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Energy solutions for smart cities and communities

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Securing our energy future

European Commissioner for Energy, Gunther H. Oettinger discusses the new Energy Strategy and how it will help to tackle Europe's energy challenges…

Energy is the lifeblood of our society. Our way of life is inconceivable without reliable and affordable supplies of energy: electricity, heat and fuel. Never before has the world needed so much energy: we use almost twice as much as in 1980. If this trend continues, it will be difficult to avoid a major energy crisis, with electricity cuts, petrol or gas shortages.

We cannot afford to wait

The energy challenges are among the greatest tests which Europe has to face: We have to act to prevent global warming. At the same time, we need affordable energy prices as our economic competitiveness depends very much on competitive energy prices and a reliable energy supply. Growing EU dependence on imports from third countries is also a matter of great concern, in particular for oil (85 %) and gas (65 %). All these challenges must be addressed and require strong action.

A new strategy for the next decade

National policies are not sufficient anymore to allow a strong economic recovery and maintain our welfare. Any decision taken by one Member State has an impact on the others. Fragmented markets undermine the security of supply and limit the benefits of a fair competition while our investments for the future will only be profitable and efficient within a continental market. We must promote a common energy policy serving our joint policy objectives: competitiveness, sustainability and security of supply.

An example of the need to think internationally is gas supply. Many Member States are reliant on gas imported from Russia. We all agreed that diversifying our gas supply will benefit citizens and businesses across the EU and we are looking to bring new, additional gas from the Caspian region to the EU. In the past few years, the EU Commission has held continuous talks with governments and companies alike to convince them to deliver gas from this region to Europe. And in June, this European effort will finally bear fruits. In Azerbaijan, the final decision will be taken on how much gas will be delivered to Europe and which pipeline project will be chosen for the first ever direct supply of Azeri gas to the EU.

In very general terms, I see 5 pillars for action to the benefit of all Member States and citizens.

Focus on energy savings

First, there is a vast amount of untapped potential to save energy, which would save money for individuals and businesses alike. Faced with commitments to drastically reduce our emissions and achieve the objective to increase energy efficiency by 20% by 2020, action on energy demand has the most potential with immediate impact for saving energy, reducing waste and maintaining our competitiveness. To this end, the EU has adopted a new energy efficiency directive which obliges Member States to implement binding measures such as an obligation scheme for energy companies to cut down energy consumption at customer level and an obligation for Member States to annually renovate 3% of the central government's building. It also encourages energy audits for SMEs and an obligation for large companies to assess their energy saving possibilities.

A strongly integrated European Energy Single Market

We should no longer tolerate barriers which impede energy flow within the EU. National borders can threaten the benefits of the Single Market, the competitiveness of our industry and the supply of basic needs to all our citizens. Fair competition, quality of service and free access must be guaranteed. The full and proper application of EU legislation is a must. But the existence of the adequate infrastructure is a condition sine qua non. It is time energy is given comparable pan-European infrastructure, as other sectors of public interest such as telecommunication and transport have enjoyed for a long time: by 2015, no Member State should be isolated from the European internal market in energy supply. This means that we have to concentrate our efforts on concrete projects necessary to achieve our goals: solidarity, an inter-connected market, new power capacities, an "intelligent grid" and large scale production of renewable energies available to all at competitive prices. A single European Energy Market will also increase the competitiveness of renewables, allowing excess energy generated in the sunny South to power homes in Northern Europe during times of light wind or vice-versa on blustery days in the North for cloudier days in the South.

Citizens first

These efforts should always focus on the impact on citizens.

Consumers should benefit from wider choice and take advantage of new opportunities. Energy policies have to be more consumer-friendly and this will require further transparency and information: I would like all tools, like the Consumer Check List, to be improved and applied more widely. This also implies that all consumers enjoy their right to basic energy needs at all times, including in a supply crisis.

EU energy policy also aims to achieve more transparency, access to better and more information, better functioning of the retail market, development of adequate infrastructure and safety nets for vulnerable consumers. This is in addition to constant efforts for more safety and security in energy production and processing. Today, the EU represents a decisive added-value for all citizens by ensuring that the highest standards are applied in all Member States for nuclear safety and security, offshore oil and gas extraction or the development of new energy technologies. We must keep on track and continue to be vigilant.

Towards a technological shift

In energy technology, we must consolidate and extend Europe's lead. I would like to develop a European reference framework in which Member States and regions can maximise their efforts to accelerate market uptake of technologies. Europe has some of the world's best renewable energy companies and research institutions: we need to keep this leadership. Beyond the implementation of the Strategic Energy Technology Plan, we have already launched a few large scale projects with strong European added-value:

- Smart grids to link the whole electricity grid system to individual households and give better access to renewable sources of energy;
- The 'smart cities' innovation partnership to promote throughout Europe integrated energy systems at local level and facilitate energy savings.

Strengthening the EU leadership in the world

The EU should be a favoured partner in international negotiations. The present situation, where external partners can "divide and rule", is untenable. The EU has the world's largest regional energy market – 500 million people. It accounts for one fifth of the world's energy use. We import on average around 3 million tonnes of oil equivalent every day. The EU is also the world's biggest economic trading block. We must exploit our geopolitical weight in the world and enjoy the benefits of the Single Market. Every time that the EU has spoken with one voice, for instance in the nuclear international cooperation, it led to results. The integration of energy markets with our neighbours is a must which contributes to both our, and their security. But our international relations must go further and should aim at establishing strategic partnerships with key partners. A common European policy is a strong leverage to strengthen our position in difficult negotiations, and secure our international leadership.

Time for action

This year we will discuss our energy and climate goals for 2030. We will decide whether we choose three targets as we did for 2020 – CO_2 reduction, increase of renewables, and energy efficiency – or just one or two, and whether they should be binding or not. We must decide it this year to allow Member States to prepare and to give certainty to investors in industry. As Jean Monnet said: "Where there is no vision, people perish". Our generation must take the opportunity to make this strategic vision a reality.

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Green Solar Cities

EU Concerto project in Valby/Copenhagen and Salzburg

A basis for a completely new way to build in Europe has been created by the recast of the EU Energy Performance for Buildings Directive from 2010, which demands that new buildings should achieve a nearly-zero energy standard based on local renewable energy sources already from 2018 for new public buildings and from 2020 for all new buildings. At the same time as the EU members states shall create incentives to ensure a similar development for existing buildings.

In Denmark, we are well on the way towards meeting these goals due to recent improved energy saving demands in building regulations including new protected low energy classes 2015 and 2020.

This means that there is a focus on extensive retrofitting of buildings, something which has also been included in the aims of the EU-Concerto project, Green Solar Cities (2007-2013), where EU funding has been utilised as a strong support for the large scale photovoltaic (PV) implementation plan in Valby in Copenhagen. This was launched in 2000 with the aim of supplying 15 % of all electricity use in Valby by PV technology in 2025.

Green Solar Cities (www.greensolarcities.com), had Kuben Management as the administrative coordinator and Cenergia as technical coordinator. Besides the European Green Cities company has been involved as responsible for dissemination and communication work. (www.europeangreencities.com)

The Damhusåen PV plant in Valby which is the largest PV plant in the Nordic Countries. It covers 8% of the electricity at the Damhusåen waste water treatment plant, which is owned by the 'Lynette Cooperative' in Copenhagen. And is supplementing biogas based electricity production to cover almost 50% of yearly electricity use by renewables.

Realisation of large housing retrofit project in Valby at Hornemannsvænge housing estate. 14 kWp PV (100 m^2) and 100 m^2 solar thermal is used for each of 6 renovated housing blocks. These are functioning as a solar energy combined heat and power solution working as a supplement to the normal combined and power system in Copenhagen.

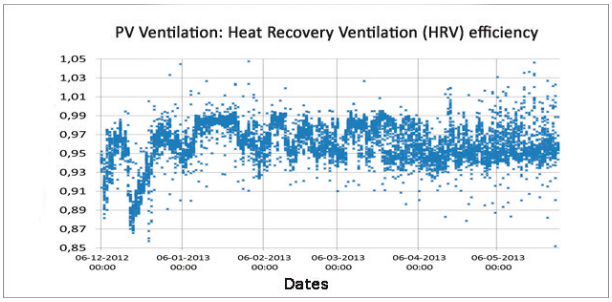
At the Hornemannsvænge housing estate low energy retrofit solutions has been used together with a kind of solar energy combined heat and power, where both solar thermal and PV electricity is supplementing energy from the large combined heat and power plants in Copenhagen.

Realisation in 2012/2013 of large housing retrofit project in Valby at Hornemannsvænge housing estate.

Demonstration of PV assisted ventilation for housing renovation has also taken place in Valby and Copenhagen. Here there has been focus on documenting a low electricity use which can be matched by PV electricity .

PV-ventilation. Compact Heat Recovery Ventilation for housing renovation where electricity use is matched by PV. Test of compact HRV unit from EcoVent/Øland is showing dry heat recovery ventilation efficiency higher than 85 %.

The HRV unit is easy to mount under the loft in existing apartments, taking fresh air in from the walls and leading exhaust air to the roof.



Monitoring results showing very high heat recovery ventilation efficiency of 90-98 % for one apartment during winter/spring 2013. Electricity use for the fans at 115 m^3/h is as low as 18 W.

It is now also aimed to introduce elements from the so-called 'Active House' concept (see: www.activehouse.info), in relation to the Green Solar Cities project monitoring and evaluation in Valby, which will be finalised by the summer 2014.

In the Active House Specifications there is defined a number of specifications within areas like, Energy, Indoor climate and Environment. And in the Energy area there is a focus on the areas: yearly Energy Balance, Energy Design, Energy Supply and Energy Monitoring and Verification, Follow up.

In the area of Energy Balance this is based on a calculation of all energy uses in a building incl. electricity using appliances and effect of the used energy supply system.

In the Active House Specifications there is a demand for energy monitoring, verification and follow up. This is new compared to the situation in Denmark today where there is a lot of focus on good calculation procedures, but, like in most other countries, no link to what the actual energy use will be in practice in realised building projects.

A good possibility here could be to introduce the same demands for 'verification' of all new building projects within a two year period, which already have been introduced in Sweden.

According to the EU-Commission Building Directive, all new buildings need to be nearly zero energy by year 2020, and EU member states need to show how a similar quality can be obtained for existing buildings as well. The Active House Specification is showing how this can be done. (www.activehouse.info)

PV-art gable promoting the Valby/Copenhagen PV plan aiming at 15 % PV electricity in Valby in year 2025.

A very well-functioning example of window integrated heat recovery ventilation (HRV) was established at the P. Knudsens Gade housing area, administered by the housing association AKB, in Sydhavnen in Denmark situated in the Concerto area of the Green Solar Cities EU-Concerto project in Denmark.

The window integrated HRV module was placed besides a normal radiator, which is used for heat accounting. The HRV module is functioning with a radiator function as well and can provide either just room temperature or higher temperatures, so you can avoid a normal radiator.

The new windows for the test apartment was supplied by the Danish EVD company with build in fresh air intake and used air exhaust integrated in the bottom of the window equal to ø140 mm.

Cenergia – Realising solar low-energy building since 1982

Cenergia (www.cenergia.dk) was already started in 1982 as an energy specialist company based on experiences from RTD work on low energy building and solar energy at the Technical University of Denmark. Since then, a large number of solar low energy new build and retrofit building schemes have been realised, in many cases as either EU or Danish funded demonstration projects.

In cooperation with VELUX and other partners involvement in the new Active House standard supporting the EU 2020 demands for nearly zero energy building. (www.activehouse.info)

First passive house building in Denmark in Næstved with CO_2 neutral operation.

Solar chimney, Lundebjerg, Skovlunde was result of architectural competition with focus on PV and ventilation.

Valby School in Copenhagen with BIPV
(Building Integrated Photo Voltaic).

Tubberupvænge, DK
Solar low energy housing with seasonal storage.

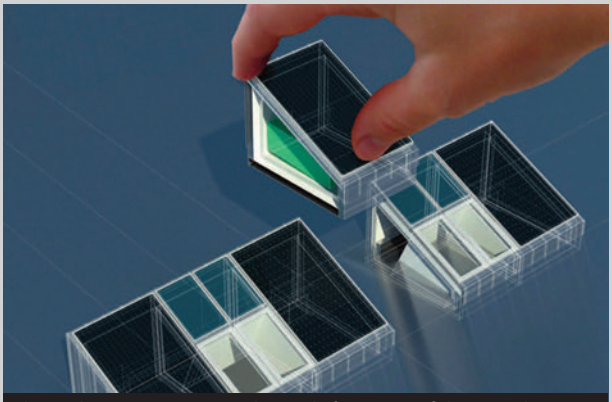
Compact integration of heat recovery ventilation

Development of the CO_2 neutral roof top apartment "SOLTAG" (www.soltag.net) in 2005 in cooperation with VELUX. Received Danish Energy Saving price in 2005

Skotteparken solar low energy housing project at Egebjerggaard in Ballerup near Copenhagen.
Received World Habitat Award in 1994

CHP with Danish district heating solutions and low energy refurbishment in Newcastle, UK. Received UK CHP price in 1995.

During 2012 60 low energy-housing units with prefabricated "Solar prisms" from VELUX and Danfoss was realised in Tranbjerg near Aarhus.



The Solar Prism can combine different prefabricated modules according to individual needs.

At Hyldespjældet the first zero energy housing renovation in Denmark was realised in 2009 introducing prefabricated construction elements from Rockwool and the Solar Prism installation element.

The Solar Prism in Albertslund was placed on the flat roof and includes all installation elements.
Can be purchased from VELUX and Danfoss.

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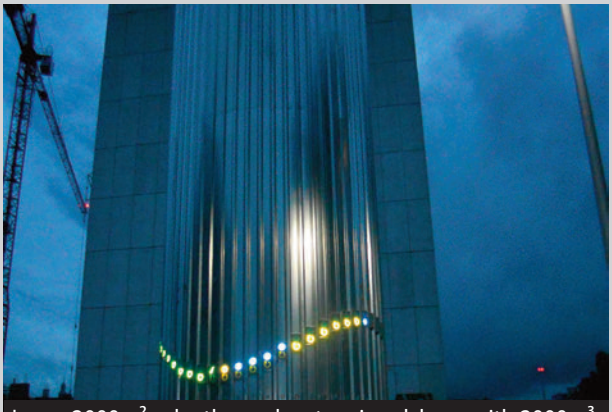
PV gable in Valby. Photo by Rune Sune Berg

777 kWp PV at Damhusåen waste water treatment plant.
Photo by Jon Rytter

Langgadehus housing area in Valby with 200m^2
solar thermal collectors

Hornemannsvænge housing retrofit in Valby



Large 2000m^2 solar thermal system in salzburg with 2000m^3
buffer storage and heat pump.
Photo by SIR (www.sir.at)

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