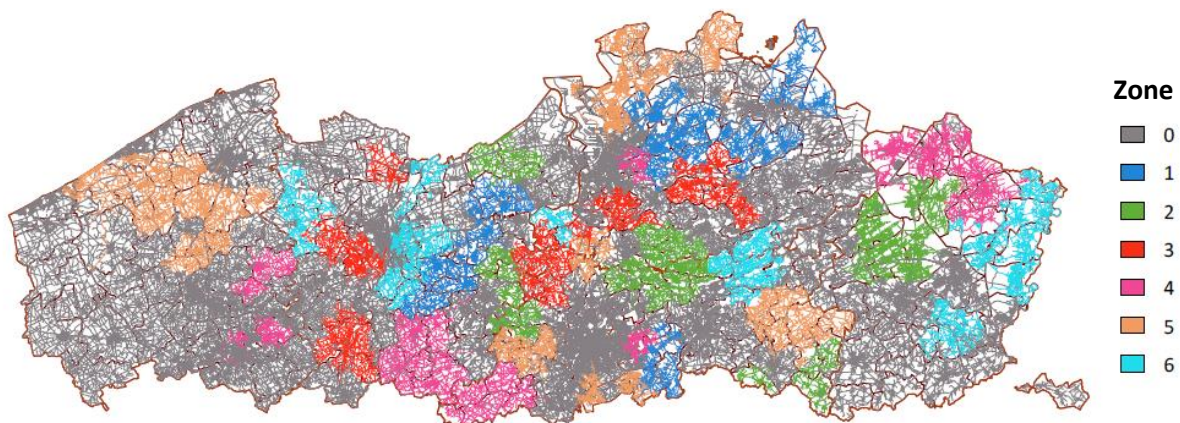


Extended abstract - English version

In 2014, three nuclear power plants in Belgium were shut down due to technical issues. Because of this, there was a risk that the electricity supply might not be sufficient to meet the consumption of the users of the electricity grid in Belgium. Especially during peak moments in winter periods this might have been a huge problem.

The federal government of Belgium and the electricity transmission system operator, Elia, came up with a plan in case of electricity shortage. The so called 'outage plan' (afschakelplan) implied that, in case of electricity shortage, certain regions in Belgium would be disconnected from the electricity grid. This would lead to enormous problems for the consumers in that region. A lot of questions were raised about the plan, and soon it became a huge media hype.



Outage plan for Flanders and Brussels

Six zones could be disconnected from the electricity grid (zone 6 first, zone 1 last). Zone 0 cannot be disconnected.

This plan clarifies that the electricity grid is not robust and that a few little problems in some nuclear power plants can lead to major problems for the entire country. Therefore, the research question in this thesis is as following:

“What are spatial solutions to conceive a more robust electricity supply in the dispersed region of Flanders?”

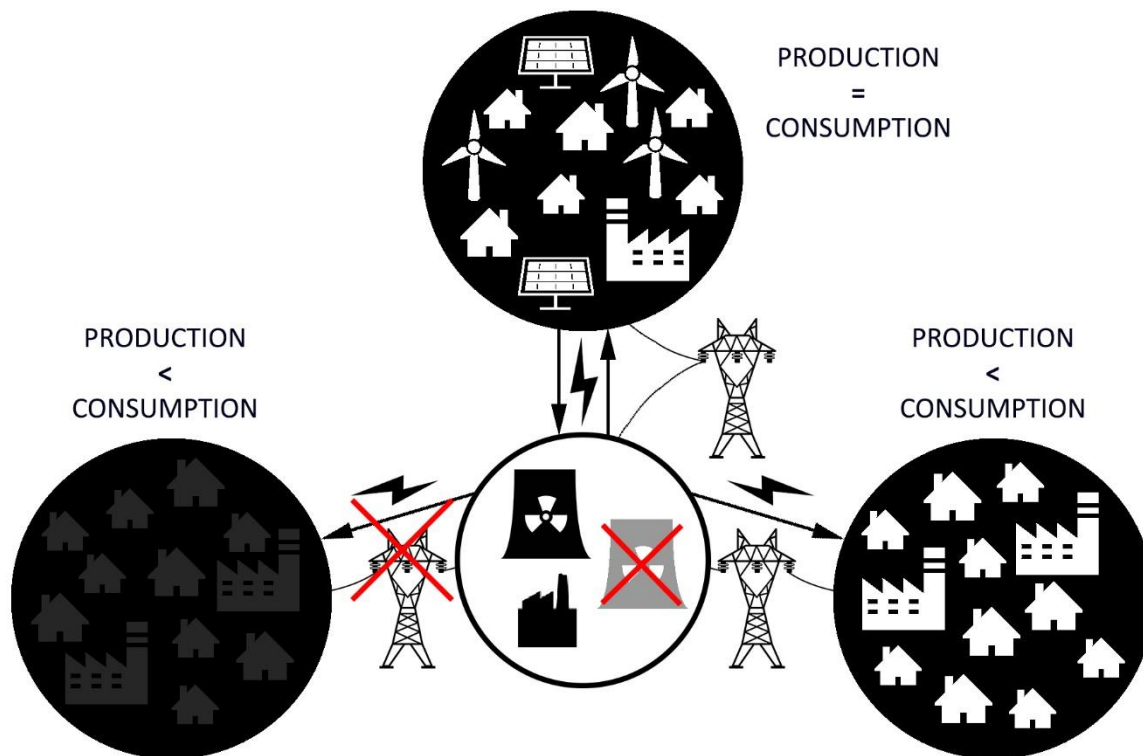
In the thesis, three strategies are proposed that show potential for a more robust grid.

The first strategy is decentralized energy, and more specific wind- and solar power. These energy sources can be planted everywhere in the country because wind and solar radiation can be found everywhere. This could lead to a more local electricity production instead of central, which is the case for the electricity grid today. Note that 'everywhere' needs to be put into the spatial context of Flanders. The urban sprawl, which is highly present in this region, reacts as a drawback for the construction of new wind turbines.

The second strategy that is proposed in the thesis is buffering of electricity. The electricity grid needs to be balanced at every moment. This means that the production has to match the consumption of electricity at any time. Two different forms of buffering are described in the thesis: smart grids and electricity storage.

A region that will be disconnected, disconnects both the consumers and the production units. In the context of electricity shortage it is important that production units stay connected to the grid. Regions that produce more or less the same amount of electricity that they consume, don't need to be disconnected because this would have no effect on the electricity shortage problem.

The challenge is matching the production and consumption of electricity on a local level as much as possible. In case of electricity shortage, regions with a much higher production than consumption will be disconnected in the first place.



Matching the production and consumption of electricity on a local level results in less risk of disconnection in case of an electricity shortage

The 'local' level, presented here, refers to the scale of the high voltage grid. The outage plan disconnects users by switching of high voltage cabins resulting the disconnection of big regions. However, disconnection could also be done more local when the technology allows this. Instead of disconnecting huge regions, it would be possible to disconnect on the scale of a single house. The impact of disconnection could also be highly reduced and high-impacted consumers (like infrastructure or industry) could be preserved. But even on a more local level it will be the users who consume (a lot) more than they produce who will be disconnected from the grid.

This thesis was written from September 2014 until August 2015. The energy policy in Belgium has made little progress during that period and focused mainly on extending the lifetime of nuclear power plants. Winter is coming and some nuclear power plants are still not operational and there are no sufficient alternatives available.

The thesis presents the production of electricity on a local level as a solution to stay connected to the grid. When the energy policy fails, it is maybe a task for companies, the most affected, or individuals to invest in renewable energy on a local level. It might be a way to a green and robust electricity system.