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Select Committee on Economic Development

BRIEFING NOTES ON INTERNATIONAL STUDY TOUR TO FRANCE AND CHINA

1. Overview of Nuclear Energy sector in France and review of China's SEZs

France is considered to be one of the greatest pioneers in the nuclear energy sector. But all this development started from the first oil shock. In 1974, just after the first oil shock, France decided to expand rapidly the country's nuclear power capacity. This decision was taken in the context of France having substantial heavy engineering expertise but few indigenous energy resources. Nuclear energy, with the fuel cost being a relatively small part of the overall cost, made good sense in minimizing imports and achieving greater energy security. As a result of the 1974 decision, France now claims a substantial level of energy independence and almost the lowest cost electricity in Europe. In 2007 French electricity generation was 570 billion kWh gross, and consumption was about 447 billion kWh - 6800 kWh per person.
Over the last decade France has exported 60-80 billion kWh net each year and EdF (Electricite de France) expects exports to continue at 65-70 TWh/yr, to Belgium, Germany, Italy, Spain, Switzerland and UK. Imports are relatively trivial. France has 59 nuclear reactors operated by EdF, with total capacity of over 63 GWe, supplying over 430 billion kWh per year of electricity (net), 78 per cent of the total generated there.[1] Total generating capacity is 116 GWe, including 25 GWe hydro and 26 GWe fossil fuel. France has an extremely low level of CO_2 emissions per capita from electricity generation, since over 90 per cent of its electricity is nuclear or hydro. In mid 2010 a regular energy review of France by the International Energy Agency urged the country increasingly to take a strategic role as provider of low-cost, low-carbon base-load power for the whole of Europe rather than to concentrate on the energy independence which had driven policy since 1973.

The Special Economic Zones (SEZs) are 'zones of exception' and may always be distinct from the rest of the economy, and the economic rules may always differ from those governing the rest of the economy. However, South African government should also use SEZs as a testing ground for new policy options. Locating those experiments in separate enclaves will allow government to reduce or avoid confrontations with entrenched interest groups opposed to wider reforms. SEZs, then, could be distinct, productive economic areas in need of no other justification than their contribution to the economy. But they could also be policy laboratories in which government tests new ways of creating investor - and business-friendly environments. Should these experiments succeed, these approaches could be rolled out to the rest of the economy. International experience shows that the 'demonstration effect' of successful SEZs facilitates wider economic reform.

This has certainly been the case in China, where Deng Xiaoping's initiatives in the 1980s and 1990s to attract Foreign Direct Investment (FDI) and expand exports through SEZs led to

[1] WNA (2010)

accelerated economic reform. The same is true of Mauritius, Costa Rica, the Philippines and elsewhere. This potential for positive policy spill-overs into the rest of the economy is the greatest promise held by SEZs. The study tour stands to empower both Committees, particularly at the back of Special Economic Zones draft Bill that has been tabled in Parliament during October 2012. This Bill was tagged as Section 76 legislation which concomitantly meant that Provinces will be consulted and will participate directly in drafting this piece of legislation.

2. Purpose of the Study Tour

The Select Committee on Economic Development and Select Committee on Trade and International relations intend to undertake a joint study tour to France and China in June 2013 (dates still to be confirmed by the two Committees).

Subsequent to the publication of Integrated Resource Plan by the Department of Energy (DoE) in 2010 which include nuclear energy and gradual uptake of renewable energy carriers for power generation over years. The Select Committee on Economic Development saw it fit and proper to visit France as it is regarded as the world's leader in nuclear energy on the one leg. This is duly informed by the fact that France generates 75 per cent of its electricity from nuclear sources. However on the other leg the study tour aim to learn from China on how Special Economic Zones (SEZs) under the auspices of Industrial Policy are best thought of as stand-alone interventions or as vehicles for addressing broader policy challenges. SEZs can be places where government concentrates its limited regulatory, infrastructural and fiscal resources in order to attract foreign investors. In other countries like China, SEZs have been used as enclaves for implementing policies which differ radically from those governing the rest of the national economy. This could particularly be beneficial to these NCOP committees especially given the poor performance of Industrial Development Zones (IDZs) in South Africa.[2]

This will allow South African government to assess the impact of various policy reforms and create a constituency that will support and drive further reform of these IDZs as espoused in the Draft Bill on SEZs that was introduced to Parliament in 2012. South Africa's SEZ programme should seek to achieve both goals. On the one hand, government should create areas where it is considerably easier to establish and run globally competitive businesses – particularly labour-intensive businesses – than it is elsewhere in the economy and contribute to job creation imperatives.

The objectives of the study tour are:-

[2] Bernstein (2012)

- The two Committees would like to draw lessons from France's successful massive build nuclear programme and Chinese Industrial Policy under which Special Economic Zones are embedded.
- The Committees would like to learn French energy mix with special emphasis on the renewable energy.
- To learn on the structure, roles and functioning of the entire energy industry in France.
- To assess the electricity regulation in France in order to improve South Africa's electricity sector.
- The Committee would also want to gain an understanding on the role of government and private sector in the energy sector.
- To learn how SEZs and industrial policy in general could be used effectively as institutional continuum which propels a dynamic process of accumulation focused on increasing the diversity, market share, linkages, and depth of an economy.

The ultimate goal of the study will be to examine the technological features employed within the reactors, the regulatory framework that oversees the program as well as the economic, environmental, and political considerations that lie in the background of such a major energy initiative. On the industrial policy perspective the efficient organizational and regulatory establishment of SEZs and Export Processing Zones could attract Foreign Direct Investments even to the Nuclear Energy Sector and facilitate exports of energy to the neighboring countries and promote technological innovations and skills transfer.

3. Factors that led to French Nuclear Energy Success

Some of the major factors that helped France attain its now level of success in the Nuclear energy can be summarized as below:

- **Strong government role in energy policy making**

In the face of insufficient energy sources, substantive engineering expertise and a sound science and technological base, turning to nuclear power became an almost natural choice. Strong government support to nuclear power translated into a rapid expansion of the nuclear infrastructure. No noteworthy public debate or scrutiny of the nuclear programme is documented before 1999. Of course, there were some anti-nuclear groups, such as the Friends of the Earth, Societes de Protection de la Nature etc. By mid-1975, several influential French newspapers, such as Le Figaro, had raised concerns over questions of radioactivity, risk of nuclear accidents, nuclear waste, and the like. A large and even violent demonstration against construction of the FBR Super-Phenix at Creys- Malville took place in June 1977. In France, support for nuclear power fell from 74 per cent in 1974 to 47 per cent in 1978. Yet, France continued to experience growth in its use of nuclear power. Al this was attributed to the Strong role of the government in framing and supporting their energy policy throughout.

- **Use of Standardized reactor design and technology**

The Standardization of nuclear reactor technology has obviously brought many advantages to France. The first of these has been the economic benefit of allowing industrial processes to be standardized for serial production of components and systems. Secondly, it has helped in easy dissemination of experience across the plants and in case of any fault detected in one plant, rectification has been quickly possible along the entire fleet of reactors. Essentially the standardization and the common plant template has significantly enhanced the possibility of probabilistic safety analysis and enabled easier maintenance and operation.

- **High Emphasis on maintenance and safety records**

As we have seen in the earlier section, the French nuclear establishments have accorded a high level of importance to maintenance of nuclear plants from the point of view of nuclear safety. After capital and fuel related costs, 60 per cent of the remaining budget is allocated for maintenance tasks and the plant engineers are subjected to rigorous training at the EdF"s specialized Maintenance Preparation and Qualification Centre for PWR Systems (Cetic). All reactors undergo a review after every ten years and, in most cases, lifetimes of the units have been extended by ten years above the initial projected operation period, mostly with minor modifications.

- **High public support**

The understanding in the French public that its nuclear programme brings the benefit of energy independence has translated into a high support for it. With a high level of emphasis on nuclear safety, France has managed to avoid any serious nuclear mishap. This unblemished safety record also feeds into the public support for nuclear power. In 2006 with the enactment of the TSN (Transparency and Nuclear safety Law) Law, the government also increased the transparency of its nuclear programme. The right to information on nuclear facilities was strengthened by supplying a legal framework to the Local Information Committees (CLIs, which were set up in 1981) and by establishing a High Committee for Transparency, in order to provide for discussions at national level. This reinforced the faith of the general population in the nuclear power.

- **Monopolistic rule of EdF**

The Nationalization Law of 1946 established EdF as the primary importer and exporter of electricity transmission within all of France and outside. EdF is also the leading exporter of electricity in Europe. It exports 13 per cent of its total production to Britain, Switzerland, Italy and Germany. At the same time, EdF has a monopoly over electricity generation. In fact, EdF is the world"s second largest electricity producer. Owned completely by the state, it has managed with the help of government subsidies to provide cheap electricity to the French industrial users as well as to the residential and commercial sectors. This has not only enabled the nation to attract foreign investment but also helped maintain a high level of public support for nuclear power. EdF"s monopoly has allowed it to evolve its own tariff levels which have been touted as an advantage of the national nuclear programme to forge national unity.

France has 59 nuclear reactors and produce 75 percent of France's domestic energy consumption. As a result of its past actions, France now enjoys a substantial level of energy independence and nearly the lowest cost of energy in Europe.[3]

4. Lessons for South Africa

As highlighted in the National Development Plan (NDP) South Africa needs energy security and competitive electricity prices if we are to attract Foreign Direct Investments and for the sustainable beneficiation of mineral resources. Nuclear power has been envisaged as encapsulated in the IRP 2010 strategic document as an important contributor to the country's future energy mix. In view of enormous capital expenditure of developing and maintaining a nuclear power plant as evidenced with the Koeberg plant as a case in point, South Africa needs foreign partnership. Such strategic equity partnerships, with Eskom in particular can be lowered by localization of the nuclear supply chain and technology transfer. However the local industry must be supported through fiscal concessions, simplified regulatory and administrative processes etc. Such that South Africa start to embark on this new mission of strengthening its nuclear power industry. The country therefore needs to learn from the experiences of other countries who have developed huge nuclear programmes with much success. France stands out in this category and could be an important partner in South Africa's nuclear expansion plans owing to its ability to provide fuel and reactors. Another factor that tends to support the case is the similarities that South Africa France share on the nuclear front:

The first of these is their completeness of scope and mastery over the entire nuclear fuel cycle. From the front end to the back end activities, both nations have indigenous capability at every level of nuclear activity.

Secondly, both nuclear programmes in these countries have been supported by a long-term vision and staunch government commitment. They have weathered changes in political leadership but the focus on nuclear power has been maintained. Thus we can conclude that

[3] Sastry et.al (2010)

South Africa can learn a lot of lessons from France that can help it in developing its nuclear programme with much success.

Lesson 1: The most important lesson that South Africa can draw from the French nuclear energy experience pertains to the importance of energy security for a nation. The oil shock in the early 1970s awakened France to its high level of energy vulnerability owing to the large-scale dependence on fuel imports. The government was then jolted into finding ways of securing energy independence and turned to nuclear power. For South Africa, the overreliance on cheap coal fired electricity generation for so many decades renders our manufacturing industries less competitive as the electricity prices were heavily underpriced to support mainly state owned enterprises. The urgent need to develop further capacity through building new additional power stations to meet ever increasing demand for electricity means exponential growth on carbon emissions which means a staunch contradiction with our United Nations Framework Convention on Climate Change (UNFCCC) commitments undertaken under Kyoto Protocol and the recent COP17 conference. Energy security is essential for the overall national security and South Africa cannot afford to relax on this front.

Lesson 2: France today has a nearly 80 per cent dependence on nuclear energy. With such a high level of dependence on only one energy source, the country seems to have fallen into the same trap which it tried to once escape during the oil shock once again. This scenario of overly dependence on nuclear energy makes it vulnerable to the shutdown of reactors since the loss of generation from one or more high capacity reactors threatens major loss of energy production. In recent times, such a situation was faced by the country in the summer of 2009 when a strike by power workers and ongoing repairs at some units put a third of French nuclear power stations out of action and the country was forced to import electricity from the UK. The lesson here for South Africa is that it must develop a diversified energy mix. Given the huge energy demands of the rapidly developing nation, the country cannot afford the luxury of depending on only one source of energy. It needs to tap every fuel source including placing a heavy emphasis on energy efficiency and conservation. Only then can the country assure itself of true energy security.

Lesson 3: France has largely been conducted without any major public scrutiny. While on the one hand, this has allowed a greater degree of consistency and steadiness in French nuclear policy, it has also led to allegations of nuclear power being made viable in the country only through government subsidies. So the third lesson to be learnt by South Africa is,that the nuclear programme undertakes a rapid expansion, it must open itself to a greater amount of transparency so that it can operate in a more democratic fashion and escape or avert potential allegations of commercial non-viability. This is important for the sake of reinforcing public support for the nuclear programme.

Lesson 4: The fourth lesson to be learnt from the French experience is the need for high public support for the nuclear programme so that it acquires the character of a national venture which is based on a broad-based consensus. Only then can issues such as land acquisition, environment impact assessments, which have the potential to become contentious, be carried out smoothly. In France, for instance, through the period 1970s to 1990s, the nation perceived its nuclear programme as a symbol of national pride and realized its importance as a contributor to energy independence. During this time, the French were able to bring about this mindset not only by the safe, consistent and cheap production of nuclear electricity but also through a conscious and well planned education campaign that included encouraging the common man to visit nuclear plants and related industrial facilities. This helped alleviate public fears about nuclear power and reduced the distance between high technology and the ordinary man from the street

Lesson 5: The fifth lesson to be learnt is that the government should play a major role in supporting the programme. This is required to provide clear and sustained policy support for the development of nuclear power as well as ensuring its public acceptance by explaining the relevance of nuclear power in the country's larger energy mix and its affordability in terms of pricing. It needs to work with transparency, fairness and strictly by the rules of the game. Any inkling of unfairness could lead to a trust deficit in the public and lead to an anti-nuclear sentiment. In contemporary times, when the media maintains a close watch over the government, nuclear policy will not be the only domain of the government. Public perceptions about risks to public health and environment will have to be accounted for and the government would be well advised to launch public awareness campaigns to undertake perception management especially in light of Fukushima tragedy of Japan in 2011. Efforts must be made to disseminate facts on the South African energy situation in general, its linkages with economic and social development, and the specific advantages of nuclear energy in the countries' energy mix. The existential risks in the nuclear sector must be addressed by explaining how the government and the nuclear industry seek to mitigate them.

Lesson 6: The next most important lesson to be looked into is that the nuclear industry must provide the highest standards of nuclear safety if the promise of large-scale generation of nuclear electricity is to be realized. The ability of the French nuclear programme to avoid any major mishap generated continued support for itself from the government and the public. In South Africa until now, the government has managed the nuclear programme, including operation of Koeberg nuclear power plant in Western Cape Province. With the entry of private players envisaged in the future, adequate terms of reference will have to be drawn for optimum public-private partnership with an apt level of investment risk being borne by private sector investors. Therefore, efficient and responsive nuclear governance will be critical for an expanding nuclear programme in South Africa.

Lesson 7: South Africa needs to build a pool of skilled labour and manpower. A consistent availability of skilled and trained manpower is essential for the nuclear sector. As generations of technicians, engineers and researchers who joined the nuclear industry at the time of major construction activity retire, replacements have to be systematically planned to preserve the knowledge and know-how as well as work on new designs.

Lesson 8: An effort is required to deal with the problem of nuclear waste. France confronted this problem after twenty years of large-scale energy generation. But, it has become an issue important enough today to bring about a dip in public support for nuclear power in the nation. If South Africa is to avoid this, serious thinking on the selection of site and construction of geological repository to house high level, long-term waste must begin now in order to reassure the public on this important matter. And public support will depend upon transparency and education programmes in this field. .

5. Role Players in the Energy Sector

5.1 Role played by individual entities

In France, the EDF (Electricite de France), the state-owned utility, is solely responsible for electricity production, transmission and end-user sales; the CEA (Commissariat a l'Energie Atomique), which is 100 percent state-owned, administers all nuclear research and controls all nuclear activities. Cogema, a subset of the CEA, has a monopoly on fuel cycle processes. The national-government standardization has become the defining characteristic of the French nuclear industry.

5.1.1. Electricite de France (EDF)

Electricite de France SA (EDF) is a France-based integrated energy operator active in the generation, distribution, transmission, supply and trading of electrical energy. It generates energy using nuclear technology, as well as thermal, hydroelectric and other renewable sources. In addition, the Company is engaged in the gas sector. Electricite de France SA is the parent company of the EDF Group and operates via its subsidiaries, including wholly owned EDEV, EDF Holding SAS, RTE-EDF Transport, EDF Belgium, Figlec, Finelex BV, EDF UK Ltd. and others. The group is present in France, Belgium, the Netherlands, the United Kingdom, the United States, Germany, Hungary, Poland, Italy, China, Vietnam and other countries worldwide.[4]

5.1.2. Commissariat a l'energie atomique (CEA)

The CEA is the French Atomic Energy Commission (Commissariat a l'energie atomique). It is a public body established in October 1945 by General de Gaulle. A leader in research, development and innovation, the CEA mission statement has two main objectives: To become the leading technological research organization in Europe and to ensure that the nuclear energy remains effective in the future.

The CEA is active in three main fields: Energy, information and health technologies, and defence and national security. In each of these fields, the CEA maintains a cross-disciplinary culture of

[4] Corporate Information (2010)

engineers and researchers, building on the synergies between fundamental and technological research.

5.1.3. COGEMA

COGEMA is an industrial group majority owned by the French State through the French Atomic Energy Commission (81.5 percent) and with private shareholders: the oil company TOTAL (15 percent) and the engineering firm TECHNIP (3.5 percent).

COGEMA, an industrial group in the energy sector, is active in nearly 30 countries. The COGEMA Group operates worldwide in all steps of the nuclear fuel, from ore prospecting to spent fuel reprocessing and recycling. Uranium is produced by COGEMA's mining subsidiaries in France, Canada, Gabon and Niger. COGEMA operates 5 production sites in France at Tricastin, Cadarache, Marcoule, Miramas and La Hague. With activities spanning from mining to spent fuel reprocessing and recycling, it offers electrical utilities all over the world with full range of products and services associated with nuclear energy. At the end of 1999, COGEMA newly expanded its industrial development by entering the capital of FRAMATOME and ERAMET.[5]

5.1.4. Autorite de Surete Nucleaire (ASN) or Nuclear Safety Authority

The Nuclear Safety Authority (ASN), an independent administrative authority set up by law 2006-686 of 13 June 2006 concerning nuclear transparency and safety (known as the "TSN law") is tasked on behalf of the State, with regulating nuclear safety and radiation protection in order to protect workers, patients, the public and the environment from the risks involved in nuclear activities. It also contributes to informing the citizens.

TSN law improves and clarifies the status of ASN with regard to nuclear safety and radiation protection. ASN thus increases its independence and its legitimacy with respect to those in charge of promoting, developing and carrying out nuclear activities. It enjoys a new legal foundation and a status comparable to that of its counterparts in other industrialised nations. It also has enhanced powers enabling it to penalise violations and take all necessary urgent measures.

The new status consolidates ASN's goal, which is to provide nuclear supervision that is efficient, impartial, legitimate and credible, that is recognised by the citizens and that constitutes an international benchmark for good practice.[6]

5.1.5. ANDRA

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[5] Global security (2010)

[6] ASN (2010)

The National Radioactive Waste Management Agency.

Created in 1979 within the CEA, it was established by the December 1991 Waste Act as a public body in charge of the long-term management of all radioactive waste, under the supervision of Ministry of Ecology, Energy, Sustainable Development and Sea (formerly the Ministry of Industry and the Ministry of Environment), and the Ministry of Research. Its 3 basic missions were extended and their funding secured through the 2006 Planning Act:

- **R&D mission** to propose safe long-term solution for radioactive waste without current disposal system; this mission includes long-term storage, since the 2006 Planning Act, in order to propose interim solutions while final ones are being studied (the long-term storage issue was initially entrusted to the CEA according to the December 1991 Waste Act),

- **an industrial mission** concerning, on one hand, waste acceptance criteria and control and, on the other hand, siting, construction, operation, closure and monitoring of repositories. This mission includes as well a public service mission in terms of collection of waste of the "small-scale nuclear activities" producers or owners (including the so-called "household" radioactive waste, i.e. waste owned by private individuals) and clean-up and rehabilitation of orphan polluted sites,

- **an information mission**, notably through the regular publication of the National Inventory of Radioactive materials and waste. This mission includes as well an active policy of dialogue with stakeholders both at national and local level (for instance through the activities of the various local information and oversight committees established for every underground research laboratory).

5.2. Exploration

The nuclear fuel cycle begins with the exploration for uranium deposits. Many types of sophisticated techniques are used to find uranium such as geophysical and geochemical analyses, satellite and airborne radiometric surveys, water sampling, and drilling. Because uranium deposits usually occur in discrete little pockets, rather than long continuous seams like coal and oil, the exploration process can be difficult and expensive.

5.2.1. Mining

If the mining operation appears profitable, the next step in the fuel cycle is to begin mining uranium ore. Uranium ore is the raw rock or gravel material that comes from the ground. It can be extracted through conventional mining in open pit and underground methods similar to those used for mining other metals.

Another popular mining technique is called solution mining or In situ leach mining. In this technology, a slightly caustic liquid such as carbonated water is injected underground to dissolve the uranium in place. The water containing dissolved uranium is then pumped back to the surface where the uranium is extracted. The water is then re-circulated back underground and the process is repeated until all of the uranium has been recovered.

5.2.3. Milling

The next step in the nuclear fuel cycle, called milling, involves the purification and concentration of uranium. Mined uranium ores normally are processed by grinding the ore materials to a uniform particle size and then treating the ore with acid to extract the uranium by chemical leaching. The milling process commonly yields a dry powdered-uranium oxide (U_3O_8) material called "yellowcake" because of its bright yellow color evident.

5.2.4 Uranium Conversion

Milled uranium oxide, U_3O_8, must be converted to uranium hexafluoride, UF_6, in order to separate the individual U-235 atoms from the U-238 atoms. A solid at room temperature, UF_6 can be changed to a gaseous form at moderately higher temperatures. The UF_6 conversion product contains only natural, not enriched, uranium.

5.2.5. Enrichment

The concentration of the fissionable isotope, U-235 (0.71 percent in natural uranium) is less than that required to sustain a nuclear chain reaction in light water reactor cores. Natural UF_6 thus must be "enriched" in the fissionable isotope for it to be used as nuclear fuel. Light-water reactor fuel normally is enriched up to about 4 percent U-235. However, different levels of enrichment for a particular nuclear fuel application may be specified. The UF_6 gas that remains has less than normal concentrations of U-235 in it and is therefore called "the enrichment tails", "depleted uranium", or simply "DU".

5.2.6. Fabrication

For use as nuclear fuel, enriched UF_6 is next converted into uranium dioxide (UO_2) powder which is then processed into pellet form. The pellets are then fired in a high temperature sintering furnace to create hard, ceramic pellets of enriched uranium. The cylindrical pellets then undergo a grinding process to achieve a uniform pellet size. The pellets are stacked, according to each nuclear core's design specifications, into tubes of corrosion-resistant metal alloy. The tubes are sealed to contain the fuel pellets: these tubes are called fuel rods. The finished fuel rods are bundled together in special fuel assemblies that are then used to make up the nuclear fuel core of a power reactor.

The back end of the cycle is divided into the following steps: interim storage, reprocessing, and waste disposal. After its operating cycle, the reactor is shut down for refueling. The fuel discharged at that time (spent fuel) is initially stored under water at the reactor site in special leak tight pools with cooling systems. The cooling systems are needed because the spent fuel continues to emit radiation and give off heat even after it is removed from the reactor. This is called "decay heat' and the levels can be as much as 5 percent of the original heat level. The spent fuel cools off and after about 5 years it can be taken out of the water and placed in special dry storage canisters made of concrete for long term storage. Reactor owners have been able to store the fuel onsite safely now for decades. However, some pools are beginning to fill up to capacity. At these sites, special dry storage pads are being installed to store the fuel in dry canisters until a final underground repository is constructed. These storage locations are known as Independent Spent Fuel Storage Installations (ISFSI) at the reactor site or at a facility away from the site.

5.2.7 Reprocessing

Spent fuel discharged from light-water reactors contains appreciable quantities of fissile (U-235, Pu-239), fertile (U-238), and other radioactive materials. These fissile and fertile materials can be chemically separated and recovered from the spent fuel. The recovered uranium and plutonium can, if economic and institutional conditions permit, be recycled for use as nuclear fuel. Currently, plants in Europe are reprocessing spent fuel from utilities in Europe and Japan. In the United States, DOE is conducting research on advanced nuclear fuel cycles that may someday recycle the spent fuel and extract more energy from the uranium. Advanced fuel cycle research is also being conducted to reduce the amount of nuclear waste that must be buried in the repository.

5.2.8. Waste Disposal

Although, the safety record for spent fuel storage systems has been good, ultimately the waste stream must be isolated from the biosphere until the radioactivity contained in them has diminished to a safe level. Under the Nuclear Waste Policy Act of 1982, as amended, the Department of Energy has responsibility for the development of the waste disposal system for spent nuclear fuel and high-level radioactive waste. Current plans call for the ultimate disposal of the wastes in solid form in licensed deep, stable geologic structures.[7]

6. Industrial Policy in China, Taiwan and South Korea lead to SEZs and EPZs proliferation

The context of industrial policy organizations include both commercial enterprises and state agencies that can influence and shape the direction of economic activity. South Africa can learn a lot from these Asian countries particularly on areas of organisational and regulatory

[7] EIA (2010)