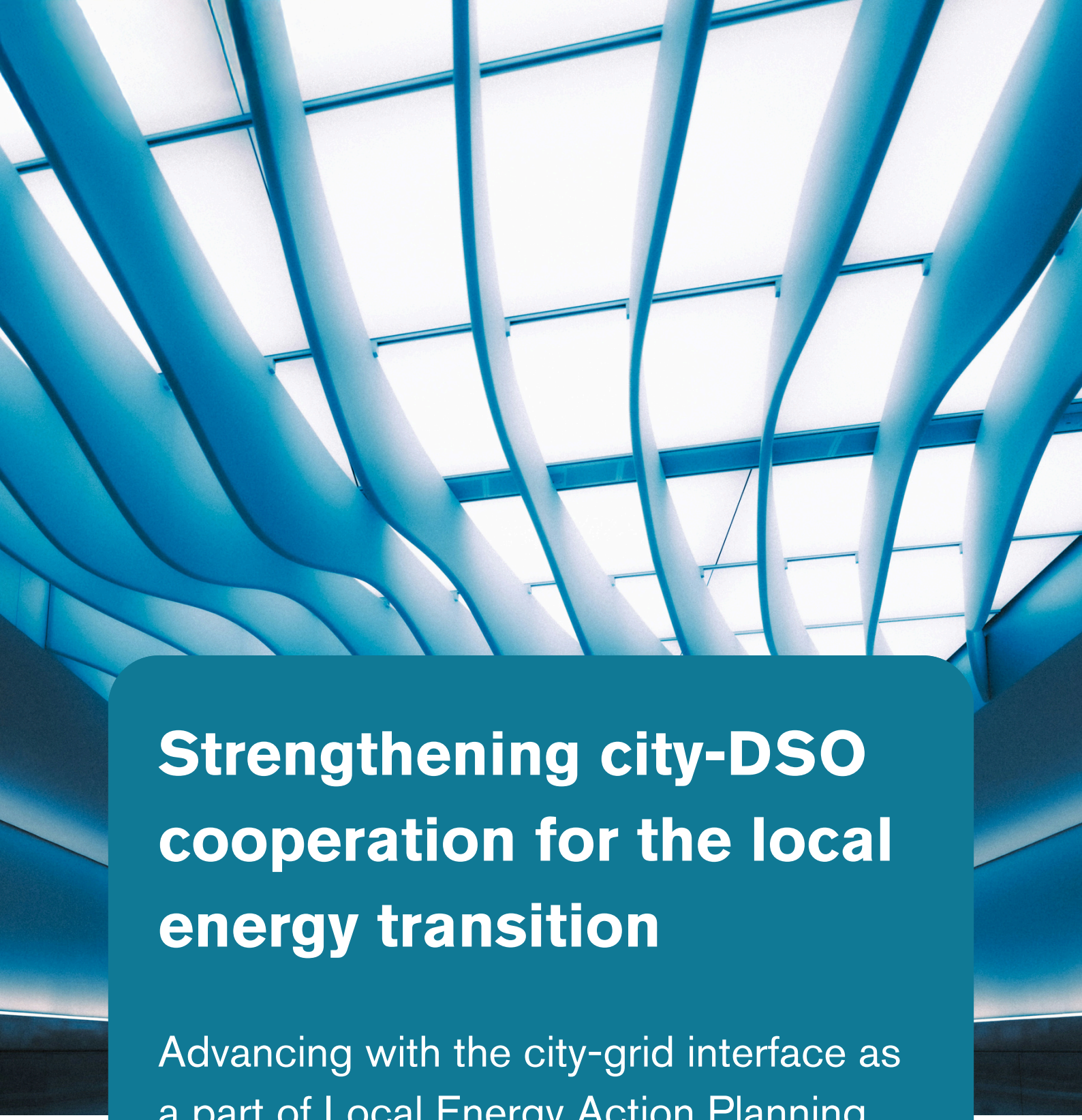

Strengthening city-DSO cooperation for the local energy transition

Advancing with the city-grid interface as a part of Local Energy Action Planning

MARCH 2026

COPPER | Interreg North Sea | Co-funded by the European Union | E.DSO

Foreword

I am very pleased to be able to write a short foreword to this paper on one of the most essential elements of the energy transition: cooperation between municipalities and Distribution System Operators (DSOs) to create a cleaner, more effective and higher quality energy system for citizens. E.DSO member DSOs, and indeed, DSOs more generally, take their commitment to public service seriously, regardless of country, region or ownership structure. How the DSOs described in the paper (six of the seven being E.DSO members) have made real progress in service delivery via the committed use of the city-grid interface (a part of Local Energy Action Plans) is gratifying to see, whether looking at it from the point of view of Secretary General of E.DSO or as a European citizen. I hope that this paper serves as a point of inspiration for other cities, DSOs and active citizens/civil society to make progress in such cooperation in many more places. Finally, and very importantly, I must mention the COPPER project, funded by Interreg North Sea, which has enabled this work to flourish and made this paper possible. To put it succinctly, "COPPER is preparing Europe's municipalities to coordinate green locally-powered cities." Many thanks to the interviewees and the authors. Happy reading!

Charles Esser
Secretary General, E.DSO

Supported by the European Union.

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Executive summary

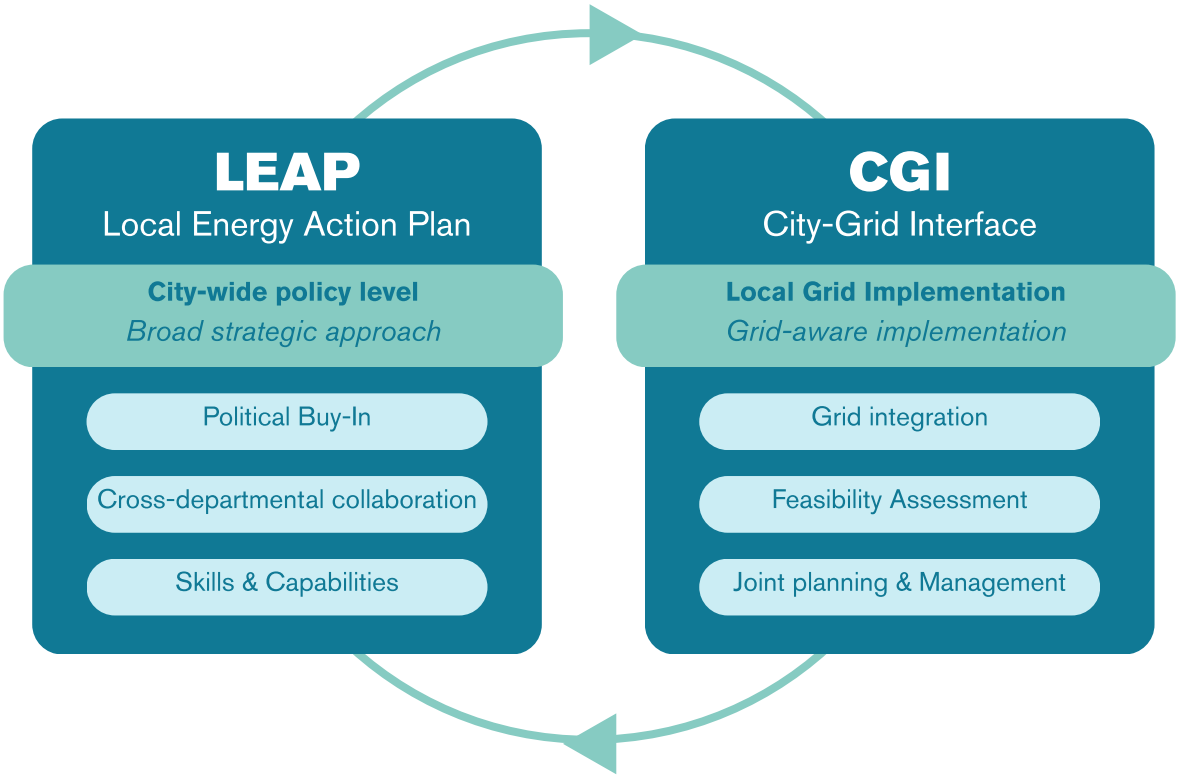
This paper examines the synergies and opportunities for cooperation between Distribution System Operators (DSOs) and cities, advocating the development of joint city-grid Interfaces as a tool to overcome existing barriers of the energy transition. Local grids are critical for delivering green and affordable energy to households and businesses, yet the current state of European grids risks becoming the number one bottleneck for electrification in the future. Given that 40% of the grid is over 40 years old (European Commission, 2023), increasing electrification can cause significant issues of grid stability and availability as well as congestion.

More than 75% of the EU's population lives in cities, meaning that the greatest amount of energy is consumed in urban areas (European Union, 2025). Cities will therefore be especially affected by local grid constraints. In some urban areas, delayed grid connections, congestion issues and limitations to infrastructure expansion are already limiting residential and commercial activities. While this clearly requires more investment in infrastructure, supportive regulation and public support tools, there is also a need for proactive network planning and enhanced cooperation with critical stakeholders.

In this context E.DSO interviewed seven European DSOs which have explored modes of collaboration with local authorities to prevent further disruption of city activities. The white paper builds on the lessons learned and puts forward recommendations for advancing city-DSO cooperation through the city-grid interface (CGI).

The CGI is a core component of local energy action plans (LEAP). LEAPs can be defined as a combination of interrelated strategies from cities to tackle the local energy transition. Within this context, the CGI specifically focuses on the relationship between the LEAP and the grid, providing a structured framework to translate strategic ambitions into grid-aware and implementable actions. Put simply, LEAPs define the local energy transition from a policy perspective, while the CGI translates these policy ambitions into concrete actions that can be implemented within the local grid.

LEAPs and CGIs as complementary tools for the local energy transition



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1. Introduction

The energy transition is reshaping our power system. One of the main challenges for electricity grids is accommodating the shift from centralised production to local generation. Given current trends, about 80% of future renewable generation and electricity storage will be connected to distribution networks (Eurelectric, 2025). In addition, "the state of European grids risks becoming the number one bottleneck for electrification in the future" (Eurelectric, 2024). With 40% of the grid being over 40 years old (European Commission, 2023), this increasing electrification can cause significant issues related to grid stability, availability and congestion. The recent European Grids package highlights how grids are the pinnacle for achieving a secure, reliable, affordable and green Energy Union (European Commission, 2025).

These challenges are further compounded by the emergence of active consumers, rising electricity demand, and the growing complexity of local energy management. The pressure on distribution networks is particularly pronounced in urban areas, where over 75% of the EU's population resides (European Union, 2025) and energy consumption is highest.

In this context, collaboration between cities and DSOs is critical to move forward. Although this cooperation is highly encouraged at EU and national level, the absence of effective coordination mechanisms often hinders their practical implementation. This report discusses how the "city-grid interface" can become an effective cooperation mechanism to enable this collaboration building on the experience and lessons learned from seven European DSOs (Caruna (Finland), ČEZ Distribuce (Czechia), E-REDES (Portugal), ESO (Lithuania) and Fluvius (Belgium), i-DE (Spain) and Varberg Energi (Sweden) and a review of national city-DSO collaboration practices.

To set the scene, chapter 2 reviews the latest changes on an international and local level that are reshaping the energy sector and the relationships between cities and DSOs. Chapter 3 introduces how cities and DSOs already work together and how the energy transition increases the need for their collaboration even further. Then chapter 4 goes into existing challenges in city-DSO collaboration, followed by opportunities in chapter 5. Chapter 6 reviews current forms of city-DSO collaboration informed by interviews with different European DSOs. Chapter 7 goes into learnings from the status quo and introduces a CGI framework, chapter 8 summarises how the CGI address the previously explained challenges. In chapter 9 policy recommendations for scalability and replication of CGI are elaborated on, followed by a conclusion.

2. Setting the scene: the evolving energy sector

The energy transition is rooted in international commitments such as Paris Agreement, which obligate signatory countries to mitigate climate change and limit global warming to well below 2°C (United Nations, 2015). This commitment has been further reinforced by European regulations, including the RePowerEU plan and the European Green Deal, which set additional targets and obligations for member states. At Member state level, governments have also set their own climate targets within the framework of the European Climate Law of 2021, which makes climate neutrality legally binding by 2050 (European Parliament, 2024). While the legislation does not apply specifically at municipal level, requirements for national energy and climate plans (NECPs) set the pace for transitions at city level. Next to NECPs thousands of municipalities have adopted SECAPs (Sustainable Energy and Climate Plans) through initiatives such as the Covenant of Mayors. Additionally, many municipalities have developed voluntary climate targets in advance, notably the 112 Mission Cities aiming for climate neutrality by 2030 (Net Zero Cities, n.d.). These commitments show how European cities are becoming more strategic to reaching climate goals. However, these strategies are not always aligned with local grid realities or developed in close cooperation with DSOs.

Given the central role of the local grid in implementing these strategies at a municipal level, the lack of coordination poses significant risks. When climate strategies are designed without close collaboration with DSOs, municipalities may set targets that exceed grid capacity, overlook existing infrastructure bottlenecks or fail to align with network planning and investment cycles. This is illustrated by the fact that in some urban areas, delayed grid connections, congestion issues and limitations to infrastructure expansion are already limiting residential and commercial activities.

Without stronger coordination, ambitious climate targets risk exceeding grid capacity, technical challenges and higher costs. To prevent further disruption of city activities, it is essential to ensure that the status and needs of the grid are considered in urban planning and local decision-making. While this cooperation is seen overall encouraged, the lack of effective coordination mechanisms still stands as a general practice.

3. Areas requiring city-DSO cooperation

Cooperation between cities and DSOs predates the emergence of distributed energy resources and the contemporary energy transition. Historically, however, this relationship has been largely transactional and operational rather than strategic. Across the EU, DSOs are typically entrusted with the operation, management and development of local electricity networks through long-term concession agreements granted by public authorities. These concessions are long-term contracts, often exceeding the 30 years. These agreements, define service standards, technical responsibilities and financial agreements. Outside this contractual framework, engagement has primarily centred on permitting procedures and other ad-hoc requests.

While functional, this model has not fostered systematic joint planning. As a result, the strategic integration of urban development and grid planning has remained limited. Cities have not consistently leveraged the granular technical expertise DSOs possess regarding network capacity, constraints, and investment cycles. Likewise, DSOs have not always been able to anticipate urban growth patterns, infrastructure priorities, or climate ambitions in a structured manner. In the context of rapid electrification and increasing system complexity, this fragmented approach is no longer sufficient given the interdependencies of cities and DSOs.

	Cities depend on DSOs	DSOs depend on cities
Urban and grid planning	For any new urban plans, cities need insights into the grid capacity to ensure feasibility. An information which DSOs have access to.	To accurately plan distribution grids and electricity demand, DSOs rely on cities to provide urban growth forecasts. DSOs are also dependent on cities to intervene in the grid and require permits from the municipalities.
Climate commitments	To meet climate goals, cities need DSOs to enable urban electrification.	Investing in grid expansions to enable electrification demands political commitment and certainty given from cities to DSOs.
Flexibility and business case	Cities depend on DSOs for the implementation of flexible tariffs that encourage end users to reduce peak demand.	DSOs rely on cities to provide mapping and forecast of flexible city-owned assets (e.g. public buildings, Public EV Fleets) to use as flexibility providers.
Resilience	DSOs do ensure a reliable and secure electricity supply, with high quality of service and ensure a resilient energy system for connected consumers.	Cities have a close relationship with their citizens and they can engage businesses, and other public institutions more effectively in grid-friendly consumption and energy efficiency efforts, which contributes to the DSOs' goal of mitigating grid congestion.

4. Challenges in advancing city-DSO cooperation

Although closer cooperation between cities and DSOs offers clear strategic value for both parties, scaling this collaboration remains complex. Moving from operational coordination to systemic, long-term partnership requires overcoming structural, institutional and technical barriers. The following lines illustrate why deeper integration, while necessary, remains challenging.

a) Multitude of stakeholders

Creating collaboration that fosters systemic change demands that all relevant stakeholders from both entities and beyond are taken into consideration. In many cities, energy is not yet treated as a primary policy area, but rather as a secondary concern emerging from other strategic priorities such as urban development, climate action, or mobility. Consequently, energy responsibilities are often dispersed across multiple municipal departments, making it difficult for DSOs to identify a clear and consistent point of contact within city administrations.

Moreover both cities and DSOs are complex entities with multiple hierarchy levels, identifying the appropriate individuals and departments to engage is of critical importance. The scale and complexity of this challenge is influenced on the one hand by how many cities one DSO is responsible for, and on the other hand by the shareholder structure of the DSO consists of. For instance, DSOs may have multiple shareholders, as illustrated by Stedin in the Netherlands, which is owned by 64 shareholders, including 61 municipalities, two provinces and the Dutch state. This influences the number of stakeholders who need to be considered to create impactful strategies for the energy transition.

In addition to this, stakeholders external to both DSOs and public authorities must also be considered, as they can significantly shape the dynamics of city–DSO collaboration. National governments, regulatory agencies, private enterprises, civil society organisations, and financial institutions are all integral components of the broader energy system. A such they must also be carefully considered in any decision-making process. A further challenge lies in creating alignment at different levels. Not all decisions and collaboration happen in the same frequency, instance, or form. For instance, to ensure that future collaboration is not only ad-hoc, but long-term and strategic, high-level decision makers both on the DSO and the public authority side need to equally engage and commit.

b) The complexity of understanding technical grid issues for external stakeholders and vice-versa

Effective city-DSO cooperation requires mutual understanding of each other's operating environments. On the municipal side, local authorities must recognise the electricity grid as a strategic asset and develop sufficient knowledge of the energy system and its technical constraints. Yet many entities and particularly small or mid-sized towns lack the technical expertise or staff capacity to engage deeply with complex grid or energy issues. This limits their ability to cooperate with DSOs to align urban planning and climate strategies with grid realities. While DSOs remain responsible for grid management, improving municipal understanding of grid functioning enables cities to design locally feasible energy transition plans. On the DSO side, a recurrent challenge lies in grasping the institutional logic and governance complexity of cities.

While DSOs typically operate within clear regulatory and technical frameworks, with defined hierarchies and procedures, municipal governance is inherently political, cross-sectoral, and difficult to understand for external stakeholders. For instance, administrations operate within electoral cycles and are subject to political shifts that can rapidly alter priorities. DSOs are characterised for having stable, long-term planning horizons, while city agendas may evolve every few years, affecting the continuity of energy-related projects.

> "Depending on the region, there's a different level of involvement from municipalities."
>
> **Head of Infrastructure Customer Unit, ESO**

c) Lack of information sharing and interoperability

Within current city-DSO collaboration certain existing practices that limit information sharing between both entities must be addressed for smoother collaboration. While both actors depend on shared access to information for effective energy and spatial planning, current practices, and technical limitations frequently restrict the flow of relevant data. On the one hand, asymmetries in data ownership and governance complicate collaboration. Grid data typically resides within the DSOs, while spatial and demographic data are held by municipal departments. The absence of standardised processes or shared platforms for data exchange means that both entities depend on ad hoc requests, personal contacts or project-specific collaborations to access needed information. On the other hand, a lack of standardisation of data formats or IT systems hinders smooth information exchange about e.g. grid capacity or energy demands. Cities and DSOs might use different digital tools, which causes interoperability issues and slows down collaboration. This is further complicated by the need to ensure compliance with regulations such as the General Data Protection Regulation (GDPR) in Europe.

d) Lack of formalised governance structures and continuity mechanisms

Many city–DSO interactions remain informal or project-based, lacking institutional continuity. Cooperation often depends on personal relationships between individual staff members or on time-limited EU or national projects. When personnel change or projects end, the accumulated knowledge and trust may dissipate. This fragility is further amplified by staff turnover within both entities and by shifting political or regulatory contexts. The absence of formal collaboration frameworks hinders the institutionalisation of long-term cooperation. Creating durable governance arrangements is therefore essential to transform isolated initiatives into sustained partnerships that survive beyond political or funding cycles.

> "i-DE has maintained numerous contacts with city councils. The city representative involved can define the scope and purpose of the relationship. A very ambitious urban mobility councillor can make all the difference."
>
> **Networks Regulation Manager, i-DE**

e) Grid concessions

DSOs are granted concessions by municipalities to manage, operate and improve the distribution networks. Cities benefit from these concessions, as DSOs provide technical and management expertise, ensure high quality of service, and pay concession fees. Reestablishing the relationship between cities and their DSOs to reflect the needs of the local, green energy transition might be slowed down through the existence of these extensive, often decades-long contracts. Adapting grid concession contracts to more flexibly include alternative approaches to the energy transition (e.g. flexibility) presupposes extensive renegotiations of the distribution of roles, responsibilities, and costs.

Overview of key challenges
Multitude of stakeholders
The complexity technical grid issues for external stakeholders and vice-versa
Lack of information sharing and interoperability
Lack of formalised governance structures and continuity mechanisms
Grid concessions

5. Opportunities arising from city-DSO cooperation

The conducted interviews as well as further secondary research show that stronger and more strategic collaboration between local authorities and DSOs not only presents considerable opportunities for the public authorities but also creates significant advantages for DSOs themselves. Moving from ad hoc coordination toward structured and continuous collaboration enables both entities to pursue shared objectives related to grid efficiency, urban development, and alignment with the EU goals for the energy transition.

a) Improved grid stability

For DSOs, closer cooperation with municipalities enhances grid stability and operational efficiency. When cities and DSOs collaborate in the local planning of the deployment of public infrastructure such as mobility hubs, DSOs get greater insights into future load patterns and congestion points which leads to better grid planning, ensuring for the reinforcement of key areas and preventing blindfold investments. This creates a win-win situation for both entities as it reduces the costs for citizens and reduces the risk of local congestion. Moreover, municipal infrastructure, such as public buildings, street lighting, or charging networks, can be leveraged as flexible assets for balancing local electricity demand, improving resilience, and facilitating the integration of distributed generation. From the city perspective such cooperation ensures that urban plans are technically feasible and aligned with the physical capacity of the grid. This cooperation ensures that the grid is taken into consideration in local decision-making process. For instance, if a municipality decides to deploy EV charging, they make sure that the selected location is not one in which the local grid is congested or reaching congestion levels. This will prevent construction work, delays, or connection bottlenecks at later stages.

b) Streamlined permitting and faster project delivery

A more structured relationship between DSOs and municipalities can also accelerate permitting processes. DSOs often face lengthy approval procedures for new substations or transformers, particularly in dense urban areas, and for intervening in the field for grid infrastructure maintenance. A stronger cooperation with municipalities could speed up this process and optimise it given that the city could arrange other works in accordance with the needs stemming from the local grid, i.e. aligning telecommunication and grid works.

For municipalities, this exchange of information supports regulatory compliance. The European Union's commitments toward climate neutrality and renewable energy targets increasingly require local authorities to integrate energy considerations into their local plans. Collaboration with DSOs provides the technical insights and data needed to fulfil these obligations effectively, while ensuring that local plans are consistent with national and regional grid strategies.

c) Increased local resilience

Joint city–DSO initiatives can enhance the resilience of the local grid. Municipalities, have a closer relationship with their constituents and they can engage citizens, businesses, and other public institutions more effectively in grid-friendly consumption and energy efficiency efforts, which contributes to the DSOs' goal of mitigating grid congestion. Municipalities can also advance social acceptance and energy literacy. For municipalities this contributes to improved preparedness for emergencies or disruptions as it reduces the likelihood of blackouts and improve the capacity to respond to extreme weather or energy supply shocks.

> "You cannot define the business case if you don't know what the plans of the city are. And without a business case, you have nothing. The cities have that visibility; they know where they want new customers."
>
> **EVP for Customers and New Ventures, Caruna**

d) Stimulation of local economic activity and innovation

Finally, enhanced collaboration can unlock new business and innovation opportunities. Joint initiatives between DSOs and cities can foster the development of local electricity markets, flexibility platforms, and energy service ecosystems that stimulate entrepreneurship and create new forms of value for municipalities and their citizens. On the other hand, having a stable grid that can accommodate new connection requests will attract citizens, businesses and investment in clean technologies, generating employment and supporting local economic transitions.

Opportunities arising from enhanced city-DSO collaboration

For the DSOs	For the cities
Grid stability Better planning and being able to use public infrastructure to balance the grid.	**Feasibility of urban plans** Collaborating with the DSO lets cities create urban plans that are in line with grid capacity.
Faster permitting By creating structural collaboration, DSOs can benefit from obtaining permits faster from cities and therefore speed up their processes.	**Cost and time reductions** Collaboration works to reduce grid congestion and allows to combine and align infrastructural works. This results in new municipal projects to be finalised quicker.
Increased capacity Energy efficiency schemes with public infrastructure and community engagement schemes on grid-friendly consumption lighten loads on the existing grid and reduce congestion issues.	**Business opportunities** Working with DSOs helps to foster local electricity markets and helps local businesses benefit from a well-planned energy system.
Clearer investment planning By proactively receiving insights into cities' urban planning, DSOs can adjust their future investment plans.	**Regulatory compliance** Cities can comply with their EU obligations such as commitments towards climate neutrality.
Increased resilience of the local grid Collaboration leads to better day-to-day operations and planning reducing the risk of blackouts and increasing sovereignty and self-sufficiency.	

6. Enhancing city-DSO collaboration

a) Existing ways of working together: From operational interactions to strategic collaboration

Strategic collaboration between cities and DSOs is encouraged by multiple EU initiatives. While there are already some synergies between these two entities, the situations differ from one municipality to another. Currently collaboration exists in different forms and on different levels depending on local conditions, ownership structures of DSOs and existing energy related strategies. This chapter reviews real-life examples of collaboration structured along the spectrum of different modes of collaboration and highlights the lack of effective coordination mechanisms still stands as an obstacle to the effective collaboration between cities and DSOs. The Collaboration Spectrum describes collaboration models over an axis of Loose to Tight coupling between different organisations, with progressive alignment of activities, to planning, to shared decision making around joint goals.

Co-Exist	Communicate	Cooperate	Coordinate	Collaborate	Integrate
No systematic connection between organisations	Inter-organisation information sharing	As needed, often informal interaction, on discrete activities or projects	Organisations systematically adjust and align work with each other for greater outcomes	Longer-term interaction based on a shared mission, goals, shared decision making, and resources	Fully integrated programs, planning, and funding

Figure 1: Types of Synergies (adapted from The Collaboration spectrum (Weaver, 2022))

The most basic type of collaboration between cities and DSOs is reflected by "**cooperate**" on the spectrum. This type is focussed on day-to-day management between city departments and a DSO's local area managers on recurring discrete operations, for example work related to new grid connections. To exemplify: when a new building needs a grid connection, the developer first submits a planning application to the city, which approves the new building's design and location. The developer applies for a grid connection with the DSO, after which the DSO cooperates with the city for any necessary ground works and associated permitting.

More intense collaboration, or "**coordination**" takes place when more complex programmes or projects that require joint planning involving different teams or departments from each organisation. Examples include the development of a new city district or industry park, or the periodic maintenance or replacement of local grid assets in the urban space such as mid-voltage cabins. The simultaneous involvement of each of the stakeholders accelerates project design and sign-off. Figure 2 exemplifies in a non-literal way how various stakeholders from both the DSO, and the city side need to be involved to coordinate.

Figure 2: Representation of possible city and DSO stakeholders coordinating. The graph is purely illustrative, the actual composition of participants in a coordinating meeting between cities and DSO will vary case-by-case.

> "The starting point should be the cooperation and a common framework between the municipality and the DSO. Then they need to include other stakeholders related to the process."
>
> **European Policies and Projects, E-REDES**

The local energy transition is increasingly considered to require structural coordination. Several city-DSO pairs have already created **working groups at program level**. Beyond district-level coordination around one-off investment projects, the purpose to is exchange and align organisations' long-term plans. The structural alignment links multi-year plans and priorities and necessitates development of joint data models beyond mere data exchange.

Belgian DSO Fluvius established the programme "Networks for Tomorrow" for joint energy system planning in Flanders. The aim is to align Fluvius' 2035 investment planning with the municipality's long-term plans and policies. The development of joint detailed datasets and models improved visibility on energy system needs, allowing for tailored investment planning. Fluvius' senior key account manager comments, "this programme is a dialogue based on data; the city shares its plans, we share how we plan to invest and meet that demand".

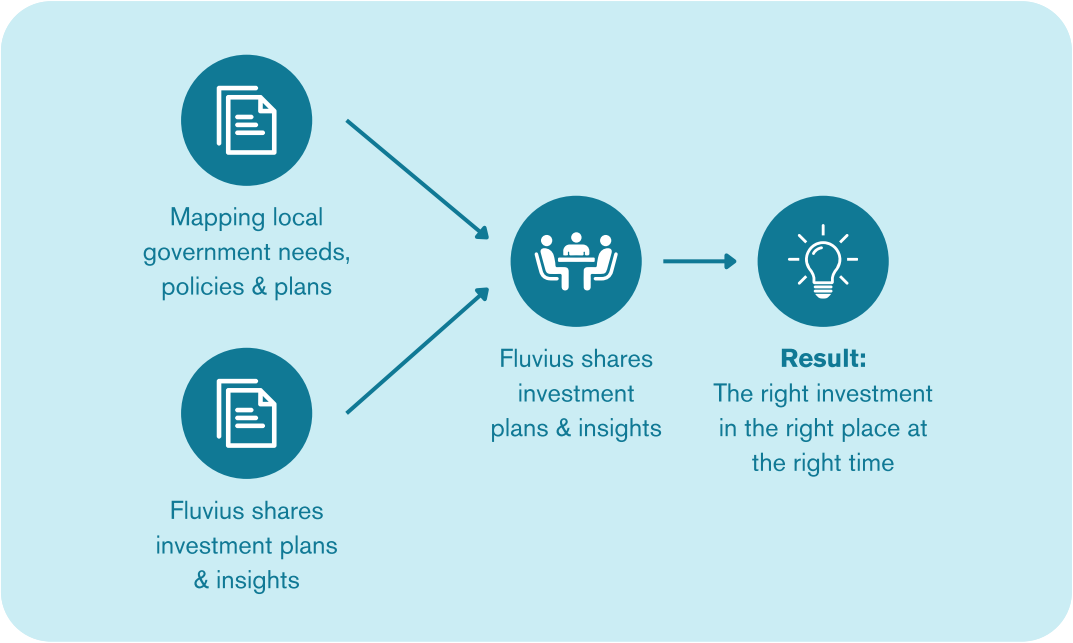

Figure 3: Fluvius' "Plan mee lokaal" (Fluvius, 2025)

In Sweden, the municipality-owned DSO Varberg Energi initiated the creation of a joint energy planning group with the municipality. A key goal of the group is to establish common grid plans, and system performance KPIs for investment planning. The City of Malmö coordinates with the private DSO E.ON on promoting local flexibility markets, showcasing synergies between the DSO's "below ground" grid visibility and the city's network and outreach capacity "above ground". The goal is to maximise the use of the existing grid capacity by shifting demand from peak to valley moments. E.ON does not participate directly in flexibility markets, but benefits from avoiding costly grid reinforcements; the city in return gets a more stable grid avoiding congestion while enabling more businesses to electrify processes as part of its energy transition.

In the Netherlands, where grid congestion is a critical issue, collaborating DSOs have agreed with the public sector on a transparent joint protocol on the prioritisation of allocating scarce grid capacity. The protocol focuses top-down on critical infrastructure such as hospitals, then energy-intensive industry and then new-build programmes such as city districts (RVO, 2025).

Very long-term alignment, or "**collaboration**" is based on joint visions and missions between independent organisations. On this level, the goals are long-term and ambitious, representing systems-thinking and alignment of joint mutual financial commitments, business models and organisational structures. The alignment is confirmed at strategic and governance level of both organisations, usually involving the CEO/board on the DSO side, and mayor/city council or the municipal side. The collaboration shifts to strategic alignment, beyond joint coordinated programmes forward or individual operational tasks.

In Lithuania, ESO has an increasingly regular meeting schedule with the 60 municipal authorities it services, meeting 171 times in 2024. This includes a minimum of one strategic-level meeting a year with the municipal administration director, and a series of reactive meetings to respond to temporary disruptions to the local grid.

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

The strategic level serves as the starting point for developing actionable mid- and short-term goals that, in the long-term, help the cities and DSOs reach their jointly set mission. This translates into all three levels (operational, tactical, strategic) being connected and dependent on each other.

In some countries, cities and DSOs even reach the final stage of the spectrum: "**Integrate**". For instance, the Belgian DSO Fluvius is 100% owned by municipalities. The shared ownership can come with alignment of goals, clearer communication channels, and long-term investment plans; generally making collaboration more straight-forward. Yet it is important to note that successful collaboration between cities and DSOs is not uniquely dependent on the DSO's ownership structure and can be achieved in a multitude of scenarios.

b) Towards operational cooperation, tactical coordination and strategic collaboration: Emerging best practices

The increasingly coupled modes towards cooperation between DSOs and cities as described above show a progressive alignment from operational, tactical to strategic decision-making between organisations.

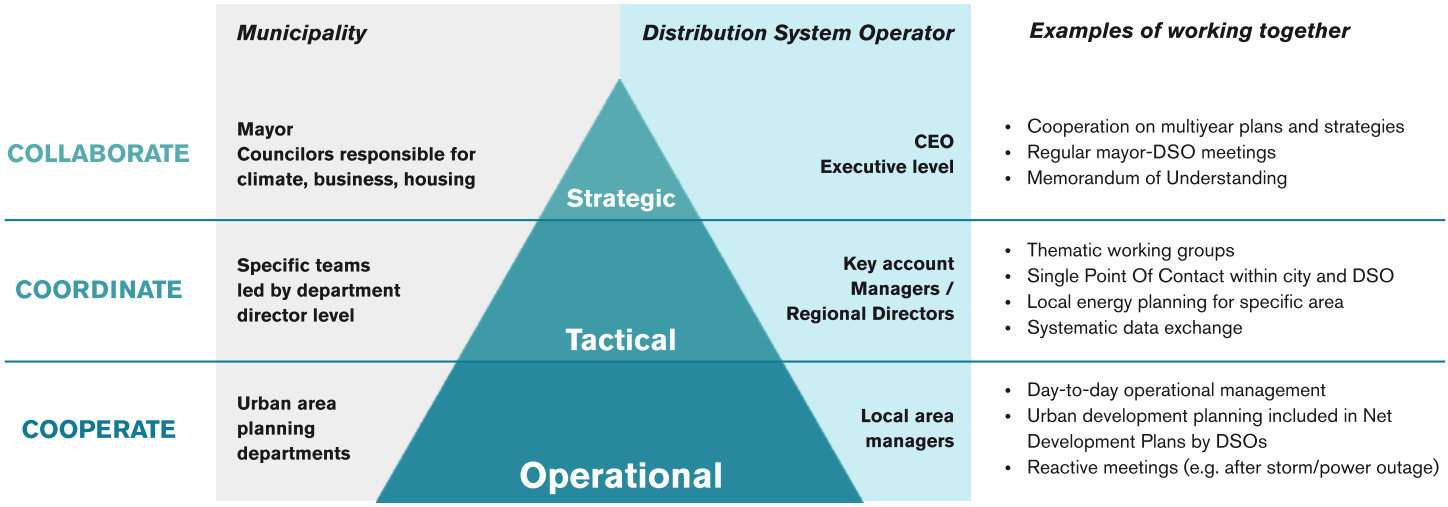

Figure 4: The levels of city-DSO interaction (Bax Innovation, 2025)

There are initiatives that manage to **combine the operational, the tactical and the strategic in a more institutionalised approach**. This happens among DSOs that serve many smaller communities or cities and thus wish to standardise processes as their counterparts often have limited capacity for programmes development. It also occurs in larger cities with a strong energy transition programme that needs deep engagement with the DSO to deliver on those ambitions. In some countries, those approaches are further standardised and aligned across municipal or DSO sectors to create best practices.

The Spanish DSO i-DE (Iberdrola group) launched a "Smart Cities" programme to formalise its collaboration with municipalities. The program involves a "signed agreement with the city to jointly develop actions", creating a structured framework for cooperation. Beyond identifying efficiency opportunities, the programme is future-oriented, for example, by identifying new locations of EV charging points, for which there is no legal requirement for cities. This proactive approach helps to bridge regulatory gaps and prevent future grid issues.

"As the city-owned DSO, we work closely to make sure the right businesses go in the right areas where we have capacity, to ensure we have a resilient energy system in Varberg."

Head of Marketing, Varberg Energi

The city of Amsterdam's regional energy strategy focuses on a structural transformation of its energy system away from fossil fuels. It is seen as a front-runner, leveraging its local governance and partnerships to develop and implement an ambitious, integrated strategy. The city's planners work directly with the DSO Liander (Alliander) to align urban development plans with the DSO's grid expansion projects. For example, the city will need dozens of new substations by 2050 to meet demand, requiring the municipality to set aside land for this critical infrastructure, all of which is addressed within the regional energy strategy.

In the United Kingdom, the national government initiated the Energy Systems Catapult which has created a streamlined approach to accelerate the country's local energy transition. Their "Local Area Energy Plans (LAEP) provides a common methodology and toolkit for local stakeholders to design joint plans. The platform aims to upskilling staff, share knowledge on relevant technologies and disseminates innovative local practices at national level. LAEPs have been developed in major urban areas, including London and Manchester and are addressing "coordination" between cities and DSOs.

In the Netherlands, the national government has initiated the creation of Regional Energy Strategies (RES) In 30 "energy regions", local stakeholders link energy demand and generation with the spatial allocation of renewable energy. The RES stakeholders identify suitable locations for wind and solar farms, considering landscape integration, environmental concerns, and public support.

DSOs are seen as essential partners in the development of the RES, assessing network capacity and plan necessary upgrades. This makes the RES an "experimentalist" and adaptive instrument. The collective of Dutch DSOs "Netbeheer Nederland", in turn, facilitates the process of local energy planning by providing standardised guidance and informal capacity building aimed at local authorities on grid operations, and translation to urban planning and financial needs.

European-funded projects with international consortia are also piloting innovative methods for city-DSO collaboration. The Interreg North Sea funded COPPER project, which E.DSO is a partner in, developed the method of **Local Energy Action Planning** (LEAP) for cross-sector strategic energy planning to identify and decide on a set of priority actions and investments for clean, flexible, and digital energy systems. LEAPs are developed by relevant city departments and key stakeholders, in particular DSOs. The result of LEAPs is a dynamic strategy for energy system planning that incorporates the needs of all sectors (e.g. mobility, housing, industry) and addresses various other subject matters of the energy transition, such as enabling skilled workers or getting political buy-in from national and international governing bodies on strategies. Since cities and DSOs are natural partners in shaping the local energy system of the future, the LEAP is complemented by the **city-grid interface**, which focusses on the **relationship between the LEAP and the grid** (see figure 5) and is explained further in the following chapter.

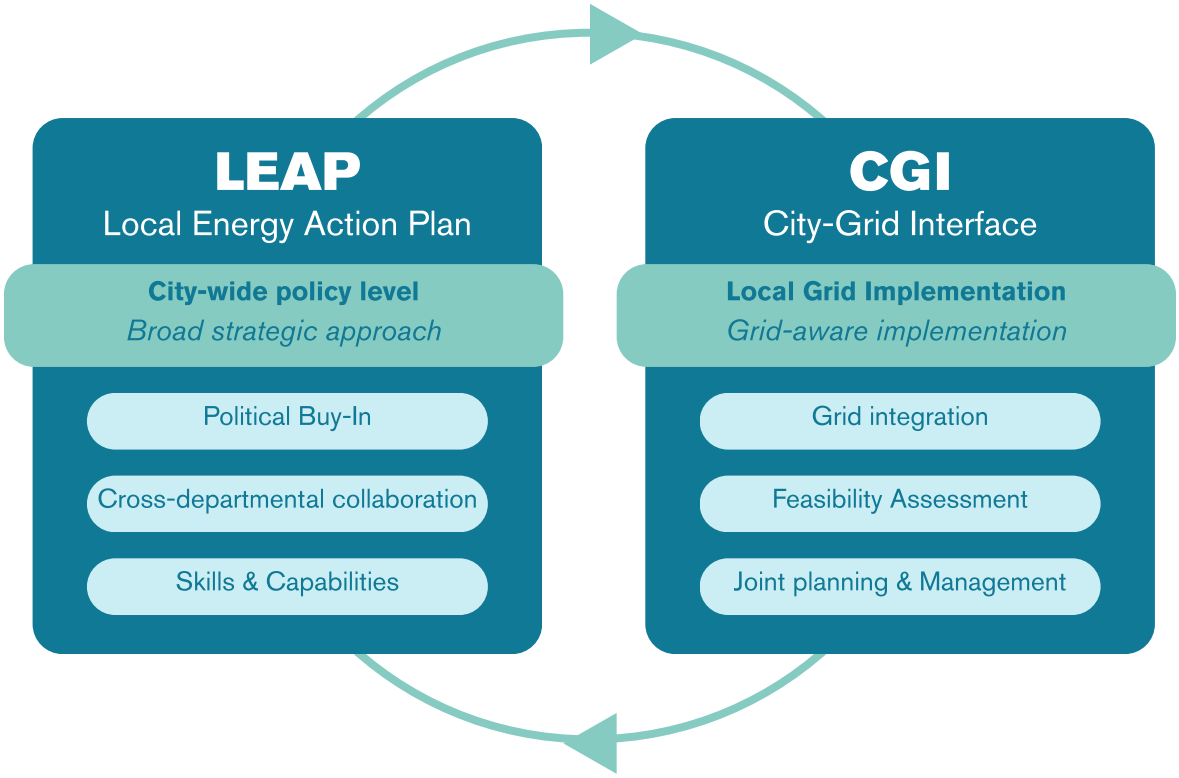

Figure 5: LEAPs and CGIs as complementary tools for the local energy transition.

7. The city-grid interface: a way forward in city-DSO cooperation

Consolidating learnings from case studies, a new approach emerges: the city-grid interface (CGI). This approach represents a structured, versatile and dynamic framework through which municipalities and DSOs can jointly plan and coordinate the development of the local energy system.

The city-grid interface is a core component of the LEAP and it focuses on the relationship between the LEAP and the grid, providing a structured framework to translate city ambitions into implementable actions that consider the needs and capacity of the grid. LEAPs define the local energy transition from a policy perspective, while the CGI translates these policy ambitions into concrete actions that can be implemented within the local grid.

CGIs are developed to inform and ensure the adequacy of both LEAPs and DSO's planning structures.

The CGI is a part of the approach of local energy action planning which is emerging as a novel tool for strategic planning of the local energy system. Moreover, LEAPs and CGIs have the potential to add value to existing SECAPs; the framework used by the Covenant of Mayors initiative with over 11,000 cities across Europe, by focussing on the local energy system transformation and specifically the role of the grid.

a) Purpose

Fundamentally, a CGI is a commitment that formalises the relationship between a city and a DSO on long-term local energy system planning. It transforms ad-hoc interactions into a structured, ongoing process with clear joint goals and responsibilities.

In Finland, the DSO Caruna and the City of Espoo established a Memorandum of Understanding (MOU) to formalise their collaboration and information exchange. This agreement was pivotal in transforming their relationship. Before, there was mutual friction over project delays. Now, "there's no blaming, not at all, because information flows freely and both organisations are committed to working together towards common goals".

The purpose is to enable strategic coordination, ensuring coherence between urban development and infrastructure provision while providing a structured forum to align project timelines, permitting procedures, and infrastructure works, reducing duplication and inefficiencies. Moreover, it introduces mechanisms for regular review and adaptation, allowing both parties to assess progress and adjust priorities as the electoral cycles and local energy context evolves.

b) Scope

A CGI can cover the whole territory of a municipality or a specific area which needs dedicated attention. Due to the adjustable nature of CGIs, they can be used in urban areas of various sizes, from smaller towns to metropolises. Yet, since the challenges of the energy transition are of greater scale in densely populated areas, that is also where CGIs have the greatest impact.

"For us, it started with meetings between the mayor and our CEO, at least twice a year, exchanging information on where we are, what's happening and long-term plans"

EVP for Customers and New Ventures, Caruna

c) Governance

Strategic-level buy-in ensures that what might start as a temporary and area specific project evolves into a standard way of working. The Caruna representative noted that their collaboration started with a project on meeting city climate targets, but after the project's end it has become process-oriented, embedded into the ongoing operations of both organisations. Ultimately, a CGI serves as the essential "coordination tool" that enables all parties to work together effectively on the strategic, tactical and operational level

d) Process

Each CGI is tailored, as the goal is to ensure meeting local characteristics and needs, with local stakeholders owning the process and jointly designing the outcome. To ensure progress of the development of CGIs, main stages include stakeholder representation, goal setting, option modelling, scenario refinement, prioritisation and decision making. Figure 6 exemplifies the process of creating a local area energy plan, which is common in the UK.

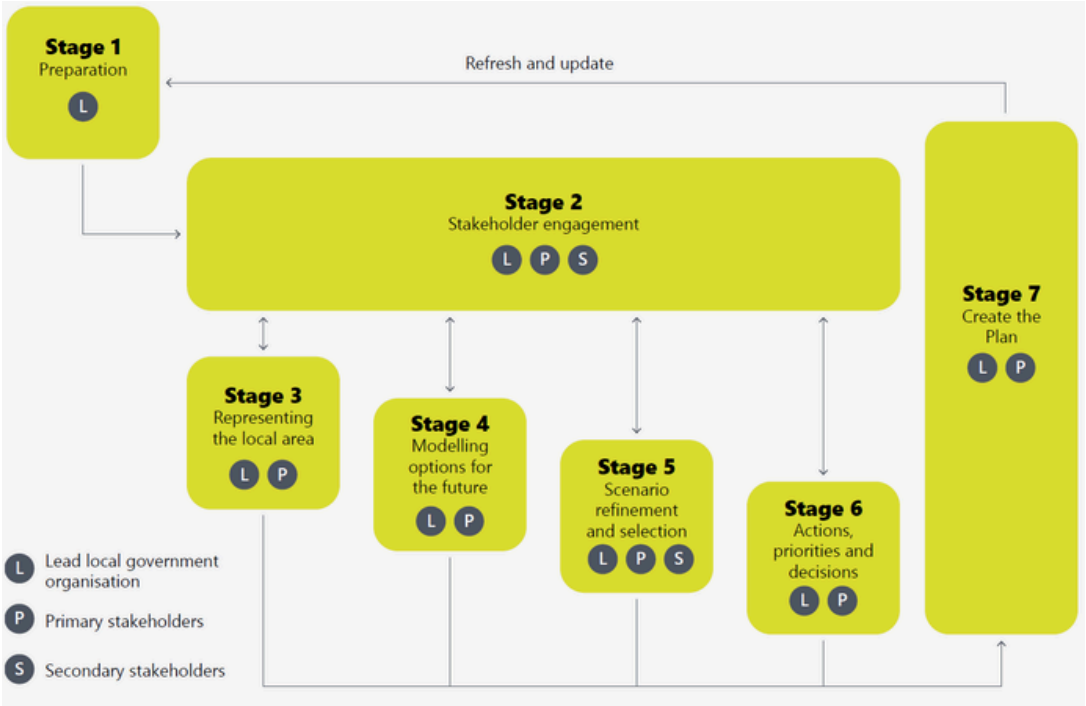

Figure 6: Seven Stages of local area energy planning (Catapult, 2023)

"We service 60 different municipalities. Some are larger with more internal expertise and capacity, others are smaller. Each has different internal decision-making processes; there is no one-size fits all. The size of the municipality as a customer also impacts the resources we can put into the planning process."

Head of Infrastructure Customer Unit, ESO

"Universal or harmonised approaches do not work well, because there are so many local specificities in this kind of work. Working with the local authorities on their future, we reviewed our investment plans for particular localities or regions."

Manager of Innovation, ČEZ Distribuce

A CGI should not be a static document that is only updated at multi-year intervals. Its primary value lies in establishing a dynamic, ongoing process of dialogue and decision-making that allows partners to adapt to a rapidly changing environment. While a foundational document is important, the regular meetings it facilitates are where the real work of alignment happens. In the Netherlands, the RES are revisited every two years.

e) Data and Monitoring

To be a living, dynamic framework, a CGI must be supported by digital tools and clear data-sharing protocols. These tools move the plan off the page and into the daily operations of both the city and the DSO, making information accessible, transparent, and actionable.

> "At the same time, the company supports municipalities, cities and energy initiatives by providing data for the creation of energy concepts and community formation and actively contributes to their awareness. Professional webinars and workshops are held for mayors and representatives of local governments."
>
> **Manager of Innovation, ČEZ Distribuce**

DSOs are already developing such tools, which could be integrated into the CGI process. i-DE described a project in a big city in Spain where they developed a "digital twin" of the low-voltage network. This consultancy tool allows them to work with the city to optimise the placement of new loads like EV chargers to minimise the need for costly reinforcements. ČEZ Distribuce provides a "special app only for municipalities" to report outages and view planned construction, creating a smooth and direct channel of communication.

8. How CGIs address challenges in city-DSO collaboration

As presented in Chapter 4, there are significant challenges that exist when cities and DSOs attempt at working together. CGIs address these challenges and propose streamlined solutions. Figure 7 summarises the value of CGI creation for jointly addressing the local energy transition.

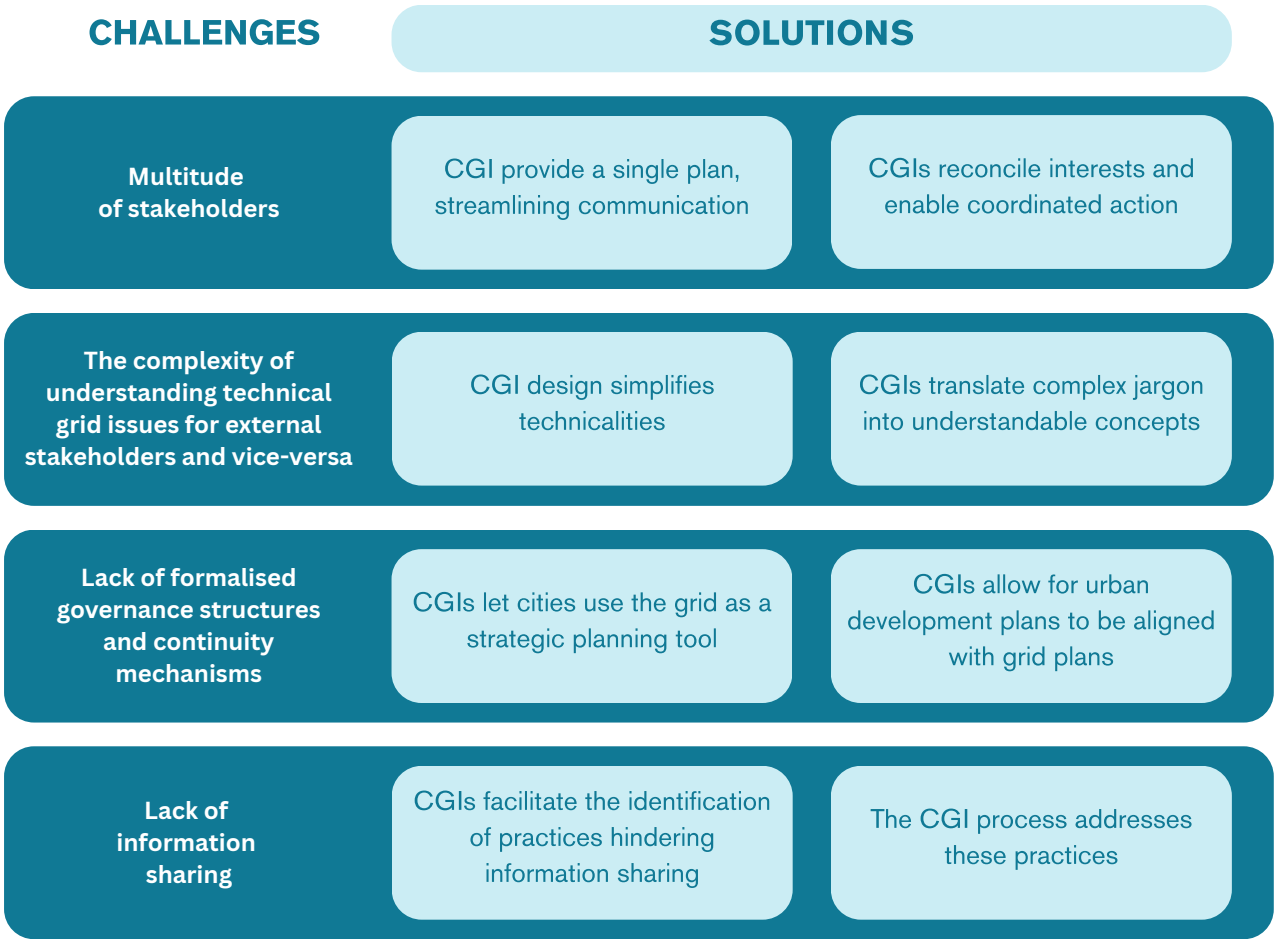

Figure 7: Challenges of city and DSO collaboration and how CGIs address them

9. Policy recommendations for scalability and replication of CGIs

As the energy transition accelerates, CGIs represent a promising governance innovation to operationalise the principle of local-level co-planning. They move city–DSO collaboration beyond individual projects toward a continuous and institutionalised partnership capable of steering systemic change. At the moment, the CGI model remains an emerging practice, but it has strong potential for replication across European contexts where similar fragmentation challenges exist. However, successful implementation requires several enabling conditions:

a) Clear legal and regulatory support for the co-planning of infrastructure

First, it is important to note that the goal of CGIs is to make the collaboration between municipalities and DSOs more efficient and predictable than the current ad-hoc approach. Thus, a CGI should not create additional burdens or administrative layers but aim to minimise them.

However, current practices leave limited space for structured coordination between DSOs and municipalities, since they are based on a time where cities and DSOs did not need to strategically cooperate. As a result, local energy system planning remains fragmented and dependent on informal relationships rather than embedded governance mechanisms.

To address this gap, the stakeholders involved in the CGIs should work with regulators to identify mechanisms that enable DSO–municipality cooperation within the regulated framework allowing DSOs to efficiently integrate CGIs and local planning insights into their investment and operational processes without additional obligations.

For municipalities, regulatory frameworks should encourage proactive cooperation with DSOs and support the establishment of local energy coordination units within city administrations. These units would take the lead in Local Energy Action Planning, serving as the primary counterpart to the DSO in the development and implementation of the CGI, and consolidating responsibilities across energy, mobility, and other relevant municipal departments.

b) Build institutional, human and technical capacity

Scaling CGIs requires strengthening the institutional, human and technical capacity of both municipalities and DSOs. Smaller cities often lack technical expertise, while DSOs may have limited understanding of municipal governance. Capacity-building measures should therefore include training programs, joint workshops, and exchange networks for city and DSO staff. And funding for dedicated roles or joint working groups in both organisations. Also, it is important to ensure an IT/OT alignment between the infrastructures used within DSOs and municipalities to allow seamless data exchange and information sharing.

c) Create standardised frameworks and guidance for CGI development

The success of CGIs lies on their flexibility and adaptability to local infrastructures and planning traditions. To facilitate replication, national governments and energy agencies should provide methodological guidance and standardised templates for establishing CGIs. While each plan must be context-specific, common elements such as governance structures, and stakeholder engagement procedures can streamline implementation. Developing toolkits or model agreements similar to the Memorandum of Understanding used in Finland, would lower the administrative burden for new partnerships and encourage diffusion.

10. Conclusion

The European energy transition is a once in a century system change. The increasing electrification of transport and building services, coupled with complexities of upgrading aging physical infrastructure in a grid reaching every single street in Europe places immense stress on local distribution systems and the urban environment.

The collaboration between cities, as city management and orchestrators of the above-ground transition, and DSOs, as owners and operators of under-ground critical infrastructure, is a key success factor in delivering upon the energy transition.

The increasing need for collaboration between cities and DSOs is widely recognised. Harmonised planning processes will reduce the friction in the energy transition, while their lack will not just delay that transition; but will have significant economic and social impact on households in businesses.

The review of current aligned collaboration practices from frontrunner European DSOs and municipalities reveals that moving beyond ad-hoc, project-based interactions to structural and strategic alignment is essential for unlocking the following shared opportunities.

For the DSO	Maintaining high system performance, de-risking investment planning, partnering with city orchestrators to smoothen stakeholder needs and engagement across realistic timeframes and priorities, and smoother processes from permitting to delivering upon grid upgrades in cities.
For Cities	Visibility of critical urban infrastructure to create transition pathways across environmental, economic and social priorities; matching grid enhancements with priority projects and long-term planning and minimising economic and social costs of extensive works.

The emerging practice of the city-grid interface is a structured approach from cities and DSOs, where they recognise each other as strategic partners. The formalisation of a structured governance process, long-term aligned priorities and plan, and standardisation of data exchange and operational infrastructures will facilitate operations in sustained partnerships.

To accelerate development and replication of these promising models from across Europe, this report calls for clear policy action:

Regulatory Support: Adjusting energy and planning regulations to formally enable and incentivise co-planning between DSOs and municipalities, ensuring CGIs are integrated efficiently without creating unnecessary administrative burdens

Capacity Building: Investing in joint training programs and funding dedicated local energy coordination units to bridge the technical expertise gap between smaller municipalities and DSOs.

Standardisation: Developing standardised guidance, templates, and data-sharing protocols (like model MOUs or digital tools) to lower the barrier to entry for new city-DSO partnerships

CGIs offer a structured pathway to create successful cooperation between cities and DSOs, which are critical partnerships within Europe to ensure an energy transition that is economically viable, socially just and environmentally responsible. CGIs align with the European Union's priorities of enhancing competitiveness and security of the energy sector, making them an impactful tool which cities and DSOs can use to jointly establish strong leadership of the local energy transition.

Keep updated on CGIs:

E.DSO will continue to develop the LEAP concept through its participation in the European innovation project COPPER.

Contact Laia Guitart (l.guitart@edsoforsmartgrids.eu) to learn more about CGIs.

The writing and graphic design of this white paper was supported by Anso Kneip, Rolf Bastiaanssen and Mathis Fay from Bax Innovation.

Bax Innovation is a boutique innovation consultancy trusted by private and public organisations in over 25 countries to deliver multi-stakeholder initiatives from supporting battery manufacturers in creating circular, recyclable batteries, to helping municipalities, SMEs, and business support organisations pilot energy action planning in their local economy.

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Strengthening city-DSO cooperation for the local energy transition

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