

# Lyon Confluence: from smart grid to smart community?

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Initiated in the mid-1990s, the Confluence redevelopment project in Lyon has gained much attention by its central urban location, size and ambitions. Central from a geographical perspective, the district has nonetheless remained peripheral in terms of urban development. The current project aims to affect this imbalance and reinvest its centrality potential. This is sought by maintaining high environmental and social standards in comprehensive planning principles.

Acknowledged and certified by multiple institutional partners as a sustainable urban development project, the Confluence district has engaged itself in a partnership with NEDO/Toshiba to develop and implement a smart grid demonstration project. Elaborated in four different yet interlinked tasks, it will require active participation and appropriation by the local community to tackle the energetic challenges it has given itself, notably in terms of CO<sub>2</sub> emissions.

## 1 Project background and description

### *A segregated central area*

The 150 hectare Confluence district is located on the most southern part of the peninsula making up Lyon's urban centre. Its name comes from its geographical location – at the confluence of the Saône and Rhône rivers and lies in the direct continuation of the city's central axis.

Despite its actual centrality, the area has however always been differentiated since its early history. Regularly flooded, it was only in the late 18th century that its marshy grounds were fully drained and that populations and activities settled there. These were mostly related to the manufacture and trade of silk as well as convents.

Rapidly, industrial activities took over the area, encouraged by increasing rate of fluvial trade and the creation of a rail track. In 1857, the Perrache station was built above ground level in order to prevent traffic from being affected by recurrent floods. It is “behind the vaults” – as the area was from then on referred to – that settled undesirable

activities: slaughterhouses, prisons, warehouses, breweries, gas factory, etc. Blue-collar populations followed this trend, moving in around these industries.

The functional and logistical vocation attributed to the area continued, reaching its climax in the 1960's/1970's with the construction of the A6 and A7 motorways, assuring that the north/south liaison between Paris and Marseilles ran immediately through the town centre. The mayor at the time, Louis Pradel, had been inspired by the model he found in Los Angeles and sought thereafter to “bring the car” in Lyon. An interchange was added to the project, allowing for an imposing intermodal pole to be erected. It was also at this period that the wholesale market was built.

The era was marked by industrial decline which had a negative impact on port activities. Soon limited by the little available space and constraints of the area, the wholesale market was already starting to be planned further out of the central area in the early 1990's. Seeing an opportunity to extend the metropolitan area's hypercentre, mayor Raymond Barre organised a city-wide consultation and suggestions as to Confluence's possible future began in the late 1990's. This was also a period of other large-scale urban projects in Lyon (Cité Internationale, Gerland, Duchère, Part-Dieu new TGV station, etc.).

### *Opportunities: developing a sustainable project through diversity*

By 1999, the Greater Lyon authority established a public company to implement the project. Divided in two main development phases and areas (Saône and Rhône embankments), it covers the entire district over a 15 years time span. The renovation of existing social housing and the development of a green link along the Saône embankment are also included within the project.

Several principles have led to the actual plans being implemented in Confluence:

- Sustainable urban development and high environmental quality standards

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**Figure 1**  
Lyon Confluence area within the city's territory



Source: SPLA Lyon Confluence 2011

**Figure 2**  
Airview depiction of Confluence project



Source: Herzog & de Meuron – Michel Desvigne Paysagiste/SPLA Lyon Confluence, 2011

The development of public transport infrastructures (extension of tramway line) is accompanied by an increased accessibility for walking/cycling possibilities whilst at the same time dissuading individual car use. Current projects also include electric car-sharing systems complementary to those already available across Lyon.

A particular focus has been brought on the issue of energy use. This has led to the implementation of planning principles favouring natural climatic effects at building and plot scale. The widespread distribution of green areas and water surfaces are planned to reduce the impact of urban heat islands. In new and eco-renovated buildings, energy efficiency is sought after with consumption rates reaching approximately 50 kWh/m<sup>2</sup>/year. This is also accompanied by the development of local production of renewable energies (solar, wind, biomass).

Special attention has been brought to the issue of water, given the district's location. Minimising soil sealing and increasing rain-water infiltration has been achieved across Confluence through limitations of parking spaces, greening of public areas or creation of swales. Rain water recovery devices are also implemented in order to achieve the 50% consumption reduction goal by 2030 (SPLA 2011).

These programmes were implemented after an extensive soil detoxification caused by industrial and trade activities linked to the port and wholesale market.

- Architectural quality and diversity

Quality of life in Confluence is also envisaged by paying attention to architectural quality beyond buildings' energetic requirements. This is part of the district's strategy to renew completely its image and thus take advantage of the opportunity to eventually become a symbolic value at metropolitan and national/international levels.

Furthermore, planning procedures have taken into account the conservation of testimonies of the area's industrious history by converting bridge cranes, by preserving rail tracks and building structures, by reusing materials from deconstruction sites for new pavement, etc. Approximately 30% of the wholesale market will be preserved from destruction to be adapted and converted to uses such as art galleries, shops, etc where-

as the two panopticon prison buildings are intended to be adapted and expanded for academic and student accommodation.

- Mixed use and social diversity

The planning of Confluence is mainly axed around the integration of housing, economic activities and public spaces.

With a planned 235 000 m<sup>2</sup> of new housing capacity throughout Confluence, particular attention has been given to social diversity in this reinvested and valuable territory. In the second building phase for example, 25 to 30% of all new accommodation will be allocated to social housing (legal minimum requirement in France being 20%). An additional 15 to 20% will have regulated rent and the remaining half will be accessible to standard purchase/rent. This policy has been pressed by the planning authorities according to Greater Lyon objectives and developed in partnership with the local social landlords. School distributions will also be regulated ("carte scolaire").

Essentially along the Saône embankment, several office buildings are being built with a care for visual demarcation. Amongst these, some will integrate office headquarters such as for the EuroNews channel and local newspaper *Le Progrès*. Other activities will mostly be linked to the service sector, with a special focus on media, communication and art. These will be situated in the planned 130 000 m<sup>2</sup> of offices dedicated to such activities. A further 120 000 m<sup>2</sup> of commercial space, hotels and leisure activities will consolidate the economic offer on site.

The landmark Musée des Confluences (an anthropological and scientific museum) is currently being built at the very tip of the peninsula and will complete the green continuity linking the district.

- Open density

Confluence has been planned as a dense urban area with wide inner open spaces. These consist mainly of green public parks and spaces spread throughout the district, as well as openings on both rivers (landscape architects were called upon for each step of the projects). The creation of an inner harbour comforts this geographical and historical link to water. Of the total 35 hectares of public spaces planned, 25 consist of parks and other green spaces.



Locked to the north by the “wall” of the Perache station and interchange, to the east by the A7 motorway running along the Rhône and otherwise limited by its geography as a peninsula, opening up the Confluence district proved to be a real challenge for planners. Solutions to go beyond this issue and “open a breach through the vaults” include the tramway extension linking Confluence to the heritage centre, redeveloping the three entry points under the interchange/station and encouraging alternative routes such as along the Saône bank.

These multiple initiatives supporting an integrated sustainable urban development approach have led Confluence to be recognised and engaged with several certification processes. The first of these was with the EU Concerto-Renaissance programme<sup>1</sup> which helped reach the goal of an average 50 kWh/m<sup>2</sup>/year on the first three plots built as well as 80% of renewable energy use. Later came the WWF “One Planet Living” label and the designation by the French Ministry of Ecology, Sustainable Development, Transport and Housing as an “éco-quartier”.

The most recent partnership is with NEDO, a national Japanese energy agency to work on a smart grid project.

## 2 NEDO/Toshiba and Grand Lyon smart grid partnership in Confluence

In December 2011, a partnership was agreed between the Japanese New Energy and Industrial Technology Development Organisation (NEDO) and the Greater Lyon metropolitan administration. This agreement is expected to last until 2015 and will focus primarily on the Confluence area where it is intended to achieve development of technologies supporting its environmental and energy ambitions.

NEDO serves as secretariat for the Japan Smart Community Alliance (JSCA), a consortium of Japanese organisations developing smart grid technologies. Presided by Toshiba, it includes other electric power, gas, automobile, information and communications, electric machinery, construction and trading industries as well as the public sector and academia, such as Mitsubishi, Panasonic, TEPCO or Toyota. It is through this alliance that Toshiba was selected and

entrusted to lead the consortium of companies involved in the Confluence project.

Both the size and importance of the city and the area covered by the project were key elements for choosing Lyon Confluence as a demonstration ground for Japanese technologies. This visibility is furthermore enhanced by the fact that the area has been certified by the French Ministry of Ecology as an eco-district and by WWF as a sustainable district. The area qualified to take part in a CONCERTO programme as early as 2004.

With a planned 50 million euros investment from NEDO/Toshiba, the Confluence project will provide a valuable vantage point for the Japanese consortium’s technological offer. For Lyon, this partnership is an opportunity to boost its territorial attractiveness and create employment (particularly in emerging sectors/activities), whilst at the same time fostering its sustainable development policy at both district and metropolitan level.

The Confluence project for NEDO/Toshiba is composed of four key tasks:

### (1) Positive energy building (“Îlot-P”)

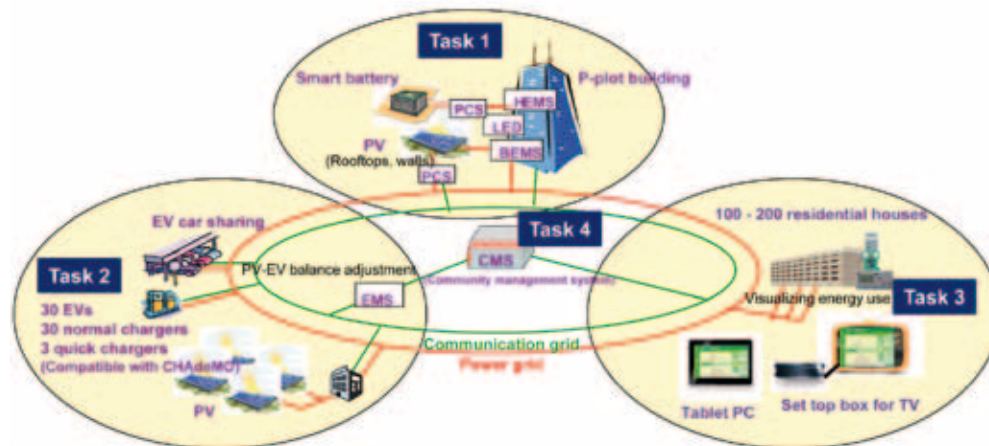
The goal for this 12,600 m<sup>2</sup> building will be to generate more energy than it consumes. It will be composed for more than half of offices and approximately one third of accommodation (42 apartments). The remaining space will be used for commercial purpose at street level. An exhibition room is also planned, displaying information on the Confluence project.

As such, it will be strategically built in the centre of the Confluence district, accessible from its main artery, close to the nautical plaza and shopping centre. As a positive energy building, it will be constructed using energy efficiency principles, techniques and materials but will also include production and storage capacities of renewable energies. It is designed to be both a testing site and a demonstration of different energy use and consumption in one same building.

Technologies introduced will comprise monitoring systems at domestic and holistic level: “Home/Building Energy Management Systems” (H/BEMS). These will seek to optimise energy consumption throughout different temporalities (day/week/seasonal), redistributing demand and costs.

(1) <http://www.renaissance-project.eu/spip.php?rubrique54&lang=en>

**Figure 3**  
**NEDO/Toshiba partnership project scheme**



Source: NEDO 2011a

Other innovations aiming to reduce energy usage will for example aim to group and centralise offices' commodities and facilities (such as printers, phone, etc).

In terms of renewable energy sources, photovoltaic and fuel cell micro-cogeneration systems have been envisaged by the architect and developer. These capacities will be augmented by geothermal heat pumps and absorption cooling devices. Excess energy will be stored in batteries for reintroduction in either the building electrical operator systems.

As an integrated building system, it will aim to optimise energy production and consumption between its different user types and distributions.

#### (2) Electric vehicle sharing system

A shared fleet of approximately 30 electric cars will be made accessible to on-site companies. These will be powered by photovoltaic energy sources located in the district, providing standard and fast charges. The system is designed for an optimised and balanced charging efficiency which, on the long run, should assure the perennity of the system on the whole.

As one of the least advanced elements of the project, this car-sharing system is still under negotiation between the parties involved. At this time, a particular issue remains in the technological compatibility of fast charges with the designed smart grid. Furthermore, a positioning of the offer at metropolitan level is also to be expected as

it could interfere with existing car-sharing systems run by different operators: Car2Go (point to point car-sharing) and Autolib' (fuel-engine car-sharing).

#### (3) Domestic energy management systems: energy boxes

Individual energy management systems will be installed in 275 eco-renovated apartments of social housing buildings in Cité Perrache (Sainte-Blandine). These boxes will provide users with detailed measurements and visualisations of domestic gas, electricity and water consumption. Alerts for high power consumption are also planned.

In order as to ease and encourage the use of this device amongst inhabitants, graphic visualisations accessible via smart phone, tablet and TV sets should increase its accessibility. This user interface will also include financial interpretations as well as recommendations for energy saving.

A crucial issue to the successful implementation of this device will reside in its social acceptance. One can wonder not only how it will be met within the local community, but also how its functioning will work out on the long run. It is so far difficult to say to what extent the community has been involved in the setting up of the project, yet local actors such as community committees and municipal energy agency have been engaged in the process. This will be particularly relevant in the course of increasing awareness and training.



Visitors in front of the Monolithe building

Photo: T. Marshall 2012

Furthermore, this system intrinsically reaches the limits of technology and calls upon human and social factors. This is probably one of the reasons of naming such projects “smart communities”, moving beyond the technological limitations implied by the concept of “smart grids”.

As such, it therefore also raises privacy issues as individual domestic information will be fed into a holistic management system. Also, one can question how changing habits will be achieved and to what extent will this rely on aiming to reduce consumption and therefore costs. Planners in Confluence have argued for the importance of not imposing a “feeling of guilt” but rather to develop a global environmental consciousness within the local community. This should be developed by different approaches such as communication, implication and training.

#### (4) Community Management System (CMS)

At district level, collected information relative to energy production and consumption will be fed into a holistic database. This

should cover data treatment, behavioural analysis, alerts, etc. in order as to monitor patterns and anticipate needs. It will be used to perform an updated energy audit of all three previous tasks to produce a multi-scale analysis. As a practical demonstration tool, it will serve to understand and in return maximise efficiency throughout the various elements of the district project.

Similarly as for the domestic energy management system (energy boxes), it raises questions of privacy and control: which information will be available to which users at what level, who will be in charge of managing this system and under which authority? Conceptually, it can be described as an information centralisation of decentralised energy production and consumption.

### 3 What is at stake: from global to local issues

#### *Institutional visibility at larger scales ...*

Eventually, this project also aspires to be spread to a wider scale by applying its principles and technologies beyond the district scale and implementing them at urban/metropolitan level.

For the Japanese consortium, investing in Lyon Confluence is an opportunity to experiment and showcase its solutions for sustainable urban development, aware that “large markets [are] expected to emerge in Europe, Asia and the U.S. in the future” (NEDO 2011b). Creating a model for urban sustainable communities is also a “support for further expansion in Japan and strengthening of competitiveness in overseas markets” (idem). After 2015, the completed project is expected to provide various dissemination supports, mainly through academic journals and workshops in Japan and abroad.

For Lyon, the partnership with NEDO/Toshiba is a means to prepare for an energy transition. By managing the interface with local stakeholders and facilitating the project’s development, it is supporting knowledge transfer and enhancing local expertise. Furthermore, the varnish provided by this international collaboration is also a wager for Lyon to shine as a model for “smart cities” and strengthen its aspirations to estab-

lish the Confluence district as a model for sustainable development worldwide.

In this respect, the district has generated a lot of interest and visits from across the world. In 2010, over 200 delegations visited the exhibition held on site, a quarter of which from abroad (Europe, Asia and South America). A majority of these delegations consisted of professionals (developers, promoters, investors, elected representatives, etc.). A further 5 000 individual visitors were registered the same year, suggesting that Confluence has also become a tourist attraction!

#### *... vs. local social acceptance*

As a particularly young project, it is impossible yet to evaluate the benefits of its implementation beyond its expected outcomes. It is important however to put forward that the technological input by NEDO/Toshiba will be accompanied by taking into account social elements, particularly in the case of affecting behavioural and energy consumption patterns. Beyond demonstration, there is a need for successful implementation through community adhesion: "to create a smart community, it is important to study how a social system functions, including not only energy supply and demand and the introduction of renewable energy, but also various lifestyles" (NEDO 2010). Smart Communities are thus envisaged as social systems where "intelligent societies are defined as societies with low carbon emissions" (Toshiba Corporation 2011).

So far, the successful development of Lyon Confluence can be related to its global and long-term planning approach. The imple-

mentation of a sustainable development charter for the entire area as well as strict environmental requirements for all new constructions have allowed for a comprehensive planning vision. The technical phasing of the project in two main stages is also a key to its success, although the separation between developments of the Saône and Rhône areas raises issues in terms of urban continuity. Other urban constraints affecting the functioning of Confluence will remain, in particular in the case of the A7 along the Rhône. The question of downgrading its status from motorway to urban boulevard is still pending.

In terms of public participation, a permanent consultation was established within the local network of inhabitants and associations. This served mainly to adapt planned developments but also to create within the community a strong membership to the project. This "participative democracy" was based on a Grand Lyon participation charter<sup>2</sup> which promotes transparency, dialogue and common decision making. It is important to note here the role of mediating actors, particularly in the case of the "Maison de la Confluence" which serves both as an exhibition space for the Confluence project with display model and a local community centre (collection point for community-supported agriculture, event organisation with newcomers, etc.). The role of local actors involved should be of particular importance in the transfer and acceptance of social change in the area as Confluence's existing housing in Sainte-Blandine has a traditional blue-collar community (and this despite efforts to balance social housing offer) – integration of likely social change is therefore also a key issue for the future.

(2)  
[www.grandlyon.com/Charte-de-la-participation.1376.0.html](http://www.grandlyon.com/Charte-de-la-participation.1376.0.html)

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