Procurement Report of WP3

Version	Date	Details	Prepared by:	Reviewed by:	Approved by:
V 0.1			Lutz Heuser	Lisa Enarsson	
V 1.0	06-05-2015		Lutz Heuser	Lisa & Barbara	
V 2.0	07-06-2015	All comments included	Lutz Heuser		

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Partners involved in WP3 according to the Grant Agreement are:

- **STADT KOLN**,
- STOCKHOLMS STAD,
- BARCELONA,
- KTH,
- Envac AB,
- FORTUM, Info24,
- AGT,
- ENDESA SA,
- RETEVISION,
- anteverti,
- BSC,
- GASNATURAL,
- IREC,
- Phillips,
- SCHNEIDER,
- Urbis Up,
- IBM

The following report summarize the procurement feedback for Work Package 3 as being reported by

- City of Cologne (STADT KOLN)
- City of Stockholm (STOCKHOLMS STAD)
- City of Barcelona (BARCELONA)

The Work Package 3 addresses the measures 5 – 8 of the Grant Agreement 646456 GrowSmarter.

Smart Solution 5: Smart Lighting

Smart lighting, lampposts and traffic posts as hubs for communication.
Demonstrate remote, self-controlled and sensor-controlled LED lighting for pedestrians and cyclists and how these solutions increase traffic safety and perceived security. Demonstrate how smart traffic posts can be used to provide wifi, charging of electric vehicles with additional built in functionality.

MEASURE 5.1 SMART STREET LIGHTING (STOCKHOLM).

Three different technologies will be tested and evaluated. The successful technology (-ies) will be taken up in city´s lighting programme if successful.

- Sensor controlled LED lighting for pedestrian and bicycle paths to enable the lights to provide base lighting to satisfy the feeling of security at all times and increase the Level of lighting when someone approaches. This technique has a potential to save 40-50 % energy.
- Self-controlled LED street lighting with pre-set lighting schemes based on levels of traffic has the potential to save about 20 % energy compared to regular LED lights.
- Remote controlled LED street lighting which can be controlled from a distance to provide sufficient lighting depending on the time of the day and the level of traffic that comes with it. 30-50 % energy can be saved compared to regular LED lighting. 7-12 GWh can be saved yearly in the entire city using local grid energy supply. The aim is to use advanced control system with standardized open protocol according to TALQ Consortium.

Procurement Report on measure 5.1:

STOCKHOLM STADS: no additional procurement is needed for measure 5.1 as they are done through existing partnerships and whole sellers. Therefore no amendments are needed.

MEASURE 5.2 COMBINED ELECTRICAL CHARGING AND STREET LIGHTING POLES + WIFI-TO-GRID CONNECTION (STOCKHOLM, BARCELONA).

As traffic posts are evenly distributed across cities they post a great opportunity to provide extra data coverage throughout the city, both wifi and mobile data (4G). In Stockholm a City Wi-Fi will provide the means for leveraging the 'Internet of Everything' potential in terms of connectivity and real-time monitoring and enabling services to support and/or manage all aspects of city life and operations. The City Wi-Fi would enable the connectivity and communication
– IP based – over one common network infrastructure. This would enable Smarter City solutions in the areas of Traffic Management, Sustainable Mobility, Low Energy solutions for buildings, Video Surveillance and Incident Monitoring, Waste Management and Quality of Life.

In Barcelona, in order to improve the electric energy efficiency on the public in the infrastructure of new "smart multi-functionality towers" that integrate lighting, traffic lights, bus shelters, environmental sensors, as well as slow charge EVSE will be deployed. The overall performance of these Smart Tower will be monitored from the energy point of view.

Involved industry partners: Philips is replaced by RETEVISION, ENDESA, IBM

Procurement Report on measure 5.2:

STOCKHOLM STADS: The city of Stockholm will add a linked third party Stokab, which is fully owned by the city. Stokab will be the responsible process owner both for the wifi and the mobil data in GrowSmarter. no additional procurement is needed for measure 5.2 as they are done through existing partnerships and whole sellers. Therefore no amendments are needed.

BARCELONA: The industrial partner Philips has left the project so this measure in Barcelona will instead be carried out by the industrial partner RETEVISION and Endesa Distribución. This change requires an amendment of the wording and the budget in the Grant Agreement.

Endesa Distribución will design and supply a cabinet called Smart Tower. In such equipment, the consumption of the different services to citizens, to be separated in essential (lighting and traffic lights) and nonessential (rest) will be integrated.
Inside the Smart Tower communications elements necessary for the operation of the measure 8.1 is also integrated (supply of equipment is not part of the scope of the measure).
Installing and connecting Smart Tower and all its devices is beyond of the scope.
This is intended to achieve:
•   Integration cabinets of different city services in one more efficient.
•   Improve maintenance work to different service providers.
•   Reducing communication costs.

MEASURE 5.3 SMART METER INFORMATION ANALYSIS AND ACTUATORS (BARCELONA, COLOGNE)

Many of residents' houses or flats will be equipped with Smart Meters or even with SmartPlugs measuring the power and heat / cooling consumption. In addition some of the residents will be prosumers as they also produce energy through e.g. their photovoltaic installation. A power cloud-based analytic engine will sift through the data generated from the sensors and provide energy-saving information to the residents. An intuitive app will provide monitoring functionalities for the users and additionally a powerful tool to control to his privacy settings and his/her data sharing policies. In addition, the system can provide intelligence for automatically controlling devices (e.g. heating, washing machine, and coffee machine) making the use more efficient and increasing energy potentials. For the operator a dashboard will be developed that allows a situational awareness picture of the smart grid. The tool will additionally provide a forecast of the expected power demand for the next 15 to 30 minutes based on the individual power demand pattern learnt over the past measurements. The operator application will also provide an anomaly detection that indicates potential failures in the grid.

In Barcelona, the smart meter information will be used to better assign priorities on the energy asset management. Smart Meter information of these Public assets will be available through a Grid Services platform system.

Involved industry partners: AGT, ENDESA

Procurement Report on measure 5.3:

STADT KOLN: no procurement issue has been reported.

BARCELONA:
Endesa Distribucion will develop and validate an advanced multiservice concentrator MSC, located at the secondary substation, compatible with the existing smart metering infrastructure. It would collect data from several meters, sensors and will manage some actuators.
• Different communications technologies supported such as PLC, RF or mobile.
• Radiofrequency (RF) based on wireless MBus protocol would be used for the communication between the concentrator and gas, water and heating meters. It would

be also used for the communication between the concentrator and wireless sensor network (WSN).

- PLC (Power Line Communication) would be used for the communication between the concentrator and electrical meters. PLC would be also used for public lighting monitoring.
- Data collected through the infrastructure composed by advanced MSCs (multiservice concentrators), meters and sensors would be managed from the AMMs and CityOS platform

These data will managed through the DSO Platform/GrowSmarter Platform and will offer some added value applications as for example to monitoring consumptions, to managing street lightings,… allowing an improvement in energy efficiency. Other agents such as ESCO (Energy Services Providers), retailers, aggregators, customers, etc. will benefit from the new information collected.

Smart Solution 6: Waste heat and local heat integration

Demonstrate new business models with plug and play heat pumps and contracts where the district heating provider buys waste heat from local energy sources such as data centers and shopping malls with many freezers and coolers. This task will focus on how to recover this waste heat into district heating or other energy systems for local energy demands and how to develop this innovative business model for this yet unexplored potential as integrated energy solution.

MEASURE 6.1 OPEN DISTRICT HEATING WITH FEED IN OF WASTE HEAT (STOCKHOLM)

Surplus heat from data centers, supermarkets and vacuum waste systems will be inserted in the district heating system.

This energy will admittedly replace biomass produced heat and also some renewable electricity produced by biomass-CHP, but it still makes sense to utilize this waste heat, as there is a win-win situation where the surplus providers today pay to get rid of the heat. Currently mid-level heat can be fed into outbound water after being further heated by efficient heat pumps, using renewable electricity, or fed inwards at the end of some lines.

- Waste heat from data centers and vacuum waste systems.
  A new type of heat pump technology suitable to handle mid-level energy streams will be implemented. This system is expected to be able to save 0.5 TWh annually in Stockholm and although there are no regulations in place forcing data centers to recover their waste heat the EU are working on such directives. The same heat pump technology will be used to take care of waste heat from vacuum waste systems (see solution 7). This system is expected to save 55 kWh/ apartment served by the system annually
- Waste heat from fridges and freezers in supermarkets.
  Fridges and freezers using CO_2 as cold media generate waste heat at 80 degrees Celsius which can be directly recovered into the district heating system- These are getting increasingly usual there is also a new EU-directive under work which will demand replacing cold media with CO_2. This solution has the potential of saving 0.5 TWh annually in Stockholm alone.

A plug and play solution providing a standardized heat pump to raise the temperature of the waste heat to the required level for the district heating system together with a new business model where the district heating operator buys excess heat will be developed.

Involved industry partners: Fortum

Procurement Report on measure 6.1:

STOCKHOLM STADS: Stockholm Vatten Avfall Ab is since 1 July 2014 responsible of waste treatment instead of the Traffic administration. One of its responsibilities is to collect biowaste and produce biogas from it. Cooperation with Stockholm Vatten Avfall Ab is necessary for collecting the waste and turning it into biofuel in Measure 6.1, but as no budget will be transferred they do not need to be a linked third.

No procurements or permits needed for measure 6.1.

MEASURE 6.2 DISTRICT HEATING AND COOLING RINGS (BARCELONA).

The District heating and cooling network will be optimized and make use of local energy generation from solar panels, heat pumps (absorption) and micro CHPs connected to a new heating and cooling net. This will be integrated with the electricity production and managed by the Smart Energy and Self-Sufficient Block (measure 4.2) making a truly integration of all energy systems at block level.

GNF will coordinate the work included in this measure and together with Aiguasol define the smart energy and self-sufficient blocks.
Involved industry partners: Gas Natural, IREC

Procurement Report on measure 6.2:

BARCELONA:

As commented in smart solution 1.1, procurement report D2.1 taking into account current district heating network location, two target locations have been selected to construct a district heating at block level, connected to the district heating and cooling network from Sant Mar´ti District (Districlima):

Alternative 1: Barcelona, Sant Martí District, Poblenou. Llacuna School block, formed by streets Pallars [n. 207-221], Rambla del Poblenou [n. 93-113], Pere IV [n. 168-200] and Llacuna [n. 72-86]. Over 10,700 m2 divided into two residential buildings.

Alternative 2: Barcelona, Sant Martí District, Poblenou. school Pere IV block formed by streets Camí de Batista [n. 1-15], Camí Antic de València [n. 27-39], Bilbao [n. 105-121] and Pere IV [n. 228-252]. Over 10,300 m2 divided into two residential buildings.

It will be proposed to the homeowners to construct a distribution station inside the Poblenou super island and to connect their buildings to the district heating network. In both cases, two residential buildings are expected to be connected (>10,000 m2) and a public school.
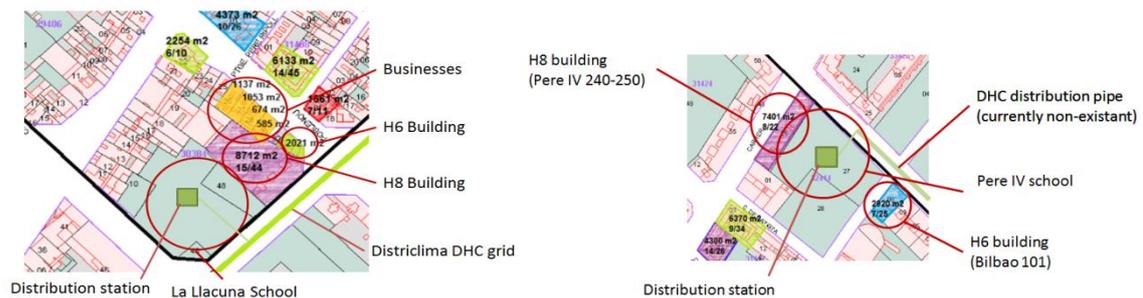
Figure 6: Residential buildings to be refurbished in Llacuna and Pere IV blocks

As aforementioned, citizen participation is a key to develop the final measures to implement in this smart solution. This means that the final scope could be somehow affected and the technical solution selected may vary, e.g. to partially centralize, in case it presents advantages in terms of cost-benefit analysis (considering not only economic factors but also energetic factors). Amendments cannot be requested until the final solution will be defined.

Smart Solution 6: New business models for district heating
Measure 6.2 District heating rings

The District heating and cooling network will be optimized and make use of local energy generation from solar panels, heat pumps (absorption) and micro CHPs connected to a new heating and cooling net. This will be integrated with the electricity production and managed by the Smart Energy and Self-Sufficient Block (measure 4.2) making a truly integration of all energy systems, including PV generation at block level. To be demonstrated that the total consumption from the grid will be closely zero.

MEASURE 6.3 SMART LOCAL THERMAL DISTRICTS (BARCELONA).

Smart local thermal district (offices, residential and social spaces) will demonstrate integration in existing district heating and cooling network including PV generation. The results will demonstrate the technical, socio and economic viability of this type solutions at higher scale and the total consumption from the grid will be nearly zero.

Involved industry partners: Barcelona, IREC

Procurement Report on measure 6.3:

BARCELONA: no additional input on procurement given.

Measure 7: Smart waste collection and turning it into electricity, heat, and bio gas

This Solution demonstrates a smart waste solution for residential areas using differently coloured bags for different sorts of waste, transporting the bags long distance underground and sorting them automatically in the collection station, in the area. The food waste will be recovered to produce biogas, which fuels 400 buses and trucks and 15,000 cars. Other waste streams will be recovered as material and/or energy. The challenge to the use of conventional Automated Waste Collection Systems (AWCS) has been the installation costs, as well as finding space underground to fit the pipe work.

MEASURE 7.1 OPTICAL SORTING OF WASTE (STOCKHOLM)

Different fractions of waste are put in bags with different colours in the same collection bin. It is then transported to a sorting facility where the different fractions are separated. This method is new and not widely spread in Europe. It will be the main way of collecting organic waste in Stockholm.

Involved industry partners: Envac

Procurement Report on measure 7.1:

STOCKHOLMS STAD: no procurement issue has been reported

MEASURE 7.2 INTRODUCTION OF AWCS (AUTOMATED WASTE COLLECTING SYSTEM) IN AN EXISTING NEIGHBORHOOD (STOCKHOLM).

Automated waste collecting systems are normally only installed in new built residential areas as the costs can be included in overall infrastructure costs. AWCS are initially more expensive than traditional waste handling systems but offer significant advantages when in place. The traffic for collecting waste can be reduced with 90 % and space can be cleared in neighborhoods as there is no longer a need for storing garbage in many different places in the area. All waste is transported underground in pipelines to a collecting station located in the residential area with easy access to collection vehicles. To reduce the cost for piping and energy use, compaction of the waste will performed already in the inlet.

Involved industry partners: Envac

Procurement Report on measure 7.2:

STOCKHOLMS STAD: no procurement issue has been reported

There is a need for building permits for building the awcs in the existing neighbourhood. These are the responsibility of the industrial partner Envac

MEASURE 7.3 WASTE COLLECTION STATISTICS FOR INDIVIDUAL HOUSEHOLDS/BUSINESSES (STOCKHOLM).

Using smart keys together with colour sensors and scales, it is possible to register down to individual households the amount and type of waste thrown at any given moment. This offers the opportunity to present statistics for individual households, buildings or clusters of buildings, visualized in the Active house /Home Energy Management Systems/ Smart home system in Smart Solution 2. It can also be used as a basis for payment.

Involved industry partners: Envac, Info24

Procurement Report on measure 7.3:

STOCKHOLMS STAD: no procurement issue has been reported

Measure 8: Big data for saving energy and improving the quality of Life

Due to the lack of standards in the area of smart cities, we propose a data integration platform (aligned with CityOS) which will aggregate information in a City Data warehouse that support third party applications exploiting the raw and rich data. The data integration platform will be composed by a set of functional modules, with the aim to establish a standard path from diverse data sources (data coming from many different heterogeneous sources, like city data sensors, mobile devices and other types of resources) to any data consumer system. New services can connect to energy consumption in residential buildings where residents can be informed about their current and historical energy consumption and with the help of that information decrease it. Another application is the collection and processing of traffic data to make it possible to create a multi-modal travel planner or develop an API able to communicate the lighting management system with other applications (e.g. traffic management, weather systems).

MEASURE 8.1 BIG CONSOLIDATED OPEN DATA PLATFORM (STOCKHOLM, BARCELONA, COLOGNE).

By consolidating, aggregating and using existing and new sensor data from infrastructure, traffic and users will generate a new base for innovation to support a new generation of management, control and policies. We will also be able to monitor the status and the impact of various measures in real time to a low cost. It will also be possible to simulate short and long term trips and transports in more detail in a dynamic way to improve the quality of decisions. By this we will manage environment and other impacts more efficiently but also open for new generations of policies as well as accelerate innovation of new services based on the open and available data. Finally this platform also will form a base for dialogue with citizens and the business community by a more transparent management.

In order to improve the energy efficiency on the public infrastructure, we will integrate information from City OS or other Service Provider System that manages data from assets. The platform will monitor the overall performance of lighting, traffic, bus shelters, environmental, and small EVSE from the energy point of view, assign priorities and command based on decision making algorithms via a "multi-functionality towers".

Involved industry partners: IBM, Schneider Electric, Barcelona Supercomputing center, AGT, RETEVISION, ENDESA

Procurement Report on measure 8.1:

STADT KOLN: To catalogue, bundle and harmonize sensor data measured it was important to implement Microsoft Azure Cloud Solution. In the past, the City of Cologne and Microsoft signed a master IT services agreement under the EU procurement regulations which is used for GrowSmarter due to the use of UrbanPulse provided by USI, linked third party to STADT KOLN.

Background: UrbanPulse is an information platform that combines the multiple information sources of a city, to better visualize, understand and react to the city needs. Government and business can integrate the information generated through UrbanPulse into their own processes and next generation services.

Using UrbanPulse and Microsoft Azure®, cities and communities can make their traffic data available to citizens — securely and affordably. In doing so, Urban[traffic!]Pulse makes use

of existing sensor data, such as data from traffic signal systems. Our solution allows you to gather and display data as annotated street maps via a web server in double-quick time and with no complicated integration process.

The main reasons for choosing Microsoft Azure are:

Microsoft is the only leading provider of cloud services which supports the world's first international standard for data security in the cloud. Although the standard is a technical standard, it delivers simultaneously important advantages to enterprise customers. Known as ISO / IEC 27018 the Standard has been developed by the International Organization for Standardization (ISO) with the aim to create a uniform and internationally valid concept to protect personal data stored in the cloud.

Microsoft Azure provides an event hub. This is a fast and lightweight alternative to services buses which are provided by other cloud services provider. The functionality fits the needs for UrbanPulse best.

The stream analytics feature of Microsoft Azure can process data at high throughput with predictable results and no data loss.

BARCELONA: no procurement issue has been reported. The service and Software will be provided by the industrial partners Schneider Electric, Barcelona Supercomputing center, AGT, RETEVISION, ENDESA
Endesa Distribución (DSO) will participate in the integration of the data collected through the infrastructure developed in Measure 5.3 (composed by advanced multiservice concentrators, smart meters and sensors) with the CityOS platform.
For this purpose, the DSO systems will be updated in order to manage the new components added into the grid. In addition, new interfaces will be developed between DSO and CityOS platforms; enabling the interaction among the different actors that participate in the demo that will take place in Barcelona: Regulated actors (DSO), Municipality and liberalized agents such as ESCOs or retailers.

STOCKHOLMS STAD:
IBM reports the following amendment:

Introduction of a Telco as subcontractor.

For the execution of our measure 8.1, and the use case where we plan to monitor and analyze the movement of citizens travelling in the city we will be dependent on getting access to mobile phone location data from a Telco.

MEASURE 8.2 URBAN MODELS (BARCELONA, COLOGNE).

Semantic urban model
Building a concept that reflects the structure, processes, and events specific to urban environments. It may contain other more general concepts such as geo-positioning, time, and KPIs, which are required by the modules computing e.g. carbon footprint and pollution. This data integration platform will provide an API that any service may use to access domain transversal data - geo-positioned when available - either in raw form or in form of aggregated indicators.

Semi-automatic urban model

We propose an approach that provides the participants and follower cities – and later on, any other city – to extend it to serve their specific needs. The techniques behind the integration are based on extending the urban model to adapt it to the specificity of the target cities. This involves the use of techniques in a semi-automatic fashion.

Involved industry partners: Barcelona Supercomputing center, AGT

Procurement Report on measure 8.2:

STADT KOLN: no procurement issue has been reported

BARCELONA: no procurement issue has been reported

MEASURE 8.3 SEMI-AUTOMATIC INSTANCE MAPPING (BARCELONA, COLOGNE).

The semantic urban model needs to be populated with actual data to take full advantage of the power of the approach. This step consists in the semantic mapping of the data to the concepts and is usually time consuming. Semi-automating this process is possible. We will use new technologies to semi-automatically map urban data to specific city. This problem is highly relevant when other want to populate the city model with their data. This requires finding correspondences between concepts and relationships embedded in the data, on one hand, and explicit in the ontology, on the other.

Involved industry partners: Barcelona Supercomputing center, AGT, IREC

Procurement Report on measure 8.3:

STADT KOLN: no procurement issue has been reported

BARCELONA: no procurement issue has been reported

MEASURE 8.4 INTEGRATION OF SENSOR AND HETEROGENEOUS DATA IN STANDARD DATA FORMAT (BARCELONA).

We will provide a platform for integration of sensor heterogeneous data coming from different producers (e.g. deployed sensors, data from proprietary platforms, open data repositories, etc) and using different formats based on a uniform, standard-driven format. This platform will provide a set of APIs to access the data from the open linked city model, and will publish the integrated data ---, raw or aggregated. We will also be building a Web portal that can access and visualize raw and aggregated data from sensor infrastructures managed by the city of Barcelona and other trusted third parties, partners in this project.

Involved industry partners: AGT, RETE, Schneider Electric

Procurement Report on measure 8.4:

BARCELONA: no procurement issue has been reported

MEASURE 8.5 SUSTAINABLE CONNECTED LIGHTING TO ENHANCE SAFETY AND MOBILITY (BARCELONA).

To develop an API (Application Programming Interface) able to communicate the lighting management system with other applications (e.g. traffic management, weather systems) and software platforms in order to exchange data between systems. The solution will be a lighting technology agnostic system

which means all kinds of luminaires (also third party products and new future innovative light sources) can be connected to the system. The lighting infrastructure will be managed by a system that will seamlessly connect to the Barcelona CityOS (Smart City Software Platform) or other SW platforms available in other cities using an API based on open standards. This means that lighting will be influenced not just by the decisions of the lighting system, but also by other systems managing other asset. The proposal seeks to motivate also a change of mind, realizing what the intelligent public lighting can do for cities when they become more interactive and create the base for novel services within the city.

Involved industry partners: AGT, PHILIPS replaced by RETEVISION, ENDESA

Procurement Report on measure 8.5:

BARCELONA: leaving partner Philips will be replaced by RETEVISION which will require an amendment. No procurement issue has been reported.

Endesa Distribution will integrate the different city services (lighting, traffic lights, sensing, electrical vehicles recharging points, Bus information areas...) on an interoperable platform from a higher Service Provider.
This measure focuses on the logical integration and communication of different services, not on developing the platform subject to the measure.
Notes:
- The physical integration of services is beyond the scope of this project.
- All operators must provide different services EDE communications protocols different teams, so that integration possible