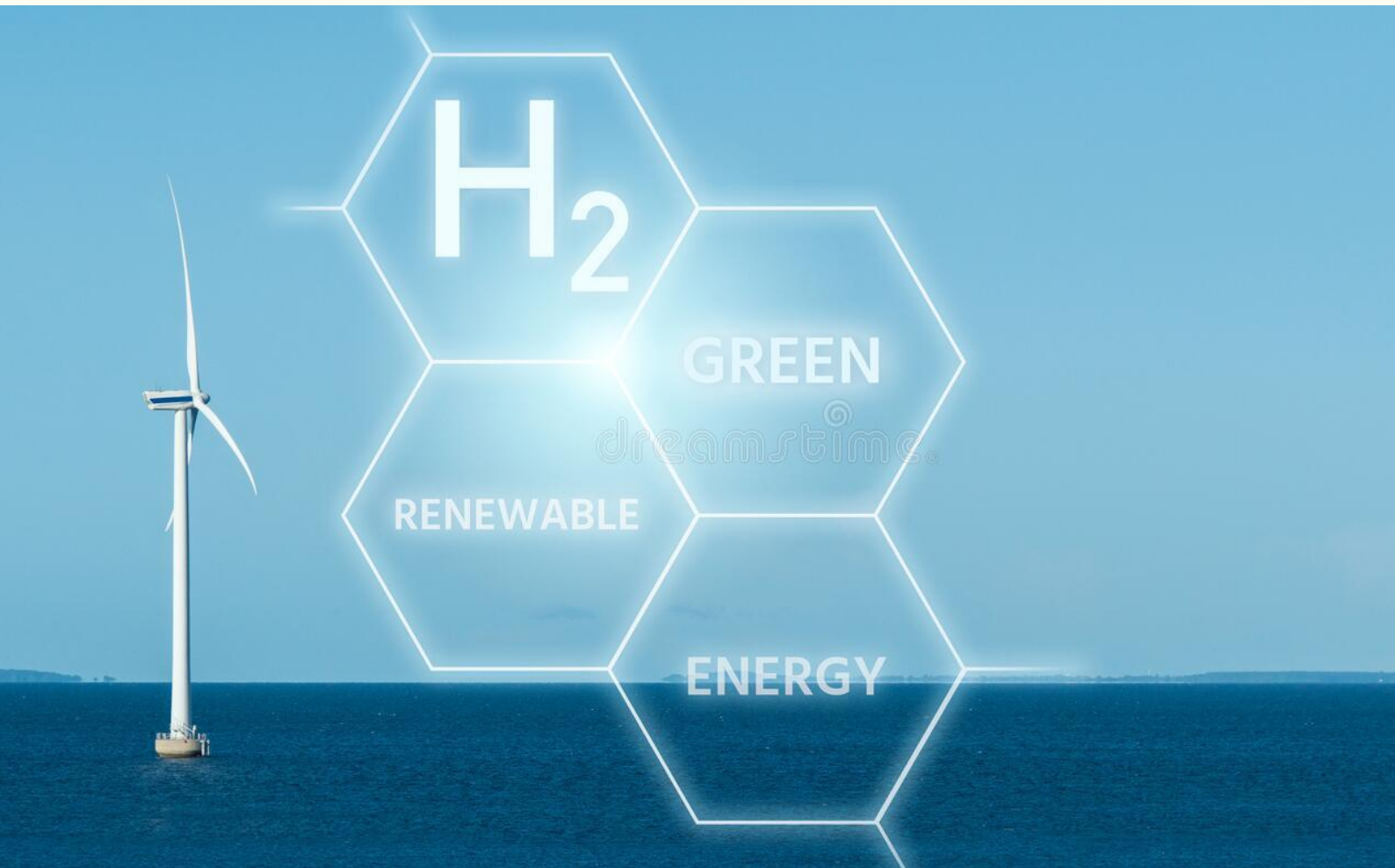
Now that our future outlook for hydrogen is clear, how do we plan to strengthen the case for green hydrogen? In addition to their own entrepreneurial and academic involvement, young energy professionals across the continent are keen to contribute by discussing tangible milestones for the progression of production technologies, needed infrastructure buildups, and tangible policies.

We asked a young Spanish hydrogen policy researcher currently working at two global top-6 universities, about the suitability of energy policies at both the EU and national level, as well as his insights on the necessary infrastructure.

In the process of analyzing technologies involved in the hydrogen ecosystem and effective policy settings, we need to find the point when technological optimization hits its maximum, considering further socio-techno-commercial variables.

By comparing the results of multiple options available, effective incentivization schemes can be drafted, ranked, and selected based on their fit within the existing regulatory landscape, while maximizing diffusion and inclusion in new policies. Simply directing all efforts towards the most energy-efficient technology is too superficial, especially considering that, historically, the technologies that finally dominate industries were surprisingly not the most efficient (with interesting examples in photovoltaic technologies based on material cost considerations).

As one of the first expansion targets for the hydrogen infrastructure buildup, the European Union set the general goal of reaching 40 GW in electrolyzer capacity until 2030, with more to be announced. The primary institutional driver for EU-level hydrogen policies is the continental push towards decarbonization. Following closely is the dream of global leadership in hydrogen technologies. Both driving forces are strongly linked to the NextGenerationEU pandemic recovery plan.



However, comparing current European efforts with non-European G20 countries competing for leadership, it appears that the EU only contributes a small share of local efforts. Our Spanish interviewee expects to see more commitment throughout the upcoming decade to meet the ambitious 2030 goal.

Although it is certainly hopeful that the EU increasingly prioritizes green hydrogen and member states continuously draft national strategies and policies, our interviewee raises the concern that existing regulatory frameworks might still enable the deployment of blue hydrogen. This is due to the fact that no national strategy directly opposes its application, while the overall rigorousness of underlying analyses and derived conclusions are at best questionable in many cases.

Explaining why policymakers should focus their efforts on green hydrogen and not consider opt-out clauses for blue hydrogen, our young policy researcher recapitulates the requirement of additional, lossy conversion processes for the latter. This is because a market that economically utilizes the co-deposited carbon is unlikely to emerge in the short-to-medium run. In addition, even countries that are potentially prone to encourage blue hydrogen production and application (e.g. countries bordering the North Sea with abundant domestic offshore gas resources) will face swift competition from the on-site green hydrogen production of offshore wind, which will likely have a better commercial business model.

During his research on the interplay of existing and drafted hydrogen policies on the national and the EU level, our interviewee identified a lack of communication and coordination – between both levels and among member states – about hydrogen strategy building. While some bilateral cooperation emerged recently (NL-PL and PL-GER), an all-encompassing EU effort does not yet exist. This approach could, however, ensure that strategic objectives towards technology leadership in hydrogen are streamlined among member states.

Advocating on the necessary next steps for a large-scale rollout for hydrogen in Europe, he encourages governments and policymakers in charge to massively build up hydrogen-related infrastructure now as the first step, without any regrets or worries of not running on full capacity on day one. The current bottleneck of co-locational hydrogen use in the EU necessitates a rapid hydrogen infrastructure buildup in the next 9 to 10 years. With an overhead capacity from renewable power production being likely available at the beginning of the 2030s, the available infrastructure can then be used directly. In short: build hydrogen infrastructure now, to later benefit economically from overhead renewable capacity.

We will now conclude this first section on in-depth trend observations by taking a closer look at the demand side, focusing on communal and industrial energy efficiency concerns.

## Demand-side perspective: enabling energy efficiency

Even with improved European energy efficiency standards in the industry, building insulation and fuel consumption in transport and the permanent urge of businesses to cut energy costs, young energy professionals across the board still see a lot of untapped potentials.

A lot of are well known to all of us, often popping up in internal audits and awareness campaigns, only to then be sadly deprioritized back to the bottom of everyone's to-do list.

Besides new digital tools, a better systemic view on consumed energy, and methods to tackle these potentials, there is a far more important reason to put energy efficiency right back on top of our priority list. Quoting our own organization: with a global energy sector moving towards decarbonization, the cleanest power is the one that was not produced in the beginning. To illustrate this statement, we can look at the power losses in the Ukrainian electric transmission and distribution grid, which account for approximately 12% or an impressive 16.63 bn kW annually. (L) Even considering inevitable technical losses (with additional tolerance due to geographic scale), we leave you with the task to calculate how many mid-sized coal power plants could be decommissioned if only some efficiency gains were made.

Efforts such as incentivized communal campaigns or cost-driven process revisions are some of the most evident solutions to the efficiency problem. We can easily raise awareness on immediate or short-time health, environmental, and cost benefits, using the tools already widely available. What's more, methods that were beyond reach in the past, would now probably yield the greatest and most sustainable outcomes. To finally realize these alternatives, young professionals use two interlinked concepts to approach the efficiency problem. Namely, that of technology-enabled consumption, followed by a more economic perspective of energy – as a commodity which is not abundant, but was (and often is) treated as such. In the long run, this approach encourages a more innovative mindset towards process optimization or, vice versa, innovative approaches towards consumption efficiency.

But where do we start to implement this approach? And what do young professionals, active in strengthening energy efficiency efforts, observe and demand change?



***"With a global energy sector moving towards decarbonization, the cleanest power is the one that was not produced in the beginning."***





### Industrial energy efficiency: utilizing data

To answer these questions, we spoke with the co-founder of an Austrian startup that leverages AI-powered sensor data analytics to improve performance and utilize in-house collected data, while reducing emissions and cost. In addition to the high energy intensity of industrial processes, they are also characterized by the need to supply high standards in constant energy supply, with low tolerances and high-temperature levels. Because most of these requirements are still optimally met by fossil fuels, she states that the industry sector will most likely be the last polluting sector to be transformed towards renewable power and heating.

While some industrial processes, such as high-temperature melting, will still be dependent on fossil fuels in the upcoming years, we should not simply shift our attention to sectors where more rapid decarbonization is expected. Firstly, we wish to raise the voices of young professionals involved in the research and development (R&D) of low-carbon fuels for existing or fully new processes to overcome these bottlenecks, thus enabling the industry to fully deliver on set carbon emission reduction goals.

Secondly, significant reductions in emissions and costs can already be achieved by increasing industrial energy efficiency now.

According to our Austrian interviewee's industry expertise, working with commercial and industrial clients, levers can easily be found in many processes, so that the energy efficiency of industrial processes can be increased up to 20% using available sensor data. The main reason why most industrial companies are less successful in finding these levers themselves is that saving energy is simply not their core business, as the traditional business tendencies still erase energy efficiency considerations out of performance considerations.

A key observation, though, is that while large process data volumes of various sensors are logged and stored, about 70% of industrial Internet of Things (IoT) data is not further processed by companies. This Austrian startup tackles this problem by enabling data analytics to efficiently use all of this data, by means of new, resourceful approaches. They emphasize the strong need within the industry sector to make better use of currently untapped, yet logged, data – one of the most valuable corporate resources – for the sake of emissions reduction and economic progress.

### **The government's role in enabling energy efficiency**

We now make the switch from the private to the public sector. The energy efficiency of communal buildings, as well as local power and heating networks, are major concerns for government budgets, security of supply, and national emission reduction goals. Because there are drastic differences, which hence cannot be expressed in merely one or two case examples, we will elaborate on the example of Moldova. This Eastern European country is in many ways exemplary for other countries in the region. We asked a top-tier national consultant for his insights on the country's energy approach, who organizes energy efficiency actions within Moldovan municipalities and state-owned companies.

Similar to other Eastern European - and many former Soviet - countries, the communal energy intensity is very high. As the majority of the building stock was constructed in the '50s and '60s, very few to no efficiency requirements were taken into consideration, due to strongly subsidized electricity and heating tariffs and the lack of attention for environmental impact at the time. With mostly occasional refurbishments in the following decades, the situation remains widely unsolved, even today.

Based on his gained expertise working with key stakeholders in energy efficiency from the communal to the national level, our Moldovan interviewee observes two major bottlenecks that prohibit further progress from being made. The first is a lack of committed execution. While the first steps were already made in the past decade, new targets on communal energy efficiency were defined at the government level but were consequently not implemented in a binding execution framework, leaving a gap between proposition and concise implementation. The second bottleneck is a lack of investment, as massive efforts are needed to refurbish the building stock. Because there are also few financial resources available to pay well-educated energy efficiency experts, almost none are available. Many young professionals intend to leave the country for opportunities in neighboring Romania or Western Europe, creating a brain drain that steadily lowers the national capability to enable communal energy efficiency actions.

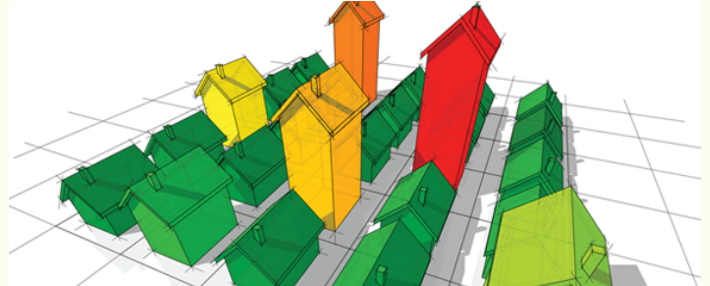
One big factor significantly fueling both bottlenecks is the remarkably low energy prices, as all related commodities are highly subsidized under political influence, highlighting the dominant role of politics and geo-economics in Moldovan energy market dynamics.

To tackle the first and ease the second bottleneck, our interviewee has witnessed first-hand how much he and other young professionals were able to push energy efficiency execution forward if local municipalities allowed them to do so. Highlighting the role of the smallest administrative levels as obstacles to enable execution at higher policy levels, he demands local decision-makers to embrace the skills of young professionals already active at the communal level. More often than not, some necessary new skills and ideas are already assembled in local project teams but held back due to traditional ways of assigning and conducting projects or missing frameworks altogether.



Giving young energy efficiency professionals early responsibility to prove new ideas concerning the building stock, budgeted refurbishment projects can be conducted more successfully, driven by the engagement of young project managers and engineers to induce change in their own local community (with fewer risks than might be anticipated). For further capacity-building at the local level: better incentivization schemes, training, and financial resources can improve the local situation, creating opportunities that create an increasingly realistic scenario in which young professionals choose to remain in Moldova and other rural areas.

While co-organizing local climate and energy youth initiatives in his time off, our interviewee has enabled a platform for young Moldovans to voice their environmental concerns, equally eager to make their contribution.



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# 2 Energy-related decision making in our daily lives - we decide

## Introduction

Following our elaborate discussion on both general and in-depth trend observations and demands above, we now move on to a discussion of individual energy-related decision making.

We asked our young respondents to reflect on their own actions and habits so that we can illustrate their own behavior towards sustainability below.

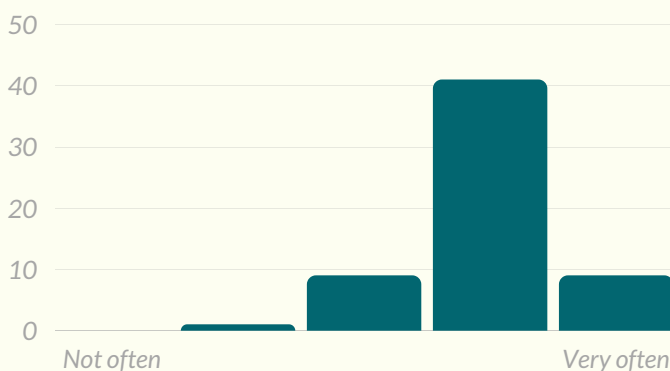
## Youth rationale - deep dive

Regulatory frameworks are the main driver to guide our society towards a more sustainable and climate-friendly future. The actions of one individual alone are not likely to instigate a societal turnaround. Though, a critical mass can. Based on our survey results, we can conclude that the young generation appears to be like-minded enough to form this necessary critical mass and will therefore be able to put enough public pressure on policymakers to enforce sustainability through regulation. Hence, personal decisions and change of habits towards more sustainability do, in fact, matter.

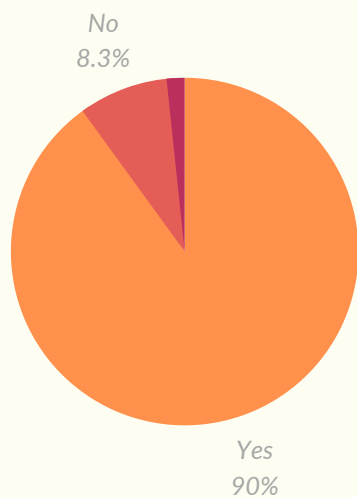
A solid 69% of our survey participants often consider aspects of sustainability in their day-to-day decision-making. Roughly 16% even admit to considering sustainability issues very often in their daily lives.

In order to dig deeper into this statement, we gathered inspiration from real-life situations. We asked our participants to answer two exemplary questions, one focusing on their professional preferences, the other on energy tariffs. We will start with the former. When assessing the importance of a career with either a high societal impact or a high salary, the results show that a majority of about 90% would prefer a high societal impact, though accompanied by a reasonable salary, over a job with a significantly higher salary, yet fewer societal benefits.

### How often do you think about sustainability in your day-to-day decision making?

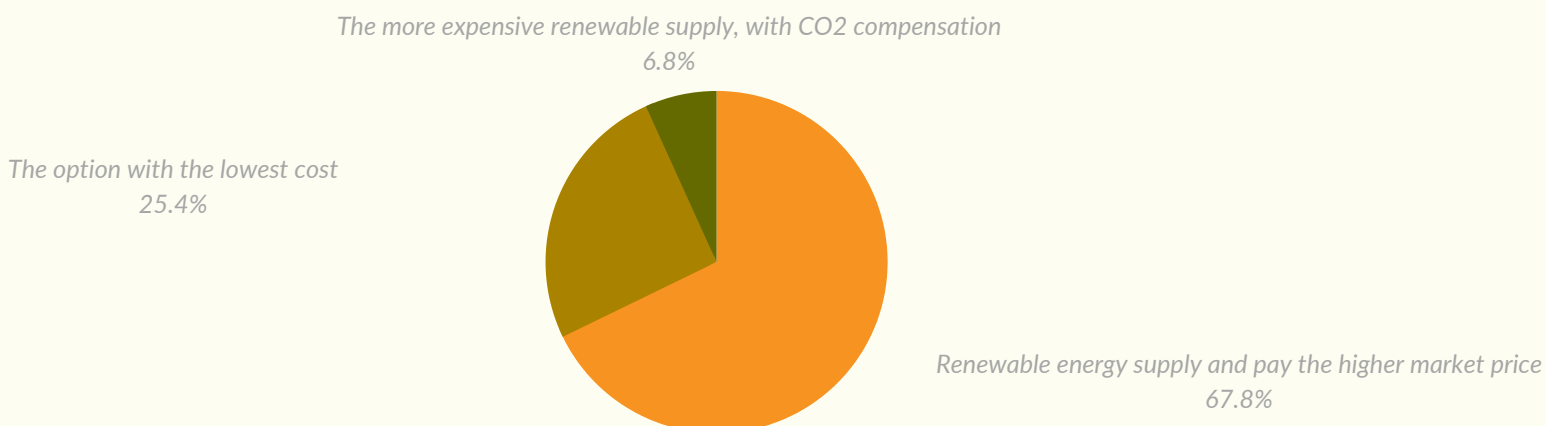


**Would you prefer a job that focuses on societal impact, instead of one with a high salary?**



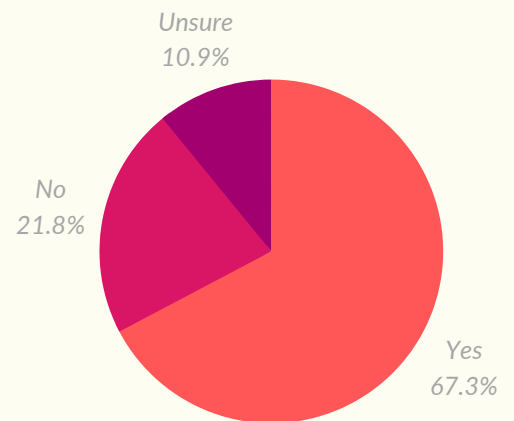
When it comes to willingness to pay for more ecological alternatives in relation to energy tariffs, we found a clear tendency towards paying higher prices for sustainable energy. Although, realistically, close to 25% of our respondents would choose the most affordable alternative. This brings us to the important debate of energy equality, namely the fact that not everyone is able to bear the same sacrifices to implement sustainable measures. As mentioned above, in the first section of the report, the EU takes this issue seriously. To lessen the blow to those most in need, their Just Transition Mechanism (JTM) initiative will “mobilize at least €150 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition”.

**Imagine your energy supplier would offer different energy tariffs for heating and electricity (the products are exactly the same). What option would you tend to choose?**



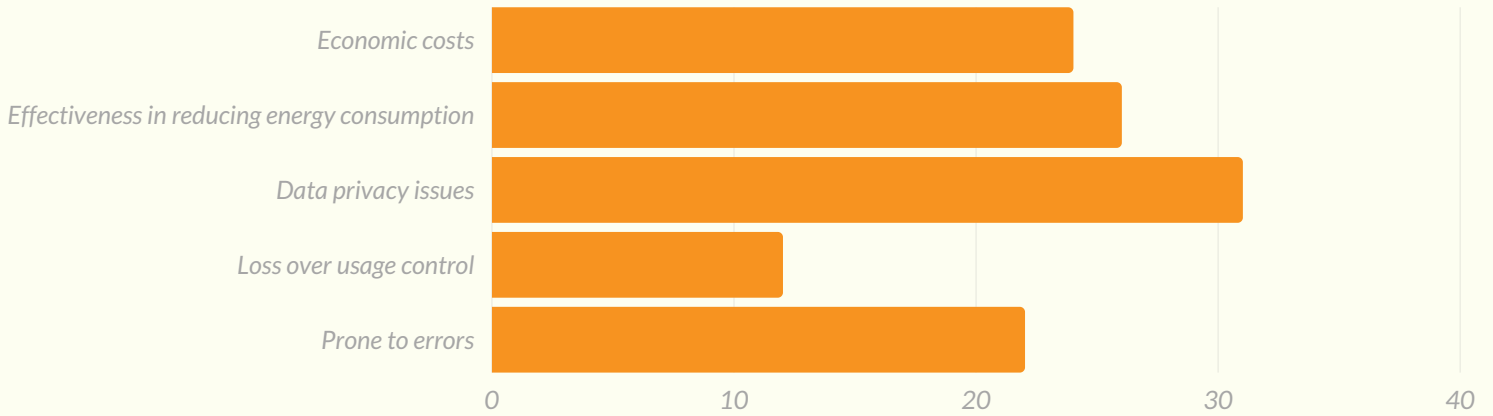
Moving on from personal sacrifices, we were also curious about the overall willingness to implement innovative technology to optimize consumption. About two thirds of the survey participants are open to investing in smart systems, such as an automated energy management system in their house, allowing users to manage their home devices remotely. As we already saw in the previous section, efficiently using data sources can significantly benefit energy efficiency and thus also sustainability.

**Would you invest in an automated energy management system / smart meter for your house ?**



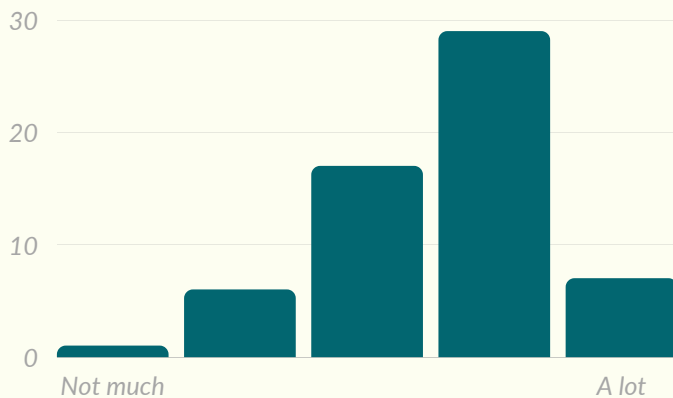
However, our respondents also raised some concerns regarding the use of automated energy management systems. The most important of which are related to data privacy issues, the overall effectiveness of such systems in optimizing energy consumption, economic costs, and error susceptibility of high-tech systems. Roughly 22% also fear losing control over their appliances’ usage (e.g. not being able to decide when to turn on one’s washing machine).

## What would be your main concerns about an automated Energy Management System?



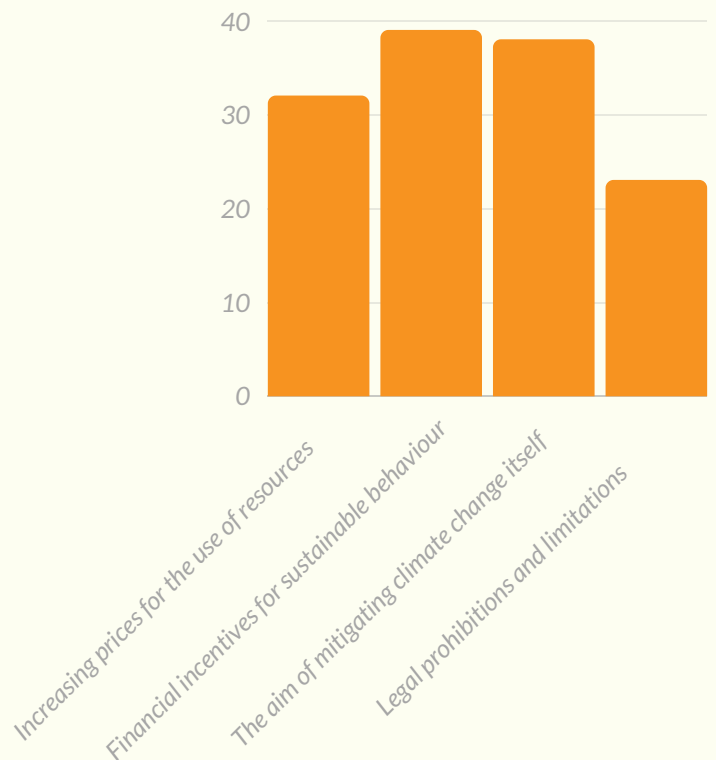
A particular complexity within our economic system is that the issue of climate change cannot only be solved merely by technological advancement. In order to reduce energy demand and attain climate neutrality, we will have to accept the necessary inconvenience that this entails, meaning a decrease in personal comfort. In contrast to financially profitable solutions, a lifestyle-change, encouraged by a strong personal will to live sustainably, may be needed to successfully achieve system change towards a climate-friendly society. Asking young professionals all over Europe, we found that there seems to be a very high affinity to accept this loss of comfort for the sake of the planet. The graph below shows that a majority (60,4%) of the survey participants will accept a (strong) decrease in comfort.

### How willing are you to accept a personal decrease in comfort in exchange for more sustainable energy consumption?



Asking participants about which actions are likely to steer them towards a personal reduction of resource consumption, financial incentives in combination with higher prices seem to be the most effective options. Interestingly, the aim of mitigating climate change itself, not further incentivized, appears to be very motivating for young professionals in the energy sector. More severe measures, such as the use of legal prohibition and regulatory limitations on consumptions, are also surprisingly popular.

### Which of the following options is most likely to steer you towards resource reduction?

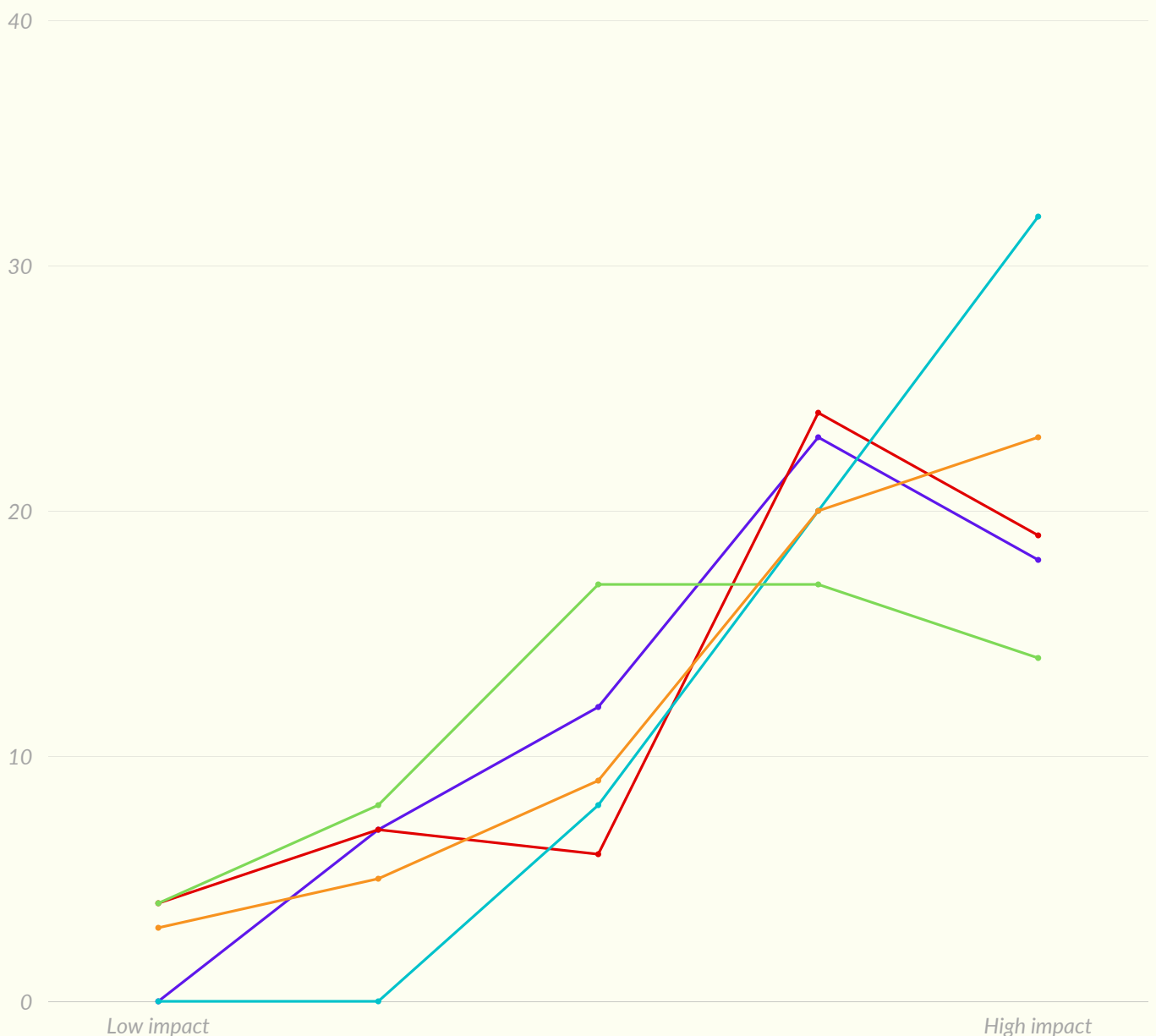




To wrap up this section, we asked our respondents which personal changes they believe to have the greatest impact on the overall sustainability of the energy system. Overall, the perceived impact of changing your consumer behavior is significant for each of the following examples. Most impactful by far is **changing your mobility habits**, from carbon-intensive options (such as planes and cars) to sustainable alternatives (like trains and bicycles), whenever possible.

Furthermore, **purchasing certified sustainable energy** was deemed to be the second most impactful way to change your energy consumption. Following closely are **investing in a self-consumption unit** (e.g. generating your own solar or PV power), as well as **adopting energy efficiency measures within your household**. Last but not least is **altering your energy consumption schedule** in accordance with the time when renewable energy production is at its highest.

### How do you perceive the impact of your energy consumption habits on the sustainability of your country's energy system?



# 3 Youth action - we do

## Introduction

Now that we have demonstrated young professionals' trend observations and demands for the energy sector, as well as their individual energy-related decision making, the following section will focus on the ways in which they actively make a difference.

We start with a discussion on raising public awareness, followed by a closer look at their personal engagements and achievements. Furthermore, we will discuss perceived enablers and constraints within the sector. Finally, we conclude this third section by listing some important takeaways, to and from young professionals.

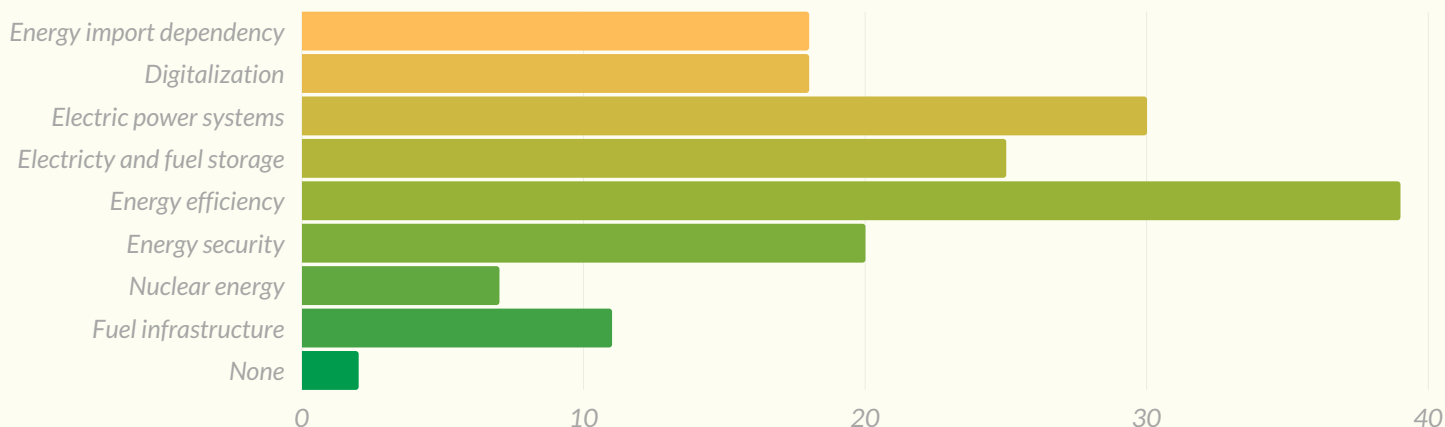
## Raising awareness

Our respondents are not only energy experts in their own right, they also actively advocate for change within the energy sector. Many of them make an effort to raise awareness concerning a variety of energy-related topics. We are truly delighted to see so many people taking the initiative to promote sustainability and efficiency in so many different fields, which we will outline shortly below.

Energy efficiency is by far the most popular subject, with 65% of respondents claiming to advocate for improvements in this field. Following closely are electric power systems (50%) and electricity and fuel storage (41,7%).

The former mainly focuses on the applicability of decentralized grids as well as the disruptive potential of smart grids. Next up are energy security, economy- and society-wide digitalization, and dependency on energy imports from third countries, each representing around 30% of respondents. Finally, fuel infrastructure (18,3%) and nuclear energy (11,7%) are also hot topics within advocating circles and activities. This implies engaging in discussions about the difference between the use of fossil and hydrogen fuels, as well as the benefits and/or shortcomings of nuclear energy.

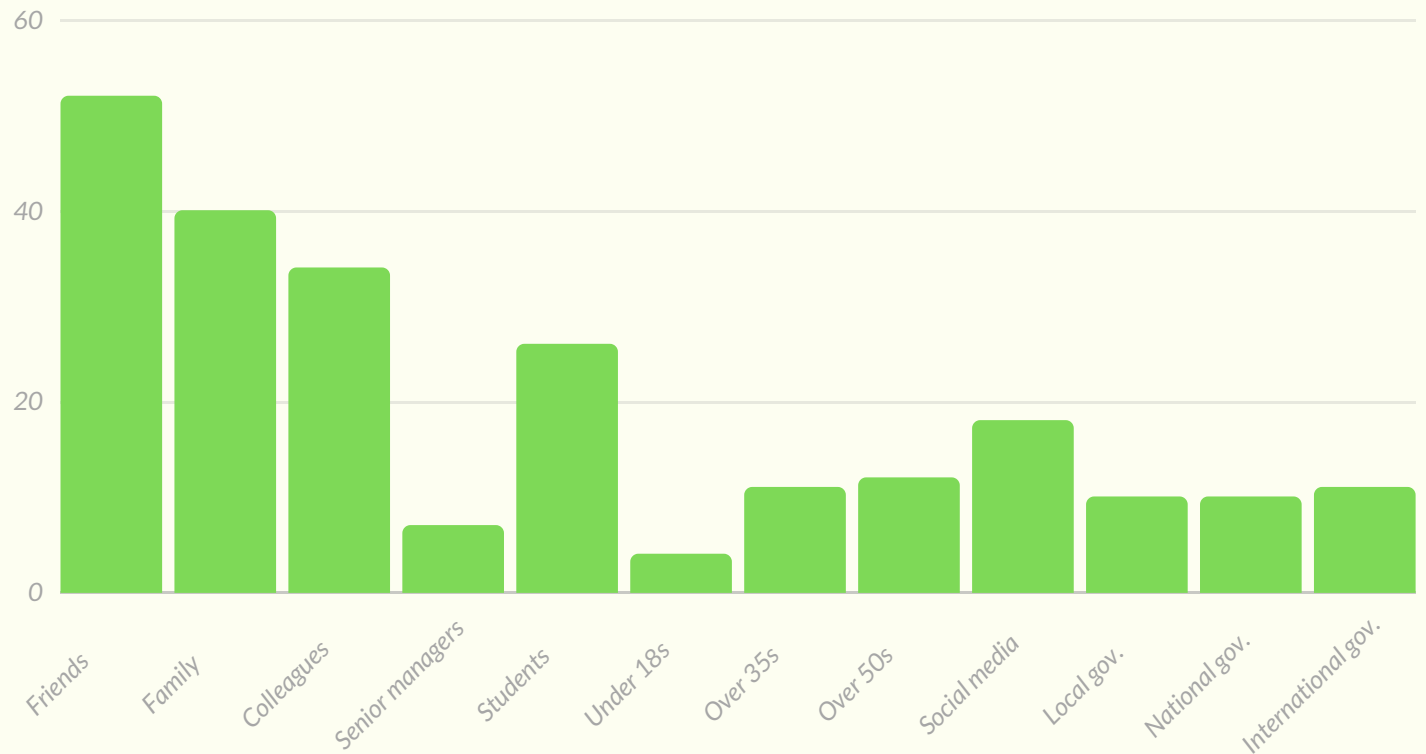
### Which topics, related to the energy sector, have you actively been raising awareness to?



All of our advocating respondents are doing meaningful work by spreading awareness to a variety of target groups. Naturally, friends (91,2%) and family (70,2%) are the most cited audiences, followed by work colleagues (59,6%) and students (45,6%). Agewise, most efforts are targeted towards people over 35 (19,3%) and those over 50 (21,1%).

Another important aspect is multilevel government lobbying, which can be divided according to the local (17,5%), national (17,5%), and international (19,3%) governance levels. Last but not least, 31,6% uses social media to reach their online network.

### What are your target audiences when raising awareness?



## Youth engagement and achievements

We all talk about energy transition, carbon neutrality, and energy targets, but what do we do in concrete to contribute to the change? In our survey, we inquired about the institutions in which students and young professionals engage. Data shows that respondents selected more than one answer because involved in more initiatives at once. The most popular answer, with 51.7%, is “student initiatives”. This data confirms the prominent role of educational institutions in fostering the energy transition and creating a new generation of professionals and citizens willing to take action to mitigate climate change.

### In what kind of energy-related institutions are you active?

- medium to large enterprises*
- governmental organizations & IGOs*
- NGOs/NPOs**
- start-ups*
- student initiatives**
- research facilities*
- small enterprises*
- think tanks*

The second most selected answer is “research facilities”. Our data points out that 38% of the respondents are young professionals directly or indirectly working in research and giving their contribution to a critical aspect of the transition. The already mentioned experience of a Spanish hydrogen policy researcher (cf. section 1) is exemplary in this case. He represents this significant share of respondents committed to making the difference by exploring uncharted territories as in his case the study of how policies can accelerate hydrogen technology diffusion.

Besides the greatest percentage composed of students and researchers, the bulk of the remaining part is composed of professionals performing activities other than research such as startups and consultants. Thanks to the interviews we conducted, we had the chance to meet some of those and listen to their stories of entrepreneurship and dedication (cf. section 1).

Among them is an Icelandic geothermal equipment startup developing wellhead valves for high-temperature geothermal wells. The co-founder revealed to us that notwithstanding the evident drawbacks such as the necessary suitable geological conditions and the high upfront costs the technology presents several advantages: it is able to provide a steady flow of energy with a near-to-zero environmental impact and is compatible with side businesses e.g. aquaculture, extraction of minerals such as silica from geothermal brines, district heating or the creation of spa centers such as the renowned Blue Lagoon in Iceland.

Our next interviewee belongs to a Norwegian startup. This company is taking advantage of the EU incentives for the deployment of solar panels by creating an online marketplace of installers with a strong focus on transparency and customer satisfaction

The fast-paced growth of the company demonstrates the business acumen of the founder and confirms the effectiveness of economic incentives to spur RE deployment.

A Stockholm-based energy start-up represents a third example of vision and entrepreneurship. Focused on the demand side of the energy market this company is a supplier of electricity and BRP (Balance Responsible Party) for electricity consumers. Besides, the company offers demand-response through EV (Electric Vehicles) charging adaptation and heating adaptation based on signals from the grid and electricity markets.

A fourth example is an Austrian software startup that utilizes AI-powered sensor data analytics to enhance the energy performance of industrial processes while reducing emissions and costs.

Among the professionals we met, other than those involved in startups, we had the chance to interview a Moldovan Climate and Sustainable Energy Consultant specialized in energy efficiency and deep dive into Moldova’s energy scenario. The consultant revealed to us how in his own country, similar to other Eastern European and former Soviet Union states, the retrofit of the aged building stock from the ‘50s’ and ‘60s has never been on the Government’s agenda if not in rare cases. The interviewee pointed out two main bottlenecks.

On one side, the chronic lack of private investments and public budget impedes Moldova both to step forward from an energy perspective and to build capacity by raising a new generation of energy professionals. In addition, a severe brain drain effect is occurring in the country and many young students and professionals are leaving Moldova to move westward.



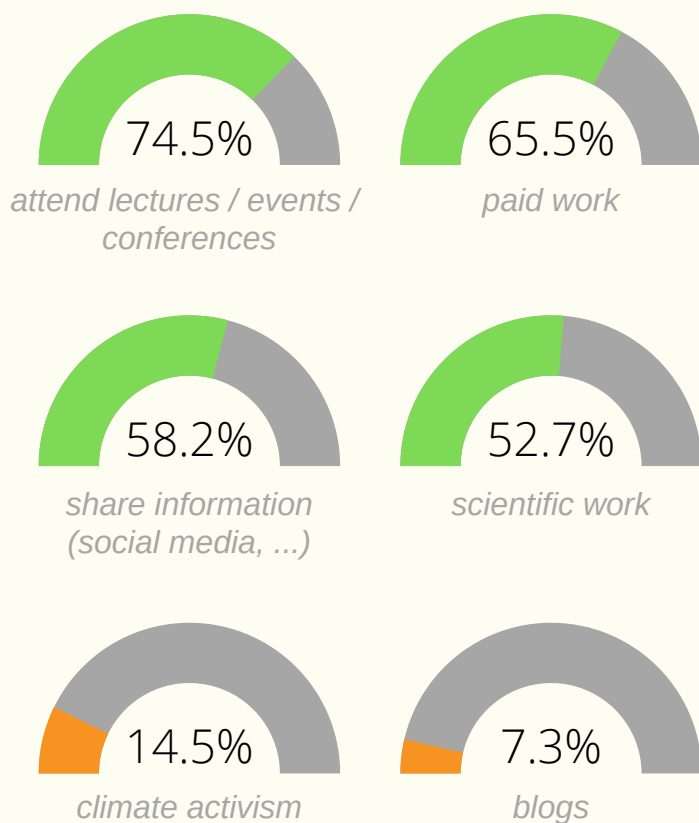
On the other side, a lack of political commitment and short-sighted policy decisions largely contributed to steer Moldova where it stands today. The governmental subsidization plan that reduces national energy and gas prices to support disadvantaged families is exemplary in this sense. If the plan is good in the first place a poor design of the regulatory tool is incentivizing people not to spare energy and consume more notwithstanding the critical energy scenario of Moldova, which imports over 70% of its energy stock.

After we identified the institutions wherein respondents are active, we investigated in what way students and young professionals actually engage themselves. Data showed that the four most clicked, by far, respectively are “Attend lectures/events/conferences” (74.5%), “Paid work” (inc. day-to-day job, part-time work, etc.) (65.5%), “Share information” (inc. social media, emails, etc.) (58.2%), and “Scientific work” (52.7%). What is possible to draw from this data is a high level of engagement among the respondents. They do not engage in a single activity, but, they are involved on several fronts at once. For example, a share of the young professional that selected “Paid work” find time to attend “lectures/events/conferences”.

Some of these respondents gave us more details on their engagement in the energy field providing us with the chance to further deepen our understanding of how students and young professionals take action to contribute to the energy transition. In the research field, it is exemplary the case of a respondent committed to the research and development of a new renewable energy technology such as Airborne Wind Energy. No less interesting is the case of another respondent who created his/her own blog to share knowledge and new idea on the topic of waste and circular economy. Lastly, the case of the respondent that created or contributed to the creation of an online community of young Europeans engaged in the energy sector.

Another interesting piece of data is the not-so-little percentage of participation in “Climate activism”. These kinds of actions demonstrated, in the last years, to have great visibility and a powerful impact on public awareness.

### How do you engage within these institutions?



## Enablers and constraints

Based on our conducted survey and interviews, we can safely say that young energy professionals, besides being strongly motivated to contribute to positive change, are remarkably capable to realize it in the upcoming decade by dedicatedly pursuing their own concepts and successfully proving their case in different organizational settings. The inherent drive to achieve the latter can be illustrated by, for instance, the preference given to a career with high societal impact rather than a high salary (section 2). Furthermore, the current initiatives we witnessed in action on the ground (section 3.2) are in themselves the strongest proof of their efforts for a sustainable future in their own way and context.

However, regardless of strong commitment, a result-yielding venture, and a promising long-term plan, there are always certain enablers and constraints that increase or, respectively, decrease the final success rate of your endeavor. During our research, we had the opportunity to speak with young professionals, already running successful initiatives, about which of those supportive or destructive factors they had detected as being the most crucial ones during their careers.

As interested editors, it is tempting to directly provide demanded factors in addition to witnessed or realized ones resulting from our evaluation and conclusion which, if applied in complex professional settings, might or might not endure the reality check and hence decreasing the strength of the results. Therefore, while clearly focusing on the latter in this section, we provide enablers and constraints clustered in groups of relevance giving you the freedom to evaluate, compare and conclude independently. In addition, we assembled factors that are precisely unambiguous and focused to ensure high actionability. While this forces us to discuss the crucial role of more general enablers like strong public awareness for youth initiatives or comprehensible career diffusion paths for young professionals in other formats, we want to encourage you to embrace and further develop these discussions in your own social and professional circles.

In the end, you – the reader – should be able to obtain the enablers from which your initiative can benefit the most while further training your muscle to detect additional enablers from other case studies far beyond the scope of this report. Conversely, you will be able to circumvent thwarted constraints and hedge your ventures against them in the future.



## Enablers

## Constraints

### (1) policy & regulation

targeted subsidies

disproportionate institutional power

tight, unfitting or unclear national regulation and policies

### (2) internal & external energy sector environment

greenwashing or buzz wording

lobbying or corruption

cheap fossil fuels      thinking in silos

lack of technological understanding

### (3) funding options

steering financial incentivization

institutional resources

available growth equity & venture capital

### (4) alliances

networking

low(er) agility of partner organization

early adopters

lack of clear alliance motives

### (5) human resources & recruiting

lack of energy experts in local authorities, business and organizations

iterative problem solving

challenge of attracting excellent people

## (1) Policies and regulation

### Enablers

- Subsidies that support the rollout of one specific technology and are tight to clear performance objectives (e.g. strongly-subsidized photovoltaic systems for residential houses in Italy).

### Constraints

- National regulations and policies set the boundary conditions in a still conservative sector. They are often too tight, unclear, or do not fit in the setting they should serve. This creates a lot of risks and uncertainties during long project or product development times, especially for big projects. Hence, these boundary conditions are limiting the action radius.
- Disproportionate institutional power can lead to incomprehensible or short-sighted decision-making.

## (2) Internal and external energy sector environment

### Constraints

- Occasional greenwashing or buzz wording too often distracts from decisive action and deteriorates credibility. In the same manner, campaigning and conferencing in itself is supportive, but it can also distract from doing more demanding, potentially inconvenient steps.
- Lobbying against public interest or corruption, benefitting from the strong interconnection between politics and the energy sector, can hinder new ideas to diffuse through.
- Silo thinking in and across sectors. Often, there is a lack of multidisciplinary and cross-sectional understanding of key players to connect solutions or create new ones.
- Cheap market prices for gas and other fossil fuels (e.g. through shale gas revolution) torpedoing clean energy business models.

- Lack of sufficient technological understanding (e.g. in policymaking) opens up a danger of putting up smokescreens which tech laymen fall for (e.g. blue hydrogen considerations while trends point towards green hydrogen).

## (3) Funding options

### Enablers

- Financial incentives which steer (rather than simply “throwing” money on problems) linked to a cohesive performance auditing are effective to foster successful execution.
- Institutional resources such as funds, machines, and staff.
- Available growth equity and venture capital (the “dry powder” for a venture), majorly pouring into hyped technologies (hydrogen, battery, eMobility).

### Constraints

- Conversely, lack of available growth equity in less-hyped technology.

## (4) Alliances

### Enablers

- Networking with committed people – other young but furthermore senior professionals – which share the same goals.
- Early adopters (industry pioneers or pilot customers), ideally members of large corporations (e.g. risk or sustainability managers or segment engineers) who are excited to cooperate.

### Constraints

- Compared to startups, established industry partners are less agile, which demands careful monitoring to not develop in alignment problems.
- Lack of a clear motive as the fundament of an alliance.



## (5) Human resources & recruiting

### Enablers

- Local authorities, businesses, and other organizations are facing a lack of energy experts. This opens up new opportunities for young professionals to apply new professional skills and valuable know-how of the conditions on the ground.
- Iterative problem solving rather than going for the big shot.

### Constraints

- Challenge to attract excellent people, e.g. qualified software developers for SaaS businesses, which are able to solve unprecedented problems by ingenuity.
- The aforementioned massive lack of energy experts, even with more incentives for the youth, will likely further increase.

## Takeaway learnings – from and to young professionals

As depicted in the previous paragraphs, European young energy professionals take an active role in shaping our energy sector by using their own initiative and innovative spirit. While pursuing their personal, institutional and corporate goals, they have identified a variety of best practices and lessons learned. The following takeaway learnings originate from scrutinizing existing processes and iterative improvement, based on trial-and-error within work, academic, and/or business environments.

We surveyed and spoke with many of such motivating individuals and organizations, eager to share the lessons they learned along the way, to further support and encourage other young professionals. This section is dedicated to providing these youngsters, who are currently pursuing similar career paths and searching for potential bottlenecks to leapfrog in their personal development, with some inside advice. In addition, we believe that senior stakeholders in academic research and business can learn from their younger counterparts how to remain successful in highly dynamic, complex, and innovative academic and business environments.

Strategic	<u>Takeaway learnings</u>		Operative
<p>test the market first</p> <p>investigate new value streams to disrupt your technology</p> <p>consider alternative business models for your product</p> <p>focus efforts in high-growth industries</p>	<p>significance of funding options</p> <p>use product data for business model and learning</p> <p>test new solutions rapidly</p>	<p>patience for partners' and own processes</p> <p><i>Entrepreneurial</i></p>	
<p>embrace collaboration</p> <p>scrutinize your task prioritization</p> <p>accommodate the multifacetedness of energy in your actions</p>	<p>resiliently stick to your vision</p> <p>ensure clear communication</p>	<p>enough rest periods</p> <p>embrace transparent processes</p>	

As the degree of what our report audience needs is fairly broad and covers contexts far beyond business and academic research, we decided to limit ourselves to providing a summary of the learnings featured in the visual above. We grouped the following takeaways according to their strategic, operative, or hybrid nature in accordance to their organizational scope.

## **Strategic**

### **Test the market first**

A lack of market need (despite a good idea and efforts in product development) is one of the major reasons why startups fail. (M) In addition, understanding the local energy sector's competitive landscape and regulatory hurdles is key, if you want to enter successfully. Quoting one of our interviewees, a renewable energy entrepreneur: *"Even if you have good technology, if it does not tick the boxes for these two [market need and regulatory fit], it is not worth the effort to start a new business."*

***"Even if you have good technology, if it does not tick the boxes for these two [market need and regulatory fit], it is not worth the effort to start a new business."***

When pursuing a new business idea as an entrepreneur, start by testing the market first. If you experience enough positive feedback or even potential customers in the process, proceed with the technical development of your initiative. If you already find yourself in the situation of a small market size for your product, consider tailoring your business model to reach larger market sizes.

### **Investigate new value streams to invigorate your technology**

Advance the applicability of renewable energy business models by leveraging new, potentially less intuitive value streams to generate new

business opportunities. These then can enable a holistically interesting return of investment and therefore create added value for society as a whole. Becoming a one-stop-shop across the selected value stream for customers can further smooth adoption and hence increases applicability.

### **Consider alternative business models for your product idea**

Keep in mind that your product idea does not necessarily need to entail you becoming a new vendor on the market: there is more to it than just providing hardware, which, in a worst-case scenario, can turn out to be a better mousetrap. Always consider alternative, service-based business models such as insurances and maintenance. Insurances, for example, can be attractive, as operating a plant incorporates a lot of risks that you want to mitigate as an operator, opening doors previously locked for you.

### **Focus your efforts in high-growth industries**

When starting a new business, focusing your scope on potential high-growth industries can be highly beneficial, as these provide the most opportunities in terms of public attention, skilled personnel, and financial and material resources. As the energy sector, overall, tends to spoil us with the latter compared to other sectors, you still need to be able to assess the future direction of the sector itself in order to remain successful.

### **Embrace collaboration**

If your organization identifies a match with others, or even small overlaps, go for it! Especially without years of market expertise, founding teams often surprisingly fail to investigate potential partnerships, leaving cross-sectional (senior) expertise, technology partnerships with industry leaders, and mutual advantages, untapped. In addition to the mutual scale and efficiency benefits, we can only achieve a sustainable energy sector by working together and sharing knowledge.

### **Scrutinize your task prioritization**

Even though this seems to be very straightforward, continuous learning is a useful skill that many new and established organizations simply fail to cultivate. On a regular (and coherent) basis, ask yourself if your current tasks and their execution are effective and then productive (mind the difference!), in the way you are performing them right now. This means that your task needs to properly fulfill its goal first (effectiveness), after which you can worry about efficiency or scaling up (productivity). In addition, observe how consistent you are in leaving deprioritized tasks as they are.

### **Accommodate the multifacetedness of energy in your actions**

For engineers and technology specialists, it is important to consider the impact of technological advancements in energy far beyond sectoral borders, namely in the broader environment and society as a whole. As this multifaceted energy problem becomes even more interconnected and complex, solutions can only be found beyond one-track specialists and a silo mentality.

## **Strategic and operative**

### **Significance of available and well-conditioned funding options for successful youth initiatives**

The most important and crucial factor for youth initiatives each of our interviewees emphasized – and obviously has to deal with – is to remain successful and align with like-minded investors. Taking the pressing example of seed-stage energy startups, we spoke with entrepreneurs below 30 years of age within YES and our international networks to better localize one of the many problems within suiting funding options for the youth. While in seed-stage with an already validated product-market-fit, a funding chasm to Series A was often witnessed as a major concern of many startups, as funding options suitable for their business model were often limited.

### **Use (product) data in your product's business model and organizational learning**

As of today, many large businesses lack the right data approach, because collecting data is often considered to be a burden rather than an asset. Our advice for the increasing number of companies now willing to utilize this untapped source of insight and revenue: start with internal capacity building, create your own (or SaaS-based) data collection system (DCS), and then analytically leverage data to improve your internal processes. Established or new equipment vendors can enhance their business model by selling equipment and software leveraging equipment data to distinguish their value proposition from sole hardware vendors.

### **Keep testing new ideas and solutions to remain innovative**

"It can be difficult to solve, but nothing is impossible." This quote captures the eagerness of an algorithmic power trading startup to seek solutions for previously unknown problems. A close connection to academic research enables startups and established companies to collect and study new approaches in academic papers so that they can rapidly develop and deploy a solution prototype. The most important takeaway here is the inexorable readiness to make mistakes – wandering through many iterations if needed – to come up with an innovative solution. A trial-and-error approach is a key to innovative success.

### **Be resilient when bringing your new product or service to market and stick to your vision**

Starting a new business, you will probably experience a lot of skepticism. Besides some legitimate feedback from which you might draw inspiration: do not be discouraged by critics and just go for it! Quoting one of our interviewees, an entrepreneur working with a successful business model which was initially not well-understood by many: "If you think that you can do something better, then that is probably true".

***"If you think that you can do something better, then that is probably true."***

## **Have a clear and targeted communication strategy**

To inform and mobilize the public for the next steps in the energy transition process, it is very important to put strong efforts into building active communities which are attentive to the issues at hand. Defining your target audience is key, as well as being able to convey your message simply to all stakeholders. Technology and business models are often complex, and it is up to you to get them on board. Another tip is to be less problem-oriented in your communication, instead of focusing more on potential solutions. This positive mindset will positively influence those around you.

## **Operative**

### **Patience for partner's and own processes**

When starting a business, be fully aware of the internal process times which range from hours in equipment vending to months in system installation (this can be up to 6 months for sales conversion and installation each!). Working with external partners, a startup might experience that their processes take significantly longer than their own, perhaps because of a more flexible business environment. Here it is important to gain an understanding of which process durations your business should expect and finds reasonable.

### **Plan enough rest periods and stick to them**

What also seems to be a very straightforward takeaway, is taking sufficient time off. Manage and plan your rest periods similar to your working schedule. In the case of founding teams eager to go the extra mile, motivate yourself to *really* take some necessary time off to recharge your batteries and clear your mind to get a fresh perspective once you start working again. The following cannot be emphasized enough: many challenges that appear as tough nuts to crack, are resolved in an instant after some fresh air and time off.

## **Embrace transparent processes for your customers and your team**

For new and established companies, transparency towards customers in pricing is key, even above the actual price amount of the offered product or service. Hidden or ill-communicated prices, such as non-advertised service fees, may lead to the customer feeling abandoned or, even worse, cheated. Despite being self-explanatory, only transparency among team members and other stakeholders enables the trust needed for an organization to be successful, both internally and externally.

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# 4 Outlook for the next decade in the European Energy Sector - *we look ahead*

## Introduction

Without exaggeration, we can state that the global energy sector currently witnesses change accelerated as never before since the oil boom. As the European sector gets more market-liberalized, interconnected across different sectors and digital, comprehending the development trajectories - at an early stage - further gains its importance for sector leaders over accumulated knowledge which will likely be outdated at the end of this decade. Being a generation of digital natives receiving the education needed to handle the future energy sector while being trained to work in interdisciplinary team settings, young sector professionals can give an advanced outlook on developments to expect in their fields of expertise.

During our research, we asked young professionals exactly that while focusing especially on the applicability of new energy-related technologies used in their own roles and organizations. Furthermore, we received action feedback on how they can increase their own impact and how key stakeholders can further support them in achieving that.

Accordingly, we can formulate this outlook as an answer to the following questions:

- What are the next steps you can take to increase your impact on the energy sector?
- What do you demand (from industries, government, etc.) to increase your impact?
- How will new energy-related technology be successfully applied in the upcoming decade?

## What are the next steps you can take to increase your impact in today's energy sector?

Enter the sector in a purpose-driven employment

Further training and advanced education

Foster public awareness for the energy transition

## **Enter the energy sector in a purpose-driven employment**

The most straightforward step for young professionals is to ensure that they can apply their skills in roles that can contribute to the benefit of society and nature beyond profit maximization as the sole rationale. Related career paths can be outlined in academic research, creating enhanced or new solutions with an own startup, or by upgrading established businesses and taking part in policymaking in political institutions or think tanks. Aligned on the specific purposes, young professionals witness the exceptional role of strong networks among the youth to join efforts in energy transition and climate change mitigation.

## **Further training and advanced education**

Continuous education and identification of what they need to learn and, equally important, whatnot. Financial and digital know-how were identified as essential “must-haves” to be able to shape better solutions. If you want to further accelerate your learning curve, approach sector seniors for mentorship or training.

Besides advanced training and education in their own field of expertise, young professionals strongly emphasize the need to become a master for work in uncertainty to align your role’s deliverables to the disruptive changes of the energy transition.

## **Foster public awareness for the energy transition**

Besides public education and consulting, young professionals emphasized the sustainable attention it can create to present your own work to the public and relevant stakeholders by showing day-to-day deliverables rather than focusing too much on purpose and high-level discussions. In general, people are getting more engaged with relatable, practical work which is comprehensible and can relate to their own experiences, independent of education levels. While this seems to be clear at first sight, young professionals however stress out the continuous challenge to keep a truly unbiased view on certain addressee groups.

# **What do you demand from sector protagonists to increase your impact in today's energy sector?**

**New roles and learning opportunities**

**Set out clear and executable programs**

**More collaboration between universities and companies**

## **New roles and learning opportunities**

In the corporate environment, young professionals generally see a relatively limited range of corporate roles depending on geographic location and degree of local market conservativeness, making certain companies unattractive to join even if the corporate profile would else be interesting enough.

They, therefore, demand from local European business leaders to create new and further push to update existing roles. Leveraging the full skillset of potential young employees increases the capability of the own workforce in value creation and long-term resiliency to successfully move in the rough waters of energy transition while proving to recruits that your company will be the one that stays on track instead of crushing on the first iceberg. As young professionals actively seek mentorship, they demand more valuable opportunities to secure and foster mentorships vice versa from research, policy, and business leaders willing to pass on their expertise.

## **Set out clear and executable roadmaps**

While young professionals overall appreciate the message sent by plans of European governments to accelerate the energy transition, it is hard for young researchers, entrepreneurs, and policymakers to act on memorandums that, astonishingly, still have the character of non-committal lip services lacking realistic milestones.

While this point is, especially in relation to climate change mitigation, a prominent reoccurring demand from many youth organizations, we want to stress out a component of bidirectional responsibility here. Once clear and (roughly) executable roadmaps are agreed on, governments themselves should hold young professionals more accountable for reaching the milestones along with the energy transition.

## **More collaboration between universities and companies**

In addition, one level below institutive collaboration, more and technically profound exchange formats between students and companies are demanded to foster flexible, R&D-driven collaboration which is detached from prevalent recruiting or marketing rationales as young professionals are more than just new customers or employees.

# **How will new energy-related technology be successfully applied in the upcoming decade?**

To answer this question, we asked selected youth leaders and young specialists to give us a look ahead on how energy-related technology will be successfully applied in the upcoming decade following their assessment in three key cases around geothermal energy, hydrogen fuel, and data-driven energy efficiency measures.

For geothermal energy, its ability to provide baseload power compared to other renewable energy sources is and will be an attractive attribute for developing countries with a lack of overall plant capacity.

As a factor to then strengthening the case of geothermal power for European countries, newly emerging Enhanced Geothermal Systems (EGS) will most likely drive upcoming large-scale geothermal projects. Besides caution to limit induced seismicity, the technology offers a new source of larger-scale sustainable energy on more potential sites ever before as heat reservoirs previously unreachable or uneconomical can be tapped.

For hydrogen as a fuel, we will refer to the expected origin of input power for the electrolyzation and its sectoral applicability in the upcoming decade. At first, as foreshadowed by the current hype, green hydrogen will most likely play the dominating role compared to blue hydrogen in this decade. This is because efforts to scale up hydrogen production, reducing conversion losses during electrolyzation, and limiting security hazards are driven and, especially in the European context, justified to the public and investors by the rationale of rolling out a clean energy commodity, leaving less efficient or polluting options out. However, which total volumes of a green hydrogen economy we will witness at the decade's end is still a big unknown at this relatively early stage as this depends on the right policies being made now on European and national levels.

Speaking about the sectoral applicability during this decade, hydrogen fuel might be, almost entirely, relevant for the decarbonization of (currently) unelectrifiable industry processes like steelmaking, ore melting, or running heavy-duty machinery. In contrast, it will not be relevant for decarbonizing heating and transport sectors. Raising the prominent example case of fuel cell vehicles (FCV) for the latter, fuel production & storage and powertrain combined leaving FCVs with more than three-times more conversion losses than competing battery electric vehicles (BEV) (380W compared to 800W per kW of electricity supplied) (9). Surprisingly, the applicability of hydrogen for grid balancing might remain limited during this decade due to the rapid increase of competitiveness for batteries and the lack of large overhead renewable power capacity in Europe to be economically utilized whose needed but the time-consuming build-up will cause additional delay.

For data-driven energy efficiency, increasing CO<sub>2</sub> prices passed on to energy end consumers will, even more, incentivize to apply energy efficiency measures as well as for the application of new and more efficient technologies. In this context, data-driven decision-making utilizing historically and real-time logged process data may play an increasingly important role for various processes by creating benchmarks which then can be used to find inefficiencies in similar processes.



# Acknowledgments

In this last paragraph, we want to thank all parties that have contributed to the success of this report.

We want to show gratitude to all of our survey respondents, who gave us a clear view of how the critical mass of European young professionals think, want, and behave. Furthermore, expressed in multiple written comments but also follow-ups and engaging and motivating discussions, they constantly encouraged us to raise the voice of young professionals across Europe, united in our efforts to take rapid and immediate action to make the green energy transition a success for all, to tackle the issue of climate change. We, the Editorial Team, hope we delivered according to your expectations.

Another shout-out is in order: to our committed youth expert interviewees who gave their valuable insights, lessons learned, and key takeaways as leaders at the forefront of key sector trends. Their contributions not only impressively demonstrated that they, and their peers, bring new ideas into action and, by doing so successfully, shape the European energy sector. What's more, we were heavily motivated by their drive to achieve excellence and passion for their work

Last but not least, we want to thank YES-Europe for providing this decisive report format to share analytical and empirical results with the broader European energy community. This will hopefully allow us to support and enable rapid action – in the organizations of our target audience and, as a result, into the whole energy sector. Especially the Knowledge Sharing Team, the editors of the previous reports (2018, 2019, 2020), and many other supporters along the way: you provided us with insightful feedback and contributions to complete our report and strengthened the course of transferring know-how to fellow junior and allied senior professionals.

# About YES-Europe



We are always looking to expand our organization! Interested in becoming a member? Then take a look at open positions on our website and apply!

Dimiri Zogg	President
Erik Turner	Vice-President
Livia Kalossaka	Strategy and Operations
Beatriz Ildefonso	Policy Lead
Sara Nyberg	Country Representative Lead
Leïla Réau	Operations Lead
Yu Ronnie Zhang	Knowledge Sharing Lead
Anh Nguyen	Membership & Community Lead
Saila Nieminen	Communications Lead
Shreyas Harsha	Partnership Lead

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## Who we are:

YES-Europe (Young leaders in Energy and Sustainability) is a community created to empower students and young professionals across Europe. We develop meaningful connections, share knowledge and take action on energy and sustainability topics. YES-Europe has the mission of catalyzing the energy transition by creating an environment where youth are given a space to develop ideas, take on responsibility, build their local community and act for change. YES-Europe is supporting in particular SDG 7, 13, and 17.

## What we do:

First, we develop content and share knowledge to continuously learn about energy and sustainability. We also provide our community with a space to develop their professional skills and leadership in a meaningful way. We then offer a platform to connect, develop both local and international initiatives and implement projects. Our activities include conferences and Climathon, public policy and position papers, networking events, podcasts, and publications such as the one you're reading.

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