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CHALLENGES AND OPPORTUNITIES FOR EMPLOYMENT IN THE GAS SECTOR IN THE CONTEXT OF THE EUROPEAN ENERGY TRANSITION: ENSURING A JUST TRANSITION FOR WORKERS

JANUARY 2023

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This project has received funding from the European Union under the grant agreement VS/2021/0044 – Challenges and opportunities for employment in the gas sector in the context of the European Energy Transition: Ensuring a Just Transition for workers.

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EXECUTIVE SUMMARY

The climate emergency has come to the fore of media debates and the political agenda in recent years. This stems from the rise in social and governmental concern around the wide-ranging impacts of climate change in ecosystems, economic sectors, and social conditions. One of the latest, and most ambitious, measures from the Paris agreement framework is the European Green Deal. This was launched by the European Commission in December 2019 with a view to making the EU the first climate-neutral region in the world by 2050.

The decarbonisation of energy systems and industrial sectors is one of the most important challenges of this century. The nature of the transition, and the economic and social impacts, will differ profoundly depending on sectors and activities in each region. Nevertheless, despite the differences, the transformation will impact job numbers and job types across the EU. This is particularly true in the energy sector and could lead to workers going through rapid changes or experiencing insecurity in their jobs if the situation is not managed properly.

The International and European trade union movements, along with employers' representatives, have stressed the need for a "just transition" on several occasions. The socio-economic risk must be tackled to protect workers through the energy transition. To support that, the trade union organisations initiated the development of the framework of action at the International Labour Organization and in the United Nations Framework Convention on Climate Change. In 2015, the Paris Agreement recognised that policy implementation should take into account "the imperatives of a just transition of the workforce and the creation of decent work and quality jobs". The International Trade Union Confederation has defined the just transition as a transition that "*secures the future and livelihoods of workers and their communities in the transition to a low-carbon economy. It is based on social dialogue between workers and their unions, employers, and governments, and consultation with communities and civil society*"[1]. Building on this, the ILO adopted Guidelines for a just transition[2] in order to offer a framework that countries can make use of, adopted through tripartite consensus, to guide the transition to low carbon economies.

Against this background, the gas industry will be deeply affected by the transition and have a ubiquitous role to play in it. The gas sector is seen today as offering an efficient transition pathway to phase out more emission intensive sources of energy like oil and coal. At the same time it is a sector that must also tackle the emissions resulting from the extraction, production, transport and use of natural gas.

Gas plays a very important role in the European energy mix. Prior to the war in Ukraine, natural gas represented more than a quarter of Europe's total primary energy mix, second only to oil. However, most of the gas supply is concentrated in a small number of countries (Germany,

[1] *International Trade Union Confederation*. (2022, 3 October). Building Workers' Power. https://www.ituc-csi.org/just-transition-centre?lang=en

[2] International Labour Organization. (2015). *Guidelines for a just transition towards environmentally sustainable economies and societies for all*.

United Kingdom, and Italy) accounting for half the gas supply. Those countries along with France, the Netherlands, and Spain, account for around three quarters of the European gas supply showing the significant disparities between European countries.

The technologies intended to decarbonise the gas sector have been clearly identified. Two main routes rely on switching from natural gas to other commodities: biogas (mainly biomethane) and hydrogen.

Biomethane has the advantage of being able to be transported and distributed in existing gas grids without any retrofitting. However, the decentralised nature of biogas and biomethane production will require increasing injection points in the transport and distribution network. The supply of renewable gas remains small today. The total injection of biomethane into the gas grid is less than 1% of the current demand for natural gas in Europe. However, this is expected to grow rapidly. The REPowerEU communication called for 35 billion cubic meters (bcm) of biomethane by 2030. Achieving this would entail a 35% average annual growth rate from 2022-30 - compared to 20% in the years 2015 to 2021. The targeted growth would be rapid despite remaining a small volume compared to the actual supply of natural gas. However, the most optimistic forecast predicts supply of 151 bcm of biomethane by 2050, provided the right conditions are fulfilled.

Hydrogen is another commodity expected to grow rapidly in Europe but compared to biomethane hydrogen is more challenging to transport and distribute. Most of the hydrogen produced today generates emissions during its production, but two less emitting alternatives exist: blue hydrogen produced from natural gas sing CCUS, and green hydrogen produced from renewable electricity using electrolysis. The European Union (EU) is putting a special focus on green hydrogen as the European Hydrogen Strategy considers it essential to the EU's 2050 carbon neutrality. This strategy set a target of installing at least 40GW of renewable hydrogen electrolysers by 2030 and producing up to 10 million tonnes of green hydrogen. The REPowerEU plan set an additional target of 10 million tons of imports by 2030.

CCUS technologies, used to produce hydrogen and capture industrial emissions, have also taken on new momentum in Europe. CCUS is of specific relevance to the gas sector because of the sector's expertise in the gas value chain, especially in transport and storage. Public support of this technology has varied through the years in Europe. This has been linked to the lack of high price signals per tonne of carbon dioxide (CO_2) and the termination of some projects initiated in the 2000s. But things are changing. In November 2021, the Innovation Fund allocated 1.1 Bn euro to 7 emissions reduction projects, 4 of which included CCUS. The 5th list of EU Projects of Common Interest (PCIs), also published in November 2021, included 6 pan-European CO_2 infrastructure projects. CCUS technologies are not without drawbacks and uncertainties, but also suffer from a lack of targets and support in the European legal framework. While the PCI list has supported opensource CCUS (designed to store emissions from any number of applications or industries), the EU taxonomy only supports investments in CCUS for hydrogen production, and not for its others uses.

The gas industry is therefore at a crossroads. Its future depends on scaling up different technologies, and to some extent on public support. The war in Ukraine and the subsequent energy crisis could act as an accelerator of change in the sector, but these crises have also brought uncertainty. The REPowerEU targets demonstrate the willingness of the European Commission to significantly develop green hydrogen and biomethane technologies,

nevertheless it is still unclear what is expected for natural gas by 2030. Similarly, the Ready4H2 project, a joint coalition of European gas distribution companies, claims that over 1 million kilometres of distribution grids are ready to carry hydrogen and contribute to its rapid scale up. The extent to which DSO networks are used in this way will depend on several factors but changes in this part of the value chain must be anticipated for workers.

Anticipating changes in employment, jobs and skills is a difficult task as the future of the sector will be as varied as current energy mixes and needs of end-users across Member States. The literature on the socio-economic consequences of the decarbonisation of the gas sector is unfortunately extremely scarce. Exact figures on projected and actual job profiles constitutes material information that cannot be shared easily and that loses a level of clarity when overly aggregated. An added level of uncertainty comes from the fast changing geopolitical and commercial landscape. Building scenarios on skills and employment at too high a level in this context would be a dubious enterprise.

The mapping performed by the French EDEC, one of the few other efforts to understand the employment landscape, is a useful framework in identifying the current jobs in the gas value chain. It can be used to link current jobs to technological, economic, and environmental changes. It also helps determine the impact that these changes might have on job numbers and types of work. Trends have been identified for employment, future jobs, and skills. The mapping provides evidence about the future for workers in the sector, although notably, those findings cannot be completely extrapolated or applied to other countries or the companies active in them.

The angle taken in this report (Challenges and opportunities for employment in the gas sector in the context of the European energy transition) was to build on identified existing practices and tools in the field of green transition related to employment and skills in order to develop a methodology useful for the social partners considering the challenges ahead. Some of the good practises identified in this report emphasise the role of social dialogue and social partners in ensuring a just transition. Chapter 3 provides examples of some interesting practises in the frame of a just transition and is also intended to be used by the social partners as references.

The methodology in chapter 5 is built on the examples identified above and inspired by/from the work of the French EDEC as it delivers what we think is an essential approach for the social partners of the gas sector. This goes beyond a “broad strokes” European level approach, to consider the national level as well. Given the vast challenges at stake, it is crucial to work to anticipate outcomes to deliver a just transition at as granular a level as possible. This methodology puts social dialogue at the heart of the tools available to ensure a just transition. It is comprised of five steps, each of them relying on the fruitful cooperation of social partners:

1) Adopting a methodology built with the social partners to guarantee its effectiveness and adherence.
2) Carrying out an inventory of jobs and skills in each European country.
3) Building scenarios for the evolution of the gas sector according to national and also local specificities.
4) Identifying future changes on jobs and skills needs.
5) Building career paths and identifying business bridges within the sector and with the outside world.

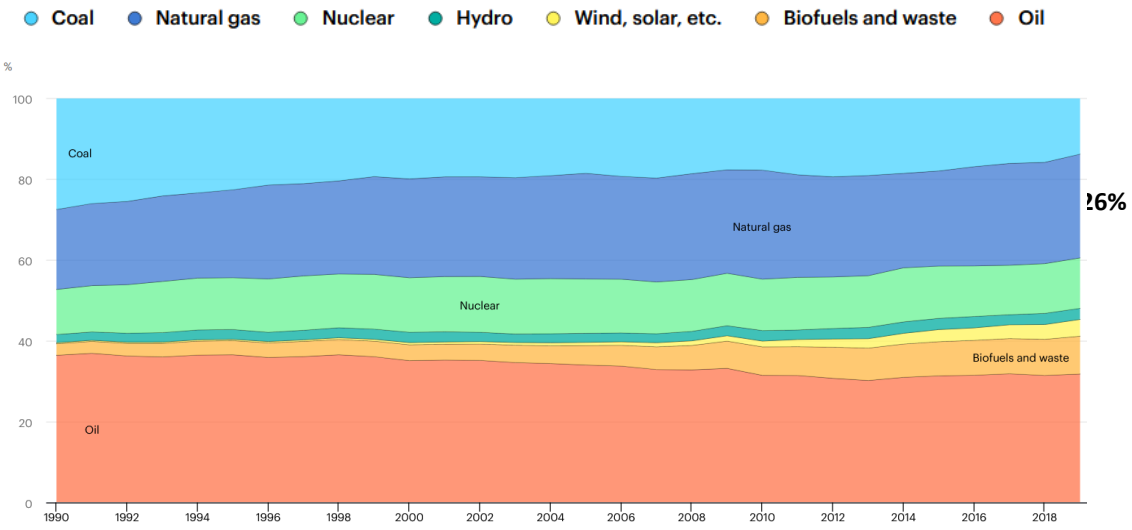
The steps outlined above are similar to the methodology we have adopted and could be repeated at national and company level for ever more granular recommendations. This report has additionality benefited from the feedback obtained during a workshop held in spring 2022.

Delivering a just transition for workers will be no mean feat given the challenges ahead. Adaptable tools for anticipation, monitoring, solid social dialogue and collective bargaining are crucial to achieving it.

>>1 AN INDUSTRY AT A CROSSROAD

Through recent decades, the gas sector has played an increasingly important role in Europe's energy mix. Its share in the continent's energy supply went up from a fifth to a quarter between 1990 and 2020. In the European Union (EU), most gas supplied is natural gas (95% of the total[3]). Around 40% of the EU's total residential space and water heating demand, and 30% of its cooking fuel demand, is currently met by natural gas. Gas powers 20% of total electricity generation and meets 25% of industrial demand, playing a significant role in sectors such as chemicals, textiles, and food production[4].

Europe's Primary Energy Mix (%) in 2019

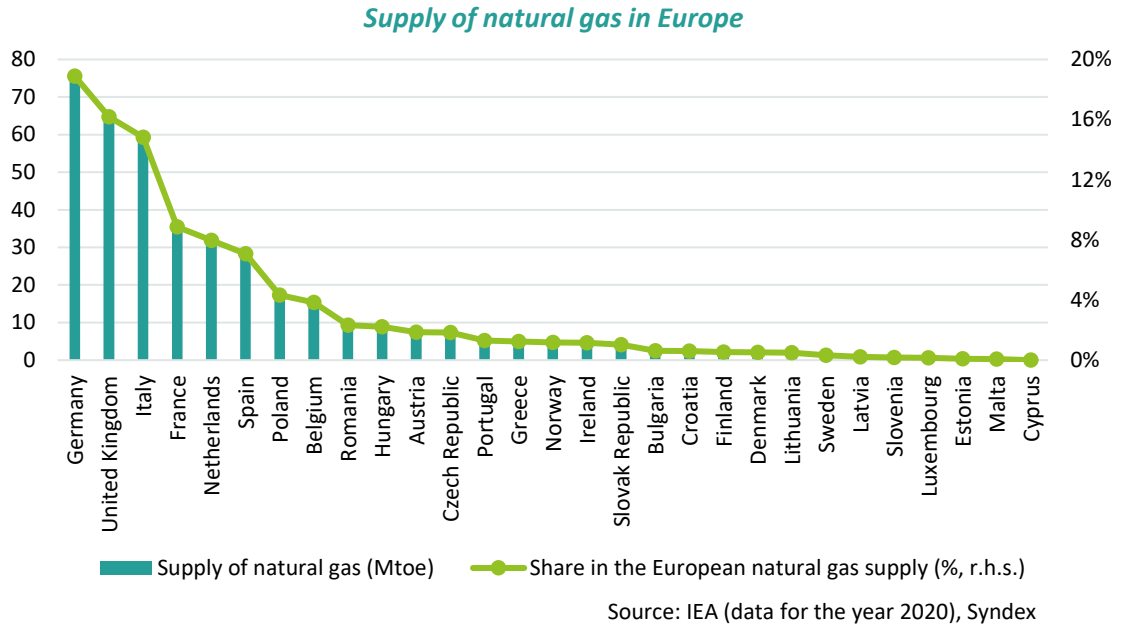


Although gas plays a key role in the energy mix of most European countries, a small number of countries account for most of the gas supplied in Europe. In terms of natural gas, International Energy Agency (IEA) data shows that the top three European suppliers — *Germany, United Kingdom, and Italy* — account for half of the continent's supply[5]. The top six, including France, the Netherlands, and Spain, account for about three quarters; and the top nine, including Poland, Belgium, and Romania, about 85%. The individual share in the remaining countries (20 out of the 29) is less than 2% each.

[3] The remaining 5% are manufactured gases (produced from other fossil fuel sources) or renewables gases (biogas, biomethane, green hydrogen…).

[4] International Energy Agency (IEA), *World Energy Outlook 2022.*

[5] Europe refers to the European countries in the scope of the study: EU, United Kingdom, and Norway.



Source: IEA (data for the year 2020), Syndex

Regardless of whether European countries are major gas suppliers or not, almost all of them heavily rely on imports to supply gas (see graph below):

- At EU level, according to European Commission data[6], net imports account for more than 90% of available natural and manufactured gases for 20 countries out of 27. Among the top suppliers, the Netherlands and Romania are the countries least dependent on imports (producing more than 80% of their own gas). Within the EU, Denmark is the only net gas exporter.
- Outside of the EU, the United Kingdom and Norway have two very different profiles. According to Cedigaz data[7], the United Kingdom imports more than half of its current consumption, whereas Norway is the top European net exporter and is among the top three exporters globally: it exports almost all its production abroad (98%).

1.1. A SECTOR AT THE CENTRE OF THE ENERGY TRANSITION

Aside from the war in Ukraine and its impact on the sector, the gas industry is seen as a key sector in achieving the energy transition from an economic point of view.

Natural gas produces less CO_2 at the point of combustion than coal or oil. Generating electricity with natural gas produces less than half the greenhouse gas emissions of coal, and up to a third less than oil[8]. Compared to coal and oil, natural gas offers industries significant reductions in

[6] These are historical data used by the Commission to assess the impact of the energy transition (see chapter 4).

[7] Cedigaz, *The global gas market edition 2020.*

[8] International Gas Union (2022). *Natural Gas Advantage: Facts & Figures. Sustainability.* https://www.igu.org/facts-figures/#sustainability

emissions and can generate substantial savings when switching from oil. For example, in industrial boilers, natural gas provides a 20-25% CO_2 advantage over oil or coal, and a combined heat and power application fuelled by natural gas could cut emissions by half.

Another advantage of natural gas is its capacity for storage and transport. Natural gas can be transported by pipeline or, in the case of LNG, by ship. In addition, natural gas is quite flexible, allowing, for example, gas-fired power plants to be switched on and off, providing an efficient response to fluctuations in demand. Such plants can also use increasing blends of hydrogen and biomethane for further emissions reductions as those gases are scaled up.

However, it is not all positive: methane emissions are generated along the natural gas value chain at the points of extraction, production, transport, and distribution. This influences the total carbon footprint, as methane is the second most potent greenhouse gas after CO_2. Although methane has a shorter lifetime (12.4 years compared to centuries for CO_2)[9], its impact is greater in the short term.

In the context of the long-term goal of achieving net zero emissions by 2050, set before the war in Ukraine, gas generation continues to increase in the short term, but is expected to start falling in 2030[10]. Natural gas is more resilient to the decarbonisation process than coal, precisely because of its use as a substitute for coal. Unfortunately, supply disruption and price volatility are slowing down the transition from coal and oil to gas. Moreover, existing gas-fired power plants need to be retrofitted with CCUS technologies or co-fired with low-carbon fuels such as hydrogen or biomethane to achieve net zero by 2050.

In 2030, it was estimated that gas will account for 17% of total electricity generation in the future (compared to 25% in 2020), as the share of renewables is expected to increase by more than 60%. Furthermore, by 2050, the share of unabated natural gas is estimated to fall to 0.4%[11] This is also because natural gas will be replaced by its decarbonised options (biogas, biomethane, blue hydrogen and green hydrogen, natural gas with CCUS and synthetic fuels). Of course, those estimations are now called into question by the consequences of the war in Ukraine (see chapter 1.3). The war has significantly impacted the supply and demand of natural gas, and these changes could be permanent if, for example, heavy industries move outside of Europe. The ever-changing geopolitical situation makes it difficult to assess the future evolution of gas demand over the next 10 to 30 years. However, this does put increased pressure and urgency on the EU to reduce its dependence on Russian gas.

1.2. SEVERAL TECHNOLOGIES AIM AT THE DECARBONISATION OF THE SECTOR

Two complimentary paths aim at decarbonising the sector. The first relies on a new source of gas supply: biomethane (and more generally biogas). The second is centred around the

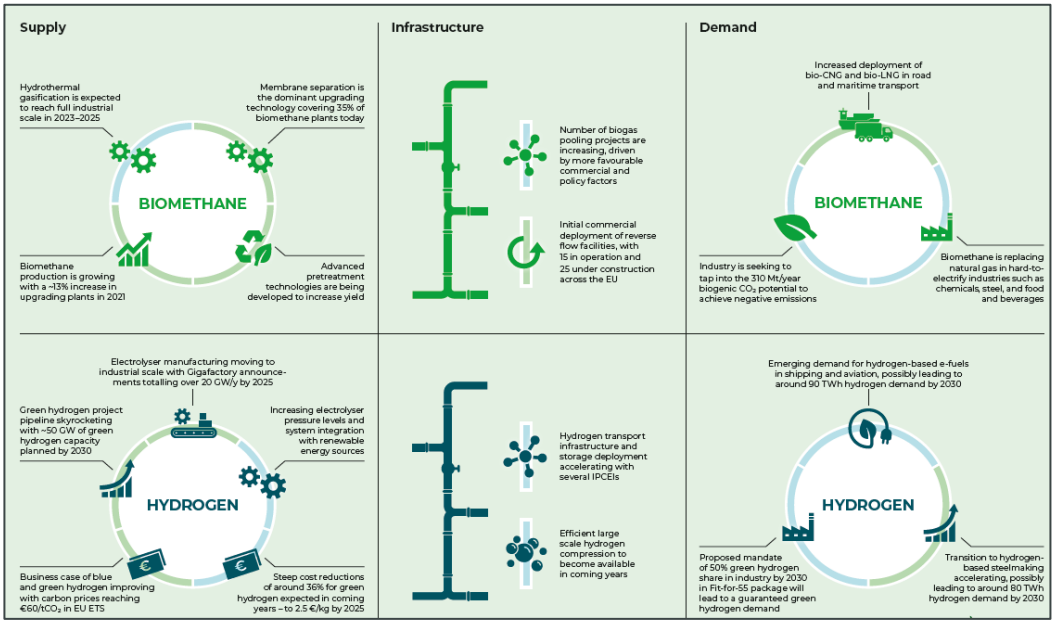
[9] International Gas Union (2022). *Natural Gas Advantage: Facts & Figures. Sustainability.* https://www.igu.org/facts-figures/#sustainability

[10] European Union Agency for the Cooperation of Energy Regulators (2021, 20th December). *ACER and CEER welcome the new gas decarbonisation legislative proposals with some recommendations*. https://www.acer.europa.eu/news-and-events/news/acer-and-ceer-welcome-new-gas-decarbonisation-legislative-proposals-some-recommendations

[11] United Nations (2015). *Paris Agreement.*

development of another commodity, hydrogen. Both these paths have an impact on the sector's infrastructure, technologies and skills needed in the future.

Key-trend in biomethane and hydrogen in Europe.



Notes: Green: confirmed trend; Blue: emerging trend is developing.
Source: Gas for Climate & Guidehouse (2021, December).

RENEWABLE GASES

Renewable gases offer a significant range of potential net emission reductions relative to natural gas. Best practice could reduce emissions by more than 80%, and could even provide a net negative balance, because of the possibilities to capture and use methane that would otherwise have been released into the atmosphere.

These gases could have different functions in a decarbonised energy system, providing:

- Storable renewable energy.
- Heat to buildings that already have connections to the gas grid.
- High-temperature heat and feedstock in energy-intensive heavy industries.
- Energy-dense fuel for heavy and long-distance road and maritime transport.
- Feedstock for synthetic paraffin for aviation.
- Cross-sectoral benefits in terms of waste management, the promotion of biodiversity, negative emissions and the diversification of rural economies.

BIOMETHANE

Despite all the advantages mentioned above, the total global production of biogas and biomethane represents only 1% of the world's natural gas production. More than 50% is concentrated in certain European countries, and 25% in China[12].

Biogas is a mixture of gases, predominantly methane and carbon dioxide, produced by anaerobic digestion[13] (the biological decomposition of organic matter). The International Gas Union[14] estimates that sustainable biogas could increase to about 20 times its current level, i.e. to 20% of global natural gas demand. However, this would require increasing the momentum of projects that could boost demand.

Biomethane is an upgraded form of biogas (produced by absorption, adsorption, methane filtration, or cryogenic separation) that involves removing CO_2 and other impurities, leaving approximately 50% raw biogas with a quality comparable to that of natural gas[15]. Currently, biogas plants in Europe are predominantly used to produce electricity and heat, and only a small amount produce biomethane for injection into gas grids. Although Europe has been a leader in this field, the total injection of biomethane into the gas grid is less than 1% of the current demand for natural gas in Europe. The REPowerEU plan now targets a supply of 35 bcm by 2030. The most optimistic forecast envisages the possibility of obtaining 151 bcm of biomethane from biomass sources by 2050[16]. Prior to the war in Ukraine, and gas prices skyrocketing, its production costs were not yet competitive (€50-100/MWh, compared to €15/MWh for conventional natural gas)[17]. These prices are related to the scale of production and the cost of raw materials. In a bid to achieve this forecast, some countries have already established support policies. For example, France has set a target of 10% of green gases in gas demand by 2030. This has contributed to an increase in the number of biomethane production plants from 17 in 2015 to 172 in 2020, and the production volume increasing from 83GWh to 120GWh[18]. Other advantages of biomethane are that its production consumes waste and generates useful bioproducts, and that it does not require significant additional energy for its production. In light of the current natural gas prices, biomethane appears more competitive than its established counterpart.

HYDROGEN

Hydrogen can be used as a feedstock and as a fuel. It is a storable gas and has various applications in industry, transport, heating, power generation, and construction. Most importantly, hydrogen does not emit CO_2 during use. However, most of the hydrogen currently consumed in the EU is grey hydrogen, which generates emissions during its production as it

[12] International Gas Union (2021). *Global renewable and low-carbon gas report.*

[13] Typically, agricultural waste, manure, sewage and municipal waste.

[14] International Gas Union (2021). *Global renewable and low-carbon gas report.*

[15] It can also be made from woody biomass through a gasification process, but this is a less common method.

[16] Gas For Climate & Guidehouse. (2022). *Biomethane production potentials in the EU, feasability of REPowerEU 2030 targets, production potentials in the Member States and outlook to 2050*

[17] The Oxford Institute for Energy Studies (2020, March). *Decarbonization pathways for oil and gas.*

[18] Gas for Climate & Guidehouse (2020, April). *Gas decarbonisation pathways 2020-2050.*

comes from fossil fuels. Two alternatives are being considered and developed to reduce or eliminate these emissions: blue hydrogen and green hydrogen.

Blue hydrogen can be produced from natural gas, and by using CCUS technology the CO_2 emitted can be captured and stored. As such, it is a low-carbon gas. The costs of blue hydrogen are between €37 and €41 /MWh.

Green hydrogen is receiving special attention in Europe and indeed worldwide in the context of decarbonisation. The European Hydrogen Strategy[19] considers hydrogen to be essential to the EU's commitment to achieving carbon neutrality by 2050 and has set a target of installing at least 40GW of renewable hydrogen electrolysers by 2030 and producing up to 10 million tonnes[20]. The REPowerEU Plan set an additional target of 10 million tonnes of renewable hydrogen imports by 2030[21].

Green hydrogen is produced through the electrolysis of water, using a renewable energy source, and therefore emits no CO_2, making it a zero-emission gas.

European national strategies have, in recent years, developed a keen interest in green hydrogen and aim to provide support to grow its market. However, the technology has not yet been deployed on a large scale so European strategies recognise the need for blue hydrogen. This will also be instrumental in helping to increase the overall supply and demand of hydrogen in Europe.

Hydrogen deployment, especially on a large scale, will require an efficient system for storage and transport to connect supply sources to demand centres. Infrastructure needs, design and planning will be significantly affected by a number of factors. These include: demand volumes, the location of infrastructure relative to resources for producing hydrogen (renewable energy generation and CO_2 transport and storage), production technologies, and existing energy networks. Cost effectiveness will also play a key role.

The final use of hydrogen also has an impact on the infrastructure needed. End uses include producing end products like steel and chemicals, or other transportable resources such as synthetic fuel and ammonia. Hydrogen can also be the end product itself and used to fuel transport or heating). It can be transported in gaseous or liquefied form via pipelines or carriers. Ultimately, where hydrogen is produced and how it is used will depend on costs.

According to the IEA, pipelines are generally the most cost-effective option for distances of <1 500—3,000km, depending on pipeline capacity. For longer distances, mainly but not only imports and exports, alternatives such as transporting liquefied hydrogen, ammonia or LOHCs[22] by ship could be more attractive[23]. Pipelines have the advantage of being a mature technology.

Currently, Europe has more than 1,600 km of hydrogen pipelines. They are mainly located near industrial centres (refineries and chemical plants) and most of them work as closed systems owned by one large provider. Nevertheless, hydrogen pipelines are capital-intensive projects

[19] European Commission (2021, December). A hydrogen strategy for a climate-neutral Europe. COM (2020) 301 final.

[20] This would amount to only about 1% of the total energy consumed in the EU.

[21] European Commission (2022, May). REPowerEU Plan. SWD(2022) 230 final.

[22] Liquid Organic Hydrogen Carrier

[23] International Energy Agency (IEA), *Global hydrogen review 2021*.

that have high initial investment costs. High costs and risks can hinder the development of such infrastructure, especially in the face of an initial low demand.

In the short to medium term, pipelines can function as a solution by blending hydrogen with natural gas. However, there are still several technical and regulatory barriers to blending such as parameters and regulations related to natural gas quality, purity requirements of certain end users. In 2020, of the ~3.5 kt hydrogen that were blended globally, almost all were in Europe and mainly in Germany[24]. This figure accounted for close to 60% of injected volumes. In Italy, the Snam project demonstrated the feasibility of blending up to 10% hydrogen in its transmission grid (the biogas directive proposal only envisages 5% blending).

In France, the GRHYD demonstration project is testing injections of up to 20 vol% hydrogen into the natural gas distribution grid of Cappelle-la-Grande, near Dunkirk. According to the industry, such projects pave the way for developing local distribution hubs.

One solution assessed to manage the issue of the cost-effectiveness of new dedicated hydrogen pipelines is repurposing existing gas pipeline systems as dedicated hydrogen networks. The assessment of the gap between new infrastructure and converting existing ones diverge on the cost differential, but not on cost-effectiveness. The latest plan of Germany's Transmission System Operator (TSO) Association estimates new-build hydrogen pipeline costs to be almost nine times higher than for the conversion of gas pipelines. The HyWay27 study (PWC, 2021) estimates that it is four times more cost-effective to reuse existing natural gas pipelines. READY4H2, a set of joint studies from a coalition of gas distribution operators has shown that over 1 million kilometres of distribution grids are ready for hydrogen. This points to one option to reuse existing infrastructure at a local level too. For renewable gases, production will be decentralised and see increasing injections into DSO grids as a way to leverage their connections to homes and businesses.

The question of the capacity to meet demand is, however, raised in view of the many ambitions and expectations with respect to hydrogen.

CCUS TECHNOLOGY: PROSPECTS FOR ITS DEVELOPMENT AND APPLICATION

The term CCUS is generally used to refer to technologies related to carbon capture, storage, and use; however, this term can be used as a generalisation and refers to different technologies related to this carbon capture process.

[24] *Ibid.*

- **Carbon Capture and Storage (CCS)**: Processes that directly capture CO_2 emissions from "point" sources, i.e., from the use of fossil fuels or industrial processes, and the CO_2 is stored for a long period of time.
- **Carbon Capture and Use (CCU):** Processes that, after capture, use CO_2 in secondary processes, such as synthetic fuels, chemicals, and materials.
- **Carbon Dioxide Removal (CDR):** Processes that remove CO_2 from the atmosphere, rather than simply reducing the CO_2 that is emitted, combined with the long-term storage of the CO_2, resulting in negative emissions.
- **Bioenergy with Carbon Capture and Storage (BECCS):** The process of extracting bioenergy from biomass, and capturing and storing carbon, thus removing it from the atmosphere. This process allows for so-called negative emissions.
- **Direct Air Capture with Carbon Storage (DACCS):** A process to directly separate and capture CO_2 from the air to be stored, thereby removing it from the atmosphere. Allows for so-called negative emissions.

CCUS technology is seen as a complementary technology. Indeed, renewable technologies such as hydrogen and renewable energy sources are not sufficient to achieve full decarbonisation in some industrial processes. CCUS has several uses including:

- Decarbonisation of industrial sectors, particularly energy-intensive sectors, as these are most complex to decarbonise with other technologies.
- The production of blue hydrogen, to mass-produce, help grow the hydrogen economy and support the deployment of renewable hydrogen.
- The creation of negative emissions, through BECCS technologies, and even through DACCS (which is currently at a very early stage of development).
- In addition, some countries will apply it to decarbonise gas-fired power generation (such as the UK and Ireland), but the expectations are still limited due to its high costs[25].

Carbon capture is not an experimental technology, nor is it widespread. There are currently 24 commercial-scale CCS and CCU installations in operation worldwide, and they can capture a total of 0.4 Gtpa (Gigatonnes per year). As far as CO_2 transport is concerned, the technology is proven, but its scale remains limited.

IRENA, in its 1.5°C pathway[26], has calculated that global CO_2 capture and storage rates should reach about 6 Gtpa by 2040, and more than 8 Gtpa by 2050. The IEA, on the other hand, forecasts around 7-10 Gtpa. Compared to the current situation (0.4 Gtpa), the forecasts are ambitious: the amount that would need to be permanently stored per year in 2050 is roughly equivalent to the net amount of CO_2 currently captured by the world's total forests and

[25] Cornot-Gandolphe, S. – IFRI (2021, September). *Un nouvel élan pour le captage, stockage et utilisation du carbone (CCUS) en Europe.*

[26] International Renewable Energy Agency (2021, April). *Reaching zero with renewables capturing carbon.*

approximately 2.5 times the volume of oil extracted annually. The map below shows how Europe offers storage sites, mainly in the North Sea[27].

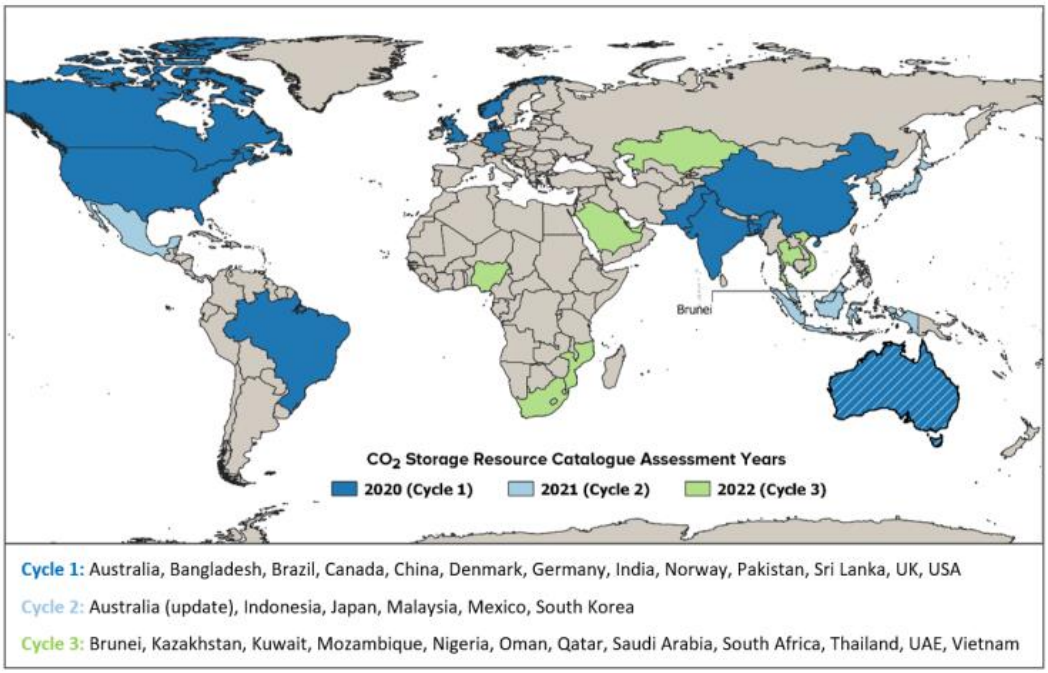


Figure 4-1: Geographic Coverage of the CO_2 Storage Resource Catalogue in March 2022

There are undoubtedly a few interrelated challenges to the deployment of CCUS technology:

- Deployment is currently limited, especially in infrastructure for transport and storage, indicating that operational experience remains limited.
- Uncertainty about the optimal use of the technologies.
- Policies and regulations developed in this area are scarce. For instance, there are no specific EU targets for scale up.
- Costs are high and often uncertain[28].

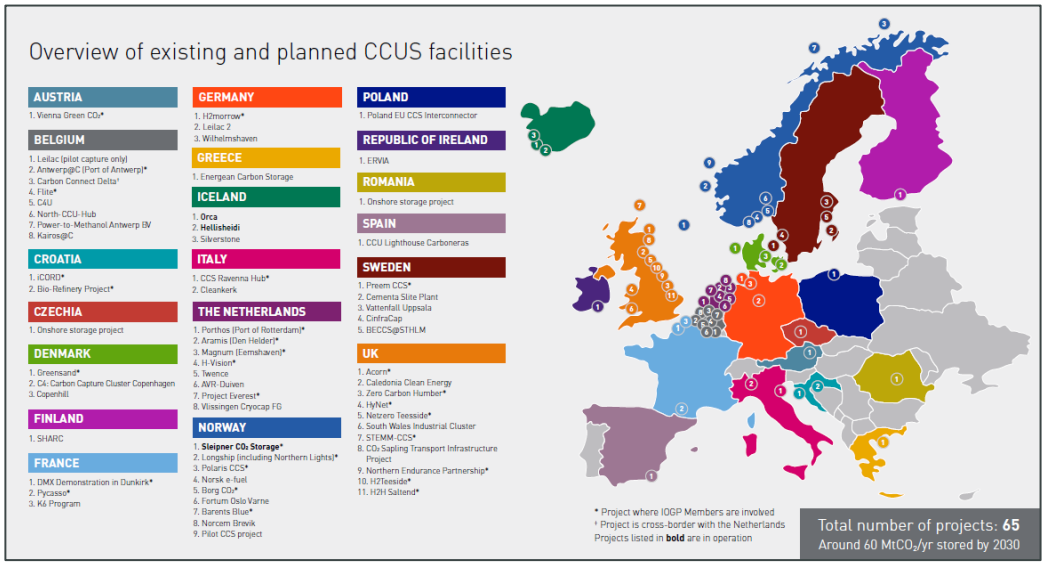
[27] Source: Oil and Gas Climate Initiative (2022, March). *CO2 Storage Resource Catalogue Cycle 3 Report. The CO2 Storage Resource Catalogue (CSRC) is an on-going programme aimed at building a global view of the commercial readiness of CO2 storage resources in key markets.*

[28] The costs of CCUS technologies are still uncertain and vary according to their application. For CCS technology they vary between 22-225 USD/tCO2. The lowest cost application is methanol production, followed by hydrogen and cement, and the highest costs are for iron and steel production. BECCS technology has a cost estimate of around 69-115 USD/tCO2, with the lowest cost application being power plants, followed by sugar cane ethanol and the highest cost application being cement production. DACCS technology is still in its early stages of development, and more research is needed to assess its potential. Source: International Renewable Energy Agency (2021, April). Reaching zero with renewables capturing carbon.

- The capture rate is not 100%.
- Financing is complicated by the lack of commercial incentives and business cases.
- At the societal level there are reservations about the use of this technology.

The European Commission considered CCUS technology as a bridging technology in its 2018 scenario[29] due to the ease with which it can be integrated into existing energy systems. At that time, the EU presented CCUS technologies as one of the pathways to decarbonisation that would enable the use of fossil fuels in the energy mix and production processes to be maintained. Nevertheless, in the communication published by the EC in March 2022 in the wake of the invasion of Ukraine[30], which directly affects the gas sector, carbon capture technologies are specifically pinpointed. They are now presented by the IEA as an indispensable link in achieving the goal of a carbon-neutral world by 2050. The EU Commission, specifically Executive Vice-President Timmermans, highlighted the need of the technologies to achieve the Green Deal in the CCUS forum in 2021. Further developments from the Commission on key aspects related to CCUS are expected in 2023.

CCUS PROJECTS IN EUROPE



Source: International Association of Oil & Gas Producers (2022, January). *CCUS projects in Europe: overview of existing and planned CCUS facilities.*

[29] European Commission (2018, 28th November). *In-depth analysis in support of the Commission communication COM (2018) 773. A Clean Planet for all A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy.*

[30] European Commission (2022, 8th March). *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. REPowerEU: Joint European Action for more affordable, secure and sustainable energy.*

1.3. THE SIGNIFICANT IMPACT OF THE WAR IN UKRAINE

Unsurprisingly, Russia's invasion of Ukraine has had a major impact on the European gas sector. Indeed, Russia is the main gas exporter to the EU: prior to the war, the European Commission estimated that imports from Russia represented 40% of EU gas requirements, far ahead of Norway (24%) and Algeria (11%).

Major supply disruption after Russia's invasion of Ukraine has left the EU's energy sector and industries in disarray. Deliveries from Russia to the EU fell by nearly 40% in the first half of 2022, to an estimated total of 60 bcm in 2022 according to the IEA. Therefore, options to substitute for natural gas are a crucial determining factor in the EU's short-term ability to adjust to potential supply shortages.

The REPowerEU Plan sets out the investments required to reduce EU reliance on Russian energy imports. Many of the measures build on the Fit for 55 package. One of the consequences of these measures, in addition to the impacts of the war, is a more rapid decrease in natural gas demand in the EU. In its APS[31] scenario, the IEA predict a decline of 180 bcm from 2021 to 2030, an average fall of 6% per year[32]. Gas use in the power sector over this period is decreasing at a faster pace than coal use did in the EU from 2010 to 2020. On the other hand, this energy shock is accelerating the EU's transition to technologies already identified as part of the gas industry's path towards decarbonisation.

BIOMETHANE

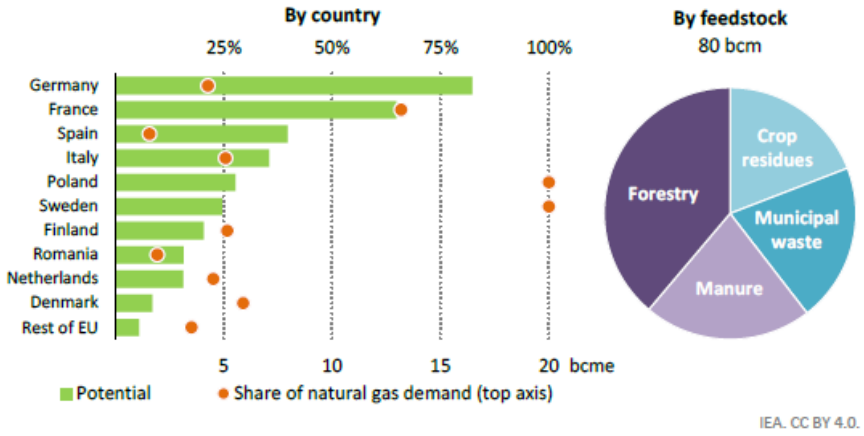
The EU is supporting the scaling-up of biomethane, and there is significant potential across the region (Figure 8.17). Around 3 bcm of biomethane and 9 bcm of biogas are currently produced (most of the latter is directly consumed in the local production of electricity and heat). The growth in biomethane production envisioned in the REPowerEU Plan would entail a 35% average annual growth rate from 2022-30 compared to 20% in 2015-21. This rapid development in the last 2 years is notable, even if the rate of growth is in the context of modest volumes.

The IEA analysis suggests that 35 bcm of biomethane could be produced in the EU for less than USD 20/MBtu. This is below the average price seen since July 2021, but well above the average of the past decade. However, it does not include injection costs into pipelines, or compression and liquefaction costs. Factors that could accelerate cost reduction and production growth include streamlined permitting procedures, factory-style fabrication of standardised biodigesters and related equipment, pooling of feedstocks, dedicated biogas financing facilities, and policy measures such as quotas, feed-in tariffs and contracts for difference.

[31] Announced Pledges Scenario: introduced in 2021 by the IEA in its analysis, it aims to show to what extent the announced ambitions and targets, including the most recent ones, are on track to deliver the emissions reductions required to achieve net zero emissions by 2050.

[32] International Energy Agency (IEA), *World Energy Outlook 2022.*

Figure 8.17 ▷ Biomethane potential in the European Union by 2030 compared with share of natural gas demand in 2021



Up to 80 bcm of biomethane could be produced sustainably in the European Union by 2030; some countries have potential exceeding their current natural gas demand

Notes: EU = European Union; Rest of EU = average of the 17 member states not shown individually.

HYDROGEN

The momentum behind the global low-emissions hydrogen sector has been significantly boosted by Russia's invasion of Ukraine. With EU member states now aiming to reduce natural gas and oil demand by increasing hydrogen use, and with higher formal targets set in the United Kingdom and elsewhere, it seems likely that major projects around the world will begin construction in the near future.

In Spain, a solar powered 20 MW electrolyser has already been commissioned at an existing fertiliser plant. In the Netherlands, another project has been approved for a 200 MW plant operating on wind power, which is due to start in 2025, and is coupled with an existing refinery with high hydrogen demand.

In 2021, the European Commission proposed that by 2030 the industrial and transport sectors in the EU should use approximately 11 Mt of renewable hydrogen per year. In May 2022, the European Commission proposed nearly doubling this to 20 Mt across all end-use and transformation sectors, with half of the total imported into the EU from other countries. To put this into context, EU industry currently produces and uses around 7 Mt per year, nearly all of it from natural gas, and its transport sector uses less than 1 thousand tonnes per year. According to the IEA, the proposal, which is calculated to displace 27 bcm of natural gas and 80 thousand barrels per day (kb/d) of oil, is too ambitious to realistically be met solely by replacing existing hydrogen sources with electrolysis. New sources of demand will also be required.

>>2 A MAPPING OF THE GAS SECTOR AS A PREREQUISITE FOR A SUCCESSFUL ENERGY TRANSITION

2.1. GREAT HETEROGENEITY IN THE EUROPEAN GAS SECTOR BUT SOME COMMON FEATURES

The gas sector is a heterogeneous one and is at the intersection of several other sectors. It brings a wide variety of activities (production, infrastructure, services) and players (from small-scale plumbers and heating engineers to large groups) together. Therefore, the scope of the gas sector can vary largely from country to country and is shaped largely by the policies and objectives at national level.

That being said, and for the purpose of our report, we have focused our analysis on the following gas value chain: Extraction & Production, Transmission, Storage, Distribution, and Trading.

Despite this heterogeneity, the gas sector across Europe shares the following series of common features that will impact the way in which future developments should be implemented:

- A very high proportion of small and medium-sized enterprises (see annex). This raises questions about the capacity of these companies to mechanisms in place to achieve the energy transition or guarantee a "coordinated" approach. Therefore, special attention should be put on these companies so that they are not left behind.
- It is at the crossroads of other industrial sectors leading to very strong competition between sectors, due to the shortage of profiles universally demanded.
- There is a very large territorial disparity in terms of the location of companies. The role of local or regional public authorities, local operators and energy communities therefore becomes key to ensuring national parity, avoiding inequalities, and supporting a bottom-up approach.
- It employs very few women and is therefore subject to issues of inclusiveness.
- It is impacted by a lack of attractiveness due to negative perceptions of fossil fuels and a lack of knowledge of professions in the sector. This is compounded by a lack the attractiveness of technical jobs in comparison to the service sector and logistics.
    - > These points raise questions about the capacity of the sector to attract new profiles and the skills needed for the energy transition. It also partially explains the difficulties in recruiting for profiles that are commonly considered to be “under pressure”: maintenance technicians and operations technicians.

2.2. A PROVISIONAL MAPPING OF JOBS AND THEIR FUTURE EVOLUTION

The diverse nature of the gas industry makes it difficult to precisely define the current jobs in the sector. For this reason, any methodology aiming to guarantee a fair transition should begin

by carrying out an accurate mapping of the current jobs and skills within the sector (see chapter 5 for further details)

However, for the purpose of our report and without prejudice to national, sectoral, or company specificities, it is advisable to consider the mapping performed by the French EDEC[33] as being adequate to identify the main jobs across the gas sector today.

THE JOB REFERENCE FRAMEWORK

Large families	Subfamilies	Trades
Technical support	Manager / Business Manager	Business Manager
	Coordinator / Technical referent	Coordinator / Technical referent
Business Development / Commerce	Business developer	Business developer
		Business Manager
		Project developer
	Sales engineer	Sales engineer
		Sales Manager
	Technical sales representative	Technical sales representative
	Support	Marketing Research Officer
Design / Engineering	Engineer / Project Manager	Generalist Engineer
		Project Manager
		Welding engineer
	Design / Engineering / Drawing / Cartography / Chemistry Technicians	Research Technician
		Draughtsman / Designer
		Design office technician
		Chemist / Laboratory Technician
		Works manager
		GIS Technician / Topographer
Operation / Maintenance Upstream	Operations Engineer / Site Manager	Site Manager
		Operations Engineer
	Operations / Upstream Maintenance Technician	Welder / Pipefitter
		Operating technician
		Mechanic
		Maintenance technician
		Operating agent
Team management	Team Leader	Downstream Team Leader
		Upstream Team Leader
Installation / Downstream Maintenance	Plumber / Heating engineer	Plumber / Heating engineer
		Other installers
	Downstream Maintenance Technician	Downstream maintenance technician / Troubleshooting
		Refrigeration specialist
		HVAC Technician
		Automatician
		Building maintenance technician
		EnRR Technician

Large families	Subfamilies	Trades
Logistics	Truck driver	Truck driver
	Logistics professions	Logistics Officer
		Supply chain manager
Quality / Control / Inspection	Method / Process / Quality Engineer	Method Engineer / Technician
		QHSE Engineer / Technician
		Process Engineer
		Energy Engineer
		Industrial Safety Engineer
	Supervisor / Inspector / Diagnostician	Supervisor
		Inspector
		Diagnostician
Relationship customers	Customer relations	Customer advisor
		Customer manager
		Teleoperator
Support	Support	Assistantship professions
		Management professions
		Communication professions
		HR Professions
		Purchasing professions
		Sales assistant
		Marketing Research Officer
Information System & Data	Computer Engineer	IS Engineer / Developer
		IT Project Manager
		IT Planning Architect
		Cybersecurity Engineer
		IoT Engineer
	Data professions	Data analyst
		Data engineer / Data manager

This provisional frame of reference could be used to relate current jobs to technological, economic and environmental changes, to determine the impact that these changes could have on jobs from both a quantitative and qualitative point of view.

A multiplicity of trends affects all the jobs in the sector. Among them, the main ones include:

- The decarbonisation of the sector and the emergence of new decarbonised processes;

[33] « Étude prospective des métiers et compétences de la filière des gaz, de la chaleur et des solutions énergétiques associées à horizon 2030 » April 2022

- The integration of renewable energies into the energy mix and new technical processes linked to renewable and low carbon gases and heating or cooling solutions;
- The interconnection of energy networks with the use of interoperable and multi-energy data;
- Energy efficiency management with a view to reducing and optimising energy consumption;
- Recent technological developments: digitalisation, data development, and the Internet of Things (IoT).

Because of these trends, the professions and skills of employees in the sector will change from a qualitative point of view but also quantitatively. Indeed, the number of some jobs is expected to decrease, whereas the number of others is likely to increase.

Jobs expected to increase in quantity:

- All IT and IT-related professions - due to the acceleration of digitalisation within the sector.
- All data-related jobs, driven by the spread of sensors in the networks, and data management needs (collection, sorting, and analysis).
- Engineering professions with a specialisation in energy or new technologies to comply with new demands aimed at reducing energy consumption.
- All professions related to the expected scale up of hydrogen, biomethane and CCUS.

Jobs expected to decrease in quantity:

- Administrative support jobs (especially sales assistants) due to the increased use of digital tools and functionalities.
- Customer service jobs could decline in number due to the automation of simple operations.
- Logistics agents throughout the value chain due to digitalisation and process optimisation.
- More generally speaking, there will be a downward trend due to higher productivity and digitalisation.

Despite these hypotheses about increases or decreases in job positions, there is no clear indication of the impact that the energy transition will have on the gas sector with regards to the number of workers needed.

On the contrary, and in terms of the impact of the profound changes in employment, tasks, skills, and job profiles, there is widespread agreement about several facts:

- The transition will require a major and sustained reallocation of labour across sectors, occupations and regions, as well as significant investment in re- and up-skilling, retaining existing workers, and attracting new workers.

- Skills development will be a particularly important challenge as new capacities will be necessary, mainly in digitalisation, decarbonisation, innovation, internationalisation, and resilience, but also in technical know-how and interpersonal skills.

As regards new skills and competencies, it is still too early to precisely determine the ones that will be needed because future developments will highly depend on European and national energy policies and technical developments (see chapter 1). Nevertheless, some trends concerning the emergence of new skill sets required to carry out the tasks, and the significant transformation of certain professions or activities, have been identified.

The French EDEC[34] has listed some of these trends as follows:

- Specialised gas maintenance will become more complex as a result of the development of IoT, sensors, increasing injection points, and the installation of concentrators.
- The development of automation, new multi-energy solutions, and the biomethane and hydrogen sub-sectors.
- Emergency gas safety operators will be confronted with new types of emergencies, for example in connection with the operational safety of installations containing hydrogen or new associated risks.
- The increase in the number of injection points and multiple sensors is leading to the emergence of jobs related to remote network operations.
- The commercial professions, and more particularly those involving customer relations, are increasingly faced with new types of customers (individuals, companies, local authorities) and situations.
- Engineering jobs are also becoming more complex and ever-changing, particularly in light of the interoperability of networks and the arrival of new stakeholders.
- In the future, design engineers will be increasingly called upon to design installations using hydrogen.

This provisional mapping of current jobs/skills and future skills must obviously be adapted to national realities but also to companies' realities. This is why a successful and fair transition needs to be supported by a sound methodology.

A multi-faceted methodology is needed, starting with mapping the current situation and the identification of the major trends, and ending with mapping the gaps between current skills and those needed in the future.

[34] « Étude prospective des métiers et compétences de la filière des gaz, de la chaleur et des solutions énergétiques associées à horizon 2030 » April 2022

>>3 BEST PRACTICES

A Just Transition is a key requirement of the Paris Agreement and one of the most important for a successful decarbonisation process. The basis for a just transition is social dialogue between employers, employees, and trade unions. For companies, a just transition is a process whereby the company plans and implements efforts to reduce emissions and increase resource productivity in a way that maintains and improves employment, maximises positive consequences for workers and local communities, and allows the company to take advantage of business opportunities. Implementing a just transition enables companies to plan, manage and optimise the operational and reputational effects of climate and business changes. From an employee perspective, the implementation of a just transition ensures there is as little negative impact as possible on jobs or even no negative impact at all.

The positive impacts that the energy transition and decarbonisation could have on employment cannot be gained without just transition plans. Negative impacts on employment can only be mitigated or minimised if all actors are involved in the development of a just transition at the corporate, local, national, and European levels.

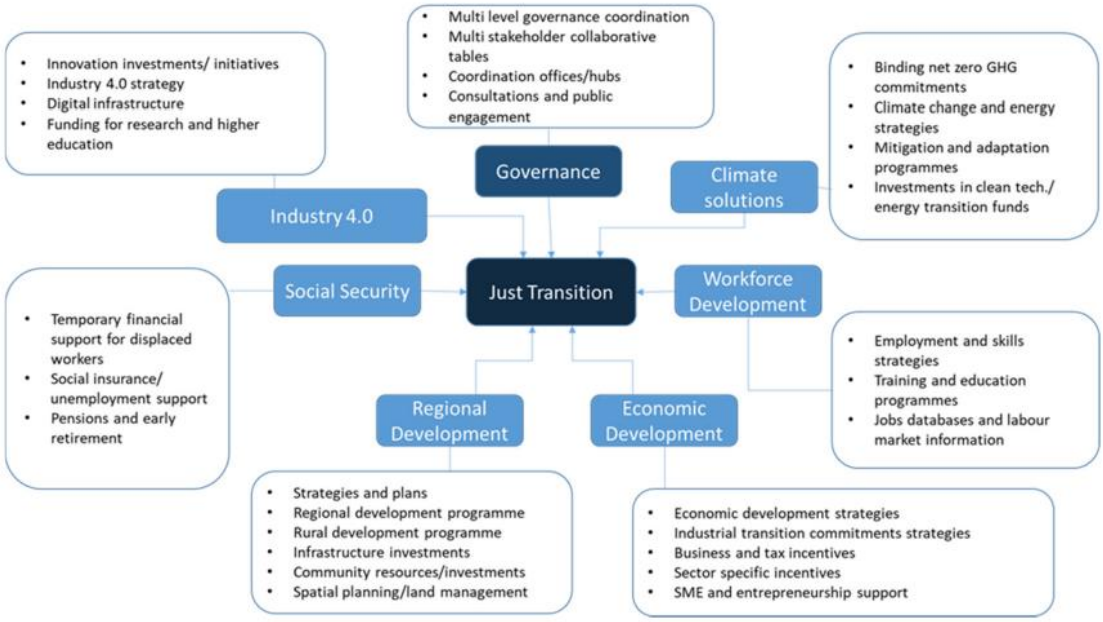
Decarbonisation of the gas sector requires a profound change in the culture of the industry, with implications for access to information, social awareness, basic education, and technical and professional training. A competitive industry depends on the recruitment of skilled labour and the ability to retain it. Therefore, it is vital to work on the Just Transition Strategy.

According to the Just Transition Centre & The B Team[35] a sound development of just transition consists of three phases:

- Engage: ensure social dialogue with workers and their unions, and potentially the government; consult broadly with key stakeholders such as communities.
- Plan: collaborate to produce a concrete, time-bound enterprise and sectoral plan for just transition, including emissions reductions.
- Enact: deliver plans and advocate for broader action to promote a just transition.

[35] Just Transition Centre & The B Team (2018, May). *Just transition: a business guide.*

A comparative study[36] of three oil- and gas-dependent regions in New Zealand, Scotland, and Denmark has revealed what kind of policies and strategies are being pursued by different national and regional governments to implement a just transition. Broken down into seven areas, these interventions can be seen in the table below:



Following on from the above, this section presents different good practices that have been developed or are being developed for a just transition. In order to serve as a model and a basis for the deployment of the methodology contained in the fifth section of this report, they are broken down from an international and European level, passing through a national and local level. They address good business practices, and finally, we provide a benchmark in relation to other sectors that can serve as a reference.

A comprehensive analysis of the best practices listed below highlights the importance of several points as prerequisites to guarantee a successful just transition:

- **The importance of allocating significant financial means and resources** as shown by the British ("North Sea transition deal") and Danish examples at governmental level. At company level the French company Engie has established a dedicated budget of €100M for training.
- **The importance of common work between all the stakeholders whether public or private**. The Italian company Enel signed a joint declaration towards a just energy transition together; as for the Spanish company Naturgy, following the closure of thermal power plants, it signed an agreement on just transition together with unions and the Spanish government.

[36] Krawchenko, T.A. & Gordon, M. (2022). *Just Transitions for Oil and Gas Regions and the Role of Regional Development Policies.*

- **The importance of setting up adequate mechanisms with regard to training and re-skilling**. Naturgy has implemented a Vocational Training Programme for Employability.
- **The need to have a strong social dialogue to obtain better outcomes** as highlighted by the ILO and the IEA.

3.1. INTERNATIONAL AND EUROPEAN LEVEL

IPIECA: the global oil and gas association dedicated to promoting environmental and social performance throughout the energy transition

Founded at the request of the United Nations Environment Programme in 1974, IPIECA remains the main channel for industry engagement with the UN.

IPIECA provides global leadership in the interaction between industry, people, and communities by acting as a unique lens to promote high standards and share best practices.

It aims to support the oil and gas industry's participation in international collaboration to transition to a lower-carbon world in a way that is fair to the workforce, communities, and consumers.

Impact opportunity 8 "thriving workforces":

- Providing productive employment, championing the health, safety, and well-being of workers throughout the supply chain.
- Encouraging businesses to:
  - Contribute to a skills base that is transferable across industry sectors in the context of the energy transition, including training and continuous learning opportunities for suppliers and local communities.
  - **Implement transition plans well in advance of transitions between different project phases, including closure, to reduce impacts on local communities, including by engaging with labour organisations and actively assisting the workforce to prepare for and access future employment opportunities.**
  - Share good practice examples to support companies' assessments of health-related risks and opportunities of the energy transition and related technological enhancements.

Recommendation to ensure a fair and equitable transition to climate neutrality in relation to the "Green Deal" and the European Social Rights Framework

This recommendation provides guidance on the implementation of employment and social policies to meet the different challenges of the green transition. Designed to be part of the European Semester.

1. **Active support for quality employment:** tailored job search assistance, training to develop "green and digital skills" and employment programmes for people in vulnerable situations. **These should combine financial measures with advisory services and be designed to be equally accessible to disadvantaged groups.**
2. **Equal access to quality and inclusive education, training, and lifelong learning**: develop up-to-date information on the skills needs of the labour market and strengthen support for learning in sectors facing skills shortages. The development of inclusive, quality education and training that enables learners to acquire skills and competencies relevant to the green transition is also part of the proposed recommendations. Member States should develop stakeholder partnerships.
3. **Fair taxation and social protection systems:** propose policies to ensure that tax, benefits, and social protection systems remain fair in the context of the green transition. These measures should support those individuals and households most affected by the Green Transition, including those in vulnerable situations.
4. **Access to essential services and affordable housing**: **mobilising public and private financial support for renewable energy sources and energy efficiency.**

IEA convenes Global Commission on People-Centred Clean Energy Transitions in early 2021

The IEA brings together 30 world leaders in energy, climate, and labour, including government leaders, ministers, and leading thinkers.

According to the Commission, a people-centred approach would ensure that the benefits and costs of energy system transformations are distributed fairly, protecting the most vulnerable actors. On this basis, they have developed a set of recommendations, based on recent experiences and good practices from around the world. These are intended to influence the clean energy policies and programmes of governments, financiers, investors, and international organisations worldwide, and consist of the following:

- Design transitions to maximise the creation of decent jobs.
- Develop tailored government support for communities and workers as well as a focus on skills and training.
- **Use social dialogue, robust stakeholder engagement, and policy co-ordination to deliver better outcomes.**
- Ensure that policies enhance social and economic development and improve the quality of life for all.
- Prioritise universal clean energy access and the elimination of energy poverty.
- Maintain and enhance energy security, affordability, and resilience.
- **Consider gender, equality, and social inclusion in all policies.**
- Ensure the fair distribution of clean energy benefits and avoid the risk of disproportionate negative impacts on vulnerable populations.
- **Integrate the voices of younger generations in decision-making.**
- **Involve the public by means of participation and communication.**
- Use insights from behavioural science to design effective behaviour change policies.
- **Increase the impact through international collaboration and by sharing best practices.**

The ILO developed guidelines for a just transition, providing recommendations for institutional arrangements and policy coherence, with governments and social partners as protagonists.

- Enter into agreements for the implementation of economic, social, and environmental policies, including with a view to achieving the SDGs.
- **Mobilise funding, support and assistance, provided by international organisations, including through Decent Work Country Programmes.**
- **Discuss and analyse the results of socio-economic and employment assessments.**
- **Promote cooperation:**
    - At the international level (through initiatives that go beyond South-South cooperation).
    - At the national level (with social partners cooperating with authorities in developing, implementing, and monitoring policies in accordance with national practices).
    - At the industry level (with industries playing a key role through social dialogue, including through collective bargaining; in anticipating skills needs and employment challenges; and in designing appropriate and continuous training).
    - At the local level (with local authorities, employers, trade unions, research and training institutions cooperating to effectively integrate just transition measures into sustainable local economic development).
    - At the company level (with social partners working together to limit adverse environmental impacts and support the development of workers' skills).

3.2. NATIONAL AND LOCAL LEVEL

The UK example: "North Sea transition deal"

Through the Deal, the UK's oil and gas sector and the government will work together to deliver the skills, innovation, and new infrastructure required to decarbonise North Sea oil and gas production as well as other carbon-intensive industries.

It aims to reset the relationship between the government and the sector and represents a *quid pro quo* partnership for taking long-term action to transform the sector and deliver the energy transition.

- The sector is committed to achieving early targets for the reduction of greenhouse gas emissions from production against a 2018 baseline and the government has identified potential funding opportunities for early offshore electrification.
- **The Deal will commit to delivering investment of up to £14-16 billion by 2030** in new energy technologies, with the government delivering a business model to enable CCUS and hydrogen at scale.
- **The sector voluntarily committed to achieve 50% local** UK content across the lifecycle for all related new energy transition projects by 2030, as well as in oil and gas decommissioning. This will be supported by the appointment of an industry supply chain champion who will support the coordination of opportunities with other sectors.
- Achieving a 60Mt reduction in greenhouse gas emissions, including 15Mt through the progressive decarbonisation of UCKS production over the period until 2030.
- Supporting up to 40,000 direct and indirect supply chain jobs in decarbonising production and the CCUS and hydrogen sectors.
- **Government investment of £6.3 million in the Global Underwater Hub, and a further £2 million to develop the Deal**, helping the sector to play a leading role in meeting the UK's net zero ambitions.
- **Supporting the government's prompt payment initiative by championing the Prompt Payment Code.**

The Denmark example: the first country in the world to commit to phasing out oil and natural gas by 2050 and Just Transition project

In 2021, Denmark cancelled all future oil and gas tenders and set the end date for the industry in 2050. This decision is estimated to cost DKK 13 billion in public revenues and will affect 10,000 jobs, as well as 16,000 indirect jobs.

Most of the jobs in the sector are in the Esbjerg region (southwest Denmark). However, good practice during the transition aims to enable this region to remain the leading producer of wind energy and other renewables.

This will take advantage of transferable skills:

- The vast majority of those currently employed will move to employment in the renewable energy industries.
- A portion of the existing workforce that is close to retirement will be offered early retirement.

An estimated 50,000 additional jobs per year will be created to meet renewable energy needs by 2050.

Government interventions have focused on securing significant investments in sustainable energy research and innovation, in transitional infrastructure for export, and in creating an effective regulatory environment.

- **The 2020 gas phase-out agreement included a commitment of DKK 90 million to support the expansion of the port of Esbjerg as a large-scale offshore wind energy hub.**
- The municipally owned port authority, in collaboration with the United Federation of Workers in Denmark is introducing an "Offshore Academy" to support education and training in renewable energy and related industries.

In terms of governance, the Danish Ministry of Environment and the Ministry of Climate, Energy, and Supply are coordinating just transition policies and there are close working relationships with companies and trade unions to support it.

In addition, the "flexicurity" model facilitates the hiring and firing of workers, while protecting their financial security through a strong social and employment support system.

3.3. COMPANY LEVEL

ENGIE: European labour relations agreement

A collective agreement was signed in 2016 with EPSU, IndustriAll Europe and FETBB: the European social agreement is imposed as a minimum base for all the companies of the ENGIE group. It cannot replace more favourable existing conditions.

It is built upon 4 pillars:

- Training and career development: **a dedicated budget of €100M** for training, target for the number of people trained, mapping of sensitive occupations, an annual training plan agreed with staff representatives without forgetting he establishment of a School of Energy Transition.
- Social guarantees: during any reorganisation, a social diagnosis is systematically carried out with the trade unions.
- Support for voluntary mobility: in the event of special training, the payment of additional costs. In the case of specific situations (rare skills, unattractive employment area, etc.), financial incentives (bonuses and others) are strengthened by the agreement.
- Cases of restructuring: the employee will be offered 3 jobs, a bonus equivalent to 1 month's gross salary (in the event of geographical or functional transfer), coverage of expenses related to the transfer, other support: help in finding a job for the employee's spouse, etc.

ENEL: Inclusive bargaining protocol - status of the person

Enel and Filctem-Cgil, Flaei-Cisl and Uiltec, have signed a protocol setting out a framework of labour relations in the context of the twin digital and climate transition. Most importantly it extends to cover suppliers and subcontractors.

The protocol focusses on three areas:

- **well-being, participation and productivity**: promote the protection of dignity at work, inclusiveness, the measurement of productivity taking into account the human factor, work-life balance and flexibility, as well as the construction and safeguarding of a prejudice-free environment.
- **knowledge and continuous learning:** based on a "life-long learning" model, with training and professional refresher courses, female empowerment to encourage the choice of scientific disciplines (STEM), the offer of apprenticeships and availability of external training, also providing for the planning of specific opportunities for self-training.
- **safety culture and behavior:** provides for the ex-ante and ex-post analysis of accident risks, the identification of the most innovative technologies for accident prevention, the empowerment of workers and the strengthening of the safety culture, including through the involvement of the supplier network

The following is a breakdown of the different good practices that should be developed by companies as part of the decarbonisation process in order to carry out a just transition having in mind that appropriate social dialogue should be engaged beforehand the implementation of each proposed measure.

AREA	MEASURES
Adaptation of workers' skills and abilities to the new demands of the labour market.	Carry out a diagnostic study of the training needs for the energy transition and decarbonisation.
	Develop programmes for young people for the realisation of a promotional offer of degrees and certificates of professionalism, promoting quality dual vocational training between companies and young people in training.
	Predict qualification needs and employment opportunities at different levels and design appropriate training services.
	At the local level, design and implement policies and actions that help create new industries, jobs, and social service benefits for workers and communities.
	Consider the risks that workers and communities may face over time and include options and resources to manage these risks and build resilience in transition plans.
	Align with government and other stakeholders (namely social partners) on employment resilience.
	Create decent jobs within companies and their supply chains, jobs with fair incomes, job security, social protection, rights to unionise and bargain, etc.
	Provide for retention, re-skilling, and redeployment of workers as part of company transformation to avoid layoffs.
	Eliminate or relax the requirement for industry-specific experience in job advertisements and actively welcome people with transferable skills.
	Consult with employees who have moved into roles related to new low-carbon technologies to understand which of their training has had the greatest impact and where there are gaps in order to provide enhanced development plans for future employees.
	Promote a culture of continuous learning and development.

	Include equal training and employment opportunities for women, youth, people with disabilities and marginalised groups in general.
Sectoral issues	Promote intersectoral communication to facilitate the employability and mobility of workers from sectors undergoing reconversion to sectors driving change.
	Promote the development of a Sectoral Transition Plan for Industry that identifies challenges and opportunities, job creation, and employee training.
	Promote the inclusion of training clauses for green jobs in sectoral agreements, and the inclusion of the contents in the institutions responsible for their offer.
Improve knowledge on the impact of the energy transition and decarbonisation on employment.	Present a periodic analysis of the energy transition and decarbonisation of the company and the sector in order to understand the situation, the trend, the evolution, its possibilities for employment generation, etc. Develop long-term strategies and just transition plans for workers having been agreed by social partners
	Present an analysis of vulnerabilities in specific aspects or areas in order to be able to implement anticipation policies.
	Develop quantitative and qualitative indicators to identify vulnerabilities in order to implement anticipation policies.
	Report on the progress or new obstacles of the Just Transition Strategy both in the Annual Report and periodically.
	Improve the information available to society as a whole on techniques and best practices.
	Elaborate the energy transition and decarbonisation plans with clear timetables, agreed upon and respected by the parties so that all actors can anticipate adaptation and transformation measures.
Adapt the company to the Just Transition process.	Work on diversification to incorporate new production lines and technological solutions to maintain quality employment in the same areas.
	Anticipate and find ways to maximise the positive impacts of the company's climate action on workers and communities, as well as to minimise its negative impacts.
	Integrate "just transition" into the business strategy.

3.4. BENCHMARK

JUST TRANSITION IN GERMANY to assist German coal communities in the transition

A central characteristic of the German approach to mitigating the impacts of the decline in coal production on workers and the regions is the use of integrative policies based on a combination of policy goals and mechanisms.

Their main goals can be characterised as:

- Economic diversification and reorientation.
- Workforce support.
- Social well-being and quality of life.
- Environmental remediation and protection.

Moreover, these policies have commonly employed three mechanisms:

- **Financial support for public organisations, businesses, and workers.**
- Service and assistance for public organisations, businesses, and workers.
- **Direct investments.**

Germany's six decades of experience with policies to support workers and regions affected by the decline in coal production provide five main lessons that can inform just transition policymakers in other countries:

- **Adopting an anticipatory approach.**
- Focusing on large-scale regional industrial policy.
- **Tailoring policy to local circumstances.**
- **Combining different policy objectives in an integrative approach.**

THE NATURGY AGREEMENT ON JUST TRANSITION following the closure of thermal power plants

Signed by Naturgy, **unions, and the Spanish government**, this agreement seeks to guarantee employment and economic reactivation in the areas affected by the closure of thermal power plants.

Several tools should be used, including:

- The implementation of a specific plan for each plant concerned including:
    - Plans for the relocation of workers (with a focus on workers of auxiliary companies).
    - A search for investments and collaboration in support plans to improve employability in new activities.
- **The follow-up of workers, including re-skilling and outplacement.**
- **A Vocational Training Programme for Employability**

SPAIN: one of the pioneer countries in just transition

In 2019, the Just Transition Strategy was approved. This five-year plan includes, among other tools, the Just Transition Agreements and an intervention mechanism for the most vulnerable areas of the country or sectors, i.e. the Urgent Action Plans. **A fundamental instrument has also been added, namely the tripartite agreements with trade unions and companies in the sectors concerned**, which involve these agents in the establishment of obligations and rights that allow progress to be made in the transition.

Two important tripartite agreements **have been signed in connection with the Urgent Action Plan:**

- The Framework Agreement for a Just Transition of Coal Mining and the sustainable development of the Mining Regions, 2019-2027, established between the Government of Spain, the trade unions CCOO, UGT, USO, and the National Federation of Coal Mine Entrepreneurs (Carbunión).
- The Agreement for a fair energy transition for thermal power plants undergoing closure, signed by the Government of Spain, the trade unions CCOO, UGT, USO, and the companies that own the plants undergoing closure (Endesa, Iberdrola, Naturgy, and EDP).

JUST TRANSITION FOR URBAN TRANSPORT WORKERS: international Transport Workers' Federation

10 points for a worker-led, democratic, public-led, gender-equal, and clean transition for urban transport.

- Formalise precarious and informal work: recognise the right to freedom of association and collective bargaining, extend/recognise social security and health insurance, develop a roadmap for the formalisation of informal transport workers, move towards fixed, decent and stable wages.
- Additional payment during extreme weather events.
- Guarantee employment for urban transport workers: stability and continuity during transition, including retraining and relocation.
- Pension support for workers nearing retirement.
- Health and safety rights in the face of the climate crisis: shelters for workers at platforms and bases across the city protecting them from extreme weather events, with a space to charge a phone, rest and park, sanitation; increased health coverage for illnesses related to exposure to air pollution; paid sick days.
- Democratic urban transport: incorporating workers and users in decision-making, prioritising cooperatives, union representation.
- Public sector participation: promote publicly owned operators, integrate urban transport under the public sector and remove profits from public transport.
- Technological sovereignty: workers should be familiar with and understand the data generated by the use of new technologies. Technological innovations should allow for improved working conditions, support workers during extreme weather events and provide greater stability.
- Mode shift: shift towards increased use of public transport and reduced use of private vehicles.
- Gender equality: female workers must be at the heart of the transition and provided with opportunities for employment, training and access to services.

>>4 TOOLS EXISTING AT THE INSTITUTIONAL LEVEL ON TRAINING AND VOCATIONAL EDUCATION AND TRAINING (VET)

VET[37] is designed to prepare individuals for a vocation or a specialised occupation. It is therefore closely tied to a nation's ability to increase productivity and competitiveness. Due to this national approach, VET is shaped widely by different cultural and social values.

In addition to the "classical" VET framework, the needs arising from the energy transition make it necessary to put in place specific mechanisms to ensure that the energy transition is a fair one.[38] These mechanisms are being created, tested, and implemented at different levels and some of them are listed below.

4.1. EUROPEAN LEVEL

At the European level, the issue of skills is a major one and a number of actions, programmes and initiatives in this regard have been adopted in recent years, the main one being the **Skills Agenda for Europe** which aims to "*help individuals and businesses develop more and better skills*" by means of 12 flagship actions including:

- The Pact for Skills
  - > Partnerships in five sectors (automotive; microelectronics; aerospace & defence; offshore renewable energy; and shipbuilding and maritime technology), have pledged to reskill or upskill more than 1.5 million workers.
- Strengthening skills intelligence
  - > CEDEFOP launched the expanded Skills-OVATE which offers information on the jobs and skills demanded by employers, presented by occupation, sector, and region.
- EU support for strategic national upskilling action.
- Future-proof vocational education and training (VET).
  - > Council Recommendation on VET adopted in November 2020.

[37] Cedefop (2008) offers a distinction between initial and continuous educational training (IVET and CVET): "***IVET*** *refers to general or vocational education and training carried out in the initial education system, usually before entering working life;* ***CVET*** *is defined by the area of education or training that comes in after entry into working life and aims to help people to (a) improve or update their knowledge and/or skills; (b) acquire new skills for a career move or retraining; (c) continue their personal or professional development*"

[38] *"The essential process of transition to the green economy may disrupt labour markets and will require reskilling and upskilling of workers to reduce the risk of rising unemployment, poverty and inequality"* "SKILLS FOR A GREENER FUTURE: A GLOBAL VIEW" ILO 2019

- Skills to support the green and digital transitions.
- Skills for life.
  - > Member States adopted a New European Agenda for Adult Learning in November 2021.
- An initiative on individual learning accounts adopted in December 2021 (i.e., personal accounts with training entitlements, which people can spend throughout their career on labour market-relevant and quality-assured training).

Upskilling and reskilling strategies in the automotive sector

The **Blueprint for sectoral cooperation on skills** was launched under the **New Skills Agenda** for Europe to create a framework for strategic cooperation between stakeholders to improve skills intelligence and address skills shortages.

The automotive sector was selected as a pilot to investigate **skills gaps and their potential impact on growth, innovation and competitiveness**; mobilise and coordinate key players to build a skills partnership at European level; and roll out the initiative at national level.

The result of the pilot was the "Blueprint for Sectoral Cooperation on Skills: towards a common vision on addressing SMEs' skills needs in the automotive sector: strengthening the development of upskilling and reskilling strategies".

Some of the inputs, conclusions and recommendations could also apply to the gas sector.

4.2. NATIONAL LEVEL

The French government has established the "Collective Transition Scheme", consisting of a number of initiatives regarding training as a means of securing employment, but also as a means of facing the challenges related to energy transition and the subsequent transformation of jobs, skills and competencies.

FRANCE: "COLLECTIVE TRANSITION" SCHEME

The "Collective Transition" scheme enables employers to anticipate economic changes in their sector and to support their employees in retraining for a promising job in their employment area.

Collective Transitions aim to respond to two issues: the need for professional retraining in sectors facing major changes, and the maintenance of skills in the territories. **These issues could appear to be essential and common to many European countries.**

The main aims of the mechanism are:

- The mobilisation of numerous actors (from the employee to the State, via companies) with a stabilised link between "territorial platforms".
- There are several steps to follow in order to benefit from these aids:

- Identification of the company's difficulties.
- Identification of vulnerable jobs, with a major role for trade unions, which can participate in this identification, particularly in order to include these vulnerable jobs in the job and career management agreement (GEPP) and to avoid abuses and omissions. Reflection on potential reception channels with **a territorial approach in** order to allow reconversions within the same catchment area to limit the need for people to move and the related personal and family impacts.
- Implementation of the Transco mechanism with a contract between the economic stakeholders, the construction of a professional reconversion project for the eligible employee[39] and their departure for training[40].

At the end of their training, employees have the option to return to their job or an equivalent position in the company, but they can also choose to move into the sector related to their retraining.

This regionalised approach in France seems to us to be transferrable to all countries with a decentralised administration and local actors capable of diagnosing the state of employment.

FRANCE: THE COMMITMENT TO DEVELOP EMPLOYMENT AND SKILLS (EDEC)

The commitment to develop employment and skills (Engagement développement de l'emploi et des compétences, EDEC) is an annual or multi-annual agreement concluded between the State and one or more professional organisations or branches.

These agreements are aimed at implementing a **negotiated action plan** in order to **anticipate the consequences** of economic, social and demographic changes for jobs and skills and to adapt training and qualifications to these changes as a tool for preventing a professional change in a given sector.

Their purpose is to **promote projects aimed at securing, maintaining and developing employment and skills in professional branches, sectors of activity, industries or territories weakened by economic change, which need to be supported or which are the subject of priority public actions.**

The question of territories appears to be an essential issue for employment.

EDEC has several objectives, namely:

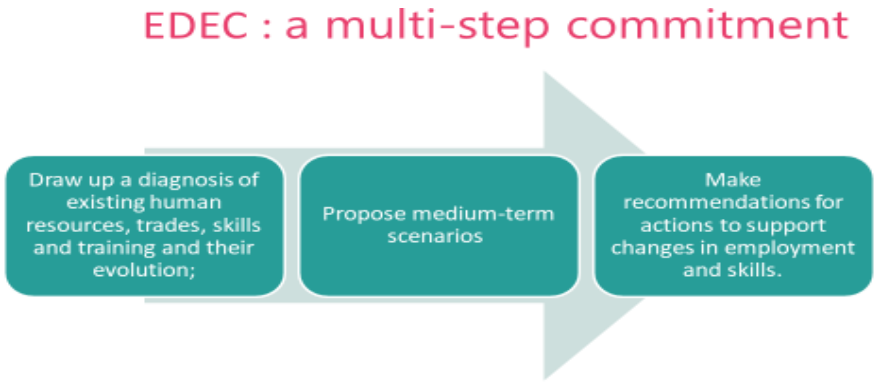
- Contributing to the realisation of prospective studies allowing the evolution of professions and skills to be anticipated;

[39] In addition to being a volunteer, the employee must meet several conditions.

[40] Training leading to certification over a cycle of up to 24 months or 2,400 hours with continued employment and remuneration. The educational and skills validation costs and the remuneration of the employees involved in these courses are paid for by the local authority.

- Designing and implementing operational actions to adapt the measures taken at the company level in terms of career management, training provisions, or professional qualifications;
- Strengthening the employability of employees, making recruitment more fluid and securing mobility;
- Anticipating the HR challenges to be met and promoting inter-company synergies to identify and pool resources and skills development needs;
- Contributing to a quality social dialogue on employment and training issues.

In a nutshell, an EDEC involves a multi-step commitment to anticipate and support transformations in employment, jobs, profiles and skills.



Among these EDECs, special attention must be given to the one established for the gas, heat and related energy solutions sector as it could be considered a best practice.

FRANCE: THE GAS EDEC FOR THE GAS, HEAT AND RELATED ENERGY SOLUTIONS SECTOR

At the end of 2021, an EDEC was signed between:

- the State,
- two professional employers' organisations :
  - employers of the Electricity and Gas Industries,IEG,
  - the Federation of Energy and Environmental Services,FEDENE),
- four of the largest French trade union organisations (CFDT, CGT, FO and CFE-CGC),
- six professional associations and unions in the gas, heat and associated energy solutions sector
  - (L'Association Française du Gaz,AFG,

- the Syndicat national de la maintenance et des services en efficacité énergétique,SYNASAV,
- the Union des Métiers du Génie Climatique, de la Couverture et de la Plomberie,
- France Hydrogène,
- France Biométhane
- France Gaz Liquides).

The Gas EDEC therefore covers more than 130,000 jobs in France and all companies in the gas industry.

This commitment is therefore made up of several stages that are relevant to the current situation, as their structuring and planning respond to the issues at stake at present. The initial shared diagnosis presents many elements that can be reused or even reproduced in other European countries, even in those parts of the value chain that are poorly represented in France.

A starting point for these industries in France

For many years now, France has been experiencing a cycle of economic and technological change which has led to major transformations in its economic, industrial and social fabric, as well as in the content of jobs and in the way work is done.

The transformation of this industry appears to have begun with the development of renewable gases (biomethane, bio-LPG, pyrogasification, hydrothermal gasification and also green hydrogen) as well as with the emergence of new uses (land, river or maritime mobility), but also through the production of renewable energy.

The gas EDEC is therefore part of the following more global objectives:

1. Providing professional branches and sectors with innovative tools to better identify short-term employment and skills needs and their medium- to long-term evolution in a context of economic, technological, social and demographic transformation;
2. Developing the skills-based approach to transforming the training and certification offer of the branches, but also to identify possible bridges within a branch or beyond;
3. Securing the professional careers of the active population over the long term, by identifying professions undergoing major changes and those in decline, and by strengthening actions to adapt skills and mobility towards the professions of tomorrow.

A targeted approach to skills, career paths and creating bridges within the sector and beyond.

The aim is to create structured, validated and mapped data that can be used by everyone, in particular the territories, professional branches, institutional players in the field of employment, employees, job seekers and young people in training.

The aim of this EDEC is therefore threefold and consists of the following:

1. Carrying out a quantitative and qualitative prospective study.
2. Presenting the evolution of needs and expectations as well as existing mechanisms to anticipate skills obsolescence.
3. Proposing local initiatives that can be reproduced on a larger scale, to facilitate access to these new trades and new skills or to encourage the reconversion of existing trades through trade bridges.

4.3. COMPANY LEVEL

At company level different examples show that the issue of skilling and professional training is one of major interest for enterprises when defining their strategies.

In **Italy**, Italgas[41] has released its Strategic Plan 2022-2028 including the issue of up- and re-skilling and professional training.

According to the financial communication of the group "The Group continues to invest in upskilling and reskilling activities by providing more than 600,000 hours of training, which will also be provided through the emerging Managerial Academy Italgas, structured on the 3 axes of the new leadership model: People, Innovation, Excellence. In addition, recruiting from the market of resources will introduce additional digital skills to make the change effective. In this context, the Italgas Digital Factory represents a strong distinctive element in the complex market of digital skills."

Also in **Italy**, Enel and Filctem-Cgil, Flaei-Cisl and Uiltec, have signed a protocol setting out a framework of labour relations in the context of the twin digital and climate transition.

While this framework agreement deals with issues such as well-being, participation, and productivity or safety culture and behaviour, it is important to highlight two key aspects:

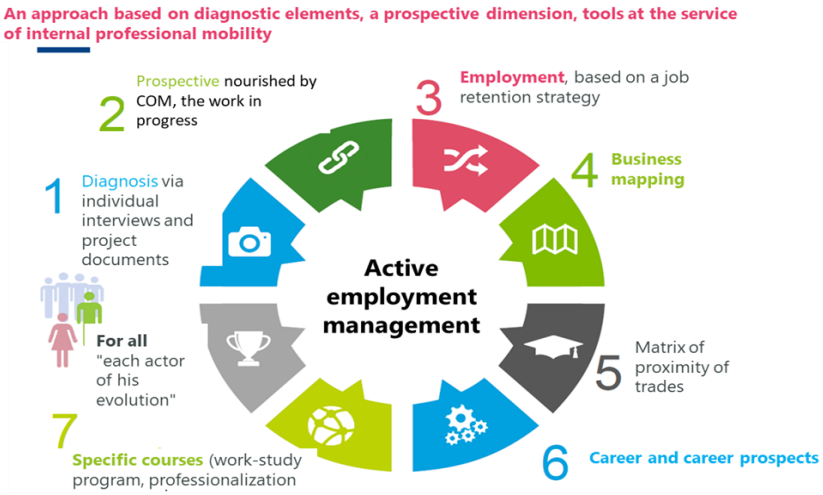
- The fact that the agreement covers suppliers and subcontractors;
- The importance given to **knowledge and continuous learning:** based on a "life-long learning" model, with training and professional refresher courses, female empowerment to encourage the choice of scientific disciplines (STEM), the offer of apprenticeships and the availability of external training, also providing for the planning of specific opportunities for self-training.

In **France**, some companies are implementing their own career management initiatives in order to develop their strategies.

[41] In 2020, Italgas carried out over 75,000 hours of training, of which over 20,000 were on digitisation issues.

Example: Company X

Following major legislative changes at National level, Company X had to review its strategy in depth resulting in major paradigm shifts. This required a profound reorganisation of the legal organisation (integration of 18 previous structures into a single legal entity), the creation of three new business structures and numerous new support departments. A geographical reconfiguration was also implemented.
This project, therefore, required the implementation of the reinforced management of jobs and skills to ensure that all the resources needed for this change of activity would be available within a fairly short timeframe. The management of Company X, therefore, implemented a major career management plan for active employment management.



The importance given by companies to the issues of training, skilling and re-skilling is also highlighted by the fact that some companies have developed their own internal training organisations:

- **GRDF, GRTgaz and the organisation "Les canalisateurs"** have created, in partnership with the French national education system and 9 CFAs, a new gas-specific training course leading to a vocational baccalaureate and the title of gas technician.

  > These two 2-year courses are mainly technical in nature but also include modules in language, general culture, communication, mathematics and science applied to the professional context.

- **GRDF** relies on Energy Formation, a training organisation attached to GRDF in 2015, which mainly trains GRDF employees (75% of its activity) but also GRTgaz (10%) and ENGIE (5%) employees and external trainees (10%), on the entire gas chain and sub-sectors (natural gas, biogas, hydrogen, CNG, etc.).

>>5 METHODOLOGY AIMING TO ACHIEVE A JUST TRANSITION

5.1. INTRODUCTION: ADOPTING A METHODOLOGY BUILT WITH THE SOCIAL PARTNERS TO GUARANTEE ITS EFFECTIVENESS AND ADHERENCE

A reflection on a transition, whatever the sector of activity, must be constructed in several stages.

The first step is to continuing drawing up inventories and diagnoses of the situation. These diagnoses will be the cornerstone of all the reflections that will be defined and carried out thereafter. It must be constructed with a clear and precise identification of the perimeter. What activities are to be taken into account? What granularity is established?

As Europe progresses through the energy transition, repeating the following steps should make it possible to identify the prospects for the sector's development. This would also make the link between the current skills and those that will become necessary as a result of the expected developments in the sector in any Member State, region or company.

THE CHALLENGE OF A SHARED DIAGNOSIS

However, it would be detrimental to construct diagnoses without establishing a few conditions that are essential for their completion. All the actions to be carried out will follow on from it. It is therefore imperative that the multitude of actors concerned are involved in its implementation and that company and employee representatives agree on the diagnosis.[42] It should therefore focus on factual elements, use a standardised and shared vocabulary and present the elements of the diagnosis in an objective manner. The weight of the various political issues should be limited in order to produce this snapshot of the current situation.

Sharing information and knowledge is therefore essential to success.

Within the framework of company X (see previous chapter), a precise inventory of jobs was carried out to identify the current situation and to determine the directions to be given to respond to the new strategy. Admittedly, the diagnosis was not co-constructed, but this is more the result of a local culture of social dialogue and a lack of resources granted to the trade unions than of a genuine desire to move forward without them. The fact remains that this new strategy and its operational implementation gave rise to numerous disputes on the part of the trade unions, which had not been able to present their conclusions beforehand. In this respect, a significant proportion of the comments made by the staff representatives proved to be very useful and helped to change the project to make it more efficient.

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[42] For example, the EDEC GAZ signed in France provides for "*sharing a common method and hypotheses for the development of a diagnosis of employment and training*". It also provides for "*the pooling of expertise and strategic visions of these actors" to build structured data, validated and presented in a mapped manner, usable by all, in particular the territories, professional branches, institutional actors of employment, employees, job seekers and young people in training.*

Best practice: ***the process should be shared****, but so* ***should the data and results.*** *They could even be made available to employees and citizens.* ***Sharing timely and meaningful information and knowledge seems to us to be essential for a successful project.***

INTEGRATE SPECIFIC DIMENSIONS FOR EACH PARTY

Since the diagnosis is intended to have shared conclusions, it must take into account the approaches of each of the parties concerned. Thus, it will be necessary to address all the issues at stake, be they economic, social, or geographical, with major disparities between countries but also within them. For example, the different employment areas do not all have the same activities, nor the same types of workforce or resources to exploit. The diagnosis will therefore have to integrate both the major dimensions that structure a sector, such as the European gas sector, and the specificities of more localised contexts.

These diagnoses must therefore make it possible to set out the major inclusive issues, to bring the problems not only to the European level but also to the level of each country, and finally to a finer scale that will have to be defined. Each country has its own particularities which should not be overlooked in the reflection and which should be considered in the final diagnosis.

The trade unions are essential partners, on the one hand, because of the interest of the employees they represent in the transition, but also as a solid vector of the transition, facilitator of the local variations or facilitator of the adhesion of the collectives and institutions.

The shared diagnosis therefore seems to us to be a relevant first step in thinking about the transition and making it a success.

The shared diagnosis can only be carried out on the basis of factual elements that serve the analysis, but also takes into account feedback on issues identified by the stakeholders. It is therefore necessary to construct a diagnosis that integrates these dimensions, particularly in the more forward-looking parts. If certain issues are not expressed or not identified by the parties, there is a risk of slowing down the development of a transition methodology or even making it impossible.

It will therefore be necessary

- to account for technological challenges in order to define the feasibility of the scenarios,
- to integrate the economic dimensions to best calibrate these scenarios,
- to take into account the geopolitical contexts (very uncertain),
- to integrate the human and geographical dimensions.

For example, the construction of a biogas production plant in a geographical area that contains neither the necessary raw materials nor skilled labour will require tactics to be developed to meet these needs.

The interest in taking into consideration all the issues of all the parties seems to push for a shared diagnosis.

The transitions of industrial sectors as important as the European gas sector also require that the obstacles to their implementation are reduced. This requires a sufficient level of buy-in to accept the constraints that this could place on actors ranging from single employees to large companies.

This support from all parties is a determining factor for success which will also make it possible to improve communication with employees, jobseekers and educational channels. Combining the communication forces of companies with those of trade unions could help disseminate messages and information widely, but also reassure employees and secure the commitments to be made (including more locally).

PROVIDE BUDGETS AND FUNDING FOR ALL THESE ACTIONS PRIOR TO THE TRANSITION ACTIONS THAT WILL BE CARRIED OUT

The diagnoses to be carried out will require substantial funding, which must enable findings to be made at European level as well as at national and territorial level. The scale must therefore be plural, and it will be necessary to identify funding to collect, aggregate and analyse the data. In our opinion, this funding is indispensable.

An illustration comes from the gas agreement signed in France, where a budget of €200,000 has been set aside solely for carrying out diagnostic studies of these sectors in France. Even if many expenses can be pooled (particularly for the steps between the diagnosis of the value chain and the identification of jobs within it), it would be advisable to provide each member of the union with the means to identify expected developments for their positions.

In our second illustration, company X has used a consultancy firm specialising in reorganisation with a budget of several tens of thousands of euros. Budget will then be allocated to employee training (on average €2,900 per employee) as well as to aid for geographical transfers on national territory (between €3,000 and €4,500 per successful transfer).

Best practice: ***provide a sufficient budget at European level to carry out the diagnosis****. Country by country variations could be considered. The quality and quantity of data available in each country varies greatly. Budget could therefore allow for significant differences between countries in order to provide greater support to those with the greatest structuring needs.*

In conclusion, for an industrial sector to achieve a successful transformation it must have effective tools, that are co-constructed with all the players, to establish a diagnosis that will serve as a starting point for everyone involved in this new process.

5.2. FIRST STEP: CARRY OUT AN INVENTORY OF JOBS AND SKILLS IN EACH EUROPEAN COUNTRY

The construction of a shared diagnosis involves several stages which are essential to its usefulness. The first is to carry out an inventory of the jobs and elements that make up the value chain of these sectors.

IDENTIFY THE LINKS IN THE VALUE CHAIN

The first step is to identify the activities. It is likely that the sheer number of activities makes it difficult to make an exhaustive record, but this step is essential to ensure that any transformation issues, actors, or opportunities are not forgotten.

All activities could be grouped into "families of activities" that would represent the entire value chain.

It will therefore be necessary to identify in each country the activities falling within the chosen scope and to integrate them into the links in the value chain.

The EDEC GAZ is carried out at this stage by identifying all the links in the value chain and then focusing its analysis on those present in France (see Annex 2).

This approach can be replicated at company level.

By identifying the internal links with the activity and prospects, the best way to evolve can be devised. Company X has established its activities and identified its growth prospects. In this way, it will be able to adapt its workforce and identify its skills needs.

Support	Expected evolution of the activity
Activities "Legal, Communication, HR and Social, Control, Logistics	→
Accounting & Finance Activity	↓
IS activity	↑

Management	Expected evolution of the activity
• Activités «**Collecter**»	↑
• Activités «**Engager**»	↓
• Activités «**Décaisser**»	↓

Interlocution (proximity)	Expected evolution of the activity
("Design", "Make", "Promote") and "Advisor" activities	→
"Assist" activity	↑

It could therefore be appropriate to consider constructing tools that can be used by the greatest number of actors to standardise data and standardise collection and analysis mechanisms.

*Best practice: **identify the major actors (those who will contribute to driving dynamics) and design the value chains**. Involve institutional and lesser economic actors to ensure that the elements identified are consistent with their understanding of their environments.*

CARRY OUT A DIAGNOSIS BY VALUE CHAIN, SECTOR AND TERRITORY

The first phase of the diagnosis requires the activities to be segmented so that they can also be analysed separately. The links in the chain are not of the same importance for each country. The challenge at European level, therefore, seems to us to be in guaranteeing that all national situations will be observed and analysed.

But this is not enough. Each of the impacted sectors must be analysed in turn and the national dimensions must be taken into account. Furthermore, in order for the final result to be the subject of a consensus, it might be necessary to delve into the study more deeply by identifying a certain number of regions or territories that are important in the eyes of all or some of the players. The regions and their administrations will be major players in the transition. They must be integrated into the study and later on granted the necessary means for the transition.

This diagnosis must, once again, devote a large space to social dialogue at all levels: European, national, territorial, and within companies.

IDENTIFY THE NETWORK OF COMPANIES BY COUNTRY, BY TERRITORY, BY ELEMENTS OF THE VALUE CHAIN

Some companies have branches in many European countries. They may be major players in those industries that will have split up part of their activities throughout the Union. It will be necessary to discuss with them how group strategies can stimulate action in countries that may experience more difficulties in the transition.

BUILD UP A REFERENCE FRAMEWORK FOR THE SECTOR'S ACTIVITIES

Once the sectors and links in the value chain have been identified, it would be appropriate to analyse the jobs that these elements comprise.

For each link, it is, therefore, necessary to refer to the companies the jobs that are occupied by collecting the job titles but also the associated job descriptions.

*Best practice: an effective principle could be the "funnel" construction. This consists of **first identifying major job families** (e.g. operations or logistics). For each of these families, **sub-families should be identified and then jobs should be listed and positioned in these groupings.***

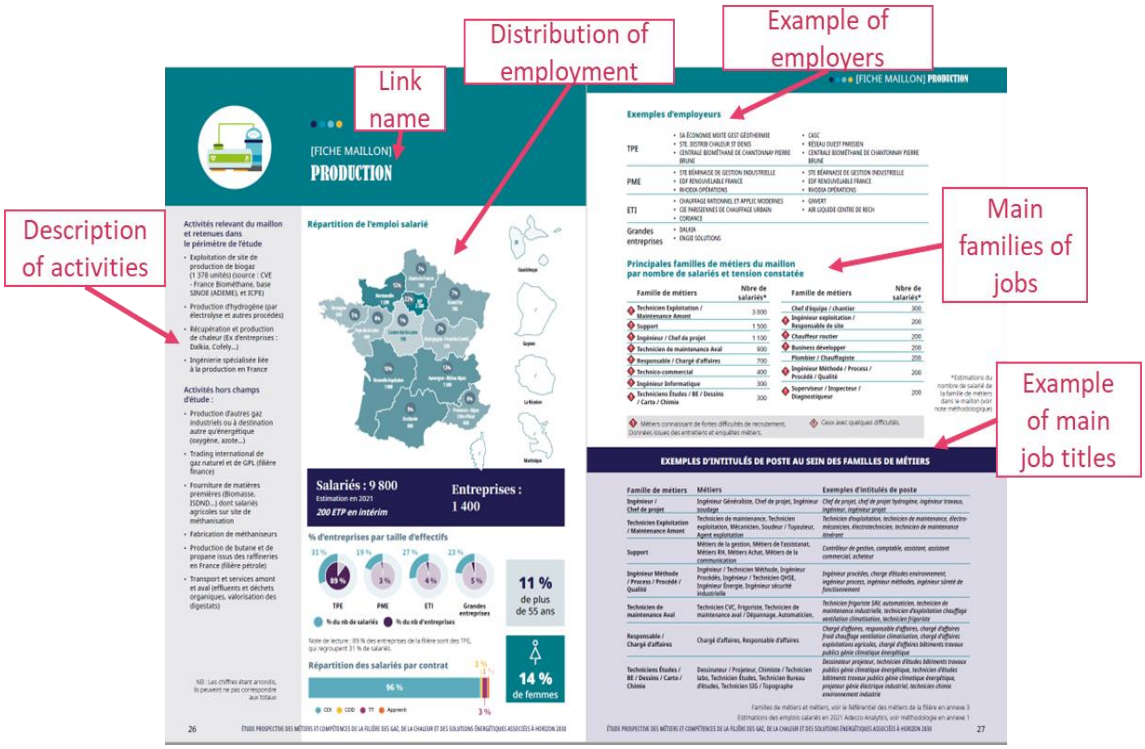
Once this stage has been completed, the jobs present in each of the links can be associated with it, giving visibility on the characteristics of the link.

These records should not be limited to the identification of jobs but should also include sociological and economic data. This should include data illustrating the typology of the populations occupying the jobs, such as information on gender, age, and seniority. For the economic data, an analysis (even a synthetic one) of the types of companies and their share of activity in the gas sector could also provide relevant insights. Finally, as the European countries are all different, national specificities could be added (the reasoning could also be oriented to include more territorial specificities).

The EDEC GAZ opted for a similar approach by producing descriptive sheets for each link in the value chain. These sheets recall the activities concerned but also present the distribution of the

activity by geographical area, with sociological and quantitative data on jobs, data describing the type of companies, and also the main families of professions present in the link.

Illustration of a link sheet in the EDEC GAZ



BUILD A MAP OF JOBS AND SKILLS

Once the links have been defined, it will be necessary to identify the existing jobs and link them to these sectors, bearing in mind that some jobs will be present in several links.

It will therefore be necessary to carry out a mapping for each link by identifying the jobs concerned, and it will also be necessary to reflect on the areas of professional mobility as well as on the existing or future bridges between these jobs.

The difficulty lies in the granularity of the analysis, since a good network is **one that makes it possible to identify identical HR issues, anticipate changes, and devise appropriate actions to facilitate them** (recruitment, training, mobility, etc.)

This approach must also make it possible to identify the trends characterising the jobs:

- **Under tension**: requiring strategic and rare skills
- **Undergoing transformation**: where the content or methods of work require new skills
- **Emerging or growing**: requiring new jobs in the short or medium term

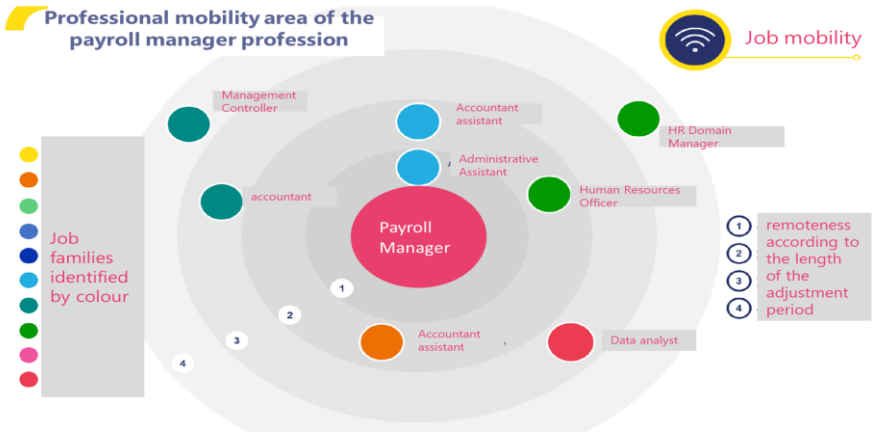
- **Declining**: exposed to downsizing or disappearance
- **Stable**: no particular developments expected
- And, of course, jobs that involve **arduous work**, such as shifts, part-time work, etc.

This step is essential as it will have several benefits:

1. Updating job descriptions for mapping (with the benefit of re-clarifying current job expectations)
2. Ensuring that no jobs are forgotten, even those not related to the core business
3. Building a comprehensive and shared record.

This mapping must also make it possible to identify the training needed, whether initial, ongoing or in situ, but also the training that would be needed to move between jobs, which concerns the notion of mobility zones and bridges between jobs.

These aspects help to identify both the jobs in the vicinity and the feasibility of changing jobs. They also indicate the degree of effort required to achieve a successful transition. In the example below, it can be seen that the transition to the job of "payroll manager" is more difficult for an employee in a "management control" position than for an employee in an "administrative assistant" position.



*Best practice: **build up these mobility zones to offer employers** (especially small companies) **and employees a good visibility on possible evolutions.** This increases the employability of employees and helps to manage recruitment difficulties.*

5.3. SECOND STEP: BUILD SCENARIOS FOR THE EVOLUTION OF THE GAS SECTOR ACCORDING TO NATIONAL AND LOCAL SPECIFICITIES

The successful implementation of a transition obviously requires an in-depth reflection on the necessary and future changes. Numerous dimensions need to be taken into account in this reflection, be they economic, social, geopolitical or ecological. It is therefore essential to consider the creation of scenarios that, starting from the current situation, will attempt to outline the possible paths for the sector in the medium term.

These scenarios of evolution must:

- **be the subject of a consensus between the parties**. They must integrate the issues and interests of all parties and take into consideration the selected links and their distribution in all European countries.
- **be coherent**, i.e. integrate the contexts of the different countries/stakeholders/ populations and be able to make the sector evolve according to these environments.
- **take into account the capacity of the public authorities** to bring about certain changes but also the capacity of companies to translate the elements resulting from the scenarios into concrete actions. Decentralisation or, on the contrary, the existence of a centralised power will have a significant impact on adherence to the scenarios and on the capacity to implement the appropriate actions.
- **evolve to integrate future events**. In this way, the scenarios selected will continue to make sense to all the actors, and the paths stemming from them can evolve to maintain their coherence and feasibility.
- **Ultimately a scenario must be achievable.**

As a scenario is by definition not likely to materialise as envisaged, it may be relevant to plan for several scenarios. Based on identified trends, this makes it possible to anticipate different developments in skills or labour requirements.

For example, it would be appropriate to put forward 3 starting hypotheses accompanied by a reflection on the probability of their realisation. These three hypotheses (nothing prevents more from being considered, but three seems to us to be a minimum) would make it possible to identify three paths for the sector over a medium-term horizon and thus define the future needs of the companies in the value chain.

*Best practice**: identifying scenarios allows us to reflect and communicate on the future of the sector**. Each stakeholder can contribute by ensuring that the issues and interests of all are taken into account. Subsequently, these scenarios will make it possible to explain and define the needs in terms of skills and manpower.*

5.4. THIRD STEP: IDENTIFY FUTURE CHANGES IN JOBS AND SKILLS NEEDS

USING SCENARIOS TO ANTICIPATE TRANSFORMATIONS IN EACH LINK

The scenarios constructed will make it possible to identify development trends for the sector, what the jobs of tomorrow will be, what the changes will be in the various links in the value chain and also what skills the companies of tomorrow will need.

Thanks to these scenarios the future of the links in the chain and the companies concerned will be identified and it will also feasible to identify the professions in decline, those for which there will be a reduced need, and those for which it will be important for employees to evolve or retrain.

BENCHMARK SKILLS REQUIRE A LARGE VOLUME AND TYPOLOGY OF SKILLS

This reflection on the jobs and skills of tomorrow will allow bridges to be built between jobs whether they are in the same link or in another part of the value chain. The challenge for employees will be to obtain guarantees and visibility on their career paths and the opportunities that the sector has to offer them.

This stage therefore aims to make an almost exhaustive reference to all the needs in terms of skills (including volumetric) for all the links in the chain. Once again, this stage must be carried out with all the players and above all with regard to the territories, whose attractiveness will be a key element in the years to come.

In this respect, in view of the issues at stake, particularly ecological ones, the question of the attractiveness of this sector must be raised, whichever scenarios are adopted. The skills required for its future operation, particularly those relating to highly technical occupations (such as engineers or specialised welders), are also in great demand in other sectors of activity which could more easily attract these populations.

The sector is undergoing a continuous and significant transformation of its professions as a result of the rulings linked to the ecological transition (objectives of lowering energy consumption and increasing the use of green energy), and new technologies.

Best practice: ***identify the job families that would be most affected by these current or future changes and strengthen the analysis of these jobs.*** *To do this, it would be advisable to interview players in the sector to gather their perceptions of future needs. These actors should be experts in the sector or more local actors with a good vision of the challenges facing the territories. At EU level, it will therefore be necessary to consider meeting or at least interviewing a large number of players.*

The provision of solid, visible, guaranteed and meaningful career paths could help to avoid labour and skills shortages, which are highly detrimental to the achievement of the objectives to be set.

The EDEC GAZ and its prospective study have made it possible to identify activities that could be subject to significant change with the addition of new essential skills:

- **Specialised maintenance** with the development of the IoT, multi-energy solutions, and new sub-sectors such as biomethane or hydrogen
- **Gas emergency operators** with new forms of emergency and facility safety issues
- **Remote operation of the network** with the multiplication of injection points and multiple sensors
- **The trade professions**, with new types of customers (individuals, companies, local authorities) and the challenges of renovation
- **The engineering and works professions** with network interoperability or network modernisation works and the increased connections linked to the arrival of biomethane
- **Design engineers** with the design of installations involving hydrogen

INVENTING THE TOOLS FOR TRANSITION

However, at EU level, there will be a greater number of problems which are also more varied. To enable everyone to move forward in the same direction (and beyond the initial shared observation), it would therefore be advisable to invent new tools for managing skills and manpower to gain visibility on what exists and to facilitate transitions through the acquisition of skills identified as being key in the years to come.

The EDEC GAZ in France has also provided for the creation of specific mechanisms. For example, the establishment of an "**industry observation portal for employment and training**". This digital portal should make it possible to have a comprehensive mapping of jobs in the sector at the French level, which would be accessible to all.

5.5. LAST STEP: BUILD CAREER PATHS AND IDENTIFY BUSINESS BRIDGES WITHIN THE SECTOR BUT ALSO WITH THE OUTSIDE WORLD

The last step to be taken is to concretely build career paths and consolidate the needs of the different links, in particular to remedy the low attractiveness of some of them.

First of all, it could be appropriate to build support and discovery programmes for the entire sector for future employees. This would make it possible to gain visibility and generate interest in these professions. These pathways could be supported by the organisations in charge of employment in each country and offered to jobseekers or employees seeking retraining via national mechanisms for the acquisition of new skills (for example, the personal training account in France).

Then, it might be opportune to build partnerships with institutions in order to promote the ecological transition to students in schools that need to be identified.

Finally, the last stage will be to build pathways within the job families identified upstream, but also with other sectors of activity that group similar trades or require skills that can be used in the sector. This is all the more important as the geographical mobility of employees may be limited and it will be necessary to be able to look for profiles in other sectors of activity.

In addition to mapping the jobs of the entire sector, it is therefore essential to be able to "reach out" to employees in other sectors. This requires the identification of declining sectors of activity, the jobs that are represented in them, and the training courses needed to bring these populations through.

Adaptation training, the duration of which could vary according to the profiles, would enable these populations to discover the gas sector in their employment areas and to acquire the necessary skills to hold a job in the future.

Concrete actions could be envisaged, such as establishing contact with national and local employment bodies and with local companies, which would quickly identify profiles or potential pools of candidates.

In addition, an analyse of national educational systems should be carried out in order to determine if training programmes need to be reviewed and whether they are in line with new needs arising. This should be done in cooperation with social partners. One example for such cooperation is the Skills 2 Power project[43] in the electricity sector, which aimed at bringing together companies, trade unions and education and training providers at sectoral level to discuss about skills needs and exchange ideas, opportunities and future challenges.

[43] Skills2Power: building skills in the electricity sector national workshops | EPSU

>>6 RECOMMENDATIONS

These recommendations could be further implemented at the European, national, regional or company level. They all follow the same logic of identifying what already exists, mapping possible future scenarios, and devising the best methods for achieving it. The list is not exhaustive and covers:

- The methodology to be implemented to understand future challenges;
- Training as a major factor in the transformation of jobs and profiles; understanding the correlation between the future needs and the resources available will invariably require concrete actions. Among these, professional training, identification of career paths and making links between jobs (such as cross-sector recognition of qualifications) will be essential;
- Social dialogue as a key element in ensuring a just transition;
- The attractiveness of, and diversity in, the sector; the sector suffers from a lack of attractiveness due to a negative perception of fossil fuels and a lack of understanding about the professions within the sector. Fostering the competencies needed for the shift towards net zero, the attractiveness of the sector must be improved;
- Connections to other sectors.

6.1. THE METHODOLOGY

MAPPING THE DIFFERENT SITUATIONS

The preliminary diagnoses are an essential element in any reflection. These must be as exhaustive and factual as possible. Choices may need to be made, such as limiting the fields of investigation for coherence and efficiency.

The diagnoses should include an in-depth reflection on jobs through the most comprehensive mapping possible of existing jobs and skills.

BUILDING COMPREHENSIVE AND REALISTIC SCENARIOS

Once a diagnosis has been made **and shared,** it is advisable to map the various medium-term scenarios of how the sector could evolve.

Here again, **social dialogue will be a decisive step**, as the feedback from local actors (institutions, companies, and staff representatives) is one of the keys to successfully constructing these forecasts.

These forecasts must also be realistic, i.e., with a significant probability of being achieved, and linked to greater challenges such as employment and the energy transition.

DEVELOPING HR TOOLS TO DEFINE THE MEANS TO ACHIEVE THE OBJECTIVES

The scenarios developed will make it possible to identify needs in terms of skills and the workforce. Based on these needs, it will then be possible to define the HR tools needed.

The development of certain tools is essential. This is the case for: competence frameworks for each job or job family; prospects for the evolution of jobs, in terms of volume or required skills; and the identification of bridges between jobs whether they are in the same family, in different families, or in different sectors entirely.

PROVIDING SUFFICIENT BUDGETS FOR EVERY STEP OF THE PROCESS

All the steps outlined require dedicated financial resources: reflecting on the future of the sector, constructing the scenarios, mapping jobs and skills, the implementation of the transition[44].

ACCOUNTING FOR LOCAL ISSUES AND SPECIFICITIES

Success is not going to be possible with a totally top-down approach such as one entirely driven by the EU for Member States' implementation. This process must account for local issues and specificities. The numerous employment areas in question have geographical, economic, and social specificities that will each require different actions and specific support. Making the approach as effective and efficient as possible, means local actions being supported, or even favoured, depending on cultural and political contexts.

6.2. TRAINING

RESPONDING TO THE CHALLENGES AROUND HYDROGEN, BIOMETHANE AND CCUS

In Europe, hydrogen is set to be a strategic energy vector in the medium term, but it is still in the scale up phase. For that reason, anticipating future needs will involve, among other things:

- Structuring relevant and clear training programmes for related jobs. These should cover a sufficient geographical area to anticipate, and best respond, to companies' needs.
- Training and/or retraining employees in both the gas sector and other sectors to capitalise on their expertise.

[44] *As an example, the EDEC GAZ has planned a global budget of €1.5M for "Understanding and analysing the existing situation" (200K€), "Federating to better support the territories in their energy transition" (€700K), "Training today to prepare tomorrow" (€560K). This budget only concerns the preparation part and does not include the actions and financing that will have to be carried out throughout the life of the project.*

DEVELOPING AND CAPITALISING ON GOOD PRACTICES IN COMPANIES

Some companies[45] allocate specific training budgets, or set up internal training centres, to ensure that their employees are trained.

Further identifying and sharing best practices in terms of budgets, organisation, and the content of training activities, would boost the development of similar initiatives across Europe.

STRENGTHENING THE LINKS BETWEEN PRIVATE AND PUBLIC ACTORS

Increased interaction between the industry (professional federations, associations, and companies) and national education systems and training institutions would:

- Support the creation of training courses.
- Develop the existing training programmes in terms of content and delivery and ensure that they stay up to date with changes in jobs, skills and companies' needs.

SETTING UP SPECIFIC ACTIONS FOR VSEs AND SMEs

Given the significant proportion of Very Small Enterprises (VSEs) and Small & Medium Enterprises (SMEs) in the gas sector, specific actions must be carried out with them to prevent them from being left behind in the energy transition. It is therefore necessary:

- To support VSEs and SMEs in formalising forward-looking employment and skills management approaches. Career paths should also be formalised and structured by drawing, where appropriate, on the best practices of large companies and Member States.
- To facilitate access to training for VSEs and SMEs.

STRUCTURING THE DIFFERENT LEVELS OF TRAINING

The process of structuring training programmes at the various levels requires a specific approach.

At company level:

- Finding a new balance between the time spent on technical training and the time spent on improving cross-cutting skills and soft skills. Ideally more time would be spent on improving cross cutting and soft skills, which include: digitalisation, digital tools, cybersecurity, project management, customer relations.
- Building training paths adapted to each profession allows employees to capitalise on, improve and develop their skills with a long-term perspective.

[45] ***ENGIE*** *has a training programme that includes ENGIE University, ENGIE Schools, and a CFA opened in November 2020, the Academy of Energy and Climate Transition Professions.* ***France Gaz Liquides*** *trains butane and propane liquid gas professionals throughout the entire value chain.* ***The Dalkia Campus*** *is both an apprentice training centre and a training organisation for professionals throughout their careers.*

At government level:

- Deploying new training courses in the field of new energies for technical job profiles.

At the cross-sectoral level:

- Accelerating the integration of training initiatives across sectors;
- Creating dedicated training courses for employees moving from other sectors (oil, coal, etc.).

6.3. SOCIAL DIALOGUE

ESTABLISHING QUALITY SOCIAL DIALOGUE AT ALL LEVELS OF REPRESENTATION

Stronger collective bargaining and social dialogue are a prerequisite for a just transition. Collective bargaining enables social partners to discuss and negotiate solutions that mitigate negative employment consequences and guarantee high quality jobs. European social dialogue could make a significant contribution to identifying the appropriate level of analysis and mobilising more local players.

It is imperative that the diagnoses are carried out jointly by all players. The processes must be inclusive to generate broad support and limit obstacles and resistance to change. Without quality social dialogue the process will likely fail. Workers' involvement, from the shop floor to strategic decision-making, is a key condition for a successful journey towards a sustainable, knowledge-based, resource-efficient, and high-performance industries.

The main actors should be identified so that they can be driving forces in the development of diagnoses and the actions that will result from them. This means that there must be strong rights to effective collective bargaining and to join and form trade unions to strengthen workers' voice in the implementation of the just transition.

Available social dialogue tools at EU level should be assessed and used where appropriate to ensure a just transition of the sector.

STEERING THE PROJECT AND ALLOWING FOR REDIRECTIONS

The war in Ukraine has demonstrated that there are unpredictable aspects that can strongly impact strategies. Strategies are devised at certain moments in time and, like a ship in a storm, it is necessary to be able to change course to avoid the reefs. It would be appropriate to use the existing social dialogue bodies at the company level (or create new ones if needed and agreed with the full involvement of workers representatives) to establish companies' just transition plans, monitor projects, and validate budgets. The social dialogue bodies should also be inspired by a quality social dialogue and include representatives of all the parties identified[46].

[46] *For the EDEC GAZ in France, a steering committee and a technical committee have been set up. The steering committee's mission is to initiate, guide and lead the implementation of the EDEC, while the technical committee's*

6.4. ATTRACTIVENESS AND DIVERSITY

STRENGTHENING THE ATTRACTIVENESS OF THE SECTOR

Strengthening the attractiveness of the sector requires several levels of communication with public authorities and people living in the EU, particularly workers and job seekers.

Attractiveness and purpose driven work are becoming increasingly important as climate issues become more and more prevalent. It is not a question of greenwashing but rather of highlighting values related to the professions, the meaning of the work, and the professional and social elements of recognition that accompany it. Remuneration and working conditions are important elements that should be considered.

Regular communications aimed at both the general public and target populations (young people and women in particular) could focus on:

- the role of the sector in the transition and increasing domestic energy production;
- the potential for job creation in response to skills shortages (technical or otherwise);
- inter- and intra-sectoral bridges for jobs that are in decline or under pressure, to attract profiles from related, declining sectors;
- highlighting the technical and technological dimensions of the jobs in the gas sector.

TAKING AN INTERSECTIONAL APPROACH TO INCLUSIVE WORKPLACES

Making the gas sector a more diverse and inclusive workplace will improve the level of diversity of thought which, in turn, will help achieve climate and social goals. On this point, it is now recognised that many people suffer from more than one type of discrimination. This means, for example, that gender inclusion cannot be properly managed without putting equal focus on anti-racism. This logic extends to ableism, homophobia, transphobia, and classism, etc. More precisely, intersectionality relates to any person who suffers from two or more types of prejudice, and who therefore stands at an intersection. An intersectional approach to inclusion in the gas sector would include steps such as:

- Giving all people an equal share of voice so everyone can steer the process of achieving a just transition.
- Addressing pay gaps with a focus on other kinds of discrimination alongside sexism.
- Communicating at all levels, including in the recruitment process and cross-sectoral efforts, with language tailored to promote inclusivity.

mission is to ensure the operational implementation and monitoring of the actions. It also has the role of implementing the process of evaluating the EDEC.

- Joint action with universities and training institutes to drive improvements in STEM preparedness and careers information.
- Incorporating diversity and inclusion objectives into performance reviews.
- Educational programmes and coaching for all stakeholders to support them through cultural change.

6.5. COMMUNICATION WITH OTHER SECTORS

Given the challenges of the energy transition, it seems appropriate to adopt a global approach to energy-related jobs, in the broadest sense. It is important to facilitate reskilling and upskilling of employees from other sectors who could fill the recruitment gaps. Employees working in the fields of electricity, petroleum, chemicals or construction, and public works could put their skills to good use in many jobs in the gas sector.

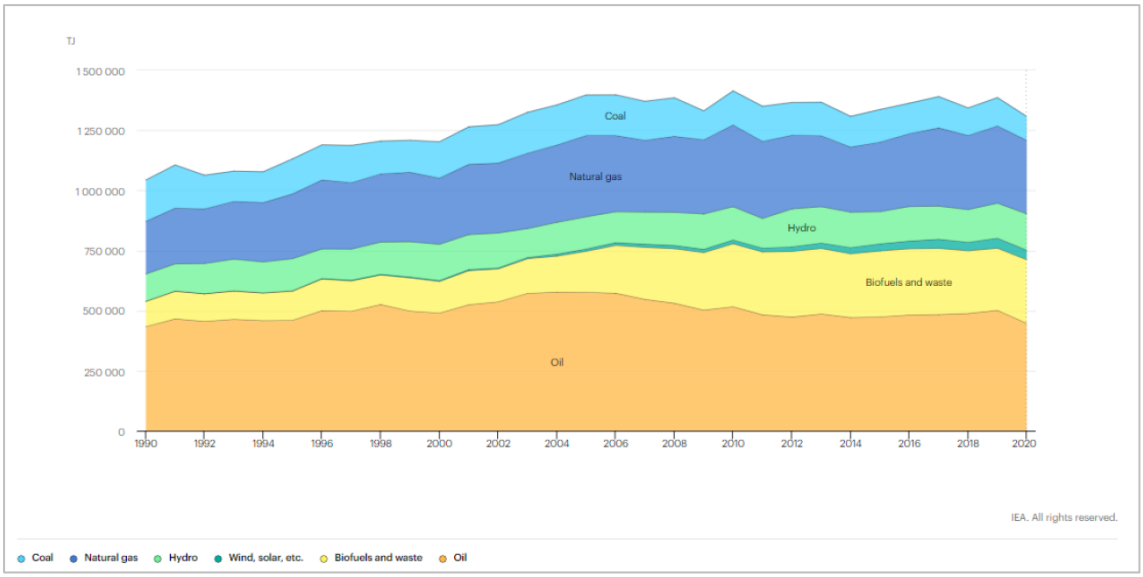
>>7 APPENDIX

For this appendix, the source for the charts is Dow Jones from the Factiva database[47]; the source for the images is Challoch Energy from IEA data[48].

7.1. AUSTRIA

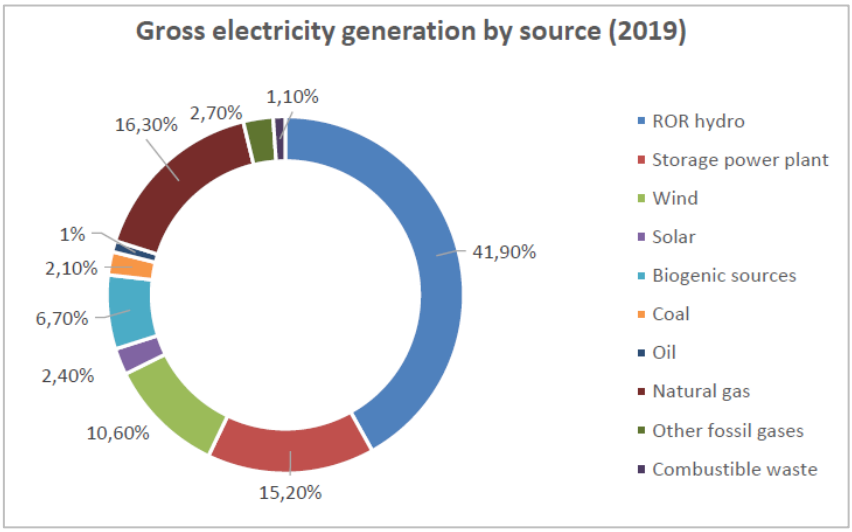
- **THE GAS SECTOR IN AUSTRIA HAS 70 157 EMPLOYEES NATIONWIDE, BUT A LIMITED NUMBER OF COMPANIES (90).**
- **THE ACTIVITIES "ENERGY WHOLESALE" AND "HEATING/COOLING/AIR TREATMENT EQUIPMENT" HAVE BY FAR THE LARGEST NUMBER OF ACTUAL ENTERPRISES.**
- **ONLY 18% OF THE ENTERPRISES HAVE MORE THAN 500 EMPLOYEES, WHILE THE MAJORITY ARE SMALL AND MEDIUM-SIZED ENTERPRISES.**
- **THE TWO MAIN GAS COMPANIES IN THE COUNTRY ARE "GAS CONNECT AUSTRIA" AND "TAG".**

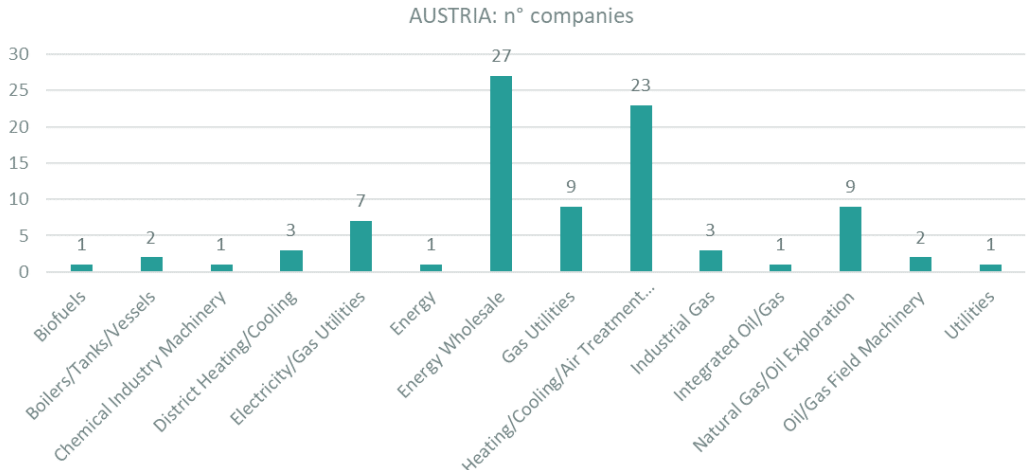
Austria: Total energy supply evolution

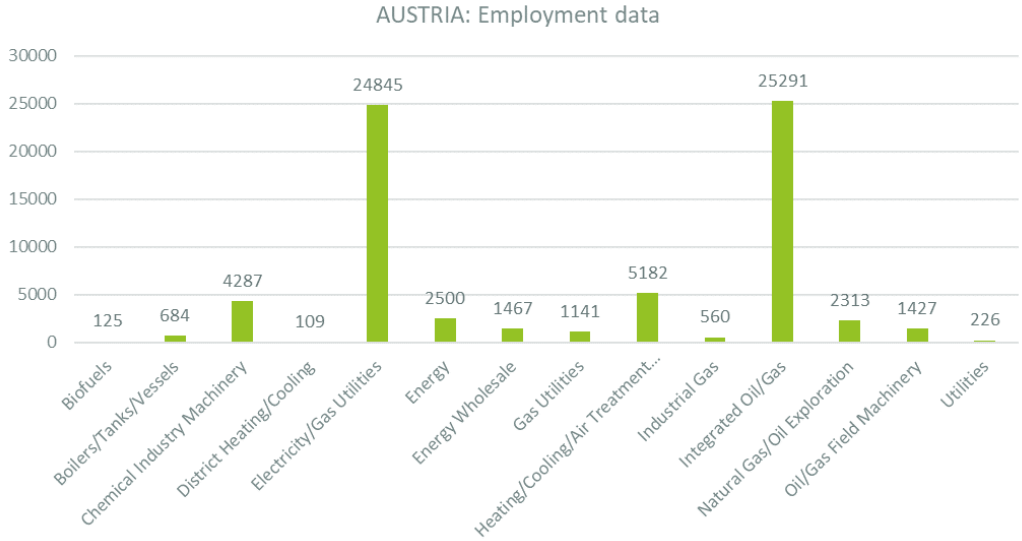


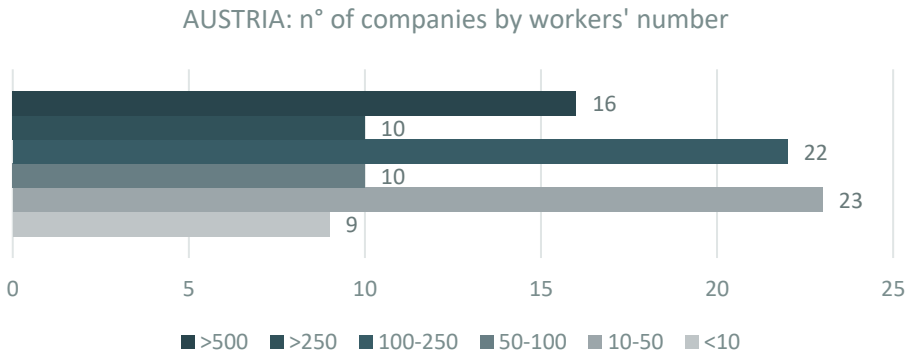
[47] The data provided by Dow Jones should be understood taking into account several issues: available data differ from one country to another, data are not available for all the listed companies, data include only global FTE and no split is available either regarding the professional status of workers, the gender, the age, the experience…

[48] Challoch Energy (2022, april). EU energy market overview Eurogas.


Gross electricity generation by source (2019)
41,90%
15,20%
10,60%
2,40%
6,70%
2,10%
1%
16,30%
2,70%
1,10%
ROR hydro
Storage power plant
Wind
Solar
Biogenic sources
Coal
Oil
Natural gas
Other fossil gases
Combustible waste


AUSTRIA: n° companies
30
25
20
15
10
5
0
1
2
1
3
7
1
27
9
23
3
1
9
2
1
Biofuels
Boilers/Tanks/Vessels
Chemical Industry Machinery
District Heating/Cooling
Electricity/Gas Utilities
Energy
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Integrated Oil/Gas
Natural Gas/Oil Exploration
Oil/Gas Field Machinery
Utilities


AUSTRIA: Employment data
30000
25000
20000
15000
10000
5000
0
125
684
4287
109
24845
2500
1467
1141
5182
560
25291
2313
1427
226
Biofuels
Boilers/Tanks/Vessels
Chemical Industry Machinery
District Heating/Cooling
Electricity/Gas Utilities
Energy
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Integrated Oil/Gas
Natural Gas/Oil Exploration
Oil/Gas Field Machinery
Utilities

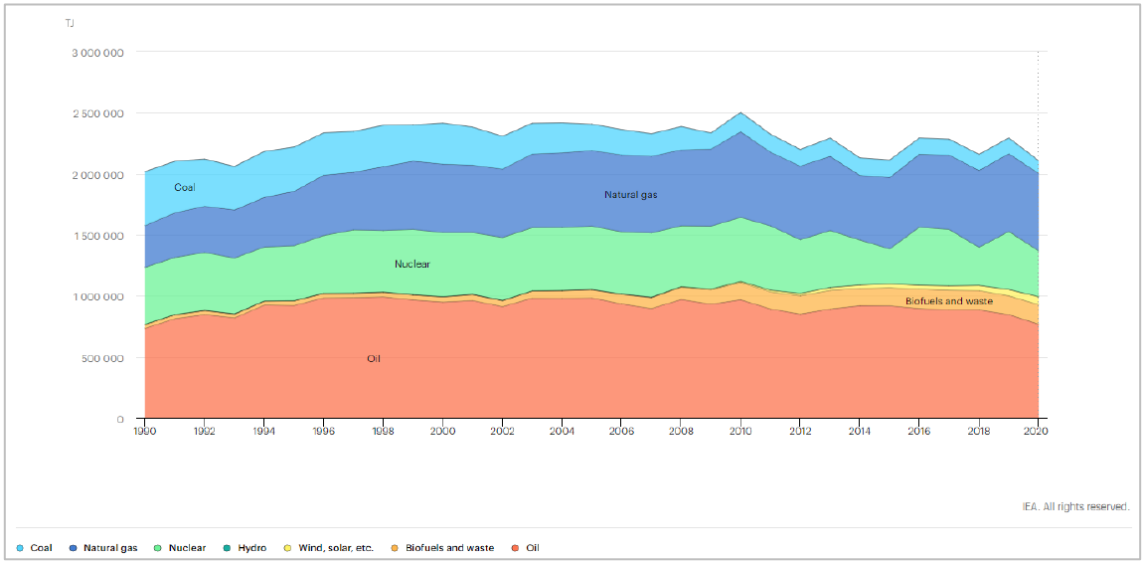

AUSTRIA: n° of companies by workers' number
16
10
22
10
23
9
0
5
10
15
20
25
>500
>250
100-250
50-100
10-50
<10

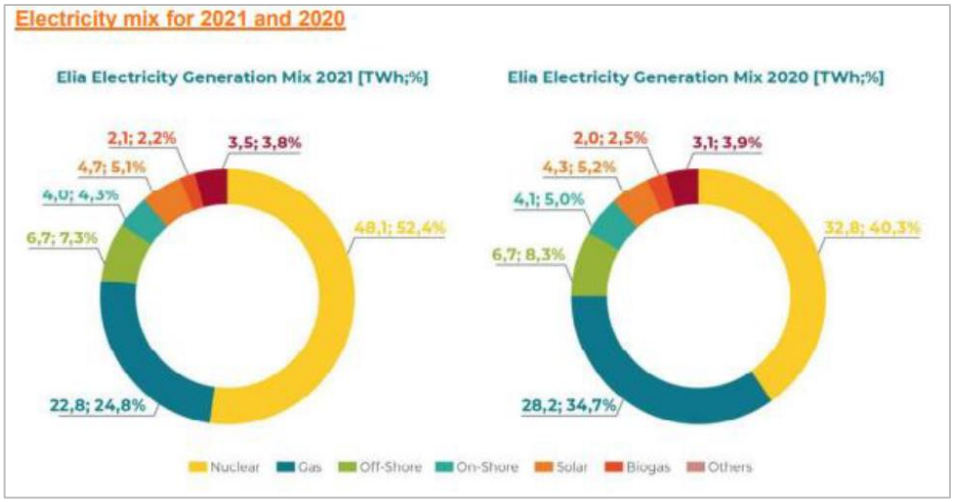

AUSTRIA: n°of companies by workers' number and activity field
30
25
20
15
10
5
0
Biofuels
Boilers/Tanks/Vessels
Chemical Industry Machinery
District Heating/Cooling
Electricity/Gas Utilities
Energy
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial Gas
Integrated Oil/Gas
Natural Gas/Oil Exploration
Oil/Gas Field Machinery
Utilities
<10
10-50
50-100
100-250
>250
>500

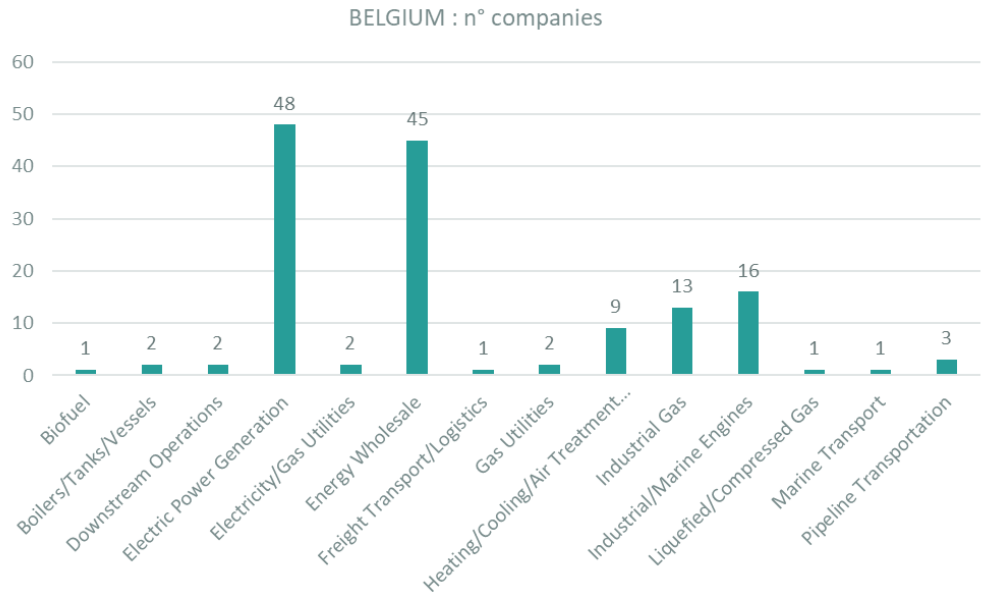
7.2. BELGIUM

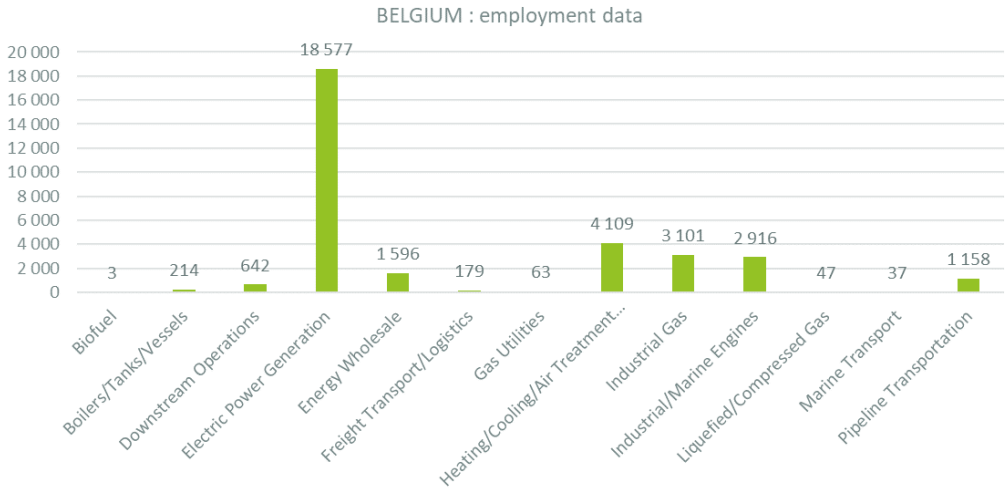
- THE BELGIAN GAS SECTOR IS MAINLY REPRESENTED BY SMALL AND MEDIUM-SIZED COMPANIES.
- "ELECTRIC POWER GENERATION" AND "ENERGY WHOLESALE" ACTIVITIES ACCOUNT FOR THE LARGEST NUMBER OF COMPANIES.
- HOWEVER, THE "ELECTRIC POWER GENERATION" ACTIVITY STANDS OUT, ACCOUNTING FOR 57% OF TOTAL EMPLOYMENT IN THE SECTOR AND 60% OF THE FEW COMPANIES WITH MORE THAN 500 EMPLOYEES.

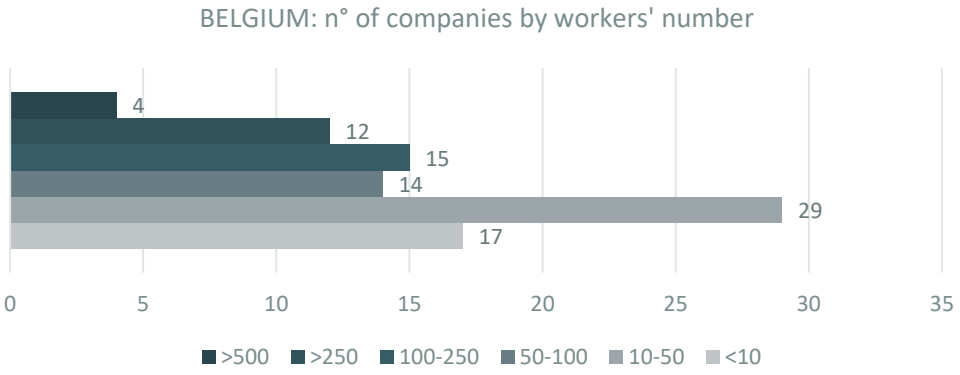
Belgium: Total energy supply evolution.

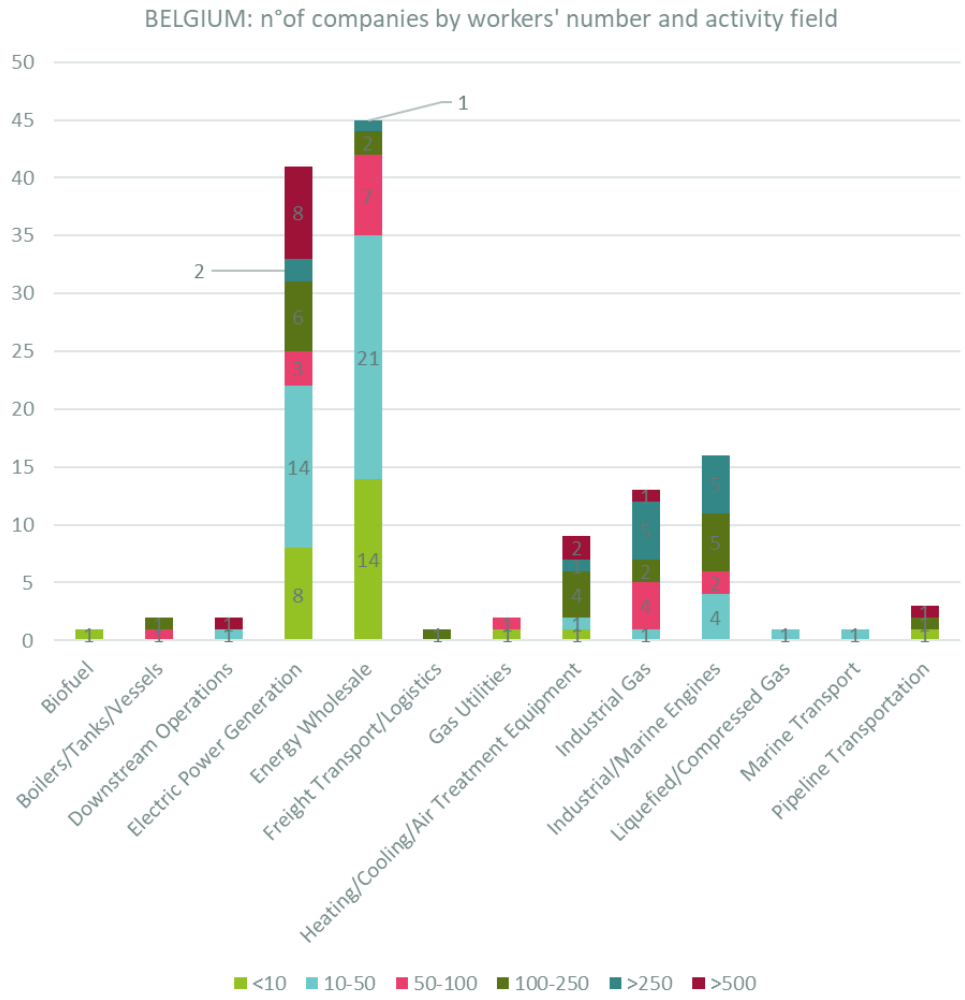




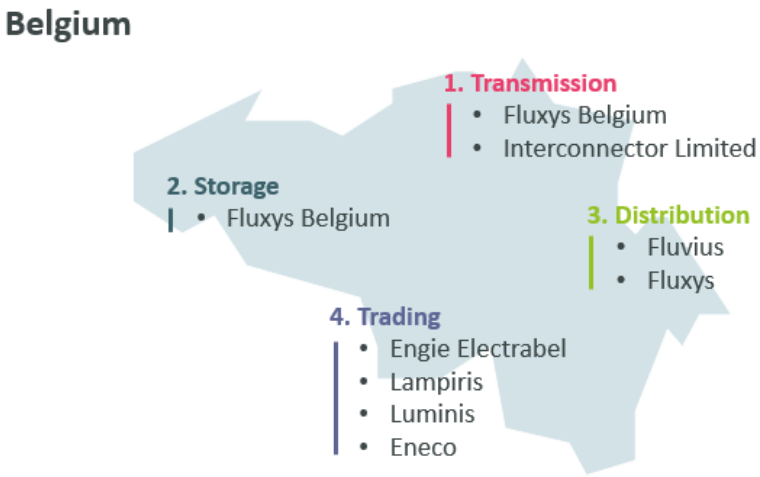

BELGIUM : n° companies
60
50
40
30
20
10
0
1
2
2
48
2
45
1
2
9
13
16
1
1
3
Biofuel
Boilers/Tanks/Vessels
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Industrial/Marine Engines
Liquefied/Compressed Gas
Marine Transport
Pipeline Transportation


BELGIUM : employment data
20 000
18 000
16 000
14 000
12 000
10 000
8 000
6 000
4 000
2 000
0
3
214
642
18 577
1 596
179
63
4 109
3 101
2 916
47
37
1 158
Biofuel
Boilers/Tanks/Vessels
Downstream Operations
Electric Power Generation
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Industrial/Marine Engines
Liquefied/Compressed Gas
Marine Transport
Pipeline Transportation


BELGIUM: n° of companies by workers' number
4
12
15
14
29
17
0
5
10
15
20
25
30
35
>500
>250
100-250
50-100
10-50
<10



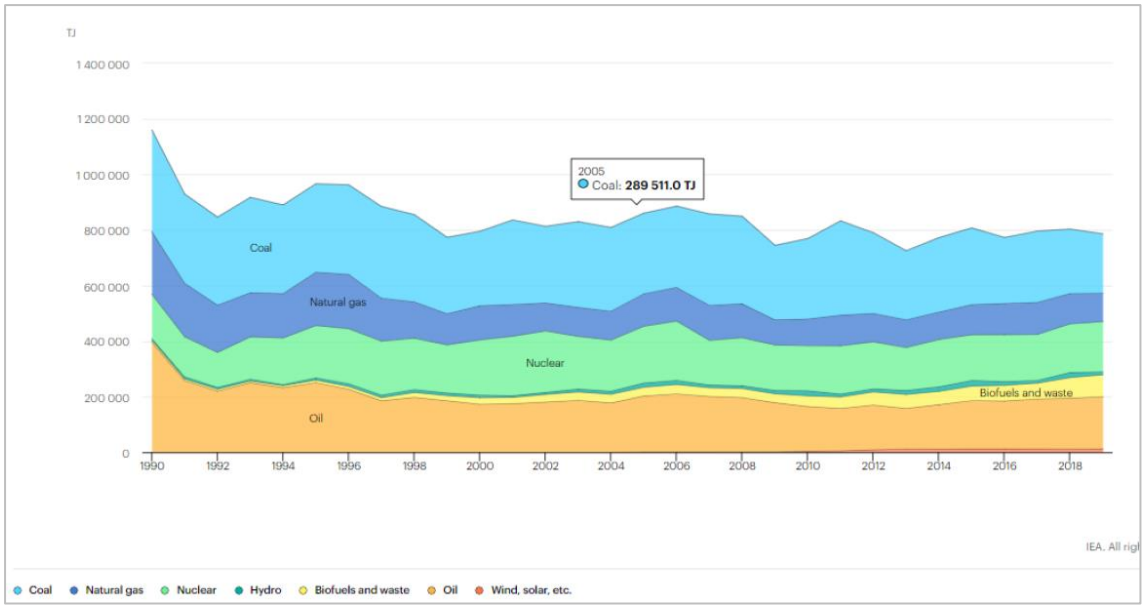
Identification of mayor European companies

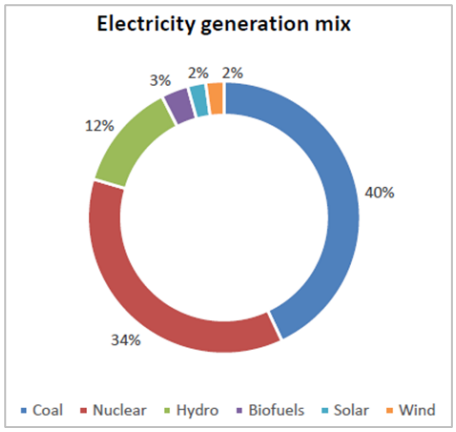


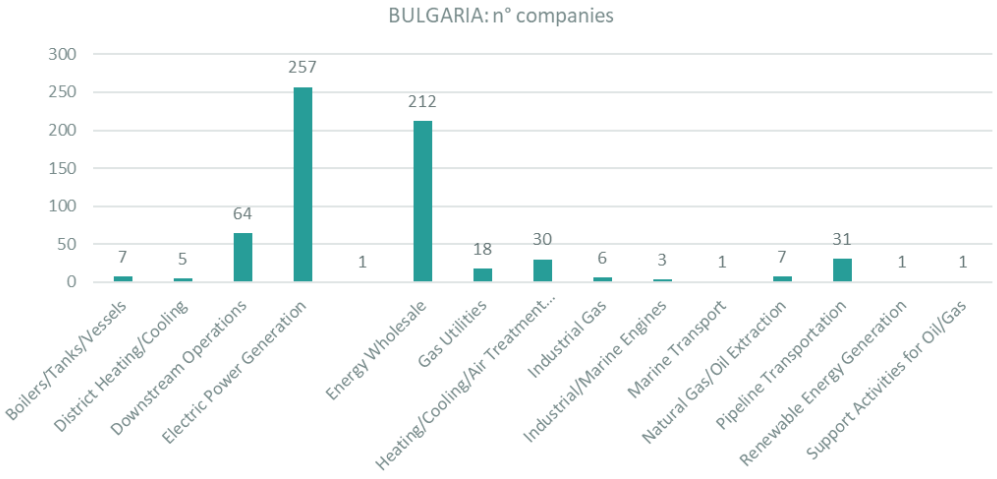
7.3. BULGARIA

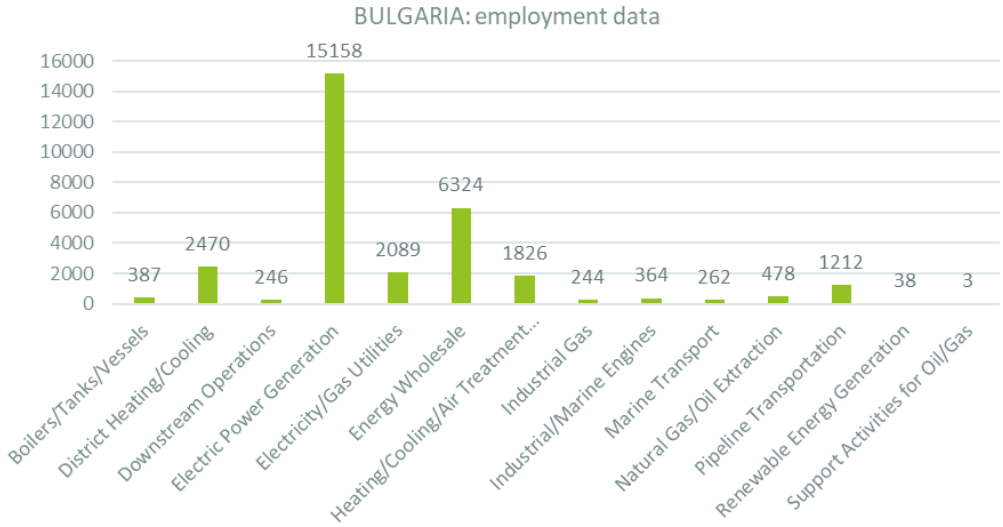
- AS IN BELGIUM, THE "ELECTRIC POWER GENERATION" AND "ENERGY WHOLESALE ACTIVITIES" CONCENTRATE THE NUMBER OF COMPANIES AND EMPLOYEES IN THE GAS SECTOR IN BULGARIA.
- MOREOVER, IT IS ALSO THE "ELECTRIC POWER GENERATION" ACTIVITY THAT HAS THE HIGHEST NUMBER OF LARGE COMPANIES.
- MEANWHILE, IN GENERAL, 60% OF THE COMPANIES HAVE LESS THAN 10 EMPLOYEES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "BULGARTRANSGAZ EAD".

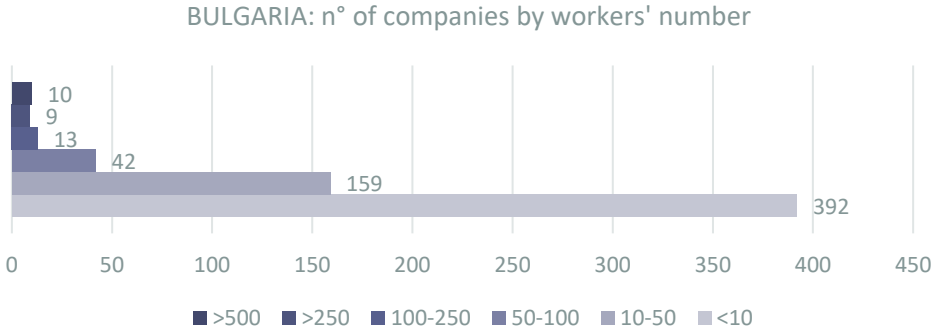
Bulgaria: Total energy supply evolution

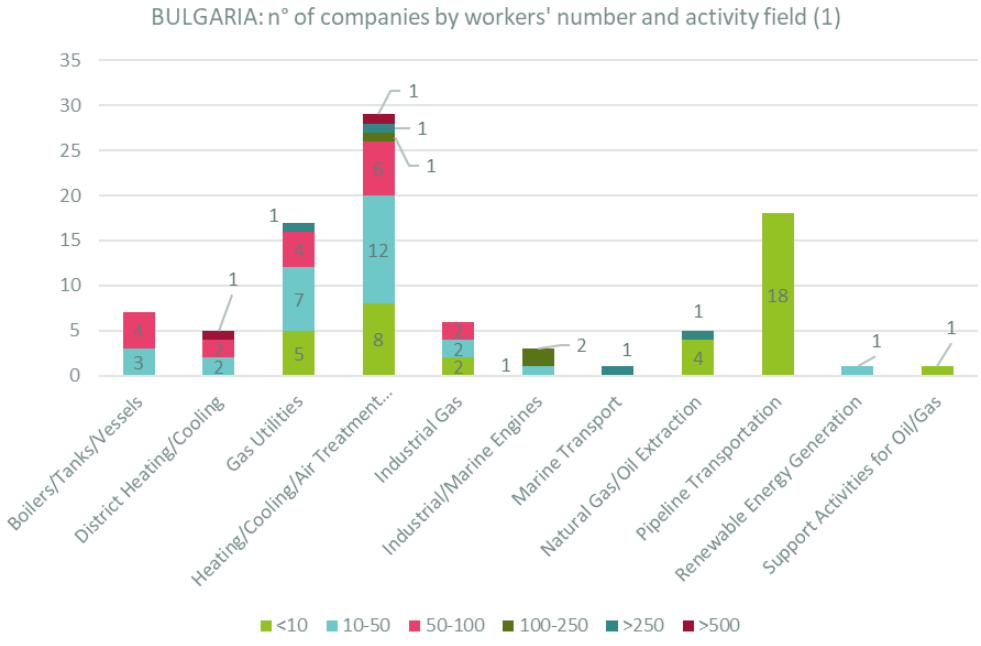


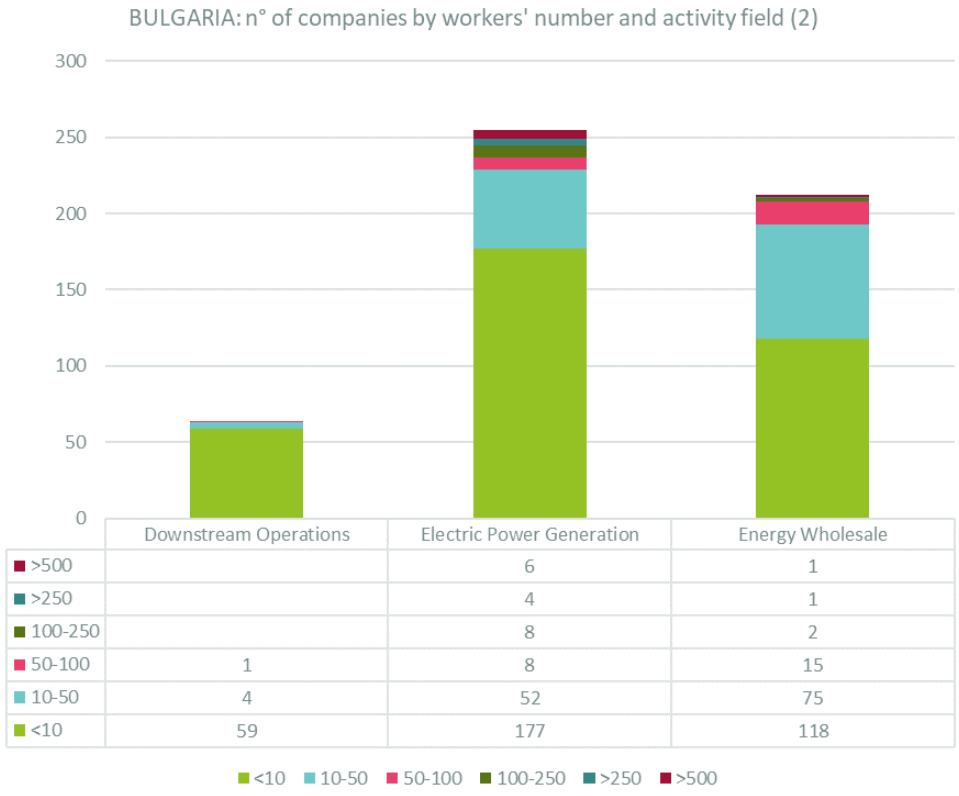



BULGARIA: n° companies
300
250
200
150
100
50
0
7
5
64
257
1
212
18
30
6
3
1
7
31
1
1
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


BULGARIA: employment data
16000
14000
12000
10000
8000
6000
4000
2000
0
387
2470
246
15158
2089
6324
1826
244
364
262
478
1212
38
3
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Heating/Cooling/Air Treatment...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


BULGARIA: n° of companies by workers' number
10
9
13
42
159
392
0
50
100
150
200
250
300
350
400
450
>500
>250
100-250
50-100
10-50
<10

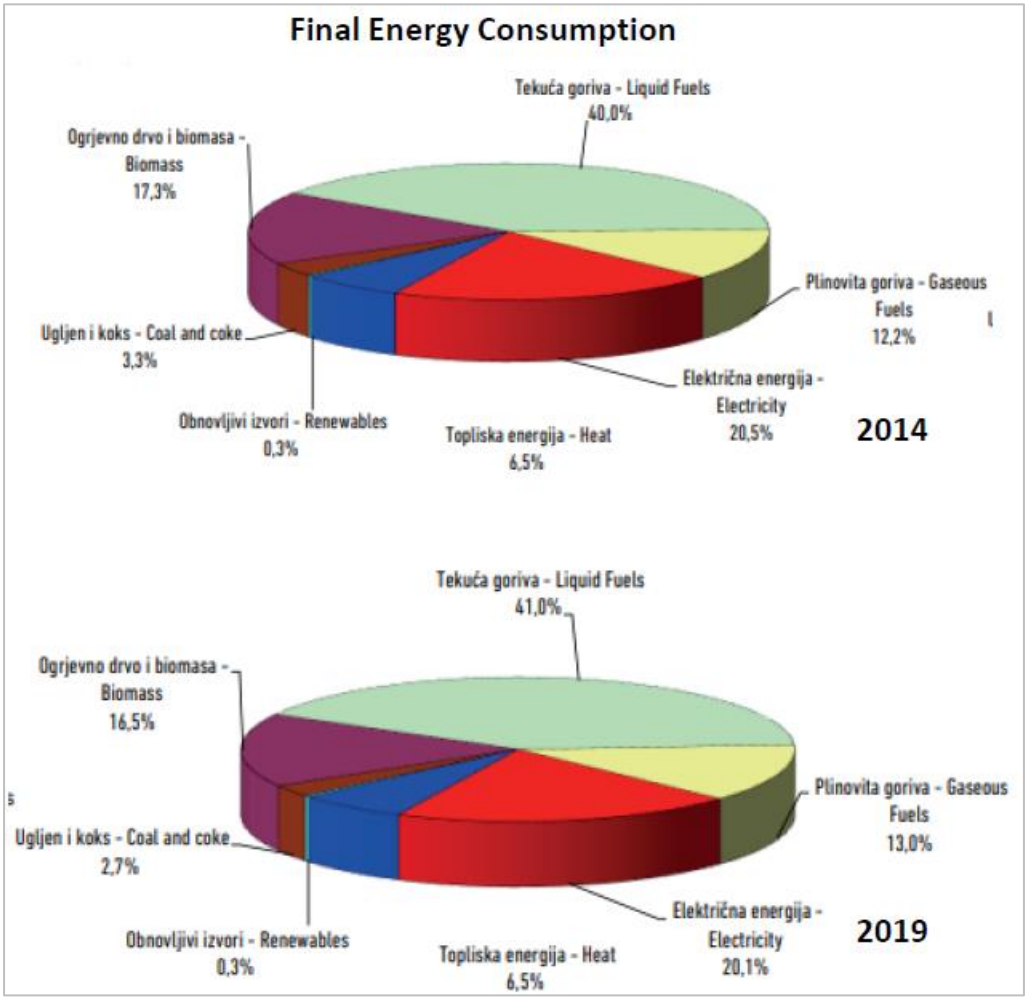




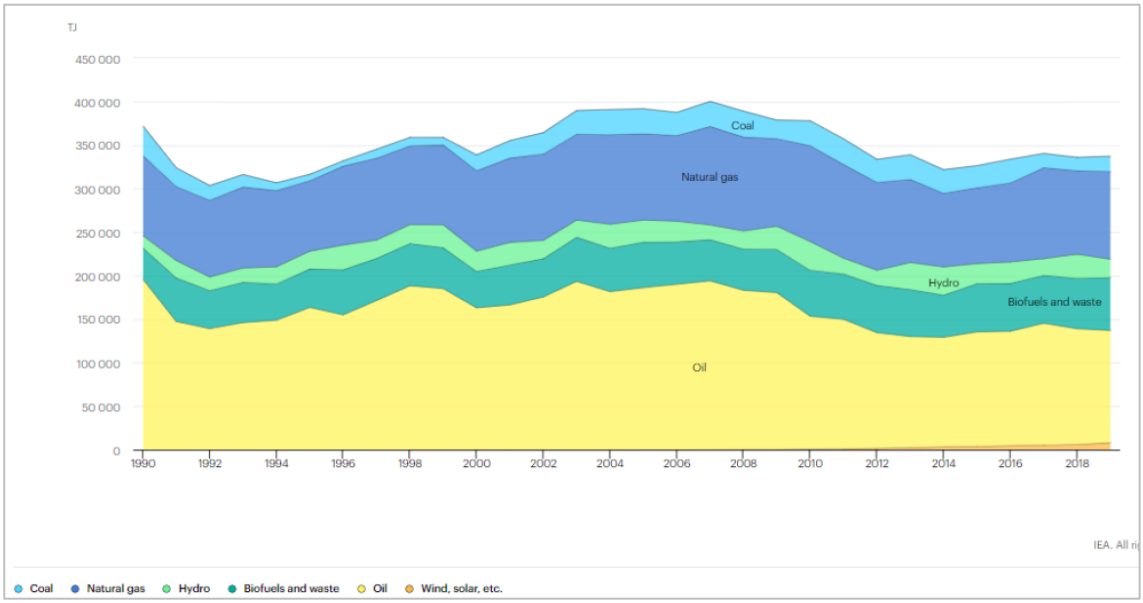
	Downstream Operations	Electric Power Generation	Energy Wholesale
>500		6	1
>250		4	1
100-250		8	2
50-100	1	8	15
10-50	4	52	75
<10	59	177	118

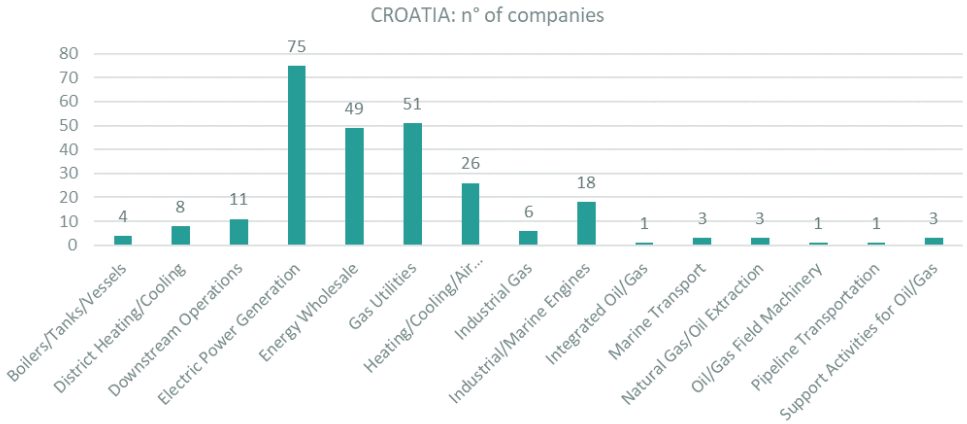
7.4. CROATIA

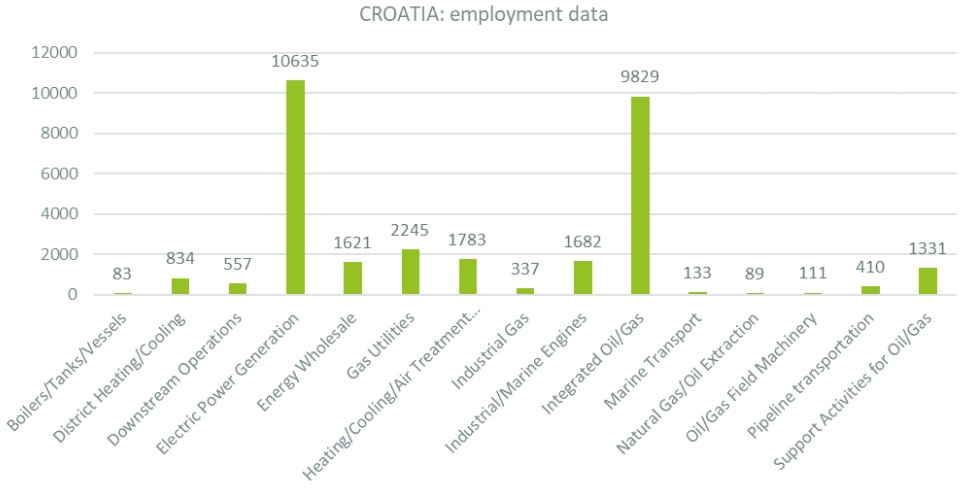
- IN CROATIA, "GAS UTILITIES" JOINS "ELECTRIC POWER GENERATION" AND "ENERGY WHOLESALE" IN THE RANKING OF THOSE WITH THE MOST COMPANIES.
- HOWEVER, IN TERMS OF NUMBER OF EMPLOYEES, WHILE “ELECTRIC POWER GENERATION” EMPLOYS 10635 PEOPLE, THE OTHER TWO ACTIVITIES HAVE LESS THAN 3000 EMPLOYEES.
- ON THE OTHER HAND, A SINGLE COMPANY WITH 9829 EMPLOYEES MAKES THE "INTEGRATED OIL/GAS" ACTIVITY THE SECOND LARGEST EMPLOYER.
- MOST OF THE COMPANIES HAVE LESS THAN 50 EMPLOYEES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "PLINACRO".

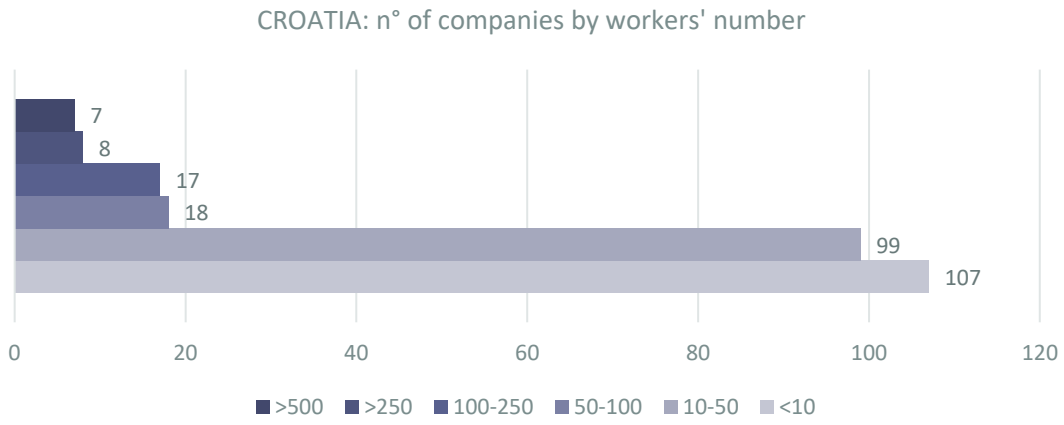


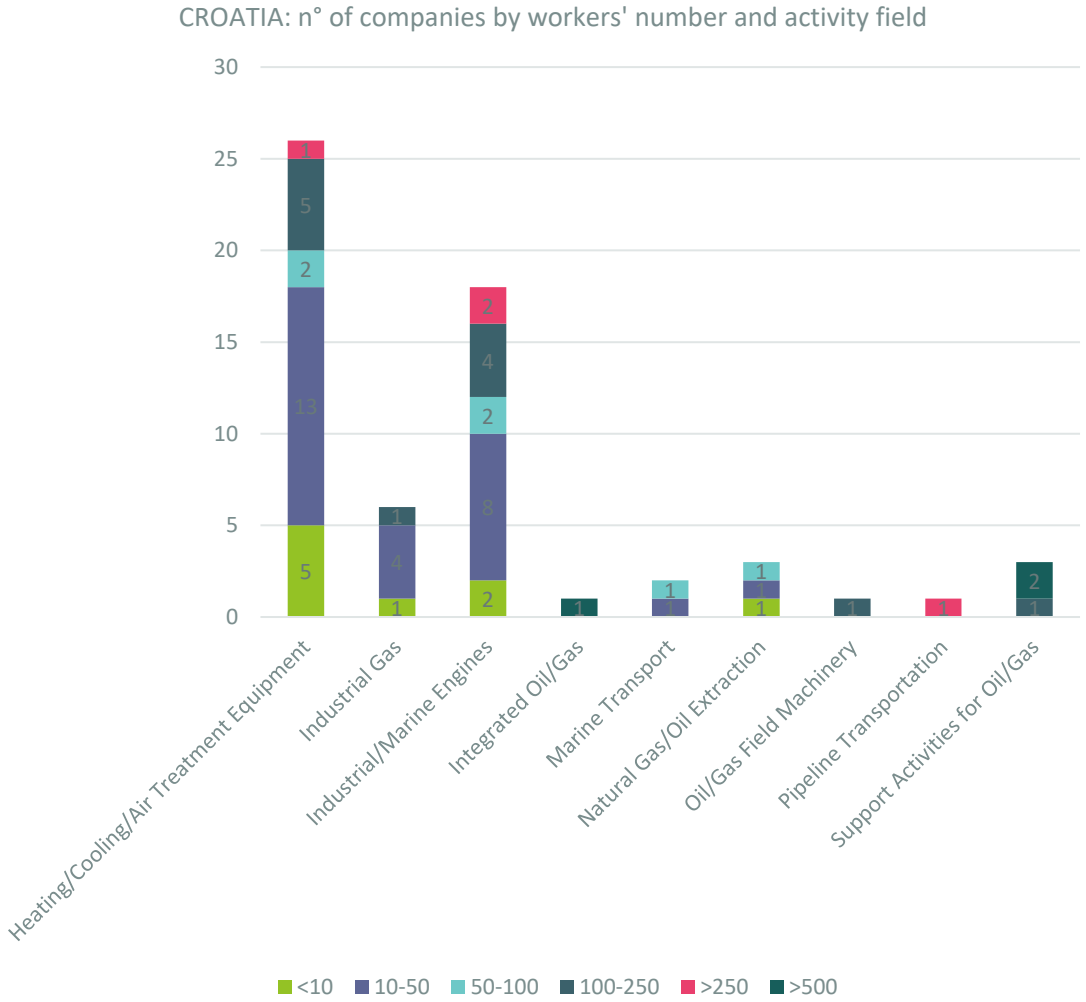
Croatia: Total energy supply evolution





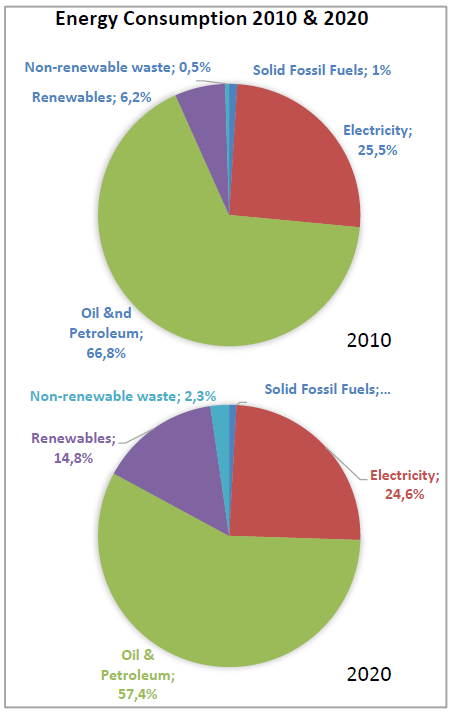



CROATIA: n° of companies by workers' number
7
8
17
18
99
107
0
20
40
60
80
100
120
>500
>250
100-250
50-100
10-50
<10

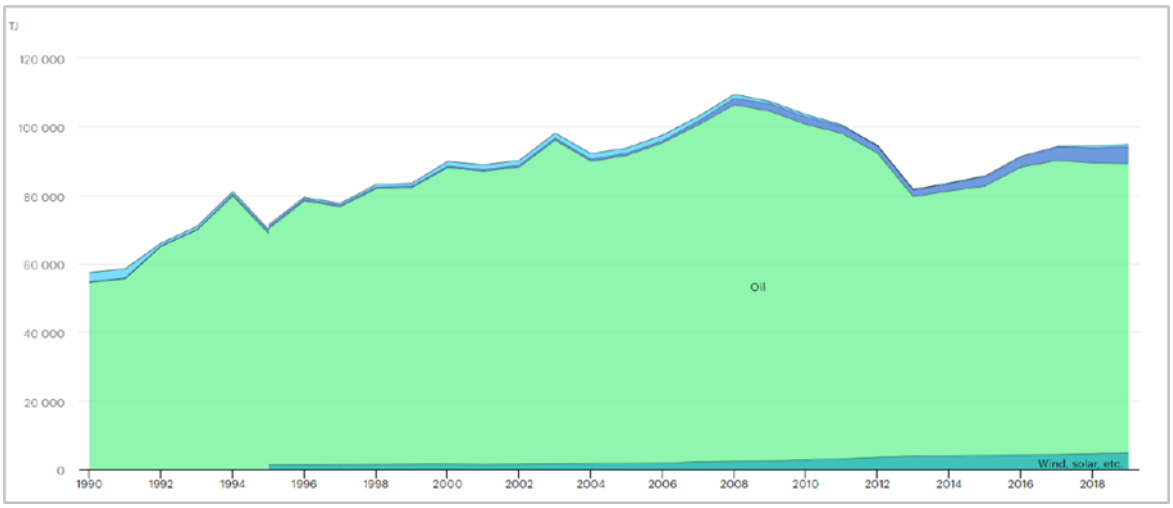

CROATIA: n° of companies by workers' number and activity field
30
25
20
15
10
5
0
Heating/Cooling/Air Treatment Equipment
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500

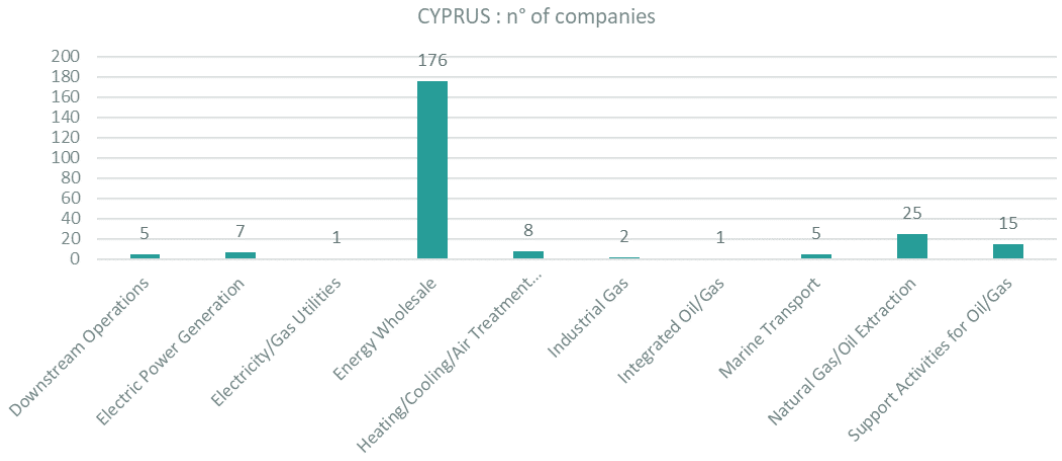
7.5. CYPRUS

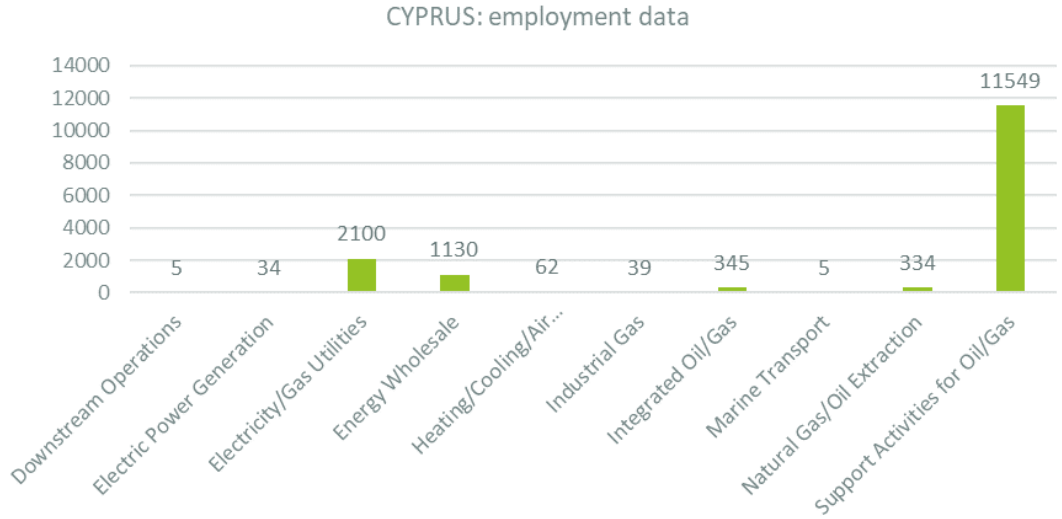
- 70% OF THE COMPANIES IN THE GAS SECTOR IN CYPRUS BELONG TO THE "ENERGY WHOLESALE" ACTIVITY.
- HOWEVER, IT IS THE ACTIVITY OF "SUPPORT ACTIVITIES FOR OIL/GAS" WHICH ACCOUNTS FOR 74% OF EMPLOYMENT DUE TO THE FACT THAT ONLY ONE COMPANY HAS 10837 EMPLOYEES.
- THE VAST MAJORITY OF THE COMPANIES ARE VERY SMALL, WITH LESS THAN 10 EMPLOYEES.

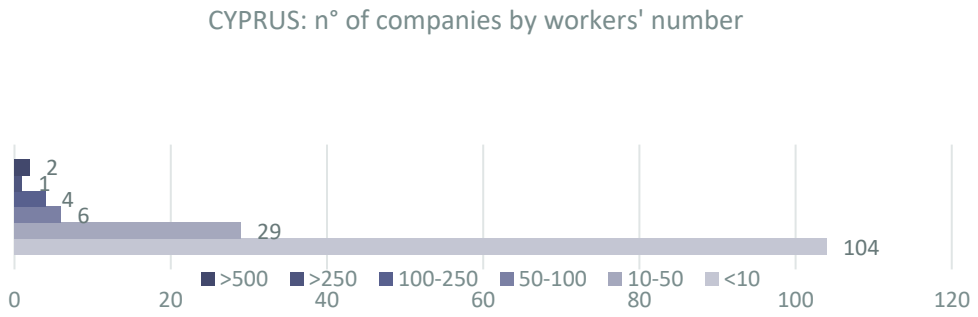


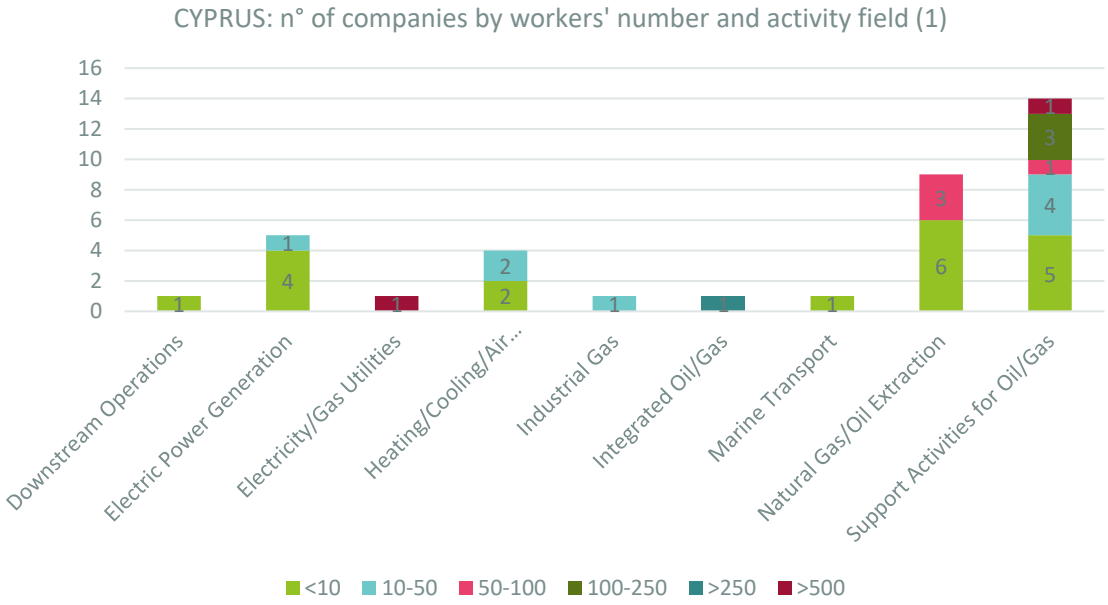
Cyprus: Total energy supply evolution

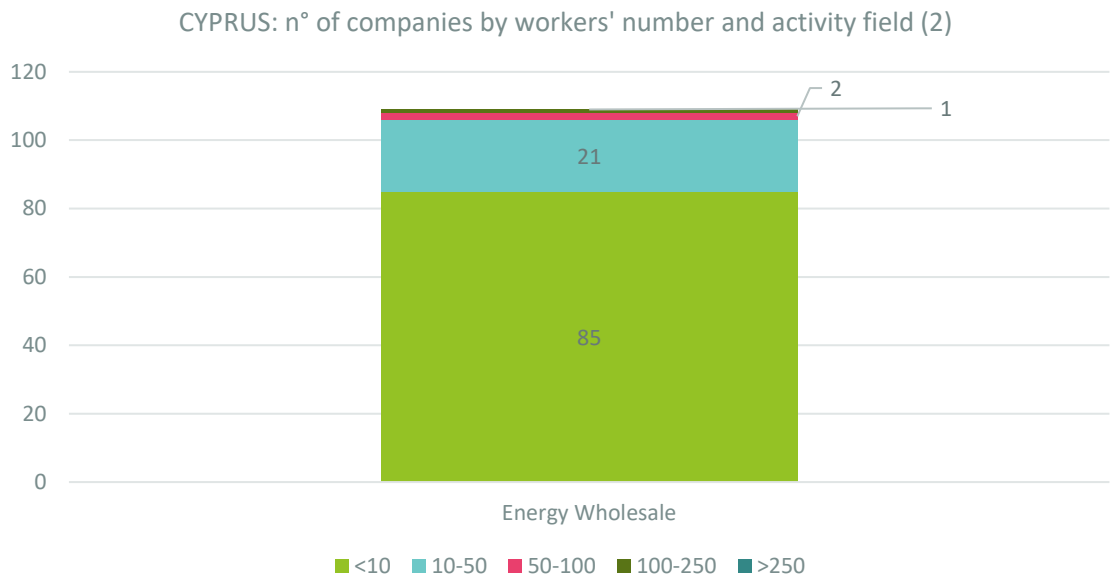







CYPRUS: n° of companies by workers' number
2
1
4
6
29
104
>500
>250
100-250
50-100
10-50
<10
0
20
40
60
80
100
120

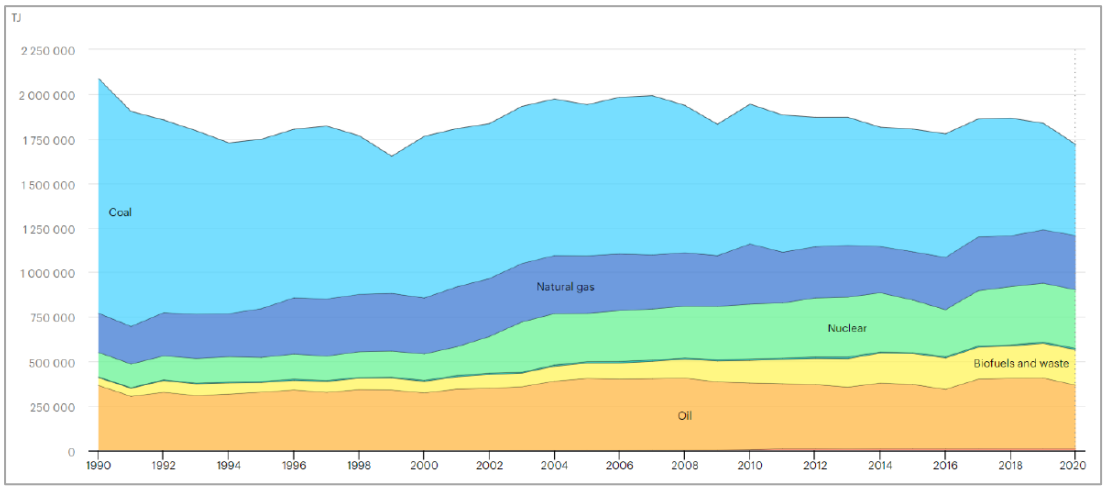

CYPRUS: n° of companies by workers' number and activity field (1)
16
14
12
10
8
6
4
2
0
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil Extraction
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500


CYPRUS: n° of companies by workers' number and activity field (2)
120
100
80
60
40
20
0
2
1
21
85
Energy Wholesale
<10
10-50
50-100
100-250
>250

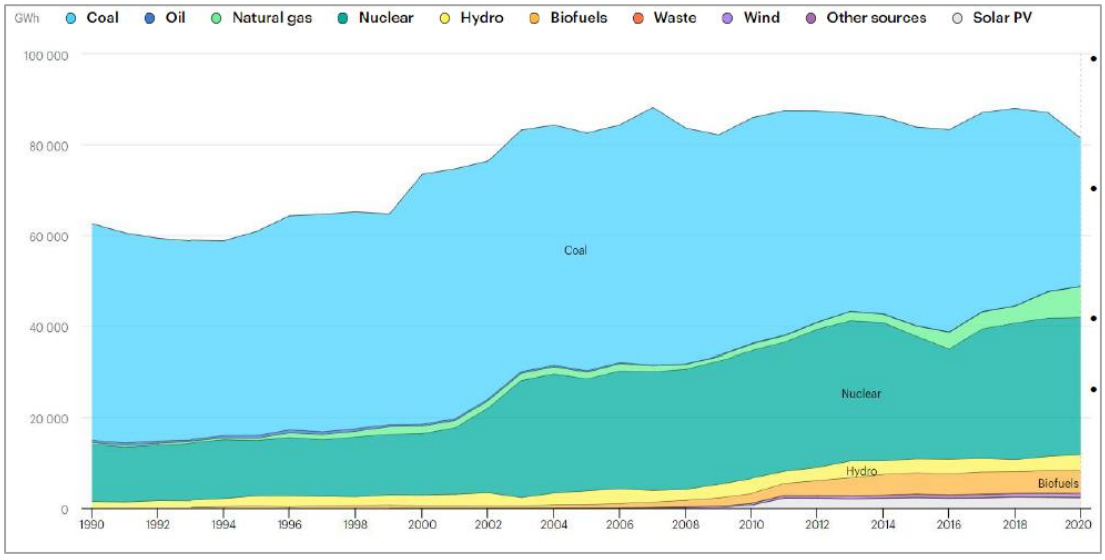
7.6. CZECH REPUBLIC

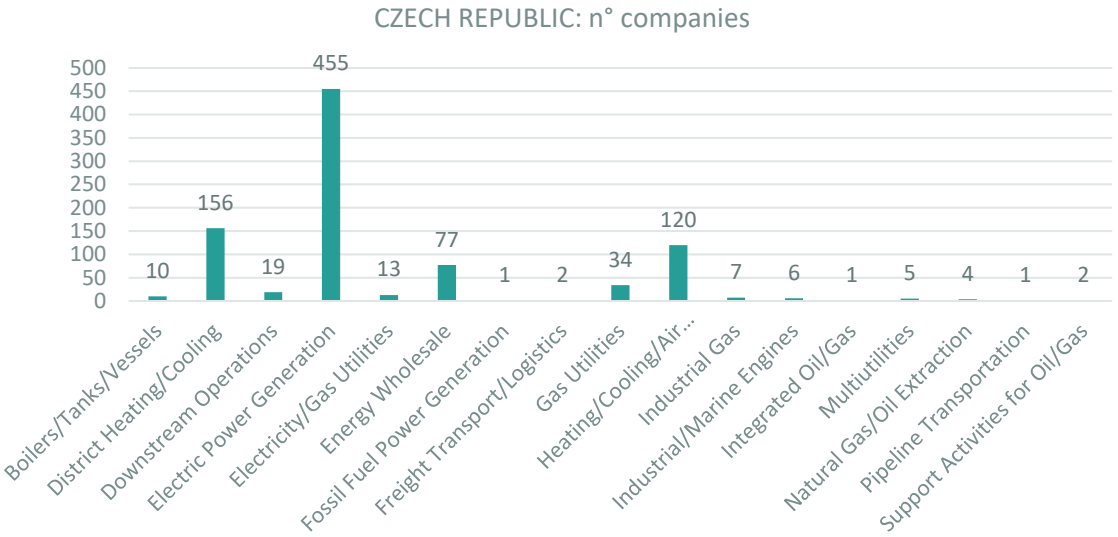
- **BY FAR THE LARGEST NUMBER OF COMPANIES BELONG TO THE "ELECTRIC POWER GENERATION" SECTOR.**
- **IN TERMS OF THE NUMBER OF EMPLOYEES, HOWEVER, THE ACTIVITY "HEATING/COOLING/AIR TREATMENT EQUIPMENT" ALSO STANDS OUT WITH 120230 EMPLOYEES (20218 FOR "ELECTRIC POWER GENERATION")**
- **AS IN THE PREVIOUS COUNTRIES, SMALL AND MEDIUM-SIZED COMPANIES, MAINLY WITH LESS THAN 50 EMPLOYEES, ARE THE MOST IMPORTANT.**

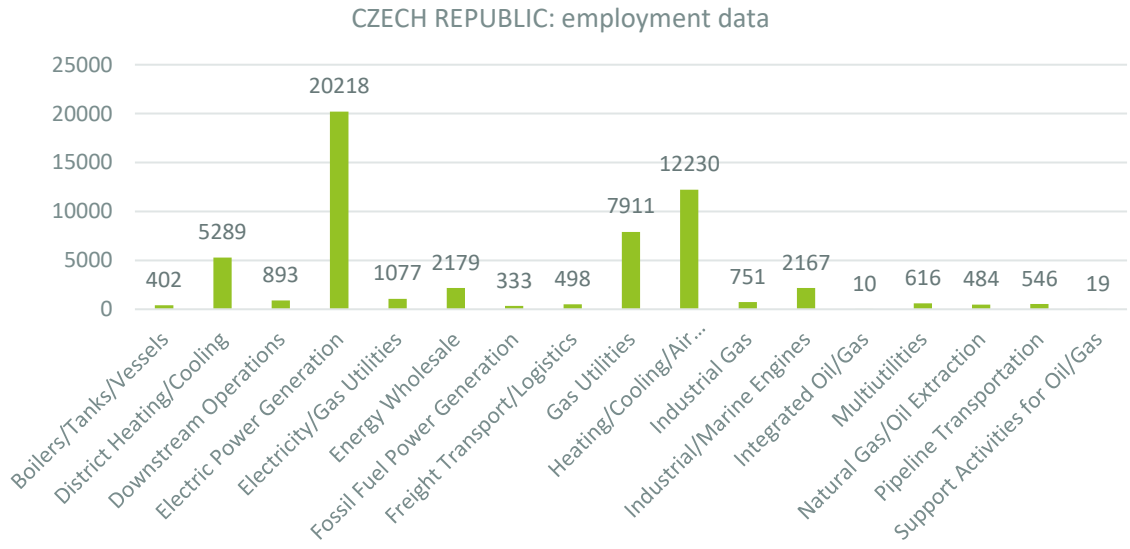
Czech Republic: Total energy supply evolution

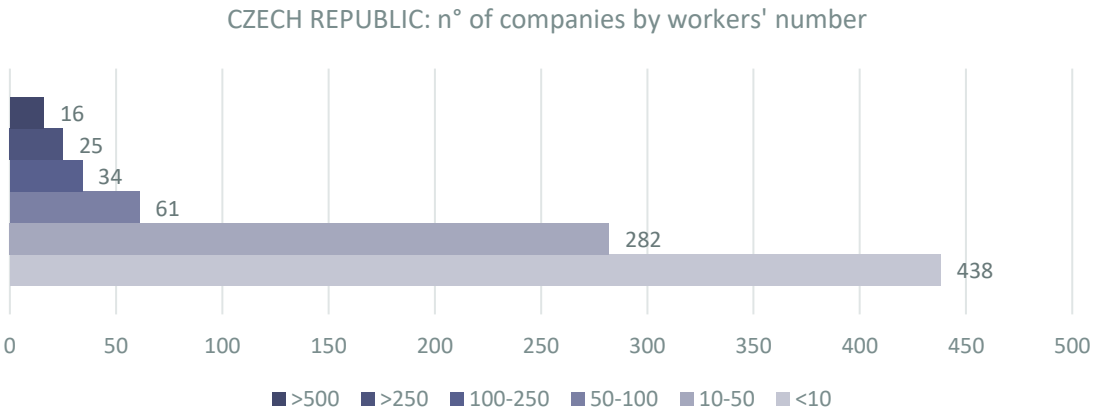


Czech Republic: Total electricity generation evolution

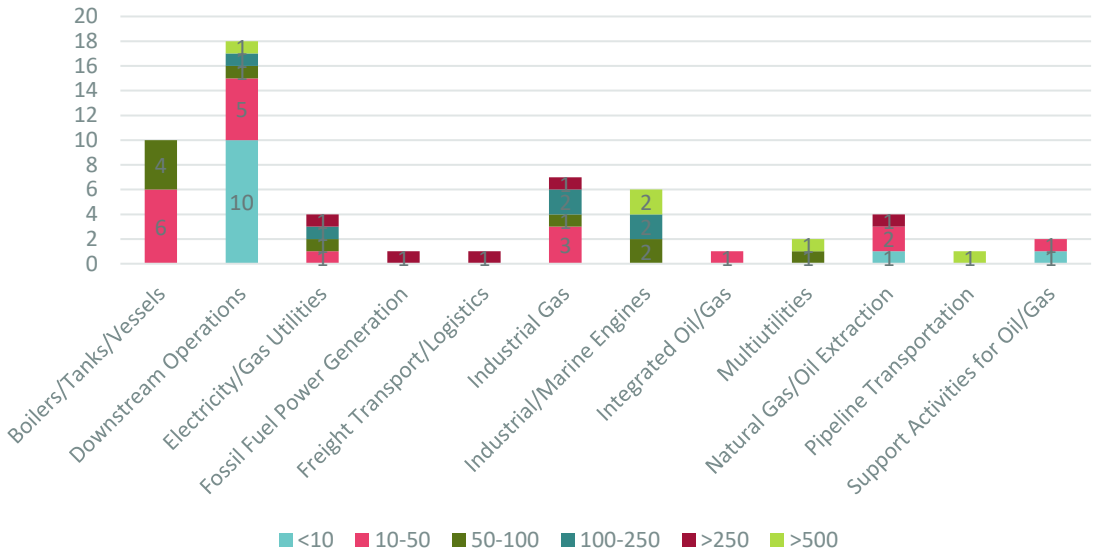



CZECH REPUBLIC: n° companies
500
450
400
350
300
250
200
150
100
50
0
10
156
19
455
13
77
1
2
34
120
7
6
1
5
4
1
2
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Fossil Fuel Power Generation
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air…
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Multiutilities
Natural Gas/Oil Extraction
Pipeline Transportation
Support Activities for Oil/Gas

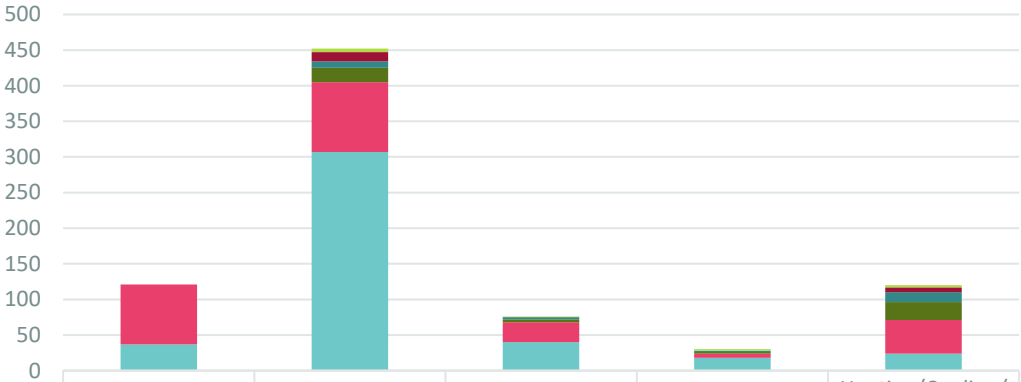

CZECH REPUBLIC: employment data
25000
20000
15000
10000
5000
0
402
5289
893
20218
1077
2179
333
498
7911
12230
751
2167
10
616
484
546
19
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Fossil Fuel Power Generation
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air…
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Multiutilities
Natural Gas/Oil Extraction
Pipeline Transportation
Support Activities for Oil/Gas


CZECH REPUBLIC: n° of companies by workers' number
16
25
34
61
282
438
0
50
100
150
200
250
300
350
400
450
500
>500
>250
100-250
50-100
10-50
<10

CZECH REPUBLIC: n° of companies by workers' number and activity field (1)



CZECH REPUBLIC: n° of companies by workers' number and activity field (2)

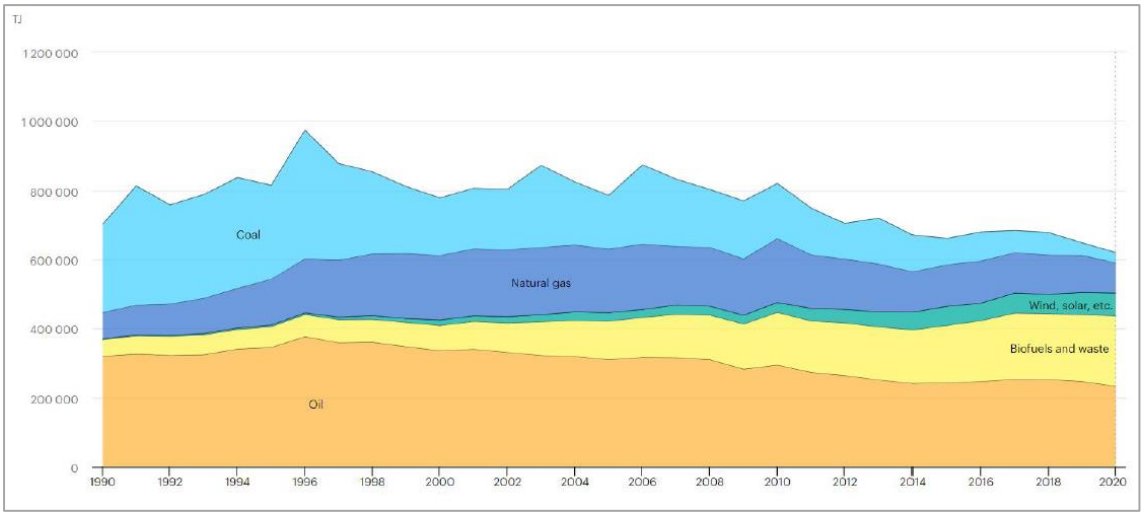


	District Heating/Cooling	Electric Power Generation	Energy Wholesale	Gas Utilities	Heating/Cooling/ Air Treatment Equipment
>500		5	1	2	3
>250		13			7
100-250		9	3	2	14
50-100		20	4	2	25
10-50	84	98	28	6	47
<10	37	307	40	18	24

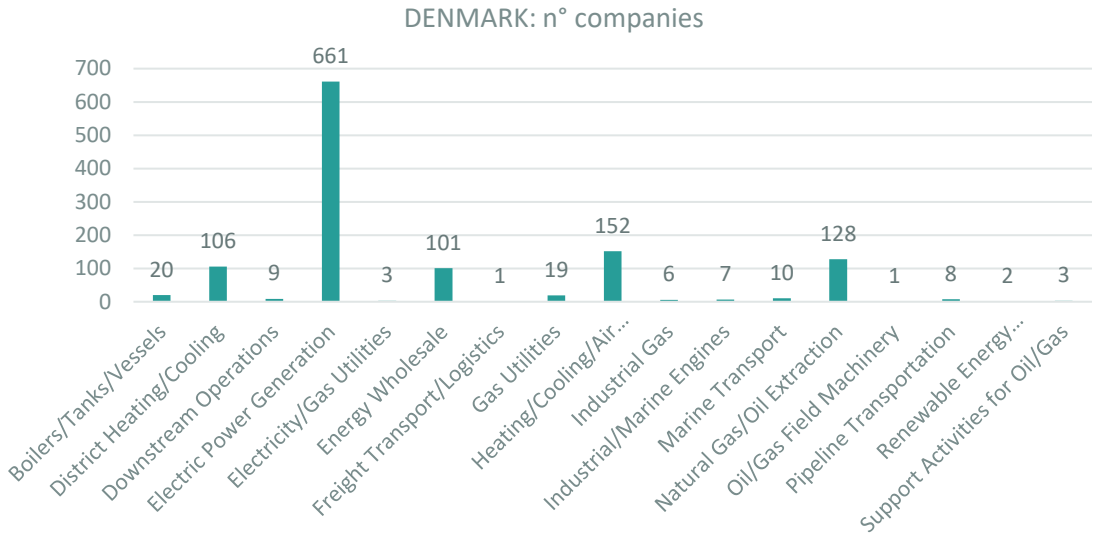
7.7. DENMARK

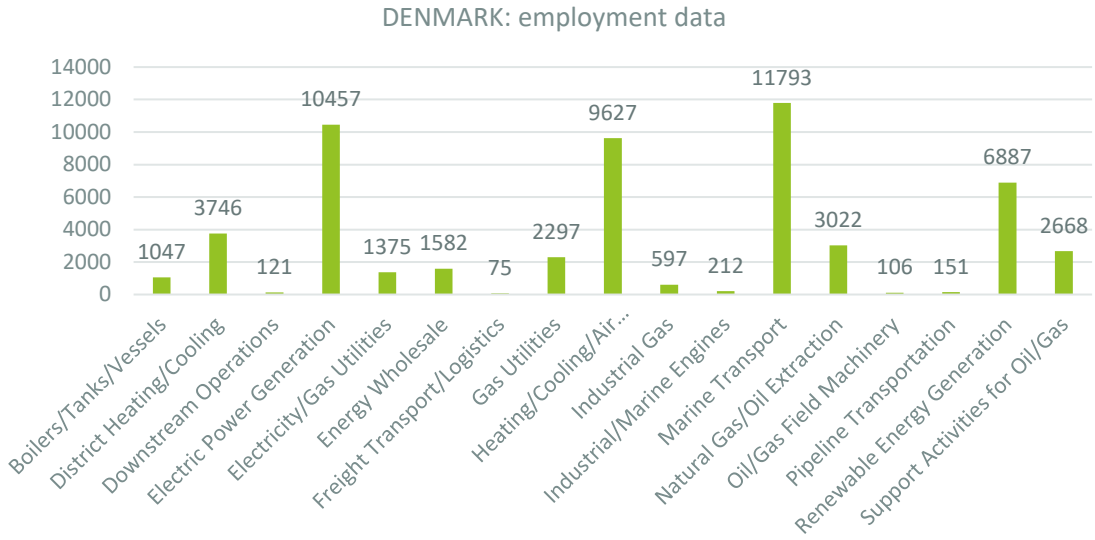
- IN DENMARK, ALTHOUGH "ELECTRIC POWER GENERATION" IS ALSO THE ACTIVITY WITH THE MOST COMPANIES, EMPLOYMENT IS MORE DIVERSIFIED IN TERMS OF NUMBER OF EMPLOYEES.
- THE NUMBER OF COMPANIES WITH LESS THAN 10 EMPLOYEES IS SIGNIFICANTLY HIGHER THAN THE REST.
- THE FEW COMPANIES WITH MORE THAN 250 EMPLOYEES ARE IN THE ACTIVITY "GAS UTILITIES", "ELECTRIC POWER GENERATION" AND "HEATING/COOLING/AIR TREATMENT EQUIPMENT" (THE LATTER WITH 3 COMPANIES WITH MORE THAN 500 EMPLOYEES).

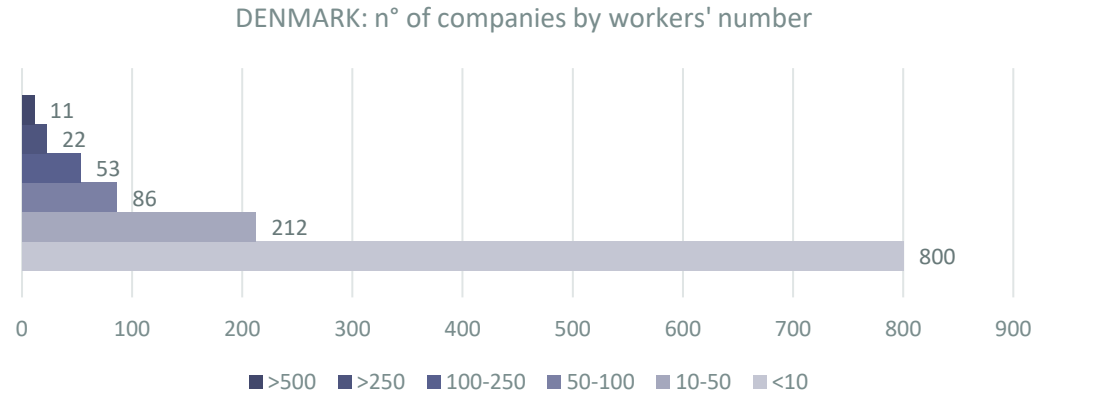
Denmark: Total energy supply evolution

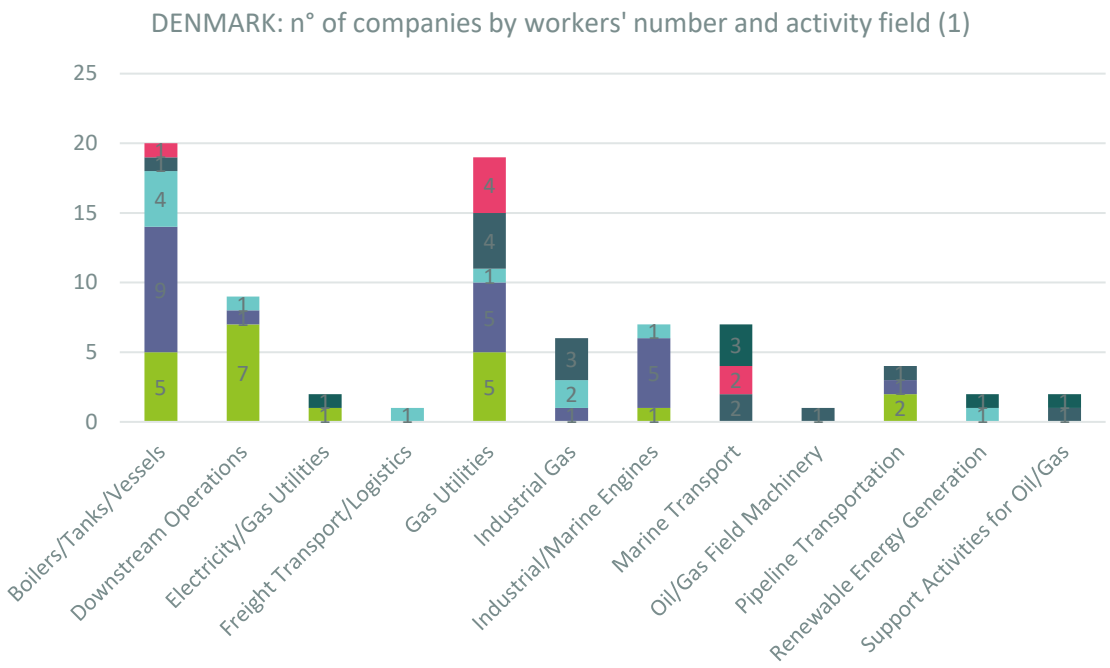


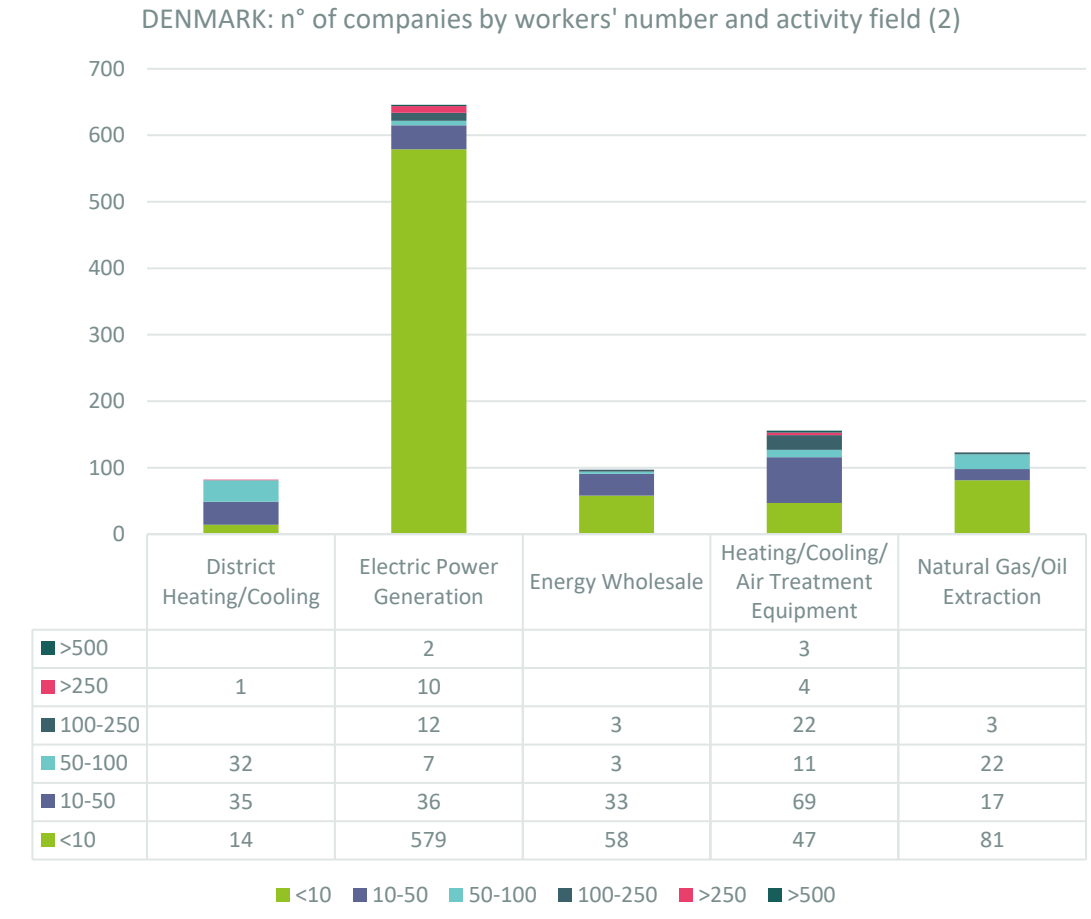
Energy production (PJ)	1980	1990	2000	2010	2020
Total production	40	424	1165	979	398
Crude oil	13	256	765	523	151
Natural gas	0	116	310	307	50
Waste, non-renewable	5	7	14	17	16
Renewable energy	23	45	76	131	181


DENMARK: n° companies
700
600
500
400
300
200
100
0
20
106
9
661
3
101
1
19
152
6
7
10
128
1
8
2
3
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy...
Support Activities for Oil/Gas


DENMARK: employment data
14000
12000
10000
8000
6000
4000
2000
0
1047
3746
121
10457
1375
1582
75
2297
9627
597
212
11793
3022
106
151
6887
2668
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


DENMARK: n° of companies by workers' number
11
22
53
86
212
800
0
100
200
300
400
500
600
700
800
900
>500
>250
100-250
50-100
10-50
<10



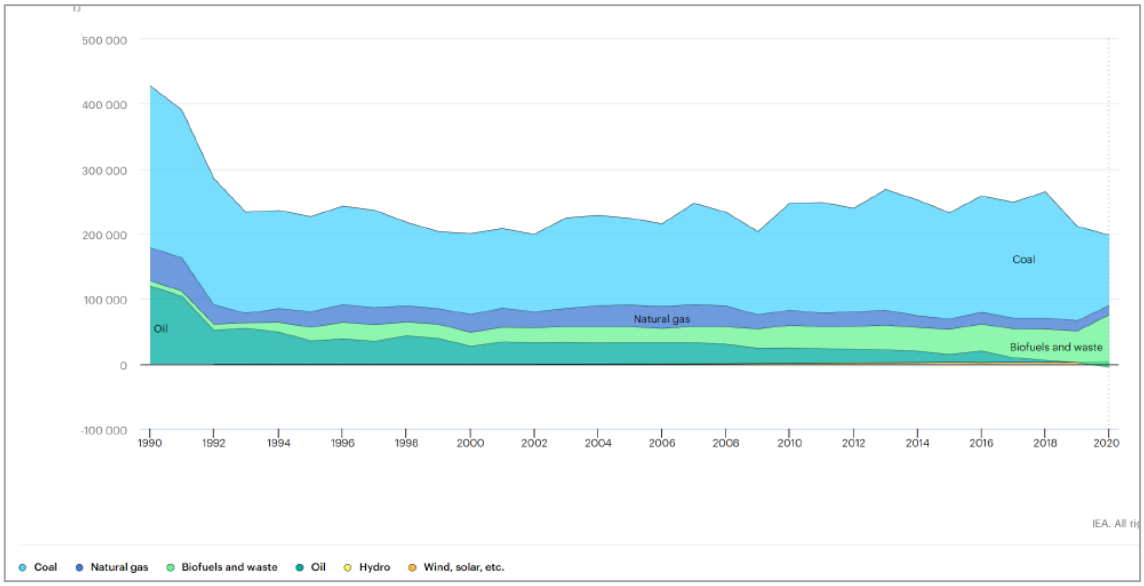


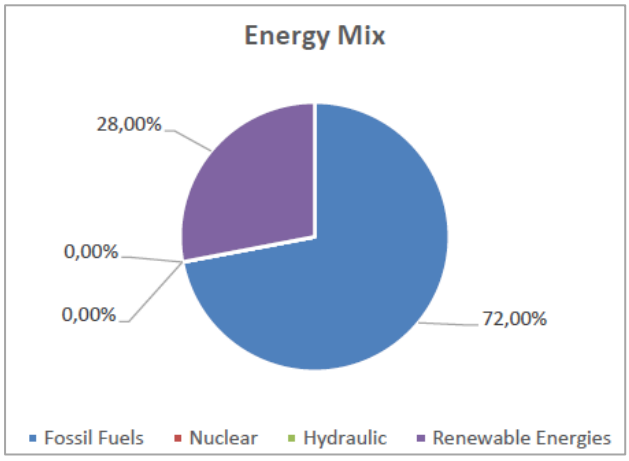
	District Heating/Cooling	Electric Power Generation	Energy Wholesale	Heating/Cooling/ Air Treatment Equipment	Natural Gas/Oil Extraction
>500		2		3	
>250	1	10		4	
100-250		12	3	22	3
50-100	32	7	3	11	22
10-50	35	36	33	69	17
<10	14	579	58	47	81

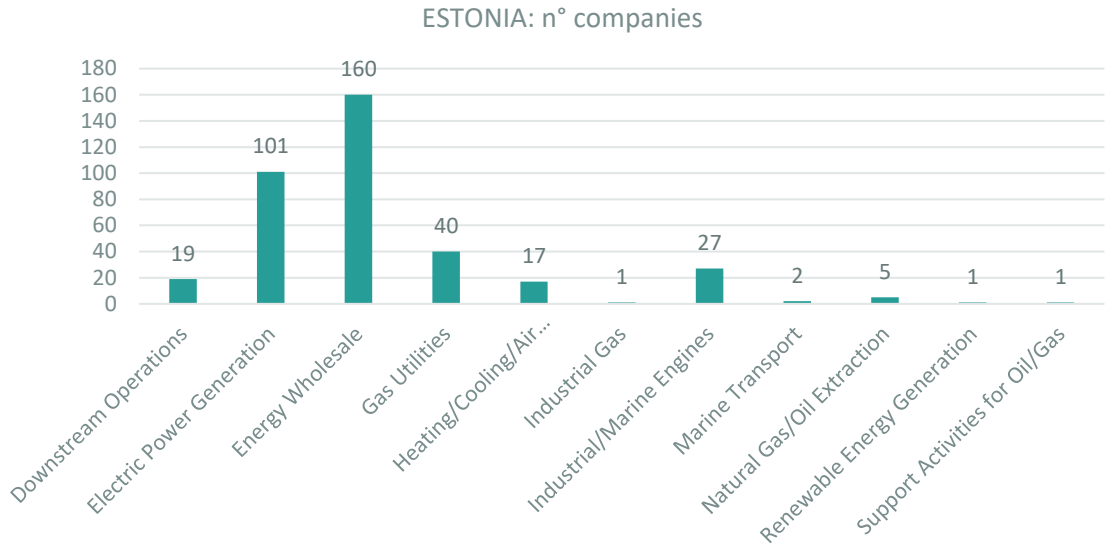
7.8. ESTONIA

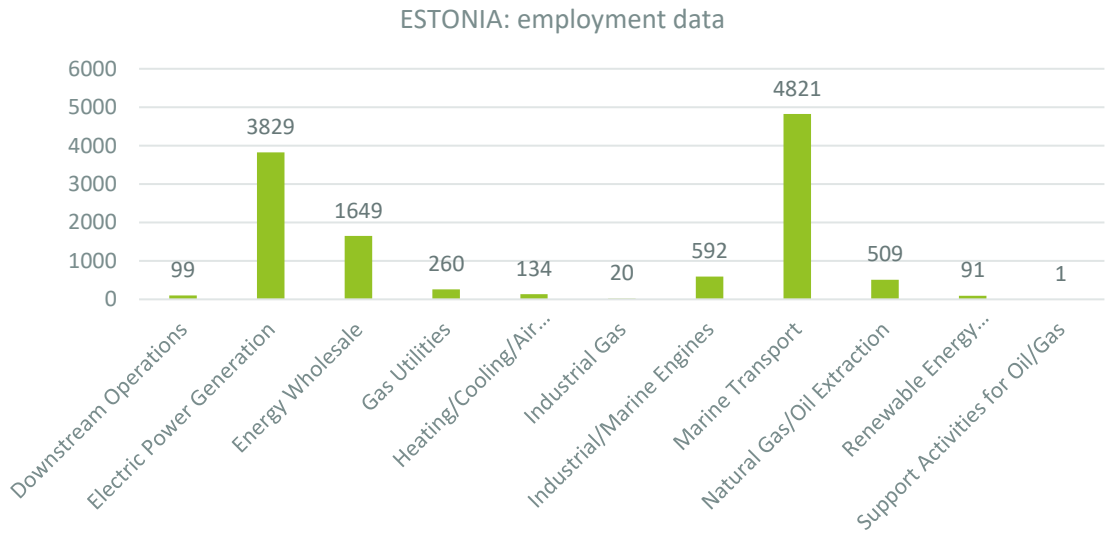
- A COMPANY WITH MORE THAN 4,000 EMPLOYEES MAKES MARINE TRANSPORT THE LARGEST EMPLOYER IN THE ESTONIAN GAS SECTOR.
- THERE ARE HARDLY ANY COMPANIES WITH MORE THAN 100 EMPLOYEES (8).
- MOST OF THE COMPANIES WITH LESS THAN 10 EMPLOYEES BELONG TO THE ENERGY WHOLESALE BUSINESS.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "ELERING".

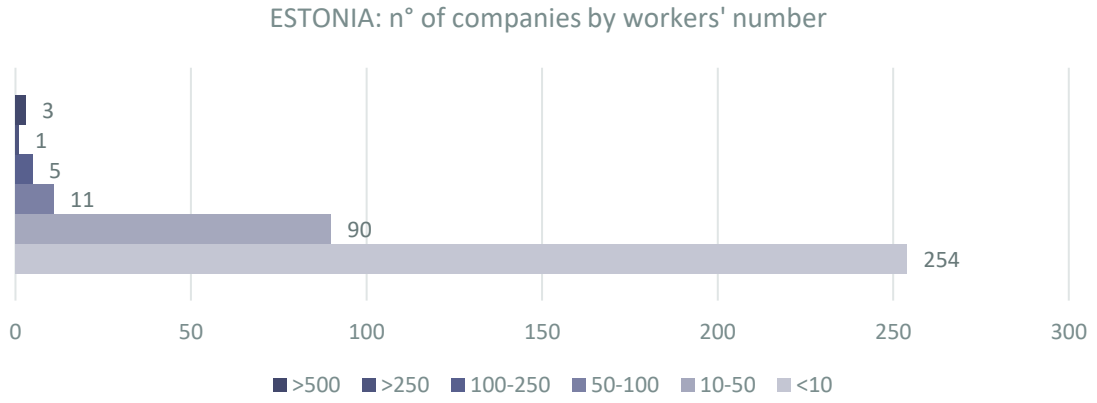
Estonia: Total energy supply evolution

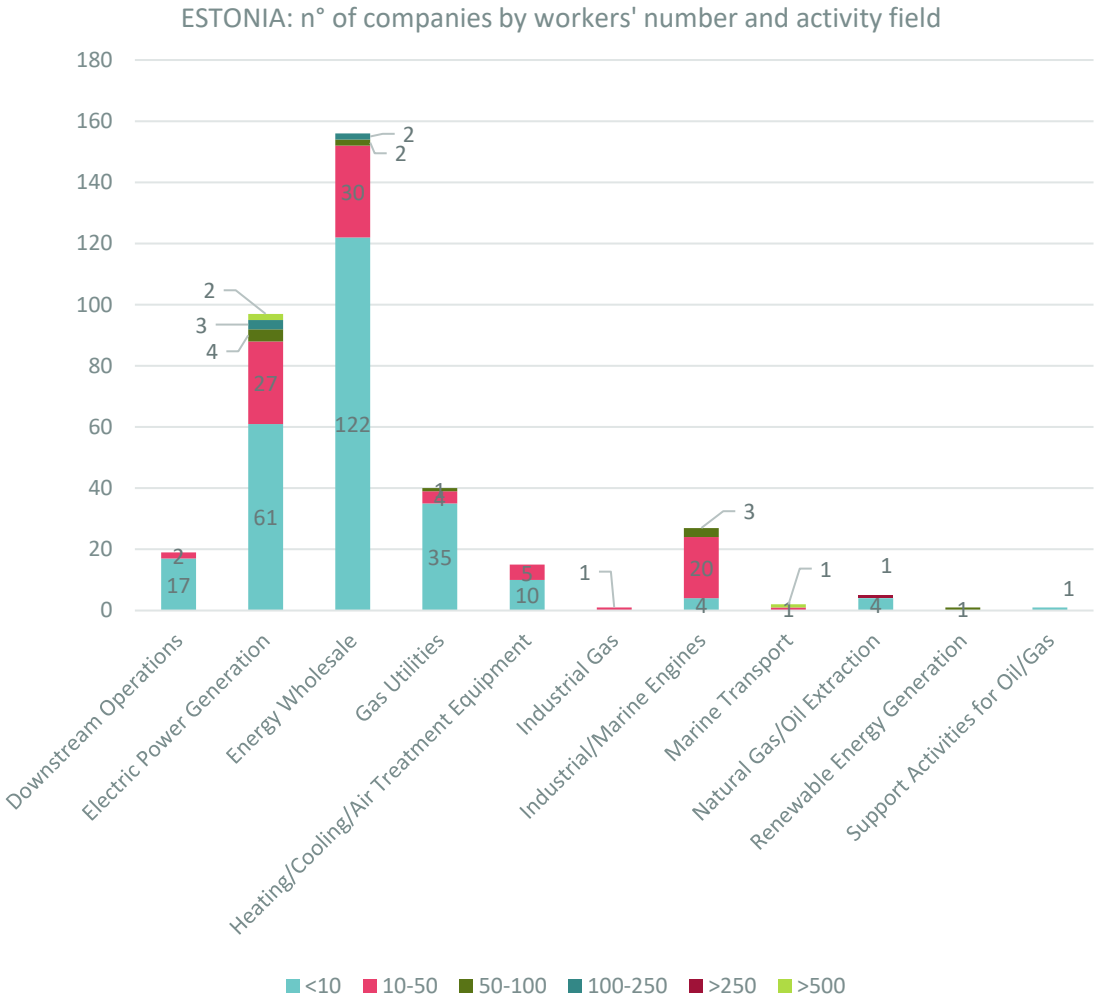





ESTONIA: n° companies
180
160
140
120
100
80
60
40
20
0
19
101
160
40
17
1
27
2
5
1
1
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Renewable Energy Generation
Support Activities for Oil/Gas


ESTONIA: employment data
6000
5000
4000
3000
2000
1000
0
99
3829
1649
260
134
20
592
4821
509
91
1
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Renewable Energy...
Support Activities for Oil/Gas

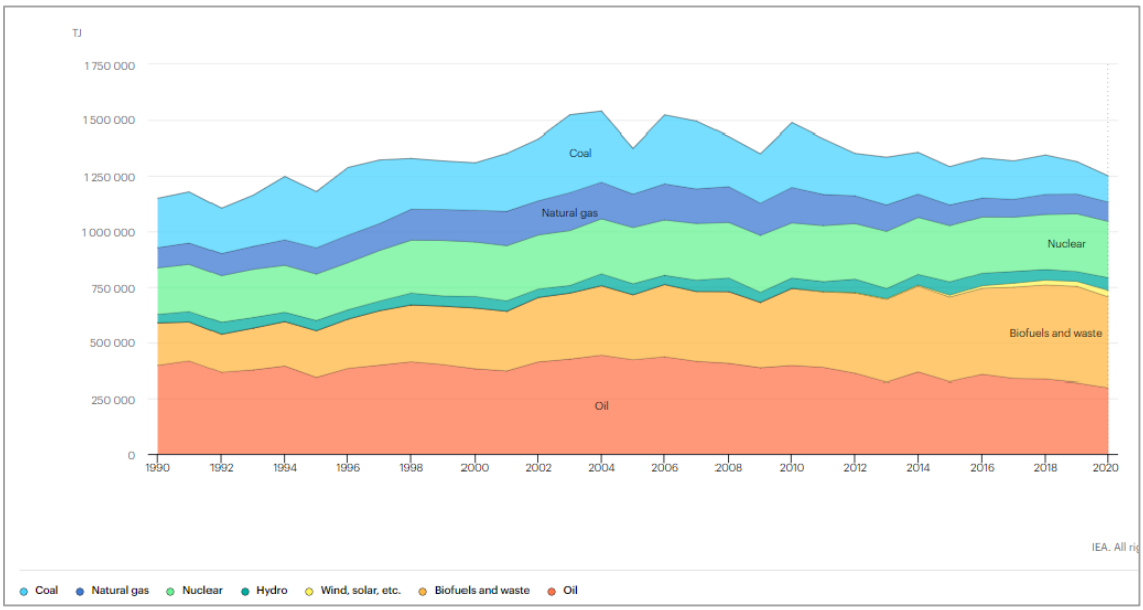

ESTONIA: n° of companies by workers' number
3
1
5
11
90
254
0
50
100
150
200
250
300
>500
>250
100-250
50-100
10-50
<10

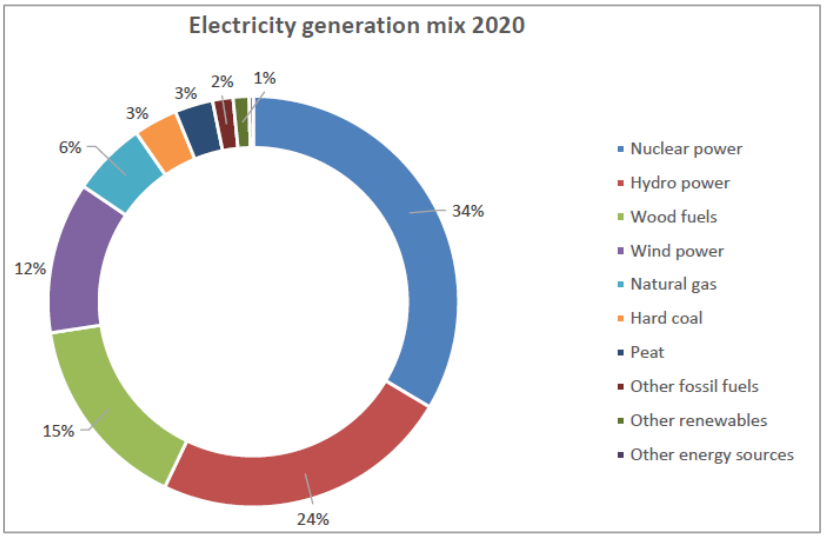

ESTONIA: n° of companies by workers' number and activity field
180
160
140
120
100
80
60
40
20
0
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Renewable Energy Generation
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500

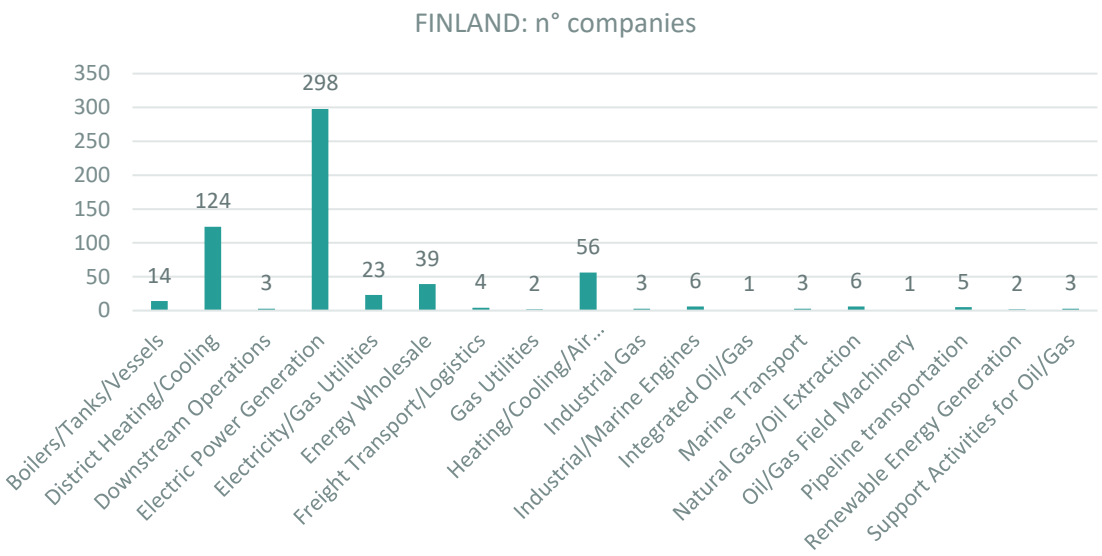
7.9. FINLAND

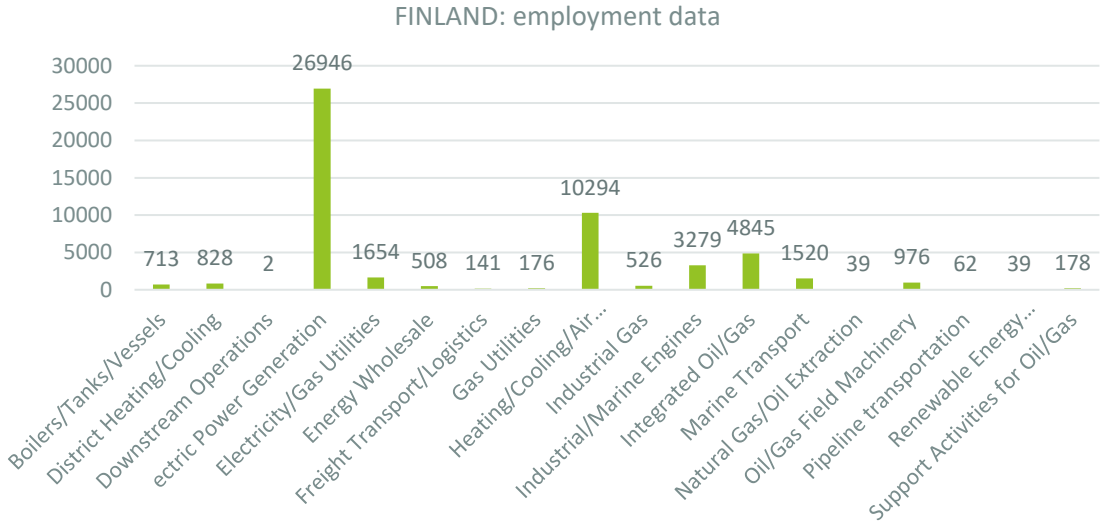
- DISTRICT HEATING/COOLING ACTIVITY CONCENTRATES A LARGE NUMBER OF COMPANIES IN THE COUNTRY, BUT ALMOST ALL OF THEM HAVE LESS THAN 10 EMPLOYEES.
- "ELECTRIC POWER GENERATION" EMPLOYS 26946 PEOPLE AND "GEATING/COOLING/ AIR TREATMENT EQUIPMENT" 10294.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "GASGRID FINLAND OY".

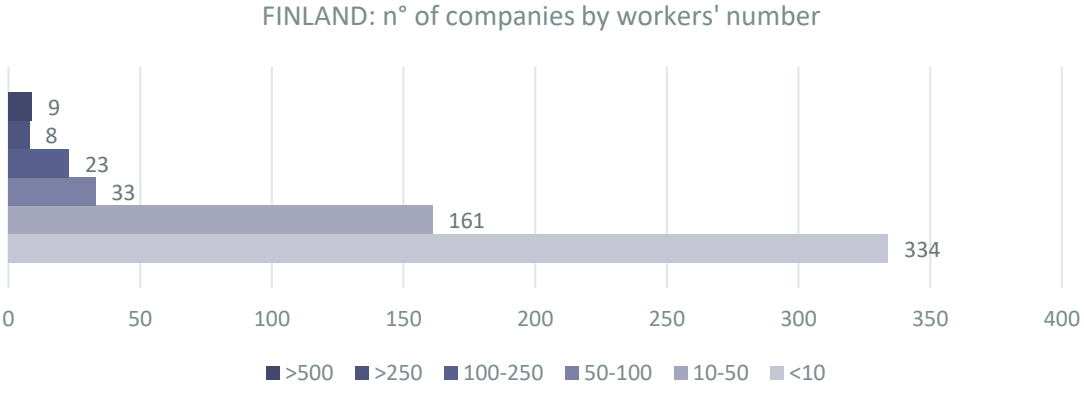
Finland: Total energy supply evolution.



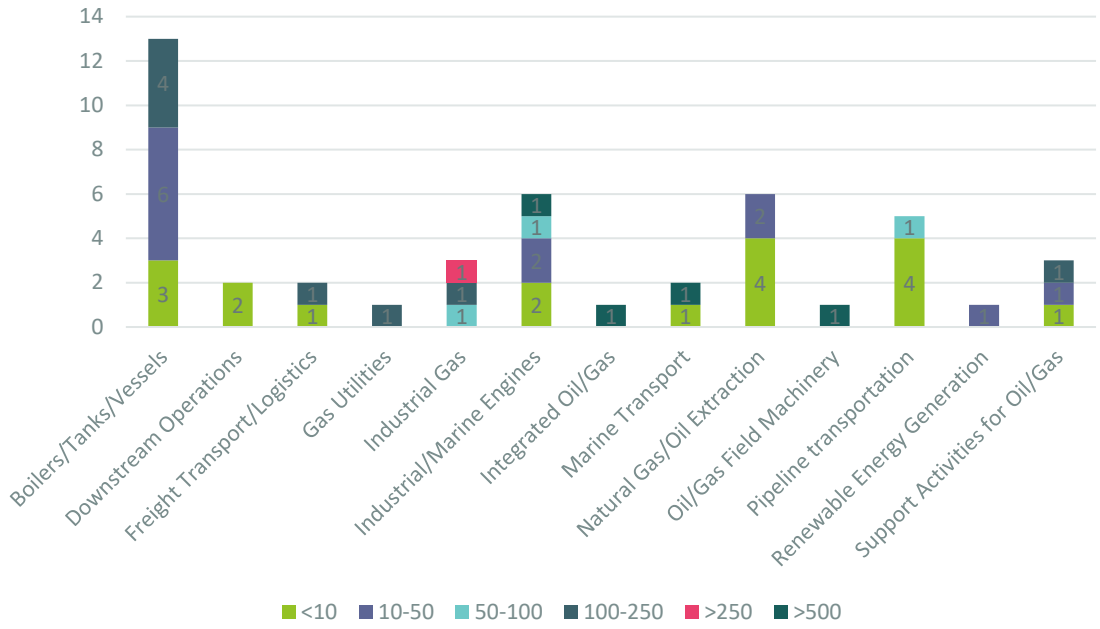



FINLAND: n° companies
350
300
250
200
150
100
50
0
14
124
3
298
23
39
4
2
56
3
6
1
3
6
1
5
2
3
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline transportation
Renewable Energy Generation
Support Activities for Oil/Gas

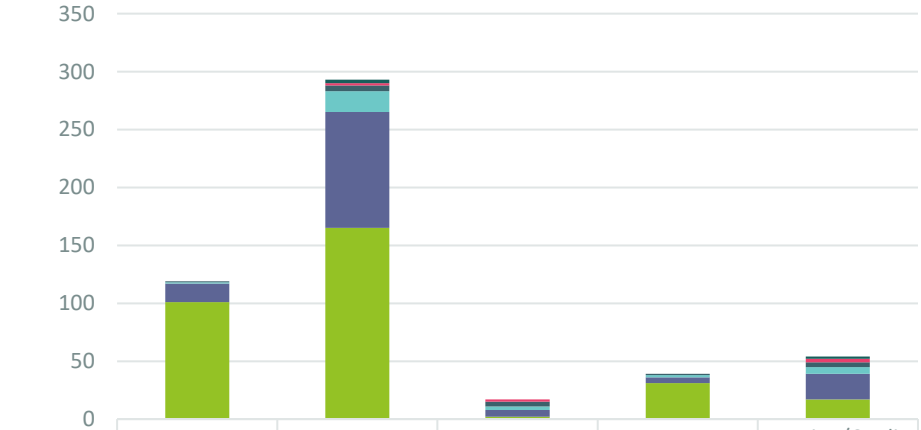

FINLAND: employment data
30000
25000
20000
15000
10000
5000
0
713
828
2
26946
1654
508
141
176
10294
526
3279
4845
1520
39
976
62
39
178
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
ectric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline transportation
Renewable Energy...
Support Activities for Oil/Gas


FINLAND: n° of companies by workers' number
9
8
23
33
161
334
0
50
100
150
200
250
300
350
400
>500
>250
100-250
50-100
10-50
<10

FINLAND: n° of companies by workers' number and activity field (1)



FINLAND: n° of companies by workers' number and activity field (2)

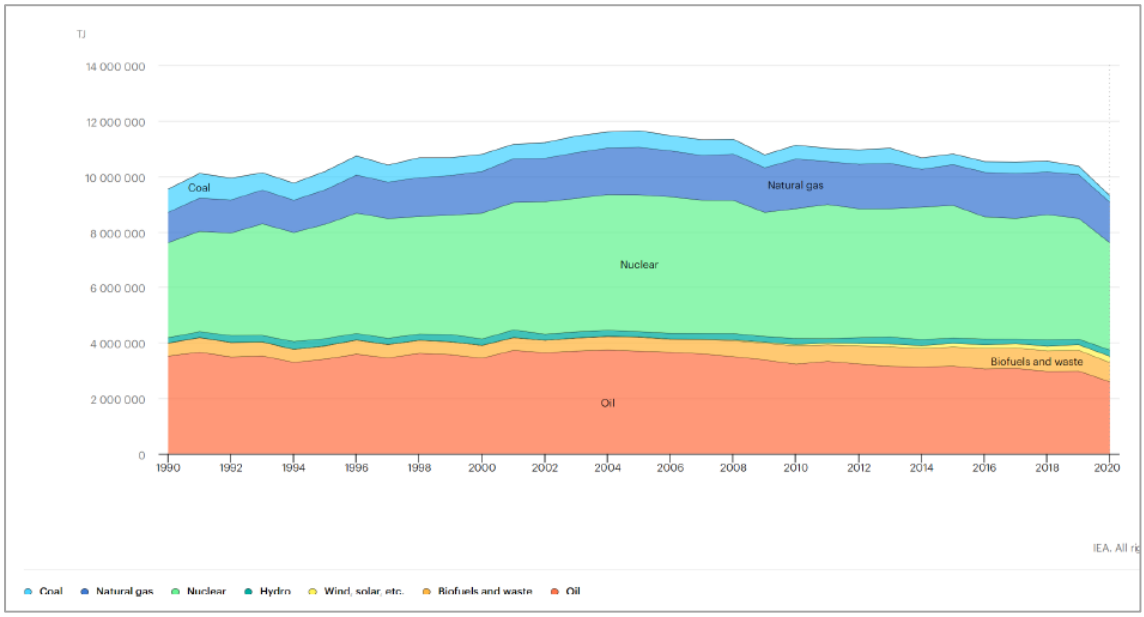


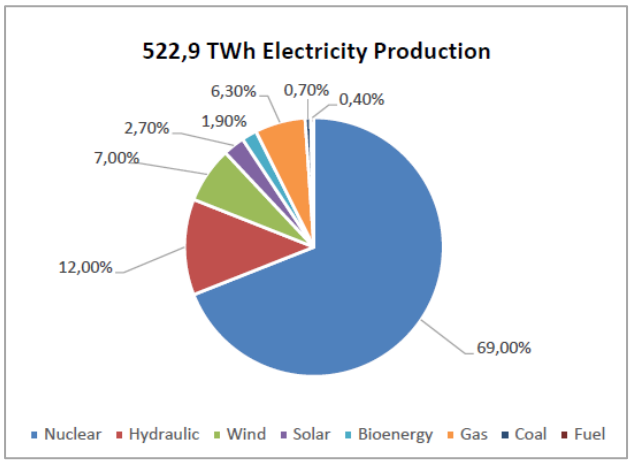
	District Heating/Cooling	Electric Power Generation	Electricity/Gas Utilities	Energy Wholesale	Heating/Cooling/Air Treatment Equipment
>500		3			2
>250		2	2		3
100-250	1	5	4	1	4
50-100	1	18	3	2	6
10-50	16	100	6	5	22
<10	101	165	2	31	17

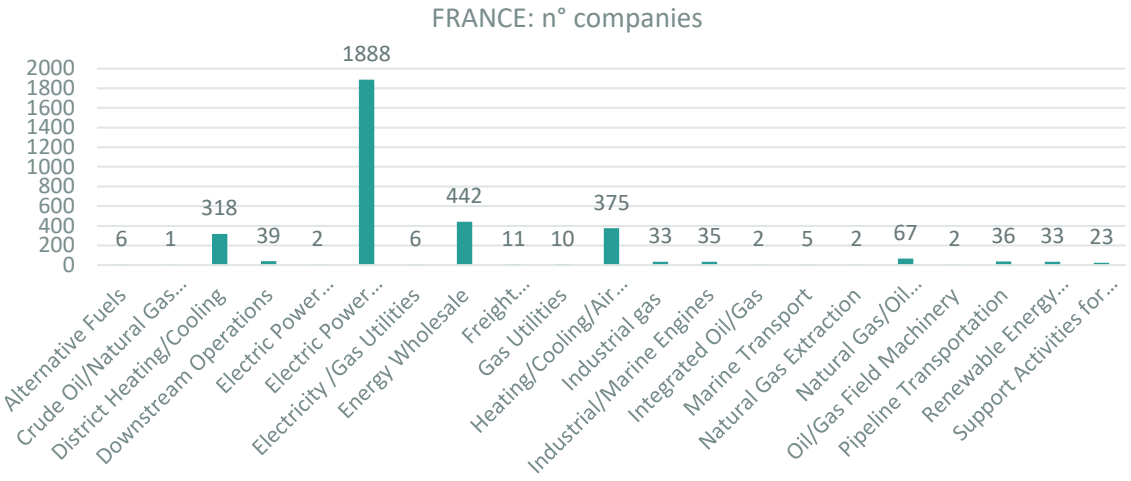
7.10. FRANCE

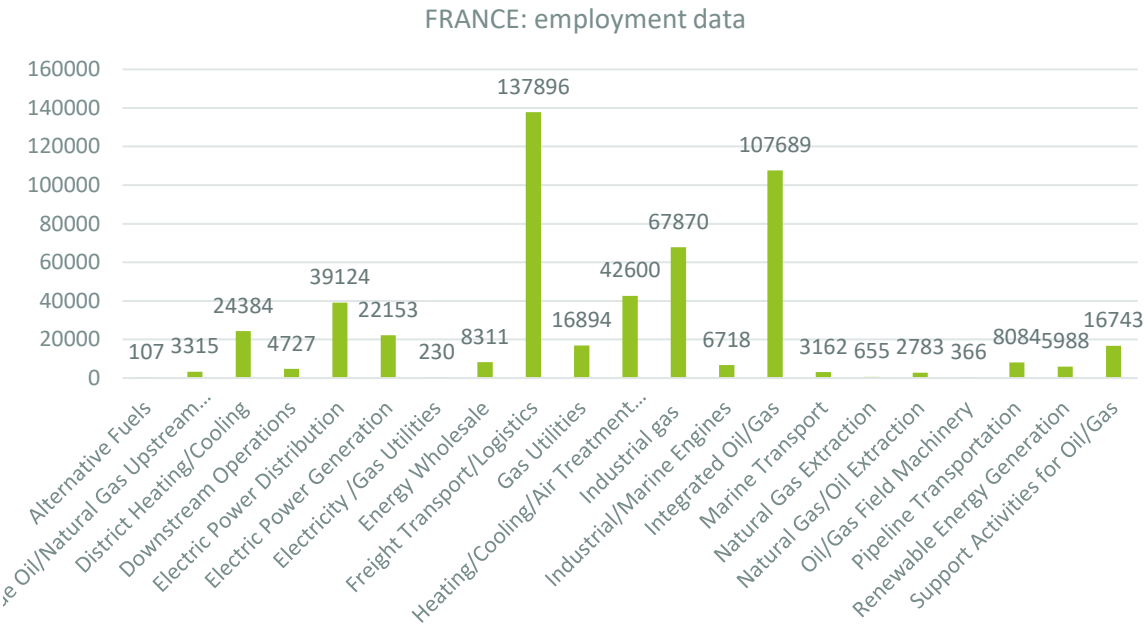
- FRANCE IS ONE OF THE LEADING GAS PRODUCING COUNTRIES IN THE EUROPEAN UNION WITH A TOTAL OF 519799 PEOPLE EMPLOYED AND 1888 COMPANIES IN THE "ELECTRIC POWER GENERATION" ACTIVITY.
- THE MAJORITY OF COMPANIES ARE ALSO SMALL AND MEDIUM-SIZED, MOST OF THEM WITH LESS THAN 10 EMPLOYEES.
- TWO COMPANIES IN THE "INTEGRATED OIL/GAS" ACTIVITY HAVE 107,689 EMPLOYEES, AND SEVEN COMPANIES IN THE "FREIGHT TRANSPORT/LOGISTIC" ACTIVITY MAKE IT THE ACTIVITY THAT GENERATES THE MOST EMPLOYMENT (13,789 PEOPLE).

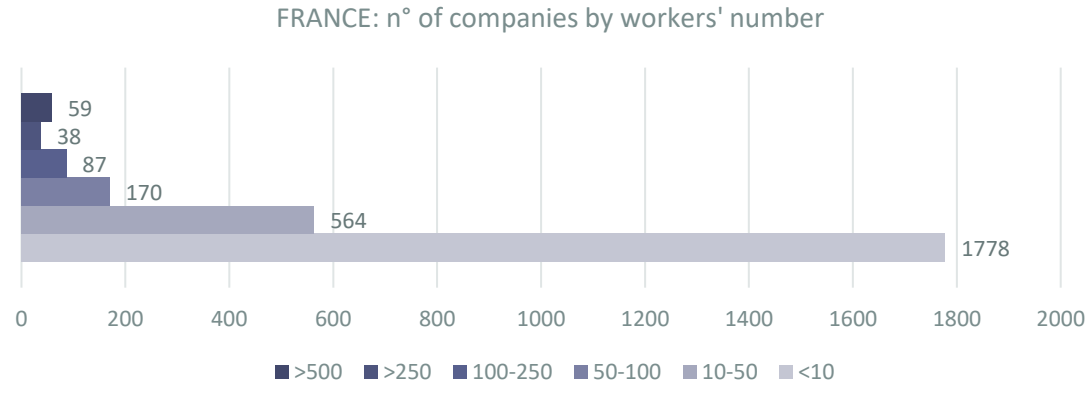
France: Total energy supply evolution.

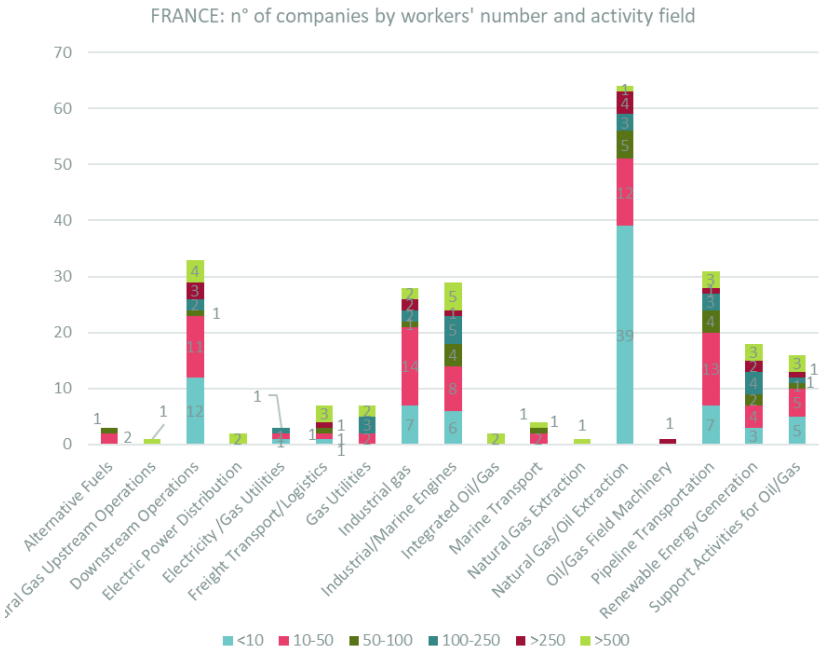


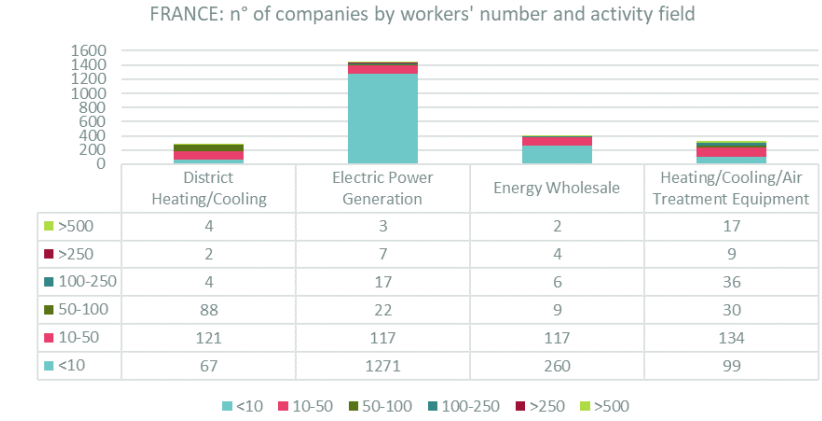



FRANCE: n° companies
2000
1800
1600
1400
1200
1000
800
600
400
200
0
6
1
318
39
2
1888
6
442
11
10
375
33
35
2
5
2
67
2
36
33
23
Alternative Fuels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power...
Electric Power...
Electricity /Gas Utilities
Energy Wholesale
Freight...
Gas Utilities
Heating/Cooling/Air...
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas Extraction
Natural Gas/Oil...
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy...
Support Activities for...


FRANCE: employment data
160000
140000
120000
100000
80000
60000
40000
20000
0
107
3315
24384
4727
39124
22153
230
8311
137896
16894
42600
67870
6718
107689
3162
655
2783
366
8084
5988
16743
Alternative Fuels
Crude Oil/Natural Gas Upstream...
District Heating/Cooling
Downstream Operations
Electric Power Distribution
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas Extraction
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


FRANCE: n° of companies by workers' number
59
38
87
170
564
1778
0
200
400
600
800
1000
1200
1400
1600
1800
2000
>500
>250
100-250
50-100
10-50
<10





	District Heating/Cooling	Electric Power Generation	Energy Wholesale	Heating/Cooling/Air Treatment Equipment
>500	4	3	2	17
>250	2	7	4	9
100-250	4	17	6	36
50-100	88	22	9	30
10-50	121	117	117	134
<10	67	1271	260	99

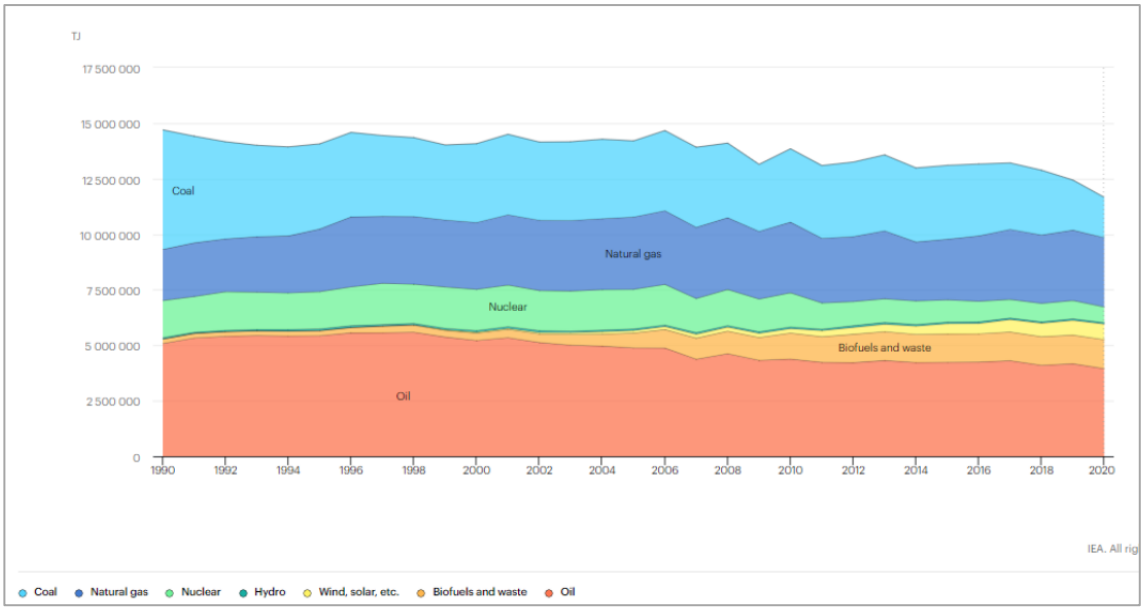
Identification of mayor European companies

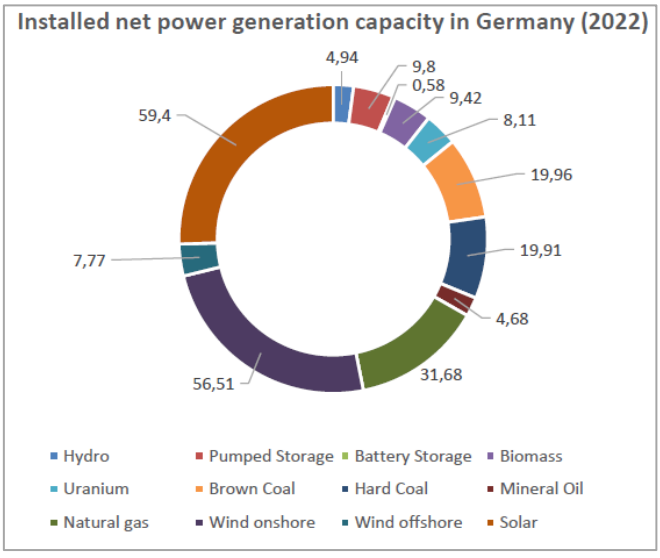
France

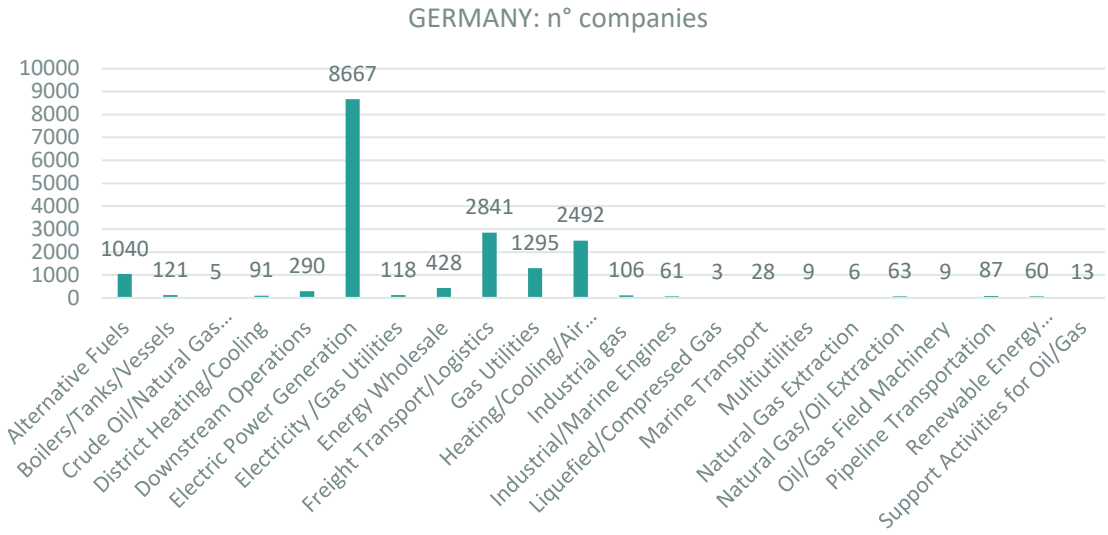
7.11. GERMANY

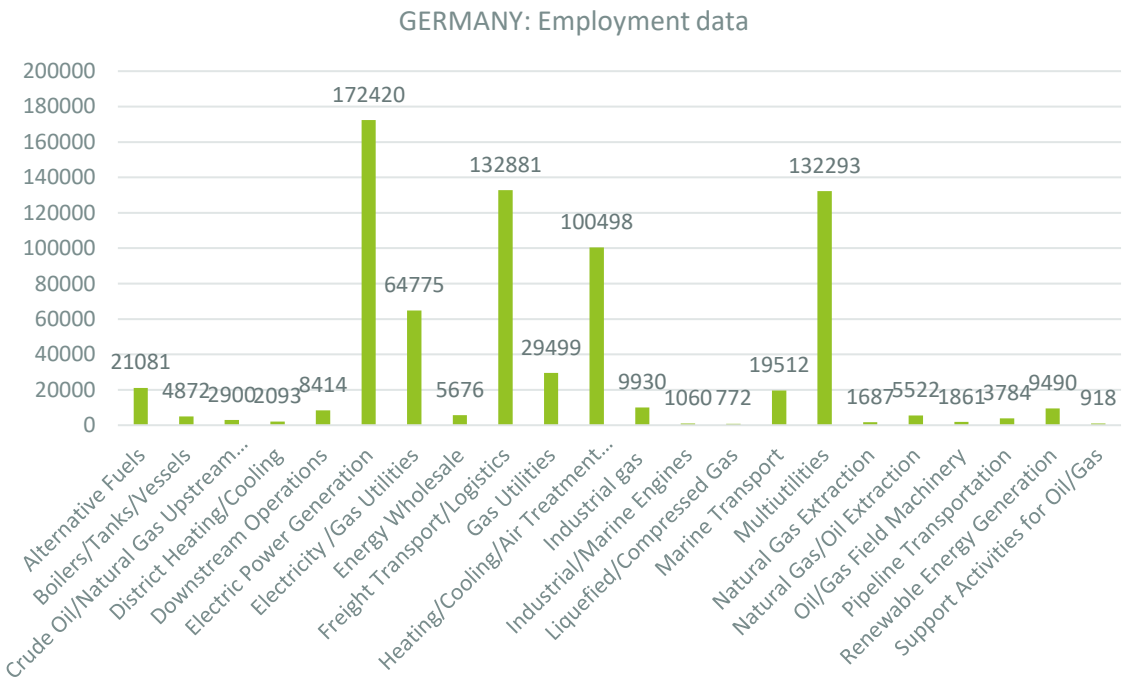
- GERMANY IS ONE OF THE MOST IMPORTANT COUNTRIES IN THE EUROPEAN GAS SECTOR. IT HAS 731939 EMPLOYEES AND 17833 COMPANIES.
- MOST OF THE COMPANIES ARE SMALL AND MEDIUM-SIZED ENTERPRISES, AND A LARGE PART OF THEM ARE IN THE "ELECTRIC POWER GENERATION" BUSINESS.
- IN TERMS OF EMPLOYMENT, SEVERAL ACTIVITIES STAND OUT: "ELECTRIC POWER GENERATION", "FREIGHT TRANSPORT/LOGISTICS", "MULTI-UTILITIES" AND "HEATING/COOLING/AIR TREATMENT EQUIPMENT".

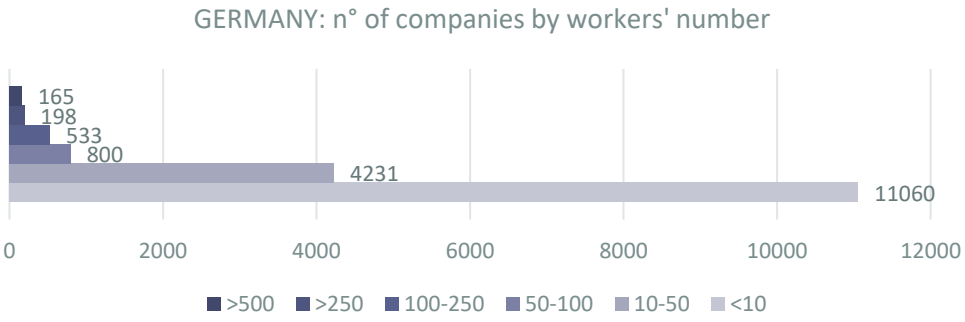
Germany: Total energy supply evolution

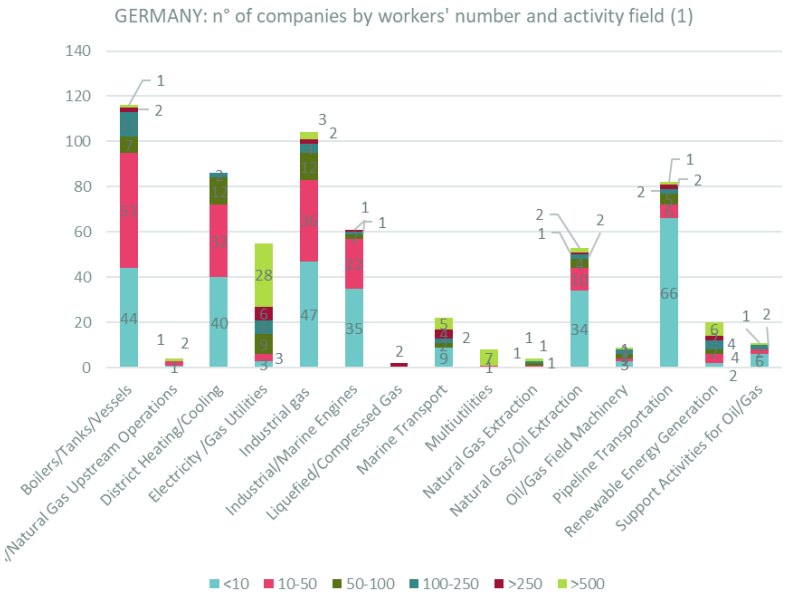




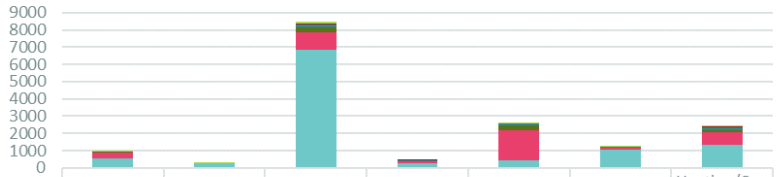

GERMANY: n° companies
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1040
121
5
91
290
8667
118
428
2841
1295
2492
106
61
3
28
9
6
63
9
87
60
13
Alternative Fuels
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial gas
Industrial/Marine Engines
Liquefied/Compressed Gas
Marine Transport
Multiutilities
Natural Gas Extraction
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy...
Support Activities for Oil/Gas


GERMANY: Employment data
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
21081
4872
2900
2093
8414
172420
64775
5676
132881
29499
100498
9930
1060
772
19512
132293
1687
5522
1861
3784
9490
918
Alternative Fuels
Boilers/Tanks/Vessels
Crude Oil/Natural Gas Upstream...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas
Industrial/Marine Engines
Liquefied/Compressed Gas
Marine Transport
Multiutilities
Natural Gas Extraction
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


GERMANY: n° of companies by workers' number
165
198
533
800
4231
11060
0
2000
4000
6000
8000
10000
12000
>500
>250
100-250
50-100
10-50
<10



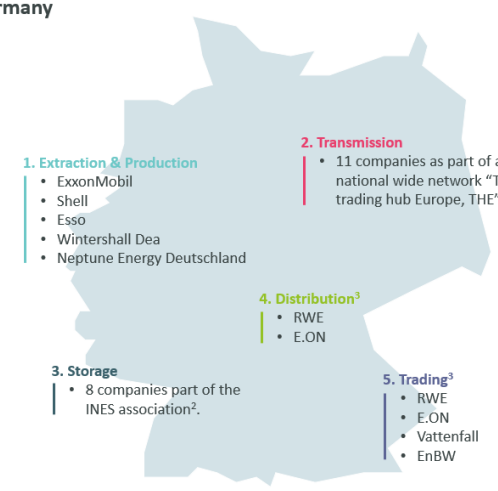
GERMANY: n° of companies by workers' number and activity field (2)



	Alternative Fuels	Downstream Operations	Electric Power Generation	Energy Wholesale	Freight Transport/Logistics	Gas Utilities	Heating/Cooling/Air Treatment Equipment
>500	2	5	58		13	7	23
>250	10	2	67	3	29	15	50
100-250	21	7	182	7	112	26	139
50-100	56	5	259	5	249	21	147
10-50	343	20	1028	108	1761	114	686
<10	524	243	6857	296	429	1063	1358

Identification of major European companies

Germany

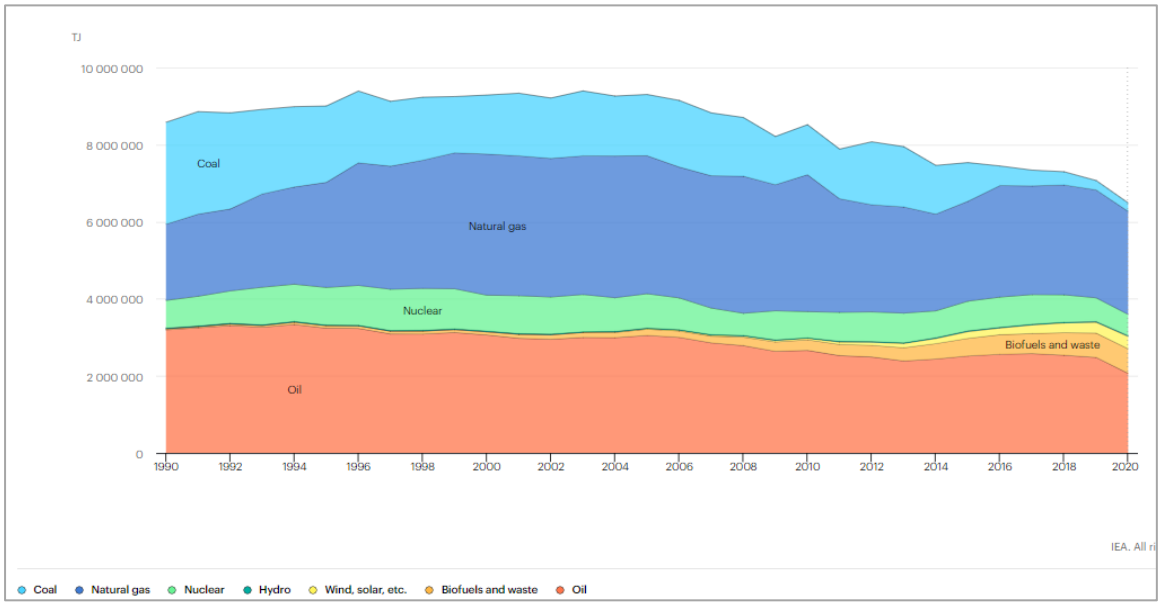


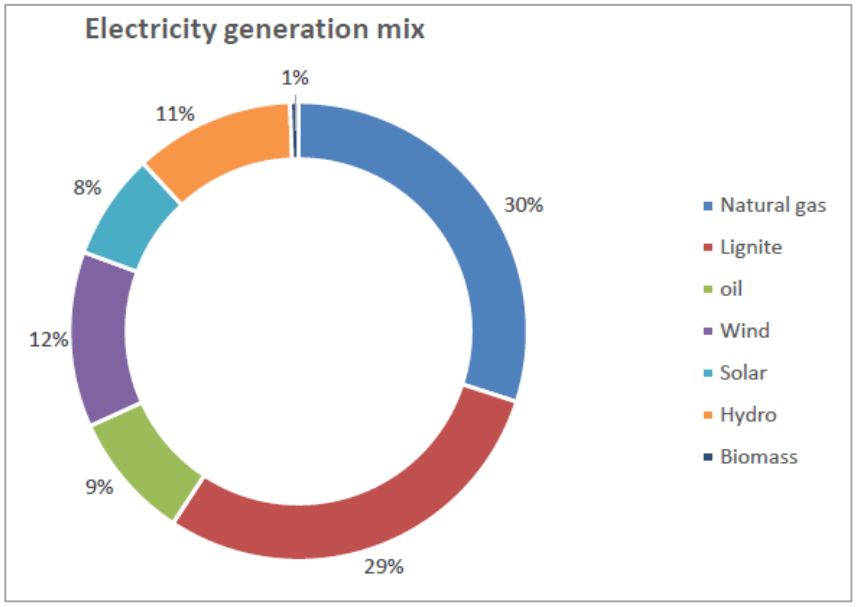
1. bayernets GmbH, Fluxys TENP GmbH, Gascade Gastransport GmbH, Gastransport Nord GmbH (GTG Nord), Gasunie Deutschland Transport Services GmbH, GRTgaz Deutschland GmbH, Nowega GmbH, Ontras Gastransport GmbH, Open Grid Europe GmbH (OGE), terranets bw GmbH, Thyssengas GmbH.
2. INES is the association of German gas and hydrogen storage system operators: Storengy Deustchland GmbH, VNG Gasspeicher, Bayernugs, Astora, Enovos, Nafta Speicher, EKB Storage, Uniper.

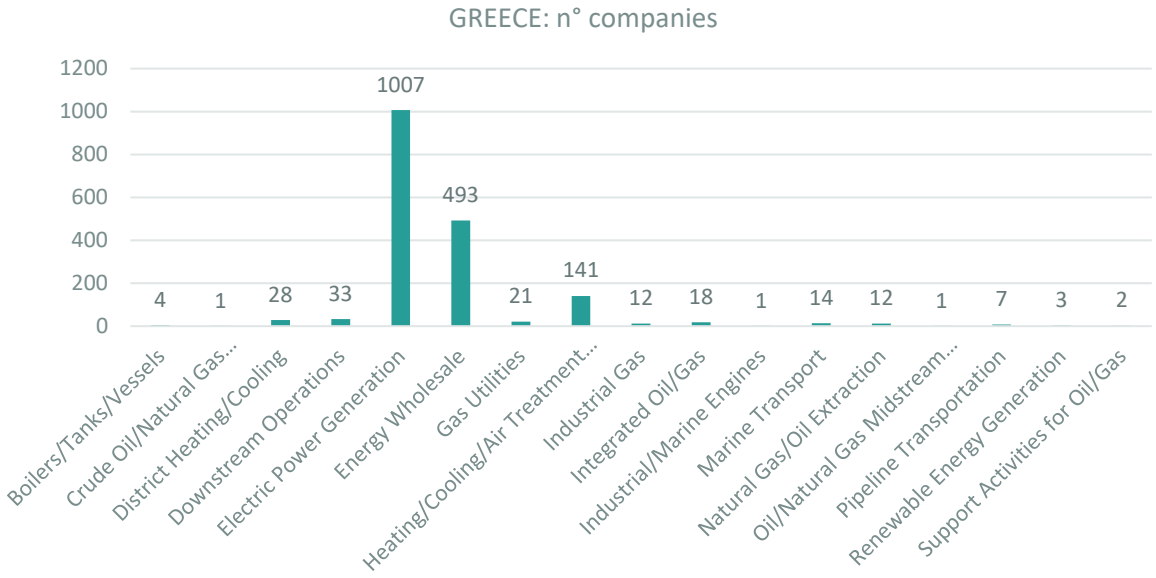
7.12. GREECE

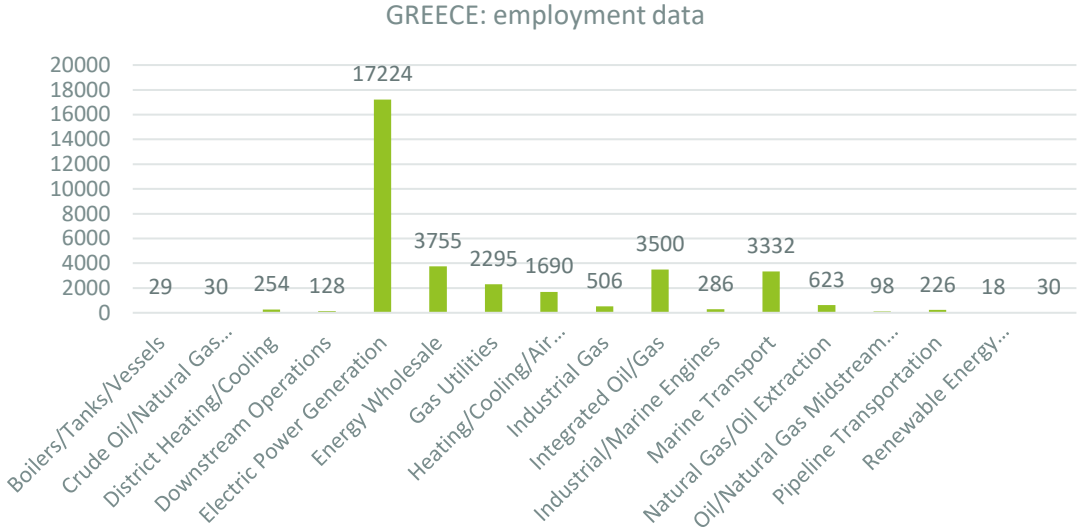
- IN GREECE, THE MAIN ACTIVITY IS ELECTRIC POWER GENERATION.
- THERE ARE FEW COMPANIES WITH MORE THAN 50 EMPLOYEES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "DEESFA S.A.".

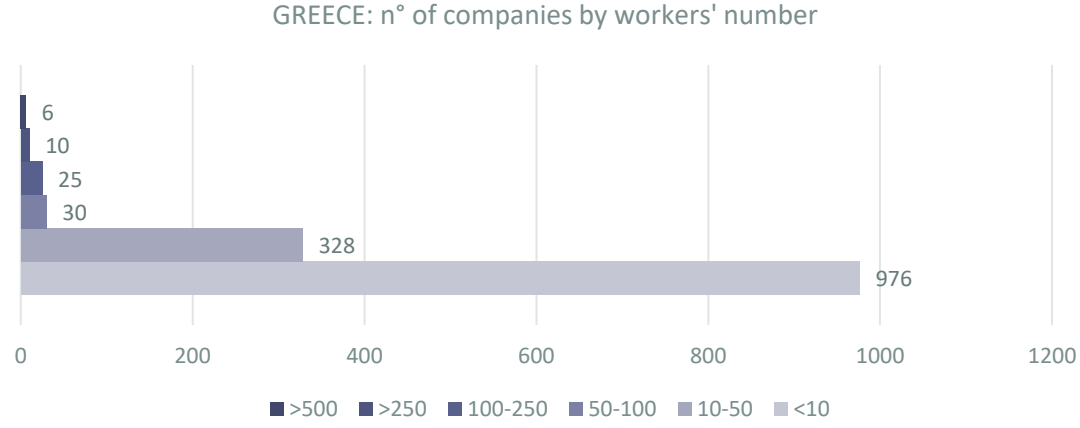
Greece: Total energy supply evolution.



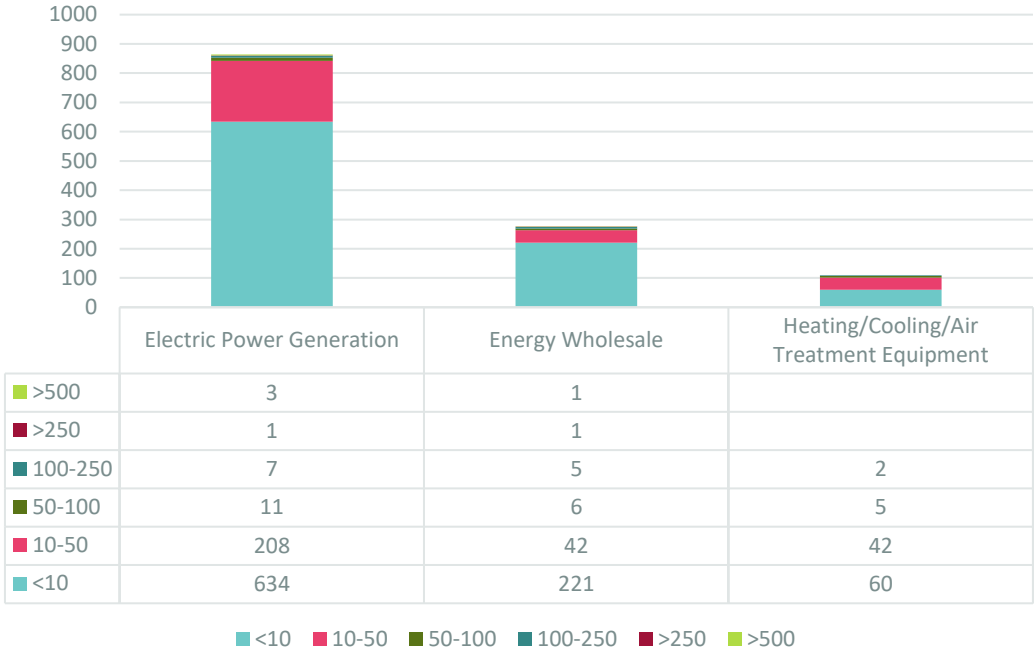



GREECE: n° companies
1200
1000
800
600
400
200
0
4
1
28
33
1007
493
21
141
12
18
1
14
12
1
7
3
2
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Integrated Oil/Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Oil/Natural Gas Midstream...
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


GREECE: employment data
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
29
30
254
128
17224
3755
2295
1690
506
3500
286
3332
623
98
226
18
30
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Integrated Oil/Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Oil/Natural Gas Midstream...
Pipeline Transportation
Renewable Energy...

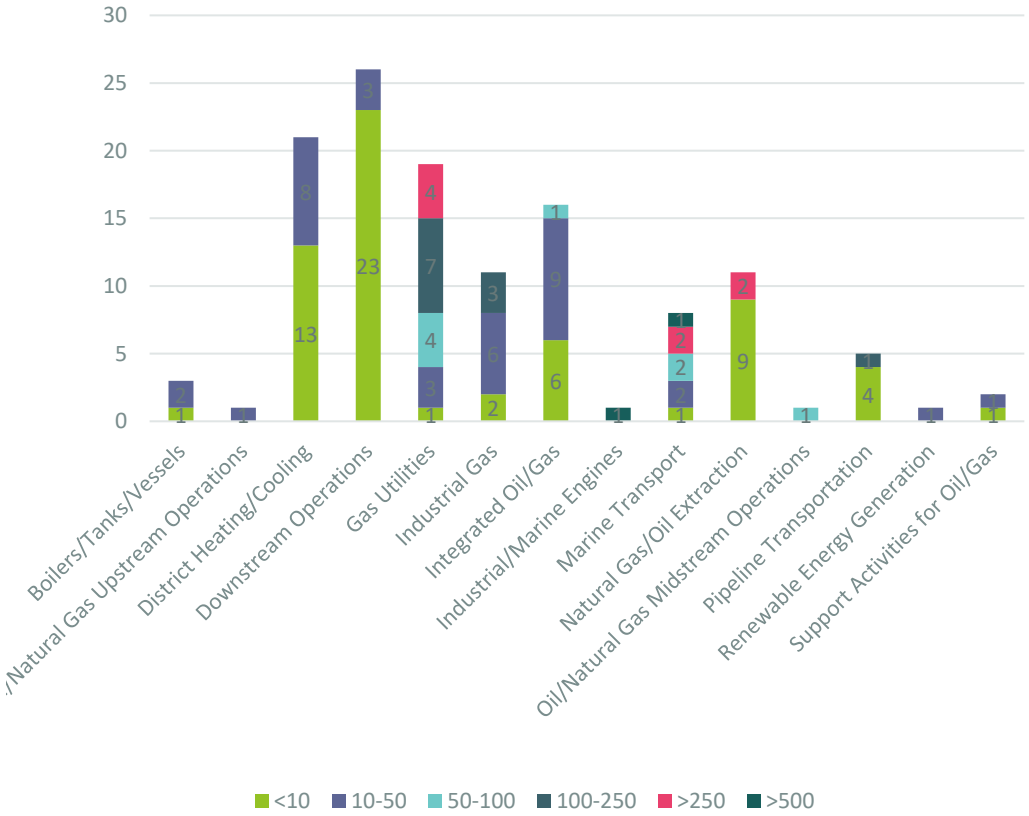

GREECE: n° of companies by workers' number
6
10
25
30
328
976
0
200
400
600
800
1000
1200
>500
>250
100-250
50-100
10-50
<10

GREECE: n° of companies by workers' number and activity field (1)



	Electric Power Generation	Energy Wholesale	Heating/Cooling/Air Treatment Equipment
>500	3	1	
>250	1	1	
100-250	7	5	2
50-100	11	6	5
10-50	208	42	42
<10	634	221	60

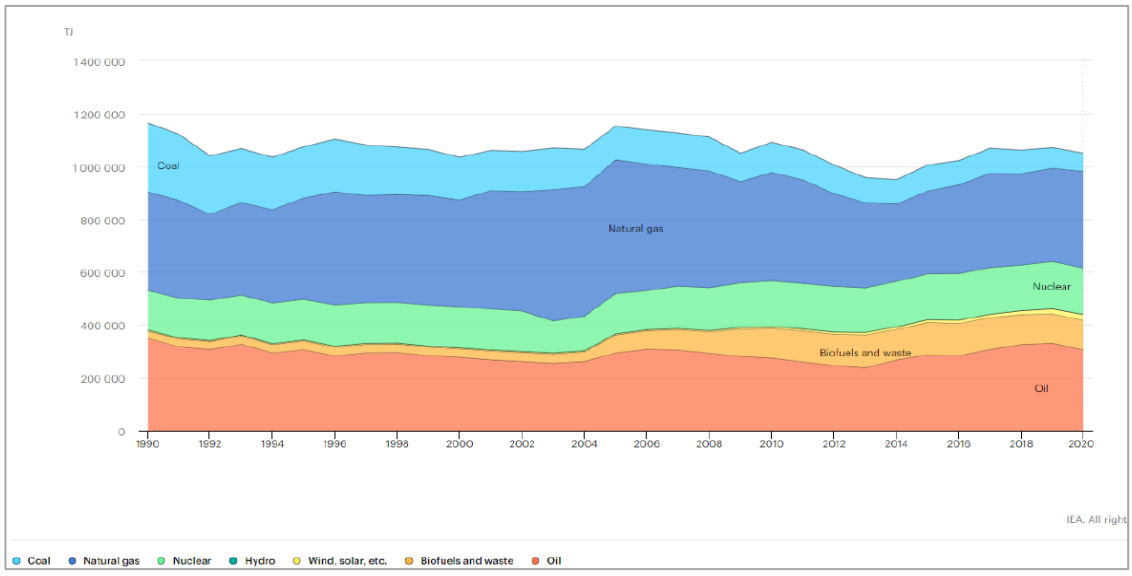
GREECE: n° of companies by workers' number and activity field (2)

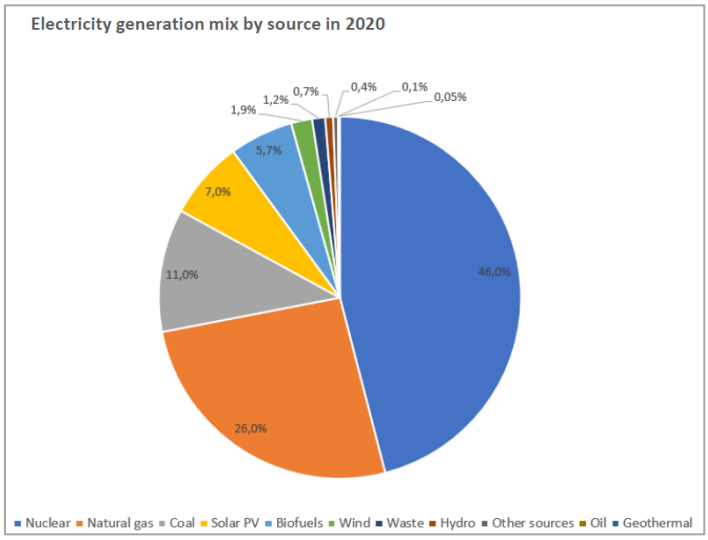


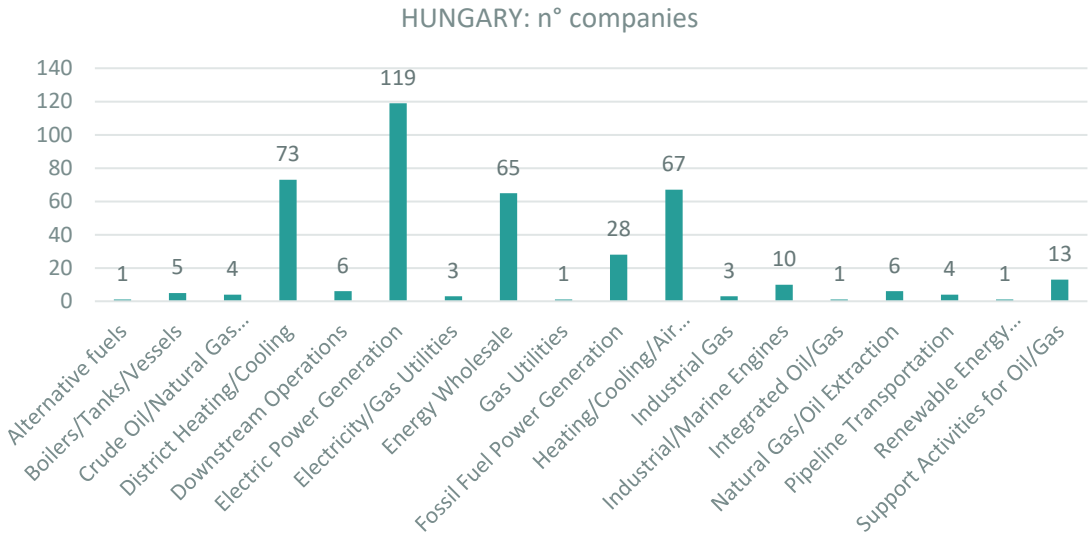
7.13. HUNGARY

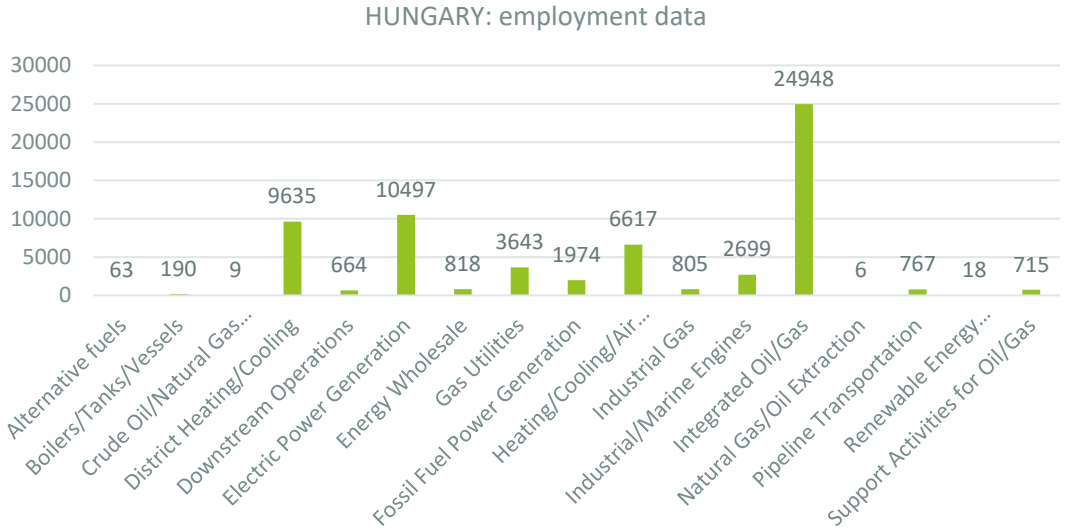
- ALTHOUGH THERE ARE NOT MANY COMPANIES IN THE GAS SECTOR IN THIS COUNTRY, THE PERCENTAGE OF LARGE COMPANIES OUT OF THE TOTAL STANDS OUT IN RELATION TO THE REST OF THE COUNTRIES.
- MOREOVER, THESE COMPANIES ARE RELATIVELY DIVERSIFIED IN DIFFERENT ACTIVITIES IN THE SECTOR, ALTHOUGH THE ELECTRIC POWER GENERATION ACTIVITY STANDS OUT ABOVE ALL.
- THE ACTIVITY THAT GENERATES MOST EMPLOYMENT IS "INTEGRATED OIL/GAS".
- THE TWO MAIN GAS COMPANIES IN THE COUNTRY ARE "FGSZ" AND “NATURAL GAS TRANSMISSION PRIVATE”.

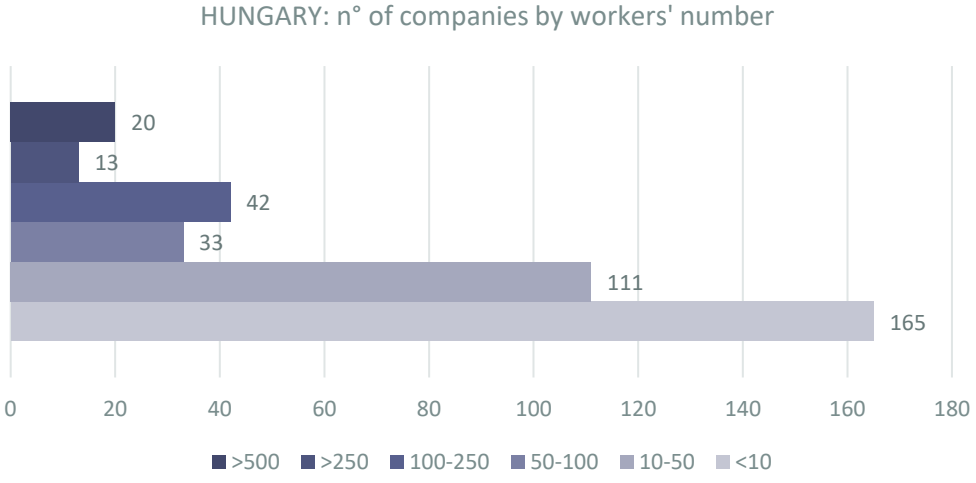
Hungary: Total energy supply evolution

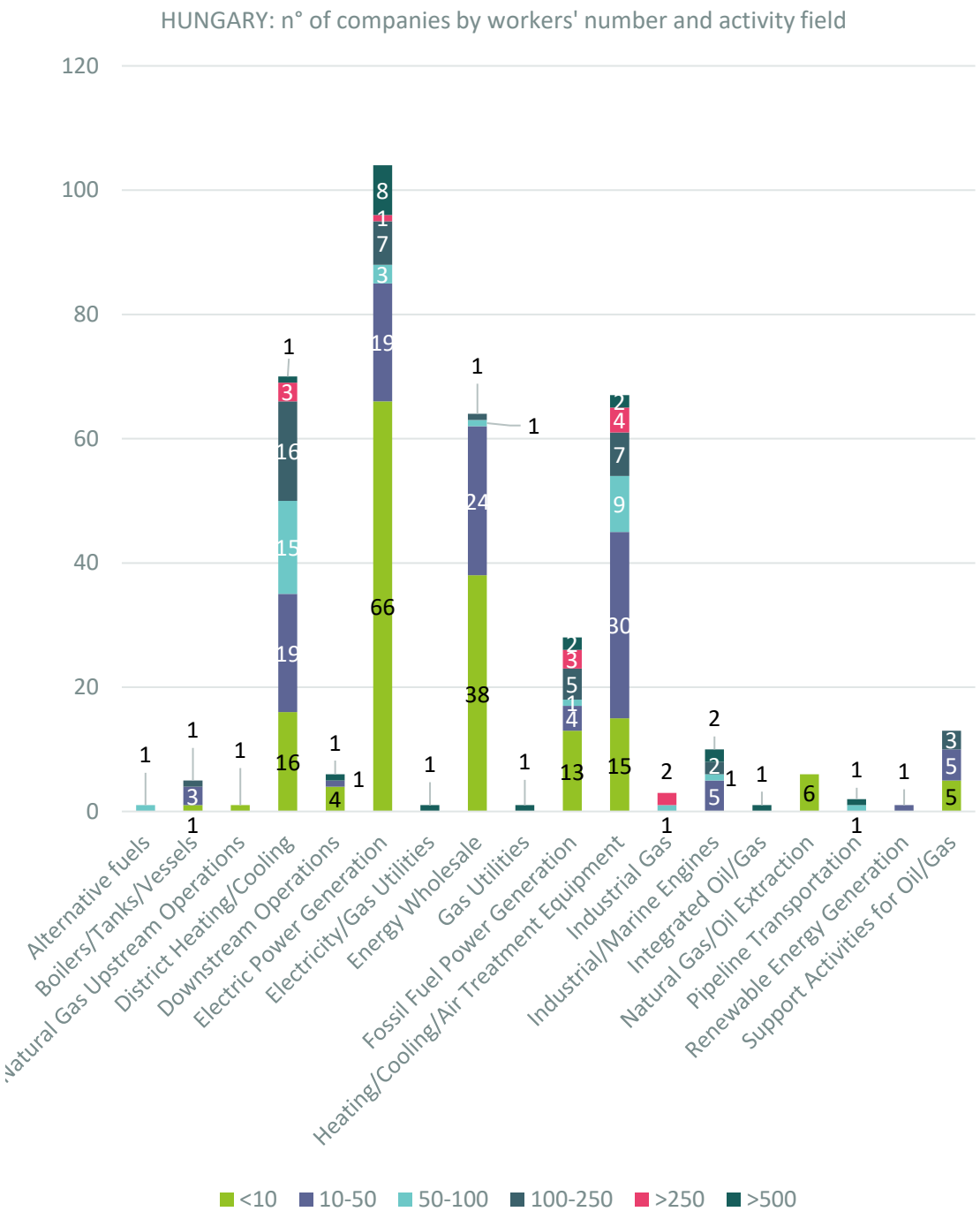





HUNGARY: n° companies
140
120
100
80
60
40
20
0
1
5
4
73
6
119
3
65
1
28
67
3
10
1
6
4
1
13
Alternative fuels
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Gas Utilities
Fossil Fuel Power Generation
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy...
Support Activities for Oil/Gas


HUNGARY: employment data
30000
25000
20000
15000
10000
5000
0
63
190
9
9635
664
10497
818
3643
1974
6617
805
2699
24948
6
767
18
715
Alternative fuels
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Fossil Fuel Power Generation
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy...
Support Activities for Oil/Gas

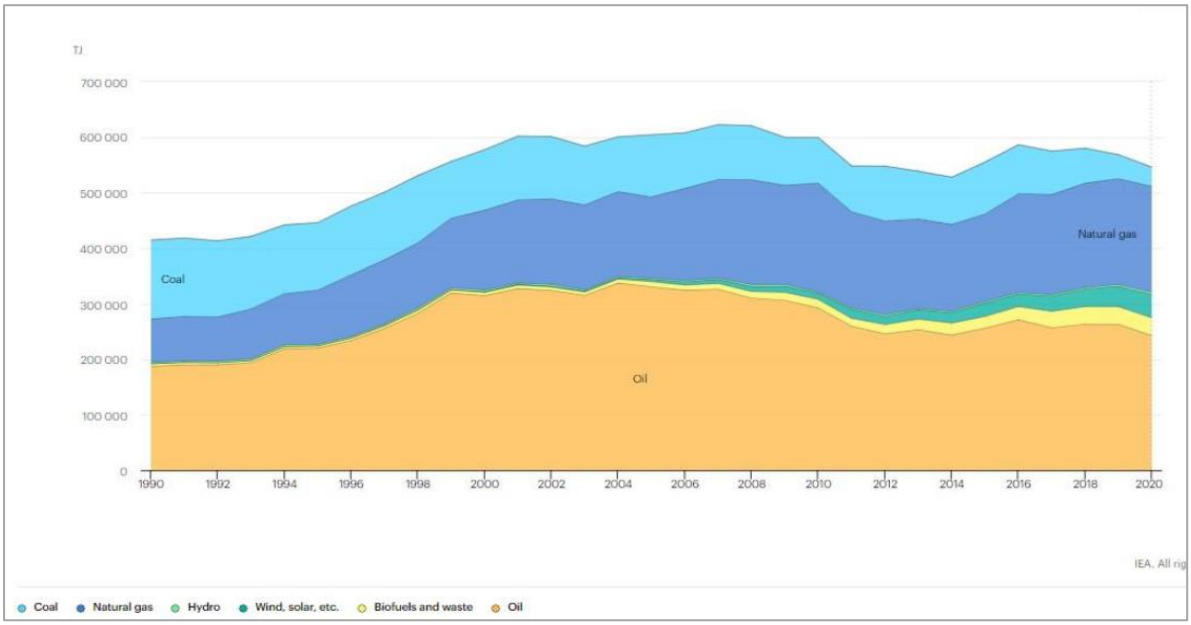

HUNGARY: n° of companies by workers' number
20
13
42
33
111
165
0
20
40
60
80
100
120
140
160
180
>500
>250
100-250
50-100
10-50
<10

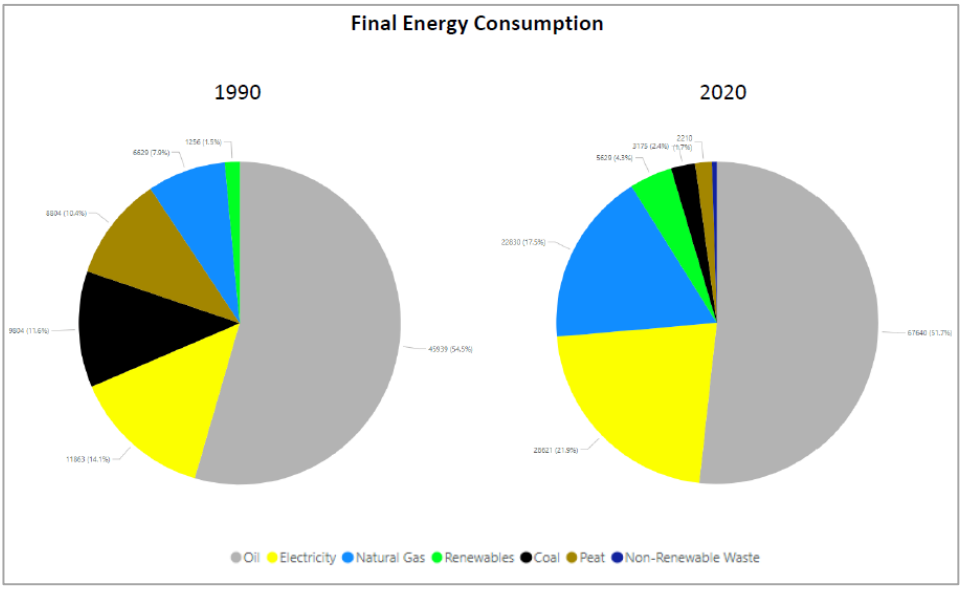

HUNGARY: n° of companies by workers' number and activity field
120
100
80
60
40
20
0
Alternative fuels
Boilers/Tanks/Vessels
Natural Gas Upstream Operations
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Gas Utilities
Fossil Fuel Power Generation
Heating/Cooling/Air Treatment Equipment
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500

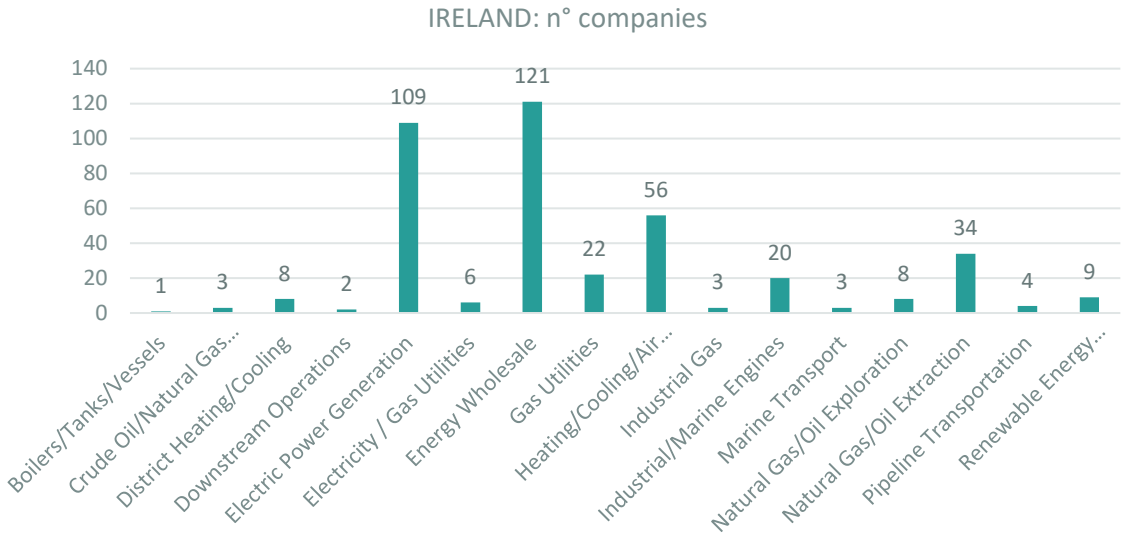
7.14. IRELAND

- WHILE IN TERMS OF THE NUMBER OF COMPANIES, "ELECTRIC POWER GENERATION" AND "ENERGY WHOLESALE" STAND OUT, IN TERMS OF THE NUMBER OF EMPLOYEES, "ELECTRICITY/GAS UTILITIES" AND "HEATING/COOLING/AIR TREATMENT EQUIPMENT" ARE AHEAD.
- THE MAJORITY ARE SMALL AND MEDIUM-SIZED ENTERPRISES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "GAS NETWORKS IRELAND".

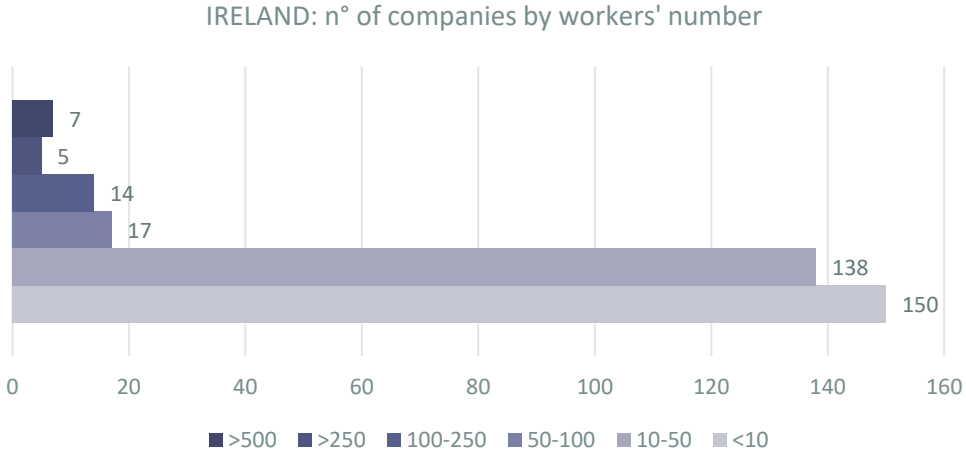
Ireland: Total energy supply evolution

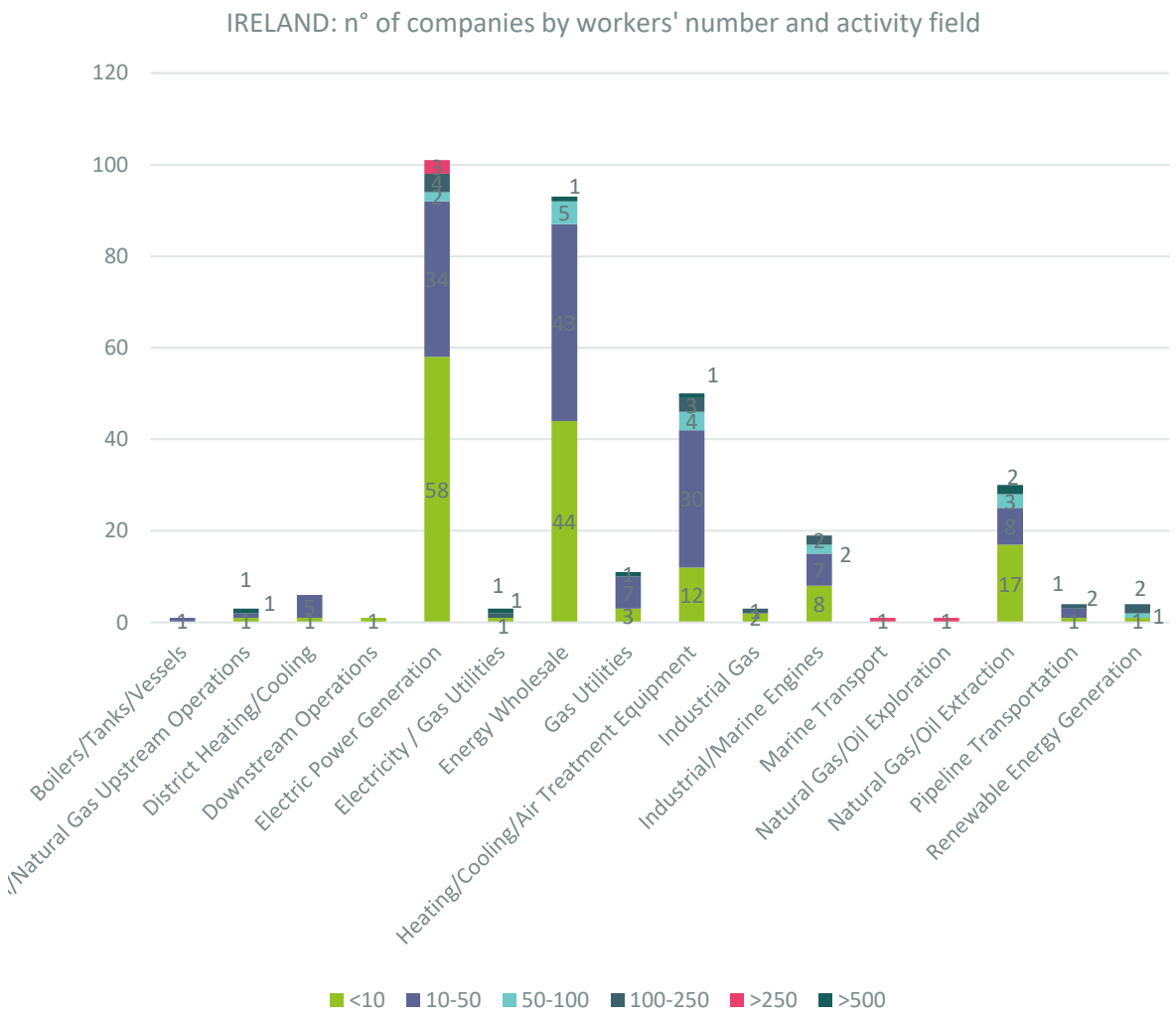





IRELAND: n° companies
140
120
100
80
60
40
20
0
1
3
8
2
109
6
121
22
56
3
20
3
8
34
4
9
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity / Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Exploration
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy...


IRELAND: employment data
8000
7000
6000
5000
4000
3000
2000
1000
0
28
1943
105
5
2465
7262
2925
123
7410
138
609
288
473
2562
143
355
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity / Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Exploration
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy...

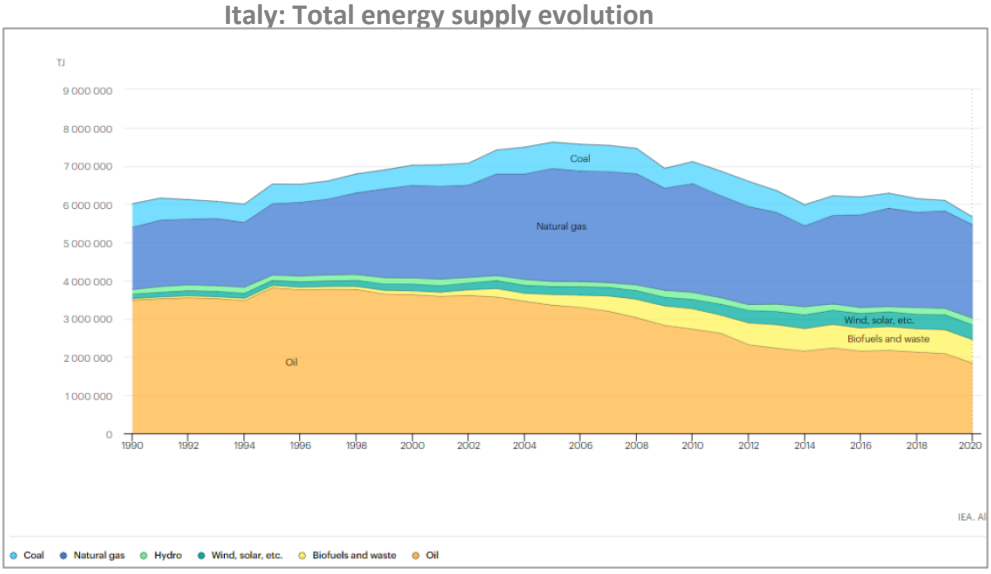

IRELAND: n° of companies by workers' number
7
5
14
17
138
150
0
20
40
60
80
100
120
140
160
>500
>250
100-250
50-100
10-50
<10

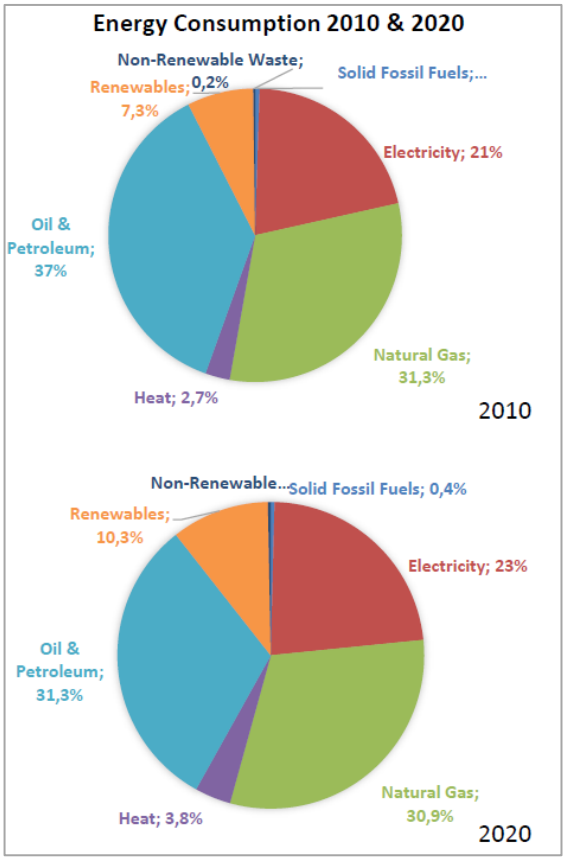

IRELAND: n° of companies by workers' number and activity field
120
100
80
60
40
20
0
Boilers/Tanks/Vessels
/Natural Gas Upstream Operations
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity / Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Exploration
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
<10
10-50
50-100
100-250
>250
>500

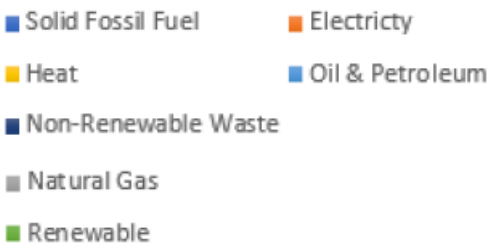
7.15. ITALY

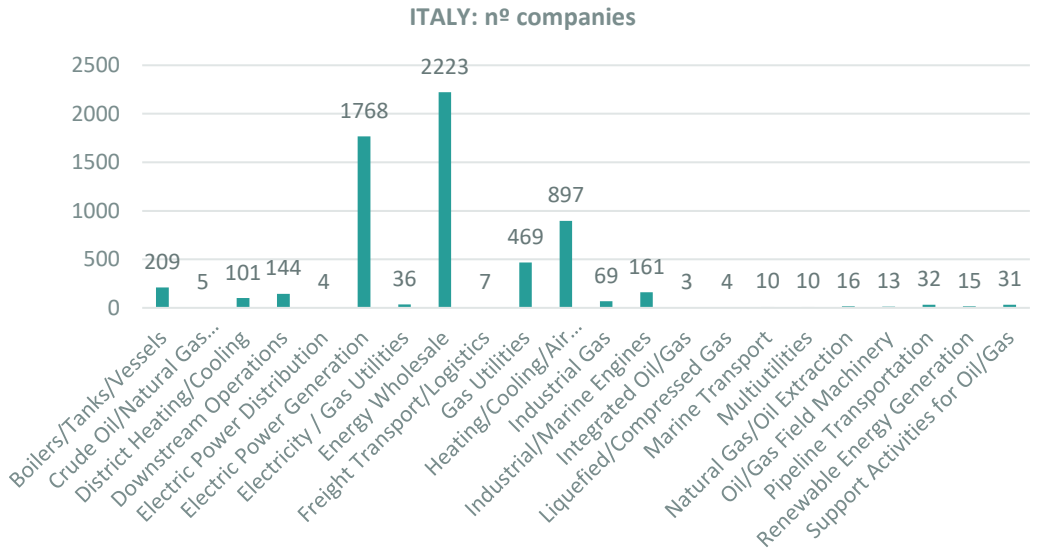
- THREE LARGE COMPANIES EMPLOY 67031 PEOPLE IN THE RENEWABLE ENERGY GENERATION BUSINESS IN ITALY.
- "ELECTRIC POWER GENERATION" AND "ENERGY WHOLESALE" ARE THE ACTIVITIES WITH THE MOST COMPANIES.
- IN GENERAL, SMALL AND MEDIUM-SIZED COMPANIES PREDOMINATE, BUT THE PERCENTAGE OF COMPANIES WITH MORE THAN 500 EMPLOYEES IS HIGH COMPARED TO THE REST OF THE EU COUNTRIES (58 COMPANIES).

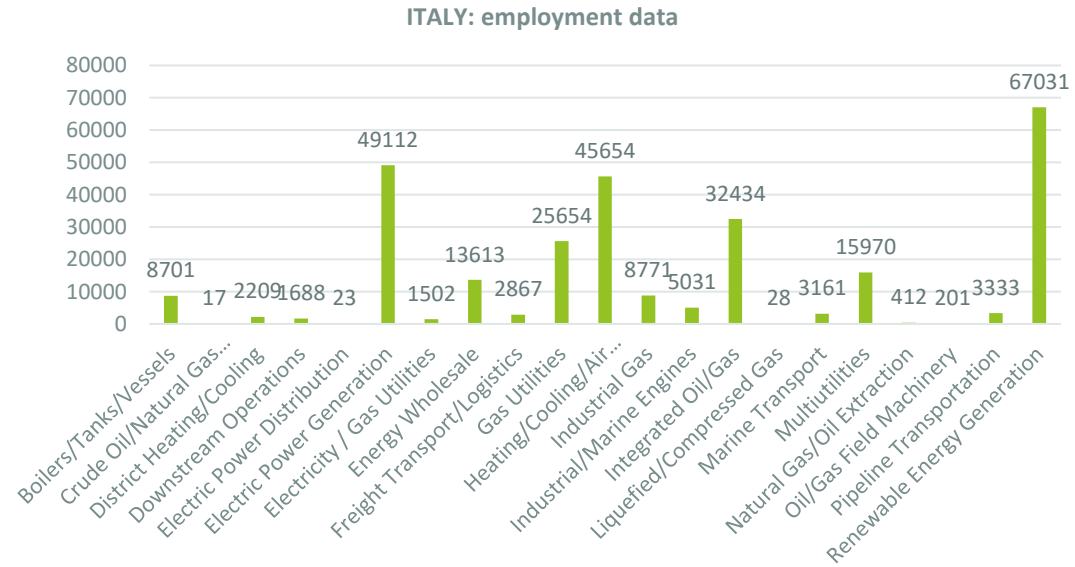
Italy: Total energy supply evolution

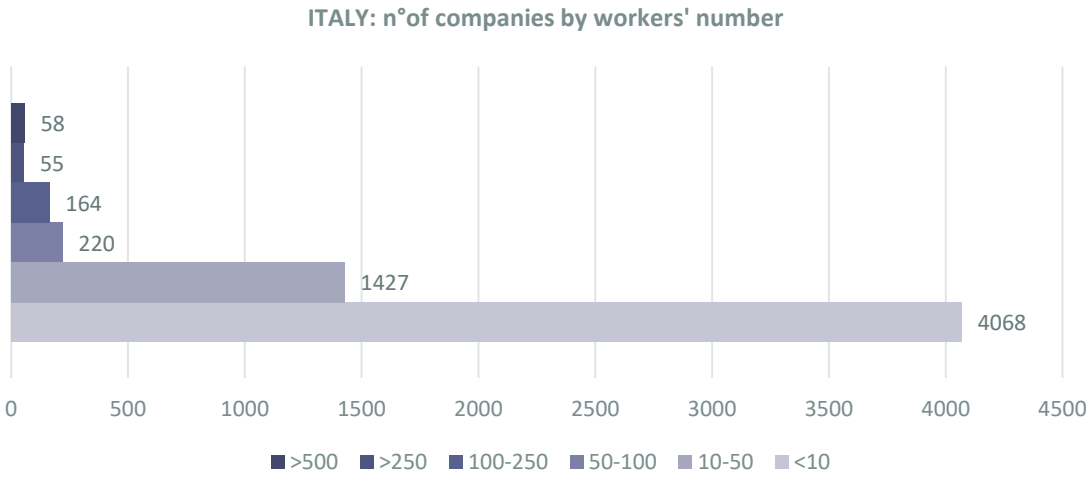


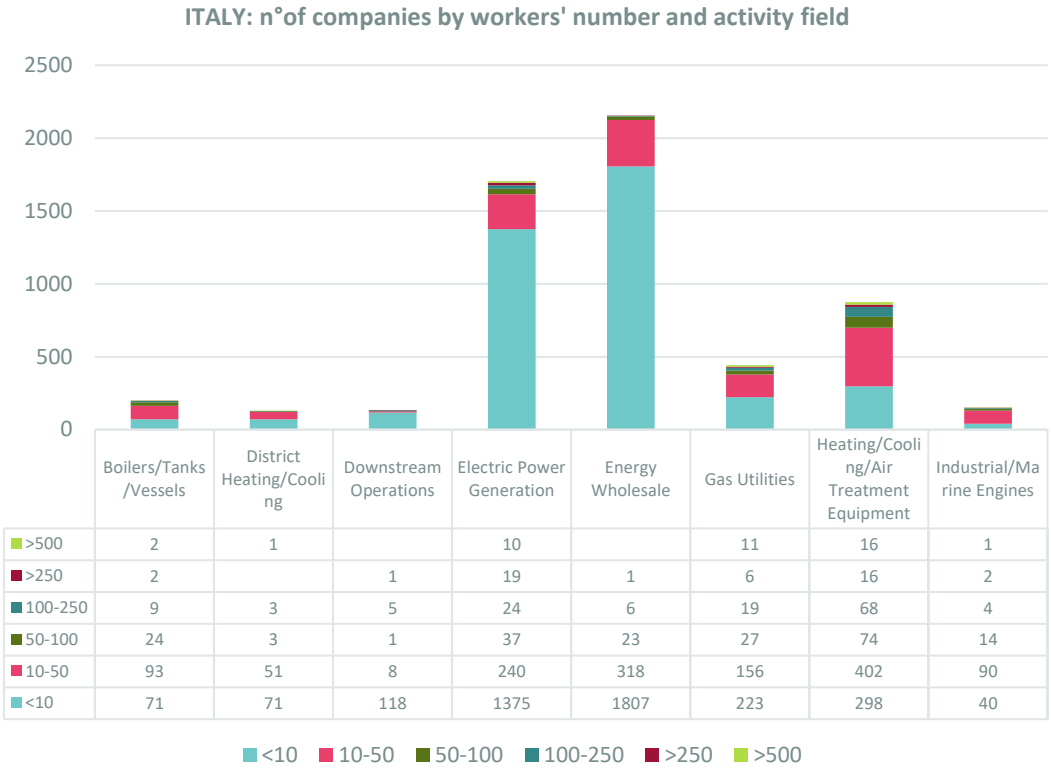




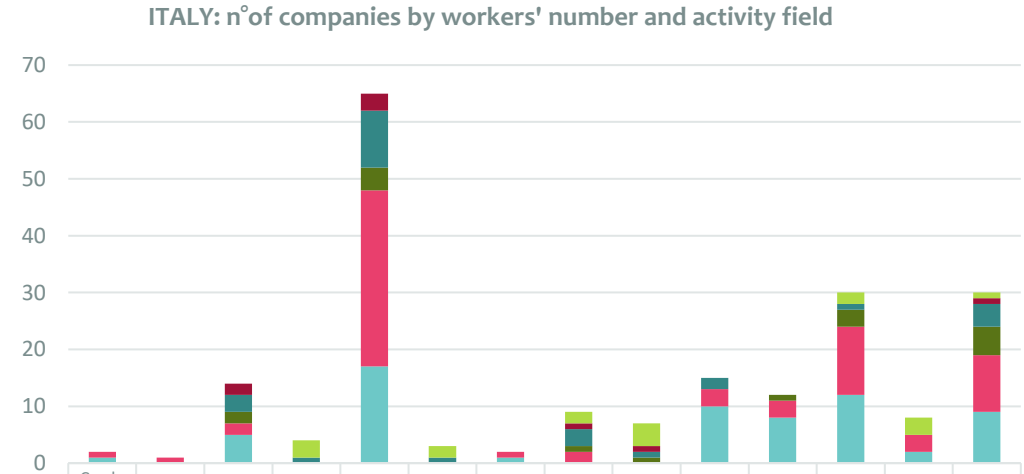

ITALY: nº companies
2500
2000
1500
1000
500
0
209
5
101
144
4
1768
36
2223
7
469
897
69
161
3
4
10
10
16
13
32
15
31
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Distribution
Electric Power Generation
Electricity / Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Liquefied/Compressed Gas
Marine Transport
Multiutilities
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


ITALY: employment data
80000
70000
60000
50000
40000
30000
20000
10000
0
8701
17
2209
1688
23
49112
1502
13613
2867
25654
45654
8771
5031
32434
28
3161
15970
412
201
3333
67031
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Distribution
Electric Power Generation
Electricity / Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Integrated Oil/Gas
Liquefied/Compressed Gas
Marine Transport
Multiutilities
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Renewable Energy Generation


ITALY: n°of companies by workers' number
58
55
164
220
1427
4068
0
500
1000
1500
2000
2500
3000
3500
4000
4500
>500
>250
100-250
50-100
10-50
<10



	Boilers/Tanks /Vessels	District Heating/Cooling	Downstream Operations	Electric Power Generation	Energy Wholesale	Gas Utilities	Heating/Cooling/Air Treatment Equipment	Industrial/Marine Engines
>500	2	1		10		11	16	1
>250	2		1	19	1	6	16	2
100-250	9	3	5	24	6	19	68	4
50-100	24	3	1	37	23	27	74	14
10-50	93	51	8	240	318	156	402	90
<10	71	71	118	1375	1807	223	298	40



	Crude Oil/Natural Gas Upstream Operations	Electric Power Distribution	Electricity / Gas Utilities	Freight Transport/Logistics	Industrial Gas	Integrated Oil/Gas	Liquefied/Compressed Gas	Marine Transport	Multiutilities	Natural Gas/Oil Extraction	Oil/Gas Field Machinery	Pipeline Transportation	Renewable Energy Generation	Support Activities for Oil/Gas
>500				3		2		2	4			2	3	1
>250			2		3			1	1					1
100-250			3	1	10	1		3	1	2		1		4
50-100			2		4			1	1		1	3		5
10-50	1	1	2		31		1	2		3	3	12	3	10
<10	1		5		17		1			10	8	12	2	9

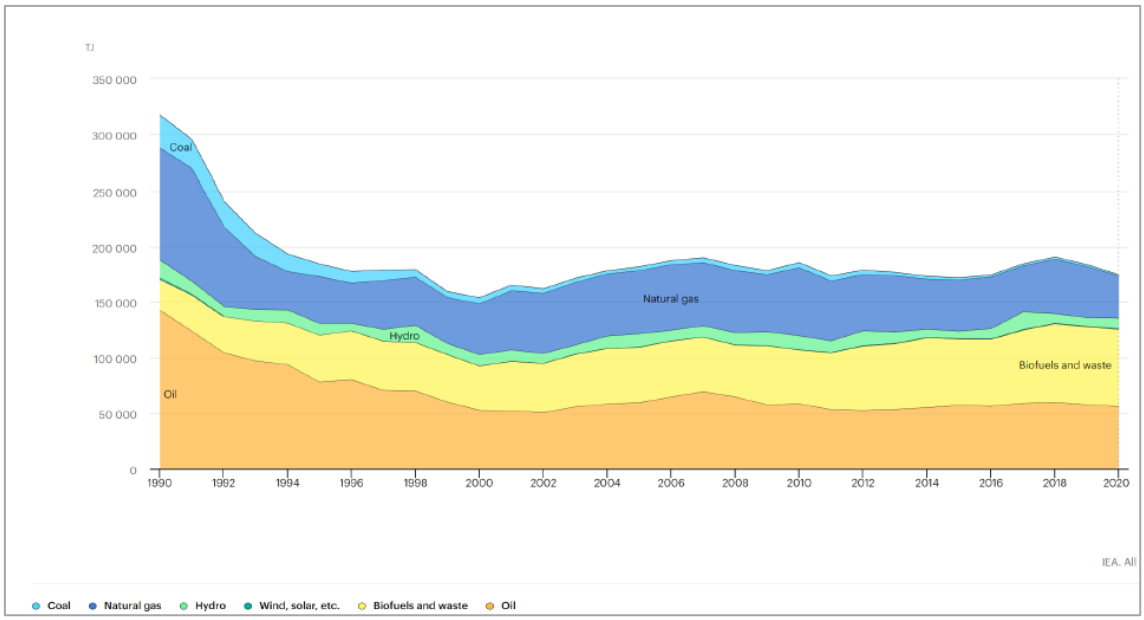
Identification of mayor European companies

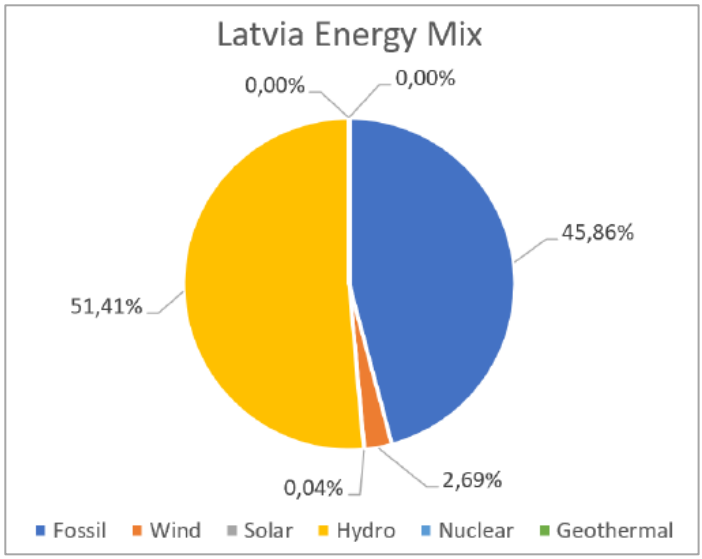
Italy

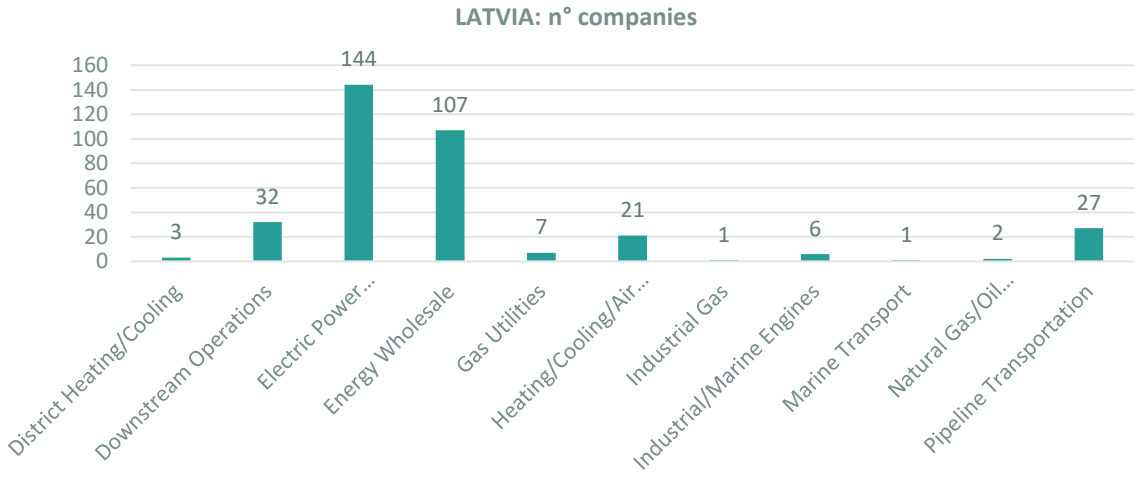
7.16. LATVIA

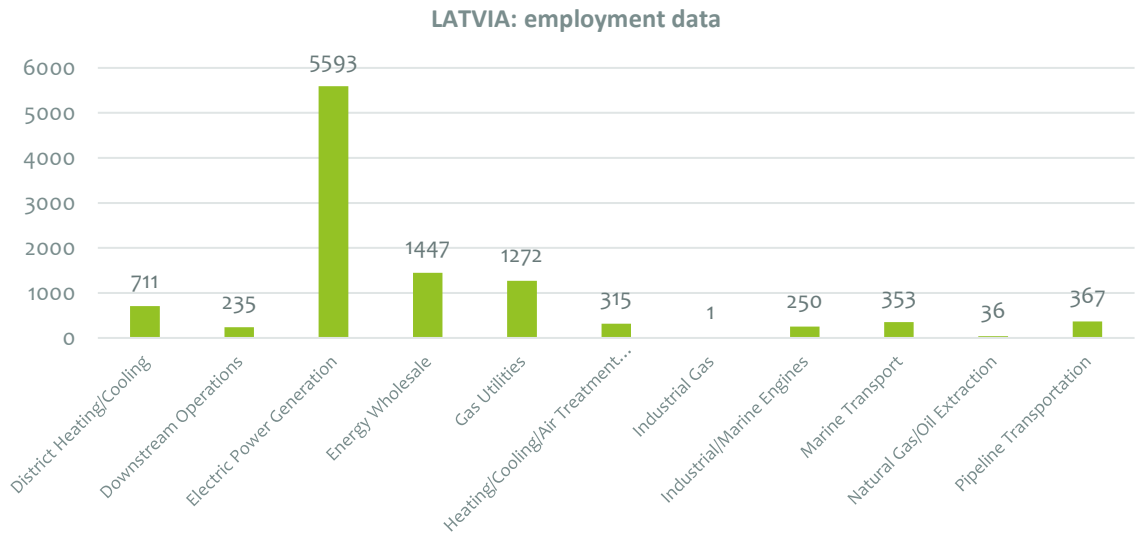
- THERE ARE NOT MANY COMPANIES IN THE GAS SECTOR IN LATVIA, BUT THE PREDOMINANT SECTORS ARE ELECTRIC POWER GENERATION AND ENERGY WHOLESALE.
- HOWEVER, IN TERMS OF THE NUMBER OF EMPLOYEES, "ELECTRIC POWER GENERATION" TAKES THE LEAD, EMPLOYING ALMOST 6000 PEOPLE.

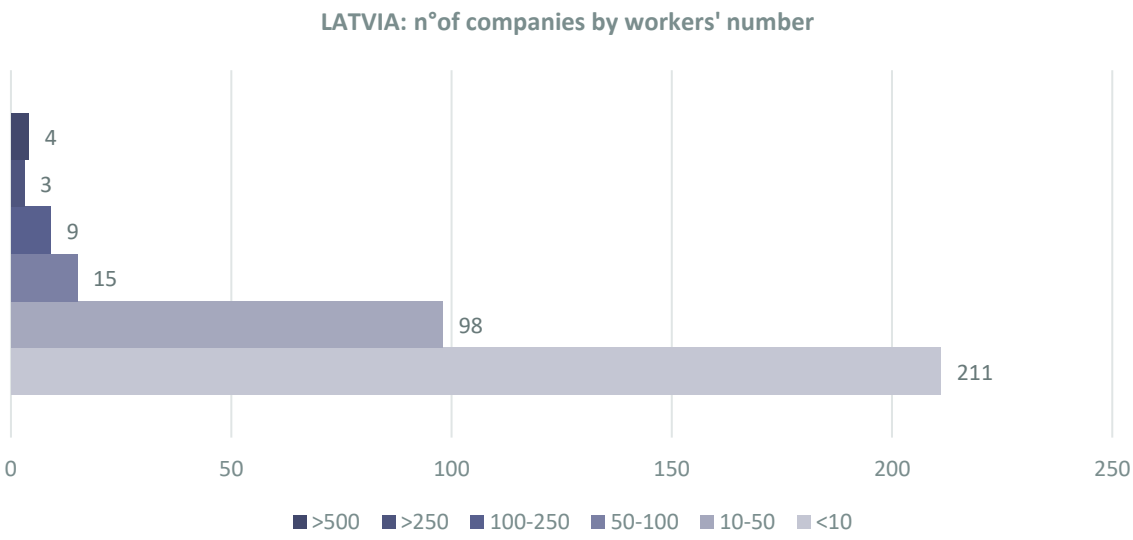
Latvia: Total energy supply evolution.






LATVIA: n° companies
160
140
120
100
80
60
40
20
0
3
32
144
107
7
21
1
6
1
2
27
District Heating/Cooling
Downstream Operations
Electric Power...
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil...
Pipeline Transportation

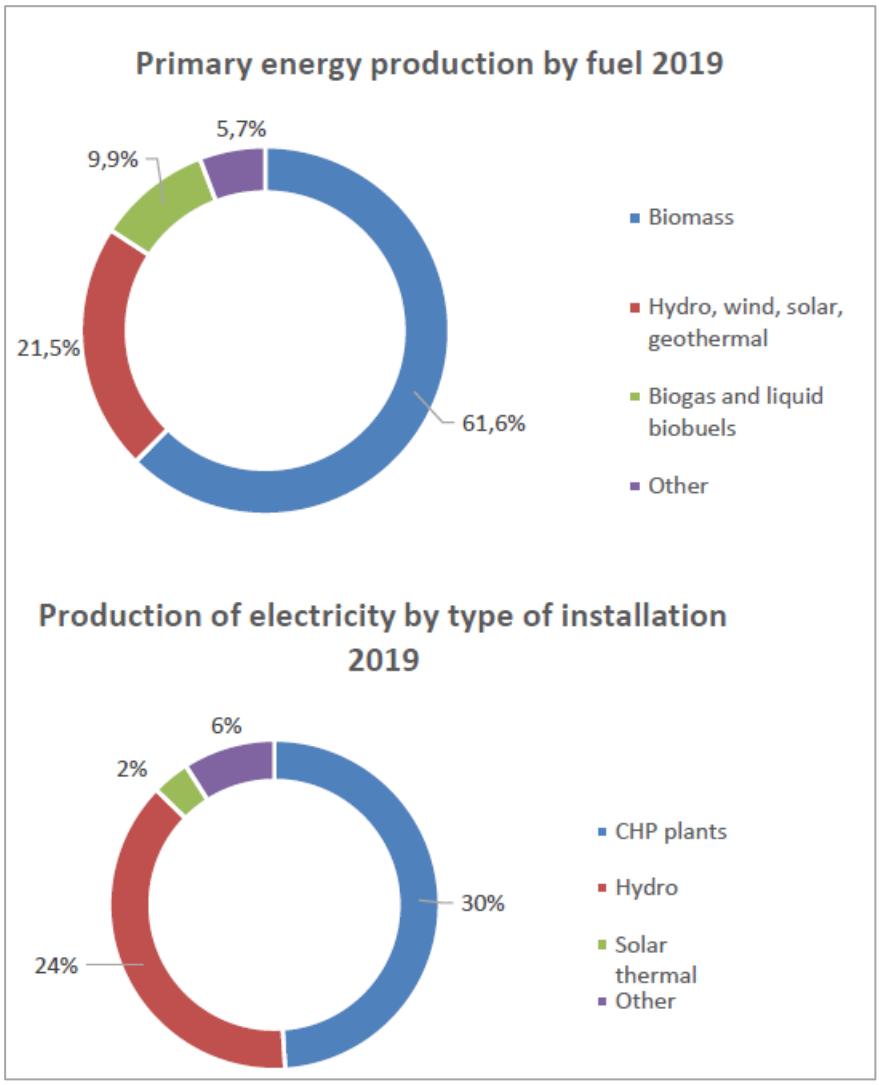

LATVIA: employment data
6000
5000
4000
3000
2000
1000
0
711
235
5593
1447
1272
315
1
250
353
36
367
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial Gas
Industrial/Marine Engines
Marine Transport
Natural Gas/Oil Extraction
Pipeline Transportation



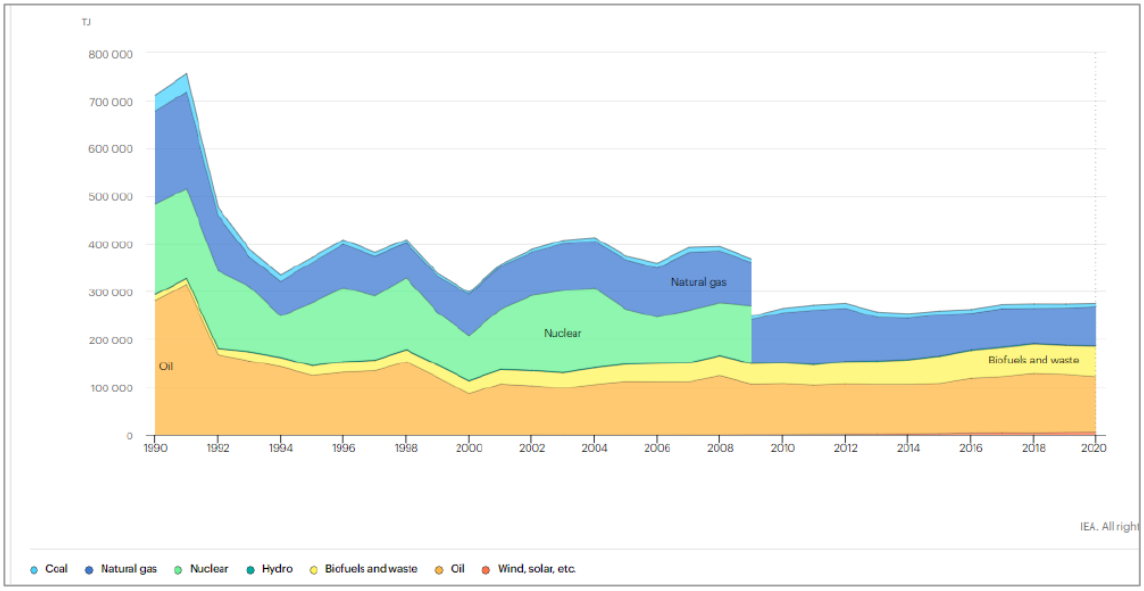
	District Heating /Cooling	Downstream Operations	Electric Power Generation	Energy Wholesale	Gas Utilities	Heating /Cooling /Air Treatment Equipment	Industrial Gas	Industrial/Marine Engines	Marine Transport	Natural Gas/Oil Extraction	Pipeline Transportation
>500	1		2		1						
>250				1	1				1		
100-250			4	2		1		1			1
50-100			13	1		1					
10-50		7	54	23		4		4		1	5
<10	1	24	69	78	5	13	1	1			19

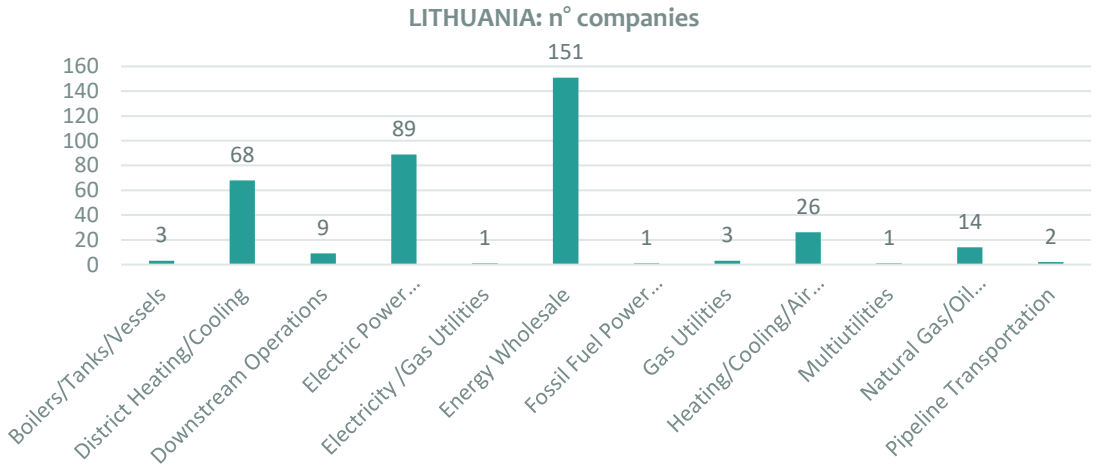
7.17. LITHUANIA

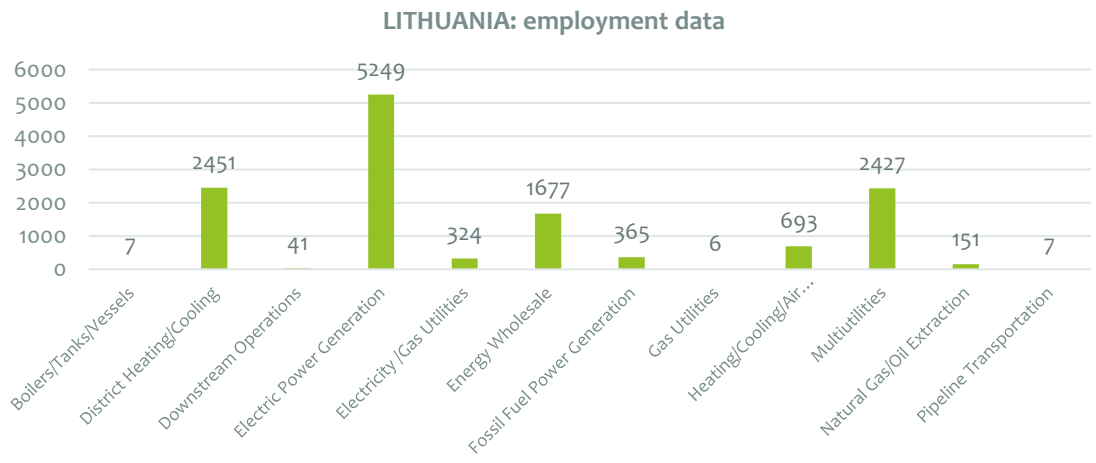
- LITHUANIA HAS LESS THAN 400 COMPANIES IN THE GAS SECTOR.
- THE ACTIVITY THAT GENERATES THE MOST JOBS IS "ELECTRIC POWER GENERATION". SMALL COMPANIES PREDOMINATE.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "AB AMBER GRID".

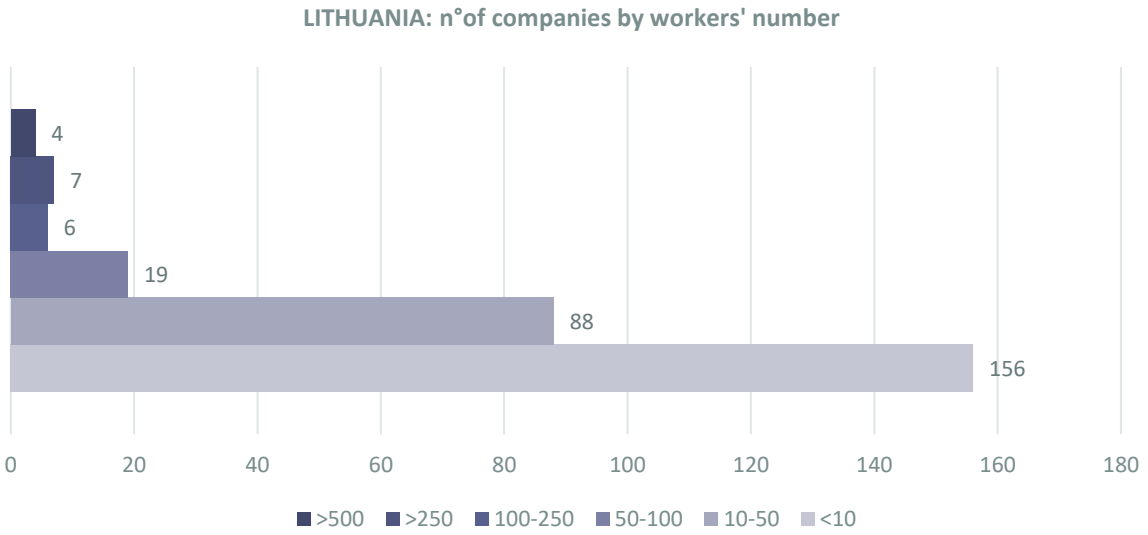


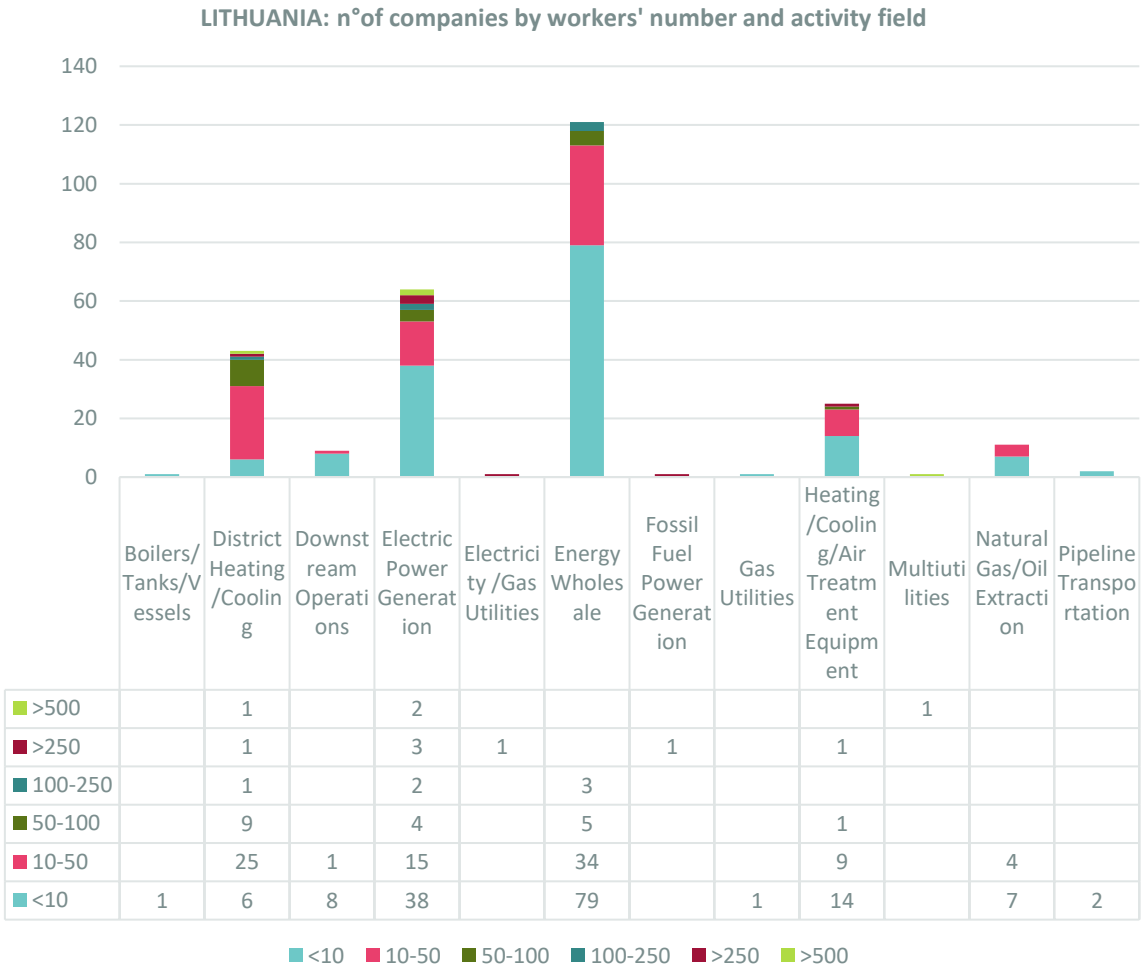
Lithuania: Total energy supply evolution.







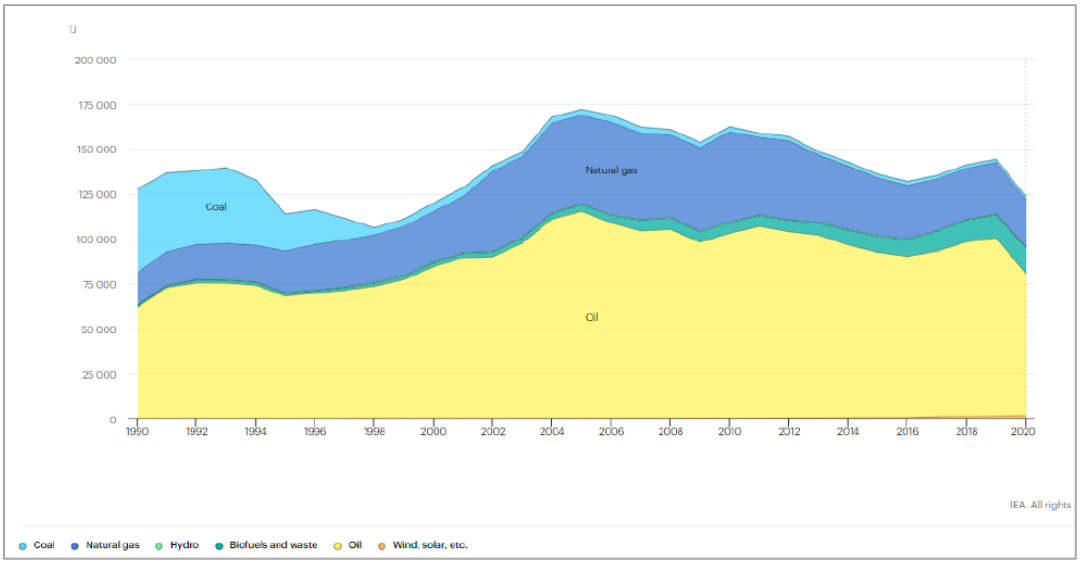

LITHUANIA: n°of companies by workers' number
4
7
6
19
88
156
0
20
40
60
80
100
120
140
160
180
>500
>250
100-250
50-100
10-50
<10

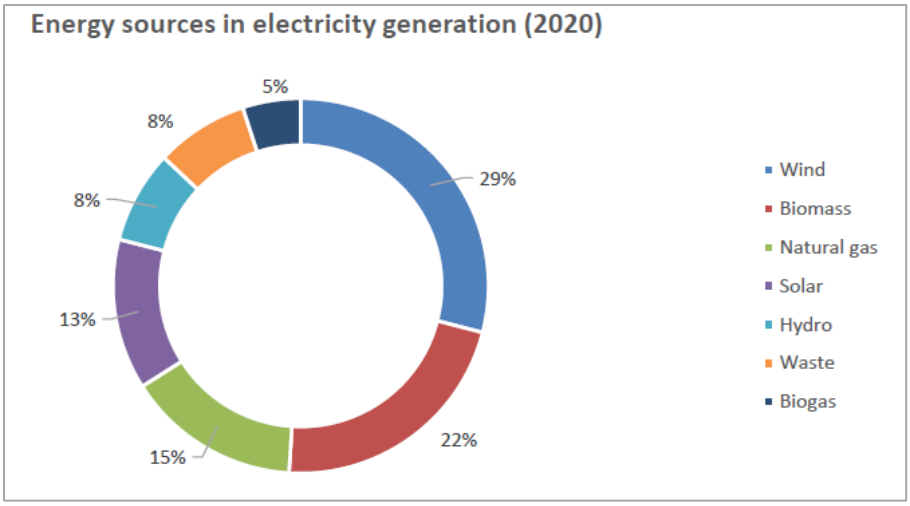

LITHUANIA: n°of companies by workers' number and activity field
140
120
100
80
60
40
20
0
Boilers/ Tanks/V essels
District Heating /Coolin g
Downst ream Operati ons
Electric Power Generat ion
Electrici ty /Gas Utilities
Energy Wholes ale
Fossil Fuel Power Generat ion
Gas Utilities
Heating /Coolin g/Air Treatm ent Equipm ent
Multiuti lities
Natural Gas/Oil Extracti on
Pipeline Transpo rtation
>500 1 2 1
>250 1 3 1 1 1 1
100-250 1 2 3
50-100 9 4 5 1
10-50 25 1 15 34 9 4
<10 1 6 8 38 79 1 14 7 2
<10
10-50
50-100
100-250
>250
>500

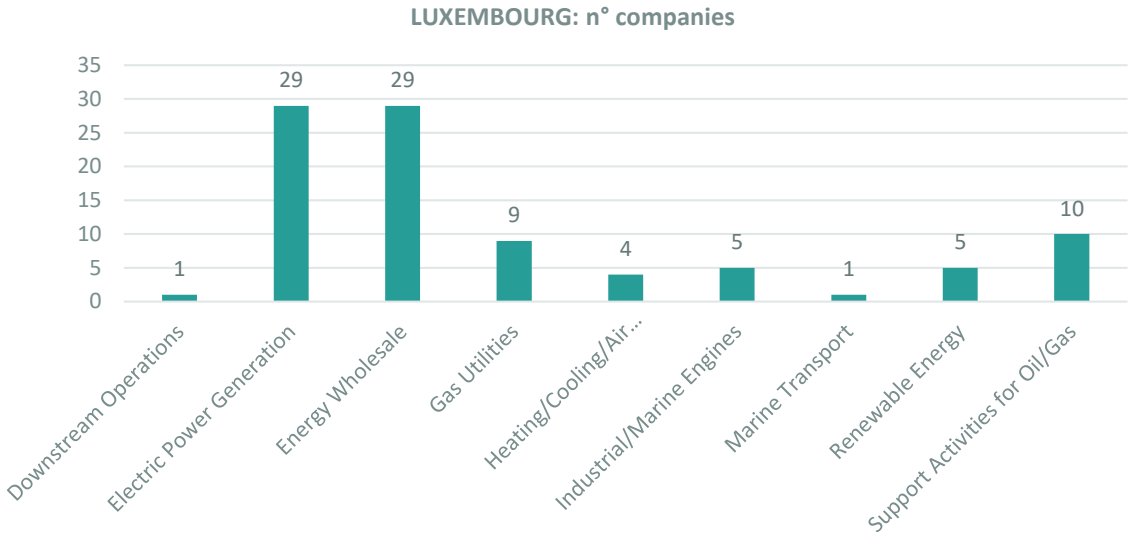
7.18. LUXEMBOURG

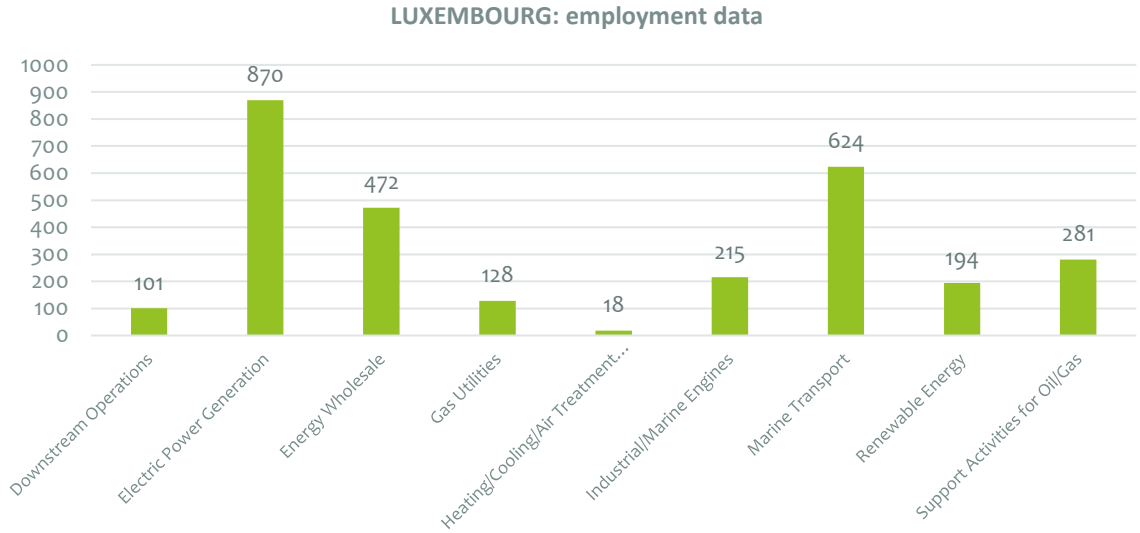
- THE FEW COMPANIES IN THE LUXEMBOURG GAS SECTOR ARE MAINLY IN THE 'ELECTRIC POWER GENERATION' AND 'ENERGY WHOLESALE' BUSINESS.
- A SINGLE COMPANY IN THE MARINE TRANSPORT SECTOR EMPLOYS 20% OF THE SECTOR'S EMPLOYEES.
- THERE ARE ONLY TWO COMPANIES WITH MORE THAN 250 EMPLOYEES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "CREOS LUXEMBOURG".

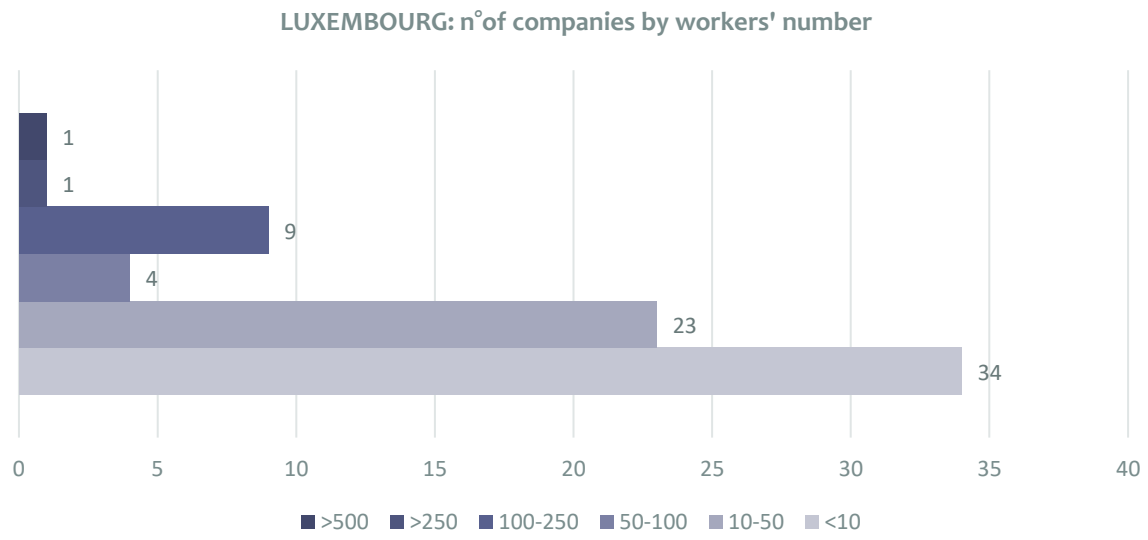
Luxembourg: Total energy supply evolution

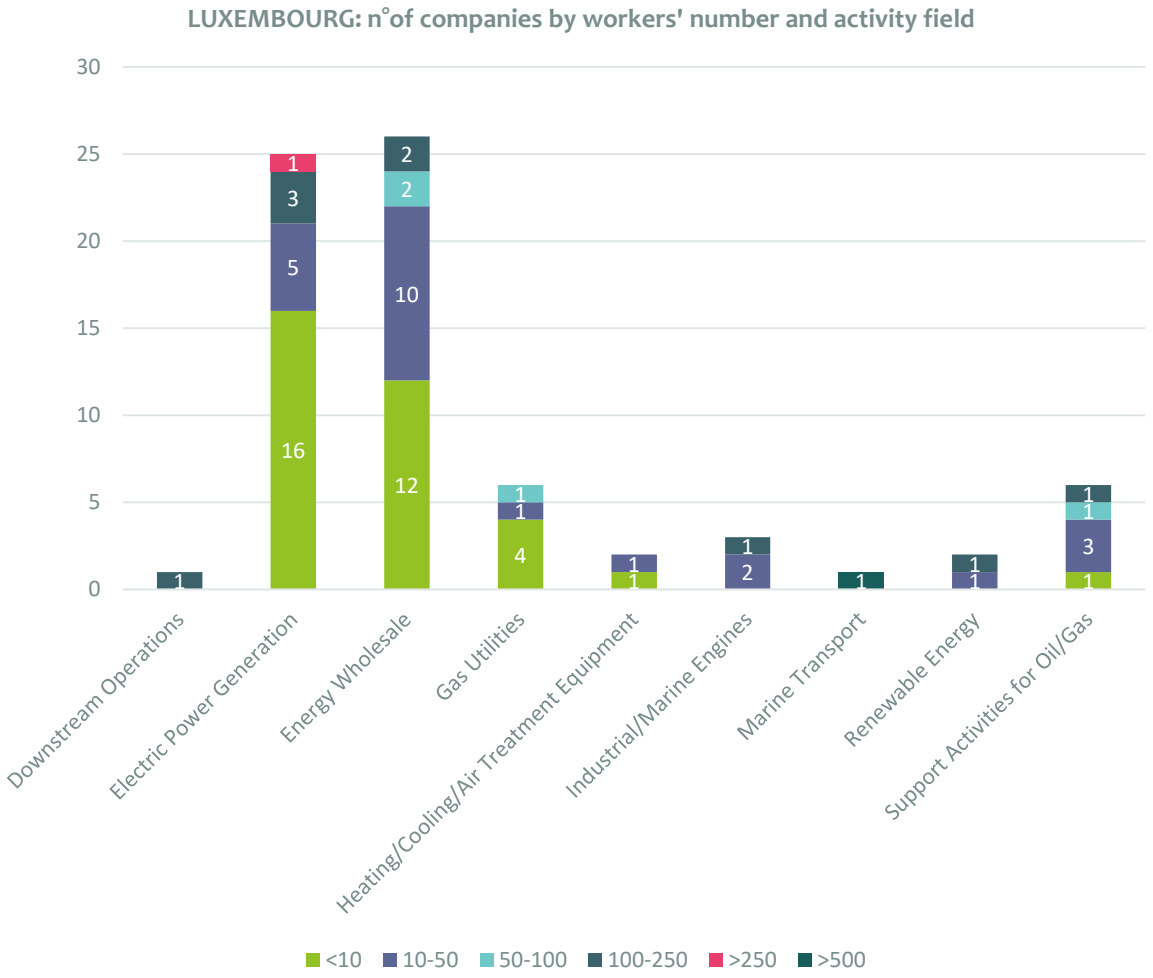





LUXEMBOURG: n° companies
35
30
25
20
15
10
5
0
1
29
29
9
4
5
1
5
10
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air…
Industrial/Marine Engines
Marine Transport
Renewable Energy
Support Activities for Oil/Gas

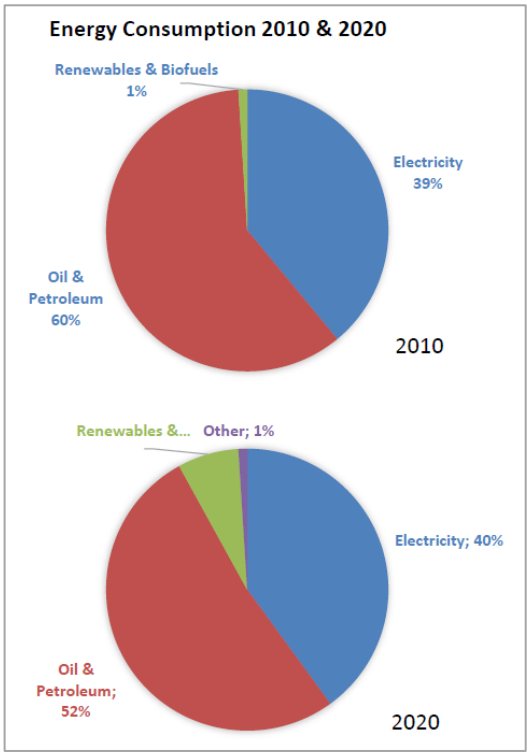

LUXEMBOURG: employment data
1000
900
800
700
600
500
400
300
200
100
0
101
870
472
128
18
215
624
194
281
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment…
Industrial/Marine Engines
Marine Transport
Renewable Energy
Support Activities for Oil/Gas

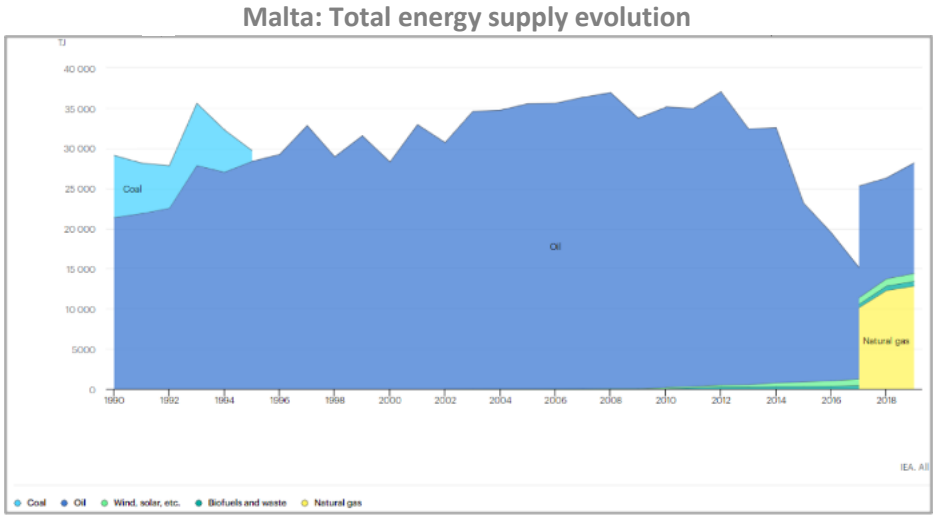

LUXEMBOURG: n°of companies by workers' number
1
1
9
4
23
34
0
5
10
15
20
25
30
35
40
>500
>250
100-250
50-100
10-50
<10

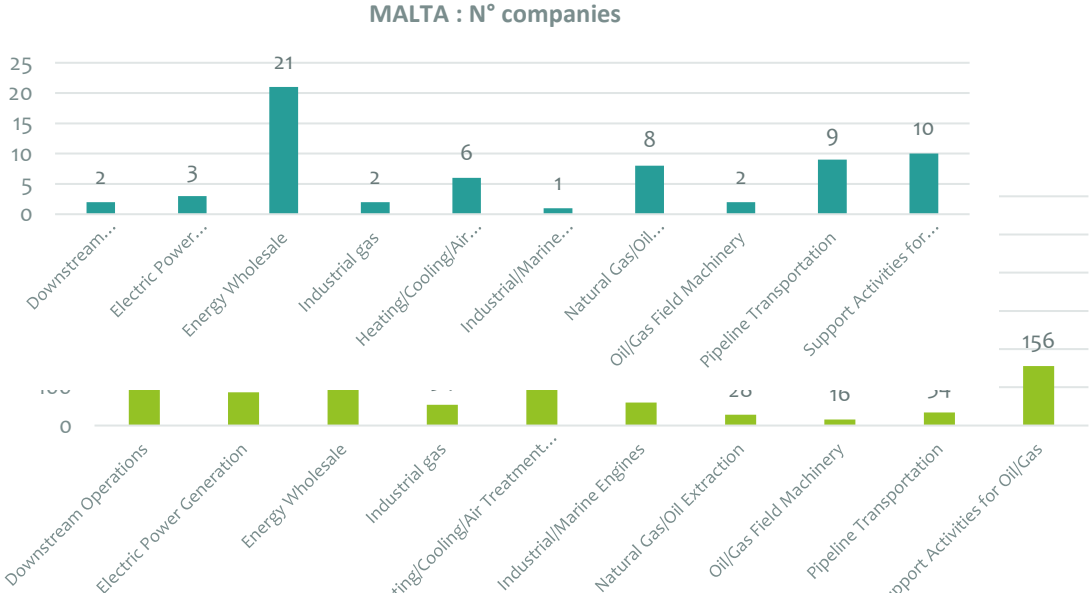

LUXEMBOURG: n°of companies by workers' number and activity field
30
25
20
15
10
5
0
Downstream Operations
Electric Power Generation
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial/Marine Engines
Marine Transport
Renewable Energy
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500

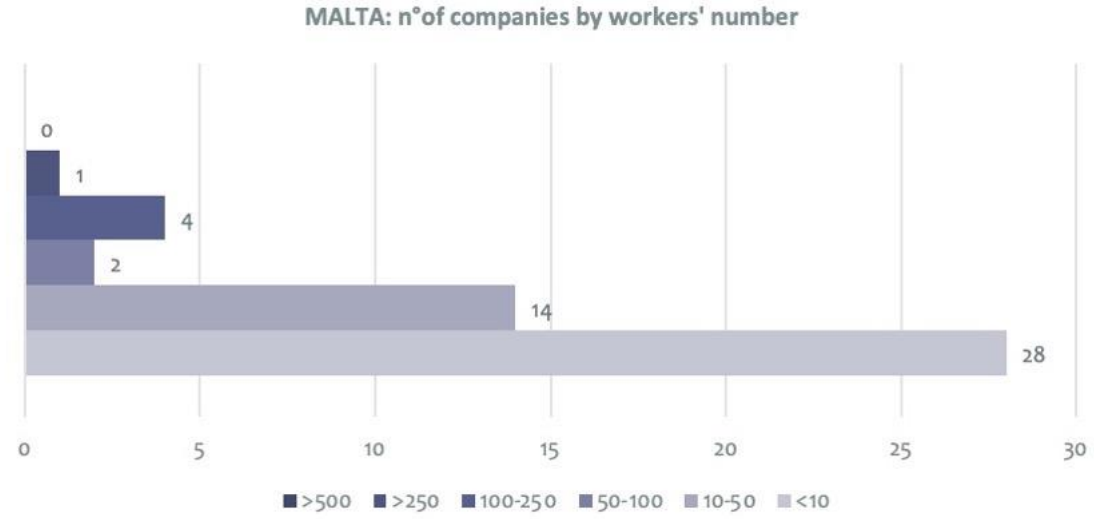
7.19. MALTA

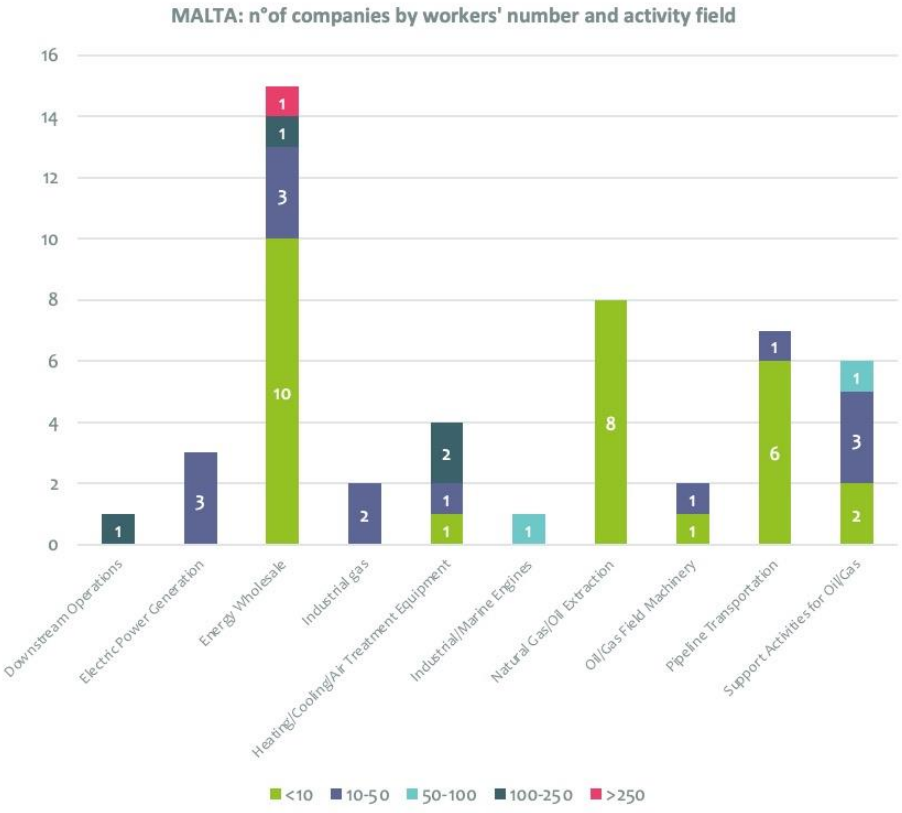
- AFTER "ENERGY WHOLESALE", THE ACTIVITIES WITH THE MOST COMPANIES IN THE MALTESE GAS SECTOR ARE "SUPPORT ACTIVITIES FOR OIL/GAS" AND "PIPELINE TRANSPORTATION".
- HOWEVER, IN TERMS OF EMPLOYMENT, ENERGY WHOLESALE STANDS OUT FROM THE OTHERS, AND GEATING IS THE ACTIVITY WITH THE MOST COMPANIES IN THE MALTESE GAS SECTOR.







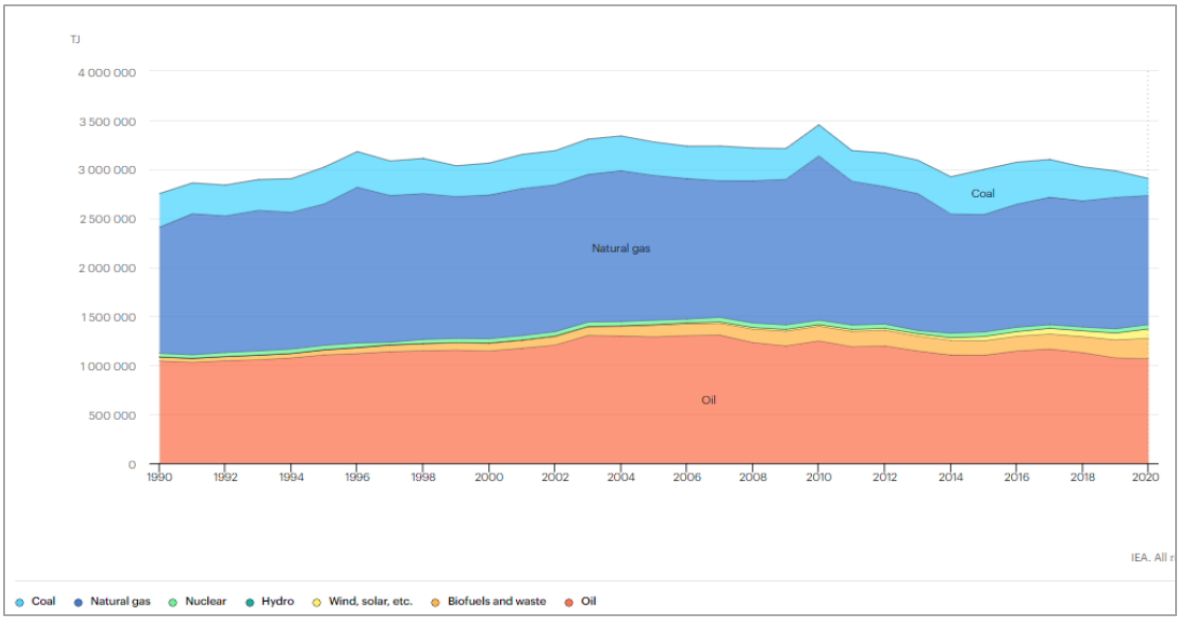

MALTA: n°of companies by workers' number
0
1
4
2
14
28
0
5
10
15
20
25
30
>500
>250
100-250
50-100
10-50
<10

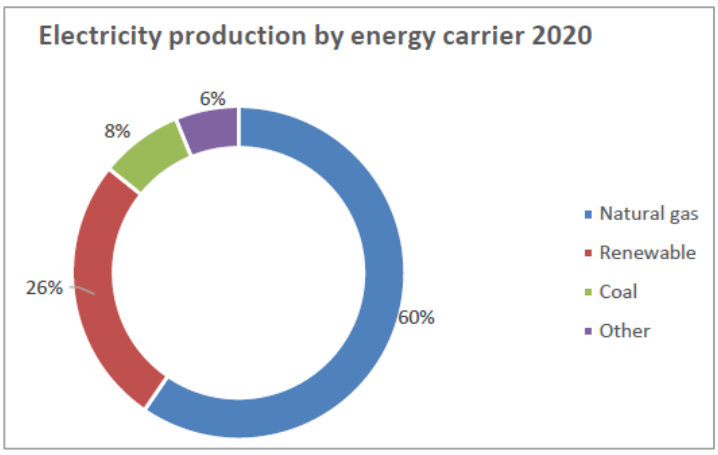

MALTA: n°of companies by workers' number and activity field
16
14
12
10
8
6
4
2
0
Downstream Operations
Electric Power Generation
Energy Wholesale
Industrial gas
Heating/Cooking/Air Treatment Equipment
Industrial/Marine Engines
Natural Gas/Oil Extraction
Oil/Gas Field Machinery
Pipeline Transportation
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250

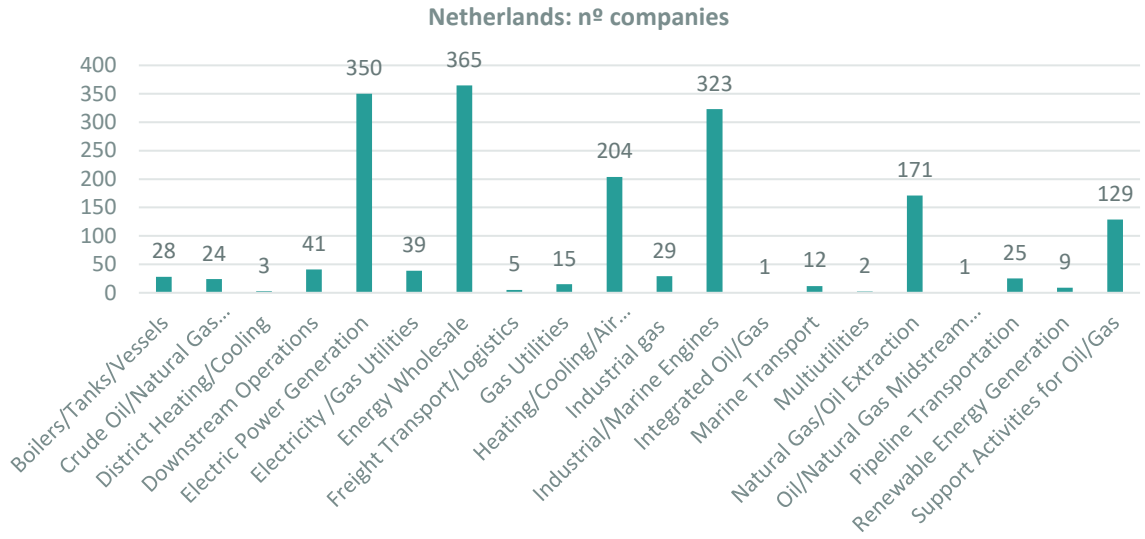
7.20. NETHERLANDS

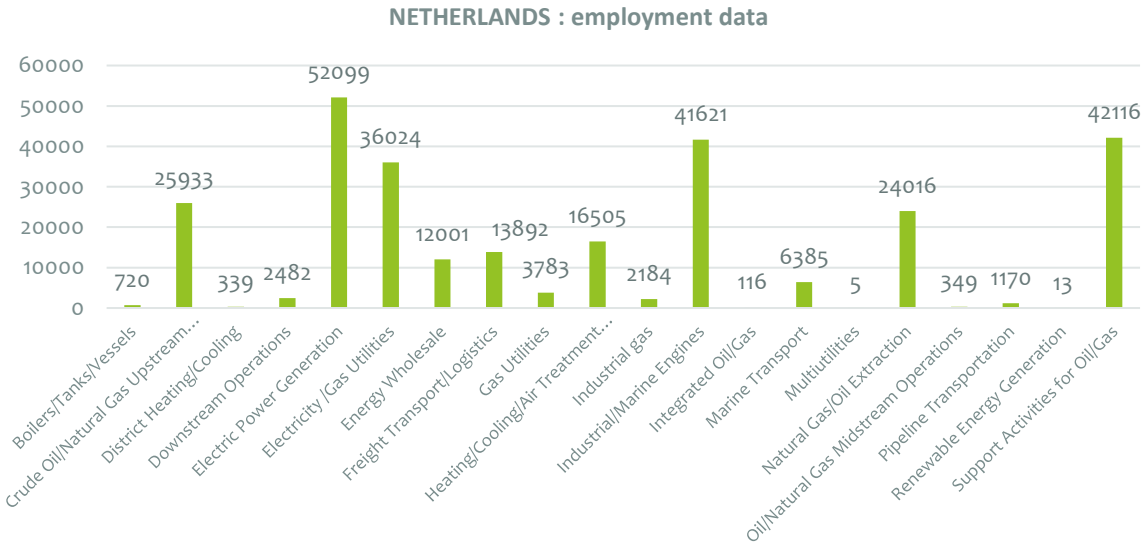
- SMALL AND MEDIUM-SIZED COMPANIES ARE THE MOST IMPORTANT, ALTHOUGH IN RELATION TO THE REST OF THE EU-27, THERE IS A SIGNIFICANT NUMBER OF COMPANIES WITH MORE THAN 500 EMPLOYEES (62 COMPANIES).
- IN TERMS OF EMPLOYMENT THERE IS AN IMPORTANT DIVERSIFICATION BETWEEN VARIOUS ACTIVITIES "ELECTRIC POWER GENERATION", "ELECTRICITY/GAS UTILITIES", "INDUSTRIAL/MARINE ENGINES", "NATURAL GAS/OIL EXTRACTION" AND "SUPPORT ACTIVITIES FOR OIL/GAS".

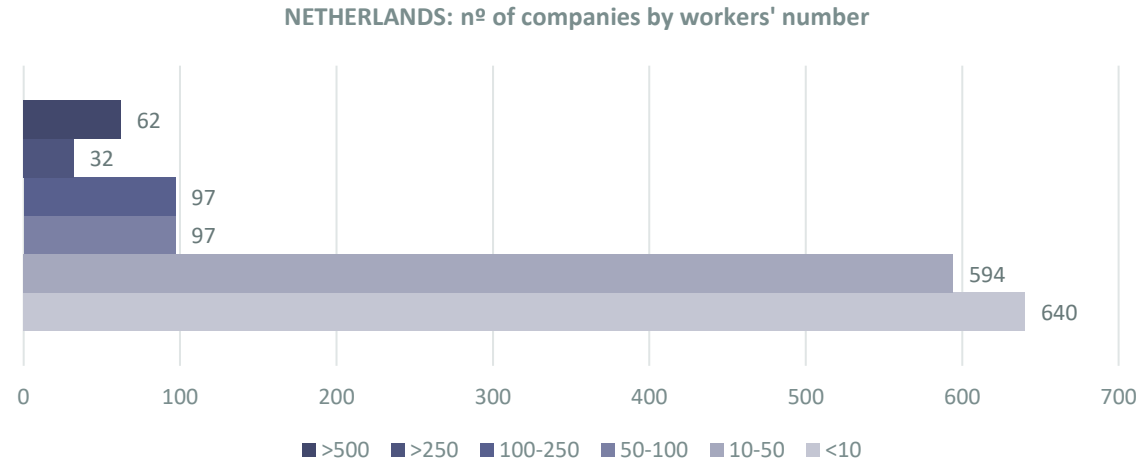
Netherlands: Total energy supply evolution.

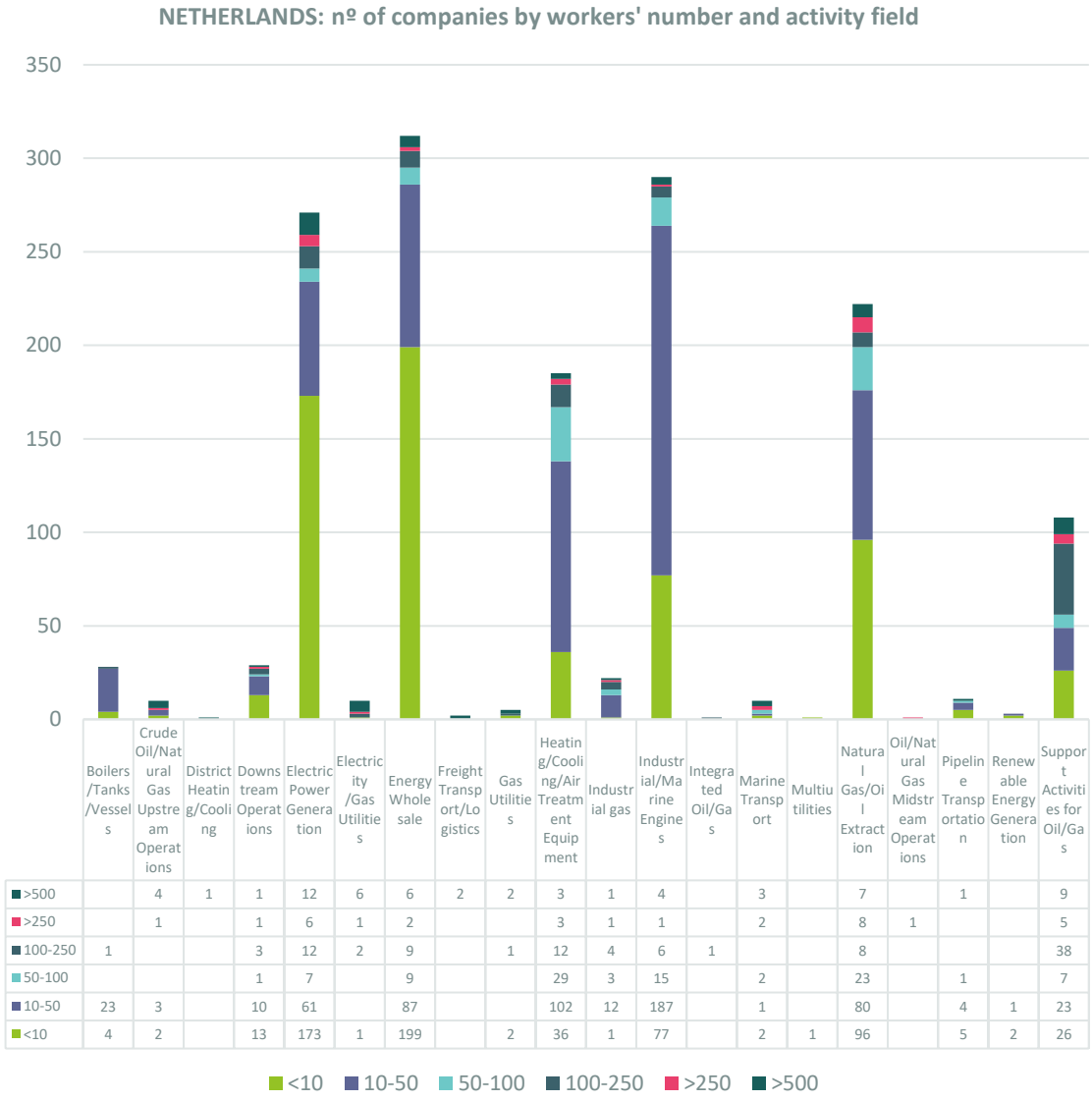





Netherlands: nº companies
400
350
300
250
200
150
100
50
0
28
24
3
41
350
39
365
5
15
204
29
323
1
12
2
171
1
25
9
129
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air...
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Multiutilities
Natural Gas/Oil Extraction
Oil/Natural Gas Midstream...
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas

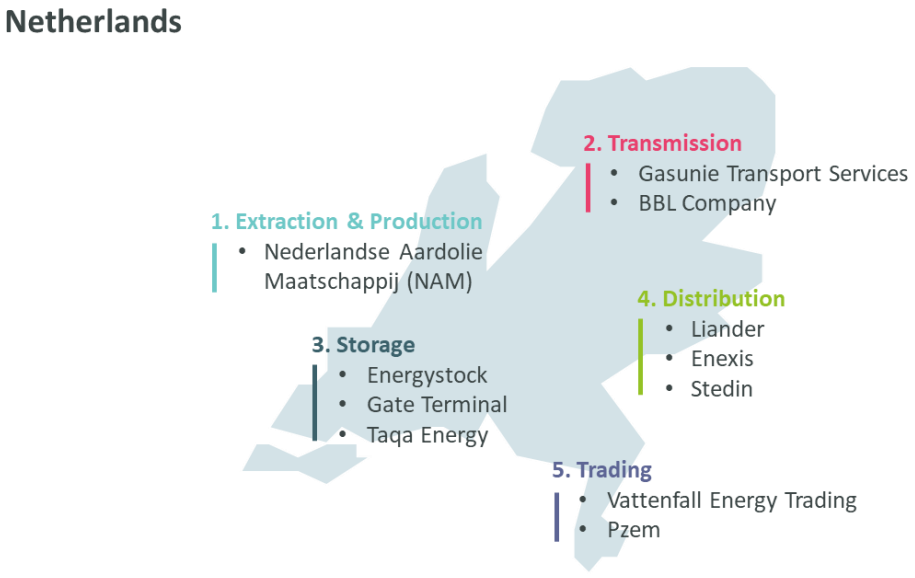

NETHERLANDS : employment data
60000
50000
40000
30000
20000
10000
0
720
25933
339
2482
52099
36024
12001
13892
3783
16505
2184
41621
116
6385
5
24016
349
1170
13
42116
Boilers/Tanks/Vessels
Crude Oil/Natural Gas Upstream...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Multiutilities
Natural Gas/Oil Extraction
Oil/Natural Gas Midstream Operations
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


NETHERLANDS: nº of companies by workers' number
62
32
97
97
594
640
0
100
200
300
400
500
600
700
>500
>250
100-250
50-100
10-50
<10



	Boilers /Tanks /Vessels	Crude Oil/Natural Gas Upstream Operations	District Heating/Cooling	Downstream Operations	Electric Power Generation	Electricity /Gas Utilities	Energy Wholesale	Freight Transport/Logistics	Gas Utilities	Heating/Cooling/Air Treatment Equipment	Industrial gas	Industrial/Marine Engines	Integrated Oil/Gas	Marine Transport	Multiutilities	Natural Gas/Oil Extraction	Oil/Natural Gas Midstream Operations	Pipeline Transportation	Renewable Energy Generation	Support Activities for Oil/Gas
>500		4	1	1	12	6	6	2	2	3	1	4		3		7		1		9
>250		1		1	6	1	2			3	1	1		2		8	1			5
100-250	1			3	12	2	9		1	12	4	6	1			8				38
50-100				1	7		9			29	3	15		2		23		1		7
10-50	23	3		10	61		87			102	12	187		1		80		4	1	23
<10	4	2		13	173	1	199		2	36	1	77		2	1	96		5	2	26

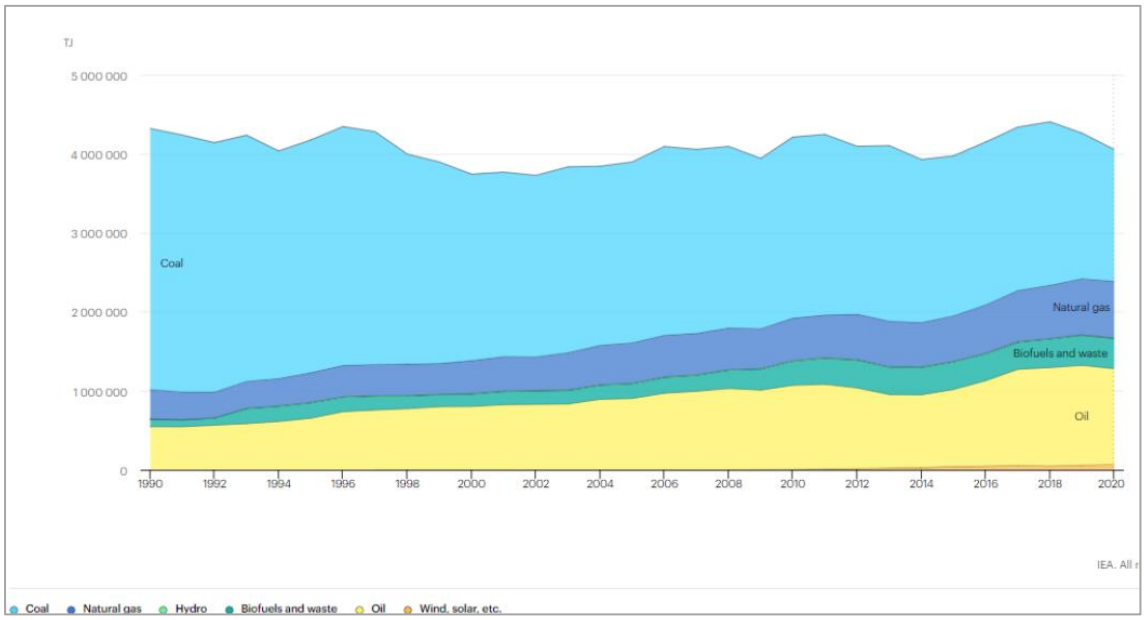
Identification of mayor European companies

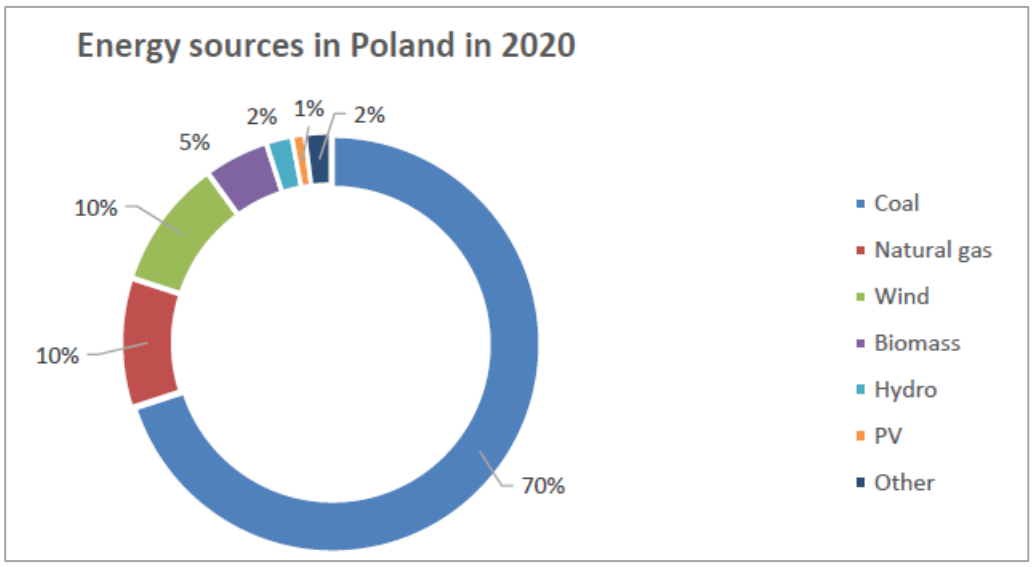


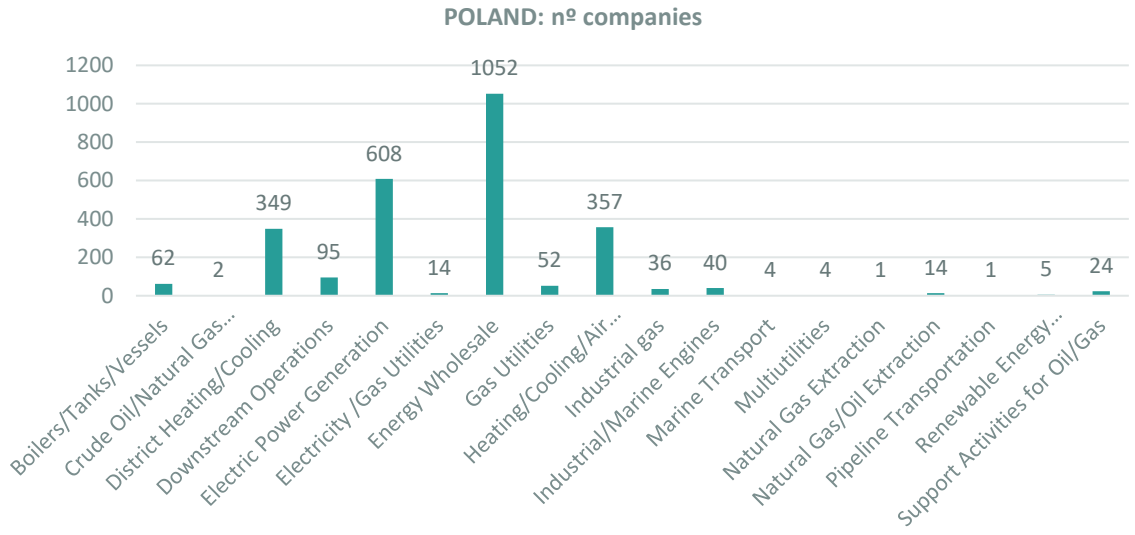
7.21. POLAND

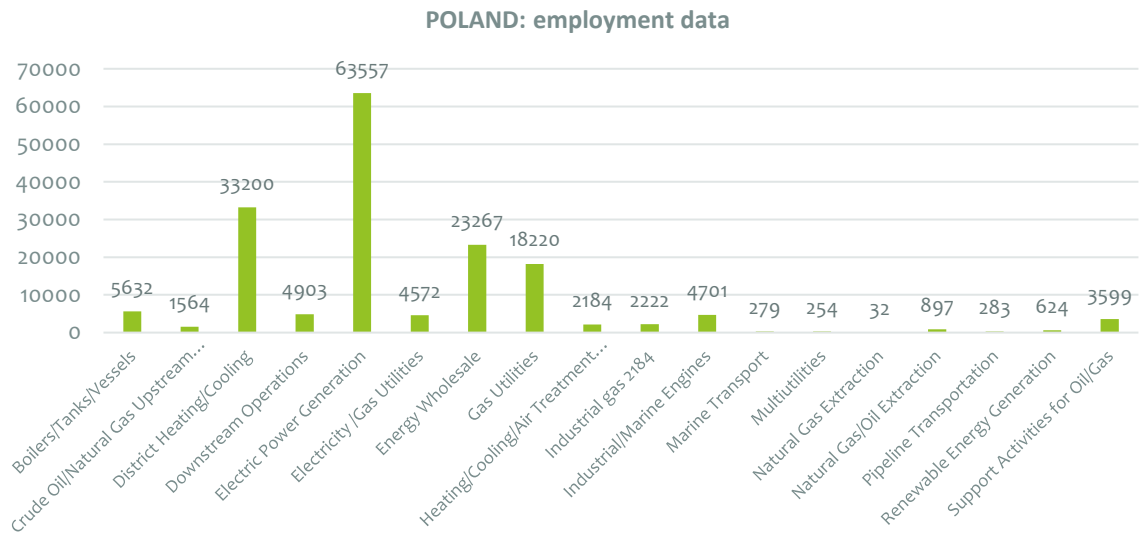
- **"ENERGY WHOLESALE" IS THE ACTIVITY WITH THE MOST REAL COMPANIES IN POLAND, AND "ELECTRIC POWER GENERATION" IS THE ACTIVITY THAT GENERATES THE MOST JOBS.**
- **THERE ARE A SIGNIFICANT NUMBER OF LARGE COMPANIES, ALTHOUGH MOST OF THEM ARE SMALL AND MEDIUM-SIZED ENTERPRISES.**

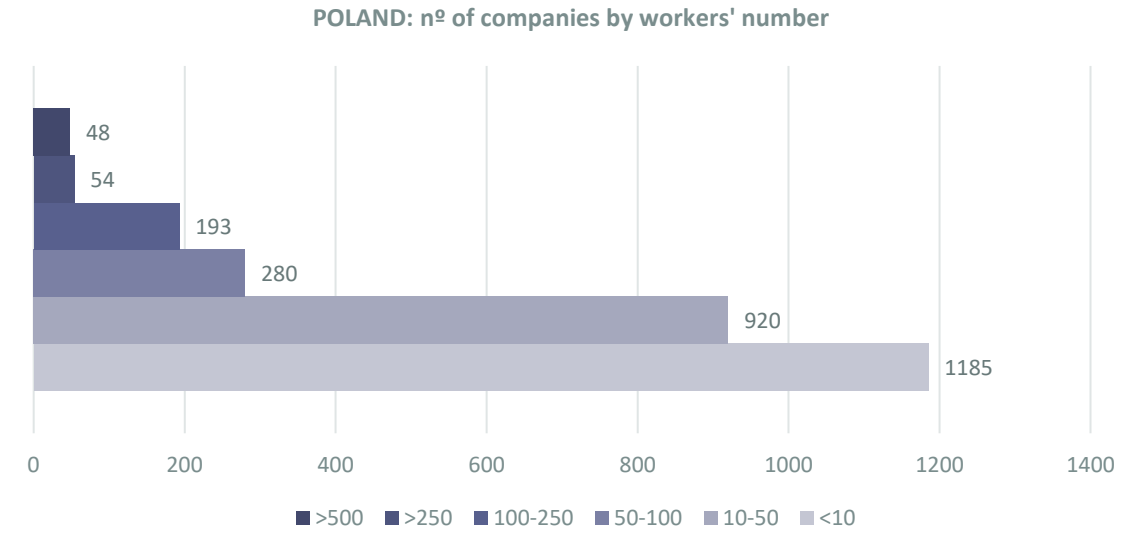
Poland: Total energy supply evolution.

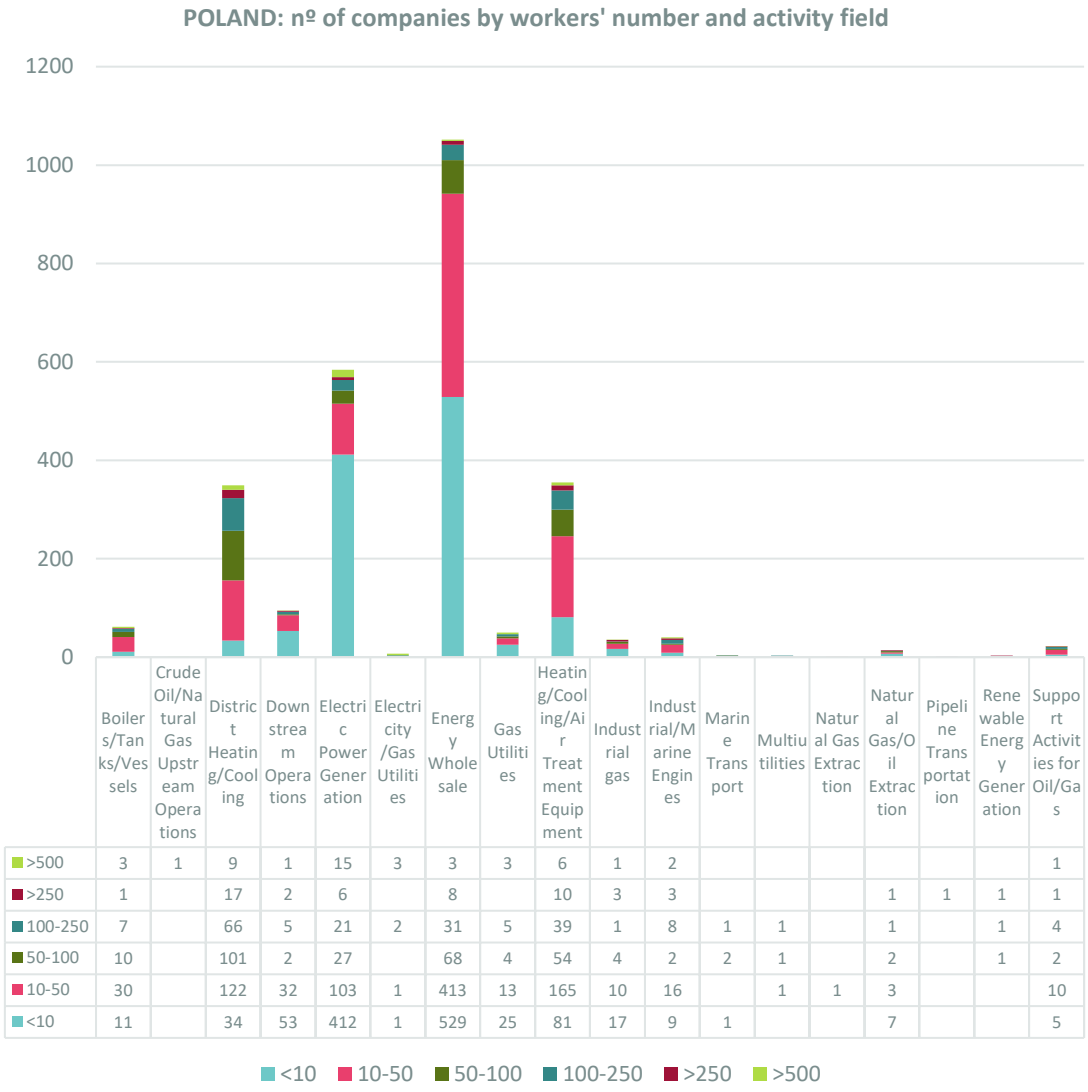


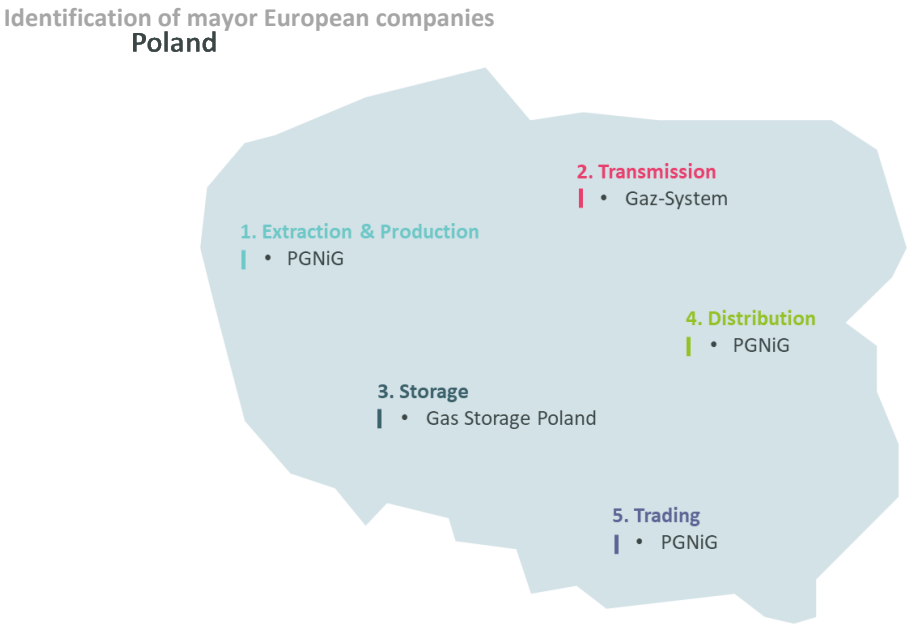



POLAND: nº companies
1200
1000
800
600
400
200
0
62
2
349
95
608
14
1052
52
357
36
40
4
4
1
14
1
5
24
Boilers/Tanks/Vessels
Crude Oil/Natural Gas...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air...
Industrial gas
Industrial/Marine Engines
Marine Transport
Multiutilities
Natural Gas Extraction
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy...
Support Activities for Oil/Gas


POLAND: employment data
70000
60000
50000
40000
30000
20000
10000
0
5632
1564
33200
4903
63557
4572
23267
18220
2184
2222
4701
279
254
32
897
283
624
3599
Boilers/Tanks/Vessels
Crude Oil/Natural Gas Upstream...
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas 2184
Industrial/Marine Engines
Marine Transport
Multiutilities
Natural Gas Extraction
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


POLAND: nº of companies by workers' number
48
54
193
280
920
1185
0
200
400
600
800
1000
1200
1400
>500
>250
100-250
50-100
10-50
<10

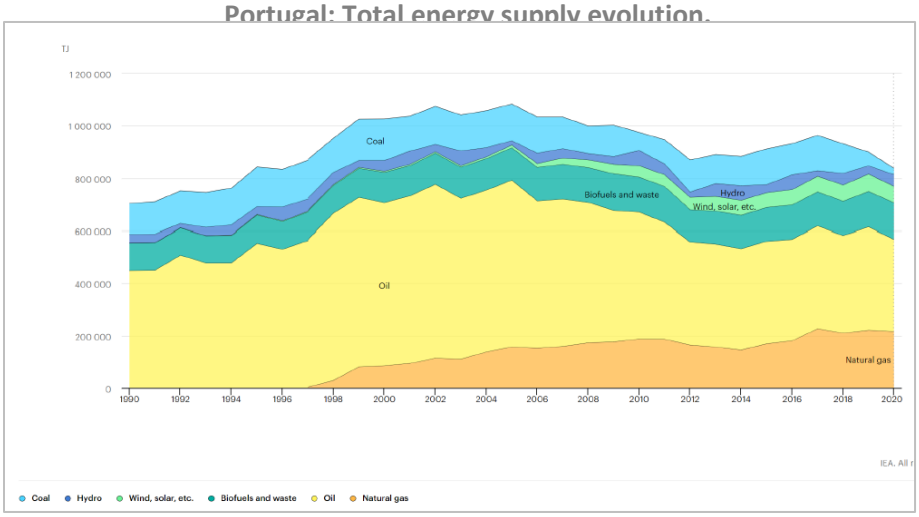

POLAND: nº of companies by workers' number and activity field
1200
1000
800
600
400
200
0
Boilers/Tanks/Vessels
Crude Oil/Natural Gas Upstream Operations
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial gas
Industrial/Marine Engines
Marine Transport
Multiutilities
Natural Gas Extraction
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas
>500 3 1 9 1 15 3 3 3 6 1 2 1
>250 1 17 2 6 8 10 3 3 1 1 1 1
100-250 7 66 5 21 2 31 5 39 1 8 1 1 1 4
50-100 10 101 2 27 68 4 54 4 2 2 1 2 1 2
10-50 30 122 32 103 1 413 13 165 10 16 1 1 3 10
<10 11 34 53 412 1 529 25 81 17 9 1
<10
10-50
50-100
100-250
>250
>500

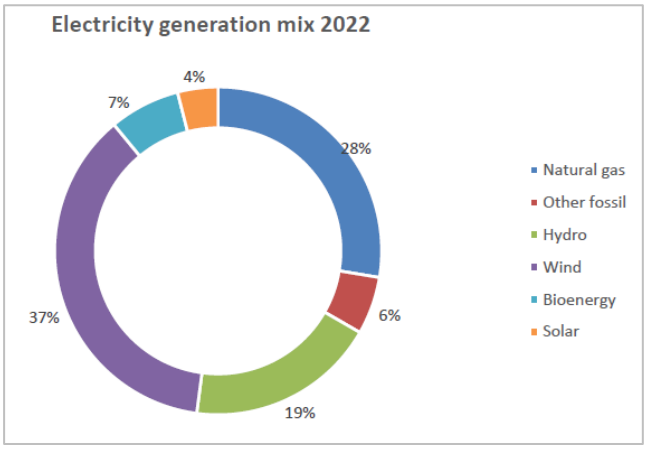

Identification of mayor European companies
Poland
2. Transmission
• Gaz-System
1. Extraction & Production
• PGNiG
4. Distribution
• PGNiG
3. Storage
• Gas Storage Poland
5. Trading
• PGNiG

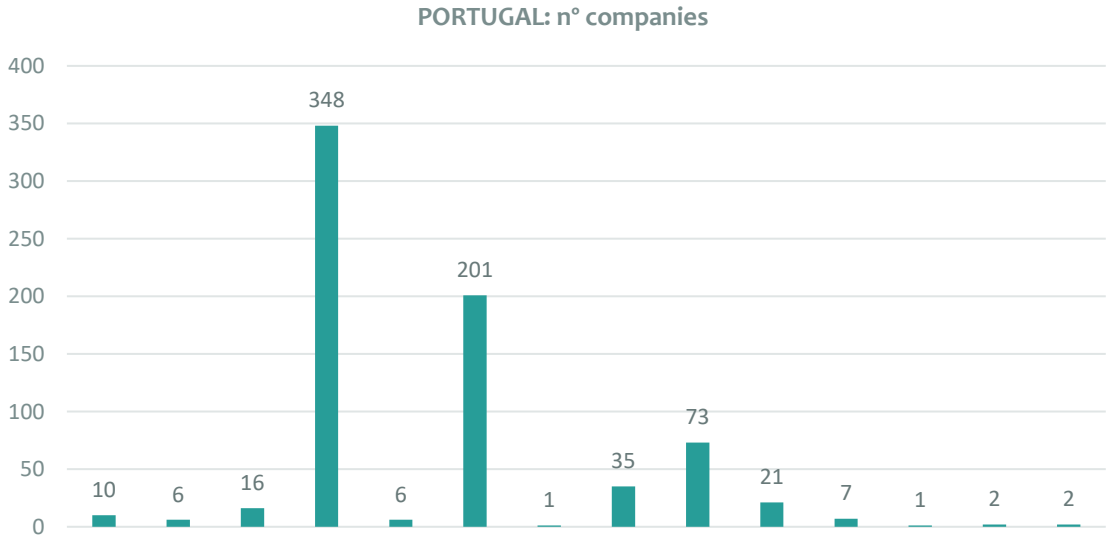
7.22. PORTUGAL

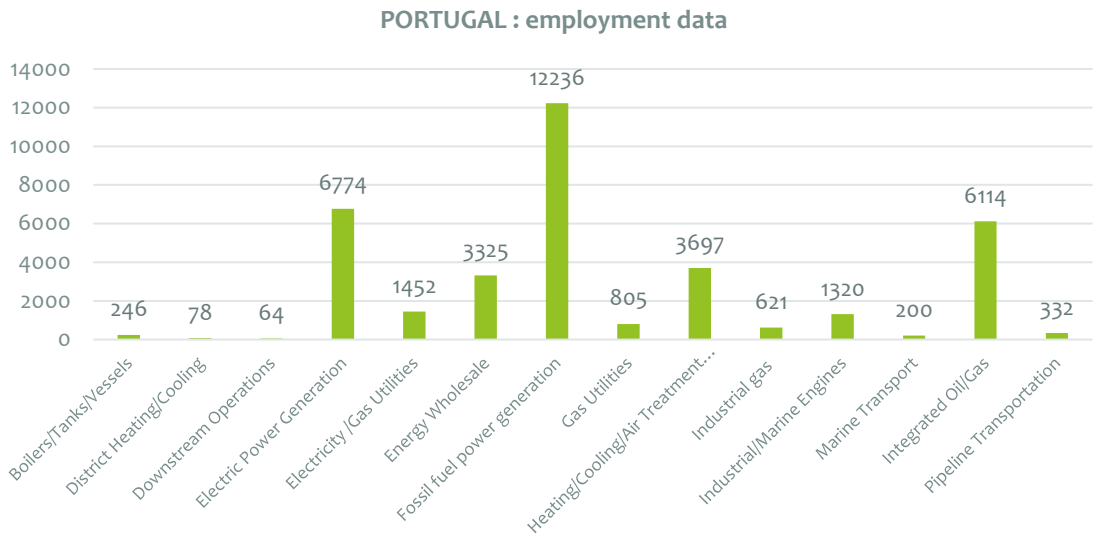
- THERE ARE NOT A LARGE NUMBER OF COMPANIES IN THE GAS SECTOR IN PORTUGAL, BUT A LARGE NUMBER OF THEM BELONG TO THE "ELECTRIC POWER GENERATION" ACTIVITY.
- ONE COMPANY (EDP-ENERGÍAS DE PORTUGAL SA) WITH 12236 EMPLOYEES IS THE LARGEST EMPLOYER IN THE WHOLE SECTOR, AND POSITIONS ITS ACTIVITY AS THE ONE WITH THE LARGEST NUMBER OF EMPLOYEES ("FOSSIL FUEL POWER GENERATION").
- THE MAIN GAS COMPANY IN THE COUNTRY IS "REN - GASODUTOS".

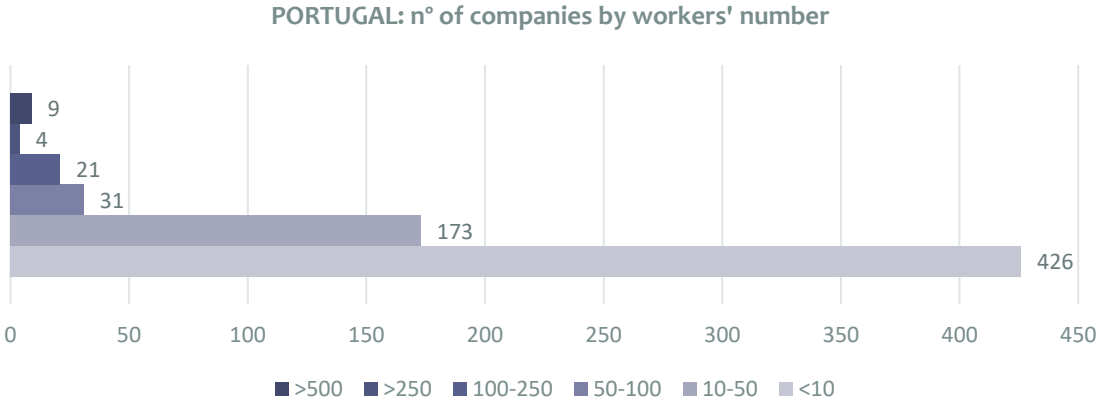
Portugal: Total energy supply evolution.

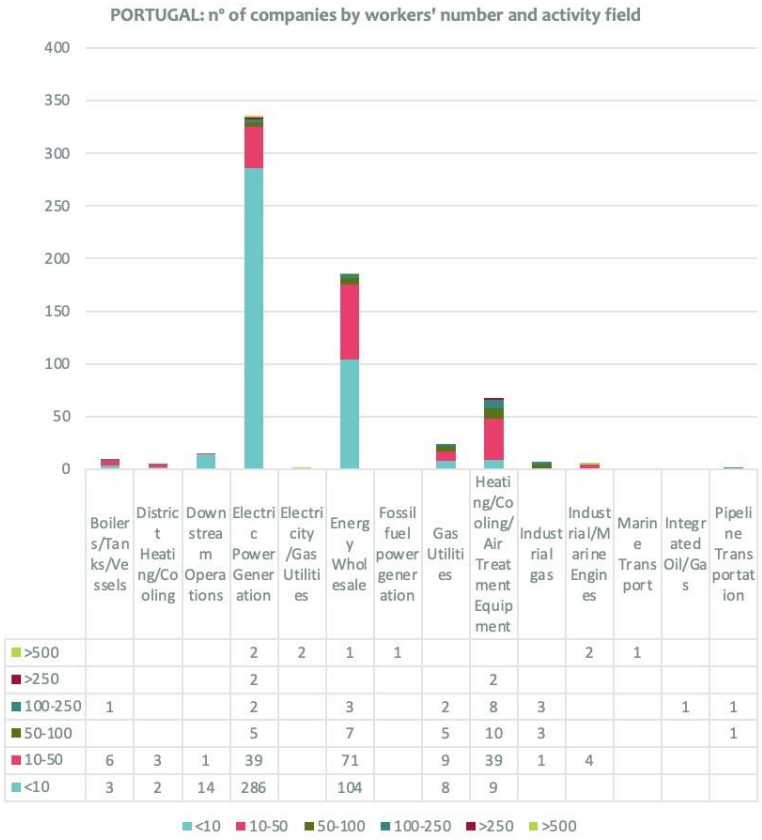







PORTUGAL : employment data
14000
12000
10000
8000
6000
4000
2000
0
246
78
64
6774
1452
3325
12236
805
3697
621
1320
200
6114
332
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Fossil fuel power generation
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas
Industrial/Marine Engines
Marine Transport
Integrated Oil/Gas
Pipeline Transportation

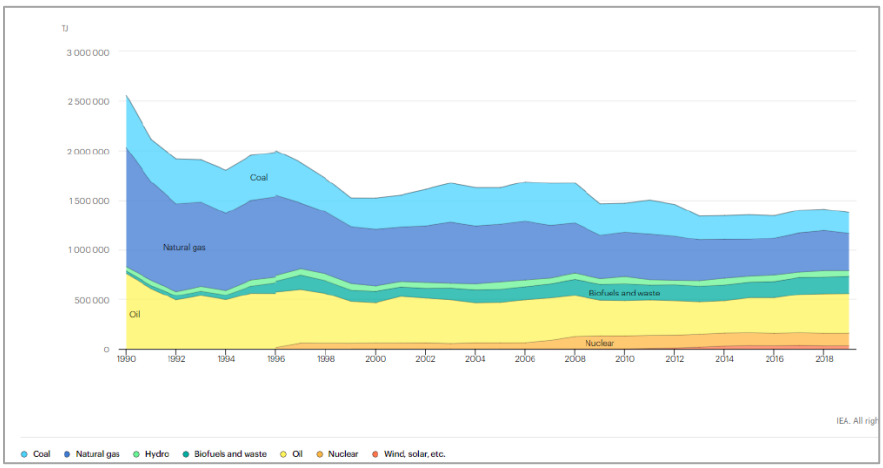

PORTUGAL: n° of companies by workers' number
9
4
21
31
173
426
0
50
100
150
200
250
300
350
400
450
>500
>250
100-250
50-100
10-50
<10

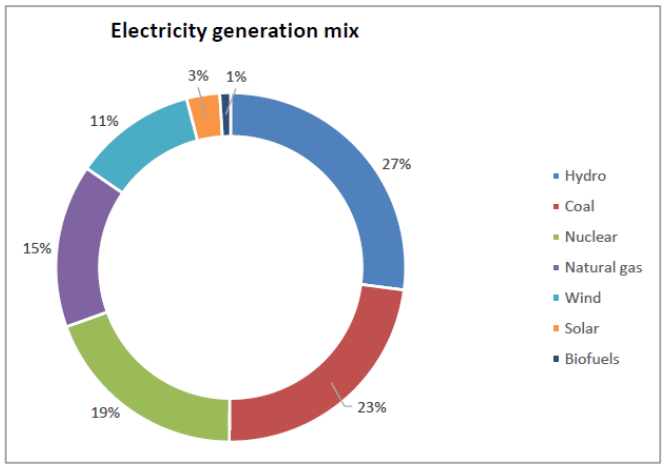

PORTUGAL: n° of companies by workers' number and activity field
400
350
300
250
200
150
100
50
0
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Electricity /Gas Utilities
Energy Wholesale
Fossil fuel power generation
Gas Utilities
Heating/Cooling/ Air Treatment Equipment
Industrial gas
Industrial/Marine Engines
Marine Transport
Integrated Oil/Gas
Pipeline Transportation
>500 2 2 1 1 2 1
>250 2 2
100-250 1 2 3 2 8 3 1 1
50-100 5 7 5 10 3 1
10-50 6 3 1 39 71 9 39 1 4
<10 3 2 14 286 104 8 9
<10
10-50
50-100
100-250
>250
>500

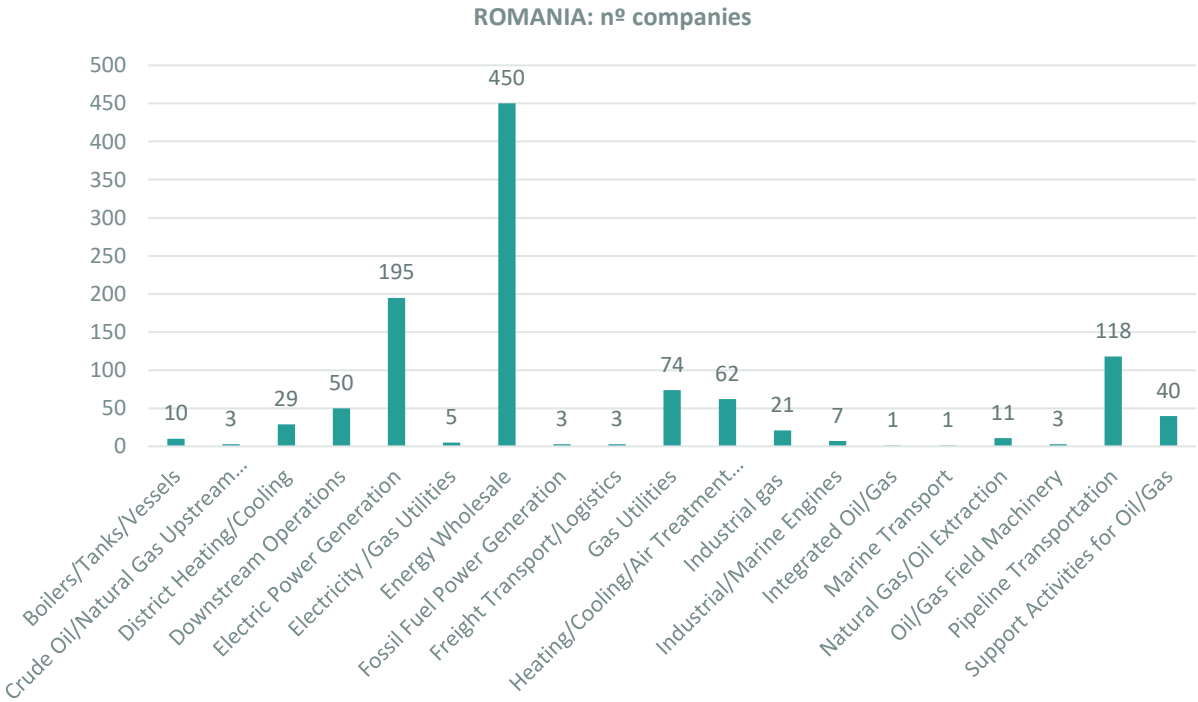
7.23. ROMANIA

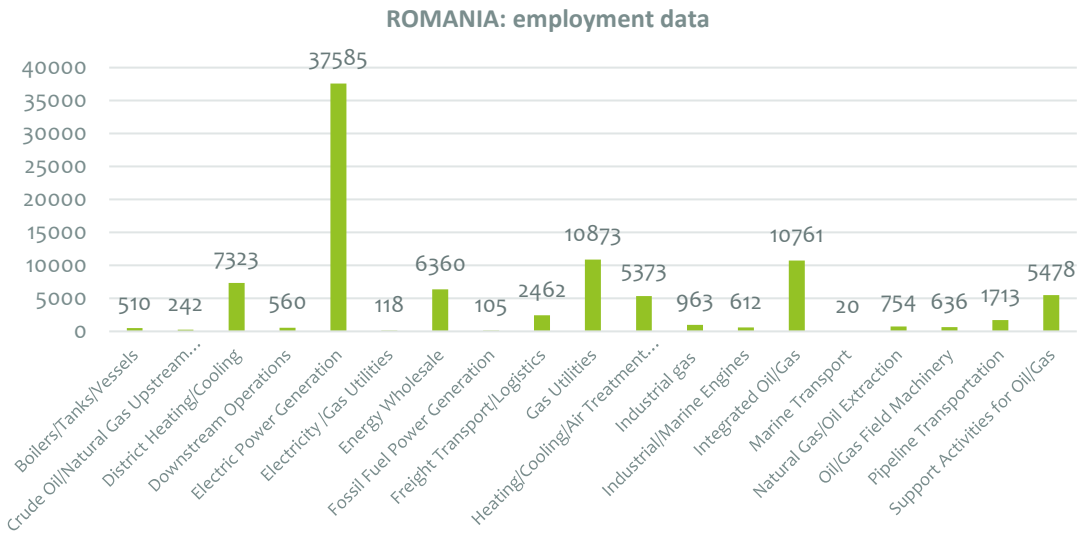
- **IN TERMS OF THE REST OF THE ACTIVITIES, "ENERGY WHOLESALE" STANDS OUT WITH 450 COMPANIES AND "ELECTRIC POWER GENERATION" WITH 37585 EMPLOYEES AND 12 COMPANIES WITH MORE THAN 500 EMPLOYEES.**

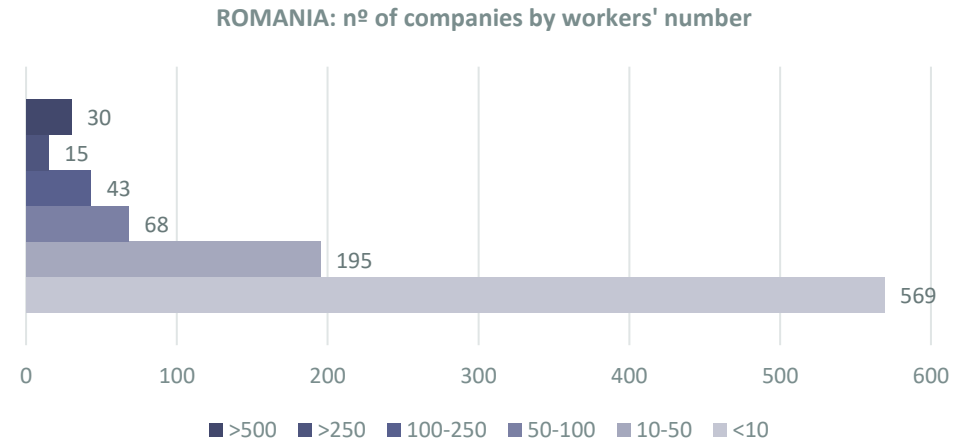
Romania: Total energy supply evolution.

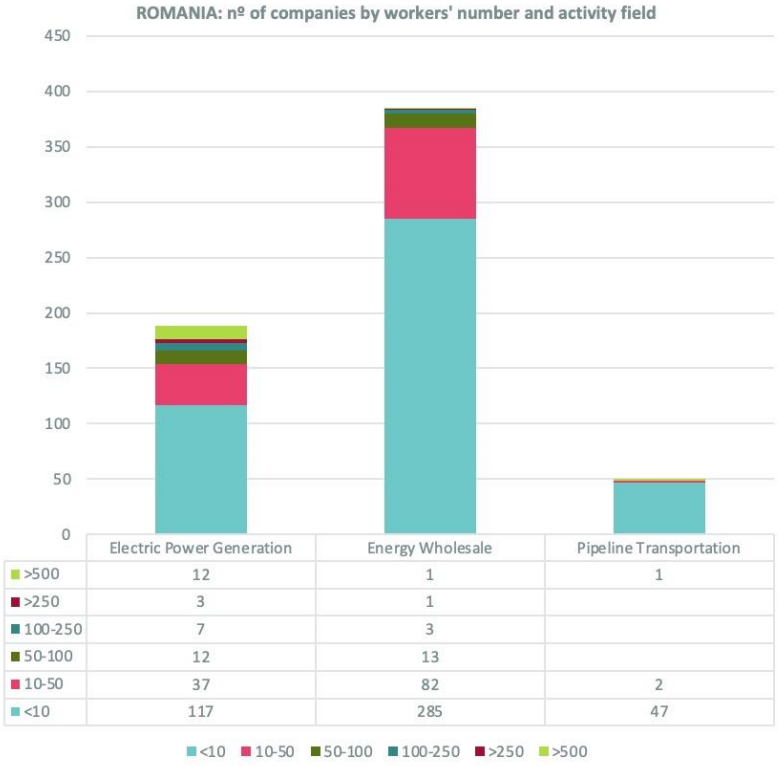




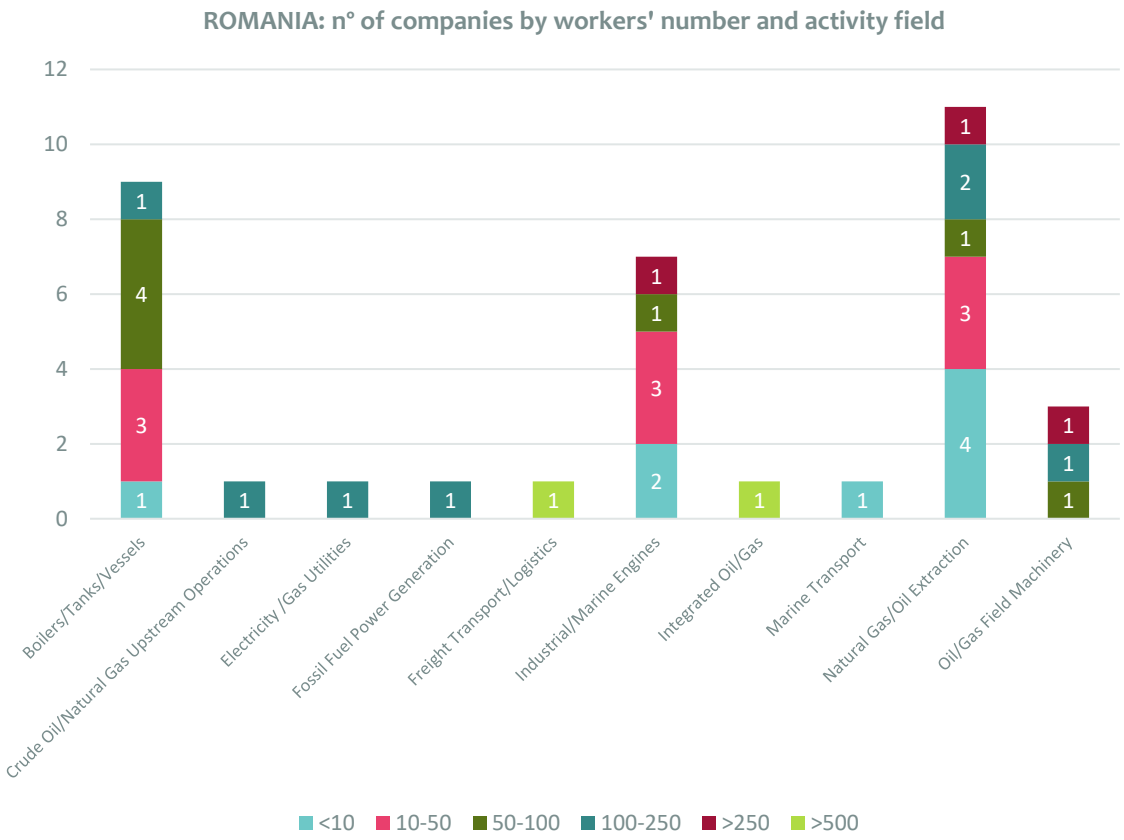






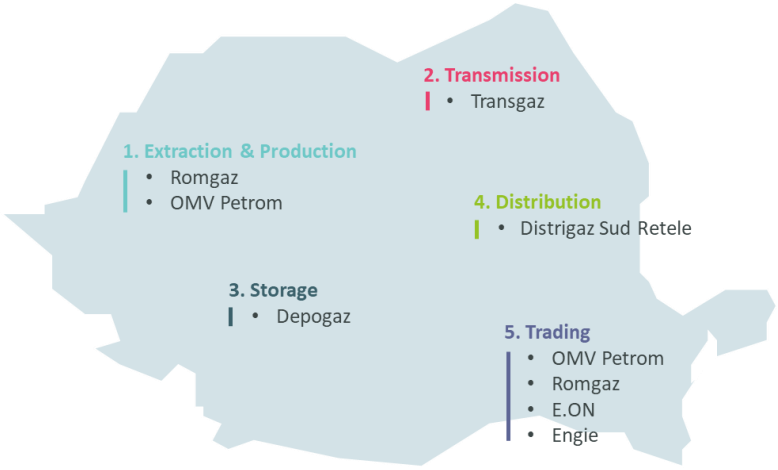


	Electric Power Generation	Energy Wholesale	Pipeline Transportation
>500	12	1	1
>250	3	1	
100-250	7	3	
50-100	12	13	
10-50	37	82	2
<10	117	285	47



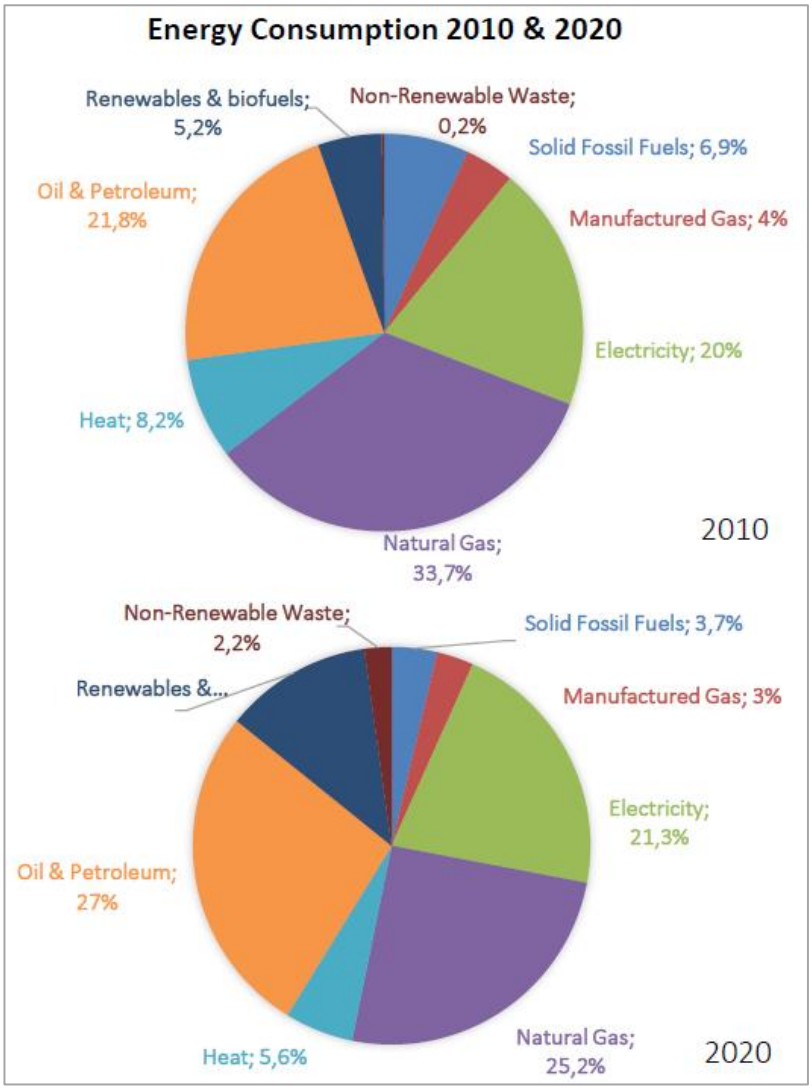
Identification of mayor European companies

Romania

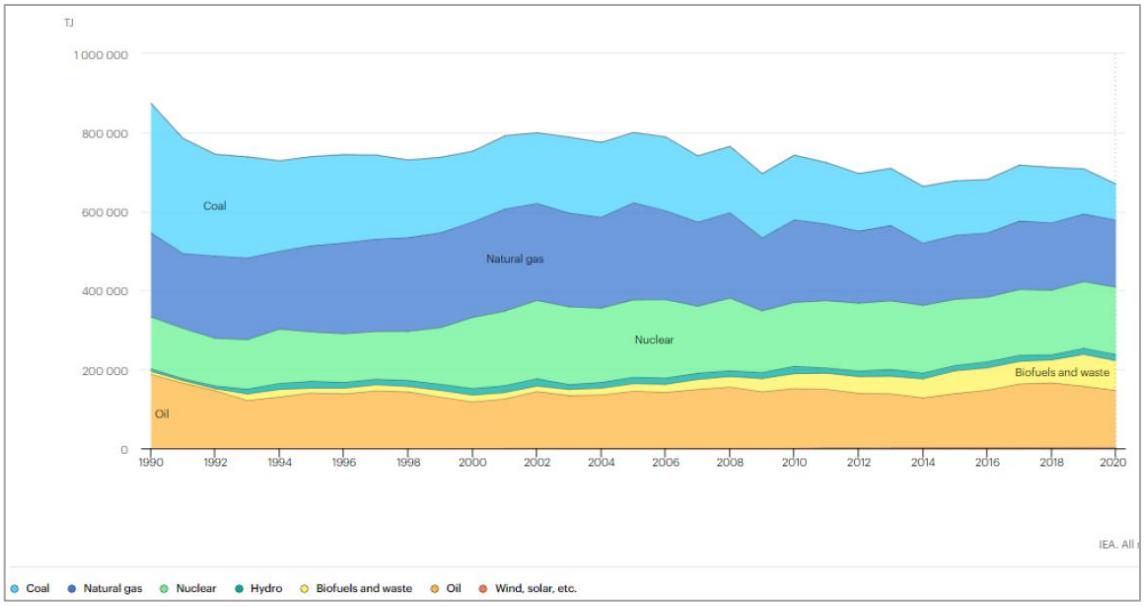


7.24. SLOVAKIA

- IN SLOVAKIA THERE ARE NOT MANY COMPANIES IN THE GAS SECTOR, BUT THOSE THAT EXIST ARE MAINLY DISTRIBUTED IN 4 ACTIVITIES: “DISTRICT HEATING/COOLING”, “ELECTRIC POWER GENERATION”, “ENERGY WHOLESALE AND HEATING/COOLING/AIR TREATMENT EQUIPMENT”.
- IN TERMS OF EMPLOYEES, "ELECTRIC POWER GENERATION" AND " HEATING/COOLING/AIR TREATMENT EQUIPMENT " STAND OUT.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "EUSTREAM".

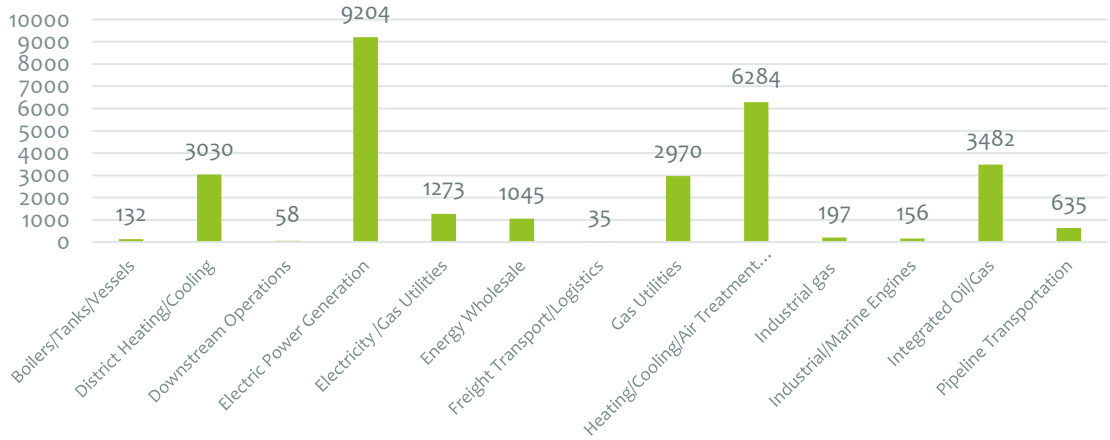


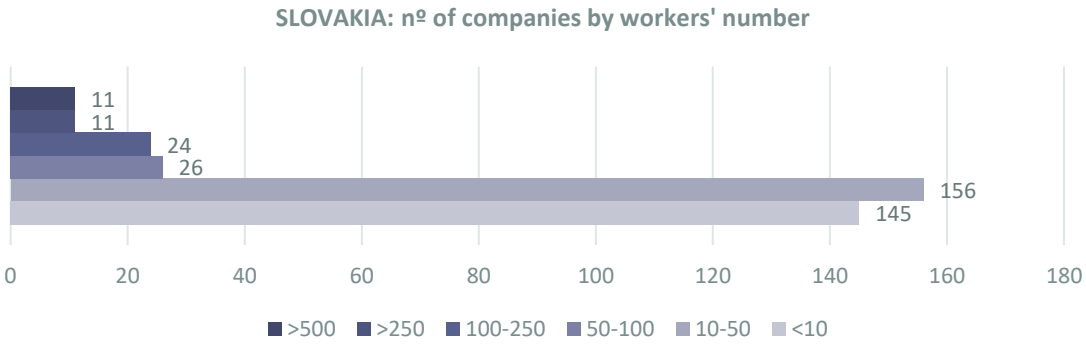
Slovakia: Total energy supply evolution



SLOVAKIA: nº companies

SLOVAKIA : employment data

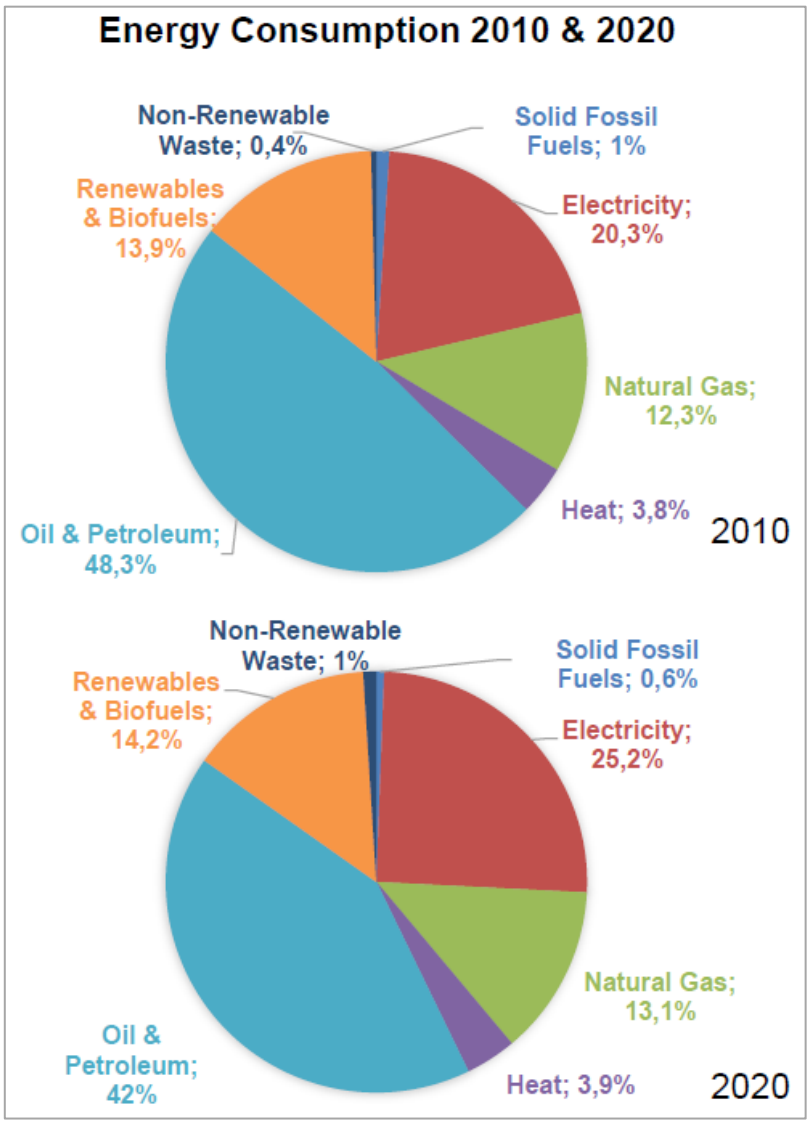




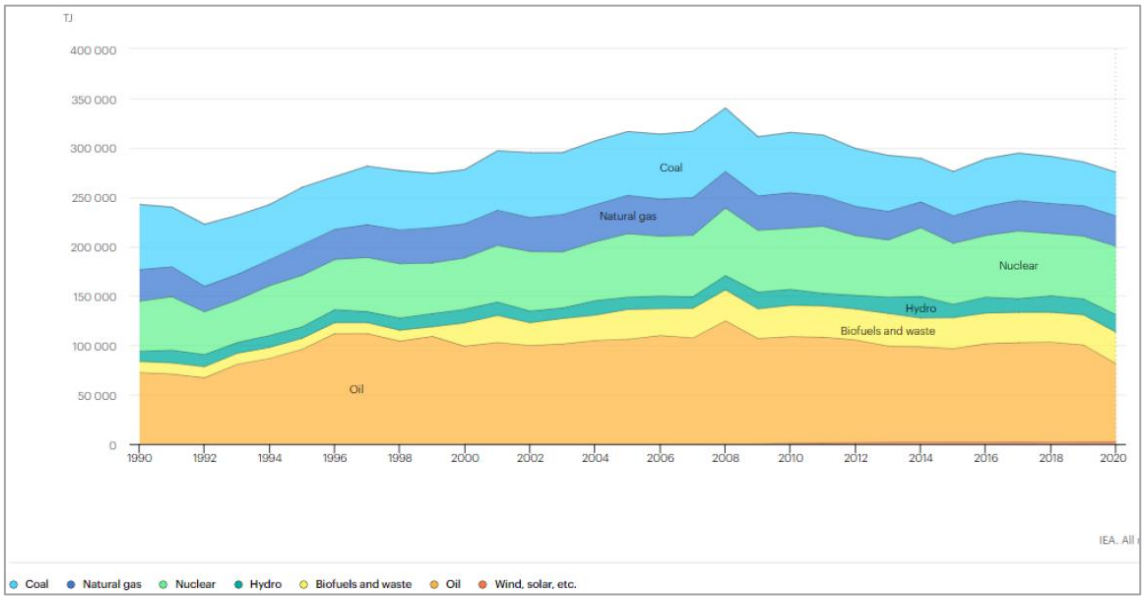
	Boilers/Tanks/Vessels	District Heating/Cooling	Downstream Operations	Electric Power Generation	Electricity/Gas Utilities	Energy Wholesale	Freight Transport/Logistics	Gas Utilities	Heating/Cooling/Air Treatment Equipment	Industrial gas	Industrial/Marine Engines	Integrated Oil/Gas	Pipeline Transportation
>500				4				3	2			1	1
>250		1		3	2				5				
100-250		3		3	4	2		1	10	1			
50-100	1	10		2		3			7	1	2		
10-50	4	62	4	24		22	1	5	33	1			
<10		18	5	66		34		3	19				

7.25. SLOVENIA

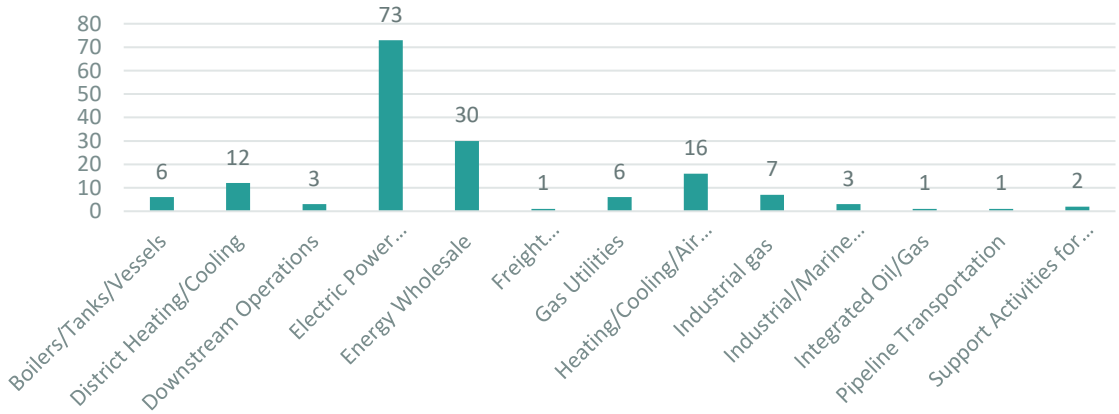
- 45% OF THE COMPANIES IN THE GAS SECTOR IN SLOVENIA BELONG TO THE "ELECTRIC POWER GENERATION" ACTIVITY.
- THIS SAME ACTIVITY IS THE LARGEST EMPLOYER, BUT ONLY ONE COMPANY IN THE "INTEGRATED OIL/GAS" ACTIVITY EMPLOYS ALMOST THE SAME NUMBER OF WORKERS (6465 AND 5157 RESPECTIVELY).
- THE MAIN GAS COMPANY IN THE COUNTRY IS "PLINOVODI".



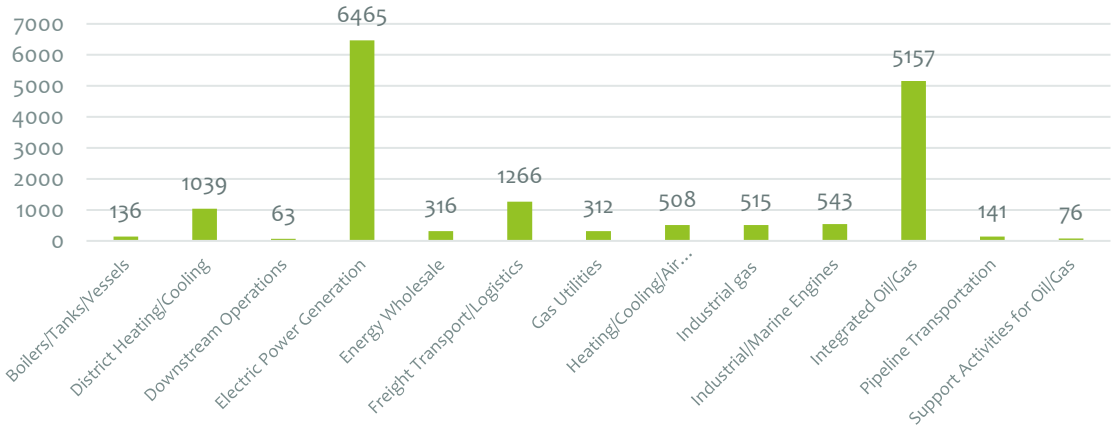
Slovenia: Total energy supply evolution

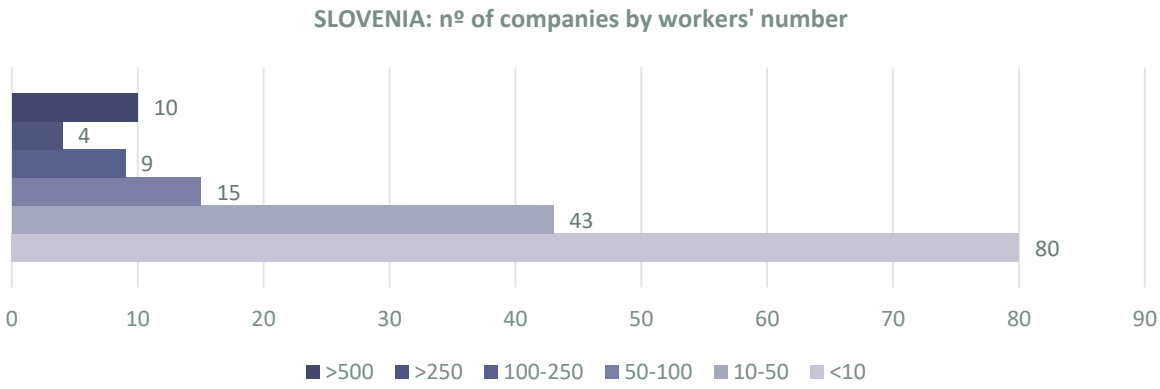


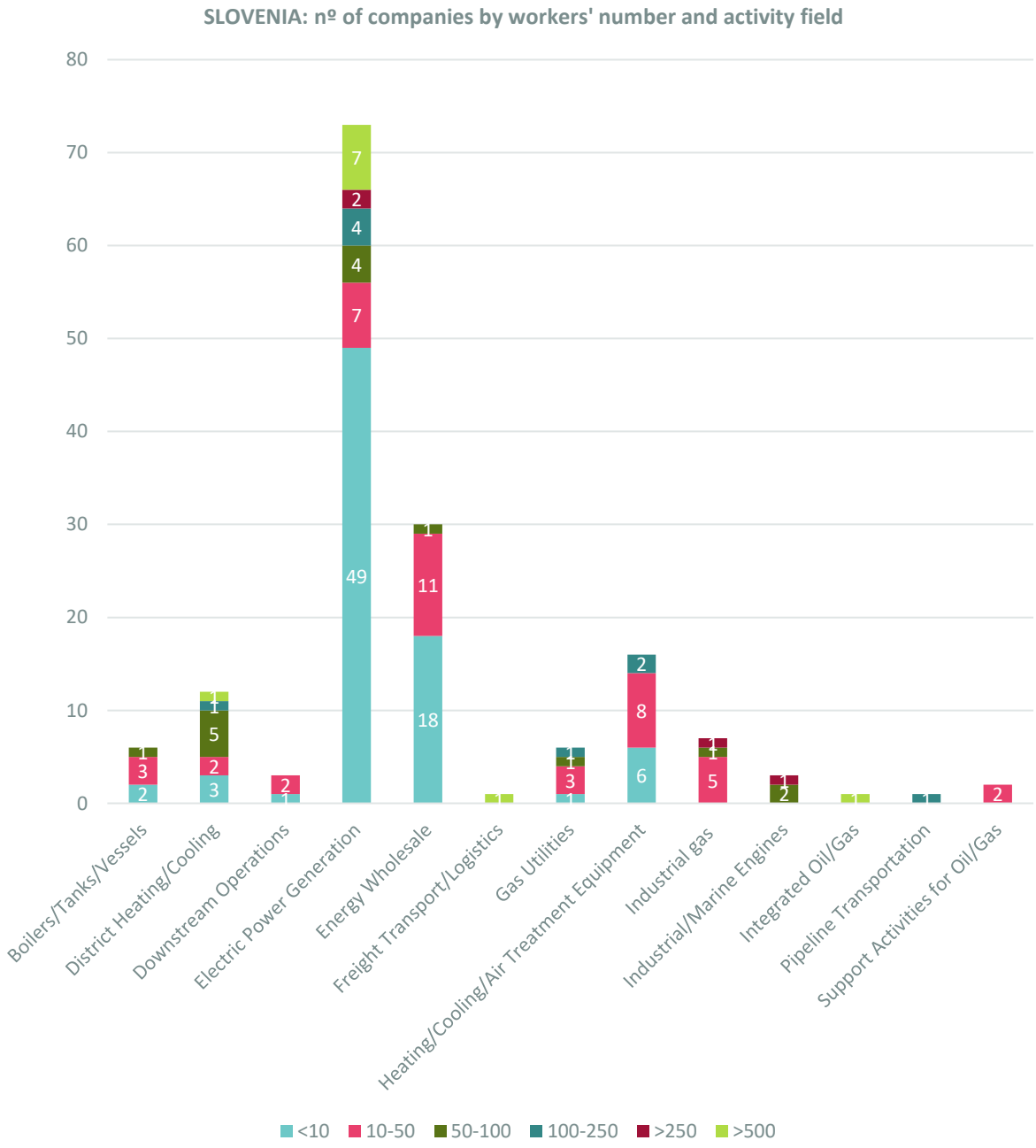
SLOVENIA: nº companies



SLOVENIA: employment data



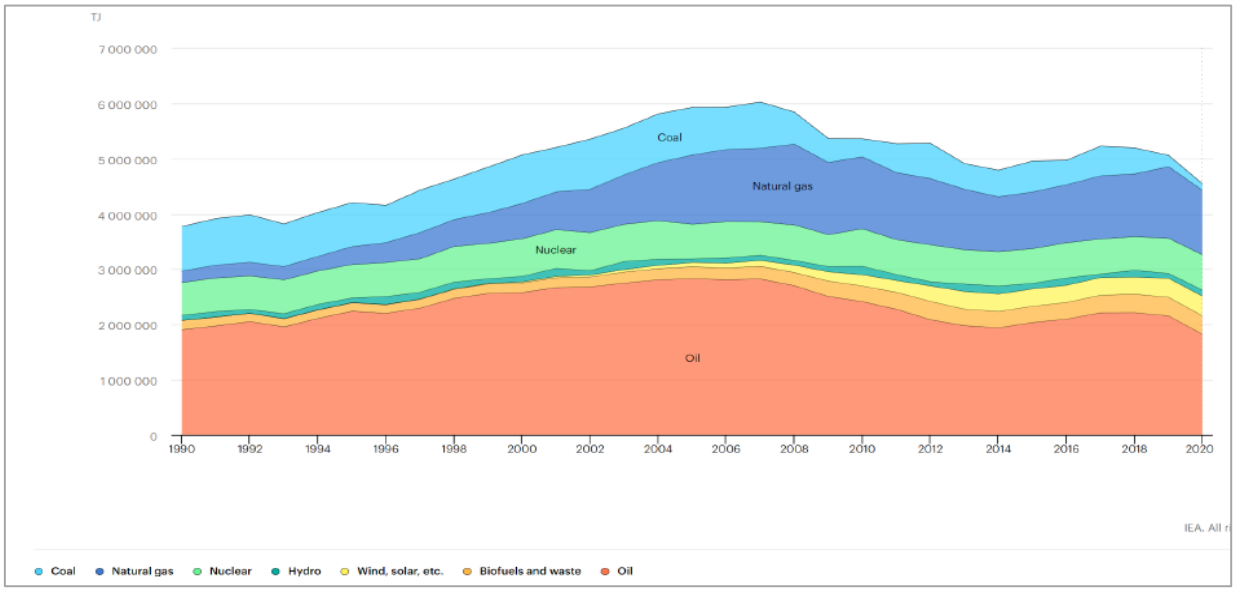

SLOVENIA: nº of companies by workers' number
10
4
9
15
43
80
0
10
20
30
40
50
60
70
80
90
>500
>250
100-250
50-100
10-50
<10

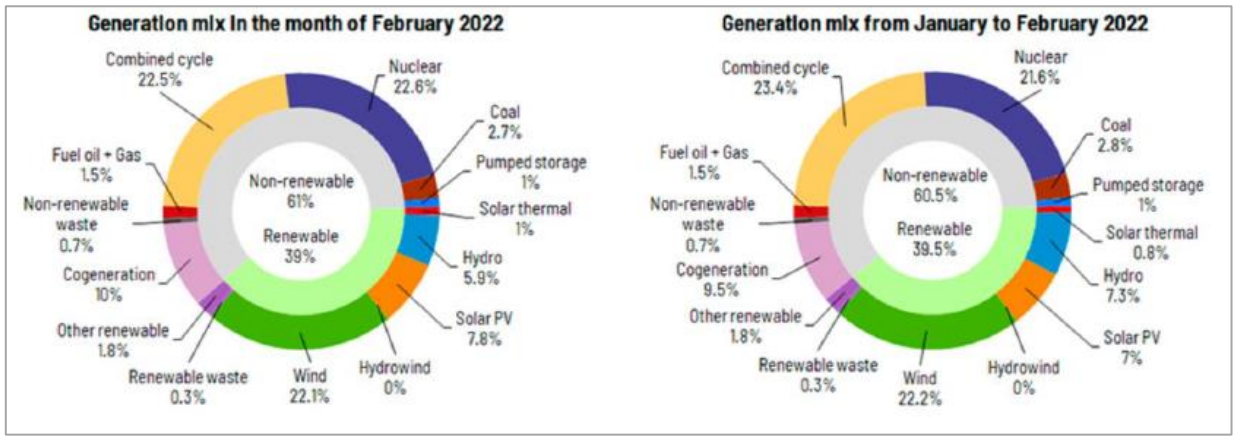

SLOVENIA: nº of companies by workers' number and activity field
80
70
60
50
40
30
20
10
0
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Generation
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment Equipment
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Pipeline Transportation
Support Activities for Oil/Gas
<10
10-50
50-100
100-250
>250
>500

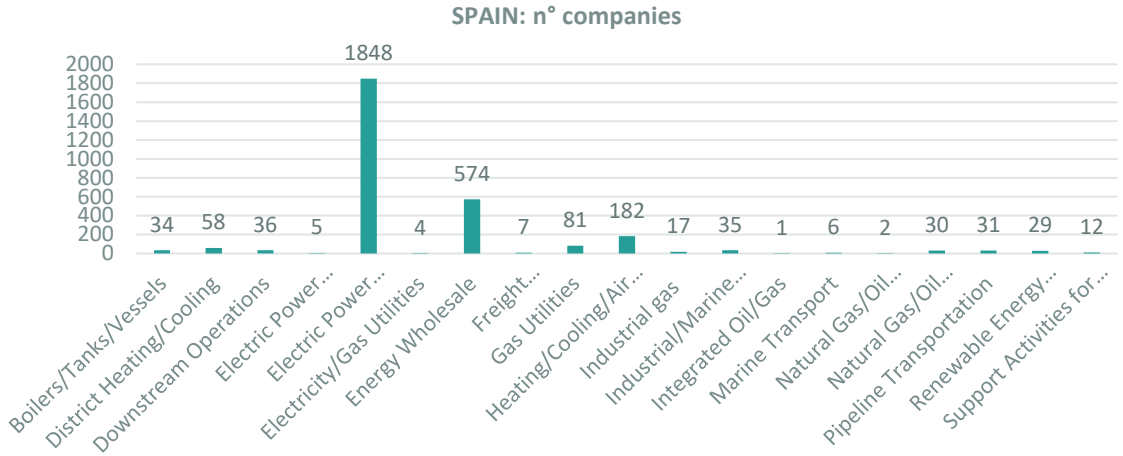
7.26. SPAIN

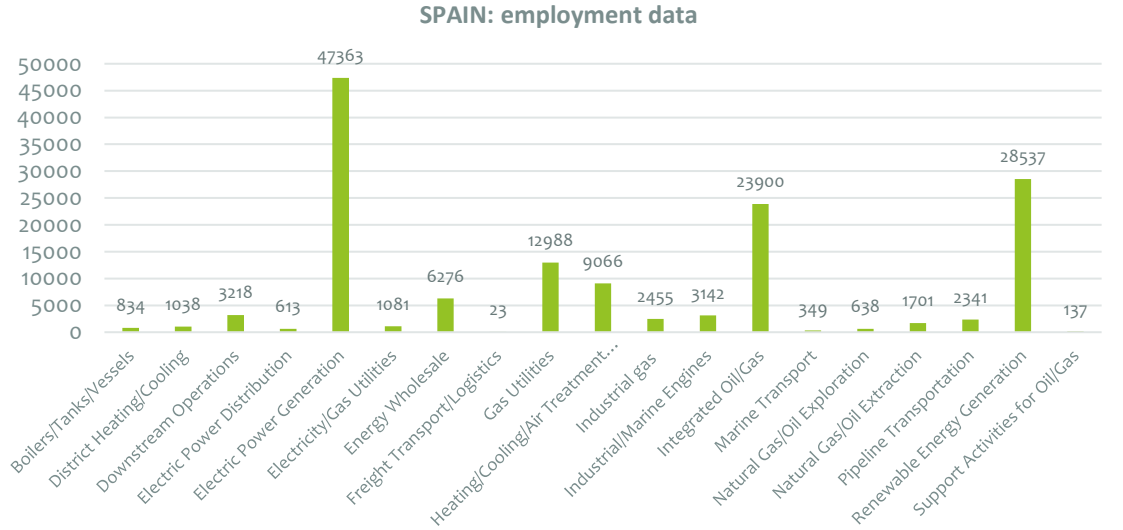
- SPAIN IS DOMINATED BY SMALL AND MEDIUM-SIZED ENTERPRISES, BUT THERE ARE ALSO 36 COMPANIES WITH MORE THAN 500 EMPLOYEES.
- 17 OF THESE LARGE COMPANIES ARE IN THE "ELECTRIC POWER GENERATION" BUSINESS, WHICH ALSO STANDS OUT IN TERMS OF EMPLOYEES OVER THE OTHERS.

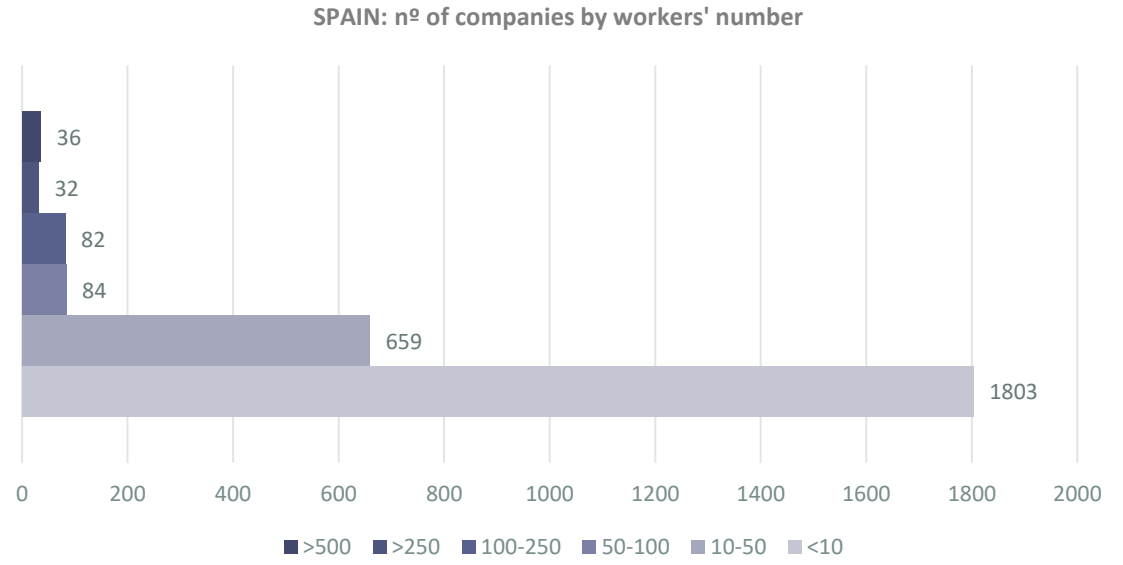
Spain: Total energy supply evolution.

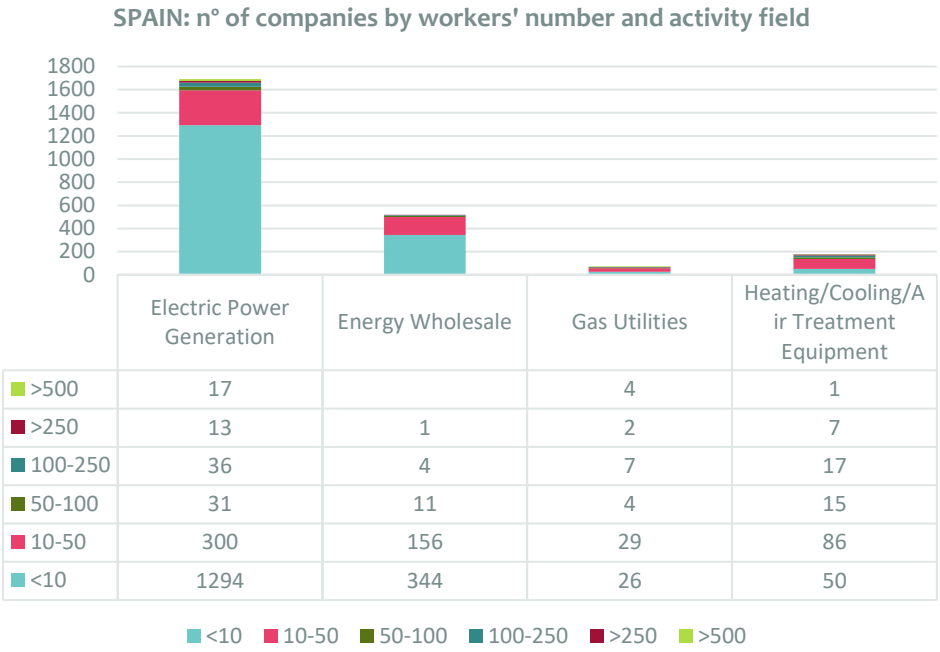




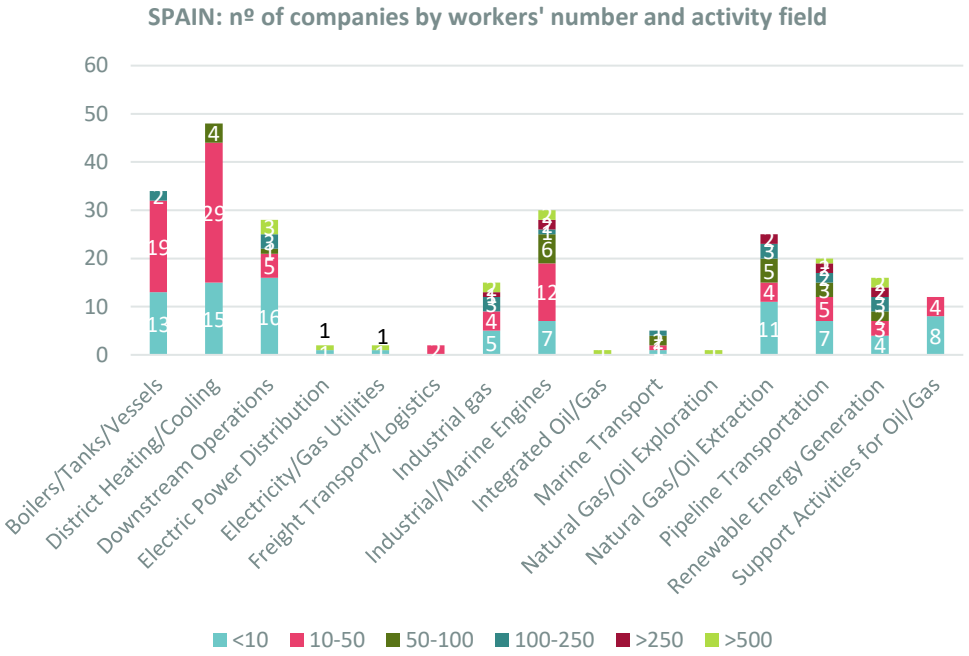

SPAIN: n° companies
2000
1800
1600
1400
1200
1000
800
600
400
200
0
34
58
36
5
1848
4
574
7
81
182
17
35
1
6
2
30
31
29
12
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power...
Electric Power...
Electricity/Gas Utilities
Energy Wholesale
Freight...
Gas Utilities
Heating/Cooling/Air...
Industrial gas
Industrial/Marine...
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil...
Natural Gas/Oil...
Pipeline Transportation
Renewable Energy...
Support Activities for...


SPAIN: employment data
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
834
1038
3218
613
47363
1081
6276
23
12988
9066
2455
3142
23900
349
638
1701
2341
28537
137
Boilers/Tanks/Vessels
District Heating/Cooling
Downstream Operations
Electric Power Distribution
Electric Power Generation
Electricity/Gas Utilities
Energy Wholesale
Freight Transport/Logistics
Gas Utilities
Heating/Cooling/Air Treatment...
Industrial gas
Industrial/Marine Engines
Integrated Oil/Gas
Marine Transport
Natural Gas/Oil Exploration
Natural Gas/Oil Extraction
Pipeline Transportation
Renewable Energy Generation
Support Activities for Oil/Gas


SPAIN: nº of companies by workers' number
36
32
82
84
659
1803
0
200
400
600
800
1000
1200
1400
1600
1800
2000
>500
>250
100-250
50-100
10-50
<10



	Electric Power Generation	Energy Wholesale	Gas Utilities	Heating/Cooling/Air Treatment Equipment
>500	17		4	1
>250	13	1	2	7
100-250	36	4	7	17
50-100	31	11	4	15
10-50	300	156	29	86
<10	1294	344	26	50

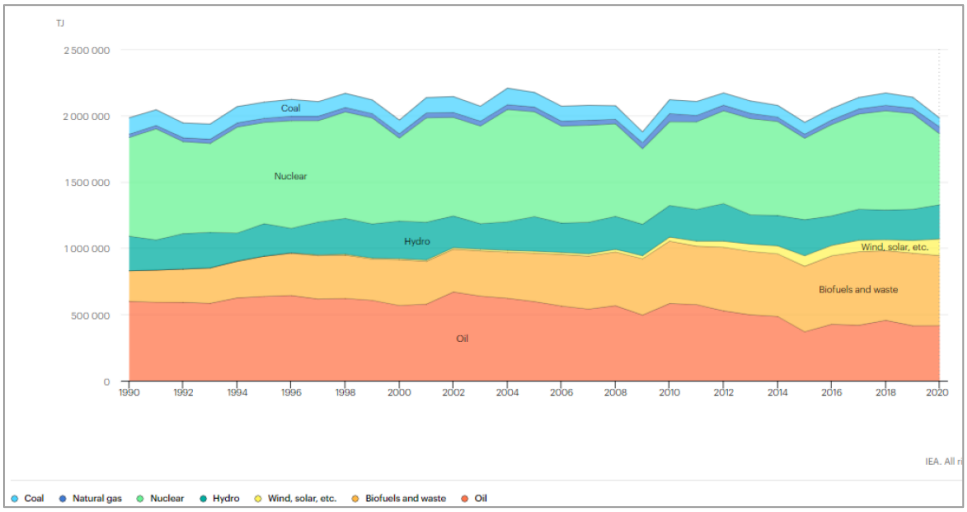


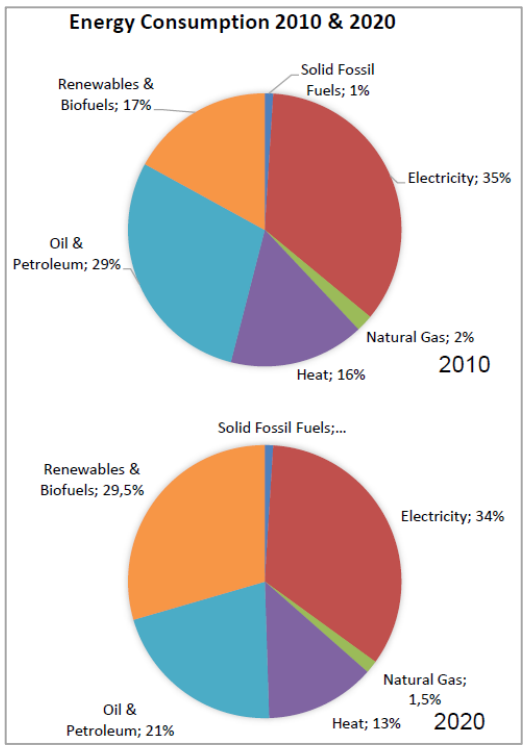
Identification of mayor European companies

7.27. SWEDEN

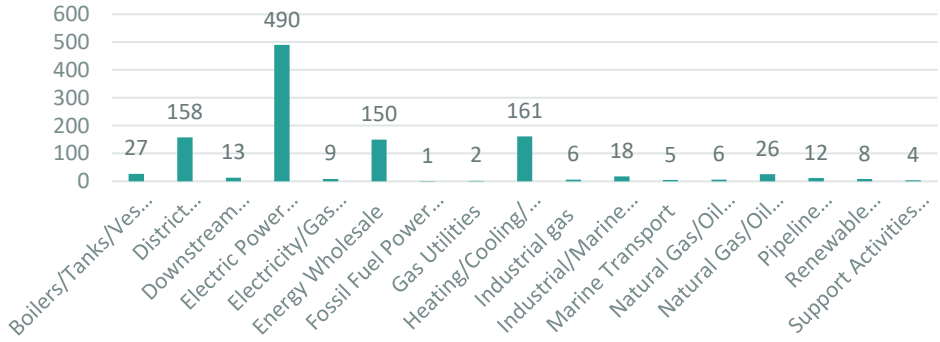
- ALTHOUGH THE LARGEST NUMBER OF COMPANIES BELONG TO THE "ELECTRIC POWER GENERATION" ACTIVITY, THE "HEATING/COOLING/AIR TREATMENT EQUIPMENT" ACTIVITY GENERATES THE MOST EMPLOYMENT (56249 PEOPLE) MAINLY IN SMALL AND MEDIUM-SIZED COMPANIES, BUT ALSO IN 10 COMPANIES WITH MORE THAN 500 EMPLOYEES.
- THE MAIN GAS COMPANY IN THE COUNTRY IS "SWEDEGAS AB".

Sweden: Total energy supply evolution

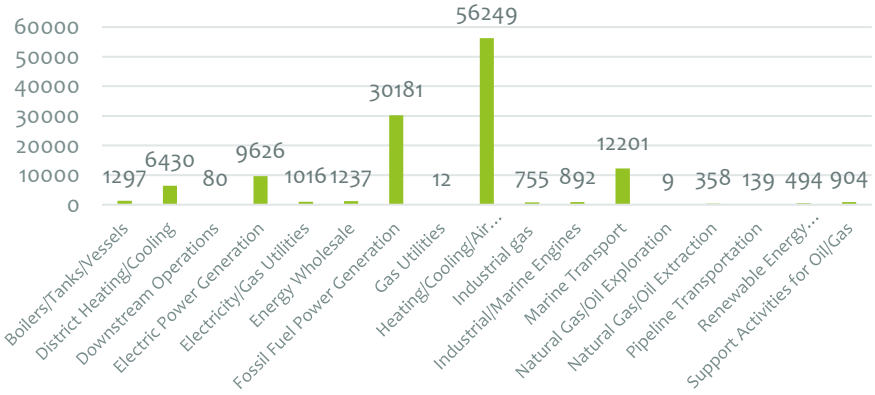


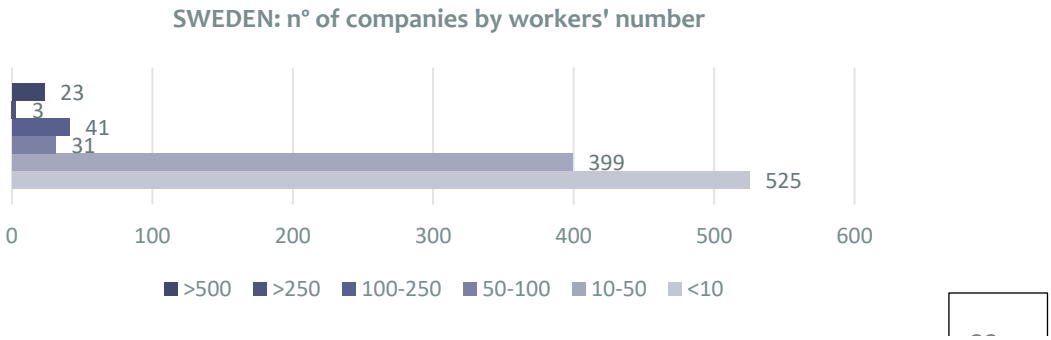


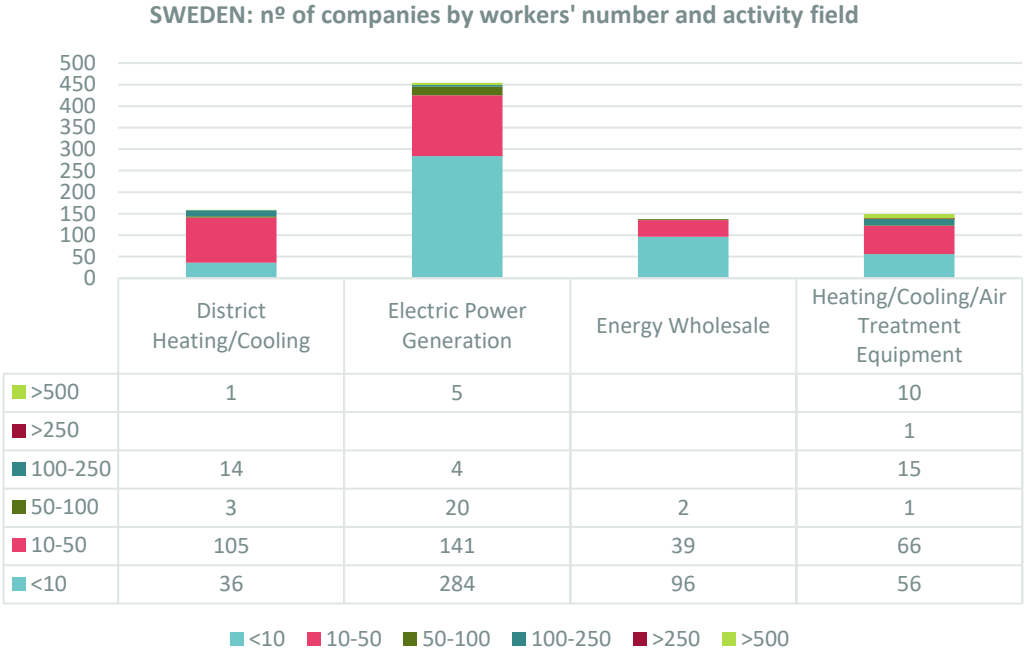
SWEDEN: nº companies



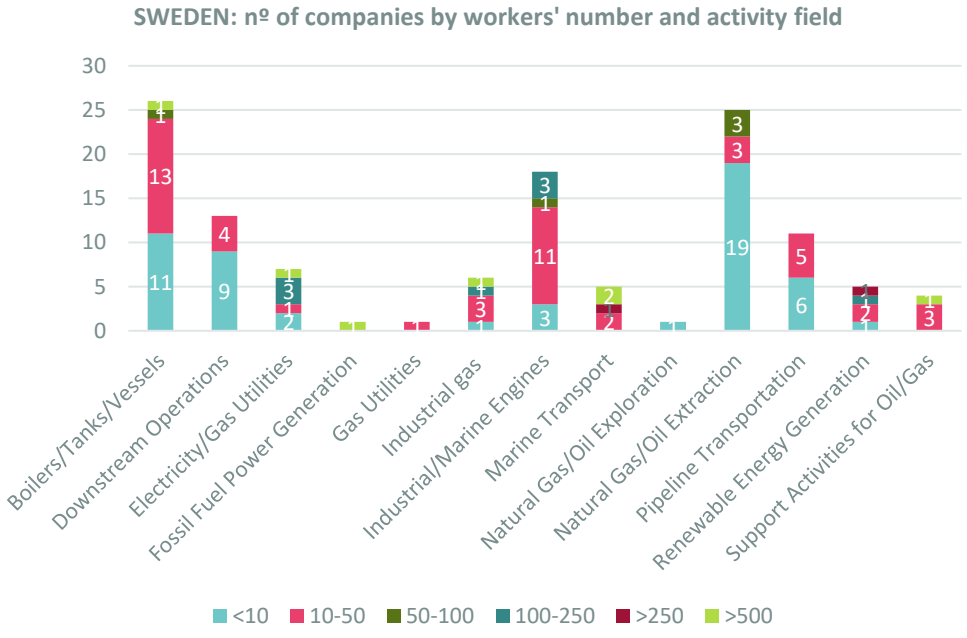
SWEDEN: employment data







	District Heating/Cooling	Electric Power Generation	Energy Wholesale	Heating/Cooling/Air Treatment Equipment
>500	1	5		10
>250				1
100-250	14	4		15
50-100	3	20	2	1
10-50	105	141	39	66
<10	36	284	96	56



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