Thorium Power

NEWS UPDATE – February 5, 2006

Press Information Bureau, Government of India Press Release – **President's Address at the 77th Annual Convocation Of Osmania University, Hyderabad (02.01.07) –** President A.P.J Abdul Kalam addresses the 77th Annual Convocation of Osmania University, Hyderabad and discusses energy independence in terms of ways to reduce damage to the ozone layer and economic solutions to energy production. The president's speech included a section devoted to nuclear power and why further technology development has to be accelerated for thorium based reactors.

Indo Asian News Service – India should achieve energy independence by 2030: Kalam (02.01.07) – The news service reports on President A.P.J Abdul Kalam's address to the 77th Annual Convocation of Osmania University, Hyderabad. The article notes the President's urging to pursue the development of nuclear power using thorium, reserves of which are high in the country.

The Press Trust of India Limited – **NTPC plans 2000 MW nuclear power by 2017 (01.31.07)** – The release announces NTPC Limited's decision to "get into the nuclear space" by setting a plan for building nuclear facilities and thus ending the monopoly of state-owned Nuclear Power Corporation of India Ltd. The announcement notes that NTPC has been involved in talks with Thorium Power to establish joint ventures in the US. (This article also ran in ZEENews.com.)

SeekingAlpha – **Fronteer Development Sizzling Hot in Gold & Uranium (01.26.06) –** The stock market opinion and analysis site reports on the boom in building of nuclear reactor sites. The report discusses using thorium in nuclear reactors rather than uranium as a solution for clean energy options and notes that SeekingAlpha is researching a company that "has been partnering with the U.S. and Russian governments on a new technology to use thorium to generate power."

Midland Reporter-Telegram – **Reactor project could be fully funded this spring (01.25.07)** – The paper reports on an announcement by Jim Wright, Director of the High-Temperature Teaching and Test Reactor Project in Texas. Wright announced that a state-of-the-art, helium-cooled nuclear research facility to be built on a 1.5-square-mile site in Andrews County, could be fully funded by March or April of this year and is slated for completion in November 20. The article mentions that among other partners, Thorium Power and Sandia National Laboratories in Albuquerque, N.M. are also involved in the project.

IndUS Business Journal – **Pundits expect cash to flow on heel of nuclear deal (01.17.07)** – The journal reports on various experts' remarks concerning the U.S.-India nuclear agreement. The article notes that Thorium Power has engaged in talks with Nuclear Power Corp. of India and NTPC Ltd. to establish joint ventures on the subcontinent and goes on to quote Dennis Hays as being excited to work with India because of its "vast thorium reserves" and its "great many trained scientists, physicians and universities that we can tap into." (This article also ran in *India New England*.)

The Sunday Times – **When oil runs out, go nuclear (01.14.07) –** Former stockbroker and present editor of *MoneyWeek*, Webb asserts that analysts can avoid the humiliation involved with prediction by aligning themselves with her own sure-bet in the secure future of nuclear power. In recommending Thorium Power, the reporter notes that the company is developing technology to take advantage of key factors such as the abundance of supply, relative short half life, and minimal waste. (This article also ran in *MoneyWeek*.)

The Economic Times – **'Thorium to give India an edge' (01.04.07)** – The article features an interview with Thorium Power's Seth Grae and includes his analysis of why thorium will play a large part in India's future. The article discusses Mr. Grae's views on thorium's advantages over uranium, Thorium Power's plans for partnerships in India and the Indian market for thorium.

President's Address at the 77th Annual Convocation Of Osmania University, Hyderabad February 1, 2007

Following is the text of President's Address at the 77th Annual Convocation of Osmania University, Hyderabad :

Energy Independence and Planet Earth's Environment

"Knowledge makes you Great"

I am delighted to participate in the 77th Annual Convocation of Osmania University, Hyderabad. It gives me great pleasure to be here in this University which is meeting the educational needs of the Nalgonda, Mehaboob Nagar, Medak, Nizamabad, Ranga Reddy and Hyderabad districts of Andhra Pradesh. I am happy that the University is named after Osman Ali Khan, the 7th Nizam of Hyderabad, who patronized education, science and development in the State. I find that he has allocated 11% of his budget for education. During his time primary education was made compulsory and provided free to poor sections of society. I am sure compulsory and primary education will come into action throughout the country.

I congratulate all the students of Osmania University on their accomplishment of acquiring knowledge and resulting into degrees and certificates. I extend my greetings to the teachers who have worked very hard in shaping the young minds of this University. I also greet all the parents of graduating students. Today I would like to share with you a few thoughts on "Energy Independence and Planet Earth's Environment". First let me discuss the importance of research in our universities.

Research - Teaching - Research

Any University is judged by the level and extent of the research work it accomplishes. This sets in a regenerative cycle of excellence. Experience of research leads to quality teaching and quality teaching imparted to the young, in turn enriches the research. Research brings transformation and development and also enhances the quality of education. Both research and teaching go together in good colleges and universities. I am happy that Osmania University is carrying out research in areas of science, technology, humanities, social sciences, language and the Indian culture. I am sure, the research results from these studies will definitely provide valuable inputs for structuring the education system needed for transforming our youth into enlightened citizens. Let us now see what are the purposes energy independence can serve.

Energy Independence born out of two purposes

I would be discussing two aspects in my presentation. How do we make our earth livable and free from CO2 bombardment and thereby reduce the damage to the ozone layer? Also how do we find an economic solution to energy production, which has several scientific challenges encompassing many scientific fields?

The world energy forum has focused on what is going to be the status of fossil fuel based material like oil, gas and coal in the next fifty to hundred years. It is estimated by international forecasting that the available resource of fossil material will get exhausted within the next fifty to hundred years since these resources are non-renewable. And also friends, I would also like to share with you about the recent article in the "New Scientist" which mentions about dumping of 30 billion tonnes of carbon-di-oxide into the atmosphere by all the nations every year. This dumping primarily arises due to the use of fossil fuels which directly affects the ozone layer which is existing between 25 kms to 30 kms above the earth's surface. As you all know, Ozone layer regulates the sun radiation and cosmic radiation on earth. Earth is experiencing both stratospheric cooling (due to ozone hole) and tropospheric warming (due to increased green house gases). The question is, how do we protect our earth by protecting the atmosphere.

I would like to focus on how India can contribute in minimizing CO2 contamination in the atmosphere to save the Planet Earth. Let me now discuss the energy requirement and its structures in the coming two and a half decades which is applicable for one billion plus people of India and it will be relevant to the other five billion people of planet Earth.

Structure of Energy Sources for India

Based on the progress visualized for the nation during the next two decades, the power generating capacity has to increase to 400,000 MW by 2030 from the existing hundred and thirty thousand Megawatts in India. This takes into consideration of energy economies planned and the design and production of energy efficient equipments and systems. Energy independence has got to be achieved through three different sources namely Hydel capacity, nuclear power and non-conventional energy sources primarily through solar and wind energy, apart from the use of thermal power through clean coal technology.

In 2030, the Hydel capacity is expected to contribute 80,000 MW. Large scale solar energy farms of hundreds of megawatts capacity in certain number could contribute around 55,000 MW and wind energy can contribute 64,000 MW. The nuclear power plants should have a target of 50,000 MW of power. The balance 15,000 MW will be generated through use of solid bio mass and municipal waste. Now, let me discuss the scientific research and development challenges for realizing the mission of energy independence. First, I would like to talk about solar energy.

CNT based solar cells for higher efficiency

One of the important need for achieving energy independence by 2030 is to increase the power generated through renewable energy sources from the existing 5% to 25%. Particularly, the energy produced through solar energy has to increase substantially. The low efficiency of conventional photo voltaic cells has restricted the use of solar cells for large application for power generation. Research has shown that the Gallium Arsenide (GaAs) based PV cell with multi junction device could give maximum efficiency of only 30%. Hence it is essential to launch a research mission on Carbon Nano Tube (CNT) based PV cell which has got higher level of promise in efficiency.

The CNTs provide better electron ballistic transport property along its axis with high current density capacity on the surface of the solar cell without much loss. Higher electrical conductivity and mechanical strength of CNT could improve the quantum efficiency to the order of 35%. But, this is not sufficient. Recent research has shown that the alignment of the CNT with the polymer composites substrate is the key issue and this aligned CNT based PV cells would give very high efficiency in photovoltaic conversion. The polymer composites increase contact area for better charge transfer and energy conversion. In this process, the researchers could achieve the efficiency of about 50% at the laboratory scale. Our scientists have to take up this challenge and come up with the development of a CNT based PV cell with an efficiency of at least 50% within the next three years so that it can go into the commercial production within five years. In addition, they can also take up the development of organic solar cells, dye-sensitized solar cells and third generation solar cells. There are lots of opportunities for research in fundamental science in this area and I would like to see these opportunities are used by Osmania University. Now, I would discuss about bio-fuel research.

Bio-fuel oil production

The country is presently importing around 100 million tonnes of crude oil with a foreign exchange outflow of Rs. 1,50,000 Cr. per annum (nearly US $ 34 billion). By 2030 with the present growth rate we may have to import 300 million tonnes. To reduce the import content, apart from locating the embedded oil resources in the country, we have to work on producing Ethanol and bio-diesel in a cost effective manner which can be blended to the extent of 30% to 40% with petrol and diesel. Simultaneously, we have to work on development of other energy sources like hydrogen which is totally pollution free.

Our study indicates that we have to realize production of 60 million tonnes of bio-diesel and 60 million tonnes of Ethanol per annum by 2030. Particularly for bio-diesel we have to get this production from 20 million hectares which is one third of the quantum of present waste land available in the country, where Jatropha can be planted. We have to achieve it through research for improving the productivity of Jatropha plant seeds, mastering the extraction and esterification technology and finding remunerative bi-products, which is a challenge for life science scientists. Our aim should be to evolve a drought resistant Jatropha seed which will provide minimum 3 kgs of seed per plant annually commencing from third year of plantation and minimum 40% oil content. Similar effort is required in ethanol plantation and production also. I consider, this is definitely an important challenge for the agriculture scientists, gene experts, plant breeders and biotechnologists of Osmania University. Osmania scientists must also collaborate with combustion experts and produce the most fuel efficient engines that can run with 100% bio-diesel or ethanol produced from Jatropha plantation or sugarcane. Let us discuss nuclear fuel research.

Nuclear Energy

So far, the present nuclear power capacity of 16 reactors which is 3900 MW is expected to go to 7400 MW by 2010 with the completion of nine reactors which are now in progress. Eventually as per present plan of BARC and Nuclear Power Corporation the capacity by 2020 is expected to be increased to 24,000 MW. There is a need to plan right from now to increase this capacity to 50,000 MW by 2030.

Nuclear power generation has been given a thrust by the use of uranium based fuel. However to meet the increased needs of nuclear power generation, it is essential to pursue the development of nuclear power using Thorium, reserves of which are higher in the country. Technology development has to be accelerated for Thorium based reactors. Thorium is a non fissile material. For conversion of Thorium and maximizing its utilization development of Fast Breeder Reactor has been rightly taken up. Now, let me discuss about efficient hydrogen fuel.

Efficient Hydrogen Fuel

During my visit to Iceland, I had a unique experience, which I would like to share with you. Friends, the President of Iceland and myself with our teams were traveling in a hydrogen fuelled bus. The bus also took us to a Hydrogen Fuel station and we filled up Hydrogen gas in the fuel tank and we continued our journey and discussions. I am aware that, hydrogen operated motorcycles, three wheelers and small generators have been developed in the country. In addition, Polymer Electrolyte Membrane Fuel Cell (PEMFC) and Phosphoric Acid Fuel Cell (PAFC) technologies and fuel cell – battery hybrid van have been developed. Hydrogen production from distillery waste and other renewable methods have also been developed. Hydrogen storage in metal hydrides has also been demonstrated. We have also to work on liquid hydrogen production plants. At present, research is in progress to further improve the performance and technology of these vehicles and generators. Particularly the Fuel cell powered automobiles will become a reality in the world. I would urge the researchers of Osmania University to concentrate on the areas such as high pressure storage of hydrogen, liquid storage, storage in nano-structure, development of safety codes and standards and development of dedicated engine for hydrogen fuel. Finally, I would like to mention about wind energy research.

Wind Energy Research

It is essential that in an area of wind energy research, we need to earmark sufficient efforts and resources for research for potential windy areas, optimal plant design, cost effectiveness and progressive improvements. For realizing, generating capacity of 64,000 MW of electrical power from wind energy, we have to take the following actions:

A. The present potential of wind energy in India has been worked out to be 45,000 MW. Studies must be launched to explore other potential sources such as off-shore wind farms, especially, since India has over 7000 km long coastlines. It may also be necessary to apply advanced techniques in wind velocity

measurement and relating it to available electrical out put.

B. Work towards standardization of the wind turbine power plants to realise the cost reduction due to economies in the scale. Also research and development is required for reducing the investment per MW through improved designs and application of newer technologies.

C. I understand that the generation cost at presently is between Rs.2.5 to Rs.3.5 per unit depending upon the site. Research is required to bring down this cost to Rs.1.00 to Rs.2.00 er unit based on improved designs and maintenance free systems.

D. Feasibility studies may be conducted by wind energy researchers to determine economic sizes of wind energy plants which can be used for lifting water from 30 meter level and serve the needs of farmer having small holdings in a region with an average wind speed of 8 to 10 km per hour.

Now, I would like to talk about the research required for reducing the impact of coal based power plants on atmosphere.

Minimizing the impact of coal based plants on environment

To minimize the impact of coal based plants on environment in the country we have to use super critical technologies with higher steam parameters for improved plant efficiency and circulating fluidized bed combustion for use of inferior coal. The newer technology option such as integrated coal gasification combined cycle and solar integrated combined cycle should be completed fast and implemented in our power plant. There is a need to implement these technologies at the earliest so that we can get better coal, higher efficiency of the plant, reduced transportation load and minimum impact on the environment. Now, I would like to present few thoughts on convergence of technology which is the emerging area of the future.

Convergence of Technologies

The information technology and communication technology have already converged leading to Information and Communication Technology (ICT). Information Technology combined with bio-technology has led to bio-informatics. Now, Nano-technology is knocking at our doors. It is the field of the future that will replace microelectronics and many fields with tremendous application potential in the areas of medicine, electronics and material science. When Nano technology and ICT meet, integrated silicon electronics, photonics are born and it can be said that material convergence will happen. With material convergence and biotechnology linked, a new science called Intelligent Bioscience will be born which would lead to a disease free, happy and more intelligent human habitat with longevity and high human capabilities. Convergence of bio-nano-info technologies can lead to the development of nano robots. Now, I would like to discuss the Global Human Resource Cadre which is essential for transforming India into a knowledge society. Universities have an important role in creating and nurturing this cadre.

Global Human Resources Cadre

Presently our university education system is contributing 3 million graduates and post graduates every year and the students seeking employment after completion of 10th class and 10+2 class are around 7 million per year. Thus nearly 10 million youth are injected into the employment market every year. In the 21st century, India needs large number of talented youth with higher education for the task of knowledge acquisition, knowledge imparting, knowledge creation and knowledge sharing. At present India has five hundred and forty million youth under the age of 25. This will continuously be growing till the year 2050. Keeping this resource in mind, the Universities and educational systems should create two cadres of personnel: (1) a global cadre of skilled youth with specific knowledge of special skills (2) another global cadre of youth with higher education. These two cadres will be required not only for powering the manufacturing and services sector of India but also will be needed for fulfilling the human resource

requirements of various countries. For realizing this, the universities and secondary school education system will have to work towards increasing the through put of the higher education system from the existing 11% to 20% by the year 2015, 30% by the year 2020 and 50% by the year 2040. The other Indians who are not covered by the higher education system should all have world class skill sets in areas such as construction, carpentry, electrical systems, repair of mechanical systems, fashion design, para-legal, para-medical, accountancy, sales and marketing, software and hardware maintenance and service, software quality assurance to name a few. No Indian youth should be without either a world class higher education or without world class skill sets. Osmania University has an important role to play in creating and nurturing the global human resource cadre in Andhra Pradesh.

Conclusion: Value of Excellence

Recently I was reading the two volumes of the book titled 'The Big and the Small' from the Microcosm to the Macrocosm written by Dr. G. Venkataraman. In this latest book, author establishes fascinating link between particle physics and cosmology in two volumes. Since I am in the midst of students and academic community, I thought of sharing with you an incident narrated in the book about Sir CV Raman. Raman was in the first batch of Bharat Ratna Award winners. The award ceremony was to take place in the last week of January, soon after the Republic Day celebrations of 1954. The then President Dr. Rajendra Prasad wrote to Raman inviting him to be the personal guest in the Rashtrapati Bhavan, when Raman came to Delhi for the award ceremony. He wrote a polite letter, regretting his inability to go. Raman had a noble reason for his inability to attend the investiture ceremony. He explained to the President that he was guiding a Ph.D. student and that thesis was positively due by the last day of January. The student was valiantly trying to wrap it all up and Raman felt, he had to be by the side of the research student, see that the thesis was finished, sign the thesis as the guide and then have it submitted. Here was a scientist who gave up the pomp of a glittering ceremony associated with the highest honour, because he felt that his duty required him to be by the side of the student. It is this character that truly builds academic excellence. I am sure the academic community assembled here will follow this example.

Once again let me congratulate all the graduating students of Osmania University for their excellent academic performance. My best wishes for success to all the members of Osmania family in their mission of promoting value based education to the youth of Andhra Pradesh.

May God bless you. "

India should achieve energy independence by 2030: Kalam
Indo Asian News Service
February 1, 2007

Hyderabad, Feb 1 (AINS) President A.P.J. Abdul Kalam Thursday said India should achieve energy independence by 2030 through hydel capacity, nuclear power and non-conventional energy sources like solar and wind power besides thermal power.

Delivering the convocation address at the 77th annual convocation of Osmania University here, he said that based on the progress visualised for the nation during the next two decades, the power generating capacity has to increase to 400,000 Megawatts (MW) by 2030 from the existing 130,000 MW.

'In 2030, the hydel capacity is expected to contribute 80,000 MW. Large-scale solar energy farms could contribute around 55,000 MW and wind energy can contribute 64,000 MW. The nuclear power plants should have a target of 50,000 MW. The balance 15,000 MW will be generated through use of solid bio mass and municipal waste,' he said.

He spoke of the scientific research and development challenges towards realising the mission of energy independence and asked Osmania University to take up the challenge.

Explaining why energy independence was essential, Kalam, on a two-day visit to Andhra Pradesh, said it was estimated that the available resource of fossil fuels would get exhausted in the next 50 to 100 years.

On nuclear power, Kalam said the capacity of 16 reactors, which at present is 3,900 MW, is expected to go up to 7,400 MW by 2010 with the completion of nine reactors. As per the present plan of Bhabha Atomic Research Centre and Nuclear Power Corp, the capacity is expected to increase to 24,000 MW by 2020.

'There is a need to plan right from now to increase this capacity to 50,000 MW by 2030,' he said.

'To meet the increased needs of nuclear power generation, it is essential to pursue the development of nuclear power using thorium, reserves of which are high in the country,' he added.

He called for increasing the power generated through renewable energy sources from the existing 5 percent to 25.

Noting that India is importing around 100 million tonnes of crude oil with a foreign exchange outflow of Rs.1.5 trillion per annum (nearly $34 billion), he said by 2030 the country may have to import 300 million tonnes.

'To reduce the import content, apart from locating the embedded oil resources in the country, we have to work on producing ethanol and bio-diesel in a cost effective manner which can be blended with petrol and diesel.'

India will require production of 60 million tonnes each of bio-diesel and ethanol per annum by 2030.

On wind energy, he said there was a need to earmark sufficient efforts and resources for research into potential windy areas, on optimal plant design and cost effectiveness to realise generating capacity of 64,000 MW.

NTPC plans 2000 MW nuclear power by 2017
The Press Trust of India Limited (this article also ran in ZEENews.com)
January 31, 2007

New Delhi, Jan 31 (PTI) NTPC Limited envisages generating 2000 MW from atomic power by the end of 2017, its Chairman and Managing Director T Sankaralingam said today.

"It is part of our corporate plan to get into the nuclear space. The board has already given its in principal approval," Sankaralingam told PTI.

Asked whether the company had finalised the location of the plant, he said it was yet to be finalised.

NTPC has already begun talking to GE Energy for setting up new nuclear facilities. It has also engaged in talks with Thorium Power, a US-based manufacturer of nuclear fuel technology, to establish joint ventures in the country.

The state-owned company has appointed former Atomic Energy Commission secretary S Rajgopal and former executive director of Nuclear Power Corporation of India V K Kaushik as consultants to expedite their move to produce nuclear power.

The move by NTPC will end the monopoly of state-owned Nuclear Power Corporation of India Ltd.

Power Secretary R V Shahi, when asked about NTPC's plans to get into nuclear power, said, "Nothing is being planned for the 11th five year plan. It is going to happen only after the 11th plan." The government plans to generate 3100 MW nuclear energy by the end of the 11th plan (2011-12), which will be further increased during the 12th plan.

India aims to produce 25 per cent of its power generation from nuclear energy by 2025, as compared to 2.7 per cent now. Global nuclear energy majors have been eyeing the Indian market after the Indo-US civil nuclear deal.

Fronteer Development Sizzling Hot in Gold & Uranium
SeekingAlpha
January 26, 2007

Jason Hamlin submits: There are 441 operational nuclear power reactors around the world today, with the IAEA reporting that 130 new nuclear power plants are either being built or are in the planning stages. These are conservative estimates, with the actual number of new plants likely to be much higher.

Supply & Demand
China plans to build two new nuclear reactors every year for the next 14 years, which would more than triple their annual uranium demand from 3 million pounds currently to over 10 million pounds by 2010. India has also stated its intention to ramp up nuclear capacity, which will double their demand for uranium from 1 million pounds currently to 2 million pounds in 2010 and 4 million pounds by 2020.

We can also add Russia and the United States to the list of countries committed to nuclear energy and needing to secure massive amounts of uranium to keep up with increasing energy demands.

But there is one tiny problem with this increased interest in nuclear power — demand for uranium is already outstripping supply. Total global uranium consumption is currently estimated at 176 million pounds, with less than half of that amount being supplied from uranium mining companies. In other words, new mine supplies are already running about 40% behind demand. That means the majority of demand is being met from inventories that are rapidly depleting. With demand estimates at 212 million pounds per year by 2015, it is clear that there will be severe uranium shortages for at least the next decade. Which of course means much higher prices for uranium and even greater increases in the stock prices of quality uranium miners.

We agree with the analysis provided by Doug Casey and Marin Katusa, who state:

Uranium is still cheap by any measure, including: what the market is willing (and able) to pay, prior highs and supply/demand ratios. Speaking of prior highs, in inflation adjusted terms, the price of uranium has been as much as 70% higher than it is today, a price level we see being taken out in this cycle. During this second phase of the cycle, the uranium price is headed to $100, then $200.

You can read the full article here: Profiting from the Next Phase of the Uranium Bull Market.

Clean Energy Solution
Another factor fueling the uranium craze is concern over global warming. Unlike energy derived from coal and other carbon-based fuels, nuclear energy production emits no greenhouse gas. However, experts are still grappling with a safe and sustainable method of storing or disposing of nuclear waste. While the current solution is not perfect, there is support even amongst members of Greenpeace, with founder Patrick Moore stating that nuclear power offers a “non-greenhouse gas-emitting power source that can effectively replace fossil fuels and satisfy global demand.”

One solution offering promise is using Thorium rather than Uranium in nuclear reactors. Thorium, a close cousin of uranium, is cleaner and safer than current nuclear fuel, and more of it can be extracted from the ground. There is far less dangerous waste and the leftover material is not suitable for weapons use. Speaking of Thorium, we have been researching a company that has been partnering with the U.S. and Russian governments on a new technology to use Thorium to generate power. The stock price is still extremely cheap and could be a home run if the technology comes around. Make sure to subscribe to our articles via the email subscription or RSS, as we plan to profile this company in the near future.

But let’s move on to a company that is sizzling hot at the moment and well-positioned to reap the rewards of higher prices in not only uranium, but gold, silver and base metals as well.

Diversified Miner
Fronteer Development Group is a diversified mining company focused on creating shareholder value by discovering large new deposits of gold, silver, copper and uranium. Their tag line “The Science of Discovery” is reflective of their concentration on the sweet spot in the mining cycle, which is “the discovery.” This is the point of the cycle that moves the stock price the most and can significantly increase a company’s value, often overnight. We think this is a lucrative area to play and we like the prospects of Fronteer moving forward.

Fronteer has built a core competency in the discovery process and utilizes advanced technology to be able to detect concentrations of mineral deposits from the air. With this bird’s-eye perspective, Fronteer can scan areas that are not easily accessible via ground transportation and determine the feasibility of building the infrastructure necessary to drill and quantify resource estimates. After this initial discovery, Fronteer determines whether to partner with a senior producer, spin-out the asset to unlock value or use their own team for development.

Projects & Properties
Fronteer owns several promising properties, all within politically stable countries. Their largest project, in the Canadian Uranium District of Labrador, is estimated to be worth over $600 million. This deposit recently increased from a historic resource of 18.3 million pounds, to a new Measured and Indicated Resource of 22.2 million pounds with an additional Inferred Resource of 13.4 million pounds. Recent drill results from Jacques Lake and Otter Lake were successful, intersecting uranium mineralization at both locations, resulting in two new uranium discoveries. These assets are 100% owned by Aurora Energy, of which Fronteer owns 47%.

In addition to the Canadian Uranium project, Fronteer controls two drill-ready gold projects in Northwest Turkey with defined resources of over 2 million ounces. The combined resources of the Agi Dagi property include:

217,000 indicated and 1,043,000 inferred ounces of gold
425,000 indicated and 4,697,000 inferred ounces of silver The second property in Turkey is the Kirazli project (pronounced Ker-As-Li). This property includes a large target area measuring 2 kilometers by 1 kilometer, with a very high-grade gold zone. Fronteer spent the 2005 exploration campaign delineating and expanding this high-grade gold zone and testing other targets on the property. Results have now defined a large gold zone that is approximately 1,000 meters long, 100 meters wide, and averaging 40-60 meters in thickness.

A recently completed resource estimate of the Kirazli gold zone has yielded the following results:

244,000 indicated and 563,000 inferred ounces of gold
1,693,000 indicated and 3,859,000 inferred ounces of silver Fronteer also continues to expand its gold portfolio in Mexico with the addition of two new discovery-stage projects optioned from Teck Cominco. The San Pedro and Clara projects are located in the western state of Jalisco, approximately 60 kilometers west and southwest of Guadalajara. The projects are 100 kilometers apart and have large gold epithermal systems similar in style to Fronteer’s advanced gold projects in western Turkey.

Financials
With the properties mentioned above and a market cap of under $600 million, we believe that Fronteer remains undervalued. We aren’t the only ones with this position, as traders have pushed the stock price up from about $4 to over $10 during the second half of 2006. Naturally, you must be asking: Is the party over?

With the Canadian Uranium project currently valued at over $600 million ($282 million worth owned by Fronteer) and over 2 million defined ounces of gold, we believe Fronteer still has plenty of room to run. Fronteer had been trading in the $8 - $9.50 range for a number of months and will find strong support in this range. Although the recent breakout is a bullish indicator, we believe that the stock price is a bit toppy at these levels and we will wait for an entry point anywhere below $9.50. Both the RSI and MACD indicators are suggesting that Fronteer will need to take a breather. We have set a target price of $16 for 2007. This does not factor any additional discoveries or resource updates, which seem to be occurring on a monthly basis with Fronteer.

Takeover Target?

Another wild card for Fronteer in the strong possibility that they will be acquired by a larger miner. Specializing in the discovery process makes Fronteer a company that is ripe for acquisition. The majors look for smaller companies that have done the grunt work necessary to find new resources and companies that have verified “pounds in the ground.” Fronteer is a likely takeover target from our perspective, as they have already amassed an impressive array of gold, silver and uranium properties and are continually discovering new resources. These are exactly the conditions that trigger takeovers from larger companies with the infrastructure and experience needed to move projects into production. Fronteer’s stock price could easily reach towards $16 on any such news.

In terms of the overall gold and silver market, we remain optimistic in the medium and long term. Many analysts and commentators are predicting a correction from the recent run, but we think it will be more of a short break than a correction. We are looking for consolidation and downside of no more than 4% over the next month. Given this, it might be prudent to keep some cash on the sideline and watch how things develop. Then again, it isn’t unusual to see the gold bull really start kicking just when the analysts start

predicting a bout of profit-taking and correction. Good luck and happy investing!

Disclosure: The author does not currently own stock in Fronteer, but will be looking to purchase on dips below $9.50

Reactor project could be fully funded this spring
By Ruth Campbell
Midland Reporter-Telegram
January 25, 2007

Announcement could come in March or April.

The source is a private donor, which could not be revealed at this time.

Wright would not disclose who the source is until it's a done deal, but said an announcement is likely in March or April.

"It will come from a single, private entity. That's all I can say," Wright told a meeting of the Environmental Study Group of the Society of Petroleum Engineers Wednesday at the Advanced Technology Center.

Project cost for the state-of-the-art, helium-cooled nuclear research facility is $546,772,000, including a 20 percent contingency, Wright said. Total cost of construction and U.S. Nuclear Regulatory Commission licensing is $455,643,000.

Project officials have started the NRC licensing process and Wright expects that to be completed in three years. Because it is a research and testing facility, the reactor would get a construction and operating license all at once.

For the first time outside of the university, Wright showed an overall site plan for the facility.

The reactor, which should be finished by November 2012, will sit on a 1.5-square-mile site in Andrews County, most likely on acreage owned by University of Texas Lands. Within that acreage will be a "nuclear island," including 37 structures such as offices, labs, wastewater treatment and disposal and waste storage.

From top to bottom, the reactor services building would be 12 1/2 stories with half of it above and half below ground, Wright said. The modular helium reactor is designed so it cannot melt, even at temperatures up to 1,500 degrees centigrade.

It would be used to help develop the next generation of nuclear reactor to help reduce dependence on foreign oil. China and Japan each have one of the same type, Wright said. It could be used for electric generation and be available for coal and hydrogen gasification.

Major project partners include the cities of Midland, Odessa and Andrews and Andrews County, University of Texas of the Permian Basin, General Atomics of San Diego and the UT System.

Also involved are UT Austin, UT Dallas, UT El Paso, Midland, Odessa, Andrews, Sandia National Laboratories in Albuquerque, N.M. and Thorium Power.

Wright said the project satisfies the University of Texas System mission of education, research and development and regional economic development. It also will help the school develop a college of engineering and programs like nuclear physics, chemistry and multifaceted world-class experiment facilities, Wright said.

Director of Midland College's Petroleum Professional Development Center Hoxie Smith said there is a lot of synergy between the HTTR and FutureGen projects. And politically, things are looking up.

A site near Penwell in Ector County is being considered for the $1 billion FutureGen plant, which would use state-of-the-art clean coal-burning technology with near-zero emissions to produce 275 megawatts of electricity and serve as a research facility for storing -- and ultimately using -- the carbon dioxide and hydrogen generated by the coal gasification.

Along with Penwell, other sites under consideration include Jewett in East Texas and two sites in Illinois -- Tuscola and Mattoon. Smith said site selection would be announced in September, although it could be as early as August.

"We are trying to develop best value (to set Penwell part from the other sites). We are still the site to beat. New Mexico is on board with this. (U.S.) Sen. Jeff Bingaman, D-New Mexico, chairs the Committee on Energy and Natural Resources, and Bill Richardson (New Mexico's governor) is running for president," said Smith, who is regional coordinator of FutureGen Texas.

He added U.S. Rep. Joe Barton, who represents the district that includes Jewett, also has lost his House Committee on Energy & Commerce chairmanship.

"We're looking at desalinization of the Capitan Reef," to use as a water source of the plant, he said, adding this water would be "three times" better than sea water.

HT3R timeline

The project started with preliminary discussions between Project Manager Jim Wright, UTPB President David Watts and John Ben Shepperd Public Leadership Institute Director Jack Ladd in June 2005.

In July 2005, Watts and Wright reached an agreement for Wright to work part time on the project. At the same time, Wright and former General Atomics Chief Executive Officer Harold Agnew started the connection between the school and San Diego, Calif.-based company.

Wright once worked for Agnew at Los Alamos National Laboratories in New Mexico.

In September 2005, General Atomics and UTPB signed a memorandum of understanding that the reactor would be near Odessa and operated by UTPB. Before it began, General Atomics said it wanted $3 million raised for a preconceptual design for the project. It was raised from local sources including the cities of Midland, Odessa, Andrews and Andrews County.

The company and university signed a teaming agreement in February 2006, and in December 2006, the technical and design plan was released.

Wright said high-temperature teaching and test reactor officials are in the process of creating a memorandum of understanding with Idaho National Laboratories, which would have a prototype reactor of the same type.

Pundits expect cash to flow on heel of nuclear deal; U.S. firms line up to boost India's energy capacity
By Chris Nelson
IndUS Business Journal (article also ran in India New England)
January 17, 2007

The recently approved U.S.-India nuclear agreement is expected to generate increased sales for U.S. companies and provide India the energy it needs to fuel its rapidly expanding economy, business and political leaders from both countries say.

"In order for India's economy to continue growing, it needs energy and power — neither of which it has much of," said Pradeep Anand, president of Seeta Resources LLC, a Houston-based energy marketing firm. "This deal essentially puts into play the framework necessary for strong cooperation between the United States and India. The end result is India gets the power it needs so desperately and American companies benefit financially."

The Henry J. Hyde United States and India Peaceful Atomic Energy Promotion Act of 2006 — which President George W. Bush signed into law December 18 — opened the door for India to buy fuel, reactors and other technology for its aging civilian nuclear program for the first time in 35 years

The act amended a law that barred U.S. companies from selling nuclear material to India for its failure to ratify the 1970 Nuclear Non-Proliferation Treaty. India has been an international nuclear pariah - unable to buy nuclear fuel, parts or equipment from most nations — since it refused to sign the treaty and went on to develop a nuclear bomb in 1974.

"This legislation marks the most significant foreign policy advancement in the history of our two democracies," said Ron Somers, president of the Washington-based U.S.-India Business Council. "It will engender an atmosphere of mutual respect, goodwill and trust that will yield a bounty of opportunity for both countries. High technology cooperation permitted by this legislation will transform the economic and geopolitical destiny of the 21st century."

Somers equated its passage to former President Richard M. Nixon's 1972 visit to China, which broke two decades of silence between the two countries.

"When you consider India's wealth of human resources, its educational institutions and its youthful demographic, history will rank this initiative as a tectonic shift equivalent to Nixon's opening of China," he said. "This is one of those defining moments when two of the world's most powerful and open economies will now accelerate convergence, triggering the alignment of two great democracies of the 21st century."

U.S. firms across a broad range of industries including IT, manufacturing and entertainment, pushed hard for the new legislation.

"This goes far beyond nuclear reactors," Somers said. "We're ripping the lid of the market so it can grow at a much faster pace."

The economic incentives for the United States are huge: as the Indian government gradually relaxes controls over the country's vast economy, American companies stand to reap tremendous gains, from investments in Indian real estate to selling designer jeans and military hardware.

The Heritage Foundation, a conservative research group based in Washington, describes India as a "vibrant democracy with a rapidly growing economy," and predicted that improved relations with India "will provide a stabilizing influence in Asia."

The U.S.-India Business Council projects bilateral trade between the United States and India — worth approximately $27 billion in 2006 — will increase rapidly as a result of the legislation, but won't come close to America's $300 billion trade relationship with China.

"If you consider that both the U.S. and India are free-market democracies, our trade relationship should be much deeper," Somers said. "The fact is, we have to do better."

India's economy has more than doubled in size over the last 16 years, and it continues to expand by approximately 9 percent annually. But that growth requires energy, and India's unstable power-generating capacity can barely keep up with the current demand.

"All one needs to do is experience a blackout or brownout in India during the heat of the summer to understand the seriousness of the situation," Anand said. "The [power-generating] infrastructure in India is old and dilapidated, and power losses are incredibly frequent."

India's current power-generating capacity stands at 132,000 megawatts; the Indian government is looking to boost it to 232,000 megawatts from conventional energy sources.

Additionally, India's nuclear power industry has announced plans to expand the nation's 2006 installed capacity from a mere 3,200 megawatts to more than 60,000 megawatts over the next several decades.

The Indian Atomic Energy Commission values such an expansion at more than $150 billion; scores of U.S. energy and infrastructure companies are clamoring to be part of it. The list includes such heavyweights as General Electric Co., Westinghouse Electric Corp., Bechtel Corp., United Technologies Corp., U.S. Enrichment Corp. and Thorium Power Ltd.

Thorium Power, a McLean, Va.-based manufacturer of nuclear fuel technology, has engaged in talks with Nuclear Power Corp. of India and NTPC Ltd. to establish joint ventures on the subcontinent, according to company vice president Dennis K. Hays.

"India's nuclear industry has great potential — they're looking at building somewhere between 30 to 110 1,000-megawatt nuclear reactors over the next 40 years — and obviously that's something we're interested in being a part of," Hays said.

The privately held company develops "non-proliferative" nuclear fuel technology for existing and future pressurized-water reactors. Current nuclear reactors are powered by a mix of two isotopes of uranium that produce a third isotope — uranium 239, which ultimately decays into bomb-grade plutonium. Over the last 15 years, Thorium scientists have been working on a new kind of fuel that mixes uranium with thorium, an element named after the Norse god of thunder. The process yields no uranium 239.

Hays said India holds some of the largest Thorium deposits of any country on earth, giving it an immediate advantage in its quest to ramp up its civilian nuclear program.

"That's part of why we're excited about working in India, the fact that it has such vast thorium reserves," he said. "But we also appreciate that India has a great many trained scientists, physicians and universities that we can tap into."

When oil runs out, go nuclear
By Merryn Somerset Webb
Merryn on Money
The Sunday Times (article also ran in MoneyWeek)
January 14, 2007

I THINK I have got to the bottom of why City salaries are so high: it's because of the regular humiliation the recipients of the cash have to put up with.

Consider the fate of Britain's economists last week. Reuters asked 50 of them whether they thought the Bank of England's monetary policy committee would raise interest rates. All but one said it wouldn't. It promptly did.

Then there are the oil analysts. At the beginning of last year most were still expecting the oil price to fall back. It didn't. By the end of 2006 they had more or less given up and started forecasting long-term oil prices in the region of $70 to $100 a barrel. It should come as no surprise, then, that the oil price spent much of last week in freefall and is now hovering at about $55 -its lowest level since mid-2005. The result? Many analysts have flip-flopped and now predict oil at below $50 by the end of the year.

Imagine the misery of constantly having to come up with reasons to explain why you were wrong without actually admitting that you usually are. I'd want Pounds 500,000-plus a year for it too.

I'm now going to put myself on thin ice by making a prediction of my own: I predict that the oil analysts will be just as embarrassed in a year as they are now. Why? Because there is no way the oil price is going to go below $50 and just stay there.

We know the population of the world is rising fast (by about 150 people a minute) and that the many people being born into increasingly rich emerging markets want to live in the same way that the western world does. They want their houses well-lit; they want their televisions and computers on standby all the time; they want heating when it is cold; they want air conditioning when it is hot; and they usually want to be somewhere they are not, which means they want a car or a plane to get there.

In the next 10 to 15 years power demand in China and in India will double and the International Energy Agency tells us global demand for energy will also have doubled by 2030. How can the price of oil not be in a long-term uptrend? Expect more flip-flopping in January 2008.

The other point we shouldn't lose sight of just because the oil price has fallen is that we still desperately need a real substitute for oil. The West has its worries about the security of supplies from the Middle East and Russia, but even if these concerns didn't exist there still wouldn't be enough oil about to cope with a doubling of global demand.

It would be nice to think the slack could be picked up by renewables -wind, wave and solar power -but it can't.

It doesn't matter how excited the European Union gets about global warming or how many announcements governments make about energy efficiency and low-carbon economies, it remains the case that renewable energy is expensive, inefficient and capable of meeting only a small part of the extra demand.

The only thing that is up to the task, as far as I can see, is nuclear power. It is secure, in that most reserves are based in stable countries such as Australia, Canada and America; it is reliable (unlike, say, wind power which is hopelessly unpredictable); it is clean, in that its production, while not carbon-neutral, emits very little in the way of greenhouse gases; and, despite perceptions to the contrary, it is safe.

No wonder then that there are 30 reactors under construction in 13 countries and that China is talking about building another two a year for 15 years. Even Russia, which you'd think wouldn't be remotely

worried about the security of its oil supplies or global warming, says it intends that 25% of its energy needs should be met from nuclear power by 2025.

The obvious way to capitalise on this surge in reactor construction is to invest in uranium, the raw material needed to produce nuclear power. You would have been wise to start doing this five years ago -the price hasn't fallen in a single month since 2001 -but the imbalance between supply and demand is such that it is probably still a good investment.

For years, mine production has met only 60% of annual demand, with the rest coming from stockpiles and decommissioned nuclear warheads. Clearly this can't go on indefinitely -stockpiles are being run down and there are a limited number of warheads left, which suggests the price of will keep going up.

Possible ways to play this story include buying shares in Energy Resources of Australia (the world's second-largest uranium miner) or, more speculatively, AIM-listed miners Uramin or Urasia. Another possibility would be to buy International Nuclear Solutions (also listed on AIM), which provides construction design and engineering services to the nuclear industry. It is small and unproven but has potential.

Finally for the very brave I'd suggest US-listed Thorium Power. Thorium is a mildly radioactive metal with similar properties to uranium in that it can be burnt in a reactor to produce power.

However, it also has advantages over uranium: it is much more plentiful, it produces less waste when burnt, and its half-life is a mere 500 years rather than tens of thousands of years.

Thorium Power is developing technology to take advantage of all these properties and as such is a risky but also potentially very good investment.

Merryn Somerset Webb is a former stockbroker and now editor of Money Week. Her views are personal and investors should always seek professional advice.

'Thorium to give India an edge'
By Urmi A Goswami
The Economic Times
January 4, 2007

Thorium Power is a privately-held, Washington DC-based company funded primarily through private equity investments. It develops proliferation-resistant nuclear fuel technologies. Seth Grae, president, Thorium Power, talks to ET about why thorium is the way forward for India.

Besides the fact that India has the second largest reserves of thorium, are there any other advantages for opting for thorium-based nuclear reactors rather than the uranium-based plants?

There are two major concerns when we talk of nuclear power - the first is that of safety and the second is the proliferation issue. On the aspect of safety, major nuclear companies like GE, Westinghouse, and Areva have addressed this issue. It is the proliferation angle that now needs to be addressed. For India, which has the largest thorium reserves in terms of quality, opting for thorium-based reactors is the logical step.

It is not merely an issue of fuel self-sufficiency but the fact is that it will also address the proliferation issue. Nuclear waste at a thorium-based reactor is minimal, and the plutonium from the process is used for further generation. It would make sense for India to opt for thorium rather than uranium.

Are there any other advantages for India to opt for the thorium fuel cycle?

Given India's vast reserves of thorium, harnessing technologies that would use thorium-based nuclear fuels would give India an edge. The country could emerge as an exporter of thorium material or fuels made out of thorium. Also, given India's massive power generating capacity expansion programme, opting for a thorium fuel cycle would make sense.

There are two types of thorium-based nuclear fuels - thorium and uranium and the other, thorium and plutonium. With the first, uranium, will come at a cost while plutonium comes free as it is a by-product of the process. The most dramatic savings happen if you use plutonium. However, fuel accounts for only 6% of costs of a nuclear plant. Indian scientists have already done work on thorium, that puts India in a favourable position.

Given thorium's obvious advantages what accounts for its lack of popularity as a nuclear fuel?

The fact is that there has been little research and development in the nuclear fuel field. R&D in this area has been somewhere between flat and dead in the past 25 years. Thorium Power has an advantage as developing anything in the nuclear sector requires a long-time. Thorium Power's work in the past will give it an edge over companies that are just about starting to explore this field.

What are your plans in India?

Thorium Power is the leading developer of proliferation-resistant nuclear fuel technologies. While working with Thorium Power designs will put India in a favourable position, we too stand to benefit from scientists in India to develop nuclear fuel for domestic consumption as well as for export.

What is the nature of association that you are looking at in India?

India has the potential to build at least 60 reactors of 1,000 megawatts each. India is already working on a plan to build dozens of new reactors in the coming years and the vast majority of them will be designed to use thorium fuels. We have found a lot of interest among all segments of the nuclear community here in the proliferation resistant, low-waste fuel technology that Thorium Power offers.

We are still exploring options, it could be in the nature of a technology transfer partnership or a joint venture. However, in international transactions things can develop fast. We may be in a position to announce a joint venture by the middle of next year. We are in dialogue with the Nuclear Power Corporation of India and NTPC as well as some major private sector companies.

How big do you estimate the Indian market to be?

Indian efforts in the nuclear power sector could lead to the award of contracts worth at least $100 billion. As I said, India has the potential to build at least 60 reactors of 1,000 megawatts each. At an estimated $2 billion per reactor, the potential for business crosses $100 billion.

Over and above this, there are business opportunities arising out of fuel supply and servicing contracts. Consider that 60% of business generated by new plants involves construction and equipment contracts and the balance to fuel processing technologies and safety services.