ISSUE 3, 2013

SECURITY COMMUNITY

THE OSCE MAGAZINE

Welcome to the exclusive preview of the Special Section on Energy in Security Community: the OSCE Magazine 3/2013.

Security Community is a platform for an open exchange of views. We invite you to send in your impressions of the Economic and Environmental Forum.

Security and energy: what is the way of the future?

Selected comments will be published.

Security Community is available in print, as a free app for iPad and online at www.osce.org/magazine.

Harnessing the sea, the sun and the wind

Left and bottom: Testing the world's first tidal turbine developed by Peter Fraenkel, Loch Linnhe, Scotland, 1994/5 (Courtesy Peter Fraenkel); Right top and centre: The SeaGen tidal turbine at Strangford Lough (Image courtesy of Marine Current Turbine, a Siemens business)

Tidal power

In 1994 the British engineer Peter Fraenkel attached a small turbine to the bottom of his steel catamaran in Loch Linnhe in Scotland. This was the world's first tidal turbine. It generated 15 kilowatts of power, enough to boil seven kettles of water, confirming his vision that you could generate energy from the tides.

Together with his partner Martin Wright, Fraenkel went on to generate tidal power commercially. The Sea Gen tidal generator, which they installed in Strangford Lough in Northern Ireland in 2008, is an accredited power station now owned by Siemens that has generated over 8,000 megawatt hours of power into the UK grid by August this year.

In contrast to wave energy won from the widespread surface movement of the ocean, tidal energy is site specific: it occurs around headlands, where water is channelled through a narrow gap. The United Kingdom is well placed to exploit tidal power.

A tidal stream turbine is akin to a wind turbine turned on its head and plunged into the sea. Except that the water pushing the propellers is 830 times denser than air. One of the main challenges is deploying the machinery in the racing tide.

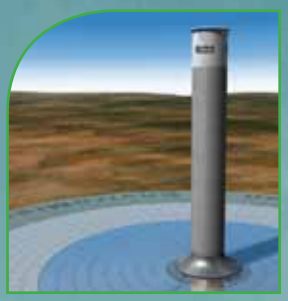
Another challenge is getting consent. In Strangford Lough, the regulators were worried about the grey harbour seals, a protected species. The consensus is that seals are not at risk as they do not go close to the turbine rotors when the tide is flowing strongly.

Stephanie Merry, Director of Focus Offshore Limited, an engineering consultancy specializing in wave and tidal power, kindly provided information for this article.

Photo: Martin Dee

Hot air rising

A solar updraft tower is a giant chimney that generates electricity using energy from the sun. Sunshine heats the air beneath a very wide greenhouse-like canopy surrounding the central base of the tower. Hot air rises, and in this case it has nowhere to go but up the inside of the hollow tower. This updraft drives wind turbines placed in the chimney to produce electricity.



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The taller and wider the tower and the hotter the air, the more energy is produced. Since the ground absorbs much of the heat, electricity generation continues at night. As the ambient air temperature goes down, the ground releases its heat and the updraft continues to flow.

Solar tower technology was tested and proven with a small-scale pilot plant in Manzanares, Spain, which generated 50 kilowatts between 1982 and 1989.

The Australian company EnviroMission has developed the first large-scale solar tower billed to generate 200 megawatts, which it plans to build in Arizona, United States. The tower will be about eight hundred metres tall, making it the second tallest manmade structure in the world, about twice as high as the Empire State Building. Arizona has a standard requiring that regulated electric utilities must generate 15 percent of their energy from renewable resources by 2025.

Making cold with heat

Energy from the sun is becoming an option of choice for cooling our rooms. By the end of 2012, an estimated 1,000 solar cooling systems were installed worldwide, about eighty per cent of them in Europe, most notably in Spain, Germany and Italy. The market is growing fast.

Using solar energy to cool a building is very energy-efficient. That makes it an interesting option in the developed world, where building energy needs are responsible for more than forty per cent of total energy consumption. Solar air conditioning systems are environmentally friendly; most use non-hazardous liquids as refrigerants.

One system developed at the University of La Rochelle in France uses only water. Air coming from outside is first dried using a desiccant, then cooled in an evaporative cooler. The system is kept going by solar energy that heats the air as it leaves the building. Electricity from the grid is needed only to turn the fans.

Desiccant cooling can reduce energy consumption by almost half. But it also has limitations. The cooling needs must be low; otherwise too much electricity is needed for the fans. In hot and humid climates, this type of cooling has to be assisted by conventional cooling.

But in moderate climates where outside absolute humidity does not exceed 14 to 15 g/kg and temperature does not exceed 34 degrees C, solar desiccant cooling can be an interesting way to reduce energy consumption and greenhouse gas emissions.

Paul Bourdoukan of SORANE SA, formerly of La Rochelle University, kindly provided information for this article.

Net positive. The Centre for Interactive Research on Sustainability at the University of British Columbia uses rainwater, solar power, waste heat from neighbouring buildings and a geo-exchange field to produce more energy than it consumes. See: cirs.ubc.ca

Choosing energy without jeopardizing peace

By Hélène Connor

Most developed countries are now radically restructuring their energy policies with a view to stabilizing climate change, and the needed transitions are likely to have major repercussions on their economies and beyond. As an example, in December 2008, the European Parliament adopted the EU Climate and Energy Package, which includes 2020 targets for carbon emissions reduction, energy efficiency improvements and the share of energy from renewable sources in European energy policies. Several countries are planning to go beyond the agreed 20 per cent. If they succeed, they will unwittingly get more than they bargained for: better energy policies for one, but additionally a lasting commitment to a world with fewer resource conflicts, particularly in relation to energy. They could also contribute to world peace; what a bonus!

"Renewable energy can be energy for all since it is the propriety of none."

Too often the search for energy has been associated with land grabbing, assassinations, kidnappings and other acts of violence to secure access to fossil energy resources. Many of the recurrent conflicts in the Middle East are directly or indirectly linked to the ownership of oil-rich lands, and the costs in terms of money and human lives are huge. These costs have never been counted in the price users pay for their energy – an omission that adds to the distortions already present in the energy market, in the form of various subsidies for instance, and favours an overuse of energy. But they are tallied on another tab. One way or another, society has to pay the price, more often than not perpetuating an endless cycle of poverty. Procuring energy does not need to be so brutal. So let's try to be sensible and face the problem squarely.

Energy is a strategic tool, not an end in itself. What counts is not the sheer quantity of energy, but rather its efficiency at rendering services. Energy services are very diverse and are geared to improving human welfare. The latter, when measured not in terms of the traditional and inadequate Gross Domestic Product (GDP) but rather in terms of the Genuine Progress Indicator (GPI), which accounts for social factors and environmental costs, peaked around 1978 and has been declining since. A recent study has shown that, coincidentally, the year when the GPI peaked was also the year when our ecological footprint began outstripping resources.

For the past thirty years we have been simultaneously increasing our use of energy and our ecological debt. The financial and other costs are reflected in the present state of both the environment and the economy. Resources wars and other power struggles continue unabated in several regions of the world. Despite the disasters engendered, some still want more access to energy and are ready to kill for it, unleashing the demons of terrorism in their wake.

Over the years, however, we have learned that our activities and our happiness are limited not so much by a lack of energy but rather by the impact of those activities, particularly those of the energy sector.

The need for energy security has to date been misunderstood by many analysts to mean the need to increase supply at all costs. But grabbing more resources is not the way. On the contrary, such an approach increases unacceptable risks at incalculable costs. Moreover, it is unethical, considering that it is often foreign companies that develop energy resources in countries where the population has not been consulted and may not even be aware of what is going on.

More energy is not the way to trigger progress or improve global human welfare. Even in less industrialized countries, the situation can only be assessed case by case. It is quality that counts, not quantity. Studies from the International Energy Agency and others show that we can do just as well with a lot less energy. Slowly but surely, we must phase out energy sources such as fossil fuels and nuclear reactors that irreversibly damage the environment or humankind's health and genetic pool. As stressed by Amory Lovins in his seminal book Soft Energy Paths,"surprisingly, a heroic decision does not seem necessary in this case, because the energy system that seems socially more attractive is also cheaper and easier."

So it is with a free mind that we can turn to renewable sources of energy, such as the flow of the wind, the rise and fall of the tides, agricultural crops, that are available all over the globe and which we are re-discovering. All are accessible and, since they mostly depend directly or indirectly on the sun, they are inexhaustible. We only need to be smart about harnessing and using them efficiently. All can be collected by peaceful means and all can provide the whole range of needed services, even when they have to be stored or transported.

Renewable energy technologies are improving every day – they can provide low, medium and high temperatures, electricity and fuels for mobility. Green technology is leading everywhere – even in oil-producing countries. Electricians are installing smart grids, builders are designing smart buildings. Smart cities are springing up on all continents, led by smart mayors, and new businesses are coming to life, creating jobs galore. Decentralized energy production is closer to the place of consumption, thus saving

energy lost in transport. Hence it makes better use of investment and provides the physical resiliency so needed to protect against the risk of blackouts with the increased occurrence of extreme climate events. Now that a momentum has been created, wise political action is needed.

Renewable energy provides a freedom – within the strict framework set by the laws of nature. The new "energetician" must be smart and have an understanding of the world that goes beyond mechanics. He or she deals with living entities and works for human beings. This can be more complex than digging for black stones or extracting liquid matter from the soil. Certainly these underground substances have promoted part of mankind into a very comfortable material world, but this benefit should not have remained unshared. Renewable energy can be energy for all since it is the propriety of none.

Our world is in transition towards a more sharing humanity. Almost all countries have made this part of their political vision: a sign that our mental energy is getting used to inspiring a new way of thinking, redirecting us towards a wiser and smarter use of energy and other resources – what some people are calling Gaïa or the noosphere.

The trend towards renewable energies is now gaining ground and a sense of empowerment has started rejuvenating active citizens now able to decide on their own energy supply, their own footprint, on how to impact the world. No need to wait for 2030 or 2020: it is happening today. Let's drop the aggressive search for fossil fuels and turn to the energy present in our own backyard, which we can enjoy without harming others. Thanks to the everlasting abundance of renewable resources, this is a new long-term trend, a "Yes in my backyard" movement in the making, which asserts that our energy systems can at long last bring local benefits and promote peace without frontiers.

Dr. Hélène Connor-Lajambe, former OECD administrator, is the founder and honorary president of HELIO International. Founded in 1997, HELIO is an independent, international network of leading energy analysts who identify, assess, measure and publicize the contribution of energy systems and policies to sustainable and equitable development. See www.helio-international.org

Read more!

HELIO International, *TIPEE: Politique énergétique et écodéveloppement* (2012) www.helio-international.org/ManualFinal.pdf
French manual explaining the energy approach to eco-development

Ida Kubiszewski, Robert Costanza et al , "Beyond GDP: Measuring and achieving global genuine progress" in *Ecological Economics* 93, 2013.
Shows that the global GPI peaked at the same time as the global ecological footprint/capita exceeded global bio-capacity/capita

Amory Lovins, *Soft Energy Paths: Towards a Durable Peace* (Penguin Books, 1977).
One of the first to champion a turn to renewable energy

"Distributed renewables save money, avoid price volatility and fuel insecurities, and prevent carbon emissions. But their unique strategic and marketing advantage is that if properly deployed in a largely distributed system, they can enable a resilient grid architecture (often called "netted islandable microgrids") that makes big cascading blackouts improbable by design. This approach, already adopted by the Pentagon, would make vital power supplies resilient against superstorms, solar storms, physical or cyberattack and other risks. After Superstorm Sandy, demand for such resilience is starting to become an important market driver."

– Anthony Lovins, "Amory's Angles: three major energy trends to watch" in *Solutions Journal*, the online magazine of the Rocky Mountain Institute.

Learning from Germany's energy transition

By Christoph Senz

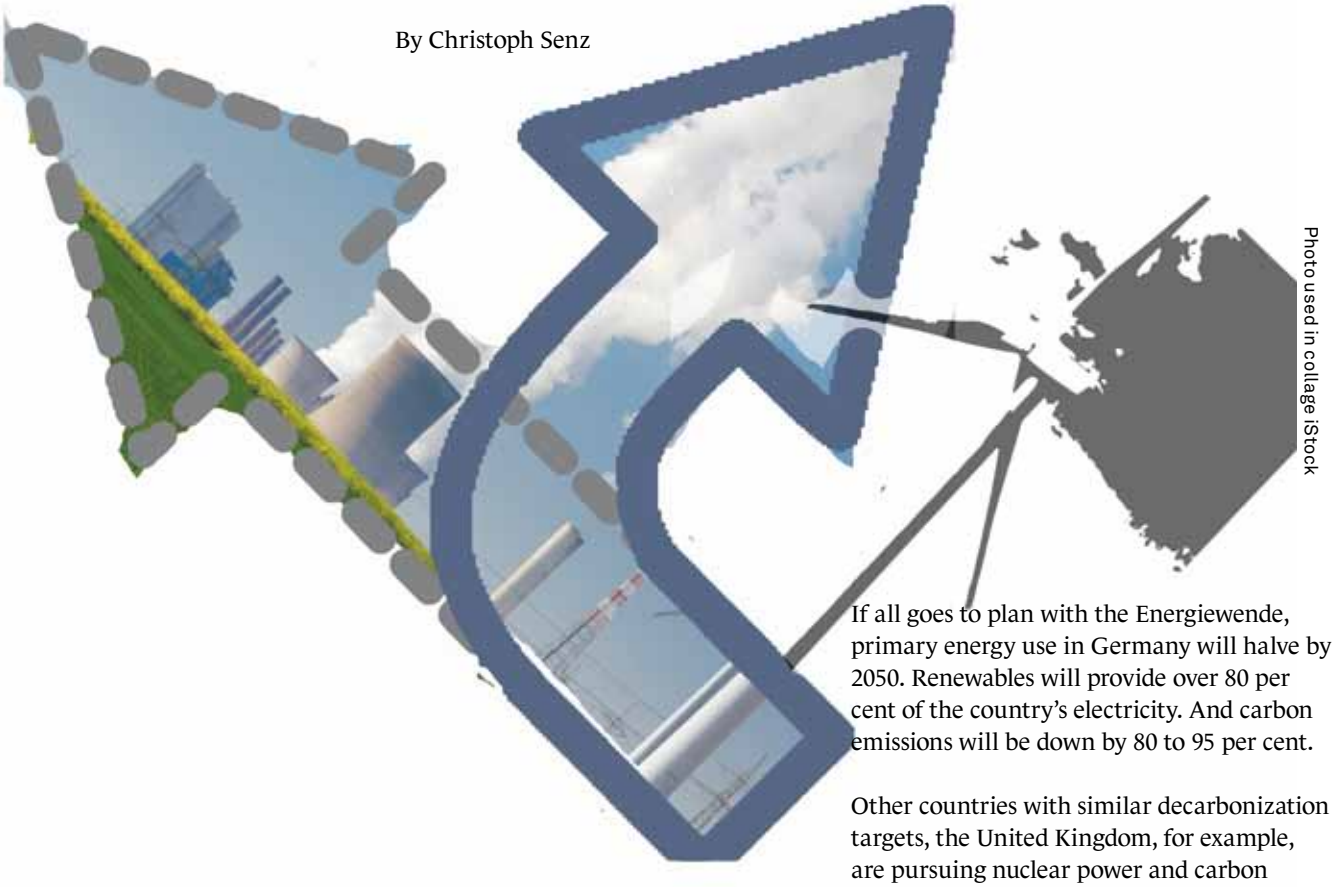

Photo used in collage iStock

The goal of the energy transition currently underway in Germany is for Europe's largest industrial economy to be powered almost exclusively by renewable energy within the next four decades.

If all goes to plan with the Energiewende, primary energy use in Germany will halve by 2050. Renewables will provide over 80 per cent of the country's electricity. And carbon emissions will be down by 80 to 95 per cent.

Other countries with similar decarbonization targets, the United Kingdom, for example, are pursuing nuclear power and carbon capture alongside renewables. Not so Germany, where the Fukushima nuclear power plant disaster in 2011 catalyzed the political decision to close all nuclear plants by 2022.

Progress so far has kept pace with ambition. A quarter of Germany's electricity is now provided by renewable sources like the sun and wind.

What lessons does the German experience have to offer to other countries wanting to lower their carbon footprint and reduce fossil fuel dependency?

Think in megawatts, not megawatt hours.

For most people, electricity simply comes from the socket. In our daily lives, we don't give any thought to the fact that demand and supply must be balanced every single second, and that it is technically almost impossible to store huge amounts of electricity. In fact, any unplanned changes in the transmission grid can cause serious problems, even a blackout.

In fossil fuel-driven power plants, engineers used to cope with this problem by carefully forecasting demand and planning production accordingly. The intermittent energy provided by the sun or the wind makes things much more complicated. Sunshine and wind cannot be controlled at will.

With the rising use of renewables, the electricity system is undergoing a paradigmatic shift, from forecast demand and scheduled production to forecast production and scheduled demand. More solar energy is likely to be produced around noon, for example. Industries therefore need to be encouraged to increase their midday demand, through incentives like lower electricity rates.

An advertisement for wind energy will typically say: "This wind turbine provides electricity for 5000 households." This may be true in terms of total energy produced over a year. But in reality, that wind turbine alone could not even provide electricity for a single household. Because there will always be times when the wind doesn't blow. It's not the amount of energy, measured in megawatt hours, but the rate at which it is produced, measured in megawatts, that matters.

Is the electricity produced at a given time needed at that time? That is the relevant question. And who provides the secured capacity during times with no wind and no sun? An analysis of the German power grid data shows that such periods can last up to two weeks. Unfortunately, they usually occur during winter, when the power demand is very high. Almost the full capacity of fossil fuel-driven power plants is needed to compensate at such times. But with a rising share of the energy market going to renewables, it is becoming less and less economical to keep them running.

This point was brought home when the world's most efficient gas-fired power station in Irsching in southern Germany threatened to close earlier this year, since its operating hours had been halved over the last four years. Arguing that the station was essential for grid stability, the transmission system operator agreed to contribute to the operating expenses, a cost that is passed on to the electricity customers via grid charges.

Renewable energy sources fundamentally change the economics of the energy market. Flexibility and capacity become the core value drivers. When renewables reach a market share of about 30 per cent, a new market design will likely be needed, in which buyers pay not only for delivery of power but also for provision of capacity. Possible solutions, such as capacity markets, in which certificates for secured capacity are traded, are currently the subject of intense debate in Germany.

Plan ahead for interconnectivity and storage.

How can flexibility and secured capacity best be achieved? One solution is to stabilize the grid by co-operating with neighbouring countries. As the use of renewables increases, there will be times when Germany produces more solar and wind energy than it needs. This excess could be exported, to meet demand in Scandinavia, for example. The Scandinavian countries, in return, could use their pumped-storage hydro plants to export power back to Germany when required.

Building interconnectors between countries takes time, however, and costs billions, especially if they traverse the sea. The interconnector currently being built between Germany and Norway, with a capacity of 1,400 megawatts, will not be finished until 2018.

At least for the next decade or so, flexibility will have to be maintained by using existing technologies: retaining fossil fuel plants capable of firing up quickly, providing incentives to certain industries to shift usage to times

when energy is abundant and using Germany's numerous combined heat and power plants to feed power into the grid at peak times.

The storage of renewable energy, with the exception of hydro power, is not likely to become widespread anytime soon, as the relevant technologies are still in their infancy. But they will be needed in the future, when renewables approach a 70 per cent share of energy production. Germany is therefore investing in technologies such as power to gas, which uses excess renewable energy to make methane from water and carbon dioxide to be stored for future use.

Avoid a completely decentralized process.

The transition to renewable energy will require less investment if the government sets out not only a political agenda but also a comprehensive action plan regarding targets, technologies and locations.

In Germany, the generation of energy from renewable sources is currently promoted by means of fixed feed-in tariffs, which can, depending on location and technology, bring returns from six to ten per cent a year. This is one of the core drivers of the massive extension of renewables in the country. The disadvantage of this strategy is a lack of control concerning installed capacity, technology and location.

Government auctions would be one way to increase control. On the basis of an analysis of the power grid, the demand and conventional production in a given region, investors could bid for the installation of, say 200 megawatts of wind capacity. The bidder who is satisfied with the lowest investment bonus would win the auction. Not only would this provide more political control, it would lower required investment into the power grid.

There is no free lunch.

Currently, many energy intensive industries in Germany are exempt from the renewable supplement on bills, with normal domestic and business consumers paying more than they otherwise would. For this reason, many are now calling for the industrial sector to pay a greater share.

However, increasing production costs for industry could be a risky strategy for a country whose economy is oriented towards manufacturing and exports. The advent of large-scale shale gas production and falling energy prices in the United States has intensified this debate. The Federation of German Industries has recently voiced concern that German firms are already suffering from high energy prices and could lose their competitiveness if current trends continue.

Whichever way you look at it, the issue of cost is establishing itself as an element that is central to the energy debate in Germany. Addressing it fairly may be no easy task, but will be essential for maintaining widespread public and political support for the energy transition.

Christoph Senz is a Strategic Consultant at ProCom GmbH in Germany. This article is based on a presentation he gave at the OSCE Expert Workshop on Sustainable Energy in the Southern Mediterranean, held in Vienna on 29 April 2013.

Painting by Michael Adonai (all rights reserved)

Maintaining the colours of the planet

Thirty-seven artists from 22 countries signed a manifesto in the Andorran mountain village of Ordino affirming their dedication to a world in which the natural beauty and energy resources of the earth will be maintained for the enjoyment of generations to come.

The 2012 edition of the biennial gathering organized by the Andorran Commission for UNESCO was devoted to the theme “Sustainable energy for all”.

“Once again, a magic moment happened with a group of artists arriving to our little country from around the world. They lived together, they worked and shared their knowledge about art, each of them bringing along a great number of vital experiences from abroad,” said the sculptor and art professor Faust Campamà, who initiated the Andorran art camp in 2008. Some of the artists came from countries that suffered or continue to suffer from violent conflict.

“The breathtaking beauty of Andorra combined with the unity of artists from around the world has consolidated my belief in human dignity and progress,” commented the artist Michael Adonai from Eritrea.

“Peace cannot be based exclusively upon political and economic arrangements among governments; it must also be founded upon intellectual and moral solidarity,” said Jean Michel Armengol, Secretary General of the Andorran Commission for UNESCO, at the 13 July 2013opening of an exhibition of a selection of the artists’ paintings in the OSCE's Hofburg Congress Centre in Vienna. Another selection of paintings is currently on display at the Venice Biennale.

Women's power from the sun

By Anke Stock

Energy use affects women differently from men. Women's economic empowerment is essential for achieving sustainable development that meets the energy needs of the present without compromising future generations, as was already recognized in the Rio Declaration of 1992. But inefficient, labour-intensive methods of producing energy often hinder women from playing an equal role in society.

Women in Europe for a Common Future (WECF) is a network of over 100 organizations mainly from Western Europe, Central Asia, Caucasus and the Balkans that was founded shortly after Rio to bring women's perspectives to policy makers. WECF also implements local projects that promote a healthy environment and strengthen the role of women. Recently, it has helped women in the OSCE region to gain economic empowerment by harnessing the power of the sun.

In some regions of Ukraine and Georgia, wood is still a major source of energy for heating and cooking. Women are usually the ones who spend time gathering firewood and tending fires to heat water for household chores or prepare meals. WECF implemented a project in these regions to assist households in switching to solar heating systems. Together with its German partner Solar Partner Süd it trained women to install and maintain solar panels themselves.

In Tajikistan, many women and children are left to fend for themselves when men leave the country to seek employment abroad. In the town of Dehkanobod, about 30 km from the capital city Dushanbe, a group of women decided to supplement their incomes by growing and selling vegetables and fruits. A major obstacle was the high cost of energy to run greenhouses.

WECF proposed that they build solar greenhouses. In contrast to traditional models, they are not expensive and can be set up without great skill. They store warmth and allow growers to reap an early first harvest.

With funds from WECF and practical advice from its local partners, the women built the solar greenhouses and started using them in the spring of this year. They were able to sell tomatoes, cucumbers and herbs in Dushanbe and the local market.

These are just two examples, of modest initiatives bringing small changes. But WECF has learned that decentralized projects implemented with the help of local partners can have a snowball effect. They can be the beginning of a larger movement of taking responsibility, for gender equality and for the earth we live on.

Dr. Anke Stock is a senior gender and rights lawyer at the WECF. She presented a gender perspective on promoting sustainable energy at the Second Preparatory Meeting for the 21st OSCE Economic and Environmental Forum, held in Kyiv on 16 and 17 April 2013.

The OSCE is watching its environmental footprint

Participating States are discussing ways to reduce the negative environmental impact of the ways in which they generate and use energy. The 21st Economic and Environmental Forum, held under the Ukrainian Chairmanship in Prague on 11 and 12 September 2013, was devoted to increasing stability and security through improving the environmental footprint.

Dialogue on energy has been on the OSCE agenda from the beginning. States formally expressed their support for the use of new and renewable energy sources in 2006.

The Office of the Co-ordinator of Economic and Environmental Activities in Vienna serves as a centre for the exchange of best practices. The OSCE field operations support host countries in developing renewable energy, in Uzbekistan, for example, where renewable energy is high on the political agenda and where the OSCE supports the Regional Centre for Renewable Energy established in Tashkent in 2012.

Coming up! High Level International Conference on Energy Security and Sustainability – the OSCE Perspective, Ashgabat, 17-18 October

What the world needs now

By Kandeh K. Yumkella

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Everyone in this world needs access to modern energy sources to manage their everyday lives and to thrive economically. Our current energy system based on fossil fuels is inequitable and unsustainable. We urgently need to reduce our energy-related carbon dioxide emissions that threaten our prosperity and security.

"....so that the world's finite resources can fuel development rather than conflict."

Reports estimate that one person in five still lacks electricity. That is 1.3 billion people – men, women and children. About twice that number, 3 billion people, rely on traditional sources of energy, such as wood, coal, charcoal or animal waste for cooking and heating. That is nearly forty percent of the world's population.

The opposite is true in the developed world. Essential services such as access to light, fuel for heating and cooking purposes are available. Instead, there is waste and pollution. Inefficient, carbon intensive energy use destroys our economic productivity and contributes immensely to the changes in climate conditions causing extreme weather events.

We must confront these two challenges. We must ensure that the "energy poor" have access to clean, reliable, affordable and modern energy services. In the industrialized world, we need to turn down the thermostat and make improvements in energy efficiency and in the use of renewables.

To achieve this, we require a sustained political focus. We must move these issues up our political and development agendas and make them a top priority.

Both challenges can be solved. Providing global energy access to sustainable energy is not a luxury, but a necessity. It will help to lift millions out of poverty. We can do it while making progress on preventing dangerous climate change, by relying more strongly on cleaner sources of energy, including renewable energy and low-greenhouse gas emitting fossil fuel technologies.

As United Nations Secretary-General Ban Ki-Moon says, "energy is the golden thread that connects economic growth, increases social equity, and an environment that allows the world to thrive." To address our huge current energy challenges he has launched his Sustainable Energy for All initiative.

Sustainable Energy for All seeks to meet three ambitious and achievable objectives: provide universal access to modern energy services, double the global rate of improvement in energy efficiency and double the share of renewable energy in the global energy mix.

Governments around the world have endorsed Sustainable Energy for All. Countries in Africa, the European Union and the Small Island Developing States have pledged their support and are committed to ensuring the three goals are met by establishing clear national targets and implementing national policies. They are also committed to supporting bottom-up approaches.

Recently, the governments of Tanzania, Mexico and Norway led a global conversation online and in various locations around the world on the importance of energy and its inclusion into the post-2015 development agenda.

After a successful Year of Sustainable Energy for all in 2012, the UN General Assembly has unanimously designated the decade 2014 – 2024 as the Decade of Sustainable Energy for All.

Energy for peace

Not only do we need to focus on energy for development, we should also focus on energy for peace. Too often, energy has been a source of conflict. The potential risks of getting our energy policies wrong are considerable; numerous conflicts have occurred as a result of competition for resources. You simply have to open a newspaper or switch on the television to see the close relationship between energy and security.

And yet there are few multi-lateral arrangements to defuse energy-related conflicts, or to promote confidence-building measures. This is a shortcoming that we need to address so that the world's finite resources can fuel development rather than conflict.

Kandeh K. Yumkella holds the rank of Under Secretary-General in the United Nations. He is the Secretary-General's Special Representative and Chief Executive of the Sustainable Energy for All initiative and Chairman of UN-Energy.