USA: Envision Charlotte, North Carolina

Executive Summary

A public-private collaboration, Envision Charlotte is supporting the city of Charlotte in North Carolina to achieve its goal of economic growth through environmental sustainability. The programme aims to encourage sustainable behaviour among citizens and businesses, reducing the usage of limited natural resources and related costs by up to 20% for each of four pillars – energy, water, air and waste – within five years.

The first pillar, Smart Energy Now™, was launched in October 2011, as a groundbreaking collaborative partnership between the city of Charlotte, the electric and water utilities, office building owners and managers, mobile network operators and technology vendors. The project is improving energy efficiency in office buildings with more than 10,000 square feet in downtown Charlotte through a series of focused, measurable and collaborative actions.

Envision Charlotte's approach may provide valuable lessons for other cities. The programme has segmented the city into smaller and more manageable sub-markets. That means there are fewer players at the table making it easier to agree upon community goals, significantly lowering the level of complexity. To encourage real estate companies to participate, the programme has also tried to minimise the need for expensive retrofitting of office buildings.

Envision Charlotte has also developed a sustainable business model, where the participating utility company, the technology vendors and the mobile operator can see a positive impact on their revenue streams. Finally, the programme is harnessing Verizon Wireless' highly-efficient 4G network to provide

connectivity for both the Smart Energy Now™ and the Smart Water Now™ projects.

Introduction

In 2010, the former U.S. president Bill Clinton announced an initiative to achieve economic growth through environmental sustainability in downtown Charlotte, North Carolina. The "Envision Charlotte" programme (www.envisioncharlotte.com) has the ambitious goal to reduce the energy use of the city's central district by 20% by 2016. The launch of Envision Charlotte is in line with the 2020 objectives of the city of Charlotte, which is aiming to make its uptown more measurably sustainable in terms of energy and water. Charlotte is also aiming to move ahead of other smart or green cities in the U.S..

Envision Charlotte was established as a non-profit organisation developed with leadership from the city of Charlotte, the Bank of America, Wells Fargo bank, Duke Energy, Charlotte Center City Partners and consultancy Intelligent Buildings, LLC along with other key community

stakeholders. The programme is composed of four pillars – Smart Energy Now™, Smart Water Now™, Waste and Air. Launched in October 2011, the first pillar, Smart Energy Now™ is a first-of-a-kind collaborative partnership between the city of Charlotte, major employers, building owners and managers, mobile network operators and technology vendors. The second pillar, Smart Water Now™, is also funded through in-kind donations from private companies including CH2M Hill (the project manager), Itron, Siemens and Verizon. The third and fourth pillars of the programme – air and waste – are scheduled to begin in 2013.

Envision Charlotte was unveiled at the Clinton Global Initiative meeting in September 2010
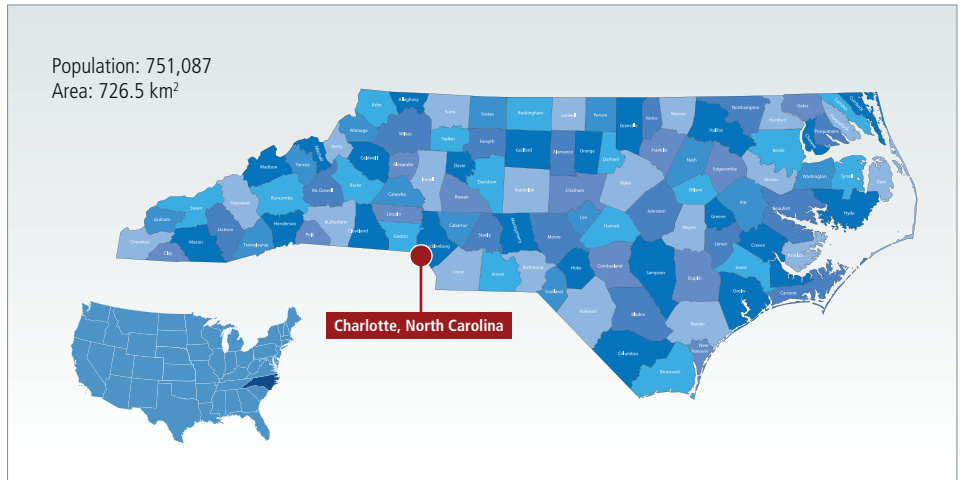
Smart Energy Now™ - a "laser-focused sub-market" for sustainable buildings

The Smart Energy Now™ programme aims to make a measurable progress in reducing energy use, particularly by commercial buildings. The programme estimated that as much as 20% of the energy used by commercial buildings could be eliminated through education and continual awareness of office building workers. Envision Charlotte decided to start with a well-defined market segment, selecting 65 commercial office buildings with more than 10,000 square feet in the central business district of Charlotte, excluding hotels and other retail properties. Involvement in the programme is not mandatory, but as many as 98% of eligible buildings agreed to participate contractually.

The programme aims to change the consumption behaviour of the selected buildings' 70,000 occupants. They are encouraged to make voluntary, personal decisions, such as turning off computer monitors when not in use, turning off coffee makers while not in use, or relying on daylight instead of artificial lights . The following measures have been put in place by the Smart Energy Now™ programme:

■ Behavioural training programmes are run to educate the users of the building.

■ An Energy Champions Scheme, whereby each building has a certain number of energy champions on every floor who remind colleagues to be mindful of energy consumption, switching off unnecessary appliances and adopting an energy saving mode.

■ Office workers are encouraged to make pledges to reduce their energy consumption.
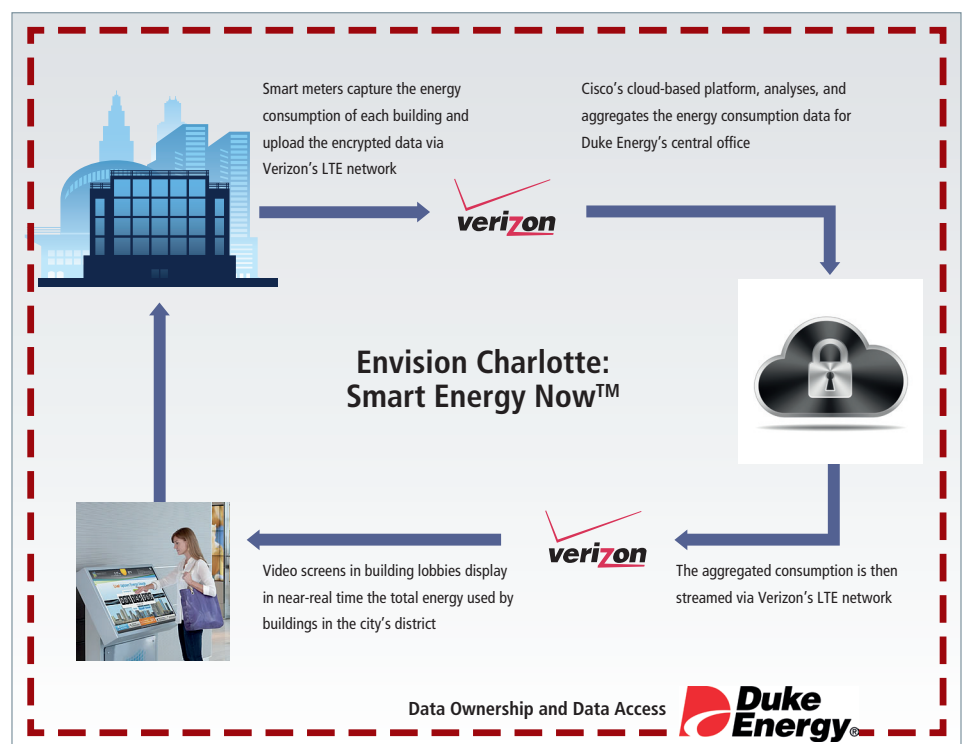
At the same time, building managers can now use near-real-time data on energy usage, and other insights from the electrical grid, to make more informed decisions and consider certain building modifications to optimise energy efficiency. However, the programme doesn't require them to make any investment in building retrofits.

Population: 751,087
Area: 726.5 km²

Charlotte, North Carolina

The programme's main stakeholders include real estate owners, the local university, the city council, Duke Energy (the main utility company in Charlotte), mobile network operator Verizon and technology vendor Cisco Systems. The programme installed smart meters in each participating building to track their energy consumption; Verizon's LTE network is used to transmit the energy usage information to Cisco's network and then a cloud-based platform processes, aggregates and analyses the data for Duke Energy's central office. The aggregated energy consumption is projected to Cisco video monitors in each building's lobby. Duke Energy also uses Verizon's LTE network to provide each building manager with confidential, detailed usage information on a near-real-time basis. Part of the service also includes additional insights on "what can I do with all this usage information?" However, each individual building's data remains private and secure.

Exhibit 1: How the Envision Charlotte Smart Energy Now works

Smart meters capture the energy consumption of each building and upload the encrypted data via Verizon's LTE network

Cisco's cloud-based platform, analyses, and aggregates the energy consumption data for Duke Energy's central office

Envision Charlotte: Smart Energy Now™

Video screens in building lobbies display in near-real time the total energy used by buildings in the city's district

The aggregated consumption is then streamed via Verizon's LTE network

Data Ownership and Data Access

Duke Energy

Source: Duke Energy

The Business Model and Benefits for Major Stakeholders

The total cost of the energy pillar of the Envision Charlotte programme to date has been $6.1 million, out of which Duke Energy contributed $4.1 million; it also ran the marketing campaign and contracted with a third party to verify meter numbers. Cisco and Verizon Wireless each provided $1 million in equipment, interactive displays and smart meter technology infrastructure. Cisco installed interactive kiosks in the lobbies of participating buildings and Verizon installed repeaters to improve indoors signals. Cisco provided the media infrastructure for data and transmission, capturing real-time energy usage, feeding it into the cloud and aggregating data feeds back to the kiosks. Some of this equipment will be reused by the other pillars of the programme.

In order to make the project sustainable in the long term, each major stakeholder needs to benefit. This is how they stand to gain from participating in Envision Charlotte:

The City of Charlotte:

I. Envision Charlotte is helping to promote Charlotte as a healthier place to live, work and play.

II. The city is reducing its impact on the environment, while the programme is showcasing Charlotte as a leader in global sustainability, helping attract businesses and strengthen its economic base.

III. Envision Charlotte is helping the city to recruit new businesses and create new jobs by lowering the cost of operating in the city's commercial office district.

Real estate agents and office building owners:

I. Lower energy usage reduces costs.

II. Lower operating costs and improved sustainability increase the value of commercial properties and make them more appealing to tenants, turning uptown Charlotte into a more attractive business location.

Utility company Duke Energy:

I. Duke Energy, the main utility company in Charlotte, invested a significant amount of time and money into the development and set up of the Smart Energy Now™ programme. The project needed to be presented to the North Carolina Utility Commission for approval; and Duke was required to meet every customer account holder to obtain a commitment to the programme and consequently install equipment.

II. In return, the project supports Duke Energy's smart grid technologies and energy efficiency strategy, delaying the need to build expensive new power plants. The energy consumption data resulting from the project is giving Duke better knowledge of energy demand patterns.

III. Duke Energy also stands to benefit financially if the objectives of the programme are achieved: The North Carolina Utility Commission provides a return based on avoided generation costs to Duke, if the education programme achieves reductions in energy usage above a specific threshold.

Mobile network operator Verizon Wireless:

I. Transmission of energy usage data through its LTE network is the main source of Verizon's revenues.

II. The programme may open similar opportunities for Verizon in other cities, as they learn about the advantages yielded by Envision Charlotte.

III. The improved image of a building that has gone "green, may generate demand for similar services in other buildings, enabling Verizon to connect more buildings to its networks.

Technology provider Cisco:

I. Created a network and media product template for future smart city applications.

II. Demonstrated collaboration with utility and smart grid technologies.

Envision Charlotte: Conclusions and Learnings

Envision Charlotte is an example of an innovative and successful public-private initiative that recognises the need to bring in private sector thinking and innovative technologies. The success of the programme is defined in a very simple manner: reduction of the energy consumption by 20% and change in the awareness and behaviour of the occupants of the office buildings. Some important lessons can also be learned from the way in which the project has been designed and implemented:

- Dividing the city into sub-markets made the project more manageable. Fewer players at the table made it easier to agree upon community goals, significantly lowering the level of complexity.

- The level of retrofitting in the participating office buildings is kept to a minimum, reducing the need for capital expenditure and encouraging involvement in the programme.

- Envision Charlotte has developed a sustainable business model, where the utility company, the technology vendors and the mobile operator have seen an uplift in their revenue streams. The utility's investment are recovered through cost recovery mechanisms approved by the North Carolina Utility Commission and a reduction of other costs associated with supplying energy. With modifications, Envision Charlotte's business model could be used by other cities and communities around the world.

- LTE networks are an efficient way to collect, analyse and distribute energy data, highlighting another valuable application for Verizon's new 4G infrastructure.

- The introduction of a collective energy usage target and confidentiality for the consumption of each building safeguards the data privacy of the participants.

"We are creating a template for communities anywhere in the world that leverages stakeholder alignment, measures what we are trying to manage and has a clear linkage between sustainability and economic growth"

Tom Shircliff, Board Chair for Envision Charlotte and Co-founder of Intelligent Buildings, LLC

Partner Background

Intelligent Buildings

Intelligent Buildings® provides smart building consulting for multiple real estate users, utilities and government that leverages technology and change management to lower costs, reduce risks and enhance experience. The company works with clients in the three key areas of strategy development, solution architecture and program management.

Verizon Wireless

Verizon, a leading mobile network operator in the U.S., providing wireless services to 98.2 million residential and business customers. Verizon's Domestic Wireless segment, operating as Verizon Wireless, provides wireless voice and data products and equipment across the United States. It launched its LTE network in December 2010; today, it is available in 480 cities, and covers 87% of the U.S. population.

Cisco Systems Inc

Cisco (NASDAQ: CSCO) is a global provider of intelligent networking technologies and solutions that transform how people connect, communicate and collaborate. In 2012, it had revenue of USD46.1billion, providing a line of products for transporting data, voice, and video to enterprise businesses, public institutions, telecommunications companies, commercial businesses, and personal residences.

Duke Energy

Duke Energy (NYSE:DUK), headquartered in Charlotte, North Carolina, is the largest electric power holding company in the United States, supplying and delivering energy to approximately seven million electric and 500,000 gas customers in the U.S. The company also manages a portfolio of natural gas, delivery and trading businesses. Its service territory covers approximately 104,000 square miles in the Southeast and Midwest of the country.

The GSMA Connected Living Programme

The GSMA's Connected Living programme is a market development initiative to help mobile operators accelerate the delivery of new connected devices and services. Its target is to assist in the creation of 700 million new mobile connections, whilst stimulating a number of service trials and launches in the automotive, education and healthcare sectors. The Connected Living programme is also working with the city of Barcelona, the Mobile World Capital, to develop and showcase smart city services. It focuses on encouraging the adoption of mobile-based solutions and services to ensure that the cities of the future are safe and healthy places to live and work.

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Connected Living