Uranium Report 2017

Everything you need to know about uranium!
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Dear Readers,

On the following pages, we present to you with pleasure our first Uranium Report. Of course uranium is a "hot" theme and many people at least don’t like it. Anyway without uranium we would have a major problem in the base load energy supply in the world and e-mobility would be still a dream of the future. Swiss Resource Capital AG has made it its business to topically and comprehensively inform metals and commodity investors, interested parties and the individual who wants to become an investor in various commodities and mining companies. On our website www.resource-capital.ch you will find 21 companies from many different commodity sectors plus lots of information and articles about the topic commodities. Our series of special reports started with lithium and silver. Now we move on with Uranium as it is the energy metal of this century whether we like it or not. Wind and solar energy are very often inefficient considering the complete energy balance including the amount of energy used to build it. This report shall give the reader an idea about the real facts of Uranium energy supply in the world and why China needs those nuclear power plants really to solve their carbon emission problems. Today around 450 nuclear power plants are producing energy in the world and 69 are under construction. Over 165 are planned until 2040 and if we all want to drive with emission free e-cars, bikes or motorcycles we need those nuclear power plants as we cannot derive the necessary power from wind and solar. We have also expert interviews with Scott Melbye and Dr. Christian Schärer about the uranium markets and the outlook for it. Also we found interesting companies which are presented with fact sheets in the Uranium Report as there are only a few in the sector. The combined market cap of all uranium companies is only around US$9 billion world wide. Crazy small market but with an interesting future outlook. Climate Change and clean air require nuclear energy involvement “There’s really only one technology that we know of that supplies carbon-free power at the scale modern civilization requires, and that is nuclear power” – Ken Caldeira of Stanford University’s Department of Global Ecology.

Commodities are the base of our whole life. Without commodities there are no products, no technical innovations and no real economic life. We need a reliable and constant base load energy supply in our industrialized world. With our special reports we would like to give you the necessary insights and inform you comprehensively.

In addition, our two Commodity IPTV channels www.Commodity-TV.net and www.Rohstoff-TV.net are available to you free of charge. On the go we recommend our new Commodity-TV App for iPhone and Android, which also provides real-time charts, share prices and the latest videos. My team and I hope you will enjoy reading this edition of the special reports and hope that we can provide you with much new information, impressions and ideas. Only the one who gets broadly informed and takes matters relating to investments in his own hand will be in the winners and preserve his wealth during these difficult times.

Jochen Staiger
Satisfying the Hunger for Energy and improving the Carbon Footprint at the same time? – Nuclear Energy can combine both!

The global energy demand has multiplied since the end of the 1980s, especially due to the emerging countries and in particular the BRIC countries Brazil, Russia, India and China. About 11.5% of the total energy demand is met by nuclear energy. Fossil fuels like coal and oil are still burned for energy production. The difference in the situation of 25 years ago is the increasing demand for reduction of CO₂ emissions and the more noticeable phenomenon of “global warming”. In particular, the energy consuming industrial nations and the emerging countries must increase their energy efficiency and improve their carbon footprint in the coming years. This cannot be achieved by burning coal and oil. The alternatives are renewable energies – which need tremendous time and cost expenditures – or nuclear energy which can provide lot of energy CO₂ cost expenditures – or nuclear energy which need tremendous time and cost expenditures – or nuclear energy which can provide lot of energy.

What is Uranium?

One of only two elements that can sustain nuclear fission chain reactions

Now for some information about the element uranium itself. Uranium was named after the planet Uranus and is a chemical element with the element symbol U and the atomic number 92. Uranium is a metal whose isotopes are radioactive. Naturally occurring uranium in minerals is comprised of the isotope 238U (99.3%) and 235U (0.7%).

The uranium isotope 235U is fissionable by thermal neutrons and besides the very rare plutonium isotope 239Pu, the only known natural occurring nuclide that is suitable for nuclear fission chain reactions. Therefore, it is used as a primary energy source in nuclear power plants and nuclear weapons.

Supply Gap inevitable in the future

Today only 90% of the global uranium demand can be satisfied by producing mines. The number of nuclear reactors will double in the coming 10 to 20 years. The previous main supplier of uranium – Russia’s nuclear weapons arsenal – doesn’t exist anymore. Where will the needed uranium come from? The existing mines can be expanded and new mines opened but not at the current uranium spot price of around US$ 20 per pound. An enormous supply gap seems to be inevitable at least at the current market price. That is the situation investors should be aware of – a sharply rising uranium spot price and an inevitable connected second uranium boom.

Occurrence

Uranium does not occur pure in nature but always in form of oxides in minerals. There are some 230 uranium minerals that could locally be of economic importance. There is a large range of uranium deposits from magmatic hydrothermal to sedimentary types.

The highest uranium grades are encountered in unconformity-type deposits with average uranium grades of 0.3 to 20%. These deposits are mined by the two largest uranium producers. The largest single uranium resource in the world is Olympic Dam with a proven uranium content of more than 2 million tonnes at an average uranium grade of 0.03%. The first industrial scale uranium mine in the world is in Jachymov (Czech Republic) produced from hydrothermal veins. According to the International Atomic Energy Agency (IAEA) the largest uranium reserves are in the USA, Niger, Australia, Kazakhstan, Namibia, South Africa, Canada, Brazil, Russia, Ukraine and Uzbekistan.

Short outline of the history of the commercial uranium industry

From the beginnings to the first atomic bomb

Uranium was produced for the first time as a by-product in Saxon and English mines at the beginning of the 19th century. Until the 1930s there was little use for the radioactive raw material. It was used for coloring glass and ceramics as well as in photography. The shadowy existence of the uranium changed suddenly as Hitler came into power in Germany, and an unprecedented spiral of armament and testing of new weapons technologies began. Above all the “Third Reich” accelerated the expedited mining of uranium. These mining activities were exclusively in the region of Jachymov (the German name is Sankt Joachimstal) in today’s Czech Republic. The German supply submarine U-234, that was seized by two U.S. destroyers two days after the end of the war and towed to the USA had uranium ore from Jachymov on board. According to leading U.S. scientists, parts of this uranium ore were used to build the Hiroshima atomic bomb.

The Cold War makes Uranium acceptable

The newly created uranium sector had its biggest boost after the Second World War due to the beginning of the Cold War. The victorious powers of the Second World War, which rivaled for global dominance, now needed the highest possible number of nuclear weapons and also vast quantities of uranium. This resulted in a systematic exploration for useable uranium occurrences in all states of the USA. The previous Atomic Energy Commission (AEC) had the exclusive right to buy all of the produced uranium in the USA for over three decades. The greed for more and more nuclear armament led to extreme high prices per pound of uranium for these days. As a result, the search for uranium was conducted in all U.S. states in the 1950s and 1960s. The USA had a strong uranium industry at the end of the 1960s that was a global leader from mining to enrichment. The Soviet Union initially expanded existing uranium mines in East Germany and Czechoslovakia. This was necessary because Russia had no knowledge of uranium occurrences in its own country until the end of the Second World War. In the 1950s and 1960s Russia began with a uranium exploration which led to large discoveries in Siberia and Kazakhstan.

Rise and temporary slump of civilian use of uranium

Already in 1953 the former U.S. president Eisenhower conceived a program for the civilian use of uranium. “Atoms for Peace” should find their way in the energy generation, medicine, traffic and agriculture and resulted in the demand for addi-
tional amounts of uranium. The civilian nuclear power had its beginning and was quickly advanced by other nations. After a 25 year long uranium boom concerns have been increasingly voiced warning of the appearing lack of security in many nuclear power plants. After the almost Maximum Credible Accident in the American nuclear power plant Three Mile Island and the Super Maximum Credible Accident in Chernobyl, the general public turned its back more and more to nuclear power. In addition, the collapse of the Soviet Union resulted in a building stop of nuclear weapons and therefore no further uranium was needed. Many nations decided not to install new nuclear reactors and some countries switched off existing reactors. Almost 90% of all uranium mines were closed because the market price for uranium had fallen to US$ 5 per pound in the meantime. The uranium for the operation of the still existing reactors came from old stockpiles or Russia’s disarmament program.

Uranium Production

Basically, there are two uranium production methods: the conventional production and the production via in-situ leaching or rather in-situ recovery (ISR). The exact mining method depends on the properties of the ore body, (like depth, shape, ore content, tectonic) and the type of country rock as well as other factors.

Conventional Production

The majority of the uranium is mined in underground mines. The deposits are developed via shafts, drifts, ramps or spiral declines. Ingressing groundwater and the ventilation of the mine often pose problems. The exact production method is chosen according to the characteristics of the deposit. The form of the orebody and the distribution of the uranium in it are especially pivotal. An orebody can be specifically mined by underground methods where less waste material is produced as by open pit methods. Ore bodies near the surface and very large ore bodies are primarily mined by open pit mining methods. This enables the use of low cost large equipment. Modern open pit mines can have a depth from a few to over 1,000 m and a diameter of several kilometers. Open pit mines often produce large amounts of waste material. Like in underground mines, large amounts of water have to be drained from the open pit however the ventilation is less problematic.

ISR Mining

The ISR method uses injection wells to pump water and small amounts of CO₂ and oxygen into the sandstone horizons to leach out the uranium. From recovery wells, the pregnant solution is pumped to the surface for processing. The whole method takes place completely underground. The advantages of this method are obvious: there are no large earth movements like in open pit mines, no waste rock stockpiles or tailings ponds for heavy metals and cyanide. At the surface only the wells are visible and the area around the wells can be used without constraints for farming. With the ISR method low grade deposits can be economically mined, the capital costs for the mine development is significantly reduced. The whole method can be implemented with a minimum of manpower which reduces drastically the operating costs. According to a study of the World Nuclear Association, 25% of the produced uranium outside of Kazakhstan comes from ISR mines.

The current status of the Uranium Market

But how does today’s uranium market look like? It is certain that the lack of investments into the procurement structure of the past 40 years – in the infrastructure of mines and processing plants – will very likely prove to be a windfall for the uranium investors in the future! Nevertheless, despite opposition against nuclear energy since the catastrophe in Chernobyl and even more after the events in the nuclear plants in Fukushima (Japan) the number of plants worldwide is at a record high. Only 31 countries currently operate (as of May 1st, 2017) 449 nuclear reactors with a total electrical net output of around 392 gigawatts.
construction per country
(Source: www.iaea.org/PRIS)

China is only at the beginning of the nuclear age

While many self-appointed experts have predicted the end of the nuclear age, it is only in the development phase in the most populous country in the world. China is operating 36 reactors where most of the electricity is generated by coal power plants. In 2016, 5 new nuclear reactors were put into service. Since 2010, 25 new reactors were put into service. The expansion of the nuclear energy sector in China is enormous and occurs with breathtaking speed! Over two thirds of the Chinese population are dependent on nuclear energy. The rise of its country among the biggest countries in the world plans to expand its nuclear energy capacity by 70 gigawatts. In contrast, India's current total electrical net output is only around 6.2 gigawatts.

India expands civil nuclear program massively

Besides China, India is the second of the so called “BRIC-Countries” which is pursuing a similar course. The second most populous country in the world plans to triple its nuclear energy capacities within the coming 15 years and more than 230 new nuclear reactors until 2050. According to information from Power China the new five-year-plan for the energy sector whose approval by the National People's Congress has been planned in March 2016 provides for a faster expansion of the nuclear capacity: to date the capacity was to increase to 58 gigawatts during the coming 5 years, but now over 90 gigawatts are under discussion. In the year 2005 the planning was 40 gigawatts until 2020. Until 2030 110 reactors should be in operation. In the year 2016 alone China started the construction of 6 new reactors. In total 21 nuclear reactors are in the construction phase. According to concepts for the energy sector initial US$ 75 billion are budgeted for the nuclear expansion. In a second step China’s nuclear power generation should be expanded to 120 – 160 gigawatts by 2030! While in Germany the elimination of electricity generation from nuclear energy was decided after the events in Fukushima, China has decided the opposite and will do everything possible to produce electricity by nuclear fission. In light of the rising energy demand – due to the increasing prosperity – and a catastrophic carbon footprint China’s approach seems only logical.

Russia and Brazil with increasing nuclear capacity

The two remaining BRIC-Countries, Russia and Brazil have also announced a massive expansion of their nuclear power plants. Currently Russia operates 35 nuclear reactors with around 27 gigawatts. 7 reactors are in the construction phase and 2 were connected to the power grid in 2016. Furthermore, Russia plans the construction of an additional 26 nuclear power plants which should increase the percentage of the nuclear energy in the Russian energy mix from currently 16% to 19%. In a second step Russia wants to increase this quota to 25%. By the year 2030 Russia wants to build 26 reactors.

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Nuclear energy is therefore the onlyPlease number the sentences starting from 1 so that the text is presented in a logical order. Additionally, please include any necessary corrections or clarifications to ensure the text is complete and accurate.

Currently Brazil is operating only one nuclear power plant with two reactors. A third reactor is under construction and is expected to be connected to the power grid in 2018. The construction of 4 additional reactors is expected until 2030.

**Rising global expansion of nuclear energy**

Besides the 30 nations with operating nuclear reactors, 17 additional countries are planning to install nuclear power plants. Among those countries are Egypt, the United Arab Emirates (four reactors under construction), Jordan, Turkey and Indonesia.

**The USA is close to an energy collapse**

The USA has a special status. With 99 reactors, they have by far the biggest nuclear power plant fleet in the world. Nevertheless, the USA is threatened by a collapse of the energy supply. The USA is still the country with the highest electricity consumption per capita. And the hunger for energy of the Americans is increasing. In addition, the USA is facing the question how to fulfill the CO₂-reductions which were agreed to in Kyoto and Paris. Because many of the coal power plants were built in the 1950s and 1960s, they are working inefficiently and uneconomically. They have to be shut down sooner rather than later. The electricity consumption is rising continuously. The USA has no choice but to increase the number of its nuclear reactors during the coming years. Of course, photovoltaic plants, wind farms, hydroelectric power plants or geothermal energy provide climate friendly energy but these energy producers can only be an addition to the total energy mix. Therefore, a law for expansion and funding of the energy generation by nuclear energy was created within the “Clean Energy Act of 2009” a program to provide carbon free energy. Both U.S. governing parties worked on a US$ 18.5 billion plan for doubling of the nuclear power capacities until 2030. At the beginning of 2010 President Obama announced that the U.S. government will provide in the 2011 federal budget additional funds of US$ 36 billion of government guarantees for the construction of a new generation of nuclear power plants. This would be a tripling of the originally planned budget. During the past years an application for lifetime extension of 60 years total operating time was made for over 60 U.S. nuclear reactors. In addition, there are 40 applications for the construction of new nuclear power plants that should be connected to the power grid by 2025. Until now only 4 plants are under construction and additional 16 are in a concrete planning phase.

**Long-term supply contracts expire soon**

The previous cycle of contract conclusions which was dominated by the uranium price peaks of the years 2007 and 2010 was the reason that the plant operators signed contracts at higher price levels and very long durations of 8 to 10 years. On the one hand, these old contracts are ending and on the other hand the plant operators didn’t look for a replacement of such deliveries. The forward contracts of the plant operators are declining and therefore the required quantities for which there are no contractual obligations are increasing and have to be contractually secured in the future. As expected the unmet demand will be just less than one billion pounds of U₄O₉ in the coming 10 years. At the same time, over 70% of the expected reactor demands are not contractually secured until 2025. For a little traded commodity like uranium it means to more “normal” long term contracts could put tremendous pressure on the long-term prices as well as on the spot prices. The international plant operators are showing more and more buying signals which are encouraging.

**Conclusion**

Fact is that currently 449 reactors are in operation and an additional 300 reactors will be added until 2030. 59 plants are already under construction and 170 additional plants are in the concrete planning phase. Even if half of the old reactors should be shut down until then 600 to 700 reactors would be in operation in 2030. Furthermore, 90% of the long-term delivery contracts between the uranium producers and the energy generating companies are expiring by the end of 2019 which could get the established nuclear energy nations like the USA into trouble especially.

**Supply Situation**

The established producers are running out of air

The established uranium producing nations Australia, Canada, Russia and Niger have problems to expand their production further. All four countries produced in total just 26,835 tons uranium in 2016. In 2009, they produced 28,000 tons uranium. Australia has problems with BHP Billiton’s Olympic Dam Mine, the by far most profitable uranium mine in this country. In Canada, the production start in Cameco’s MacArthur River Mine had to be postponed many times due to repeated groundwater ingress. In Niger planned mine openings also had to be postponed.

The uranium production in the USA has hit rock bottom

The situation in the USA is even worse. Although the Obama government has approved a US$ 54 billion program for the funding of the nuclear energy industry, it is not clear from where the necessary uranium
will be derived. The uranium industry in the USA is only a shadow of the past. During the past 40 years there have been no investments in development of new deposits and almost 95% of the needed uranium was derived from the disarmament programs. The US-American nuclear reactors consume 18,000 tons uranium per year. An expansion of the capacities would also be an increase of the needed amount of uranium. The World Nuclear Association (WNA) estimates that 40,000 tons uranium per year will be needed in the USA alone by 2025. Even at the peak of the US-American uranium production during the past 10 years, the original amount was disarmed in the past 20 years. This material has been already consumed in form of fuel elements. In spite of the massive production expansion in Kazakhstan during the past years a large supply gap will form in the uranium sector in the foreseeable future. There is already such a gap. Until now this gap could be closed with material from nuclear disarmament. But Kazatomprom is not the only uranium producer which opts for production cuts. These are specifically 4 million pounds of U$_{235}$O$_{2}$ for the Rabbit Lake Mine and 2 million pounds of U$_{235}$O$_{2}$ for the MacArthur River Mine which rank among the 10 largest uranium mines globally. From the Husab Mine in Namibia 5 million pounds of U$_{235}$O$_{2}$ per year are missing and from the Langer Heinrich Mine in Namibia 1.5 million pounds of U$_{235}$O$_{2}$.

**Kazakhstan – the new uranium superpower**

Almost all established uranium producers are having difficulties with the rebuilding or the expansion of their uranium production but one region has climbed to the top of the uranium production. Central Asia. Kazakhstan especially could multiply its uranium production during the past 10 years. The uranium production of the previously Soviet Republic increased from 2000 to 2016 from 1,870 to over 24,500 tons. Kazakhstan surpassed the previous leader Canada in 2009 and is responsible for close to 40% of the global uranium production.

**Massive production cuts were already initiated**

Kazakhstan is part of the nations which can mine uranium at the lowest costs. The country is however not willing to give away its uranium resources to absolute low prices anymore. At the beginning of 2017 the state-owned group Kazatomprom announced that the uranium production will be cut by at least 10% in 2017. This would take around 2,500 tons uranium off the market. But Kazatomprom is not the only uranium producer which opts for production cuts in light of the ridiculous uranium price. The uranium-major Cameco also announced production cuts. These are specifically 4 million pounds of U$_{235}$O$_{2}$ for the Rabbit Lake Mine and 2 million pounds of U$_{235}$O$_{2}$ for the MacArthur River Mine which rank among the 10 largest uranium mines globally. From the Husab Mine in Namibia 5 million pounds of U$_{235}$O$_{2}$ per year are missing and from the Langer Heinrich Mine in Namibia 1.5 million pounds of U$_{235}$O$_{2}$.

**Supply gap unavoidable**

In spite of the massive production expansion in Kazakhstan during the past years a large supply gap will form in the uranium sector in the foreseeable future. There is already such a gap. Until now this gap could be closed with material from nuclear disarmament. But Kazatomprom is not the only uranium producer which opts for production cuts. These are specifically 4 million pounds of U$_{235}$O$_{2}$ for the Rabbit Lake Mine and 2 million pounds of U$_{235}$O$_{2}$ for the MacArthur River Mine which rank among the 10 largest uranium mines globally. From the Husab Mine in Namibia 5 million pounds of U$_{235}$O$_{2}$ per year are missing and from the Langer Heinrich Mine in Namibia 1.5 million pounds of U$_{235}$O$_{2}$.

**New disarmament contracts without effect to the uranium market**

The currently existing disarmament contract between the USA and Russia, New START, will not change that. It provides for a further reduction of the nuclear weapons arsenal by 30%. These 30% don’t include the total weapons arsenal at the end of the Cold War but only from 2011. Since 1990 85% of all nuclear weapons have been disarmed. The remaining 15% will be reduced by 30% meaning that from the original amount only 5% will be disarmed. According to this new contract only 5% of the original amount will be disarmed during the coming 10 years, while 85% of the original amount was disarmed in the past 20 years. This material has been already consumed in form of fuel elements. The future disarmament uranium is minimal compared to the amount of the past 62,000 tons are covered by the global uranium production. The International Atomic Energy Agency (IAEA) estimates that the global uranium demand will rise to 140,000 tons uranium by 2030 due to the construction of new nuclear power plants. The percentage of primary supply has to increase because Russia has reached the end of its nuclear disarmament.
20 years and will have no big effect on the uranium market. The secondary supply for the uranium market will fall from currently 9% to below 5% by 2030. Therefore, the whole amount of Russia’s secondary supply will remain in Russia because Russia has not offer uranium from its own disarmed nuclear weapons at the free market since 2013.

**Summary**

The supply side in the uranium sector is going through a transition phase. The secondary supply from Russia’s disarmed nuclear weapons becomes less and less important. While in 2006 37% of the demand was covered by disarmed nuclear weapons, currently it is only 9%. Concurrently the number of nuclear reactors will increase rapidly. This rapidly increase in demand will not be completely covered by the established uranium producers – at least not at the current uranium spot price of US$ 20 per pound U\textsubscript{3}O\textsubscript{8}. From where will the needed uranium in the future come from?

An increased production can only be achieved with a higher uranium price and associated large investments in the expansion of existing and the construction of new mines. The basic problem is still the relatively low uranium spot price, which doesn’t allow producers to mine difficulty accessible and more expensive deposits.

Experts estimate that there are less than 650,000 tons of economically recoverable uranium at a market price of US$ 40 per pound uranium.

At an annual consumption of around 68,000 tons uranium, these resources would not even last for 10 years assuming a constant market price of US$ 40 as well as a constant demand. This will rise inevitably. If the market price for uranium would increase and would justify production costs of US$ 80 per pound uranium the triple amount of 2.12 million tons uranium could be mined economically.

At a uranium price of US$ 130 per pound approximately 5.7 million tons uranium could be mined economically. At the current consumption, the known reserves would last for 83 years.

**Conclusion**

**Doubling of demand is not faced by any expansion of the supply!**

The uranium spot price is as far as the US$ 130 per pound uranium as the current demand will be from future demand. According to a conservative estimate of the International Atomic Energy Agency (IAEA) this will double during the coming years. The aforementioned range can be cut in half in 10 to 15 years.

It shows that the still – apparently cheap way of generating electricity can only be used if the market price for the starting product uranium increases again. Supply and demand determine the market price for uranium too.

If the market price doesn’t allow an economical production, it will have to increase. In the case of uranium, the demand will increase sharply due to the construction of several hundred new nuclear reactors so that the market price will benefit twofold as well as the investor who has recognized that trend in time.

**High demand is uncovered to date**

As expected the unmet demand will be just less than one billion pounds of U\textsubscript{3}O\textsubscript{8} in the coming 10 years. At the same time, over 70% of the expected reactor needs are not contractually secured until 2025. For a little traded commodity like uranium this return to more “normal” long term prices as well as on the spot prices. The international plant operators are showing buying signals more and more.

**The best uranium stocks promise multiplication potential!**

We have taken the current situation of way to low and not reality reflecting uranium spot price plus the expected future supply deficit to present you a compact summary of promising uranium stocks. Our focus is especially on development companies with very promising projects because these offer, besides the actual appreciation due to a higher uranium spot price, in this connection also a high takeover chance. At the end of 2015 the merger (in fact a takeover) of Fission Uranium with (by) Denison Mines failed due to, among other things, the vote of Fission’s shareholders. This example shows that the investor can act on the assumption that there will be other takeover or merger possibilities in the future. That is because the uranium sector is currently undervalued and has to be rectified first.
Interview with Dr. Christian Schärer – Manager of the Uranium Resources Fund and partner of Incrementum AG

Dr. Schärer you are manager of the Uranium Resources Fund (ISIN L0122468528) of LLB Fundservices AG in Lichtenstein. What is your strategy and what precisely represents the Fund?

The Fund invests heavily in companies which are involved in the development and mining of uranium deposits. The Fund predominantly has shares of mining companies in its portfolio. The investment goal is to benefit maximally from the emerging supply gap at the uranium market. This supply gap is the result of a scar-

茅 sor movement of supply and demand at the uranium market. While supply has been stagnant for years due to falling ura-
nium prices, the demand is continuously growing with high visibility of 3% per year. Until now the supply deficit is covered by existing inventories as well as secondary sources. But this will not be sufficient in the near future…

Nuclear energy, especially in the Germ-

speaking region, is controversial and the price for that has initiated the exit out of production of nuclear energy. Nevertheless you see an increase in demand by 3% per year?

We have to differentiate between the situ-

ation in Germany or in Switzerland on one side and the global perspectives on the other side. Contrary to Germany, the emerging economies in Eastern Europe or Asia count on the expansion of nuclear energy. The construction of new nuclear power plants should reduce CO2 emissi-

ons and air pollution as well as the de-

pendence on imports of fossil fuels. In addition nuclear energy provides the ba-

sal load to the power grids which are cons-

stantly under pressure due to the fast gro-

wing demand. China and India especially consistently advance the expansion of their reactor fleet. Despite the events in Fukushima and the nuclear phase-out in German-speaking regions this results in total to a capacity expansion of the nucle-

ar energy production from 330 gig watts (2012) to 580 gig watts in 2030. The pre-

dicted demand growth of around 3% per year is to be seen against this background.

Since the reactor accident in Fukushima the uranium price is permanently under pressure. What are the main reasons for this price collapse and how do you assess the current market situation?

At the uranium spot market the price dropped during the past 6 years from US$ 75 per pound to currently US$ 23. A movement that puts tremendous pressure on the producers. Three reasons seem to be primarily responsible: First, the sale of uranium from inventory of the Japan-

ese nuclear power plant operators that were disconnected from the power grid after the reactor catastrophe in Fukushima. Second, the sale by uranium pro-

ducers with liquidity shortages and pro-

ducers with uranium as a by-product which then sell the uranium with little price sensitivity. Third, the restraint of the buyers, which are not stressed by falling prices despite low inventories.

The uranium spot price has marked a multi-year low with US$ 18 this past No-

vember and has risen moderately since. This price increase was stimulated by the announce-

ment of a production cut of 10% by the largest uranium producer in the world Kazatomprom. In this context, precautionary purchases resulted in sig-

ificant rebounds of the share prices of uranium producers. This rally has already sold off and from a technical perspective the securities are traded again at the bre-

akout level of the bottom formation. With a view at the emerging supply gap an in-

teresting entry opportunity for the long-

term oriented investor is opening again.

How do the uranium producers come to terms with these low uranium prices and when do you expect a rebound?

The price decline at the uranium market is a tremendous challenge for the pro-

ducers. A profitable production is unthink-

able in this environment. The costs are consistently reduced accordingly. Pro-

duction plans are adjusted to the low prices and unprofitable mines are closed. The existing capital is allocated with much discipline. Development and ex-

pansion projects are rescaled or cancel-

led accordingly. With this behaviour (tight-

ening of the supply) the producers are preparing the ground for a medium-term price turnaround at the uranium market when the stagnant supply cannot satisfy the steady demand from China and India against this background. The uranium prices will have to rise in direction US$ 70 permanently to stimulate the necessary expansion of the production capacities…

Returning to your question: we expect that a change for the better could materi-

alize by 2018. During that timeframe an inventory cycle comes to an end for many European and American nuclear power plant operators. They will have to come to the market to rebuild their inventories. This impulse could become the catalyst of a sustainable turnaround. Normally the market will anticipate this turnaround withi-

n a timeframe of several months…

Is such a fund, focused on a single commodity, not too specialised and there-

fore too risky?

An investment in the fund is a focussed bet on the emerging supply gap at the uranium market. An attractive return po-

tential is opening up in front of an investor with a medium-term investment horizon which could also be very risky. Therefore the fund is suitable as complementary building block in a diversified portfolio but not as a basic investment. The Uranium Resources Fund has between 25 and 30 positions in the portfolio. This diversifica-

tion makes sense against the background of the current state of the uranium mar-

ket.

What do you recommend to investors who are interested in an investment in the uranium sector?

The outlined supply gap and the related potential of rising uranium prices are only foreseeable at the moment. The exact timing of the expected turnaround at the uranium market is uncertain despite the good perspectives. If, against expecta-

tions, the current phase of lethargy contin-

ues for a longer time the air will become thin very fast for some uranium producers. Their balance sheets are emaciated after the persistent price collapse and the cost reduction potentials are mostly exhaus-

ted. Even for a developer of new uranium projects the environment is challenging because their projects become economi-

cally viable and thereby feasible with in-

creasing uranium prices. As a result it is difficult to find investors for the funding of the next project stages. Who bets every-

thing on one card at that constellation takes a big risk – possibly too big. The stake within a diversified investment fund seems to be reasonable. In addition we
suggest a timely scaled build-up of the positions.

**What are your selection criteria for the selection of your fund holdings?**

We initiated the fund with great confidence based on the described positive medium-term prospects three weeks before the reactor accident in Fukushima. These events have pushed back the positive starting position by 5 to 6 years. The decommissioning of the Japanese reactor fleet, which comprises 10% of all operating reactors worldwide and the related uncertainty about the future perspectives of the civil use of nuclear energy is responsible for that. Against this background we became very humble although we still feel confident about the potential of the uranium market. Our primary goal is to remain a player when the uranium market rebounds.

Our portfolio is therefore based on three pillars. The core of the portfolio is comprised of 2 solid basic investments. First an investment in Uranium Participation (UCN), a Canadian holding company which invests in physical uranium. If we are right the supply gap at the uranium market will be closed by the increasing uranium price. Uranium Participation will be one of the first and direct profiteers. In addition we always have a significant position in the Canadian industry leader Cameco (CCO CN). The company has a broad-based portfolio of World Class Assets, is cash flow positive and pays a dividend despite the challenging environment.

When the prices begin to climb only the producers, which can place a significant uranium production on the market will benefit. Only the one who produces can deliver. To be on the safe side we invest in companies with low production costs and that have a solid order book. It is good to know in this context that only a relatively small amount of the annual uranium production is traded at the spot market. The main portion of the uranium production is processed within long-term delivery contracts at a predetermined (forward) price. We invest in companies that have sold a significant portion of their production in the past at a predetermined price, which is considerably higher than the current spot prices. This softens the current psychological strain. An example for a company in this category is Ur-Energy (URE CN).

Third, we invest in explorers and developers that are advancing development and mining projects on a world class level. Of special interest are those that can start their production in the timeframe of the expected supply gap. They will benefit from the attractive sales prices. In addition, these assets should have the necessary size to qualify as take-over targets. We assume that after the price turnaround at the uranium market a consolidation wave will roll through and mining companies from outside the sector would like to position themselves in the uranium business as well. This would make sense due to the low cyclical sensitivity and the relative high visibility of the uranium production.

Currently which are your biggest individual positions and why?

Besides the mentioned standard assets Uranium Participation and Cameco assets like Uranium Energy (UEC US), Berkeley Energia (BKY LN), NexGen Energy (NXE CN), Energy Fuels (EFR CN), Fission Uranium (FCU CN) or Denison Mines (DML CN) fit, for various reasons, in our aforementioned acquisition strategy.

In addition, do you keep an eye on smaller uranium companies which could become interesting during the coming months?

This is a difficult question. There are some attractive investment possibilities. If I have to name one of my favourites it would be Berkeley Energia after the recent significant price correction. The company has started the construction of the Salamanca uranium mine in Spain and will commence production in the coming year. At that time many nuclear reactor operators in the EU might start to renew their long-term delivery contracts. Berkeley Energia is in an excellent position because the Salamanca mine will be the only significant uranium producer in the EU-region. This makes the project attractive from a strategic point of view. In addition I like that, by global comparison, low investment volume of less than EUR 100 million is necessary to bring the mine to production. This is the result of the excellent infrastructure (water, electricity, and workforce) and the attractive geographic location. Due to the fact that the uranium deposit is near the surface low cost open pit mining is possible. Low investment volume, low production costs and an annual production volume of about 4.4 million pounds make the project from an economic perspective very attractive.
Interview with Scott Melbye
Executive Vice President of Uranium Energy, Commercial V.P. of Uranium Participation Corp. and Advisor to the CEO of Kazatomprom

Mr. Melbye, over the course of your career you have held positions as Executive Vice President, Marketing of Uranium One, President of Cameco Inc., Chair of the Board of Governors of the World Nuclear Fuel Market and President of the Uranium Producers of America. Currently, you are serving as Executive Vice President of Uranium Energy, Commercial V.P. of Uranium Participation Corp., and as the Advisor to the CEO of Kazatomprom. In other words: You are THE uranium expert! What led to your uranium-career?

Thank you, that is very nice of you to say, I feel fortunate to have spent my entire career in the uranium and nuclear energy business. Our industry is quite unique in that it is a fairly small and international community of quality, smart, and devoted people who are all pulling together to supply 11 percent of global electricity supplies with highly reliable, clean-air, base-load energy.

My introduction to the uranium business was at a very young age. Being a second-generation uranium miner, I grew up around the business. My father, Chuck Melbye, graduated from the Colorado School of Mines in 1950. He explored, and developed uranium deposits throughout the Colorado Plateau, Wyoming and even Paraguay, with joint venture partners such as Southern Californian Edison, Korea Electric Power and Taiwan Power Company. I recall an early memory at the age of 12 travelling to Moab, Utah with my father to meet a bearded and dusty old prospector at the local motel coffee shop. After spreading out the exploration maps over the breakfast table, we jumped in his old pickup truck and headed out a jeep trail into the remote red-rock canyons and plateaus of that prolific uranium district. Arriving at the prospective outcropping, we took some scintillator readings, bagged some mineral samples (kicking a scorpion off one of them) and headed three hours back into town. Experiences like this helped me develop a real passion for the resource business. Years later, I graduated from Arizona State University in 1984, and took on my first industry role with uranium broker, NuKem Inc. in New York.

Since mid-2015 we saw significant volatility in the uranium spot-price. It went from 40 to 18 and back to 26 US$. So, have we already seen the bottom?

The short answer is yes, even though we will have some starts and stops before we fully gain traction (as has been the case recently with the price back down around the US$20 level on thin trading volumes). The industry has been in a six-year bear market that began after Fukushima in March 2011. This has been a long and challenging downturn, as it would be for any commodity. While this period has challenged the patience of uranium investors, the depth and breadth of this downturn has sowed the seeds of an even more robust and sustainable recovery. We are finally seeing years of low prices beginning to take its toll on the supply side of the market. Production cutbacks are becoming the norm, as higher priced legacy term contracts begin to fall off. Uranium prices in the low US$20 per pound U3O8 range are simply unsustainable over the longer term. All-in production costs of the lowest cost mines are higher than the current depressed price level. Further, the current price environment fails to incentivize the majority of undeveloped uranium projects towards construction.

Japan is going to bring its reactors back to the grid step-by-step, but cancelled a supply contract with Cameco in early 2017. Will Japan put too much pressure on the spot-price?

The pace of the Japanese recovery has certainly been a disappointment. Most analysts, including me, have been wrong as to how quickly their reactor restarts would occur. The good news is that positive developments seem to be taking hold during 2017 (despite Cameco’s high profile contract dispute with Tokyo Electric Power, which appears to be isolated to those parties). Japan now has 26 restart applications submitted to regulators and 12 have been given the green light to resume operations. Another level of hurdles has been the legal challenges raised in two jurisdictions and the requirement of local governments to consent to each reactor restart. Great progress has been made on both these fronts in recent weeks, and it is not unreasonable to see seven reactors operating by year’s end (where only four are operating today). These don’t sound like big numbers, but would be viewed as positive developments for both market fundamentals and sentiment in the uranium industry.

In the last few months, a couple of producers reported that they are planning to cut their production, including Kazatomprom where you serve as an advisor. Will this significantly affect the uranium spot-price?

This is absolutely a key catalyst in the uranium price recovery that has been long in coming. Global uranium production amounted to 163 million pounds in 2016. While this continued a trend of annual uranium production increases in the face of low prices, the rate of increase has finally slowed and cutbacks are being implemented. This supports observations that a peaking of mine production is occurring. Several high-profile production cutbacks have been announced, including Cameco’s Saskatchewan and U.S. operations, Areva’s Niger mines, Paladin’s Namibian Langer Heinrich mine and Kazakhstan’s 10% reduction in output. The 10% reduction in output from Kazakhstan is particularly significant, as Kazakhstan is the world’s largest producer of uranium, accounting for about 40% of global mine supplies. Clearly, the move...
signals a disciplined and responsible market approach. Recently, Kazakhstan also announced that progress to date on that goal amounted to a solid 13% production reduction based on 1st quarter 2017 results. Furthermore, a senior Kazatomprom representative also announced at an industry meeting last month that “further production cuts are not off the table”, as they navigate through this difficult market environment.

Finally, while not a production cutback, we received great news this month that the U.S. Department of Energy has bowed to pressure from the U.S. producers and reduced the amount of government inventories that are released to the market by over 1 million pounds per year in 2017 and 2018. This may not sound like much, but combined with announced production cutbacks, about 16 million pounds of annual supply has now been removed from the market.

Many long-term contracts will run out in the next 12 to 18 months. Utilities are beginning to return to the market. Will they get their uranium for less than 30 US$ per pound?

Only in the very near term and until such time renewed utility uranium procurement levels pick back up. This is the other key catalytic that has me excited right now. The world’s fleet of operating reactors, and those nearing completion, are now expected to generate a cumulative fuel requirement of 174 million pounds of U\(_{2}\)O\(_{8}\) in 2017. This fuel requirement is expected to grow about 2% per year through 2030. While this demand for uranium is fairly steady and predictable, the procurements decisions of utilities can vary based on contract coverage, inventories, forecasts of future prices and risk tolerance. The previous contracting cycle, brought on by uranium price spikes in 2007 and 2010, resulted in utilities rushing to contract at higher prices and for very long terms. While these old contracts are expiring, the utilities have not been moving to replace these supplies. As a result, the forward coverage of utilities has fallen appreciably, increasing the uncommitted requirements that will need future contract coverage. It is expected that these unfilled needs may total just under one billion pounds of U\(_{2}\)O\(_{8}\) over the coming ten years and over 75% of expected reactor requirements are uncovered by 2025. In a thinly traded commodity, like uranium, this return to more normal long term contracting levels should put considerable upward pressure on long term and spot prices. We are beginning to see the signs of this increased buying activity by global utilities which is very encouraging.

New reactors are being built and older ones will be shut down. What does this mean for the future demand? Do new reactors need more uranium than older ones?

Ten reactors were added to the global grid during the 2016 calendar year, exceeding the mark set in 2015 for the highest growth rate of nuclear power capacities in the past 25 years. The World Nuclear Association reports that 447 reactors are operable in 30 countries. These reactors have a capacity of 392 gigawatts of electricity and supply about 11 percent of the world’s electrical requirements. Currently, 59 nuclear reactors are under construction in 14 countries with the principal drivers of this expansion being China, Russia, India, the U.S. and the United Arab Emirates.

The new reactors are all of designs which exceed 1000 megawatts and more than compensate for the retirement of some older smaller reactors that have reached the end of their operating lives. The total demand for uranium will increase with the requirements of the larger reactors balanced against the retirement of the older smaller units with designs typically less than 1,000 MWe.

A trend to keep our eyes on, and not yet factored into the near-term supply and demand analysis, is the growing emergence of Small Modular Reactor (“SMR”) designs. These are reactor designs which have a 50-100 megawatt range of output, and are similar to the small, compact U.S. naval reactors which have operated safely since the 1950’s. SMR’s can be mass produced in factories and shipped on site. They are scalable in nature, can accommodate small grids like islands and remote areas, require much lower upfront capital, and have a faster payback period due to short construction times. The U.S. Nuclear Regulatory Commission is updating their regulations to accommodate these small-scale power producers, which has been a big barrier to entry to date. While these reactors will use less uranium than today’s large units, this potential new growth area is a very welcome development.

Just to give the readers some numbers: How much uranium does a new reactor need for the first load and how much does it need for further loads?

Great question and something that adds to near term uranium requirements due to the 59 reactors currently under construction. A reactor under steady-state operation refuels only once every 12 – 24 months depending on their optimal fuel management and operating strategy. At these periodic refueling outages, approxi-
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**Chinese cities.** As a case in point, in 2017, China has built up massive investment in the Husab uranium mine in Namibia, which will advance this mine's development earlier than economics would otherwise dictate, other investments in existing mines, like Langer Heinrich, also in Namibia, will take significant volumes of production "out of circulation" for western utilities.

**The new leading nuclear nation will be China. How will their current construction plans affect the uranium sector?**

China continues to lead the global nuclear construction story, expanding from their currently installed 33 gigawatts of capacity from 36 reactors, to close to 100 gigawatts within the next ten years. The Chinese government has increased its emphasis on nuclear energy as a way to deliver vast amounts of electricity, without adding to the severe air pollution crisis from carbon emissions affecting their major cities. As a case in point, in 2017, China is expected to add five nuclear units to the grid and is expected to break ground on an additional eight reactors. This all has a profound impact on uranium supplies, as China possesses relatively little in the way of quality domestic geologic uranium reserves, despite its large geography. As such, China state-owned companies have been aggressively pursuing uranium imports to the tune of about 50 million pounds of U\(_{3}\)O\(_{8}\) per year, taking advantage of the uranium downturn and accumulating an under-valued commodity that they will rapidly consume at their current growth rate. Their investments in foreign uranium deposits and production assets also have significant impacts on the global market. While their massive investment in the Husab uranium mine in Namibia will advance this mine's development earlier than economics would otherwise dictate, other investments in existing mines, like Langer Heinrich, also in Namibia, will take significant volumes of production "out of circulation" for western utilities.

**Let's come to uranium supply. Do you see major new mines starting production in the next five to eight years? What does the pipeline look like and what price will most companies need to advance development, and bring their projects into production?**

This development should be startling to the nuclear generating companies, and probably explains the current, and very strong appetite for Chinese investments. Beyond the large Chinese Husab uranium mine, we see very little in terms of new mine development. From a producer's viewpoint, this is not surprising, given the six-year period of challenging price conditions we have experienced. The incentive price for meaningful new uranium production (new developments or mine expansions) to come to the market is estimated by BMO, in their March 2017 uranium market outlook, to be higher than US$60 per pound U\(_{3}\)O\(_{8}\). This, and the prolonged licensing and permitting process required to bring on new production (as much as 10 years or more for a major conventional mine/mill complex), make for an interesting situation as the uranium market is expected to move into a near term supply deficit amidst higher contracting volumes.

**In summary: What are your feelings about the current supply-demand-status in the uranium sector and could this lead to another uranium-price upward trend?**

The uranium market has required a great deal of patience from investors as it has worked through the over-supply conditions that emerged out of the Fukushima events in 2011. Having said that, as we head into the summer of 2017, we have a very exciting development materializing that is rarely seen, but certainly coveted, by commodity investors. With the record number of reactors operating, and coming on-line around the world, we are seeing a robust and growing global demand for uranium. While utilities have recently been heavily covered under contract from past cycles, we see a new contracting cycle emerging that will put renewed stress on available supplies in the coming years. The trend of global uranium production cutbacks, like those announced by Kazakhstan earlier this year, have been long in coming. These cutbacks are now occurring at the same time when the pipeline for new supplies is at a low point, and lead-times required to reverse that trend could be rather prolonged. The price impact could be acute.

This is certainly the right time to be positioned in uranium investments to capitalize on an emerging, sustained, price recovery.
Future low cost uranium producer with large resource and big leverage on uranium price

GoviEx Uranium is a Canadian mining development company specializing in the exploration and development of uranium projects in Africa. To date the company outlined resources with more than 200 million pounds of U₃O₈. GoviEx already has valid mining licenses for the two most advanced projects. The current goal of the company is to reduce the uranium price necessary for the project development and to advance toward production of the most advanced project, Madaouela, parallel to the increasing uranium spot price.

Madaouela – Location, Infrastructure, Resource
Madaouela (100% GoviEx) is located in Niger, 10km from Arlit and near the mines of Cominak as well as Somair in which AREVA has an interest. The mine of Cominak is in operation since 1978 and is considered to be the largest underground uranium mine in the world. GoviEx benefits from the well-developed infrastructure provided, besides all-season roads, sufficient groundwater and a good power supply. Madaouela has reserves of 60.54 million pounds of U₃O₈ and total resources of 117 million pounds of U₃O₈. In January 2016 GoviEx received the final mining permit for Madaouela 1 i.e. for one of six license areas (comprised of Madaouela 1 to 4 as well as Erail and Anou Melle). Pursuant to the permit the company can build the appropriate mine including all necessary facilities as well as mine the known deposits.

Madaouela – Deposit
Currently the most important deposit is called Marianne-Marilyn and is located within the Madaouela 1 concession. It is a sandstone hosted uranium deposit in a shallow depth of 30 to 120m. The second important deposit is called MSNE and is located four kilometers to the south. The third deposit, Maryvonne, is located right in the middle. A fourth mining area, Miriam, is located in the south of the Madaouela 1 concession. In contrast to the first three deposits, Miriam can be mined by open pit methods. The deposits are only 60 to 80m below the surface and have a thickness of up to 30m. In addition, this deposit contains in part up to more than 1% U₃O₈ and contributes to a tremendous cost reduction of the total planned mining operation.

Madaouela – Exploration potential
Madaouela most likely has more resources as previously known. Although more than 600,000 m were drilled, Anou Melle has a high “blue sky potential” because this license area is located on the same geological structure as Cominak and So- mair. In addition, there is the possibility that the Miriam deposits continues on to Madaouela 4 and that a Cominak extension stretches at depth on to Madaouela 1.

Madaouela – Development strategy
Currently GoviEx is working on a four-staged development strategy for Madaouela. The first stage is a loan financing including the participation of several international export credit agencies. The second stage is the project optimization and the completion of the detailed engineering work. The third is the completion of the appropriate long-term offtake agreements for which Houlihan Lokey EMEA, LLP was engaged as financial advisor in February 2017. The fourth stage will be a share based equity financing in parallel.

Mutanga – Location, Resource, Infrastructure
Mutanga (100% GoviEx) is located 200km south of the Zambian capital Lusaka and immediately north of Lake Kariba. The project contains more than 49.2 million pounds of U₃O₈ in the deposits Mutanga, Dìbwe and Dìbwe East discovered to date. GoviEx has a mining license over 25 years for three of the five concessions allowing the production by open pit methods and heap leaching. Mutanga is connected to a road and has sufficient groundwater. A high-voltage-line passes at a distance of 60km. The mineralization starts at the surface and is open in strike.

Mutanga – Exploration potential
Although the resource appears to be large, to date not all areas of the concession were explored for possible uranium deposits. Especially the areas near the west and east limits of the license areas offer a high potential for additional significant uranium deposits.
New VTEM surveys identified a high exploration potential in the northern section of Dibwe East. The company will test that area for possible additional deposits by means of drilling.

**Njame and Gwabe – potentially top-class expansion possibilities for Mutanga**

This northeastern area borders African Energy Resources Ltd.’s concessions Njame and Gwabe. Due to the aforementioned VTEM results, GoviEx has made African Energy Assets an offer which was accepted by African Energy in March 2017. Together Njame and Gwabe contain a resource of 11.2 million pounds of U₃O₈. GoviEx has to issue 3 million of its shares and 1.6 million warrants to African Energy for the two concessions. This is a very small price for a project with 11 million pounds of uranium and an apparently high exploration potential in the southwestern part of Njame, which borders GoviEx’s Dibwe East concession.

**Falea**

Falea (100% GoviEx) is located in Mali 80km from AREVA’s Saraya East uranium deposit. The project consists of three exploration licenses: Bala, Madini and Falea. To date a resource base of 30.8 million pounds of U₃O₈, 63 million pounds of copper and 21 million ounces of silver has been identified. This equals a converted resource of 38.1 million pounds of U₃O₈. It is important to know that only 5% of the license area (in total 225 square kilometers) was explored for the appropriate deposits. In addition, the majority of the known deposits are not completely defined. Falea offers a high potential for the construction of an underground mine. The project is accessible by road and plane.

**Strong shareholder base**

GoviEx has a very strong shareholder base including Toshiba, which signed the first offtake agreement for 11% of the planned production, Denison Mines, that provide technical assistance, Cameco, which co-financed the initial exploration program at Madaouela, and Ivanhoe Industries, with its mining expert Robert Friedland as investor. Including the private investment of GoviEx’s Executive Chairman Govind Friedland, these five main shareholders own around 49% of all outstanding shares of GoviEx. In addition, at the end of 2016, Sprott came on board of GoviEx.

**Summary: several guarantees for higher share prices!**

GoviEx is, without a doubt, a heavyweight in the uranium industry with a resource base of over 200 million pounds of U₃O₈. Madaouela the biggest project by far is ready for production. The missing part is an appropriate uranium price which would push GoviEx, due to its large resources, towards unimagined price peaks. An additional advantage: contrary to many other African countries, Niger and Zambia are considered as politically stable. Mining companies are not faced with obstacles for example Cominak whose mine is in operation since the 1970s. In addition, GoviEx has a very experienced and successful management team as well as strong major shareholders which will ensure that GoviEx will become a real success story.