Energy mix case study 3: France - a nuclear future?

France has very limited fossil fuel reserves. It imports 99% of its oiL. mainly from Norway and the Organisation of Petroleum Exporting Countries IOPEC). Coal was once mined in north eastern France but the difficulty and expense of access ing the remaining reserves caused the closure of the last coal mines at the beginning of the 21st century. Although France already had nuclear power plants. it was the Oil crisis of 1973 that drove the creation of 59 nuclear power plants and a stable, nationally produced source of power. Although controversial, and until recently unpopular with many, the need to reduce France's greenhouse gas emissions to comply with the Kyoto Protocol has led to a resurgence of interest in maintaining nuclear power and replacing, not removing, the aging plants. Another pressure, in a time of global recession and high unemployment, is that nearly 60,000 people work in Frances nuclear power industry. Their expertise in the nuclear industry has enabled French energy companies such as the giant Electricite de France IEDF) to operate in and adVise other countries.

HEP is well-established in France. It is concentrated in areas of high precipitation in the mountainous areas of the Massif Central and the Alps, and along the river Rhone. The latter produces 25% of Frances HEP, and HEP produces 20% of the country·s total electricity. There are plans to increase renewable sources, for Instance by encouraging individuals and communities to set up solar collectors. Outline plans exist to import solar-generated power from areas of the Sahara in North Africa - a form of energy outsourcing. The former French colony Algeria already has solar power plants in operation. France was an early pioneer of tidal power with the development of the tidal basin of the River Ranee in northern France, but this remains the country·s only commercial tidal system.

Electricity generation is dominated by nuclear power [see Figure 2.71. HEP, which can respond more quickly than nuclear power to increased demand, is often used as a back up during peak times. Oil makes a tiny contribution; most oil is refined and used for transport and heating.

France·s energy mix is relatively secure. However, the French authorities regard nuclear power as a medium-, rather than a longterm strategy, and in the future are looking towards far greater use of renewable and locally-produced energy.

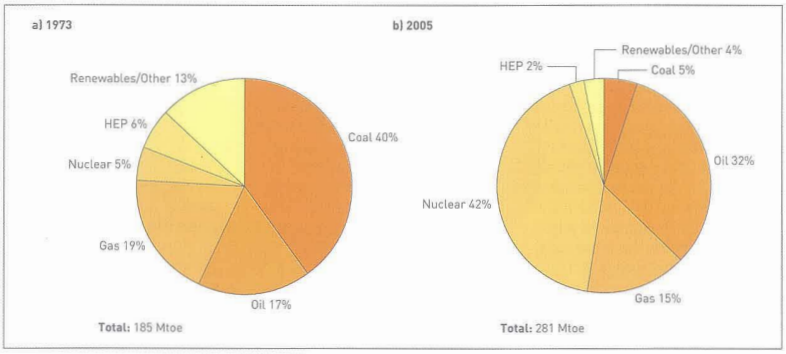

Figure 2.6 Primary energy sources in France: a) 1973, b) 2005. **Source:** IEA.

Energy mix case study 1: Namibia

Namibia IS a developing country in Africa with a per capita income of U5$6400. Its most important industries - agriculture and mining - are both energy intensive, so Namibia has an annual per capita energy consumption of 7.5MWh. Namibia relies heavily on fuels, especially gas and oil, imported from South Africa ElectriCity generation runs at 387MW but at peak times demand exceeds this: 50% of the country·s electriCity also has to be imported. In total. Namibia produces less than a third of Its own energy needs, so energy security is a concern. The country has a reasonable electricity network with 70% of urban households being connected to a national grid. However, many shanty developments within the urban areas are not. In rural areas only l5% of households receive electricity from the gnd. The rest of Namibia's energy Infrastructure IS poorly developed.

Namlbia·s heavy dependency both on fossil fuels and imported energy is a matter of national concern, so plans are being made to Widen its energy mix. Possible coal reserves at Aranos and natural gas at Kudu have been identified, but overseas. investment and expertise are needed in order to develop them. Namibia IS the world·s sixth largest exporter of uranium ore and would like nuclear power stations to process it Into fuel for domestic use, thus Widening Its energy portfolio, rather than Just exporting the raw material. However, this would need foreign help and management; with nuclear power this might be risky.

Namibia receives an average solar radiation of 6kWh/m2 per day - one of the best rates in the world - and this could be developed to provide a secure and everlasting source of energy. The country IS considering setting up concentrated solar plants [CSPsl as well as coastal wind farms and a mega dam along its border with Angola on the Cunene River,
The Namibian authorities recognise the inherent lack of security in the present energy mix but need further outside investment to develop a more sustainable and secure combination.

Energy mix case study 2: India
During its race towards
development over the last three decades India's energy mix has changed [Figure 2.41. Between 1973 and 2005 India's energy consumption grew by over 300%. All primary energy sectors grew, including fuelwood renewable!' although this grew more slowLy. so by 2005 its percentage share was lower. In 1973 the majority of the population was dependent on fuelwood for heating and cooking; while millions of Indians still rely on fuelwood, other fuels now predominate. Oil, gas and coal represent 68% of the country's primary energy sources, and as population and energy demand have grown India has had to rely heavily on Imports. particularly from volatile parts of the world see Figure 2.51. India's own limited oil reserves are diminishing and In the immediate future the country is likely to become even more oiL-dependent. It is training large numbers of engineers and investing in the research and development of a range of renewable energy sources. With limited indigenous resources, it is looking to nuclear power, assisted by Russian expertise, to help manage its energy gap until the technology, finance and infrastructure an~ there to support more renewable resources. India has undertaken several dam projects. Perhaps the mast controversial is the Narmada mega dam scheme, consisting of 3200 130 major, 135 medium and over 3000 smaller dams ranging in scale up to the large Sardar Saravar Project. Although the dam has provided secure water supplies for agriculture and HEP and drinking water for up to 20 million people, some argue that it is first and foremost a status symbol, reflecting the country·s technological prowess, and that the same result could have been achieved through a series of smaller projects with fewer negative environmental and sociaL impacts. India is committed to the research and development of solar power - as is China - and they are poised to become world leaders in this field. In March 2010 a branch of the World Bank agreed to invest US$20 million into further developing large-scale solar power stations , such as the 2MW plant created by India·s Azure Group. India plans to generate 20MW of electricity via solar power stations by 2020.
In its Reference Scenario [see Chapter 6) the IEA estimates that by 2030 India's primary energy demand will increase to 1299 Mtoe. India will need to further diversify its energy mix and reduce its reliance on imported fossil fuels if it is to move towards sustainability.

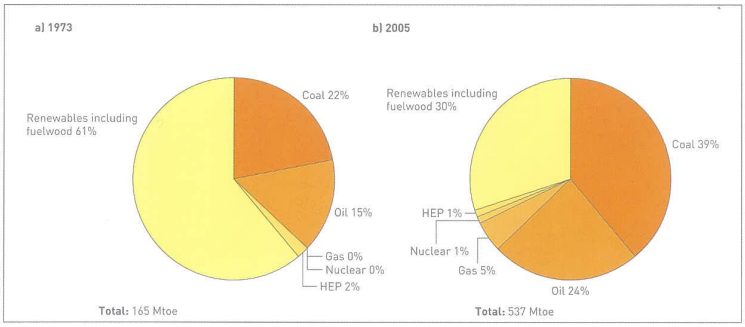

Figure 2.4 India's primary energy supply: a) 1973, b) 2005. **Source:** IEA.