Electricity Shortages
Kazakhstan plans to build new power plants and import more gas from neighboring Uzbekistan to cope with an electricity deficit it is likely to face later this year.

Winds of Change In Tanzania

A group of villagers gathers at the local bicycle repair shop at Njiapanda, a dusty roadside hamlet on the rift valley in Singida region in central Tanzania, to marvel at magazine pictures of massive electricity-generating wind turbines.

They have never seen anything like this before and are clearly impressed, BBC said.

They will soon find out exactly what the turbines are like. In a matter of months, 24 of these 100m-plus-high power generators will be erected next to their homes, as part of the first commercial wind farm in sub-Saharan Africa. This is one of the poorest parts of Tanzania. There is little agriculture, no industry, but one thing there is plenty of is wind.

It is an untapped resource, but one which could hold the key to providing much-needed electricity to central and northern Tanzania and kick-starting the development of the region. The 24 turbines, which should be in operation within 18 months, will generate 50 megawatts (MW) of power, almost 10 percent of Tanzania 's current power needs.

The company behind the $113 million project is Wind East Africa. "It's important that Tanzania diversifies its power sources," says project manager Mike Case.

"The country is very reliant on hydro-electric power, which means in times of drought, there is a power deficit. Oil-generated power is very expensive, so wind power offers a cheaper and more reliable alternative."

The demand for power in Tanzania is growing by more than 50 MW a year, fuelled partly by an expansion of gold and nickel mining in the north of the country.

At present, electricity is sourced from power plants more than 1000km away. The wind farm at Njiapanda will mean that power-hungry industries will soon be provided with electricity generated locally.

The wind farm will benefit the local economy, providing jobs during the construction phase and a handful of jobs when it is up and running.

Regional Commissioner Parseko Kone is also hoping the rest of his impoverished region will profit. "The people of Singida are expecting a lot of this project," he says. "They're hoping it will help to develop our economy and because wind is free, they're also expecting cheaper electricity tariffs."

It is unlikely that tariffs will come down, as electricity is already heavily subsidized, but it does mean that Tanzanians can expect fewer power blackouts.

Wind power on a commercial scale is unknown in sub-Saharan Africa, despite the existence of constantly blowing and consistently strong winds, especially along the top of the rift valley, the mountain plateau which runs through East Africa from Ethiopia to Malawi and Mozambique.

In Europe, the industry is well developed. Germany, the European leader in terms of generation, produces more than three gigawatts of power (3000 MW) from wind turbines. The target in many European countries is to have 50 percent of all power generated by wind.

Africa is now set to benefit from the progress made in Europe. The equipment is becoming cheaper, as well as more robust.

According to wind expert Dr Ladislaus Lwambuka, from the University of Dar es Salaam, Africa is now ready for wind power on a commercial scale.

"If the Wind East Africa project is a success, then it could lead to more wind farms, not just in Tanzania but in the rest of Africa, particularly along the rift valley, where we know the winds are strong."

Wind power on a commercial scale is unknown in sub-Saharan Africa, despite the existence of consistently strong winds.

Making Hydrogen Fuel Cells Cheaper

Two great obstacles to hydrogen-powered vehicles lie with fuel cells. Fuel cells, which like batteries produce electrical power through chemical reactions, have been plagued by their relatively low efficiency and high production costs. Scientists have tested a wide assortment of metals and materials to overcome the twin challenge.

Now a team led by Shouheng Sun, professor of chemistry at Brown, has mastered a Rubik's Cube-like dilemma for dealing with platinum, a precious metal coveted for its ability to boost a chemical reaction in fuel cells, ScienceDaily reported.

The team shows that shaping platinum into a cube greatly enhances its efficiency in a phase of the fuel cell's operation known as oxygen reduction reaction. Sun's results have been published online in the journal Angewandte Chemie. The paper was selected as a Very Important Paper, a distinction reserved for less than 5 percent of manuscripts submitted to the peer-reviewed journal.

Platinum helps reduce the energy barrier--the amount of energy needed to start a reaction--in the oxidation phase of a fuel cell. It is also seen as beneficial on the other end of the fuel cell, known as the cathode. There, platinum has been shown to assist in oxygen reduction, a process in which electrons peeled from hydrogen atoms join with oxygen atoms to create electrical energy. The reaction also is important because it only produces water. This byproduct--rather than the global warming gas carbon dioxide--is a big reason why hydrogen fuel cells are a tantalizing area of research from automakers in Detroit to policy-makers in Washington.

Scientists, however, have had trouble maximizing platinum's potential in the oxygen reduction reaction. The barriers chiefly revolve around shape and surface area--geometry and geography, so to speak. What Sun has learned is that molding platinum into a cube on the nanoscale enhances its catalysis--that is, it boosts the rate of a chemical reaction.

"For the first time, we can control the morphology of the particle to make it more like a cube," Sun said. "People have had very limited control over this process before. Now we have shown it can be done uniformly and consistently."

During his experiments, Sun, along with Brown graduate engineering student Chao Wang and engineers from the Japanese firm Hitachi Maxwell Ltd., created polyhedron and cube shapes of different sizes by adding platinum acetylacetonate (Pt(acac)2) and a trace amount of iron pentacarbonyl (Fe(CO)5) at specific temperature ranges. The team found that cubes were more efficient catalysts, owing largely to their surface structure and their resistance to being absorbed by the sulfate in the fuel cell solution.

In the News

Europeans Switching Back to Coal

At a time when the world's top climate experts agree that carbon emissions must be rapidly reduced to hold down global warming, a leading Italian electricity producer, Enel, is converting its massive power plant here from oil to coal, the dirtiest fuel on earth.

According to IHT, over the next five years, Italy will increase its reliance on coal to 33 percent from 14 percent. Power generated by Enel from coal will rise to 50 percent. And Italy is not alone in its return to coal.

Driven by rising demand, record high oil and natural gas prices, concerns over energy security and an aversion to nuclear energy, European countries are slated to build about 50 coal-fired plants over the next five years, plants that will be in use for the next five decades. The fast-expanding developing economies of India and China, where coal remains a major fuel source for more than two billion people, have long been regarded as one of the biggest challenges to reducing carbon emissions.

But the return now to coal even in eco-conscious Europe is sowing real alarm among environmentalists who warn that it is setting the world on a disastrous trajectory that will make controlling global warming impossible. They are aghast at the renaissance of coal, a fuel more commonly associated with a sooty Dickens novel and which was on its way out just a decade ago.

There have been protests in Civitavecchia in Italy ; at a new Vattenfall plant in Germany ; at a plant in the Czech Republic ; as well as at the Kingsnorth Power station in Kent , which is slated to become Britian's first new coal-fired plant in over a decade. European power-station owners emphasize that they are making the new coal plants as clean as possible. But critics say that "clean coal" is a pipe dream, an oxymoron in terms of the carbon emissions that count most toward climate change. They call the building spree short-sighted.

»Aging Infrastructure

Enel, like many electricity companies, says it has little choice but to build coal plants to replace aging infrastructure, particularly in countries like Italy , which prohibit nuclear power. Fuel costs have risen 151 percent since 1996, and Italians pay the highest electricity costs in Europe .

In the United States, fewer new coal plants are slated to go on line, in part because it is becoming hard to get regulatory permits for those previously planned and in part because nuclear power is an alternative, politically unacceptable in much of Europe. In terms of cost and energy security, coal has all the advantages, its proponents argue. Coal reserves will last for 200 years, rather than 50 like natural gas and oil. It is relatively cheap compared to oil and natural gas, although coal prices have tripled in the past few years. More important, many countries export coal--there is not a coal cartel--so there is more room to negotiate prices.

Clean coal is a term coined decades ago by the industry, referring to its efforts to reduce local pollution. Using new technology, clean coal plants sharply cut down the number of sooty particles spewed into the air, as well as gases like sulfur dioxide and nitrous oxide. The technology has no effect on carbon.

In contrast, the technology that the industry is counting on to reduce the carbon emissions that add to global warning--carbon capture and storage--is not now available for coal. No one knows if it is feasible on a large, cost-effective scale.

»Underground Reservoirs

Enel says it will only start experimenting with the technology--in which carbon emissions are pumped into underground reservoirs rather than released--in 2015, in the hopes of "a solution" by 2020.

In the meantime, new coal plants will be spewing more green house gas emissions into the atmosphere than ever before, meaning that current climate predictions-- dire as they are--may still be "too optimistic," he said. "They assume the old energy mix even though coal will be a larger and larger part."

The problem is that carbon capture and storage, the holy grail of clean coal, will take global coordination and billions of dollars in investment, Sachs says, which no one country or company seems inclined to spend.

There are a few dozen small demonstration projects in Europe and in the United States , most in the early stages. But progress has not been promising.

The European Union had pledged to develop 12 pilot carbon capture projects for Europe , but said that was not enough. There is a new coal-fired plant going up in India and China every week and most of those are not constructed in a way that is amenable to carbon capture, even if it were developed.

Many have likened carbon capture's road from the demonstration lab to a safe, cheap, available reality as a challenge equivalent to putting a man on the moon. Norway , which is investing heavily to test the technology calls carbon capture its "moon landing." In fact it may be even harder than that. It is a moon landing that must be replicated daily at thousands of coal plants in hundreds of countries, many of them poor.

Plants that are capable of capturing carbon gases--those that generate pure carbon as an efflux--cost 10 percent to 20 percent more to build and only a handful exist today.