

# CITIES AS ACTORS FOR A GRID- CONSCIOUS ENERGY TRANSITION

Robbert Claeys, MSc, PhD

# WHEN THE GRID BECOMES A CONSTRAINT

We interviewed 48 DSOs, active in 25 countries, serving 193 million consumers (64% of EU-27)

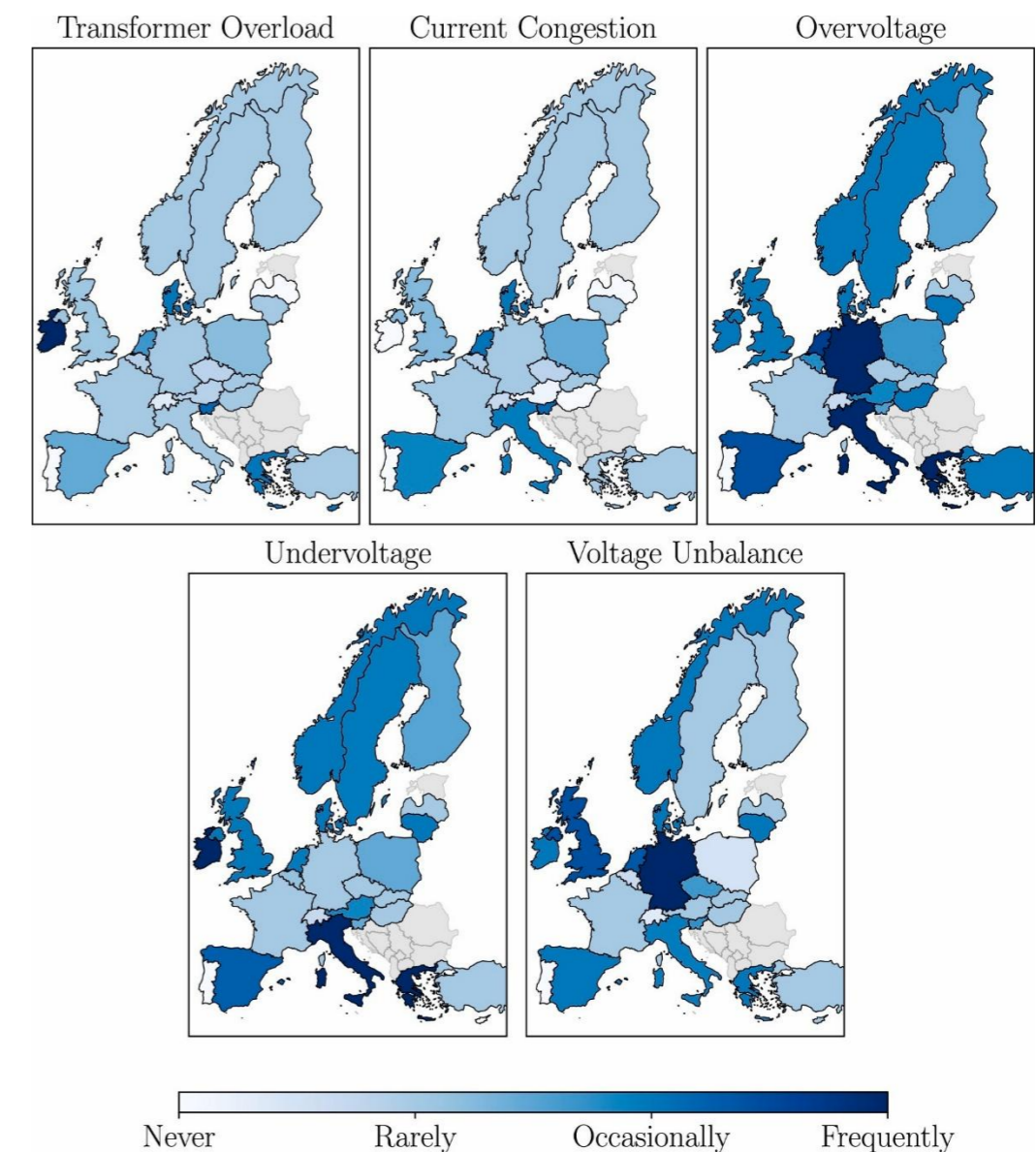
DSOs shared operational challenges they are facing today

Operational stress is widespread and strongly shaped by local choices

**Which role can cities play?**

Distribution networks in transition: A European survey on challenges and opportunities

Rémy Cleenwerck <sup>a, b</sup> ✉, Robbert Claeys <sup>a</sup>, Thierry Coosemans <sup>b</sup>, Jan Desmet <sup>a</sup>



# 1. CITY AS SPATIAL PLANNER

Location choices define grid needs for 40+ years

Every spatial decision = implicit energy policy

Use data to guide heating sources and locate car parks/charging hubs in grid-robust zones

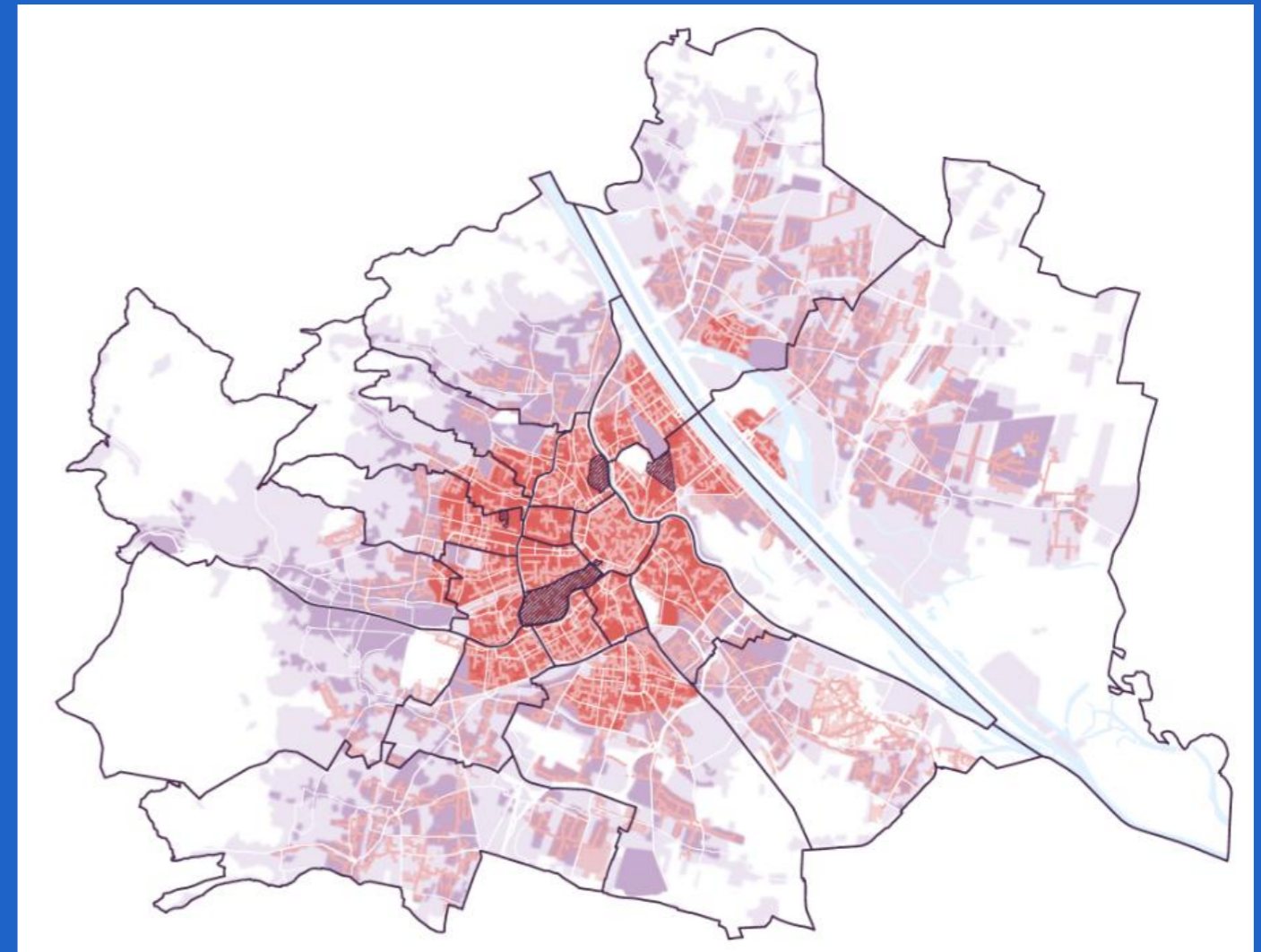
## Vienna (Austria)

Developed energy zoning plans for 23 districts

Zone: defines which heating energy carrier is allowed

Fossil heating banned for new buildings in several zones

Spatial planning used to steer long-term heating choices



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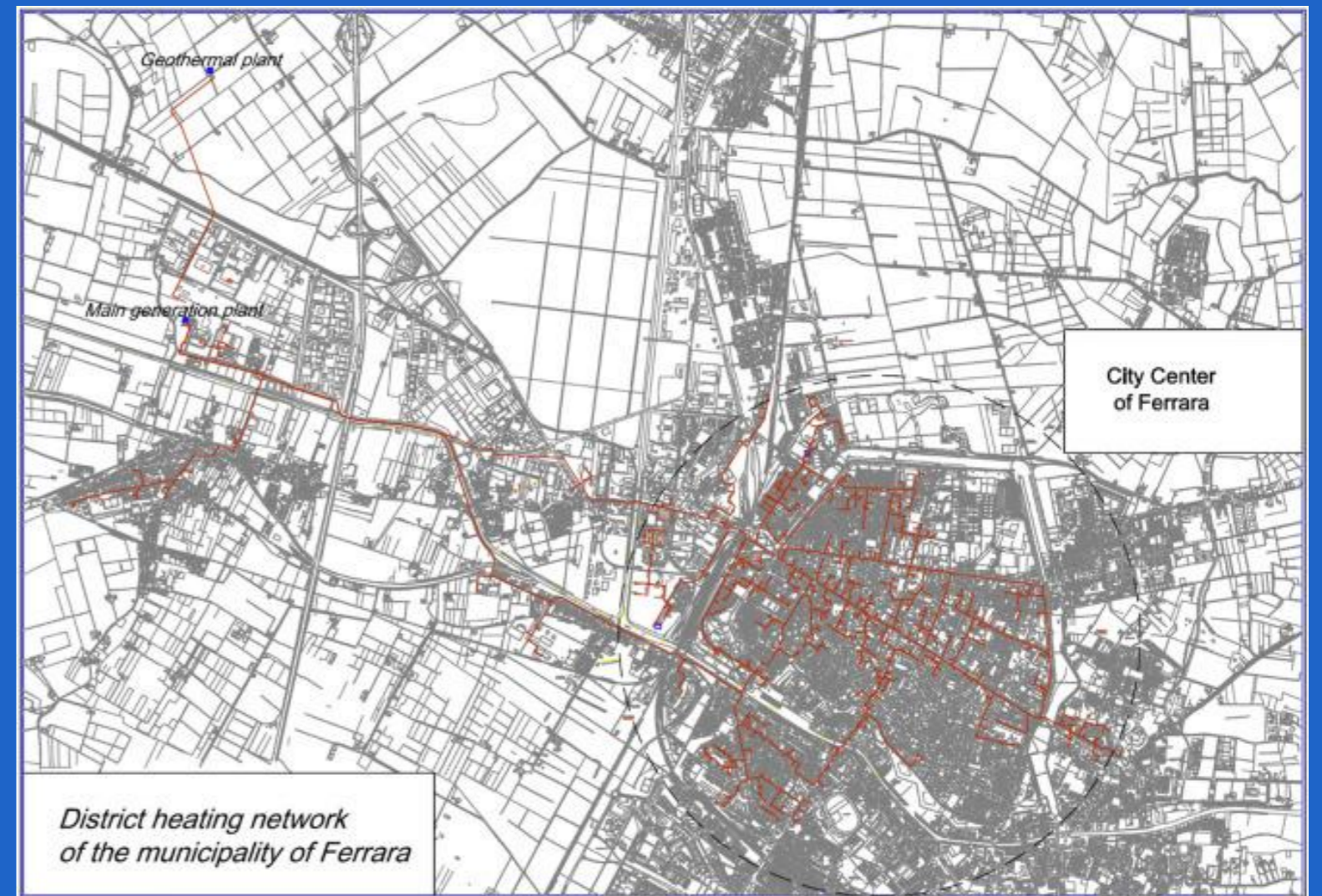
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## Ferrera (Italy)

Conducted geothermal mapping of city area  
Identified promising reservoirs

Prioritise development in regions suitable for district heating



## 2. CITY AS PERMITTING AUTHORITY

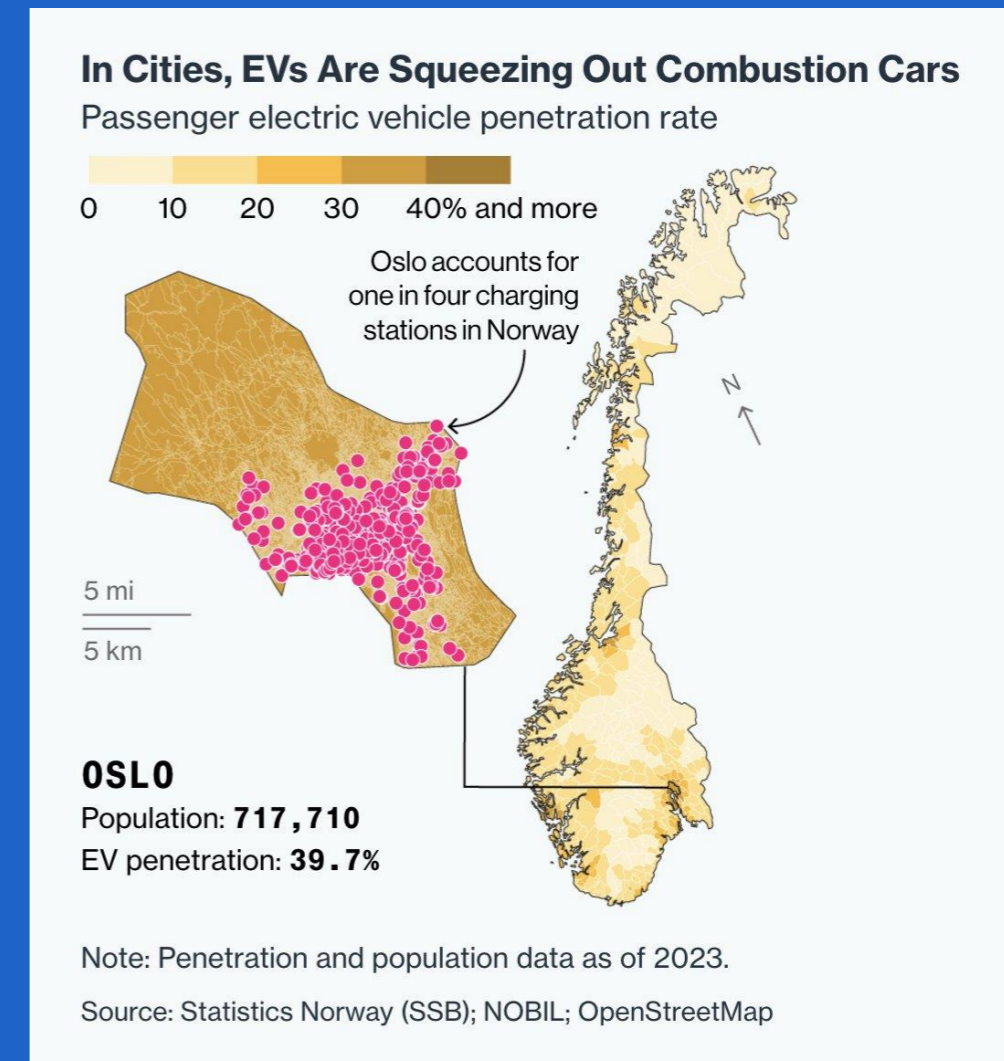
Every building permit shapes the local grid load

Cities can set norms on capacity, heating, cooling, EV charging depending on local bottlenecks and expected developments

### Oslo (Norway)

Since 2017: New buildings must equip at least 50% of parking spaces for EV charging

Mandatory electrical connection sized to simultaneously supply all chargers at 3.6 kW



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### Zürich (Switzerland)

Electric resistance heating was prohibited in 2021  
Mandatory phase-out by 2030 for remaining installations  
Upheld in court in 2023

Ruling

**Ban remains in place: Electric heating systems will no longer be permitted in the Canton of Zurich from 2030**

April 27, 2023, 12:53 PM

As of 2030, electric heating systems and electric boilers will be definitively banned in the Canton of Zurich. The Federal Supreme Court has rejected an appeal against the regulation, which had been approved by voters

# 3. CITY AS COLLECTIVE ENABLER

Enables energy solutions  
that individuals cannot  
build alone

Provides coordination,  
legitimacy, and scale

## Bordeaux (France)

Collective self-consumption with municipal roofs  
City makes public roofs available for large PV installations  
Surplus solar shared with local businesses and residents  
Participants shift consumption to sunny hours



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## Cologne (Germany)

City-owned RheinEnergie builds 150 MW aquathermy system

Municipal utility enables coordinated, grid-friendly heat supply

Helps stabilize the local grid

Freed-up grid capacity can be used by local businesses

## Cologne to Get Germany's Largest Heat Pump

German power company Rheinenergie has announced plans to construct a heat pump with a capacity of 150 megawatt – making it the largest facility in Germany and Europe.

Jun 21, 2023

The new facility will use heat energy from the Rhine River to produce "green" heat that will feed into the district heating network of the western German city of Cologne. The heat generated will be enough to service some 30,000 homes and represents an increase of the capacity of Rheinenergie's district heating network of 15 percent.

# 4. CITY AS FLEXIBILITY FACILITATOR

Turning load, storage,  
and generation on/off at  
the right moment = major  
avoided grid costs

Cities can act as  
matchmakers: data, trust,  
local knowledge

## Maia (Portugal)

City opens energy data to a European dataspace

Data converted into automatic flexibility signals

City acts as neutral coordinator between grid operator & tech partners

### Flexibility use case in the municipality of Maia

18 September 2023

Tags: DATA ENERGY FLEXIBILITY PROSUMER SERVICES USE CASE

OMEGA-X set up four use case families that will showcase the value of having a common energy data space for a particular problem identified by energy stakeholders: renewables, local energy communities, electromobility and flexibility. The flexibility use case will be demonstrated in the Portuguese municipality of Maia, whose infrastructures will be used as sources of flexibility for the electric grid and its data used to deliver advanced data-driven flexibility services.

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## Wolfhagen (Germany)

City bought back its grid in 2006 and now controls tariffs

Local variable tariffs which align with production

>280 German municipalities have now bought back their grid

### Our City, Our Grid: The energy remunicipalisation trend in Germany

By Sören Becker

#### Reversing privatisation, establishing local ownership

Does it make a difference who owns and controls energy infrastructure? In many German municipalities, the answer to that question has been a clear “Yes,” resulting in a trend that has been referred to as “a wave of remunicipalisations” across the energy sector. Among the different remunicipalisation trends covered in this book, the greatest number of cases comes from the German energy sector. The country accounts for 347 cases since the year 2005, with the energy sector clearly making up the biggest part with 284 remunicipalisations overall. Not only does the sheer

# 5. CITY AS LAUNCHING CUSTOMER

Cities can use their own purchasing power to push the market toward grid-friendly innovation

Demonstrates demand for emerging technology (V2G, smart controls)

Requires knowing what is technically feasible but not yet widely offered

## Stockholm (Sweden)

Leverage power of public procurement to shape markets as part of their Climate Action Plan

For transport, construction, goods and consumption

The machines on Hallvägen in the Slakthus area are now powered entirely by electricity and fossil-free alternatives, and one of the world's first heavy-duty electric excavators is being used here. This is the result of the City Development Department having used a competition-based dialogue in the procurement process. This contributed to extended requirements and better results in work towards the goal of creating a fossil-free construction site.

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## Lappeenranta (Finland)

Public buildings join a virtual power plant

City explicitly procures flexibility as a service, not just energy

**Lappeenranta to become one of the first cities in the world to operate a virtual power plant – Siemens enables properties to join the electricity balancing market**

**Siemens Oy is supplying a virtual power plant service for properties to the City of Lappeenranta. Lappeenranta is one of the first cities in the world to utilise the potential of flexible consumption on this scale. The service will initially be offered at nine properties. In addition, the agreement includes 50 properties as an option.**

The virtual power plant service will reduce the city's environmental impact and increase revenues, says Development Manager **Markku Mäki-Hokkonen** from the City of Lappeenranta.

– From the city's point of view, it is a good development that, in addition to facility rental, revenues can also be generated by offering flexible capacity in the electricity market. This allows a whole new kind of benefit to be gained from energy efficiency investments.

①

## **Spatial planner**

**Plan where demand arises**

**Shape long-term grid load**

②

## **Permitting authority**

**Set conditions in permits**

**Avoid future grid stress**

③

## **Collective enabler**

**Allow for shared solutions**

**Reduce grid stress together**

④

## **Flexibility facilitator**

**Coordinate when things run**

**Unlock low-cost flexibility**

⑤

## **Launching customer**

**Demand innovation first**

**Lead through procurement**

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