

EXCEL SERVICES CORPORATION

Strategy and Scenarios for Developing Nuclear Fuel Leasing with a Geological Disposal Facility (GDF)

Final Report submitted to:

**NUCLEAR FUEL CYCLE ROYAL COMMISSION
ADELAIDE, AUSTRALIA**

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Strategy and Scenarios for Developing Nuclear Fuel Leasing with a Geological Disposal Facility (GDF)

TABLE OF CONTENT

1. Nuclear Fuel Cycle Royal Commission (NFCRC) Scope of Work
2. Statement of Competence
3. How a Proposal to "Fuel Lease" might be commercially developed based on the development of a South Australian Used Fuel Facility (GDF)
 - A. Commercial Strategy for a 'Holistic' concept, whereby Australian Uranium could be initially converted, enriched and fabricated into fuel (by suitable partners / members of consortia) and sold to Utility providers worldwide, based on disposal of Used Fuel taking place at a facility located in South Australia (GDF)
 - B. Commercial Strategy for a concept whereby services are offered in a similar way to new international SMR Vendors
4. Description of medium and long-term developments in markets relevant to potential fuel leasing
5. Challenges and Impediments to development of Fuel Leasing integrated with Used Fuel Disposal
6. Conclusions and Recommendations

1. NFCRC Scope of Work

PURPOSE

The NFCRC seeks to obtain further information on the concept of "Fuel Leasing" to further inform its Tentative Findings on the issue. The additional information will be incorporated into the Commission's Final Report.

REQUIREMENTS

The Contractor will supply a brief Report, which outlines, at a high level, a framework for a commercial strategy for linking the disposal of Used Fuel with potential front-end nuclear fuel cycle activities, including uranium conversion, enrichment and nuclear fuel fabrication (referred to herein as 'Fuel Leasing activities').

The Contractor will explain the potential commercial pathways, and challenges likely to be involved, in fuel leasing activities, including in relation to the following concepts:

- A. A 'Holistic' concept, whereby Australian uranium could be initially converted, enriched and fabricated into fuel (by suitable partners/members of a consortia) and sold to utility providers worldwide, based on the disposal of the Used Fuel taking place at a facility located in South Australia (GDF).
- B. A concept whereby services are offered in a similar way to new international SMR vendors.

2. Statement of Competence

EXCEL SERVICES CORPORATION is a recognized Nuclear Industry leader in the fields of technical design management, operations and training, regulatory and license consulting, safety, and security. EXCEL has worked with nearly every nuclear power plant in the United States and many International organizations and utilities. EXCEL is supporting licensing of all on-going nuclear new build programs in the U.S. (covering 5 different Gen III/III+ reactor designs), as well as Technical and Economical Feasibility Studies (and "Road Maps") worldwide.

EXCEL has supported international Nuclear Utilities (Finland, Sweden, Switzerland, Czech Republic, Germany, Hungary, UAE, South Korea, China, South Africa and Kenya), and Reactor Vendors (GE, Hitachi, Toshiba, Westinghouse, AREVA, AECL, KHNP and Mitsubishi), as well as SMR Vendors (Westinghouse, mPower, NuScale and others). EXCEL was founded in 1985, has about 200 experts and is headquartered in Rockville, Maryland, USA.

Key Experts

This report is based on the combined expertise of the following four experts. Three of them have life long careers in Nuclear Fuel (both in Fuel Design, Engineering and Sales and Marketing in Management positions) at the major Nuclear Fuel Vendors. One has five years experience in selling natural and enriched Uranium in the European and Asian markets. The Team Leader has extensive worldwide contacts at Utilities, Regulators and Vendors in his capacity of owning and operating a nuclear Consulting Company for over three decades, and as former ANS President.

Donald R. Hoffman	President & CEO of EXCEL, former President American Nuclear Society 9 years Nuclear Navy, 5 years US NRC, 31 years leading EXCEL 45 years in Nuclear Industry
Johann Lindner	Director Business Development - Europe at EXCEL past 13 years 30 years ABB Nuclear Fuel Division, 5 years International Sales VP at SEC (U.S. Uranium Enrichment Corporation) covering Europe and Asia 48 years in Nuclear Industry
Dr. PK Doshi	Director Business Development - Asia at EXCEL past 10 years 25 years Westinghouse Nuclear Fuel Management positions, 9 years at SCIENTECH including managing Canadian Nuclear Utility Services 44 years in Nuclear Industry
Keith Perron	Director Business Development - UK/ France at EXCEL past 10 years 13 years at Rolls-Royce Civil Nuclear, 10 years at Framatome Fuel, 7 years at BNFL (British Nuclear Fuel, Sales & Marketing Manager) 40 years in Nuclear Industry.

3.A. A 'Holistic' concept, whereby Australian uranium could be initially converted, enriched and fabricated into fuel (by suitable partners / members of consortia) and sold to utility providers worldwide, based on the disposal of the used fuel taking place at a facility located in South Australia.

The Basic Concept is to make Australian Uranium most "attractive" by promising the complete Fuel Cycle (Conversion, Enrichment, Fuel Fabrication, all Transportation, and Final Storage of Australian-mined Uranium Fuel. The economically very attractive Proposition of Final Used Fuel Storage in a South Australian Geological Disposal Facility (GDF) would make such a complete "Fuel Leasing" business model possible. South Australia is one of the geological/political most stable regions. Today only Russia (ROSATOM) can do that, but it may be politically less "attractive" for some Countries or Customers.

Developing this concept is based on the inherent "commercial leverage" of the Owner of the South Australian GDF Facility, added by the commercial "advantage of scale" compared to an individual Country's own GDF Project cost. Below follows a description of current industry practices in case of fuel for a new build nuclear plant, respective for routine Reload business, and how the fuel procurement market works, and how the GDF Owner can get involved.

Initially, the GDF Owner would contact a major Reactor Vendor that is competing for new build Nuclear Power Plant business worldwide (preferably in emerging nuclear Countries), and who needs to improve his competitive strength by offering "Fuel take-back". Such a Reactor Vendor will act as an "Integrator", since normally a Reactor Order is a Turnkey Contract (or Nuclear Island Contract), which usually includes the first Core plus 3 - 5 Reloads. As an "Integrator" the Reactor Vendor will offer in connection with the Reactor delivery, a complete Fuel Contract for the first Core and 3-5 Reloads. This Fuel Contract covers everything from Mining, Conversion, Enrichment and Fuel Fabrication Services and including Transportation.

The GDF Owner relationship with the Reactor Vendor ("Integrator") can be built "organically" over time into a suitable structure that will provide for the GDF Owner to take on an increasing share of the total "Fuel Leasing" business.

For Reload Fuel business the GDF Owner would contact a major Fuel Vendor (usually owned by a Reactor Vendor), who wants to become more competitive by offering "Fuel take-back" to Reload Fuel customers (i.e., the same Fuel Leasing business model based on Australian-mined Uranium). The Fuel Vendor can initially take on the same "Integrator" role as a Reactor Vendor. Later on this can be developed into a similar structure with increased GDF Owner participation in the Fuel Vendor business volume, as described for the Reactor Vendor case above.

In addition, most mature Nuclear Utilities act as "Integrators" themselves, by contracting Mining, Conversion, Enrichment and Fuel Fabrication Services separately. In all such cases the GDF Owner would have to contact the Nuclear Utility directly, or work in cooperation with the Fuel Vendor, who has the necessary Nuclear Utility contacts and market presence.

Once enough business volume is achieved to justify investment in Conversion, a Conversion Plant could be set up (takes ~ 5 years), that could be at least partly owned by the GDF Owner. Beyond that it would be of considerable advantage to set up an Enrichment Plant (preferably based on the Australian-invented Laser SILEX process), and by using the leverage of fuel take-back for Australian-mined, converted and enriched Uranium it would become an attractive proposition that the GDF Owner could make to the GLE Consortium (GE, Hitachi, Cameco), who have tested and licensed the SILEX process in the USA, but have not invested into a commercial SILEX facility since their domestic U.S. market outlook does not support the investment at present. The Laser-based SILEX process is technically / economically far superior to any other Enrichment Technology - however, the existing large capacity of Centrifuge Enrichment Plants (in Russia and Europe/USA - mostly fully depreciated) makes investment into a SILEX plant unattractive at present. The inherent advantage of fuel-take back that the GDF Owner could offer, would change the equation and make such an Australian-based SILEX Enrichment Plant attractive already near term. A backup solution would be to approach URENCO to discuss the merits of a South Australian based Centrifuge Plant using the inherent leverage of the GDF (and Fuel take-back).

Finally, building a Fuel Fabrication Facility in South Australia will probably not make commercial sense at present, since the technology involved is very closely "coupled" to the Reactor Vendor technology. This has eliminated all Fuel Fabrication Facilities worldwide, who are not owned by a Reactor Vendor (e.g., Exxon Nuclear), and the only exception is ENUSA in Spain, who survive because of their close cooperation/license with GE and Westinghouse BWR/PWR Fuel. This means an Australian Fuel Factory could be built like ENUSA in Spain, if a Reactor / Fuel Vendor would find enough advantage of having a Fuel Factory located in South Australia - this assessment could change. This is a subject for the GDF Owner to discuss with Reactor/Fuel Vendors in due time.

Fuel Cycle Activity	Suggested ACTIONS for South Australia	Road Map suggested - Initial Steps
Mining	Continue existing business in Australia	Let the "Integrator" (Reactor/Fuel Vendor) contract the Mining companies
Conversion	A potential Vendor is CONVERDYN	"Integrator" (Reactor/Fuel Vendor) contract the Conversion companies
Enrichment	A potential Vendor is URENCO	"Integrator" (Reactor/Fuel Vendor) contract the Enrichment companies
Fuel Fabrication	Potential Vendors are Westinghouse, GE-Hitachi (GNF), Candu Energy, Mitsubishi, KHNP	GDF Owner to contact the Fuel Vendor most suitable
Reactor Vendor	Potential Vendors are Westinghouse, GE-Hitachi, Candu Energy, Toshiba, Mitsubishi, KHNP	GDF Owner to contact the Reactor Vendor most suitable
Transportation	Potential Vendors are TLI, Edlow	"Integrator" (Reactor/Fuel Vendor) contract the Transportation companies

3.B A concept whereby services are offered in a similar way to new international SMR Vendors

This concept could help remove some serious impediments to SMR development worldwide, especially in emerging nuclear countries. The most likely SMR Customers are mainly located in emerging 3rd world nuclear Countries - who cannot afford to build a GDF for Used SMR Fuel. The South Australian GDF could help eliminate the biggest "road block" for SMRs to take off worldwide. Currently - none of the potential SMR Vendors can take back the "Used Fuel/Core" (except Russia).

Using the leverage of Australian GDF, allowing Fuel Leasing and Fuel take-back could not only help the SMR development, most importantly it would very much help to improve safety concerns over "proliferation issues", since many of these SMR countries are not politically stable enough to guarantee non-proliferation at many small sites and without a GDF, since the SMR Vendors are not equipped to take fuel back.

The proposed concept is for the GDF Owner to team up with the most suitable near-term SMR_Vendors and proposing Australian Uranium plus all front-end services, and most importantly "take-back" of the Used Fuel for Final Storage in the South Australian GDF.

CURRENT SMR MARKET OUTLOOK - Light Water Reactor type SMRs

In spite of all the expectations, the current outlook for SMRs is still not good. That is why highly experienced reactor vendors like Westinghouse and B&W have put their PWR-based SMR programs on hold for now.

The top SMR Vendors we suggest the GDF Owner to contact / meet and discuss common strategy are in order of importance:

Westinghouse	Will restart if outlook is good (i.e., Fuel take-back option from GDF)
mPower/B&W	Will restart if outlook is good (i.e., Fuel take-back option from GDF)
NuScale/Fluor	Have no solution to fuel cycle or Fuel take-back (needs GDF option)
HOLTEC/Shaw	Going forward, but have no solution on fuel cycle or Fuel take-back
SMART/KAERI	Have no customer outside Korea, may need Fuel take-back as incentive
CAREM/INVAP	Have no customer outside Argentina, may need Fuel take-back incentive

All of these near term SMR Vendors use standard PWR technology fuel assemblies (with maximum 5% enrichment). This would make it easy for Australian GDF to care of the "fuel take-back market" and of course being fueled by Australian Uranium (and front-end services: Conversion, Enrichment, Fabrication) adding value to Australia's Uranium exports.

The time frame for all these potential SMR projects is 2025 and onwards, which means first fuel take back would occur earliest in 2030. The markets for these SMRs would be mainly in emerging 3rd world Countries, who have no nuclear infra-structure. The GDF fuel take-back option would greatly improve the Nuclear Non-Proliferation safety aspects of selling SMRs to these 3rd world Countries.

In the long term there will be many more exotic SMR designs (e.g., 20% enrichment, Lead-Bismuth cooled, Helium cooled, Molten Salt, Fast Neutron, etc), which means the Used Fuel from these advanced SMRs may or may not be suitable to be stored in South Australia's GDF, or will require re-design of a part of GDF to be able to store such "exotic" SMR fuels.

The initial activities and steps requested from the GDF Owner would be the same as described under Section 3.A above. The future development of GDF activities for SMR will depend on market volume development post 2030, which may justify an increasing involvement / investment by the GDF Owner into an increased portion of the entire SMR fuel cycle activities.

Fuel Cycle Activity	Suggested ACTIONS for South Australia	Road Map suggested - Initial Steps
Mining	Continue existing business in Australia	"Integrator" (Reactor/Fuel Vendor) contract the Mining companies
Conversion	A potential Partner is CONVERDYN	"Integrator" (Reactor/Fuel Vendor) contract the Conversion companies
Enrichment	A potential Partner is URENCO	"Integrator" (Reactor/Fuel Vendor) contract the Enrichment companies
Fuel Fabrication	Potential Partners are Westinghouse, mPower, HOLTEC, KAERI/SMART and CAREM/INVAP	GDF Owner to contact the Fuel Vendor most suitable
Reactor Vendor	Potential Partners are Westinghouse, mPower, HOLTEC, and many more	GDF Owner to contact the Reactor Vendor most suitable
Transportation	Potential Vendors are TLI, Edlow	"Integrator" (Reactor/Fuel Vendor) contract the Transportation companies

4. DESCRIPTION OF MEDIUM AND LONG-TERM DEVELOPMENTS IN MARKETS RELEVANT TO POTENTIAL AUSTRALIAN FUEL LEASING BASED ON AUSTRALIAN "ORIGIN" URANIUM

In order to understand how a Fuel Leasing arrangement would be developed, and why it would be sustainable, it is necessary to offer some insight into the near and medium term time frames of markets where the proposed Fuel Leasing activities might be undertaken.

That requires as a first step the identification of the time period in which the commercial arrangements could first occur.

The near/medium term time frame overview of international markets for a potential Fuel Leasing Agreement, that utilizes a South Australian GDF, is approximately 15 years after any Australian decision (i.e., assuming it were made in 2016, the earliest is about 2031).

At that point it would be reasonable to assume that used fuel take-back arrangement to a South Australian GDF could commence. This requires that certain International Agreements have been amended accordingly without undue delay (allowing retransfer of Used Fuel back to Australia).

The listed timeframe takes account of certain factors that operate in the international market for fuel supply that must be understood in order to gain a real appreciation of how fuel leasing would work. This does not mean that arrangements would not need to be made before then – they would need to be made with the overall timeframe in mind.

Assuming a fuel lease was integrated with a new reactor development that was a Gen III/III+, that is, a fuel lease is tied with the delivery from a Reactor Vendor, the time schedules would be as follows. These estimates are based on long term industry experience (average values):

- 9 months Uranium Mining Contract & delivery
- 9 months Conversion Contract & delivery
- 12 months Enrichment Contract & delivery
- 24 months Fuel Fabrication Contract & delivery (24 months for 1st Cores of new build reactors, 18 month for reloads)
- This means delivery time of a 1st Core of a new build NPP is about 4-5 years
- Startup of a first new build NPP is typically/earliest 7 years after Turnkey Contract signature
- The new build Reactor Vendors deliver normally the 1st Core and 3-5 Reloads (means typically fuel supply for first 8-10 years of operations)
- After 5 years operation the fuel will be discharged and stored minimum 5 years for "cool down" in the Fuel Pool of the Reactor.

The time schedules would be similar if applied to potential new build SMR's. However, no Western SMR Concept will be built and become operational before about 2025 (due to current licensing schedules). Furthermore, it is widely understood that SMR Vendors would seek to "factory-produce" SMRs based on a sizable order book, so as to justify investment in facilities for their factory-construction and to deliver efficiencies in production through their modularization. This means any sizeable SMR market is more likely to be a decade further out, assuming a decision today means mid to late 2030s. This means any SMR Used Fuel take-back market to a South Australian GDF will develop rather "slowly", especially because the volume of Used Fuel from each single SMR Unit is about 10x times smaller than from a large commercial nuclear plant. However, the SMR market in emerging nuclear countries would be greatly assisted by a fuel take-back arrangement, because it would potentially allow the SMR Owners to meet internationally accepted standards directed at limiting the risk of proliferation.

If the basis for commercial entry into Fuel Leasing is through integration with Reactor/Fuel Vendors, then it is necessary to consider the countries and regions to which such an arrangement may be relevant. It is necessary to deal with them separately, because of differences in policies and arrangements for Used Fuel management and disposal.

Currently, though this may change by 2025, both the United States and Europe are closed markets regarding Used Fuel retransfer to South Australian GDF. Their national non-proliferation Laws will prevent in most cases any export of Used Fuel, with some possible exceptions. It is quite possible that such restrictions might be removed, if suitable international arrangements (amendments to existing Treaties) were to be developed by working with the IAEA, but this may take some time (would be years). Therefore, such contacts with IAEA should be taken as early as possible.

However, the current top 5 Fuel Leasing candidate countries, can be summarized as follows in order of importance based on their potential relevance:

- UK: (Sellafield and NDA), who are under tremendous pressure, since they cannot handle all HLW and Used Fuel given their budget and time constraints. UK plans to leave EU will possibly let them "operate" outside EU Rules. Also, the planned new NPP plants of Hitachi-GE (2xABWR, Horizon), Westinghouse (2xAP1000, Nugen), Bradwell (2xHualong-1000, CGN), and Hinkley Point C (2xEPR, EDF) would greatly benefit from teaming up with the South Australian GDF.
- UAE: Have ordered 4xAPR1400 from KHNP/South Korea (startup 2017/18/19/20), and signed Agreements not to enrich/nor reprocess nuclear fuel. There are another 6xAPR1400 planned - and South Australian Used Fuel take-back Option should be extremely attractive to UAE. The Utility ENEC will probably "outsource" the operation of these NPPs to a foreign Utility, who will be responsible both for both fuel supply and operations.

- Saudi Arabia: Big potential future fuel-take back customer could be KA-CARE. Saudi's plan to construct 16-32 NPPs and "outsource" the operation of these NPPs - this opens great opportunities to South Australian GDF. Saudi Arabia also plans to build SMRs for Desalination.
- Turkey: First Turkish Site (4xVVER1200 at Akkuyu) under ROSATOM Contract (Build-Own-Operate: 80 years, including Fuel Supply, Used Fuel Take-Back and final Decommissioning), which puts great "pressure" on Competitors to match these conditions. Second Site Sinop: Mitsubishi / AREVA 4xATMEA1, but they cannot offer Used Fuel-take-back. Third Site: Westinghouse 4xAP1000, but they cannot offer Used Fuel-take-back. Great opportunity for South Australian GDF.
- Vietnam Ninh Thuan-2 Site: (4xJapanese NPPs). ROSATOM is contracted to supply 4xVVER1200 plants for Ninh Thuan-1 Site. Japanese Companies are hard pressed to match Russian offer. Still open if Japanese winner will be Toshiba, Hitachi or Mitsubishi. A Used Fuel take-back option would make a big difference.

Next 5 markets of interest:

- South Africa: Going out for Bids for 8xNPPs end of 2016: Means Russian (ROSATOM) and China (CNNC and CGN) have "inner track", since neither GE-Hitachi nor Toshiba / Westinghouse can match those Bids, unless they can offer "Used Fuel take-back".
- China: Near-term we see possibilities for Australian GDF to work with CGN in export markets. Mid/long term, Chinese plan to reprocess their Used Fuel for use in FBRs.
- Japan: Toshiba works the worldwide BWR/PWR new build markets via Westinghouse, and certainly needs help with Used Fuel take-back to South Australian GDF (we consider them the most important near term Partner for South Australian GDF "Corporation"). Hitachi is Partner of GE and we suggest that teaming up with GE is very important for South Australia (considering the GE Australian-SILEX Enrichment connection). Mitsubishi can become an important Partner, since they are going to be a major player in future emerging Country new build business, and South Australian Used Fuel take-back will be extremely important to them.
- South Korea: Want to Reprocess Nuclear Fuel in near future. This means they will have little interest in Used Fuel take-back option themselves. However, they may need this option when they are offering new build NPPs to new emerging nuclear Countries in 3rd world.
- Argentina: Both China and Russia are expected to construct 4 new NPPs, and Used Fuel take-back could become a decisive factor.

Long term markets of interest:

- Indonesia: Very interested in ordering many SMRs for their many Islands/small Grids. Could develop into a major SMR Used Fuel take-back market in due time.
- Thailand: Currently nuclear power program is on hold - but this will change well before 2025, and thus it is a very interesting future market for Used Fuel take-back.

- Malaysia: Currently NPPs are on hold - but this will change well before 2025, and thus it is a very interesting future market for Used Fuel take-back.
- Mexico: If and when they start new build NPP program. Meantime, reload fuel based on Australian "origin" Uranium and Used Fuel take-back could be an opportunity.
- Kenya: Newcomer nuclear Country, planning first NPP by 2030, which will be very interested in "Used Fuel take-back". (We consider this realistic as of today).

5. Challenges and Impediments to Development of Fuel Leasing Integrated with Used Fuel Disposal in South Australia

- All Western nuclear Customers/Countries have today National Laws that prevent export of any Used Nuclear Fuel (if they are the "End Users") due to non-proliferation concerns and International Treaties in place. This can be overcome by asking IAEA to "broker" a Fuel Leasing deal, while waiting on amendments to the International NPT Treaty. The U.S. controls currently about 60% of the world's fuel cycle (through "US origin" labels due to U.S. companies involved in the various fuel cycle activities), which requires U.S. consent as well to most of such Fuel Leasing deals.
- International Laws and Treaties are currently "restricting" such concepts, with one exception: Russia has routinely taken back Used Fuel, and still promises such services to new ROSATOM Customers for new build nuclear plants (before joining EU: Finland, Hungary, Czech Republic, Bulgaria, East Germany, and today: Turkey/Akkuyu, etc). Once joining the EU those Countries had to stop Used Fuel take-back to Russia.
- That means - that the most likely Customers for a South Australian Final Repository (GDF) - are all the new emerging nuclear Countries (like Turkey, UAE, Saudi Arabia, Vietnam, Kenya, etc). In addition, any Country procuring SMRs is a "prime customer" to South Australian GDF, since they "cannot afford" a Used Fuel Storage Facility and the most likely and credible SMR Vendors have no way to "take back fuel/cores" and store themselves - this presents a great opportunity for a South Australian GDF.
- Big "vertically integrated" players that are state-owned (i.e., ROSATOM, AREVA/EDF, CNNC and CGN), are potential competitors to a South Australian GDF concept, since it would eliminate some of their most competitive advantages (especially for ROSATOM, who offers fuel take-back today) and AREVA who intends to offer fuel take-back for Reprocessing. This competition with vertically integrated Vendors arises from the following basic facts:
 - If a Customer selects the South Australian GDF alternative then ROSATOM would lose its advantage of fuel take-back
 - If a Customer selects the South Australian GDF alternative then AREVA would lose its advantage of providing AREVA-mined Uranium plus its option to provide Reprocessing
 - Same arguments apply to Chinese CNNC and CGN, except they are not ready for fuel take-back at present, they plan to start Reprocessing latest by 2050
 - This means the real competitors today are ROSATOM and AREVA (and their successors)
- Worldwide, front-end Fuel Cycle Vendors have been "consolidated" over the past 20 years into very few "survivors". The front-end nuclear fuel world market is today still largely "oversupplied" (due to Fukushima impact and slow new build programs outside China and Russia). This situation will improve by 2025, but introducing Front-end Fuel Cycle Facilities in South Australia will still depend on the synergy provided by the proposed Australian GDF based on using Australian mined Uranium.
- TRANSPORTATION of Used Nuclear Fuel around the world - is an obstacle/issue for the planned South Australian GDF. Sweden (SKB) has developed acceptable technology for "coastal transports" of Used Fuel using double-hulled ships. Another issue will be a

Transportation Cask that can be used for both transportation and final storage in the GDF (to avoid the expensive step of using a new Casks for final storage - a potential supplier is German Siempelkamp/CASTORs, which could be manufactured locally in South Australia).

- Uncertainty about future actual Market Size and economic feasibility: NFCRC (or GDF Owner) need to carry out a detailed market analysis to determine if the realistically "available" world market would be sufficient to sustain an economically sound front-end nuclear industry in South Australia, and if so - which year? Absent a detailed market review the best estimate is the 2030-35 time frame.

6. Conclusions and Recommendations

The GDF Owner (and Australia) need to work with IAEA to overcome any hurdles due to existing International Treaties allowing this "Fuel Leasing" business model, where the "End-User" is the South Australian GDF Owner. IAEA can help broker such Fuel Leasing Agreements absent an Amendment to the International Non-Proliferation Treaty.

A market for South Australian GDF Services can be developed based on the inherent attractiveness of this concept to Reactor Vendors and Fuel Vendors, who initially can act as "Integrators" and work with the GDF Owner, to cover the entire front-end of the fuel cycle, from Australian-mined Uranium all the way to the South Australian GDF that supports "fuel take-back". Furthermore, the "economy of scale" will also help the South Australian GDF Owner to win over many smaller emerging nuclear countries worldwide, due to their much higher cost of constructing a GDF for a small country/small HLW volume (i.e., "economy of scale").

An optional approach is to accept Australian-mined Uranium in current/existing Used Fuel. However, this approach carries the risk of defeating the whole "Fuel Leasing" concept. If considered, it should be carefully priced (higher) to separate it from the proposed "Fuel Leasing" concept presented in this Report and based on South Australian GDF Owner to achieve a dominant role in the front-end nuclear fuel cycle business over next two decades.

The same approach can be taken by the GDF Owner working with SMR Reactor and Fuel Vendors as initial "Integrators".

The time frame to develop a sizeable market for the GDF Owner will be about 20-25 years, given the new build nuclear power market growth rate in countries other than Russia, China and India. Once a sufficient market volume is reached the GDF Owner could work with its Partners (Integrators) to set up a Conversion and also an Enrichment Facility preferably based on the Australian-invented SILEX process.

To begin with, South Australia can embark on the Concepts described in this Report, to create an Integrated Fuel Cycle structure based on suitable cooperative Agreements with the best suited (most motivated) Western Fuel Cycle companies to carry out Conversion, Enrichment and Fuel Fabrication using Australian-mined Uranium. The most important partners to South Australian GDF will be Western Reactor Vendors and Fuel Cycle Companies trying very hard to stay viable in a currently oversupplied world market (due to slow a nuclear renaissance and Fukushima) to carve out a commercially viable market share.

To make any Fuel Leasing (Take-back) Agreement credible, an "ironclad" guarantee of Used Fuel removal from the Customer Country must be provided, otherwise all other Agreements remain moot.