The GeoThermal Option for the Economic Recovery of Iceland

Geographical Situation. Iceland has a geographical unique location on the collision/edge of two huge tectonic plates: the European and the North American. Due to this the nuclear fusion driven endless heath of the earth core 'has a hot fold to the earth's surface' in Iceland. This creates possibilities to harvest geothermal on the low height parts of the fault. The tectonic fault is a line from north to south on Iceland. Iceland also is surrounded by the high seas, which can deliver abundant water need for the geothermal energy harvesting process.

Harvesting Process. This harvesting is done by drilling 2 (redundancy is also here important for delivering operational stability) water injection pipes and multiple steam ejection pipes in (often) a circle around the injection pipes. The cold water input crushes the underground rocks due temperature change which automatically delivers small 'waterways' in a circle around the water injection pipe. If they reach the ejection pipes the circle is round and the hot water harvesting process can start. The only energy input in operation is the water injection pump, as the return path of the water is powered besides the earth internal pressure also is very much powered by the internal water pressure due to heat. The very hot (under pressure) water comes to the surface in pipes and due the lower pressure it vaporizes in hot steam which powers turbines, which delivers power. The process delivers both power and clean (condensed, thereby sweet) water. As water input salt seawater can be used. Concentrated rest water can be injected again into the wells (or if they have only NaCl: into the sea). This process of harvesting geothermal energy delivers the cleanest/cheapest power in the history of mankind. Another very beautiful facet of geothermal energy is the fact that it delivers a continuous base load, it depends not on daylight like solar energy or on wind like wind energy. It a 365*24 continuous process that delivers each second of the year the steady same amount of kWh as it designed for. Geothermal energy is harvesting an endless non-finite fully renewable energy source, which is very clean and has no impact on the local environment and global climate.

Transport Process. Power can basically be exported in 3 ways: 1) In products (moving energy intensive industries like aluminium, but also silica crystals to Iceland). Each product has an energy component and of some product this energy component is very high. These products can be used as in products captured energy export method. 2) As fuel (power > hydrogen). The power to hydrogen process with the current technology status delivers a severe energy lost. Still is a perfect method to benefit of not used energy in every energy model. As hydrogen becomes more common/voluminous the technology to realize it more cold (warmth is now the unwanted process by-product) and there by with better output ratios. There is no hydrogen transport and distribution infrastructure yet. Hydrogen is a not very compact gas, so it transport demands more transport capacity than of other fuel gasses like LNG. 3) By wire: New power transport technologies delivers only an approximately 3% lost per 1000 km (i.e. approximately only 5 per cent per 1000 mile). HVDC, LTS and HTS are these new technologies, where HVDC (High Voltage Direct Current) have taken the leadership in new energy transport wires as they have the best ROI, successful and voluminous install base. Inside de cables there also optic fibre cables for data transport. Making it possible for the very energy intensive data centre industry to move 'north' where a) power is cheap and b) cooling (in the south responsible for +70% energy demand per data centre) can be done by nature. Wires needs to be multiple redundant, as accidents may not harm more than some per cent of the total transport volume. Redundancy makes wires also not attractive as war/terror targets. Wires needs also a hydrogen backup component on both sides of the wire for maximal power ROI on the sending side and maximal power security on the receiving sides.

Transport Model. The transport model must be open. The early days of the oil age have proofed that severely. Who holds the transport, controls the bridge to the market. Transport monopolies are therefore not a good model, but open transport models are needed. All cables financed by the Open Finance model therefore must be open to everyone by digital capacity auction. So the market determines always the best and fair price for both supply and demand. Each cable connection will be hosted in a separate company (unlocking more tight back to back finance). Each cable connection will have a certain percentage long term capacity and a certain percentage spot market capacity. Long term capacity leasers can offer their capacity on the spot market if they have more transport capacity than own transport demand. Governments of power receiving nations are a special breed of long term capacity leasers. By this they ensure power price stability in their nations. Wire transport models must always compete with hydrogen based gas transport models. They operate in symbiosis. Hydrogen plants live of the power generation that has no transport capacity or remote demand available. For example night time power can be used to produce hydrogen (or to pump water into hydro reservoirs). Huge energy demanding processes base factories in Iceland will only operate in night times. This energy price based flexible process operation within factories is very standard in the USA for huge energy consuming processes like recycling). Everywhere energy prices making up most of the cost price, this will become more and more common practice. There will be hydrogen powered power plants in the remote sea harbours of Europe, Russia and America. Due the easy start-up of this hydrogen > power process, the power plants will be used to generate/supply attractive peak load power demand.

Technological Model. The needed science/technologies/businessmodels are numerous: geodata, geolicensing, drilling installations, drilling pipes, water management, water chemical analysis, stream/hotwater pipelines, steam reactor vessels, stream turbines, power cables, power transformers, cable ships, hydrogen process, hydrogen storage, hydrogen transport, financemodels, green houses, fish farms, etc, etc, etc. All these needed science/technologies/businessmodels will be developed in open models, everybody can contribute under moderation of smart professionals, capable of managing loads of information. There will be a complaint structure for people with different views than the moderators. This moderation will be done online (not on one location). This moderation will be done paid related to activity level. By this model every interested business can obtain for free the best possible science, technologies and business models for implementation. They can hire contributors for the implementation process. Open models strongly accumulate human knowledge and contribute severely to economic improvement.

Licence Model. Every business can obtain a geolicense of one square kilometre each for a small production area both on the right and left of the tectonic fault. The licences must be brought into production within 2 years after receiving otherwise the license will be revoked. Licences can not be traded (preventing speculation on licences). Licences can not be used as collateral (preventing a credit bubble based on licences). Licences forbid the use of fresh water (as that is a limited natural resource, but seawater is an unlimited resource). The geolicense model needs some sever clever minds to rule out speculation, credit bubbling and non exploration as much as possible. The license fees have a start fee and an operational fee. The start fee is used for infrastructural projects (seawater in infrastructure, concentrated salt water out infrastructure, fresh sweet water use infrastructure, warm water infrastructure for houses, offices, factories, fish farms, green houses, power lines, roads, bridges, etc). By the start licence fees the Icelandic Administration is financial ready for every infrastructural investment with no state loans needed. The operational fee delivers the Icelandic State a huge continuous income in by a 0.5 % of the generated kWh, making taxing the people and companies no longer needed. Iceland will become the first tax free nation of the world driven by monthly geothermal licence income. And the operational license will be paid in kWh, so this gives the Icelandic Administration also a hedge against currency value decline. This can make the Icelandic Krona a very strong currency. The only thing the Icelandic Administration needs to do is mapping a licence geographical map. If the result of the legal research is that Iceland needs to pay the Icesave debts in Europe (this is not clear yet in legal terms), than Iceland can offer the UK and Holland a certain percentage (like for example 5%) of this continuous operational license income to release the debt without any actual burden for the state budget of Iceland.

Business Model. By the open science/technologies/businessmodels ambiance every interested business can obtain for free the best possible science/technologies/businessmodels for implementation. A fair playfield demands certainly an open access for everybody. They can hire contributors for the implementation process. Open models strongly accumulate human knowledge and contribute severely to economic improvement. Businesses can use the infrastructure delivered Finance Model to fund their business cases out of the global capital markets. Due the 'kWh as ROI' model, global investors will appreciate these business cases as it gives them a hedge against currency value decline. Due the Open Models investors knows they invest in cases researched/developed by world's smarted brains. This leaves them with significant fewer risks then in any other investment. A good management team, some equity and a good licence location for example is all what's needed for a realizing one of the thousands possible geothermal plants.

Tendering Model. Specification based auctioning/tendering for purchase/sales/finance delivers the best deals possible for every party involved. The specification based model contributes enormously to innovation and security: it focuses everyone's eyes on improvement of specs, terms and guarantees. It also delivers a bribe free purchase and sale system for everybody and by this contributes to the fair play movement and improvement movement within the business culture. Prices and guarantees are the answers on specification based tendering. For example suppliers will certainly seek state warranties of their own governments to support their bids. The tendering model facilitates both demand and supply in hosting their business case, making it easy for both sides.

Finance Model. Businesses can use the 'capital infrastructure' delivered Finance Model to fund their business cases out of the global capital markets. Due the 'kWh as ROI' model (as in: kWh as repayment 'currency'), global investors will appreciate these business cases as it gives them a hedge against currency value decline. Due the Open Models investors knows they invest in cases researched/developed by world's smarted brains. This leaves them with significant fewer risks then in any other investment. A good management team, some equity and a good licence location is all that needed for a realizing one of the thousands possible geothermal plants. Due the tendering model, financiers knows they get to best money can buy as collateral in terms of specs and guarantees. Due the multiple (commercial, governmental and also market demand issued) guarantees financiers gets multiple guarantees. Demand supplying market parties are also very good guarantee issuers: their customer base delivers a direct connection to enduser originated power payments. Combined with delivery (partial debtor) collateral this direct link to this revenue source is ensured maximal. Furthermore there will be collateral on the kWh output. National States that issue any type of guarantees gets possibilities to get something in return. Selling the finance

cases to long term investors will deliver quite a profit. These profits will be put in guarantee funds so that their local banks can lend more out for local energy transition investments. This way the profit on global investments facilitates increasing local energy transition investments. Operation can be insured by operational and maintenance contracts. The Open Finance Model has just two goals: a) facilitating capital supply and demand maximal and b) ensuring maximal financers have maximal value security. When this message arrives in the brains of the financials worldwide, the model will be very voluminous in turnover. The fact that financiers and guarantee issuers get always kWh will make the Finance Model the widely used and perfect hedge against currency value decline, which is inevitable as there is printed a lot money worldwide the last years and the end of this is still not in sight. This is why Open Foundation advocates the use of Quantitative Easing only for energy transition investments, as fossil energy drains an economy and renewable energy enriches an economy.

Nation Model. National States that issue any type of guarantees will get an energy guarantee funds in return after the sales of the investment. These funds are funded by selling the finance cases to long term investors, which will deliver quite a profit. These investment case profits will fund this national energy transition guarantee fund, so that their local banks can lend more out for local energy transition investments. This way the profit on sales of the investment cases of global energy transition investments facilitates increasing local energy transition investments.

Initiation Model. There's a mutual interest of the UK, Holland and Iceland that this possibility will get realized. Therefore there must be an office in London, Amsterdam and Reykjavik. Employees are detached by the respective nations. Each nation delivers also an auditor who do continuously the auditing for and reporting to the Administration that has hired them. In phase two (as the prospectuses are made ready and banks supported are gathered) there will be sales branch offices in Silicon Valley, Wall Street, Beijing, Shanghai and Abu Dhabi.

Actual Version. An actual version of this info can be found on www.planck.org/projects/iceland/geothermal. This PDF file version can be found on www.planck.org/projects/iceland/geothermal/The-GeoThermal-Option-for-the-Economic-Recovery-of-Iceland.pdf