# FUTURE OF ENERGY 2018

**By Young leaders for Energy & Sustainability**

YES Europe

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# Preface

The energy industry is at a crossroads. Shifting priorities, strengthening mega-trends and emerging technologies compose a changing context for the global energy system. In the coming two decades, the energy system of the future will take shape.

The young generations entering the industry are to play a key role in defining these changes. This report aims to understand what lies ahead for the energy industry according to young leaders in energy and sustainability.

The Future of Energy by Young leaders in Energy and Sustainability 2017 report is an annual publication by the Analytics team of YES-Europe. The YES-Europe (young leaders in energy and sustainability) network is a unique pan-European organization led by students and young professionals in energy. As part of our mission to create a community of young leaders, YES-Europe creates and disseminates fact-based knowledge through its analytical projects.

*In the coming two decades, the energy system of the future will take shape*

The Future of Energy 2018 report gathers the views of 88 respondents who live in 20 countries, 89% of them in Europe (34% in Germany) to an online survey ran throughout 2017. About 82% are energy students (65% master students), while the rest are young professionals (8%), PhD candidates (4.5%) or are looking for a job (4.5%). Participants answered an online survey, which is the input data for our analysis. The diversity of respondents (e.g., geographical location, occupation) in our sample provides confidence that our results are not biased towards the views of a single group of young professionals and students, despite being a relatively small sample.

Through the following pages, we represent the ideas of highly engaged and proactive individuals within the young energy professionals and students community in Europe. This report is a platform to spread their views. In a few years, these young leaders will be the decision makers of the energy industry. By listening to what they have to say today, we imagine what future of energy they will build tomorrow.

# Executive Summary

This report aims to understand what lies ahead for the energy system according to the next generation of professionals in the energy sector. It summarizes the insights from a survey conducted through YES-Europe's network of young leaders for energy and sustainability. Eighty-eight respondents from 20 countries shared their perspectives about the future of energy. We analyse the forces shaping the future of energy, the energy scenarios envisioned by our respondents, and how these scenarios may come into being from different balances in the forces shaping them.

The first section focuses on the **Forces Shaping the Future of Energy**. The young generation in the energy industry believes that out of the energy trilemma, affordability and security of supply will have lower relevance than today while the focus will shift towards sustainability. Climate change is seen as the key mega-trend shaping the future of energy. Regulation and energy technologies are expected to undergo the largest disruption, driven by technology innovation.

Secondly, we outline three **Scenarios for the Future of Energy**. Most respondents envision a "Sustainability Common Goal" (SCG) scenario with strong decarbonisation and decentralization. The "Divergent Priorities" (DP) scenario predicts diverging pathways for emerging and developed economies conducive to a more decentralized system with a sizeable reliance on fossil fuels. Finally, the "Negative Balance" (NB) scenario contains no major change in the next two decades, which results in a centralized system and a strong dominance of fossil fuels.

Thirdly, we analyse the **Roads to each Scenario**. Sustainability becomes crucial in all three scenarios. In the DP and NB scenarios, demographic changes play a more relevant role than in the SCG scenario. Additionally, in the NB scenario, technology breakthroughs are much less prominent.

Overall, the young generations in energy foresee a future of energy shaped by climate change. Technology innovation drives change in a world where supplying a growing energy demand becomes even more challenging.

# Forces Shaping the Future of Energy

The forces that drive change in the energy industry have shifted over time. For decades, finding affordable energy sources to meet a growing demand was the key force in the industry. After the oil crisis in the 1970s, security of supply started to play a vital role. More recently, the pursuit of a more sustainable energy system is a major force shaping the industry [1].

The forces shaping the future of energy influence policies and regulation, investment decisions and consumption behaviour. In turn, this results in technological and economic changes in the energy industry that reverberate through the entire global economy.

Young energy professionals and students (YEPS) foresee changes in their countries energy trilemmas, rank the most relevant mega-trends for the future of energy, and estimate the degree of disruption on the global energy system. In this section, we cover all these key aspects of the future of energy.

# Energy trilemma rebalancing

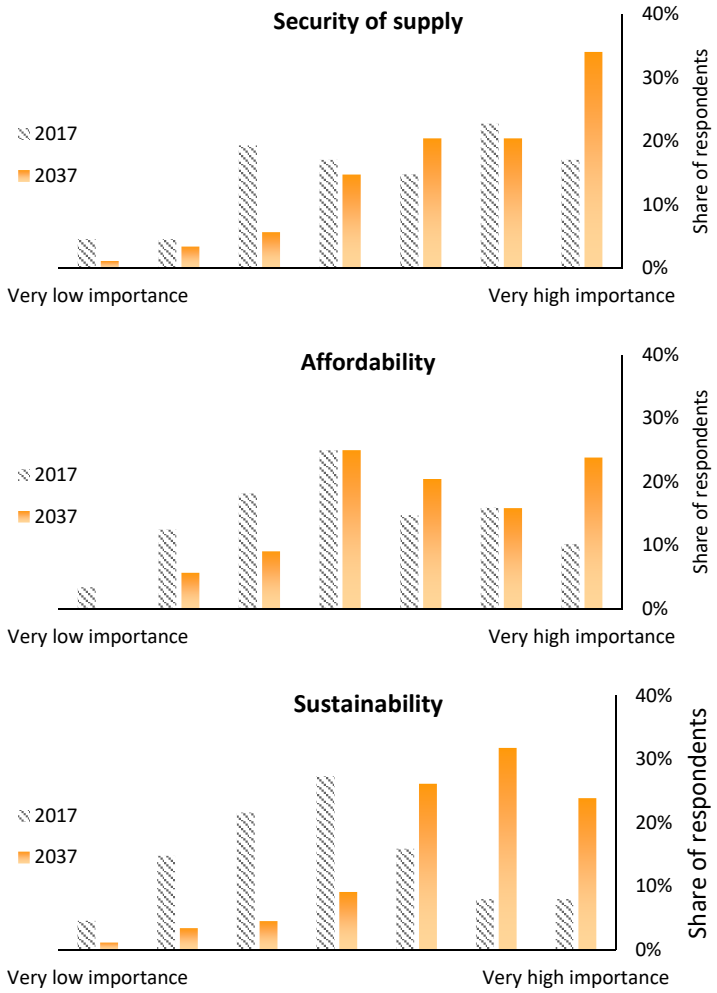



**Figure 1. The three dimensions of the energy trilemma – security of supply, sustainability, affordability – will become more challenging.**

*All three aspects of the energy trilemma will come under greater pressure in the next 20 years*

Half of the respondents consider *security of supply* to have high or very high importance in their home-countries in 2017. However, a strong consensus exists (75%) that it will be an essential concern in 20 years.

Young energy professionals and students think *sustaina-bility* is medium or medium-low importance for the energy systems of their home countries. However, in 20 years from now, a big majority (82%) agree that *sustainability* will have a high to very high importance.

Opinions differ about the importance of *affordability* in 2017, which is rated medium or medium-high importance. The relevance of *affordability* is expected to increase slightly in 20 years but remains lower than *security of supply* or *sustainability*.

# *In 20 years, sustainability will be as important as security of supply*

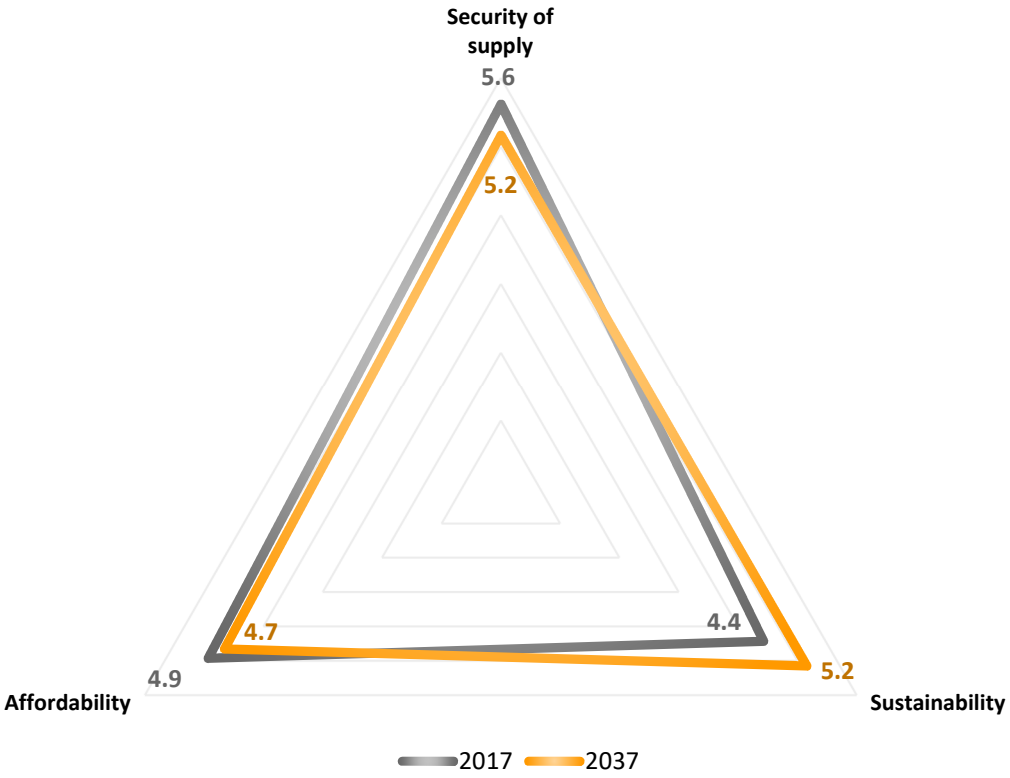



**Figure 2. The energy trilemma shifts towards *sustainability*, which becomes as important as *security of supply* and more than *affordability*.**

*Security of supply*, the top priority for 2017, will lose its prominence and meet midway with the growing importance of *sustainability*. YEPS think that the energy industry in their countries of residence will focus on *security of supply* (100) and *affordability* (100), with *affordability* in a distant second place (88).

**Table 1. Average importance and indexed ranking of the elements of the energy trilemma in 2017 and 2037.**

| **2017** | **Average importance** | **Index** |
|---|---|---|
| *Security of supply* | 5.6 | 100 |
| *Sustainability* | 4.4 | 79 |
| *Affordability* | 4.9 | 88 |
| **2037** | **Average importance** | **Index** |
| *Security of supply* | 5.2 | 100 |
| *Sustainability* | 5.2 | 100 |
| *Affordability* | 4.7 | 90 |

# *Young energy professionals think sustainability is a much higher priority than power utility professionals*

## A greener generation

Young energy professionals think Sustainability is a much higher priority, in 2017 and in 2037, than power utility professionals surveyed by PwC (2015) [2]. Participants in the 14th PwC Global Power & Utilities Survey (2015) – top managers from 70 energy firms – rated Sustainability as a much lower priority for the present (2015, av. score 3.6) and the future (2017, av. score 4.6).

Scores for Security of supply and Affordability are similar between managers and young professionals. In terms of the energy trilemma, the generational divide in the energy industry is in the weight attributed to Sustainability.

# Key mega-trends shaping the future of energy

Climate change and technological breakthroughs are the most relevant megatrends shaping the future of energy according to the survey respondents. Global economic and political power shifts and demographic changes are less likely to determine the direction of the global energy system in the next 20 years. Accelerated urbanization is an important trend, but less so than technological change or climate change.

We are living in a world disrupted by consolidating economic and political powers such as China and the seemingly declining relevance of traditional actors such as the United States. Yet young energy professionals do not consider the impact of these power shifts a key trend shaping the future of energy.

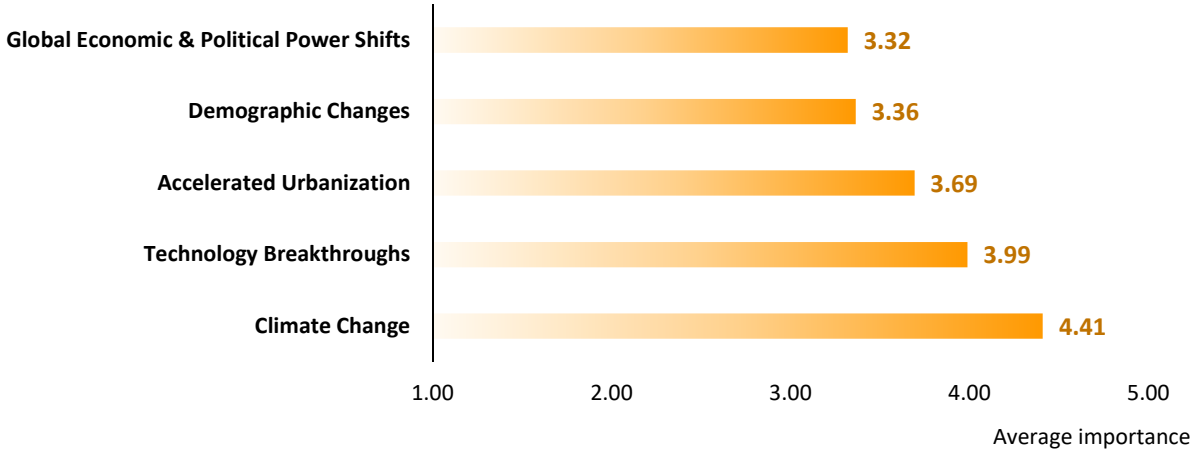



**Figure 3. Ranking of the key mega-trends shaping the future of energy.**

According to the UN, in 20 years, there will be more than 9 billion persons on Earth, with the segment of the population above 60 years-old growing the fastest [3]. Despite the important consequences of these demographic changes, most respondents consider this trend of medium-high relevance for the future of energy.

Accelerated urbanization will increase the urban population from 4 billion people (54%) to above 6 billion (66%) by 2050, according to UN projections [4]. This will have a major impact on energy demand and two-thirds of respondents give this trend a medium-high or very high relevance.

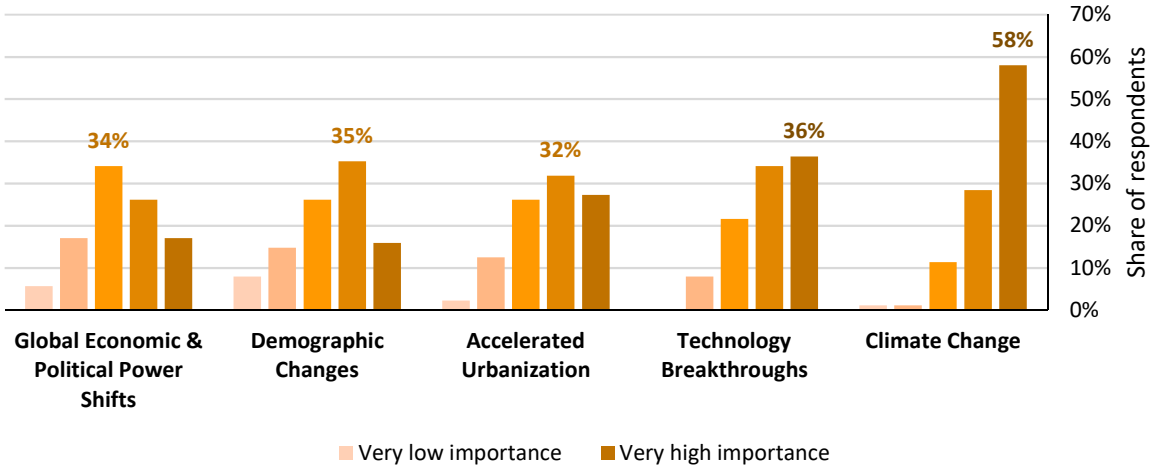



**Figure 4. Distribution of answers about the importance of each mega-trend shaping the future of energy, order according to the overall average importance.**

Technological breakthroughs are shaping today's energy system; from hydraulic fracturing enabling the shale revolution to the dramatic evolution of wind and solar energy costs or the promise of low-cost batteries and the diffusion of electric vehicles. Young energy professionals and students foresee a key role in technological innovation and change in the next 20 years with 36% considering it very important.

## *Climate change and technological breakthroughs are the most relevant megatrends shaping the future of energy*

Finally, climate change is almost unanimously considered the defining mega-trend that will shape the future of energy in the coming decades with 86% of respondents considering it important or very important.

## **A perspective on the future energy workforce,** by Giuseppe Galati

The concentration of carbon dioxide ($CO_2$) in the atmosphere surpassed 403 ppm in 2016, the highest level in the last 800,000 years [5]. The impact of human activity is now obvious. Countries across the world try to reduce the emissions caused by the generation of electricity by supporting the transition towards renewable energies. In the last decade, the share of electricity from renewable has more than doubled (see Figure B1). This will not only determine the future technology mix, but the future workforce of the energy industry.

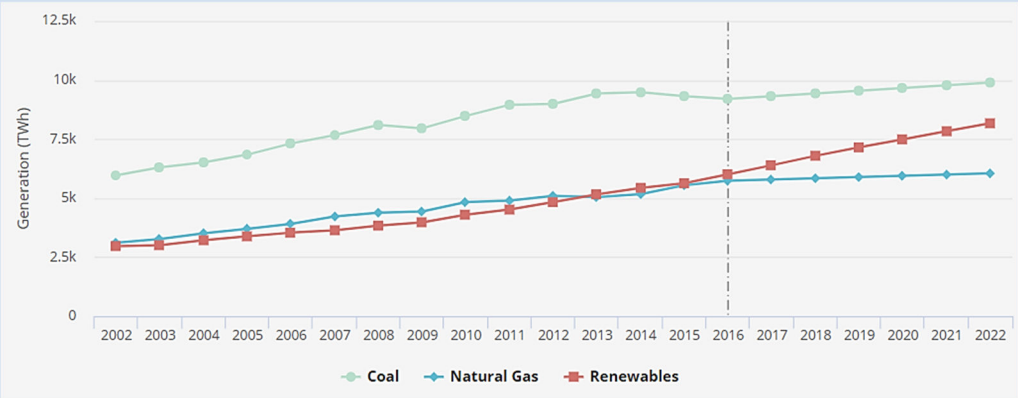



**Figure B1. Evolution of global electricity generation by renewables 2002-2016, and projection until 2022.** Adapted from [6].

Young energy professionals and student across the world become more interested about the renewables sector as it experiences strong growth rates. In 2017, global investment in clean energy technologies was over $333 billion. [7] The number of people working in renewable energies reached 9.8 million in 2016 [8].

The trend is clear according to a study by the International Energy Agency (IEA) [9]. Based on the REmap scenario, which tries to prevent average world temperatures from rising above 2° C by 2100 [9], the report studies the evolution of the workforce in the energy industry. In Figure 2, we observe a remarkable growth of jobs in renewable that triple its value by 2050. A careful observation reveals that this increase comes together with a reduction in jobs in the fossil fuels sector.

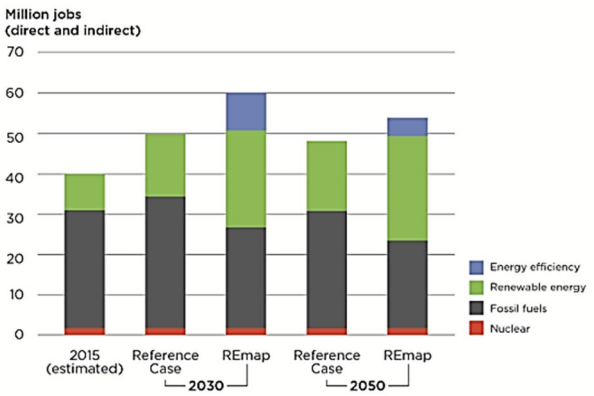



**Figure B2. Employment in the overall energy sector 2015, 2030, 2050.** Adapted from [9].

The net change will be positive. The transition towards renewable technologies will not be a detrimental factor for society but an excellent opportunity to revive the economy. Governments know it and they are starting to invest heavily in the sector, both to solve climate problems and to create jobs. **We can expect an important change in both the technology and the workforce in the future of energy.**

# What will be disruptive?

A disruptive innovation is an innovation that creates new market value and eventually disrupts existing market and value networks, for example, displacing traditional economic actors in the network [10].

Young energy professionals and students expect a moderate disruption in the overall energy system. However, the impact is of disruptive innovation is unequally distributed across the main aspects of the global energy system.

Business models will go through only medium disruption; 60% of respondents foresee medium to very low disruption in the coming 20 years. Energy demand and energy technologies will experience significant disruption levels with nearly 60% of respondents predicting high to very high disruptive changes. Energy regulation will experience the most disruptive changes with one-fourth of young energy professionals foreseeing very high disruption.

Changes in energy demand driven by growing efficiency, digitalization and an increasing number of prosumers may ally with disruptive technologies such as low-cost energy storage or distributed ledger enabled energy transactions. These disruptive changes pose tremendous challenges for energy regulators, such as the correct pricing of flexibility and the delineation of the roles of supplier and consumer in the electricity markets, which may explain the responses of the survey participants.

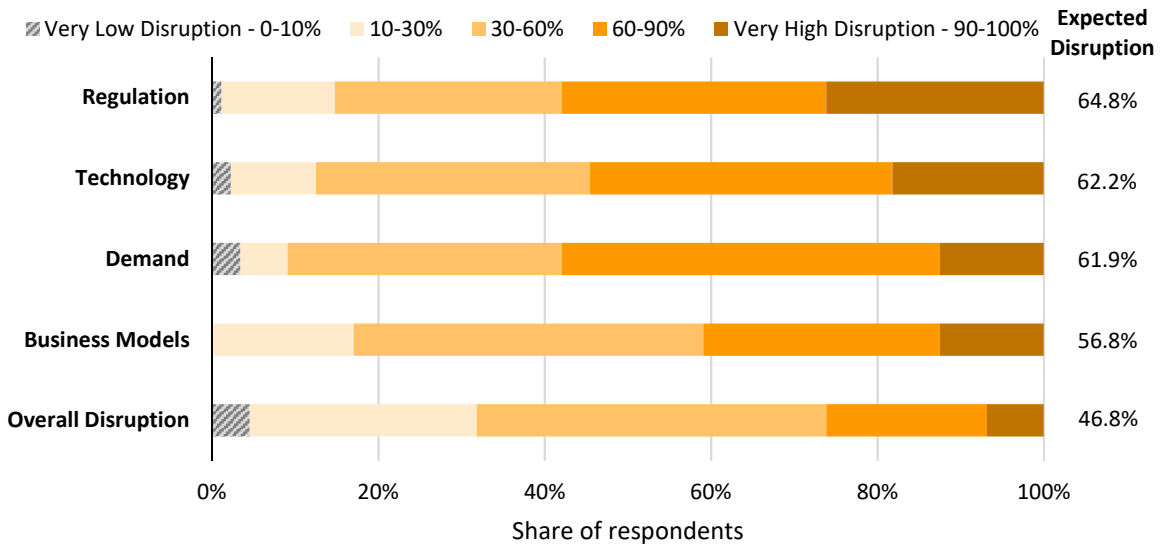



**Figure 5. Expected levels of disruption in key areas of the energy industry in the coming two decades.**

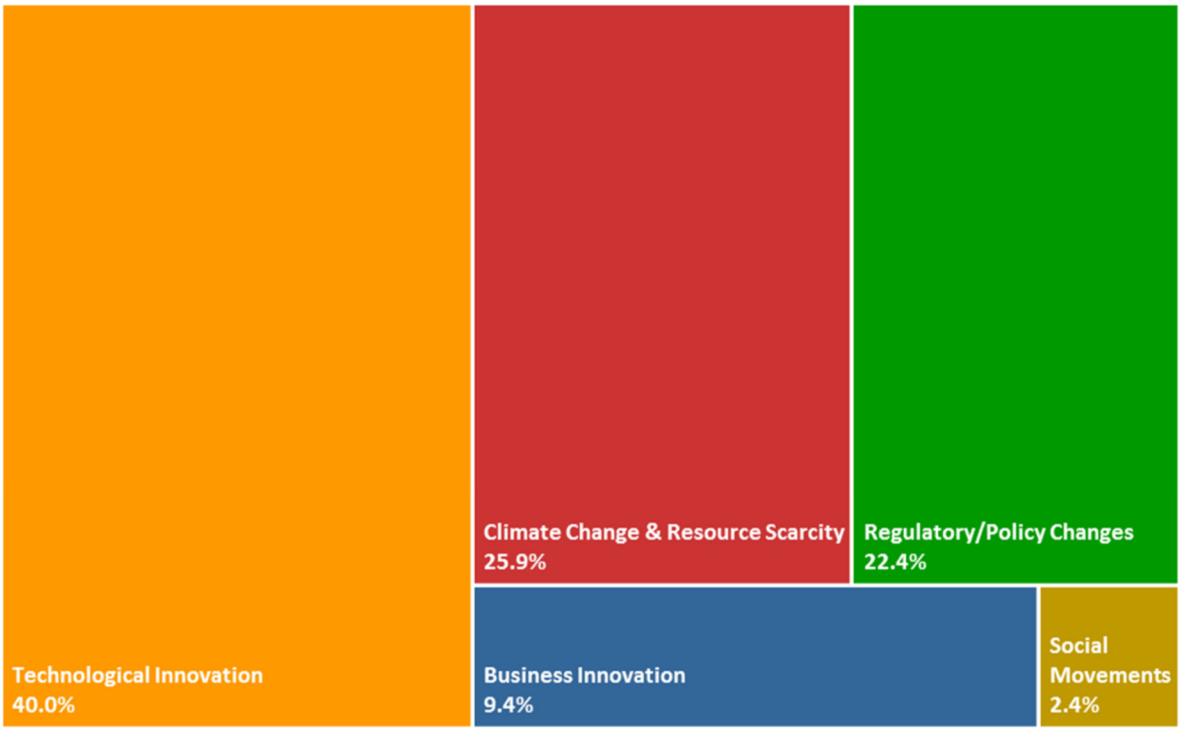



**Figure 6. Ranking of key drivers of change in the future of energy.**

Technological innovation will be the main driver of change in the coming 20 years in the energy sector, say 40% of young energy professionals and students. Climate change and resource scarcity and regulatory/policy changes are the main driver of change for 26% and 22% of respondents, respectively. Only 9% think business innovation will lead the way and just 2% that social movements will set the agenda of the energy industry.

*Technological innovation will be the main driver of change in energy - agree 40% of young energy professionals and students*

Technology innovation may not see disruptive changes (see Figure 6) but it is more frequently regarded as the main source of changes. Young energy professionals expect the most drastic changes to happen in energy regulation as a reaction to not-so-disruptive technology innovation but also to climate change and resource scarcity.


240V~
110V~

**The future of electric vehicles: V2G vs. smart charging**, by Marnix Paanakker

The batteries of electric vehicles (EVs) are often portrayed as unexploited grid flexibility when discussing the impact of distributed energy generation and a large penetration of electric vehicles. This flexibility may not remain idle for too long, though.

In the future, the batteries of EVs could help to solve local congestions. However, it may depend on how the technologies to manage the charging and discharging of the batteries evolve. Vehicle-to-grid (V2G) enables a grid operator to charge and discharge the batteries of EVs to optimize the grid operations. Smart charging (SC) uses an automated algorithm to time the charging of the EV in order to lower peak demand.

The amount of flexibility provided to the grid by V2G is many times higher than SC, but it comes with a downside. Batteries have more or less a fixed number of duty cycles. Due to the extra load cycles from V2G, batteries may depreciate faster than using SC. This results in an estimated cost in the order of 0.05 EUR per kWh to be paid to the electric vehicle owner for the accelerated depreciation of its battery. In contrast, smart charging, if done 'smartly', does not cost anything!

The business case for vehicle-to-grid in the long term is very uncertain, holding back large-scale investment and deploy-ment. The vehicle-to-grid eco-nomics depends on the evo-lution of many different factors such as the price of batteries, the regulation of flexibility mar-kets, or the development of degeneration protection tech-nologies for the batteries of electric vehicles. Competition may play a critical role too, such as other storage devices and demand response.

*If local grid congestions can be solved more cheaply than with vehicle-to-grid, then it would not be needed*

Eventually, **if local congestions can be solved more cheaply than with V2G, the technology would not be needed**. Despite different research programs and pilot project working on this technology, uncertainty remains. We will have to wait to see the future of electric vehicles.

# Scenarios for the Future of Energy

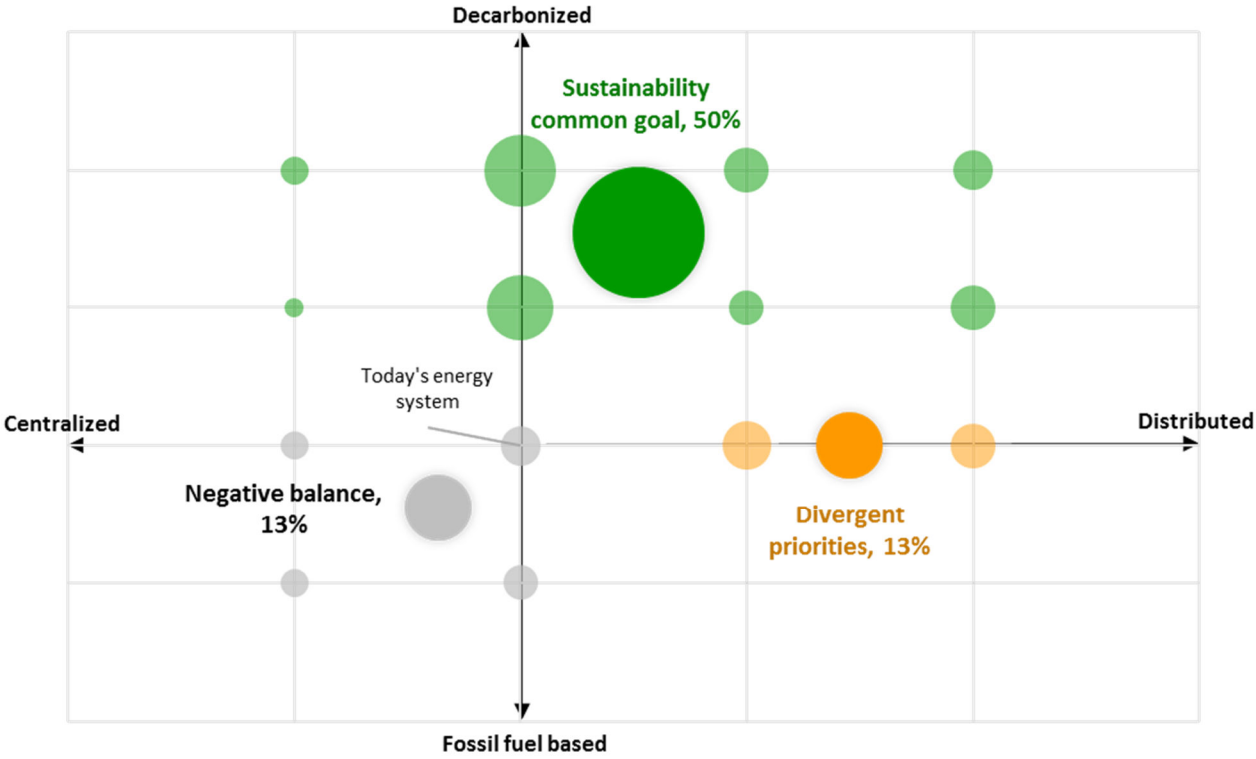



**Figure 7. Location of the scenarios for the Future of Energy – Sustainability Common Goal (SCG), Divergent Priorities (DP), Negative Balance (NB) – according to their decarbonization and decentralization.**

We outline three possible scenarios for the future of energy from the analysis of the visions stated by YEPS. Each of the scenarios builds on concepts and ideas repeatedly mentioned by the survey participants. All responses were classified independently by two coders who rated from 1 to 4 the degree of decarbonisation and decentralisation envisioned for the future of energy. Today's global energy system was set at (2,2) – a mostly centralized system, highly reliant on fossil fuels – as a reference.

Each future of energy scenario depicted by the respondents appears in Figure 8. The sizes of the bubbles indicate the fraction of respondents who share the same view. The three largest bubbles represent a weighted average for each scenario and the total percentage of participants who support them. The fraction missing to 100% are respondents who did not provide enough information or skipped this question. In the following pages, we explore each scenario in detail.

## Sustainability, common goal

In this scenario, the large expansion of renewables (mainly solar and wind) dominates the entire energy market (see Figure 8). Greener energy policies and regulation are embraced by advanced economies, which results in developed regions being fuelled exclusively by clean energy sources. India and China deeply exploit clean and renewable energy resources as well. Emerging economies are able to follow up with the increasing energy demands due to the continuous and quick technological development that allows a green energy transition.

The generation of energy becomes more and more decentralized. Energy is produced at the household or small community level. The decentralized producers are interconnected with each other thanks to the use of digital technologies. The grid serves mainly as a backup source fed by large-scale renewable and nuclear plants.

The shift to greener technologies is also observed in transport, which relies entirely on electricity. This shift produces a great improvement on the sustainability axis - as greenhouse gas emissions from transportation are greatly reduced.

> *"Developed countries will focus much on the better energy policies to have maximum renewable energy supply on grid without economic discrepancies […] and on a better energy mix and energy storage technologies [...] Developing countries will increase their renewable energy capacity and the share of renewable energy in their overall energy production is going to be significantly high. There will be a significant increase in energy production through clean technologies all around the world. [...] The future of energy production will be sustainable, secure and affordable."*
>
> *Quote from a supporter of SCG scenario.*

The development of efficient energy storage technologies plays a key role in this scenario. It allows improvements in the affordability and security axis for renewably generated energy. Among the three elements of the energy trilemma, the privileged one in this scenario is Sustainability.

## Divergent priorities

The energy demand rises due to demographic and economic growth in developing countries. Clean energy sources are not able to keep up with such a steep demand rise, because of their high costs. The unbalanced between a strong need for more energy and a technology that cannot provide it results in an energy system still bound and dependent on fossil fuels.

A widening gap is observed between developed and developing countries. On one side, Europe, United States and other developed countries experience an important increase in the share of renewable energy and electrical transport, along with others sustainable innovations. Grid interconnections increase through the development of technologies such as High Voltage Direct Current, which facilitates energy exchanges among countries and the survival of a centralized energy system.

On the other side, China and India energy transitions are not driven by green policies. Economic development - and energy affordability - is prioritized against sustainability since renewables and nuclear do not provide enough energy supply to decarbonize power generation. Globally, greenhouse gas emissions increase slightly as they are considerably balanced out by the strong green regulation dominating in developed countries.

*"As a citizen of a major developing country, I believe the major driver for growth would be to fulfil the rapidly increasing demand for energy. Thus, the government may focus on unsustainable sources such as nuclear energy and continue the trend of relying heavily on coal. I expect renewables such as wind and solar to make inroads, but do not expect renewable Shares higher than at best 25 - 30%."*

*Quote from a supporter of DP scenario.*

# Negative balance

Twenty years is a too short period of time to observe radical changes in the energy sector. Accordingly, the energy scenario of 2037 looks quite similar to what we can observe today. Europe, United States and others developed economies still heavily rely on conventional energy sources, with large fossil fuels share on grid electricity. Energy distribution is still centralized.

> *"I think it will be similar to what we have now. For every push toward sustainability, there is a new push against it."*
>
> *"More carbon emissions due to the rapid development of emerging economies, specifically in Asia and Africa."*
>
> *Quotes from two supporters of the NB scenario.*

However, a slight increase of renewables share is observed at different levels even among developing countries. Energy policies and regulations are non-uniform and only Northern European countries adopt sustainability-oriented policies. Different choices are made by the largest part of developed countries governments, who do not consider renewables an economically viable option for public investments.

As a result, on a global level, such localized changes are not sufficient to balance out the large increase of GHG's emissions due to the ongoing energy transition of India and China, heavily relying on fossil fuels exploitation.

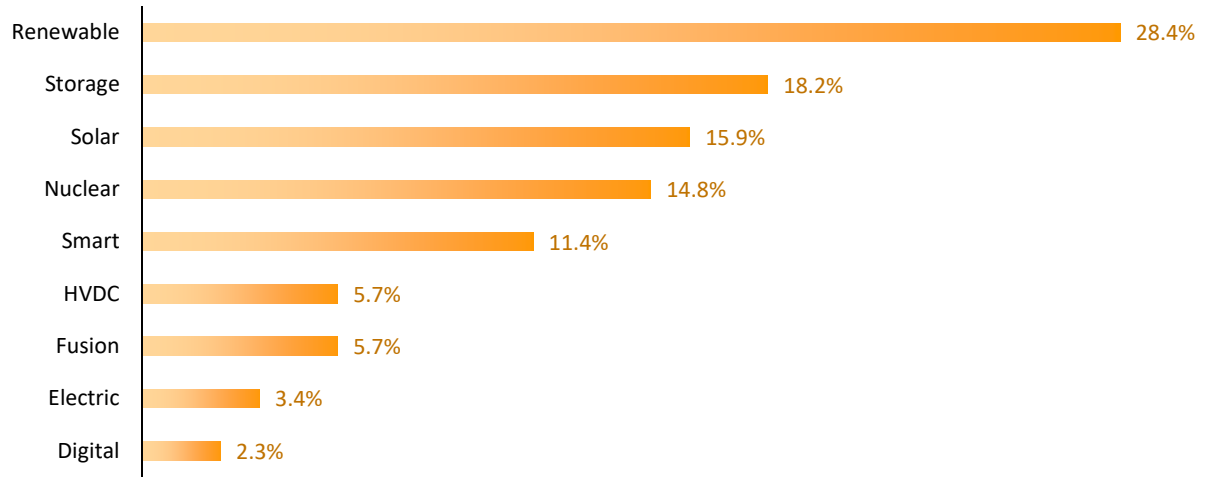
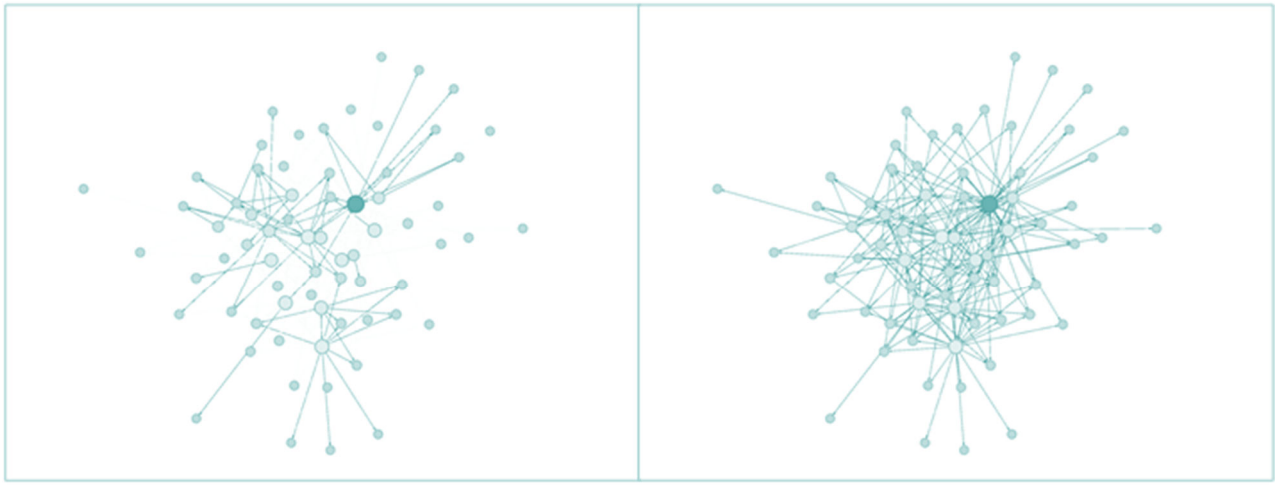



**Figure 8. Frequency of key technological terms in the descriptions of the scenarios for the future of energy.**

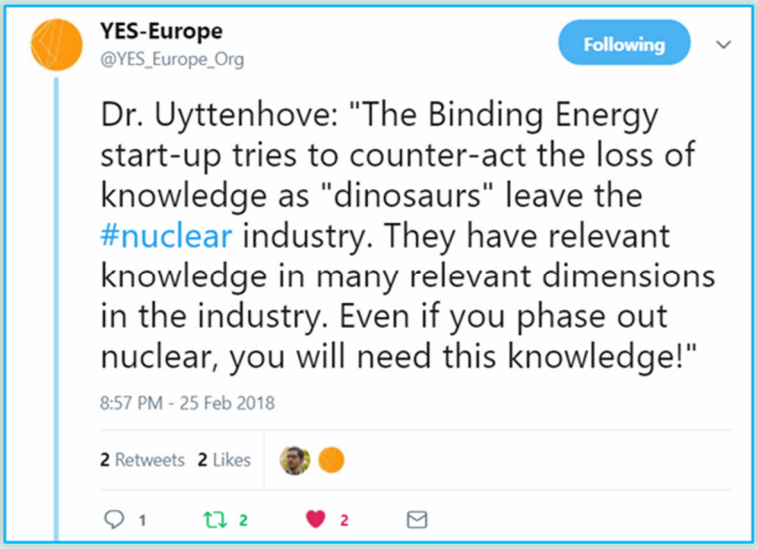


*Social network of the participants before (left) and after (right) the EESN 2017 Annual Conference.*

## **Effective communication to build the future of energy,** by Evgheni Camenscic

The importance of effective communication is often neglected in the energy industry. It becomes prominent mostly in moments of crisis [11]. This creates the impression that many problems come out of nowhere simply because people were not able to communicate effectively. To build the future of energy, we first need a more effective communication.

Dr. Wim Uyttenhove, entrepreneur and expert in the nuclear industry, shared with YES-Europe an example of the dangers of lacking effective communication from a public event at the university. Dr. Uyttenhove shared the stage with an energy industry colleague from a well-known environmental organization. During the event, this person confessed him that it would do everything possible to discourage students in the audience from getting into the nuclear sector. This position, though aligned with his goal to oppose nuclear power, revealed a serious communication problem.




Even if all nuclear power plants in the world stopped operating tomorrow, we would still need nuclear experts at least 30-50 to manage them. Dr. Uytten-hove pointed out during our conversation with him. Very specific skills are required to decommission nuclear power plants for the next 50 years. A lot would still need to be done with existing nuclear waste for much longer than 50 years. A shortage of new nuclear engineers could create serious problems.

Discouraging students from working in nuclear energy shows how the lack of effective communication between experts from different fields can harm the energy industry and society. Realizing that effective communication is a key factor in the transition towards a more sustainable future of energy is a major step towards real change.

YES-Europe creates opportunities for professionals to connect and develop relationships that facilitates communication. We bring professionals from difference energy sectors and countries together in interactive sessions to create an environment where relationships can flourish. Communication is a key tool for building the future of energy – Let use it wisely!

# The Roads to each Future of Energy Scenario

In this section, we analyze what roads lead to each future of energy scenario according to the young energy professionals and students that envisioned them. We study the importance of the forces shaping the future of energy the three scenarios outlined by our respondents: Sustainability Common Goal (SCG), Divergent Priorities (DP) and Negative Balance (NB).

Overall, the survey's participants foresee an energy trilemma in which *affordability* and *security of supply* concede importance to *sustainability*. However, depending on the future scenario they consider more likely, the change in the energy trilemma differs.

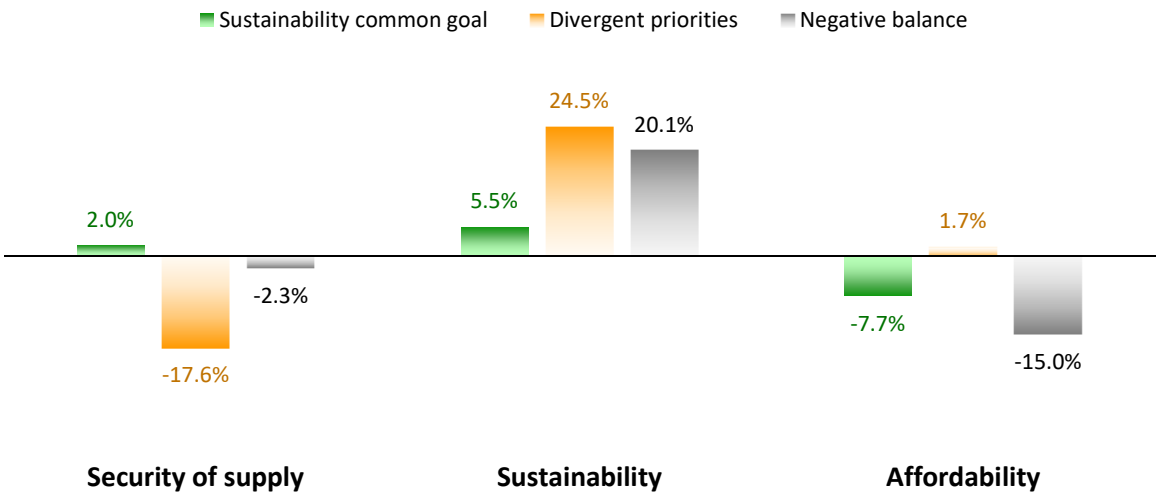



**Figure 9. Shifts in the average importance of the energy trilemma dimensions – *security of supply*, *sustainability*, *affordability* – in the coming two decades, depending on the future of energy scenario.**

The expected shift towards *sustainability* is larger for the supporters of the least decarbonized scenarios. In Figure 9, we observe the changes in the importance of the energy trilemma elements for each scenario. In the DP scenario, the increase in *sustainability* (+25%) comes at the expenses of *security of supply* (-18%). The opposite happens in the NB scenario, where the increase of *sustainability* (+20%) comes from a decrease in *affordability* (-15%).

Two factors explain these results. First, proponents of the DP and NB scenarios think *sustainability* is less important today than supporters of the SCG scenario. Therefore, the shift towards *sustainability* requires a larger change, even if they do not expect a future of energy as *sustainable* as the supporters of the SCG scenario. Second, proponents of the DP scenario stress the importance of meeting the growing demand in emerging economies, which explains their stronger focus on *affordability*.

Climate change is the most relevant mega-trend shaping the future of energy, regardless of the scenario. Figure 10 shows that respondents supporting the NB and DP scenarios rate demographic changes as very important (3.7 out of 5), which reflects their concern of how population growth will drive energy demand upwards, particularly in emerging economies.

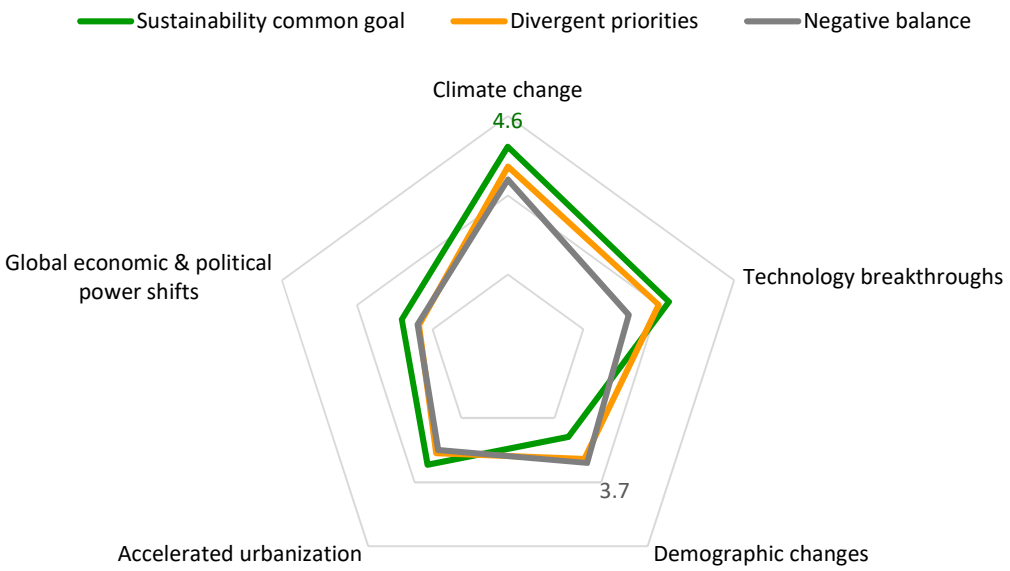



**Figure 10. Average level of importance of selected mega-trends impacting the energy sector in the coming two decades depending on the future of energy scenario.**

Respondents that support the NB scenario assign a lower importance to technology breakthroughs. This lower trust in technological progress implies that the rising demand needs to be met using fossil fuels. In stark contrast, technology breakthroughs play different but crucial roles in both the SCG and DP scenarios.

Cheaper solar photovoltaic and energy storage technologies increase the share of decentralized systems in the SCG scenario. Alternatively, the deployment of high voltage direct current transmission lines leads to a more interconnected grid that allows a more centralized system. Finally, the arrival of nuclear fusion could reshuffle the cards of all scenarios, resulting in a highly centralized but decarbonized future of energy.

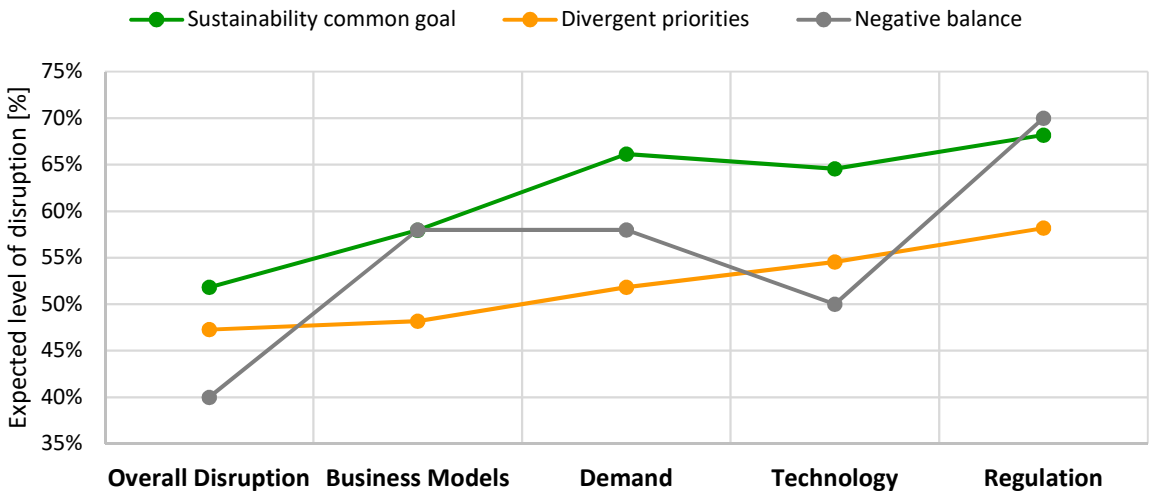



**Figure 11. Average level of disruption for different aspects of the energy industry in each future of energy scenario.**

The results from Figure 10 correlate with the expected degree of disruption and the main driver of changes envisioned by the supporters of the different scenarios. The Negative Balance scenario has the lowest degree of overall disruption (40%) because none of the mega-trends is strong enough to generate a remarkable change. Yet regulation is expected to change drastically, in agreement with the SCG and DP scenarios that foresee higher overall disruptions (SCG 52%, DP 47%).

Finally, while resources scar-city drives change in the Negative Balance scenario, technological change and innovation lead the transfor-mation in the Sustainability Common Goal and Divergent Priorities scenarios. In both the SCG and DP scenarios, regulation and technology undergo the largest changes, though much larger in the SCG scenario (Technology disrupt-tion: SCG 65%, DP 55%).

## *Cheaper solar photovoltaic and energy storage technologies increase the share of decentralized systems in the 'Sustainability, Common Goal' scenario*

**Power at your feet**, by Carlos Hernández Hernández

Headlines about a particular country running for a few hours or days exclusively on renewable electricity are becoming less rare. However, one European country has quietly managed to do it every single day for years: Iceland.

A combination of hydroelectric and geothermal stations effectively removed the country's need for fossil fuel based power generation, just 0.01% of the electricity generation in 2017 [nea2017]. Yet, in stark contrast to hydropower, geothermal energy struggles to make it into the energy debate. A surprising feat for an emissions-free, dispatchable, baseload-suited, commercially tested renewable energy.

Much in the same vein that wind and solar potentials could cover all our energy needs, so does the planet's thermal energy. With a theoretical potential that for all intended purposes is infinite, the problem is how much we can economically use. Sadly, we do not really know due to a lack of geological data on many areas. However, now-viable low-temperature and EGS can be applied almost anywhere. Some reports say geothermal production could competitively generate as much as 50% of the electricity in the EU by 2050 [Geo1].

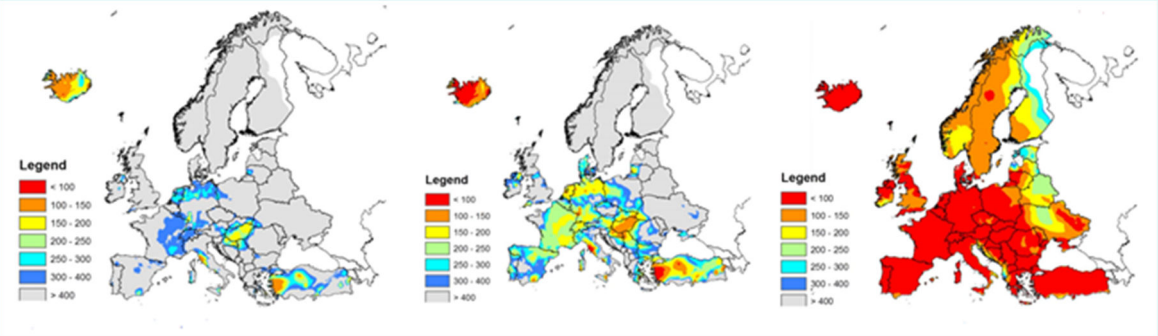



**Figure B3. Projected costs in EUR/MWh in 2020, 2035 and 2050 respectively.**
Adapted from [geo1].

This proves wrong one of the most common misconceptions, that geothermal sources are only conveniently located to provide penguins and polar bears with steamy spas. That image corresponds mainly to hydrothermal systems, which are simple to exploit, scarce and mostly already in use. However, Enhanced Geothermal Systems (EGS) exploits hot dry impermeable rocks that our soils treasure, and holds a much larger potential. EGS plants remain pilots, hampered more by the lack of funding than by technical barriers [geo2] [geo3].

The real tragedy though, is that, for now, all prospects remain more a reminder of what could be than a prediction of what will happen. We find disappointingly low figures if we explore actual projects being developed. A tendency undeterred by the fact that most studies, when asked about the insurmountable barrier preventing progress in the sector, cannot find any. We are simply not talking enough about geothermal.

So the next time you find yourself at some bar trying to save humanity from its insatiable hunger for energy, instead of aiming to reach for the stars, it may be worth your while to lower your eyes and look at the power at your feet.

# Conclusions

The Future of Energy 2018 report contributes to the understanding of what lies ahead for the global energy industry by exploring the views of the younger generations in the industry. Young leaders for energy and sustainability from 20 different countries provide us with three insights that uncover their view of the future of energy.

First, young energy professionals foresee a more demanding context for the industry characterized by a strong shift towards sustainability. Climate change is the key trend shaping the future of energy. Technological innovation will be the main driver of change that will forcefully disrupt the current regulation and energy technologies.

Second, young energy professionals envision a more decentralized and decarbonized energy system in two decades from today. However, a significant fraction foresees an equally or less decarbonized system. The role of renewable technologies, energy storage, nuclear power and smart systems are often mentioned as key determinants of the evolution of the system in the coming years.

Third, young energy professionals point to demographic changes, resource scarcity and technology breakthroughs as the key determinants for what the future of energy looks like. Respondents who underline the impact of demographic changes or undermine the importance of technology break-throughs foresee a future with divergent priorities or even a negative balance.

These insights prove young generations in the energy industry are well aware of the challenges the industry faces. The consensus around the importance of climate change and sustainability comes together with a sobering dose of realism. Young leaders in energy and sustainability acknowledge the difficulty of meeting a growing energy demand while delivering technological innovations that contribute to the shift towards sustainability. These results should build up optimism and confidence to senior energy professionals, policymakers and educators, though. The young generation in energy understand the challenges ahead and foresees a more sustainable system that they will work to realize.

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# About YES-Europe

In early 2016, a group of enthusiastic students at EPFL (Switzerland) reached out to their fellow peers across Europe and proposed that they meet to find how to make a greater impact on the World energy challenges. To their surprise, they accepted the invitation, and dozens came from more than 9 countries to attend the conference. YES-Europe was born. We envision a sustainable tomorrow and strive to achieve it by connecting future energy leaders and enabling them to make an impact now and in the future.

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YES Europe