LEADING THE CHARGE

LOCAL ENERGY ACTION PLANNING TECHNIQUES FOR A CITY-LED LOCAL ENERGY TRANSITION

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COPPER

Interreg North Sea

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CLIMATE ALLIANCE

FOREWORD

The role of cities in the energy transition is shifting. As global average temperatures break the 1.5 degree barrier, a rapid energy transition is essential to progress on the climate. Worldwide, cities are responsible for 75% of the world's energy use, making them key sites for this transformation.

Many of the policy changes needed for acceleration will happen at the regional, national and international level. But as this study shows, a new wave of local energy management techniques is empowering municipalities to deliver a decarbonised, affordable and competitive energy transition.

This report highlights inspiring examples of municipalities already leading the charge. From new collaborations with grid operators to the founding of local energy companies, cities are forging a path towards a local energy transition, with Climate Alliance members among the leaders.

As Climate Alliance, we will continue to champion these efforts, facilitating exchange and amplifying the voice and needs of cities in the climate transition. Together, we can build a future where energy empowers our cities to be more sustainable, fairer, and competitive.

Andreas Wolter
Mayor of the City of Cologne
Climate Alliance President

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Climate Alliance is a partner in the COPPER project.

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Energy is rising up the agenda of almost every city in Europe.

A perfect storm of factors – from impending climate targets, to concerns about the affordability of the energy transition, to the difficulties and expense of new electrification efforts - is slowing the city's transition to climate neutrality, and putting energy management in the spotlight.

In the coming decade, **every city in Europe will need to talk more, invest more, and plan more for the energy transition**, as decentralised renewable generation and electrified consumption underpins everything that happens in a city.

This change requires a step-up in active energy management from municipalities, **driven by a new local energy action planning approach**. Access to a clean, reliable energy supply was once one of the last considerations in urban development. Increasing, it will become the first.

> "In the old paradigm, energy was the last consideration in an area development - you'd develop an area and then they ask for energy. That's switched completely. Now the city has to think about energy from the start." **- Arnhem**

This foundational role for energy also presents a great opportunity for cities to plan for and develop a **local energy economy**.

Distributed renewable assets like solar panels, batteries, EVs and heat pumps are already enabling a local value-driven energy economy. And as energy systems continue to decentralise, **cities have a new opportunity to promote local affordability, competitiveness and local value creation through energy planning.**

> "A mid-sized city in Northern Europe will spend somewhere around €5bn on energy by 2050. That's an enormous figure, paid by local citizens and businesses. It's also a huge opportunity for cities. Self-produced green energy costs €0,10/kWh, versus the European average of €0,28/kWh today.
>
> **Investing in that energy accelerates progress climate targets, reduces energy bills and keeps the value of energy local.** Today, most energy value is effectively exported out of the city. Cities can change that, if they manage energy more actively."
> **- Rolf Bastiaanssen, Bax Innovation**

Most cities have not yet seized the opportunity of the local energy economy. However, as this study shows, **frontrunning cities are developing a growing range of tools, collaborations, roles and organisational techniques to deliver an energy transition that meets their wider objectives**.

Underlying these techniques is a broader shift in how energy is approached at city level. Leading cities are unifying planning processes with top-down political backing; creating new connections with the distribution system operator (DSO), businesses, and other key stakeholders, and taking active market roles to accelerate their energy transition timetable.

To help its members understand emerging techniques for local energy action planning, Climate Alliance in collaboration with Bax Innovation has interviewed 10 cities in Northern Europe. This study outlines the best practices observed, and give recommendations to Climate Alliance members.

EXECUTIVE SUMMARY

RECOMMENDATIONS

The study concludes with the following recommendations to Climate Alliance members:

1) Engage local politicians in energy management and decision-making: A clean local energy supply will impact every activity in a city - achieving sustained results requires political engagement in decision-making across city portfolios. Developing a compelling, long-term narrative that resonates with local politicians across the political spectrum is key to long-term buy-in for a unified city approach to energy.

2) Develop new strategic partnerships with the local distribution system operator: Cities should pursue stronger collaborations with Distribution System Operators at strategic and political levels to improve long-term energy planning.

3) Explore new market and finance-based roles for the city in the energy transition: Cities are beginning to assume new roles in local energy markets and financing, using public guarantees and other public sector tools to accelerate the uptake of sustainable energy solutions where the private sector cannot.

4) Formalise cross-departmental energy management: Cities need to integrate energy management across all departments, ensuring joined-up planning in order to integrate sufficient renewable energy into the city, and in some cases address the growing demands on the electricity grid.

5) Increase knowledge of the energy system and investments required: Cities must improve their understanding of energy systems to facilitate effective discussions with external stakeholders. In particular, cities should understand the amount that their city pays for energy, in order to make informed decisions about investments in the energy transition. For cities without resources to invest in their own energy specialists, joining networks and city associations can support this knowledge building.

GLOSSARY

Term	Definition
Demand-side flexibility	The ability to adjust electricity consumption in response to signals, used to improve grid resilience and ease grid congestion.
Distributed renewables	Renewable energy sources that are connected to the local distribution grid, rather than large, centralised power stations.
Distribution System Operator (DSO)	The entity responsible for operating, maintaining, and developing the local electricity grid, managing the flow of electricity from the transmission network to homes and businesses.
Electrification	The process of transitioning various sectors, such as transport, heating, and industry, to predominantly use electricity instead of fossil fuels.
Grid congestion	A condition where the electricity grid cannot handle the demand for electricity or the amount of local generation, resulting in bottlenecks and extended wait times for new connections.
Local Area Energy Plan (LAEP)	A strategic, data-driven blueprint developed by local councils in the United Kingdom to translate national Net Zero targets into specific, cost-effective actions for their communities.
Local energy action planning	An approach to energy transition management where cities set energy ambitions and align cross-departmental actions to meet them, in collaboration with distribution system operators and energy demand stakeholders.
Local flexibility markets	Markets in which owners of distributed energy resources, like solar panels or electric vehicles, can sell their ability to adjust energy consumption or generation to local grid operators, helping to manage network constraints and improve grid stability.

THE EVOLVING ROLE FOR CITIES IN LOCAL ENERGY PLANNING

THE ENERGY TRANSITION SWITCHES FROM A CLIMATE ISSUE TO AN EVERYTHING ISSUE

The energy transition at city level has typically been treated as a subset of climate policy. International and national legislation on carbon reduction targets have led cities to develop comprehensive climate plans in which the energy transition is a central pillar. The Covenant of Mayor's Sustainable Energy and Climate Action Plans (SECAPs) is one such example of plan setting objectives for the energy transition, within the framing of the 2015 Paris agreement.

As these climate plans and policy decisions compel cities to decarbonise every part of city life - from mobility to heating to cooking to energy supply - **the availability of affordable, stable, clean and renewable energy is becoming central to all city policy.**

> *"[the need to act is] bigger than just sustainability and the energy transition. It's about housing, because we also have a huge shortage… it's about mobility, it affects every part of city life."* **- The Hague**

THREE EMERGING PRIORITIES FOR THE LOCAL ENERGY TRANSITION

Within this paradigm, **the drive for the energy transition is extending beyond climate targets**, and is becoming a foundational factor in all city decisionmaking. Three emerging priorities were identified through interview:

1) MEETING URBAN DEVELOPMENT NEEDS WITH DECARBONISED ELECTRICITY AND HEAT

For cities with fast approaching climate neutrality targets - such as the 112 Mission Cities of the EU with their 2030 neutrality targets - all urban development plans need to factor in a decarbonised energy supply.

European legislation is partially driving this change, with the revised Energy Performance of Buildings Directive (EPBD) mandating that all new buildings must have zero on-site carbon emissions from fossil fuels by 2030 - and by 2028 for public buildings.

Already in many parts of Europe, such as Flanders in Belgium, no fossil fuel heating is allowed in new developments, and across Europe the installation of solar panels will become obliged in some new developments starting in 2026.

For cities looking to build new or renewed districts, schools, hospitals, business parks or other installations, ensuring sufficient generation, distribution infrastructure, and consumption of cleanly-powered electricity is becoming a primary consideration in urban development planning by necessity.

On top of sufficient clean electricity supply, sufficient sustainable heat is a key concern for urban development. Almost 80% of energy use in EU households goes towards heating and cooling with fossil fuels still dominant in the heat mix.

Depending on the heating solution chosen, the decarbonisation of heat could also have a significant impact on demand for electricity, also needed to power buildings, electric vehicles and critical infrastructure.

Cities therefore need integrated energy and urban planning that integrates decarbonised heat and electricity considerations into future city developments.

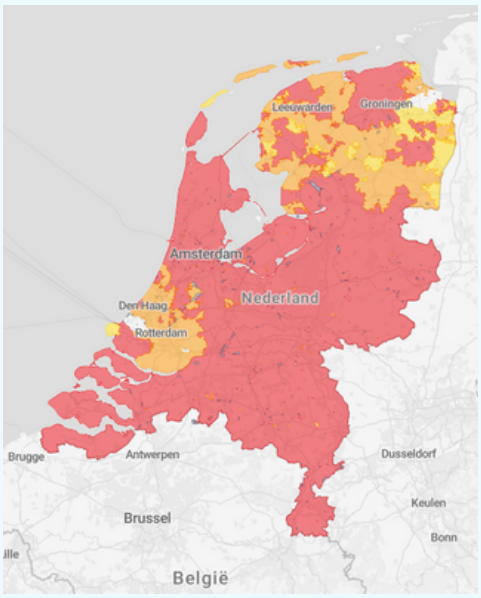
GRID CONGESTION IN THE NETHERLANDS

While for decades cities could rely on the local electricity grid being able to handle new requests for connections, the energy transition is quickly challenging this dynamic in some parts of Europe.

Grid congestion - where demand for electricity transmission exceeds the capacity of the available wires in the ground - is becoming a live issue for many cities, particularly in the Netherlands (IEA, 2025).

When multiple claims for new grid capacity - from new local generation to new demand assets like electric vehicles, heat pumps and more, demand at peak times can quickly exceed local grid capacity.

For example, **adding an additional 10 extra electric vehicles to a single street is enough to exceed the local grid capacity for some parts of Europe**. As cities target high electric vehicle uptake and the decarbonisation of heat, insufficient grid capacity and unmanaged demand could quickly become a roadblock to achieving a full climate transition.



Source: Netbeheer Nederland

In parts of the Netherlands, where grid congestion is severe across most of the country, waiting times to connect to the new grid can be up to 8-10 years. Currently, 12,000 businesses are in the queue for a connection, with 90% of businesses affected.

2) ENERGY AFFORDABILITY FOR CITIZENS

Energy is one of the largest expenses for European households. Following the 2022 energy crisis, where end prices for households in European capitals rose by 36%, energy affordability has become a key concern of cities all across Europe.

Without the right management, the energy transition could lead to long-term affordability issues. An emerging concern through the energy transition are the 'distributional effects' of the energy transition.

Higher income households are able to invest in home PV systems, improving self-consumption and lowering their energy bills.

For lower income households, investing in a solar system is not feasible, leading to higher bills as they take on more of the overall cost burden of maintaining the electricity grid.

Addressing this energy affordability is emerging as a priority alongside decarbonisation.

> *"Ever since the 2022 energy crisis, energy affordability has been an absolute priority for the city. It's our citizens who pick up the bill, so the energy system should be designed to be cheap as well as green"*
> **- Malmö**

TREND TO WATCH - ETS2 ROLLOUT

From 2027 onwards, the new Emission Trading System (ETS2) will be put into place next to the European Union's existing Emission Trading System (EU ETS), while the overall EU 2030 emission reduction goal has been increased to 62% compared to 2005 levels.

The new ETS2 covers heating buildings, road transport and small industry, while a share of the revenues obtained by trading goes to a new Social Climate Fund that supports vulnerable people in saving energy costs (e.g. for installing heat pumps). Each EU country has to decide themself how to best distribute the money from the fund. Importantly, the ETS2 has a "cap-and-trade" principle, meaning that the amount of permitted emissions from each sector will decrease every year.

Cities will need to prepare for the changes from ETS2. Since any sector that uses fossil fuel is affected, **inaction can lead to higher transport costs and heating bills, disproportionally affecting vulnerable communities.** Through strategic, long-term planning of the local energy transition, cities will play a role in softening the impact of increasing fossil fuel-based energy prices.

3) A STABLE AND COMPETITIVE ENERGY PRICE FOR LOCAL BUSINESS

At European level, there is recognition that the future of European competitiveness depends on a reliable and stable energy supply.

This is equally true at a local level. Local businesses need stable, predictable and low energy prices. **As decentralised energy systems creates differences in a local levelised cost of energy (LLCOE), the attractiveness of a city for businesses, and the competitiveness of products and services produced locally, will be increasingly influenced by this energy price**.

In a decarbonised Europe, access to cheap, reliable electricity means stronger local growth and reliable local jobs. Cities need to assume their own responsibility for providing a competitive environment.

Current policies see national governments subsidising Energy Intensive Industry at the expense of households and SMEs. **Cities and regions will need to develop their own approaches to support local businesses to access the best prices in future.**

"By developing local energy models like collective-self consumption, you can have a fixed price for energy... ensuring a stable energy price, which is one of the things businesses have really been searching for since the energy crisis"
- the Metropole of Grand Nancy

INTRODUCING A NEW WAVE OF LOCAL ENERGY MANAGEMENT TECHNIQUES

Municipalities in Europe have a unique role in the energy system.

They do not have direct control over key decisions on electricity pricing or regulation for energy markets. Management of the electricity grid is the responsibility of the Distribution System Operator. And cities are typically not technology developers, with this role better taken by private companies and research institutions.

Instead, cities have two primary roles within system governance - lobbying up to higher level decisionmakers, and setting the conditions for on-the-ground actors.

This report focusses on the second, looking at what cities can do within the existing policy landscape - identifying the supporting actions and management techniques to deliver a competitive, affordable and climate-neutral energy transition.

Cities have two important roles within energy system governance:

LOBBYING UP TOWARDS REGIONAL, NATIONAL AND EUROPEAN POLICYMAKERS

Landscape level policy and regulation determines energy system conditions on a number of important topics - from electricity pricing, taxation, tariffs, and market design. These happen above city level, meaning on many key decisions, cities must lobby and advocate for new policies to meet their objectives.

One example is the case of Flemish energy taxation, which sees electricity taxed at an effective rate higher than gas:

"We need a tax shift in Belgium, because gas prices are much lower than electricity prices, and if you don't change that, you can't create a society based on electricity, because gas is too cheap to make sustainable heating options attractive" **- Ghent**

SETTING CONDITIONS AND SUPPORTING ACTIONS FOR ON-THE-GROUND ACTORS

Cities are also well positioned to support on-the-ground actions, with coordination, facilitation, funding, contracting, and planning initiatives that organise and empower actors to deliver energy transitions on the ground.

The typical range of actions cover:

- **Policy** - Designing new planning techniques to coordinate local energy system management.
- **Economy** - Supporting and participating in new business models that make clean energy more affordable.
- **Societal Capacity** - Assembling the right actors and ensuring they have the resources, expertise and capacity to deliver the local energy transition.

REPORT INTERVIEWEES

The remainder of this study identifies best practices from 10 cities across the North Sea region of Europe towards local energy action planning.

These new sets of actions, which make up a '**local energy action planning**' approach, focus on using the municipality's unique position within the local economy and governance structures to design an energy system that meets their objectives - typically one that delivers a competitive, affordable, resilient and decarbonised local energy economy.

MAP OF PARTICIPANTS

City	Country	Population
Zoersel	**Belgium**	**23,000**
Ghent	**Belgium**	**265,000**
Antwerp	**Belgium**	**536,000**
Rüsselsheim	**Germany**	**64,000**
Bremen	**Germany**	**569,000**
Aarhus	**Denmark**	**373,000**
Albertslund	**Denmark**	**28,000**
the Metropole of Grand Nancy	**France**	**255,000**
The Hague	**The Netherlands**	**560,000**
Arnhem	**The Netherlands**	**163,000**
Malmö	**Sweden**	**365,000**

BEST PRACTICES FOR LOCAL ENERGY MANAGEMENT

Through this study, five best practices for local energy management were identified. Each one represents a different technique in a **local energy action planning** approach.

In local energy action planning, cities set ambitions for the energy system on the basis of an accelerated transition, energy affordability and local competitiveness, and align cross-departmental actions to meet them - in collaboration with distribution system operators (DSOs) and energy demand stakeholders.

1) SECURING POLITICAL ENGAGEMENT IN ENERGY MANAGEMENT

More than just securing support for the energy transition from political level, l**eading cities are finding ways to secure formal and ongoing engagement from top-level local politicians** in energy decision-making.

2) ENHANCING DSO-CITY COLLABORATION

Leading cities are working more closely than ever with local grid operators. Beyond operational day-to-day engagements, cities are setting up working groups, formal collaboration agreements and strategic partnerships for long-term energy planning.

3) FORMALISING CROSS-DEPARTMENT ENERGY MANAGEMENT

Through roadmaps, programme approaches and cross-department meetings, **frontrunners are coordinating energy needs across city departments and services** in increasingly formal and integrated ways.

4) EXPLORING NEW MARKET-BASED ROLES FOR THE PUBLIC SECTOR

Cities can leverage their unique position as public sector actors to deliver local energy solutions. By providing public guarantees, starting their own climate companies, and supporting 'above-ground' coordination of energy markets, cities can participating in the local energy economy.

5) ACTIVELY ENGAGING BUSINESS STAKEHOLDERS

Businesses need a low, stable energy price in order to be competitive. **Leading cities are actively working with businesses to ensure the benefits of the energy transition support their local economy**.

BEST PRACTICES FOR LOCAL ENERGY MANAGEMENT

BEST PRACTICE #1
SECURING POLITICAL ENGAGEMENT IN ENERGY MANAGEMENT

SUMMARY: Leading cities interviewed are working to secure active political engagement in energy planning - involving political representatives in ongoing energy-based decision-making. By engaging politicians this way, and securing political commitments through Memorandums of Understanding with key energy system stakeholders, cities improve their ability to plan for energy across political cycles.

Successful energy management requires political support. Not just from the politician or department lead with an environment portfolio, but also from politicians responsible for business, housing, mobility, and other portfolios - all the way up to mayor-level.

All cities interviewed had support for delivering on the climate transition in some form, at least at the point their climate strategies were made, and most still had sufficient support even despite changes in government.

> *"Grid congestion is not a controversial subject, and no one in our Council is pro-grid congestion.The urgency of the situation means we now have widespread support"* **- The Hague**

However, one factor that made a notable difference was **the level of political engagement in long-term energy system decision-making**. Though the energy transition was not described as a controversial topic, the decisions needed to realise it were:

> *"The problems will start if you need new distribution infrastructure. Space is always an issue in a city like the Hague, so there's competition between the grid infrastructure needed, and also having enough space for trees for green for houses, sports facilities etc. There's growing competition for space."*
> **- The Hague**

Resolving these conflicts requires political engagement at the highest level. Competing claims for space is just one example of the number of on-going political decisions that require political involvement to resolve at speed.

A **Memorandum of Understanding (MOU)** is one tool that can secure a political-level involvement in energy management. Two recent examples of the use of MOUs shows how they can be used to engage top level politicians in important strategic choices for the local energy system.

ESPOO MAYOR SIGNS MEMORANDUM OF UNDERSTANDING WITH DSO CARUNA

The city of Espoo in Finland has signed a Memorandum of Understanding with its DSO Caruna to work together on local energy management. Signed by the city mayor and CEO of Caruna, the agreement allows top level political actors to meet regularly within a long-term agreement framework. To maintain continuity of the agreement after a recent election, Caruna is providing information packs for incoming politicians to get them up to speed on grid issues.

SEVEN MUNICIPALITIES IN THE NETHERLANDS SIGN MOU WITH STEDIN

Seven municipalities in the Drechtsteden region in the Netherlands are collaborating with DSO Stedin to ensure a future-proof electricity grid amidst increasing demand. The partnership, formalised through a cooperation agreement signed at political level, aims to efficiently expand the network by jointly identifying suitable locations for new transformer substations and laying additional electricity cables.

Political engagement in energy decision-making needs to go across portfolios. Climate and the environment departments of those interviewed typically fall under the remit of one councillor. But **as energy impacts the portfolios of every councillor, engaging multiple councillors with energy-based decision-making becomes central to the success of energy management.**

MAYOR OF BREMEN ENDORSES CROSS-DEPARTMENTAL WORK ON E-MOBILITY PLANNING

The city of Bremen has received political endorsement from mayor level for its cross-department work on e-mobility. As electric truck charging will be central to the transition of Bremen's most important industrial zones, there is increasing recognition at political level that energy planning is needed for Bremen's future competitiveness.

ARNHEM DEVELOP ENERGY TRANSITION PROGRAMME FOR DIRECT POLITICAL COMMUNICATION

Arnhem have developed the "*Accelerating the Energy Transition*" programme, with a team of 25 civil servants taken from across the organisation. The programme director reports directly to the Secretary General of the municipality, and **communicates directly with several of the relevant aldermen (councillors), covering the economy, housing, and other portfolios**. By having an independent programme that sits outside of the portfolio of any one specific councillor, Arnhem is able to consult all councillors and make decisions across multiple sectors.

"The programme approach is an agile and flexible way of working that the energy transition really needs. It gives us more political mandate to try out new initiatives across the organisation, because decisions are made directly with the councillors" **- Arnhem**

BEST PRACTICE #2
ENHANCING DSO-CITY COLLABORATION

SUMMARY: While all cities have operational relationships with their Distribution System Operator (DSO), the big shift in local energy system management is the development of a **tactical and strategic collaboration on long-term energy ambitions and energy economy innovations**. In almost all of the cities interviewed, municipalities had started improving this relationship in some form, often meeting several times a year. The initiation of these collaborations was mixed between the city and DSO side. The collaborations took multiple forms, depending on the existing DSO-city relationship, but regular annual meetings, sector-specific sprints and topic-specific taskforces were common working approaches.

One of the central relationships for effective city energy management is the one between the city and the distribution system operator.

A number of relationship models exist for cities and distribution system operators in Europe, from 100% public to 100% private models. The 'concentration' of the DSO also varies, with some countries predominately having local DSOs, owned or contracted by a single municipality (common in Germany). In others, DSOs have multiple municipalities as shareholders, like Stedin in the Netherlands, which is owned by 64 shareholders, including 61 municipalities, two provinces and the Dutch state.

Across this range of ownership models and concentrations, cities work with their DSO on day-to-day operations and urban planning measures to ensure the right infrastructure can be installed and maintained.

> *"We're currently renovating a town square, so we've been in technical discussions with the DSO on lighting, moving cables and other things, all approved by the deputy mayors responsible for different aspects of the renovation. So on a technical and practical level, we're frequently talking with the DSO, but this work is generally separated from our climate department and the long-term goals."* **- Zoersel**

However, **the growing importance of the electricity distribution grid for city climate and urban development plans has led to increased interest from both DSOs and cities in working together on long-term planning**:

> *"In the last few years, we've improved our collaboration with the DSO. Historically, the DSO was just in charge of distribution - it was quite easy for them.* ***Now they're facing all these new challenges with renewable production connection and electric vehicles, so we have new collaboration topics to work on****."*
> **- the Metropole of Grand Nancy**

> *"Ten years ago, there was a much bigger distance between the DSO and the municipality. In Denmark, the DSO used to do their job and that was it - the city requested a connection, they built it, we paid for it. Until a few years ago, if you asked our DSO to attend an event or a meeting, they'd be reluctant.* ***Now they're aware of the problems to come and they've really stepped up their cooperation with the municipality****."*
> **- Albertslund**

BEST PRACTICES FOR LOCAL ENERGY MANAGEMENT

The new approaches to city-DSO relationships are varied. But they share a common theme: **an increasingly integrated relationship, in which DSOs and municipalities share data and plans to align longer-term city objectives with grid investment planning**.

Four key collaboration techniques were identified:

1) ESTABLISH A SINGLE POINT OF CONTACT

The most straightforward step observed was to establish a Single Point of Contact (SPOC) within the city and the DSO for long-term energy planning. In many cases, DSOs can work with as many as 150 different contact points within city departments on day-to-day operations. Having a SPOC for longer-term planning on both sides streamlines this collaboration, and opens a channel for collaboration beyond day-to-day operations.

GHENT ESTABLISH A SINGLE POINT OF CONTACT IN THE CITY FOR LONG-TERM PLANNING

The City of Ghent has established a Single Point of Contact within its Environment and Climate Service, as well as SPOC within its DSO Fluvius. The creation of the SPOC relationship allows Ghent to more easily exchange information with their DSO on long-term energy planning and ambitions.

2) ESTABLISHING A WORKING GROUP

In some cases, topic-based working groups have been started as a matter of urgency, with impending grid congestion requiring close tactical work with the DSO on a regular basis.

THE HAGUE ESTABLISHES A CITY-DSO WORKING GROUP ON CONGESTION

The City of The Hague faces severe grid congestion issues, which are limiting the city's ability to grow economically. To combat it, **The Hague has set up a working group with DSO Stedin that meets every three weeks**, enabling both sides to determine priorities and support urgent actions.

In other cases, the city has proactively contacted the DSO to improve working relationships and address gaps in knowledge about how the two organisations operate:

"I meet with the regional director of Enedis every two months, to discuss projects as well as operational issues. Before, this kind of interaction was really rare - Enedis would present their grid plans once a year, but that was the only contact. Our new relationship is quite new, starting in the last two years."
- the Metropole of Grand Nancy

3) COLLABORATING ON MARKET INNOVATIONS FOR GRID RESILIENCE

Energy systems based on decentralised and intermittent renewables require new services and system setups to support the resilience of the grid. Cities can work with DSOs to develop market-based solutions that provide these services.

MALMÖ COLLABORATES WITH DSO EON ON LOCAL FLEXIBILITY MARKETS

The City of Malmö is cooperating with its private DSO E.ON to support the setup of local flexibility markets. **Malmö handles 'above-ground' relationship building, introducing local businesses to the potential of flexibility** (both in securing new connections, and generating an income from flexibility).

This division of responsibilities plays to both organisation's strengths. DSOs are unable to participate directly in flexibility markets, but benefit from flexibility by reducing the need for costly grid reinforcements. Cities have good contacts with businesses, and are invested in ensuring they benefit from the energy transition.

THE METROPOLE OF GRAND NANCY COLLABORATES WITH DSO ENEDIS ON COLLECTIVE SELF-CONSUMPTION

Led by the regional public economic development agency, **Enedis and the Metropole of Grand Nancy are collaborating on getting business stakeholders from business parks interested in collective self-consumption models.** Enedis is sharing (anonymised) consumption data with the public organisations to help inform decision-making on self-consumption.

4) STRUCTURED PROGRAMMES TO ALIGN CITY AND DSO PLANS

With the increasing demands of the energy transition, DSOs are recognising the importance of closer collaboration with the city. The collaboration allows DSOs to understand city plans at higher resolution, informing their own Network Development Plans, as well as getting city support for the future permitting and network build-out plans. In some cases, **this is leading to structured programmes in which cities and DSOs meet to align their work on the energy transition**.

DSO FLUVIUS SETS UP THE "NETWERKEN VOOR MORGEN" PROGRAMME FOR CITIES

DSO Fluvius has established a programme to work more closely with the city of Antwerp on energy planning. A first planning meeting saw the DSO share the grid map for Antwerp under its current 2033 investment plan for the region. The city then provided more updated input on its plans, regulations and targets, leading to a second meeting discussing a revised map. A planned third meeting will discuss how this kind of cooperation can be made official.

"Before, we had a largely transactional approach with our DSO. Beyond legal mandates, when they needed something, they asked, when we needed something, we asked. Through this programme we're establishing a more strategic partnership" **- Antwerp**

In some cases, cities are combining efforts to work with their DSO, as is the case for Antwerp and Ghent with Fluvius:

ANTWERP AND GHENT ARRANGE JOINT COOPERATION AGREEMENT WITH FLUVIUS

The cities of Antwerp and Ghent are both members of the COPPER partnership, exploring new local energy action planning techniques. As part of the project, Antwerp and Ghent are jointly cooperating with their DSO Fluvius for the duration of the COPPER project until 2027. The project will test the potential for joint city collaboration when working with DSOs on energy planning, potentially expanding to other large cities in the future.

The most advanced example observed was the city of Arnhem with their DSO Liander. Liander's headquarters is based in Arnhem, and this proximity has enabled a deeply strategic relationship to emerge.

ARNHEM AND LIANDER ESTABLISH A STRATEGIC PARTNERSHIP

Arnhem has established a strategic partnership with its DSO Liander, with 10 full-time employees from Liander assigned to city initiatives. At any one time, there are five joint project teams working on specific operational cases. A shared project management team meets every two weeks, using an agile way of working to focus on different issue 'sprints', and three times a year the city and DSO meet at a higher level to discuss strategic issues together.

The Hague, one of the cities in Europe most actively addressing grid congestion, suggested that all cities investigate building these relationships, even if there is no perceived urgency. Starting earlier allows for the city's considerations to influence long-term investments into the energy system, ideally avoiding problems before they arise:

"My advice to cities is ***to work together with the grid operators to look ahead, probably further than they are today****. We've probably been too passive over the years, and now the problem has become acute."* **- The Hague**

BEST PRACTICE #3
FORMALISING CROSS-DEPARTMENT ENERGY MANAGEMENT

SUMMARY: As the energy transition impacts plans of all departments in a city, cross-department coordination is necessary. Best practices include electricity supply roadmaps, cross-departmental meetings and planning processes, and even establishing independent energy transition programmes to oversee department activities.

City-wide climate targets will require increased electrification from all city departments.

For example, mobility departments need to ensure enough charging infrastructure for electric buses, private passenger cars and Heavy Duty Vehicles. Housing departments need to switch to electrified cooking equipment in all homes, and in many cases, have sufficient grid capacity available for private heat pumps.

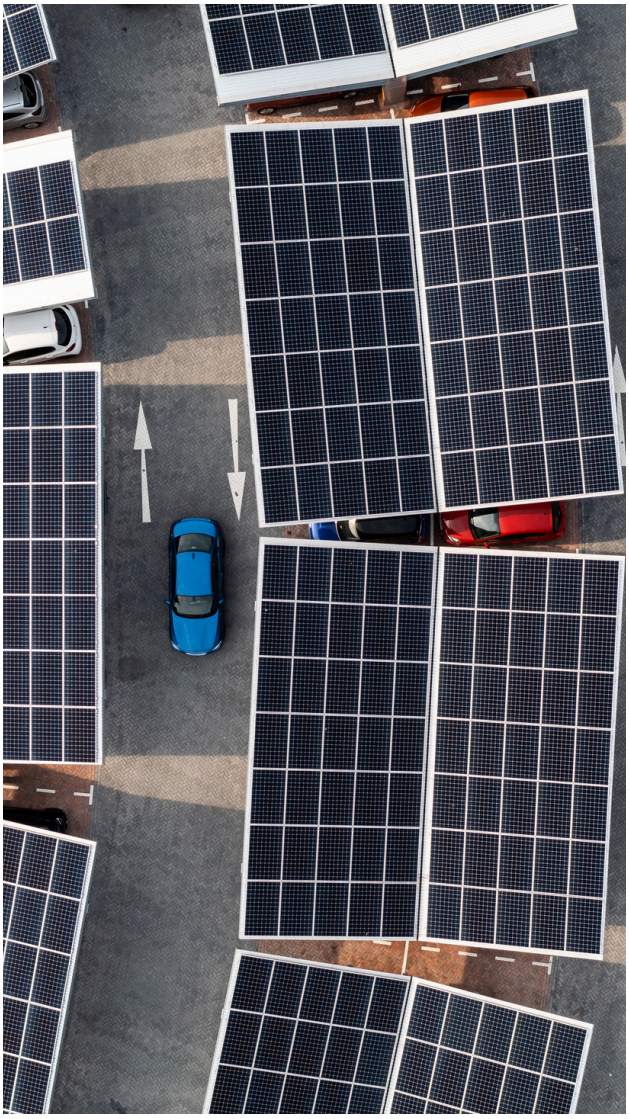
The net result is that **all departments will be operating on the same electricity grid in the coming decade, meaning departments will have to coordinate the needs of all departments together**, working with the distribution system operator through one aligned approach.

All city climate and environment departments interviewed are already in ongoing conversations with relevant departments on energy transition targets:

> *"Our environment department is very close to the housing department, our mobility and Transport department, and of course our colleagues from urbanism."* **- Nancy**

However, these conversations did not necessarily translate to a coordinated approach on energy planning.

> *"The climate and energy transition department is just one of many departments. We're not an overview department with an influence on all decisions to be taken. We even have a separate department which deals with heating networks - it's separate for historical reasons"* **- Nancy**



BEST PRACTICES FOR LOCAL ENERGY MANAGEMENT

To address the siloed approach to energy management, **frontrunner cities are setting up new processes and structures that would ensure energy was treated as a foundational asset to every department's objectives.**

These included:

1) CROSS-DEPARTMENT AWARENESS MEETINGS ON THE ENERGY TRANSITION

At the least formal level, awareness-raising meetings can bring together multiple departments to discuss a common approach to energy system planning.

GHENT CONVENES MULTIPLE ENERGY DEPARTMENTS TO DISCUSS LOCAL ENERGY PLANNING

The city of Ghent is driving an ambitious plan to establish an all-electric neighborhood in Mariakerke, primarily through the development of area-based Local Energy Action Plans (LEAPs). This endeavor requires extensive collaborative efforts between multiple departments. To start these conversations, a team from the Environment and Climate Service organised an internal meeting for ten city departments. This led to the formation of a LEAP working group with a designated contact person from each department and guidance from topic directors.

2) SPECIFIC ROADMAPS FOR THE ELECTRICITY SYSTEM

A specific roadmap for the electricity system, owned by a member of the climate and environment department with specific objectives for other departments, can bring a higher level of detail to cross-department discussions.

MALMÖ USES AN ELECTRICITY SUPPLY ROADMAP TO ADVISE CROSS-DEPARTMENTAL ACTIVITIES

In the city of Malmö, an electricity system roadmap exists alongside a heat roadmap, distributing responsibilities among departments. While these roadmaps do not set mandates for other departments, the roadmap does serve as a basis for interdepartmental conversations. The roadmaps include actions not only for the municipality but for all relevant city actors.

3) EXISTING GOVERNANCE STRUCTURES FOR CROSS-DEPARTMENT COLLABORATION

In some cases, existing governance structures already in place for coordination on climate goals are being extended to include electricity system coordination.

ANTWERP USES CLIMATE GOVERNANCE STRUCTURES TO INTRODUCE ENERGY PLANNING

Antwerp coordinates delivery of its 2030 Climate Mitigation Plan through a Climate Neutral City Mitigation Chamber, which brings together department leads every three months to align climate neutrality actions.

This is connected to the political level through a steering group which combines climate neutrality and climate resilience.

A Climate Board of external stakeholders, including the DSO Fluvius, gives advice and input on these mitigation plans.

Antwerp plans to present their work with the DSO Fluvius in the "Netwerken voor Morgen" project through this Climate Neutral City Mitigation Chamber - **using this existing climate governance structure to introduce energy planning topics at director and political levels of the organisation.**

4) CREATION OF ENERGY TRANSITION PROGRAMMES

A deeper shift in governance comes through the formation of a 'programme' which works alongside departments, with direct communications with politicians, and a mandate to coach and mentor departments with new energy transition initiatives. This is the most advanced form of coordination observed, treating energy as a strategic asset which underlies the work of all departments.

ARNHEM'S ENERGY TRANSITION PROGRAMME ADVISES CROSS-DEPARTMENTAL ACTIVITY

Based on the US programme management model, **Arnhem has established a programme for accelerating the energy transition.** The programme sits alongside the five units of Arnhem's municipal structure, and each year requests expertise from across the organisation to work on new policies for accelerating the energy transition, which are then delivered back to the units. With a 5-8 year outlook, the programme has 25 full time employees, drawn from different departments across the city. The programme director speaks directly to local politicians on a regular basis to ensure political alignment on their decisions.

BEST PRACTICE #4
EXPLORING NEW MARKET-BASED ROLES FOR THE PUBLIC SECTOR

SUMMARY: While cities have no direct control over electricity pricing and market conditions, a growing number of initiatives are seeing cities take on a 'market-making' role - creating their own climate companies to deliver rooftop solar panels in conditions where the private sector is unwilling to step in.

Through tools like the establishment of municipal energy companies, special purpose finance vehicles, and public guarantees, a new wave of public sector organisations are getting more proactive in local energy markets.

These tools are attracting private finance to deliver affordable energy, even when payback periods are longer than the private sector are willing to take (up to 15 years in some models).

AARHUS ESTABLISH A PUBLICLY OWNED CLIMATE COMPANY TO ACCELERATE RENEWABLE GENERATION CITY-WIDE

The City of Aarhus recently founded its own 'Climate Company' to accelerate its transition to climate neutrality by 2030.

The Climate Company is 100% owned by the municipality, and has a small technical and financial team. Its current objective is to install rooftop solar panels on buildings operated by its municipal buildings department.

Instead of funding the development through taxation, the Climate Company took the proposal to regional banks, looking for a loan to cover 70,000 square metres of public rooftops with solar.

The payback period for the investment was longer than a bank would typically accept - **so the city offered an 80% public guarantee on the loan, with the bank only taking on risk for the 20%**. The Climate Company also created a **Power Purchase Agreement (PPA) with the municipal building department**, who own the public rooftops on which the solar was installed.

This long-term PPA was enough to reassure three of the five banks to **offer a €13m private loan to the climate company**. Working with local contractors for installations, solar panels are now being installed on public roofs across Aarhus - including on the Musikhet Aarhus, Scandinavia's largest concert hall.

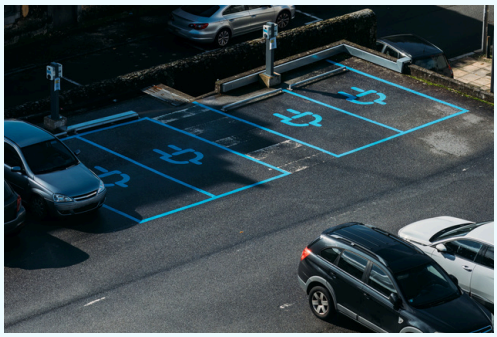
Building the company required a shift in mindset for the city – as did moving from funding from taxation to a public guarantee model. The creation of the Climate Company also allowed a dedicated team to work to a specific objective outside of the city department structure.

Aarhus is now trying to promote this model to other cities, sharing its model used to calculate the return on investment for all municipalities in Denmark.

The Climate Company model is becoming popular, with Malmö and Albertslund setting up a Climate Company of their own:

> "The decision to start a Climate Company came from the highest political level in Malmö. It's about increasing the public possibilities to affect the energy transition and making sure that the pricing is fair and reasonable." **- Malmö**

While these models are typically focussing on well-understood technologies like rooftop solar, there is no reason these could not be expanded to other asset types in the future.



ALBERTSLUND COPY AND EXPAND AARHUS' CLIMATE COMPANY MODEL

The Aarhus model is now being copied by smaller municipalities in Denmark. The municipality of Albertslund has specifically copied the climate company model, providing an 80% public guarantee for a private loan in rooftop solar, with the remaining 20% being non-guaranteed, risk being split between the city and the private bank.

Albertslund is also looking to extend the model by putting revenue from concessions for EV chargers on public land into the Climate Company. This revenue will fund the roll-out of more renewable assets in the municipality, and is another example of cities using publicly-owned property to generate revenue through the energy transition.

"The creation of the Climate Company was a political wish in Albertslund. Politicians heard about the case in Aarhus, and felt that we should do the same. It's called a Climate Company, not a PV Company, so we could even look at extending it to other assets like batteries in the future." - ***Albertslund***

Albertslund are even investigating how they can use their municipality-owned heating network to provide new revenue-generating services to the electricity grid, operated by DSO Radius Elnet:

ALBERTSLUND INVESTIGATES A HEAT BATTERY TO PROVIDE ANCILLARY GRID SERVICES

Albertslund is investigating the purchase of a large-scale heat battery to add to their municipally-owned heating network. This heat battery could provide 'ancillary services' for the grid, absorbing excess electricity on the network, and dispatching it when needed. This would support the local grid and allow the municipally-owned heating company to bring down heating bills for citizens.

In Arnhem, the city is supporting the setup of an energy cooperative to install a seasonal heat battery in cooperation with their DSO, reducing the need for network reinforcements and keeping the value of energy local:

ARNHEM INVESTIGATES ENERGY COOPERATIVE TO INVEST IN HEAT BATTERY

Arnhem is setting up an energy cooperative to invest in a heat battery in the former Saksen Weimar barracks.

Connecting private rooftops and social housing roofs with an underground seasonal heat battery, this local energy system will store energy for use in heating in winter months.

Designing the system locally will significantly decrease the need for network investment from the DSO Liander, who are also collaborating on the initiative.

"By developing local energy sharing initiatives like this, we can make the local grid 5 times smaller, rather than 3 times bigger under current projections. ***Across Europe we can save hundreds of billions of euros with this thinking****."* **- Arnhem**

Public sector actors are uniquely placed to support some of these emerging business models, which are not yet attractive to private companies. With lower return on investment requirements, cities are able to invest in collective solutions where private companies may just 'cherry pick' the most profitable cases.

"The commercial market wants a return on investment in 10 years. That's impossible - ***if we as the city get in, we can offer a lower cost of capital which improves the business case, and we have a longer 30-year time horizon to get a return****. In this we can operate as a financial partner for the energy transition."* **- Arnhem**

It is not only cities that are taking on this 'market-making role'. **Social housing providers, who have large rooftops and a tenant profile typically unable to make upfront investment in solar panels, can also become market-makers**, as is the case in Flanders:

FLEMISH HOUSING COMPANIES SECURE A €105M LOAN TO ROLL OUT MORE THAN 400,000 PV PANELS

ASTER is a non-profit Special Purpose Vehicle (SPV) company established by 41 Flemish social housing companies, with the goal to provide affordable and clean energy to all social households in Flanders on a large scale.

ASTER serves as a contracting vehicle to outsource operation involving installing and managing solar panels on social housing units. It has secured a €105 million private loan from the Belgian bank Belfius for the mass rollout of solar PV systems.

Since its launch, **ASTER has installed over 114,000 solar panels across more than 12,000 dwellings**. This initiative is projected to generate over €160 million in social benefits over a 25-year period and reduce CO2 emissions by more than 35,000 tons.

The organisation aims to offer an average self-consumption energy price of €0.17/kWh to social tenants, which is approximately 40% below market prices.

Cities can also support energy cooperatives to deliver more renewables. This allows local citizens to get involved and receive the value of investments into new renewables.

ENERGY COOPERATIVE INSTALLS PV ON TOWN HALL OF ZOERSEL

The town of Zoersel in Belgium recently had solar panels installed on its town hall by a local energy cooperative Campina Energie (Zonnewind before a recent merger).

The town held an information event for citizens to become shareholders in the cooperative, ensuring that citizens had the opportunity to invest in rooftop solar, and are continuing to encourage citizens to join the cooperative.

""As the energy cooperative is local, it allows our citizens to invest in the local renewables, like the ones on our town hall and receive the value from it. It's a great way to get local citizens involved.""
- Zoersel

BEST PRACTICES FOR LOCAL ENERGY MANAGEMENT

These models represent a mindset shift at city level, thinking outside the typical toolbox of a city and developing new models to address gaps in local renewable energy.

Cities can use them take advantage of their position as public sector actors - with longer investment time horizons, a lower profit need, stable asset ownership and high bankability - to fill in gaps in the local energy economy where private companies currently cannot operate.

In doing so, cities accelerate the energy transition while passing on energy savings to billpayers.

EMERGING MARKET TOOLS AVAILABLE FOR CITIES IN THE ENERGY TRANSITION

Offering Public guarantees	While many cities lack the funds to develop large-scale renewable developments, municipalities can be seen as 'bankable' by finance providers. Public guarantees that leverage this bankability and have been effective in accessing private finance for renewable roll-out.
Founding a Climate Company	A publicly-owned Climate Company gives cities more flexibility and focus towards scaling local renewables, with a dedicated team working only towards the roll-out of renewable assets.
Establishing Power Purchase Agreements (PPA)	For cities that own or long-term rent municipal buildings, a power purchase agreement (PPA) between a Climate Company and the building owners can improve the bankability of a renewable energy installation. As the long-term owner of the building (compared to a commercial building that may change owners many times before the loan is paid back), cities can reassure banks that a long-term PPA is viable.

BEST PRACTICE #5
ACTIVELY ENGAGING BUSINESS STAKEHOLDERS

SUMMARY: Businesses, a significant energy consumer and employer in Europe, pose a challenge for the energy transition due to their large and highly concentrated energy demand. Cities like the Metropole of Grand Nancy and Malmö are actively engaging businesses to improve grid resilience and promote demand-side flexibility, often through local flexibility markets which also allow businesses to generate an income.

Combining industry and services, business is the largest end energy use group in the European Union. They are also significant sources of local employment, and their competitiveness is crucial to the health of local economies.

Business zones and parks located in and around cities present a challenge for cities in the energy transition, with a high concentration of capacity needs in single locations. There were multiple attempts to actively engage business stakeholders in the energy transition.

THE METROPOLE OF GRAND NANCY WORKS WITH BUSINESS PARKS ON GRID RESILIENCE

The Metropole of Grand Nancy and its DSO Enedis worked on a pilot with stakeholders in one of its nine business zones to improve local grid resilience. Working with on-site businesses, the city is trying to improve awareness about the impact businesses have on the local grid.

The pilot ultimately found limited interest from the business zone, as the business zone was mostly office blocks with limited consumption or ability to shift their demand.

However, **collective self-consumption - where local businesses virtually share energy at local level - is changing this.** With large rooftops and high energy demand, self-consumption is already an established method for businesses to reduce their long-term energy bills. Recent legislation changes in France and other countries in Europe enabling collective self-consumption makes local renewable installations more financially viable for the owner of the installation.

Led by the regional public economic development agency, business zones in the Metropole of Grand Nancy are investigating the potential for collective self-consumption, with support from the Metropole of Grand Nancy as part of their Territorial Climate-Air-Energy Plan.

ANTWERP ESTABLISHES A 'SOLAR BROKERAGE' TO ACCELERATE PV ROOFTOP INSTALLATION

The city of Antwerp, which is falling behind in its target for rooftop PV installation, is working on projects with large companies and the Port of Antwerp to increase solar PV uptake. This includes the contracting of a 'solar broker', who connects buildings with large rooftops to potential developers.

Notably, cities are better placed to engage business actors this than distribution system operators. **Cities have the contacts and 'above-ground' positioning that is required.** Engagement with businesses was not only limited to grid resilience and availability of connections. In some cases, activating business stakeholders took the form of inclusion in local flexibility markets, which would allow businesses to earn additional income from their renewable assets.

MALMÖ INTRODUCES FLEXIBILITY MARKET POTENTIAL TO LOCAL BUSINESSES

The City of Malmö is collaborating with DSO E.ON to develop local flexibility markets, where E.ON is considered a leader in Sweden. Malmö's primary role in this partnership is facilitation, focusing on bringing in more participants and explaining the city's needs rather than direct recruitment.

The city is also exploring the possibility to become a flexibility provider itself using its own assets.

"The city knows that developing these markets is good, but we must involve more participants; companies need to want to become flexibility providers. The municipality's role is to make the case and communicate these needs clearly." **- Malmö**

REMAINING CHALLENGES FOR CITIES

While some frontrunners are beginning to embrace new local energy action planning techniques, **a number of barriers exist that need to be addressed for its widespread adoption**:

CHANGES REQUIRED AT NATIONAL AND EUROPEAN LEVEL

Most of the key decisions that could accelerate the energy transition must be made and implemented above city level - limiting the ability of cities to accelerate on their own. One notable example is energy sharing legislation. Originating from the European Union directive 2019/944, member states are now in the process of converting this legislation but slowly and unevenly. A national legislative framework to support energy sharing could unlock huge investment potential at city level by improving the business case for renewable energy. But beyond advocating for national level change, cities are restricted from developing new models.

SECURING LOCAL POLITICAL SUPPORT

Securing long-term political commitment for energy planning is difficult, as it requires sustained effort and vision that extends beyond typical political cycles. Maintaining consistent support from political leaders is essential for successful implementation but often proves challenging. **Memorandums of Understandings were one technique that showed promise.** Another is building a political story around energy that works across the political spectrum.

CAPACITY FOR ACTION

Cities, particularly smaller ones, often lack the necessary staff and resources for effective energy planning and implementation. This can hinder their ability to develop and execute comprehensive energy plans, limiting their capacity to take meaningful action. This seemed to be the case in both high and low budget scenarios:

> *"Lack of know-how is a huge barrier. Our budget situation means we simply can't hire experts right now"*
> **- Russelheim**

> *"Money is not the first problem, it's the people who know what to do. That's the problem."* **- The Hague**

One way to overcome this is to leverage their position in city networks For smaller cities without the resources for a dedicated energy management team, relying on existing energy-based networks for advice and support is an established technique.

ZOERSEL USES EXISTING NETWORKS TO DEVELOP ENERGY TRANSITION CONCEPTS

The municipality of Zoersel in Belgium, with a population of 23,000, is maximising its position in city networks to support its energy transition work. The town is part of an intercommunal dialogue with 28 other municipalities in which the energy transition is one of the core themes. The municipality is also in close contact with the Province of Antwerp for advice and questions. Zoersel also recently joined the Flanders-based 100 Neighbourhoods Platform for its work on collective energy renovation, which plugs the town into the innovative work taking place in larger cities.

KNOWLEDGE OF HOW THE GRID WORKS

A better understanding of energy systems and grid operations is crucial for cities to effectively engage with Distribution System Operators (DSOs) and set realistic energy transition targets. However, many cities lack this technical expertise, hindering their ability to make informed decisions.

FIVE RECOMMENDATIONS FOR CLIMATE ALLIANCE MEMBERS ON DEVELOPING ENERGY PLANNING

This report concludes with five key recommendations for Climate Alliance members.

1) ENGAGE LOCAL POLITICIANS IN ENERGY MANAGEMENT AND DECISION-MAKING

Political representatives in municipalities should be engaged in active decision-making wherever possible, including meeting with key stakeholders like distribution system operators. To build consistency in political decision-making, it's important to build a comprehensive, opportunity-based 'story' for a local energy economy that encompasses goals of climate mitigation, sustainability, competitiveness, jobs, resilience and affordability.

2) EXPLORE NEW STRATEGIC PARTNERSHIPS WITH THE LOCAL DISTRIBUTION SYSTEM OPERATOR

As operators of the local electricity grid, Distribution System Operators have a significant role in a city's energy transition. While every city will have an operational relationship with their DSO, **frontrunners are finding new ways to develop tactical and strategic relationships with their DSO.**

From formal Memorandums of Understandings to twice-annual meetings, a common theme is the increasing need – from both city and DSO side – to work more closely on long-term planning. In many cases, DSOs are making the first move – as notably seen by Fluvius' Networks for Tomorrow plan with Antwerp. But cities can also make the first move, attempting to connect political level stakeholders with the leaders of grid operators.

3) INCREASE KNOWLEDGE OF THE ENERGY SYSTEM AND INVESTMENTS REQUIRED

Cities must improve their understanding of energy systems to facilitate effective discussions with Distribution Systems Operators and establish ambitious yet achievable energy transition goals.

Cities must also assess energy system investments and financial impacts of the energy transitions to effectively frame energy as a valuable asset. For cities without resources to invest in their own FTE, joining networks and city associations can support this knowledge building.

It is no longer enough for a city to set a climate neutrality target, without a detailed understanding of the investments in the energy system that will enable it.

One concept that can crystallise the value potential of local energy systems is the city energy bill. It's calculated by adding up the total energy spend of a city's inhabitants and businesses on energy and in doing so, shows the full economic value of the local energy economy.

This can be an important policy tool for future energy investment. By understanding the total price paid for energy, cities can make more confident and ambitious strategic investments in clean energy, ensuring that energy becomes more affordable and that the maximum possible generated value stays local.

FIVE RECOMMENDATIONS FOR CLIMATE ALLIANCE MEMBERS ON DEVELOPING ENERGY PLANNING

4) EXPLORE NEW MARKET ROLES FOR CITY

The move to a decentralised energy system offers new opportunities for cities to become market actors in the local energy transition.

This 'public sector market-making' approaches include cities developing local energy companies to accelerate uptake of assets like solar PV, and directly engaging with the DSO on pilots for local flexibility markets and clean energy hubs.

These are enabled by features unique to public sector actors - such as public guarantees and tolerance for long payback periods - that unlock some local energy business models unfeasible for the local private sector.

5) FORMALISE CROSS-DEPARTMENTAL ENERGY MANAGEMENT

Energy management is becoming central to all services provided by cities. As such, energy should be managed cross-departmentally, rather than within department silos.

This management can take a variety of forms. The City of Arnhem for example has an Energy Transition programme, which works directly with the political level to influence and mentor departments in their daily operations, Other cities like Malmö have developed roadmaps for electricity supply.

While new approaches are emerging, the message is clear: all services use the same grid and in future will be making claims on the same capacity.

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LEADING THE CHARGE

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