EU-Japan Centre for Industrial Cooperation

SMART CITIES IN JAPAN
An Assessment on the Potential for EU-Japan Cooperation and Business Development

Tokyo, October 2014

PHAM Clarisse

Table of contents

Executive summary

Smart Cities are a booming market in the EU and Japan. The growing economic importance of cities and the necessity of addressing environmental issues has brought both partners to develop local solutions for energy management especially. Following the accident at the Fukushima nuclear power plant, Japan has further adjusted its energy policy. As leaders of sustainable technology and services, European and Japanese companies could benefit from advanced cooperation on Smart City development and management. The two economies could improve their models and enhance their competitivity at a global scale.

In order to assess the opportunities for partnerships between Japan and the EU in this regard, this report investigates the Japanese Smart City policy, from the context in which it is embedded to the different types of projects that have been initiated. The interviews conducted contributed to establishing that many Smart Community pilots in Japan are heavily dependent on the central government, as they rely on massive subsidies from the METI. Few projects are entirely financed by the private sector. In most cases of both private and public initiatives, the LG's authority is overridden by the central government and the consortium of companies. The Japanese Smart Communities are thus showcases of technology, which are aimed at local economic revitalisation and commercialisation at a global scale. That is also why the government subsidises many Japanese companies involved in pilots in Asia, Europe and the United States. This report lists all the Smart City project where Japanese companies are involved, domestically and abroad.

The present context is favourable for EU-Japan business cooperation. Massive investments are needed in order to achieve the new energy mix and energy efficiency necessary to shift away from nuclear power and fossil fuels, and Smart Cities are part of this policy. The ongoing negotiations for the FTA/EPA and the upcoming investments related to 2020 Olympic Games also play a part in the opening of the Japanese market, especially considering that Tokyo has a Smart City strategy. There are opportunities for EU-Japan cooperation in Smart Community projects where consortiums have not been decided yet.

This report analyses the sectors in which European companies could contribute to incremental improvement in energy efficiency technology and services at the scale of communities. European expertise, especially in power transmission technology and data management, is already a significant asset for European companies to cooperate with Japanese firms. The report ends with a few recommendations on how to access the Japanese market of Smart Communities.

List of Abbreviations

AMI	Advanced Metering System
ANRE	Agency for Natural Resources and Energy
BEMS	Building Energy Management System
CEMS	Community Management System
DR	Demand Response
EMS	Energy Management System
EPA	Economic Partnership Agreement
EPCO	Energy Power Company
EV	Electric Vehicle
FEMS	Factory Energy Management System
FCI	Future City Initiative
FIT	Feed In Tariff
FTA	Free Trade Agreement
FY	Fiscal Year
GHG	Green House Gas
HEMS	House Energy Management System
IBEC	Institute for Building Environment and Energy Conservation
ICT	Information and Communication Technology
LG	Local Government
METI	Ministry of Economy, Trade and Industry
MIC	Ministry of Internal Affairs and Communications
MOU	Memorandum of Understanding
NEDO	New Energy and Industrial Technology Development Organisation
NEPC	New Energy Promotion Council
NGO	Non Governmental Organisation
OCCTO	Organisation of Cross Regional Coordination of Transmission Operators
PV	Photovoltaic
QoL	Quality of Life
R&D	Research & Development
RE	Renewable Energy
SEZ	Special Economic Zone
SST	Sustainable Smart Town
TEPCO	Tokyo Electric Power Company
TMG	Tokyo Metropolitan Government

List of figures

Introduction

A. Background

Cities are hubs of economic activity. They attract most of the national businesses and services, and concentrate the densest infrastructures. The larger they are, the more investments they draw. Urban population keeps on increasing, and in 2012 accounted for respectively 74% and 92% of the total European and Japanese population[1]. As centres of production, cities are also centres of consumption. The massive spread of technology coupled with the increasing concentration of urban activity has led to a steep increase in energy consumption in cities.

In order to meet this energy demand, energy supply has expanded too. However, the most productive and cost-effective means of energy production are not the cleanest. Globally, cities consume up to 80% of energy supplies and produce about 75% of CO_2 emissions[2]. Cities in the EU and Japan are among the largest consumers, as urban hubs where infrastructure and technology are highly developed. They face the challenge of maintaining energy security and economic competitivity, while promoting sustainable development and preservation of the resources. This issue has led the central and local governments from the EU and Japan to support an innovative model of urban growth: the Smart City.

In Japan, the Ministry of Economy, Trade and Industry (METI) has invested in the increasing numbers of Smart City projects since 2010. The promotion of smart energy initiatives is now one of the goals established by the Fourth Energy Strategic Plan, released in April 2014 (Chapter 3, Sections 2 and 9)[3]. Meanwhile in the EU, the number of projects have also surged in the past five years and Smart City support is part of the Europe 2020 strategy as a target of the "Digital Agenda for Europe", one of the Flagship Initiatives[4]. Besides, in many Japanese and European cities, projects independent of the government subsidies have emerged.

The Smart City market for both the EU and Japan will keep growing as renewable energies and sustainable life style solutions are key sectors of public and private investments. For instance, TEPCO announced it would install 27 million smart meters by March 2021[5] and it is thus expected

[1] World Bank. http://data.worldbank.org/topic/urban-development

[2] World Business Council for Sustainable Development. 2014. "The Urban Infrastructure Initiative" p.15 http://www.wbcsd.org/uiifinalreport.aspx

[3] ANRE. 2014. http://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/4th_strategic_energy_plan.pdf

[4] European Commission. http://ec.europa.eu/digital-agenda/en

[5] Bloomberg New Energy Finance. 2013. http://www.bloomberg.com/news/2013-10-28/tepco-aims-to-install-smart-meters-3-years-earlier-than-planned.html. October 28th

that Smart City business in Japan will grow from ¥1.12 trillion in 2011 to ¥3.8 trillion by 2020[6]. The worldwide market is also going to expand, especially in regards to the growing investments in China and in the US by 2015: China is expected to increase its investments four fold while the US should triple its expenditures in Smart City activities. An increasing number of projects are likewise initiated in India and in the Middle East by 2020[7]. Selection of bidders to the upcoming pilots across the world is already very competitive as international firms are answering the tenders. Cooperation between the EU and Japan could lead to better competitiveness for both partners.

The two economies are leaders of sustainable development promotion, both in technology maturation and policy making. Although there is no agreement for business cooperation on Smart Cities between the Japanese government and the EU, other partnerships between the two entities already exist in related fields of sustainable development. Considering that their advanced positions and the future market growth, there is good potential for economic cooperation in Smart City development and management.

This report first aims at providing an understanding of the Smart City policy and Smart City actors in Japan (part 1). It then investigates the different types of projects in Japan and abroad, and can thus put them in perspective of international standards (part 2). The last section is dedicated to the identification of key sectors of possible cooperation between the EU and Japan and to the assessment of the obstacles to these opportunities (part 3). The report ends with a set of recommendations and conclusions on the Smart City market in Japan. Throughout the report, the differences between the Japanese and European projects are outlined in the perspective of possible partnerships.

B. Methodology

Data collection was conducted over a three month period. Detailed information was not always available and the multitude of projects in Japan makes it difficult to get a complete picture of existing opportunities. However, as much data as possible was gathered through desk research and interviews. Desk research mostly included analysis of expert and academic papers and presentations, as well as official press releases, and documentation provided by government institutions and companies involved in Japanese Smart City projects. In addition to potential European business partners and experts from the academic field and from the private sector, interviews were conducted with key actors of some of the projects.

---

[6] From about €8.1 billion to €27.4 billion, calculated following June 2014 exchange rates. Fuji Keizai. http://mnj.gov-online.go.jp/smartcommunity.html

[7] METI. 2013. p.127 http://www.METI.go.jp/METI_lib/report/2013fy/E002865.pdf

C. Definition

Establishing what a Smart City is can be challenging: the definition differs depending on the sources and on the projects, and have changed over time. Indeed the branding of projects ranges from "Smart City", "Smart Community", "Smart Grid", "Sustainable Smart Town", "Eco-city", "Active Aging City" to "Green Community" among others. And while the mayor of Yokohama describes its project as a model aiming at handling the issues of global warming and rapidly aging society, Fujitsu representative argues that *Smart City* is based on technology used "to efficiently develop human oriented infrastructure"[8]. Furthermore, the concept of *Smart City* and the orientation of the projects in Japan have evolved since the launch of the initial pilots in 2010, mostly due to nuclear accident in Fukushima in March 2011 and the resulting shift away from nuclear power.

Nevertheless, it can be said that the expression "Smart Community" is more widespread than "Smart City" in Japan. The definition best encompassing the different types of projects is provided by the Japan Smart Community Alliance (JSCA)[9]: *"A smart community is a community where various next-generation technologies and advanced social systems are effectively integrated and utilized, including the efficient use of energy, utilization of heat and unused energy sources, improvement of local transportation systems and transformation of the everyday lives of citizens."*

As a means of comparison, the latest report produced by the European Parliament on Smart City projects in Europe proposes this definition[10]: *"A smart city is a city seeking to address public issues via Information and Communication Technology (ICT)-based solutions on the basis of a multi stakeholder, municipality based partnership."* The report further establishes that all projects aim at the optimization of management in at least one of the six following areas: economy, environment, government, living, mobility and people.

The European approach is very broad based and encompasses many fields, while the Japanese model is more specific and focuses on energy, infrastructure, ICT and lifestyle. In both cases though, ICT is key to achieve a model of urban development where both economic and environmental targets can be achieved. ICT is used to make energy consumption more visible and manage it depending on the available local sources, such as Photovoltaic (PV) panels or storage batteries. ICT is also used for a variety of purposes, ranging from public safety through CCTVs to electric bus network management. Another key element is the integration of the urban system, where PV produced energy can be used for Electric Vehicle (EV) charging, while wind farms can serve for night street lighting and building security. The data control centre is then the key tool to link all the supply and demand points, so that constant response is achieved and maintained.

---

[8] Japan Times. 2012. "Smart City concepts offers solutions to global problems". http://info.japantimes.co.jp/ads/pdf/0131p10-11.pdf. January 31st

[9] JSCA. https://www.smart-japan.org/english/index.html

[10] MIC. 2013. http://www.stat.go.jp/english/data/jinsui/tsuki/index.htm

1. Smart City development in Japan

A. Decision-making in Japanese urban planning

Japanese population adds up to a total of 127.2 million inhabitants[11], of whom 117 million live in cities. Traditionally, people have settled on the riverside and coastal land. This is even more the case for Japan as the mountains make the inland unfavourable to urban development. Japanese cities are dense in terms of population, building patterns and infrastructure networks. Population density in Japan is six times higher than world average (350 persons per km^2 to 54 per km^2 in 2012[12]). In the most densely populated urban areas such as central Tokyo, the figures go up to 12,022 habitants per km^2, while the 6,758 is the average for the main cities[13].

Local Governments (LGs) in Japan have a governing capacity they do not always make use of. Although some prefectural governments are involved in Smart City projects, in most cases the representative of the local public power is the city hall. The mayor is directly elected every four years without term limit, and appoints vice-mayors to the different departments, who in turn must be approved by the city assembly. Many municipalities have more competences than others due to the size of their population, in which case some decisional powers in urban planning are transferred from the prefectural government to the city hall[14].

Nevertheless, the model of political decision-making is generally considered to be centralised in Japan, as the State remains a key player in city planning. The centralised system often translates into a model where LGs are executing bodies of the central policy, in spite of the two decentralisation reforms of 2000 and 2006. These measures gave power to municipalities as they obtained more competences and their financing capacities were slightly expanded[15]. Based on the interviews conducted, it can be said that the local governments obtained an equal legal status with the central government. Yet the central government remains the main initiator of local policies, especially when it comes to large scale projects such as Smart Cities.

Moreover, the private sector, notably real estate and construction companies, is an extremely influential actor of urban planning in Japan, where municipalities tend to let them take and conduct large scale initiatives. This results into a situation where municipalities are not the leaders of projects, but often mere advisory participants. In some cases, LGs manage to lead actively the planning and implementation of projects, instead of following the roadmap decided by the private sector, in

[11] EU. 2014. "Mapping Smart Cities in the EU" http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf p.17

[12] WB. http://data.worldbank.org/indicator/EN.POP.DNST/countries/1W?display=default

[13] MIC. 2012. Japan Statistical Yearbook. Section 2-5. http://www.stat.go.jp/english/data/nenkan/1431-02.htm

[14] The Revised Local Autonomy law is available at https://nippon.zaidan.info/seikabutsu/1999/00168/contents/002.htm

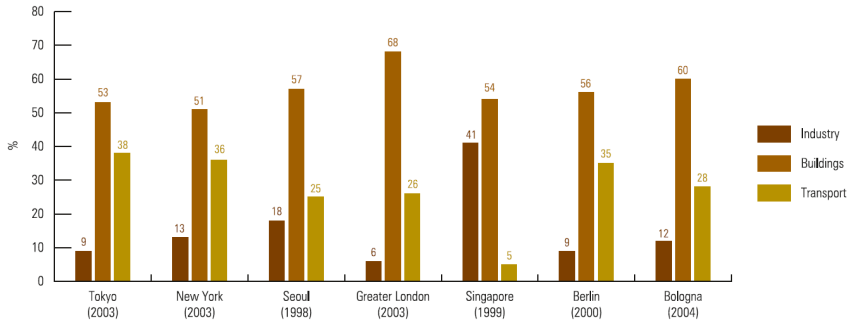
[15] Council of Local Authorities for International Relations. 2010. http://www.clair.or.jp/j/forum/series/pdf/j05-e.pdf

accordance with the central government's economic requirements. The degree of autonomy of the LG depends on each city and on each government elected by the local citizens. Tokyo is at the forefront of urban level innovative initiatives, particularly in terms of sustainable development. Smart Community projects are an opportunity for LGs to promote decentralized decision-making, but Japanese local authorities are not always keen on taking the lead[16] and often end up on the advisory committees. LGs give priority to project development that stimulates the local economy over the establishment of a regulatory system where urban issues could be addressed[17]. The development of Smart Cities is now slowly becoming an actual tool for energy management in cities, but first it has been a showcase of technology.

B. Energy consumption in Japanese cities

Although population is decreasing in Japan, the ongoing spread of technological equipment, ranging from home appliances and lighting to individual and company ICT devices, is such that energy savings are not what they could be.

Energy consumption in urban areas is made up of residential and commercial demand, but also of transportation use. In cities the maintenance and operation of existing infrastructures is more costly energy wise than industry consumption. For instance, in 2003 it was estimated that Tokyo's residential and commercial consumption makes up 53% of the total, while transport represents a 38% share, against 9% of industrial energy use as shown in the graph below (the figures are slightly dated but they are given for illustration purposes)[18]. However, industrial consumption in a number of Japanese cities can be a more important source of consumption, in the case of cities built around local industry and still dependent on them, such as Kitakyushu for example.



Energy consumption per sector in cities of high income countries. Source: see reference 17

[16] Fukushima, Hirohiko. 2012. « Building the Foundation for Local Governance ». Tokyo Foundation. August 31th. www.tokyofoundation.org/en/articles/2012/foundation-for-local-government

[17] Sorensen, Andre. 2002. "The Making of Urban Japan Cities and Planning from Edo to the 21st Century". Ch.10

[18] UN-Habitat. 2008. http://mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2562. p.160

In the long term, residential and commercial final consumption in energy has increased in Japan[19]. The present consumption in those sectors is lower than the peak it reached in the late 1990s and beginning of the 2000s. The overall final total consumption followed a similar pattern. Except for the oil shocks after which Japan took a couple of years to boost its consumption again, this lasting change in the trend of Japanese growing consumption can be explained by the ambitious policies following the Global Warming Law passed in 1998, the entry into force of the Kyoto Protocol in 2005 and the promotion of programmes for greener cities and sustainable initiatives that led to the reduction of Green House Gas (GHG) emissions by cutting on consumption. The Great East Japan Earthquake and the resulting stop of nuclear power plants are reflected in the sharp decrease in electricity consumption from FY2011. Nonetheless residential and commercial consumption, as well as transport consumption, have not decreased as fast as industrial consumption. Therefore their shares in overall consumption have steadily increased. This trend is reflected in the following table.

	Final energy consumption (in 10^{10} kcal)	**Share of overall consumption (%)**
FY1990	153,234	47.4
FY2000	190,402	50.6
FY2010	180,597	53.3
FY2012	173,233	53.5

Residential, commercial and transport energy consumption in Japan. Source: see reference 19

Smart Cities are models of development which aim at improving the visibility and quality of consumption of the residential, commercial and transport sectors: communities as urban businesses and in particular citizens are the targets of the policy initiated by the government.

C. Smart Cities in the national energy policy

Prior to the Fukushima accident

Japan is not self-sufficient in terms of energy. It can produce a maximum of 20% of the final energy consumption. And since the Fukushima accident, Japan produced 11% of the domestic energy demand on its own. In the UK energy security goes up to 68.9%, while China produces 88.3% of its energy consumption demand[20]. In Japan more than half of the imports are oil, imported from the Middle East. The two other major fuels used are LNG, which is mostly bought from South East Asia and Australia, and coal coming from Australia.

[19] EDMC Handbook of Energy and Economic Statistics. 2014. p.40-43
[20] EDMC Handbook of Energy and Economic Statistics. 2014. p.278

Tokyo's commitment to struggle against climate change and to promote sustainable development led the government to change its energy policy from the early 1990s[21]. In order to meet the new CO_2 emission targets (a 25% cut by 2020 compared to 1990 levels), Japan proceeded to energy diversification by shifting away from fossil fuels and relying more on nuclear and renewable energies. Although fuels still needed to be imported to meet the demand, nuclear power led to better energy security at the same time it contributed to the reduction of GHG emission reduction. Nuclear energy provided up to one fourth of the electricity prior to March 2011 while the share of renewable sources slowly grew.

In this context, the first Smart City projects were initiated in late 2009, as high tech urban demonstrators of advanced quality of life. Pilot projects subsidised by the METI and other pilots privately funded were inaugurated. The interest in smart grids sparked by the 2009 Green New Deal in the USA also stimulated the METI to invest in such projects[22].

After 3/11

The accident in Fukushima Daiichi nuclear plant showed how unstable the energy supply was in Japan. Firstly, it put into light the lack of safety, linked to insufficient risk prevention in the construction of nuclear power plant sites and the radioactive threat to local citizens. Considering that there are 50 plants throughout Japan, the risk could not be disregarded and all plants were stopped until security checks were conducted and new safety regulations were applied. Secondly, the sudden shortage of power and the inadequate electricity grid resulted into blackouts and undesired lumps in electricity consumption, showing how constant energy supply cannot be ensured, even for key services in emergency situations, such as communication networks.

Measures have been taken to ensure energy security again and the energy policy has shifted away from nuclear generation back to fossil fuel, boosting coal and LNG consumption. As a result, in 2012, Japan was the second biggest net importer of fossil fuel after China[23], and the fifth largest producer of CO_2 in the world[24]. In November 2013, at the UN talks on climate change, the Japanese government announced that it was amending its goal: instead of reaching the CO_2 emissions reduction by 25% by 2020, the country would hit a 3.1% increase. It further declared to be relying on its neighbours to lower their own emissions in exchange for Japanese clean-energy technology[25].

---

[21] Sugiyama, Noriko and Takeuchi, Tsuneo. 2008. "Local Policies for Climate Change in Japan", The Journal of Environmental Development, Vol.17 N.4, p.424-441

[22] Japan Times. 2012. http://info.japantimes.co.jp/ads/pdf/1014z01-08.pdf

[23] US Energy Information Administration. 2013. http://www.eia.gov/todayinenergy/detail.cfm?id=13711

[24] Bloomberg. 2013. http://www.bloomberg.com/news/2013-11-15/japan-sets-new-emissions-target-in-setback-to-un-treaty-talks.html

[25] Ibid.

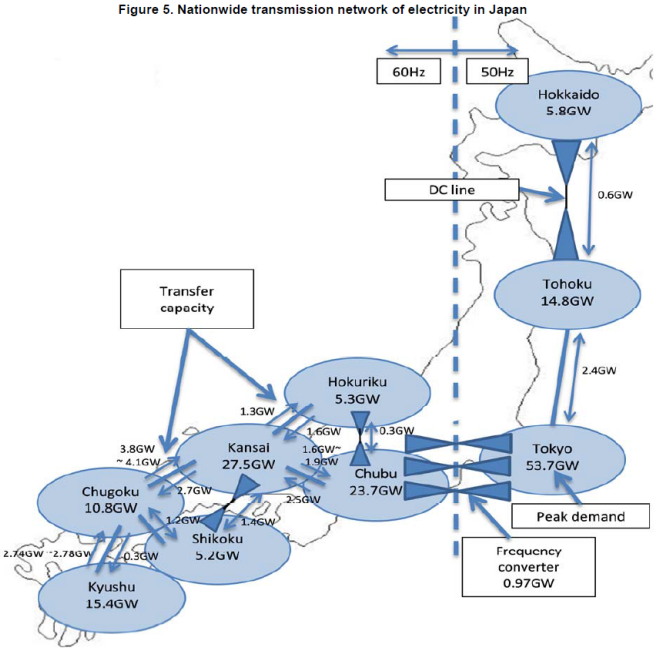
Another contested decision of Abe's government lies in the re-start of up to one third of the nuclear power plants[26]. New Regulatory Requirements and New Safety Standards were established by the Nuclear Regulation Authority formed in September 2012[27] and should be applied to the nuclear plants before plants are used again. Albeit the 2020 goals of GHG emissions targets will not be respected, Japan still aims at lowering its production of carbon dioxide in the long term. Similarly to the pre-Fukushima accident, the focus is jointly put on renewable and clean energy promotion. Energy efficiency is another key tool to contribute to energy security and reduced CO_2 emissions.

A last key set of policy changes relates to the power grid. The production, transmission and distribution of electricity until the Great East Japan Earthquake was efficient enough that no radical reform was needed, especially as the power companies opposed it, while after 3/11 it was clear that a push towards more efficiency and through energy sector liberalisation was necessary.

The electricity sector in Japan

Japan uses two frequencies, 50 Hertz in the East and 60 Hertz in the West. Prior to the accident in Fukushima Daiichi, the electricity market was shared between 10 vertically integrated utilities with regional monopolies founded in 1951 (Electricity Power Companies, EPCOs). The map below illustrates their area of business (Okinawa EPCO is not represented).

Figure 5. Nationwide transmission network of electricity in Japan



Electricity transmission network in Japan. Source: Randall, S. Jones and Myungkyoo Kim. 2013. "Restructuring the electricity sector and promoting green growth in Japan". OECD.

[26] Reuters. 2014. http://www.reuters.com/article/2014/09/10/us-japan-nuclear-idUSKBN0H507F20140910. September 2014

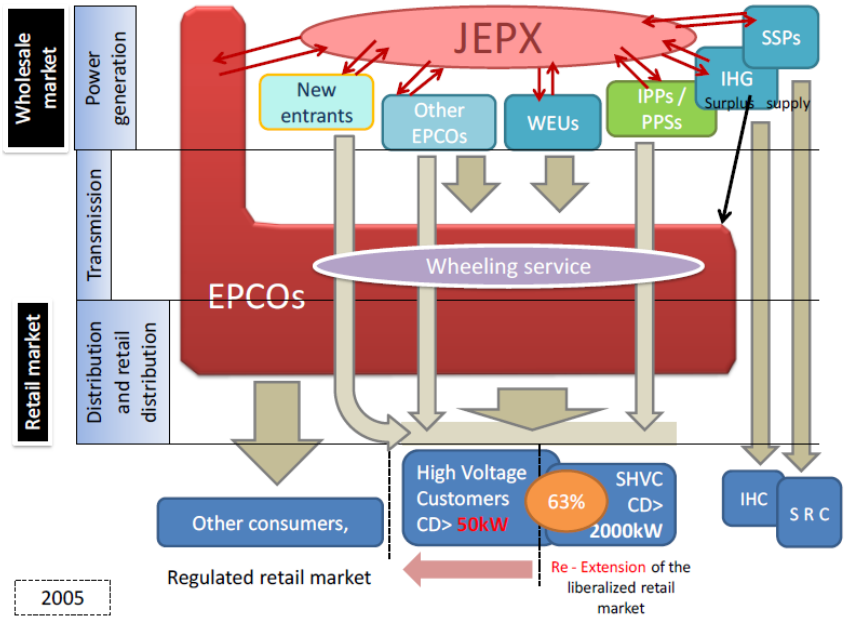
[27] For further information see http://www.nsr.go.jp/english/

Until 1995 the ten EPCOs produced 88% of Japan's electricity consumption. Then a series of reforms was launched to start liberalising the market; they are summed up in the following table.

No.	Year enforced	Overview
1	1995	• Open the IPP (Independent Power Producer) market • Allow specified-scaled and vertically integrated power generators
2	2000	• Introduce partial retail competition • Accounting separation of transmission/distribution sector
3	2005	• Expand retail competition • Establish the wholesale power exchange (JEPX) and its supporting body for transmission in wider areas
4	2008	• Modify the rule of wheeling rates…

Electricity reforms in Japan. Source: ANRE http://www.METI.go.jp/english/policy/energy_environment/electricity_system_reform/pdf/201311EMR_in_Japan.pdf

The current electricity market structure is as follow:



Electricity market structure in Japan. Source: Vigot, Victoria. "The Japanese clean energy sector development". 2013. http://www.eu-japan.eu/sites/eu-japan.eu/files/Japanese-Clean-Energy-sector-development-2014.pdf

The following companies entered the market:

- Wholesale Electric Utilities (WEUs): businesses having a supply capacity of two million kilowatts and above, supplying power to EPCOs

- Independent Power Suppliers (IPPs): businesses supplying to EPCOs based on contracts of a minimum of 1000kW for at least ten years or 100,000kW for at least five years
- In House Generation (IHG) supplying In House Consumption (IHC)
- Specified Supply Projects (SSP) or Specific Electric Utilities (SEU): businesses producing, transmitting and distributing their own power through to Specified Regional Consumers (SRC)

However, the Great East Japan Earthquake revealed the weaknesses of the electricity system which were not addressed by the reforms. Randall and Myungkyoo (2013)[28] identify the following points:

- weak safety supervision left Japan vulnerable to nuclear accidents: the lack of sufficient disaster prevention structures and strategy reveals the regulatory failure over EPCOs and the lack of coordination of the Japanese government agencies
- a market structure based on regional monopolies limits the supply response to shortages because of the lack of interconnection capacity and the non-standardisation of the two frequency systems
- price mechanisms are insufficient to adjust supply and demand: they are not based on consumer preference and there is little incentive for either suppliers to adapt their production or for users to change their consumption when supply and demand conditions require it
- the continued dominance of regional monopolies hinders the development of market mechanisms as the liberalisation reforms were ineffective: the EPCOs still dominate the wholesale and retail markets

The fifth reform was passed in April 2013 by the Cabinet, relying on three phases: the establishment of the OCCTO, the Organisation for Cross Regional Coordination of Transmission Operators (by 2015), full retail competition and elimination of wholesale regulation (by 2016), legal structure separation of power transmission and distribution sector, abolition of retail rate regulation (by 2018-2020)[29]. The Electricity Business Act of 1964[30] was amended in November 2013 for the implementation of the first phase, and was revised again in June 2014 for the enactment of the second stage of the reform.

[28] Randall, S. Jones and Myungkyoo Kim. 2013. "Restructuring the electricity sector and promoting green growth in Japan". OECD.
http://www.oecd-ilibrary.org/docserver/download/5k43nxrhfjtd.pdf?expires=1403577774&id=id&accname=guest&checksum=6B9F323B9D59C3270D729B0CD92126A0

[29] For further information on five reforms see http://www.tepco.co.jp/en/corpinfo/ir/kojin/jiyuka-e.html

[30] Available at http://www.japaneselawtranslation.go.jp/law/detail_main?re=&vm=02&id=51

D. The Smart City strategy in Japan

Smart Cities revolve around ICT use for better energy efficiency, but they also serve for local revitalization. Smart Cities are based on the most advanced technology for precision, reliability and quickness of information regarding energy consumption; in addition to the value of the technology, the worth of the data circulating is already high priced. Smart Cities rely on the latest high performing batteries and RE sources. This report identified three goals in the strategy of deployment of Smart City projects throughout Japan:

- fostering energy security and efficiency
- boosting local development economically and socially
- enhancing regional and global competition

Fostering energy security and efficiency

Reducing energy consumption in order to preserve resources is a basic goal. In the context of Japanese Smart Cities, electricity savings are also required so that the load on the energy grid is decreased. Self-sufficiency is enhanced in two ways: Smart Cities help lowering the energy consumption and they help introducing individual clean energy means of energy production. Both courses of action contribute to lowering GHG emissions and replace a tiny share of nuclear and fossil fuel generated electricity. Energy security is also boosted: in case of blackout provoked by a natural disaster, households should be able to survive even when isolated, thanks to locally produced energy and storage batteries.

Boosting local development economically & socially

Initially Smart City projects have been promoted because they serve the double purpose of environment preservation and economic growth. The projects are developed by consortiums of enterprises, which aim first at showcasing their products and second to massively commercialize them. A large panel of companies are involved, from ICT firms (like Fujitsu) and real estate agencies (for example Mitsui Fudosan) to the car industry (such as Toyota) and Electric Power Companies (for instance Kansai EPCO). Every features of the Smart City plan call in companies providing services relating to transport infrastructure, sensors, construction material or data security.

Most often, the projects take place in a previously disused areas of the selected city, thus boosting the local economy around a massive project and revitalizing a piece of land, making it attractive for new inhabitants. The Smart Community becomes a new symbol of social standing where Quality of Life (QoL) is advertised as enhanced and improved in all possible ways. At the individual level, daily life is supposed to be more comfortable thanks to high tech use, and at the community level, the district is to be safer and more convenient in regards to mobility. Moreover, care for the elderly

is often included in Japanese Smart City plans: in a country where the elderly population could reach 40% by 2060[31], it has become essential for municipalities to plan for their welfare, even as they live on their own. Many project plans have a section dedicated to elderly care; it is the case for instance with the sanatorium in Higashi Matsushima's master plan where the Smart Community involves the Kitahara Nursery Institute, a major medical treatment centre in Japan.

QoL upgrading is not just a marketing tool for all Smart Cities in Japan. In the case of Tohoku cities in the reconstruction phase, Smart Community projects help mobilizing key actors from the private and public spheres with the support of government subsidies for urban and economic revitalization. The reconstruction is also the opportunity to improve the infrastructure and to promote a new resilience based on the ICT of the Smart City.

Enhancing regional and global competition

Public and private institutions alike openly declare that they want to "find local solutions to global problems"[32] and that locally tested Smart City technology and energy management models are intended for deployment abroad. Pilots in Japan are tools for boosting economic activity locally, and economic competitiveness globally. Neighbouring countries are potential markets for Japanese companies, as well as competitors. As economies relying on ample and comparatively inexpensive labour, many Asian countries can rival Japan. The Chinese Smart City market is expanding quickly and ICT companies are growing fast, while many other South East Asian countries are expected to increase their spending in that field[33].

Hence the commitment of Japanese companies' focus on the sectors with the best economic potential, in other words "the fields of the environment and energy, ICT and other advanced technologies, as well as manufacturing"[34]. Choosing Smart Cities as part of the economic competitivity boost is also in the public discourse as can be observed in the Yokohama master plan[35]. Producing models that are exportable and replicable in the region has already shown some success as Japan has agreed to take part to projects in South East Asia for instance (see part 2 of the report, section D).

Japanese companies are also designing a package of solutions for the global market. The competition with foreign companies such as IBM is not based on the price of the services as much as on the quality and the comprehensiveness of the solutions the firms propose. Japanese Smart City innovations are already tested in Europe and in the US, for instance in Los Alamos and Alburquerque, New Mexico.

---

[31] National Institute of Population and Social Security Research. 2012. http://www.ipss.go.jp/site-ad/index_english/esuikei/ppfj2012.pdf

[32] See reference 8, p.8

[33] Bloomberg New Energy Finance. 2014. http://about.bnef.com/press-releases/china-out-spends-the-us-for-first-time-in-15bn-smart-grid-market/

[34] Japanese Business Federation. 2010."Sunrise report". http://www.keidanren.or.jp/en/policy/2010/114.html

[35] Yokohama City. http://www.city.yokohama.lg.jp/ondan/english/pdf/initiatives/master-plan-of-yscp.pdf

2. Smart City project analysis in Japan

A. Overview of the Smart Technology

The core Smart City technology is ICT: it makes the difference between a project of a green city, where sustainable development is promoted in a general way, and a smart community where information is key to energy management. A Smart system does not only rely on better efficiency but also on clean sources of energy to be used. The technologies common to Smart Communities in Japan are mostly found in Smart House projects[36]. It is particularly the case for private initiated projects. Smart Grid projects, focused on the power network rather than the building, are only slowly emerging in Japan. The fifth reform of the electricity sector may encourage more projects. The technology used in "smart houses" include the following (see Annexe 3 for the listed technologies used in Japan):

- clean energy sources, storage batteries
- Advanced Metering Structure (AMI), Energy Management Systems (EMS), Intelligent Transport Systems (ITS)…
- Electric Vehicles (EV) and related infrastructure

Clean Energies

The most commonly used clean energy sources are Photovoltaic generation (PV) and wind power. Following a short lived boost of solar energy in the late 1990s and early 2000s thanks to a subsidy programme, PV use is now promoted by the government again: the aids put in place in 2009 in addition to the Feed-in Tariff (FIT) launched in July 2012 have helped revitalising the solar generation sector in Japan[37]. New areas for PV installation are opened in urban areas: Tokyo Metropolitan Government launched an interactive map interface where it is possible to visualise which buildings are suitable for PV installation[38]. Panasonic also announced its intention to rent factory rooftops for solar panel installation[39].

Prior to the 2012 FIT, solar power represented most of the RE. The FIT helped diversify the clean energy sector in Japan. The new energy mix targeted in the Fourth Strategic Energy Plan now includes wind and geothermal power as key clean energies to expand (Chapter 3, Section 3)[40].

---

[36] Japan Business Press. 2013. http://jbpress.ismedia.jp/articles/-/38436

[37] For further information see http://www.METI.go.jp/english/policy/energy_environment/renewable/

[38] For further information see http://tokyosolar.netmap.jp/map/index_map.html (in Japanese only)

[39] Bloomberg New Energy Finance. 2014.
http://about.bnef.com/bnef-news/panasonic-targets-factory-rooftops-for-solar-expansion-in-japan/. May 13th

[40] See reference 3, p.6

Besides the development of solar projects has considerably slowed down[41], and the incentive program might be revised in order to further reduce the PV production[42]. A major wind industry group, the Japan Wind Power Association, also upgraded its power capacity goal: it now targets both onshore and offshore wind generation development for a 75 GW capacity by 2050, instead of 50 GW[43]. This was confirmed by one of the interviewees: the former TEPCO manager pinpointed the wind power as a key investment sector, especially in regards to the potential for farm installation in Hokkaido, in northern Japan. Geothermal sources are another underdeveloped sector which could boost the share of RE in consumption, through the exploitation of the numerous sources in Japan, with the construction of small plants for instance[44]. Other clean energy sources that can be found in Smart Community projects include biomass (which will be used in Sakashima Smart Community project in Osaka[45]) and hydrogen (as in Fujisawa Sustainable Smart Town[46]).

Storage batteries (also called Energy Storage Systems, ESS) are essential in Smart Cities. The energy supplied by RE may not be used straight away as consumption patterns do not necessarily match the production peaks. For instance, PV energy needs to be consumed during the day or must be stored for evening household consumption. Likewise wind currents may be strong late at night and the energy produced in the farms may not be needed immediately. Therefore storage batteries and fuel cell batteries are key components of the Smart Community as they contribute to a balanced energy management. Moreover, ICT makes delayed consumption possible, as appliances can be programmed to work at off peak hours. Yet efficient energy management systems contribute to a balance of Demand and Supply, and batteries may not be always necessary. The government promotes clean energy use by making it one key criteria for selection to the METI subsidy[47].

AMI and EMS

Advanced Metering Infrastructure and Energy Management Systems are devices that enable the user to understand their detailed energy consumption, and adapt it based on better awareness of the economic and environmental consequences. AMI mostly rely on Smart Meters, which focus on the consumption visualisation, while EMS are a platform through which supply and demand can be

---

[41] Bloomberg New Energy Finance. 2014. September 10th
http://about.newenergyfinance.com/about/bnef-news/japan-s-meti-says-1-820-megawatts-of-solar-projects-canceled/

[42] Bloomberg New Energy Finance. 2014.
http://about.newenergyfinance.com/about/bnef-news/japan-may-apply-solar-brakes-with-rate-overhaul-yomiuri-reports/. October 1st

[43] Bloomberg New Energy Finance. 2014.
http://about.bnef.com/bnef-news/japan-wind-lobby-boosts-wind-capacity-target-by-half/. May 30th

[44] Bloomberg New Energy Finance. 2014.
http://about.bnef.com/bnef-news/ihi-expects-japan-market-for-small-geothermal-projects-to-expand/. May 21st

[45] For further information see http://sakishima-smart.jp/jigyo_en.html

[46] For further information see http://panasonic.net/es/fujisawasst/

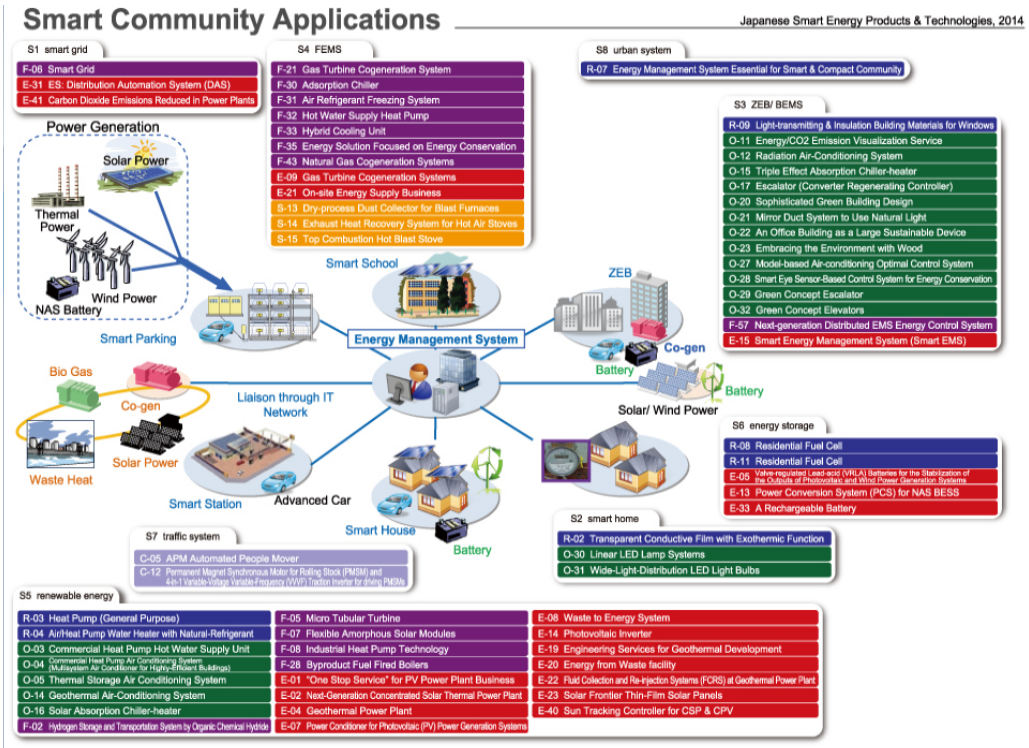
[47] METI. 2010. http://www.METI.go.jp/english/press/data/20100408_01.html

managed. EMS are mainly applied to Houses (HEMS), Buildings (BEMS), Factories (FEMS), and Communities (CEMS). For example, in a house, all energy producing and consuming devices are connected through the HEMS, which facilitates the visualisation of the supply and demand, and enable the users to initiate specific measures of control for saving, consumption peak shift control and storage. That means the user can set the daily produced energy to be stored and used at night, by programming their EV charging after the evening consumption peak. CEMS are used in the same way at the level of a whole district in order to promote optimal energy management by connecting with RE in the community, BEMS, HEMS and power through ICT network.

Electric Vehicles and related infrastructures

There are different types of EVs: electric cars can be used by individual households and electric buses can be used for public transportation. The types of motors can vary too: some are fully electric, but other hybrid models are being developed to optimize the efficiency, especially in regards to the battery autonomy. It is the case of the Plug-in Hybrid Electric Vehicles (PHEV), which use both electric and gasoline motors. Charging stations are the infrastructure necessary to the full deployment of EV, both in the households and in public space.

A more detailed categorisation of Smart technology was established by the Japan Business Alliance for Smart Energy Worldwide (JASE-W) following eight fields: Smart Grid, Smart Home, ZEB/BEMS, FEMS, RE, Energy Storage, Traffic Systems and Urban System[48].



Smart City Technology, JASE-W. Source: See reference 48

[48] JASE-W. 2014. http://www.jase-w.eccj.or.jp/technologies/smart_community.html

The exact number of projects in Japan is unknown. Depending on the definition of Smart City adopted, a number of projects can be included or excluded from the list. Ernst & Young Institute Japan listed more than 200 projects[49]. They also differ in regards to the issue(s) they aim at addressing. Two main types of pilots can be identified in Japan though, depending on their business model: projects subsidized by the central government and projects that emerged outside of the METI's sphere of influence.

B. Projects subsidized by the METI

Many ministries are involved in the Smart City policy. The Ministry of Finance is a key authority as the budget granting institution. However it is the METI that holds the main power of decision and management. The other ministries which have influence in land planning (Ministry of Land, Infrastructure, Transport and Tourism, MLIT) or which promote sustainability (Ministry of Environment, MOE) are expected to follow the roadmap established by the METI and adapt their agenda accordingly: for the METI, a Smart Community seeks to "create a bold image of a whole-city ask-solution system that copes with worldwide problems"[50], also formulated as the promotion of "the construction of a Japanese-version smart grid and its introduction overseas, which are goals set forth in the government's growth strategy, under the topic of 'strategy for becoming an environment and energy power through green innovation'."[51]. The METI is thus the main ministry in charge of the Smart City policy making and implementation.

One of the METI agencies plays a key role at the national level: the New Energy Promotion Council (NEPC)[52]. It was established in 2008 and operates at the national level. It is the authority in charge of promoting the introduction of clean and renewable energies, selecting the businesses for subsidies and distributing the aids. It has contributed to the launch of the first and second wave of Smart City pilots. Prior to 2010, the METI financed a few isolated projects, such as the Micro Grid in Hachinohe named the Project of Energy Return from Flowing Water (from FY2003 to FY2007)[53]. Later on, feasibility studies for Smart Community plans were conducted; this report focuses on the projects that have already been implemented.

---

[49] Ersnt & Young Institute Japan. 2014. In DeWit, Andrew. 2014. "Japan's rollout of Smart Cities: what role for the citizens?". The Asia-Pacific Journal. Vol-11, Issue 23, No.1, June 16. http://www.japanfocus.org//-Andrew-DeWit/4131

[50] METI. http://www.METI.go.jp/english/policy/energy_environment/smart_community/

[51] METI. 2010. http://www.METI.go.jp/english/press/data/20100408_01.html. For further information of the New Growth Strategy see http://www.METI.go.jp/english/policy/economy/growth/report20100618.pdf

[52] For more information see http://www.nepc.or.jp/ (in Japanese only)

[53] NEDO. 2012. "NEDO and international activities". http://www.narucmeetings.org/Presentations/NEDO%20and%20International%20Activities.pdf

From the different interviews conducted and the analysis of various official documents, it was established that projects supported by the government are generally elaborated according to the following pattern:

1. The METI calls for Smart City project proposals
2. The LG asks the local consulting companies to draft a preliminary plan
3. The METI selects the cities (project winners) which will benefit from subsidies
4. The LG enters a consortium of companies that produces a master plan and a provisional budget
5. The NEPC distributes subsidies to companies & covers the costs for project management

Prior to the METI's call for applications, some cities may have had other sustainable development plans. From the interviews conducted, it can be said that cities and companies often built on the ongoing local programme or sustainable measures to fit the METI's requirements, in order to be eligible to the financing offered, mostly in the case of projects launched prior to 3/11.

The consulting company hired by the municipality is usually a long term partner, which is called on for conducting research, and producing reports and development strategies. Consulting companies such as Mitsubishi Souken or Fujitsu Souken[54] are openly attached to a larger group. At this stage of the draft, the companies which will be involved in the project are informally chosen: partnership systems are strong in Japan and once a large company is recruited (in this case, through the consulting company), the other members of the consortium are easily decided, as companies choose to rely on well-known, long lasting collaborators.

Once the project has been selected by the METI to benefit from the subsidy, the LG acts as the interface between the companies and the citizens. In the consortium, the municipality has a status equivalent to the company, but as a non-expert body, its contribution to the planning is usually very limited. In addition, the subsidies are distributed directly to the companies, which deprives the LG of any leverage of negotiation it could have had with the private sector. The firms are subsidised between half and two thirds of their part of the provisional budget.

The consortium is generally composed of at least:

- one construction company eg Taisei, Shimizu
- one real estate developer (although it may act as the constructor too) eg Mitsui Fudosan Residential, Nomura Real Estate Development
- one power company eg Chubu Electric, JX Nippon Oil & Energy
- ICT companies eg Hitachi, Toshiba
- one car industry representative eg Toyota Motor, Mitsubishi

[54] The full name is "sougou kenkyuusho" (総合研究所 or institutes of general research).

- energy specialised companies eg Furukawa Battery, Eneres
- urban planning & architecture companies eg Nihon Sekkei, Urban Renaissance Agency
- other IT companies eg SECOM, Softbank Telecom

It is also common to see a bank (for instance, Sumitomo Trust & Banking) and a communication company such as NTT Docomo among others. Sometimes local research centres (for instance, Kansai Research Institute in Keihanna), universities and in some cases hospitals (such as Higashida Clinic in Kitakyushu) are members of the Smart City project board. Some foreign companies are taking part in a few projects but for now in a very limited field of action. Most foreign companies which have managed to enter the project consortiums are from the USA (Accenture in Yokohama for example), but some European firms can also be found (mostly in Yokohama, such as the Swedish owned Gadelius KK).

The two waves of subsidised projects occurred from 2010 and 2012 onwards (see Annexe 2 for a non exhaustive list of the projects). All subsidies are provided by the METI under the Science, Technology and Innovation (STI) budget[55].

The first wave of subsidized projects: from 2010 onwards

The first wave focused on the Test Projects for Next Generation Energy and Social Systems. The four key pilots are located in the following cities (refer to Annexe 1 for prefecture location):

- Keihanna (Kyoto, Ohara and Nara prefectures)
- Kitakyushu (Fukuoka prefecture)
- Toyota City (Aichi prefecture)
- Yokohama (Kanagawa prefecture)

In November 2009, a committee was established to identify how to promote economic growth while preparing for a future lifestyle, and thus the Smart City model was chosen. As explained by Hiroko Kudo, "following the same old methods to improve quality of life of residents and vitalize economic activities, while solving urban issues, is no longer a viable option from the point of view of function and cost. (..) cutting back CO_2 emissions is an important requisite"[56]. The Smart Community is used as a vector of change in economic, social and environmental terms.

In January 2010, the METI called for application to subsidies for the development of Smart City projects and in April of the same year, four cities were selected out of 20 candidate cities, based on their draft plan. By August 2010, the master plans had been designed and approved by the METI,

[55] All budgets are available on National Science Foundation's Tokyo website http://www.nsftokyo.org/trm.html

[56] Kudo, Hiroko. 2012. "Quality of life and resilience – Japanese Smart City projects after the 3.11 Great East Japan Earthquake". https://www.scss.tcd.ie/disciplines/information_systems/egpa/docs/2013/Kudo.pdf. p.3

and the projects were launched for experimentation with subsidies lasting until March 2015. The total budget for the projects altogether amounts to ¥126.5 billion[57] distributed by the NEPC.

As the main Smart Community projects in Japan, the four cities have a dedicated website, the Japan Smart City Portal (JSCP)[58]. The description is as follows "Smart cities are a new style of city providing sustainable growth and designed to encourage healthy economic activities that reduce the burden on the environment while improving QoL. The JSCP indicates it "will provide up-to-date information on the four cities of Japan that are forging ahead with a variety of operational experiments in order to create smart cities". The Next Generation projects are the first operational pilots and serve as showcases of the Japanese technology. All cities had prior ongoing measures and experiments for the promotion of sustainable development. For instance, Keihanna district in Kyoto, also called Kansai Science City[59], has been under construction since the late 1980s, with the aim of fostering research activities in culture and mostly science. A cluster of academic centres and industries was thus developed, and achieving a sustainable city became a key goal of the Third Stage Plan in 2006. The Smart City project only adds to the existing local programme of green development of Keihanna. The Next Generation projects were originally outlined as displayed in the table on the following page.

[57] About €911 million, calculated following June 2014 exchange rates. Source: Agentschap NL. 2012. "Japan's Four Major Smart Cities". http://www.rvo.nl/sites/default/files/Smart%20Cities%20Japan.pdf

[58] For further information see http://jscp.nepc.or.jp/en/

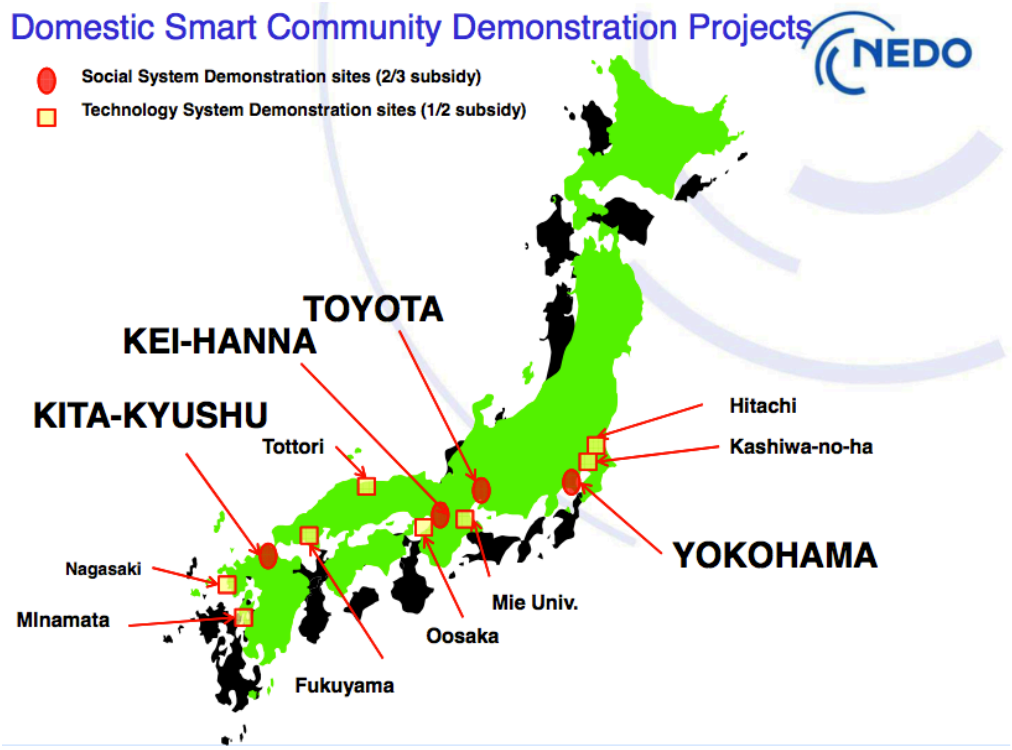
[59] For further information see http://www.kri-p.jp/english/index.html

	Population targeted	Budget (¥ billion)	Technology	Targets	Main companies[60]
Keihanna Eco City (Kyoto, Ohara and Nara prefectures)	102,024 people	13.5 (€97.6 million)	EMS, power DR, EV	-20% CO_2 emissions in households by 2030 (to 2005 levels) -40% CO_2 emissions in transport 1,000 houses with PV	Fuji Electric, Furukawa Battery, Mitsubishi Group, Osaka Gas, Sharp
Kitakyushu Smart Community (Fukuoka prefecture)	225 households	16.3 (€117.9 million)	PV, wind power, heat energy, hydrogen, EMS, EV, data centre	-50% CO_2 emissions in household, residential & transport by 2030 10% of production = new energy Smart meters for 70 firms and 200 households	Azbil, Fuji Electric, IBM Japan, JX Nippon Oil & Energy, Mitsubishi Heavy Industry, Sharp, Toyota Group
Toyota Low Carbon Society (Aichi prefecture)	227 households	22.72 (€164.3 million)	PV, biomass, EMS, EV & ITS	-20% CO_2 emissions in households -40% CO_2 emissions in transport 3,100 EV	Chubu Electric, Fujitsu, Hitachi, HP Japan, Mitsubishi, Sharp, Toshiba, Toyota Group
Yokohama Smart City (Kanagawa prefecture)	4,000 households	74 (€535.1 million)	PV, storage batteries, EMS, EV	-30% CO_2 emissions by 2025 (to 2004 levels) 27,000 kW PV 2,000 EV	Accenture, Hitachi, Mitsubishi Estate, Nissan Motor, Panasonic, Sharp, TEPCO, Toshiba

Test Projects for Next Generation Energy and Social Systems. Source: Kudo (2012), Agentschap (2012), JSCP

[60] For the complete list of companies involved see http://jscp.nepc.or.jp/article/jscpen/20120930/325043/

Following the Great East Japan Earthquake, the projects took on a more demand driven approach. Programmes for better energy efficiency, involving a change in consumption behaviour have become part of the strategy, while before March 2011 the Smart City policy mostly relied on technology marketing. Dynamic pricing systems, also called Demand Response (DR) programmes, are now under testing. One of the most advanced cities in this field is Kitakyushu, with up to 20% cut in consumption peak period[61]. Other concrete demand side projects are emerging such as the DR Demonstration launched in November 2013 by the consortium of TEPCO, Sojitz, Schneider Electric and its subsidiary Energy Pool[62]. The French companies were hired by TEPCO for their European expertise and technology in DR management, so that they contribute to the design and set up of an industrial DR ("iDR") system adapted to Japan, especially in the fields of industrial process engineering for DR and Network Operation Centres (NOC). The massive deployment of Smart Meters in Japan will also boost similar initiatives to lower the energy demand. The following map displays the four main Smart Community projects and the main DR projects (in capital letters), partly financed by the METI under the Technology System Demonstration budget.



METI subsidised Smart Community projects in Japan. Source: NEDO. 2102. http://www.conference-on-integration-2012.com/fileadmin/user_upload_COI-2012/RE_PDF/Morozumi_Satoshil__Kompatibilitaetsmodus_.pdf

[61] JSCP. 2014. http://jscp.nepc.or.jp/article/jscpen/20140325/389545/index3.shtml March 25th

[62] Sojitz. 2013. http://www.sojitz.com/en/news/2013/11/20131122.php November 22nd

The second wave of subsidised projects: from 2012 onwards

The second of showcases for better QoL was launched the year after Fukushima accident, in order to foster the urban and economic reconstruction of some disaster hit areas and improve their resilience. The selection of cities took place in April 2012 and the total budget allocated to the Projects for Promoting Introduction of Smart Communities is ¥8.06 billion, provided under a third supplementary budget for FY2011[63]. The ten chosen municipalities are:

- Fukushima prefecture: Aizuwakamatsu City, Iwaki City, Minamisoma City
- Miyagi prefecture: Ishinomaki City, Kesennuma City, Ohira Village, Yamamoto Town[64]
- Iwate prefecture: Kamaishi City, Miyako City, Mogami in Kitakami City

From an interview with an academic researcher, it was gathered that areas which were hit by the earthquake and the tsunami benefit from special tax regimes in order to facilitate the reconstruction. Companies contributing to the urban redevelopment and inhabitants buying energy efficient houses can ask for tax breaks or subsidies[65]. Unfortunately information on the effective detailed conditions of the tax breaks could not be collected. Originally eight projects were selected then the METI included Iwaki City and Minamisoma City as beneficiaries of the subsidy. The METI is helping them to create master plans for a Smart Community project, and the one in Minamisoma is for now more advanced. Most projects of reconstruction rely on RE and ICT such as Next Generation pilots. They differ from the first Smart Community model, as the local authorities have managed to put the emphasis on the care of ageing population and the community resilience to disaster.

Elderly care relies on massive ICT deployment for health monitoring and data processing, while community resilience can be improved by faster and more reliable ICT in regards to emergency situation. Agribusiness and forestry related measures are two other fields which are taken into account in the master plans of the second wave of Smart Cities. As the cities' economies do not rely on high tech or large industrial activities, they highlight their local businesses and adopt strategies oriented for the benefit of their community members. Agribusiness binds communities together: the monitoring of harvests contributes to better management of the resources, especially in case of disaster when sharing undamaged goods is key to the survival of affected communities. The ten projects are summed up on the following page.

---

[63] About €58.1 million, calculated following June 2014 exchange rates. Source: METI. 2012. http://www.METI.go.jp/english/press/2012/0417_01.html

[64] Cities have a population of 30,000 at least. "Towns and villages usually belong to a county. However, 'county' simply designates a geographical area and does not entail any administrative functions. Comparing towns with villages, towns have a more urban appearance and more people engaged in urban-type work, such as commerce and industry. However, there is no difference in the duties handled by their governing bodies." Source: CLAIR. 2010. http://www.clair.or.jp/j/forum/series/pdf/j05-e.pdf

[65] Japan Reconstruction Agency. 2013. https://www.reconstruction.go.jp/english/topics/framework_of_special_zone.pdf and https://www.reconstruction.go.jp/english/130528_CurrentStatus_PathToward_FINAL.pdf p.20-21

	Project	Companies
Aizuwakamatsu	Smart Community	Fujitsu, Tohoku Electric
Iwaki	Nippon Paper Industries Nakoso project	n/a
Minamisoma	Solar Power & HEMS	Tohoku Electric
Ishinomaki	Tomarihama Solar Power & Smart Community	Toshiba, Tohoku Electric
Kesennuma	Smart Community	Ebara Environment Plant, Future Design Center, Abecho Shoten, Kane, Kaneka Seafood, Kesennmuma Cooperative Society of Marine Products Processors, Sanriku Toyo, Takajun Shoten, Takahashi Suisan, Hachiyo Suisan, Marufuji
Ohira	Smart Community	Toyota, Central Motor
Yamamoto	Smart Community of Compact City	ENNET, NTT East
Kamaishi	Recycling Biomass City	Nippon Steel Engineering, Tohoku Electric
Miyako	Smart Community	ENNET, NTT Data, JDC
Mogami	Smart Community	JX Nippon Oil & Energy, Kitakami Office Plaza

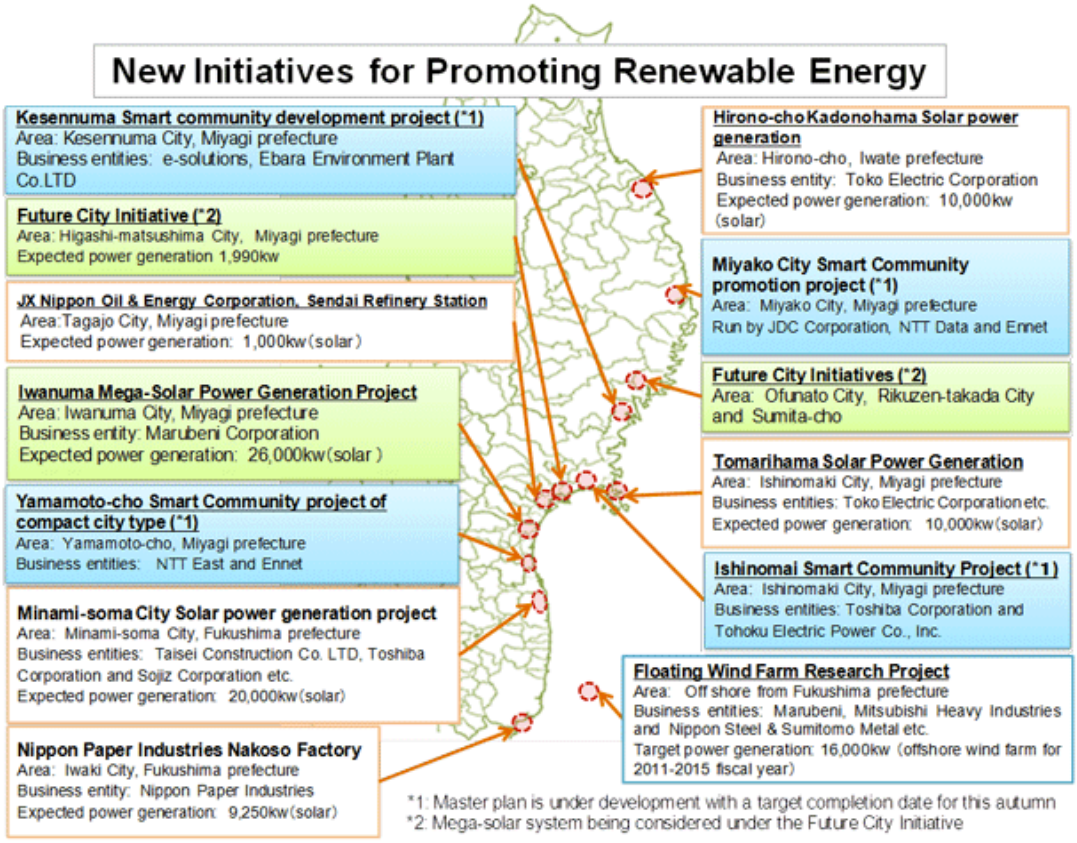
Projects for promoting introduction of Smart Communities. Source: METI. April 2012. http://www.METI.go.jp/english/press/2012/0417_01.html

The New Growth Strategy launched in June 2010 by the Japanese Government identified 21 national projects as pillars of development. One of them is the Future City Initiative (FCI), to be promoted as the Action 20 of the 100 Actions to launch Japan's New Growth Strategy[66]. The FCI builds on the prior initiative of Eco-city models launched in 2008. Keidanren[67] defines the FCI as projects aiming at solving social issues, creating urban spaces in which anybody would be happy to live, boosting industrial competitiveness by exercising comprehensive power and growing through domestic and overseas expansion[68]. It relies on different models of projects, which are often branded without relying on "smart" terms. Nevertheless, ICT and better energy efficiency are recurrent features of the strategies of the FCI. Smart Grid and RE are pinpointed as key tools for the creation of the projects. Although the Future City programme is publicly promoted by the government, cities do not receive massive subsidies from the government, such as Test Projects for Next Generation Energy and Social Systems and the Projects Promoting the Introduction of Smart Communities. They all benefit

[66] METI. 2011. http://www.METI.go.jp/english/aboutMETI/policy/2011policies.pdf
[67] Japan Business Federation. For further information see http://www.keidanren.or.jp/english/
[68] Keidanren. 2011. http://www.kkc.or.jp/data/pub/00000073.pdf

from special measures, such as deregulation in the legal and tax system in order to foster the project development[69]. Cities receive minor financial aids: in Kamaishi (Iwate prefecture), the subsidy is focused on hardware maintenance in public finance-related support measures[70].

The Fukushima accident changed the government policy: among Future Cities, a few projects now receive substantial subsidies for reconstruction, as is the case in Higashi Matsushima, Iwanuma and Ofunato (in green on the map below). The amount of the aids is unknown. Below is a map of the main projects of reconstruction, showing both Projects Promoting the Introduction of Smart Communities and additional Future City pilots in Tohoku.



Second wave of projects. Source: Japan Reconstruction Agency http://www.reconstruction.go.jp/english/topics/2013/03/smart-community-and-future-city-initiatives.html

[69] Future Cities. https://www.kantei.go.jp/jp/singi/tiiki/kankyo/en/about/index.html

[70] Keidanren. 2012. https://www.keidanren.or.jp/en/policy/2012/046.pdf

C. Projects outside the METI's programmes

Smart Community projects which are not massively subsidized by the METI follow different business models. Their financial plan rely almost entirely on funds from companies. This results into more independence of the consortiums vis-à-vis the central government. There are two types of projects:

- projects initiated by the private sector
- projects initiated by LGs

Smart Communities initiated by the private sector

In September 2009, the Smart City Project group was founded by 25 companies and one association, the Future Design Centre. The Smart City Project gathers some of the largest firms in Smart City technology and planning. It includes Azbil, e-solutions, Itochu, SAP, NEC, NTT Communications, LG CNS, Kaneka, Kawasaki, Kokusai Kyogo Group, JX Nippon Oil & Energy, Shimizu, Sharp, Sumitomo Forestry, Sekisui House, Seven & i Holdings, Tsuneishi Holdings Corporation, Tokyo Gas, Toshiba, Toppan, Nikken Sekkei, HP, Hitachi, Mitsui Fudosan and Mitsui Home[71]. The private sector also supported Smart City projects early on by promoting the Future City Initiative.

Like the Test Projects for Next Generation Energy and Social Systems, the pilots initiated by the private sector are showcases of advanced technology. Their purpose is to attract the consumers by advertising a better lifestyle, and ultimately to export the model abroad. Ernst & Young Institute Japan identifies at least 18 projects set up by the private sector in Japan[72]: 16 projects promoted by Sekisui House (see the table below), Hitachi Smart Industrial Town led by Hitachi and Fujisawa Sustainable Smart Town led by Panasonic. The Sekisui projects mostly rely on Smart technology at the scale of the house in one neighbourhood or at the scale of one building.

[71] For further information see http://www.smartcity-planning.co.jp/en/participants/index.html

[72] Ernst & Young Institute Japan. 2014. In DeWit, Andrew. 2014. "Japan's rollout of Smart Cities: what role for the citizens?". The Asia-Pacific Journal. Vol-11, Issue 23, No.1, June 16.
http://www.japanfocus.org//-Andrew-DeWit/4131

City	Prefecture	Project
Iga	Mie	Smart Common Life
Matsuzaka	Mie	Smart Common Life
Seishin Minami (in Kobe)	Hyogou	Smart Common City
Teriha	Gunma	Smart Town
Hayashi (Komastu)	Kanagawa	Smart Common City
Seya (in Yokohama)	Kanagawa	Smart Common Stage
Tempaku (in Nagoya)	Aichi	Smart Common Life
Ichihara	Chiba	Smart Common City
Yotsukaido	Chiba	Smart Common Stage
Tsukuba Mirai	Ibaraki	Smart Common Stage
Keyakidaira (Kurobe gorge)	Toyama	Smart Common Stage
Akaishidai	Miyagi	Smart Common City
Mitazono	Miyagi	Smart Common Stage
Moriya	Miyagi	Smart Common Stage
Koufu (in Fujimi)	Yamanashi	Smart Common Life
Sakaide	Kagawa	Smart Common Life

Sekisui Smart Town Projects. Source: http://www.sekisuihouse.co.jp/bunjou/smarttown/

Both Hitachi Smart Industrial City and Fujisawa Sustainable Smart Town (SST) are part of the Future City Initiative. While Hitachi Smart Industrial City focuses on energy management in the industrial park, Fujisawa SST has a more urban perspective.

It was initiated in November 2010 when Fujisawa municipality and Panasonic reached an agreement for Panasonic to develop a Smart Community on unused land[73]. That area is the former site of a Panasonic television factory; the historic presence of Panasonic in Fujisawa has largely contributed to the emergence of the project. The company is the head of a consortium with eight other companies formed in May 2011: Accenture, Mitsui & Co, Mitsui Fudosan, Nihon Sekkei, Orix, PanaHome, Sumitomo Trust & Banking, and Tokyo Gas have collaborated to develop a Smart Community from the ground up. Fujisawa SST should be completed by 2018, with a total of 600 smart houses and 400 smart apartments built over 19ha. About 50 housing units have already been completed and started selling in March this year[74]. It is one of the most complete Smart Community project in Japan with a master plan focusing on eight services: energy, security, mobility, community,

[73] Panasonic. 2011. http://news.panasonic.net/archives/2011/0526_5407.html

[74] Plug in Cars. 2013. http://www.plugincars.com/panasonics-smart-city-features-electric-cars-and-battery-bikes-128886.html November 13th

and healthcare. In addition to an independent business model where the project does not need to overcome the hurdles of finding new financial sources, once the government subsidies run out. The town management after the completion of the project is also planned on the long run: Fujisawa SST Management Company was established in March 2013 through the joint investment of Panasonic and the eight firms of the consortium[75]. This Management Company aims at providing and maintaining the services provided and goes beyond the functions fulfilled by the Fujisawa SST Council for the set up of the services. Through the deployment of Smart Houses, EV (cars and bicycles), smart street lighting and security systems among other energy saving devices, SST energy efficiency is advertised as a means to reduce CO_2 emissions by 70% (compared to 1990 levels) and reach a share of 30% RE in the production. The whole project is estimated to cost ¥60 billion[76].

Smart Communities initiated by LGs

In addition to the reconstruction projects financed by the central government, many local initiatives of Smart City projects have been launched throughout Japan in order to foster energy efficiency and security. The boost in RE has been accompanied by increased ICT investments and the spread of Business Continuity Plans (BCP) in offices and public buildings. BCPs are emergency strategies where key spots are identified for receiving energy in priority, in case of blackouts. Ernst & Young Institute Japan put into light the rising number of projects initiated by LGs after March 2011. Thus Kanto area METI's regional bureau determined in January 2014 that 10% of LGs had launched Smart City projects[77].

Among others, Osaka municipality has been very pro-active and is now developing a project in Sakashima. The Sakashima Asia Smart Community Alliance gathers 18 companies around the LG: Azbil, BYD, connectFree, Dai-Dan, Hitachi Infrastructure Systems Company, Hitachi Zosen, NTT Communications, NTT Facilities, Obayashi, Taika Logistics Solution, Takasago Thermal Engineering, Terl, Tokyo Electron Device, Toshiba, Yachiyo Electrical Construction, Yasui Architects & Engineering, and two companies which names are not yet disclosed (as of March 2014)[78]. Not only is Sakashima one of the first Smart Community projects which focuses on thermal power; Osaka city hall even took part in the International CleanTech Network event in Copenhagen in May 2014, and presented a challenge: any individual or company could submit a draft plan for the improvement of the thermal grid system in Sakashima to the authorities of Osaka[79].

---

[75] Panasonic. 2013. http://panasonic.co.jp/corp/news/official.data/data.dir/2013/03/en130307-5/en130307-5.html

[76] 434 million. Calculated based on June 2014 exchange rate. Source: http://panasonic.co.jp/corp/news/official.data/data.dir/2013/10/en131021-4/en131021-4.html

[77] DeWit, Andrew. 2014. "Japan's rollout of Smart Cities: what role for the citizens?". The Asia-Pacific Journal. Vol-11, Issue 23, No.1, June 16. http://www.japanfocus.org/-Andrew-DeWit/4131

[78] Sakashima-Asia Smart Community Alliance. http://sakishima-smart.jp/kaiin_en.html

[79] Ecotech Quebec. http://www.novacentris.com/innoplus/en/challenge?def_id=1021117&no=19899

D. Japanese contribution to projects abroad

The New Energy and Technology Development Organization (NEDO[80]) is the representative of the METI abroad for Smart City projects. Similar to the NEPC, it is the authority holding the funds and therefore has the necessary power for negotiating with foreign LGs and companies at the planning phase of the project. The main comparative advantage of the package proposed by the NEDO lies in the advantageous financial plan: the Japanese government draws on the METI budget and subsidizes most of the technology provided by the Japanese firms of the consortium, leaving municipalities with the cost of operation and maintenance once implementation is over. Japanese firms have also been successfully seeking opportunities to get involved in Smart Community projects on their own. Whether Japanese businesses are supported by the NEDO or not, the objective of companies is to showcase their technology and to increase their global market share of Smart City services and solutions. The widespread commercialisation of Japanese products abroad can contribute to the revitalization of the Japanese economic growth. In all cases, the export strategy of the Japanese model is conducted in two distinct types of cities:

- cities without sufficient infrastructure
- cities with sufficient infrastructure

Smart Community projects in cities without sufficient infrastructure

Many of Japan's neighbours do not have an equivalent power grid or urban infrastructures. The population also tends to be younger, resulting in a market different from Japan's. The Smart Community model needs to be adapted. However ICT is growing in all markets and the NEDO assiduously looks for opportunities for Japanese firms to be involved in Smart City projects in Asia.

In January 2011, the Vietnamese Ministry of Industry and Trade made a Cooperative Agreement with the NEDO to promote collaboration activities on Smart Community technology between the two countries[81]. In July 2013 a Memorandum of Understanding (MOU) was signed between the NEDO and the Ministry of Energy and Mineral Resources of Indonesia to confirm the mutual interest to build a Smart Community in Suryacipta City of Industry[82]. Another large market with opportunities for Smart City development is China. As early as January 2011, the NEDO, the National Development and Reform Commission of China and the Beijing Municipal Development and Reform Commission concluded a MOU for a demonstrator of Traffic Information System. And in June of the same year, a collaborative project of Smart Community was initiated in Gongqin[83].

[80] For more information see http://www.nedo.go.jp/english/

[81] NEDO. 2011. http://www.nedo.go.jp/english/whatsnew_20110128_index.html

[82] NEDO. 2013. http://www.nedo.go.jp/english/whatsnew_20130718.html

[83] NEDO. 2011. http://www.nedo.go.jp/english/whatsnew_20110124_index.html & http://www.nedo.go.jp/content/100152422.pdf

The most recent MOU was signed between India and Japan in August 2014, for a Smart City project development in Varanasi city[84] after talks started in 2013[85]. The agreement concluded between Varanasi city and Kyoto city is supported by the India Japan Investment Promotion partnership signed by the two national governments[86].

The NEDO is also conducting talks with Russia, where Energy Dialogues have been initiated with the government for a possible Smart Community project that might take place in Sestroretsk[87]. The large natural resources of Russia are an asset for energy scarce Japan[88].

Hitachi and Panasonic are two active firms which take part in Smart Community projects without the contribution of the NEDO. Both are involved in the Chinese project in Dalian for instance[89].

Toshiba is especially involved in no less than 11 Smart Community initiatives in Asia[90]:

- in China: Gongqing "Smart Community", Tianjin "Environmental City", Guangzhou Nansha Development Zone "Smart City feasibility study", Jinzhou "Smart Community", Dongying and Wenzhou "eco-city"
- in India: Manesar and Haryana Industrial Areas "Cogeneration Projects"
- in Vietnam: Hanoi "Software Technology Park", Ho Chi Minh "Bason District Redevelopment"
- in Thailand: Amata Science City "Advanced Industry Integrated City"
- in Malaysia: Putrajaya "Green Township"

Smart Community projects in cities with sufficient infrastructure

The NEDO is now promoting one project in Hawaii and two pilots in New Mexico. The Smart Grid in Hawaii on Maui Island started with a MOU in November 2011, and the demonstration was launched in December 2013. The two Smart Grid projects in Los Alamos and Alburquerque were initiated at a later stage, in May 2012[91]. The NEDO investments in the two New Mexico projects amount to ¥4.8 billion (€34.7 million). In Europe there are two fully launched Smart City pilots and one project in ongoing negotiations.

---

[84] Times of India. 2014. http://timesofindia.indiatimes.com/india/India-Japan-sign-MoU-to-develop-Varanasi-into-smart-city/articleshow/41267829.cms

[85] NEDO. 2013. http://www.nedo.go.jp/content/100537411.pdf

[86] Narendramodi. 2014. http://www.narendramodi.in/tokyo-declaration-for-india-japan-special-strategic-and-global-partnership/

[87] Global Smart Grid Federation. 2014. www.globalsmartgridfederation.org/2013/12/19/russia-designs-a-smart-city-based-on-japanese-design-principles/

[88] HSE. 2014. http://www.hse.ru/en/news/science/133894033.html

[89] For further information see http://panasonic.net/es/solution-works/bestcity/

[90] Toshiba. http://www.toshiba-smartcommunity.com/EN/casestudy/

[91] For further information see http://www.businesswire.com/news/home/20131217006136/en/Hitachi-Commences-Demonstration-Site-Japan-U.S.-Island-Grid#.U56dFnbvWSc & http://www.toshiba-smartcommunity.com/EN/casestudy/newmexico/

The first European project of Japanese Smart Community was launched in Spain. The demonstrator in Malaga was built on the Letter of Intent concluded in April 2011 by the NEDO and the local City Council, and on the Japan-Spain Innovation Program established by the NEDO and the Spanish Centre for Industrial Technological Development in May 2012. The main feature of the project is the deployment 200 EVs, based on the collaboration of Japanese Mitsubishi Heavy Industries, Mitsubishi Corporation and Hitachi and Spanish Endesa, Telefonica Investigacion y Desarrollo and Ayesa Ingeneria y Arquitectura. The demonstration funds provided by the NEDO comes up to ¥5 billion (€36.1 million)[92].

The second major project financed by the NEDO is in France: Lyon Confluence Smart Community was launched in December 2011 by the Memorandum of Agreement between the NEDO and the local authority Grand Lyon. Not only PV powered EVs were deployed in October 2013, but also EMS in houses and offices, and Positive Energy Buildings are under construction. The partnership involves Japanese Kengo Kuma and Associates, Toshiba, Sanyo Electric and Asahi Glass, Mitsubishi Motors, and French PSA Peugeot Citroen, Bouygues Immobilier, and Veolia Transdev among others[93]. The NEDO has invested ¥6.9 billion in the project (€50 million).

The third major project conducted by the NEDO in Europe is still negotiated. After a feasibility study conducted by the NEDO in Manchester, the Greater Manchester Combined Authority, the Department of Business Innovation & Skills and the Department of Energy and Climate Change of the British Government signed in March 2014 a MOU with the NEDO for a Smart Community project[94]. The emphasis will be on heat pump technology and ICT, with the aim of shifting energy production from gas to electricity and of lowering the urban CO_2 emissions.

Other Japan led Smart Community projects might emerge in Europe. For instance, the NEDO signed in 2012 a Letter of Intent of technological cooperation with Portugal in the fields of RE, energy efficiency and Smart Communities[95], which may lead to further collaboration. Toshiba is also conducting studies in Central Eastern Europe for Smart Community feasibility[96].
Nonetheless, on the European market, Japanese companies are in competition with several European firms which offer competitive Smart solutions and technology, such as Siemens, Schneider Electric or Enel. The competition also takes palce at a global level (in Asia and South America particularly), with more competitors, such as IBM.

[92] NEDO. 2013. http://www.nedo.go.jp/content/100523327.pdf
[93] For further information see http://www.nedo.go.jp/content/100453196.pdf
[94] NEDO. 2014. http://www.nedo.go.jp/english/whatsnew_20140318.html
[95] NEDO. 2012. http://www.nedo.go.jp/english/whatsnew_20120316.html
[96] See reference 90, p.34

E. Benchmarking and analysis

In order to evaluate Japanese Smart Community projects and to assess them in an international context, it is necessary to rely on a benchmark. However, such universally used ranking does not exist yet. Different systems of ranking are used, for instance rewards for innovative projects, such as the International Smart Grid Action Network Award. Various scales are used to assess the degree of innovation and "smartness", and of success of the projects is debatable.

In one of the first reports published on Smart Cities in Europe[97], 70 cities are benchmarked based on their "smartness", regardless of the branding strategy of their projects of urban development. The method used to determine how "smart" the city is depends on a variety of factors, categorized in smartness economy, people, governance, mobility, environment and living. Each factor is composed of indicators, that add up to a total of 74. These indicators included R&D expenditure in percentage of GDP, voter turnout at city elections, share of female city representatives, traffic safety, green space share and poverty rate. These criteria were applied to cities with population between 100,000 and 500,000 inhabitants, thus excluding large urban centres. The argument is that large cities cannot be "smart" because they have inherent traffic congestion and density issues which make environmentally friendly living impossible.

While this point could be valid, the approach to assessment of smart cities has changed since 2007. It is now argued that every city faces a wide range of challenges, and that "smartness" should be determined based on how the urban actors address the issues, hence the focus on the initiatives of Smart Communities themselves. The geographic, economic and social context of the city remains key in the evaluation, but serves only as basis to evaluate the level from which the city starts and how it succeeds (or not) in improving its economic and environmental situation. Benchmarking of Smart Cities is still at an early stage of development and are not entirely reliable.

So far the research conducted did not identify a specific Japanese benchmarking system of the projects. There may be a ranking that is available in Japanese only, but of now no mention of it was found. However the Japanese government regularly evaluates most projects: the METI monitors the pilots it subsidises, as it checks that requirements are fulfilled and targets are reached by the companies of the consortium. Besides, Japanese academic research on Smart Communities provides good insight on the project details, even though systematic benchmarking is not performed.

[97] Centre of Regional Science, Vienna UT. « Smart Cities - Ranking of European medium sized cities » http://www.smart-cities.eu/download/smart_cities_final_report.pdf October 2007

Below several types of benchmark initiatives used worldwide are listed:

- *company assessment framework,* such as IBM's "Smarter city assessment tool"[98]: developed as a service to municipalities, it is described as the first step for the development of a comprehensive city strategy
- *independent expert ranking,* such as Boyd Cohen's Smart City Wheel[99]: based on the six factors of the 2007 report on EU Smart Cities, the ranking uses a simplified panel of indicators with only 27 criteria relating directly to sustainable development (for example the number of start-up companies and the total energy consumption)
- *private institutes specific benchmark* for instance IEEE's "Benchmarking Internet of Things Deployment in Smart Cities" [100]: the framework was released in 2013 and relies on seven factors (available on their website)
- *International Standard Organisation* "Smart Community Infrastructures"[101]: the Secretariat ISO/TC 268/SC 1 published a first standard ISO/TR 37150 in 2014 and is now working on the elaboration of metric standards (ISO/DTS 37151); the Secretary and Chairperson are Japanese nationals
- *public institution success evaluation* as in the 2014 report "Mapping Smart Cities in the EU"[102]: commissioned by the European Parliament, the study defines successful Smart Cities as initiatives meeting their objectives and contributing to Europe 2020 targets

This report partly relies on the definition of success provided by the 2014 EU commissioned report: although 2020 targets are not used as reference for the Japanese projects, the success of the Smart Communities in terms of the objectives the cities set for themselves is fundamental. Besides, when it draws a comparison with European projects, this report takes on a more general approach as regards the strengths and weaknesses of the Smart Community pilots in Japan, in order to assess the potential fields of cooperation between European and Japanese partners.

The success of Japanese Smart Communities vis-à-vis the objectives initially set cannot be completely evaluated since not all projects are yet completed. However, the following points can be established: the introduction of RE in local production is a success as advanced technology in the Test Projects for Next Generation Energy and Social Systems has been fully deployed. Moreover, the Japanese Smart Communities are developing aspects which are not often covered in Europe,

---

[98] IBM. http://www.ibm.com/smarterplanet/us/en/smarter_cities/solutions/solution/S868511G94528M58.html

[99] For further information see http://www.boydcohen.com/smartcities.html

[100] Institute of Electrical Electronics Engineers. http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6550578&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D6550578

[101] ISO. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=656967

[102] EU. 2014. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf p.12

such as elderly care and agribusiness. Although energy savings have been achieved in Kitakyushu through the Dynamic Pricing system, other Smart Communities still have to perform as well.

Both in Japan and in the EU, Smart Community projects present several inherent weaknesses:

- the technology is not commercially affordable: the production, management and maintenance are costly and represent an investment cities and companies cannot always make, and that citizens are often reluctant to cover
- RE are not totally reliable and increase the grid instability: most widespread RE, wind and solar powers especially, are intermittent sources depending on weather, which makes the energy supply unpredictable, and they are RE with low inertia, which makes the power grid less stable
- batteries do not store larger quantities of energy: the technological innovation to upgrade battery storage efficiency remains to be elaborated
- energy prices will go up: even if a peak load is reduced and the consumption spread out, ultimately the Smart City aims at a decrease in consumption; energy utilities will increase prices in order to keep a margin of profit, which contributes to making the Smart City less attractive
- data security is not completely assured: the amount of centralised private information means that any breach in security has large scale effects; furthermore, it is yet unsure to whom the data belongs and what rights the utility companies have over it
- results are not striking: establishing coordination between the actors takes a long time and, considering that initial pilots have just been completed and other initiatives are still in planning or implementing phase, it is difficult to assess the final energy efficiency, for instance in terms of reduction of carbon dioxide emissions

From the interviews conducted and an analysis of the projects, it has been observed that Japanese Smart Communities have some other drawbacks:

- vision and implementation do not match
- the business model is fragile
- the projects rely too much on technology
- some sectors are underdeveloped
- the projects lack transparency
- key actors are absent

Vision and implementation do not match

Especially in the case of disaster affected cities, the projects are extremely difficult to implement for several reasons. Japanese LGs lack competence in planning and operating, as they tend to rely on consulting companies for the planning, and on the companies of the consortium to run the project. This slows down the Smart Community projects: in the case of reconstruction, companies have little interest in investing in unstable areas. Besides, government subsidies are delayed because of regulation inflexibility. Following the earthquake and the tsunami, there were 18,517 deaths and missing people and 267,419 people are still out of their home (March 2014)[103]. Therefore the ownership of large parcels in many cities is unclear and still pending. Yet regulations are such that the aids can only be delivered to projects where the owner of the land agrees to the project, preventing the initiatives from being fully launched.

The business model is fragile

In the case of projects subsidised by the central government, the long term plans regarding the emancipation of the pilots are not solid. Once the subsidies are discontinued, the viability of the highly expensive initiatives is questionable: for now the scheme to pay off the projects is to draw from the increasing land and housing selling prices. The Smart Communities are supposed to make the areas more attractive in terms of living and thus prices are supposed to rise: this tax increment financing scheme is not as reliable as the financing schemes of the projects led by the private sector, where the companies are investing on a longer term. Furthermore, the consortiums of the Test Projects for Next Generation Energy and Social Systems are expected to dislocate following the end of the governmental subsidy programme. The technology from the demonstrators will be sold separately on the Japanese market. Whether the companies will take charge of the maintenance costs of the constructed infrastructure is yet unknown.

The projects rely too much on technology

Based on the interviews conducted, all pilots take place within a limited area, most often a neighbourhood but rarely at a full urban scale. That makes the projects independent but also isolated units with their own infrastructures and technologies. Besides, the projects take place on land that was previously unused: the projects rely on brand new construction and technology instead of renovation and adaptation of existing structures to an innovative model of energy management. That means upgrading of buildings is not tested yet, and that the Japanese Smart City may not be replicable to already constructed areas. Japanese Smart Communities provide advanced technology services to individual customers before providing urban solutions to municipalities. Technological

[103] Nikkei. In Tachibana, Yoshiharu. 2014. http://www.brookings.edu/~/media/events/2014/3/13%20electricity%20japan/20140313_tachibana_presentation.pdf

approaches to energy efficiency (sensors and EMS among others) are widely deployed but few non-structural mechanisms are tested to help consumers contribute and adapt to the new model of consumption offered by the Smart City. The reduced role of the municipalities contributes to the lack of integrated vision, as companies set up their technologies independently of one another. In the first wave of projects especially, the master plans were not drafted based on people's need, but on what companies wanted to sell.

The integrated approach of planning with multi stakeholders involved, from businesses and LGs to citizens and Non Governmental Organisations (NGOs), is rare in Japan. Smart Communities inhabitants are users and consumers and are not often actively engaged in the projects as citizens. In some projects, citizen involvement does take place in the decision making process: several interviewees, from the academic and from the private spheres, designated Kashiwanoha, a Smart City project led by Mitsui Fudosan[104], as an exceptional model of citizen participation. Kitakyushu is another example of participation where the citizens actively collaborated to the Dynamic Pricing programme and were invited to make suggestions. In other projects, citizen participation is not encouraged. DeWit points out a report published by the Ministry of Internal Affairs and Communications (MIC) in April 2012 that highlights the issue; yet no measure to address the problem has been undertaken[105].

Some sectors are underdeveloped

Citizen participation is one underdeveloped sector of Japanese Smart Communities. Present initiatives in Europe (in Amsterdam Smart City for instance) but rarely in Japan, include waste treatment, data management systems, positive energy buildings, mapping and localisation softwares and smart meters. The potential for business cooperation between European and Japanese firms in these fields is developed in the third section of the report.

The projects lack transparency

The lack of citizen involvement goes in par with the lack of transparency. The decision making process and the roles of Smart Community actors are not completely open. The monopoly held by the EPCOs contributes to the opacity of the decision, in regards to the power grid. The reform of the electricity market may help getting a clearer picture of the situation. For now it appears few EPCOs are favourable to Smart Grid initiatives and are ready to facilitate their set up while most EPCOs are not open to innovations and changes in their operating systems, for instance in regards to Dynamic Pricing measures.

Although the METI is in charge of driving the development of Smart Community projects, and

[104] Mitsui Fudosan. http://www.mitsuifudosan.co.jp/english/corporate/csr/2012/special/smartcity/01/index.html

[105] DeWit, Andrew. 2014. http://www.japanfocus.org/-Andrew-DeWit/4131 June 16

draws from its budget to subsidise the pilots, the overlapping of ministries and agencies over projects is confusing: the MOE, the MLIT and the MIC also have programmes of support to green initiatives and ICT projects. It is not rare to see a same project under both the "Future City Initiative" and the "Project for Promoting Introduction of Smart Communities". This adds up to the complexity about the source and the management of the budget, for instance which government agency is in charge of providing the financial aid.

The high number of actors involved in several different projects does not contribute to better visibility. Initiatives also tend to overlap, and in one city it is common to see more than one project: for instance, in Yokohama the main project subsidised by the METI takes place alongside smaller initiatives like the Smart Cell project[106].

The lack of transparency also comes from the interactions between the actors of the private sector. When the master plan of the project is under elaboration, the consulting company in charge of the drafting determines the participation of some companies based upon the services they can offer; and long established partnerships between firms leads to the selection of regular business collaborators, and little competition. Especially in Smart Community projects where so many companies are involved, this system of partnerships makes it hard for foreign companies to enter the market. Once the consortiums are decided, it is unclear how Japanese companies reach agreements. While the LG's role is certainly downplayed, the hierarchy among the firms is implicit and large industrial groups are the leaders. However, when looking up the Smart Community websites, little distinction is made between the companies. The high number of players contributes to the lack of transparency as the role of each Smart Community actors is not detailed: several Japanese companies are involved in such a large range of services that it is difficult to determine which specific services they provide in the project.

Key actors are absent

The municipality's role is taken over by companies, from the planning phase (with consulting companies deciding the consortiums) to the post implementation operational phase (with Town Management Company such as in Fujisawa taking the lead). Citizens are not very active.

Three other actors have limited influence in Japanese Smart City projects: universities and research institutes, NGOs, and SMEs.

Universities and research institutes are often mentioned in the consortium of Smart City projects and in model planning schemes. However, with the exception of Keihanna, they are not very active players and have a limited influence over the projects. As centres of expertise and innovation, the laboratories and collaboration platforms of universities and research institutes have a great potential for contribution to Smart Communities.

[106] For further information see http://www.smartenergy.co.jp/yokohama/index-e.html

Besides, there are few Japanese NGOs. Most of them have too small a budget to take medium or large scale action with less than ¥1,000,000 a year[107]. They are also understaffed and therefore lack visibility as groups of representing civil society. However, some NGOs are gaining power as they take on active roles in the Smart City projects of reconstruction in Tohoku. The immediate need for enhanced coordination in order to achieve urban recovery and resilience has fostered civilian participation, in particular through the involvement of local business associations, such as fishermen union. Other NGOs have become very active: it is the case for Higashi Matsushima Organization for Progress and Economy, Education, Energy (HOPE)[108]. As one of the cities selected for funding of the FCI as a tsunami-hit municipality, Higashi Matsushima LG is now trying to implement the master plan of Smart Community it has presented for fund selection. However it is facing difficulties with finding partners from the private sectors, and with setting up a coordination model.

Local enterprises are still struggling to recover from the disaster. They are most often small and medium companies which may not be stable, and now face the challenge of restoring their business. In addition, they often lack the financial capacities necessary to invest in costly high tech projects, such as Smart Communities.

[107] About €7147, calculated based on exchange rates in June 2014

[108] For further information see http://hm-hope.org/ (in Japanese only)

3. Business cooperation assessment between Japan and the EU

A. Investment context

The present context in Japan is favourable to business and technological cooperation between EU and Japanese companies in the field of Smart Communities as significant investment opportunities are expected to be driven by:

- Abenomics and the 2020 Olympic Games in Tokyo
- Tokyo Vision 2020
- the Japanese energy policy

Abenomics and 2020 Olympic Games in Tokyo

Among the structural reforms promised in the third arrow of Abenomics, deregulation and liberalisation focus on the energy sector, hence the liberalisation of the electricity market. They also target foreign investments, especially with the creation of Special Economic Zones (SEZ)[109]. SEZs established in the past 10 yeas in Japan have not managed to attract many foreign companies mostly because conditions to benefit from tax breaks are stringent[110]. However, such a zone has been operating in Tokyo since 2011 (the "Special Zone for Asian Headquarters") and has recently been trying to boost its activity, by holding a seminar "to attract foreign companies" in April 2014 at the Tokyo Metropolitan Government (TMG)[111]. Besides the regulatory reforms on SEZs planned in the Abenomics as released in September 2014[112] include relaxation of regulations regarding zoning restrictions and urban development, for instance regarding floor area ration restrictions. The upcoming Olympic Games are another incentive for the national and local government to relax regulations in order to be more attractive to foreign investors.

Tokyo's successful bid to 2020 Olympic Games gives another opportunity to Japan to stimulate the national economy: revenues up to ¥3 trillion are expected in the service sector, especially tourism and advertising, but also in the construction and commercial sectors[113]. There lies the opportunity for foreign companies to invest in Japan.

---

[109] Investment in Japan. 2014. http://www.investmentinjapan.com/magazine/2014/140630_01.html

[110] Japan Macro Advisor. 2014. http://www.japanmacroadvisors.com/page/category/special-reports/the-truth-about-tokku-special-zone/

[111] TMG. 2014. http://www.metro.tokyo.jp/ENGLISH/TOPICS/2014/fgo41100.htm. p.10

[112] Prime Minister Cabinet. 2014. http://www.kantei.go.jp/jp/singi/keizaisaisei/pdf/kaikakudankou260926EN.pdf

[113] About €22 million. Calculated following June 2014 exchange rates. Forbes. 2013. http://www.forbes.com/sites/stephenharner/2013/09/10/the-2020-olympics-a-fourth-arrow-for-abenomics-and-second-term-for-abe/

Tokyo Vision 2020

The opportunity for European Smart City companies to find Japanese partners is all the more well timed that the TMG is reinforcing its Smart Energy City strategy of May 2012[114]: the Tokyo Vision 2020's goal is to "create a low carbon society with efficient, independent and distributed energy systems".

This translates into the following targets[115]:

- start the construction of a high efficiency, natural gas-fired power plant with one million kW capacity
- expand the introduction of independent and distributed power sources by utilizing urban development schemes among others
- promote the installation of solar power systems in homes
- implement model projects for the realization of a smart city
- have large-scale establishments achieve their mandatory reduction of total CO2 emissions (6 to 8% reduction)
- have 27,000 next-generation vehicles on the streets

The Tokyo Vision 2020 relies on 12 key projects, and the fifth initiative is indeed the realisation of a Smart City[116]. Details are not provided but the main objective is to achieve better energy management, based on RE, storage batteries, and EMS installation throughout the city, providing new opportunities for European companies, including SMEs.

The energy policy

Massive investments are not required only for the Tokyo Olympics. The energy unstable supply in Japan requires a new energy mix. The focus has been placed on renewable energies and alternative energy models; the fourth Strategic Energy Plan dedicates two sections (Chapter 3, Sections 2-3)[117] for the promotion of energy efficiency and the introduction of RE, especially wind and geothermal power. Massive investments are necessary to boost these sectors as well as the solar generation, and national funds from the private and public institutions cannot cover all the costs. Now is a favourable time for foreign investments and access to the Japanese renewable energy market.

Furthermore, Japan is now looking out for international expertise and advisory input in regards to Smart Communities. The International Energy Agency visited Tohoku cities in March 2013 in order to discuss energy management and reconstruction, and existing best practises for the development of Smart Communities[118]. The growing opening of Smart City events in Japan to foreign companies

[114] TMG. Bureau of Environment. http://www.kankyo.metro.tokyo.jp/en/energy/smart_energy_strategy.html
[115] TMG. http://www.metro.tokyo.jp/ENGLISH/PROFILE/policy03.htm
[116] TMG. http://www.metro.tokyo.jp/ENGLISH/PROFILE/policy02.htm
[117] See reference 3, p.6
[118] IEA. 2013. http://www.iea.org/newsroomandevents/news/2013/march/name,36355,en.html

and municipalities (such as the Smart City Week and the Kyoto Smart City Expo[119]) is coupled with the increasing participation of Japanese companies, researchers and government representatives to international seminars and forums on Smart Communities (such as the Barcelona Smart City Expo[120]).

B. Existing cooperation

In addition to the Smart Community projects abroad where the NEDO and European municipalities have concluded partnerships, several types of cooperation on Japanese Smart Cities exist:

- public partnerships
- multi stakeholder partnerships
- business partnerships

Public partnerships

The coupling of between Japanese and European city authorities can be the bedrock for Smart Community cooperation. Partnerships with Japanese counterparts are more easily established when they build on an existing relation. This report identified three cases of collaboration between cities around Smart City technology and management: the recent partnership between Tsukuba and Grenoble (France), the long established twinning between Higashi Matsushima and Lolland (Denmark) and the prospective exchanges between Amsterdam City and Japanese companies. Many other partnerships between European and Japanese cities exist, and negotiations may be ongoing to collaborate further in the field of Smart Community.

First, the cooperation convention signed in November 2013 between Tsukuba and Grenoble builds on a prior partnership between the local universities. The cooperation aims at strengthening the ties between the cities and at promoting exchanges in culture, tertiary education, scientific research, and sustainable development[121]. Special mention is made of collaboration on Smart Cities, as both Tsukuba and Grenoble are leading national centres of research and innovation in that field; they aim at becoming a globally competitive tandem. This French-Japanese collaboration on Smart Cities is mostly technologically oriented[122], while the Danish-Japanese cooperation is based on project planning and implementation.

Second, the Danish-Japanese collaboration frame is still under elaboration. Higashi Matsushima and Lolland were sister cities prior to the Great East Japan Earthquake. In June 2011, the Danish Crown

[119] For further information see http://expo.nikkeibp.co.jp/social/english/smartcity/ and http://www.kyoto-smartcity.com/index_en.php and the "Smart City Events in Japan" section of this report, p.66

[120] For further information see http://www.smartcityexpo.com/en/

[121] French Embassy in Tokyo. 2013. http://www.ambafrance-jp.org/Grenoble-et-Tsukuba-signent-leur (French only)

[122] For further information, see http://grenoble-lanef.fr/spip.php?article73

Prince Frederik visited Higashi Matsushima and proceeded to donations to help with the immediate relief. Lolland also largely contributed to the relief measures and in early 2012 the two cities concluded a MOU to collaborate on technology and human resource development in the perspective of achieving reconstruction and the Smart Community project[123]. A consortium of Danish companies was founded in November 2012 to provide the expertise in green reconstruction[124]. However, from the interview conducted with a member of the NGO "HOPE" it appears the negotiations are still under way and Higashi Matsushima is still looking for investors.

Third is the example of public partnership that is at an even earlier stage of cooperation. Amsterdam Smart City Council created a new department to look for investors and partners, Amsterdam Connects. In February 2014, a delegation of Amsterdam Connects and of Dutch companies came to Japan to see some projects and visit companies[125]. While the language barrier was mentioned, the initiation stage for negotiation between Japanese and Dutch companies was facilitated by this visit organised mostly by the Dutch Embassy in Tokyo. Talks have been initiated with Aizu Wakamatsu, Kitakyushu and Yokohama municipalities[126].

Multi stakeholder partnerships

Two types of multi stakeholder partnerships are to be pinpointed. The first relies on workshops and best practise sharing, while the second is based on common objectives in a specific field of R&D.

The Hasekura program is an example of the former. Initiated by a Barcelona based NPO, it is an "international business exchange program for SMEs, social entrepreneurs, private and public institutions and postgraduate students from Japan/Tohoku and Spain/Europe"[127]. It aims at promoting exchanges of experiences and best practises of Japanese and European Smart Community actors, as well as supporting Japanese SMEs and LGs in their participation to Tohoku reconstruction. One section of the program is dedicated to Smart Communities and has successfully attracted Japanese and European experts who conducted seminars in Barcelona, in addition to key actors who are involved in the reconstruction process.

Multi stakeholder partnerships based on common objectives is best explained through the case of the ClouT project, or the "Cloud of Things for empowering the citizen clout in smart cities"[128]. The ClouT aims at developing the tools to "establish an efficient communication and collaboration platform exploiting all possible information sources to make the cities smarter". The consortium gathers four municipalities, two universities, two research centres and five large industrials from

[123] Regional Revitalization Bureau. 2012 http://www.city.yokohama.lg.jp/seisaku/kyoso/yport-e/pdf/ascc/csg.pdf p.19

[124] Ramboll. http://www.ramboll.com/media/rgr/danish-know-how-benefits-tsunami-victims-in-japanese-city

[125] Amsterdam Connects. 2014. http://amsterdamsmartcity.com/news/detail/id/134/slug/amsterdam-connects

[126] Amsterdam Connects. 2014. http://amsterdamsmartcity.com/news/detail/id/228/slug/amsterdam-connects-update

[127] For further information see http://hasekuraprogram.com/

[128] For further information see http://clout-project.eu/

Japan, Spain, France and Italy. It is jointly financed by the 2013 Seventh Framework Programme (FP7) of the EU and the National Institute of Information and Communications Technology of Japan. There may be other examples of European Japanese cooperation through the FP7 related to the Smart City sector that this report has not pinpointed.

The MOU signed by the Sakashima Asia Smart Community Alliance and Copenhagen Cleantech Cluster (CCC, which recently became CLEAN) is a different type of collaborative sectorial research, and one of the first of its kind. The partnership was initiated in June 2013 and binds the consortium of the project of Smart Community in Osaka, and Denmark's national cleantech network and green project organisation. It aims at promoting collaboration among industry, academia and government in the field of environmental technology[129].

Business partnerships

Few European companies have succeeded in entering the consortiums of Japanese Smart Communities. Only German SAP has a significant business advantage, as a member of the Smart City Project mentioned earlier (Part 2, Section C). On the major four projects of METI until now, only firms from the United States only have been able to participate. IBM Japan, HP Japan and Accenture are the three main competitors. In projects of a smaller scale, European firms have been able to be selected: for instance, it is the case of Smart Cell Project supervised by Yokohama Smart Community, separate from the main Smart City initiative. In this project, German BASF Japan and Swedish Gadelius Industry KK have secured a position. However, their role is limited: they provide materials but do not take part in the design or construction of the Smart Cells[130].

In addition to Smart City consortiums, business cooperation exist in two related fields:

- DR Management: French Energy Pool, a subsidiary of Schneider Electric, has secured a contract with Sojitz and TEPCO for a another Next Generation Energy and Social System focusing on iDR[131]; launched in November 2013, the project underlines the interest of the Japanese government in European expertise in regard to power grid management; follows Toshiba's acquisition of Landis+Gyr in May 2011, and supports TEPCO's project to install 27 million smart meters. This can open the way to further cooperation between European and Japanese utilities, and companies specialised in Demand Response initiatives
- Global Navigation Satellite System: GNSS Asia is a platform for the promotion of industrial cooperation between the EU and Asian countries, among which Japan, for downstream applications of the GNSS[132]

[129] Sakashima Asia Smart Community Alliance. http://sakishima-smart.jp/top_en.html
[130] For further information see http://www.smartenergy.co.jp/yokohama/index-e.html
[131] Sojitz. 2013. http://www.sojitz.com/en/news/2013/11/20131122.php
[132] For further information see http://www.gnss.asia/japan

C. Challenges to cooperation and investment

Among the challenges, we can identify several obstacles to Japan-EU cooperation on Smart Community:

- competition with companies from Japan and the USA
- complexity and lack of transparency of the current Smart City projects
- inflexibility of public and private actors

Competition with companies from Japan and the USA

Japan is one the leaders of sustainable development technology. The clean energy devices and ICT produced by Japanese firms are among the most competitive of the global market. Therefore competing on the Japanese market with European products of equivalent quality, but of higher prices because of the importation costs is challenging. Another disadvantage for European companies is that large Japanese groups tend to be makers of everything, from PV and EMS to housing development. It is the case for Panasonic which offers solar panels through its main branch and proposes housing services through its company PanaHome. As a result, such groups do not need to form as many partnerships as European businesses to make up a consortium for a Smart City project.
Competition also comes from the presence of companies from the USA. Most of foreign firms involved in Smart City projects in Japan are American. Accenture, HP, ESRI, Texas Instruments, DSpace and Felxtronics are involved in Yokohama Smart City and Smart Cell projects while Johnson Controls and IBM Japan work on the Smart Community in Kitakyushu. EnerDel is involved in a project in Tsukuba.

Complexity and lack of transparency of the current Smart City projects

One obstacle to the investment of European companies in Japanese Smart Cities is the language barrier in two respects: information access and direct communication. Although many websites are translated in English, only basic information is provided and the details are available in Japanese only. Then English is not fluently spoken by the Japanese company representatives. In the case of Smart Community project negotiations, fluent communication is vital to lead negotiations and establish an effective model of coordination not only with companies but also with LGs. Therefore Japanese language is a fundamental asset.
Furthermore, the lack of transparency mentioned earlier in this report (part 2, section E) is a real challenge: the overlapping of ministries and programmes on Smart Cities, the opacity of the role of the Japanese companies in the existing consortiums, and the absence of clear regulations on Smart Community make the Japanese projects complex to understand for foreign companies willing to invest.

Inflexibility of public and private actors

Smart Community actors of the public sphere are also inaccessible for reasons beside the language barrier. The lack of familiarity of LG officials with international exchange makes cooperation between Japanese and foreign municipalities a laborious process, even if the Japanese representatives are open to change and willing to innovate. Moreover, their absence of practical experience in operational governing slows down negotiations and realisation of projects.

The dependence of Japanese LGs on the national government to issue directives, and on consulting companies to come up with urban master plans, translates into an absence of technical competences when it comes to bottom up initiative and management. According to one of the academic interviewee, the municipal structure further impedes Smart Community project elaboration and local to local authority interaction: any project requiring timely coordination and cost effective organisation is a challenge for Japanese hierarchy, where the city departments are disconnected from one another.

Japanese companies providing Smart City technology and services are also hampered by the inflexibility of their practices. Large companies which offer a wide range of smart services tend to conduct Smart Community projects independently such as Hitachi, which sells storage batteries and data management systems. When such companies need additional material or products, they appeal to well-known local partners.

Smart Community projects where consortiums are already decided cannot be accessed. Large showcases, such as the Next Generation Energy and Social System demonstrators are especially closed to European SMEs as one of the main aim of such projects is to revitalize the local economy, and thus to give employment to domestic companies. Privately funded projects, such as Fujisawa SST, are also inaccessible for similar reasons.

D. Opportunities for cooperation

Projects which are still in the early decision making phase, in regards to associate company selection and plan drafting, are more likely to be open to cooperation with foreign partnerships. It is the case of reconstruction projects in Tohoku. As stated in the Hasekura Program outline, "the reconstruction process of post-tsunami Japan represents a challenge, but also a unique opportunity to rethink a number of social, economic and political issues at stake"[133]. Several interviewees from the academic sphere, that communities in disaster struck areas are more open to change: they have the opportunity to rebuild, but do not want to be under the umbrella of large industrial groups. It is indeed widely recognised that the large Japanese companies tend not to take into account the specific needs of the people of a given community, but impose ready-made solutions and technology on to a given area.

[133] See reference 127, p.46

There are two fields of cooperation to be developed in the public sector, as first steps to potential business partnerships. First, relying on existing partnerships between cities, the municipalities can share best practises and experiences on the policies and strategies currently conducted for Smart Community implementation. European LGs could contribute to the development of Japanese LGs' operational management in particular: thanks to common workshops and internships for instance, European municipalities could demonstrate the leverages they use in order to be in a position of influence during the decision making phase, as well as during the implementation of the Smart Community projects. This opportunity should not be missed as Japan is now interested in sharing such experiences. Second, R&D collaboration between research centres on Smart City technology can be further developed, for instance based on the model of the ClouT: as excellent producers of clean energy technology, EU and Japan laboratories can benefit from cooperative research and boost their respective national competitivity, especially under the European financing scheme Horizon 2020, which is an opportunity for promoting research projects with Japanese participation.

As for the private sector, opportunities for European companies to find partners and invest in Japanese Smart Cities are limited but they exist nonetheless: based on the existing entry points to the market and on the under-developed fields of Japanese projects, it is possible for European companies to get access to Smart Community projects. Some European companies have managed to enter markets related to Smart Cities, such as the solar generation market and the construction material market. Companies that already have a market access are more likely to get involved in Japanese Smart Community projects: prior presence on the Japanese market is important for local firms, which are more likely to trust a domestically recognised company. Furthermore, it is essential to target under-developed fields of Japanese Smart Cities, where European businesses have complementary expertise. Considering that Japanese projects are already quite advanced in terms of infrastructure and technology, European companies must propose products which have additional value and enhance the Japanese technology and services.

Competition with the Japanese companies in the field of transportation is very challenging: Nissan and Toyota are world leaders in terms of EV and PHEV. Many Smart Community sectors are overly competitive. However the following fields were identified through interviews as key targets for European companies:

- clean energy sources
- power grid technology and expertise
- energy and data management
- sustainable construction
- citizen participation applications

Clean energy sources

While the market of the solar energy is already significant and can keep growing to a certain extent, the market of wind power is going to massively expand thanks to the FIT and the measures to be taken based on the 4th Strategic Energy Plan. Several European RE companies are already present on those two markets, as well as on the market of biomass energy[134]. There are several ways for European clean energy companies to expand their access to the market: as Japan produces high quality products, European firms could acquire a Japanese company (i.e. the Italian PV producer Infrastutture acquired Hergo Sun), or provide some material that can increase the energy efficiency of the clean energy devices themselves. For instance, Japanese solar panels could be improved if Japanese makers used inverters produced in Europe: these require a smaller power to function, and the efficiency of the solar panels could be improved. Reducing the demand in energy would mean that the load on the grid can be lessened, and that transmission line cables could be smaller and further energy savings could be achieved[135].

On the contrary, geothermal energy is not a market with promising potential: although the 4th Strategic Energy Plan puts the emphasis on the potential of such sources in Japan, the growth of the market is still uncertain. The hot spring sector in Japan is composed of numerous small businesses which are very influential, protective of the sources and opposed to the development of geothermal plants. Besides, sources are often located in protected national parks where regulations prohibit the establishment of large plants. An additional obstacle to the European investment lies in the excellence of the Japanese geothermal technology: Japanese companies already have a large share of the global market, thus if the market grew in Japan, it would be difficult to compete with the national companies.

When European companies are already present on the Japanese market, it translates into better chances to enter consortiums of Japanese Smart Communities. Although none have succeeded so far, key projects such as the reconstruction projects in Tohoku and the Tokyo Olympic Games are windows of opportunity opened by the need for better resilience and energy security.

---

[134] For more information on clean energy market access in Japan, see Lambrecht, Stijn. 2014. "The Japanese clean energy sector development" http://www.eu-japan.eu/sites/eu-japan.eu/files/Japanese-Clean-Energy-sector-development-2014.pdf and Vigot, Victoria. 2014. "The clean energy sector in Japan: an analysis on investment and industrial cooperation opportunities for EU SMEs" http://www.eu-japan.eu/sites/eu-japan.eu/files/clean-energy-paper%2827feb-b%29-finale.pdf

[135] For further information, see Hahn, Edgar. 2014. "Solar PV Market and Industry in Japan – Opportunities for European SME, including SMEs", http://www.eu-japan.eu/publications (to be published autumn 2014)

Power grid technology and management expertise

Transmission line expertise is another sector of possible investment, considering the upcoming massive investments in RE from both national and international companies. No less than six large scale projects are now planned in Japan[136] and wind farm projects in Hokkaido and offshore are multiplying. These projects require upgrades in the Japanese power grid: for now there are not enough transmission lines to ensure a stable supply all over Japan, especially from West to East and vice versa. That issue, coupled with the low number of conversion stations between Western and Eastern Japan, was at the root of the power shortage and blackouts in the East following the Fukushima accident: the required amount of power could not be dispatched across the country.

As Europe is advanced in power grid technology and management and long distance transmission networks, utilities could establish partnerships to provide expertise along material and products necessary for the grid upgrade. The collaboration between TEPCO and French Energy Pool is a first step to further cooperation. Market restructuration, power grid upgrade and massive expansion of RE on the other hand are not implemented yet and will require considerable adaptions in the Japanese energy system. There is a good opportunity for European companies to invest while the market structure is under change and the role of Japanese utilities is modified. Although the power grid transmission and management at the national scale is not part of Smart Community projects, all pilots rely on the grid for energy to be provided; it is thus a key related sector.

Energy and data management

The power grid at the scale of the city is also a sector with good market potential for European companies. Smart metering, energy recuperation devices and DR and Dynamic Pricing programmes are fields where European firms have a matured set of expertise, and where they can bring additional know-how. The service area covered by TEPCO in regards to the installation of the 27 million smart meters leaves the rest of the country to be provided with smart meters. The main challenge is the competition with the Swiss smart meter producer Landis+Gyr, acquired in May 2011 by Toshiba. Any innovative equipment that may reduce energy consumption and hence GHG emissions has likely potential to be sold in Japan.

Mapping softwares and GNSS are not widely used in Japanese Smart City projects. Information processing and management through the creation of applications for the use of the municipality to visualise city data and events could be another opportunity for business development in Japan. However, for now Japanese companies do not sell visualisation technology to local LGs but advanced daily services to individual consumers instead. Therefore European businesses could bring in expertise and technology to expand that sector, as it is a growing market in Europe. The research collaboration ClouT is a key step in this process.

[136] For further information see http://www.asiabiomass.jp/english/topics/1402_06.html

Sustainable construction

European companies can bring expertise in regard to insulation and energy efficient building design. As of now, no policy actively supports the upgrading or new building standards, however Japan's Institute for Building Environment and Energy Conservation (IBEC)[137] is a major supporter of Smart City projects and thermal insulation standards improvement have become one of their key targets for better energy efficiency and GHG reduction.

In the sector of construction, the market is full and mature, which makes access very difficult. Providing construction materials for better insulation represent a good opportunity, although the competition is tough in Japan. Saint Gobain has access to the market thanks to its local subsidiary Mag Isover, while Swedish Gadelius KK has been present in Japan since 1907[138]. However, in Japan there are almost no incentives for construction companies and building owners to upgrade the building insulation: Japan is an excellent performer in terms of low heating use compared to international standards. According to an interview with an executive from the insulation material sector, a reform on insulation regulations should be passed by 2020. However it would be based on standards required in the late 1990s in Europe, therefore the cost of using over-performing construction material from European companies would be a disincentive for Japanese constructors to import any.

Citizen participation applications

Currently various incentives and innovative initiatives to encourage participation in Smart City projects are tested in Europe. Companies in cooperation with municipalities and citizen associations have gained experience in the development and design of applications to facilitate the involvement of inhabitants through better data access and visualisation. The use of Internet of Things is a successful tool for civil contribution to the Spanish project Smart Santander[139]; cities such as Amsterdam and Stockholm have also developed effective systems for participatory governance. However, citizen participation is not a clear priority in Japanese Smart Communities for now. It is encouraged neither by the companies nor by the central government. Some LGs are slowly opening to the idea and adopting measures to involve the citizen though (as in Kitakyushu). Consequently European companies should consider entering the potentially promising niches.

[137] For further information see http://www.ibec.or.jp/jsbd/index.htm

[138] For further information see http://www.gadelius.com/company/story_e.html

[139] "SmartSantander: Internet of Things research and innovation through citizen participation". 2013. In *The Future Internet – Future Internet Assembly 2013: validated results and new horizons.* Springer. p.179-186

Conclusions and recommendations

Smart City projects in Japan were launched in two waves, in 2010 and 2012. The first projects are mostly showcases of Japanese technology aimed at global exports. The Fukushima Daiichi nuclear plant accident of March 2011 forced a change in the national energy policy, namely efficiency and resilience, which have now become priorities in the pilot projects. The Japanese market for Smart Community services and solutions is developing quickly, thanks to government subsidies and private initiatives.

Considering that Japanese Smart City technology is advanced, the cooperation between European and Japanese businesses can be based on incremental enhancement of the clean energy and ICT equipment used in Japanese projects, and on expertise transfer regarding power grid management. The following observations and recommendations for enhancing business cooperation between Japan and the EU can be made:

Ensure an active local presence

As indicated in Lambrecht (2014)[140], the access to the Japanese market is often more solid when European companies have an office in Japan, or in most successful cases, when they have a Japanese subsidiary. Furthermore, working with a Japanese expert in the targeted sector contributes to a better assessment of the market. In the case of Smart Communities in particular, it is essential to have a good understanding of the involvement of the public and private actors. Besides, in the case a European company has a Japanese partner, it is essential that the former does not rely on the latter to make all the investments and shoulder all the risk, if they want to be part of the decision making process. The Japanese partner may not bring all the know how that the European enterprise may be looking for, and the European firm should rely on its own resources to know the market first hand, and not through what would be an agent.

Consider the Japanese regulations and requirements

A European company willing to sell its product on the Japanese market (especially hardware), should verify that their product is meeting all technical requirements stipulated by the Japanese regulations (for instance approval processes, labelling requirements among others). The issue of frequency should also be well investigated so that products are functional in the market they are sold.

[140] "The clean energy sector in Japan: an analysis on investment and industrial cooperation opportunities for EU SMEs", http://www.eu-japan.eu/sites/eu-japan.eu/files/clean-energy-paper(27feb-b)-finale.pdf

Investigate the local EPCO

Investigation of the local power grid is necessary: not only does the frequency differ depending on the region, but especially until the third phase of the fifth reform is fully enforced (by 2020), local EPCOs remain extremely influential and their openness to Smart Grid projects is crucial, especially in regards to DR and Dynamic Pricing measures. While TEPCO was virtually nationalised after the Great East Japan Earthquake, other EPCOs have to be approached individually.

Exchange with local universities

The role of universities is underestimated: they are well acquainted with the local economic and environmental situation, and they are thus capable of bringing an expert perspective on the Japanese projects. Local universities may not be directly involved in the projects as institutions. However from a few interviews conducted, it can be said that it is not rare that professors and researchers play a role in the Smart Community planning as expert advisors. Universities can act as first intermediates and facilitators for partnerships between research laboratories, and at a later stage, companies and LGs, without being market competitors. For example, the exchanges between Grenoble and Tsukuba universities are the foundations for the partnership that was concluded between the municipalities.

Promote R&D cooperation

Smart Communities are models of urban development relying on sustainable technologies and ICT. The competitivity of the companies is directly dependent on how innovative and efficient the technologies and services are. Partnerships between laboratories, research centres, start-ups and universities can be key to maintain and boost the competitivity of EU and Japan at a global scale.

Develop city partnerships

Though many Japanese LGs let companies run the projects, the accident at the Fukushima nuclear power plant pinpointed weaknesses in this mode of governance. Other obstacles like inexperience in international cooperation and in active governing can hinder EU-Japan city collaboration. However such partnerships can be the first step for further cooperation: long term relations are a very reliable asset for business in Japan, and the Smart Community projects require the involvement of LGs.

Conclude bilateral agreements

Based on the recommendation made by one interviewee of the public sector, it is suggested that European businesses and LGs should conclude agreements with Japanese companies for projects in Europe, while taking care to establish a bilateral relationship. European enterprises could negotiate to invest in Japanese projects, in return for Japanese participation in European projects.

Bring in an external coordinator

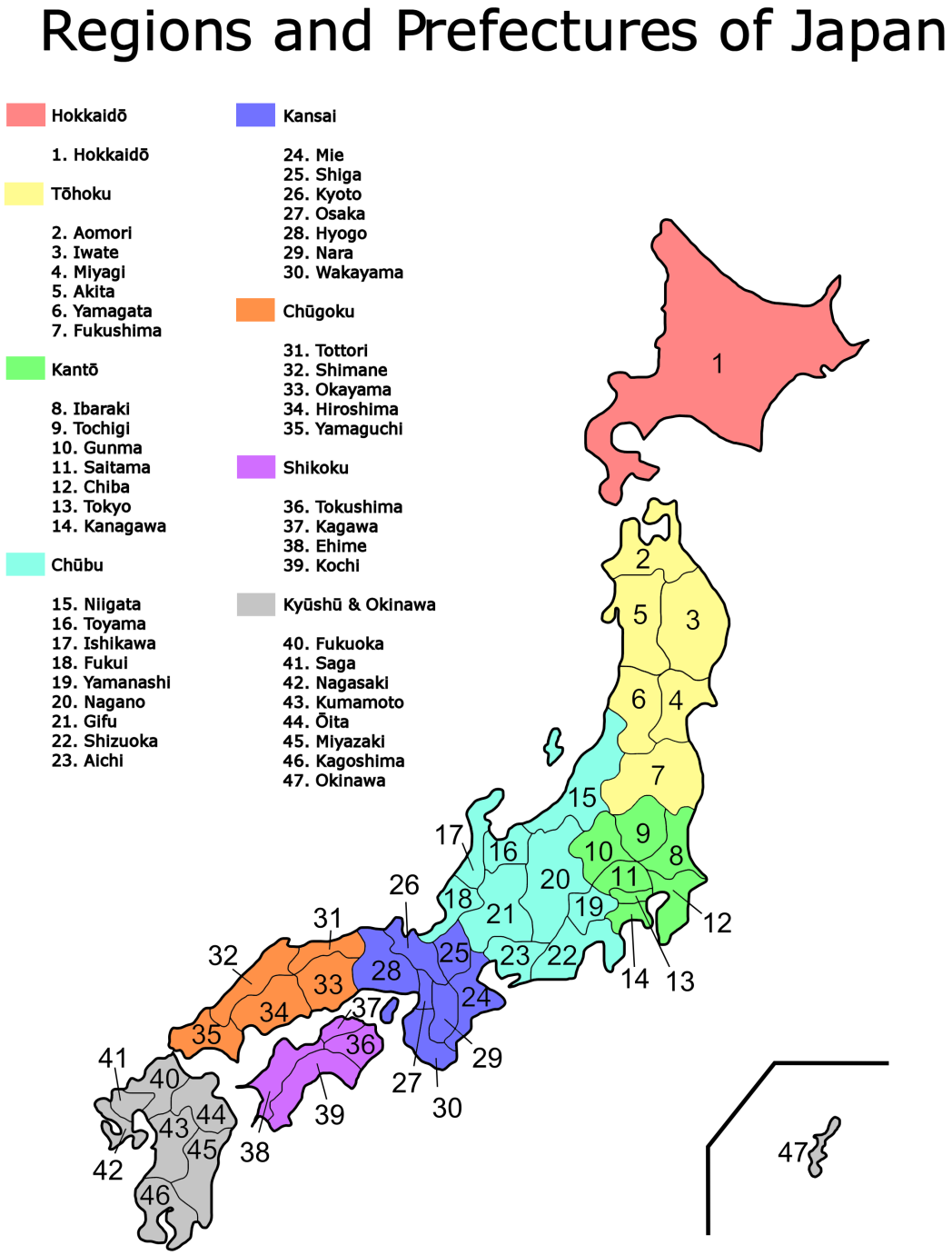
All Smart Community projects require the establishment of a consortium and of a model of coordination. The process takes time as conflicting interests must be overcome for a compromise to be found first between companies and the LG, and second between the enterprises themselves. International cooperation face additional obstacles during the LG to LG and the company to LG negotiations, such as differing languages and business practices. Therefore bringing in an external actor can help facilitating the cooperation process. A neutral coordinator can give priority to the global vision over the individual interests. At present there is no such existing coordination model in Japan. Nonetheless an example exists in China: the Smart City Hong Kong project is based on French-Chinese cooperation, facilitated by the model of coordination put in place by Schneider Electric. According to one of the interviewee, it took two years for all partners to set up and run the model, but it has advanced the partnership and facilitated the present decision making process.

Seek opportunities for EU-Japan cooperation in cities without sufficient infrastructure

Competition with Japanese companies on the Japanese market of Smart Community is challenging. Thus some interviewees from the private sector suggest that European businesses should seek to expand their market access at a global scale, and establish partnerships with Japanese companies for Smart City projects in regions without the sufficient infrastructure. Attempts at joint projects in Africa especially would be more likely to succeed because of the clear gain for Japanese firms: they are looking for more market opportunities, and the strong European presence in some countries would be an advantage for any Japanese firm collaborating with European companies. Cooperation in other regions is also possible in South East Asia but at a smaller advantage for European companies, as Japanese companies aim at leading this particular market.

Annexes

ANNEXE 1: REGIONS AND PREFECTURES OF JAPAN
Source:
http://upload.wikimedia.org/wikipedia/commons/5/5a/Regions_and_Prefectures_of_Japan.png



Toshiba, Nissan Motor, Panasonic, Meidansha, TEPCO, Tokyo Gas, Accenture			
PCO			
Toshiba & Tohoku EPCO			
Nippon Paper Industries Nakoso Factories			
Nippon Steel Engineering, Tohoku EPCO			
Future Design Centre, Abecho Shoten, K Cooperative Society of Marine Products Processors, Sanriku Tokyo, e-solutions			
Fujitsu & Tohoku EPCO			
ENNET, NTT Data, JDC Corp			
JX Nippon Oil and Energy, Kitakami Office Plaza			
Toyota Motor & Central Motor			
ENNET & NTT East			

Fujisawa	Kanagawa	Sustainable Smart Town (SST)	EV, photovoltaic generation, HEMS, storage	Panasonic, Mitsui Fudosan & Mitsui Fudosan Residential, Nihon Sekkei, Orix, PanaHome, Sumimoto, Tokyo Gas, Accenture	http://panasonic.net/es/fujisawasst/
Higashimatsushima	Miyagi	Smart Community	HEMS, EV, biomass	not disclosed/chosen yet	Not public
Hitachi	Ibaraki	Smart Industrial City	EV, FEMS	Hitachi	http://www.reconstruction.go.jp/english/topics/2013/03/smart-community-and-future-city-initiatives.html
Iwanuma	Miyagi	Mega solar Power Generation	PV	not disclosed/chosen yet	
Kashiwa	Chiba	Environmental Campus/Smart City Project	EMS, PV, storage batteries	SAP Japan, Sharp, Nikken Sekkei, Mitsui Fudosan, e-solutions, HP Japan	http://www.mitsuifudosan.co.jp/english/corporate/csr/2012/special/smartcity/01/index.html
Kyoto	Kyoto	E-bus Network City	EV	Mitsubishi Heavy Industries	https://www.keidanren.or.jp/en/policy/2012/046.pdf http://www.kkc.or.jp/data/pub/00000073.pdf
Naha	Okinawa	Logisitic Hub City	EV	Hitachi	
Ofunato, Rikuzentakata, Sumita	Iwate	Compact City	PV, EV, regional decentralized power storage system	not disclosed/chosen yet	http://www.reconstruction.go.jp/english/topics/2013/03/smart-community-and-future-city-initiatives.html
Shinchi	Fukushima	Smart Hybrid Town	PV, EV, HEMS, storage batteries	not disclosed/chosen yet	http://www.reconstruction.go.jp/english/topics/2013/03/smart-community-and-future-city-initiatives.html
Iga	Mie	Smart Common Life	HEMS, RE	Sekisui	http://www.sekisuihouse.co.jp/bunjou/smarttown/
Matsuzaka	Mie	Smart Common Life			
Seishin Minami (Kobe)	Hyogou	Smart Common City			
Teriha	Gunma	Smart Town			
Hayashi (Komatsu)	Kanagawa	Smart Common City			
Seya (Yokohama)	Kanagawa	Smart Common Stage			
Tempaku (Nagoya)	Aichi	Smart Common Life			
Ichihara	Chiba	Smart Common City			
Yostukaido	Chiba	Smart Common Stage			

Tsukuba Mirai	Ibaraki	Smart Common Stage			
Keyakidaira	Toyama	Smart Common Stage			
Akaishidai	Miyagi	Smart Common City			
Mitazono	Miyagi	Smart Common Stage			
Moriya	Miyagi	Smart Common Stage			
Koufu	Yamanashi	Smart Common Life			
Sakaide	Kagawa	Smart Common Life			
Akita	Akita	Smart City Integrated Information Management Platform Project	EMS, ArcGIS	Itochu, IBM Japan, ESRI Japan	http://www.itochu.co.jp/en/news/2011/111006.html
Fukuoka	Fukuoka	Hydrogen City	PV, storage batteries, HEMS, EV	Kokusai Kyogo	http://www.altenergymag.com/emagazine/2012/04/green-innovation-%E2%80%93-fukuoka-hydrogen-town/1876
Funabashi	Chiba	Morino City	PV, EV	Mitsubishi Corporation, Nomura Real Estate Dvlpt Co	http://www.mitsubishicorp.com/jp/en/pr/archive/2012/html/0000014497.html
Hirono	Fukushima	Kadonohama Solar Power Generation	PV	n/a	http://www.reconstruction.go.jp/english/topics/2013/03/smart-community-and-future-city-initiatives.html
Nagasaki	Nagasaki	Smart Community	EV	Toyota, Mitsubishi, Nissan	http://www.smartenergy.co.jp/nagasaki/
Osaka	Osaka	Sakishima Smart Community	thermal heat, AMI	Azbil, NTT, Obayashi, Toshiba	http://sakishima-smart.jp/kaiin_en.html
Rokkasho	Aomori	Smart Grid	EV, HEMS, photovoltaic and wind generation	Japan Wind Development, Toyota Motor, Panasonic Electric, Hitachi	http://www.hitachi.com/New/cnews/100915a.html
Saitama	Saitama	E-kizuna (smart home)	HEMS, EV	Honda	http://world.honda.com/news/2011/c110523E-KIZUNA-Project/index.html
Tokyo	Tokyo	Smart Energy City	EMS, PV, storage batteries	not disclosed/chosen yet	http://www.metro.tokyo.jp/ENGLISH/PROFILE/policy03.htm
Tsukuba	Ibaraki	Green Crossover	EV, photovoltaic generation, data center	Itochu, Mazda, Seiko Electric	http://www.itochu.co.jp/en/news/2010/100512.html

ANNEXE 3: SMART COMMUNITY TECHNOLOGIES

Source: http://www.jase-w.eccj.or.jp/technologies/sector.html

Applicable Sector	File No.	Title	Corporate Name	JSIC	Keyword Y				Keyword Z					S
					Material or Part	Device	Equipment or Facility	System or Software	Solid Fuels	Oil	Natural Gas	Electricity	Water	Smart Community
Residence	R-01	Inkjet Multifunction Device	Canon	E30		●						●		
	R-02	Transparent Conductive Film with Exothermic Function	Fujifilm	E16	●							●		2
	R-03	Heat Pump (General Purpose)	HPTCJ	L		●				●	●			5
	R-04	Air/Heat Pump Water Heater with Natural-Refrigerant	HPTCJ	L		●				●	●			5
	R-05	Household Refrigerator	Hitachi	E29		●						●		
	R-06	Far Infrared Heaters	JIRA	L		●						●		
	R-07	Energy Management System Essential for Smart & Compact Community	JGC	L				●				●		8
	R-08	Residential Fuel Cell	JX Nippon Oil & Energy	E17		●						●		6
	R-09	Light-transmitting & Insulation Building Materials for Windows	Sekisui Chemical	E18	●							●		3
	R-10	High Efficiency Gas Cooking Stove	Tokyo Gas	F34		●					●			
	R-11	Residential Fuel Cell	Tokyo Gas	F34		●					●	●		6
	R-12	High Efficiency Condensing Water Heater	Tokyo Gas	F34		●					●			
	R-13	Energy Conserving Freezer-Refrigerator	Toshiba	E29		●						●		
Office	O-01	Heat Shielding and Heat Insulation Glass Units	Asahi Glass	E21	●					●		●		
	O-02	Digital Multifunction Printer	Canon	E30		●						●		
	O-03	Commercial Heat Pump Hot Water Supply Unit	HPTCJ	L		●						●		5
	O-04	Commercial Heat Pump Air Conditioning System (Multisystem Air Conditioner for Highly-Efficient Buildings)	HPTCJ	L		●					●	●		5
	O-05	Thermal Storage Air Conditioning System	HPTCJ	L		●				●	●			5
	O-06	Spot Cooling System for Data Centers	Hitachi	E29			●					●		
	O-07	ESCO Service Project	Japan Facility Solutions	L				●				●		
	O-08	ESCO Service with Guarantee of CO2 Emission Reduction (Double Guarantee ESCO)	Japan Facility Solutions	L				●				●		
	O-09	Energy Center	Japan Facility Solutions	L				●				●		
	O-10	Analysis of Current Situation Based on Energy-Audit and Support for Formulation of Energy-Saving Renovation	Japan Facility Solutions	L				●				●		
	O-11	Energy/CO2 Emission Visualization Service	Japan Facility Solutions	L				●				●		3
	O-12	Radiation Air-Conditioning System	JIRA	L			●					●		3
	O-13	Clathrate Hydrate Slurry (CHS) Thermal Energy Storage System	JFE Engineering	L			●					●		
	O-14	Geothermal Air-Conditioning System	JFE Engineering	L			●					●		5
	O-15	Triple Effect Absorption Chiller-heater	Kawasaki Heavy Industries	E25		●					●			3, 4
	O-16	Solar Absorption Chiller-heater	Kawasaki Heavy Industries	E25		●					●			5
	O-17	Escalator (Converter Regenerating Controller)	Mitsubishi Electric	E29			●					●		3
	O-18	Machine-Room-Less Elevator	Mitsubishi Electric	E29			●					●		
	O-19	Integrated Building Facility Management System	Mitsubishi Electric	E29				●				●		
	O-20	Sophisticated Green Building Design	Nikken Sekkei	D				●			●	●		3
	O-21	Mirror Duct System to Use Natural Light	Nikken Sekkei	D				●			●	●		3, 5

	O-22	An Office Building as a Large Sustainable Device	Nikken Sekkei	D			●				●		3
	O-23	Embracing the Environment with Wood	Nikken Sekkei	D	●						●		3
	O-24	High-efficiency Heat Supply System (Unused Energy Utilization and Heat Recovery Heat Pump)	TEPCO	F33				●			●		
	O-25	Gas Engine Driven Heat Pump (GHP)	Tokyo Gas	F34			●			●			
	O-26	Energy Saving Modular Data Center	Toshiba	E29			●				●		
	O-27	Model-based Air-conditioning Optimal Control System	Toshiba	E29				●			●		3
	O-28	Smart Eye Sensor-Based Control System for Energy Conservation	Toshiba	E29				●			●		3
	O-29	Green Concept Escalator	Toshiba	E29			●				●		3
	O-30	Linear LED Lamp Systems	Toshiba	E29		●					●		2
	O-31	Wide Light Distribution LED Light Bulbs	Toshiba	E29		●					●		2
	O-32	Green Concept Elevators	Toshiba	E29			●				●		3
	O-33	Data Center Power Consumption Measurement	Yokogawa Electric	E29		●					●		
	F-01	Area-wide Pinch Technology	Chiyoda Corp.	L				●		●			
	F-02	Hydrogen Storage and Transportation System by Organic Chemical Hydride	Chiyoda Corp.	L			●				●		5
	F-03	Fuel Cell Power System	Fuji Electric	E29			●				●		
	F-04	Energy saving due to Medium Voltage Inverter	Fuji Electric	E29			●				●		
	F-05	Micro Tubular Turbine	Fuji Electric	E29			●				●		5
	F-06	Smart Grid	Fuji Electric	E29			●				●		1
	F-07	Flexible Amorphous Solar Modules	Fuji Electric	E29			●				●		5
	F-08	Industrial Heat Pump Technology	HPTCJ	L		●					●		5
	F-09	Environment-friendly High-Efficiency Gas Burning Boiler	IHI	E25			●			●			
	F-10	High-Efficiency Turbo Compressor	IHI	E25			●				●		
	F-11	Automated, Unit-based, Palletized Warehouse	IHI	E25			●				●		
	F-12	Automated Warehouses for Freezing and Refrigeration	IHI	E25			●				●		
	F-13	Vacuum Carburizing Furnace and Vacuum Carburizing Full Automated Line	IHI	E25			●				●		
	F-14	Flue-gas Desulfurization & Selective Catalytic Reduction System	IHI	E25			●				●		
	F-15	Screw Decanter-type Centrifuge (Electric Power Regeneration System)	IHI	E25			●				●		
	F-16	Far Infrared Heating	JIRA	L			●			●	●		
	F-17	Far Infrared Drying	JIRA	L			●			●	●		
	F-18	Far Infrared Food Processing	JIRA	L			●			●	●		
	F-19	Gas Engine Cogeneration Equipment	JFE Engineering	L			●			●			
	F-20	Waste Heat Recovery Plant for Cement Industry	JFE Engineering	L			●				●		
	F-21	Gas Turbine Cogeneration System	Kawasaki Heavy Industries	E25			●			●	●		4
	F-22	Gas Engine	Kawasaki Heavy Industries	E25			●			●			
	F-23	Steam Turbine Facilities for Environment-oriented Power Generation	Kawasaki Heavy Industries	E25			●		●				
	F-24	Waste Heat Recovery Power Plant	Kawasaki Heavy Industries	E25			●				●		
	F-25	Waste Treatment Systems Using Cement Kiln	Kawasaki Heavy Industries	E25			●		●				
	F-26	Friction Spot Joining System	Kawasaki Heavy Industries	E25			●				●		
	F-27	Large Once-through Boiler	Kawasaki Heavy Industries	E25			●			●	●		
	F-28	Byproduct Fuel Fired Boilers	Kawasaki Heavy Industries	E25			●			●	●		5
	F-29	Small AC Servo Press	Komatsu	E25			●				●		
	F-30	Adsorption Chiller	Mayekawa Mfg.	E25		●					●		4
	F-31	Air Refrigerant Freezing System	Mayekawa Mfg.	E25		●					●		4
	F-32	Hot Water Supply Heat Pump	Mayekawa Mfg.	E25		●				●	●		4
Factory	F-33	Hybrid Cooling Unit	Mayekawa Mfg.	E25		●					●		4
	F-34	General-Purpose Inverter	Mitsubishi Electric	E29		●					●		
	F-35	Energy Solution Focused on Energy Conservation	Mitsubishi UFJ Lease & Finance	J				●		●		●	3, 4
	F-36	Energy Saving by Multiple Installation System of High-efficiency Small Once-through Boilers and Energy Management System	Miura	E25			●			●	●		

	F-37	Energy Management System Utilizing the Super High Efficiency Solid-Liquid Separation Technology	NGK Insulators	E21			●				●		
	F-38	Drying Furnace for Crystalline Solar Cell	NGK Insulators	E21			●				●		
	F-39	System for Recovering Solvents via Water Separation	NGK Insulators	E21			●			●			
	F-40	LED High-Bay Light	Sharp	E29		●					●		
	F-41	LED Canopy Lighting	Sharp	E29		●					●		
	F-42	Energy-saving Free Float Steam Trap	TLV	E25		●			●	●			
	F-43	Natural Gas Cogeneration Systems	Tokyo Gas	F34			●			●			4
	F-44	High-performance Industrial Furnace Equipped with Regenerative Burner	Tokyo Gas	F34			●			●			
	F-45	Energy Saving at Oil Refineries and Chemical Plants	Toyo Engineering	L				●		●	●		
	F-46	Optic Fiber Distributed Temperature Sensor	Yokogawa Electric	E29		●					●		
	F-47	Key Enablers of Vigilant Cycle for Global Environment	Yokogawa Electric	E29				●		●			
	F-48	Zirconia Oxygen Analyzer	Yokogawa Electric	E29		●				●			
	F-49	Pressure Transmitter	Yokogawa Electric	E29		●				●			
	F-50	TruePeak Tunable Diode Laser Spectrometer (TDLS) Analyzer	Yokogawa Electric	E29		●				●			
	F-51	Infrared Gas Analyzer	Yokogawa Electric	E29		●				●			
	F-52	Magnetic Flowmeter	Yokogawa Electric	E29		●						●	
	F-53	Turbidity Analyzer	Yokogawa Electric	E29		●						●	
	F-54	Plant Information Management System Package	Yokogawa Electric	E29				●		●			
	F-55	Paperless Video Graphic Recorders	Yokogawa Electric	E29		●					●		
	F-56	Consolidated Alarm Management Software	Yokogawa Electric	E29				●		●			
	F-57	Next-generation Distributed EMS Energy Control System	Yokogawa Electric	E29				●			●		3
	F-58	Advanced Process Controller	Yokogawa Electric	E29				●		●			
	F-59	Operation Efficiency Improvement Package	Yokogawa Electric	E29				●		●			
	F-60	Integrated Production Control System	Yokogawa Electric	E29				●		●			
	F-61	Safety Instrumented Systems	Yokogawa Electric	E29				●		●			
	F-62	Energy-saving Control for Various Utilities	Yokogawa Electric	E29				●			●		
	F-63	Clamp Wattmeter for Visualization of Energy Saving	Yokogawa Electric	E29		●					●		
	F-64	Film Sheet Thickness Measuring and Controlling System	Yokogawa Electric	E29			●				●		
	F-65	Vortex Flowmeter	Yokogawa Electric	E29		●					●		
	F-66	Low-power Consumption Type Intelligent Remote Terminal Unit (RTU)	Yokogawa Electric	E29		●					●		
Construction & Transport	C-01	Giant-sized Electric-Hydraulic Excavators and AC-drive Rigid Dump Trucks	Hitachi	E29		●			●				
	C-02	Energy-efficient Hydraulic Excavators	Hitachi	E29		●			●				
	C-03	Ring Belt Material for CVT	Hitachi	E29	●				●				
	C-04	Hybrid Hydraulic Excavator	Hitachi	E29		●			●				
	C-05	APM Automated People Mover	IHI	E25			●				●		7
	C-06	Hydrostatic Transmission Forklifts	Komatsu	E25			●		●				
	C-07	Capacitor Hybrid Forklift Truck	Komatsu	E25			●				●		
	C-08	Dissemination of a Fuel-efficient Operation of Construction Machinery	Komatsu	E25			●		●				
	C-09	Hybrid Hydraulic Excavator	Komatsu	E25			●		●				
	C-10	Energy Saving Tires	Nihon Michelin Tire	E19	●				●				
	C-11	Tires That Contribute to Fuel Cost Saving (for Trucks and Buses)	Nihon Michelin Tire	E19	●				●				
		Permanent Magnet Synchronous Motor for Rolling Stock											

	C-12	(PMSM) and 4-in-1 Variable-Voltage Variable-Frequency (VVVF) Traction Inverter for driving PMSMs	Toshiba	E29		●					●		7
Electricity	E-01	"One Stop Service" for PV Power Plant Business	Chiyoda Corp.	L			●					●		5
	E-02	Next-Generation Concentrated Solar Thermal Power Plant	Chiyoda Corp.	L			●					●		5
	E-03	Support for Promoting Energy Efficiency and Conservation (EE&C)	Electric Power Development	F33				●				●		
	E-04	Geothermal Power Plant	Fuji Electric	E29			●			●				5
	E-05	Valve-regulated Lead-acid (VRLA) Batteries for the Stabilization of the Outputs of Photovoltaic and Wind Power Generation Systems	Hitachi	E29			●					●		6
	E-06	Amorphous Alloy for Energy Efficient Distribution Transformer	Hitachi	E29	●							●		
	E-07	Power Conditioner for Photovoltaic (PV) Power Generation Systems	Hitachi	E29			●					●		5
	E-08	Waste to Energy System	Hitachi Zosen	E25			●		●	●				5
	E-09	Gas Turbine Cogeneration Systems	Hitachi Zosen	E25			●			●	●			4
	E-10	Advanced Gas Engine	IHI	E25			●					●		
	E-11	Wire Saw for Photovoltaic Cells	Komatsu	E25			●					●		
	E-12	Proposal for the One-stop Service for Energy Saving	Kyushu Electric Power	F33				●				●		
	E-13	Power Conversion System (PCS) for NAS BESS	Meidensha	E29			●					●		6
	E-14	Photovoltaic Inverter	Meidensha	E29			●					●		5
	E-15	Smart Energy Management System (Smart EMS)	Meidensha	E29			●					●		3
	E-16	Transfer Molding Type Intelligent Power Module (IPM) with Built-in BSD	Mitsubishi Electric	E29	●							●		
	E-17	Insulated Gate Bipolar Transistor (IGBT) Module for Megawatt Class Power Generation Systems	Mitsubishi Electric	E29	●							●		
	E-18	Concentrated Solar Power Generation (CSP)	Mitsui Engineering & Shipbuilding	E31			●					●		
	E-19	Engineering Services for Geothermal Development	Nippon Koei	L				●				●		5
	E-20	Energy from Waste facility	Nippon Steel & Sumikin Engineering	D			●		●	●				5
	E-21	On-site Energy Supply Business	Nippon Steel & Sumikin Engineering	F35			●				●	●		4
	E-22	Fluid Collection and Re-injection Systems (FCRS) at Geothermal Power Plant	Nippon Steel & Sumikin Engineering	D			●		●	●				5
	E-23	Solar Frontier Thin-Film Solar Panels	Solar Frontier K.K.	E29			●					●		5
	E-24	Engineering Service: Thermal Power Plant Development	TEPCO	F33				●				●		
	E-25	Engineering Service: Thermal Power Plant Operation and Maintenance	TEPCO	F33				●				●		
	E-26	Engineering Service: Hydro Power Plant Development	TEPCO	F33				●				●		
	E-27	Engineering Service: Hydro Power Plant Operation and Maintenance	TEPCO	F33				●				●		
	E-28	Engineering Service: Renewable Energy Development	TEPCO	F33				●				●		
	E-29	Engineering Service: Power System Planning	TEPCO	F33				●				●		
	E-30	Engineering Service: Network Protection Scheme	TEPCO	F33				●				●		
	E-31	Engineering Service: Distribution Automation System (DAS)	TEPCO	F33				●				●		1
	E-32	Engineering Service: Technical Support in Energy-saving Master Planning	TEPCO	F33				●				●		
	E-33	A Rechargeable Battery	Toshiba	E29		●						●		6, 7
	E-34	Adjustable Speed Pumped Storage Systems	Toshiba	E29			●					●		
	E-35	Supercritical Pressure High-performance Thermal Power Plant	Toshiba	E29			●					●		
	E-36	Switching Loss Measurement for Energy-saving Power Device Development	Yokogawa Electric	E29		●						●		
	E-37	PWM Waveform Measurement for Energy-saving 3-Phase Inverters	Yokogawa Electric	E29		●						●		
	E-38	Measuring Power Conversion Efficiency in Solar Power Generating Systems	Yokogawa Electric	E29		●						●		
	E-39	Aiding Energy Efficiency in Inverter Motors	Yokogawa Electric	E29		●						●		
	E-40	Sun Tracking Controller for CSP & CPV	Yokogawa Electric	E29		●						●		5
	E-41	Carbon Dioxide Emissions Reduced in Power Plants	Yokogawa Electric	E29		●						●		1, 5
	S-01	Waste Heat Recovery System	JP Steel Plantech	E25			●					●		
	S-02	Waste Plastics Injection System for Blast Furnace	JP Steel Plantech	E25			●					●		
	S-03	CDQ - Coke Dry Quenching Process	JP Steel Plantech	E25			●					●		

Iron & Steel	S-04	Waste Heat Recovery for EAF	JP Steel Plantech	E25			●			●		●		
	S-05	Smelting Reduction Process for EAF-dust Treatment	JP Steel Plantech	E25			●		●					
	S-06	Oxygen Converter Gas Treatment System	JP Steel Plantech	E25			●				●			
	S-07	Ecological and Economical High Efficiency Arc Furnace	JP Steel Plantech	E25			●					●		
	S-08	Top-Pressure Recovery Turbine Plant (TRT)	Kawasaki Heavy Industries	E25			●					●		
	S-09	Rotary Hearth Furnace (RHF)	Nippon Steel & Sumikin Engineering	D			●		●					
	S-10	Coke Dry Quenching (CDQ)	Nippon Steel & Sumikin Engineering	D			●		●				●	
	S-11	Coal Moisture Control (CMC)	Nippon Steel & Sumikin Engineering	D			●		●					
	S-12	Reheating Furnace with Regenerative Combustion System for Steel Works	Nippon Steel & Sumikin Engineering	D			●		●					
	S-13	Dry-process Dust Collector for Blast Furnaces	Nippon Steel & Sumikin Engineering	D			●				●			4
	S-14	Exhaust Heat Recovery System for Hot Air Stoves	Nippon Steel & Sumikin Engineering	D			●		●		●			4
	S-15	Top Combustion Hot Blast Stove	Nippon Steel & Sumikin Engineering	D			●				●			4
Oil Refinery & Chemicals	P-01	LNG Receiving Terminal	IHI	E25			●				●			
	P-02	CO2 Capture Process for Reducing Environmental Impact	JGC	L			●				●	●		
	P-03	Tanker Vapor Recovery System (TVR)	JX Nippon Oil & Energy	E17			●			●				
	P-04	Production Technology of Sulfur-free Gasoline	JX Nippon Oil & Energy	E17			●			●				
	P-05	Chloride Oxidation Technology	Sumitomo Chemical	E16			●					●		
	P-06	Steam Condensate Recovery Pump Requiring No Electricity (Mechanical Pump)	TLV	E25		●				●	●			
	P-07	Energy-saving Urea Synthesis Process	Toyo Engineering	L				●		●	●			
	P-08	High-efficiency Ethane & LPG Recovery Process	Toyo Engineering	L				●		●	●			

▲ pagetop

Smart City Events in Japan

Below are listed a few annual events held in Japan.

Kyoto Smart City Expo
March, Kyoto
http://www.kyoto-smartcity.com/index_en.php

Smart Community Japan
June, Tokyo
http://www.nikkan.co.jp/eve/smart/english/

Smart Energy Japan & Embedded Technology West
July, Osaka
http://www.low-cf.jp/SEJ_Osaka

Smart City Week 2014
October 29th to 31st, Yokohama
http://expo.nikkeibp.co.jp/social/english/smartcity/

Green Innovation 2014
November 12th to 14th, Tokyo Tokyo Big Sight
http://www.jma.or.jp/green/en/index.html

Japan Home and Building Show 2014
November 12th to 14th, Tokyo Big Sight
http://www.jma.or.jp/jhbs/en/

Smart Energy Japan 2015
January 28th to 30th, Tokyo Big Sight
http://www.low-cf.jp/eng/

World Smart Energy 2015
February 25th to 27th, Tokyo
(held twice a year, in Tokyo and Osaka)
http://www.wsew.jp/en/

Japan IT Week 2015
May 13th to 15th, Tokyo Big Sight
(held twice a year)
http://www.japan-it.jp/en/haru/

Disclaimer

This report is based on interviews and information available to the researcher and is believed to be reliable but no independent verification has been made. The information does not constitute investment advice or an offer to invest or to provide management services and is subject to correction, completion and amendment without notice.