Track 16: Urban and Regional economics of transition

Financial or societal returns? Exploring the ambiguous role of intermunicipal energy company Fluvius in the energy transition in Flanders

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Abstract: Energy systems are key sites of spatial and socio-political transformation. This paper explores the role of distribution network operator Fluvius in the energy transition in Flanders. We examine the tension between the societal expectation for this public company to contribute to a more sustainable energy system, and the financial and spatial conditions for its operation. The analysis is based on 20 in-depth interviews, and advances the three spatial concepts of density, spatial selectivity, and scale, to highlight the socio-spatial tensions surrounding energy distribution. It reveals questions around energy tariffs for dense versus sparse areas, locational choices for collective heating and renewable production, and the spatial redistribution of the cost of energy transition. Although fundamentally political, the regulation and management of such issues is often framed in technocratic and economic terms, leaving spatial planning and redistribution implicit. By revealing these spatial and political dimensions, the research contributes to a broader debate about the role of energy distribution in a more sustainable and democratic energy system.

Keywords: energy distribution, implicit planning, socio-spatial redistribution, dispersed urbanisation

Introduction

Transforming urban energy systems has become a key element of spatial and socio-political urban change (Bulkeley *et al.* 2014). Rather than a merely technological challenge, the energy transition is therefore about a fundamental transformation towards a more sustainable and inclusive energy system (Morris and Jungjohann, 2016). This requires understanding and rethinking the arrangements of who owns, operates and finances these systems, and how they are spatially configured.

However, energy infrastructure networks are often characterised by a strong inertia since they are embedded both materially and spatially in the existing territory, and connected socio-technically to the energy 'regime' (Frantzeskaki and Loorbach, 2010, Markard, 2011). Spatial planning and design have started to explore the energy transition as a spatial question, showing how energy infrastructure transformation is connected with broader processes of spatial change (Juwet and Ryckewaert, 2018,

Sijmons, 2017). Transition studies have often focused on 'niche' innovations, but are is increasingly interested in the role of regime players in transformation processes. Incumbent players in the energy sector are under pressure to adapt to a context of liberalisation and unbundling, decentralization and digitization, decarbonization and denuclearisation. As many urban infrastructures in Europe are privatised and increasingly financialised (Pike *et al.* 2019), in countries like Belgium, but also Switzerland and Germany, energy distribution largely remains in public hands (Mühlemeier, 2018).

This research focuses on the case of electricity and gas distribution networks in Flanders. These networks are 100% publicly owned by the municipalities, and managed by a single operating company called Fluvius. The research explores the ambiguous position of Fluvius by analysing the tension between societal expectations about its contribution to a more sustainable and democratic energy system, and the financial and socio-technical conditions in which it operates. Hypothetically, this tension can be identified both at the level of the municipalities and of Fluvius itself. While municipalities increasingly formulate strong climate ambitions, they also expect and depend on a yearly dividend from the network operator. Fluvius claims the ambition to become carbon neutral, and has public service obligations to promote energy efficiency and facilitate the uptake of renewables, but also has vested interests in the existing fossil gas network and a revenue that is relative to the kWh of energy supplied. This paper will focus on how these tensions materialise in the way Fluvius deals with questions of spatial planning and socio-spatial redistribution.

In the context of Flanders' dispersed urban landscape, the relation between the spatial and organizational configuration of energy networks, and processes of urbanization is a particularly relevant dimension of Fluvius' societal role. Many authors have showed how technical networks have historically facilitated and reproduced Flanders' nebulous urbanization (De Block, 2014, Ryckewaert 2012, Van Acker, 2014). Heavy transport infrastructures such as canals, railways and later highways were often part of formal plans that had the ambition to modernise and industrialise the nation. Bruggeman shows how lighter supply systems, such as the electricity networks, can be read as an example of how collective consumption was organised through different governance and spatial arrangements within this urbanising territory (Bruggeman, 2019). Usually considered a rather technical question, the spatial organisation of the energy network was rarely an explicit object of formal spatial planning. However, as in other domains like transport or economic policy, many forms of 'implicit' planning have contributed to territorialisation processes (Ryckewaert, 2011).

Today the ecological and social limits of Flanders' dispersed spatial organization are increasingly clear (Van Broeck and van Ypersele, 2019). Understanding the implicit mechanisms that reproduce or could potentially counteract these urbanization patterns therefore becomes crucial and could also inform formal processes of spatial energy planning. Looking at Fluvius today, this paper therefore explores in particular how the organisation of the energy distribution network relates with processes of spatial development, and what forms of implicit spatial planning are at stake in the way it is operated, financed and regulated.

Methodology

The key empirics of this case study research are based on 17 in-depth interviews with 20 people that took place between March and May 2019. The interviewees included staff members from several departments within Fluvius, such as financial management, strategy, and business. We also interviewed multiple stakeholders, such as representatives and civil servants of municipalities, civil society actors (environmental movement, labour unions, energy cooperatives), the Flemish energy regulator VREG, and the Flemish government energy agency. The interviews were semi-structured and lasted between 1 and 3 hours. Interviewees were asked about their role in, or relation with Fluvius, and about the societal, political, spatial and financial aspects of how Fluvius operates. We complemented the interviews with desk-research on secondary documents, such as the Flemish Energy Decree, annual reports of Fluvius, the Fluvius website, and reports by the regulator. The transscribed interviews and most relevant documents were coded and analysed with the software MAXQDA.

Introduction of Fluvius as a case study

To introduce Fluvius as an object of study, we use recurring descriptions by interviewees, as they highlight diverse perceptions of Fluvius' current and potential role as a public actor in the energy transition.

Fluvius is regularly described as '*the extension of the municipalities'*. It is the operating company for electricity and gas distribution for 11 locally organized 'intermunicipal companies' ('opdrachthoudende verenigingen', distribution network operators or DNO's, Figure 1). Ultimately, the shareholders of these intermunicipal companies are the 300 Flemish municipalities, that have transferred the construction and operation of the energy distribution system to Fluvius.

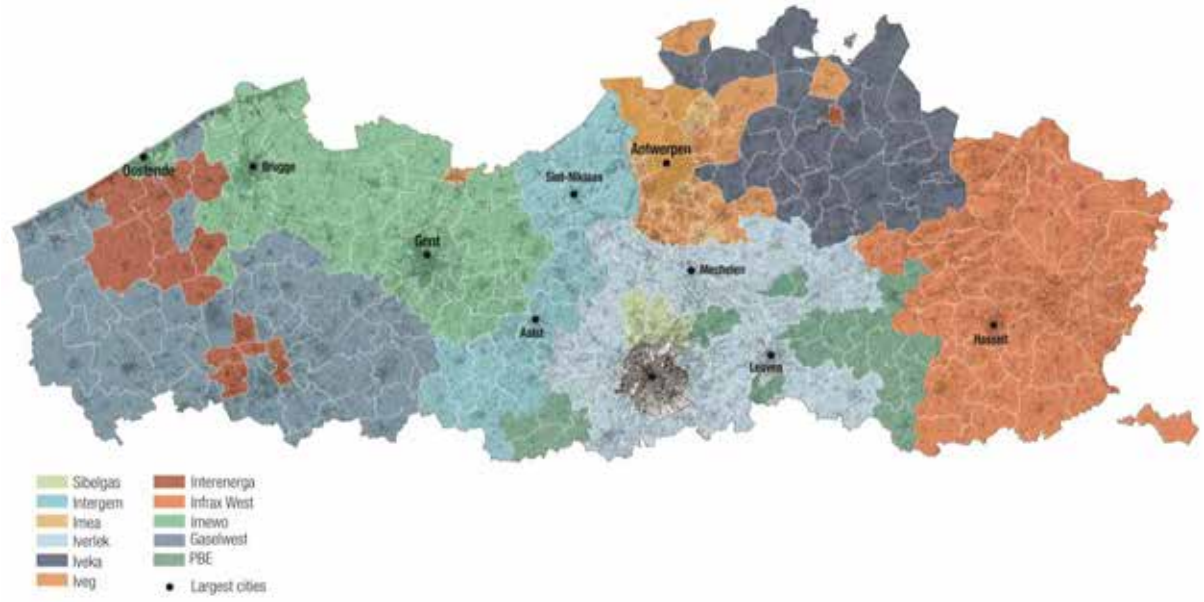

Figure 1. Map of Flanders showing the intermunicipal energy companies for electricity distribution. Source: elaborated by author based on Fluvius.be, May 2019

Next to operating Flanders' electricity and gas networks, in several areas Fluvius also operates some sewerage, tv cable, public lighting, and district heating. Providing this range of services, the company is referred to as '*the manager of the underground'*. Today, Fluvius explicitly positions itself as a multi-utility company with the ambition to become 'the' network operator for Flanders. On top of its core business of 'managing underground assets', Fluvius also ventures into other activities, sometimes assigned through the Flemish Energy Decree, other times developed independently by Fluvius. This has raised questions about what its 'core tasks' as a public company should be.

As an operating company Fluvius is the result of a merger between the two formerly existing distribution companies Eandis and Infrax. Eandis worked for the so-called 'mixed' intermunicipal companies (historically combining public and private shareholders), while Infrax operated the network for the 'pure' intermunicipal companies that had only public shareholders. Fluvius' current monopoly for energy in Flanders, and multi-utility position explain its perception as '*a tanker*', for which it is difficult to change direction. This monopoly position also challenges the work of the regulator as a comparable benchmark is missing.

Findings and discussion

In the context of an increasing awareness about the ecological, social and economic consequences of Flanders' dispersed urbanization, it is particularly relevant to understand the spatial mechanisms behind the operation of the energy network. How does the organization of the distribution system support or reproduce dispersed forms of urbanization, or does it offer opportunities to rethink these processes? These are crucial elements in understanding the network operator's role in the transition towards a more sustainable energy system and territorial organization. This section therefore focuses on the findings related with the spatial logics behind how the distribution network is planned, operated, financed and regulated. The three concepts of 'density', 'spatial selectivity' and 'scale' will be used to structure these findings. Based on an earlier literature review (Juwet and Ryckewaert, 2018) and on the empirical material, they emerge as useful notions to conceptualise the relation between energy infrastructure and spatial morphology, and to reveal some of the tensions and ongoing debates about Fluvius' role in the energy transition.

Density: energy tariffs and the cost of sprawl

The spatial dimension of the distribution system becomes explicit in discussions about the relation between energy tariffs and spatial morphology. This is particularly relevant in the context of a broader societal debate in Flanders about the 'cost of urban sprawl', and the transition towards a less space- and energy-intensive form of urbanization (Van Broeck and van Ypersele, 2019). This section will illustrate how a planned tariff reform is nevertheless treated as a technical question and public debate about the cost of this extended utility network remains limited.

Today, connection fees for electricity and gas are independent of a customer's location, even though denser areas need less infrastructure per building. Differences in distribution tariffs exist between DNO's, but are related to a historical valuation of the network assets, rather than to the density of urbanization (Figure 2).

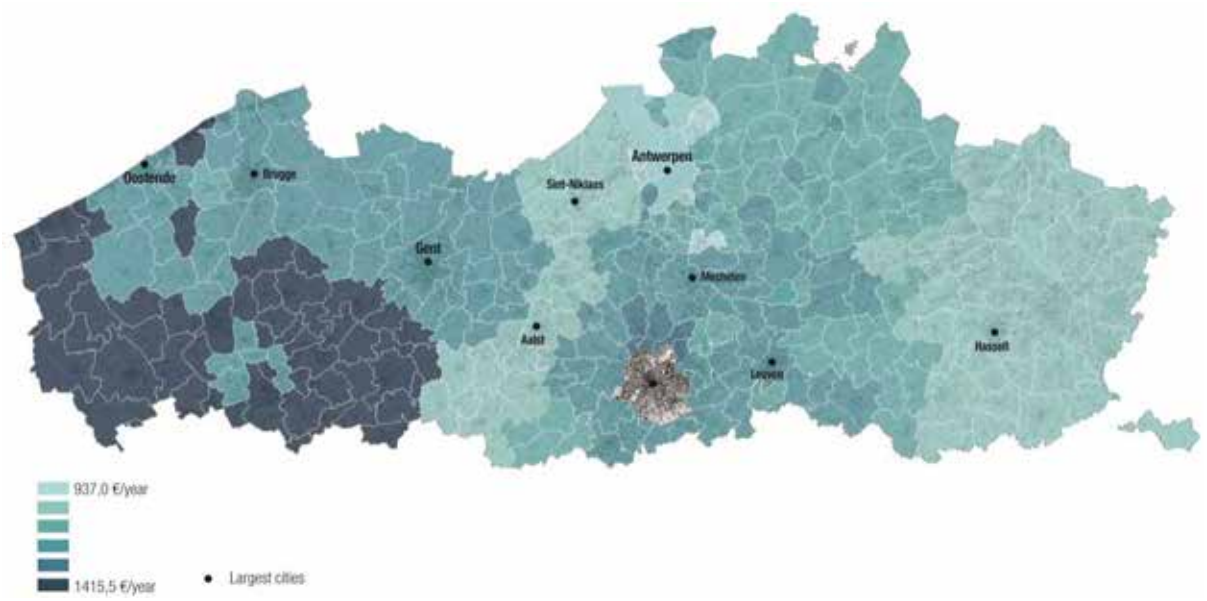

Figure 2. Map of Flanders showing the tariff difference (network cost + charges) for electricity and gas for an 'average family' in each municipality.
Source: elaborated by author based on tariefchecker.be, 2017

Today, a thorough reform of the energy tariff structure is under investigation by the Flemish regulator. Instead of a tariff based on energy use (€/kWh), the reform proposes a tariff based on the capacity of the connection (€/kW), to make the tariff more 'cost reflective' as required in the Flemish Energy Decree. Interestingly, this Decree also specifies that "*when introducing a capacity tariff, the tariffs take into account regionally objectifyable differences*" (Energiedecreet, 2015). One interviewee indicated that "*this passage was added explicitly on demand of the city of Antwerp"* because if energy tariffs would be homogenised in Flanders, *"the city, and other cities probably, would want to keep their comparative advantage of lower tariffs*" (interviewee 1).

The regulator is therefore investigating which 'regionally objectifyable differences' could be identified that influence the network cost, and what criteria these differences should meet. A first study by an external consultancy firm analysed the legal context for such criteria and the use of regionally diversified tariffs in Norway and the Netherlands (Vanden Berghe *et al.* 2018). While the regulator aims to identify these criteria through a scientific study rather than engage in policy discussions, it also recognises that the percentages used to judge the 'significance' of a particular difference, have 'an arbitrary character' (cons-2018-03, p. 8). Possible 'differences' to be considered could range, as they did in the Dutch and Norwegian cases, from landscape characteristics (canal crossings, terrain slopes ...) to technical aspects (number of substations, underground cables), differences in governance (local charges, malpayments ...) or aspects of spatial morphology (distance to roads, building density, connection density, proportion of villages or cities ...) (Vanden Berghe *et al.* 2018).

This rather technical discussion is related to a broader understanding of the historically shifting role of public actors in the provision of basic energy services accross the territory, brought up by multiple interviewees. "*When those networks emerged, the private [sector] was only interested in the cities, and they left the 'sparse' areas for the public sector*" (Interviewee 17). But today, the societal cost of this extended provision of utility networks is questioned. "*Yes, energy is a basic need and therefore*

everyone has to have it, and then we [the public sector] have to put a huge amount of money into it. And then you have to ask whether that is the solution, or whether we have to bring people where the opportunities are. That has to do with densification, strengthening centres and such more" (Interviewee 6). That is why some actors are in favour of diversifying energy tariffs according to (building / population / connection) density. "*Moreover* [next to paying for capacity], *in far-away-land, you probably have a kilometer of cable just for you, so we'll have you pay for density as well*" (Interviewee 6).

On the other hand, some interviewees doubt the relation between density and network cost. "At first you would think: such lengths, you'll have to put more pipes... but one forgets that in the country you only have to 'pull a cable' in a ditch. In the city you have to break open the streets, the footpaths, [...], try putting a cable in Antwerp! [...] It has to do with the proportion between investments and maintenance, and the balance between both. [...] My prognosis is that there will be differences, but they will be limited: the disadvantage of being dispersed, is compensated by the complexity in urban areas" (Interviewee 1).

Interestingly, a study about regionally objectifyable differences for the Netherlands, was unconclusive about the potential factor of 'connection density' because there wasn't enough objective information to recognise this aspect as a regional difference (Vanden Berghe *et al.* 2018). A recent study quantifying the cost of urban sprawl in Flanders, confirms that the investment and maintenance cost per meter of energy infrastructure is higher in urban than in rural areas (85€/m vs. 30€/m for electricity distribution). However, because the length of infrastructure per building in very dispersed areas (86,2m/building) is much higher than in urban areas (9,2m/building), the total cost of energy infrastructure per building is around 3 times higher for dispersed areas (Vermeiren *et al.* 2019, p. 62).

A complex aspect of researching these regional differences, is identifying the appropriate scale to analyse factors such as density. In theory, both tariff differences between intermunicipal companies, and within the area of a distribution network operator are possible. "*As far as I'm concerned, you just look at the level of the DNO, what is the density [...]. For Antwerp it would be best if you would do that per municipality, or per street. But that's not workable, you shouldn't make it more complex than it already is*" (Interviewee 6). But investigating regional differences only at the level of the DNO would, in the case od spatial density, even out more significant differences at smaller scales. *"[...] We can't just say 'for Gaselwest it's like this, and for Imea it's like that. [...] If the one would be purely city, and the other purely villages, you could say there's a difference. But they are both a mix of cities and villages*" (Interviewee 18). While data gathering and calculation on a finer resolution might be more complex, it would better represent the actual morphology within a region. Therefore, a crucial question is whether data about infrastructure and maintenance costs are available at smaller resolutions, and what approach and spatial data will be used to conceptualise and analyse 'density'.

Another complication is the suggestion in Europe's Clean Energy Package (2017) that distance-related factors should be part of the connection cost rather than the distribution tariff: "*We agree that transmission and distribution tariffs shall not be distance-related since distance of a customer from the network is not a cost driver for the operation of the network. [...] therefore, it has to be clarified that only connection charges, in order to be cost-reflective and give locational signals, may well be distance-related*" (Vanden Berghe *et al.* 2018). Some interviewees indicated that such technocratic European guidelines limit the possibility to use tariffs as part of a broader (spatial) policy approach.

Europe assigns competency on tariff matters to the VREG, which indeed treats the regional tariff differentiation as a purely technical question. "*The government can give a few guidelines but can't say 'this has to be payed through the tariff, and that not'. Then the VREG says 'we determine the tariffs, the government can't decide anything about that*" (Interviewee 20).

Consequenctly, public and political debate about spatial tariff differentiation remains limited. To a stakeholder consultation organised by the VREG, only a limited number of actors responded: the Farmers' syndicate ('Boerenbond'), FEBEG (Federation of the Belgian electricity and gas companies), and a collective response by several DNO's. A wider stakeholder consultation could have contributed to a societal debate about the future of the energy system, and include perspectives from civil society or the Flemish Department of environment and spatial planning. However, as emphasised by FEBEG in response to the consultation, "*the introduction of regionally objectifyable criteria can't be used as a policy measure. Tariffs are only to cover the costs of the DNO, they are not a policy instrument*" (cons-2018-03, 2018, p. 14).

Other interviewees have the opposite view: "The regulator has an independent role, a bit too much for my taste. [...] Those objectifyable differences, 'objectifyable' is a word too much for me, you can objectify or de-objectify everything. [...] These are things [...] that should be determined much more by the Flemish government and parliament. Not the technicalities, that should be done by the VREG, but the political choices, for example should we use density and even how to use it [...]. That is a choice you make, but one where it might be easier later-on to hide behind the regulator. My opinion is: make a political choice and defend it" (Interviewee 6). Indeed, diversifying energy tariffs based on density is a very sensitive issue, especially since the dispersed urbanization of Flanders has long been supported by public policy, among which the ubiquitous and cheap connectivity to energy supply systems. It is therefore especially important not to treat energy tariff reforms as a technical matter, but to understand and publicly discuss their socio-spatial implications as an inherently political question.

Spatial selectivity: energy transition and the canibalisation of the gas network

Electricity and gas networks became historically structured around centrally produced energy, distributed ubiquitously accross the territory. But renewable energy production and in particular sustainable heating solutions (individual or collective systems) will be more localised, and therefore spatially selective. Indicative of this evolution is that the obligation for Flemish DNO's to increase the degree of connectivity to gas networks - up to 99% for urban areas and to 95% for 'rural areas', implemented after the oil crisis in the 70s - was lifted recently. It then becomes crucial to understand how decisions are made about what type of infrastructure will be provided where, what criteria are used and who makes such choices. In this section we illustrate how investment decisions by Fluvius are rather justified by arguments of rentability, than through explicit political or spatial planning objectives.

In recent years, Fluvius started developing district heating projects. While the company has a monopoly on electricity and gas, the emerging heating sector is not yet strongly regulated. Fluvius is only one of the district heating developers next to commercial firms and citizen cooperatives. Often such projects are initiated following a request by a municipality: "*We get a lot of questions around heating, it's a hot issue. Especially when elections are coming up. Then [...] every municipality wants its district heating project. And every request gets answered*" (Interviewee 2). Several interviewees

confirm that the economic feasibility, is the decisive factor for a district heating project. Fluvius looks at the availability of residual heat, the heat demand density, and the business case[1]. "*That whole cost (transport, pipes, construction, maintenance, measuring) needs to be earned back through the price people pay, that is a purely economic story.*" From that perspective, this interviewee sees only a limited role for government: "*Who decides this? Al those who put money on the table, that take economic risks to build the pipes, supply the heat, or use the heat. [...] What should the government do? We have to make sure the pipe gets in the ground, that the permits are there...*" (Interviewee 6).

According to these criteria, district heating is only feasible for Fluvius in areas where the linear heat demand density is high[2]. "*[drawing a map of Belgium] Here you have Antwerp, Ghent, Brussels, maybe Liege and some other cities that have some waste incineration will have district heating. All the rest will be a mix of everything: all-electric solutions, gas, maybe some geothermal*" (Interviewee 2). The feasibility also depends on local context: "*District heating is interesting in areas with a lot of public buildings: swimming pools, hospitals, elderly homes,... [...] But new allotments, unless we're talking about low temperatures, classical district heating? No!*" (Interviewee 2). Another respondent explained: "*As a society, we have made a choice for natural gas in the past. Today, district heating is technically and economically not justifyable anymore*" (Interviewee 17). This difficulty to 'make the business case work' was confirmed by Fluvius: "*It is an interesting story, but not an easy one. Untill now it [district heating] is making a loss*" (Interviewee 2). At the same time, investing in these projects is also seen as part of Fluvius' societal role, investing in infrastructure that is not (yet) commercially profitable (Interviewee 2). Another respondent explained: "*Intermunicipal companies have much longer depreciation periods than commercial firms. If you would do this commercially, you'ld want to earn back the investment in 7 years, for us that's after 20 or 30 years. So in that sense there is a great advantage in doing this as an intermunicipal company"* (Interviewee 6).

In practice however, several district heating projects developed by Fluvius, are located in greenfields, sometimes in strategic central locations, but also in peripheral areas with lower densities. Crucially, all the realised projects are located in sites where no natural gas network existed. As one interviewee remarked "*At a certain moment, these intermunicipal companies, Fluvius, that are now developing district heating, are canibalising their other assets, the gas network*" (Interviewee 5). Asked about this internal conflict of interest, one Fluvius employee responded: "*We should nuance this impact on the natural gas network. We see very little projects where we switch from natural gas to district heating from one day to the next. [...] In the total investment needed to realise the energy transition, the residual value of the natural gas network is a marginal fact*" (Interviewee 4). When calculating the feasibility of district heating projects, the company does not (yet) include the cost of 'stranded' gas assets (Interviewee 2). Simultaneously, Fluvius emphasizes that the gas network does not have to be a stranded asset. "*The gas distribution network doesn't hold back a sustainable future. It is often associated with a fossil story, but you can also transport green gas, hydrogen gas, carbon dioxide... such a network can still have value in a sustainable future*" (Interviewee 4).

[1] using the principle that the 'total cost of energy' for heat has to be lower than for the alternative, today considered as a gas boiler used for 15 years..

[2] This interviewee mentions a minimum of 4 or even 5 MWh/m, while other analyses often use an indicative 'rule of thumb' estimating that district heating is feasible above 3 MWh/m (Nussbaumer & Thalmann, 2014)

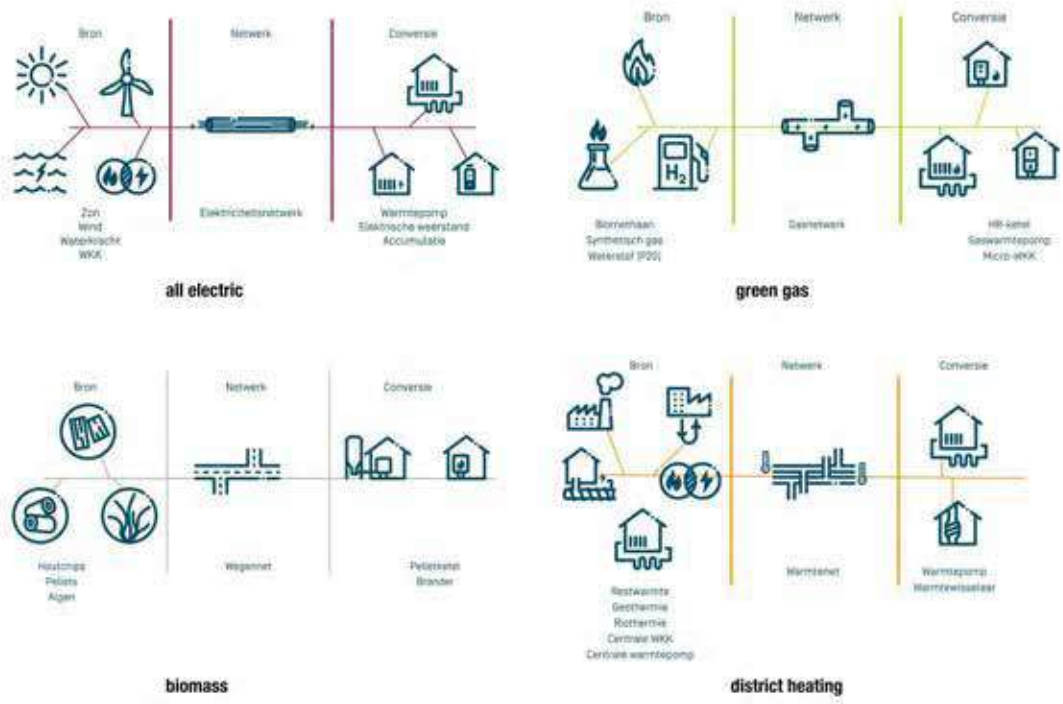

Figure 3. Climate neutral energy concepts. Framework for the approach to energy transition. Source: Fluvius, December 2018

From that perspective, it is interesting that Fluvius has developed four 'sustainable heating concepts' (Figure 3), and sees a role for itself in all electric, green gas and district heating solutions. The status of these concepts remains unclear. Several interviewees hinted at the need for spatial heat planning, but so far Fluvius is not developing plans about which technology would be appropriate where, and suggests this is a question for municipalities and/or the Flemish government. Some consider this a rather technical exercise: "*I think we need the same approach for heating [as we have for sewerage*[3]*]. The Flemish energy agency or regulator should make comprehensive zoning plans, based on the heat demand map and residual heat offer*" (Interviewee 5). Others recognise the heat planning efforts of several larger cities, and would like Fluvius to be more involved in those exercises, such as the SEVIA project by the city of Antwerp to develop a 'Strategic Energy Vision' (Interviewee 2). On the other hand, the company is often not represented at heat planning workshops organised by local governments. Moreover, it could support such heat planning initiatives by making data about current energy use, but also about the gas network (planned investments, financial value, remaining lifespan) available more easily and at higher resolution.

The question of spatial selectivity also appears in the location of renewable energy production. They integration of intermittent energy sources like solar and wind, challenges Fluvius to reconfigure the distribution network from a one-directional to a multi-directional and smart system that can flexibly balance production and demand. However, rather than trying to steer siting choices for renewable production, Fluvius rather responds to concrete requests for connection. "*When the government imposes certain obligations, the networks have to follow. It would be ideal if a calculation would be*

[3] Since 2006, every Flemish municipality was obliged to develop a zoning plan indicating where public, collective or individual water cleaning infrastructure would be developed.

made beforehand to understand what it will cost and keep that under control. But in a dense country like Belgium this should not mean a big added cost, wherever those installations will come" (Interviewee 18). Eandis and Infrax commissioned such a study about 'reception capacity' ('onthaalcapaciteit') together with transmission network operator Elia in 2012 (VITO, Infrax, Eandis, Elia, 2012). But in practice, the location of wind turbines for example, is determined by many other factors beyond the optimal network configuration. Overall, Fluvius appears to prefer anticipating trends in the energy sector and responding to requests from municipalities, rather than planning or directing the energy transition. "*We can answer questions that exist, but we shouldn't try to answer questions we don't know will come. [...] It has to be planable*" (Interviewee 2). Another Fluvius employee explained: "*It is true that we determine what infrastructure comes where, and that the availability of infrastructure has farreaching consequences for the decisions people will take in the future. We have to make sure that we don't block better alternatives, but it is very hard for us to know, in 50 year, what will be best?*" (Interviewee 3). This interviewee positions Fluvius as a neutral partner for municipalities: "*We are very neutral, literally, we are an independent, objective partner to think along with municipalities about what is possible, what is sensible and what is not. We're not there to sell heat pumps or gas boilers. Is it a natural gas net or an electricity net or a district heating system, we'll build it. For us, it doesn't matter what goes in the ground, as long as it is durable. Why? In 20 years we'll still exist, and if it isn't a durable solution we'll have to deal with the costs*" (Interviewee 3).

On the one hand it is problematic that Fluvius often justifies investment choices based on arguments of rentability and 'business cases' without recognising their spatial consequences and inherently political character. No spatial decision or choice for a specific infrastructure is really 'neutral' in a context where energy networks are an essential part of a territorial organization and energy system in need of fundamental transformation. However, such structural decisions transcend Fluvius' role as operating company, and point to the need for a clear mandate, either from its Board of Directors or from the Flemish government. This mandate should be based on a societal discussion, that sets out the strategic lines for the appropriate energy distribution system of the future.

Scale: socio-spatial redistribution and the cost of transition

A third dimension of how the distribution system is spatially managed, relates to the scale and composition of the intermunicipal companies who own the network and represent the municipalities. This configuration influences how costs are redistributed spatially and socially through the different components of the energy tariff. The companies' ongoing (re-)composition creates or forecloses possible operational synergies, strategic planning advantages, and coherence in governance arrangements.

Historically, governance of the energy network has evolved towards increasing homogenisation and upscaling. Electricity systems have diverse origins, being set up by entrepreneurs or cooperatives, initiated as public firms by municipalities or expanded through provincial policy Bruggeman, 2019). "*It started with electricity after WWI. In the village you had a brewery, they installed a generator but they had some surplus electricity and started a line to the church and the town hall... and that is how public lighting started. [...] These 'gemeentelijke regies' started to grow, and neighbouring municipalities ofted said: 'let's do this together'. Then you had the 'intercomune': intermunicipal company. Some did it themselves, but others gave a concession to a local electrician. That is how the*

'pure' and 'mixed' intermunicipal companies emerged" (Interviewee 2). Over time these local companies gradually merged: "*Since 1954-55 the electricity sector was centralised more and more. [...] At a certain moment, the 'mixed' intermunicipal companies owned 80% of the distribution networks, and the municipalities had 20%. Those that survived where the ones that organised more efficiently*" (Interviewee 17). Since 2003, Eandis and Infrax acted as the operating companies for respectively the 'mixed' and 'pure' intermunicipal companies. Following the European directive to 'unbundle' electricity distribution and production, private shareholder Electrabel was bought out of Eandis and the mixed intermunicipal companies, leaving them 100% in the hands of local municipalities. Eandis and Infrax ultimately merged into Fluvius in 2018.

This process of centralisation also lead to a homogenisation of governance arrangements. Several historical constellations, that spark interest in current discussions on remunicipalisation or citizen participation in urban utility governance, have disappeared. Considering several Flemish cities are discussing the possibility to start a public energy company, in the spirit of the German Stadtwerke, it is relevant to know that the city of Ghent, for example, used to have an urban utility company: "*At that time you had the EGW in Ghent: 'Elektriciteit, Gas, Water': and urban company like you have in Germany, and the only one of that scale and that integrated in Flanders. But it was sold after the elections in 1983*" (Interviewee 17). In light of demands from civil society about citizen participation in the energy sector, and with the increase in citizen energy cooperatives (Interviewees 10, 11, 12, 13), it is interesting to see that customer participation has also existed in the distribution sector: "*We used to have something fantastic here at IVEG. We had a 'consumer association' where people could buy a certain amount of shares and then got a reduction on the energy tariff. [...] Overall, you had a return of 11%, it was succesful! This association [...] had a voice in the Board of Directors. We wanted to continue this but because of the decree on intermunicipal collaboration of 2001 we had to abolish the association as private capital was no longer allowed in the intermunicipal company*" (Interviewee 1).

Several interviewees mentioned advantages of this increasing centralisation. "Many small municipalities can achieve standarisation this way. By working together they can get better conditions. [...] For example Sibelgas, the smallest DNO, is composed of only six municipalities so the solidarity is limited, the weight of one becomes much heavier" (Interviewee 4). Fluvius' scale was also seen as an advantage for knowledge and equipment for another respondent. Although he was critical about the level of innovation within Fluvius, he still preferred this arrangement: "So I think you better struggle for your intermunicipal company to become more effective and future-oriented, than to start doing everything on your own" (Interviewee 7). Others regret that the increasing scale of the network operator changed its relation to municipalities: "The position of municipalities diminishes: the distance, it becomes technically complex, it exceeds the level of the average local representative..." (Interviewee 1).

The historical evolution of the intermunicipal companies and the former competition between Eandis and Infrax for municipal concessions, has sometimes resulted in geographically incoherent associations (Figure 4). Moreover, a recent change in the Energy Decree stipulates that municipalities have to contract the same operator for electricity and gas. The process of integration and rationalisation is therefore ongoing. It simultaneously follows two directions: on the one hand forming more geographically coherent and sometimes larger-scale entities, and on the other integrating different types of utilities in one operating company. Such mergers between intermunicipal companies

were realised in the Antwerp region and the Limburg province in April 2019, and considered in Flemish Brabant as well.

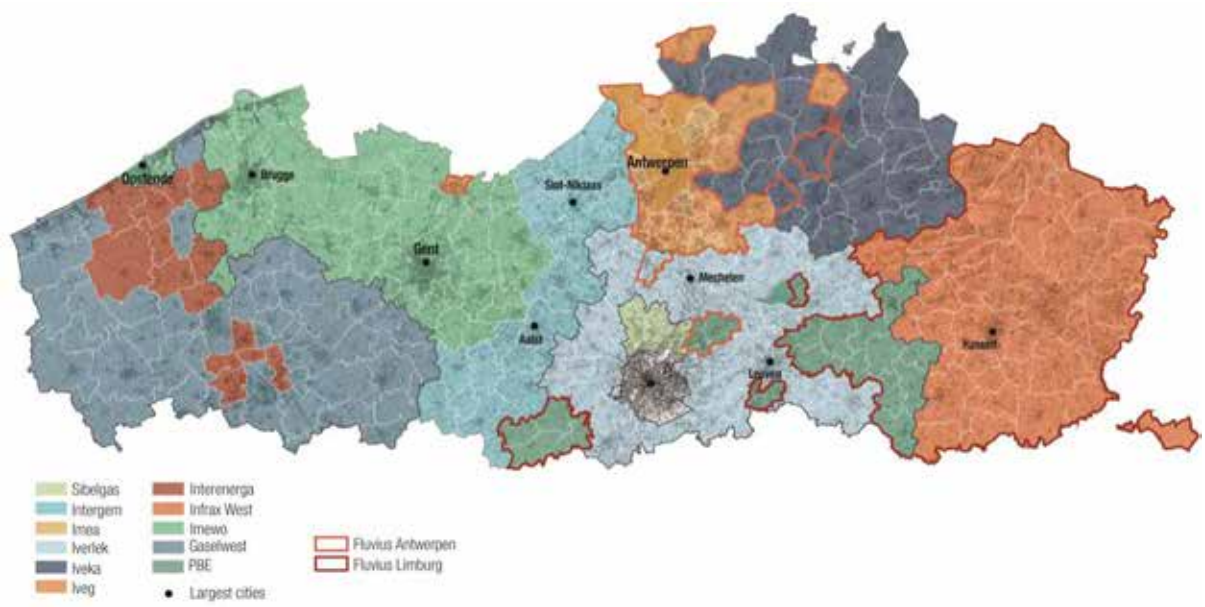

Figure 4. Recent mergers of intermunicipal network operators.
- Antwerp region: Iveg (formerly public, electricity + gas + sewerage) + Imea (formerly public-private, electricity + gas) + Integan (cable) > Fluvius Antwerp (April 2019)
- Limburg: Inter-Energa (electricity+gas) + Inter-Aqua (sewerage) + Inter-Media (cable) > Fluvius Limburg (April 2019)
Source: elaborated by author based on Interviewee 1 and Fluvius.be, May 2019

Because the public companies under Infrax often managed not only electricity and gas networks, but also sewerage and cable infrastructure, Fluvius became a multi-utility company. It publicly claims the ambition to develop further in that direction, and started to realise that aspiration with the mergers in Antwerp and Limburg. "*I would like Antwerp to be the first to bring water, gas, heating, electricity, cable, sewerage, all together and say: all my underground assets are in one hand, and one hand will operate and try to manage it better*" (Interviewee 6). One of the advantages of integrating different utility systems in one operator is that synergies, and therefore cost optimisation, between different infrastructure works would become easier. Avoiding nuisance from road works was mentioned as an important concern for municipal representatives.

Other interviewees were more critical about Fluvius' increasing scale and monopoly in energy distribution. "*It risks to become a state within the state. From a democratic perspective that is really a point of attention*" (Interviewee 1). This concern also resonates with other interviewees, who asked for more transparency, and better stakeholder participation to complement the stepped political representation of municipalities. On a strategic level, more spatially coherent and integrated regional utility operators would provide a stronger governance base to plan and implement regional spatial strategies for energy and other utilities. An interesting reference are the 'transport regions' that were recently introduced in Flanders.

Costs of energy infrastructure and 'public service obligations' are redistributed on different spatial scales through different components of the electricity tariff (Figure 5). Fluvius is charged with social obligations (eg. supplying energy to customers dropped by their commercial supplier) and ecological

obligations (eg. awarding subsidies for rational energy use investments, buying 'Green Energy Certificates' for connected PV installations). These different costs are recuperated through the distribution tariff at the intermunicipal scale, and through Flemish and federal charges on the tariff. These mechanisms organise a social and spatial redistribution that has historically allowed energy to be available as a basic service for almost everyone.

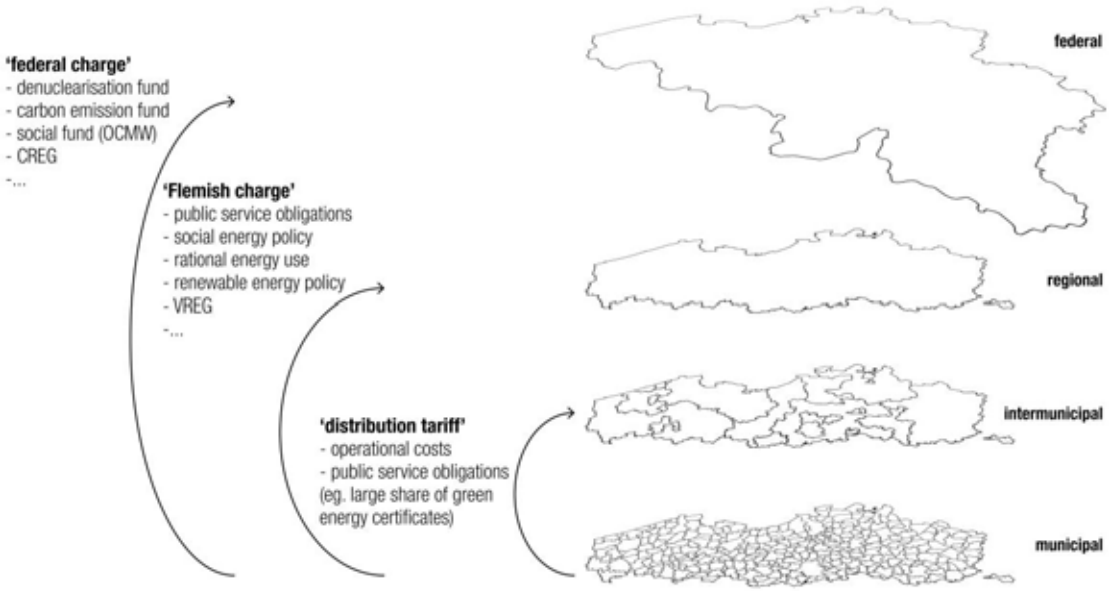

Figure 5. Socio-spatial redistribution of cost for public service obligations on the intermunicipal, Flemish and federal scale. Source: author based on vreg.be, 2019.

However, this system is criticised for multiple reasons. On a structural level, several civil society actors argue for a shift of charges from electricity to fossil fuels. They also criticise the fact that these charges apply only for customers of the low-voltage grid while energy-intensive industries are directly connected to the transmission grid and pay no fair share in the societal cost of the energy transition. These redistribution mechanisms were also a main element in critiques from civil society about the planned introduction of a capacity tariff: "*This includes all kinds of redistribution aspects. Concerning the low-voltage customers, we're roughly speaking about the redistribution between poor families and families with very low consumption, and rich middle-class families and small SME's, a butcher and a bakery. The more the capacity tariff works as a fixed cost, the better for the high-consuming low-voltage customers, and the worse for the low-consuming customers. But that has an economic and a social impact!*" (Interviewee 15). However, the regulator's competency on tariffs, independent from politics, and its technocratic focus on 'cost reflectivity' seem to limit the possibility and impact of a more fundamental political debate on the topic. Interestingly, the Flemish water sector shows that it is possible to translate policy objectives into the tariff structure, in this case by distinguishing between a 'basic consumption' tariff below a particular threshold and a much higher tariff for 'luxury consumption'.

Because the cost of buying up Green Energy Certificates is higher regions where more PV installations were installed, than in others, a solidarisation between different DNO's was arranged. "*Eandis had 80% of the energy network and Infrax 20%, but Infrax had 30% of the solar panels, and Eandis 70%. Infrax was historically always a pioneer in supporting rational energy use. But it could also be because Infrax had more rural areas and there are more roofs to put solar panels*"

(Interviewee 1). This imbalance is also criticised as an unwanted socio-spatial redistribution: "*Antwerp inhabitants are paying for the solar panels of people in Limburg who have more financial means and live in a detached villa where you need a very long cable to connect, while Antwerp people live in an apartment or rowhouse and the number of connections per cable is much higher. Urban inhabitants are paying for the solar panels on the countryside, and those urbanites are in general less well-off*" (Interviewee 6).

These discussions indicate how governance arrangements for the energy distribution system are part of bigger societal questions about socio-spatial redistribution. They are particularly relevant in understanding and negotiating how the societal cost of the energy transition is distributed, an aspect that will become even more pertinent as more alternative heating solutions are implemented. Sustainable heating systems can be individual or micro-collective installations or larger-scale district heating systems, each with different costs and tariffs. A crucial societal question is therefore how to ensure equality in access to sustainable heating solutions, and a just social redistribution between a diversity of technical and governance arrangements.

Conclusion

While Fluvius' work is often framed as 'functional' or 'neutral', and justified through technocratic and economic arguments, the research reveals that investment decisions, tariff structure and regulation, and network governance have fundamentally spatial and political dimensions. We showed how the concepts of density, spatial selectivity and scale allow to expose and analyse these dimensions in seemingly technical discussion.

A first aspect regards the relation between energy tariffs and density. The dominantly technical approach of the Flemish regulator to tariff reform and the inclusion of 'objectifyable regional differences', fails to recognise the social and political dimension of spatially diversified energy tariffs. This discussion should be part of a broader societal debate to rethink the mechanisms that support or reproduce dispersed spatial patterns. To grasp the social, economic and political complexity of this question, the insights of civil society, Flemish energy and spatial planning departments, municipalities and other stakeholders need to be brought together. This dialogue should inform a political debate and decision about the energy tariff structure, that forms the basis for a technical elaboration by the regulator.

Second, the energy transition signifies an evolution from a territorially rather homogeneous energy system towards spatially selective and more context-specific energy solutions. Despite Fluvius' interests in the existing gas network, and while holding the key to the successful integration of decentral electricity production through operating the distribution network, the company positions itself as a 'neutral' partner of municipalities. Fluvius doubts the 'planability' of the energy transition and prefers to 'keep all options open'. At the same time it recognises that without clear policy choices the European climate targets won't be reached: "*Natural gas consumption is declining, despite the fact that there are more connections every year. [...] When we look at 2050, we see a reduction by 50%. That sounds a lot, but if we compare that to the plans of europe, the ambitions to be climate neutral in 2050, we see a discrepancy between current policy and the ambition, because that would*

mean that carboniferous gas consumption in 2050 should be quasi zero" (Interviewee 3). Most interviewees agreed that strategic decisions about a future energy system should not be made by Fluvius alone but should result from a societal and political discussion. Moreover, the company should support this debate with its expertise and data, pro-actively organise dialogue with stakeholders and engage with energy planning efforts at Flemish and (inter-)municipal level. Co-creating a vision about the future of electricity, gas and heat distribution would allow Fluvius to plan its future investments more effectively and orient its societal role explicitly towards a climate-neutral energy system by 2050.

Third, the discussion about the increasing scale and continuous recomposition of the intermunicipal companies, reveals how governance arrangements for urban infrastructure matter in optimising energy systems. More spatially coherent and integrated multi-utility regional governance structures could provide a stronger basis for operational synergies and strategic future development. These governance arrangements include the redistribution of Fluvius' 'public service obligations' on different scales through different components of the energy tariff. This illustrates how socio-spatial redistribution mechanisms are inherent to the organization of the distribution system in Flanders. The network operator and regulator therefore have a key role to ensure a fair distribution of the societal cost of the energy transition. But also federal and Flemish politics and the Flemish Energy Agency have the responsibility to create a policy framework for a just transition. Civil society has demanded a more transparent and democratic network governance, and more attention for the impact of tariff changes and energy efficiency policy on vulnerable households. More openness from policy-makers and from Fluvius towards these demands is crucial. Particularly in the emerging transition towards sustainable heating alternatives, where solutions are particularly context-specific and technically diverse, a thoughtful approach to redistribution, compensation and support mechanisms will be essential.

By making these socio-spatial dimensions explicit, this research aims to contribute to a broader societal debate that rethinks the role of the distribution network towards a spatially and socially sustainable energy transition. On the one hand this would require Fluvius to further develop a more open attitude towards civil society and policy-makers at Flemish and municipal level. On the other hand, it is a reason for spatial energy planning initiatives at local, regional and Flemish level to consider Fluvius as an essential partner in the energy transition and insist on a more open collaboration.

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