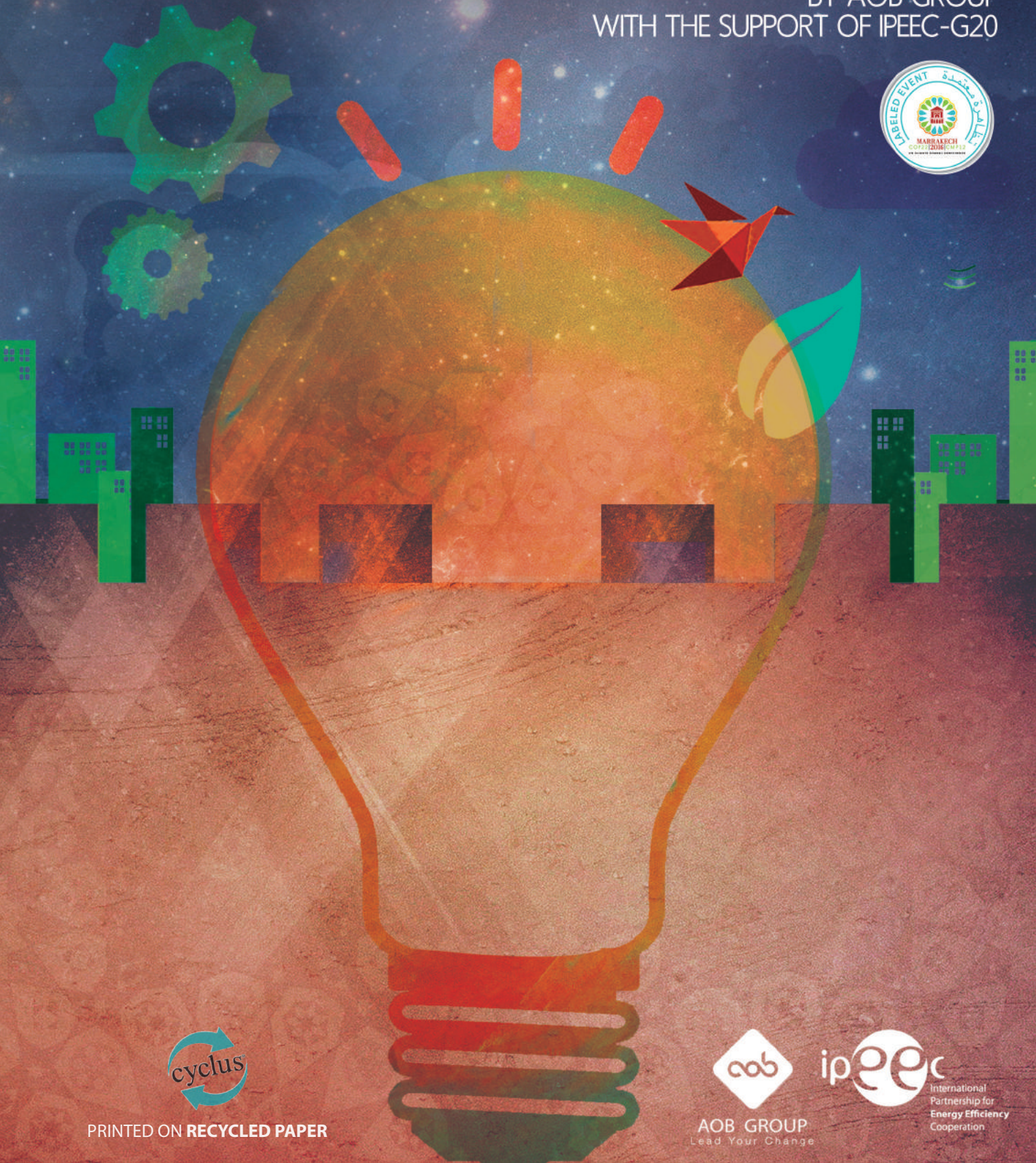


# ENERGY EFFICIENCY MAGAZINE FOR COP 22

BY AOB GROUP  
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Partnership for  
Energy Efficiency  
Cooperation



International  
Partnership for  
**Energy Efficiency**  
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IPEEC coordinates the implementation of the **G20's energy efficiency plans**. Through international collaboration, IPEEC seeks to hasten the deployment of energy efficient technologies best practices.

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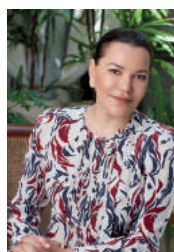
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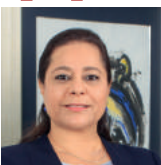
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## Energy efficiency, the cheapest and fastest pathway to reducing greenhouse gas emissions

**Said Mouline, CEO of the Moroccan agency for energy efficiency AMEE**



The energy transition is based on two axes of equal importance. The first is that of renewable energy, which permits production of low-carbon energy; nowadays, when good policies are implemented, investors scramble to develop such projects. The other axis of the energy transition is that of energy efficiency; unfortunately, energy efficiency continues to be perceived as a poor relation of renewable energy. Because energy efficiency comes with policy rather than high-visibility projects such as solar or wind power plants, the issue is less visible than renewable energy. Nevertheless, energy efficiency offers just as much positive impact for the economy and the environment. The International Energy Agency (IEA) and its member states have identified energy efficiency as both the fastest and the least expensive option for addressing energy security issues and economic and environmental challenges. **Often, during the COPs, only renewable energies are raised in discussions on mitigation, whereas, in fact, good energy efficiency policies can have as much impact, if not more, on greenhouse gases emissions.**

In Morocco, a Royal Letter to the National Energy Forum of March 2009 gave priority to renewable energy and energy efficiency in national energy policy. Today, the goal for 2030 is for renewable energy to reach 52% of electric capacity and for energy efficiency to achieve a 20% reduction compared to a business as

usual scenario.

The Moroccan Agency for Energy Efficiency (AMEE, formerly known as **ADEREE**) is responsible for promoting energy efficiency across several targeted sectors (transport, construction, industry, agriculture and public lighting). This entails putting in place new regulations, dedicated funding, as well as pilot projects, training programs and awareness-building initiatives.

At the industrial level, it is important to raise awareness among industrial actors about best practices enabling them to reduce both their energy bills and their emissions. This is done in collaboration with the Moroccan private sector, represented by CGEM, which has a committee dedicated to energy, climate and the green economy. Financial tools were also made available to facilitate investment in this area.

Developed with the assistance of multiple international and national financial players and a total of nearly 100 million dollars, MorSEFF is the financing line of sustainable energy for Moroccan private companies. It offers loans or leasing through local partner banks, investment subsidies but also free technical support measures for the implementation of energy efficiency and renewable energy projects for better business competitiveness. Financing energy efficiency therefore requires approaches distinct from those proposed for renewable energy.

Finally, in parallel, a regional program, "Jiha Tinou" is conducted for each region to adopt policy on energy efficiency. It aims to encourage local initiatives while promoting the implementation of the national energy strategy in the territories and communities of the Kingdom.

The International Energy Agency also tells us that, in OECD countries, energy efficiency measures would reduce demand growth to 60% of what it would have been otherwise. Hence, whenever major energy generation projects are launched in the South, it is essential that accompanying energy efficiency policies be established in conjunction. In parallel, we must remember that fossil fuel subsidies reached almost \$500 billion in 2014. This is a huge sum that should instead be used to support energy efficiency policies. At COP22 in Marrakech, an international initiative for energy efficiency, equivalent to those dedicated to renewable energy, will be presented. Its objective is detailed in this work. It is necessary that the COPs finally put their weight behind the energy efficiency sector.

**Finally, energy policy must be internally consistent; promoting energy efficiency requires ending fossil fuel subsidies; in their place, we should be establishing support for the most disadvantaged social groups to be equipped with energy-efficiency technologies, which require less energy though can be capital-intensive.**

## International energy efficiency cooperation and the G20

### Energy efficiency is for everyone.

It is cost-effective, cross-cutting, and can benefit all individuals and communities around the world. Through energy efficiency, countries can achieve up to a third of the energy-related greenhouse gas (GHG) emissions reductions necessary by 2030 to keep global warming to below 2 degrees Celsius, as outlined in the Paris Agreement. This is the single largest contribution to global reductions, greater even than that from renewable energy. To realize this potential, however, energy efficiency action must be undertaken at a truly international level - and this is where IPEEC and the G20 have a big role to play.



**Benoit Lebot,**  
*Executive Director, IPEEC*

The International Partnership for Energy Efficiency Cooperation (IPEEC) is an autonomous partnership of 16 major economies dedicated solely to promoting global cooperation on energy efficiency. Representing member nations that together account for over 80 percent of global energy use and 85 percent of GHG emissions, it has since 2014 been coordinating the G20's energy efficiency activities under the group's two plans - the G20 Energy Efficiency Action Plan (2014) and the newly-endorsed G20 Energy Efficiency Leading Programme (EELP, 2016) -, which are both voluntary and provide a flexible mechanism for cooperation by countries on energy efficiency topics that are in-line with their ambitions and national priorities.

The new EELP in particular is important because it gives energy efficiency just what it needs: time. It provides the timeframe necessary to realize results, since energy efficiency must be envisioned and supported over a long time to give the opportunity for projects to mature and bear the best outcomes. It is also a dynamic process that must be continuously engaged with, since the low-hanging fruits of energy efficiency, once picked, grow back. By providing a long-term framework, the EELP puts the G20 on a path to realize the level of energy efficiency action the world needs in the coming years. Most importantly, the EELP shows the very best of international collaboration: how countries can discuss, decide, and act together to do more for the world. This is as true for the G20 as it is for other international cooperation, like the Conference of Parties (COP) process.

Strengthened international action on energy efficiency can make a real difference for economies and climate change, individuals and businesses. This is because energy efficiency never comes out of a vacuum. To become reality, energy efficiency requires a set of ingredients: political willingness, special human, technical and institutional capacities, massive data gathering and analysis, and dedicated tools and instruments such as metrics, ratings, and monitoring. International cooperation can provide the crucial first step for all of this by creating the right environment for exchange and collaboration, and by giving the political signal that energy efficiency is important and must be taken further - as was the case with the Paris Agreement and the G20 energy efficiency plans.

It is true that energy efficiency is by nature domestic and very local, and its solutions are the results of very granular decisions and investments. International cooperation however does not seek to replace or to supersede national policies. Instead, when properly established, collaboration can accelerate the exchange of information, technical opportunities for regional harmonization, and mobilization of key partners by national governments - typically financial institutions. International collaboration can therefore greatly accelerate the adoption and implementation of domestic energy efficiency policies.

Thanks to the G20 EELP and the Paris Agreement, we are better placed now to make the most of the opportunities before us, and IPEEC is ready to play its part in these efforts. We must not forget that it took many years for energy efficiency to gain the attention it deserves, and more, always more, can be and must be done to create a sustainable future. In particular, we need to increase financial flows toward energy efficiency investments and build technical capacity to gather and analyze more data and metrics. We must also look to helping developing countries make technical strides, and in this perhaps there is an opportunity in climate finance, especially under the Paris Agreement. We have drawn the map. Now all we must do is follow it towards a more sustainable, prosperous world.



# Improving Manufacturing through Technology and Innovation

Dr. Ernest Moniz, US Secretary of Energy



Today, we are announcing the Smart Manufacturing Innovation Institute. Smart technologies, such as sensors, can help manufacturers better design, measure, predict and control all aspects of the manufacturing process. As a result, these traditional manufacturing processes become more productive and efficient.

Thermal processing for food, for example, is typically energy intensive, using massive amounts of energy and water to give products a longer shelf life. But through the work of the **Smart Manufacturing institute companies can integrate small controls on the thermal processing line to monitor, adjust and improve technology to regulate and reduce energy and water consumption.**

And once food is produced, smart technologies can also be used to make the packaging and shipping processes more efficient by allowing manufacturers to see data from their manufacturing line in real-time. This helps manufacturers manage products through their distribution centers and gives them more information about when products are ready to ship.

By modernizing the energy and water intensive manufacturing techniques that have been in place for decades and increasing energy efficiency, we can lower the cost of processing our food, dramatically shrink the footprint of equipment need on a crowded factory floor and enable the large-scale production of wide bandgap semiconductors to increase the efficiency of products that range from industrial motors to household appliances.

The Smart Manufacturing Innovation Institute will be headquartered in Los Angeles, California and led by the Smart Manufacturing Leadership Coalition in partnership with the Department of Energy. The coalition brings together a consortium of nearly 200 partners from across academia, industry, and non-profits—hailing from more than thirty states. Through this institute, information technology leaders will work with manufacturers in energy intensive industries to manufacture more while spending less and using less energy.

The institute will launch five regional manufacturing centers – based in California, New York, North Carolina, Texas and Washington – that will be focused on local technology transfer and workforce development. These regional centers will be home to technology testbeds aimed at helping new smart manufacturing technologies reach the marketplace faster.

The new institute is one of three Energy Department-led institutes in the broader National Network for Manufacturing Innovation (NNMI), a network of manufacturing hubs launched by President Obama in 2012. Through the NNMI, the new Smart Manufacturing Innovation Institute will also partner with existing manufacturing innovation institutes to pioneer technologies at the intersection of their unique capabilities.

# Energy efficiency first: the spine of EU energy policies

**Maroš Šefčovič** - Vice-President of the European Commission, in charge of Energy Union.

The European Union adopted, in 2015, the framework strategy for the Energy Union. The aim of this strategy is to ensure that Europe has secure, affordable and climate-friendly energy. Achieving these objectives required introducing the so-called “Efficiency First Principle” in the design of our energy policies.

The “Efficiency First Principle” is a paradigm shift in the design of any energy system. It requires assessing the potential value of investing in energy savings (those resulting from energy efficiency as well as those resulting from demand response) in all decisions related to developing our energy system. In practice this means investments in energy savings are prioritised whenever they cost less or deliver more than building new supply and networks. In other words, energy savings, which were considered for decades as a hidden fuel, will be given a fair chance to compete on an equal basis with supply side solutions. The aim is to make energy savings the “First Fuel” of Europe starting from 2030.

The energy transition from a fossil fuels-based energy system to a clean and secure energy system is one of the biggest challenges we face globally. It is clear that the energy system for the 21st century has to be citizen-oriented, and clean energy has to be affordable for each EU citizen and business. **The “Efficiency First Principle” will help achieve all of these outcomes. It can bring down the**



**costs of the energy transition while driving green growth, creating new jobs, reducing imports and improving air quality.**

It will also boost innovation in technologies, policy design, business models and governance. The Paris Climate Agreement is a historic milestone for the transformation of the global energy system, including the European one. Adopting the “Efficiency First Principle” when designing our energy policies will allow Europe to speed-up this transformation to clean and low-carbon energy future. The “Efficiency First Principle” is key for both the implementation of the Paris Climate Agreement and the energy transition of the EU energy system.

Making the “Efficiency First Principle” a reality requires policy-makers to embed the principle in each policy instrument. Fortunately, Europe has to revise most of its energy instruments in 2016; there is no better time to start introducing the concept of the “Efficiency First Principle” in our funding decisions and infrastructure planning. The aim is to make the energy transition fair, competitive and sustainable. The “Efficiency First Principle” and its role in bringing about a forward-looking energy system for the 21st century is not a European luxury. It is a necessity, one we owe globally to Millennials and future generations.

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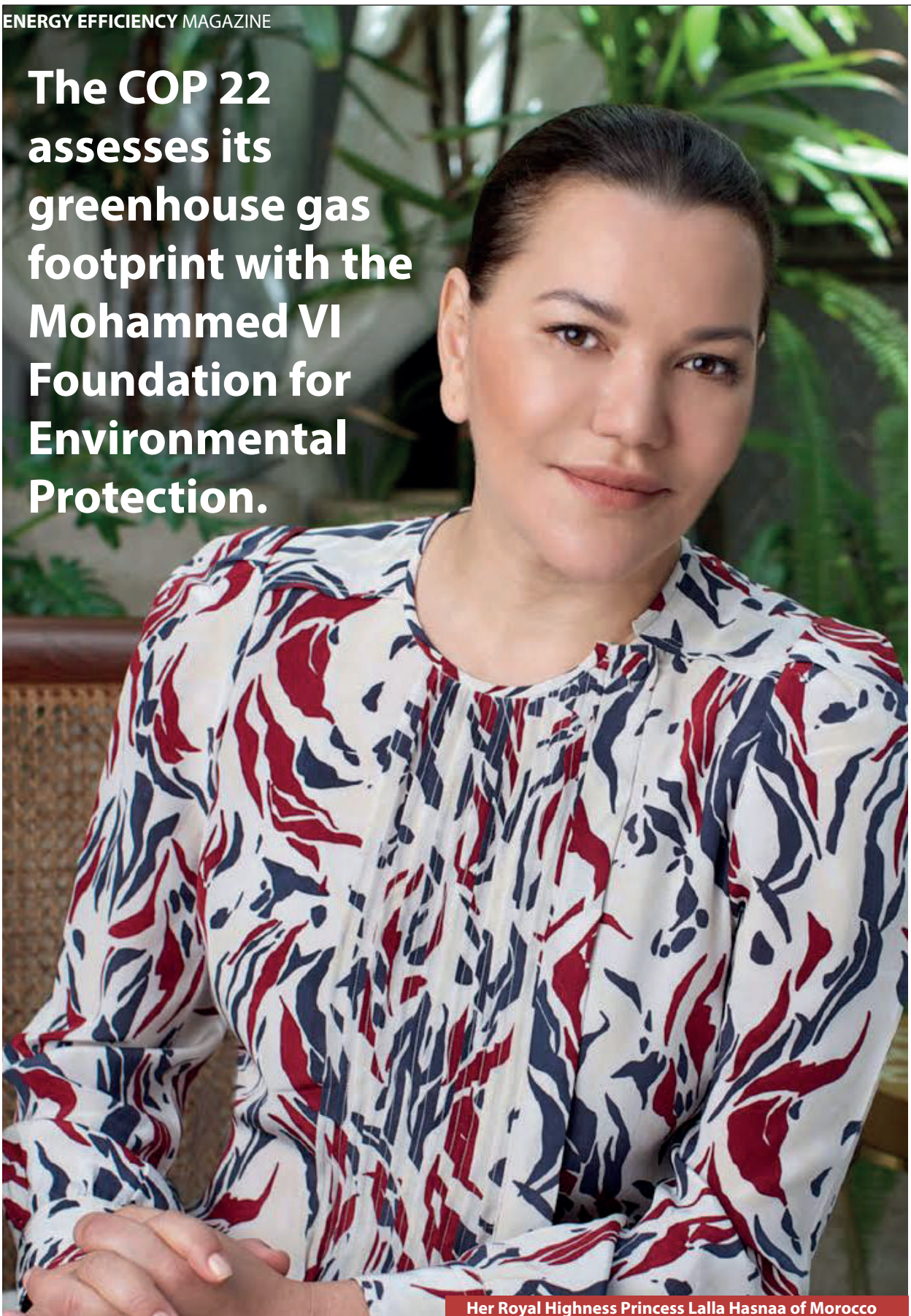
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**The COP 22  
assesses its  
greenhouse gas  
footprint with the  
Mohammed VI  
Foundation for  
Environmental  
Protection.**



**Her Royal Highness Princess Lalla Hasnaa of Morocco**

*The COP 22 will use tools developed by the Foundation to estimate and offset its emissions.*

The Mohammed VI Foundation for Environmental Protection, chaired by **HRH Princess Lalla Hasnaa**, made its greenhouse gas footprint assessment tool, carbon calculator, and Voluntary Carbon Offsetting Program available to the COP22 organizers so they can evaluate the carbon footprint of this global event, and offset CO2 emissions carbon capture operations in Morocco. The COP 22 will thus lead by example in the fight against global warming, for which states are meeting in Marrakech.

The Foundation, observer to the United Nations Framework Convention on Climate Change since 2009, has been committed since 2007 to improving air quality by first developing a Voluntary Carbon Offsetting Program. This program allows organizations, governments and companies to offset their greenhouse gas emissions in two projects developed in Morocco by the Foundation: palm plantations in the Marrakech palm grove and electrification of rural schools with photovoltaic panels. To date, over 12,000 palms have been planted and 365 schools have received solar installations benefitting 35,000 students.

This will capture or avoid atmospheric release of over 18,000 tons of CO2 for the duration of these projects. Twenty partners, which are large public and private enterprises, support the Foundation in this effort.

The Mohammed VI Foundation for Environmental Protection then set up a tool for organizations, companies and administrations to manage their greenhouse gas emissions. A database of emission factors has been established with the help of the French Environment and Energy Management Agency (ADEME). A total of 300 emission factors have been identified, and half of them were estimated based on the characteristics of Morocco. This emission factors database helped to develop an emissions calculation tool for organizations, called the Greenhouse Gas Footprint Tool. It is fully operational, complies with ISO 14069 greenhouse gas emissions accounting, and is at the disposal of organizations that want to conduct assessments of greenhouse gas emissions and develop resulting reduction strategies.

The General Confederation of Moroccan Businesses (CGEM) supported the Foundation's approach by signing a Qualit'Air pact on February 11, 2016 with the Foundation and with member companies. The pact aims to promote the use of this GHG tool among its members. Sixteen pilot companies have volunteered to carry out the first carbon footprints of businesses in Morocco. The regions of Morocco have followed suit and three of them will complete their GHG emission footprint in 2017, with Foundation support.

These tools developed at the initiative of the Mohammed VI Foundation for Environmental Protection, in a unifying approach, provide a template for new governance that is taking place to improve air quality and mitigate climate change. The Foundation conducts its outreach among economic actors and the administration, in parallel with another approach for children and the general public. It also published a CO2 calculator that allows everyone, individuals or companies, both large and small, to estimate the carbon footprint of travel and to directly offset it via a carbon sequestration operation. The CO2 calculator is available on the [www.fm6e.org](http://www.fm6e.org) site, smartphone or tablet iOs and Android.

**HRH Princess Lalla Hasnaa** chairs the **Mohammed VI Foundation for Environmental Protection**, established in 2001. Its mission is environmental education and awareness for the public. It is active in almost twenty programs covering five areas: youth education for sustainable development, the coast, air quality, historic gardens, and sustainable tourism.

## Interview with **Mrs BENSALAH CHAQROUN MIRIEM**, *President of the moroccan employers association CGEM (General Confederation of Moroccan companies)*

### **1. What are the growth opportunities that can companies benefit from through sustainable development?**

Since Stockholm's Earth Summit held in 1972, the world's leaders have become more aware that economic, environmental, and social issues were interrelated, and have learnt to benefit from reducing energy and water consumption, increased renewable energy share in their production process, optimized waste management and wastewater reuse...

Entrepreneurs who have introduced innovation in their processes and reduced Greenhouse Gas Emissions, through a favorable carbon footprint, have a competitive edge.

Those who have not started yet should step up their efforts and investments to overcome this serious gap because they have no other choice!

It's necessary for businesses, that want to ensure profitability

and sustainability, to better manage inputs and outputs of industrial processes. They will have to develop and provide sustainable solutions in energy, transportation, sustainable cities, water & waste management...

### **2. How does CGEM encourage energy efficiency?**

Since the 90's, CGEM has already laid the basis for climate policy by engaging in sustainable development and by setting up a committee dedicated to Energy, Climate and Green Economy.

Several initiatives were therefore launched such as: the creation of the Moroccan Center of Clean Production (CMPP) in partnership with the Ministry of the Industry and the Ministry of the Environment; the implementation of a charter and a Corporate Social Responsibility label, in partnership with the Mohammed VI Foundation for Environmental Protection; the creation of a coalition for waste recycling (COVAD) and more

recently, another coalition called the Moroccan Coalition for Water (COALMA).

The Energy, Climate and Green Economy Committee is dedicated to facilitate the transition to a green economy in Morocco, while using renewable energy and energy efficiency. It also help companies in addressing climate change issues through the Moroccan Centre for Clean Production (CMPP), providing technical support to moroccan companies, mainly SMEs.

Recently, CGEM has launched the Qualit'Air Pact in partnership with the Mohammed VI Foundation for Environmental Protection, through which it allows our members to assess their GHG emissions, offset and reduce them.

### **3. What communication tools CGEM uses to sensitize Moroccan companies on global warming and sustainable development?**

CGEM is fully convinced of the role that companies should play in supporting Governments to contain the extent of climate change as stated by the Paris agreement.

As I said earlier, CGEM's actions relating to climate change have started way before COP22. It has

designed an awareness program to sensitize Moroccan companies on the challenges of climate issues as well as on the available opportunities.

As for COP22, many events have been scheduled before and during the Conference of the parties. Some of them are national, such as the Green Growth Academy, where sectoral themes are addressed; and others are international such as the Business Dialogue, a platform for high-level meetings between business and government representatives, the Waste and Climate Summit and the High Level Business Summit on Climate Change. During COP22, many other side events are planned in the Blue Zone such as the Business and Climate Summit, the Climate MEDCOP and the Caring for Climate Forum.

All this work has been possible thanks to the expertise and efforts of the members of the task force that I have the honor to chair.

Besides, CGEM has launched the Morocco Business Climate Initiative whereby it will provide education, training and assistance to companies which commit to the Green Economy.

#### **4. What is your role, as the main Moroccan private sector representative, in COP22 organization and success?**

Last September, CGEM has signed a partnership agreement with the COP 22 High Committee. We have committed to mobilize international employer's organizations worldwide, in particular from the South, to sign the "Marrakech Declaration" during

the High Level Business Summit on Climate Change. This declaration aims to endorse the commitment of the global private sector's fight against climate change.

In recognition of its efforts, CCGEM was granted the status of "Observer Organization" by the United Nations Framework Convention on Climate Change and will take part in climate negotiations during COP22 as well as in all upcoming COPs.



**MIRIEM BENSALAH CHAQROUN, MOROCCO**

*President of the moroccan employers association CGEM (General Confederation of Moroccan companies)*



## International Energy Efficiency Initiative (IEEI)

### Context

In its role as the incoming Presidency of COP22, Morocco is seeking partnerships with other countries and groups to advance the development of a new initiative, the International Energy Efficiency Initiative (IEEI). The Initiative is hosted under the umbrella of the Global Programme on Renewable Energy and Energy Efficiency (GPREEE), which stems from the joint interest of the Group of Least Developed Countries (LDCs), the Alliance of Small Island States (AOSIS), Sweden and Morocco to build on the experience of other initiatives, such as the African Renewable Energy Initiative to scale up the development of energy efficiency and small-scale renewable energy systems. Energy efficiency and renewables are a high priority for Morocco, and their achievement is promoted by two agencies: The Moroccan Agency for Sustainable Energy (MASEN) for renewables and the Moroccan Agency for Energy Efficiency (AMEE, former ADEREE) for energy efficiency in various sectors, including the building sector, industry, agriculture, transport, public lighting and small integrated renewable energy systems. The diffusion of energy efficient technology is also a key element of the COP22 action plan. The present note outlines an International Energy Efficiency Initiative (IEEI) under the umbrella of the GPREEE. Countries as well as key non-state stakeholders both from developing and industrialised countries will be invited to join the global initiative.

### Objective

The IEEI aims to promote rapid global diffusion of energy efficiency and small-scale renewable energy best practices as a way to support efforts to achieve the ambitious targets of the Paris Agreement. As such, the Initiative embraces a broad view on energy efficiency measures, and includes small-scale renewable energy sources that help save energy, such as solar water heaters. The IEEI seeks to assist its members to obtain first-class information from around the world to support national decision-making processes on energy efficiency and small-scale renewable energy to help build capacity for the implementation of NDCs.

It will also follow the institutional and regulatory framework needed for implementing pro active policies in this field.

### Structure

The proposed initiative is envisaged to bring together governments and multinational institutions from the public, academic, private, financial institutions and NGO sectors at the international level, while, the national level, helping to mobilise sub-national governments and stakeholders, private sector companies, banks, civil society and academia interested in promoting energy efficiency.



## Activities

**The cornerstone of the IEEI should be to coordinate activities including:**

- ▶ Publication of authoritative reports on the status of energy efficiency and small integrated renewable energy applications worldwide
- ▶ Collection of global and national data series on energy efficiency and small integrated renewable energy for all economic sectors
- ▶ Convening of processes to accelerate the diffusion of proven policy instruments for enhancement of energy efficiency and small integrated RE
  - Revolving funds for energy efficiency improvement
  - Top runner programmes
  - Dynamic energy efficiency standards
  - Dynamic labelling programmes
  - Supportive legal frameworks for Energy Service Companies
- ▶ Coordination of international financing of energy efficiency improvement including small integrated renewable energy applications, through climate and development finance
  - Mobilizing of financing for lighthouse activities in energy efficiency improvement
  - Capacity building for participating in international market mechanisms to harness revenues
  - Enhancement of monitoring, reporting and verification (MRV) capacities for GHG mitigation and sustainable development
  - Design and implementation of joint government procurement programmes of energy efficient equipment
- ▶ Establishment of platforms for knowledge, best practice and experience sharing
- ▶ Coordination of the preparation of energy efficiency-related components of the Nationally Determined Contributions (NDCs) of countries before and after 2020, thereby linking the global initiative to national action plans,

While the IEEI shall be an initiative with a global reach, its activities will be organized in regional pillars (e.g. Latin America and Caribbean, Africa and Middle East, Asia and Oceania).

In addition to regional pillars, different pillars according to country groups could also be considered, such as AOSIS, LDCs, African countries or industrialized countries, which might be located in different regions but face similar challenges, are at a similar level of technology development or have similar environments for energy efficiency technologies and small integrated renewable energy systems. Thereby specific needs of regions or country groups can be considered and potential challenges or gaps of existing energy efficiency initiatives for specific regions or country groups can be addressed.





**Etiosa Uyigue,**  
*Executive Director,  
Community Research and  
Development Centre, Nigeria*

From the 2006 census, the population of Nigeria is estimated to about 170 million people. Only about 50 percent of the population has access to electricity. The power generated in Nigeria is grossly inadequate for the population, thus making electricity supply in Nigeria very unstable and erratic; Nigerians suffer from frequent power outages that last for several hours. This has forced households, industries and businesses to rely on privately owned diesel and petrol generators as primary or back-up sources of electricity. The use of private generators is very expensive and a major source of air pollution, emitting greenhouse gases into the atmosphere. Much more worrisome is the waste of energy that comes from human behavior and the use of energy intensive appliances. Previous efforts taken by government to bridge the energy demand and supply gap focused mainly on generation with little or no effort made to address the efficient utilization of energy.

The government has begun to take advantage of the potential inherent in the energy efficiency concept

## Energy efficiency in Nigeria: Bridging the energy demand and supply gap

and practices to bridge the energy demand and supply gap. In 2011, with support from the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP), the Federal Government of Nigeria through the Energy Commission of Nigeria began the implementation of a project aiming to increase the energy efficiency of a series of end use appliances. The project was designed to develop minimum energy performance standards for end use appliances, provide policy direction for Nigeria to promote energy efficiency and enhance the capacity of Nigerian stakeholders to promote energy efficiency. Since the implementation of the project began, significant achievements have been made.

Through the program, the Nigerian government has developed minimum energy performance standards for lighting appliances and refrigerators. It is one thing to have energy efficiency regulations, but another to enforce the regulations. Any regulation is useless without putting an enforcement mechanism into place. To enforce the new energy efficiency regulations, testing laboratories for lighting appliances and refrigerators were established in the Standard Organization of Nigeria and the National Centre for Energy Efficiency and Conservation. National Energy Efficiency Guidelines were

developed and given to the authorities to enrich existing energy policy (National Energy Policy) and develop the National Renewable Energy and Energy Efficiency Policy, which was approved by the Nigeria Federal Executive Council in 2015.

To bridge the research and information gaps in the energy efficiency sector in Nigeria, several baseline studies were inaugurated and implemented to elicit the much-needed information to provide policy direction. These include the End-use Monitoring Study in Residential Buildings, the Nigeria Appliance Inventory Study and the Nigeria Lighting Compliance Study. To further showcase the benefits of energy efficiency practices, about one million compact fluorescent lamps were distributed in different locations in Nigeria with support from the Cuban government, leading to estimated savings of 14.8 megawatts and avoided generation of 38.9 megawatts of electricity, in addition to an estimated abatement of 233,400 tons of carbon dioxide. Furthermore, over 2000 stakeholders, mainly from relevant national agencies and NGOs, were trained on different aspects of energy efficiency. Retrofits of selected public buildings were embarked upon, including a community primary health center.

## The success story of the Energy Efficiency Drive in Ghana

**Kofi Agyarko** *Head of Energy Efficiency and Climate Change Division Energy Commission - Ghana*

Ghana has achieved significant success in turning its economy into an energy efficient economy. The energy efficiency drive was prompted by periodic energy supply shortages dating back to the 1980s. The energy supply challenges were caused by the actions of oil cartels, long droughts that reduced the water volumes in the major hydro dam and the use of old and inefficient end user appliances. Imported old appliances from Europe and elsewhere had dominated the market for a long time. Until recently, thirty percent of the electricity generated went to waste because of these old and inefficient appliances.

The efficiency drive was started with the development of minimum energy standards for end user appliances. Standards were developed for three major end user appliances: lighting, air-conditioning and refrigerators. In order to make compliance mandatory, laws were passed to lend legal support to the enforcement of the standards. Another law was passed to prohibit the importation of used refrigerating and air conditioning appliances as well as the manufacturing and sale of incandescent filament bulbs.



Ghana then put in place an appliance labelling regime which made it an offence to sell appliances without the labels. The labels became a 'mark of efficiency' through consumer education.

The objective of the appliance standards and labelling regime was to reduce the electricity bills of consumers, prevent Ghana from becoming a dumping ground for obsolete appliances, and finally to transform the appliance market.

Two categories of appliances - lighting and refrigeration - were selected for definite interventions to achieve market transformation. In 2007 the government funded the purchase of six million compact fluorescent lamps to be distributed free of charge to consumers to replace incandescent lamps. The results were amazing: 124 megawatts were shaved off the peak load, which delayed a USD 105 million investment to expand thermal energy generation. With an average crude oil price of USD 105 per barrel between October 2007 and October 2008, the savings realized equalled USD 33.3 million per annum, with carbon dioxide savings of 112,320 tons per annum. As of September 2009, the penetration rate of compact fluorescent lamps (CFLs) in Ghana had increased from 20 percent in 2007 to 79 percent, with incandescent lamps reduced from 58 percent in 2007 to 3 percent in 2009.

With funding from Global Environment Fund (GEF) and United Nations Development Programme (UNDP), a refrigerator energy efficient project was launched aimed at reducing the electricity

consumption of refrigerating appliances and transforming the market from old inefficient refrigerating appliances to new and efficient ones.



The project ran for three years, at the end of which the refrigerating appliance market had been transformed and the average consumption of refrigerators reduced from 1,200 kilowatt hours (kWh) per annum to 600 kWh per annum. A rebate scheme was put in place to serve as a special purpose vehicle to entice consumers to voluntarily turn-in their old and inefficient refrigerators in exchange for new and efficient ones. At the end of the project, 10,000 old and inefficient refrigerators were retrieved from homes and replaced with the same number of energy efficient ones. About 30,000 illegally imported used refrigerators were seized and destroyed to prevent them from use. The project yielded 400 gigawatt hours (GWh) of savings, i.e. a third of the total national generation. Carbon dioxide savings equalled one million tons.

## The role of **energy efficiency** in meeting **energy access goals**

*Rose Mutiso, U.S. Global LEAP lead - US State Department of Energy*

Energy efficiency is a critically important component of global efforts to provide access to modern energy services to the billion plus people worldwide who currently lack access to electricity. In tandem with the deployment of innovative off-grid energy supply solutions, such as solar home systems and mini-grids, demand-side energy efficiency can transform energy access markets by increasing the affordability of energy services.

Basic energy services such as lighting and phone charging are an important first rung in the energy access ladder, but the broader socio-economic benefits of electricity access require higher levels of energy services – encompassing household, income-generating, and community applications such as health and education.

High-quality, super-efficient off-grid appliances require less energy and reduce the size of the off-grid energy systems needed to run them, lowering costs considerably and making modern energy services affordable for a greater share of the world's population.

For example, research commissioned by the Clean Energy Ministerial's (CEM) Global Lighting and Energy Access Partnership (Global LEAP) shows that coupling solar home systems with super-efficient appliances, including a TV, fan, mobile charger, and LED lights, requires 75 percent less power and reduces overall costs by as much as 50 percent.

**This nexus between energy efficiency and energy access is an area of tremendous opportunity.** Global LEAP partners are working to support thriving commercial markets for off-grid appliances and equipment. This work includes the Global LEAP Awards program, which

recognizes high-quality and super-efficient off-grid appliances in key product categories, and PlugFests, which help off-grid energy service providers and appliance manufacturers connect, identify interoperability barriers, and exchange information.

Another effort is also taking place through the CEM, led by Global LEAP in partnership with Sustainable Energy for All (SE4All). The Efficiency for Access (E4A) Coalition is a global campaign to harness the game-changing power of energy efficiency to drive universal access to enhanced energy services beyond lighting by 2030. E4A was launched at COP21 as a Year of Action to mobilize commitments from public- and private-sector partners to support the development and deployment of these technologies, accelerating progress towards the recently announced Sustainable Development Goal 7 (SDG7) targeting universal energy access.

By working on both sides of the energy access equation—supporting markets for both quality off-grid clean energy supply technologies and super-efficient off-grid appliances—Global LEAP and its partners are helping to transform the lives of households and communities around the world.

## Governments working together to **save energy**

**Tracey Crowe**, *Clean Energy Ministerial Secretariat, USA - US State Department of Energy*

A collaborative approach is absolutely critical to realizing the ambitious and comprehensive agreement reached at COP21 in Paris last year. With the energy sector worldwide representing two-thirds of global greenhouse gas emissions, it is clear that one of the most essential solutions to climate change is a global transformation to clean energy - and as is highlighted throughout this publication, energy efficiency can deliver a huge portion (up to a third) of energy-related GHG emission reductions necessary to keep global warming to below 2 degrees Celsius. As clean energy, and energy efficiency in particular, plays a critical role in addressing climate change, so does the Clean Energy Ministerial – the CEM.



The CEM is a partnership of the world's largest and most forward-leaning economies working together to accelerate the global transition to clean energy. It is a small and efficient group – 24 countries and the European Commission – with great influence. Together, the CEM members account for about 90 percent of clean energy investments and 75 percent of greenhouse gas emissions. If we get it right with this relatively small group of countries, we can change the energy trajectory for the rest of the world.

The CEM is a bottom-up, voluntary, and collaborative forum with member countries proposing and working on initiatives and campaigns that help them achieve their own national clean energy goals and priorities, but that also make a difference at the global level.

**The CEM delivers year-round and on-the ground energy-efficiency programs through multiple action-driven and transformative initiatives including:**

- the Super-efficient Equipment and Appliance Deployment (SEAD) initiative working to engage governments and the private sector to accelerate the pace of market transformation for energy-efficient equipment and appliances;
- the Energy Management Working Group (EMWG) working to improve

energy efficiency in the industrial and commercial sectors worldwide by accelerating broad use of energy management systems;

- the Electric Vehicles Initiative (EVI) working to accelerate the global scale-up of electric drive vehicles;
- the Global Lighting and Energy Access Partnership (Global LEAP) working to catalyze markets for affordable, clean, efficient, and quality-assured off-grid appliances and equipment.

As one example of impact, the governments participating in the SEAD initiative have made significant progress implementing effective energy efficiency standards. Those standards are projected to save 704 terawatt hours (TWh) of electricity, 563 petajoules (PJ) of oil and gas, and more than 4 Gt of CO<sub>2</sub> in 2030 – equivalent to roughly 235 fewer power plants and taking over 8 million cars off the road in the next 15 years.

In addition to these sustained energy-efficiency initiatives, CEM has launched multiple campaigns designed to be short-term efforts to raise ambition, increase visibility, and target resources to topic areas that have particular potential for impact.

**CEM campaigns focusing on energy-efficiency include:**

- the Advanced Cooling Challenge

challenging governments and industry to develop and deploy at scale super-efficient, smart, climate-friendly and affordable cooling technologies critical for prosperous and healthy societies;

- the Energy Management Campaign aiming to achieve 50,001 global ISO 50001 energy management certifications by 2020 in order to drive energy savings, cost savings and emissions reductions in the commercial and industrial sectors; and,

- the Global Lighting Challenge challenging the world to reach cumulative global sales of 10 billion high-efficiency, high-quality, and affordable advanced lighting products, such as light-emitting diode (LED) lamps, as quickly as possible.

The energy-efficient road from Paris, through Marrakesh, now requires sustained innovation, cooperation, smart policies, and global leadership for many years to come. It also requires strong international collaboration on solutions and implementation. With new energy-demand goals and commitments put forward by countries as part of the Paris Agreement, the CEM has crucial work ahead to help countries implement innovative and ambitious policies and programs to achieve those goals and to intensify them over time.

## Trust and cooperation are key to energy efficiency:

An interview with IPEEC's new Chairman **TUDOR CONSTANTINESCU** – *Principal Adviser to the Director General for Energy, European Commission* by **Jurei YADA** - *Policy analyst - IPEEC*



Tudor's remark comes in response to a question about the role of energy efficiency in the European Union.

"The EU is at the forefront of sustainable energy policy - in renewable energy and energy efficiency in particular," he states. "It enjoys support from the highest level, from the President of the Commission. At the same time, one of the major projects the EU has is the Energy Union, whose slogan is 'energy efficiency first'. Strongly promoted by our Director General, it is the core principle of our energy policies, our energy transition, and the efforts we are undertaking to achieve our 2030 objectives on climate change, sustainable energy, and the security of our [energy] supply and competitiveness."

The EU is indeed a major player in energy efficiency. Given the quadruple challenges of import dependency, energy prices, decarbonization, and technology mix that it faces, energy efficiency - along with renewable energy sources - is at the core of the European Commission's energy solutions for 2020-2050. Supporting these policies are key pieces of legislation, namely the Energy Performance of Buildings Directive and the 2011 Energy Efficiency Directive. The EU is currently discussing how to move ahead and what revisions in legislation and policies would be required so that, after a 20 percent improvement expected for

2020, the bloc can achieve at least a 27 percent (possibly 30 percent) efficiency target by 2030.

"We try to offer as much as possible a platform for dialogue and cooperation, as well as support by financing energy efficiency projects," Tudor explains. He gives his answers calmly, precisely, and with the quiet confidence that makes it easy to see him as the expert he is. "For example, we have the Cohesion Policy 2014-2020 that has allocated up to EUR 45 billion for the low carbon economy. We also fund research and innovation through Horizon 2020 and are mobilizing EUR 315 billion in additional investments for sustainable energy through the Juncker Plan, which is the European Fund for Strategic Investments."

The task of working with 28 member states in the Commission must be a complex one. I ask him if there are any similarities between working in the EU and working with IPEEC - a partnership of 16 major economies and the world's biggest energy consumers.

"IPEEC is a partnership - it is voluntary cooperation in exercise and highly beneficial," he says, after briefly reflecting on the question. "Countries make their own commitments and bring their own understanding of the issues to the table. In the Commission there is the EU approach - the commitment is to push and achieve the common objectives of all EU members, and

"The energy landscape is changing at an unprecedented pace, both in the world and in the European Union," says my interlocutor, and so begins IPEEC Newsletter's chat with Dr. Tudor Constantinescu, Principal Adviser to the Director General for Energy in the European Commission and newly appointed Chairman of IPEEC's Policy Committee.

The day is a sunny one, and we sit in the lobby of a building not far from the Eiffel Tower in Paris. Tudor is here to represent the European Union at a series of meetings on energy efficiency, a subject he has been deeply involved in for twenty years, first at the Energy Charter in Brussels and then at the Romanian Agency for Energy Conservation (ARCE), the Network of European Energy Agencies, and the Buildings Performance Institute Europe, which he founded and led as Executive Director.

to ensure that all make contributions in line with their skills and resources while always aiming to improve and achieve better results."

Tudor believes strongly in **the need for cooperation and trust between countries to further energy efficiency for the benefit of all**. "Resources and knowledge may differ geographically, but the art is to put technologies and resources together to bring the benefits – efficiency benefits – to the transition to a low carbon economy everywhere," he says, with an emphasis on the last word. In this, he believes IPEEC provides a valuable platform for dialogue and exchange. "IPEEC offers the basis for a platform for the EU to share its experiences and successes, and also the challenges it faced, on energy efficiency with a lot of countries, not just the G20 and large economies but also beyond. We need such a platform and to strengthen it [...], to really build knowledge and trust among participating countries and engage other international organizations, such as the IEA – which has strong analytical capabilities. The world is big and big actions are required, locally and regionally."

He continues, "it is not that someone wants to impose something arbitrarily, but a true collaborative partnership exercise. It is important that we have a common understanding, access to the best knowledge and technology, so that those acting in

different regions can make the best decisions on energy efficiency and develop sustainability without locking-in inefficiency."

A good example of voluntary collaboration is the G20's activities on energy efficiency. In 2014 G20 Leaders endorsed the G20 Energy Efficiency Action Plan for countries to work on six energy efficiency areas: transport, buildings, finance, networked devices, industrial energy management, and electricity generation. This was followed by the G20 Energy Efficiency Leading Programme (EELP), the first long-term framework on energy efficiency for the G20 and beyond, adopted by G20 Leaders at the Hangzhou Summit in September 2016. IPEEC was mandated to coordinate the G20's work under both plans.

"The G20 provides an excellent platform bringing together large developed and developing economies, who are the largest energy consumers. [...] The G20 Energy Efficiency Leading Programme is a very good basis for starting enforced and strengthened action first of all for G20 countries, but also for other countries and organizations [...]. It can support work in areas not immediately tackled by those involved in the EELP but that are also important for the countries involved," he observes.

Again, trust is an important factor for Tudor. He praises the increasing attention placed on energy

efficiency by the G20 and the momentum for action it creates. He adds, however, that "it is a challenge to really bring cooperation to the level of trust and confidence that goes beyond the G20. I see the role for a platform on the basis of the work IPEEC has done to encourage various countries to go further and make their own commitments, to make their own policies that fit their circumstances and achieve optimal results." For this, he stresses the importance of a long-term view. "This concept is strong at the EU level- a long-term view of the costs of energy efficiency. It is vital not to base decisions on short-term calculations, but to really take into account long-term perspectives and impacts on society and the economy."

People, perhaps, are the biggest challenge of all. "We have to cope with the expectations people may have today. It is not so much about convincing them of the benefits of energy efficiency, but to convince people that we can bring these benefits to individuals, to the economy, and to the climate negotiations." He says this with feeling and purpose, someone who knows that much has been done, but there is much still left to do.

That is no doubt true, but one thing is clear: energy efficiency needs effective leadership, and IPEEC is in safe hands with its new Chairman, **Dr. Tudor Constantinescu**.

## The buildings sector challenge in Italy

A. Federici, C. Martini, R. Moneta, *Energy Efficiency Technical Unit, ENEA - Italy*

What place is more relevant for energy efficiency than where we live and work?

The energy efficiency renovation of buildings is a priority for Italy. More than two thirds of the building stock was built before 1976, the year of the first Italian law on the energy performance of buildings. The energy savings potential is great and often achievable through interventions characterized by a short payback period.

Indeed, **the Italian Strategy for the energy renovation of the national building stock assesses an energy saving potential of almost 5.7 Mtoe per year by 2020.** The corresponding level of investments in the residential sector is about EUR 13.6 billion per year for interventions aimed at the overall renovation of buildings, and EUR 10.5 billion per year for partial interventions (roof, facade, windows, heating system). In the services sector, the amount of necessary investments is about EUR 17.5 billion per year.

In order to face this challenge and make real the aforementioned huge investment potential, deep transformations have already begun with the aim of modifying the Italian construction sector and reshaping strategic visions, processes and products.

Indeed, some mature technologies are already available, **resulting in different factors guiding the process:**

- The crisis of traditional market areas and new emerging fields, with the losses of the former already offset by the gains of the latter, represented for example by plant engineering, facility management, and integration of building services.
- The adoption of new products and evolution of systems and components, such as 3D printing, the development of robotics and the so-called Internet of things.
- The development and spread of information technologies within three different and interrelated fields: inter-cooperation among all the players of the chain; interoperability of models to support improvements of processes, design systems, building management and maintenance; and adoption of Building Information Modeling (BIM) for the reduction of design errors.
- New processes resulting from the integration of different operative levels, able to (re)activate and radically improve the productivity of the construction sector: new contract standards, also integrated with BIM application and/or Lean Production principles; evolution of the materials potential and building equipment.





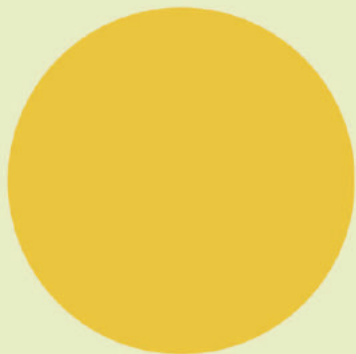


**Albeit not yet completed, all of these phenomena are already ongoing, clearly depicting the evolutionary process taken in at least three areas:**

- The use of data and BIM, reducing the risk of changes and delays to a minimum and allowing to control expenditure and additional costs during and after the construction;
- The use of prefabricated components, heavily simplifying building site procedures and reducing labor need in the site itself;
- Industrialization of supply, reshaping traditional ways to meet the micro-demand for building maintenance/renovation, integrating products and services.

Notwithstanding this very promising potential, most of the technologies above have not yet become common in the market. This is mainly due to a lack of expertise among practitioners and/or higher costs compared to the market average. The absence of dedicated budgets and long payback times are the main barriers to the spread of large-scale investments. Lack of technical expertise in the credit sector is the other side of the same coin: “traditional” bank loans are the main financial instrument employed for financing energy efficiency projects.

**By contrast, different financial instruments could be chosen according to the type of energy efficiency intervention, whether “standard” or more complex, in combination with the economic elements involved in the decision process. More information on already implemented, reliable “solutions” may be very helpful to aggregate similar energy efficiency projects and eventually replicate them, thus facilitating their bankability and, more generally, improving their attractiveness.**



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## IRENA's REmap analysis shows that the two pillars to decarbonise the global energy system are renewable energy and **energy efficiency**

In March of 2016 the International Renewable Energy Agency's (IRENA) released the second volume of its global renewable energy roadmap (REmap) study showing that renewable energy is essential to realise long-term climate targets.

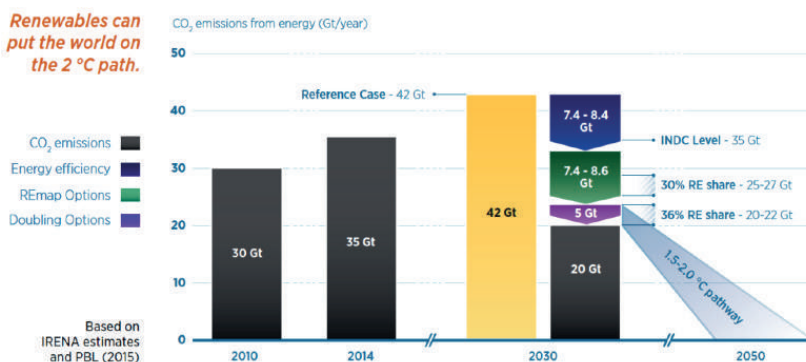
Going below the 2 °C target called for in the Paris Agreement will require a doubling of the renewable energy share in the global energy mix by 2030. This requires the substitution of fossil fuels and a rapid acceleration of renewable energy starting today, but also continued efforts beyond 2030 that will be required in order to ensure that the long-term climate change mitigation goals are achieved. According to REmap, decarbonisation of the global energy system will require

renewable energy shares in total global primary energy supply to reach between 50% and 70% by 2050 depending on how energy demand grows. Energy-related carbon dioxide (CO<sub>2</sub>) emissions, which makes up around two-thirds of global greenhouse-gas emissions, must go down to 20 gigatonnes (Gt) per year by 2030 and 5 Gt by 2050, reaching zero quickly after.

Accelerating renewable energy alone will play an important role, but alone, it will not be sufficient to put the world on the 2 °C pathway. IRENA's REmap analysis has shown that a combined portfolio of renewable energy and energy efficiency technologies is required to achieve deep CO<sub>2</sub> emission reductions necessary to go below 2 °C (see figure).

In realizing the long-term global objectives, there are various ways renewable energy and energy efficiency technologies can positively influence each other. For example, with savings in energy demand, the same amount of renewable energy capacity can cover a higher share of the total demand. At the same time, some renewable energy technologies also offer improvements in energy efficiency, such as a solar photovoltaics with 100% efficiency compared to a coal-fired power plant that can reach average efficiencies of around 40%.

IRENA's forthcoming study under its REmap umbrella elaborates on these synergies at technology and sector level. The study carries out a bottom-up analysis for the largest energy using G20 economies, including China, Germany, India, Japan and the United States. According to the study, current government plans are increasingly considering the need for both energy efficiency and renewable energy, however, the synergies between the two need to be better understood and reflected in new energy and climate policies.



For more information please visit [www.irena.org/remap](http://www.irena.org/remap) or email [remap@irena.org](mailto:remap@irena.org)

## Deepening energy efficiency cooperation and seeking green development



**Dai Yande**, Director General, Energy Research Institute (ERI) of the National Development and Reform Commission (NDRC), China

At the G20 Summit in Hangzhou in September 2016, Leaders discussed and reached consensus on a wide range of topics related to the creation of an innovative, invigorated, interconnected and inclusive world economy, as well as other issues. Among these topics, energy efficiency was highlighted as a key priority. The endorsement by Leaders of the G20 Energy Efficiency Leading Programme (EELP) placed energy efficiency in a prominent position within the framework of global policy issues, providing a crucial foundation to further promote international collaboration on energy efficiency.

Recognized as an important measure to enhance energy security, optimize the energy mix and improve environmental quality, many countries have developed medium-to long-term energy efficiency goals. The

European Union put forward “20-20-20” as part of its 2020 Climate and Energy Package, and Germany set a target of reducing primary energy demand by 50 percent by 2050.

The Chinese government also attaches great importance to energy efficiency. From the very early stages of economic reform to now, energy conservation and energy efficiency have been a key strategic component of China’s Five Year Plans. Since 2005, China has set energy intensity, measured by energy consumption per unit of gross domestic product (GDP), as an indicator of national socio-economic development.

With the global economic downturn, all countries are facing great challenges to accelerate their development and transformation into low-carbon economies.

As an important platform for global economic and energy governance, the G20 is an important body that can deliver on global climate change objectives and needs to play a leading role in driving energy efficiency improvements. It can do so by:

### **1. Playing a key role in promoting energy efficiency as a key measure to address climate change.**

The Paris Agreement adopted in 2015 elevated the issue of climate change to a new priority level on the international agenda. Research from the International Energy Agency (IEA) shows that to limit global temperature rise to less than 2 degrees Celsius, energy efficiency improvement needs to account for about 57 percent of energy related emissions – making it the most cost-effective measure to reduce energy related greenhouse gas emissions.

### **2. Realizing the full potential of energy efficiency to create economic prosperity.**

Continuous energy efficiency improvements can generate multiple benefits, such as energy capacity, new markets, and a new growth dynamic for economic development. For example, energy efficiency has led to the development in China of more than 5,000 SMEs over the past ten years specializing in energy savings, generating revenues of about USD 50 billion and creating nearly 600,000 jobs. Energy efficiency has also helped avoid 30 million tons of coal equivalent (tce) in energy consumption for traditional energy industries, and brought new momentum for the transformation and upgrading of economic

development.

### **3. Recognizing energy efficiency as a driver to improve environmental quality of the environment.**

Developing countries, in particular, are faced with increasingly severe energy and environmental constraints due to high population density, economic development and rising income levels. Significantly improving energy efficiency, including the efficiency of end use products, buildings, and industrial parks and cities, can strongly contribute to meet growing energy demand. It can also play an important role in improving people's livelihood and welfare by reducing emissions from various pollutants and improving the city environment.

### **4. Integrating energy efficiency as a key pillar of the energy transition.**

Energy technology breakthroughs have in the past been essential drivers of industrial revolutions. They are however not static – breakthroughs are continuous and ongoing, and have led to such technological innovations as global energy interconnections, electric vehicles, energy storage technology, and 3D printing. There are tremendous opportunities for developed and developing countries alike to reshape their energy production and consumption systems through the application of new technologies. Currently, we are witnessing a new round of technological breakthroughs in global energy development. Increasing energy efficiency is necessary to seize the opportunities available to drive the energy transition and enhance international competitiveness.

### **5. Grasping the new opportunities for international cooperation on energy efficiency.**

There is great potential to improve energy efficiency globally in the long-term. To achieve the dual goal of economic growth and sustainable development, both developed and developing countries should continue to significantly improve energy efficiency. The G20 comprises of developed and developing economies and therefore allows for the effective strengthening of energy efficiency cooperation. In the context of the current slowdown in economic and trade activity, strengthening exchange and cooperation on energy efficiency, innovative technology, best practices, and business models can become drivers to boost global economic growth, employment and sustainable development.

China benefits from international collaboration and likewise should also contribute to energy efficiency improvements internationally. In its new position **as the world's largest energy producer and consumer, China has the responsibility, obligation and ability to play a leading role in energy efficiency.** Taking the opportunity of the G20 Energy Efficiency leading Programme, China should continue to promote energy efficiency through the proactive exchange of advanced technology, products and services, and to jointly advance the universal goals of sustainable development and climate change mitigation with countries.

# Strengthening energy efficiency collaboration- in pursuit of Green Growth

**Ren Shuben** *Director General, National Development and Reform Commission (NDRC), China*

China has always been an advocate for energy conservation and energy efficiency. Even at the early stages of the country's reforms and open-up policies, China had already formulated energy guidelines which called for paying "equal attention to energy production and saving – making energy saving a priority". In recent years, China has achieved its goal to "quadruple economic growth through [only] doubling energy consumption growth".

In the 2000s China paid even more attention to improving energy efficiency. Since 2005, China has designated energy intensity - measured by energy consumption per unit of gross domestic product (GDP) - as an indicator of national socio-economic development, and

has achieved remarkable results. From 2006-2015, energy intensity fell by 34 percent. This led to savings of 1.6 billion tons of coal equivalent (tce), with a reduction in carbon dioxide emissions of 3.6 billion tons, as well as significant reductions in emissions from other pollutants. World Bank research shows that **China has contributed more than half of total global energy savings in the past twenty years.** China's own experience has shown that improving energy efficiency plays a key role in promoting economic transformation, ensuring energy security, protecting the environment and addressing climate change.

In the future, China aspires to develop into an innovative, green and open economy.

China's 13th Five-Year Plan for Economic and Social Development (FYP) has set a clear energy intensity reduction goal of 15 percent by 2020 –keeping total energy consumption to less than 5 billion tce. At the same time, China has proposed changes to the energy mix by significantly decreasing the share of coal in total energy consumption and increasing non-fossil energy sources to 15 percent of total energy consumption.

Such national actions are important, but so too are international ones. Progressing global energy efficiency further requires strengthened international collaboration. Major energy consuming countries such as those represented in the G20 need to play a leading role. In September this year, the G20 Leaders at the Hangzhou Summit endorsed the G20 Energy Efficiency Leading Programme (G20 EELP), which is not only a programmatic document, but also a major milestone for energy efficiency collaboration. The G20 EELP for the first time outlines a set of G20 Voluntary Pillars for Energy Efficiency Collaboration and a G20 Long-Term Aim, which together set a concrete framework for energy efficiency collaboration under the G20. Thus, to strengthen energy efficiency collaboration and actively respond to energy challenges and climate change has become the common aspiration and responsibility of the international community. Below, I would like to share three recommendations to strengthen international collaboration on energy efficiency, especially under the G20:

**First is to give full play to the important role of energy savings and energy efficiency in addressing climate change.** I call on G20 countries to strengthen international energy efficiency collaboration, prioritize energy efficiency domestically, and lead and encourage other countries to implement the Paris Agreement in a joint, active response to global climate change.

**Second is to further strengthen the market framework and industry**

**support for energy efficiency in the G20.**

Energy efficiency has multiple benefits. It leads to reductions in environmental pollution and greenhouse gas emissions, and also drives economic prosperity, economic growth, and the creation of green jobs. I recommend that the G20 continuously work together to expand the scope of collaboration to strengthen energy efficiency, and support the development and scale up of energy-efficient equipment and products, as well as the energy service industry, and establish international platforms for the exchange of information for enterprises. This will strengthen the industrial and market framework for energy efficiency globally and create economic momentum.



**Third is to innovate and expand the areas of G20 energy efficiency collaboration.**

In recent years, G20 members have carried out various forms of collaboration on energy efficiency. In the future, this can be extended to demonstration projects and

energy efficient production. I suggest expanding the scope of collaboration to other countries and regions so that together we may explore potential and innovative forms of collaboration, leading to the construction of a new energy efficient future.

Energy security, environmental protection, and climate change are common challenges faced by mankind. There is a growing consensus that energy efficiency and emission reductions are key to low-carbon development. Energy efficiency is the inevitable first choice for all countries on this path to low-carbon development. China will actively participate and lead in international energy cooperation by sharing policy and experiences, best available technologies and best practices, and new market concepts in an active exchange with other countries, so that we may all jointly work to promote energy efficiency and actively contribute to global sustainable development.

## Energy efficiency has been and will be key to a low carbon transition

**Dr. Brian Motherway, Energy Efficiency Division Head, IEA**



You don't need to squint to see that the clean energy transition is approaching quickly. The silhouette of wind turbines and solar panels installed on the neighbors' roof are no longer novel – they're increasingly normal. Investment in renewable energy now makes up 70 percent of all power sector investment. Coal-fired electricity generation in China was down in 2015 while generation from low carbon technologies was up. Low prices pushed investment in upstream fossil fuels down by a quarter. So while decarbonizing our energy supply has been critical, it's what you don't see that's had the greatest benefit to the global climate to-date.

Energy demand peaked in 2007 in OECD countries and demand has since stabilized at levels not seen in over a decade. The annual growth in energy demand in China was the lowest it has been since 1999. Global energy intensity improved at a rate three times greater than the average over the past decade. These developments are conflicting with the idea that lower energy prices beget higher consumption.

**So what is going on?**

Another no-carbon "source" of energy has been working in the background to speed up the transition to a sustainable energy

system. Analysis from the International Energy Agency (IEA) shows that improving energy efficiency has had the largest role in lowering energy demand and reducing greenhouse gas emissions. Efficiency saved the equivalent of 13 percent of final energy consumption in 2015 in OECD countries. Huge efficiency gains in China over the last decade lowered coal consumption by 350 million tons in 2015. Energy efficiency improvements across these countries lowered emissions by 2.7 billion tons of CO<sub>2</sub> in 2015.

**How is this possible?** While the year-over-year changes in efficiency may appear small, over time its impact can be truly significant. If the efficiency of our lights, appliances, buildings, vehicles and motors had not improved in OECD countries since 2000 we would have added the energy demand of another Japan to the global energy system. Efficiency improvements in China alone avoided adding the energy demand of another Germany.

That efficiency is improving is no accident. Investment in energy efficiency grew 6 percent in 2015 to USD 220 billion. This was driven by policy. Since 2000, the number of policies mandating minimum efficiency levels has grown

substantially. The share of global energy consumption from the industries, buildings, products, and vehicles subject to mandatory standards has tripled since 2000. Meanwhile, the average efficiency level mandated by these policies has risen by a quarter. Vehicle efficiency standards covered 74 percent of new vehicle sales and saved 2.5 percent of global oil consumption in 2015 – approximately the annual production of Brazil.

Unlike conventional oil and gas resources, **energy efficiency is the one resource that all countries possess in abundance.** This resource is at the fingertips of policy makers who can and should continue to broaden and strengthen policies. While efficiency gains to-date have been impressive, they are still far off from where we need to be. To achieve our goal to limit warming to well beyond 2 degrees, efficiency is a central action. IEA analysis shows that over one-third of all emissions reductions needed are achieved through energy efficiency by 2040. The upshot is that efficiency doesn't just help us decarbonize, it works to satisfy all of our energy policy goals such as improving energy security, access, affordability. It is the first fuel.



## District energy: a tried-and-tested energy efficient solution to modern urban energy problems

**Lily Riahi**, Sustainable Energy in Cities Advisor, UN Environment Programme

For many cities worldwide delivering sustainable heating and cooling means the development of modern district energy systems. These consist of networks of insulated pipes running under city streets, pumping hot or cold water to multiple buildings in a district, neighborhood or city. Modern district energy systems can reduce primary energy consumption for heating and cooling of urban buildings by half. This dramatic reduction in energy consumption delivers the diverse benefits that progressive cities are committed to providing for their citizens, such as clean air and local jobs.



The energy sources needed to heat or cool the water pumped around modern **district energy systems are often extremely energy efficient and renewable**. These energy sources are often local and otherwise cannot be used, such as waste heat from industry or power stations, or excess heat in the sewage system. Many cities also connect large renewable sources such as geothermal, solar thermal or free cooling from lakes, rivers or seas. The multiple benefits of using such energy sources include reduced fossil fuel consumption, cleaner air, steady and reduced heating and cooling prices, and increased energy security by reducing blackouts.

Paris is one example of what can be achieved. The City of Light has developed one of Europe's largest district cooling networks, using the cool water from the river Seine to provide cooling to offices, shops, hotels and museums. This district cooling network uses half the energy for cooling that individual buildings would otherwise use and produces 50 percent less CO<sub>2</sub> emissions and cuts refrigerant use by 90 percent. Paris also has a city-wide district heating network using geothermal, biomass and excess heat from power plants and waste incinerators to heat the equivalent of 500,000 households. By 2020, the district heating network will use 60 percent renewable or recovered energy.

This is just one of the forty-five city examples from the UN Environment Programme's flagship report District Energy in Cities – Unlocking the Potential of Energy Efficiency and Renewable Energy, which sets out the best practice technology applications, policy and business models needed for cities to implement sustainable heating and cooling.

Through 150 interviews across 45 low-carbon cities, district energy systems emerged as a best practice approach in scaling up renewable energy and energy efficiency. Cities worldwide, in countries as diverse as China, Canada, the United States, South Korea, Singapore, Colombia, Russia, the European Union, Saudi Arabia, the United Arab Emirates and Japan are using modern district energy to reduce energy consumption for heating and cooling of urban buildings by 30 – 50 percent and to achieve ambitious targets for energy efficiency, renewable energy, CO<sub>2</sub> and clean air.

Switching to modern district energy requires innovative local planning that integrates energy and land-use, and coordination across multiple city sectors such as energy, transport, housing, waste collection and wastewater treatment. Because it's new to many cities it takes time and many local governments worldwide do not have the capacity, accounting tools, or a clear mandate from their

national governments to intervene in the sector.

In response to these barriers UN Environment's District Energy in Cities Initiative is supporting local and national governments worldwide to strengthen policy and planning frameworks that will enable accelerated investment in modern district energy systems.

The Initiative has built a partnership of almost 40 organizations including technology providers, utilities, financial institutions, academia, international organizations, city networks, NGOs and champion cities to raise awareness and transfer policy best practice worldwide in countries such as India, China, Serbia and Chile.

One example of the Initiative's work is an ongoing collaboration with the government of Italy to support Marrakech and the national government of Morocco to adopt and scale-up modern district cooling systems. This approach to cooling buildings can contribute significantly to Morocco's ambitious energy efficiency targets, and showcase the viability of the technology to other countries in the region.

The District Energy in Cities Initiative is a multi-stakeholder partnership and one of five key energy efficiency accelerators of Sustainable Energy for All.

# Energy productivity first: The SEforAll Energy Efficiency Accelerator Platform

- UN - World Bank : Sustainable Energy For All

**Energy efficiency – so often overlooked – is a game-changer.**

Major improvements in the way we use and save energy globally are becoming increasingly important. Focusing on energy efficiency maximizes benefits while reducing cost. It also significantly mitigates climate change, accelerates economic development, reduces environmental pollution and alleviates extreme poverty.

An 'energy-productivity-first' approach, using targeted energy efficiency measures, could deliver close to 40 percent of the emissions reductions required to limit global warming to 2 degrees Celsius by 2020, helping to fulfill the Paris Agreement on climate change. At the same time, it forms one of the pillars of Sustainable Development Goal 7 (SDG7), which calls for universal access to affordable, reliable, sustainable and modern energy by 2030.

Energy efficiency brings important multiple benefits, from enhanced productivity to a cleaner environment and more livable cities. Targeted energy efficiency measures by countries, regions, cities, private companies and individuals, in sectors such as buildings, industry and transport, have the potential to reduce global energy-related emissions by 1.5 gigatons by 2020.

Yet although great progress has been made over the past two decades – especially in China, India, the United States, Europe, states of the former Soviet Union and parts of Africa – the great potential of energy efficiency has not yet been harnessed effectively.

Current and planned energy-efficiency policies harness just one-third of the economically viable energy efficiency potential – meaning that two-thirds will go untapped if we continue to do business as usual. Additional investments worth USD 430 billion every year are still needed in order to reach the SDG7 target of



doubling the rate of energy efficiency by 2030.

Perhaps energy efficiency does not yet get the attention it deserves because of its quite technical nature, or maybe because it requires long-term investment and radical rethinking of the status quo. **We need to trigger behavioral change.** The challenges include generating project pipelines, with a lack of knowledge on how to put bankable projects together and how to take them to scale. Governments are not yet prioritizing energy efficiency, and there is limited knowledge-sharing across borders.

Although energy efficiency solutions exist throughout our economies, the specific technologies, policies and regulations, supporting programmes and investments differ widely from sector to sector. In all instances, there is a need for strong collaboration between the public sector, which sets policy and regulatory frameworks, the private sector, which has the technologies



and skills needed to deploy them, and the financial sector, which typically supplies the investment needed.

To enable energy efficiency to help us meet our climate goals and support economic growth, we need to change the way we do business.

The SEforALL Energy Efficiency Accelerator Platform is a public-private partnership programme established to scale up energy efficiency policy, action and investment, with the aim of doubling the rate of improvement in energy efficiency worldwide by 2030. SEforALL launched the Accelerator Platform to drive action in a number of key sectors, including buildings, lighting, appliances, district energy systems, transport and industry.

The Accelerator Platform, which was already showcased at COP21, provides governments with the opportunity to engage with a variety of significant stakeholders whose knowledge of technologies, markets, financial instruments and implementation approaches can

support energy-efficiency policies and goals. Through technical assistance, policy advice, mutual support and collaboration, it works to promote a major increase in energy-efficiency investment.

The Platform is made up of individual sector 'Accelerators', each comprised of organizations and companies that are active in both global and local markets, including UN Environment Programme, UNIDO, Philips, Danfoss, Johnson Controls, the International Copper Association, FIA Foundation, World Resources Institute and many more. The Copenhagen Centre on Energy Efficiency helps to coordinate these sectoral efforts as SEforALL's energy efficiency hub. The Accelerators can leverage the expertise of these partners in a global campaign to recruit commitment to ambitious energy efficiency goals that can be tracked and reported.

Accelerating energy efficiency in these sectors will harness multiple benefits. The SEforALL Accelerator Platform is not only about cutting greenhouse gases, but also about

reducing environmental pollution, promoting social and economic development, increasing productivity and improving health and well-being.

A shift to more energy-efficient refrigerators, for example, could reduce global electricity consumption by more than 275 terawatt hours per year – equivalent to the electricity needs of Australia – and save USD 40 billion on electricity bills. In Costa Rica, a poor household could save as much as USD 230 a year by replacing an old refrigerator with a new, efficient model.

What if someone proposed that you could do more with less, save USD 11 trillion in the next 15 years, reduce CO2 emissions by 5 gigatons, create a huge number of jobs, and help to make modern energy services available for everyone across the world? Wouldn't you do whatever you could to move towards energy efficiency?

We hope we all will – together at COP-22 and beyond.

Dan Hamza-Goodacre, Energy Efficiency Program Director, ClimateWorks



## How much does energy efficiency cut the costs of 2-degree future?

It is commonly known that energy efficiency decarbonizes the economy, although it doesn't directly decarbonize energy supply in the way renewables do. Instead energy efficiency reduces the amount of energy being used and thus the amount of carbon. Less well known is the contribution that energy efficiency makes to reducing the costs of decarbonizing energy supply by reducing the amount of energy we need to decarbonize. The key question here is - by how much?

ClimateWorks Foundation partnered with The Fraunhofer Society, a German research organization, to answer this question. The findings were published in a new report — "How Energy Efficiency Cuts Costs for a 2° C Future" (aka The Cheaper Pathway report), in which we analyzed how energy efficiency policies and programs in Brazil, China, Europe, India, Mexico, and the U.S. can reduce the cost of economy-wide decarbonization. The results were not surprising but they are most certainly compelling. Taking an energy efficient pathway to reducing carbon emissions commensurate with a 2-degree pathway will save up to USD 250 billion per year for these regions, with no net cost to society through 2030. In contrast, an energy intensive pathway that focuses primarily on decarbonizing energy supply can help achieve a 2° C future, but at substantially greater expense.

Between now and 2030, the energy efficient pathway can reduce the global cost of limiting warming to 2° C by up to USD 2.8 trillion compared to the more energy intensive pathway. The potential annual savings of the energy efficiency pathway vary by nation. Annual savings range from 0.1 to 0.4 percent of annual GDP and are not sensitive to macroeconomic shifts or to changes in fuel price. To put this in perspective, the cost savings from an energy efficiency pathway can eliminate energy poverty worldwide. Recent research by the World Bank shows that **the world can achieve universal access to electricity through investments of between USD 40 billion and USD 100 billion annually. The USD 250 billion saved in the regions studied could help finance this critical goal.**



## TRACK RECORD UNDERPINS FUTURE POTENTIAL

While modeled results suggest significant future savings from current and new energy efficiency policies and programs, the future costs of decarbonization in China, the European Union and the United States have already been reduced by at least USD 750 billion between 2015 and 2030 by energy efficiency policies that have been adopted since 1990. These gains have been realized in the transport, buildings, and industry sectors through policies such as fuel economy and appliance standards, building energy codes, and best practices in industrial energy management.

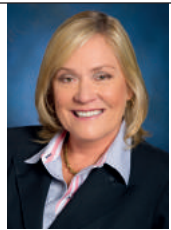
The Cheaper Pathway report most likely represents a conservative estimate of the contribution of energy efficiency to reducing the costs of decarbonization. This is because, even in the more energy intensive renewable pathway there is some energy efficiency baked in. To exclude efficiency would have required choosing renewables and other decarbonization options such as carbon capture and storage (CCS) on a larger scale that would have pushed the price per ton of carbon to levels we did not think society would bear, and thus we used a cut off of USD 200 a ton of CO<sub>2</sub>. If we assumed no energy efficiency in the renewable pathway then the cost savings of the efficient pathway would have been significantly higher. Furthermore, we account for moderate “rebound effects” from energy efficiency in some sectors and regions, where new energy demand partially consumes the gains made by energy efficiency. However even compensating for rebound effects, the analysis finds that energy efficiency continues to provide the lowest-cost carbon abatement for most policy interventions in the regions studies.

## OTHER KEY FINDINGS

The Cheaper Pathway report finds that the mix of energy efficiency potential across different regions is heterogeneous, with some regions seeing substantial potential for cost savings in sectors where other regions see less potential. [For example, In India we found significant opportunities to improve energy efficiency as few sectors there are currently subject to best practice efficiency standards. India can prioritize efficiency gains while strengthening its economy and making decarbonization more affordable. Cost savings in India are however lower when one compares a renewables with an efficiency pathway. This is because of increasing energy demand in these regions; a significant amount of energy efficiency is required in order for them to contribute to any cost effective pathway that can help limit warming to 2°C. In contrast, there is a narrower range of opportunities in the US and EU, however the opportunities that do exist are substantial and make huge economic sense – the biggest emissions savings opportunities were found in existing buildings in the EU and US. These may be achieved through new policies and programs resulting in large scale retrofits.]

This regional variation reinforces the need for policymakers to consider domestic energy consumption patterns when prioritizing efficiency interventions. Across regions, the INDCs submitted for the 2015 international climate negotiations mostly state national emission reduction targets, with some also stating energy efficiency targets. Plans for realizing these targets will have to be further developed. If nations are looking for the lowest cost options to limit warming to 2° C, which most national treasuries are usually keen to identify, then efficiency needs to be much more seriously considered than is currently the case.

“How Energy Efficiency Cuts Costs for a 2° C Future” shows that the world’s largest energy consuming countries and regions have much to gain from prioritizing energy efficiency in the policy queue. In addition to nearly USD 3 trillion in savings for decarbonization, such policies bring substantial societal and economic benefits in reducing the cost of energy access, reducing the need for more expensive expansions of energy supply, improving business competitiveness, creating jobs, and improving air quality and human health. INDC’s that overlook the contribution of energy efficiency, risk overlooking far more than just energy savings.



## Doubling Energy Productivity: The Path to Achieving Paris Goals

**Kateri Callahan**, President, and Karen Hughes, Senior Program Manager of International Policy, Alliance to Save Energy

Reducing greenhouse gas emissions enough to limit global temperature increases to well below 2 degrees Celsius is nothing short of a monumental challenge. But it can be accomplished, and the single most important element of any successful strategy will be to rapidly improve energy productivity.

Energy productivity is a measure of how effectively we transform energy use into economic output. As the ratio of economic output to units of energy consumed, it effectively quantifies the benefits of efficient energy use. The Alliance to Save Energy and the Global Alliance for Energy Productivity support efforts to double energy productivity in the United States and the world to achieve widespread economic, social and environmental benefits.

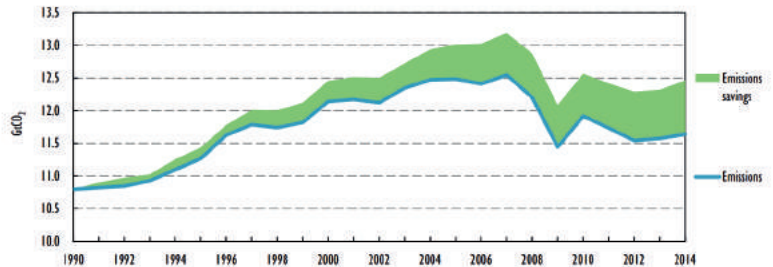
### Benefits of doubling energy productivity

U.S. modeling shows that doubling energy productivity could save \$327 billion annually in energy costs and add 1.3 million jobs to the American economy. Globally, energy productivity has the potential to create 6 million jobs and reduce the cost of fossil fuels by almost \$2.2 trillion.

These benefits aside, the most critical reason to prioritize energy productivity is to enable countries around the world to achieve the climate goals set in Paris last year. The International Energy Agency estimates that energy productivity makes up 49 percent of the emissions reductions needed -- beyond the measures planned in countries' Intended Nationally Determined Commitments (INDCs) -- to stabilize the climate.

In fact, according to an analysis by the Energy Transitions Commission, energy productivity will have to improve by 3 percent annually from now through 2050 to meet the goals set at COP21.

**Chart: IEA emissions from fossil fuel combustion, and emissions savings from energy efficiency investments, 1990-2014**



Source: IEA (2014e), "CO<sub>2</sub> emissions by product and flow", IEA CO<sub>2</sub> Emissions from Fuel Combustion Statistics (database), available at <http://dx.doi.org/10.1787/data-00430-en> (accessed 1 June 2015).

The transition to a clean energy economy required by the Paris agreement will be a financial challenge. However, prioritizing energy productivity can significantly ease this burden, reducing by \$2.8 trillion the financial investments required to keep global temperature rise to "well below" 2 degrees.

### Energy productivity provides a path forward

In short: Rapid action is necessary. World leaders must enact policies that will accelerate deployment of the energy efficiency technologies and practices that we already know are effective.

Within this framework, public and private sector institutions will be able to take actions to improve energy productivity and reduce emissions. These include unlocking finance at a scale necessary to retrofit buildings worldwide, adopting robust appliance standards and building energy codes to lock in long-term emissions reductions, and improving industrial energy management. These tried-and-true policies and practices are guaranteed to help break the link between economic growth and rising energy consumption.

Key to this effort will be the Nationally Determined Commitments (NDCs) that countries have submitted and can continue to update with increased ambition. **These NDCs present an opportunity for countries to make energy productivity the first priority** -- and thus to jump-start their transitions to a clean energy economy by limiting the long-term growth of energy demand, stabilizing national grids, and improving opportunities to expand energy access to all.

No country should have to choose between opportunities for growth and combatting climate change. The good news is that, with rapid improvements in energy productivity, countries around the world will not have to make that choice.



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Believe in you

## Let's give planet earth a new breath

Because global warming is nowadays a major issue threatening the safeguard of our planet, Attijariwafa bank places energy transition at the center of its environmental approach, by accompanying companies and states in their projects targeting a sustainable growth.

With over MAD 5 billion of commitments since 2011 in major wind and solar parks in Morocco, Attijariwafa bank has confirmed its position as a key player in the funding of renewable energies.





## How to score investments to achieve Paris goals? CarbonCount gets you there

**Kevin Lucas, Director of Research, Alliance to Save Energy**

### What sets the CarbonCount scoring tool apart?

The Conference of the Parties – now in its 22nd year – is upon us yet again, and attention is keenly focused on the goal made in last year's Paris climate conference: limiting global warming to well below two degrees Celsius by the end of the century. In order to achieve this goal and address other climate challenges we face, decision-makers around the world must use all tools available to them. Two of the best options we have are energy efficiency and renewable energy, and it is critical that we drive investment toward them.

For this reason, the Alliance to Save Energy has developed the CarbonCount scoring tool, a third-party green bond certification in accordance with the CarbonCount methodology. This tool evaluates bond investments in U.S.-based energy efficiency or renewable energy projects to determine how effectively they can be expected to reduce CO2 emissions per \$1,000 of investment. Through the CarbonCount scoring process, the Alliance aims to push investments and favorable capital pricing toward projects that promise superior climate benefits.

While other rating systems might offer a qualitative assessment of the "greenness" of an investment, a CarbonCount score is unique in that it takes a quantitative approach to determining the CO2 benefits associated with a project. This enables investors to perform an apples-to-apples comparison between projects located in different regions of the country and comprised of varying underlying assets. With this extra level of confidence about the CO2-reducing benefits of a project, investors will be able to better steer their support to the projects that have the greatest impact.

Industry leaders who have utilized the CarbonCount scoring tool have found that the tool allows them to transparently and effectively communicate the value of projects to investors. "We find **the CarbonCount score to be an efficient tool to evaluate and communicate a project's environmental benefits to both equity and debt investors,**" says Jeffrey Eckel, President and CEO of Hannon Armstrong, a leader in green bond financing. "By systematically using a quantitative and transparent metric that allows

different projects and technologies to be compared and evaluated, the CarbonCount methodology enables more targeted investment choice by parties seeking to maximize their contribution to reducing CO2 emissions."

### How does the scoring tool work?

A CarbonCount score starts with a review of Independent Engineer reports for each project or subproject in a portfolio. These reports contain detailed information about the quantity of energy generated (for RE projects) or the amount of energy saved (for EE projects), which is then mapped into an hourly load profile.

The data is then entered into the U.S. Environmental Protection Agency's AVOIDED Emissions and Generation Tool (AVERT), which contains hourly marginal emissions profiles for ten geographic areas of the U.S., largely corresponding to the footprint of regional power grids. By using the marginal emission rather than average emissions, a CarbonCount score more accurately reflects the CO2 reduction based on the actual time and location of the project's energy generation or savings. This is a critical distinction, as not only are marginal emissions often higher than average emissions, but





the energy profile of certain technologies or measures might differ substantially from a static, flat reduction.

Generally, projects that are located in areas with a high-CO<sub>2</sub> electricity system (that is, parts of the country where relatively more electricity is generated from coal, such as the upper Midwest) have better CarbonCount scores than projects located in low-CO<sub>2</sub> grids (areas with higher natural gas or hydro power resources, such as the Northwest). Additionally, projects that generate or save more electricity per unit cost of the asset result in higher CarbonCount scores. While investors previously might have intuited these

relationships, the CarbonCount score offers confirmation.

### Opening the door to increased funding

As the broad and rapid deployment of clean energy technologies becomes increasingly important for meeting energy needs while addressing climate concerns, financing will be a key element to unlock the potential of renewable energy and energy efficiency projects. The Alliance to Save Energy's CarbonCount methodology will help investors target their funding to projects that have the best carbon reduction return for the dollar.

And by making these choices easier and more transparent, we are optimistic that – at this critical time – more funding will become available as we work to reduce CO<sub>2</sub> emissions.

The Alliance to Save Energy is an internationally known and respected non-profit organization that promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment and energy security. The Alliance works closely with diverse industry leaders, including Whirlpool Corporation, Lockheed Martin, Siemens, United Technologies Corporation and The Dow Chemical Company.

## Energy Efficiency and the RINGOs, Research and Independent NGOs

Yves Marignac, négaWatt Association, RINGOs representative at COP21



The Research and Independent NGOs (RINGOs) community brings together researchers, practitioners, educators, and experts dedicated to a low carbon and resilient development. Sharing the concern that the world needs to build a clear pathway to the decarbonisation of the economy through effective, fair and sustainable options, they offer a breadth of pluralist knowledge and expertise to help respond to the urgent need for coordinated action.

Our constituency welcomes the political will and appreciation of scientific evidence that led Governments to sign the Paris Agreement. We also welcome the growing commitment of businesses and local authorities to achieve ambitious targets such as 100% renewables, and the growing attention paid to the key issue of energy efficiency.

This is fully consistent with the own contribution of the négaWatt Association, a French independent non-profit gathering of experts working on sustainable energy policy options. The sustainable approach proposed by négaWatt is based on three principles. It is first about being collectively and individually clever about what energy services we are using energy for (what we call energy sufficiency), then about implementing the best

technical options to use as less energy resources as possible to deliver energy services (energy efficiency), and finally substituting dominant energies by renewable ones. In a nutshell: bringing clever, efficient, renewable based energy services to all.

In the framework set by the Paris Agreement, nationally determined contributions from the parties are fundamental for limiting warming to 2 degrees or less. But they are still insufficient. Increased energy efficiency is the most ready and obvious mean for accelerating decarbonisation.

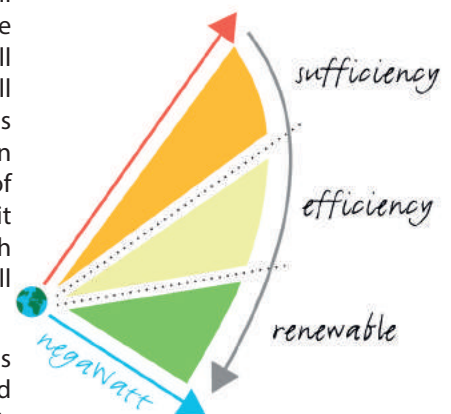
It will require both decentralised action to tap the potential on the very local level, and concerted action to ensure a consistent transition of the global economy. Stimulating international collaboration on energy efficiency will be particularly instrumental in the decades to come.

**Energy sufficiency will be crucial to complement energy efficiency technologies.** Reducing the waste of energy for somehow useless services in developed countries will be key to meet their own climate objectives. Behaviour change will also send an important signal to all those longing to get to this developed lifestyle, particularly in emerging countries. In a world of constrained energy consumption, it is also a matter of solidarity with places where more energy is still needed to meet vital needs.

As a local member of the RINGOs constituency, négaWatt was proud to speak on their behalf at COP21, emphasizing their potential

contribution to identify and develop the best mitigation and adaptation options, to monitor and evaluate their implementation in an accountable, comparable and transparent way, as well as to develop sound and equitable means to protect, and meet the needs of the most vulnerable communities. To support implementation of the Paris Agreement, the full breadth of human talent and invention will need to be deployed. This will require a sustained commitment to research, development, education, public engagement, and capacity building. The RINGOs are eager to collaborate with all players and engage at all required levels.

We bring words of confidence to all those who face obstacles and have doubts about a fair, ambitious and binding agreement: pluralistic research and expertise are key resources, which you can rely on. Integrating this into open decision-making processes will help to meet the level of ambition that this agreement must set for the world.



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MOROCCO SUSTAINABLE ENERGY FINANCING FACILITY

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## LA LIGNE MAROCAINE DE FINANCEMENT DE L'ÉNERGIE DURABLE



## A turnkey financing solution for energy efficiency and small-scale renewable energy investments of Moroccan private companies

MorSEFF is a credit facility dedicated to financing energy efficiency and small-scale renewable energy investments of private companies operating in the agriculture, industry, transport and commercial buildings sectors in Morocco.

The facility offers access to a unique package comprised of:

- Loans or leasing available through local participating banks,
- Free technical assistance,
- Investment incentives of 10% or 15% of the financing amount

Eligible projects include new equipment purchases (efficient motors, boilers, compressors, pumps, solar water heaters ...) as well as large or more complex projects (modernisation, retrofit, capacity increase) which lead to energy savings or the use of renewable energy and CO2 emissions reduction.

These sustainable investments result in lower operating costs, higher productivity, reduced environmental impact and overall better competitiveness.

### A customised approach :

- Loans / leases of up to 3 000 000 DH for the purchase and installation of pre-qualified equipment included in the List of Eligible Materials and Equipment (LEME) available on [www.morseff.com](http://www.morseff.com)
- Loans of up to 50 000 000 DH / leases of up to 10 000 000 DH for investments requiring a more thorough technical and financial assessment with evaluation and implementation support.

\* The Southern and Eastern Mediterranean (SEMED) Multi-Donor Account is supported by Australia, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Taipei China and the United Kingdom.



## Lithium ion batteries for **efficient energy** storage system application

**Rachid Yazami**, *Draper prize winner, Energy Research Institute (ERIAN), Nanyang Technological University, Singapore*

For a broad public lithium ion batteries (LIB) are known for their daily utilization in portable electronics such as in smartphones, tablets, PCs, cameras, toys...Less commonly known is LIB application in electro-mobility (EM) and in energy storage systems (ESS). In fact, EM and ESS are relatively recent market developments as they concern less visible systems such as electric vehicles, power plants and buildings, yet EM and ESS are the fastest growing market applications of LIB. There are about 20 billion LIB cells used worldwide in 2016. Market forecasts puts it at 6.8 billion the amount of LIB to be produced in 2016, an over 20% increase from 2015.

The reasons behind LIB outstanding commercial success is due to their excellent performances when compared to other rechargeable battery systems. **LIB store up to 5 times more energy per weight and volume units and deliver as much power.**

Their calendar life can exceed 10 years in some applications while their cost is dropping each year due to scale effect and competition. Moreover LIB demonstrate a good safety record despite the highly publicized and unfortunate Samsung Galaxy Note 7 case.

In the future energy transition LIB will play a major role in EES as they will significantly contribute to reducing greenhouse gas emission owing to high energy efficiency LIB provide. Electrical energy has this in particular that production and consumption should be equal at any time. Conventional electric power plants such thermal (coal, gas, oil) and nuclear better operate at constant power output. However consumption is variable by nature from day to night, upon weather changes and surges in demand. To balance between production and consumption energy storage is commonly used. Among various ES technologies, those based on LIB is the fastest growing one as LIB provide more flexibility, and shorter response time, while being economical. Applications include 1) regulation (frequency, voltage support, load levelling, power quality); 2) arbitrage (store energy when cheap), 3) back-up and

reserve (UPS, power continuity), 4) black start (active reserve to restart a power generator), 5) investment deferral (avoid infrastructure investment) and, 6) grid independent power supply (in areas not connected to grid such as rural community, stations powered by solar energy).

In the sustainable clean energy space (solar, wind, waves, hydroelectric) ES will also play a major role in the energy efficiency because of the intermittent nature of these energy generation systems. For instance solar and wind energy power output depends on whether sun is shining or not and wind is blowing or not. LIB based ESS are among best choice considering outstanding performances in terms of energy and power density, calendar life, safety and costs.

LIB overall worldwide production is expected to grow from 60 GWh in 2015 to 215 GWh in 2025, which is about 15% annual growth per year. ESS will play a driving force in this future growth as humanity is moving towards cleaner energy to save environment and reduce global climate warming.

# New Study Reveals Options to Replace Global Warming-Causing Chemicals Used in Air Conditioning

David Nemptow - Building Technologies Office Director - US State Department of Energy

Chemicals commonly used to air condition buildings pose a significant threat to the global climate. Today, Secretary of State John Kerry is hosting foreign and environmental ministers in New York City – to coincide with the United Nations General Assembly – to voice support for an ambitious amendment to the Montreal Protocol to phase down the use of these dangerous chemicals, known as hydro fluoro carbons (HFCs). Phasing down HFCs – which can be hundreds to thousands of times more potent than carbon dioxide and can last for centuries when released into the atmosphere – could avoid up to 0.5°C of global warming by the end of the century. While reducing CO2 pollution is essential, gases such as HFCs are rapidly growing in use in air conditioning and refrigeration around the globe **(by 2050, energy consumed for space cooling in developing nations alone may grow by 450% from 2010 levels as billions of people seek relief from high heat and humidity)** which means that without action on HFCs, gains from cutting CO2 would be significantly undermined.

The Energy Department plays an important role in protecting the environment, including by contributing to worldwide negotiations to address the issue globally. Last fall, Secretary of Energy Ernest Moniz discussed the need to phase down HFCs under the Montreal Protocol. Last year in Dubai, countries agreed to work within the Montreal Protocol to an amendment in 2016 – and the follow up negotiations next month in Rwanda represent the last opportunity to fulfill the end-of-2016 commitment. However, many developing and hot weather countries still have reservations about how well alternatives to HFCs can perform compared to conventional refrigerants, especially in very hot



Secretary of State **John Kerry** and Energy Department Secretary **Ernest Moniz** discuss energy issues. Photo courtesy of the U.S. Department of State.

climates.

Led by my colleague, Antonio Bouza, the Energy Department’s Building Technologies Office (BTO) has been working with a research team at Oak Ridge National Laboratory (ORNL), led by Omar Abdelaziz, to assess how several low-global warming potential (low-GWP) alternative refrigerants perform under high temperature conditions of up to 131°F, and to see if they were up to the challenge. Last year we looked at the performance of alternative refrigerants in the mini-split air conditioners that are used ubiquitously worldwide. This year, we focused on performance in packaged rooftop unit air conditioners, given these units’ prevalence in low-rise commercial buildings. The evaluation program was advised by a panel of experts from Brazil, China, Egypt, India, Italy, Japan, Peru, Saudi Arabia, the U.S. and the United Nations.

Today, we’re releasing a report that summarizes the results of this evaluation program, based on rooftop units designed and manufactured in the developing world. The research at ORNL shows quite clearly that both R-22 and R-410A – two of today’s most common refrigerants – have several viable replacements, including ones that will give equivalent performance even under extreme ambient temperatures. Because alternatives

were tested without making any major equipment changes, researchers believe that their actual performance can be even better when used in air conditioners that are optimized for their unique properties.

This new study, like the one before it, provides the international community with solid evidence that viable replacements for HFC refrigerants can be used across building types and climate zones – including some of the most punishing ones – without significantly impacting unit energy efficiency or cooling capacity.

The U.S. Energy Department is working on other fronts with industry partners and national labs to develop a new generation of air conditioning and heating technologies to revolutionize the industry by utilizing low- to zero-GWP innovations in advanced and non-vapor compression systems. Projects with the Energy Department’s office dedicated to building technologies, such as advancements in supermarket refrigeration, commercializing alternative refrigerants, and developing the first electrochemical compressor for home water heaters are leading the way among existing technologies. At the same time, projects such as magnetocaloric cooling seek to leap-frog the status quo to new, zero-GWP refrigeration technologies.



# Lighting the world with 10 billion LED bulbs: the CEM Global Lighting Challenge

Chad S. Gallinat, U.S. Global Lighting Challenge lead



Stand next to a traditional incandescent light bulb and a light-emitting diode (LED) bulb, and you will feel the difference as much as see it. Both produce the same amount of light, yet the incandescent bulb is too hot to touch. All that excess heat is wasted energy.

LED technologies slash this waste dramatically. The best-performing 60-watt equivalent LED bulbs available today consume 85 percent less energy than their incandescent counterparts. What's more, the bulbs have seen a dramatic cost reduction – 94 percent since 2008. With their vast potential for

energy savings, lower costs, improved performance, and added benefits like long life and maintenance savings, LEDs are driving an energy-efficient lighting revolution.

But much of the world still relies on non-LED technology. Lighting accounts for 15 percent of global electricity consumption and 5 percent of worldwide greenhouse gas emissions. At the same time, 1.2 billion people lack access to modern energy services, including reliable lighting. For many, hazardous energy sources like kerosene are the only option.

To address these immense problems, last year at COP21 in Paris, the Clean Energy Ministerial (CEM) launched the Global Lighting Challenge (GLC) – a race to deploy 10 billion high-efficiency, high-quality, and affordable lighting products (like LEDs) as quickly as possible.

Since its launch, the GLC has built a public-private volunteer coalition of more than 40 governments, manufacturers, retailers, and expert groups. Sixteen countries and the European Commission have already endorsed the GLC and are actively contributing to the 10-billion-bulb goal. At the time of this printing, the GLC had accumulated more than eight billion LED lighting products pledged toward the 10 billion goal, and more than 150 million deployed around the world.

The GLC provides a high-profile global platform to recognize public- and private sector leaders driving the global transition to efficient lighting and cutting global carbon emissions. The GLC will continue to seek additional commitments until the goal of 10 billion bulbs is achieved. The GLC asks participants to commit to stock, sell, promote, finance, or implement policies encouraging the sales of advanced lighting products. Participants are big and small businesses, retailers and manufacturers, regional and global development agencies, and local and national governments, to name a few.

**Population growth and increased urbanization are expected to cause a 50-percent rise in lighting demand by 2030.** However, if we accelerate the global lighting transition to advanced lighting solutions such as LEDs (through campaigns like the GLC), we have the ability to cut electricity consumption from lighting in half over that same time period. That's 50 percent more light using 50 percent less electricity!

What's more, a global transition to highly efficient LED lamps could avoid 800 million metric tons of carbon dioxide emissions a year, equivalent to 684 coal-fired power plants.

More than just a statistic, these efforts are a socioeconomic imperative – an improvement for humanity and the environment, rooted in the innovation and collaboration spurred by efficient lighting.



## Passive Systems for Buildings Air Refreshment in Marrakesh Region: the RafriBAT research Project

**Brahim BENHAMOU**, *Professor & project - University Cadi Ayyad of Marrakesh*

The building sector is one of the most dynamic areas in economically emerging countries, due to high growth rates in population and urbanization. In the Southern and Eastern Mediterranean (SEMED) countries, it is estimated that in 2025, urban population will increase by about 100 millions additional inhabitants relatively to 2000 [1]. Hence, the housing demand increases drastically making the construction sector one of the main drivers of the global economic growth in these countries. In the SEMED region, buildings energy consumption represents more than 30% of the consumed energy. Besides, traditional buildings, which are integrated in their climate environment and thus energy efficient, are substituted by "modern" buildings with poor energy performance. Specifically, in the Moroccan traditional way of life, people developed empirical solutions (architectural, but also behavioral) to reach a minimal level of thermal comfort. However the rapid growth of income induces higher comfort requirements, which are mostly achieved through the use of electric air-conditioning equipment. This leads to a significant increase in energy consumption and in greenhouse gas emissions. Furthermore, the impact of air conditioners usage on electricity demand is a serious issue as the peak electricity load increases continuously, forcing the National Electricity Authority (ONEE) to build additional plants. Morocco, which is highly dependent on energy imports, has in the past decade taken determined steps to tap into its significant renewable energy resources. In 2009, the Moroccan public authorities launched a national energy strategy, setting clear targets for wind, solar and hydropower. It was one of the first countries in the MENA region to scrap most fossil energy subsidies while at the same time adopting energy efficiency measures to reduce energy consumption with a target of 12% by

2020 and 15% by 2030. Thus, a wider deployment of energy efficiency technologies across all sectors of the economy is needed. **The construction sector, which accounts for more than 25% of the final energy consumption in Morocco [3], is one of the key sectors for achieving the energy efficiency target.** To achieve the goal of the best environmentally friendly thermal comfort within a building having lowered conventional energy consumption, it is advisable to make use of passive or low-energy cooling strategies, including the reduction of the cooling and heating loads of the building. Moreover, it is often possible to fulfill thermal comfort requirements at low energy cost, taking advantage of the particular climate features by an appropriate design of the building [2]. A specific research was conducted at Cadi Ayyad University of Marrakech on the impact of passive systems for air refreshment on energy saving, in terms of cooling and heating, in buildings in Marrakech region. Many passive systems are studied including (but not limited to): thermal inertia, the earth-to-air heat exchanger, the ventilated double hollow core slab, solar chimney, thermal insulation, composite eco-friendly construction materials. This study showed that these systems has significant impact on energy saving in buildings. In this way, it was stated that thermal insulation of the roof is the most significant parameter that reduce the energy demand of a house in Marrakech region. However, the walls thermal insulation using conventional insulation materials (polystyrene, glass wool and so on...) is not mandatory. The usual way for construction of external walls in Marrakech consisting in double walls with an air gap of around 5cm (the so-called "cavity wall" technique) is largely sufficient. Indeed, our research showed that, the combination of the "cavity wall" technique and thermal insulation of the roof contributes to an energy saving of up to 40%. Further

thermal insulation, especially for the slab-on-grade floors (house's floor in contact with soil), is not recommended as it increases significantly the cooling demand. On the other hand, thermal inertia plays major role in the reduction of the ambient air amplitude which are large in Marrakech climate. On top of the recommended thermal insulation and relatively high thermal inertia, large double glazing areas oriented South, will led to the erasure of the heating demand of the building. Of course, these glazing areas should be equipped with overhangs to avoid summer overheating. In addition solar protections of West facing façades are mandatory. The glazing areas oriented West or East, if any, should be minimized. Regarding the residual cooling load of the building, it may be met by means of semi-passive systems, such as the Earth-to-Air Heat Exchanger (the so-called "Canadian Well"). This system consists of a fan that pushes ambient hot air into a pipe buried under the ground at around 3m. The hot air is then cooled to almost 20°C, thanks to the soil inertia. This system may therefore supply the required cool air to the building.

### RafriBAT research project overview

**RafriBAT** stands for *Passive Refreshment of Buildings*

**Funded by:** Hassan II Academy of Sciences and Techniques, Programme PARS 2010

**Running Period:** 2012-2017

#### Partners:

- Energy Process Team, LMFE CNRST Associated Research Unit (URAC27), Faculty of Sciences Semlalia, Cadi Ayyad University, Marrakech, Project Leader
- Renewable Energy & Energy Efficiency Laboratory, National Center for Studies and Research on Water and Energy - CNEREE, Cadi Ayyad University Marrakech
- P2M2E Laboratory, Faculty of Sciences and Techniques, Cadi Ayyad University Marrakech
- Heat Transfer Group, LAMMAT Laboratory, Faculty of Sciences Ain Chock, Hassan II University of Casablanca
- Elie Mouyal Architect,
- Private Companies: GMTA for Thermal Systems, ISTICHAR design office.

## Energy efficiency Law in Morocco

**Fedwa Bouzoubaa**, Business lawyer - LL.M. Degree in European Law at Lausanne University – Casablanca



Energy efficiency is governed in Morocco by the Law n°47-09 of 17 November 2011 relating to the energy efficiency of buildings (« the Law ») and by the implementation Decree n° 2-13-874 of 15 October 2014 approving the building energy code (« the BEC ») which sets energy performance standards in buildings and establishing a National Committee on Energy Efficiency in buildings.

The principal objective of the Law is to increase the efficiency of energy resource consumption, to reduce energy costs on the national economy and to contribute to sustainable development. It also encourages the use of solar water heaters and energy-saving light bulbs.

**There are four main aspects to the Law:**

### 1. Minimum Energy performance requirements:

The law sets the criteria of "minimum energy performance" for appliances and electrical equipment powered by natural gas, liquid or gaseous petroleum products, coal and renewable energies. No implementation decree has been adopted yet to specify these minimum energy performance requirements.

In parallel, mandatory labelling under the Moroccan standard NM 14.2.300 applies since 2012 to household cooling, cooking cleaning appliances and also to household electric lamps.

The Law also sets limits on the energy consumption of buildings and vehicles, providing for energy efficiency incentives in road transport, buildings and industry that should be fixed by regulations.

The BEC is the first regulation adopted to optimize energy needs for heating and air conditioning for new buildings in the residential and service sector (tourism, health, education, administration, commerce and services) according to 6 climatic zones in Morocco.

### 2. Mandatory energy audits:

The law introduces the obligation for high energy-consumption sectors (institutions and companies) and individuals to carry-out energy audits. It also applies to companies and institutions in the production, transmission and distribution of energy. An implementation decree on energy audit is currently under development.

### 3. Energy impact study:

The Law subjects to an energy impact study any projected urban planning or new building construction program, regardless of use. A list of these projects is to be addressed in a specific regulation.

### 4. Enforcement regime.

There is no single body appointed by the government to enforce energy efficiency regulations in Morocco. Both judicial police officers and administration officers responsible for the energy performance inspections, are the enforcement authorities of the Law.

**Violations of the obligations set forth in the Law are punishable**

**as an administrative offence in the main following cases:**

- fail to carry-out energy audits;
- fail to comply with the minimum energy performance requirements in buildings, appliances and equipments using energy;
- obstruct energy performance technical inspections;
- sell in Morocco non-compliant appliances and equipments.

The above offences are punishable by a fine ranging from MAD 2.000,00 (approx. 180,00 euros) to MAD 300.000,00 (approx. 27.000,00 euros). In the event of a repeat offence, the penalty shall be doubled.

### Conclusion

Strong emphasis on improving energy efficiency is also a key issue in the Morocco's energy strategy. The organization in November 2016 of the climate change conference COP22 in Marrakech will hopefully contribute to accelerate the implementation process of the energy efficiency legal framework in Morocco.



## PACE Adds Market Value for Home Energy Upgrades

**Dr. Kathleen Hogan, US State Department of Energy**

Today, the U.S. Department of Energy announced new partnerships and resources that will bring the benefits of energy efficiency and renewable energy to more states and communities. As a part of this announcement, the Energy Department is releasing updated guidelines for residential Property Assessed Clean Energy (PACE) programs. Residential PACE is an innovative financing mechanism that allows homeowners to make affordable clean energy investments in their homes.

**Residential PACE programs allow state and local governments, where permitted by state law, to offer this financing option for homeowners to fund energy efficiency, renewable energy, and water conservation improvements to their homes.** Homeowners are able to benefit from energy improvements immediately and pay back the costs over time through their property taxes. If the property is sold, including through foreclosure, the remaining PACE assessment will stay with the property, meaning the next owner is responsible for the outstanding PACE assessment and will benefit from the lower energy bills.

The Energy Department is now seeking stakeholder input on the draft revised Best Practice Guidelines for Residential PACE Financing Programs. Visit the State and Local Solution Center to learn more and submit comments.

Making the value of energy efficiency visible to homeowners, purchasers and sellers is an important component of PACE financing programs. The Energy Department is working in partnership with appraisal organizations and the real estate industry to help ensure homeowners realize the investment value and benefits of energy efficiency.

### These activities and partnerships are highlighted below:

- Launched last year, the Better Buildings Home Energy Information Accelerator brings together 28 national and local partners who are making home energy information, such as a home's efficiency certification or its estimated energy usage, readily available at relevant points in residential real estate transactions. Through this program, the Energy Department is developing replicable, sustainable approaches that make energy-related information – important data for the home buying process – easily available to home buyers and sellers through multiple listing service (MLS) and other reports. These partners are also improving how energy efficiency is captured in appraisals and real estate transactions.
- In coordination with The Appraisal Foundation, the Energy Department is sponsoring the development of appraisal resources focused on valuation of energy efficiency and high performance features in residential and commercial buildings. The Appraisal Practices Board has adopted two Valuation Advisories that identify areas where high-performance building features and market conditions impact the



valuation assignment process, including scope of work, information gathering and analysis techniques, and core competencies for appraisers.

- The Energy Department is also working in partnership with the Appraisal Institute which delivers training and education to appraisers and real estate agents. The Appraisal Institute developed training resources, valuation tools, including the residential green and energy efficient addendum.

The Energy Department is also developing tools and resources and hosts webinars and peer exchanges focused on the topic of capturing energy efficiency in real estate transactions and appraisals, including the following:

- The Energy Department's Home Energy Score is similar to a vehicle's miles-per-gallon rating. It helps homeowners and homebuyers understand how much energy a home is expected to use and provides suggestions for improving its energy efficiency. It also allows an energy performance comparison to other homes nationwide.
- The Energy Department's Better Buildings Residential Program Solution Center provides informational resources, step-by-step guidance, case studies, and descriptions of programs that have integrated energy efficiency into appraisals and real estate transactions.

We look forward to continue working closely with states and communities, PACE program administrators, and the residential real estate and home improvement industries to continue advancements in methods for incorporating energy efficiency into appraisals and real estate transactions.

# NOVEC, engineering company for sustainable development

GROUPE CDG

Founded in 1958, Novec is now a key player in engineering in Africa. As a subsidiary of the group "Caisse de Dépôt et de Gestion", Novec offers first-class engineering services to support the Kingdom in the development of territorial projects and provides assistance in growth-generating projects in Africa and the Middle East.

Novec is currently undertaking several projects in different fields ranging from urban planning, building, energy, industry, water, agriculture and environment- to roads and railways infrastructure...

In addition to its classic business lines, Novec has set up two subsidiaries, Ingeplan and TME (Tanger Med Engineering), the first specialized in the production and export of plans and drawings for large civil engineering works, and the second dedicated to maritime engineering.

Backed with its affiliation to the Group "Caisse de Dépôt et de Gestion", one the most important players of sustainable territorial development, NOVEC have assisted the group in a set of structuring projects with growth-generating value for the national economy.

There are several large scale projects, in which NOVEC plays a leading role. Among these, we can refer to the design study of the project of use of surpluses of the northern watersheds, the supervision of the high speed train line (Tangier – Larache section), used waters pre-treatment plant with a sea outlet in Casablanca, the Euro-Mediterranean University of Fez, the Tennis stadium and the Olympic swimming pool of Tangier, the implementation studies of Dar Khrofa, Tamalout and Kherroub dams, etc...

Considering the fact that respecting the environment, health and human development are inseparable and integral elements of Novec's work ethics, a sustainable development charter was adopted by the company in 2010. This Charter is the outcome of a long process that was first initiated in the year 2000 and which consists of the integration of a global approach to sustainable development in its projects.

In the building's sector, Novec has its own principles of energy efficiency so that the criteria and methodologies in the field can be applied. As an illustration, a few projects can be named:

**Taghazout:** The villas are equipped with energy class A air conditioning units and solar roofs for water heating,

**Vichy Thermalia 4\* Hotel Spa:** transformation of heat of thermal water to energy for hot water production (geothermics),

**University hospital of Tangier :** photovoltaic / thermal hybrid solar panels for electricity and hot water production, which downsizes the surface of the reduced installation and also a significant optimization of the embodied energy used in production and logistics

**Euro-Mediterranean University of Fez:** Air Handling Units (AHU) decentralized for heat recovery: the supply of fresh air will be through the patios where the air is "pre-refreshed" by vegetation and fountains, a modern conception of ancient Persian BADGIR (wind towers).

Furthermore, all the conventional technical installations are designed while integrating the energy efficiency component. In this respect, the following systems have been implemented in the majority of building projects:

- Cooling units, heat pumps and air handler recovery with high performance energy class A;
- Fresh air flow modulation system based on actual occupancy requirements;;
- Use of refrigerant fluid R410-a with low emission of greenhouse gases, with very low potential for the depletion of the ozone layer;
- Use of high performance spot lights with a modulation system which adapts the illumination depending on the natural light;
- Managing by command control systems that adjust energy consumption specifically to a building consumption;

Novec's expertise extends beyond the borders of the kingdom. Its know-how has been exported for more than 20 years, particularly in Africa where it is one the key players in engineering and consulting.

Projects such as the preliminary study of roads and other networks of the project of the "Cité des Affaires de l'Afrique de l'Ouest de Dakar", on the current site of the Dakar International Airport Léopold Sédar Senghor, the Agricultural Development study of 17 000 ha along the channel Aftout Essahili Trarza Mauritania, the construction of a business center and a hotel of 100 keys in Libreville and the design of a road development plan for the republic of Ivory Coast... are the confirmation of a strong dynamic in the continent.



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4

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