The newspaper of the Advanced Master OSE

Inf'OSE

The energy pause

April 2012

Washington D.C.
World Bank

Illinois and Indiana
NUCOR Steel...

California
Berkeley...

Nevada
Hoover Dam...

Summary of the students' travel to USA

N° 67

MINES ParisTech

Editorial and Contents

Six months ago, we stood for the first time in the office allocated to the students of the Advanced Master in Energy Systems Optimization (OSE) at MINES ParisTech School. All of us coming from various engineering schools throughout the country, we were ready to start an exciting one-year post-graduate diploma together on the French Riviera… a perfect place to study. To say the least, the semester that followed September 2011 was far from being a waste of time. With numerous projects and lectures given by some of the most renowned energy, economics and management specialists, our days were constantly filled with challenges and achievements. The midterm was topped off with a 10 days study trip all around the U.S.A. that took us from Washington D.C to Las Vegas, through Chicago, Indianapolis, Berkeley and San Francisco.

We left the French Riviera early April 2012 and headed to new horizons to carry out our Advanced Master's thesis, with the strong feeling that we had come a long way since we started our journey.

This new edition of our monthly newspaper l'Inf'OSE looks back on the ten exciting and interesting days we just spent in the United States of America. During this trip, we visited various companies, utilities and facilities throughout the country like the Argonne National Laboratory, the Hoover Dam, the Chicago Board of Trade and many others.

We also have had the very unique chance to give a presentation at the World Bank in Washington, as well as at the Berkeley University in California, during the Young Engineers and Scientists Symposium co-organized by the French Consulate in San Francisco.

Let's now discover in this edition the report of these visits. We all hope you will enjoy your reading!

The Inf'OSE team

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World Bank

On Monday 19th, the Advanced Master OSE students had a chance to talk about Smart Grids and developing countries in front of an audience from the World Bank Group. The talk dealt with the different views of Smart Grids in Europe, US and emerging countries. European countries and companies are currently deploying Smart Grids to tackle country-specific challenges, such as peak shaving, reduction of non-technical losses or large-scale wind integration. However and despite these specificities, Smart Grids in Europe are in every case an ICT improvement to an already well-working and well-deployed grid. Those improvements are today mainly centered on smart meters.

Smart grids in developing countries, however, are quite another tale. Smart Grids deployment happens there while the deployment of the 'dumb' grid itself is far from complete. In countries which are facing important challenges to their developing economy, Smart Grid can be really different from the one in 'developed' countries, and Smart Grid and micro-grid often merge into one unique concept. In Nicaragua, a distributed electricity generation system deployed in the village of Kahkabila, using advanced technologies such as batteries and inverters is already close to being a smart grid, despite being islanded from the main grid. The uses of electricity are also different between developed and developing countries. The share of 'specific uses' for electricity (computers, electronic devices) is much higher in OECD countries.

Those contextual differences can impede western comprehension of developing countries. Hopefully, they can also allow developing countries to leapfrog, developing their networks without having to go through all the steps it took to build our own 'developed' but 'dumb' grids.

After this talk, Mr. Frédéric Verdol, a former student of the Advanced Master OSE (he graduated in 2001), gave us an overview of the main features of the Group. Together with the IMF, the World Bank Group is one of the biggest organizations in the world for cooperation with developing countries. In 2011, the Group lent or gave more than $ 43bn to developing countries across the world, mainly through the IDA (International Development Association) and the IBRD (International Bank for Reconstruction and Development). To efficiently allocate this money, the World Bank Group is divided in six regional vice presidencies , namely Africa (Sub-Saharan), East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, and South Asia– and its entities are structured around five thematic networks: Financial and Private Sector Development Network, Human Development Network, Operations Policy and Country Services, Poverty Reduction and Economic Management Network and finally Sustainable Development Network. Those thematic networks are subdivided into 23 sectors, and the regions are divided in 185 countries. Mr. Frédéric Verdol himself works as an Energy specialist for the "Latin America and Caribbean" regional division.

We warmly thank Mr. Frédéric Verdol who spent a considerable amount of time preparing our conference at the World Bank Group, and then spent again some more time with us, explaining us how the organization works.

Sébastien POSTIC

Sources :

[1] World Bank Annual report 2011 : www.worldbank.org/annualreport/2011

Advanced Master OSE's conference at the World Bank

Visit of the French Consulate in Chicago

On Tuesday 20th of April, the French Consul General of Chicago, Mr. Graham Paul, kindly received us at the French Consulate, on North Michigan Avenue. Located in the very heart of the city, the Consulate is in charge not only of the French people in Chicago, but of all the Midwest: nothing less than 10 000 French expatriates, the size of a not-so-small city! It is, with the French Alliance Institute and the French-American Chamber of Commerce, one of the most prominent showcases of France in Chicago.

First, Mr. Paul presented to us a brief summary of the city's history, its fast expansion from 1850 to 1900, the migration towards its suburbs, starting in the fifties, and how it then undertook a successful re-urbanization policy, making its centre widely known today for its quality of life. We also talked a little about the French presence in the Midwest, which has been strong and active since more than two hundred years now.

Then, Mr. Juan-Luis Goujon, President of the Board of the French-American Chamber of Commerce of Chicago, gave us an overview of the possibilities at hand for young engineers who would like to get a first experience of working abroad. One of the most important is the InterConnect Program, which provides the framework – including the visa – for a 3 to 18 months long internship in American companies for those who meet the access conditions.

Last, Mr. Jean Lemaire, the former student of the Advanced Master OSE who made this meeting possible, presented the big facts of Akuo Energy, a French company which develops, installs, and uses renewable energy sources all around the world. He has been working for them in the North of the USA for more than two years now.

With a target of more than 3,000 MW worldwide installed capacity by 2014, Akuo Energy is represented in all five continents. The United States, with more than 1,000 MW projected capacity, accounts for one third of its activity. The conjunction of a truly windy area with innovative business models makes it possible for onshore wind energy to be competitive (less than USD 8cts/kWh), and allows it to survive without the feed-in tariffs that exist in France. Help for renewable can also be provided in the US, but it takes several forms in different states. For instance, in Illinois, it is a tax reduction on the installation of such sources.

Thanks to the valuable – and voluntary – help of Jonathan Broutin, a young French entrepreneur who founded and runs the Seagull Institute (an organism for the abroad training of graduate and post-graduate students), this visit

Presentations at the French Consulate in Chicago

was followed by the Chicago Board of Trade and the Argonne National Laboratory's ones. After a very instructive architectural tour on our way back, the day ended – or culminated, we are French after all- in a good restaurant!

We would like to thank warmly Mr. Graham Paul, who received us at the Consulate and spent some of his time with us, Mr. Jean Lemaire who greatly organized our stay in the Midwest, making it really instructive and interesting, encouraging us to come again, and all the other people who shared with us some of their time, and of their knowledge.

Sébastien POSTIC

Sources :

http://www.consulfrance-chicago.org
http://www.af-chicago.org
http://www.facc-chicago.com

The Chicago Board of Trade

Until the 18th century, American sellers and buyers of agricultural goods used to go on the market place to share commodities. Every financial transaction was immediately followed by the delivery of the traded goods. At the beginning of the 19th century, Maine potato growers started to sell their crops before planting in order to raise the necessary funds to cover the production expenses. In the meantime, Chicago market places experienced the first forward transactions of cereals, but the credit risk was excessively high and represented a serious threat for financial actors. A strong need to standardize trades emerged, leading to the Chicago Board of Trade (CBOT) birth in 1848 and later on to the development of futures. Futures contracts are standardized according to the quality, quantity, delivery time and location for each commodity.

Located in the heart of Chicago Downtown, the CBOT is today considered as the world's oldest futures and options exchange. Gathering almost four thousand employees, about 50 kinds of options and futures contracts are traded on the CBOT. Contracts are traded both with "old-school" methods (open outcry) or using modern platforms (eTrading). While initially created to trade agricultural commodities such as corn, wheat, oats and ethanol, the CBOT now proposes a well-diversified portfolio of options and futures contracts, trading products ranging from metals and treasury bonds to FED funds, swaps and credit default swaps. In 2007, the CBOT merged with CME (Chicago Mercantile Exchange) to create the world's largest futures and options market.

During our stay in Chicago, we had the chance to visit this internationally famous market place. We first enjoyed the view of the impressive Art Deco building housing the CBOT, one of the tallest buildings of the city, before being explained how the operations are run in the pits. The six-story tall trading room astonished us all as we stood behind a large window overhanging hundreds of brokers and tens of rows of computers. The room is divided into different pits based on commodities type such as wheat or

Front of the CBOT building

corn: each pit presents an octagonal structure where open outcry trading occurs. A few steps up the pit provide an amphitheater atmosphere, and enable a large number of brokers to see each other and communicate with ease during trading hours. It also allows customer orders to move into the "pit" quickly. A normal trading session runs from 9:30 am to 1:15 pm. The central trading area is surrounded by the rows of desks and computers that allow workers of the middle and back offices to support transactions. Electric display boards line the walls all over the trading hall and provide brokers with the latest market data and news.

We all thank our guide who was really informative, as we thoroughly enjoyed the visit. During his short presentation, we understood the large variety of futures and options contracts and the complexity of the hand signals used by brokers to clarify their verbal bids and offers. This language (for instance a broker with his palm facing inward signals a wish to buy) is permanently used as the trader shouts the quantity of the commodity he is dealing with and the inherent price he wants. Some of the pits staff wears color jackets: we were told that jackets help for easy recognition during active trading. Finally, we were told that anyone of us could become a trader as far as we hold a membership. As clearly indicated in the CBOT's rules, "any individual, who is at least 21 years of age and is of good character, reputation, financial responsibility and credit and who satisfies the Membership Committee that he/she is suitable to assume the responsibilities and privileges of membership is eligible". It gave some of us hope to come back later and be on the other side of the window!

Karim AMZAL

Translated by:

Mounir MECHERI

Date	Highlights
1848	CBOT birth
1865	Creation of futures contracts for cereals
1973	Chicago Board Options Exchange (CBOE) birth
1994	Creation of the CBOT eTrade system
2007	Merging with the Chicago Mercantile Exchange (CME)

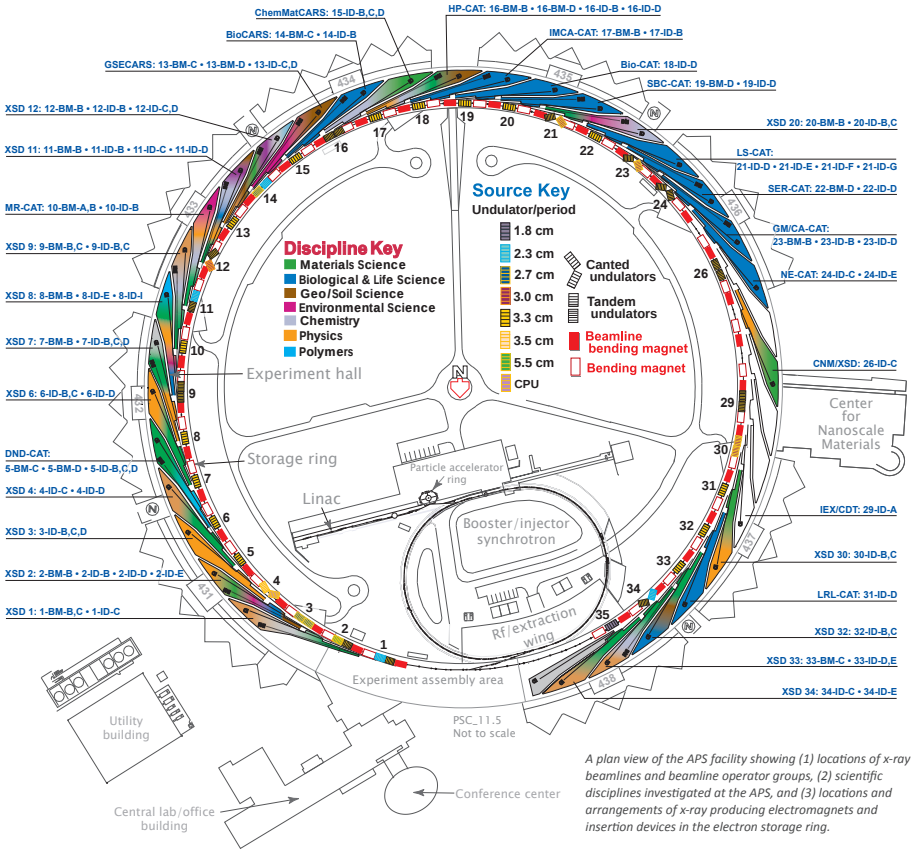
CBOT trading floor (Source : Hamsa Ramesha/Medill)

Argonne National Laboratory

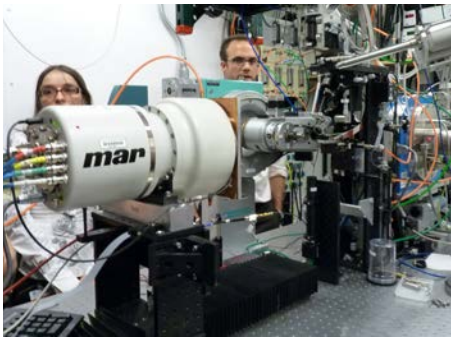
Argonne National Laboratory (ANL) is a massive scientific research centre occupying more than 1,500 acres in south-east DuPage County near Chicago. Argonne's first purpose is to provide worldwide scientific teams with the user facilities that would be too expensive for a single company or university to build and operate. The centre currently hosts more than 2,800 scientists and employees from various origins. Argonne conducts R&D in many different basic and applied science fields including materials science, high-energy physics, energy resources, environmental management and high-performance computing. The visit of the site was led by two former physics teachers working as volunteers. They took us to two of the major ANL user facilities: the Advanced Photon Source (APS) and the Advanced Powertrain Research Centre, where a former student of Mines ParisTech is currently working on electric vehicles.

The Advanced Photon Source (APS) is a national synchrotron radiation research facility providing scientific teams with X-ray beams for such research areas as superconductors, pharmaceuticals, polymers and catalysts. At the APS, a specific area comprises the radiation sources (bending magnets and insertion devices) and the beamlines, enclosures, and instrumentation that are associated with a particular storage ring sector. The overall facility has 35 sectors, 34 of which are dedicated to user experimental equipments. To access the APS as general users, worldwide research teams must submit proposals which are independently reviewed and rated. Some of the results recently obtained at the APS impacted the evolution of combustion engines, aided in the development of new drugs and nanotechnologies, to highlight just a few examples.

As one of the DOE's lead laboratories for research in hybrid powertrains, batteries and fuel efficient technologies, Argonne's transportation program focuses on the development of next-generation vehicles. We had the chance to discover the Advanced Powertrain Research Centre that is equipped with multiple high-tech facilities, including a 4-wheel and 2-wheel drive dynamometer test facility



A plan view of the APS facility showing (1) locations of x-ray beamlines and beamline operator groups, (2) scientific disciplines investigated at the APS, and (3) locations and arrangements of x-ray producing electromagnets and insertion devices in the electron storage ring.



Experiment using X-ray to analyse the structure of materials

The Advanced Photon Source (schematic on the left)

and a Power Electronics laboratory. Ann Schenkler, the Section Leader of the Vehicle Systems Group at Argonne National Laboratory, showed us how they instrument car components including batteries using innovative techniques that measure a full inventory of power and energy flows through vehicle powertrains. Argonne is for instance internationally recognized for its expertise in the area of lithium battery materials R&D. Dominik Karbowski, a former student at Mines ParisTech, also told us about his areas of expertise, including powertrain energy management optimization and model validation of Light- and Heavy-duty vehicles (conventional and hybrid).

Mrs Ann Schlenker presenting the work of the Vehicle Systems Group to the students of the Advanced Master OSE

All the students, together with their teachers Marc Bordier and Gilles Guerassimoff, offer their warmest thanks to Mrs. Ann Schlenker and Mr. Dominik Karbowski for their valuable and informative presentations, as well as Mrs. Phyllis Nelson and her colleagues for being our guides through the different APS facilities.

Moutaz ALOTHMAN

Translated by:

Pierrick BOUFFARON

Source :

APS Science 2010, ANL-10/35, ISSN 1931-5007, May 2011

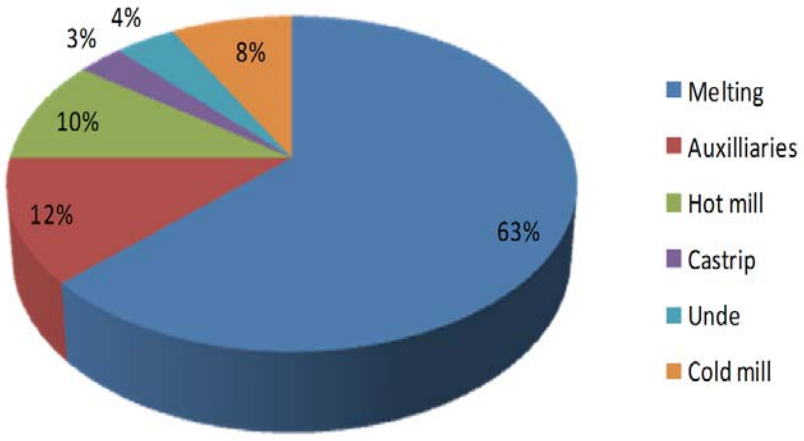
Argonne NATIONAL LABORATORY

Nucor Steel - Crawfordsville (IN)

NUCOR STEEL is the largest steel recycler in the United States and produces mainly structural-steel and pipelines. Its 22,000 employees are spread over 196 sites and the group operates twenty mills.

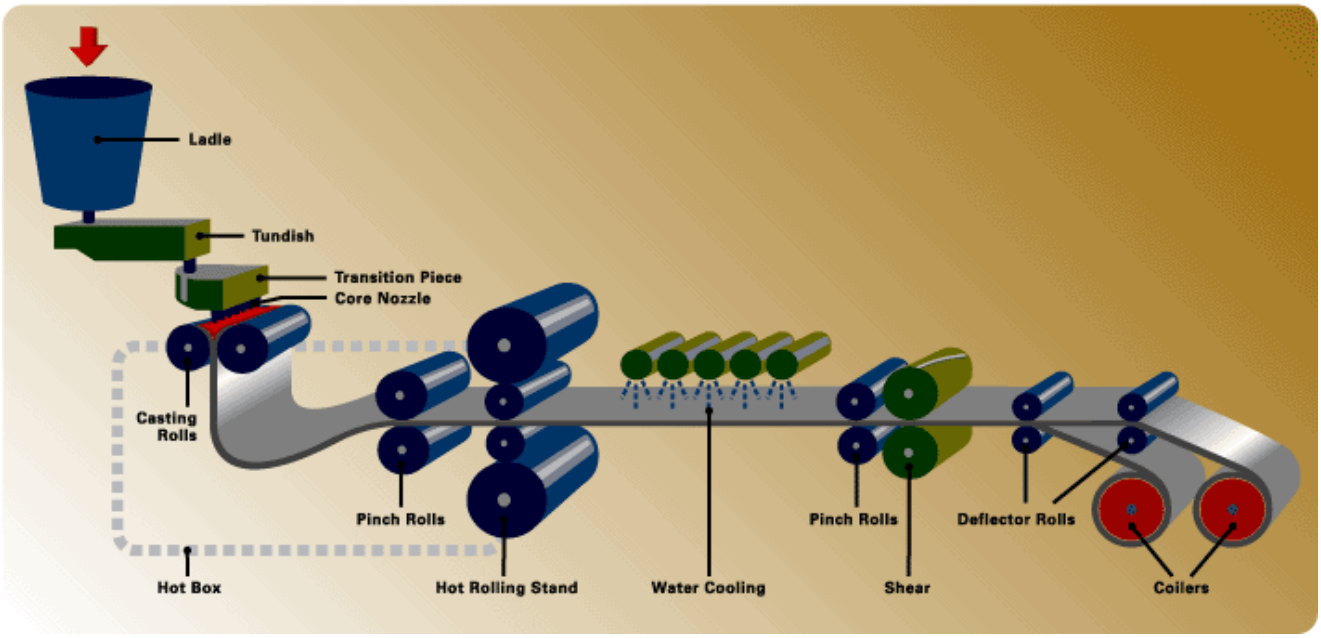
The Crawfordsville site we visited includes an electric arc furnace, six hot rolling mills and two coilers. It also has the largest CASTRIP unit in the world and a production line of galvanized steel. The site produces annually 1 million tons of cold rolled steel.

The site is engaged in a continuous improvement process for its production facilities and has developed policies to reduce its energy consumption as well as to identify priority actions to implement. The site is indeed very energy intensive with a monthly bill of $ 5 million.



Share of energy consumption by workshop in the NUCOR factory

Our tour of the factory started with the 38 MW electric arc furnace. Three electrodes release enough thermal energy to pro-



The CASTRIP® process (source CASTRIP®)

duce liquid steel by melting the metal to be recycled. The tanks of liquid steel are then placed on hold, then dumped in tundishes where additives (powder lubricant ...) are added. Next, the liquid steel is poured either in a conventional continuous casting line or at the beginning of the CASTRIP process:

• The conventional production line includes a continuous casting for converting molten steel into solid slabs. These slabs are reheated by natural gas throughout the process. At the end of the latter, they undergo a first rolling and are then moved to the strip mills to be hot-rolled. The steel plates produced are water-cooled, rolled in coils and then evacuated.

• The CASTRIP production line allows direct processing of liquid steel into a solid steel strip (twin roll casting process, hot rolling, cooling and coiling). The fact that no reheating is required allows energy savings and CO_2 emissions reductions. Compared to conventional rolling processes, the thickness of steel plates is reduced and production time is shortened.

Once produced, the coils are cooled at room temperature for three days. They are then uncoiled to be deoxidized and cold-rolled three to seven times depending on the thickness specified by the customer (which can reach 5 mm). Steel is hardened during the rolling process and needs to be softened before the final coiling. This coiling is performed at an average speed of 1,200 rpm (with a maximum speed up to 2,100 rpm).

The facility also encompasses a galvanizing line: the coils are unwound and the steel plates are welded together to enter the galvanizing line where zinc or cadmium is added.

The students and teachers of the Advanced Master OSE warmly thank Nucor Crawfordsville staff for their hospitality and the time each speaker gave us during the visit.

Stève LECHEVALIER

Julien ROMEZIN

Translated by:

Manon FOUQUET

Sources :

http://www.castrip.com

http://www.nucor.com

Galvanized steel coils

Sacramento Municipal Utility District

SMUD is a community-owned electric utility governed by a board of 7 members. As a vertically integrated energy company, SMUD has a monopoly position over the distribution of electricity throughout the overall Sacramento area. The close-by capitol of California, San Francisco, is growing so rapidly that its suburbs – including Sacramento – represent today more than 2 million inhabitants.

We were greeted by Jim Parks, SMUD Program Manager in the R&D department, currently working on smart grid pilot projects. He gave us an overview of the company's current projects dealing with most smart grid concepts such as renewables, storage technologies and micro grids.

SMUD is highly involved in the development of breakthrough technologies and was awarded a federal funding (Smart Grid Investment Grant) from the U.S. Department of Energy. The government contribution covers $ 127.5 million for funding projects with a total value of $ 308 million. These include the integration of many innovative technologies: smart meters, storage facilities, electric vehicles, islanding, cyber-security. In terms of smart meters, the utility installed over 50,000 units out of the 614,000 SMUD clients. Inhabitants were given the option either to accept free installation of the smart meter or to refuse it for an additional fee tariff. While some clients were concerned about data security, a large majority did approve the smart meter without any hesitation. The return on investment is about 7 years, and so far smart metering has helped

SMUD's Smart meter

in sharply reducing network operation and maintenance costs thanks to real-time data processing. Also, based on smart metering, innovative electricity pricing is used to reduce carbon emissions, helping to bring down the use of peak load fossil fuel based power that can be damaging for the environment. Dynamic prices are sometimes multiplied by ten between off-peak and peak periods: the kilowatt-hour is then charged 79 cents to be compared with the average SMUD price of 12 cents.

SMUD is also a pioneer in the exploitation of renewable resources. The utility has been managing since 1984 the first photovoltaic plant in the United States with a capacity exceeding 1 MW.

Following the presentation of current SMUD Smart Grid projects, we visited a Microgrid pilot project located on the same site. The microgrid hosts two cogeneration units connected to cold storage tanks: these units produce cold water at night when electricity is

SMUD's Combined Heat and Power generation unit

cheap and re-inject it into the process during the day when the ambient temperature rises.

Finally, we went to a residential site named Anatolia, where SMUD deployed solar panels, decentralized SAFT Li-ion battery systems and smart meters.

We warmly thank Jim Parks for helping us to better understand the challenges of micro-grids and discovering the SMUD leadership in fostering smart grid technologies

Adrien WACZIARG

Clément MENANTEAU

Translated by:

Thomas PAULO

Further information on :

http://www1.eere.energy.gov/solar/pdfs/highpenforum1-14_rawson_smud.pdf

Visit of the David Brower Center and Young Engineers and Scientists Symposium (YESS)

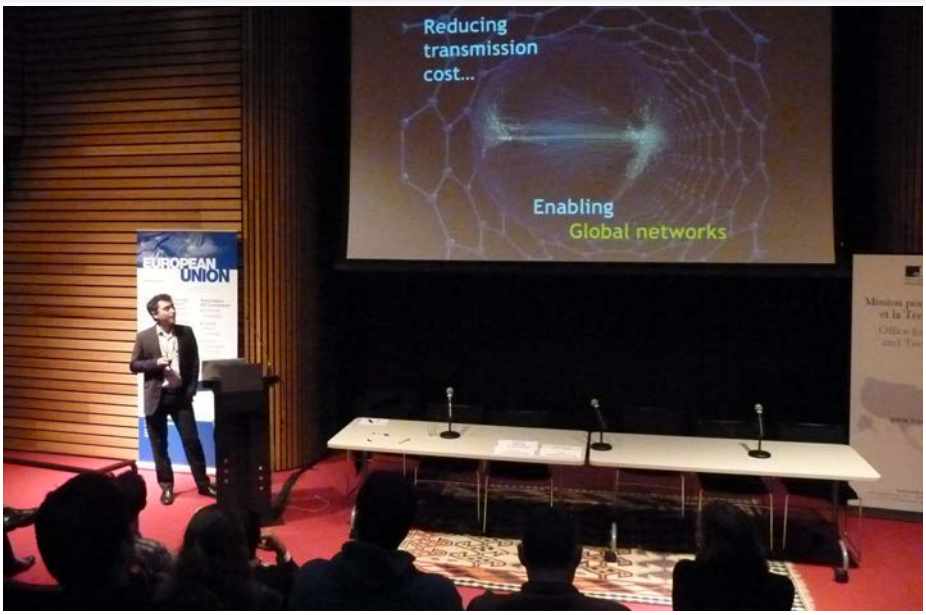
The 22nd of March ended with the David Brower Center visit. The Centre, two steps away from the UC Berkeley campus, is an eco-friendly building, known as one of the best green building achievements in San Francisco area. More than half of the building materials come from waste. Home to a non-profit association engaged in environmental causes, it is named after David Brower, a highly renowned American environmentalist, savior of the Grand Canyon and founder of the Friends of Earth NGO. The building has received the platinum LEED label (LEED: Leadership in Energy and Environmental Design), the highest distinction awarded by American authorities for green buildings.

The David Brower Center

The Brower Center building conception blends rigidity and flexibility in a very innovative way and allows it to absorb the seismic phenomena which happen often in the Bay's Area. With its modern aesthetic, the building fits perfectly in its environment. But it is also a building of its era, or maybe even the next one, with the host of technology and architectural wonders on which it relies. The concrete and cement present here have been designed using innovative processes limiting environmental impacts, and the needs for space heating and cooling have been scrupulously designed to avoid wasting any extra energy. The environment serves for every single imaginable use, from solar heat contributions to heating, to photovoltaic panels, and even plants watering using only rain water and smart draining systems. Last, the system that airs the whole thing obeys CO2 sensors, controlling pollutants concentration and starting ventilation only when it is needed, to preserve inner temperature. We thank the Berkeley Energy and Resources Collaborative student association and the member who explained us all this, for making this visit possible.

The next step was then the student participation in YES Symposium, a three days long series of conferences co-organized by the French Consulate of Chicago, and UC Berkeley. The 2012 symposium was devoted to nanotechnologies, bringing together the French and American scientific communities, with the collaboration of BERC and CNRS (Centre National de la Recherche Scientifique, French National Center for Scientific

Research). The presentation of the Advanced Master OSE students stressed the potential added value of nanotechnologies to the electric grid efficiency, and what contribution to expect from them for tomorrow's smarter networks. After presenting why and how Europe is moving today towards smarter grids, and highlighting some pilot projects throughout Europe, the need for new transmission and storage technologies was detailed, together with the input of nanotechnologies in those two fields. A series of five posters was then presented during the Social Mixer following the conference.



Conference of the Advanced Master OSE students at the Young Engineer Scientist Symposium

All the students, together with their teachers Marc Bordier and Gilles Guerassimoff, offer their warmest thanks to Pauline Caumon for her major commitment to the success of our stay in California, before and during the stay, as well as to Thomas Deschamps, whose valuable help in the organization of the presentation has been highly appreciated.

Mounir MECHERI

Translated by:

Sébastien POSTIC

Altamont Landfill

The Altamont Landfill is one of the largest landfill operations in Northern California. It accepts for disposal all non-hazardous municipal solid wastes, non-hazardous industrial and special wastes. The site is located in the heights of Livermore.

The visiting tour of the landfill was conducted by Mr. Enrique Perez, Operations Manager at Waste Management. The company processes on site about 1.5 million m3 of waste per year, collected from the surrounding communities and the Bay Area (including San Francisco, Berkeley and Oakland). Solid waste materials are brought and spilt in the landfill area by truck, whereas liquid waste is pretreated on site, undergoing a solidification stage. Altamont receives approximately 500 trucks per day, contributing to both re-use and disposal flow rates at the landfill. Waste is then compressed in order to gain space. Once the maximum authorized height level is reached, a new landfill area is selected and opened for use.

Workers at Altamont Landfill

Biomethane station for the vehicles of the landfill

Biological fermentation processes that take place in the recovered landfills result in gas production. This gas is extracted from the site and fuels two internal combustion engines, which produce about 1 MW each. The lixiviate that flows down the sink is re-injected in the landfill in order to speed up the decomposition process.

The collected gas is composed of about 50% methane. Injected into a purification unit (created thanks to Obama's stimulus package), the end product coming out of the whole process is a purified and liquefied methane gas.

This liquefied methane will be used for three different purposes. First on-site thermal power plants will use the gas to generate the electricity necessary to run the landfill operations. Second, this gas is sent to another power plant located outside. Finally, surplus gas is used in gas-powered trucks that collect waste materials from the Bay area.

Thomas PAULO

Renaud DUDOUIT

Translated by:

Adrien WACZIARG

Teachers and students of the Advanced Master OSE at Altamont Landfill

WASTE MANAGEMENT

Cogenra Solar

Silicon Valley has built its success on high technological competences in the field of semiconductors. If today the photovoltaic industry has mostly moved to the Asian Tigers, California has maintained its ability to innovate and support the launch of promising companies.

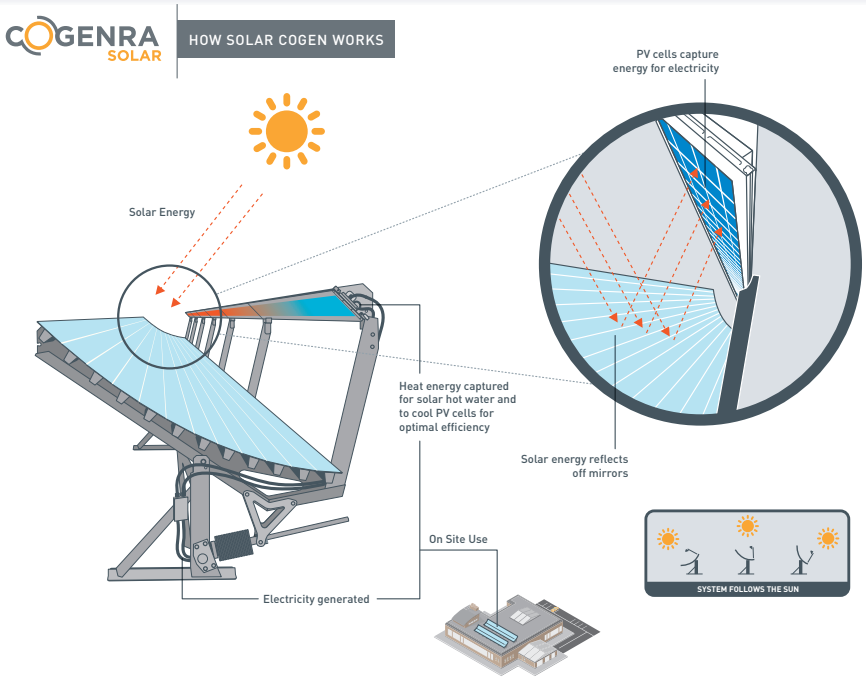
Cogenra is a start-up founded in May 2009 with the support of Khosla Ventures. Their engineers invented a smart system that simultaneously generates electricity and produces heat (70°C hot water). This technology optimizes the power of the sun using a combined solar photovoltaic and thermal module.

The system is both smart and simple: parabolic mirrors concentrate solar radiations onto a collector made up of photovoltaic cells. The PV cells produce electricity while being cooled down by a glycol-water mixture, which is used as a medium to transfer thermal energy to other processes. This configuration offers several benefits: on the one hand, by concentrating solar radiation, a smaller area of photovoltaic cells – the most expensive part of the system – is necessary. On the other hand, the efficiency of PV cells generally drops when temperature increases but the circulation of the coolant at the rear of the cells ensures a maintained performance. Finally, each panel

is equipped with a one axis tracked system that optimizes both heat and electricity productions: the electrical efficiency is about 15% (maximum yield of the cells) and the thermal efficiency is on the order of 60%.

Cogenra has developed a specific business model based upon flexibility, modularity and easy transport. Basic and structural elements are produced locally or at the Californian headquarters, then shipped and assembled on-site (which highly reduces shipping costs!). The overall system has also been designed to easily integrate future breakthrough PV cells.

This combined heat and power technology is particularly suitable for consumers with co-occurring needs for heat and electricity. The technology is competitive without subsidies and has a payback time of three to five years, which depends on the price of the fuel that would have been used for heat production otherwise. Food industries, communities and even residential customers are the main targets. For example, the Californian winery Sonoma Wine Company has installed fifteen Cogenra modules on its site. They produce annually 64 MWh of electricity and 366 MWh of heat while avoiding the release of 120 tons of CO2. This technology could also be used in rural electrification projects in lieu of expensive and polluting diesel generators.



Schematics of Cogenra's solar hybrid system (Source : Cogenra)

Cogenra proves that energy efficiency of processes is not limited to increase the efficiency of components but also to play on synergies between proven technologies!

Thibault PERRIGAULT

Manon FOUQUET

Translated by:

Manon FOUQUET

Sources :

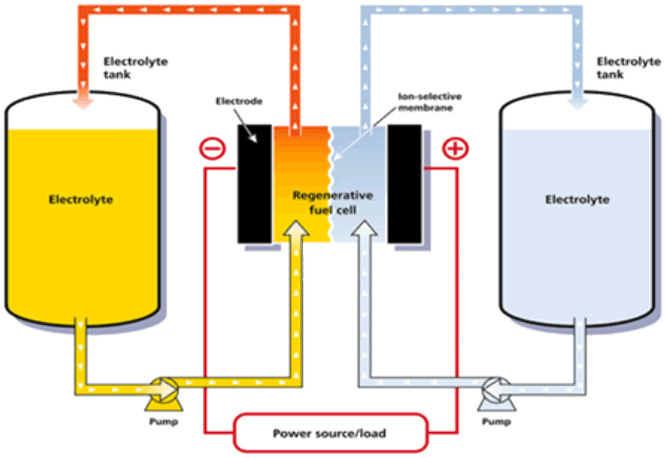
http://www.cogenra.com

Presentation of Cogenra's products by Dr. Gilad Almogy, CEO and founder of the company

Primus Power

In addition to an ever-growing energy demand and ageing power plants, one of the most important challenges USA faces today is the integration of a rising share of renewable energy sources into its grid. That grid must then evolve through new and flexible technologies to preserve the same quality of supply that it is offering today to its customers.

How Primus Power can help to tackle these challenges?



Operating principle of redox-flow batteries

This freshly-launched American startup was born in 2009 and hires 32 employees today. Primus Power is offering innovative and all-inclusive storage solutions to bring flexibility to the power grid and tackle challenges inherent to renewable energy integration and demand management. Primus Power's main product, called EnergyPod™, looks like a simple shipping container from the outside. Take a closer look inside, and the trick is different: you will discover a flow battery technology offering high power cost effective energy storage for a very low deployment cost. Flow batteries, sometimes called regenerative fuel cells, are a type of rechargeable battery in which electrolyte flows through an electrochemical cell, which in turn converts chemical energy directly to electricity. The EnergyPod™ offers many advantages: an AC-to-AC efficiency reaching 70%, a power density 5 times bigger than traditional storage technologies, a 20 years life expectancy (~10 000 charge/discharge cycles) or the cost effectiveness that makes the energy from this product competitive with electricity from conventional power plants. The EnergyPod™ has been designed with reusable materials to be fireproof and to respect safety and environmental standards. In order to keep it safe and fully optimized, Primus Power operators remotely control the EnergyPod™.

Mrs. Stina Brock presenting the EnergyPod™

Besides a reliable and patented product, Primus Power reportedly relies on a strong business model. A demonstrator project has been signed with MID (Modesto Irrigation District) in order to compare both impacts of a 25 MW EnergyPod™ and a 50 MW natural gas power plant in smoothing a 230 MW wind farm fluctuating production.

Primus Power seems ready to take up the big energy challenge. Only time will tell us if they were really fit for it.

Yoann LINTZ

Mounir MECHERI

Translated by:

Mounir MECHERI

PRIMUS POWER™

Tesla Motors

Tesla Motors was created in 2003 by a group of young entrepreneurs from the Silicon Valley. The current head of the company is Elon Musk. Tesla Motors hires 1,400 persons in 21 agencies over the world. The Tesla Roadster, the first vehicle developed by the firm, is sold since 2008 at a price of € 84,000. For those 4 years, about 2,100 vehicles have been sold in 32 countries.

The Tesla Factory that we visited is located in Fremont (CA), in an industrial area between highways 880 and 680. This facility was previously held by a joint-venture between Toyota and General Motors called New United Motor Manufacturing (NUMMI). In May 2010, Tesla Motors and Toyota announced a partnership created to develop electric vehicles. This agreement included the acquisition of the NUMMI facility by Tesla for 45 million dollars in order to produce the Tesla S, the new sedan of the firm.

The Tesla S offers enough space for five adults. The first deliveries are expected in August 2012 in the USA for a price of about € 40,000. Forecasted performances are exceptional for a car of this size: 0 to 100 km/h in 5.6 seconds, autonomy up to 480 km and quick charge of the battery in 45 minutes (from 20 to 80% of the autonomy). The facility has been designed to produce 20,000 vehicles a year and will hire 1000 employees. In 2015, the Blue Star, an affordable vehicle designed for families and sold € 22,000 will become the second model produced in the factory.

The visit focused on the production lines of the sedan Tesla S model and was conducted by Gilbert

The Advanced Master OSE in the TESLA factory

Presentation of the Tesla Model S to the Advanced Master OSE

Passin, a French engineer. We discovered plastics facilities (manufacturing bumpers, instrument panels, interior panels, etc...), the stamping facilities manufacturing all visible parts of sheet metal and aluminum, welding and assembly facilities and finally the integration of lithium-ion batteries and mounting of the engine block facilities. The plant, pure and spotless, gave us the impression of an unfinished production line, although the high-tech effect was striking. The production model developed by Tesla is the "integrated whole" rather than the outsourcing of production (the car seats themselves are produced on-site!). According to Gilbert Passin, this business philosophy combined with aggressive communication campaigns explains the proven and announced success of Tesla electric vehicles.

Matthieu SAVINA

Pierrick BOUFFARON

Translated by:

Thomas PAULO

Plus d'infos sur :

http://www.teslamotors.com/

Hoover dam

In the middle of the Nevada desert, a couple of miles away from Las Vegas, Hoover Dam stands as one of the most successful American public works projects of the last century. This concrete gravity-arch was constructed between 1931 and 1936 and has been inaugurated by the president Franklin Delano Roosevelt himself. This dam has been built in order to optimize the Colorado flow rate and is also dedicated to regulate the Colorado River for arid zone irrigation. The hoover dam created Lake Mead, which extends for 550 miles of shoreline and 247 miles of area, and is one of the largest man-made lakes in the world. As a comparison, the French largest man-made lake (lac du Der-Chantecoq) contains, in volume, ten times less water than lake Mead.

Six companies were involved in this gigantic construction. Despite the tough working conditions and the complexity to access the construction site, the project was completed two years ahead of schedule with a budget lower than expected. Indeed, a large amount of unemployed workforce arrived just after the beginning of this big project. 112 people died in this construction site.

The hydroelectric power plant has been operated since October 1936. The 17th and last turbine was commissioned in 1961. Average flow rate and hydraulic head have been taken into account to design the 14-foot diameter Francis turbines. With an installed capacity of 2.08 GW, Hoover Dam provides each year more than 4 billion kWh of cheap and low-carbon electricity to the states of Nevada, Arizona and California, the equivalent of about 1.3 million people, not to mention that besides generating electricity, Hoover Dam offers several benefits. The dam prevents the surrounding areas from flooding, helps regulating the water flow in the Colorado River, improves navigation and facilitates irrigation

Hoover Dam	
Type of dam	Concrete gravity-arch
Height	726 ft
Length	1,244 ft
Crest width	45 ft
Base width	660 ft
Volume of concrete	3,250,000 cu yd
The hydropower plant	
Number of turbines	17
Installed power	*2080 MW*
Lake Mead	
Capacity	*28,537,000 acre•ft*
Maximum water depth	*590 ft*
Surface area	*247 sq mi*
Reservoir length	*112 mi*

7 of the 17 turbines of the Hoover dam

The Colorado river

schemes. Finally, Hoover Dam is part of a system that provides water to over 20 million people in the southwest United States, including cities such as Las Vegas, Los Angeles, San Diego and Phoenix.

Moreover, this tremendous edifice represents an interesting touristic point. Born in 1995, a nice and air-conditioned reception place welcomes each year more than a million of tourists. Elevators bring you down into the heart of the dam where lies the huge electricity alternators above the Francis turbines. Outside, the typical red Colorado rocks surround lake Meads and large electrical poles enable electricity transportation toward Nevada and Arizona.

Mariam BARQUE

Martin LE COZ

Thibaud GRIMALDI

Translated by:

Manon FOUQUET

The Hoover dam

Springs Preserve

First we warmly thank Ms. Jessica Hougen who welcomed us at Springs Preserve in Las Vegas for the very last study visit of our American journey. The Preserve is located near ancient springs that dried up long ago. These springs were the main reason for which the first Mormons settled in the arid Nevada Desert in the 19th century, in what would later become the city of Las Vegas. The Springs Preserve is a masterpiece of botanical gardens, museum galleries and eco-friendly buildings that blend together architectural design and energy efficiency.

Living conditions in the Nevada Desert are difficult. Like most deserts, the environment is extreme due to both heat and drought. While in the touristic palaces of the city, a host of air conditioners is used to tackle the problem (consuming in the meantime a stupendous amount of energy), Springs Preserve buildings integrate sustainable and efficient temperature

The architecture is optimized for a high energy efficiency

The car park protects from the sun and generates green power

regulation devices, based on solar energy only. As the major energy source available in Las Vegas, solar energy thus meets most of the on-site energy needs, including the production of electricity and hot water. A good illustration is the car park, covered with photovoltaic panels that both protect cars from the sun and allow meeting more than a quarter of the on-site electricity demand (however, the produced electricity is injected into the local grid for stability reasons).

Look at it closer, and you will see that every single building has been designed to improve energy efficiency and use local natural resources up to their full potential. Hence, the main objectives of sustainable design are to avoid resource depletion of energy, water, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create built environments that are livable, comfortable, safe and productive. Rainwater collection systems are used to irrigate the gardens and fuel two cooling towers that aim at cooling down the insulated buildings. Underfloor heating systems, innovative air flow control technologies, efficient design and the high insulation performances of the selected building materials allow dividing the total energy bill by four. An example of natural material is the compressed earth that replaces concrete in almost every wall – a sustainable, biodegradable, non-toxic and cheap material.

The Spring Preserve was awarded the Platinum LEED (refer to the David Brower Center-Berkeley article) for its pioneer contribution to environmentally friendly building design.

The entire site is presented in a fun and entertaining approach to sustainable living and interactive learning. Aimed at all-age audiences, the facilities and galleries have been built two steps away from the biggest energy and water consumption centre mankind has ever built in the middle of the desert to familiarize visitors with the issues related to sustainable development.

David JESUWAME

Nicolas CALANDRUCCIO

Translated by:

Sébastien POSTIC

Sources :

http://www.springspreserve.org

Despite the arid climate, fauna and flora are idyllic

Highly effective buildings

SPRINGS PRESERVE
www.springspreserve.org

Special Thanks

We would like to start with our warm thanks to the three former OSE students who made this trip a reality: Mr. Frédéric Verdol who organized our stay in Washington and introduced us at the World Bank, then Mr. Jean Lemaire who managed our stay and visits in Chicago and, finally, Mrs. Pauline Caumon who prepared our visits within the Silicon Valley and the Bay area.

We are also thankful to Mr. Thomas Audinet (World Bank Group) and Mr. Thomas Deschamps (French Consulate in San Francisco) who respectively helped Mr. Frédéric Verdol and Mrs. Pauline Caumon to make possible our presentations at the World Bank and UC Berkeley.

Our very special thanks go to NUCOR-Crawfordsville team, for their warm welcome and their willingness to share their passion.

Moreover, we warmly thank all the professionals and officials who gave us some of their time: Mr. Graham Paul, the French Consul General of Chicago, Mr. Jonathan Broutin from Chicago, Mr. Ron Mr. Dickerson, Mr. Phil Fettig, Mr. Bill Henderson from Crawfordsville, Mr. Jim Parks, Mr. Enrique Perez, Mr. Gilad Almogy, Mr. Thierry N'Guyen, Mrs. Stina Brock, Mr. Gilbert Passin in California and Mrs. Jessica Hougen in Nevada.

Last, we would like to thank our Head of Studies, Mr. Gilles Guerassimoff, and all the people that worked in order to make this trip so enriching and unforgettable.

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