Oslo

Energy planning tool

A platform for dialogue and data sharing in city development

April 2025 I The City of Oslo Climate Agency

Document information

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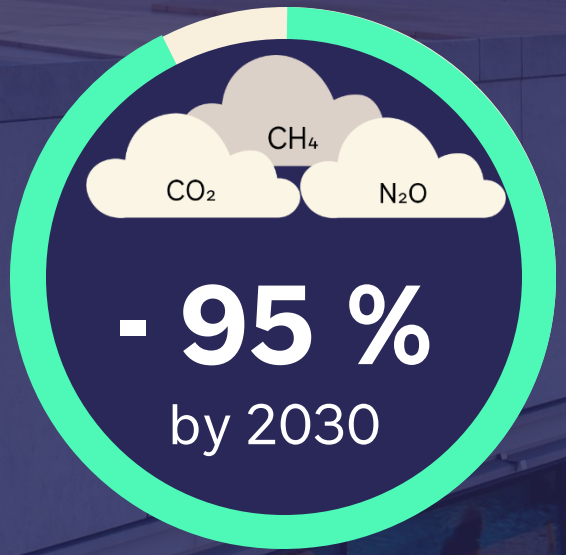
Part 1: Introduction

Oslo’s climate goal



Reduce direct emission

Oslo’s ambitious climate target of 95 % reduction of direct GHG-emissions by 2030 creates a demand of more electrical power

Bli klimarobust

Bevare skog og areal

Redusere energiforbruket

Redusere indirekte utslipp

Why an energy planning tool

- To reach Oslo’s 2030 target of 95% emission cuts, we must electrify transport, construction and port activity — without overloading the power grid.
- This requires better coordination between urban development and energy infrastructure.

The Energy Planning Tool is pivotal for the city's climate goals
Oslo plans to build over 3,000 homes annually and nearly 330,000 square meters of commercial buildings over the next ten years. To ensure that the city uses energy more efficiently, the municipality has developed a new energy planning tool. The tool is designed to help reduce energy consumption and the need for additional power grid capacity, partly by utilizing excess heat that would otherwise be wasted.

Winter is the Major Challenge
Oslo experiences particularly high electricity consumption during the winter due to electric heating of apartments, houses, and commercial buildings. If we succeed in reducing electricity use during the winter season, we can accommodate more electricity demand on the power grid without the need for additional grid development.

Around 90 percent of the time, there is available capacity in the power grid. This makes it crucial to map potential heat sources, opportunities for local energy production, and the areas in Oslo that are connected to district heating. More efficient use of excess heat through integration into the low-temperature district heating network is a particularly important measure for improving energy utilization.

Energy Planning for the Future
The new energy map makes it possible to explore how urban development, climate measures, and energy use are interconnected. The goal is to identify solutions for using energy more efficiently and highlight areas of the city where heating and cooling can be done in a smarter way than today. The insights provided by this tool will play an important role in the planning of new buildings and areas in Oslo.

Road traffic, construction machinery, port activity and ships are some of the sectors that need to be electrified by 2030.

If this new electrical power demand is not coordinated or optimized, additional grid capacity investments will be needed, which could delay the achievement of the city's climate goals.

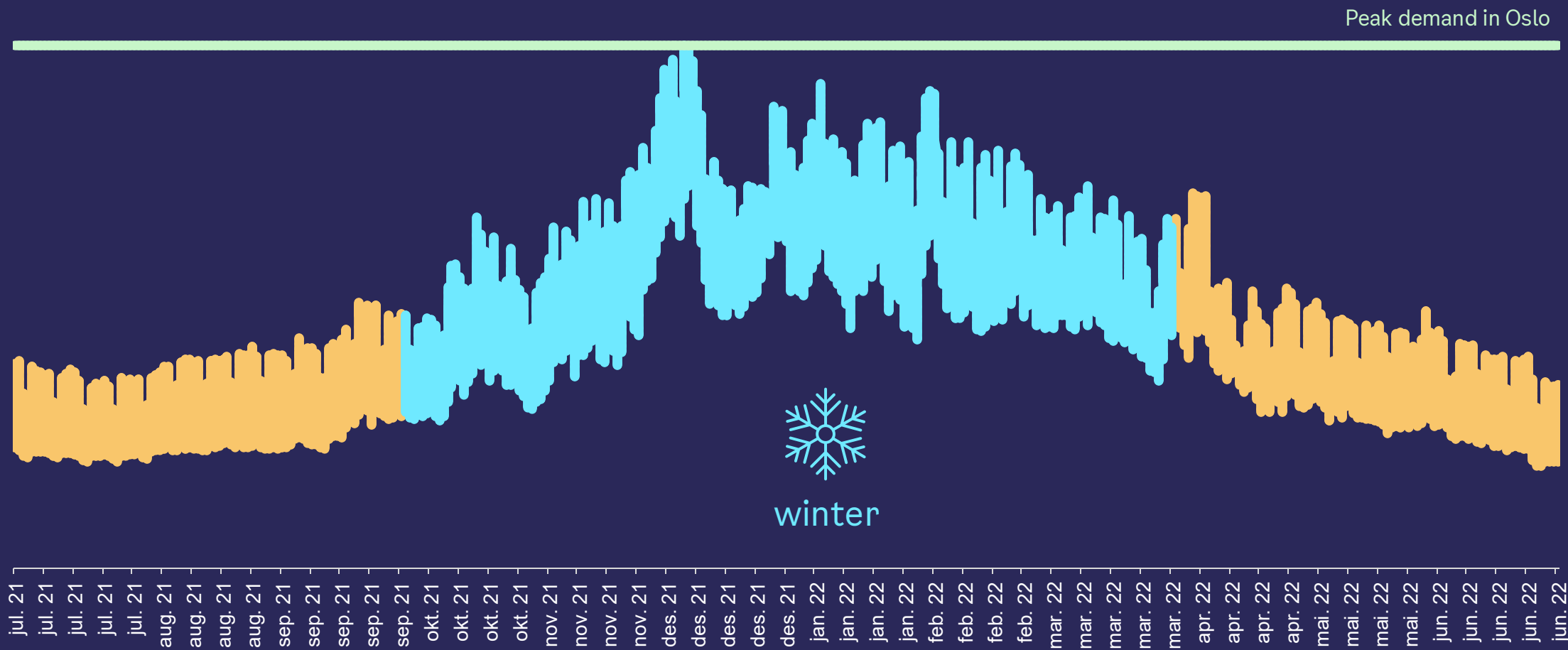
Oslo’s energy system – Key facts

- Oslo uses clean renewable based electricity, mainly hydro- and windpower produced in Norway. Renewable based electricity. Carbon footprint estimated to 15 gCO2 per kWh (2024)

- As electricity is to a large extent used for heating in buildings, the peak electricity demand happens on the coldest day during winter.

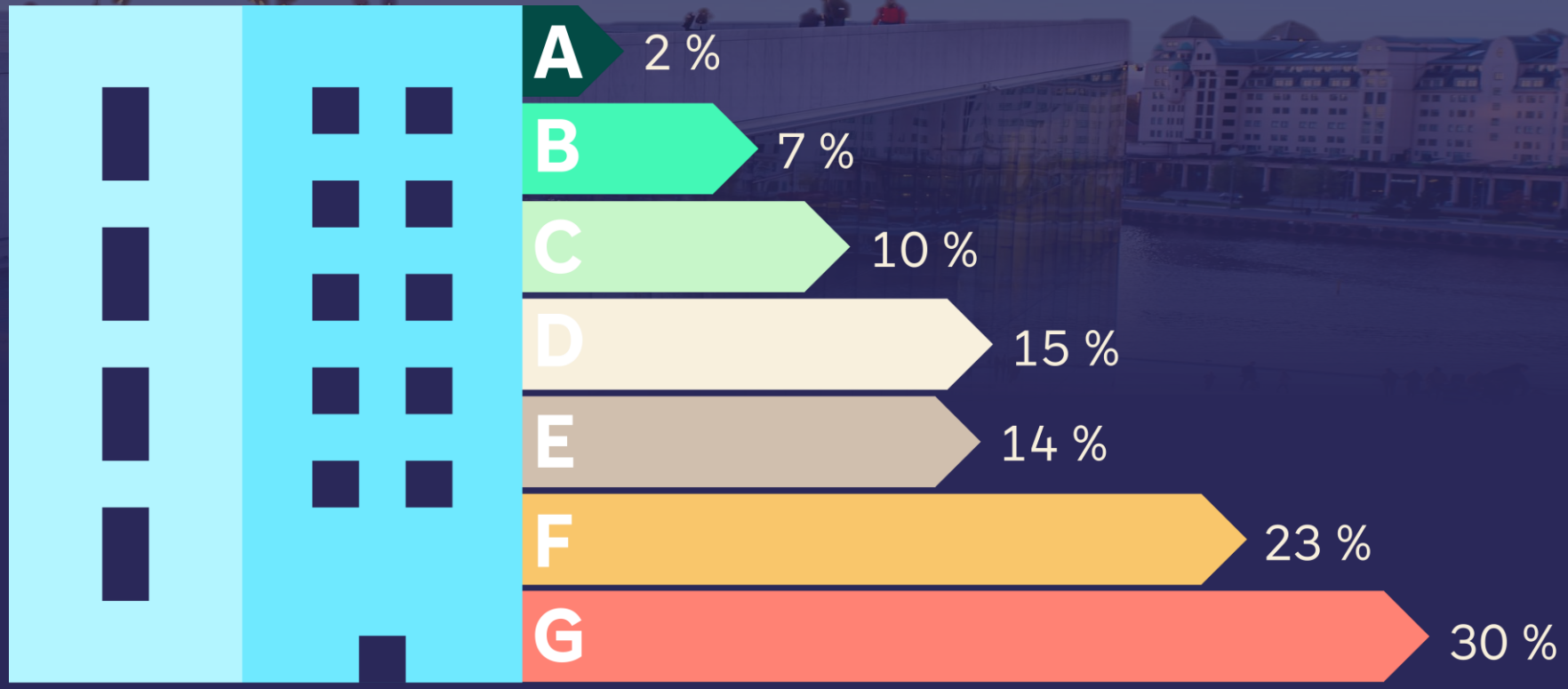
- The transmission grid in the Oslo area is close to being at capacity- but there is plenty of capacity 90 % of the time

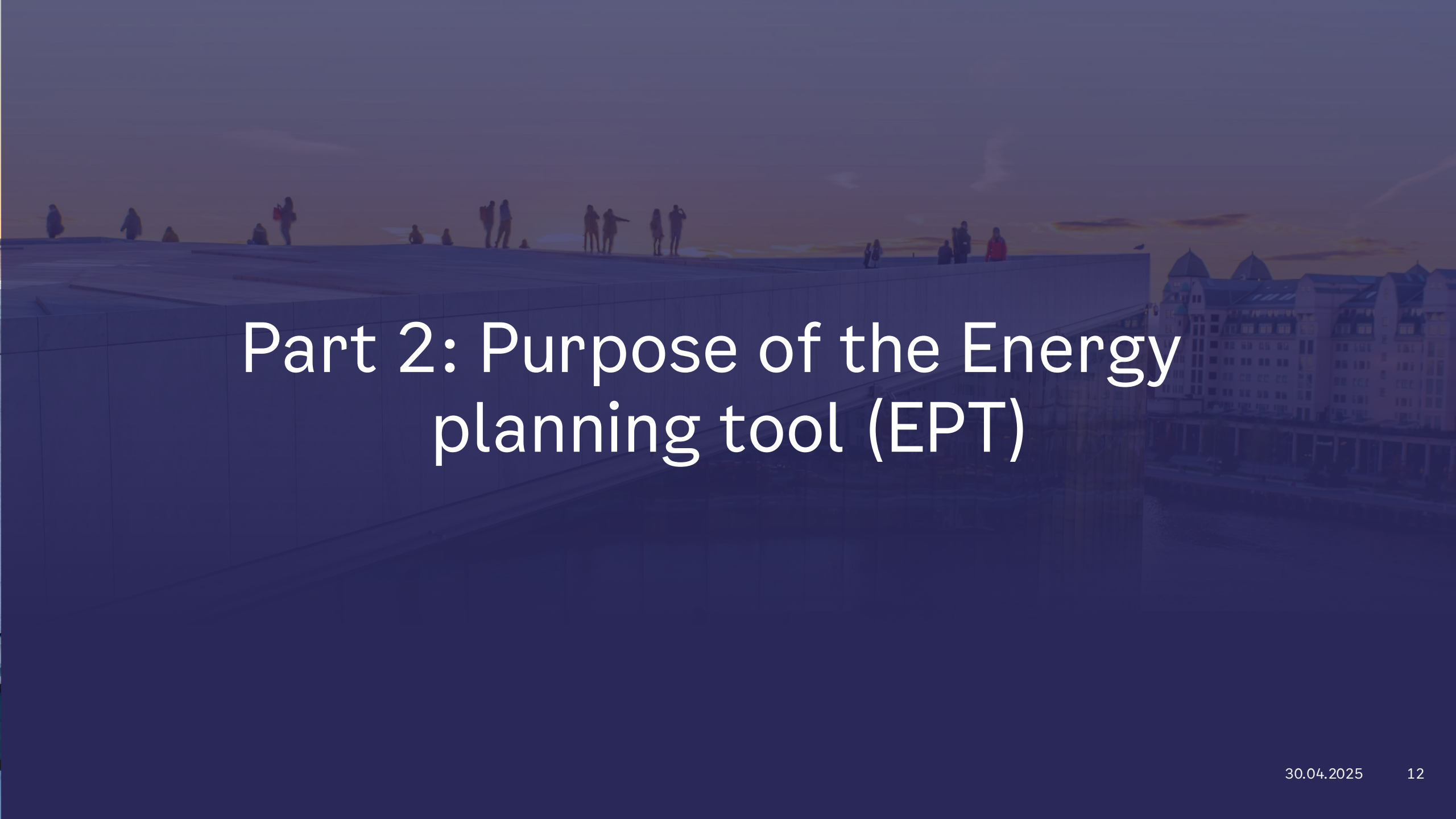
90 percent of the year there is ample spare capacity



≈75 %

of total energy use in Oslo goes to buildings and housing





Part 2: Purpose of the Energy planning tool (EPT)

The tool bridges urban and energy planning to promote sustainable, coordinated development.

What is the Energy planning tool?

- The Energy Map is a digital planning tool developed by the City of Oslo, the DSO Elvia and the local district heating company Hafslund Celsio.
- A cooperation that started in 2021 and resulted in a GIS-based energy data sharing platform in 2023, launched officially 14 th of February 2025
- It brings together energy-relevant data in a single platform to support early-phase decision-making in zoning and area development.
- The tool helps identify:
  - ✓ Grid capacity constraints
  - ✓ Opportunities for local energy production
  - ✓ Areas where district heating or waste heat is available
  - ✓ Energy needs based on building types and codes
  - ✓ Identify potential for ground sourced heat-pumps
  - ✓Geothermal seasonal heat storage facilities

The energy planning tool helps make sure we have enough energy and grid capacity to reach our climate goals

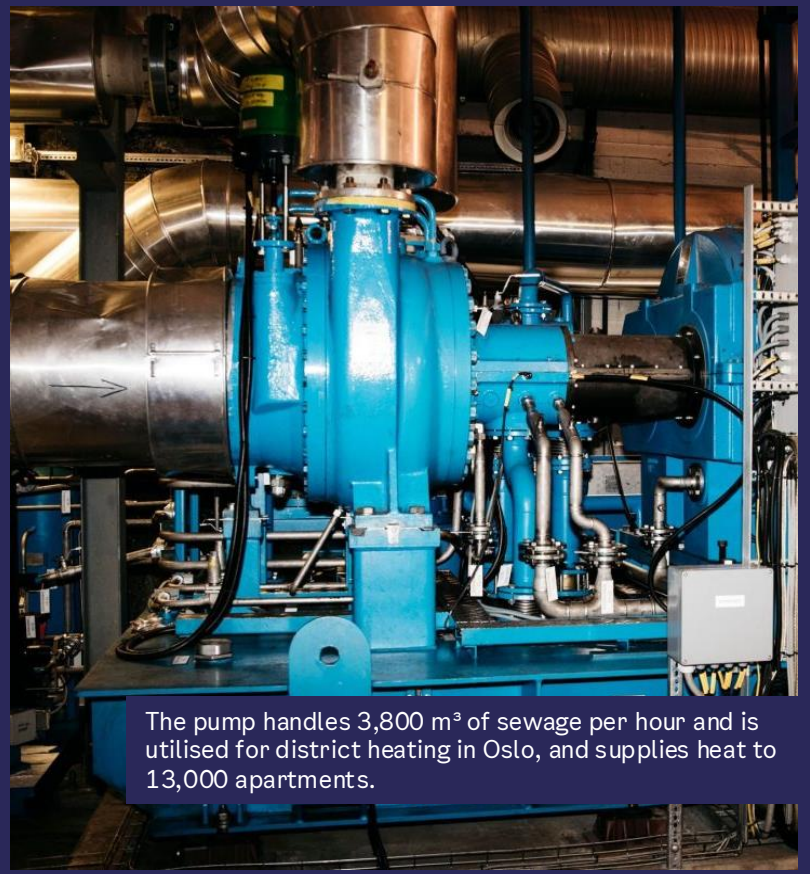
Solutions to lower peak demand

- Better planning and smarter energy use in buildings can substantially contribute to lower peak demand in Oslo.
- Energy efficiency and flexible energy solutions plays an important part
- Local energy solutions like district heating and geothermal can reduce pressure on the grid.
- District heating covers ~20% of heating needs in Oslo – much lower than e.g. Stockholm (90%).

Klemetsrud is Oslos's main waste-to energy plant and fully integrated into the city's district heating network. Carbon capture is scheduled to be on place by 2030

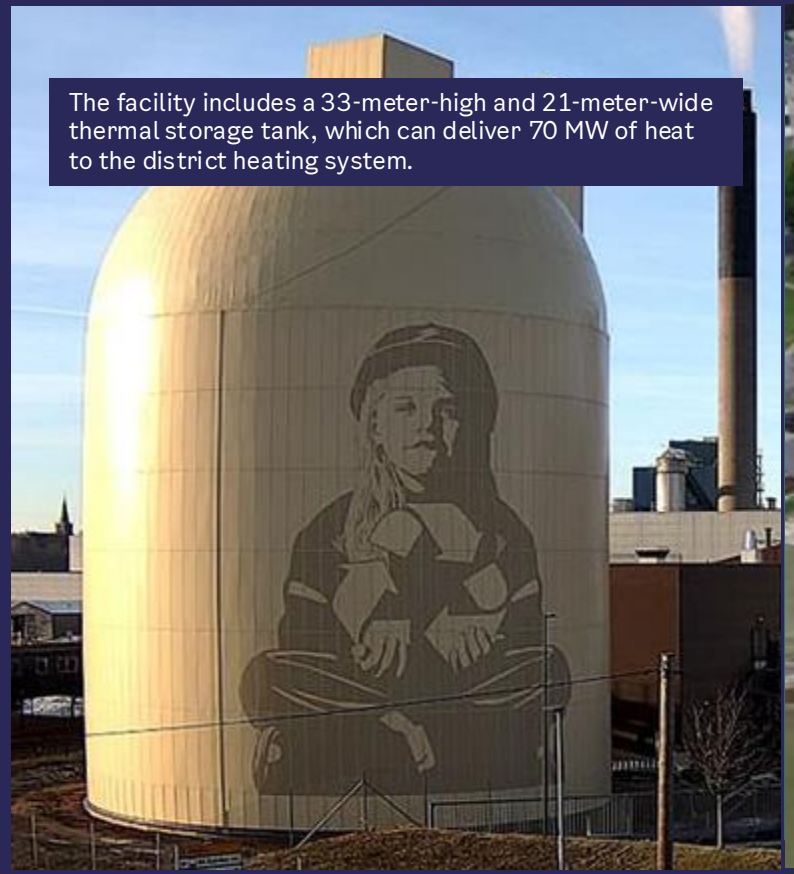
Credit: Hafslund Oslo Celsio

Local energy solutions freeing up electric grid capacity



The pump handles 3,800 m³ of sewage per hour and is utilised for district heating in Oslo, and supplies heat to 13,000 apartments.

Photo: KlimaOslo



The facility includes a 33-meter-high and 21-meter-wide thermal storage tank, which can deliver 70 MW of heat to the district heating system.

Photo: Celsio

Beneath the parking lot, there are 100 wells for heat storage.

Solar panels storing high temperature heat in geothermal storage wells

Illustration: Drammen Eiendom

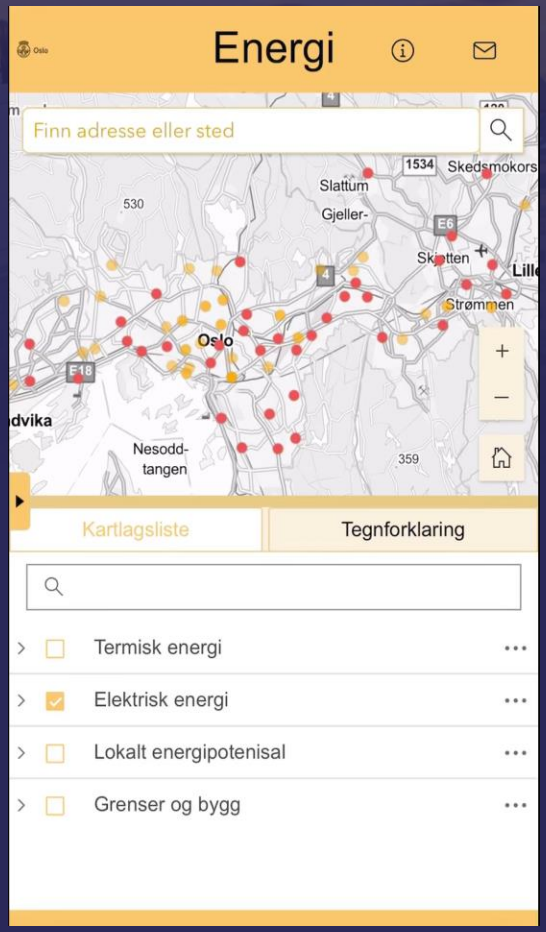
Part 3: Demonstration of the tool

How the tool works: 3 steps

1. Webpage open to the public: https://www.klimaoslo.no/energikart/

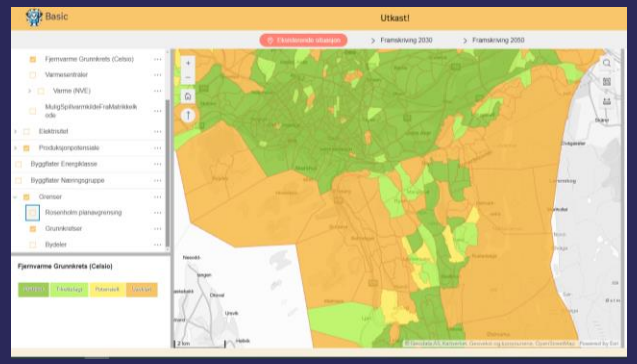
2. Choose the topic you want more information about:
   - Thermal, electricity and local energy potential and building information

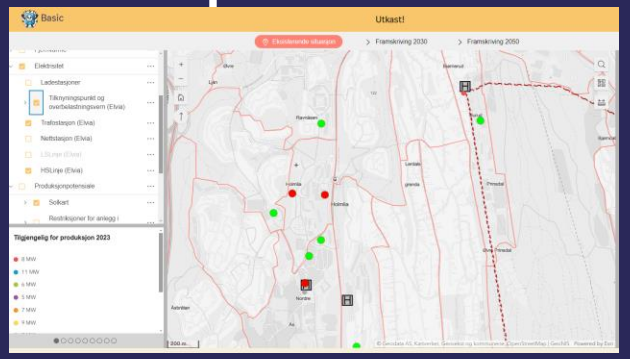
3. Locate you area

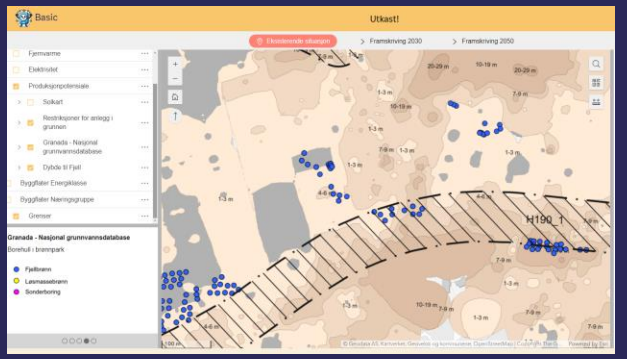


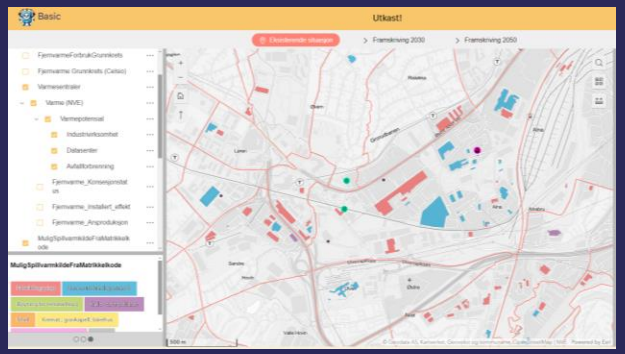
Everyone supplying data to the platform is responsible
for keeping it updated and ensuring compliance
with legislation related to GDPR
and sensitive energy system information.
Most of the data on the platform is already
available upon request
or classified as non-sensitive.

Smart exchange of data provides more knowledge









Hafslund Oslo Celsio

Oslo

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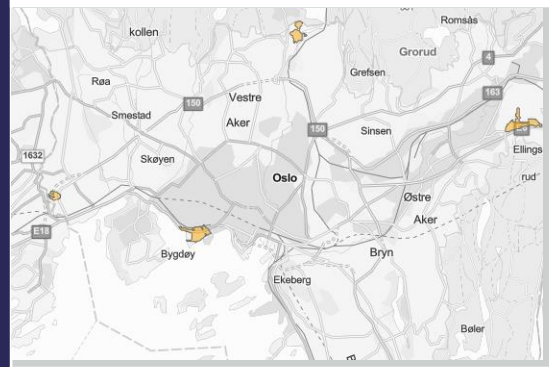
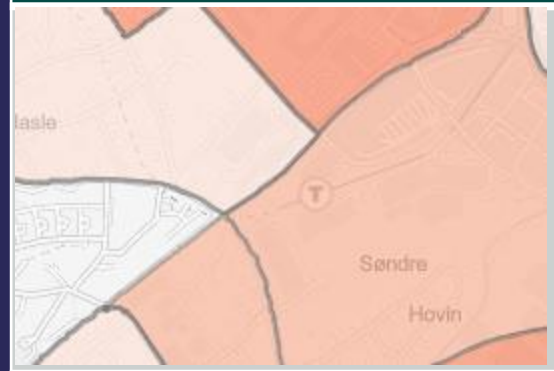
Making all this information accessible on a single platform provides significant value for businesses and energy infrastructure planning companies.

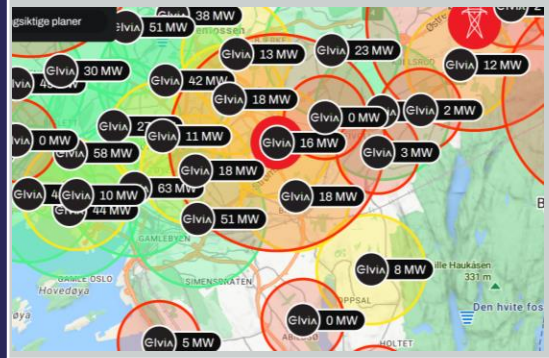
List of sources used in the energy planning tool

	**Thermal – low temperature heat networks**: This map layer shows areas in Oslo with potential for low temperature heat networks. The data is provided by Hafslund Celsio and is continuously updated based on expected urban development plans and future energy needs.
	**Thermal – excess heat:** This map layer shows potential buildings where excess heat can be utilized for the district heating network. The data is based on the national database for excess heat sources and includes building types that are considered likely to generate surplus heat, such as data centersand industrial facilities. The layer supports planning and identification of opportunities for heat recovery.
	**Thermal – buildings above 500m²:** In Norway, buildings over 1,000 m² are required to connect to the district heating network. This layer highlights buildings over 500 m², which are encouraged to consider connecting as suitable candidates for district heating.

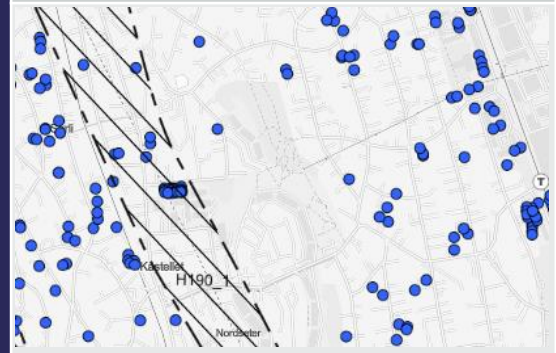
List of sources used in the energy planning tool

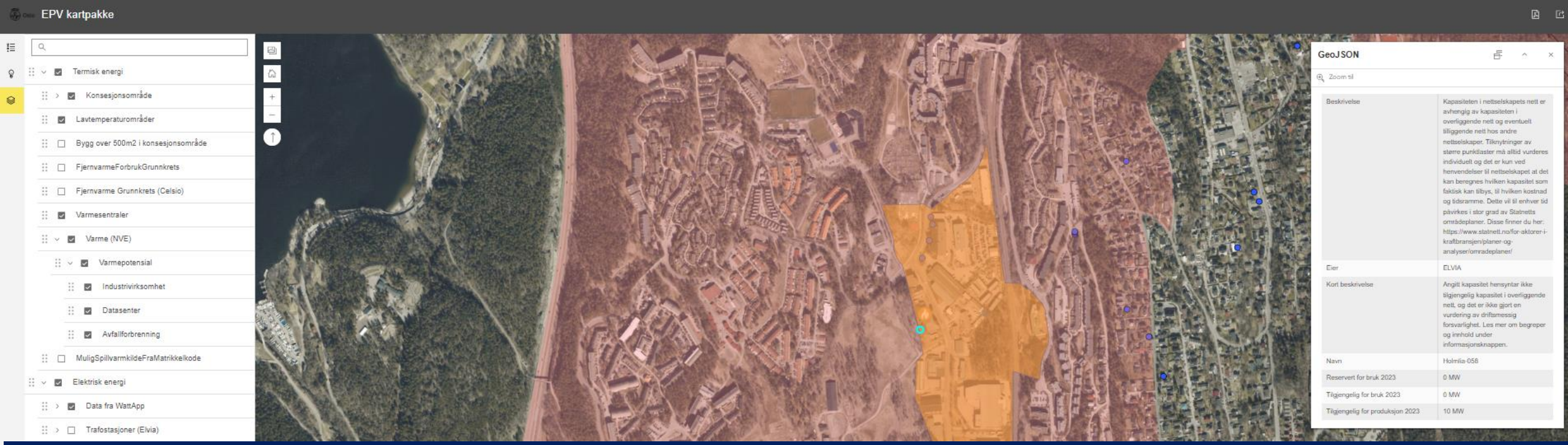
	**Thermal – district heating demand:** The layer shows heat consumption in Oslo. Buildings are grouped into subareas of Oslo. The shade of redness indicate the level of district heating consumption. The data is provided by the district heating company.
	**Thermal – district heating stations:** The map shows all heating stations in the different district heating networks. This map layer is maintained by the district heating company and is intended to inform property developers about the locations of district heating plants and provide useful information to stakeholders in property development.
	**Thermal – District Heating License:** This layer shows the different district heating companies licensed to operate within the city limits. It provides property development stakeholders with information about which company to contact when developing an area.

List of sources used in the energy planning tool

	**Electricity – grid capacity map**: This layer shows available grid capacity for new demand **above 5 MW, based** on data from the Distribution System Operator (DSO). It covers all major transformers in Oslo and is updated annually. Note that the data is based on assumptions about surrounding grid infrastructure and may contain uncertainties.
	Electricity - Electricity consumption in Oslo Under development
	Electricity - Peak electricity demand in sub-areas of Oslo Under development
	Electricity – electricity production in sub-areas of Oslo Under development

List of sources used in the energy planning tool

	**Local energy potential:** Restricted area for energy infrastructure under ground in Oslo. It provids under ground restrictions in accordance to the draft municipal plan for land use (kommuneplanens arealdel) published in 2024.
	**Local energy potential:** Ground source heat wells. This map layer shows the locations of ground source heat wells (boreholes) registered in the national well database. The data is provided by the Geological Survey of Norway (NGU), which maintains the national registry of groundwater wells and heat wells.
	**Local energy potential:** This map is provided by the municipality of Oslo. The layer identifies areas suitable for establishing new underground heat storage facilities or ground sourced heat pumps. The data shows the distance to bedrock, which is an important factor for ensuring effective and economically efficient heat storage systems.



How do we use the Energy planning tool:

The lack of comprehensive information about the condition and status of the energy supply creates significant challenges for planning optimal energy solutions in urban development. By integrating local energy-related data—such as electricity consumption, district heating, and housing and business forecasts — Oslo can more effectively evaluate energy solutions tailored to its specific local needs.

Using a scientific method developed by SINTEF Energy, energy needs for buildings are estimated based on the floor area of different building types and applicable building codes. Combining these early energy demand estimates with data from energy infrastructure companies, local waste heat sources, and geothermal potential provides a foundation for exploring and selecting efficient energy solutions in urban planning.

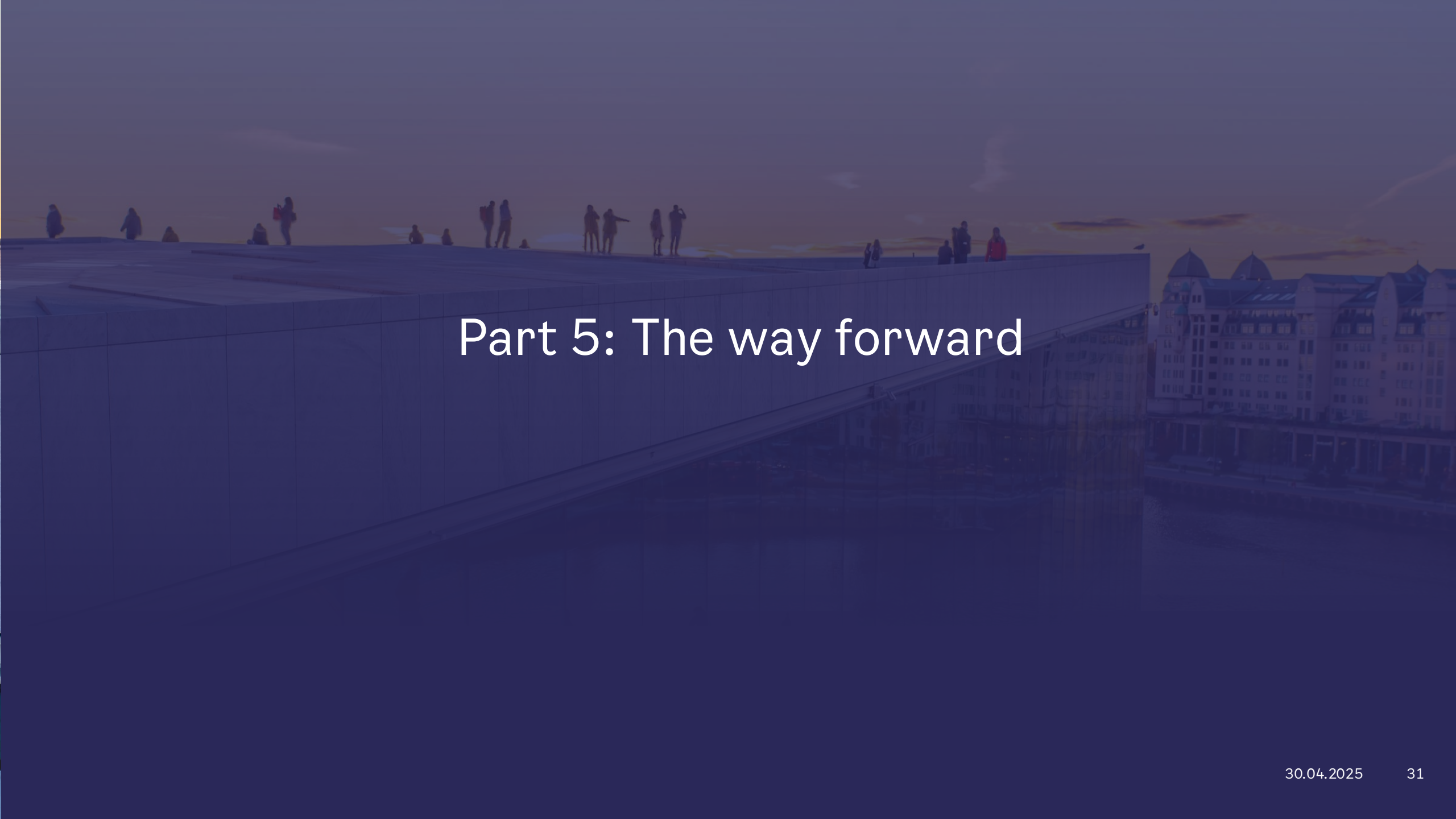
Part 4: Testing the energy map:

lessons learned from Rosenholm zooning plan

- The tool made it easier to compare different energy solutions early in the planning process
- Access to multiple data layers helped identify the electric and thermal energy need
- a nearby datacenter showed that the area is suitable for low-temperature district heating system
- Distance to the bed-rock showed that the area is suitable for geothermal storage
- Using the tool created a more structured dialogue between the municipality, Elvia and Celsio.
- The tool helped align expectations and improved the understanding of technical constraints across sectors.

Key experience: Rosenholm Zoning plan

- Early estimates support infrastructure planning:
  The tool gave a realistic picture of energy demand and infrastructure needs, helping allocate space for technical systems.
- Shared map enables area-wide energy thinking:
  Users could explore synergies with nearby projects and assess potential for waste heat use beyond individual buildings.
- Shared information platform enables better energy solutions
- *The energy planning tool serves as a one-stop shop for information related to zoning and energy planning, integrating data from the DSO and district heating company. This saves time for users, the district heating company, and the DSO by providing local, automated advice based on site-specific information..*
- Coordination challenges remain:
  Lack of routines and legal mechanisms makes it difficult to follow up insights. Developers need better guidance to avoid overcommitting to suboptimal energy solutions.



Part 5: The way forward

Going forward: what is needed?

- To integrate energy planning into Oslo's urban development, the following steps are proposed:
  - ✓Clarify when and how to use the Energy Map in planning processes
  - ✓Strengthen routines and responsibilities across agencies
  - ✓Improve coordination between city, DSO and developers
  - ✓Consider how the tool can support assessments of district heating connection requirements

Conclusion

- The Energy Map is a practical step toward smarter urban planning in a zero-emission city. It helps make energy needs visible early, opens up for alternative solutions, and facilitates cooperation across sectors.
- To succeed, the tool must be embedded in planning routines and supported by stronger coordination and clearer responsibilities.
- There is growing interest in the Energy Map from other cities in Norway. The Norwegian Water Resources and Energy Directorate (NVE) has expressed interest in developing a national version of the tool.