Work Package 2:
'Specifying a Transformation Agenda'

January 20, 2015

Key Consideration 3
'Smart Grids and Enabling Infrastructures'

In the Work Package 2 of the TRANSFORM project, cities' governments have to produce a Transformation Agenda which will describe their path toward a Smart Energy City.

The main objective of the KC working groups is to provide cities with insights regarding some challenges they wish to address in their Transformation Agenda. Through the KC working groups, cities will share together and with industrials partners, their experiences, difficulties and successes regarding the KC topics.

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Content Table

Key Consideration 3: 'Smart Grids and Enabling Infrastructures'

1- KC3 partners

Cities : Grand Lyon (France) , Copenhagen (Denmark)

Utilities : ERDF (France, Electricity), ENEL (Italy, Electricity), HOFOR (Denmark, Heating, Cooling and Gas), HAMBURG ENERGIE (Germany)

Industrials : Siemens (Austria, Vienne)

2- KC3 partners' preoccupations

Details in annex 1

There are four main categories of expectations from the group members:

- Economical expectations: Members wanted to work on business models for data collection and sharing, looking at the cost benefit analysis of Smart Grids and at new services for consumers.
- Political expectations: Members wished to investigate the role and interactions between different stakeholders, find synergies between the energy networks and get insights of the municipalities' visions of Smart Grids.
- Technological expectations: Members wanted to look at Smart Grid infrastructures development and valorisation.
- Legislation expectations: In all countries individual data are owned by the customers and cannot be published without their consents. Hence, members wanted to explore ways of providing a data service without breaking any confidentiality regulation.

These expectations are different according to the partners:

- For the cities: How to put together all the data collection provided by all the utilities? How to coordinate the utilities? How to find an efficient business model for sharing data?
- For the utilities: How to assure the security, the quality of supply, the respect of legal obligations and confidentiality of the data? How to fund this collection?
- For the industrials: How to develop business with benefits for consumers?

3- KC3 partners' current situation

Details in annex 2

The energy sector is organised differently in the five represented cities of the group (both at the local and national scale). They also have different regulations. Most of the members were not aware of the other cities' energy

organisation, which made communication more difficult. As the KC3 working group aimed at providing advises to the cities, it was necessary that all members understood each other's situation.

Therefore, the first task of the group was to make an exhaustive panorama of the represented cities' energy sectors and Smart Grids.

Cities energy market organisation:

In all cities, the **production** and **supply** of electricity are liberalised activities – a consequence of an EU regulation. The situation is slightly different for Gas which is not liberalised everywhere. For example in Copenhagen HOFOR has a monopoly in gas supply. Finally in most cases there is a monopoly for district heating and cooling production and supply.

The energy **transport sector** (electricity or gas) is almost similar in all represented countries as this activity is a natural monopoly (however in Germany and Austria, several Transmission Operators co-exist but in different parts of the countries).

There is however an important diversity in the **energy distribution** sector:

- Mono/multi energy DSO: In some cities, such as Lyon and Genoa, there is a specific DSO per energy (electricity, gas, and district heating and cooling) while in other cities, the same company can be DSO for several energies. In Vienna for example Wiener Netze is DSO for all energy. In Copenhagen, HOFOR is DSO for gas, district heating and district cooling.
- Size of the DSO: The size of the DSOs differ from one city to another. Some companies are the DSO for almost all of their country (ENEL 90% of Italy, ERDF 95% of France), while most of the other DSOs are local companies. This difference is very important in understanding the way the other cities work. Indeed a national scale DSO needs to optimise its investment at the national scale.
- Ownership of the DSO: Some DSOs are fully owned by the city (HOFOR or Hamburg Stromnetz GmbH for example), some are fully private companies (DONG Energy, Copenhagen electricity DSO) and some are owned by the national government.
- Ownership of the grids: In some cases the energy grids are owned by the municipality and the DSOs only have a concession contract (Lyon or Hamburg for example) in the other cities, grids are directly owned by the DSOs.

Smart Grids and urban planning in the cities:

The cities are in different stages of Smart Meter implementation. In Genoa all customers already have a Smart Meter and ENEL Distibuzione is able to monitor in real time the quality of the electricity supply. Lyon is also quite ahead regarding Smart Meter implementation as it was the experimentation area and 180 000 Linky Smart Meters have been installed. The installation of Linky to the rest of France will start in 2015. In the other cities, Smart Meter

implementation is being planned and should start in the following years (except maybe in Germany where many issues still need to be solved before a large scale implementation of Smart Meters).

In terms of integrating energy consideration in urban planning development, the cities do not have the same types of legislative frameworks. For example in Denmark, the "Heat Supply Act" from 1979 and the "Heat Plan Copenhagen" from 1984 make it compulsory for customers to connect to the heat network. As a result of these plans, district heat is the only energy used for heating in Denmark. In other countries, there is a competition between the types of energy and the municipality cannot impose a choice to the developers.

4- Smart grids shared definition

The International Energy Agency (IEA) has made one of the most inclusive definition of Smart Grids:

"A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Smart grids coordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability."

This definition only deals with electrical grids, however the working group considers that at city level, other energies play a role in creating flexibility for the electrical grid. Therefore, the KC3 working group will use the IEA definition, but adapt it to include other energy grids.

5- KC3's partners recommendations

The energy panorama reveals that:

- Cities and DSO's do not collaborate at the beginning of the reflexion of the urban development project.
- Cities do not always understand issues concerning data collection especially regarding security, quality of supply, legal obligations and confidentiality.

There is also a lack of collaboration between the cities and the DSOs regarding energy planning.

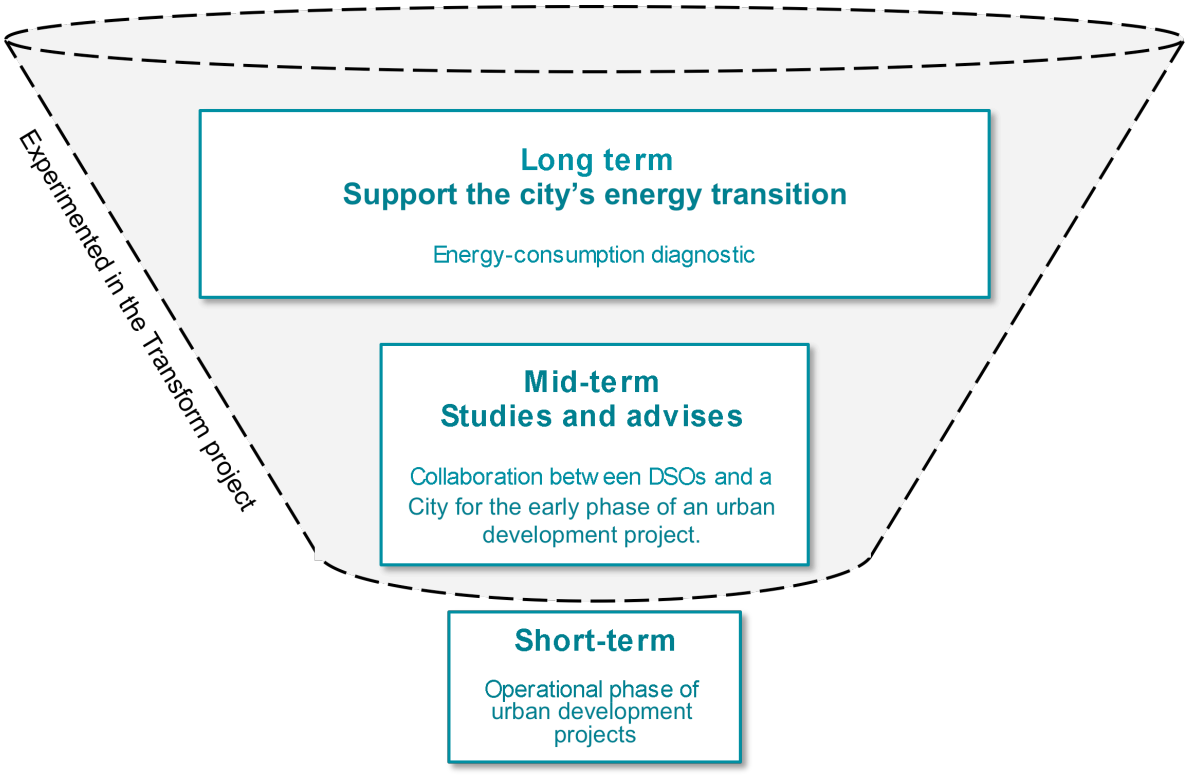
The question of data was cited as an important issue by many members of the group during the cities' energy panorama and during group discussions. Yet no one really specified what types of data they were talking about and for what usage.

So the principal recommendation for Europe is:

Urban planning's actors and energy utilities have to collaborate from the very beginning of urban development projects in order to build the smartest project possible.
The data exchanges need to be organised.

This question has been investigated with the KC3 partners and in a local working group between ERDF and Grand Lyon. Three levels of collaboration between a DSO and the city – for which data exchanges are needed – were identified:

- A long-term collaboration aiming at supporting the city's energy transition by providing an energy diagnostic of the city.
- Mid-term collaboration during the early phase of an urban development project. This collaboration can take the form of studies and advises from the DSO.
- Short-term collaboration aiming at optimising the operational phase of an urban development project. This subject was not investigated in the KC3 working group as it is very operational and out of the scope of the Transformation Agendas.



5.1 - DSOs could support the city's energy transition

DSOs and cities can collaborate in order to support the city's energy transition by providing energy consumption diagnostic of the city. This diagnostic can highlight priority areas for energy saving and fuel poverty actions as well as serve as an indicator of the overall energy performance of a city.

Input data needed to do the diagnostic (furnished by the city):

- Geographical delimitation of the study area
- Existing buildings' addresses and their associated aggregation block

Potential output data from the DSOs:

- Aggregated energy consumption of an area. (Possible options if available : correction of the data to consider the climate impact on consumption and/or separation of the data by activities or usages)
- Aggregated energy production of an area. (Possible separation by type of production)
- Fuel poverty indicator if available.

A proposition of Business Use Case describing this process of collaboration can be found in annex 3 of this document.

5.2 - But there are some barriers to this collaboration

This energy diagnostic requires the DSO to share energy consumption data with the city municipality. Yet there are some important barriers the DSO needs to overcome in order to share these data:

- **Institutional** – Caused by the internal organisation.
- **Economic** – Related to the economic consequences of making data open. Such as the loss of income and cost of the data collection and processing.
- **Legislation** – Caused by country legislations preventing data publication such as data confidentiality regulation.
- **Information quality** – Caused by the quality of the data (lack of certain data or the data is not structured enough).
- **Technical** – such as lack of standards, the lack of proper software or hardware.

Each of these barriers have to be overcome in order to make the energy consumption diagnostic. The way DSOs overcome these barriers depends on their internal organisation. The Business Use Case in annex 3 explains how to tackle the legislation barriers regarding confidentiality of the data. This issue is present in all countries and can be dealt with by aggregating the data. The other types of barriers are much more specific to each DSO situation and therefore are not dealt with in this Business Use Case.

This Business Use Case should therefore be modified to take into consideration the specific situation of the DSO regarding the previous barriers. It should also clearly answer the following questions:

- Who pays for the cost of the data gathering?
- What is the level of control on the use and broadcasting of the data?

5.3- Studies and advises during the early phase of an urban development project to enable smart grids development

Another subject for which collaboration between the city and the DSOs is important concerns the early phase of an urban development project. This cooperation could benefit both the City and the DSO by getting a vision of the future energetic situation of an area. This can help to improve network planning and assess the most interesting evolution scenarios for the area integrating smart grids solutions. Indeed the cities need smart grids solutions for different reasons:

- Monitor diffuse energy production
- Increase the flexibility of the grid in order to:
    - Reduce energy consumption at peak periods
    - Insure the stability of the grid while integrating large amount of RES.
- Reduce the need for new infrastructures
- Optimize electrical network operation and decrease loss
- Improve network planning and management methods
- Improve municipal energy planning
- Optimize investments of networks
- Enable new added value services for the end users as Electric Mobility
- Match local with global network optimizations
- Sensitize users on reducing their overall consumption

This topic has been identified by Grand Lyon as an important subject to include in their Transformation Agenda. It will therefore be developed in the local working group Grand Lyon – ERDF in Part C of Grand Lyon Transformation Agenda.

Annexes

Annexe 1: KC3 Group member's expectations and contribution

Annexe 2: Panorama of the cities' energy sector.

Annexe 3: Business Use Case - Energy-consumption diagnostic - In order to support the city's energy-transition

Annex 1: KC3 Group members' expectations and contribution

KC3 Member	Expectations for the working group	Potential contributions to the working group
Grand Lyon	▪ Compare the challenges for each cities regarding the development of SG ▪ Clarify the role and position of cities in SG development	▪ First experience results concerning the TRANSFORM Urban lab in Lyon ▪ Experience of other SG projects in Lyon (5 in total)
City of Copenhagen	▪ Ways to create more collaboration between actors (especially utilities) ▪ Find new and efficient business model for SG concerning: ○ Sharing data ○ Extract value from data	▪ Knowledge of the Nordhavn project (up-start phase) dealing with data collection and infrastructures ▪ Knowledge from an ongoing competition aiming to develop a business model and open platform for data exchange ▪ Familiarity with Demand-Response Models
HOFOR	▪ Ways to create more collaboration between actors (especially utilities) ▪ Find new and efficient business model for SG concerning: ○ Sharing data ○ Extract value from data	▪ Develop concepts on how district heating can support system reliability in the electricity sector ▪ Share experiences on data management and advanced modelling
ERDF	▪ Develop a new vision for urban development process that would lead to a Smart Grid city ▪ Reinforce the neutral market enabler role as a facilitator for demand-response models development	▪ Deep knowledge of distribution networks ▪ Experience of Smart Grid projects in France ▪ First experience results concerning the TRANSFORM Urban lab in Lyon
ENEL	▪ Identify and assess the main challenges for the urban infrastructures development ▪ Cost-benefits analysis of smart grids measures	▪ Deep knowledge on smart grids development in urban area ▪ To identify the key (socio-economic-Environmental) indicators and define a model do assess their impact
HAMBURG ENERGIE	▪ Investigate: ○ New ways to create benefits for consumers ○ Potentials of Hybrid-SGs and of coupling solutions with other data/information ○ Increase in value of existing infrastructure	▪ Research activity: smartpowerhamburg.de ▪ Understanding of the German energy value chain ▪ Experience in data-handling and processing
Siemens	▪ Getting understanding of the consumer requirements ▪ Focus on the technical solutions	▪ Experience in : ○ Smart low voltage grid ○ Smart buildings ○ Interaction between building and grid ○ Data integration and deployment for different applications ○ Work on Aspern, a Smart Urban Lab in Vienna

Annex 2: Panorama of the cities' energy sector.

France - Lyon (by Grand Lyon and ERDF)

Description of the country's energy sector	
Producers	The energy generation sector has been liberalized.
Transport	RTE is the electricity Transmission System Operator (TSO) of France. RTE is in a monopolistic situation.
Distribution	ERDF manages **95% of the electricity distribution network in continental France**. The remaining 5% is distributed by Local Distribution Companies. This network belongs to local authorities (French municipalities or groups of municipalities), who subcontract to ERDF as an operator through a public service delegation. ERDF thus has 2 major public service duties: - **Service continuity and quality**: managing nearly 1.3 million km of electric lines, ERDF is responsible for continuous public electricity service. To fulfil this role, the company operates, maintains and develops the network. ERDF also invests in modernising and securing the network, particularly against extreme weather conditions. - **Non-discriminatory access to the distribution network**: in compliance with regulations, ERDF ensures that users have transparent, objective and non-discriminatory access to the network. The company also guarantees the confidentiality of commercially sensitive information handled, having developed **a code of conduct** for this specific purpose. Adherence to this code is examined in an annual report submitted to the Commission de Régulation de l'Energie, France's regulatory authority on energy. ERDF employs 38,211 people and operates 618,000 km of low voltage lines, 697,000 km of high voltage lines and 35 million delivery points in metropolitan France. ERDF serves approximately 34,000 of the 36,500 towns in France. At the request of its customers or suppliers, ERDF provides a certain number of services. - **Connection**. ERDF handles the physical connection of a facility or site to the distribution network under technical and financial conditions set by regulations and contracts. The connection service includes: extension of the grid, if needed, building of the connection line for the facility. - **Commissioning**. After completing a connection project, ERDF ensures commissioning of the facility's power installations at the request of the electricity supplier chosen by the customer. - **Repair**. ERDF handles repairs on the network at all times. A dedicated hotline is available to customers 24 hours a day, 7 days a week. - **Meter reading**. ERDF handles meter readings as well as the inspection, maintenance and replacement of meter materials. - **Change of supplier**. Every customer is free to choose their electricity supplier. The process is handled by the new supplier, who then contacts ERDF. - **Contract termination**. ERDF ceases the provision of electricity to customers who terminate their contracts, whether for a change of residence or at the request of the electricity supplier. - **Additional services**. ERDF performs additional services, such as changing

	meter options due to contract changes (change in power...), verifying meter readings and protective equipment, or moving materials and installations.
Supply	The energy supply market has been liberalized. Yet more than 80% of end residential users are still using EDF, the historical electricity supplier.
Regulation	The energy sector is heavily regulated in France by the CRE (Energy Regulation Commission). The CRE controls all aspect of the relations between energy actors (producers, TSO, DSO and suppliers). The CRE is responsible for proposing tariff's evolution to government.
Cities' electrical grid	
Who owns the grid?	The electrical grid is owned by the cities. As owners of the grids, cities are empowered to administrate the distribution grid which is operated by the DSO, this is the case of Lyon city. However in the Grand Lyon area (57 cities around Lyon + Lyon) the cities delegate the power of administration to 2 Energy Union (Syder and Sigerly), which are in charge of the contractual relation with the DSO. The Grand Lyon institution has only legal competences on urban planning. From the 1st January 2015 these competences will be enlarged to the distribution grids administration, meanwhile is not clear is Grand Lyon will practice directly these new competences or if there will be still executed by the Energy Unions.
Who is the DSO?	The DSO in Lyon region is ERDF
Description of the DSO (Age and size of the company? Who owns of the DSO? Is it regulated and if yes how? Is there any specificity about the company? Does the city has smart meter and how many? What is the current use of the smart meters (for the DSO, for the customer, for the city)?	ERDF is the main DSO of France and distribute electricity for over 35 million households. ERDF is fully owned by the EDF Group which is 84% owned by France. ERDF has public service contract with the States and municipalities. ERDF and local authorities in charge of the network administration work together to decide the conditions of the concession's contract. Every year, ERDF provides transparent reports on its business to the local authorities. The company also provides each authority with a concession activity report (CRAC). This document outlines the events that occurred during the year, as well as the property and financial information regarding electricity distribution. However the institution which is in charge of the urban planning has actually no such detailed information on quality of distribution, energy consumption data, grid investment plan and does not intervene on investments choice. **Smart meter "Linky"** has been deployed in some areas of Grand Lyon (180000 smart meters). Smart meter in France is bi directional technology. It is able to drive tariffs, peak signals, flexibility, end-to-end services like home displayed. It enables the collection of Electricity Data. Linky has been designed as an "infrastructure" that should benefit every user on the electricity network.

	End-consumers will: - have easy access to information about their actual consumption, and be able to manage it better, - receive bills based on their actual consumption. **Electricity suppliers will:** - be able to determine the length of their billing periods, based on actual consumption, - be able to diversify their price offering and adapt it more closely to their customers' needs. **Electricity producers will:** - have better visibility on periods when they have produced electricity, - be able to use simplified electrical equipment, given that Linky allows the metering of both their production and their consumption. **Network managers will:** - follow up electricity supply quality in real time, - reduce intervention time during outages, - carry out remote operations (connections, power adjustments, etc.), - develop services to allow sustainable use of electricity for all people in France. **Local authorities will:** - have better visibility about the network reinforcement work to be carried out, - have a better visibility on consumption data to monitor their local energy policies and coordinate them with the sectorial policies (eg. Electrical mobility, economical development by ensuring attractively by ensuring high quality of energy supply). - be informed about the quality of supply. These benefits will be implemented gradually, enabling information systems, commercial offers and market regulations to be adapted to Linky accordingly.
Smart Grids and Urban Planning in the city	
Process of energy planning regarding new connections to the grid process for renovation of urban areas flexibility for dimensioning network	ERDF contributes to the smooth operation of the electricity market by pursuing a twofold objective of quality and neutrality. The quality of ERDF's electricity supply is among the highest in Europe. To preserve this level of service, ERDF maintains and develops the network. The company also innovates to meet the needs of customers, electricity producers and electricity suppliers, particularly in the areas of information systems and metering. ERDF contributes to the smooth operation of the open electricity market by guaranteeing non-discrimination against other parties in the network. Service continuity and quality primarily depend on the electricity network's performance. For this reason, **ERDF is committed to renewing and developing the network**. In 2011, System Average Interruption Duration Index (SAIDI) for low-voltage customers was 73 minutes. To improve supply quality and to adapt the public distribution network to new

	uses, ERDF committed to a major 10-year investment plan beginning in 2006. In 2011, the company dedicated almost €1 003 million to improving the quality of service and the safety of the network Security of the electricity network . These investments were again increased They were made possible by the increase in the TURPE, the public network usage tariff. The primary investments are those in maintenance of performance and network security, as well as major incident management. Within the context of opening markets to competition, electricity transmission and public connection to the distribution network are public service duties. The tariff paid by network users is therefore regulated by public authorities. The TURPE (Tarif d'Utilisation des Réseaux Publics d'Électricité) today ensures 90% of ERDF's revenue. It has recently been updated (TURPE 4), and allows ERDF to finance its business and to ensure that its network maintenance and modernisation duties are fulfilled. The TURPE was proposed by the Commission de Régulation de l'Énergie (CRE) and approved by ministerial decision. The determination and application of the tariff depends on 4 basic principles. - **Uniform Tariff on the national territory:** the price is the same throughout the whole country, in accordance with the notion of territorial solidarity described in the law of February 10, 2000. - **The "postage stamp" principle**: the price does not take into account the distance covered by the energy between the production site and the consumer site (individual solidarity). - **Tariff:** function of capacity subscribed and energy withdrawn.. - **Seasonal metering:** some versions of the tariff vary rates according to seasons, days of the week and/or hours of the day. Grand Lyon **is not** co builder of this Master Plan (the energy competence belongs to City of Lyon and other municipalities of Grand Lyon area have delegated the competence to a third party, the "Sigerly"). Beside that, Grand Lyon has the urban planning competence on urban planning and test within smart grids experimental project the integration of energy component in the urban planning (eg. Lyon Smart Community). The most important of network development is based on safety supply of part of the city of Lyon which which needs to develop a new primary substation and development of smart meters in Grand Lyon and in France.
Current situation regarding Smart Grids in the city (SG experiments on the city area. Are they linked with planning?)	There are currently six experimental Smart Grids projects in Lyon : - Linky (smart meters) - Greenlys - Lyon Smart community - Smart Electric Lyon - Watt et Moi - Move in pure
Actors involved in the developing Smart Grid and Smart process in your city? Level of implication	**Strong implication players:** - French government through the Agency of Environment and Energy (ADEME)

(Low, Average, Strong)?	- Electrical network management - Energy suppliers - Technological solution suppliers - Consumer association - Institutional funders **Average implication players:** - Gas network management - Developers **Implication to grow:** - Decentralized energy producers - Flexibility aggregators **Other players:** - Consumers - Research institutes - Competitiveness centre
Does your city have any specific policies promoting Smart Grids?	PCET SCOT Partnership with NEDO, EDF
What are the mains barriers to the development of SG in your city?	**Economical :** - Investments - Sustainability of business model : The framework for sharing benefits of delayed investment in grids is not well defined **Legal :** - Simplification of processes and laws : coordination between local energy policies and the global system must be put in place to avoid degrading the optimum of the whole system. **Governance:** - The flexibility economical framework is for some aspects defined at a national level, which reduces the local latitude on defining new roles and business models. - Not a clear role of each actor **Social** - Reluctance of end-users to smart metering and smart tools in general, that are perceived as surveillance - Uncertainty of achieved energy savings through direct power control and price signals. - Multiplication of interfaces between actors and technologies means more complexity
Do you see any opportunities that could help overcome these barriers?	**Governance and Legal :** - The legal and governance barrier can be reduced with the new coming low on energy transition and on decentralization project. The decentralization low will empower Grand Lyon on energy grid administration, which will allow having a more consistent smart grid development more on line with urban planning. The municipality will

	have a role of flexibility facilitator. This will also allow translating local climate and energy policies into practical realisations by influencing energy consumption and production, as well as prioritising choices. - The question of the clarification of the role of each actor still unsolved and will be directly related to the business opportunities for private actors. **Economical :** - Job opportunities, creation of new economical areas - Creation of a network of local partners with global competencies - Optimize the economical local energy balance (energy supply and consumption). - Improved knowledge of the territory may enable other benefits. - Encourages work culture sharing amongst different actors since land planner, municipality services, energy experts and DSOs (at minimum) will have to work in common. **Social** : - Improve trust and participation of end-users in smart grids and also the perception of smart metering. - Demonstrate the added value brought by smart grids on allowing to control energy consumption and at the end the increase in the electricity bill of consumers. **Technical :** - Encourage and boost standardization and interoperability of electrical devices. **Environmental :** - Improved knowledge of the territory may lead to identify inefficient use of energy. - Improved resilience by having control over part of the production and the consumption and decreasing energy consumption. - Identify zones where storage units make economical and environmental sense.

Denmark – Copenhagen (by the City of Copenhagen and HOFOR)

Description of the country's energy sector	
Producers	Generation of electricity, district heating and district cooling has been liberalized. Natural gas is a state-owned monopoly.
Transport	Electricity transmission is a national monopoly. District heating transmission in Greater Copenhagen is operated by two virtual monopolies (central Copenhagen and western Copenhagen).
Distribution	**Municipality of Copenhagen (equivalent situation in other cities):** - Electricity distribution: Physical grid owned and operated by monopoly (DONG Energy Distribution). - District heating distribution: Network owned and operated by HOFOR. - District cooling: Network owned and operated by HOFOR. - City gas grid: Network owned and operated by HOFOR and all gas sold by HOFOR.
Supply	- **Electricity:** All customers may purchase electricity from anyone. - **District heating:** All heat sold by HOFOR (monopoly). - **District cooling:** Commercial market, but so far HOFOR is the only supplier. - **City gas grid:** All gas sold by HOFOR.
Regulation	Commercial activities are regulated by the 'Danish Competition and Consumer Authority', while energy monopolies are regulated by the 'Danish Energy Regulatory Authority'.
Copenhagen's energy grids	
Who owns the grid?	**Electricity:** DONG Energy Distribution. **District heating, district cooling and city gas:** HOFOR.
Who is the DSO?	**Electricity:** A subsidiary of national energy company DONG Energy, distributing electricity and natural gas. However, no gas in the Municipality of Copenhagen. **District Heating and District Cooling and City Gas:** HOFOR which is owned by the Municipality of Copenhagen is the DSO for these energies.
Description of the DSO (Age and size of the company? Who owns of the DSO? Is it regulated and if yes how? Is there any specificity about the company? Does the city has smart meter and how many? What is the current use of the smart meters (for the DSO, for the customer, for the city)?	Electricity DSO is not participating in TRANSFORM. Therefore this text is about HOFOR. **HOFOR** (District Heating and District Cooling and City Gas DSO): Owned by the Municipality of Copenhagen. District Heating and City Gas regulated by the 'Danish Energy Regulatory Authority'. District Cooling is a commercial business. Smart meters : Cf. below.
Smart Grids and Urban Planning in the city	

Process of energy planning (regarding new connections to the grid, process for renovation of urban areas, flexibility for dimensioning network)	**Electricity :**
	- All buildings are connected.
	- Major effort in recent years to replace all overhead distribution lines by underground cables, including lines supplying street lights.
	
	District Heating
	- Established in mid-1920.
	- Following the 1970s energy crisis
	  ○ Comprehensive heat planning launched in Denmark
	  ○ Heat Supply Act from 1979: enabled municipalities to dedicate certain areas to district heating and make it mandatory for households to connect to district heating
	  ○ Very successful initiative in term of cost reduction for consumers, energy savings and imported oil dependence reduction
	  ○ Massive development of district heating and Combined Heat and Power in the Copenhagen metropolitan area in the 1980s
	  ○ Heat Plan Copenhagen (1984): obligation for consumers to connect to the heat network
	  ○ 98% of all heat demand is covered by district heating
	- Today, district heating network planning is done on a project-by-project basis (in reality only new development areas) with public hearings and approvals by the Municipality of Copenhagen.

Current situation regarding Smart Grids in the city (SG experiments on the city area. Are they linked with planning?)	**District heating**
	- Network operated by online real-time meters located at strategic points in the grid in order to continuously optimize the flow and temperatures of the system.
	- The utility has online remote readers in almost all buildings
	  ○ Heat consumption data may be collected on an hourly or even 5-minutes basis
	  ○ How to utilize all these data for energy savings and other purposes?
	- A major challenge is how to share data among stakeholders, on open platforms or otherwise.
	
	Electricity
	- The electricity DSO will be installing remote readers for all consumers during 2017-2020.
	
	Example of projects (running or being planned)
	- Optimized flow in traffic based on sensors
	- Parking app to reduce the time spent driving around to park
	- Open data portal with data sets from the City of Copenhagen (data.kk.dk)

Actors involved in the developing Smart Grid and Smart process in your city? Level of implication (Low, Average, Strong)?	- The energy utilities - The municipality - Private enterprises and universities A fairly large number of development projects are ongoing.
Does your city have any specific policies promoting Smart Grids?	No policy, but many projects.

What are the mains barriers to the development of SG in your city?	- No urgent need in the Danish energy system for ambitious development of SG or flexibility solutions.
	- The situation may change with increasing levels of RES in the energy mix and difficulties at matching the resultant more volatile energy production with 'uncontrolled' levels of energy consumption (that is, while pursuing an ambition to reduce peak load).
	
	What (how big) is the actual need for flexible energy consumption and SG solutions?
	When will the tipping point occur?
	Will decision-makers (private and public – energy suppliers, grid operators, City administration, national government…) have prepared for a change in time?
	
	Issues regarding data :
	- Data generated and owned by the utilities
	- Other stakeholders are interested in getting access to the data
	- Issues regarding data sharing :
	  ○ Privacy or commercial concerns for some data
	  ○ Cost of delivering data (e.g. creation of common data platform)
	  ○ These costs cannot be covered through consumer tariffs
	- A scheme for the payment of data needs be developed.

Do you see any opportunities that could help overcome these barriers?	Develop a particular business model, e.g. set up a separate data management company, possibly owned by our holding company.

Italy – Genoa (by ENEL)

Description of the country's energy sector	
Producers	The electricity generation is a Liberalized activity. **Main Players operating in the domestic electricity generation for the year 2010:** - Gruppo Enel (27,8%)[1] - Gruppo Edison (10,7%) - Gruppo Eni (9,8%) - E.On (5,5%) - Edipower (5,5%) - A2A (3,8%) - Tirreno Power (3,6%) - ERG (2,5%) - Axpo Group (2,2%) - Iren (1,9%) - others producers (26,9%)
Transport	The transport of electricity is an activity of natural monopoly. The Transmission system is managed by TERNA which is the Transmission System Operator partially owned by the Italian Government.
Distribution	The distribution of electricity is a regulated activity subject to license. **Main Players operating in the Distribution energy system for the year 2010:** - Enel Distribuzione (247 785 GWh) - Acea S.p.A. (9 696 GWh) - A2A(11 511 GWh) - IREN (3 620 GWh) - Dolomiti Energia(2 196 GWh) - HERA (2 373 GWh) - AGSM VERONA (1 812 GWh)
Supply	The electricity supply operating in the protected market is partially regulated. **Main Suppliers operating in the regulated market for 2010:** - Enel Servizio Elettrico (66 922 GWh) - AceaElectrabel Elettricità (4 133 GWh) - A2A Energia (2 408 GWh) - Iren Mercato (1 133 GWh)
Regulation	The task of the Regulatory Authority for Electricity and Gas is to pursue two main objectives as laid down in Law 481/95: "*guaranteeing the promotion of competition and efficiency*" while "*ensuring adequate service quality standards*" in the electricity and gas sectors.
Cities' electrical grid	
Who owns the grid?	Enel Distribuzione S.p.A owns more than 80% of the national electricity distribution grid of Italy (including the electricity grid of Genoa) and it is in charge

[1] Market Share for the year 2010

	of managing the electricity distribution services through a 30 years license. At the end of the license the Italian Ministry will launch a new tender for service provider of electricity where any DSOs can participate and the winner will become the new owner of the grids (by paying the asset acquisition to Enel Distribuzione) and will become in charge for the management of the service.
Who is the DSO?	Enel Distribuzione is in charge for the management of the Genoa's electricity grid.
Description of the DSO (Age and size of the company? Who owns of the DSO? Is it regulated and if yes how? Is there any specificity about the company? Does the city has smart meter and how many? What is the current use of the smart meters (for the DSO, for the customer, for the city)?	ENEL Distribuzione S.p.A. is part of ENEL Group, Italy's largest power company, and Europe's second listed utility by installed capacity. ENEL Distribuzione S.p.A. ensures the electric power distribution service on the network of its competence that is the transport of energy between the transmission network and consumers. Enel Distribuzione mission is to research constant improvement for supplying an excellent service with competitive prices, with respect to the objectives set by Italian Regulator in terms of quality of service and to the consumers' expectations.
Smart Grids and Urban Planning in the city	
Process of energy planning (regarding new connections to the grid, process for renovation of urban areas, flexibility for dimensioning network)	14 -16 May 2014 the Intensive Lab Session on the Smart Urban Lab of Mela Verde took place. Different Smart Grids measures were identified and discussed with the aim to set a Technological Roadmap. The following measures are those identified and for which the expert and the local stakeholders have carried out a SWOT analysis: ▪ active participation of the end-users into the electricity markets (e.g. enabling the Active Demands) ▪ smart recharge infrastructures for electric vehicles and offshore power supply (so called Cold Ironing) ▪ smart public lightings system through the use of LED technologies and remote control and management systems ▪ added value services (security systems – smart parking) **The Technological Roadmap:** 1. **Electric Mobility:** the recharge infrastructures installation might be implemented in two ways: **a.** Request made by a public or private entity: The Municipality of Voltri or the Port Authority or Rete Ferroviaria Italiana (Italian Railway Body) address a request to Enel Distribuzione for installing (upon economic offset/payment) the Electric Vehicle recharge infrastructures **b.** Scouting of Public Funds: The Municipality of Voltri can received public funds (such as Structural Funds, Piano Città etc), for the development of the electric mobility system that might cover also the costs for the recharge stations installation. 2. **Active Demand/Smart Info:** the Smart Info installation is strongly correlated with the acknowledgement by the Italian Authority for Electricity and Gas that this electronic devices is part of the DSO's assets and notably part of Enel Distribuzione' assets. The Smart Info is currently tested in some Municipalities of Isernia province. This pilot phase started after that Enel Distribuzione was earmarked of public funds through an

	open call for proposal launched by the Authority for Electricity and Gas itself. 3. **Public lighting:** the installation and/or replacement/refurbishment activities related to public lighting components might be pursued in two ways: a. Work entrusting to a Technological Provider of the public lighting system: Enel Sole will, upon economic offset/payment from the Municipality, draft the blue print, provide the devices, carry out the installation/replacement works b. Management entrusting to an ESCO of the public lighting system: the Municipality will entrust (through an Energy Performance Contract/tender) the public lighting system management to an ESCO that will take care of the investments needed for energy improvement of the system until the payback of the investments granted by the annually energy and cost savings
Current situation regarding Smart Grids in the city (SG experiments on the city area). Are they linked with planning?)	Genoa has 611,000 habitants, of whom 401.824 are energy customers, and aims to cut the CO2 emissions baseline of 2.3million tons by 24 per cent. In Genoa there are 396.734 smart meters installed in the end-user's households. The so-called Telegestore (remote management system) is the innovative solution that Enel has deployed since 2001 in Italy for the remote management of the new electronic meters. More specifically, the Telegestore is a set of electronic devices and software whose main elements are: - The electronic meter; - The concentrator installed in medium to low voltage substations, to gather the data recorded by the connected meters; - The central system for remote management of meters, processing billing information as well as to monitor the quality of service. Thanks to the remote management infrastructure, Enel can perform bidirectional communication with the meters by remote, automatically and at any moment. In particular, the Telegestore allows to easily read the consumption of its customers and to remotely manage contractual operations. At the same time, it can gather relevant data on the quality of electricity supplies while monitoring, in real time, service continuity, intervening promptly in case of network failure or malfunctioning. Beside Enel has laid out a plan which will offer support to both local municipal authorities in their Sustainable Energy Action Plans (SEAP) targets, where the most import elements to address are smart grids, electric mobility and the active involvement of consumers in the energy system. This will contribute to about 30 per cent of the total emissions targets fixed by the Municipality of Genoa, in view of their commitments by 2020. Moreover Genoa is frontrunner city in the electric mobility development at urban area. Notably there are already 17 installed public and private recharge infrastructures. The most significant actions that Enel has realized on the distribution grid of Genoa are: - Technological upgrade according to the smart evolution of the grid of 45 MV-LV electrical substations on the basis of the state-of-the-art solution (other 22 substations scheduled for the next years);

	- Voltage level adaptation according to the EU standard (more than 5.000 customers involved).
Actors involved in the developing Smart Grid and Smart process in your city? Level of implication (Low, Average, Strong)?	- **Municipality of Genoa and Voltri districts:** High involvement - **Enel Distribuzione:** High involvement - **Genoa Smart Cities Association:** High involvement - **Italian National Railway**: Medium involvement - **Port Authority:** Medium involvement - **ESCO:** Medium involvement - **Citizens:** Medium involvement
Does your city have any specific policies promoting Smart Grids?	Municipality of Genoa is one of the first cities in Italy to submit its Sustainable Energy Action Plan (SEAP) in accordance with the Covenant of Mayors initiative of the European Commission, whereby each city makes a voluntary and unilateral commitment to reduce its CO_2 emissions beyond the target of 20% by 2020. This will be achieved by means of measures in several sectors/fields of action in which the signatory governing bodies have specific competences: local transport, public and private buildings, renewable energy sources (RES) and innovative technologies. However there is not a specific program aiming to support the smart grids roll out.
What are the mains barriers to the development of SG in your city?	Business Model - financial and regulatory
Do you see any opportunities that could help overcome these barriers?	The Transform project can play an important role in streamline the Transformation process toward a Smart Cities by providing useful input on technology, regulatory, financial and business model aspect.

Germany – Hamburg (by HAMBURG ENERGIE)

Description of the country's energy sector	
Producers	The energy generation sector has been liberalized.
Transport	4 Independent Transmission Operators for electricity: - 50 Hertz Transmission - Amprion - Tennet TSO - TransnetBW 17 Independent Transmission Operators for natural gas divided in two market areas: - Gaspool for North- and East-Germany (11 members) - NetConnect for West- and South-Germany (6 members)
Distribution	888 DSOs for electricity. 728 DSOs for natural gas. It is estimated that district heating covers about 14% of the German heating market.
Supply	The energy generation sector has been liberalized.
Regulation	One of the Bundesnetzagentur's core tasks is to ensure compliance with the Telecommunications Act (TKG) and Energy Act (EnWG) and their respective ordinances. In this way, it guarantees the liberalisation and deregulation of the markets for telecommunications, post and energy via non-discriminatory network access and efficient system charges. To achieve its regulatory aims, the Bundesnetzagentur has effective procedures and instruments at its disposal, including rights of information and investigation along with the power to impose graded sanctions. **In the area of energy, the Bundesnetzagentur ensures:** - the most secure, low-priced, consumer-friendly, efficient, and environmentally sustainable supply of electricity and gas possible for the general public, - effective and genuine competition in the supply of electricity and gas, and efficient and reliable operation of energy supply systems for the long term, - implementation and execution of Community law on energy supply, - efficient approval proceedings to adapt the German extra-high voltage network to the growing use of renewable energy sources. [http://www.bundesnetzagentur.de/cln_1411/EN/General/Bundesnetzagentur/About/Functions/functions_node.html] The Bundesnetzagentur shares its competence in many areas with some states of Germany and the corresponding regulating authorities. The market for district-heating is currently only subject to an ex-post price control. A real competition does not evolve due to spatial segregation of the grids.

Cities' energy grid	
Who owns the grid?	The electrical grid is a public good. The right of use is granted to a company by a concession via according proceedings. Currently the concession for the electrical grid is fully owned by the City of Hamburg since 16 January 2014. Before, the DSO for electricity was owned by the City of Hamburg (25,1%) and Vattenfall (74,9%). The City of Hamburg will participate in the next concession proceedings which start in 2014 to assign the concession from 2015 on. Due to a referendum in September 2013 the City is obliged to take over all energy distribution networks and to operate them by the public sector.
Who is the DSO?	Hamburg Stromnetz GmbH
Description of the DSO (Age and size of the company? Who owns of the DSO? Is it regulated and if yes how? Is there any specificity about the company? Does the city has smart meter and how many? What is the current use of the smart meters (for the DSO, for the customer, for the city)?	The City of Hamburg started to privatize its municipal supplier for electricity and district heating named Hamburger Electricitäts-Werke AG in 1997. The Supplier including the infrastructure was fully privatized by 2002 in possession by the Vattenfall Group. In the course of unbundling processes a DSO was established which was also owned by the Vattenfall Group. When it became obvious that the public interest in the activities of the DSO would rise due to the energy transition in Germany the City of Hamburg rebought 25,1% of the company in 2012 in order to regain influence on the development of the DSO. The new and current name "Hamburg Stromnetz GmbH" has been assigned to the DSO. Today the DSO is owned completely by the City of Hamburg (see above). Smart Meters have not been rolled out on a large scale, only small scale projects with pilot character have been launched so far. A lot of regulatory alterations on national level are imminent (e.g. the definition of technical and data interfaces as well as the definition of roles for smart metering) and the future development of Smart Meters in Germany is difficult to predict.
Smart Grids and Urban Planning in the city	
Process of energy planning (regarding new connections to the grid, process for renovation of urban areas, flexibility for dimensioning network)	All processes are planned, organised, executed and controlled by neutral companies focused on energy distribution networks.
Current situation regarding Smart Grids in the city (SG experiments on the city area). Are they linked with planning?)	- Only small scale projects / pilots of SG / Smart Meter deployment - Research activity in the field of SG / VPP - cooperation of municipal supplier with the Ministry of Urban Development and Environment: smartpowerhamburg.de - Ideas for the automation of substations at medium voltage level have been developed.
Actors involved in the developing Smart Grid and Smart process in your city? Level of implication	- Currently only private companies have the potential to drive the development of Smart Grids or Smart Meters. - A key actor is the DSO, but its actions are reliant on political input.

(Low, Average, Strong)?	
Does your city have any specific policies promoting Smart Grids?	VPPs are referenced in mid-term (2020) and long-term (2050) visions for Hamburg via the “Master Climate Action Plan”
What are the mains barriers to the development of SG in your city?	- Costs - Privacy aspects / data protection - Limited advantages / benefit for consumers
Do you see any opportunities that could help overcome these barriers?	- Processes (e.g. technical administration, management) need to be simplified instead of complicated while maintaining a high level of security of systems and data. This can also reduce costs. - A solution for the data security question needs to be found. Perhaps local authorities can act as trustee for the accumulation, storage and processing of data?

Austria – Vienna (by Siemens)

Description of the country's energy sector	
Producers	Different Energy producers, complete liberalized market
Transport	**Two transmission operators:** - Austrian Power Grid AG - Vorarlberger Übertragungsnetz GmbH
Distribution	Market also liberalized, more than 200 different facility-based carriers are operating the market. The operational availability of Austria's grid represent 99,9 %.
Supply	Liberalized market.
Regulation	E-Control Austria is a public agency with a autonomic agenda, and the direction and guidance are independent from market interests. Generally is our market liberalized but with a strong regulation.
Cities' electrical grid	
Who owns the grid?	The electrical grid is owned by the "Wiener Netze".
Who is the DSO?	The DSO in Vienna region is "Wiener Netze"
Description of the DSO (Age and size of the company? Who owns of the DSO? Is it regulated and if yes how? Is there any specificity about the company? Does the city has smart meter and how many? What is the current use of the smart meters (for the DSO, for the customer, for the city)?	Wiener Netze is the DSO of Vienna and the surroundings for electricity, gas and district heating (primary network). **Responsibilities of the network operator:** - Network strategy, planning, construction, operation and maintenance, of the gas, district heating, electricity and fiber-optic network - Customer services - Meter and data management The Wiener Netze GmbH (WN) is the largest Austrian combined electricity-, natural gas- and district heating-grid operator serving approximately 1.5 million customers in Vienna and parts of Lower Austria and Burgenland. The "infrastructure backbone" of the metropolitan region of Vienna comprises ~1.5 million electric meters, nearly 700,000 gas meters, 23.000 km of electric power lines, 3.500 km of gas mains, 46 primary substations, over 10,000 secondary substations, 650 km primary network of district heating and 2700 km passive fibre network. Wiener Netze is fully owned by the "Wiener Stadtwerke" which is 100% owned by the municipality of Vienna. The electricity and the gas grid are regulated. Grid tariffs are set by the national regulatory authority (E-Control). Method: cost-plus regulation 1999 to 2005 Method: Incentive based regulation 2006 up to now Currently the 3rd regulation period is running **Smart Meter:** There are 3 regulations in place:

	- Set by the regulatory authority: The "*Datenformat- und Verbrauchsinformationsdarstellungs VO 2012 (DAVID-VO 2012)*" defines the requirements for customer-information. - Set by the regulatory authority: The "*Intelligente Messgeräte-Anforderungs VO 2011 (IMA-VO 2011)*" defines the required functions of the smart meters. - Set by Federal Ministry of Economy, Familiy and Youth: The "*Intelligente Messgeräte-Einführungsverordnung (IME-VO)*" defines the time schedule for the roll-out (from 2015 to 2019) **Required functions for electricity smart meters (by regulation):** Bidirectional, 15 min + daily consumption values, daily readings, stored for 60 days at the meter, bidirectional interfaces, unidirectional interface for customer usage, Breaker, Status- and error logs, manipulation detection, Remote firmware-update, State of the art security means **Roll-out schedule for electricity (by regulation) / schedule for gas open** - 2015 => 10% - 2016 => 40% - 2017 => 70% - 2019 => 95% **There were made 3 cost-benefit analysis (CBA):** - by Federal Ministry of Economy, Familiy and Youth. - by the regulatory authority - by OE / Österreichs Energie (the Austrian association of utilities) Whereas the CBA of the responsible ministry is still not public, the results of the CBAs done by OE and the regulator are differing significantly e.g. in terms of the sum of necessary investments or positive vs. negative socio-economic benefits of the smart metering roll-out. The DSOs in Austria are responsible for metering by law (Electricity Act) and as a consequence they are responsible for the roll-out of smart metering. Currently WN is preparing for the roll-out and is running some trials in different areas with different solutions and technologies. - The DSO is responsible for metering - Small pilot projects are currently running to prepare the roll-out (gas and electricity).
Smart Grids and Urban Planning in the city	
Process of energy planning (regarding new connections to the grid, process for renovation of urban areas, flexibility for dimensioning network)	The Wiener Netze plans by self-developed process. This process is not for public.

Current situation regarding Smart Grids in the city (SG experiments on the city area. Are they linked with planning?)	Smart Grids are considered in the planning process. Wiener Netze are also involved by many SG research Projects like - Smart City development - Smart Metering **Research projects are:** - ASCR- Aspern Vienna's lakeside, one of the biggest Smart City projects in Europa (20.000 inhabitants + 20.000 workers --> until 2030; Size: 240 hectare); Concept for technologies, products and solutions for energy efficient city district - SRA: Strategic Research Agenda (The goals are cross-sectoral ideas for energy infrastructure and research topics for the year 2035) - Technology platform Smart Grid Austria: steps for the realization of Smart Grids until 2020
Actors involved in the developing Smart Grid and Smart process in your city? Level of implication (Low, Average, Strong)?	**Strong:** - EU, - E-Control, - City (municipality of Vienna) **Average:** - industry, - research organisations **Low:** - consumer
Does your city have any specific policies promoting Smart Grids?	Wiener Netze has to ensure security and quality of supply for the whole service area. To ensure the further energy supply with additional more decentralized feed-in measures for a smart infrastructure is required. **The main barriers are given by standards like:** - ÖVE/ÖNORM 50160 about the voltage characteristics of electricity supplied by public networks. and - TOR D4 on the technical and organizational rules for operators and users of networks Another barrier could be the energy strategy of Vienna **Policies, strategies and departments:** - STEP – "Stadtentwicklungsplan Wien 2025" - Plan for the security of supply - Renewable action plan Vienna - Municipal department of City Planning - Municipal department of Energy Planning - Project: Transform – Realisation of Smart Cities
What are the mains barriers to the development of SG in your city?	- Costs of the infrastructure - Benefit for consumers / distribution operator - Security / data protection

Do you see any opportunities that could help overcome these barriers?	

Annex 3: Business Use Case - Energy-consumption diagnostic - In order to support the city's energy-transition

1 Description of the Use Case

1.1 Name of Use Case

Use Case Identification		
ID	**Domain(s)/ Zone(s)**	**Name of Use Case**
1	TRANSFORM – WP2 – KC3	Energy-consumption diagnostic

1.2 Version Management

Version Management				
Version No.	**Date**	**Name of Author(s)**	**Changes**	**Approval Status**
0.1	05/09/2014	ERDF		
0.2	16/12/2014	ERDF	Changes following the city of Copenhagen and HOFOR comments	

1.3 Scope and Objectives of Use Case

Scope and Objectives of Use Case	
Scope	This document is a generic Business Use Case aiming to formalize and describe the processes of data exchange between a city and a DSO in order to realise an energy-consumption diagnostic. This Use Case has been written so it can work for any type of energy DSO. Therefore, through all this document, the term "DSO" refers to either "Electricity DSO", "Gas DSO" or "District Heating and Cooling DSO", and the term "energy" refers to either "electricity", "gas" or "district heat and cold". This Business Use Case may not be fully adapted to each European country. It should therefore be modified to take into consideration local specificities.
Objective(s)	These data exchanges aim at improving town planning by getting information on the current energy state of an area. This information is very useful to help the city's energy transition as it can help to highlight the most energy inefficient areas and to monitor the results of energy savings policies.

1.4 Narrative of Use Case

Narrative of Use Case
Short description
This Business Use Case aims at describing data-exchange processes in order to make an energy-consumption diagnostic. After selecting a study area, the city and the DSO negotiate the terms of the data exchange and sign a contractual document describing all parties' responsibilities. The city gives the DSO the exact definition of the study area and of the desired data aggregation scale. Then the DSO extracts all the energy-consumption data of the customers located in the study area. The DSO aggregates the energy consumption data. If the data comply with confidentiality regulations the DSO gives these data to the city. Otherwise the city modifies the aggregation mesh until all the data comply.

Complete description

1/ Selection of the study area

The city's department in charge of the energy policies or the urban planning (later called in this document "The city"), define an area of their territory for which they would like to have a vision of the current energy situation.

The size of the area may vary from a small district (few square kilometres) to the full city territory.

2/ Definition of the data exchanged characteristics

The quality of the data analysis and its benefit for the city depend on the data characteristics.

The city meets with the energy DSO to inform them about their needs and the area the city wishes to study.

2.1 – Negotiations between the city and the DSO

The city and the DSO discuss the city project. The goal of this meeting is to define the characteristics of the data that will be exchanged. The city and the DSO have to balance the quality of the data analysis and more practical issues such as cost or technical and legal constraints (for example limitations caused by the DSO's Information System or by legal obligation).

2.2 – The city and the DSO come to an agreement

The city and the energy DSO agree on the characteristics of the data that will be exchanged. This agreement has to cover the following points :

- The scale of the data aggregation (for example: data aggregated at a building scale, at a city block scale)
- Type of data collected (for example: daily, monthly or annual energy consumption)
- Time period (for example : from 2010 to 2015)
- If necessary, level of precision on the data collection (defining how consumers not attached to a specific address are dealt with)

2.2Bis – The city and the DSOs cannot come to an agreement

If the city and the DSO cannot come to an agreement regarding the characteristics of the data that will be exchanged, they must refer to the existing legal framework on data exchange (for example data at the scale of the entire city).

3/ Contractual negotiations

The DSO evaluates the cost of the data service. The DSO informs the city of the cost and they discuss practical issues to include in a contractual document.

Two options are usually available:

- The city and the DSO can decide that this service is a collaborative effort and then share its cost
- A formal contract can be made and the City pays for this service.

It's also possible to test this type of collaboration on a small scale through a pilot project.

The city and the DSO write a contractual document (such as a convention) dealing with the following subjects :

- What will be include in the data service (data collection, and/or quality assurance service)
- Who pays for the cost of this service?
- What will be the shape of the deliverables (example: CSV document, access to an online database, map...)?

- Who will have access to the data (example: strictly for the usage of the city, for the usage of the city and other public actors, available to anybody on an open data platform)?

4/ Choice of data type (Aggregated or Individual)

In most countries, regulations on private information make it impossible to publish individual energy consumption data without the customers' consents.
The city therefore decides if they want to get aggregated data or individual data. For the second option, data owners (final customers) need to give their consents.
The city wants aggregated data

5/ Creation and transmission of the area definition documents

5.1 - Creation of the area definition documents

The city defines at what scale they wish to have the data aggregated. If data are aggregated a scale bigger than a building, the city creates a document explaining in details how the data should be aggregated.

5.2 - Transmission of the area definition documents

The city sends to the DSO a map of the study area (defined at the step 1) and the aggregation definition document (step 5.1).

6/ Collection or quality assurance of the data

If the service negotiated between the DSO and the city is data collection, the DSO gathers the data specified in the contractual document (step 3).
If the negotiated service concerns data quality assurance, the DSO assesses the reliability of the data.

7/ Aggregation of the data

The DSO uses the addresses-distribution document provided by the city to aggregate the data at the requested scale.
The DSO tests the compliance of the aggregations with confidentiality regulations.

7.1 - All the aggregated data comply with the confidentiality regulations
=> Step 9.

7.1Bis - Some of the aggregated data don't comply with the confidentiality regulations

The DSO indicates to the city which aggregation blocks don't comply with the confidentiality regulations. These data cannot be given by the DSO.

The city can either:
- Accept to not have these data. =>Step 9
- Merge some aggregation blocks in order to have only valid data.
  The city modifies the addresses-distribution document =>Step 5.

The city wants individual data

6bis/ Collection or quality assurance of the data

If the negotiated services concerns data collection, the DSO gather the individual data of the customers located

in the study area.

If the negotiated services concerns data quality assurance, the DSO assesses the reliability of the individual data.

8/ Collection of the data owners' consents

The city gathers the consents of all the customers located in the area to publish their individual consumption data in an anonymous form on a public webpage.

9/ Transmission of the data

9.1 – Transmission of individual data.

The DSO verifies that all customers in the area have given their consent to publish their data. In case some customers refused to give their consents, the DSO takes out their data from the final deliverable.

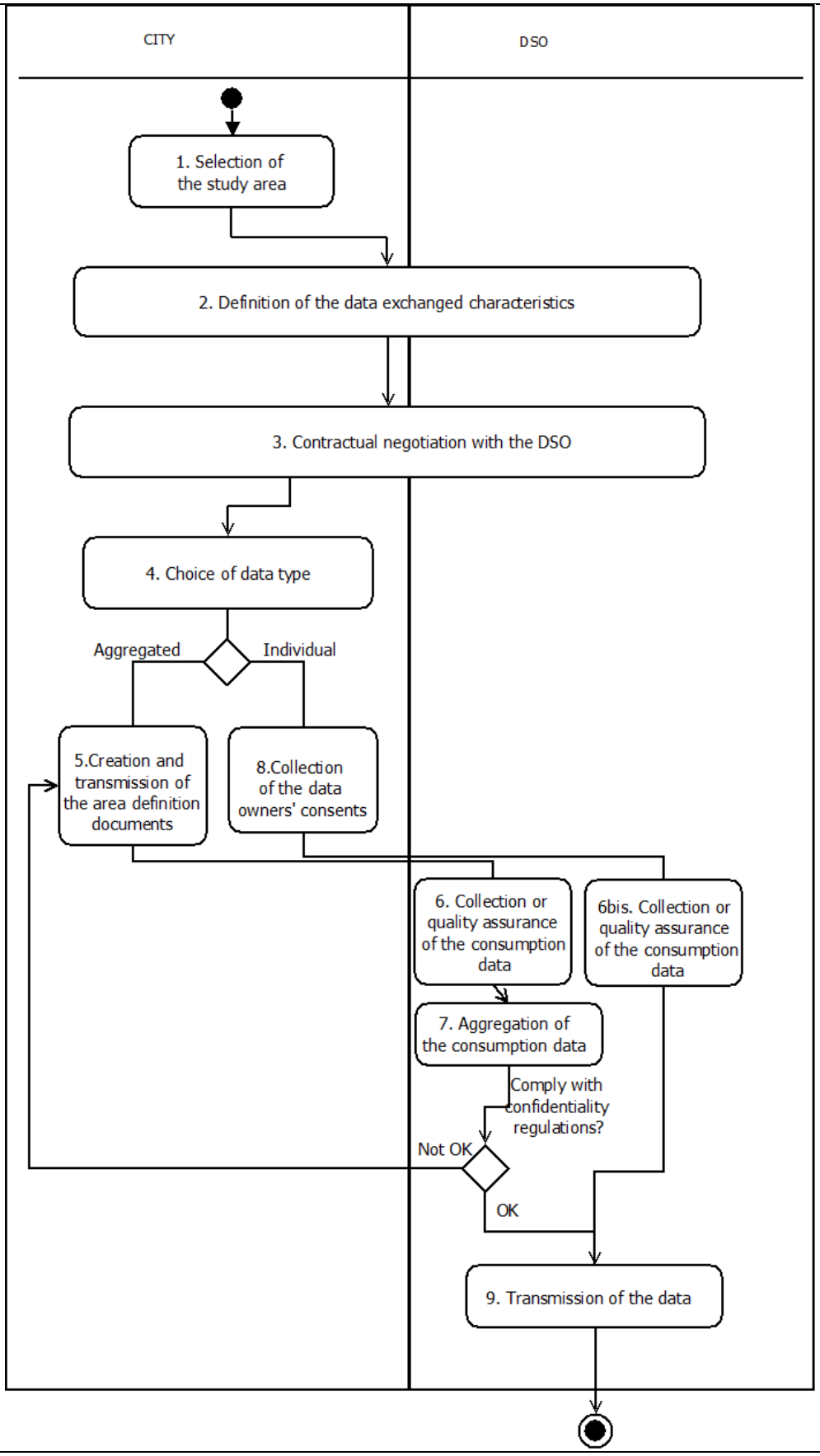
Then the DSO transfers the individual consumption data to the city following the requirement of the contractual document (Step 3).

9.2 - Transmission of aggregated data.

Once the aggregated data have been validated internally, the DSO transfers them to the city following the requirement of the contractual document (Step 3).

2 Diagrams of Use Case

Diagram(s) of Use Case


CITY
DSO
1. Selection of the study area
2. Definition of the data exchanged characteristics
3. Contractual negotiation with the DSO
4. Choice of data type
Aggregated
Individual
5.Creation and transmission of the area definition documents
8.Collection of the data owners' consents
6. Collection or quality assurance of the consumption data
6bis. Collection or quality assurance of the consumption data
7. Aggregation of the consumption data
Comply with confidentiality regulations?
Not OK
OK
9. Transmission of the data

3 Actors

Actor Name	*Actor Type*	*Actor Description*
City		The city's department in charge of the energy policies or the urban planning
DSO		Energy Distribution System Operator. In this Use Case, the term DSO refers to electricity, gas or district heating DSO.

4 Information Exchanged

Information Exchanged		
Name of Information (ID)	*Description of Information Exchanged*	*Requirements to information data*
1	Definition of the study area	
2	Desired mesh for the data aggregation	
3	Aggregated consumption data	