100TWh Vision
for a sustainable energy transition

Management summary

100TWh is a citizens' association that advocates and takes action for socially sustainable electricity, which means electricity that is environmentally friendly, reliable, affordable and sufficiently available to everyone ! For us, nuclear energy meets all these criteria and should continue to provide the largest share of Belgium's electricity. We bring together citizens from all socio-economic backgrounds and of all opinions.

For our association, the primary objective of the energy transition is to ensure that all energy in Belgium is produced in a decarbonised and socially sustainable way. This applies not only to the 90 TWh/year of electricity, but to the total of 430 TWh/year of final energy, which is currently supplied mainly by fossil fuels.

To meet this target, Belgium would have at least to double its electricity production. It is therefore crucial to ensure that the electricity mix becomes socially sustainable.

For 100TWh, the following 7 conditions are necessary to achieve this :

1. The electricity generation and distribution sector must be capable of meeting national demand and be resilient.

2. The electricity sector must be sovereign and independent of suppliers from outside the European Economic Area.

3. In an optimised electricity mix, nuclear power must provide the base production. (the "baseload").

4. Renewables must be charged for the additional costs of making them dispatchable.

5. The proportions of nuclear power and renewables in the electricity mix must be optimised in order to make electricity prices as cheap as possible.

6. Some electricity generation systems should work off-grid or as hybrid systems.

7. Subsidies for decarbonised electricity production should be abolished, as should all means of distorting the market.

Given the importance of nuclear power, it must also be socially sustainable, and to achieve this it must meet 3 requirements:

1. Nuclear safety must be maintained at the highest level.

2. Nuclear waste management must be optimised.

3. Training and research must be relaunched.

The 7 conditions for a socially sustainable electricity mix

In the appendices, you will find the technical and economic arguments that support the conditions set out below.

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1. THE ELECTRICITY GENERATION AND DISTRIBUTION SECTOR MUST BE CAPABLE OF MEETING NATIONAL DEMAND AND BE RESILIENT.

Electricity production in Belgium must match demand, even if the European framework tends to strengthen cross-border exchanges.

For 100TWh, it is unrealistic to count structurally up to 38% of electricity imports as recommended by ELIA.

The national electricity production system must be reliable and resilient. It must therefore have the necessary capacity at all times to meet demand, withstand contingencies, consolidate the interconnection of the European electricity system and participate in "energy" solidarity between Member States (TFEU Art 194).

This electricity system will have to cope at least with a doubling of demand, even if a certain amount of energy sobriety is implemented.

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2. THE ELECTRICITY SECTOR MUST BE SOVEREIGN AND INDEPENDENT OF SUPPLIERS FROM OUTSIDE THE EUROPEAN ECONOMIC AREA.

The independence and sovereignty of our production system implies the availability, without political agreement outside Europe, of raw materials (gas, rare earths, etc.), resources, technologies (wind, PV, nuclear, thermal, etc.) and equipment.

In the nuclear sector, the closure of the fuel cycle and the use of advanced Generation IV fast neutron reactors should give us total independence in the supply of nuclear fuel for centuries to come.

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3. IN AN OPTIMISED ELECTRICITY MIX, NUCLEAR POWER MUST PROVIDE THE BASE PRODUCTION (THE "BASELOAD").

For a socially sustainable electricity mix, there are only 2 possible technologies: nuclear and renewable.

What remains to be determined is the best place for each of these technologies in such a mix.

Given its high availability and its good match with criteria 1 and 2 above, nuclear power should provide the baseload.

And in this case, large nuclear power plants are the most suitable. SMRs allow a great deal of flexibility, but are not necessarily designed to meet this need.

Large-scale nuclear power is also the most economical way of producing electricity (International Energy Agency IEA, 2020). But to do this, they need to run continuously at maximum load to ensure that the huge capital they require is amortised.

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4. RENEWABLES MUST BE CHARGED FOR THE ADDITIONAL COSTS OF MAKING THEM CONTROLLABLE.

The total cost of electricity consumed is made up of production costs, network infrastructure costs, external costs and also the costs of ensuring the security and reliability of the network, including the management of the intermittency of renewable energies.

In a proper market, the various suppliers must be subject to the same rules and the same constraints. This is known as the "level playing field".

This is why 100TWh considers that all forms of generation must be capable of producing on demand: they must be controllable.

To be considered as such, intermittent renewable energy suppliers would have to contract with one or more facilities that would back them up when they are unavailable or insufficient: a thermal power plant and/or a storage system (batteries, pumping station, etc.).

The extra costs brought by intermittency will then be charged to the renewable capacities and will no longer generate hidden costs in the "overall system".

The same applies to the assessment of the production of greenhouse gases, particularly if thermal power stations are used to compensate for the intermittence of renewables.

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5. IN THE ELECTRICITY MIX, THE PROPORTIONS OF NUCLEAR AND RENEWABLES MUST BE OPTIMISED IN ORDER TO MAKE ELECTRICITY PRICES AS CHEAP AS POSSIBLE.

An OECD study (Nuclear Energy Agency NEA, 2019) shows that the optimum production cost for a highly decarbonised electricity system is reached with 20 to 35% of production from intermittent sources. This percentage depends on the geographical conditions of the sites where the intermittent sources are installed.

Ensuring that 100% of electricity production (a fortiori energy production) comes from renewable energies, necessarily combined with a controllable system or storage, is economically and ecologically not sustainable for a country.

In a system where all electricity production capacity has been made "dispatchable", the security and reliability of the network can be optimised both technically and economically. In

particular, it is no longer necessary to invest in redundant production resources to protect the electricity system against the unavailability of certain intermittent sources.

In addition to the guarantee of electricity with a CO_2 content lower than 60 g/kWh, such an optimised mix will be accompanied by controlled costs and predictable, stable prices lower than 85 €/MWh over the long term. Long-term, fixed-price contracts" could be offered to citizens and businesses, to the great benefit of the global economy, society and our environment.

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6. SOME POWER GENERATION SYSTEMS SHOULD WORK OFF-GRID OR IN A HYBRID SYSTEM

All the electricity produced is currently injected into the electricity network. Designed for the electricity needs of the 20th century, this network is no longer suitable for the needs of the 21st century which will be doubled and decentralized.

Without a policy adapted to decentralization, the costs of strengthening the network will be enormous, and they will increase consumers' bills even more.

For 100TWh, there is no need to put all this electricity on the grid.

Individuals who have solar panels should be encouraged to use and store the electricity produced, rather than injecting it into the network, contributing to the unpredictability of the system and the associated additional costs.

One should also encourage consumers to form a pool served by an own production unit not connected to the general network.

In the future, a more sophisticated solution could call on so-called hybrid systems, made up of various means of production and various uses. An industrial site could, for example, produce electricity locally and sell the residual heat from this production to neighboring homes.

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7. SUBSIDIES FOR DECARBONOUS ELECTRICITY PRODUCTION MUST BE SUPPRESSED AS WELL AS ALL MEANS THAT DISTORT THE MARKET.

A study by the European Court of Auditors shows that subsidies for intermittent renewable energies totalled nearly 700 billion Euros between 2008 and 2019.

For 100TWh, we must return to a pricing mechanism that reflects total real costs in the interest of the end consumer.

We must also attract investors on sound grounds. Rather than subsidies disproportionate to one form of production, we should provide technologically neutral means of support for

investment, and therefore benefiting any form of decarbonized production on an economic basis, to build a decarbonized and optimized production park.

Financing means such as Contract for Difference, Regulated Asset Base, Power Purchase Agreement, already used successfully by certain countries, can be used.

The 3 requirements for socially sustainable nuclear power

As electricity production will rely on nuclear power to satisfy a significant part of demand, its operation must be carried out under adequate safety conditions and must include the costs of waste management and dismantling.

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1. NUCLEAR SAFETY MUST BE MAINTAINED AT THE HIGHEST LEVEL.

For nuclear power, safety is the direct responsibility of operators and under the exclusive control of the National Safety Authorities (AFCN/FANC in Belgium).

Serious accidents, such as those at Three Mile Island (USA 1979), Chernobyl (USSR 1986) or Fukushima (Japan 2011), have been used by the media to show the dangers of nuclear technology, but this coverage was exaggerated.

100TWh considers that it is not correct to refer to Chernobyl (USSR) when talking about the safety of our reactors, because it is a different technology (RBMK).

Even the Fukushima accident cannot serve as an adequate reference for an accident of the same type in Belgium, where there is no risk of a magnitude 9 earthquake or of this kind of tsunami.

Only the Three Miles Island accident (USA 1979) can be referred to. But even though part of the core melted and some of the radioactive “noble gases” escaped into the atmosphere, the levels of radioactive material measured outside the site were minimal.

100TWh refers to the United Nations body, UNSCEAR, which analyzes and monitors the consequences of industrial accidents. And for this Institution, there are no declared consequences for the populations following the accidents at Three Mile Island and Fukushima.

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2. NUCLEAR WASTE MANAGEMENT MUST BE OPTIMIZED

The competent authorities must immediately define the strategy for managing nuclear waste and spent fuel in particular. It must be explained to citizens.

Waste management is the responsibility of operators in the short term and of national agencies (ONDRAF/NIRAS in Belgium) in the long term. There are three categories of waste

from the nuclear industry. The third category, called “C”, includes high-level waste. They represent only 5% of the total volume of waste, but 90% of the total radioactivity.

There is no “mountain” of nuclear waste as some critics say. Category C waste takes up ½ a football field covered with 1m of waste. Moreover, it is not just “waste” but spent fuel which still contains a lot of fissile and fertile material that fast neutron reactors can use for centuries. This is, among other things, what the MYRRHA Project in Mol will demonstrate.

Countries which do not consider the reprocessing/recycling of spent fuel opt for disposal in deep and stable geological layers (operation underway in Finland). The indecisions regarding this waste management option are more political than technical.

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3. TRAINING AND RESEARCH MUST BE RELAUNCHED

To prepare our energy future and ensure the independence of our electricity sector, whether developing technologies or training experts, a long-term strategy must be adopted by Belgium, and within the EU. .

Belgium has been a globally recognized pioneer in the nuclear sector (science, research, production of electricity and medical isotopes) and must remain so.

A new generation of nuclear energy experts must be quickly educated while maintaining a high level of training and education, always with an international dimension.

100TWh welcomes the fact that all universities in EU countries that teach and research in the field of nuclear energy have decided to join forces within the "European Nuclear Education Network" (ENEN, which secretary is in Brussels).