

# The Middle East: The move to low carbon energy and beyond

As the region of the world with the greatest concentration of hydrocarbons, some may take the view that the Middle East is not the most obvious area within which to consider sustainable development designed to limit Greenhouse Gas (GHG) emissions. However, the Third Summit of OPEC Heads of State held in Saudi Arabia in November 2007 placed the need to prevent climate change at the centre of its agenda and there is increasing interest across the Middle East in investments and technologies that will assist in global efforts to reduce GHG emissions.

It is also important to remember economic drivers: if power is generated locally without use of hydrocarbons, these hydrocarbons will be available for export. At a time when both Oman and Dubai have announced potential coal fired plants (in the case of Dubai, using carbon capture technology), it is also important to remember the fact that in certain parts of the Middle East there are constraints on gas supply.

So, far from renewable power and new nuclear being unusual ideas for the Middle East, their need in the region is obvious. Considerable steps have already been taken in their development and the expectation is that this will develop into an important area for investment. The potential use of coal fired plant also introduces the potential for carbon capture technology and a project using natural gas feedstock for a hydrogen power project with associated carbon capture is already underway.



David Laurence

In this article, **David Laurence**, a partner in our Dubai office, looks at developments in all these areas and also discusses moves to consider sustainable development in the context of the planned eco-city in Abu Dhabi.

## The international legal framework for GHG abatement

### UNFCCC and Kyoto Protocol

The countries that have ratified the United Nations Framework Convention on Climate Change (UNFCCC) include Bahrain, Iran, Iraq, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen. The commitment period for the "Annex 1" industrialised countries (that have binding commitments to reduce GHG emissions) has now commenced and provides new opportunities for investment in non-Annex 1 countries due to the so called flexible mechanisms which enable these commitments to be achieved through the trading of "carbon credits".

The initial commitment period runs from 2008 to 2012 and in December 2007 a UNFCCC conference meeting was held in Bali which sought to establish a "road map" for continuing and developing the existing international framework beyond 2012. Further detail for the steps to be taken in delivering the Bali targets were developed at the recent follow-up meeting in Bangkok.

### Clean development mechanism

In the context of the Middle East, the Clean Development Mechanism (CDM) is of interest. Under the CDM, an Annex 1 Country may implement an emission reduction project in a non-Annex 1 Country and count the resulting certified emissions reductions (CERs) against its own target. The system requires close co-operation between the sponsor and the host state.

They system for registration of a CDM project is essentially as follows:

- the consent of the developing country hosting the project must first be obtained.
- using methodologies approved by the CDM Executive Board the applicant must:
  - make the case that the project would not have happened anyway (called establishing additionality); and
  - establish a baseline estimating the future emissions in the absence of the registered project.
- The case is then validated by a third party agency, called a Designated Operational Entity, to ensure the project results in real, measurable, and long-term emission reductions.
- The Executive Board then decides whether or not to register (or, in effect, approve) the project. If a project is registered and implemented, the Board then issues CERs to project participants for the monitored difference between the baseline and the actual emissions, based on the findings of the Designated Operational Entity.

At the time of writing, only one CDM project has been registered in the Middle East. This is a project at the offshore Al-Shaheen oil field in Qatar which involves the recovery and utilisation of gas from oil wells that would otherwise be flared. The project has been registered as preventing the emission of approximately 2.5 million tonnes of CO<sub>2</sub> annually.

However, given the huge investments in power and other energy projects across the Middle East region and the inclusion of CERs in phase two of the European Union's Emission Trading Scheme (which runs from 2008 to 2012) the potential for the registration of CDM projects and the creation of revenue in the form of CERs is significant and at least five CDM projects are currently under consideration in Abu Dhabi alone. Moreover, a large number of projects in the Middle East have recently been announced which appear to fall within the CDM eligibility criteria.

### Carbon Capture and Storage (CCS)

Of particular importance in the Middle East in relation to CCS is the potential to use carbon dioxide from power generation or industrial processes that has been captured for enhanced oil recovery (EOR) by injecting it into oil reserves.

#### Legal issues in relation to CCS

CCS is a relatively new technology and as such there are a number of technological, commercial and legal

uncertainties surrounding such projects. The following issues are of concern generally and will need to be considered in the Middle East:

- cost – CCS projects are expensive and in order to be financially viable will require either government subsidy or recognition of the technology under the Clean Development Mechanism of the Kyoto Protocol together with a sufficiently high carbon price – it is hoped that the UNFCCC meeting in Poland later in 2008 will finally recognise CCS as a suitable technology for the CDM;
- categorisation as waste – other significant legal issues that arise relate to whether or not CO<sub>2</sub>, being a by-product of industrial activity, could be categorised as waste or hazardous waste and therefore subject to regulation. In the Middle East, this issue will have to be considered on a jurisdiction-by-jurisdiction basis;
- land ownership – issues of land ownership are of crucial importance. In many common law jurisdictions (such as the US and UK) ownership of land includes both the surface and sub-surface, but this issue would have to be considered in relation to the relevant Middle East country;
- liability – there is a risk that CO<sub>2</sub> that has been stored could escape into the atmosphere, so there is a need to consider who has short, medium and long term liability for stored CO<sub>2</sub>. New laws may be needed to address this in the Middle East and host country governments may need to become “insurers of last resort”. In Europe, these issues are addressed by the draft CCS Directive which was published in January 2008 this year;
- hydrocarbon regulation – the interaction between CO<sub>2</sub> storage and the hydrocarbon regulations of the relevant country (which may also apply to CO<sub>2</sub>) will have to be considered. Does an entity which is developing an oil and gas field also have the rights to inject and store CO<sub>2</sub>? A related issue, which is particular to instances where CO<sub>2</sub> is stored following use in EOR activities, is that oil and gas companies may not be concerned about what happens to CO<sub>2</sub> once it has been injected, yet if CCS used for EOR is to be meaningful, they will need to engage in the additional expense of ensuring injected CO<sub>2</sub> is stored and may be unwilling to face the liabilities associated if the CO<sub>2</sub> escapes.

#### CCS in the Middle East

As part of the UAE's Masdar Initiative, Hydrogen Energy (a joint venture between BP and Rio Tinto) has signed an agreement with Masdar in relation to the development of the world's first industrial scale installation of an integrated hydrogen power and carbon capture and storage system. Herbert Smith advised Hydrogen Energy.

The project will take natural gas and convert it to hydrogen and carbon dioxide. The hydrogen will be the feedstock for a 420MW low-carbon power generation project, providing more than 5% of Abu Dhabi's current power generation capacity.

The CO<sub>2</sub> will be transported to a producing field and used to replace natural gas that is currently injected as part of an EOR programme. This will increase oil recoverability and will free-up natural gas with CO<sub>2</sub> remaining stored in the oil field.

Other countries in the region are also interested in the development of CCS, given its potential, if widely used, to make a significant contribution to GHG abatement.

### Low-Carbon Energy and Biofuels

Historically, the Middle East has not developed renewable energy projects, despite having substantial potential to do so, most notably in solar power, but also in wind and water-based power generation.

This looks set to change, for a number of reasons:

- technology has become available to exploit this potential more effectively. In particular, solar technology has been developed which can function in the extreme heat of the Middle East summer. In October 2007, Masdar announced the development of a 5 x 100MW power plant using concentrated solar power, or CSP, which generates heat using lenses and reflectors to concentrate the sun's energy;
- demand for electricity in the Middle East is growing rapidly and cannot easily be satisfied by conventional means. According to the World Energy Council, the Gulf Cooperation Council (GCC) will require 100,000MW of additional power over the next 10 years to meet demand;
- awareness of environmental issues is increasing in the population at large as well as at the highest levels of government, leading to a demand for renewable energy to be developed; and
- the financial incentives available to renewable energy projects in the Middle East under the Clean Development Mechanism mean that these projects can be developed on a more commercial basis.

However, the governments of Middle Eastern countries have not yet introduced any domestic measures to boost renewable generation, such as an obligation to ensure that a certain percentage of electricity is generated from renewable sources, or higher tariffs payable to generating companies for electricity generated from renewable resources, which have been widely adopted in Europe and elsewhere.

### Wind power

Wind speeds in the UAE often exceed the minimum of seven metres per second required to harness power, often reaching up to 12 metres per second.

The Middle East's first experimental wind-power plant was set up in the UAE on the Sir Baniyas Island, and the Dubai Water and Electricity Authority has announced it has appointed a consultant to study the feasibility of using wind energy in Dubai in a US\$1 billion project to supply 10% of Dubai's electricity needs.

In relation to the Masdar initiative in Abu Dhabi, it is reported that the Abu Dhabi Future Energy Company (ADFEC) is looking into the possible use of wind to generate electricity, with feasibility studies being conducted as far as 15 kilometres offshore.

In Iran, two projects have been developed in the Manjil Tunnel and Binalud in Khorasan Province in which 120MW electricity turbines have been installed. The total potential electricity generation capacity from wind in Iran has been estimated at 6,500MW.

### New-build nuclear

The International Atomic Energy Agency has announced that more than 10 Middle Eastern states (including Algeria, Bahrain, Egypt, Jordan, Morocco, Oman, Saudi Arabia, Tunisia, the UAE and Yemen) have expressed an interest in developing a nuclear power programme.

In August 2007 Jordan's Committee for Nuclear Strategy set out a program for nuclear power to provide 30% of electricity by 2030, and to provide for exports. Jordan joined the Global Nuclear Energy Partnership in 2007 and, crucially, has indigenous reserves of uranium in its southern deserts.

In December 2006 the six member states of the GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates) announced that they are commissioning a study on the peaceful use of nuclear energy. In February 2007 the GCC agreed to co-operate with the International Atomic Energy Agency on a feasibility study for a regional nuclear power and desalination program.

Recent developments this year have seen both Qatar and Abu Dhabi announce plans for new nuclear plants, with Suez and Total involved in the Abu Dhabi proposal (where site selection is already said to have taken place) and EDF and Areva backing plans in Qatar.

### Waste to energy

In October 2006, a €850 million solid waste management contract was signed by the Government of Qatar and Keppel Corporation of Singapore for the development of a facility in Qatar to design and build four waste transfer stations and one integrated domestic

solid waste management centre to handle and treat domestic solid waste for the whole of Qatar.

Designed to treat an initial capacity of more than 1,550 tonnes of waste a day, the facility will comprise waste sorting and recycling facilities, landfill, composting plant and a 1,000 tonnes per day waste-to-energy incineration plant.

In Saudi Arabia, US-based International Power Group has been commissioned to construct a US\$300 million waste-to-energy plant in the city of Jizan, located in the southeast, near the Yemen border, which is expected to come online in December 2008. It is reported that the plant will process up to 180 tons of solid and hazardous waste, while generating 6MW of electricity and up to 250,000 gallons of distilled water per day.

### **Biofuels**

Growing world demand for oil and gas alongside concerns about security of supply and climate change has led, over the last few years, to rapid growth in the international biofuel industry. Many nations are pushing ahead with ambitious targets for biofuel, which could see biofuels playing a major part in the fuel mix used throughout the world.

The Middle East has not adopted targets similar to those applicable in the EU under the Biofuel Directive but, spurred by high oil prices, biofuel projects are being developed in the Middle East.

In June 2007 Oman Green Energy Company (OGEC) announced plans to build the Gulf region's first biorefinery, a 710 million litre per year ethanol plant in Sohar in Oman. The plant will produce ethanol from date palms. The plant will be imported from Brazil and is due to become operational early in 2008, with OGEC intending to set up a chain of biofuel petrol stations across Oman.

### **Eco-cities**

The term eco-city is generally used to refer to an integrated urban development or re-development designed to take account of sustainable development concerns. In developing countries these are likely to be greenfield developments such as Dongtan in China and the Masdar eco-city development in Abu Dhabi.

### **Unique legal issues associated with eco-city developments**

In addition to the particular legal issues generally associated with large scale infrastructure projects, in developing countries there are a number of legal issues that are particularly acute for developers, investors and financiers of greenfield eco-city projects. The significance of these issues will vary depending on the location of the eco-city project but broadly speaking the issues can be summarised as follows:

- **involuntary resettlement / social relocation issues:**

this is often a significant issue for developers and financiers in developing countries eager to attract foreign investment. Paradoxically, governments who legislate to forcibly internally displace large populations or expropriate land in order to make way for the development of large scale infrastructure may dissuade foreign investment. Involuntary resettlement that is not properly managed will fall foul of the Equator Principles, a voluntary code applying to project financing to which most of the major international banks have now signed up;

- **inter-dependence of developments:**

in a completely self-sustaining city, all of the services necessary to support a community must be provided from the very beginning of the development, it does not have the luxury of being able to evolve over time as and when funding is available. Moreover, one of the fundamental premises behind the eco-city concept is that the elements of the city (transportation, energy production, agriculture, waste and water management, residential and commercial building etc) cannot be developed in isolation. As a result, one of the biggest challenges for an eco-city development attempting to attract international funding is how to demonstrate bankability in the absence of an existing demand for services or a proven revenue stream, no existing supporting infrastructure or local industry and, in relation to some elements, significant technological risk. Structuring such financing will be extremely complicated and will require an understanding of additional revenue generation opportunities provided by the sale of CERs generated from CDM accredited renewable energy generation and waste management projects in the eco-city; and

- **protection of intellectual property rights:**

in order to keep costs sufficiently low to maintain a sustainable economically mixed population, a significant proportion of the new technologies required for an eco-city will need to be manufactured locally, with the IP required imported from overseas. Protection of IP rights is obviously of considerable concern to international investors when setting up joint ventures with local manufacturers. In the absence of robust protections in local intellectual property legislation, this is often dealt with through exclusivity arrangements, whereby the local JV partner maintains the right to exploit the new product in country, and the international partner holds exploitation rights in foreign jurisdictions.

### **Masdar's Eco-city**

The Masdar eco-city in Abu Dhabi will use the traditional planning principals of a walled city, together with existing technologies, to achieve a zero carbon and zero waste community, including residential areas and a university focused on sustainable development.

The city's walls will be covered in photovoltaic panels

capable of generating 130MW. Electricity will also come from photovoltaic cells integrated into rooftops and a 20MW wind farm. The city will get its water from a solar-powered desalination plant.

Research fields and plantations surrounding the development will supply crops for the city's biofuel factories, and will also help reduce waste by acting as carbon sinks to offset gases produced in the factories. They will be irrigated with water drawn from the city's water treatment plant.

The city will be car free. With a maximum distance of 200 meters to the nearest transport link and amenities, the compact network of streets encourages walking and will be complemented by a personalised rapid transport system.

## Conclusion

Those involved in the various aspects of the climate change and sustainable development industry should keep a close watch on the Middle East. The region is already seeing major developments in all aspects of clean energy, has a vast eco-city underway, new nuclear is being planned in a number of countries and there are moves from carbon traders and specialist funds to establish in the region. The combination of a genuine political desire to be seen to actively participate in the world's efforts at GHG abatement and real economic drivers make the Middle East an area that will see considerable growth and opportunity in this sector.

## The Masdar initiative

A sign of the huge interest in sustainable development investment in the Middle East is the Masdar initiative in Abu Dhabi.

The initiative is promoted by Abu Dhabi Future Energy Company (ADFEC), which has been created to manage the implementation of a significant renewable and alternative energy initiative. Mubadala (a wholly owned investment vehicle of the Government of the Emirate of Abu Dhabi) is behind ADFEC.

Masdar is comprised of six strategically designed and focused units:

- Masdar Institute of Science and Technology – this will offer Masters and PhD programmes in science and engineering focused on advanced energy and sustainable technologies.

- Masdar Research Network – a unique collaborative network of world-class scientists and post-doctoral researchers linking the MASDAR Institute and seven leading global scientific research institutions in three continents, including the Tokyo Institute of Technology.
- Innovation & Investment – this unit invests in the commercialisation of advanced energy and sustainability technologies and includes a US\$250 million private equity fund.
- Special Projects – this focuses on large scale projects, including in relation to carbon capture and storage.
- Carbon Management – this focuses on greenhouse gas reduction projects across the region and into North Africa, with a particular emphasis on CDM projects under the Kyoto protocol and the use of CCS to assist in enhanced oil recovery.
- Masdar Zone Development – this is the planned eco-city described in the main body of this article.