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Landsvirkjun's Renewable Energy Potential and its Impact on Iceland's Economy

Analysis by GAM Management hf. [GAMMA] for Landsvirkjun hf.
September 12th 2011

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PREFACE

In April 2011, Landsvirkjun [LV] asked GAM Management hf. [GAMMA] to prepare an analysis of the outlook for LV from 2025 to 2035, in the wake of LV's proposed investment plan. The analysis includes an assessment of LV's financial position and its ability to pay dividends and also the potential impact of the dividend payments on the Icelandic economy. The effects of investment activity on the Icelandic economy in the next 10 to 15 years are also estimated.

This is the english version of the Icelandic report, which was published June 28th 2011. All numbers, data, calculations and conclusions are from that date.

Chapter 3 presents an overview of LV's investment policy, along with possible investments in industry. Effects derived from the investment policy can in fact be split into three elements:

- effects from investments during the investment period,
- effects from the operation of energy plants and new industrial activity and
- wealth effect derived from the improved financial situation of LV, i.e. dividend payments and tax paid to the Icelandic state.

The economic situation in Iceland is analysed in chapter 4, focusing on the output gap and unemployment, while trying to estimate the possible multipliers and crowd-out effects. The consequences of LV's investment plan and the subsequent industrial activity are estimated in chapter 5, along with its impact on the economy, i.e. economic growth and jobs, with special attention paid to the problem of possible crowd-out effects.

The wealth effects derived from the investments are studied in chapter 7, where the effects of potential payments to the Icelandic Treasury are put into a macroeconomic context, considering, for example, possible tax cuts, the paying off of debt and investments. This is also covered in chapter 10 where a study of LV's financial ratios is presented, in addition to LV's ability to pay dividends and tax.

Chapter 9 presents a discussion on the possibility of a submarine cable, connecting Iceland to the European energy market. The consequences of such an undertaking on the Icelandic economy are debated, by asking, for example, whether it would be more economical to only sell energy to the Icelandic market or to enlarge the market by connecting it to the European energy market.

This report was written by specialists working at GAMMA, following a request from Landsvirkjun. LV's own assumptions on the development of domestic average energy prices, the investment needed and energy sales are used, although GAMMA is responsible for the calculations and final conclusions.

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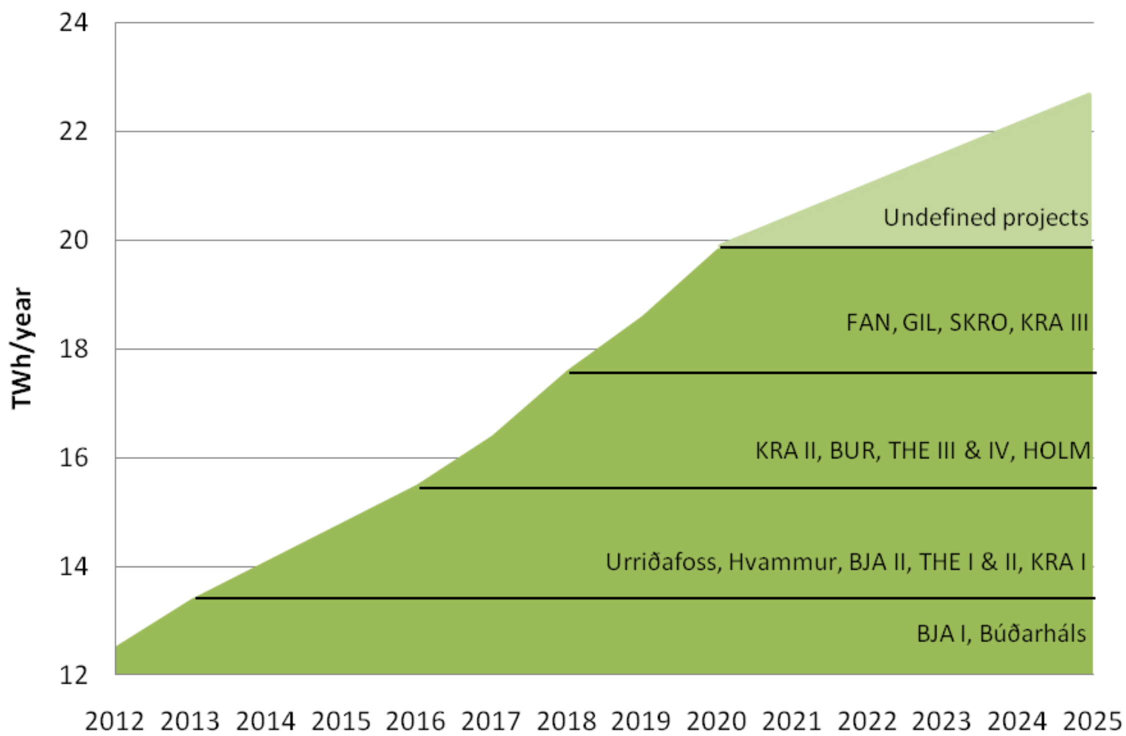
SUMMARY

This report estimates the economic impact of LV's investment plan on the Icelandic economy up until 2025 and projects the operating profit of the company until the year 2035 under four scenarios; A) LV base case, B) a sea cable connecting Iceland to Europe in 2020, C) a moratorium on new power projects and D) moratorium and fixed power prices. Furthermore, the report lays out a framework for assessing the effect of projected dividend payments from LV to its owner, the Icelandic government, for both public finance and balance of payments.

The underlying assumptions are based on LV's recently disclosed investment plan. In this report no attempt is made to assess the feasibility of individual energy projects or their environmental impact, but rather the investment plan is evaluated as a whole as a potential stimulus for the Icelandic economy. It is worth mentioning that the expansion of power producing capacity, according the plan, is based on relatively large number of medium sized individual projects which could be sped up or delayed according to economic conditions in Iceland or other factors. Further, the investment plan is based on the Icelandic Master Plan for Hydro- and Geothermal Energy Resources and investments can only be made once the relevant permits have been issued. The possible power plants are well defined and in Graph 1 we can see how energy production is increased over time, as new plants gradually become operational.

Graph 1: Energy production build up



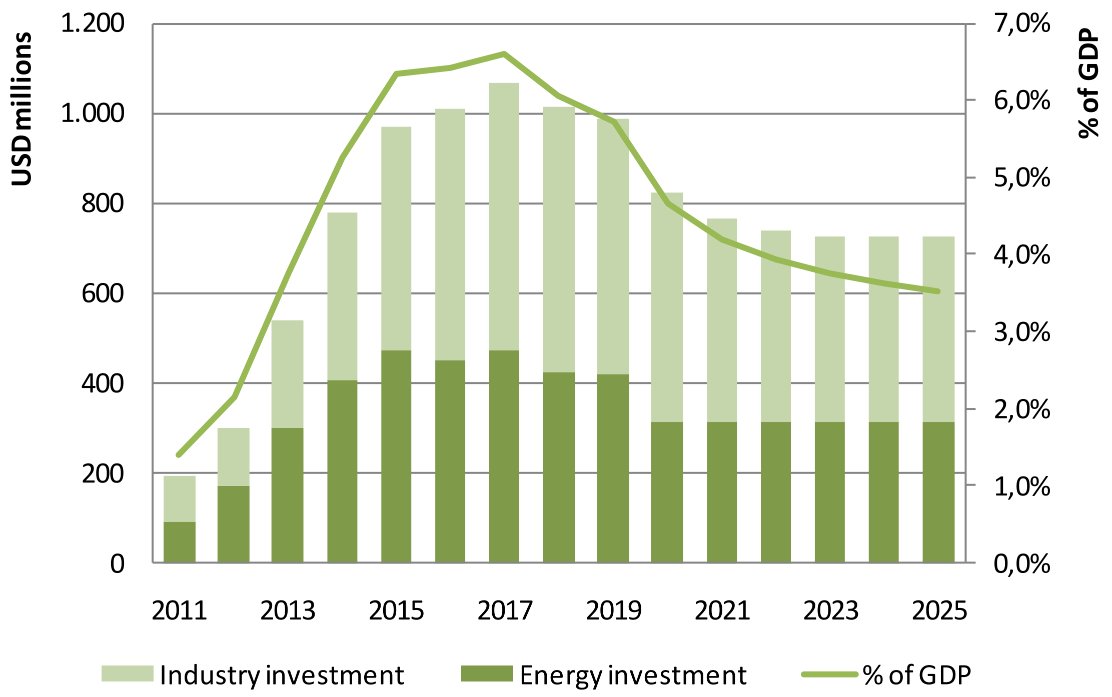
Source: Landsvirkjun
BJA = Bjarnarflagsvirkjun, THE = Þeistareykjarvirkjun, KRA = Krafla, BUR = Búrfell, HOLM = Hólmsárvirkjun, FAN = Fannalækjarvirkjun, GIL = Gilsárvirkjun, SKRO = Skrokkölduvirkjun

According to information from the National Energy Authority, the potential capacity for hydro power is estimated to be around 64TWh per year and geothermal energy around 20TWh per year, or 84TWh per year in total. Only part of this energy can be harnessed due to environmental and cultural concerns. Of potential capacity 20% has been harnessed to date, of which LV has about 75% share. Under LV investment plan, LV's power production will increase by 7TWh in the 2011 -2021 period and further 4TWh per year could be added during the 2021-2025 period. This constitutes almost a doubling of the current production capacity during that 15 year period, from roughly 12 to 23TWh per year. About 55% of the increase will stem from hydro power and 45% from geothermal energy.

Economic impact from energy investment

According to LV's investment plan, $3.5bn (ISK 400bn, USD/ISK 115) is expected to be invested in energy projects over the next 10 years and $1.6bn (ISK 184bn) in the 2021-2025 period. Here we also factor in further investments in the transmission grid, accounting for around 15% of the total amount deployed in the investment plan. When estimating the macroeconomic impact of the investment plan, it is imperative to also include the accompanying investments in energy-intensive industries that will buy the power made available through the investment plan. Up to now, the ratio between LV´s investments in power capacity and industrial investment has been 1 to 1. So far, most of the energy intensive Industry has mainly been in aluminium smelter and the energy has been produced in hydropower plants.

Graph 2: Total investment by LV and in industry

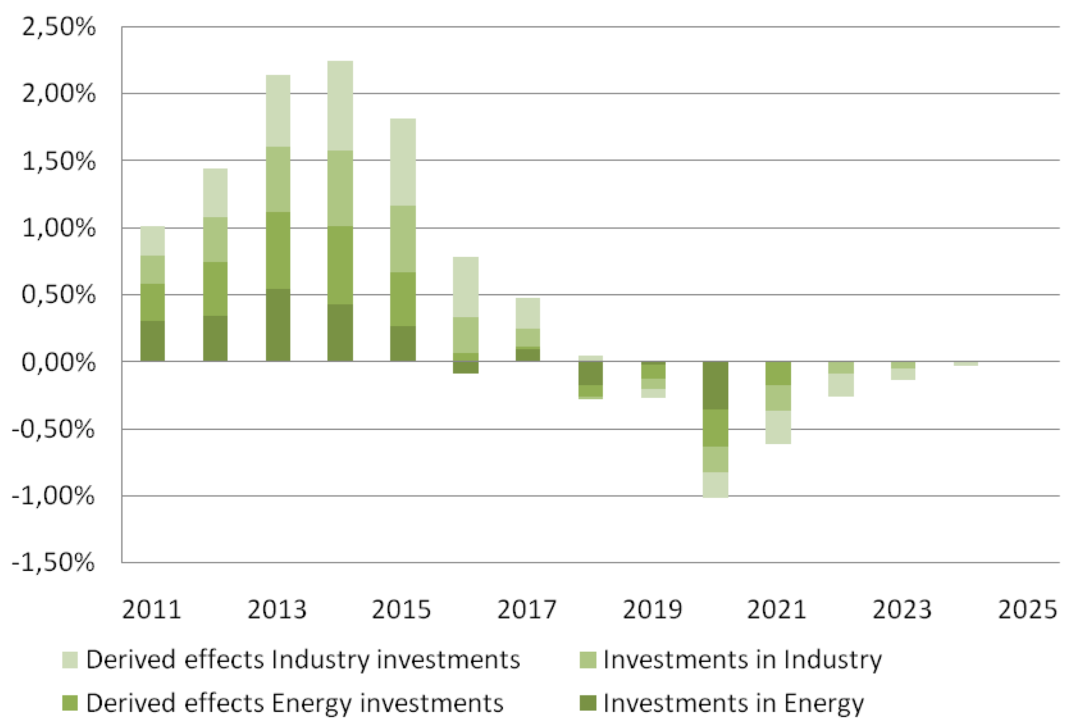


Source: Landsvirkjun, GAMMA

Under the new investment plan, about half of LV's proposed projects are in geothermal plants, which have lower construction costs (but higher operation costs). Furthermore, there are expectations about a more diversified customer base for future energy usage that will be less power intensive than the aluminium smelting. The assumption is therefore that investment in the energy sector will lead to investment in industry at a ratio of 1.3 to 1, with a lag. Up to 2020, LV's investment will be around $3.5bn (ISK 400bn), resulting in an estimated $4.5bn (ISK 517bn) investment in industry. All in all, investments in energy plants and the industrial build up should amount to $8.0bn (ISK 917bn) until 2020, peaking at $1bn (ISK 115bn) per year during the 2015-1019 period as seen in Graph 2.

When estimating the impact of the aforementioned investments on the Icelandic economy, there are two issues at the forefront of the discussion. Firstly there is the usage of domestic factors in investments and, secondly, the question of the multiplier effect from the investment activity. In this analysis it is assumed that 40 – 60% of capital expenditure on power plants will be domestic and 50% of the industrial investment. These ratios determine the direct impact of the investment on the Icelandic economy. It should be kept in mind that Iceland is a very small open economy and almost all capital goods are imported. Furthermore, that all contractors from the EU area are allowed to bid for the projects on equal footing with domestic contractors. On the basis of this, it is forecasted that investment in energy and industry with its derived effects could lead to additional 1.4% growth in GDP per year until 2017, after which investment is expected to shrink and negatively impact GDP growth. Accumulated effects on economic growth will peak in 2017 at 10% and some of the growth will be returned, due to reduced investment, even though it is assumed that investment will follow a smooth path throughout the investment period.

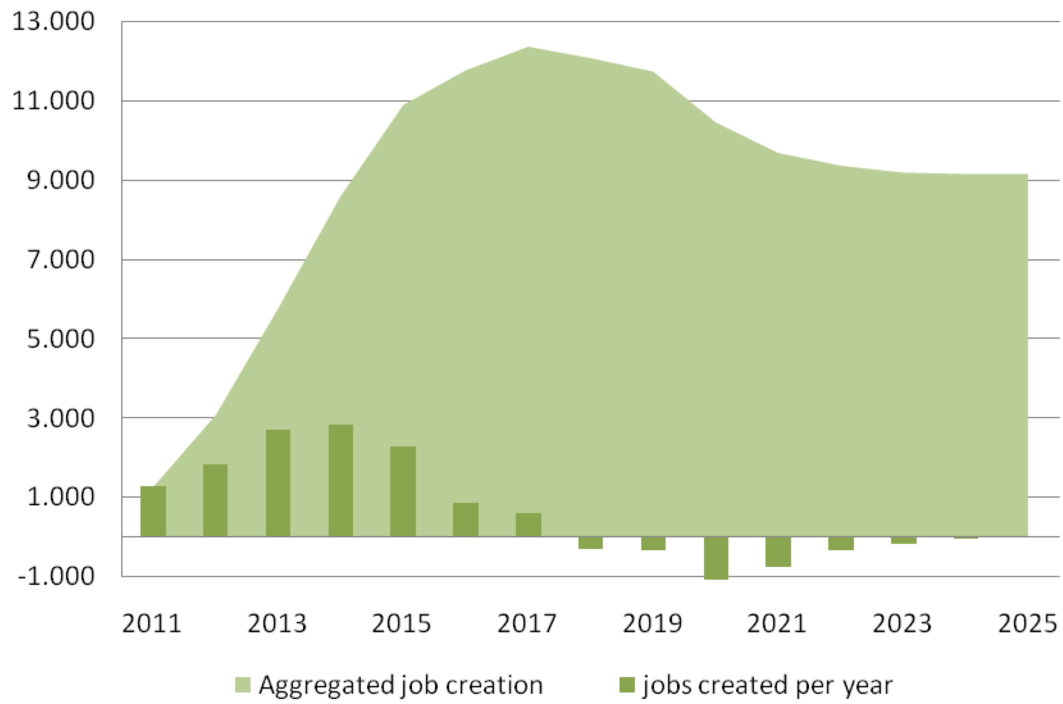
Graph 3: Effects on economic growth per annum



Source: GAMMA

During the investment period, new investments in energy and industry could yield 1,000 – 2,000 jobs yearly. At the height of the activity more than 11,000 jobs could be created, due to both the direct and indirect effects of LV's investment plan. When investment starts to decline during the latter part of the period, this number will be reduced to just under 9,000 people. This estimate is based on Okun's law on the relationship between economic growth and jobs. This methodology has the benefit of taking into account all job creation in the wider economy, rather than trying to account for job creation in relation to each and every individual project.

Graph 4: Effects from investment in energy and industry on job creation



Source: GAMMA

<u>Economic growth or "crowd-out" effects?</u>

An economic stimulus caused by large scale investment does not always manifest itself in economic growth and sometimes the consequences can turn out to be negative for the economy. The general economic situation or where the economy is placed in the business cycle is paramount when assessing the potential economic growth generated by certain investments. If an investment is made when all production capabilities are fully utilized, or even during a boom, and when the labour force is fully occupied, new investments will only take workers away from other activity and therefore not create new jobs, unless workers are imported from abroad. In that case the derived effects are in fact crowd-out effects, which have a negative impact on long-term economic growth prospects. Crowd-out effects are observed as overheating in the labour market, pay rises above productivity gains and subsequently inflation, higher interest rates and a strengthening of the exchange rate. If there is a recession, however, and unemployment and the production capability is underused, investment will be directly added to economic growth, without any crowd-out effects. Various multiplier effects will also lead to new activity, thus further increasing the economic benefit. The above description fits the current economic situation in Iceland very well. In view of the slack that now dominates the Icelandic economy, any possible crowd-out effects from LV's investment plan will be kept to a minimum, and potential economic gains will certainly be reaped in the short and medium term.

This report presents a few simplified scenarios about the output gap and underlying economic growth in order to assess the possible crowd-out effect of the investment plan. The base case is for the current output gap to be somewhere around 7%. Economic growth will be low in 2011 and 2012, in absence of power sector investments, but will move towards a 3% growth path in 2013. In view of this, it would take the economy until 2020 to close the output gap, which is twice the time it would take if the LV's investment plan is implemented. These findings are quite robust, and some variations in the assumptions have little effect on the results. The investment plan will therefore not cause overheating or crowd-out effects, neither in the short or medium term (for 3-5 years at least) and the duration of the economic recession and high unemployment levels will be considerably shorter.

It is worth noting that increased investments will increase the production capability of the economy and thus have an independent effect on the output gap. Economic growth can be thought of as picking fruit from trees that have been planted over a long period of time. Every year new trees are planted and the harvest subsequently increases the following year. When the planting of new trees is suspended for a long period the result is a smaller crop in the long term than there would have been otherwise. This was the case in Iceland during the 1989-1994 recession, when the lost production capacity was mainly caused by lost time and opportunities that would have delivered future economic growth. More precisely, during those 5 years many working hours were lost and savings lay unused instead of being harnessed in investments. This led to a permanent loss of production capacity in Iceland.

In 2009 and 2010 the Icelandic GDP has contracted by 10% and the recovery has so far been slow. On the other hand, it must be recognised that there was a substantial overheating of the Icelandic economy between 2006 and 2008 and the contraction can therefore partly be viewed as a correction of the imbalance that reigned during those years. Nevertheless, it is a well established fact that an output gap can quickly lead to permanent loss of production capabilities, since resources will either be depleted or they are moved abroad, and workers give up looking for jobs and accept unemployment as a permanent condition.

Permanent effects from the operation of energy plants and industry

As soon as investment has been completed, factories and energy plants will start running and their operations become a permanent part of the economy. Using the existing aluminium industry in Iceland as a benchmark, the domestic factor use about 30 - 40% of the total operation costs. Thereof somewhere between 50-70% is energy, but the use of other domestic factor is relatively minor in context of operation costs but still register within the Icelandic economy and will on average generate a 0.2% increase in economic growth until the year 2025.

Economic stimulus from new ventures is subject to the same principles as existing ones, i.e. real economic growth hinges on the state of the economy. If the economy is in balance, then the permanent growth effects are due to increased productivity since, all things being equal, the new companies use resources more efficiently than the existing ones. Regarding the labour market, the economic growth stemming from new jobs created by new companies is only measured as the difference in wages between the old jobs and the new ones.

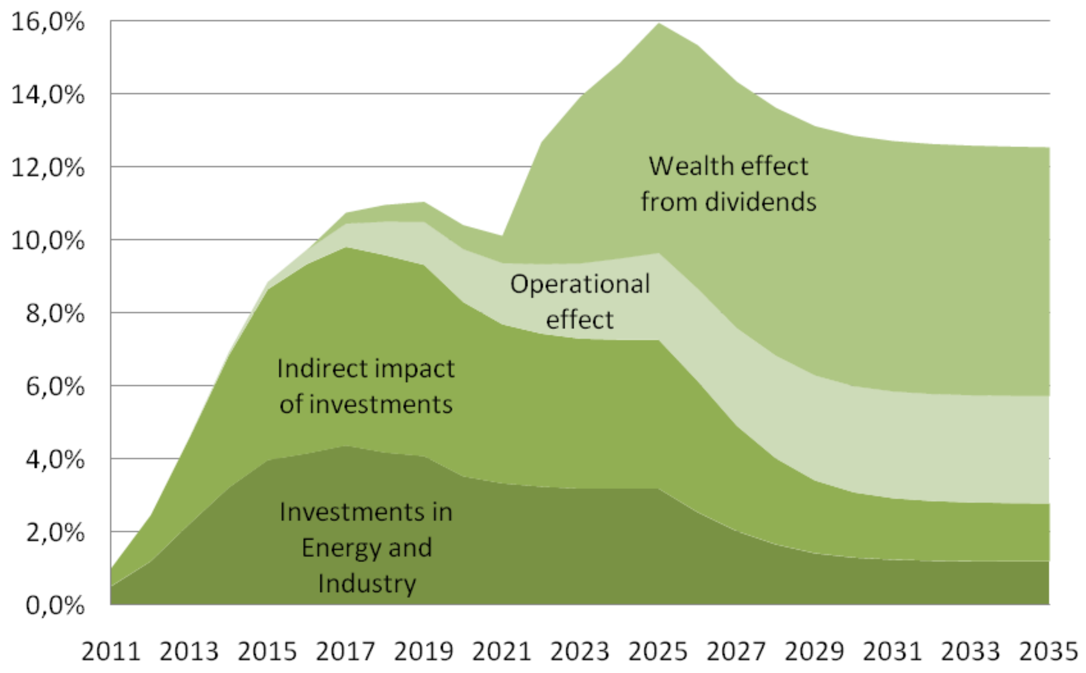
The expansion of both industry and power production in Iceland has much greater impact on the Icelandic economy than simple multiplier calculations imply. Between them the engineering companies in Iceland employ around 1,300 people, one third working on energy and heavy industry-related assignments. The skill and experience gathered through the years have placed many of these companies at the forefront in this arena worldwide and one can safely speak of an emerging cluster that has become an export industry in its own right. In 2009, it is believed that Icelandic engineering and geo-scientific companies earned about $12m (ISK 1.5 billion based on USD/ISK 125,00 in 2009). The same development can be observed around the aluminium business. Icelandic engineering companies and other specialised companies have, on the basis of their experience working for the aluminium companies in Iceland, started to export their expertise and products used by the aluminium industry. It is therefore clear that further investment in energy and energy-intensive industries will continue to boost this cluster formation, leading to more wealth creation based on Icelandic knowhow.

<u>Possible dividend payments from LV</u>

According to LV's business plan, dividend payments in the future will be considerable in an Icelandic context, along with drastically higher tax payments post the investment plan period, which ends in 2025. Annual total payments to the state coffers could be around ISK 30-112bn, depending on factors such as development of energy prices and whether a submarine interconnector will be built or not. It has to be kept in mind that the Icelandic economy is indeed small, or only one thousandth part of the US economy, and therefore no super rent is needed to have a significant impact on the Icelandic economy. In fact, GAMMA's estimates only predict a rise in return on capital employed from roughly 4% to 9% in 2020, but that is nevertheless significant to have a large impact on public finance in Iceland. It is straight forward to estimate the economic impact of the dividends by assuming that the state will invest the dividends in domestic projects with the attached multiplier effects, as is the case with private investment. The only difference here is that it is assumed that the government is more inclined towards using domestic resources than the energy and industry companies. Similar economic results would emerge if, instead of investing the dividends, taxes were to be lowered or government spending increased.

The following graph presents the accumulated effect on economic growth. There are three components involved: effects from the investment plan, effects from the operation of the new investments in energy and industry, and finally the effects from the dividend payments, all according to Scenario 1, which is described in greater detail later in this report. The same methodology is applied when measuring all three components, capturing the multiplier effect and making it possible to compare them in a meaningful manner. It is important to bear in mind that the profits enjoyed by LV do not only come from selling energy to new ventures, since existing customers are expected to pay higher energy prices in the future as contracts mature, in line with development on mainland Europe but with discounts, and will thus contribute to boosting profits.

Graph 5: Accumulated effect on economic growth according to Scenario 1



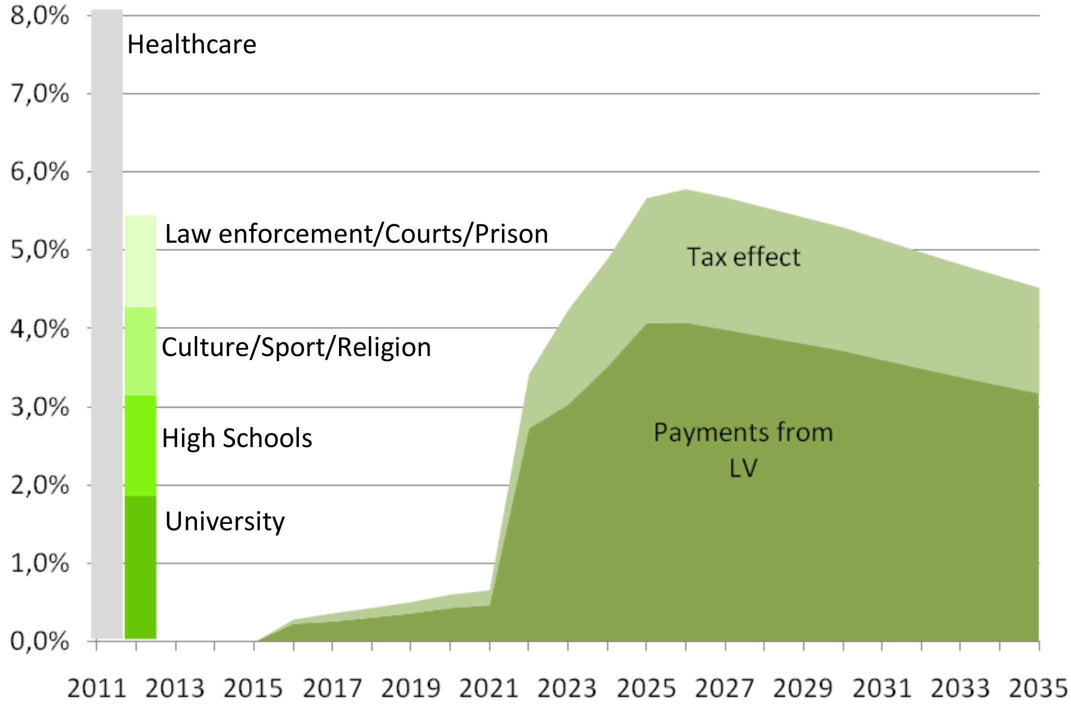
Source: GAMMA

<u>LV's dividend payments in relation to public finances.</u>

In order to assess the impact of LV's dividends policy on public finances, it is assumed that the Icelandic state will maintain a 42% share of the GDP, which is the average ratio for the last decade prior to the collapse of the banks in 2008. Furthermore, a part of the state expenses are returned to the state through the tax system, be that income tax or VAT or other forms of taxation. Therefore dividends and tax payments from LV could, enlarged by the derived tax effects, amount to 3-6% of GDP or 9-14% of state revenues.

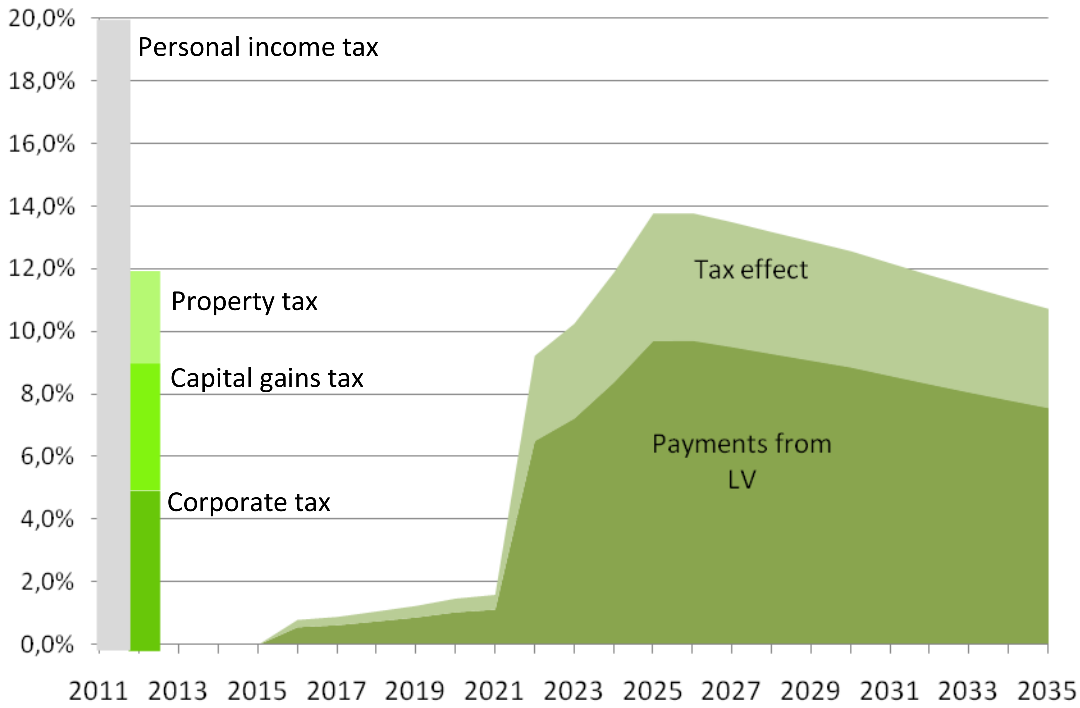
This is analysed further in Graph 6 and Graph 7. There the dividend payments and the tax effects described above are presented as a proportion of GDP and state revenues. Additionally, the former graph shows comparisons between the state's major expense categories and the dividends and tax income from LV. The latter offers comparisons with the state's major sources of income. From this it can be seen that payments from LV could possibly pay for the universities, high school system, culture/sport/religion and law enforcement/courts and prison. Alternatively the payments could go a long way towards covering the cost of health care, which currently claims around 8% of the GDP.

Graph 6: Payments from LV as proportion of GDP



Source: Statistics Iceland, GAMMA

Graph 7: Payments from LV as proportion of state revenues



Source: Statistics Iceland, GAMMA

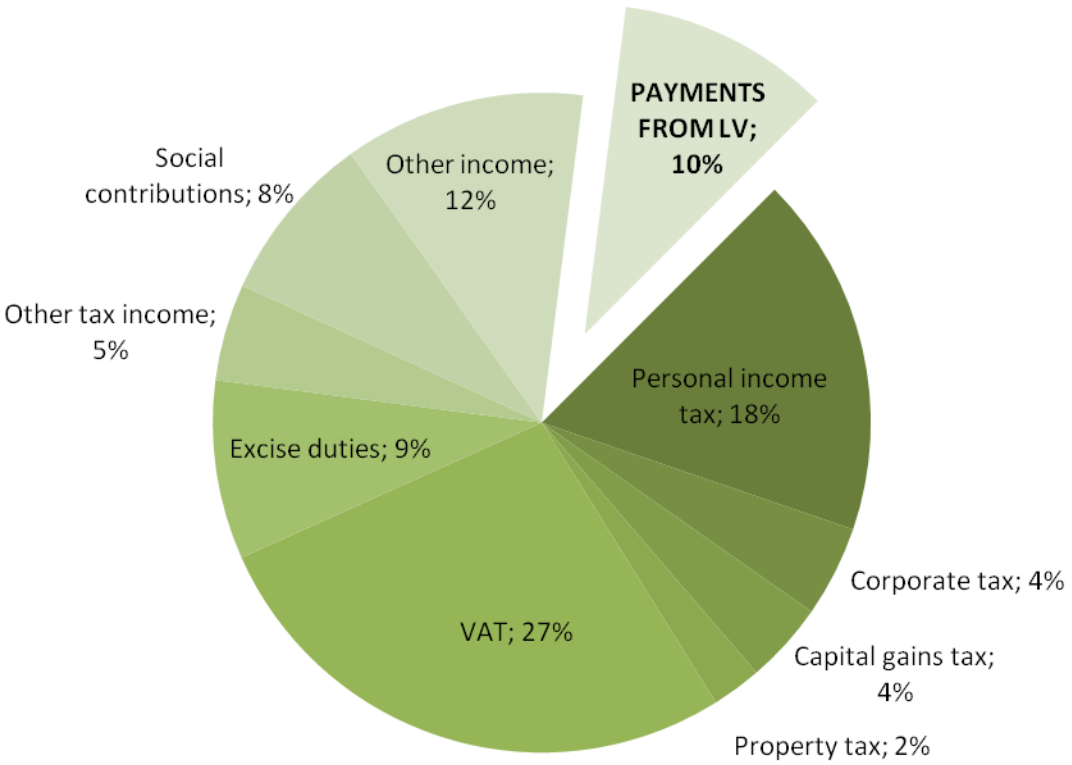
If LV's dividend and tax payments are compared to historical income tax revenues (approx. 20% of the state's income during the 2001-2009) one can speculate that personal income tax could be lowered by half, either by decreasing the tax rate, raising the personal allowance limit, or paying each and every Icelander an annual sum of ISK280 to ISK320 thousand at 2011 fixed prices.

On average, during the 2001 – 2009 period, personal income tax accounted for around one fifth of state revenues, excise duties 10%, corporate tax and profits around 5%, capital gains tax 4%, property tax 3% and VAT around 30%. Thus LV's payments to the state could allow it to:

- abolish excise duties or
- abolish property tax, capital gains and corporate tax or
- abolish social contributions tax or
- allow for lower personal income tax by half or
- reduce VAT by third.

Graph 8 shows the possible composition of the state revenues streams in 2030. Given the above assumption, direct payments from LV could amount to 10% of total revenues. At the core of this discussion is the fact that the size of LV's energy sales, compared to the Icelandic economy, means that any rise in energy prices over and above the average production cost, has a great impact on the economy as a whole.

Graph 8: Possible revenue sources for the state in 2030



Source: Statistics Iceland, GAMMA

Macroeconomic benefits from LV's operations until 2035

Job creation and revenues in foreign currencies tend to be the first things that people think of when discussing macroeconomic benefits or economic benefits in general, but this type of analysis is not very insightful or revealing, since the number of jobs or influx of foreign currency is a rather clumsy measurement. The economic well-being of nations does not hinge on the number of jobs created, but on productivity and the value created by each and every job.

As previously mentioned, the timing of the investment plan is of utmost importance when assessing the actual growth stemming from the investing projects and the macroeconomic benefits for Iceland. In view of the current recession and the subsequent output gap, it is clear that LV's investment plan will generate considerable positive impact for the Icelandic economy during the next 4 to 5 years. This will be comparable to what happened in Iceland during the sixties, when the first aluminium plant in Hafnarfjordur (now owned by Rio Tinto) was built and also to developments in the nineties when an aluminium plant was built in Grundartangi (owned by Century Aluminium) and the plant in Hafnarfjordur was enlarged. Here, investments in energy and industry delivered a most welcomed economic stimulus during times of recession. Therefore one can conclude that the effect from the investment plan on economic growth will be strong, but causing minor or even no crowd-out effects. More importantly, by tackling the contraction, the economy's long-term capability will be preserved.

Most important, though, as far as economic well-being is concerned, is the energy price that LV will be able to charge, defining the company's ability to pay dividends. Historically LV has sold energy at prices close to production costs, in part because of lower energy prices world-wide and in part to pull large industrial customer to Iceland. This policy has been reflected in LV's low average profitability of 3-6%. The return is generally considered low, particularly in light of the company's access to low cost hydro electric opportunities. It can be argued that if the resources were of significant value, it should be reflected in LV's profitability and dividend payments. If profitability is low, it can mean that either the energy resource itself is of little value or the energy price is too low. In the latter case the resource rent goes to the energy buyer.

The core issue at stake here is that if the energy seller is the state and the buyer is a foreign owned company, the domestic macroeconomic benefit will be determined by the energy price agreed upon. Other issues that are often more prominent in the public debate, such as job creation, are far less important, apart from the local impact on the job market.

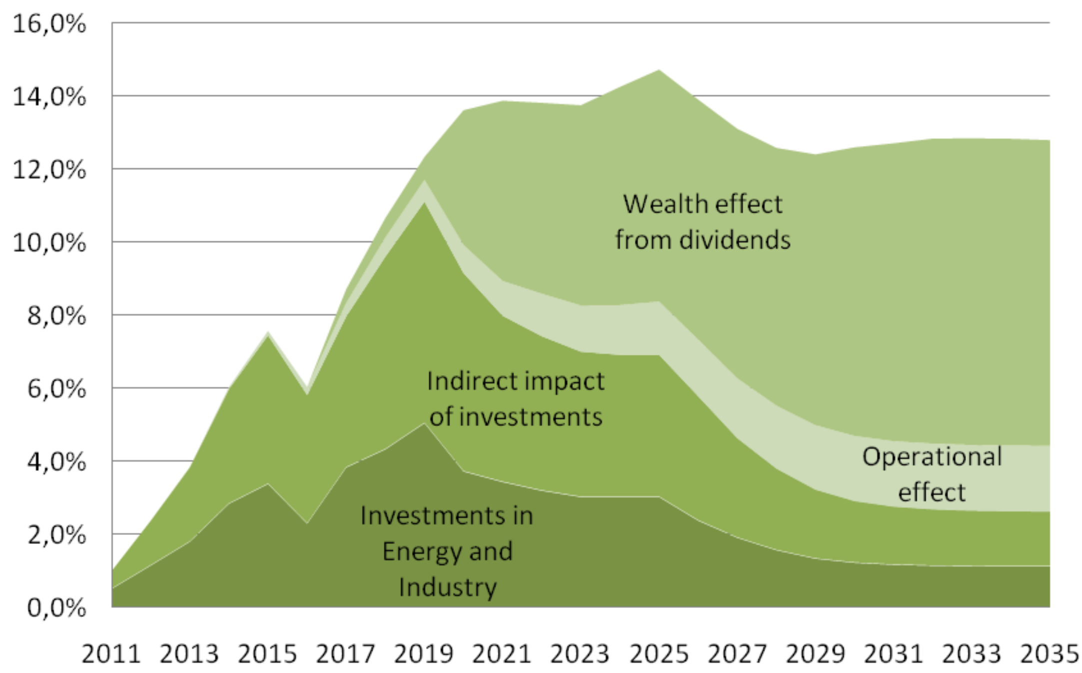
Submarine Interconnector between Iceland and Europe

LV is currently carrying out profitability and feasibility studies on a submarine interconnector to mainland Europe. The high voltage cable which would be anywhere between 1,000 (Scotland) to 1,900km (Germany) long and could have between 600-1,000MW capacity. The technology for such an undertaking has been available for some time. The motives for connecting different electricity markets are many, such as capitalizing on price differentials, harnessing excess electricity which would otherwise have been lost and for security reasons mitigating local shocks and malfunctions. In any case exports of electricity should only account for 15-25% of total production in Iceland.

As soon as the Icelandic energy grid is connected to the European one, power prices should start to converge somewhat and LV's average price should rise. This higher price will not only be obtained for energy exported via the interconnector, but also through higher prices from domestic buyers, due to the strengthened bargaining position enjoyed by LV. What exactly the impact on the Icelandic energy market will be and how it will affect different groups of buyers is difficult to predict, but in our calculation certain assumptions are made about how average prices will behave. Undoubtedly, it will remain in LV's interest to continue to provide power to large industrial buyers within the country, who buy energy on long-term contracts, along with direct exports via the submarine interconnector. Moreover, the extent to which rising energy prices will affect Icelandic households is also a political issue. There are also other issues that are open to debate, such as, for example, how much of a premium green energy will obtain in the European energy market and so forth.

Graph 9 shows the impact of LV's dividend payments on the Icelandic economy, after a submarine cable has been installed. The effects from the investment activity are somewhat diminished, due to reduced industrial activity, but that is fully compensated by accumulated economic growth stemming from dividend payments.

Graph 9: Accumulated economic growth by LV's investment plan and submarine cable



Source: GAMMA

When contemplating energy exports to Europe via submarine interconnector, many people's initial reaction is undoubtedly to think that, in doing so, Iceland would be exporting raw materials instead of using it for further production by, for example, selling the energy to aluminium companies in Iceland, thus creating jobs and boosting the export industry. There is a kernel of truth in that approach, since Iceland has a vested interest in upholding a strong domestic industrial base, at least up to a certain degree. Additionally, one of the macroeconomic benefits enjoyed by Iceland is the fact that, by selling energy to energy-intensive industries like aluminium plants, economics of scale have been created, leading to lower average costs for domestic businesses and households, as well as more secure energy delivery.

Again, the main issue at stake is that the price difference between Iceland and Europe can be so great that the increased profitability of LV, thanks to the energy it will sell through the submarine interconnector, should yield considerable economic benefits to the Icelandic nation. The price will not only rise because of the energy that is exported via cable, but also thanks to the strengthened bargaining position of LV in the domestic market, due to the possibility of alternative buyers for LV's energy abroad. Since Iceland is geographically far away from the worlds electricity markets and transmission costs will play a part in pricing the energy abroad, LV will likely continue to offer rebate on "European prices". But despite the rebate there is little doubt, in view of current European electricity prices that prices to heavy industry in Iceland will rise in the future. As mentioned earlier, only a small part of the energy produced in Iceland would be exported to Europe via submarine interconnector, the remaining energy would, as before, be used in Iceland.

But it is not only LV that will benefit from constructing a submarine cable. Other Icelandic energy companies would greatly benefit from gaining access to the European energy market, even despite the high cost of transmission. As wholesale prices trend upwards, the number of economically feasible energy projects increases, which will bring forth more energy supply along with higher profits. All Icelandic energy producers will therefore be better off and Iceland's foreign income would take a leap upwards.

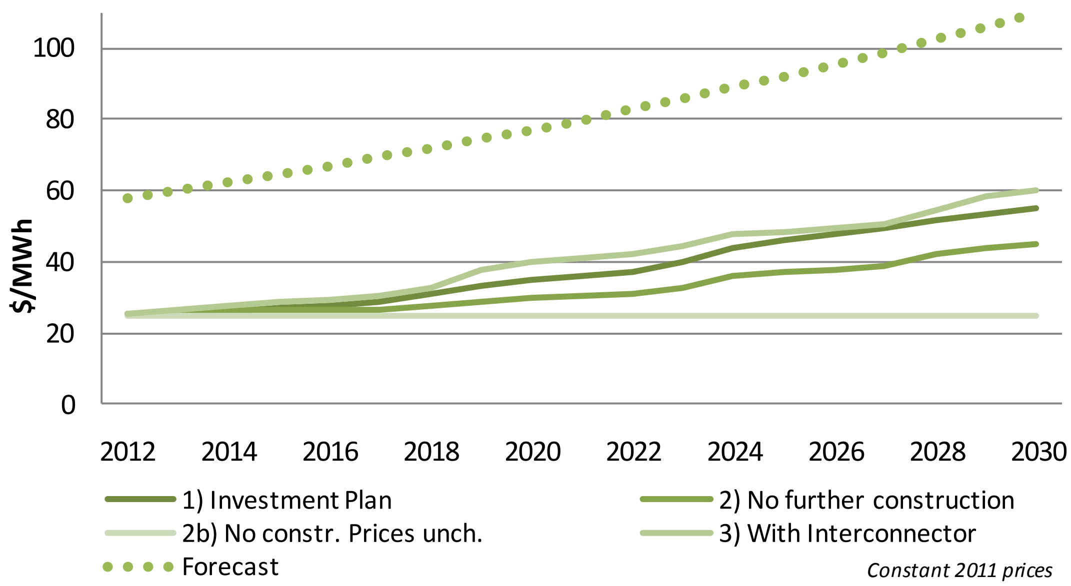
Possible Icelandic Energy Fund

It is interesting to compare the profits received by the Norwegian Oil Fund to the expected profits Iceland could enjoy from its renewable energy resources. It is noteworthy that both of these nations started to harness their energy resources at around the same time. LV was founded in 1965 and by 1969 the company had quadrupled its energy production after building the Burfellsvirkjun power plant. Norwegians searched for oil in the sixties, pumping the first oil in 1971, but it was OPEC and its actions that pushed up oil prices, making it economically feasible to extract oil for the North sea, although the cost of production was considerably higher there than in most other places. Nevertheless, Icelanders have not been able to generate any significant rent from their energy resources, which is chiefly due to geographic isolation making it impossible for it to connect to the European energy market. Furthermore, it can be argued that the "OPEC moment" for Iceland did not occur until 2003 when energy shortages and the emphasis on environmental concerns led to higher energy prices. Currently, there is a huge gap between energy prices in Iceland and Europe and the question will be to what extent that gap can be bridged. In many ways Iceland is in a better position than Norway, since its energy resources are renewable, whereas the oil deposits will sooner or later dry up. This means that Icelanders could pay out all the profits generated by their energy resources on an annual basis, while the Norwegians have to hoard theirs in funds and then pay out the dividends from their investments. An Icelandic energy fund, properly managed, would therefore be a welcomed addition to an already strong pension fund system.

An overview of the Scenarios

Energy prices have risen considerably in Northern Europe during the last decade and for example prices in the Nord Pool market are roughly two to four times higher now than ten years ago, going from $20 (EUR20) to $55-$85 (EUR40-60) per MWh. Industrial analysts almost unanimously agree that an upward trend is set to continue in the near future. The plans that are used as bases for projections in this report assume that LV's average prices will follow this trend, as new energy plants become operational. Moreover, as existing delivery contracts expire, opportunities will be created to renegotiate higher energy prices. It is not assumed that it will become possible for LV to sell its energy at "European" prices, only that LV will be able to follow price trends abroad. In this report, fundamental business ratios are calculated based on four different scenarios. Each of these scenarios captures different combinations of investment and price development.

Graph 10: Development of LV's average wholesale energy prices under different Scenarios



Source: GAMMA, Landsvirkjun

Higher energy prices in the three scenarios are mainly explained by higher prices on the global markets and consequently how these high prices will be incorporated into LV's price structure when LV renegotiates its existing long-term contracts. Due to the long duration to the expiry of existing contracts, the average prices in the scenarios are similar in the short run, except that in Scenario 1 the excess energy being sold at higher prices leads to earlier discrepancies in average prices. In the long term, the energy prices in Scenario 2 will not match the prices in Scenario 1, since it is assumed that new investment projects could lead to earlier renegotiations of existing contracts, since new emerging industries will be able to pay higher energy prices than existing industries and current buyers may use the opportunities created by the increased energy supply to expand their current businesses in order to enhance their economics of scale. In estimating the effects on LV's operations and on the economy in general, LV's investment plan was presented with two scenarios to compare.

Tafla 1: Overview of Scenarios

Scenario	Investment plan	Energy prices*
1.	LV's investment plan	Average wholesale prices increase to $35/MWh. in 2020 and reach $55/MWh. in 2030.
2.	No further investments	Average wholesale prices increase to $30/MWh. in 2020 and reach $45/MWh. in 2030. For comparison purposes, scenario 2b, with a fixed average wholesale price of $25, is occasionally used.
3.	LV investment plan with submarine interconnector to Europe	Average wholesale prices increase to $40/MWh. in 2020 and reach $60/MWh. in 2030. The cable option furthermore increases the yield due to sale of excess energy and reaps benefits from selling energy at peak hours.

Source : Landsvirkjun and GAMMA
** Prices are fixed at 2011 price levels and exclude cost of transportation.*

Scenario 1 is based on LV's investment plan as presented and described in chapter 3. Energy prices are expected to rise in 2011 real terms, with some discount to European prices, in line with forecasts made by international industrial analysts. It is noted that the lion share of energy sold by LV is bought by long-term buyers and therefore a considerable lag in the rise of average prices is observed.

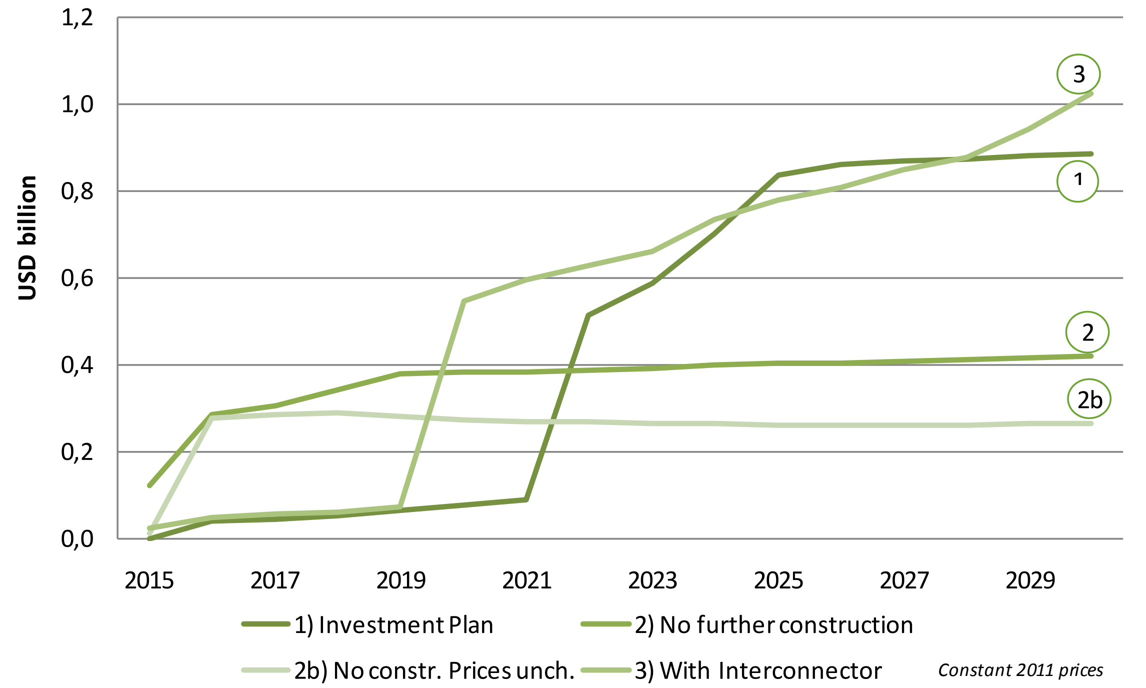
Scenario 2 assumes no new investments, but anticipates that rising energy prices in Europe will find their way to Iceland through renegotiations of long-term contracts, leading to higher average prices, but with discounts off the European price level. Occasionally, Scenario 2b is projected, but in that scenario, the average wholesale price is fixed at $25/MWh to help readers realise the importance of LV extracting higher energy prices from its customers in line with price development abroad.

Scenario 3 assumes that LV's investment plan is augmented by the construction of a submarine interconnector, connecting Iceland to Europe, starting in 2015. Therefore higher energy price are anticipated, thanks to the energy sold via the cable, LV's enhanced bargaining position, and the increased yield of the energy system.

<u>Summary of findings – possible prospects of LV in 2030</u>

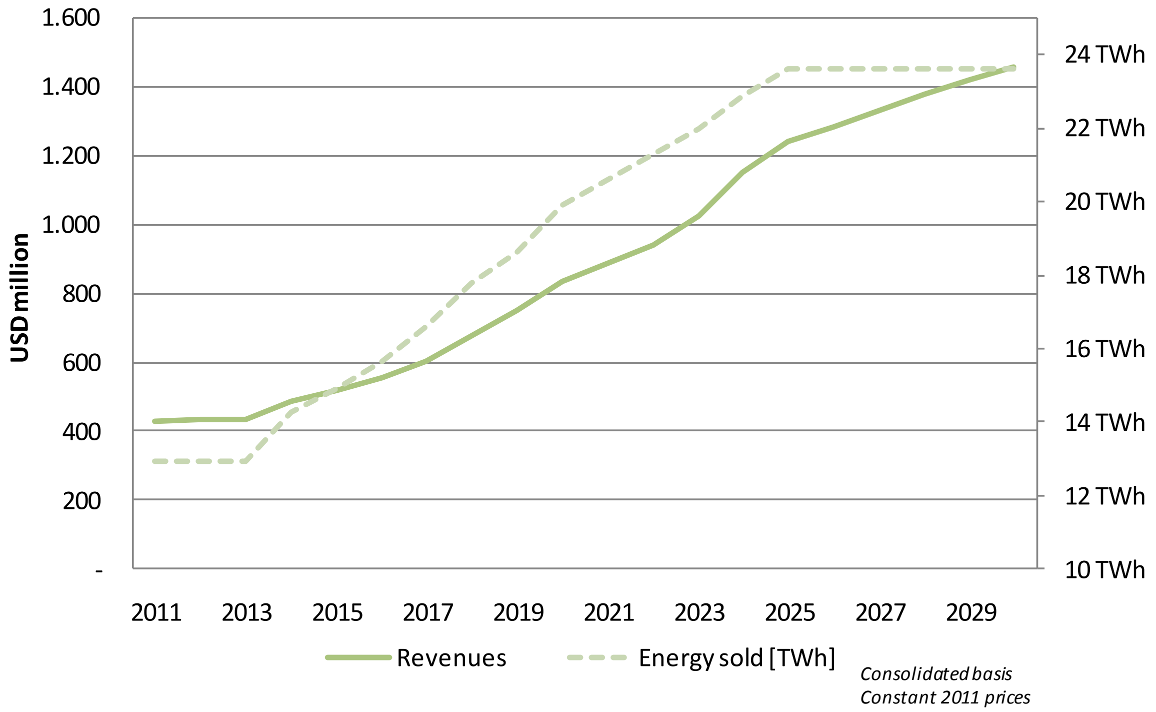
LV is on solid footing despite having shouldered considerable debt in the wake of recent large investments in Fljotsdalur. Recent positive development of aluminium prices, after two weak years (2009 and 2010), contribute to this strong cash flow, but half of LV's revenues are indexed to aluminium prices. If LV's investment plan were to be implemented and if energy prices develop according to the scenarios described earlier, then LV's ability to pay dividends and tax will be considerably increased.

Graph 11: Annual dividends- and tax payments according to different Scenarios



Source: GAMMA

Graph 12: Forecasted revenues and average wholesale electricity price (Scenario 1)



Source: GAMMA

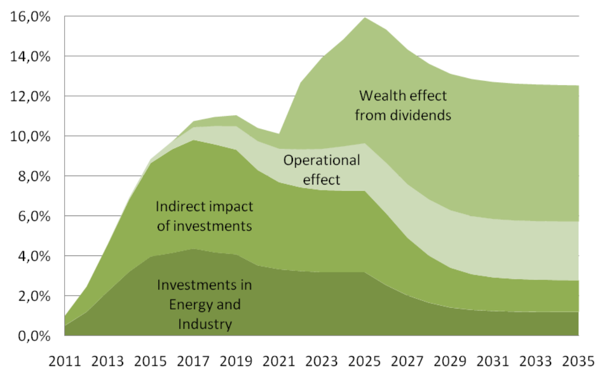
If implemented, LV's investment plan will double the company's energy production within fifteen years and its revenues could, according to Scenario 1, increase from $425m in 2011 ($378 in 2010) to around $1,250bn in 2025 (at 2011 fixed prices).

Without new equity the proposed investment plan will result in higher debt levels. As the new plants come online, however, they will increase LV's capacity to service its debt. Dividends payments will start after the investments have peaked in approximately 2022 with ND/EBITDA leverage ratio at approximately 4.0x. The investment plan is capital intensive and dividend payments will therefore, ceteris paribus, be delayed by approximately 5 to 7 years, compared to what would be the case if no further investments were made. However it is worth noting that in Scenario 2, no derived consequences from investment activity are observed.

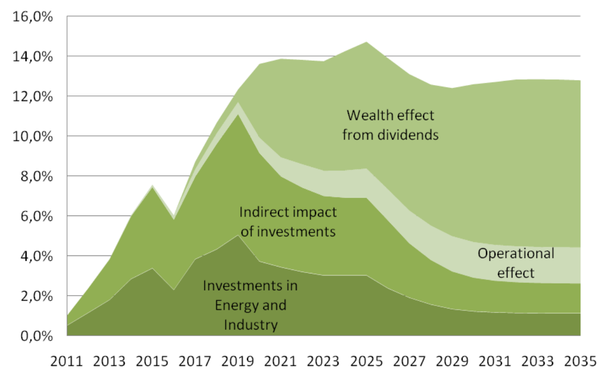
Graph 13 presents the economic consequences of the Scenarios described above. In all cases, LV's profitability is expected to increase during the period, although the graph clearly demonstrates how the proposed investment plan could add to LV's profitability. Graph 14 shows LV's payments to the State Treasury, as a proportion of GDP, and total tax revenues according to different scenarios.

Graph 13: Economic consequences of different scenarios

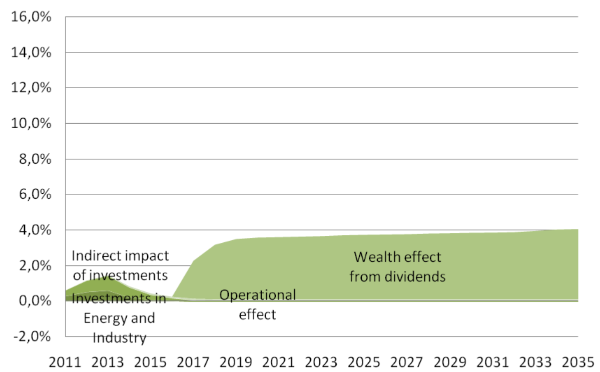
Scenario 1



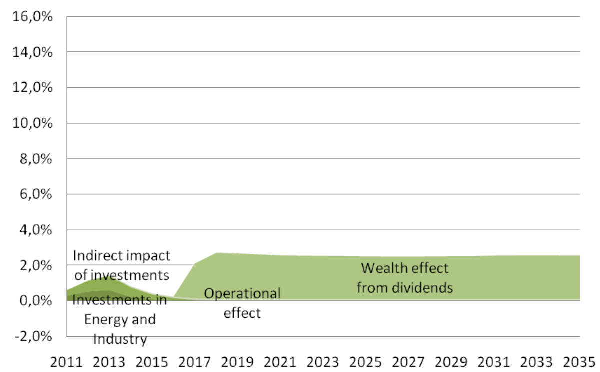
Scenario 3



Scenario 2a

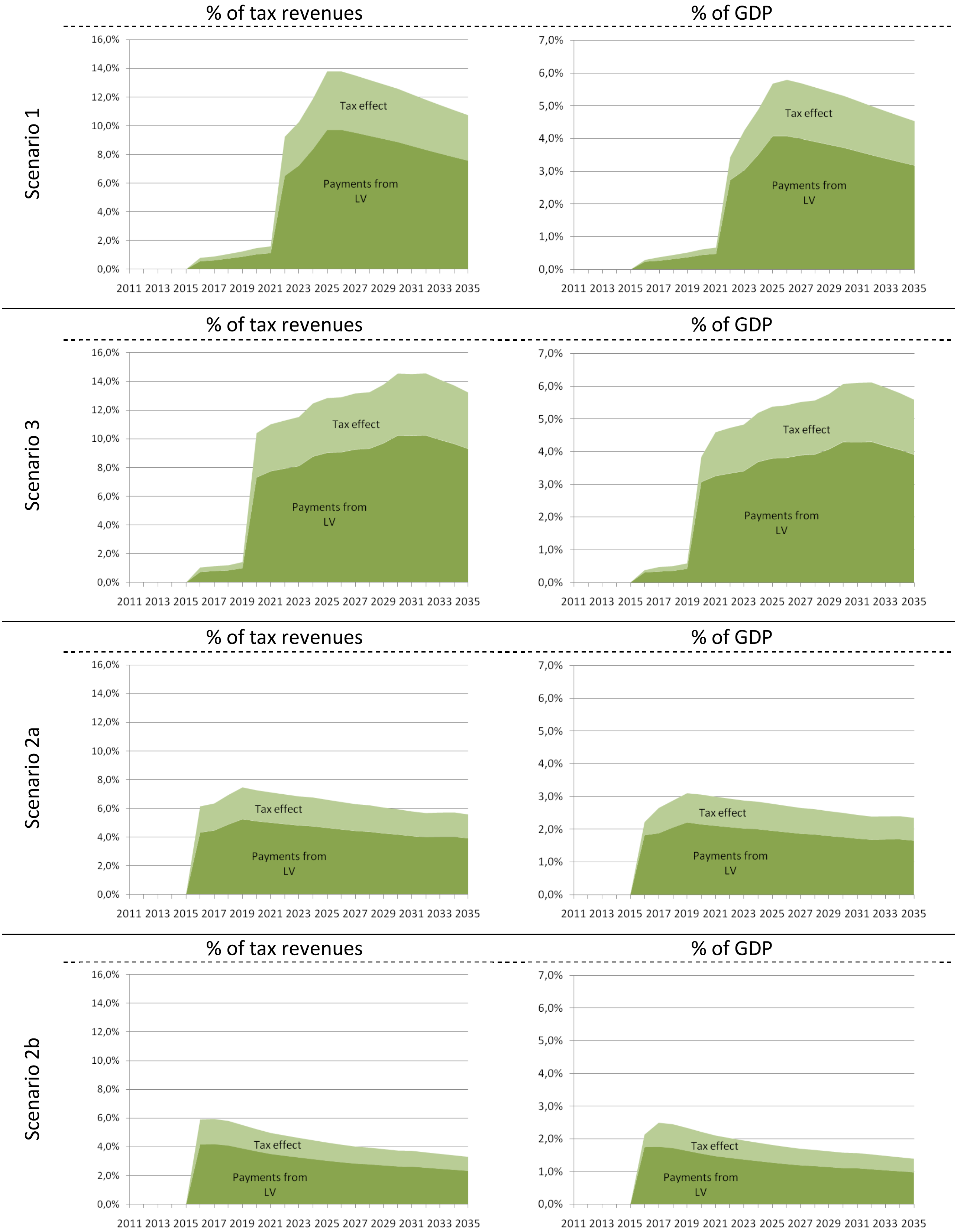


Scenario 2b



Source: GAMMA

Graph 14: Summary of dividend potential in different scenarios



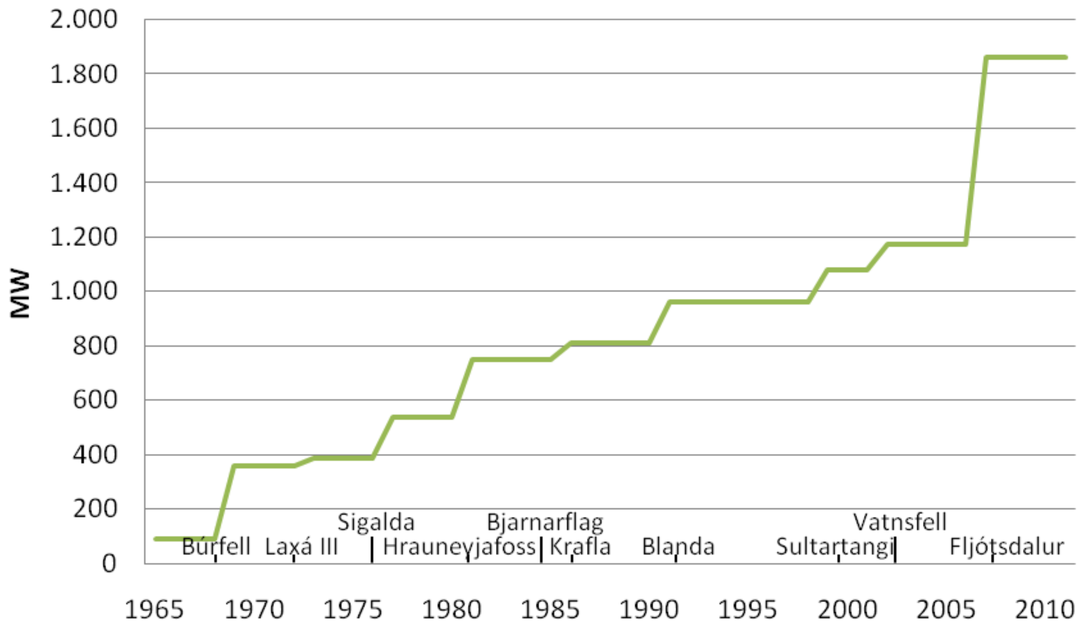
Source: GAMMA

INTRODUCTION

A SHORT HISTORY OF LANDSVIRKJUN

Landsvirkjun was founded in 1965 and is wholly owned by the Icelandic state. The company operates 13 hydropower stations and two geothermal stations, providing 75% of electricity produced in Iceland. The first station, Búrfell in the Thjorsá river, was built by Landsvirkjun in 1965-1969 and generates 180MW, but previously a power station located at Sog was used as a dowry for the new company.[1] As seen in Graph 15, production capacity has steadily grown and the biggest power station, Karahnjuka, was built in 2003-2007, delivering 700MW. The total production capacity of Landsvirkjun is now 1,900MW and yearly production is close to 13TW/h.

Graph 15: Buildup of production capacity



Source: Landsvirkjun

Looking at the current composition of Landsvirkjun's consumers, 6% of the energy goes to households, 14% to industry and 80% to heavy industry. The biggest consumers are Alcan, Alcoa, Nordural and Elkem. From early on a substantial proportion of Landsvirkjun's revenue stream comes from Aluminium smelters. The first smelter started operating in Straumsvik and was owned by Alusuisse, later Rio Tino Alcan, but more smelters have followed in the wake of increased energy production. The current production capacity of aluminium smelters is around 800 tons per year and current investment plans indicate a possible increase of up to 50% over the next few years (provided

[1] Landsvirkjun 1965 – 2005; The company and its surroundings.

that enough energy is available). Apart from running aluminium smelters, large energy buyers operate factories producing ferrosilicon and aluminium foil. Potential new customers are, for example, data centres, as well as chemical industry and energy producers.

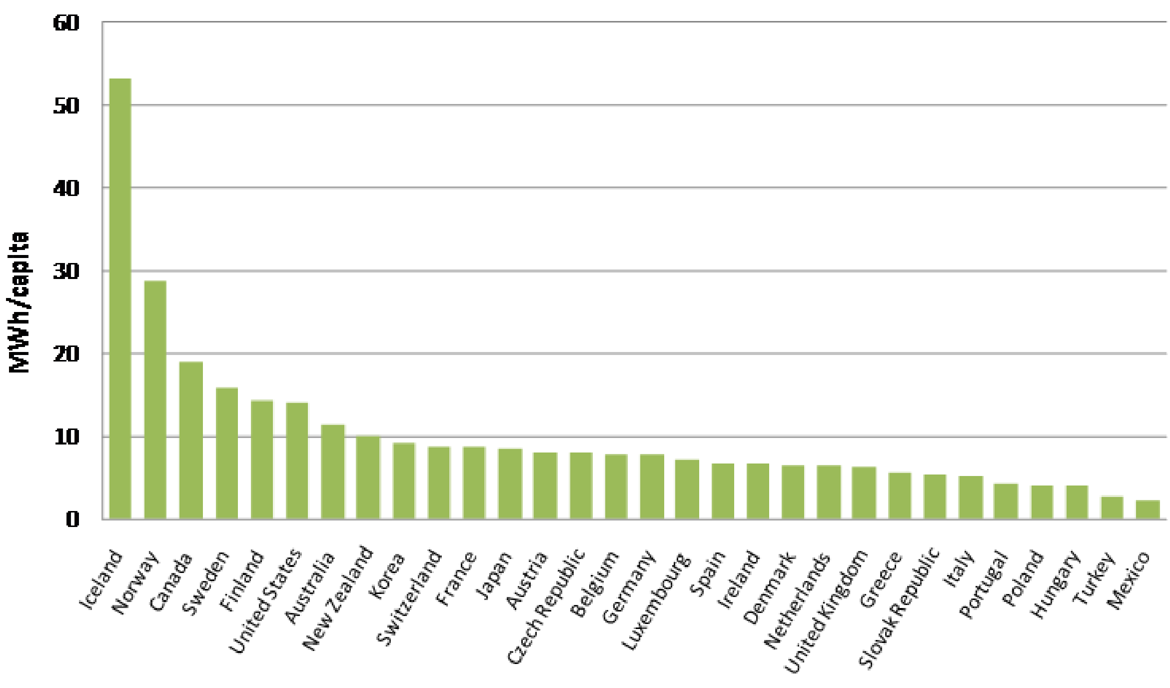
Table 2: Consumption by industry in 2008

Aluminium Industry	75,9%
Ferrosilicon Industry	5,8%
Other Industry	5,1%
Other:	
Utilities	4,3%
Public services	1,8%
Agriculture	1,4%
Fishing	0,2%
Residential consumption	5,5%
	100,0%

Source: National Energy Authority

Even though only 0.1% of the world's energy is produced in Iceland, electricity production is more important to Icelanders than most others due to Iceland's low number of inhabitants (Graph 16).

Graph 16: Electricity production per capita within OECD



Source: IAE Electricity Information 2010, OECD statistics, GAMMA

Even though Landsvirkjun has, over the past two years, strengthened its balance sheet by reducing debt, some new ventures are being pursued. In 2010 work started on the Búdarháls Power Station, which is expected to be completed by the of end of 2013. Work is also in progress regarding possible stations in the Thjorsa river and Landsvirkjun participates in research into possible deep heat drilling in North-East Iceland. The possibility of linking Iceland with the energy market in Europe through a cable is also being considered. Such a cable has now become technically and economically feasible.

ENERGY OPTIONS IN ICELAND

This report is not intended to look specifically at available energy options but to show that these options are available, public information is briefly summarized. According to information from the National Energy Authority, it is estimated that 84 TWh/a can be harnessed from hydro- and geothermal resources. Some 64 TWh/a of this can come from hydropower and 20 TWh/a can be extracted from sustainable geothermal sources.[2] More usage will be possible utilizing smaller opportunities for energy production by, for example, building power stations that are smaller than 1 MW. However, it is important to bear in mind that, due to environmental concerns, all of this energy will not be utilized. Currently 17 TWh/a has been utilized, amounting to approximately 20% of the total energy resource in Iceland.

The Icelandic Government has put forward a Framework for Energy Utilization (FEU) with the aim to evaluate and categorize energy resources in view of their size, profitability and impacts on nature and the environment. The FEU is divided into two sections, which encompasses possible energy projects amounting to 53 TWh/a.

– Within the framework of the first section, which was finalised in 2003, 35 energy resources, amounting to 28 TWh/a, are evaluated. Thereof 17TWh/a stem from geothermal sources and 11 TWh/a derive from hydropower.[3]
– In the second section of the FEU, an additional 24 hydropower options with a combined capacity of around 11 TWh/a[4] are evaluated. Moreover, a further 23 geothermal sources are considered. These geothermal sources are believed to deliver up to 14TWh/a[5]. Adding the two together increases the size of possible energy resources by 25 TWh/a.

The FEU classifies potential energy projects into categorises that range from a to e, according to their impact on the environment. Table 3 shows this classification, which indicates that projects classified under a and b, (minimum impact on nature and environment) amount to a total of 17 TWh/a.[6] Were these projects to be executed, the total energy production in Iceland would amount to around 40% of potential energy production in Iceland.

Table 3: Environmental classification within the first section

Classification	Energy production TWh/a	Aggregated
a	11	11
b	6	17
c	2	19
d	4	23
e	5	28

Source: National Energy Authority

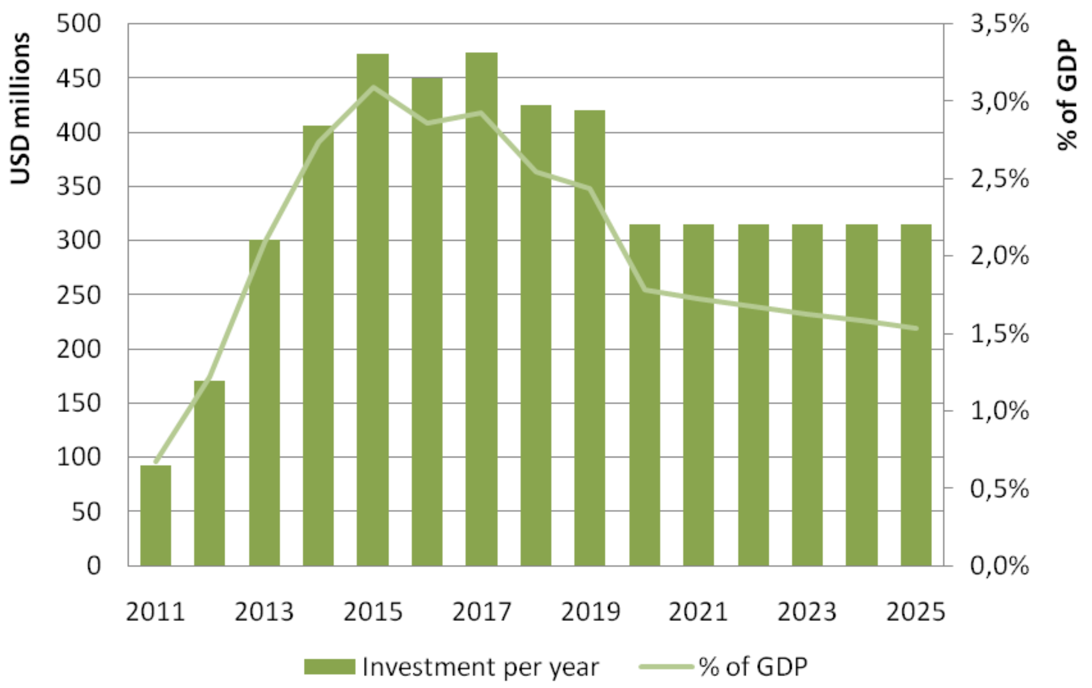
[2] Source: National Energy Authority (www.os.is/vatn/vatnsafl og www.os.is/jardhiti/jardhitinn).
[3] This plan includes Karahnjuka project so here 5 TWh/a has been deducted from possible utilization.
[4] http://www.rammaaaetlun.is/media/nidurstada-faghopa/Vatnsafl-tafla-8mars.pdf
[5] http://www.rammaaaetlun.is/media/nidurstada-faghopa/Jardhiti-tafla-8mars.pdf
[6] http://www.landvernd.is/natturuafl/skyrsla/skyrsla_5_kafli.pdf

LANDSVIRKJUN´S INVESTMENT PLAN

INVESTMENT BY LANDSVIRKJUN (LV)

Graph 17 shows investments according to LV's possible investment schedule for the next 10 years, amounting to $3.0bn and $1.5bn during the 2021-2025 period. Investments will peak in the 2015-2018 period, during which around $400m will be invested every year. The greatest increase in investments will occur in 2011-2012 and then again in 2014-2015. Investments will gradually decrease after 2017 until they level off between 2020 and 2025.

Graph 17: Possible investment schedule by Landsvirkjun

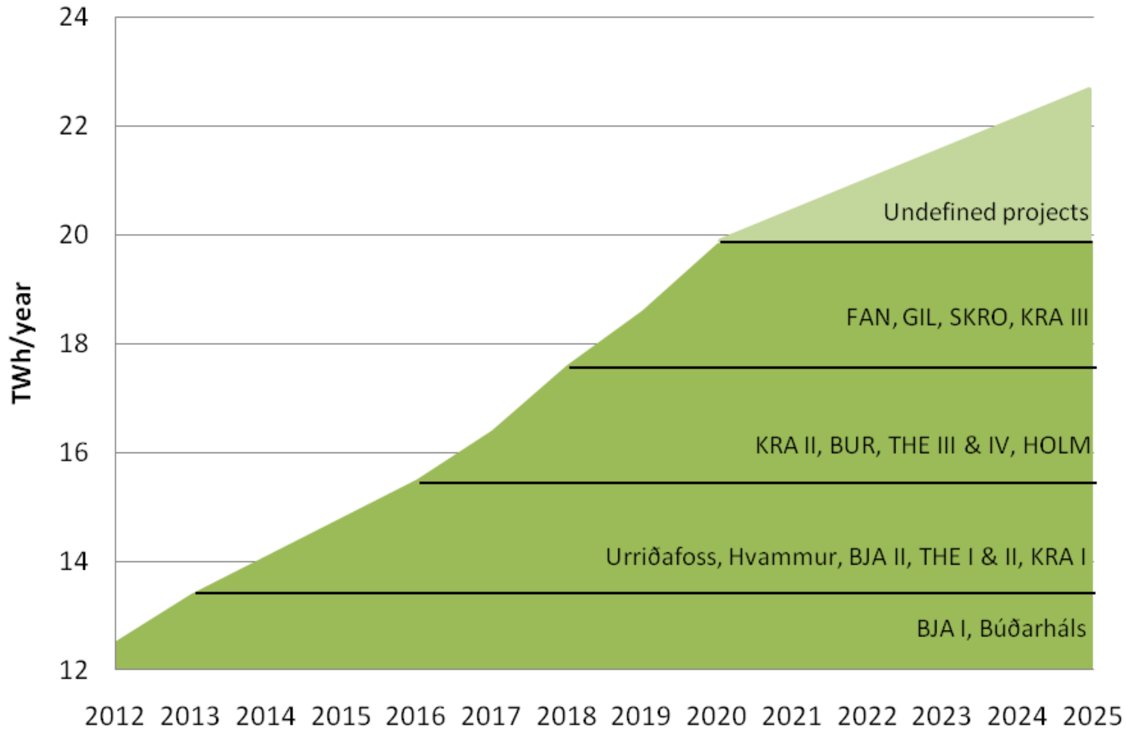


Source: Landsvirkjun

The yearly changes in investments are what matter the most for economic growth with regard to this investment plan, since these changes will have an effect on the currency flow and trade balance. A steep increase in one year will lead to a sudden increase in GDP, while decreases in investment in another year will result in a lower increase in GDP.

The investment plan put forward by LV is based on the assumption that 55% of the energy will be derived from hydropower and 45% from geothermal resources, leading to an increase in total production of 7 TWh/a at the end of the 2011-2021 period. In addition to this, energy production could be increased by 4 TWh/a during the 2021-2025 period, leaving LV with almost twice as much energy production compared with current production, i.e. from 12 TWh/a to 23 TWh/a. A caveat that should be mentioned is that the investment plan is constrained by the Framework for Energy Utilization (FEU) and that required permits need to be issued by the relevant governing bodies.

Graph 18: Buildup of energy production according to investment schedule



Source: Landsvirkjun

TOTAL INVESTMENT IN ENERGY AND INDUSTRY

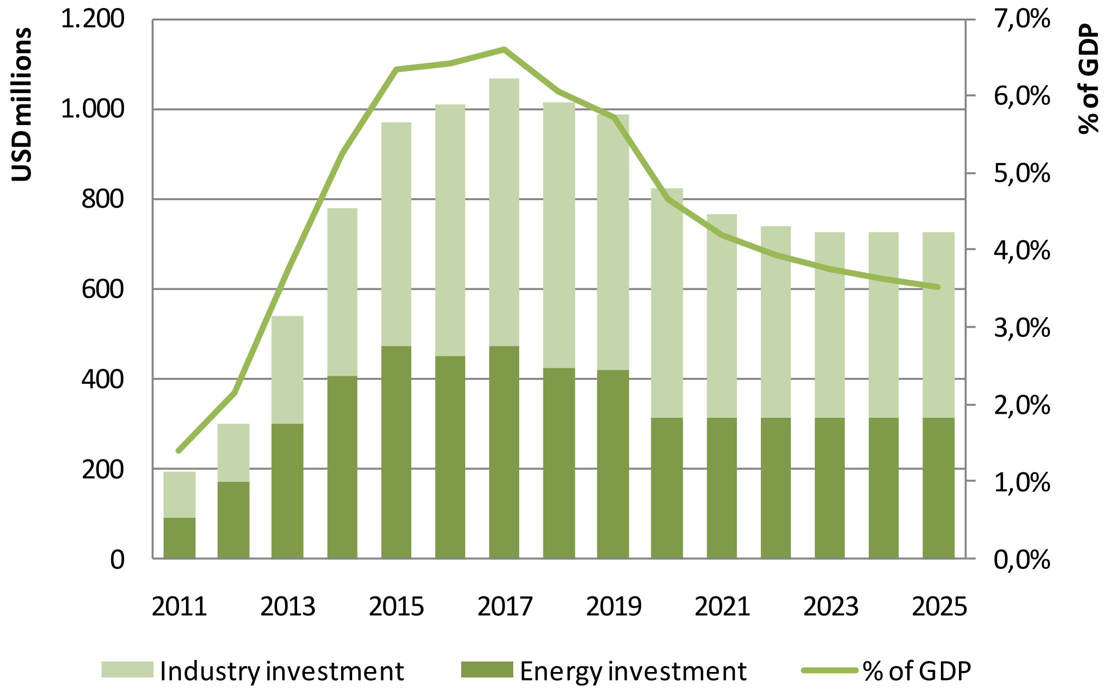
In this report it is assumed that, parallel to investment in energy utilities, other investments in various types of industry that will use this new energy will also take place. Furthermore, it is assumed that these investments would not have occurred, unless this increase in energy supply has become available. New investment in energy production is not deemed feasible unless there are already committed buyers available. Many have declared their interest in buying energy in Iceland. Rising energy prices and regulations concerning green energy have firmly placed Iceland on the map as a profitable and reliable supplier of sustainable energy. In addition to this there is a growing debate about a European Super-Grid, through which the European energy markets will be interlinked with cables, channelling energy from renewable resources in, for example, North Europe and North Africa to mainland Europe.[7]

In order to understand the total effect of the proposed investment plan by LV, it is imperative to include the effect of investments in industries that will use the newly available energy. Historic averages indicate that the ratio between investment in energy and in industry is 1 to 1. However, two factors could affect that ratio. Firstly, up to now, investment has mainly been in aluminium smelters and secondly, the big energy projects have mostly been hydro based. Geothermal energy is estimated to constitute 45% of new energy projects, but since such projects are less expensive than hydropower, the ratio between investment in industry versus energy will be higher than 1. Also, future investment in industry might not be in aluminium smelters, but rather in more developed industry such as, for example, data centres. In view of this, it is assumed that the ratio between investment in industry and energy is 1.3, i.e. investment in energy will lead to 1.3 times more investment in industry, with a time lag. Thus, until the year 2020, LV's $3.0bn investment in energy will lead to a $3.9bn investment in industry.

It is estimated that accumulated investment in energy and parallel investment in industry will amount to $6.9bn in 2020. This combined investment will peak in 2015-2029, annually injecting between $800 to $900 million into the Icelandic economy, which is equivalent to around 6% of GDP. It is clear that the proposed investment will make up such a significant proportion of the GDP that it will positively affect economic growth in a marked way.

[7] EU news & policy debate, „EU countries launch North Sea electricity grid". 14. desember 2010, www.euractiv.com/en/energy/eu-countries-launch-north-sea-electricity-grid-news-500324

Graph 19: Total investment by Landsvirkjun and heavy industry



Source: Landsvirkjun, GAMMA

ECONOMICAL IMPACT OF INVESTMENTS IN ENERGY AND INDUSTRY

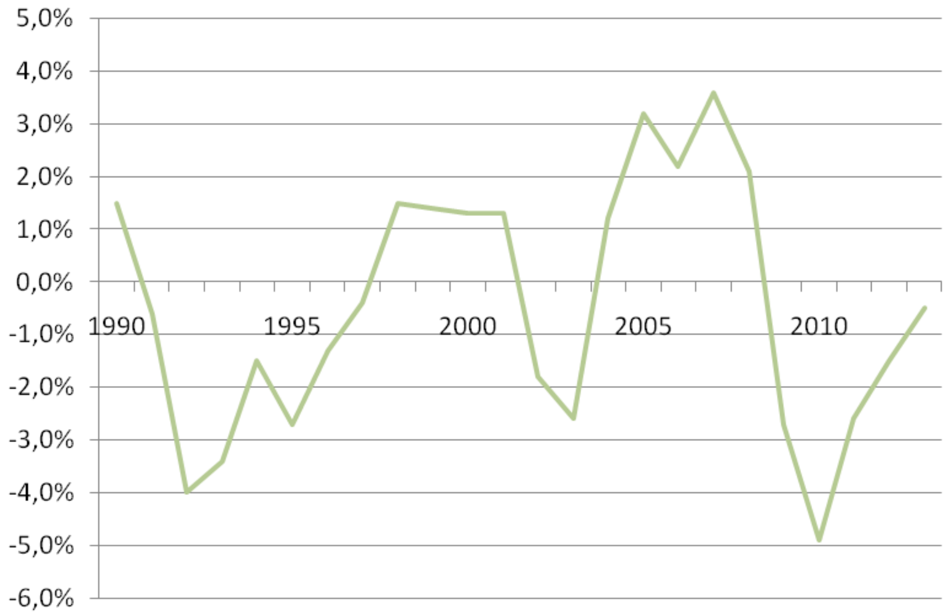
POTENTIAL ECONOMIC GROWTH

The output gap is the most significant factor when the realized growth impact is assessed of the economic stimulus that new investment projects bring with them. This is especially so when the economy is relatively small and projects relatively big as is the case with power projects in Iceland. If the proposed investment takes place during a period of full employment and the economy is operating at full capacity or even in a boom phase, then the new investment will only draw workers from existing industries, without increasing the overall number of jobs in the economy. In this scenario, the growth from new investment is matched by the crowd-out effect negatively affecting economic growth in the long run. The crowd-out effect is manifested in an over-heated labour market, accompanied by pay rises in excess of gains in productivity, leading to the familiar cycle of inflation, higher interest rates and appreciating exchange rates. Since the projects are funded from abroad, either with direct lending on part of LV or FDI inflows from foreign companies, the effects on the currency are likely to be strong, undermine the competitiveness of Iceland's export industry. Thus, in the case of an economy working at full capacity, investment in one sector will lead to decreased growth in other sectors and overall economic growth will inevitably be less. If, on the other hand, the economy is in a phase of decline, unemployment is above natural levels and the usage of other economic resources is below optimal, then new investment will directly fuel economic growth, without the crowd-out effect. This positive impact on economic growth will be further boosted by the multiplier effect stemming from unemployed people becoming economically active again. When estimating the potential economic effects of an investment programme, it is therefore crucial that policy makers measure the state of the business cycle correctly.

The Icelandic economy has contracted by 10% during the 2009 to 2010 period. It is therefore obvious that there is considerable scope for economic expansion with a risk of overheating. . It is important to bear in mind here, though, that there was a considerable boom in the Icelandic economy from 2006 to 2008, resulting in an inevitable contraction. It is also worth pointing out that boom and bust cycles always lead to a deterioration of production capacity during the downturn. During the upturn, certain industries, such as the construction industry and financial services, grow fast, adding manpower and consuming financial resources. When this growth stops and reverses into decline, layoffs and bankruptcies inflict heavy costs on the economy. Taking these observations into account, it is not an easy task to accurately estimate the excess capacity of the economy.

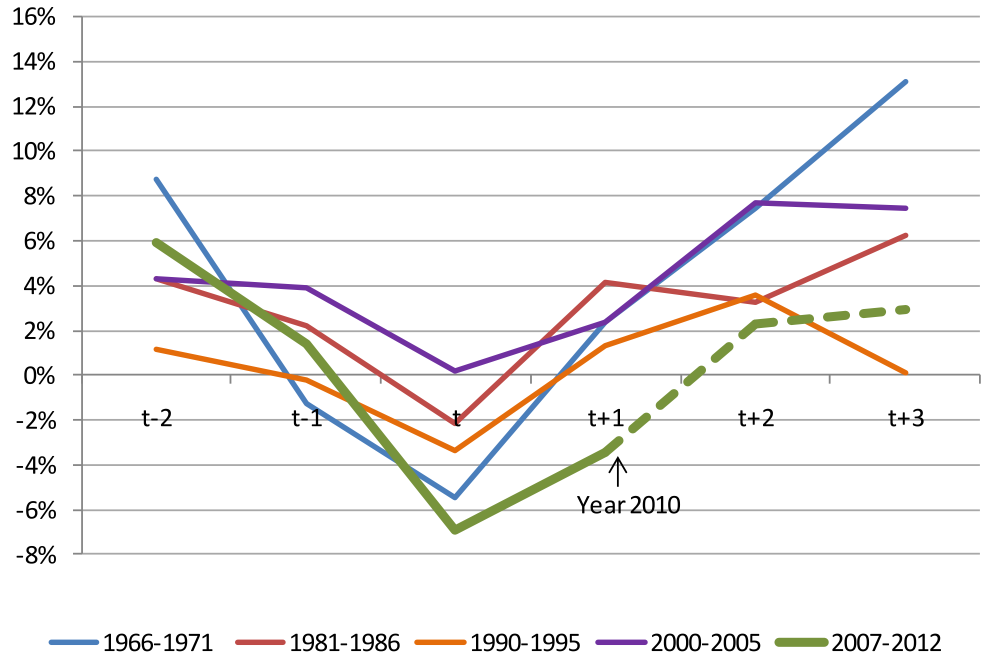
In its Monetary Bulletin of April 2011, the Central Bank of Iceland (CBI) estimates that the output gap amounts to 5%. It also predicts that the slack will diminish over the next few years, as shown in Graph 20. According to this estimate, the Central Bank believes that the economy has suffered some systemic damage in the wake of the collapse of the banks in 2008 with a considerable loss of production capacity. The Central Bank seems to believe that the production capacity will not increase significantly until 2013, since the production slack will be reduced by a relatively low economic growth. The Central Bank predicts that Iceland's GDP will grow by 2.3% this year, 2.9% next year and 2.7% in 2013. This growth trajectory is rather flat in historic terms and will only suffice to close the output gap if the production capability does not grow at all during the forecast horizon.

Graph 20: Estimation by the Icelandic Central Bank of the output gap



Source: Monetary Bulletin of April 2011

Graph 21: Comparison of recessions – change in GDP



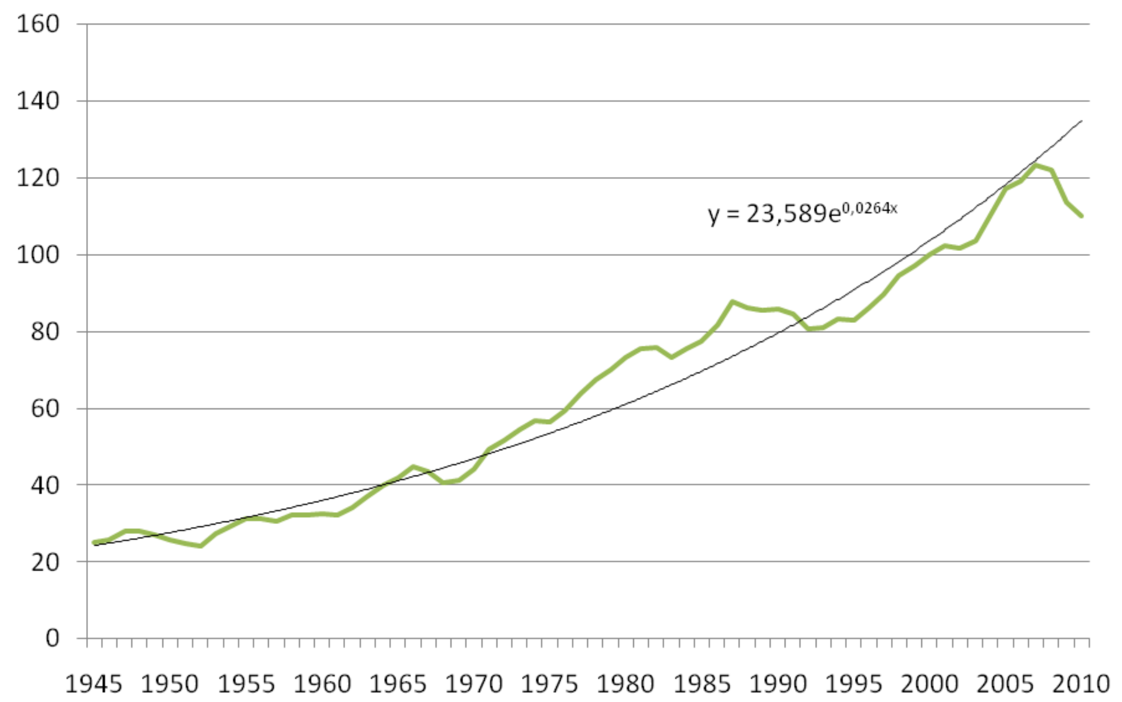
Source: National Statistics and GAMMA

This rather conservative estimate of the size of the output gap is bound to raise some questions, especially when looking back to previous periods of economic contraction in Iceland and how the Central Bank estimated them. For example, the output gap in 1992 was estimated by the Central Bank to have amounted to 4%, only 1% less than in 2010, even though the contraction in GDP was considerably higher in 2010 than in 1992 and unemployment lower in 1992 than in 2010. This difference can clearly be seen in Graph 21.

In order to sustain the argument that there is only a 1% difference between the output gap in 1992 and 2010 respectively, one has to explain why the 10% drop in GDP in 2010 does not comparatively yield as much slack as the 4% drop in GDP did in 1992. Furthermore, it is interesting that after 1995, 4% to 6% economic growth was needed for 3 to 4 years in order to close the output gap. Now the Central Bank expects the gap to be eliminated with only 2 to 3% growth in GDP. In order to accept this prediction, one has to assume that considerable long-term systemic damage has been inflicted on the economy. The Central Bank has not explicitly explained its rationale for this assumption.

But what is the growth potential of the Icelandic economy in the near future? In order to answer this question, it is appropriate to investigate the long-term growth path of the economy. All economies have a certain "heartbeat" regarding their economic growth, which in the long-term remains stable. As seen in Graph 22 on annual productivity, i.e. the yearly growth in GDP per capita, has been on average 2.6%. According to Statistics Iceland, the labour force has grown by 1.3% per year, thus generating a total economic growth of close to 4% per year. The chart also clearly indicates that, even though considerable fluctuations are to be expected, the contraction in the last two years is somewhat unique in the economic history of Iceland.

Graph 22: Real GDP per capita from 1945 to 2010 and trend



Source: National Statistics

For decades the fishery industry was the main engine of economic growth in Iceland. In 1989 it became clear that the cod stock had been severely depleted and, in the wake of drastic cuts in allowable catch, the economy suffered badly. The period from 1990 to 1995 was marked by economic stagnation and rising unemployment, but a turnaround was observed from 1995 onwards and the economy got back on track. It is obvious that a sizeable part of the production capacity was lost during the 1989-1995 period and the composition of the economic base was altered considerable. Hence, the economic growth after 1995 was led by new industries while many older ones became obsolete or were significantly diminished. Even though growth rebounded after the stagnation period finally ended in 1995, it can nevertheless be estimated that the output gap between 1989 and 1995 amounted to approx. 10-15%, and 5 to 6% of this was recovered through economic growth in excess of long-term growth, leaving a permanent output loss of 5 to 10%.

The economic situation today is a lot direr now than it was in 1994. Back then the economy had suffered a serious contraction but a modest growth was expected. Now there are few signs that indicate any sizeable economic growth on the horizon. In fact, all of the entities that publish economic growth forecasts for Iceland expect GDP growth to be less than 4% over the next 2 to 3 years, even though these low growth forecasts include the expected positive effects of some investment in the energy sector. GAMMA makes the assumption that a considerable output gap was formed in the wake of a misallocation of finance and labour during the credit boom years and that the economy was operating beyond its real capacity. Considering these caveats and drawing on the experience from the 1989 to 1994 period, GAMMA expects to see an output gap of somewhere around 7-8% in 2010. This output gap will manifest itself in permanent loss of production capabilities if economic growth does not pick up soon.

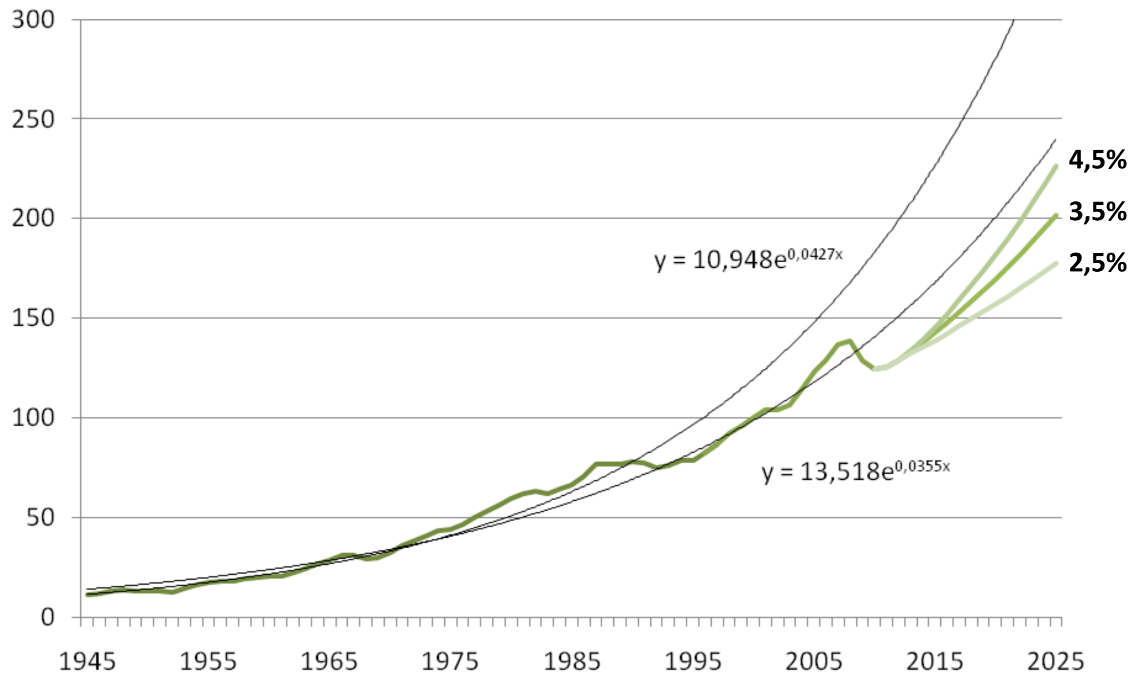
It is important to recognize that in 1984 the economy was hit by a shock in the export industry, i.e. the real economy was badly shaken. The shock currently being dealt with stems from the finance sector and from there it spread into the real economy. It is an established fact that a considerable proportion of investment in Iceland was aimed at the construction industry and it is hard to argue that this investment will facilitate economic growth in coming years. Also, it is becoming clear that it is taking longer than expected for the banks to reorganize corporate debt, consequently hampering investment in coming years. But, on the other hand, it is also clear that the economic loss due to the devaluation of misplaced capital will hit foreign bond holders and investors, while the actual machinery and production facilities remain at large. It is therefore not obvious that the damage to the economic system now should be much greater than was the case during the nineties.

If we assume that the labour force will grow annually by 1%[8], it is clear that under normal conditions the GDP will be increased by 3%. In order to reduce the output gap, economic growth needs to be in excess of 2%. It is therefore likely that the output gap will remain for the next 4 to 6 years and that unemployment will exceed 2-3%[9], if some firm measures are not taken to bolster economic growth.

[8] As predicted by the National Statistics.
[9] Estimated natural unemployment i.e. level of employment that does not cause inflation: Þórarinn G. Pétursson. Verð- og launamyndun í litlu opnu hagkerfi. Fjármálatíðindi, 49. árgangur 2002.

This report endeavours to quantify the economic consequences of Landsvirkjun's possible investment programme. The base case that is being put forward here is therefore without any investment in the energy sector and consequently there are no effects from industries that would emerge as buyers of energy coming from new energy investment. Therefore some differences are to be expected in the base case put forward by GAMMA and other predictions made by, for example, the Central Bank or other economic analysts that include some energy investment in their base cases to varying degrees. In this analysis we propose three different scenarios regarding the economic growth trend for the next 10 to 15 years, i.e. 4.5%, 3.5% and 2.5% growth trends from the year 2013, as shown in Graph 23.

Graph 23: Trend growth in 1945 to 1994 and 1995 to 2010 and scenarios for next 15 years



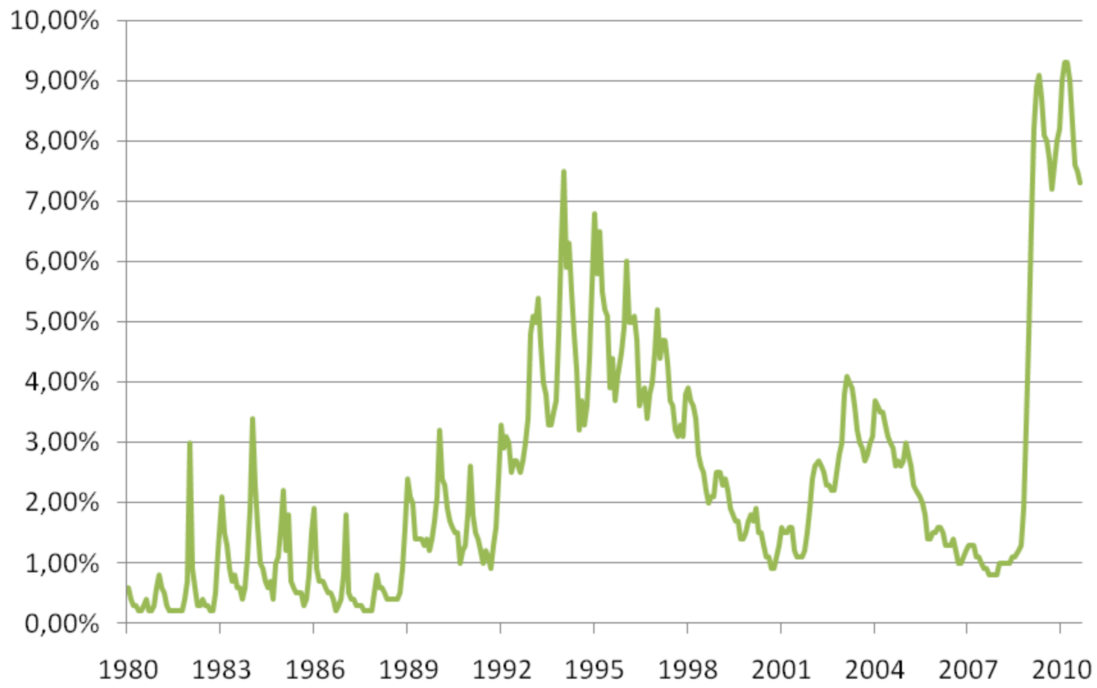
Source: National Statistics, GAMMA

In order to clarify the concept of output gap and economic growth, the following metaphor can be useful. Economic growth is in a way like picking fruit from trees that have been planted over a long period of time. Every year new trees are planted, adding more fruit to the total harvest every year. A prolonged halt in planting activity leads to a smaller plantation and, in the long term, a smaller crop than would have been possible had the planting activity been continuous. Therefore, the lost production capacity from the 1989-1994 period, was caused by wasted time that was not used to plant new trees, to use the above metaphor. During this 5 year period, many working hours were lost and savings were not used for investment, leading to a permanent loss in Iceland's production capabilities.

EFFECTS ON THE LABOUR MARKET

The output gap can, for example, be observed in the Labour Market Survey conducted by the national statistics office. The survey finds that around 14 thousand people are out of work. On top of this there is the number of people who have left the work force, by going back to school, emigrating, reducing their work hours etc. National Statistics believe that the total workforce is somewhere around 180 thousand people, a number that has shrunk by 10 – 15 thousand since 2007. Natural unemployment is estimated to be between 2-3% and unemployment should therefore be around 4,000 people but this figure is likely to rise through the prolonged economic slump.[10]

Graph 24: Unemployment in Iceland



Source: National Statistics

[10] Analyzing the magnitude of unemployment, the number of people on the unemployment register is included, in addition to the number of people who will take jobs as soon as they are offered them and the 1% increase in the labour force.

CONSEQUENCES OF THE INVESTMENT PLAN

In this section we look at the economic consequences of Landsvirkjun's investment programme, mainly on growth and job creation. The study takes both the direct and indirect consequences of the investment into account, i.e. the multiplier effect. It is important to note that this estimate only encompasses the effect of the investment programme, and that effects from future accumulated profits derived from the investment in energy and industry are not included. The economic effect calculated here is therefore temporary, but its effects are felt throughout the investment period.

EFFECT ON ECONOMIC GROWTH AND JOBS

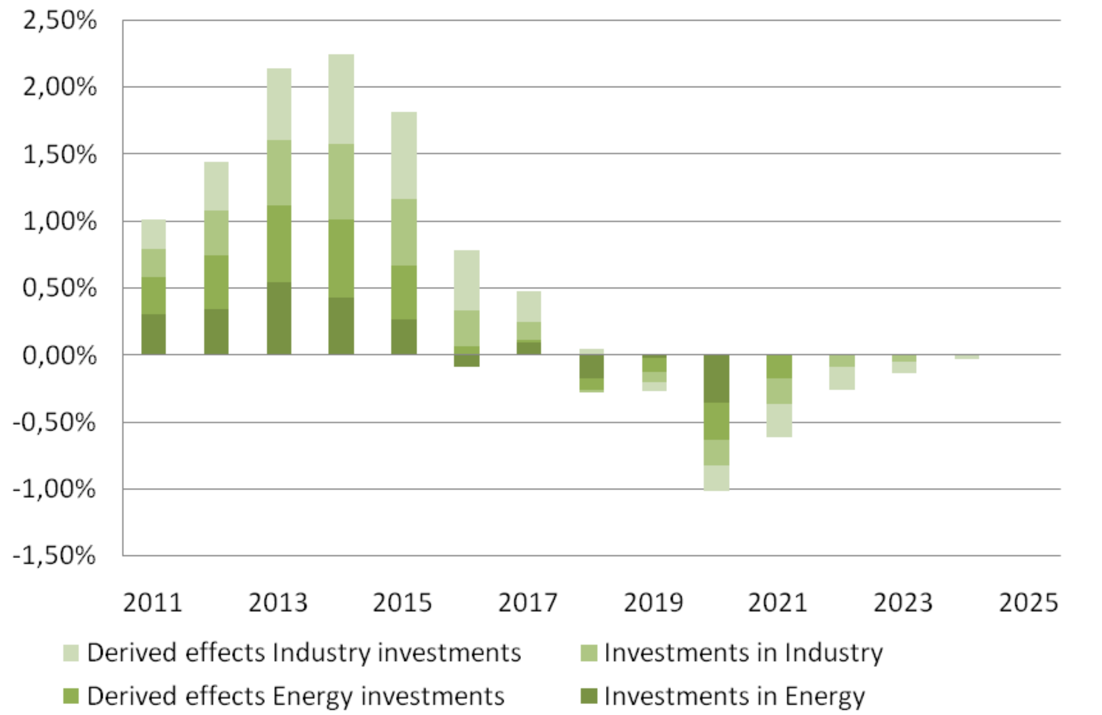
The following analysis is founded on the investment programme put forward by Landsvirkjun. During the construction period, i.e. until 2025, it is assumed that there will be a relatively constant investment level and that, at the end of the period, there will be some construction projects in progress. If we assume that there exists an output gap, one can say that the direct economic effects stemming from investment and the multiplier effect derived from them, will be manifested in economic growth, without any distortion effects due to overheating in the economy. The growth effect linked to the proposed investment will only last during the construction period, but when finished, a significant increase will have occurred in the national capital, productive capital that will yield dividends and create income for years to come.

When assessing the economic effect of the investment programme, two factors are at the forefront. On one hand, there is the question of domestic factor use of the contractors building power plants and factories and, on the other hand, the question of the multiplier effects derived from the investments. The competitive position of domestic contractors is to a large extent determined by the exchange rate which is difficult to project far ahead into the future. If the economy is in an expansion mode, one can expect that a considerable proportion of the required work force will be imported, as was the case when the Kárahnjúka project and the aluminium plant in Reydarfjordur were built back in 2004-2008. When the economy is contracting and the exchange rate is weak, the domestic workforce and contractors will become more competitive. In this analysis it is assumed that domestic resources will amount to 40 -60% in energy projects and that in industry projects the percentage will be 50%.[11] This proportion of the planned investment will therefore increase the GDP directly during the construction phase.

Here it is assumed that every Icelandic krona spent on domestic resources will generate just over one krona in derived economic effects. More specifically, the investment multiplier is expected to be 2.25 for domestic resources, but as stated above, the proportion of domestic resources versus imported will vary, according to the nature of specific projects.[12]

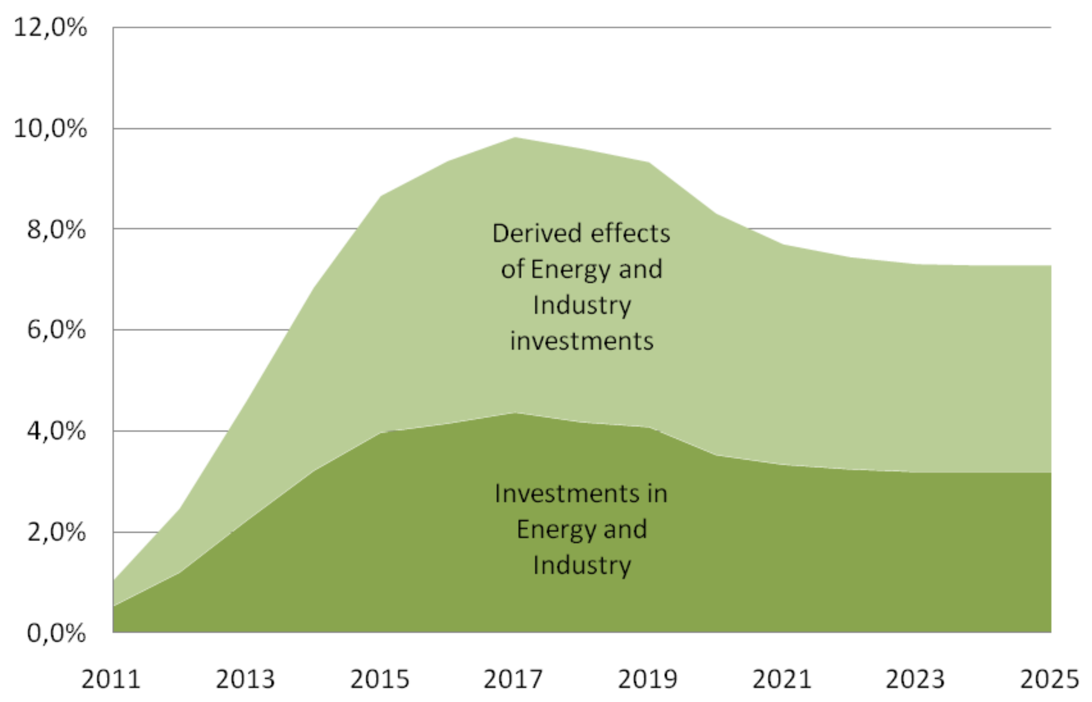
[11] Source: Landsvirkjun
[12] Institute of Economic Studies: Economic consequences of the aluminium plant in Reydarfjodur, Dec 2005

Graph 25: Effect on economic growth from Landsvirkjun investment plan



Source: GAMMA

Graph 26: Accumulated effect on economic growth

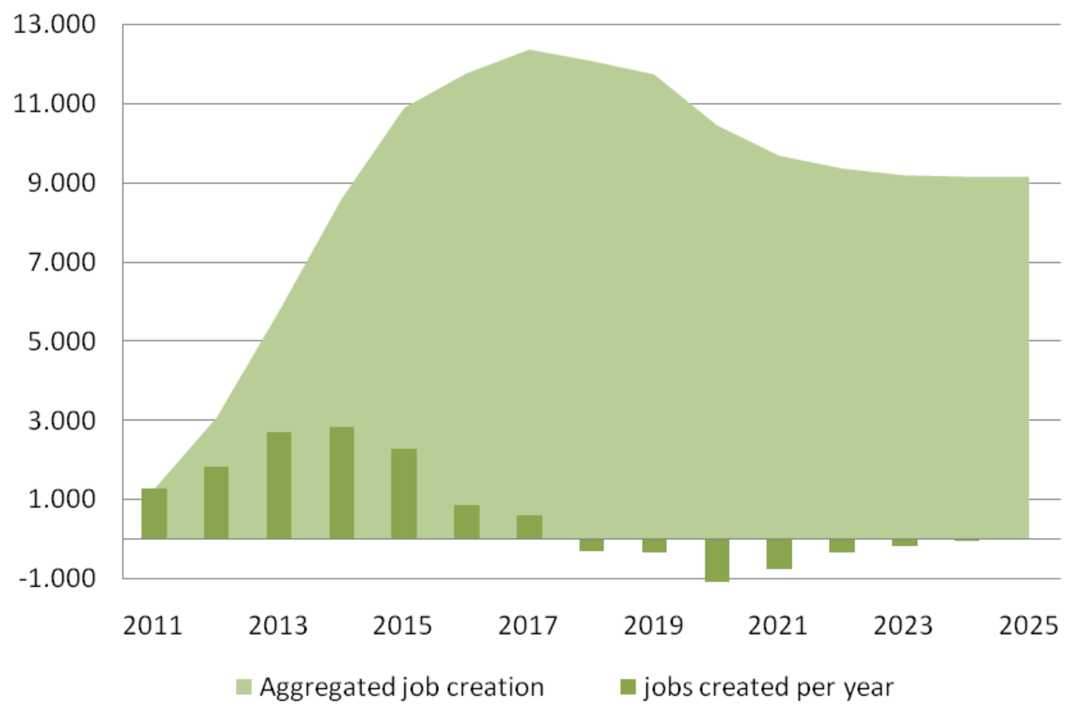


Source: GAMMA

In light of the above, Graph 25 shows how investment in energy and industry, augmented by the multiplier effect, will increase economic growth by 1.2% per year until 2017. Thereafter investment will be reduced and a negative impact on economic growth will emerge. The accumulated effect on economic growth will peak in 2017, amounting to 8.4%, but at the end of the investment period the accumulated growth will be around 6.6% as shown on Graph 26.

During the construction period, the number of jobs created by investment projects in both energy and industry will be around 1,000 to 2,000 per year. At its peak, the investment programme will, both directly and indirectly, generate more than 10,000 jobs. During later phases of the programme, investment will decline and the number of jobs will be close to 8,000. This estimate is based on Okun's law, linking job creation with economic growth. This approach is based on looking at job creation in the economy as a whole, an approach preferable to an accounting approach, founded on counting jobs related directly or indirectly to certain projects. Okun's law is also appropriate here, since it handles the fact that there is a substantial output gap in the Icelandic economy well, which minimises the crowd-out effect of the proposed investments.

Graph 27: Job creation by investment programme



Source: GAMMA

PREDICTIONS OF THE OUTPUT GAP

From what we have previously established, LV's investment plan will have a considerable effect on economic growth and job creation, but how great the economic growth will be is dependent on the size of the output gap and how quickly that gap will be closed. When the output gap is no longer there, the crowd-out effect will kick in. Since we want to estimate the economic consequences of investment in energy plants and related investment in industry, a growth pattern is established without any investment in energy. Therefore, the forecasts put forward here differ from those issued by the Central Bank or other analysts, since these predictions include investments in the energy sector.

Excluding investment in energy production, it is assumed that in 2011 economic growth will be 1% and 2% in 2012, based on published forecasts.[13] From this we can deduce that it will take a long time to redeploy excess production capabilities and there is even a chance that the output gap will widen, due to weak economic growth. Looking beyond 2012, economic growth is expected to stabilize at 3%. It should be borne in mind that all economic forecasts for such long terms are virtually impossible, and most people are hard pressed to predict what will happen within the next two years. In the case of long-term forecasting for economic growth, one must rely on historic averages, usually calculated by using numbers for growth in the past few years.

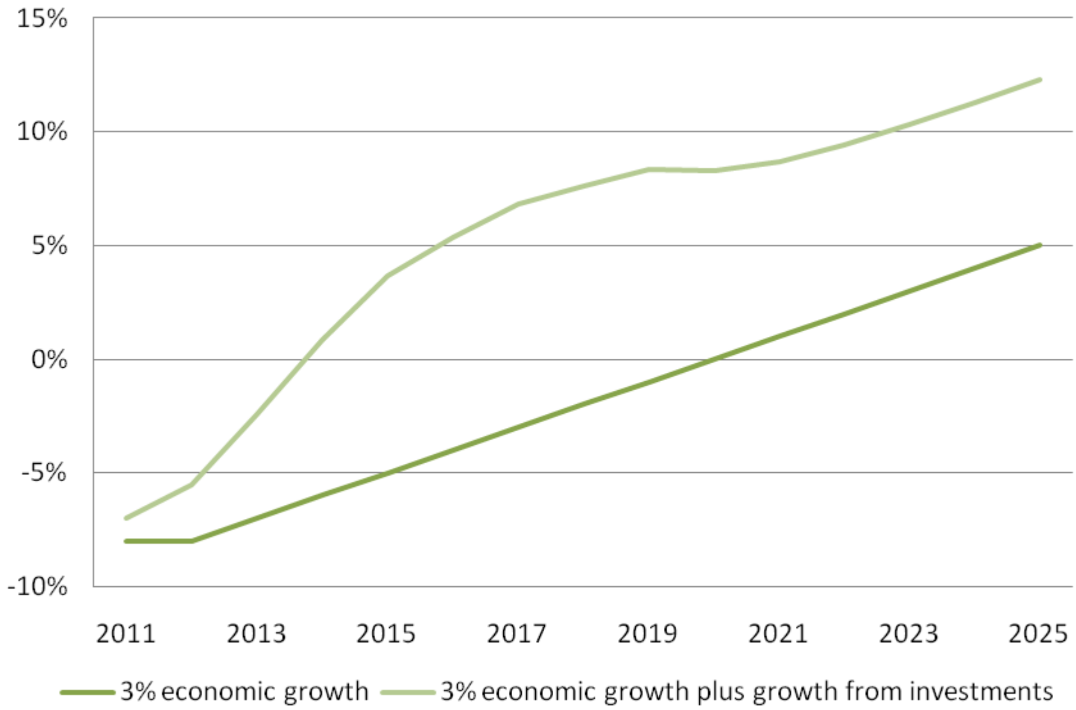
If it is assumed that the output gap is somewhere around 7% (for more detailed discussion see chapter 4) and that economic growth will be 3% in 2013, we can estimate how LV's investment plan will affect the output gap. The assumptions are as follows: This year and the next, the output gap will increase somewhat or remain unchanged, if no investment in energy production and related investment in industry takes place. But from 2013 onwards, economic growth will be around 3%, as the economy approaches equilibrium. To simplify, it is taken as a given that, in order to start reducing the output gap, economic growth in excess of 2% is needed. This means that 3% growth will reduce the gap by 1% per year.

Graph 28 shows how it would take until 2020 to claw back the output slack, but by adding LV's investment plan to the equation, that time interval is halved, down to 4 to 5 years. An interval many feel to be too long. Forecasts and plans for the future always revolve around assumptions and there is always room for debate about them. A valid question would, for example, be to ask if average economic growth remains the same after the bank collapse as it was before. It is not self evident that young Icelanders will decide to work in Iceland as was previously the case. Rather they might in increasing numbers seek their fortunes abroad, now that they have full access to the European labour market. Furthermore, it is also not given that Iceland will be able to attract the same level of investment, since Iceland's access to international financial markets may have suffered long-term damage. These are but two examples of how difficult it is to properly substantiate any forecast. It should also be kept in mind that there are two very different ways in which idle production capacity

[13] All economic forecast have some energy related investements included e.g. the Central Bank has a project in Helguvik included in their forecast.

can disappear, resources are either re-deployed as a result of strong economic growth or both workers and capital flee the country and are put to use abroad. The flip side here is that strong economic growth in Iceland will attract workers and capital and in that manner expand the production base.

Graph 28: Output gap, assuming 3% future long-term growth with and without power sector investments.



Source: GAMMA

The crux of the matter is that an output gap that is left open for too long will quickly turn into a permanent loss of production capability. Unused resources will not by idle forever, if resources are not brought back into play through increased economic growth, they will either migrate or become damaged. In the case of labour, people will move to seek better opportunities or simply accept the state of unemployment. This is a very real and persistent problem in many European countries today.

SENSITIVITY ANALYSIS ON ASSUMPTIONS ABOUT LONG TERM ECONOMIC GROWTH

It cannot be assumed with absolute certainty that the Icelandic economy will move back towards a 3% growth trend i.e. growth might either be slower or faster. Three possible scenarios are therefore examined, each with a different growth trend, excluding any investment in energy production after 2012.

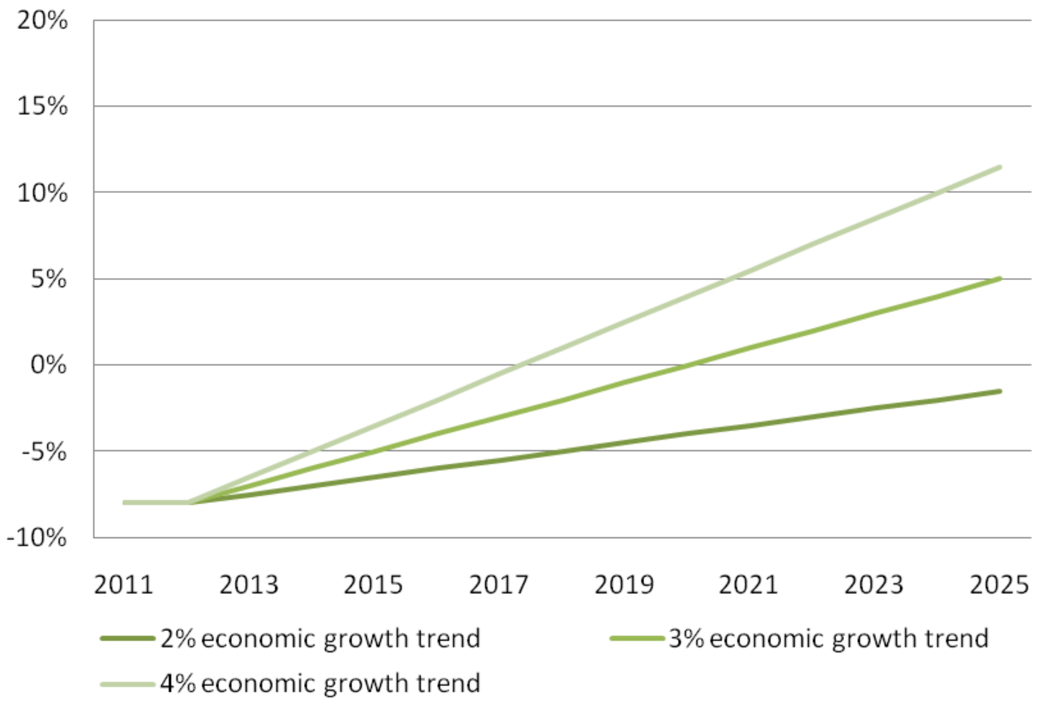
a) 2% economic growth until 2025.
b) 3% economic growth until 2025.
c) 4% economic growth until 2025.

Whether these assumptions are optimistic or pessimistic is open to debate. But these scenarios provide a framework that can be used to better understand the economic effects of LV's investment plan. The purpose is to isolate effects from LV's investment plan on the economy. Below, a sensitivity analysis is presented, based on different assumptions about long-term economic growth. These scenarios should not be treated as forecasts for economic growth. It would, for example, be overly optimistic to assume that the economy will grow yearly by 4% for such a long time and it would be equally pessimistic to only hope for 2% growth. Again, these scenarios create a framework to measure when the output gap can been closed and there is a danger of overheating because of investment in the energy and heavy industry sectors.

These three different growth paths affect the output gap in different ways. In recession and 2% growth, the output gap will be diminished by 0.5% per year, due to, among other things, the migration of workers and low salaries. In the 3% scenario, the gap is expected to be reduced by 1% per year, as mentioned above. But in a boom and 4% economic growth, the gap is expected to be reduced by 1.5% per year, since such a strong growth will attract workers to Iceland and salaries will rise. Graph 29 shows these three different paths. As can been seen, different growth factors lead to drastically different results when projected decades into the future. If the economy grows by 4% the gap will be closed in 2017 but remain unchanged if the economy only grows by 2% per year.

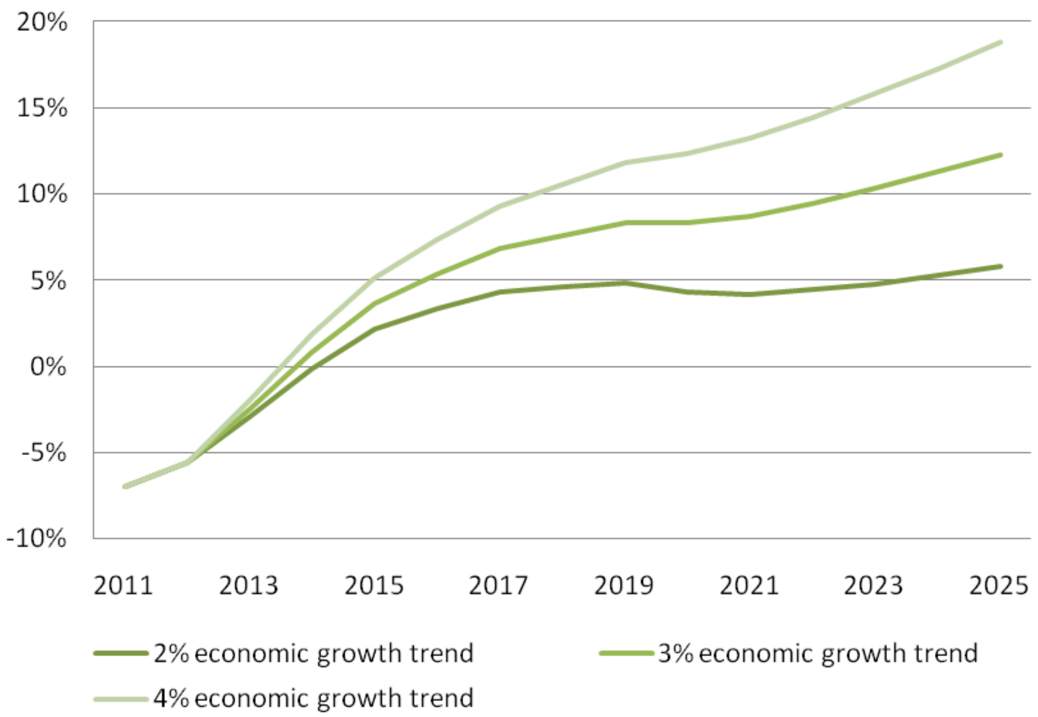
In Graph 30 we add the economic effects of LV's investment plan to long-term growth. This is a very simplified method of calculation, but it is sufficient to show that energy related investments will cause limited or no crowd-out effect in the next 5 to 8 years, even though optimistic assumptions are used for economic growth. Furthermore, energy related investments will considerably shorten the time needed for the economy to return back to full production capacity. What our model might not capture well enough is that the growth impetus created by LV's plan comes at a crucial moment for the Icelandic economy, making it more likely that the country will be able to recover its production resources, which would otherwise be permanently lost.

Graph 29: The closing of the output gap according to three long-term growth scenarios



Source: GAMMA

Graph 30: The closing of the output gap according to three long-term growth scenarios with the effects from the power sector investmensts



Source GAMMA

Currently, Iceland is going through the sharpest economic downturn of its modern history, and unemployment is higher than it has been for decades. However, it should be emphasized that LV’s goal is not to create jobs or to become an instrument used to dampen economic fluctuations. LV’s objective is to utilise the energy resources in Iceland to ensure that maximum value can be obtained for its owner, the Icelandic state. The economic stimulus offered by the investment projects will nevertheless be a beneficial side effect. The following chapters will discuss the long-term effects LV and its operations will have on economic growth.

INDUSTRY, ENERGY AND ECONOMIC EFFECT

Energy production and energy-intensive industry are enormously capital intensive, requiring very large capital outlays during the investment period but the operation itself is relatively light in labour requirement when it is up and running. .

Given the assumption that the economy is in equilibrium, the long-term economic consequences of new activity will appear as an increase in productivity. To put it differently, the new companies are expected to be able to extract more value out of existing resources than was previously possible by older companies. Looking at how labour usage affects economic growth, the difference between salaries paid by new companies versus old companies measures the impact. Thus new industries linked to increased energy production will boost GDP growth as a result of the higher salaries offered by these new companies, compared to what other companies pay workers with comparable qualifications, skills and experience.[14] Since energy is by far the most important resource used, energy prices play a crucial role in generating economic growth. One could mention a multitude of beneficial effects that derive from energy intensive industry, but all that of these are dwarfed by the effects caused by energy prices on the GDP.

There are also effects on the balance of payments to be considered, both on the current and capital accounts. A distorted picture will emerge if we only look at the export value created by energy intensive industry, since a considerable part of its resources have to be imported. The total effect on the current account is positive, since there will be added value created by the operations, but since in most cases, the owners of the factories are foreign, dividends paid to them result in an outflow of capital, thus generating negative effects on the capital account. The effects on the balance of payments are, therefore, not as great as one might have initially expected.

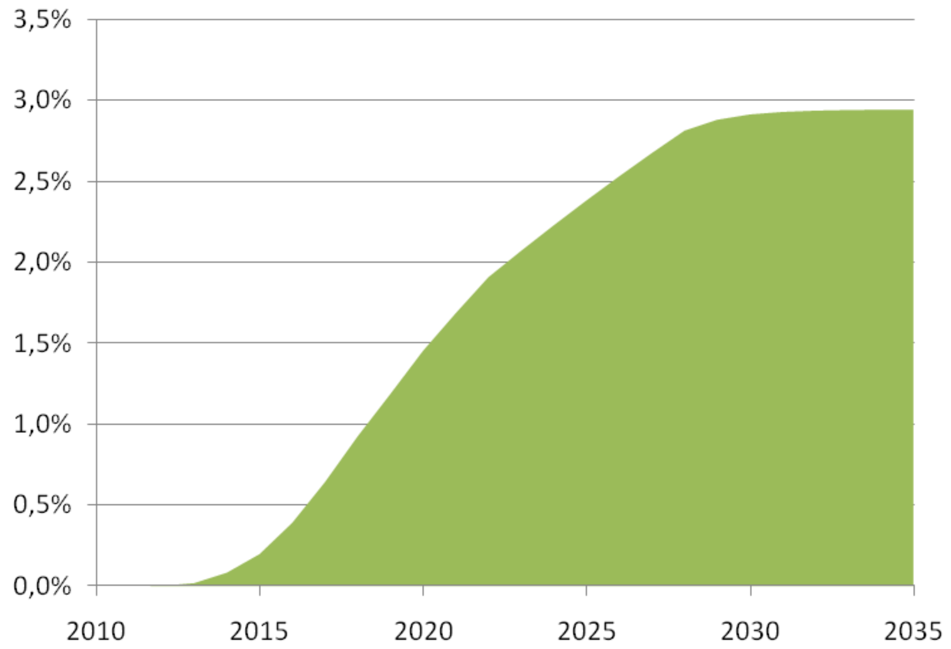
Long-term cluster effects will play an important role. The greater the number of people working on certain tasks at the same place and within the same industry, the greater the competitive advantage becomes. Policy makers in small nations will have to consider this carefully and choose their economic and industrial strategies accordingly. The Icelandic energy sector has the potential to become a cluster that breeds competitive advantage on an international scale, opening up opportunities for the exporting of knowledge, comparable to fisheries and aviation. In view of this it is very positive that LV will continue to invest in and boost this nascent export industry.

[14] Ministry of Industry: Effects from investment in heavy industry in Iceland, July 2009.

MACRO-ECONOMIC EFFECT FROM NEW ENERGY COMPANIES AND NEW PLANTS

In our calculations we assume that the domestic use of resources by the new factories will be the same or even slightly higher than current levels with existing factories that are heavy energy users. Energy is the dominant component in this case, although purchases of other resources are still considerable. For example, excluding energy purchases, Alcan buys products and services from Icelandic producers for its factory in Straumsvik that amount to ISK 5 billion per year. The cost of the domestic products bought accounted for around 40% of the turnover, i.e. approximately ISK 19 billion in 2008. In that year it is estimated that the aluminium companies operating in Iceland bought domestic resources for around ISK 24 billion.[15]

Graph 31: Aggregated impact on economic growth by new industry



Source: GAMMA

Continuing with the same methodology applied above, when estimating the economic effects of the investment plan, an estimate can be worked out for the operation's contribution to GDP growth. Here it is assumed that LV's energy production will increase by at least 8TWh/a. Assuming the emphasises of industry development will be along the same lines as before, i.e. heavy industry, the contribution to economic growth can be calculated with the multiplier effect, as seen in Graph 31. These effects are caused by the salaries paid to workers and the purchase of domestic resources, both in the form of products and services. The investment plan proposed by LV assumes that investment will be fairly smooth in terms of its timeline and size, allowing therefore for the assumption that the industrial build-up will also be continuous and regular. This reasoning underlines

[15] Speech given by Rannveig Rist, CEO of Alcan Iceland at the annual meeting of the Chamber of Commerce.

the fact that, in spite of the undeniable size of the companies classified as heavy energy users, their impact on economic growth is rather limited, excluding the effect derived form energy sales. To put a number on this contribution (excluding energy), it is estimated that until 2035 the contribution to economic growth will be around 0.2% on average.

Notwithstanding this, it is obvious that investment in energy projects and related industry will affect the Icelandic labour market. It is believed that new types of industrial companies will start operations in Iceland in the near future, such as data centres, silica production and even food production. These companies do not use as much energy per labour unit as, for example, aluminium smelters. Verne Holding believes, for example, that the data centre the company wants to build will need 100 workers and 210Wh/a of energy, resulting in 2.1Wh per worker.[16] This indicates that we can expect future energy sales to create more jobs than before and usage of domestic resources will in general increase. However, this will not alter the fact that energy-intensive industry, such as the aluminium smelters, will be the dominant energy buyer in Iceland in the foreseeable future.

Table 4 presents an overview of the most important heavy industry players in Iceland in terms of the number of employees and how much energy they buy each year. The table reveals that 5 factories consume around 14TWh per year, employing 1,700 workers[17]. This amounts to about 8.5GWh/a per employee.

Table 4: Overview of heavy industry in Iceland – current and estimated in next years

Company	Industry	Production-capacity	Employ-ees*	Energy consumption	Consumption pr employee
Current:					
Alcoa Fjarðarál	Aluminium	346k t	450	5,044 GWh	11.2 GWh
Alcan Straumsvík	Aluminium	185k t	470	3,582 GWh**	7.6 GWh
Norðurál Grundartanga	Aluminium	260k t	500	4,176 GWh***	8.4 GWh
Elkem Grundartanga	Ferrosilicon	120k t	180	1,105 GWh	6.0 GWh
Becromal	Aluminium Foil	12mln m2	100	555 GWh	5.6 GWh
Total:			**1,700**	**14,462 GWh**	**8.5 GWh**
Estimated:					
Helguvík	*Aluminium*	*250k t*	*450*	*3,750 GWh*	8.3 GWh
Húsavík(1-3 projects)	*na*	*Na*	*400*	*3,000 GWh*	7.5 GWh
Carbon Recycling	*Methanol*	*50-100m l*	*100*	*520 GWh*	5.2 GWh
Verne Holding	*Data Center*	*Na*	*100*	*210 GWh*	2.1 GWh
Globe Specialty Metals	*Silicon metal*	*40k mt*	*150*	*560 GWh*	3.7 GWh
Total:			***1,200***	***8,040 GWh***	***6.7 GWh***
		Total:	*2,900*	*22,502 GWh*	*7.8 GWh*

Source: Company web pages.
** Not including contractors or subcontractors.*
*** Enlargement in 2011 by 40th tons and energy consumption increased by 650 GWh from LV.*
**** From HS Orka and LV.*

[16] Notes to a bill put forward in Parliament. http://www.althingi.is/altext/138/s/0393.html
[17] Not including contractors or subcontractors.

Based on current heavy industry employment it can be assumed that new factories will create around 1,200 new jobs and will be added to the 1,700 already working in heavy industry in Iceland. The Institute of Economic Studies at the University of Iceland has estimated that each job created in aluminium and silica production will generate 1.4 jobs in the economy as whole.[18] Thus 1,200 new jobs in heavy industry will create 1,700 new auxiliary jobs. Combined, 3,000 new jobs will emerge directly and indirectly from the operation of new energy intensive industry in the next decade. Thus, in 2025, for example, around 3,000 people could be working in heavy industry, using 22 TWh/a of energy. This is around 1.5% of the Icelandic workforce. On top of this number there would be 4,000 jobs (2.2% of the total workforce) created as a result of the indirect effect explained above. According to this, almost 4% of jobs in Iceland would be linked, directly or indirectly, to various energy-intensive industries.

The same line of argument can be applied when estimating the scope of activities for energy production after the investment period has run its course. In this case, however, operations of energy plants are not labour intensive and it is likely that the energy companies will not have to significantly increase their staff in order to run new plants. Table 5 gives an overview of companies supplying and transmitting energy to heavy users. All in all, 1,240 people are employed in energy production and transmission. The increase in energy production will not result in a proportional increase in jobs created. However, power plants need maintenance and geothermal plants require more attention and subsequently more labour than hydropower plants do. Therefore, we assume that LV will need around 65 new employees for the maintenance of new power plants that generate 8TWh/a and an approximate workforce of 1,300 will be needed to operate the plants and transmission after the investment period is finished. The Institute of Economic Studies estimates that the multiplier for job creation in the energy production sector is 1.4, i.e. the same as in the energy intensive sector.[19] From this reason we expect 1,700 jobs to be indirectly created, leaving us with a total of 3,000 jobs directly and indirectly linked to energy production.

Table 5: Overview of number of employees supplying energy in Iceland

Company	*Number of employees*	*Energy production*
Landsvirkjun	235	12.400 GWh
Orkuveita Reykjavíkur	520	2.100 GWh
HS Orka	77	1.400 GWh
Rarik	200	250 GWh
Orkubú Vestfjarða	57	80 GWh
Norðurorka	55	0,1 GWh
Rafveita Reyðarfjarðar	1	0,1 GWh
Orkuveita Húsavíkur	5	0
Landsnet*	90	0
Total	1.240	16.230 GWh

Source: Company web pages.
**Owns and operates major electricity transmission lines in Iceland.*

[18] The Institute of Economic Studies. Þjóðhagsleg áhrif álverksmiðju Fjarðaáls á Reyðarfirði, des 2005.
[19] ibid.

Table 6 shows job creation, directly and indirectly linked with energy production and energy intensive industry. The table shows that there are currently around 7,000 people employed in these two sectors. Once LV has completed its investment programme, 3,000 additional jobs (1,300 directly, 1,500 indirectly) will be added to the workforce. After 10 to 15 years it is not unreasonable to expect that 10,000 people will be earning their livings producing energy or working in industries that are energy intensive. This number of people translates to 6% of the total workforce.[20]

Table 6: Overview of employees working in energy and energy intensive industry in Iceland

	Current employees	*New jobs*	*Total*
Energy directly	1.240	60	1.300
Energy indirectly	1.740	90	1.830
Energy total	2.980	150	3.130
Heavy industry directly	1.700	1.200	2.900
Heavy industry indirectly	2.400	1.700	4.100
Heavy industry total	4.100	2.900	7.000
Total heavy industry and energy	*7.080*	3.050	10.130

Source: GAMMA.

Needless to say, calculations of this sort should always be taken with a grain of salt. "Here we get by, by helping each other to get by" was the classic answer given by a shopkeeper when asked by a farmer how people in Reykjavik earned their living. Many companies and individuals, who sell their products, services or labour to energy-intensive industries, could find other buyers, especially if there is a boom in the economy. Furthermore, it can never be stressed enough that it is not the number of jobs that create welfare in society; the quality and productivity of the jobs are more important. When the current recession is over, energy production and energy-intensive industries will compete with other up and coming industries for labour and resources. Taking the long-term view, it is clear that job creation will be driven by competition for resources, resulting in increased productivity. But government policy can play a crucial role in deciding in what sectors of the economy job creation will take place.

[20] This report only takes into account the investment plan by Landsvirkjun. Other energy companies might also increase their production and sell to other industrial companies, thereby creating even more jobs and economical impact.

CLUSTER CREATION

One of the concepts that has drawn considerable attention when debating industrial policies is the concept or theory of clusters. Cluster policy revolves around the idea of economics of scale, more precisely external economics of scale. Economics of scale is a well known concept, especially in the more traditional meaning, i.e. a single company reduces its average unit cost as volumes increase. This happens, for example, when the fixed cost per produced unit is lowered, due to increased volumes or when investment increases productivity in relation to cost. At the core of the cluster policy there is the idea that economics of scale can be created not only within a single company, but also through the collaboration of many companies. The effect will be materialised even though increased volumes are distributed between many companies, so long as they are located within the same territory. In this manner, external economics of scale are created within a certain industry or industry segment, leading to lower average costs enjoyed by companies that operate in close vicinity and consequently luring other companies to join in, in order to improve their competitiveness.

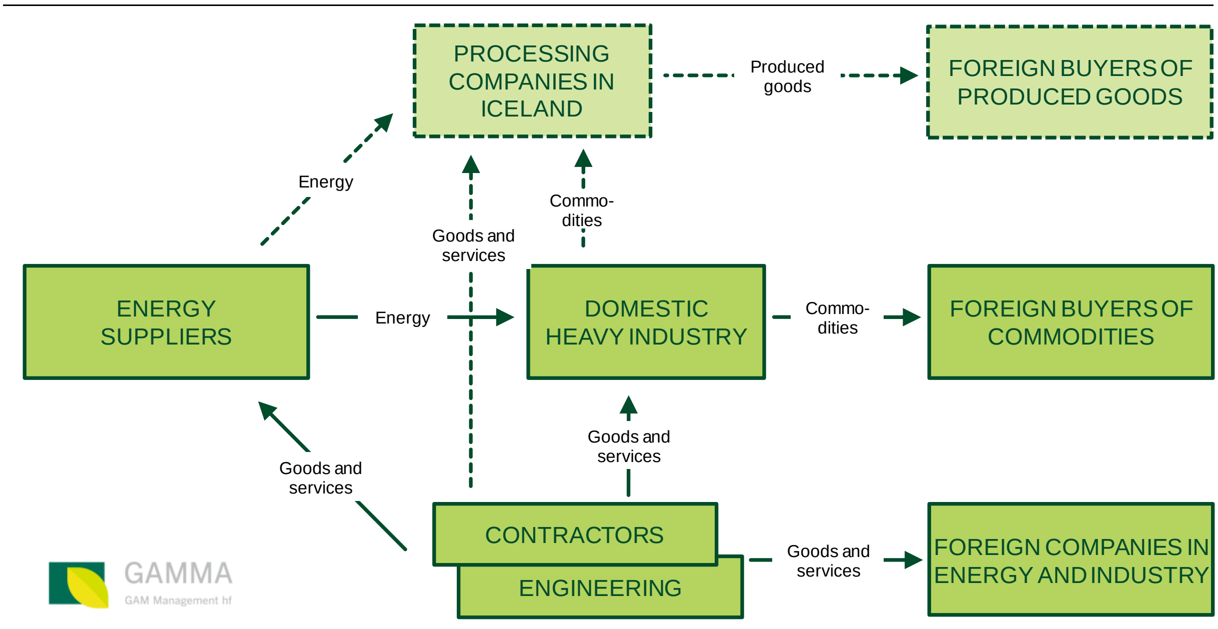
There are many examples of this phenomenon, but one of the best known is probably Hollywood, where movie companies have flocked together in order to enjoy the cluster effect or external economics of scale. These companies are, of course, all competitors, but at the same time they create a mutually beneficial environment for each other. Together they create a big and diverse labour market, opening access to a huge number of specialists, actors and technicians, who can be hired as needed. Therefore the risk of a resource shortage is minimised. Consequently, people with special skill sets will come to Hollywood, since there they have the best prospects of finding jobs that require special and unique skill.

The clustering of movie companies also secures a constant supply of various specific resources used, for example, to create special effects or when filming stunt scenes. These highly specific resources would be extremely hard to get without this cluster effect. These specialised companies would not be commercially viable unless they had access to a market big enough for them to sell and develop their services. Therefore clustering facilitates opportunities for localised, highly specialised auxiliary services, which contribute resources that otherwise would be impossibly expensive to obtain. But there is more to it. The cluster effect generates positive collaboration since a great number of knowledgeable and uniquely talented people are concentrating on solving similar problems and tasks in the same vicinity. Each company is, of course, a single commercial entity, but knowledge and technology will be transferred between companies, both directly and indirectly. This happens when employees leave their companies for new employers or use their skill to tackle new types of tasks and problems. It also happens in an informal way, for example, at cocktail parties or other social functions. A spillover effect of this kind breads technological progress, increases profitability and helps facilitate efficient marketing, to name but a few advantages of this phenomenon. Clusters allow access to information and resources that would be impossible to use for creating value if one were not a member of the cluster.

The cluster in Hollywood is only one of many examples that can be cited of how companies start to group in order to enjoy the benefits that follow close proximity, outweighed by the cost their location entails. Other good examples of well known clusters include the high tech cluster in Silicon Valley and the financial quarters in Manhattan New York, to mention but a few. Clusters can also be found outside the knowledge industry; all carpets in the USA are, for example, produced in one city, Dalton in Georgia.[21]

Here in Iceland, clusters have been forming within the energy sector and it is possible to regard energy production as a upstream for energy-intensive industries. Graph 32 shows how such cluster formation can take place, concentrating around LV and its activities.

Graph 32: Cluster formation within the energy sector of Iceland



Source: GAMMA

Clusters can also emerge on the upstream and downstream side of certain industries. Upstream or downstream companies can reach the level of conduction of their own independent product development, creating in the process great economic value. A good example of this can be found in connection with the Icelandic fishing industry. Not only can we see considerable external economic scale effects enjoyed by the fishing companies themselves, but we also observe clusters being formed both upstream and downstream. Many companies that have serviced the Icelandic fishing industry have been able to grow and develop their products, thus creating a competitive edge that has helped them enter the international market. Examples of this are Icelandic companies like Marel and Maritec. Furthermore interesting niches have been created through this process, as in the case of dyed capelin roes from Raufarhöfn, a small rural town in North East Iceland.

[21] Krugman, P. (1991), „Increasing Returns and Economic Geography," The Journal of Political Economy 99, nr. 3, bls. 483-499.

In Iceland there is a considerable upstream activity servicing both energy production and industry during construction and also after operations have begun. In the upstream activity many indirect jobs are created and it is indicative that of the 1,300 people working in engineering companies in Iceland, one third work on projects connected to energy and energy-intensive industry. Knowledge and experience from energy projects has grown year by year and Icelandic engineering companies have now started to export their expertise in this field. It is estimated that Icelandic engineering companies and geological research boutiques earned about $12m (ISK 1.5 billion based on USD/ISK 125,00 in 2009) in 2009.[22]

Increased knowledge and experience within companies that offer their services to aluminium companies has led to the exporting of services of this kind from Iceland. One example that can be mentioned is HRV, an Icelandic engineering company, which in 2007 was put in charge of renovating a 60 years old aluminium smelter owned by Kubal in Sundsvall, Sweden.[23] Moreover, companies specialising in electricity engineering have been able to successfully export their expertise. An example is Rafmidlun, a company that services industrial plants operated by Nordural and Elkem and participated in the construction of Icelandic Alloys and the Nordural plant at Grundartanga as well as working on energy projects, such as the energy plants at Svartsengi and Hellisheidi. The company has fulfilled requirements for operations in Norway, Sweden and Greenland and, based on the expertise they gained from the Icelandic market, have been involved in projects such as a hydro-plant in Greenland, 20 MW waste disposal plant in Oslo, Norway, and has also worked on fume treatment plants for Norsk Hydro in Norway and for Kubal in Sweden.[24] These examples all point to the fact that when enough experience, knowledge and resources are gathered, cluster effects will kick in with external economics of scale, as described above.

There is considerable upstream activity around energy-intensive industries in Iceland, but far less activity is observed downstream. Distance from international markets and a small domestic market are likely culprits and outweigh the possible benefits created by competitive energy prices. Relative advantage enjoyed by Iceland in producing and selling electricity makes it profitable to operate aluminium smelters here. But the disadvantage created by location, a small domestic market and possibly higher labour costs makes any downstream production difficult. Due to the lower exchange rate in recent years, there has been a growing interest, but the small size of the domestic market is most likely to remain the dominant factor prohibiting derived productions from aluminium. Instead what has happened is that the aluminium smelters have placed their emphasis on higher production values. An example of this worth mentioning is that in 2010 Alcan decided to invest $140m to change its factory in Straumsvik in order to change its production from bars to bolts, since the bolts are a more valuable product. Furthermore, the company decided to invest $347m in a project aimed at increasing its production capacity through a better use of electricity.[25]

[22] Speech given by Eyjólfur Árni Rafnsson, CEO of Mannvit hf. at the annual meeting of the Chamber of Commerce, 17. Feb. 2011.
[23] Newsletter VST 2. issue. 7. edition, Des 2006.
[24] Presentation on Rafmiðlun hf., www.rafmidlun.is and information from Baldur Steinarsson og Björgvin Pálsson.
[25] www.riotintoalcan.is

WEALTH EFFECTS OF DIVIDEND PAYMENTS

In this chapter potential dividends that would be paid by LV are placed into context with the Icelandic economy and an analysis of the impact of the dividend payments on the public purse is provided and the economy as a whole. An estimation of potential macro-economic benefits is provided and the dividends are compared with specific public segments and other industries.

POSSIBLE DIVIDENDS AND TAX PAYMENTS BY LV AFTER 2025.

If LV's investment plan is implemented, the company's ability to pay dividends will be considerable in the future. This goes hand in hand with LV's ability to dramatically increase its tax payments after it has completed its investment plan in 2025. Table 7 presents possible dividend payments along with average tax contributions from 2025 to 2035, all in 2011 prices. From the table we can see that the combined contributions to the Icelandic state would amount to somewhere from ISK 30 and ISK 112 billion per year, depending on how energy prices develop and whether or not a submarine cable is laid.

Table 7: LV's potential average dividends and income tax payments in USD between 2025-2035 base on 2011 prices (exchange rate ISK/USD 115).

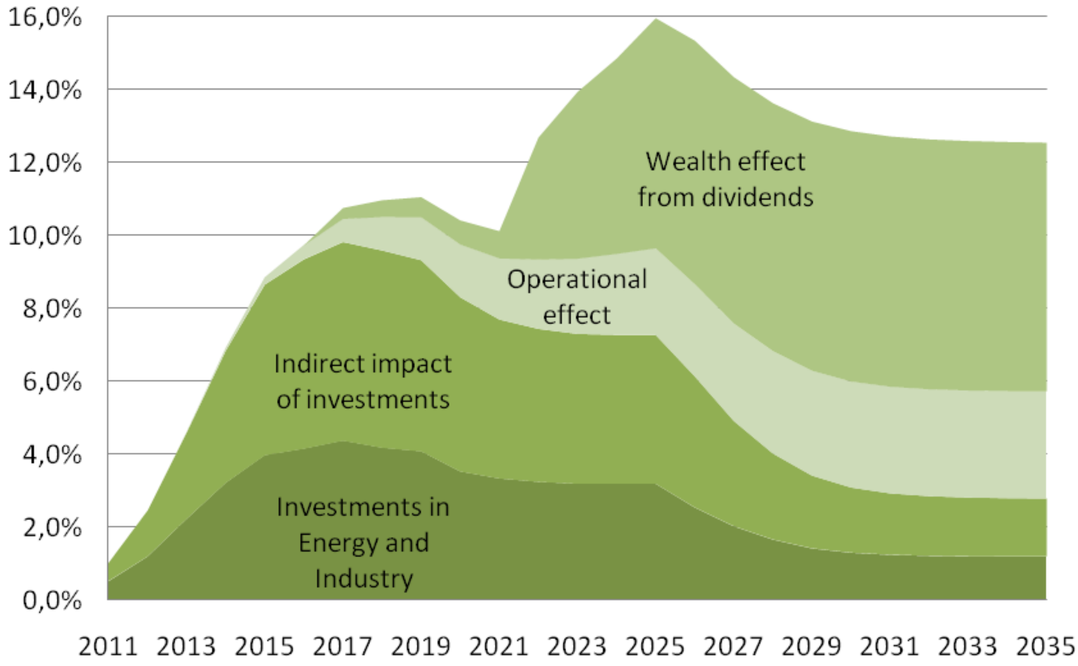
Scenarios*	Income tax	Dividends	Total
1) LV's investment plan	\$160m (ISK 19bn)	\$710m (ISK 81bn)	\$870m (ISK 100bn)
2a) No further investment	\$80m (ISK 10bn)	\$340m (ISK 40bn)	\$420m (ISK 50bn)
2b) same as 2a, except no changes in energy prices.	\$45m (ISK 5bn)	\$220m (ISK 25bn)	\$265m (ISK 30bn)
3) Assuming a submarine cable	\$195m (ISK 22bn)	\$780m (ISK 90bn)	\$975m (ISK 112bn)

Source: GAMMA

**Calculations and definitions of scenarios in chapter 10.*

In order to understand the impact of these dividend payments on the economy, it is useful to calculate them as a ratio of GDP at the point of time when the dividend is paid. Calculating the GDP, it is assumed that after 2013 the economy will grow by an average of about 3% per annum, as has been the case for the last few decades. There are many ways to measure the effects derived from increased dividend payments from LV, depending on how the state will use the money. The most straightforward way is to use the same methodology used when estimating the effects from investments in energy plants and industry, i.e. by assuming that the state uses the dividends for domestic investment with the accompanying multiplier effect. Here the state behaves as a private investor. Comparing the state to energy intensive industry, the state has a tendency to use more domestic resources than, for example, an aluminium smelter. This is to be expected, since the government is labour intensive. Comparable results would be found using the dividends to lower taxes or increase public expenditure. The result can be viewed in Graph 33, which compares the impacts of investments and operations.

Graph 33: Impact of investments and operations on economic growth



Source: GAMMA

Here the operational effects are defined as domestic resources, excluding energy, bought by energy intensive industrial companies and the operation of energy plants, augmented by the relevant multipliers, as described in chapter 6, but LV's profits from energy sales are materialised in the economic effect they generate. It is important to keep in mind that increased profits are partially derived from existing customers paying higher energy prices, in line with the business plans presented in chapter 3. Now we can clearly observe the economic effect that can be generated by increased energy production and higher energy prices. Of course, it is always possible to play around with assumptions and tweak them to and fro. The main point here, however, is that energy prices are vitally important for the Icelandic economy, energy being the only domestic resource used in any substantial quantities by the energy intensive heavy industry.

DIVIDENDS FROM LV AND PUBLIC FINANCES

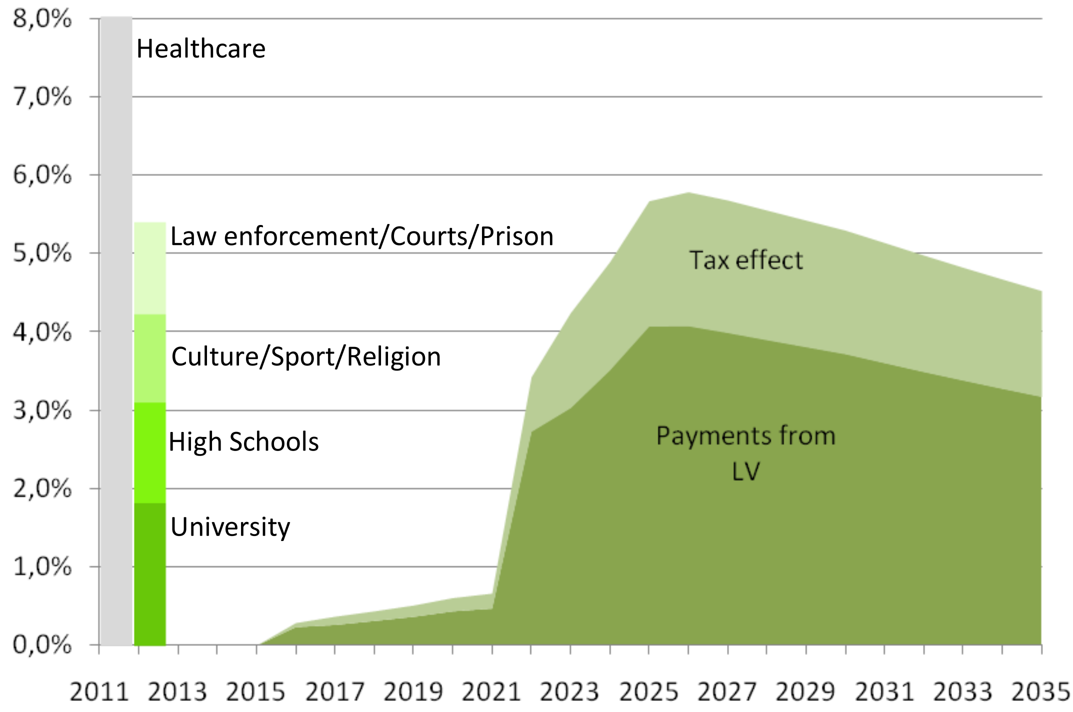
The estimation of the consequences of dividend payments from LV on public finances is based on the assumption that, when projecting public expenditure, the state's share, as a percentage of GDP, will be maintained at a fixed rate of 42%, which roughly corresponds to the ratio of the decade preceding the bank collapse. The dividends will go into the public funds, and the state can choose between many different ways of allocating the money. How it chooses to spend/invest will lead to different macro-economic impacts. The state could use the dividends to pay down debt, strengthen the foreign exchange reserves, invest them in important infrastructure projects and so on. Here we use the same methodology as before when trying to comprehend the economic effects, i.e. we assume that the dividends are reinvested back into the economy. Same results should be obtained assuming lower taxes or a combination of lower taxes and public investments. As before, no positive effects are assumed to come from operations after the investment period, and therefore only the effects of investment activities or spending are included in our calculations.

When the state uses the dividend payments for investment, a portion of the funds will find their way back to the state's coffers through the tax system, since salaries, for example, are taxed and resources bought are subject to VAT. This self financing of public expenditure is a well known leitmotiv in economic theory, whether it be the Keynesian multipliers theory or the well-known Laffer curve, describing the link between tax rates and tax revenues. In these calculations we do not have to take into account the negative effects linked to increased government spending financed by higher taxes or increased debt. What we are working with here is long-term projections, using an assumed fixed ratio between GDP and government spending.

Given a 3% annual trend growth projection of GDP, dividends and tax payments from LV to the Icelandic state, augmented by possible derived tax effects, could amount to 3-6% of GDP, around 10-14% of the state revenues during this period. This can be seen more clearly in Graph 34 and Graph 35, where the direct effect from dividend payments plus the aforementioned indirect effects from taxes, are presented as a proportion of GDP and state revenues. Furthermore, the first graph compares the state's major expenditure categories and the latter compares the major revenue sources. We can see that payments from LV could finance the state university, high school education, culture/sport/religion and law enforcement/courts/prison. The payments would also go a long way towards covering all healthcare costs, which are currently equivalent to 8% of the GDP.

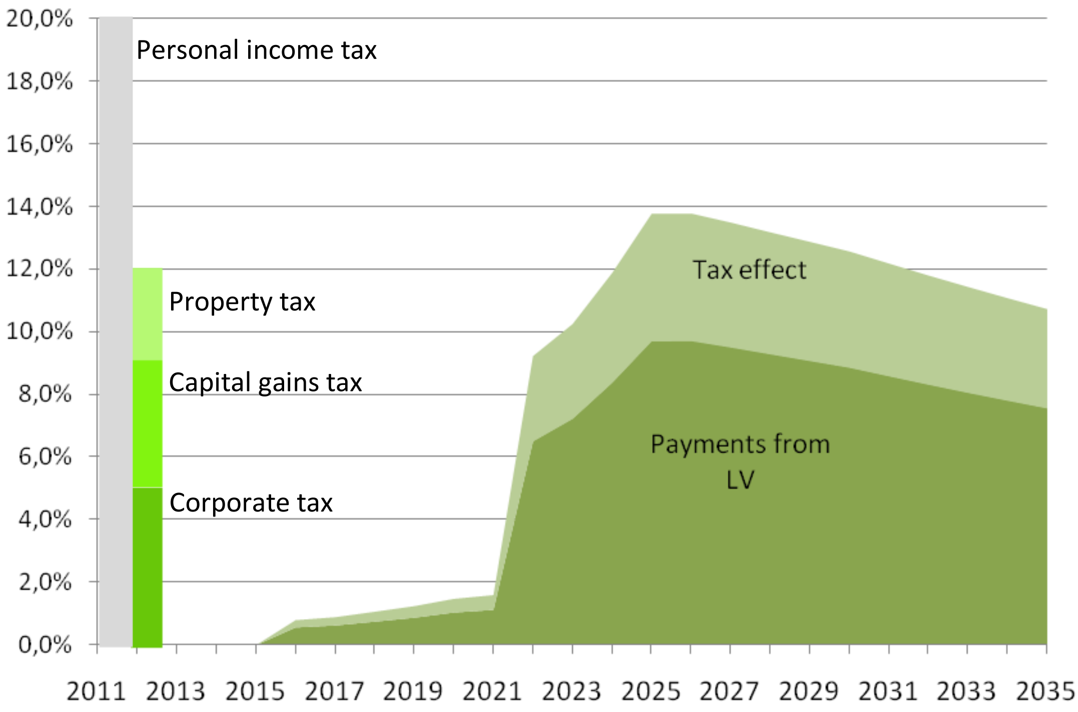
When comparing dividend payments in relation to the state's tax income, it is useful to bear in mind that tax, both corporate and on individuals, made up around 20% of the state's income in the 2001-2009 period. Expected dividend payments could therefore be almost half of the tax income enjoyed by the state and close to 75% accounting for the tax effect. Thus, the state could lower tax by half, either by lowering the tax rate or raising personal allowances, or annually paying every Icelander $2,400-$2,800 (i.e. ISK 280,000 – 320,000 given exchange rate USD/ISK 115,00) at 2011 fixed prices.

Graph 34: Relative size of Landsvirkjun payments of GDP



Source: National Statistics, GAMMA

Graph 35: Relative size of Landsvirkjun payments of Icelandic state total income



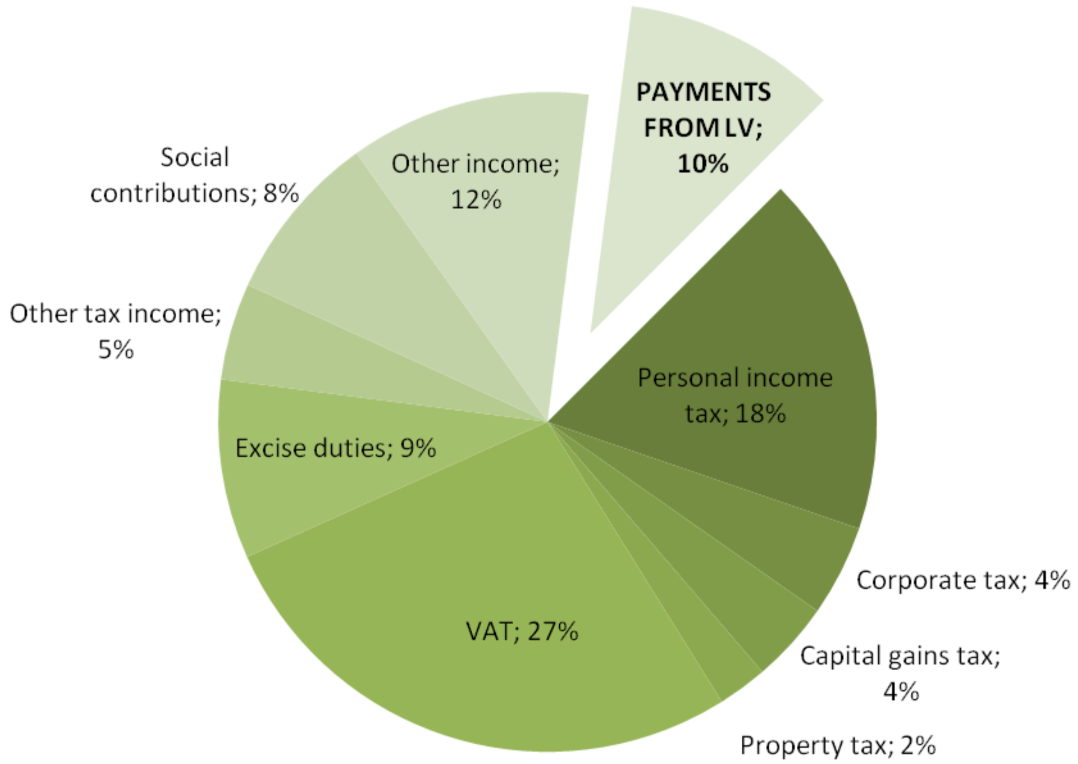
Source: National Statistics, GAMMA

From 2001 to 2009, personal income tax accounted for around one fifth of the state income, excise duties around 10%, corporate tax around 5%, capital gains tax 4%, property tax 3% and VAT around 30%. Dividends from LV could allow the state to do some of the following:

- abolish all excise duty or
- abolish property tax, capital gains tax and corporate tax or
- abolish social contributions tax or
- lower personal income tax by half or
- lower VAT by third.

In Graph 36 we can observe possible combinations of different income sources for the state in 2030. Given certain assumptions, direct payments from LV could amount to 10% of state income. The state could, of course, reduce other levies, thus changing the composition. However, the crux of the matter is that energy sales by LV are so extensive in relation to the size of the Icelandic economy, that any rise in energy prices above LV's average cost of production will generate dividends that have a serious impact on the Icelandic economy.

Graph 36: Possible combination of income sources for the state in 2030



Source: National Statistics, GAMMA

Comparisons with other sectors of the economy

According to National Statistics, taxes on corporate income and capital gains have returned an average of around ISK 17 billion in the 2001-2007 period.[26] Income from this source grew rapidly during these years. It amounted to ISK 8 billion in 2001, for example, but ISK 32 billion in 2007. As a percentage of GDP, the ratio rose from 1% to 2.5%. Dividend payments to the state averaged at around ISK 7 billion during the 2001- 2007 period. As a percentage of state income, this source of income has decreased from 2% to 1% in 2007. This trend is a manifestation of the privatisation process during those years. As a percentage of GDP, this ratio has been around 0.5%.

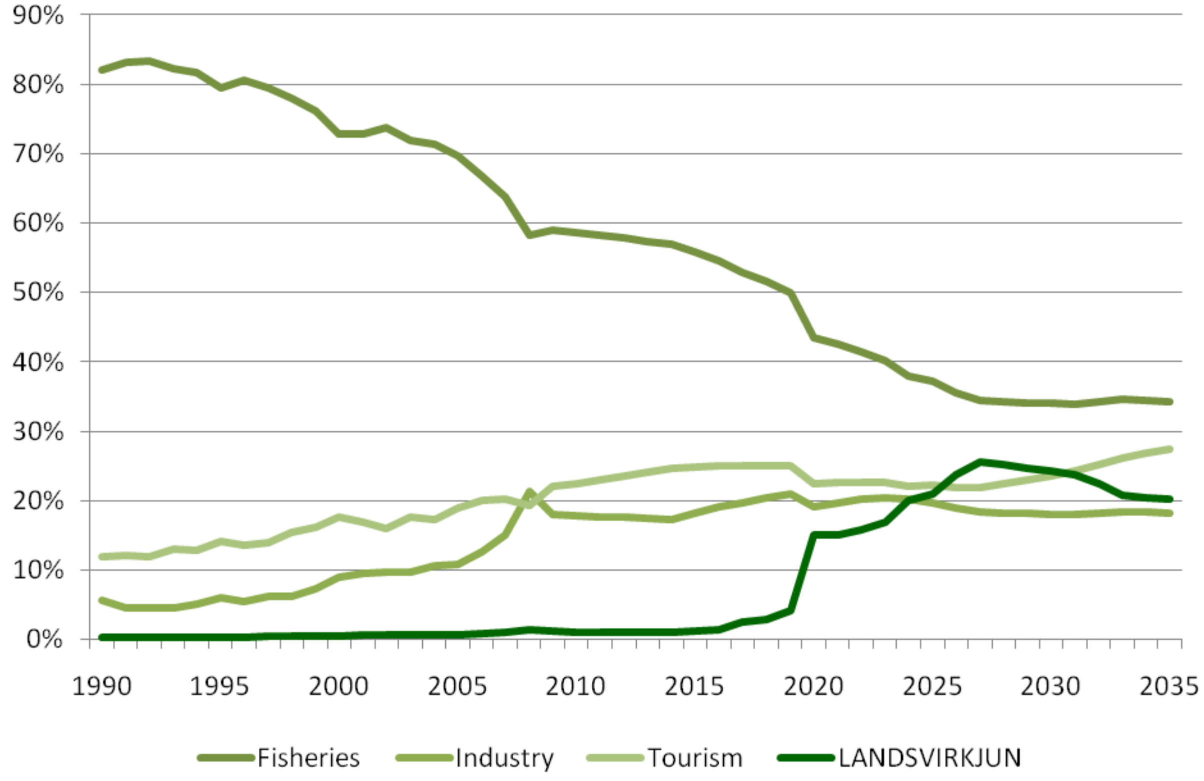
Data from the Statistics Iceland bureau show estimated income tax from different sectors. There we observe that, during the 2001 to 2007 period, heavy industry and general industry[27] returned around ISK 1.3 billion to the state in the form of corporate tax (0.6% of state revenue), fisheries around ISK 2 billion (0.5% of state revenue), whereas financial services yielded around ISK 9 billion (1.8% of revenue) and the remaining companies contributed ISK 10 billion (2.3% of total revenue). On the basis of LV's estimated dividends policy and the corporate tax it would pay, state revenues from the corporate sector would be doubled. All in all, LV could yield more revenue to the state in the form of tax and dividends than the rest of the Icelandic corporate sector .

Effects on balance of trade.

Since an overwhelming majority of LV's income is in foreign currency, dividends will most likely be paid in foreign currency. Clearly, LV's ability to pay dividends will amount to a significant proportion of the trade balance. Thus, the dividends could affect the exchange rate (presuming the Icelandic krona still exists) if they are converted to Icelandic krona´s . In Graph 37 we can observe how export revenues are divided between various export sectors of the economy. This data reaches back to 1991 and includes revenues until 2035. In this scenario we present net revenues, i.e. the cost of imported resources have been deducted from foreign revenues created by each sector. More precisely, we assume that 80% of the export coming out of the fisheries is a net figure, 20% of the heavy industry[28], 40% of the revenues created by tourism. LV is estimated as 5% of the heavy industry export[29] adding the forecast dividends after 2015.

[26] www.hagstofa.is
[27] General industry is for example construction, retail, hotel, transportation, real estate and insurance.
[28] Domestic resources used by heavy industry are somewhere between 30-40%, half of it being energy.
[29] Here it is assumed that LV gets paid in foreign currency from the heavy industry buyers, and only "take home" a portion of the amount, since LV is mostly financed in foreign currency.

Graph 37: Proportion of net export revenues between largest export sectors*



Source: National Statistics, GAMMA
**Fishery 80% of export revenues.*
**Heavy and general industry 20% of export revenues.*
**Tourism 40% of export revenues.*
**Landsvirkjun 5% of industry export revenues and dividend payments from 2015.*

Paying down foreign debt

Income and dividend payments from LV are in foreign currency and clearly there is a considerable benefit for the Treasury to be able to use the increased foreign revenues to pay down foreign debt, strengthening the foreign reserves or an energy fund modelled on the Norwegian oil fund could be established. The improved debt ratio will strengthen Iceland's sovereign credit rating, leading to improved credit, and using the revenues to increase the foreign reserves would also enhance the state's finances. Iceland's foreign reserves have mainly been built up by loans issued by the Icelandic Treasury and the Central Bank. If the reserves are not used, the foreign assets covering the loans are held, but loss in interest revenues is to be expected. It is therefore difficult to pinpoint with any certainty what the foreign debt level of the Icelandic state will be. Furthermore, it is still not known how much the state will have to fork out to pay for Icesave and in this analysis we omit any possible cost related to this issue.

In 2011, the Central Bank issued a report called "How much does Iceland owe?".[30] According to this report, the State and the Central Bank collectively owe 54.8% of the GDP, equivalent to ISK 843 billion. Net debt, excluding the foreign reserve, amounts to 14.6% of GDP or approximately ISK 225 billion. Given that foreign debt owed by the Treasury and the Central Bank amounts to ISK 843 billion and that the Treasury and Central Bank will pay interest on the loans until maturity, the loans being refinanced until the year 2020, then tax and dividends from LV should be sufficient to repay the principal within 10 years, leaving the Central Bank and the state debt free in 2030. If we only take into account net debt and assume as before that the debt will be refinanced until 2020 and that interest is paid until maturity, then the principal could be repaid in 5 years.

These calculations are, of course, subject to great uncertainty, since it is impossible to predict what the state's debt level will be in the future. But this exercise reveals the possibilities the dividend payments will create for the state. However, it is clear that if the proposed investment plan is carried out and the projections are realised, Iceland could be debt free within a few years or the country could build an energy fund, comparable to the Norwegian oil fund, which is discussed further in chapter 9.

[30] Efnahagsmal, nr. 4, February 2011 http://www.sedlabanki.is/lisalib/getfile.aspx?itemid=8471.

ECONOMIC GROWTH AND LANDSVIRKJUN´S DIVIDENDS

The number of jobs created and foreign currency earnings are the first two things that come to many people's minds, when they think of economic growth. But this type of folk science is not as sound as one might think, since the number of jobs and inflow of currency is a rather inaccurate measurement of economic benefits. The prosperity of a nation is not determined by the number of jobs that it can create within its boundaries, but rather by its productivity. Generally speaking, a nation should not be over-dependent on a single sector or type of activity when it comes to job creation or the general direction of the economy. This type of dependency is often to be found in third world countries. New jobs should emerge from diversified sources, various sectors of the economy should contribute to wealth creation and no single sector should be regarded as indispensable, even if the loss or downsizing of a particular sector could create temporary problems for the economy.

Increased income in foreign currency does not in itself guarantee increased prosperity, but it is an indication of increased specialisation within the economy and it consequently enables the nation in question to tap into other nations' specialised know-how. Apart from this, income in foreign currency is only a measurement of revenues earned by export companies; it does not represent their profits or productivity. Nevertheless, short-term benefits can be gained if investments are made during periods of recession and unused resources are utilized. As we have discussed in previous chapters, economic conditions play a crucial role, when it comes to estimating the potential impact of investment on economic growth. If the economy is booming, for example, resources are used to their maximum capacity, in which case increased investments followed by their multiplier effects, will not have a positive economic impact. On the contrary, they will have a negative impact, which will manifest itself in crowd-out effects and inflation.

The economic benefits that derive from investment in energy production and related investments in industry are twofold. On one hand, they boost economic activity and job creation while, on the other, they increase general productivity. It is a daunting task to describe and measure the economic and social benefits created by LV's investment plan and subsequent dividends payments, since there are obviously great uncertainties involved. It is therefore appropriate to only present the main themes, describe them, and try to capture their most important aspects. The fact that LV's dividends are mainly composed of revenues from energy sales to foreign companies means that they can therefore be regarded as a direct hit to their bottom line and consequently as a pure gain for the Icelandic state, being the sole owner of LV.

ECONOMIC BENEFITS OF INCREASED ACTIVITY DURING RECESSION

Joseph Schumpeter, an Austrian economist, talked of recessions as being a force of creative destruction. Such events were necessary for capitalistic economies in order to drive obsolete companies out of business and create room for the new innovation.[31] But this notwithstanding, it is obvious that prolonged recessions can become very expensive, since resources remain unused, workers are idle and savings gather dust in bank vaults instead of generating wealth through investment. A lot is therefore to be gained from trying to prevent or at least to diminish the consequences of unemployment during a period of recession. In fact, since the Great Depression, economists have been preoccupied with trying to reduce the pain of downward turns, either by trying to prevent them from happening in the first place or by mitigating the effects if preventions becomes impossible. This may sound straight forward, but exactly how to formulate policies and how to implement them has, of course, been the subject of great controversy.

There was considerable slack in the Icelandic economy in the late sixties when the first aluminium smelter was built in Hafnarfjordur by ISAL. The same can be said of the nineties when a new aluminium plant was built at Grundartangi and ISAL enlarged its plant. It can therefore be argued that these investments were timed to perfection, in terms of their effects on economic growth. This is important, as can be seen in an article written by Pall Hardarsson in the Central Bank of Iceland's Monetary Bulletin in 1998. The article is named "Measurement of macroeconomic effects of heavy industry in Iceland from 1968 to 1997" and in it the author comes to the conclusion that 60% of the economic impact derived from investment in heavy industry in this period can be traced to the optimal timing of the investment, being able to counterattack the effect of the collapse of herring fisheries and cuts in cod fisheries.[32] The Icelandic economy is currently going through its worst recession since the Second World War and one can therefore expect investments in energy plants and heavy industry to create similar economic effects as those of the late sixties and the nineties. It can be assumed that there will be little or even no crowd-out effects as a result of LV's investment plan and the economic effect will therefore directly translate into economic growth. But even more important is the fact that LV's investment plan will greatly reduce the length of time in which resources are left unused and consequently preserve the long-term growth capacity of the overall economy.

[31] Schumpeter, Joseph A.. 1947. *Capitalism, Socialism and Democracy (1947).* Kessinger Publishing, Whitefish, Massachusetts.
[32] Páll Harðarson, Fjármálatíðindi apríl 1998.
http://www.sedlabanki.is/uploads/files/Ft98-2_7.pdf eða á vef Landsvirkjunar:
http://www.landsvirkjun.is/media/fjarmal/Pall_Hardarson_ahrif_storidju_a_isl_66-97.pdf

LONG-TERM ECONOMIC BENEFITS GENERATED BY LV'S INCREASED PROFITABILITY

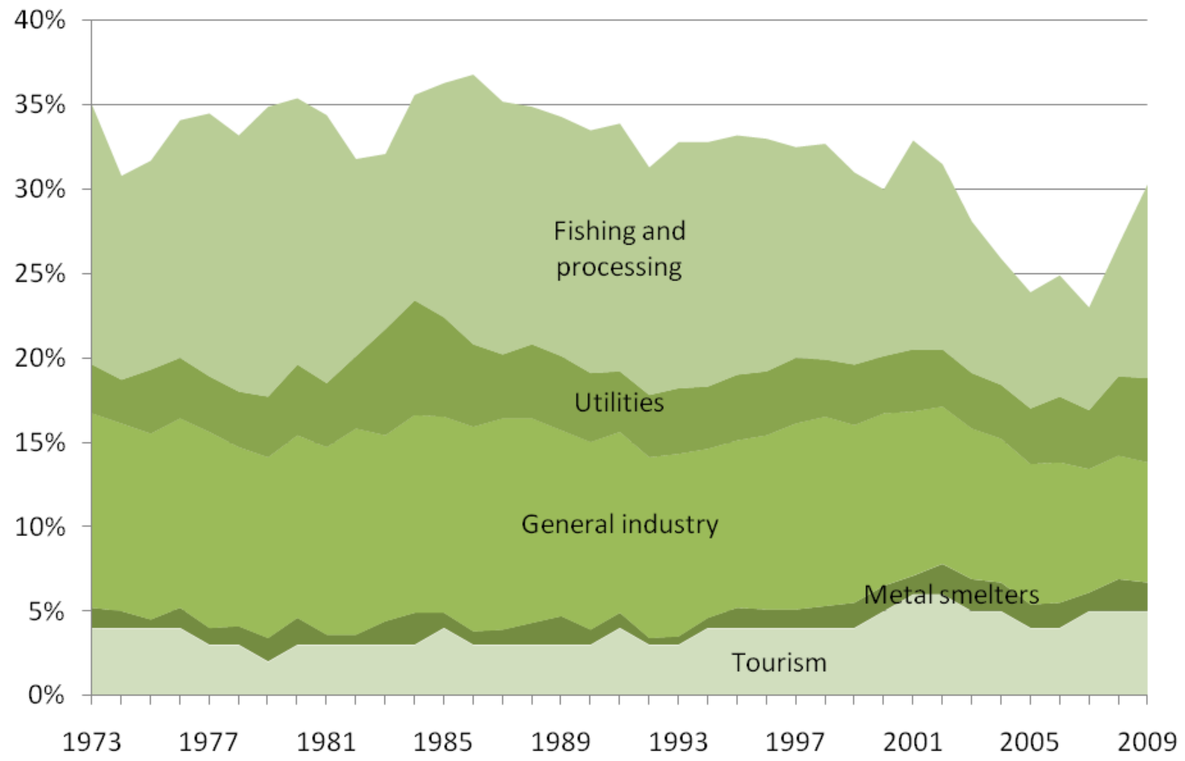
When debating economic prosperity, the concept of productivity will always be at the forefront. Productivity is equivalent to increased yield, i.e. greater economic value is extracted from existing resources. It is within this context that we speak of the productivity of labour, i.e. the output per hour. Productivity powers economic growth and prosperity. The difference between rich nations and poor ones is, broadly speaking, the difference in productivity per working hour. Of course, this is a somewhat simplified version of a complex truth, since various socio and political factors explain why different countries are not able to adopt otherwise easily obtainable technology, thus diminishing productivity growth.

Progress in technology drives growth in productivity, leading to increased production per working hour. Behind all this there is, of course, human ingenuity to which economic growth is inextricably linked. Economic benefit for a nation is therefore not the question of size of its resources, but rather a question of productivity. Investment in energy production and energy-intensive industry needs to measure up to such metrics.

The increased productivity generated by energy production for heavy industry in Iceland mostly derives from the higher prices energy-intensive production is able to pay for various resources, mainly energy and labour. Here profits from energy sales play a crucial role, which is reflected in the profitability of the energy companies selling energy to heavy industry. Putting this into perspective, it is useful to look at the contribution of different sectors to the GDP. As can be seen in Graph 38, tourism, heavy industry, general industry, utilities and fisheries account for one third of the GDP. This ratio has been relatively steady since 1973, excluding the years prior to the collapse of the banks, when the banking sector ballooned. A closer look at the numbers reveals that in 2009 tourism was around 5% of GDP, heavy industry (metal smelters) around 2%, utilities around 5%, general industry 5% and fisheries (fishing and processing) 12%. It has been argued in this paper that the dividends LV pays to the Icelandic state could be equivalent to 4-7% of GDP. LV's potential payments to the state could therefore amount to the total contribution of tourism to the GDP and almost equal to general industry, excluding heavy industry, if tax effects are taken into account.

It is quite significant that the contribution from heavy industry on its own to the GDP, on the other hand, only amounts to 1.7%. This reflects the fact that, apart from buying energy, the companies in question use little of domestic resources. This highlights two issues: Firstly, contributions from heavy industry to the GDP could be considerably raised if it becomes possible to raise the energy prices they are faced with. Secondly, the increased revenues thus obtained would be a net gain for the Icelandic state, being the owner of LV. The crux of the matter is that when the seller is the state (through its ownership of LV) and the buyer is a foreign company, which transfers all of its profits out of the country, the economic benefit of energy productions is primarily dictated by energy prices. Issues, which are often at the forefront of the debate on the merits of heavy industry, such as the number of jobs created, are far less important, although their impact on the local labour market can, of course, be quite substantial.

Graph 38: Contribution of different sectors to GDP



Source: National Statistics, GAMMA

POSSIBLE ECONOMIC EFFECTS OF DIVIDEND PAYMENTS FROM LV

The long-term economic effects from new industry (excluding the effects from the investments themselves and their timing) are mainly embedded in increased productivity, thanks to its ability to pay higher prices for available resources such as, for example, higher salaries. Aluminium smelters pay a premium over and above what the market pays for similar jobs, but the economic impact of this premium is small, since the aluminium smelters employ few people in view of their size. This effect is also diminished by tax benefits that have been granted to the aluminium companies. The Icelandic Central Bank pointed out in its Monetary Bulletin in 2003 that the net present value of the economic growth generated by the operation of the aluminium smelter in Reydarfjordur from its first day of operation onwards was around 1%. Its annual impact on the economy is therefore negligible. The reason for this is quite simple. Despite their size, the aluminium smelter scarcely uses any domestic resources apart from energy and, for a long time, a policy of pricing energy sold to aluminium smelters close to the cost of production has been in place, resulting in, among other things, the low profitability of LV, since historically profitability has averaged at around 3-6%.[33] This profitability has to be regarded as low, since LV's business is based on the energy bound in Iceland's abundant waterfalls. Taking it as a given that these energy resources are valuable, their value should be reflected in high profitability and dividends payments. A relatively low profit means that either the rent is non-existent or it is enjoyed by the energy buyer.

Resource rent is a well established concept in economic literature. In simple terms it represents the difference between the price at which an output from a resource can be sold and its production costs. In an open market, competition between companies will lead to this rent being enjoyed by the consumer. But if a company has access to a certain resource, such as a natural resource at a lower price than its competitors, the rent can be sustained for the benefit of the company in question.

This report is based on LV's investment plan, which is founded on the assumption that, in addition to increasing energy production, LV will be able to extract higher resource rent and thus pay higher dividends to the Icelandic state. Chapter 7 presented an estimate of the economic effects these dividends would have. It is an established fact that the cost of energy production in Iceland is generally lower than in the rest of Europe, but at the same time, the distance from the European energy market results in lower energy prices in Iceland. How big the economic rent actually is therefore open to debate. Regardless of this debate, LV has been entrusted with important resources and it is clear that the rent stemming from them is of great economic significance for Iceland. The debate in Iceland about energy production and natural resources should concentrate on this crucial point, if the aim is to improve the economic prosperity of Iceland. It is therefore vital to ensure that LV is as profitable as possible. That being said, it is also important to ensure that the local communities, within whose boundaries the energy is to be found, enjoy their fair share of the rent, regardless of the energy being used within that specific community, and whether it is sold to and used in another municipality or even sold to another country.

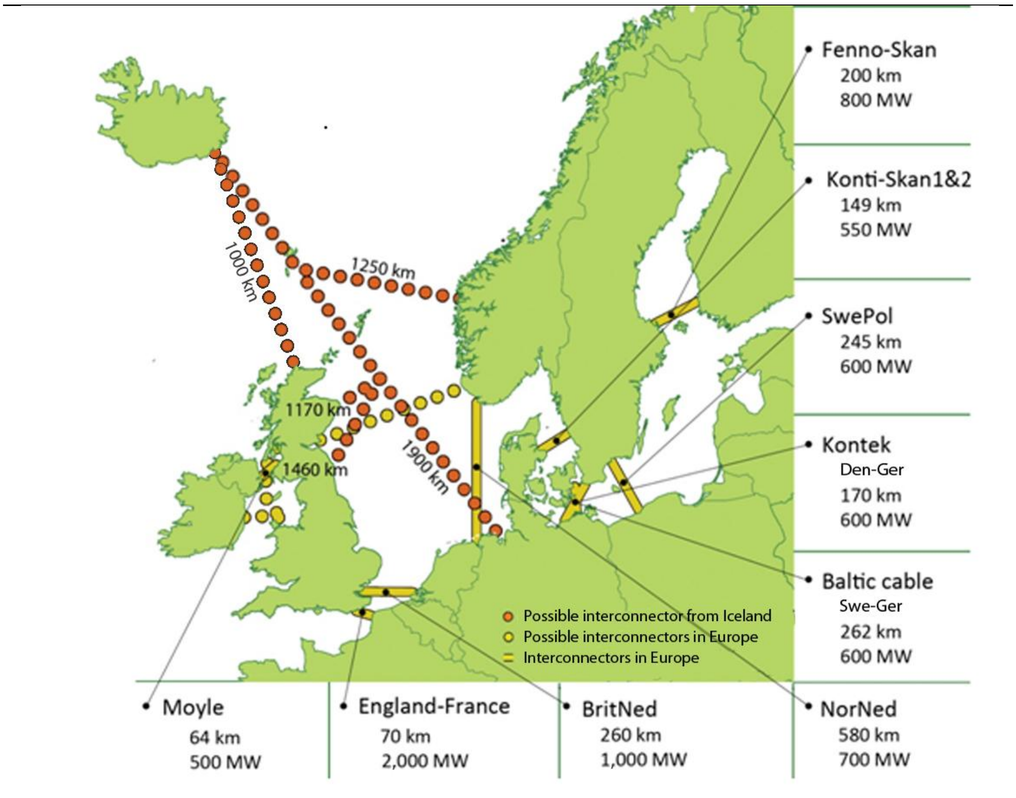
[33] Páll Harðarsson, Fjármálatíðindi apríl 1998 and Ásgeir Jónsson et. Al. Mat á arðsemi orkusölu til stóriðju; Fyrsta áfangaskýrsla. Written by Sjónarrönd ehf. for Ministry of Finance May 2009.

SUBMARINE INTERCONNECTOR BETWEEN ICELAND AND EUROPE

The idea that a high voltage submarine interconnector between Iceland and Europe is economically feasible might at first sound a bit far fetched, due to the vast distances. The technology for such an undertaking has been available for quite some time, but laying a cable and building the necessary facilities at shore is a very expensive undertaking. But now, due to the much higher prices in European energy markets in recent years and rapid developments in cable design, feasibility studies indicate that a cable from Iceland to Europe has become a possibility worth investigating, if LV wants to maximise the return from Iceland's energy resources.[34]

The motives for connecting different markets with long distance cables are many. Some areas are blessed with an abundance of cheap energy, while others are cursed with limited and expensive options. The rationale of a cable is to link such areas, making trade in energy possible. But there are important benefits to be tapped from connecting many different areas into a single market. Greater security in energy delivery enhances the ability to better mitigate local shocks or malfunctions in a single energy plant, and peaks in energy consumption can be better handled through interconnection of energy markets.[35]

Graph 39: Submarine interconnectors in Northern Europe



Source: Information from producers web pages, summary by GAMMA

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[34] Landsvirkjun Annual Report 2010.

[35] The Guardian: BritNed power cable boosts hopes for European supergrid, April 2011. http://www.guardian.co.uk/environment/2011/apr/11/uk-netherlands-power-cable-britned

There has been increased activity in submarine cable construction around the world and great leaps have been made in developing cables and the powerful transformers that are needed to change alternating current (AC) into high power direct current (DC) and vice versa. Many such cables are already in place worldwide, and many are in the waters around the UK and Scandinavia, as can be seen in Graph 39. None of the existing cables compares in length to the possible Iceland/Europe cable. One of the first cable laid was in 1960 and connected the UK and France. It was replaced in 1986 with a new 2,000 MW cable. But the 580 km long and 700MW NorNed cable, built between 2005 and 2008, connecting Norway and the Netherlands, is the longest one. The new BritNed is an example of the strong growth there has been in cable activity. This cable became operational in April 2011 and stretches 270 km between the Netherlands and the UK, carrying 1,000MW. Moreover, recently a new cable project was announced, connecting Norway and Germany with a 570 km long cable, carrying 1,400MW.

IMPACT OF SUBMARINE INTERCONNECTOR ON LANDSVIRKJUN

This report does not offer any analysis of the potential profitability of laying a cable between Iceland and Europe. LV has carried out such an analysis and reached the conclusion that an undertaking of this kind is could be a profitable one, creating possibilities for LV to sell renewable hydro- and geothermal energy to Europe. Further studies into this venture are being conducted by LV.[36]

Estimating the profitability and feasibility of an interconnector, many different scenarios are possible, based on, among other things, where it will lay on the seabed, where it comes ashore, its capacity, funding etc. There are a number of places that are possible as final destination for the cable, Norway (around 1,250 km), to the UK, the Netherlands or Germany (between 1,000 to 1,900 km). In terms of carrying capacity, the likely range is 600MW to 1,000MW but might be even larger for an option of continued interconnector to Greenland where hydro power options are potentially ripe. In comparison the power from Icelandic power plants in 2009 was equivalent to almost 2,600MW[37] and LV's investment plan to 2021 aims at increasing LV's power production from 1,860MW to around 3,000MW. Assuming other energy companies in Iceland will comparably increase their production, the total power produced would be around 4,000MW. Therefore energy transferred through an interconnector to Europe could account for around 15 to 25% of the total power produced in Iceland.

As mentioned above, there are many possible scenarios regarding the interconnector's ownership, financing and setup of the several types of long term contracts in the energy market. For example, the ownership structure could be structured so that, as time evolves, ownership would gradually move to LV or the Icelandic state. It is worth noting that, due to the long amortization time of the interconnector, it is strictly not necessary to run it on full capacity from the start of operations. Total return for such an investment does not need to be very high, since a project of this kind fits nicely with the stated aims of, for example, development banks, who grant favourable terms to loans used to strengthen important infrastructure, whether it be in transport, communications or energy.

A submarine interconnector from Iceland to Europe would increase the efficiency of the Icelandic energy system. Due to the Icelandic market's isolation from rest of Europe, LV needs to maintain an energy surplus in the system in order to ensure secure delivery, thus creating a buffer to meet risks e.g. because of dry years, malfunctions in power plants and seasonal and intraday fluctuations in demand from the general market. Immediately after the interconnector becomes operational, power can flow both to and fro Iceland and consequently surplus energy can be sold. To model this, it is assumed that around 600GWh of surplus energy is sold without any new plants being built.

Following the connection of the Icelandic energy grid to mainland Europe, price differences between these two areas is likely to contract as the average price of LV rises. This, of course, applies to energy sold through the cable, but domestic energy sales will also be affected, since LV will enjoy a better bargaining position toward local energy buyers. How exactly the energy price will be effected and how different customer groups will absorb that effect remains to be seen, but here relatively modest

[36] Landsvirkjun Annual Report 2010.
[37] National Energy Authority.

assumptions were made about the development of LV's average price. It will still be in the interest of LV to provide energy to local large users, in addition to exporting energy through an interconnector, since the combination should reduce LV's risk. The Icelandic government can also intervene on how the interconnector affects Icelandic households. There are many more issues that have to be taken into account when trying to analyse the costs and benefits involved, such as what extra premium will be paid for green energy in the European market, etc.

When discussing energy export via submarine interconnector to Europe, in many cases the first reaction will be to assert that, by doing so, Iceland would be exporting raw material instead of developing it further by selling the energy to local industry. There is a kernel of truth in this statement, since it is in the interest of Iceland to maintain strong industry, at least up to a certain degree. Also it should be remembered that part of the economical benefit Iceland has enjoyed through energy sales to heavy industry is the fact that, through economies of scale, made possible by industrial buyers who commit to longer term contracts, the average price for general usage is considerably lower and energy transmission is more reliable. The relief from the annual Christmas power shortage, when every family home was cooking Christmas dinner at the same time, creating a power shortage, can be attributed to investment in power plants built to accommodate the requirements of heavy industry. Not only is there more secure transmission, it is also estimated that the energy bill an average family pays, in fixed prices, is 30% lower in 2008 than it was in 1997 and it is argued that this lower energy bill can be attributed to economics of scale, due to energy production for heavy industry.[38]

At the centre of this discussion is the fact that the price difference between Iceland and Europe can be so great that energy sales directly to Europe should lead to a considerable economic benefit for the Icelandic state. It is not only that LV will enjoy higher energy prices for the energy sold via the cable, but also the fact that LV's bargaining position becomes stronger due to the possibility of alternative buyers for LV's energy. In view of the distances to world energy markets and the cost of energy transmission to Europe, LV will likely continue to grant a rebate from a "European price". It is however important to remember that only small part of the energy produced will be exported via cable, the lion share will still be consumed in Iceland.

Dividends paid to the Icelandic state could be considerably higher, as shown in Scenario 3, if LV is not confined to the domestic market. If 15 to 25% of the energy is sold to international markets, the effects of industrial build-up on economic growth will be less than if all the energy were to be utilised in Iceland. Higher energy prices lead to similar economic benefits, as those of higher prices for exported fish. In the fishery industry, the first round effect is shared by fishermen, vessel owners and the financiers, but since LV is solely owned by the Icelandic state, the increased dividends will all go into the state coffers. As previously discussed, there are many options available on how best to use the new wealth for the benefit of Icelanders. This can, for example, be done by lowering taxes, paying off foreign and domestic debt, or creating a fund similar to the Norwegian Oil Fund (NOF). The Icelandic state could also use the dividends to finance investment in important infrastructure projects. As before, economic effects stemming from the dividends payments are calculated on the

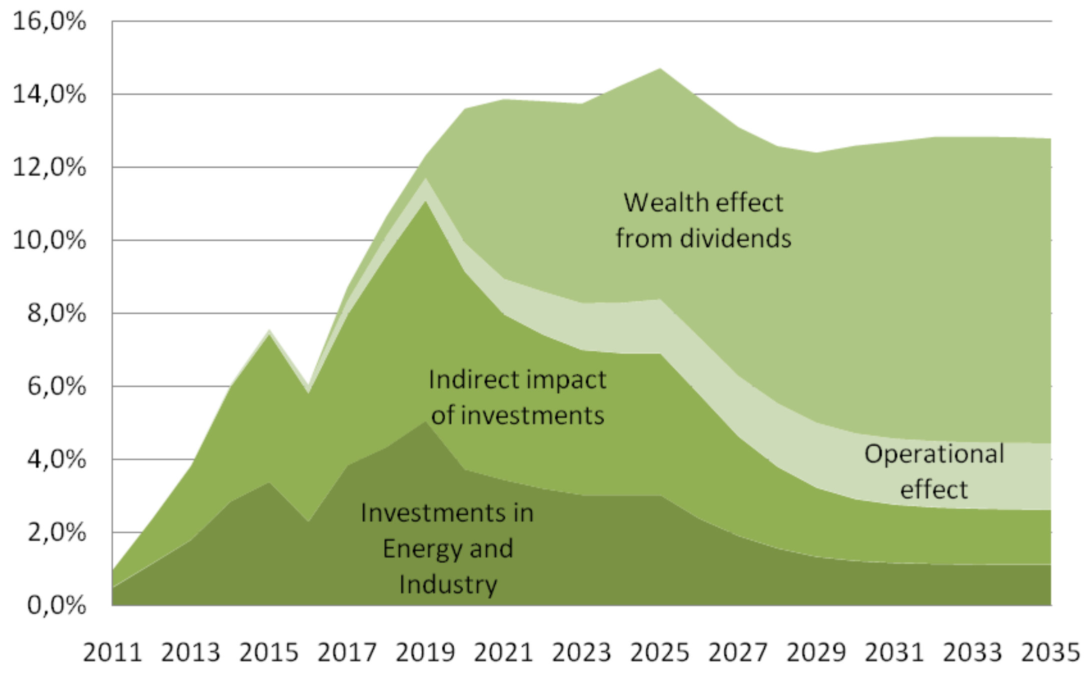
[38] Jóhannes Geir Sigurgeirsson: Energy prices in Iceland 1997-2008, August 2009.

assumption that the state will reinvest the money received and the effects from those investments are estimated using the same methodology applied when estimating investment in industry. In this case it can be expected that the state uses domestic resources more than industry, mainly due to the fact that salaries are, proportionally speaking, a more dominant cost factor in the case of the state than industry.

In Scenario 3 of this report, an attempt is made to estimate the effect of a 700MV submarine cable being ready for use in 2020, on LV's ability to pay dividends. It is assumed that the financing and operation of the cable will not be executed by LV, but it is clear that a submarine cable will influence LV in many ways. By nature it is a complicated matter to build a model that predicts future prices, but in doing so, use is made of internal predictions made by LV involving estimates about costs of transmission and a prediction of future energy prices made by a consultant company working for LV. Figures were verified among other things with a model which accounted for the repricing of existing contracts when they expire, likely result of negotiations and an estimate of interconnector transmission costs. As before the assumptions are numerous so there is significant uncertainty in the results.

Graph 40 demonstrates the effects from LV's dividends payments after a cable has been installed, alongside with investments in the Icelandic economy. Here one can see that the investment effects are smaller, due to energy being exported, but that they are more than offset by the accumulated effects from the dividends payments than when only the effects from the investments themselves are taken into account.

Graph 40: Aggregated impact on economic growth assuming interconnector



Source: GAMMA

But it is not only LV and the Icelandic state that would benefit from installing a submarine cable. All incentives for Icelandic energy producers will dramatically change when it becomes possible to sell energy at European prices. Higher wholesale prices increase the number of economically viable energy projects and therefore one can expect that the supply of energy will increase and profitability will rise. Shortly we will turn our attention to small energy plants and their feasibility, but it is abundantly clear that all Icelandic energy companies would benefit from gaining access to the European energy market and foreign exchange income would take a leap.

Taking a long-term view, one can expect energy prices in Iceland to gradually move towards prices in Europe. The energy bills for homes in Iceland would therefore rise. This does not have to be too severe; ways can be found for the state to return some of the economic gains back to the households, thus mitigating the loss in disposable income. Higher energy prices should also lead to a more economical and sensible usage of energy in Iceland, taking economic costs better into account. That in itself will leave more energy available for export.

SMALL ENERGY PLANTS

As stated above, LV will not be the only energy producer to enjoy economic benefits from a submarine interconnector, other energy companies will also reap benefits. Arguably all energy plants will increase their profitability. These may include small energy plants[39] that have more difficult time obtaining long-term sales contracts. Even though the transmission and sale of energy is dependent on licences and official surveillance, there are relatively low barriers for entry into energy production.

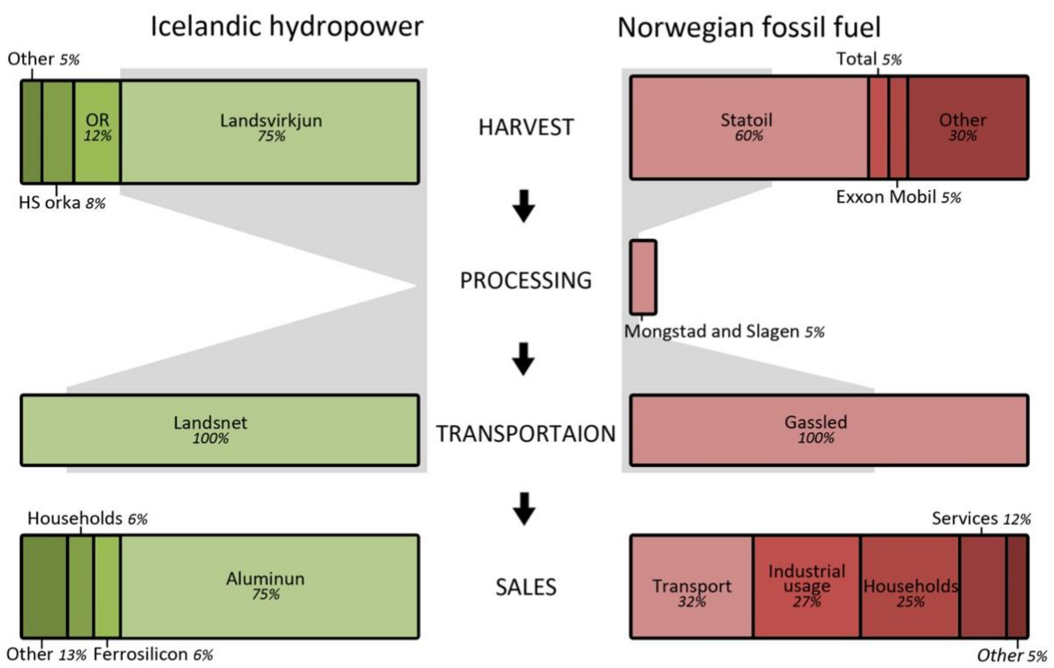
Many small energy plants have been built in Iceland; they now number around 250 and are widely distributed around the country.[40] Not all of them are connected to Landsnet (the main grid operator) but produce for local or own use. Nevertheless, all plants in with power capacity in excess of 7MW are obliged to connect to the grid according to Landsnet.[41] Total energy production by plants smaller than 10MW was in 2008 around 800 GWh per year, amounting to around 7% of the total hydro power produced. Most likely production can be enhanced by new plants and by upgrading existing ones. It is believed that maximum production by small plants will be around 1,500 GWh per year inferring that only 60% has been harvested. Thus, the ratio of small plants to bigger plants could remain at 7% over the next 10 to 15 years. In Europe, 85% of profitable small plant options have already been utilised.[42]

[39] Small power plant is here defined as less than 10MW in line with EU definition.
[40] Orkuþing 2006 and National Energy Authority May 2011, *www.os.is.*
[41] Landsnet May 2011, www.landsnet.is
[42] Orkuþingsbók 2006 (calculations GAMMA, estimated to 2011).

COMPARISONS WITH NORWAY'S FOSSIL ENERGY RESOURCES.

Here we try in a rather informal way to compare Iceland and Norway's main energy resources in order to shed some new light on the utilisation of hydropower. Extraction of fossil fuel in Norway contributes around 25% to Norway's GDP and 1.6% of the workforce is employed by companies in this industry.[43] Comparable statistics for Iceland, combining energy production and heavy industry, are respectively 7% and 0.9%. In both cases the resources go through similar value added chains, generally looked upon as supply chains. Both these resources have to be utilized, moved at great expense to the market and then sold. Energy in Iceland is ready to use immediately after being harnessed. Fossil fuel, on the other hand, be that oil or gas, requires further refinement in order to be usable and only 5% of fossil fuel exported from Norway is refined domestically.[44] Even though this quantity more than suffices for domestic use, most of the refined oil is exported. The oil industry is mainly shared by two areas, i.e. Mongstad and Slagen. Statoil owns 80% in Mongstad, which is responsible for 70% of the production. Through its share in Stadoil, the Norwegian state owns 35% of the production. Graph 41 shows the shape of the two supply chains.

Graph 41: Supply chain for Icelandic hydropower and Norwegian fossil fuel (grey is state owned)



Source: GAMMA

[43] Statistics Norway May 2011, www.ssb.no
[44] *The European Gas and Oil Market: The Role of Norway.* 2008. Editor Florentina Harbo. The Institut Francais des Relations Internationales, París.

In Norway, around 40 companies are drilling for oil and gas, Statoil (which the Norwegian state holds a 63% stake in) being the biggest. Statoil has a market share of around 60%, with Total and Exxon Mobil following at a distance, each with 5%. In Iceland, four companies control around 98% of all power plants and, as previously mentioned, LV holds the lion share of 75%.

Norway produces the equivalent of 4.4 million barrels of oil per day.[45] Barrel Equivalent (BE) is a useful unit of measurement to compare oil and gas on a equivalent energy basis. In the case of Norway, oil is 69% of the BE, gas being 31%. Over the coming years it is believed that oil production will be reduced, since 60% of the oil that can be used has already been extracted. Supporting this argument is the fact that Norwegian oil production has not increased since 1995. A different future lies in store for the production of Norwegian gas, which is predicted to increase until it matches oil in terms of BE. This estimate is highly uncertain, though, due to, for example, global fossil gas prices. Rising prices will lead to more wells becoming economically feasible.[46]

Norway's gas wells are all located off the west cost of Norway, but a small proportion is sent ashore. Most of Norway's fossil fuel is sold to Europe, i.e. 80% of the oil and almost all the gas. In the North sea, between Norway and the UK, there is a network of gas and oil pipes that link the UK, France, Belgium, Germany and Norway to the resources.[47] In continental Europe there are harbours that can forward the fuel through the vast network of pipes that stretch throughout Europe or pump it into specially equipped ships for further transportation. Most of the pipes connecting the oil wells in Norway are owned by Gassled, a company owned 64% by the Norwegian state. The combined pipe system is 7,800 km long, which is greater than the distance between Akureyri in Iceland and Santiago, the capital of Chile. Since the pipe system is an example of a natural monopoly, control has been handed over to Gassco, an independent company.[48] This arrangement enhances the whole supply chain. In Iceland the energy grid is controlled by Landsnet, a company which the Icelandic state holds a 67% stake in. Three fourths of the energy in Iceland is transmitted to a handful of industrial areas, dispersed around the country. Now, however, the Icelandic energy production industry is faced with the prospect of exporting energy to Europe. A submarine cable would serve the same purpose as the Norwegian pipe system; to connect the resource with the European energy market.

It is a widely held view that nations should enjoy rent from their own resources and both Icelanders and Norwegians are of that opinion. In Norway two methods are used to fulfil this aim: direct ownership and resource tax. It is obvious that if the state is the sole owner, then the rent goes to the state. But there are strong arguments against such direct ownership. Under such an ownership structure, the state is exposed to the risk of losses. Moreover, state run enterprises are in the danger of being badly run, one issue being that political interests often prevail over business interests. It is difficult to implement resource tax, one problem being how to distinguish between real profits and

[45] U.S. Energy Information May 2011, *Conversion Factors*, www.eia.gov/oiaf/archive/aeo01/pdf/apph.pdf
[46] *The European Gas and Oil Market: The Role of Norway.* 2008. Ritstjóri Florentina Harbo. The Institut Francais des Relations Internationales, París.
[47] Information from the Goverment and the Ministries in Norway maí 2011, Pipelines and land facilities, www.regjeringen.no/upload/kilde/oed/bro/2002/0006/ddd/pdfv/152181-facts_17.pdf
[48] Gassco maí 2011, www.gassco.no

accounting profits. The Norwegian state, for example, charges an additional tax of 50% on oil drilling companies, but allows for some sort of uplift, which is supposed to draw the line between real and accounting profits.[49]

Purpose and aim

It is a well known fact that countries often suffer from the so-called resource curse. This paradox is that countries or regions that have access to natural resources often experience lower economic growth and are poorer than their neighbours. A classic example of this is from 1959 when Holland discovered gas wells.[50] This apparent blessing soon turned out to be an economic curse, since the exchange rate grew stronger, causing the export industry to suffer. Furthermore, due to increased demand for labour, salaries increased, as did prices for goods and services, cumulating in inflation. Thus by being price takers in the international market and having stronger exchange rates means that other export sectors became less competitive. These events gave rise to the name Dutch disease, as a synonym for this phenomenon.

It is useful to look to Norway to find examples of how to combat the Dutch disease. The solution is simply to keep the revenues from resource in question outside the economy and make sure that they do not affect the exchange rate. In Norway this is done by channelling all the revenues from the oil and gas sales into a foreign exchange fund. Examples of this can be found in other countries. This fund mitigates risk by investing in various assets and currencies, everything except domestic assets and domestic currency. This strategy is especially useful in the case of non-renewable resources. When the resource has been fully utilised, the fund slowly starts to be dissolved, channelling wealth back into the economy. Again, since the fund is kept in foreign currency, it will not affect the exchange rate.

It can be said that the Norwegian Government Pension Fund Global is a well executed attempt by Norway to utilise its fossil energy resources as well as possible. This structure required some trial and error before emerging. Norway's oil affair started in 1971, but one year before a system had been put in place mapping out how the resource should be utilised. The core principle was that the oil was collectively owned by the Norwegian people and that the rent should therefore go to them. Based on this principle , a state company was created, making sure that even though foreign companies were involved in the exploitation, Norway would get its fair share. In the wake of this, strong economic growth followed in Norway, since oil prices grew steadily, but on the other hand crowd out effects from the oil industry caused other export sectors to suffer badly.[51]

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[49] Information from the Government and the Ministries in Norway maí 2011, www.regjeringen.no/en/dep/fin/Selected-topics/taxes-and-duties/bedriftsbeskatning/Taxation-of-petroleum-activities.html?id=417318

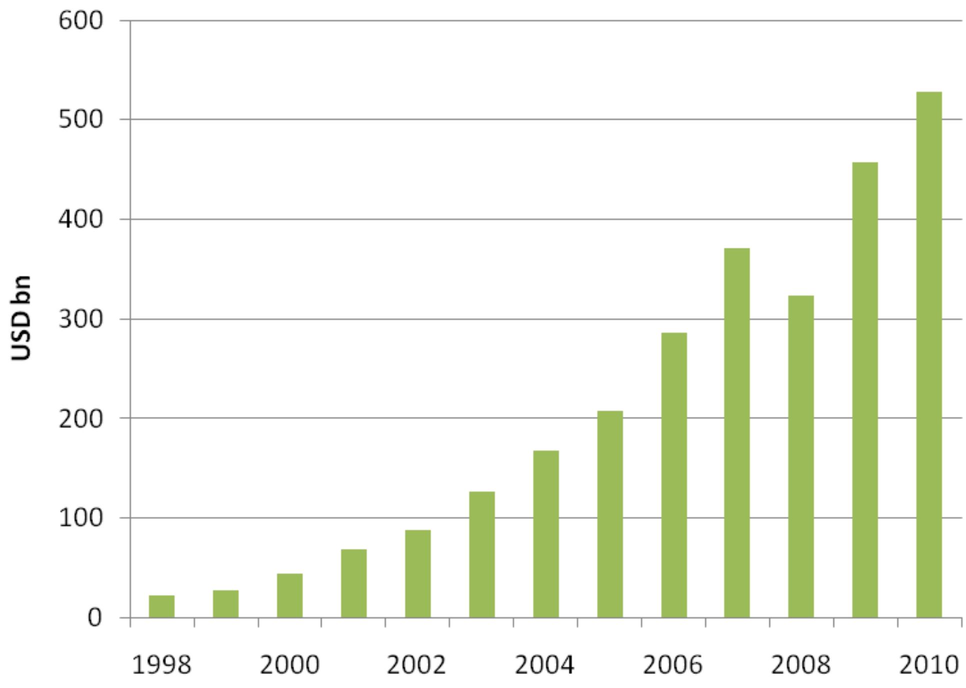
[50] The Dutch Disease. Gylfi Zoega, Marta Skúladóttir og Tryggvi Þór Herbertsson. Fjármálatíðindi, 47. árg. 2000. http://www.sedlabanki.is/uploads/files/ft00_23-37.pdf

[51]Economic History Association, *The Econmic History of Norway,* http://eh.net/encyclopedia/article/grytten.norway

It was not until 1990, after an adverse shock caused by falling oil prices and problems in Norway's export industry, that the oil fund emerged in its current shape and form. Since then the proceeds from the oil industry have been kept out of the Norwegian economy, thus managing to avoid overheating the economy or adversely affecting the exchange rate. Great variations in economic growth could be traced back to governments using the fund to create expansion. In order to prevent such behaviour it was decided that the Norwegian Central Bank would run the fund on behalf of the Ministry of Finance. The fund is owned by the Norwegian state and if there is a budget deficit, then revenues from the fund are used to fill the gap. For this reason, five years passed before the fund was established until oil revenues started to pour in. In 2006 the fund changed its name into Government Pension Fund Global, thus underlining the task of the fund to meet the future obligations caused by changes in age demographics. Despite its name, the fund has no formal role with in the Norwegian pension system and no political decisions have been made regarding how to spend the money in the fund.[52]

Assets held by the fund are mainly shares in foreign companies and bonds, but recently the fund has started to invest in foreign real estate. Graph 42 shows the size of the fund, which is now $560billion and the fund currently holds 1% of all listed shares in the world.[53] If the fund were to be dissolved, each individual in Norway would get paid around $113,000. One should bear in mind that these results are obtained by years of savings, built up both from resource taxes and dividends from direct investments made by the Norwegian state, as well as compound interest.

Graph 42: Size of Norwegian Government Pension Fund Global



Source: Annual Reports of Norwegian Government Pension Fund Global

[52] Norges Bank Investment Management, http://www.nbim.no/
[53] Annual Reports of Norwegian Government Pension Fund Global

Initially income from the oil industry was meagre. Between 1996 and 2000, it amounted to an average of $2,000 per capita. Since then, income from the oil industry channelled into the fund has increased, due to greater fiscal leniency from the Norwegian state.[54] At the same time, oil production in Norway peaked at the start of this century, having now diminished back to the 1996-2000 levels.[55] Between 2000 and 2010, the average income per capita from the oil industry was $7,300 (brought forward to 2010). Graph 43 shows the breakdown between income from the oil industry and income from interest for the Norwegian Oil Fund.

Graph 43: Payments into the fund and investment return

Source: Annual Reports of Norwegian Government Pension Fund Global, GAMMA

Possible Icelandic Energy Fund

It is interesting to compare the dividends Norwegians enjoy from their oil and gas production to the possible dividends Icelanders could enjoy from utilising their energy resources. It is noteworthy that both nations started to harvest their resources at a similar point in time. LV was founded in 1965 and had already quadrupled its production in 1969 after building the Burfells station. Norwegians explored their potential oilfields in the sixties and started production in 1971. Since production costs were prohibitively high, it was only after OPEC forced oil prices up that extracting oil from the North Sea became profitable. Icelanders have not yet been able to generate rent from their energy resources, a fact explained by the isolation of the country from the European energy market. One

[54] Annual Reports of Norwegian Government Pension Fund Global

[55] *The European Gas and Oil Market: The Role of Norway.* 2008. Editor Florentina Harbo. The Institut Francais des Relations Internationales, París.

can also say that the “OPEC moment” for Iceland did not happen until after 2003 when energy shortages in Europe and the emphasis on green energy production caused energy prices to rise. There still exist a wide gap between energy prices in Iceland and Europe and the question will be to what extent will energy prices in Iceland reflect European prices in the next few years.

In this report some assumptions have been made regarding the convergence of Icelandic and European energy prices. According to Scenario 1, dividends from LV could peak in 2025 -2035 and payments to the Icelandic state could amount to between $2,400-2,800 per capita. A comparable number for Norway has been $7,300 per capita for the last decade. But in some respects Icelanders are in a better position the Norwegians, since theirs energy resources are renewable, whereas the Norwegian oil will sooner or later run out. This means that in the case of Iceland, all profits could be paid out immediately, compared to the Norwegian fund, which amasses its income into a fund and then only uses the dividends from the fund. An Icelandic energy fund, sensibly constructed, would therefore be a most welcomed addition to the strong pension fund system already in place.

IMPACT ON LANDSVIRKJUN´S FINANCIALS

LV is at a crossroads. The energy market has evolved towards higher prices and increased demand for green energy. LV, along with other energy companies in Iceland, enjoys the strategic advantage of having access to numerous energy projects that allow the energy companies to benefit from this important development. LV's investment plan would nearly double the company's power output and increase its revenue stream dramatically. Below key future financial and operational figures of LV are explored, given several important assumptions, and an estimate is formed of how much the increased activity would generate in terms of dividends and taxes to the Icelandic state.

It is important to note that, due to several factors, access to low cost debt financing is currently somewhat restricted. Even though LV has been able to auction several new issues and fund the Budarhalsvirkjun project in the last two years, it could very well prove difficult to fund an investment programme of this magnitude unless international capital markets and sentiment toward Iceland improves.[56] Alternatively LV could raise part of the funds by issuing new equity and concurrently lowering its leverage ratio. In the following analysis it is assumed that LV will succeed in raising required funds, using debt issuance, with a given risk premium. A more detailed account of this and other key premises can be found at the end of this chapter.

In order to assess the impact of the investment programme on LV's business and subsequently on the economy as whole, we present a scenario with LV's investment plan and two alternative scenarios that are used to estimate its economic significance.

Table 8: Overview of scenarios

Scenario	Investment Plan	Energy Price*
1.	LV's Investment Plan	Average wholesale prices increase to \$35/MWh. in 2020 and reach \$55/MWh. in 2030.
2.	No future investments	Average wholesale prices increase to \$30/MWh. in 2020 and reach \$45/MWh. in 2030. For comparison purposes, scenario 2b, with a fixed average wholesale price of \$25, is occasionally used.
3.	LV's Investment Plan with submarine interconnector to Europe	Average wholesale prices increase to \$40/MWh. in 2020 and reach \$60/MWh. in 2030. The cable option furthermore increases the yield due to sale of excess energy and reaps benefits from selling energy at peak hours.

Source: Landsvirkjun and GAMMA
** Prices are fixed at 2011 price levels and exclude cost of transmission.*

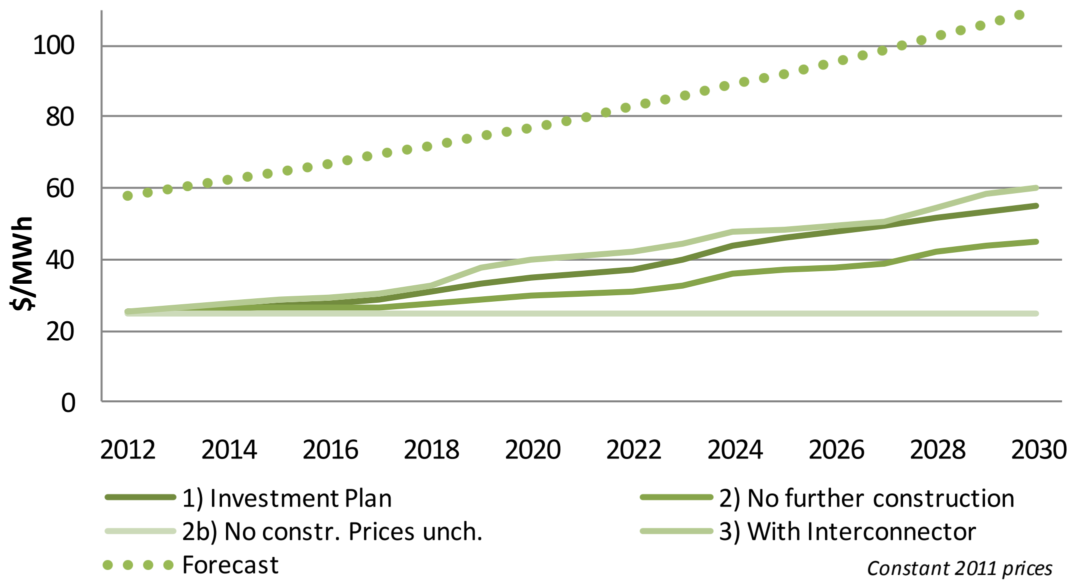
[56] Recent 5 year, \$1bn bond issuance by the Icelandic Government in June 2011 is likely to have further facilitated LV's access to international debt markets.

Scenario 1 is based on LV's investment plan, as proposed by LV and introduced in chapter 3. It is assumed that energy prices will increase in 2011 real terms, in line with projections by international research and energy consulting firms, discussed in more detail at the end of this chapter. It is recognized that the majority of energy contracts held by LV are long-term contracts and therefore a time lag is assumed when incorporating the anticipated rise in energy prices to LV's average wholesale price.[57]

In Scenario 2 it is assumed that there will be no further investments on behalf of LV. Increases in international energy prices will benefit LV through re-negotiations with its buyers on continued discounted basis as in the past. Scenario 2b, where energy prices remain fixed, is occasionally shown to draw attention to the importance for LV to seek higher prices when older contracts expire in line with energy price development abroad.

Scenario 3 assumes a changed investment plan, now including a submarine interconnector to Europe decided on in 2015.[58] Furthermore, higher energy prices are assumed, both due to energy sales via the interconnector and in view of the stronger bargaining position enjoyed by LV as well as due to the increased efficiency of the energy system.

Graph 44: Development of LV's average wholesale price according to different scenarios



Source: GAMMA, Landsvirkjun

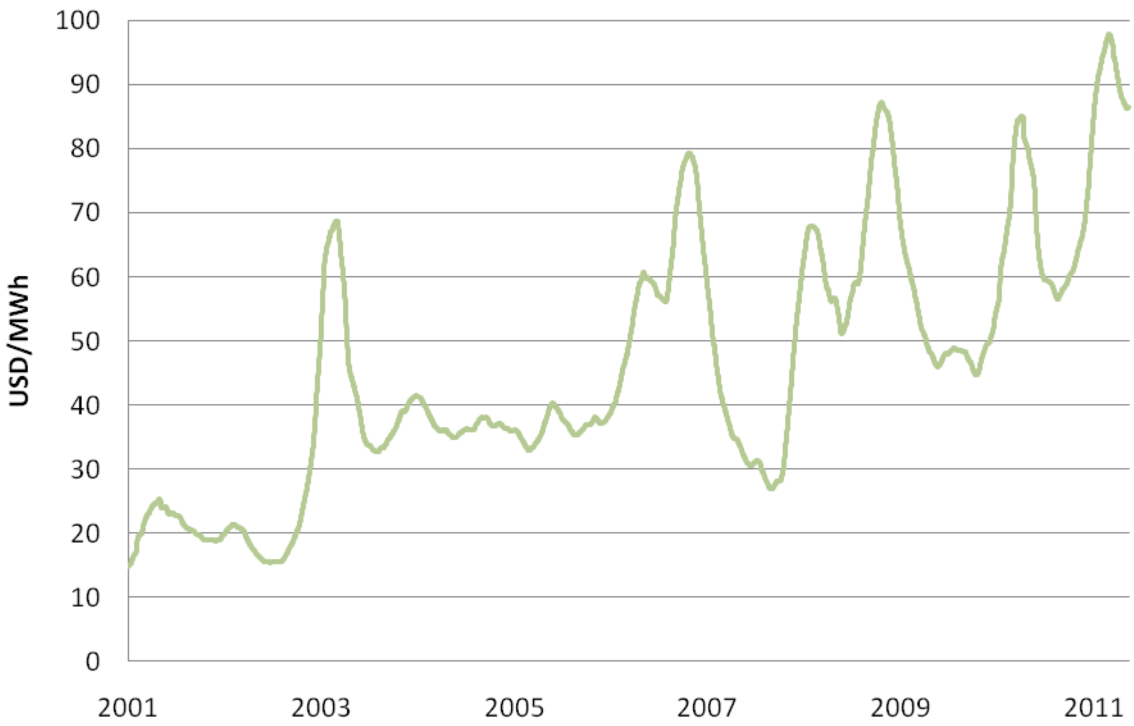
It is interesting to compare average energy prices in Scenarios 1 and 2 (with and without the investment plan) in Graph 44. Initially, the energy prices are not that different, but due to the sale of additional energy at higher prices in Scenario 1, the average prices start to diverge. In the long term,

[57] Information from Landsvirkjun and draft report "Orkustefna fyrir Ísland", January 2011
[58] According to information from Landsvirkjun.

energy prices in Scenario 2 will not reach prices in Scenario 1, since it is assumed that new investment will open up possibilities for LV to re-negotiate existing contracts, and new industries, capable of purchasing energy at higher prices, while existing customers might increase their activities and economies of scale.

The upward development of prices in the scenarios is mostly explained by the significant increases in spot electricity prices over the last decade and its eventual shift into the renegotiation of older long-term contracts. For example the prices on the Nord Pool market has about quadrupled in the last ten years.

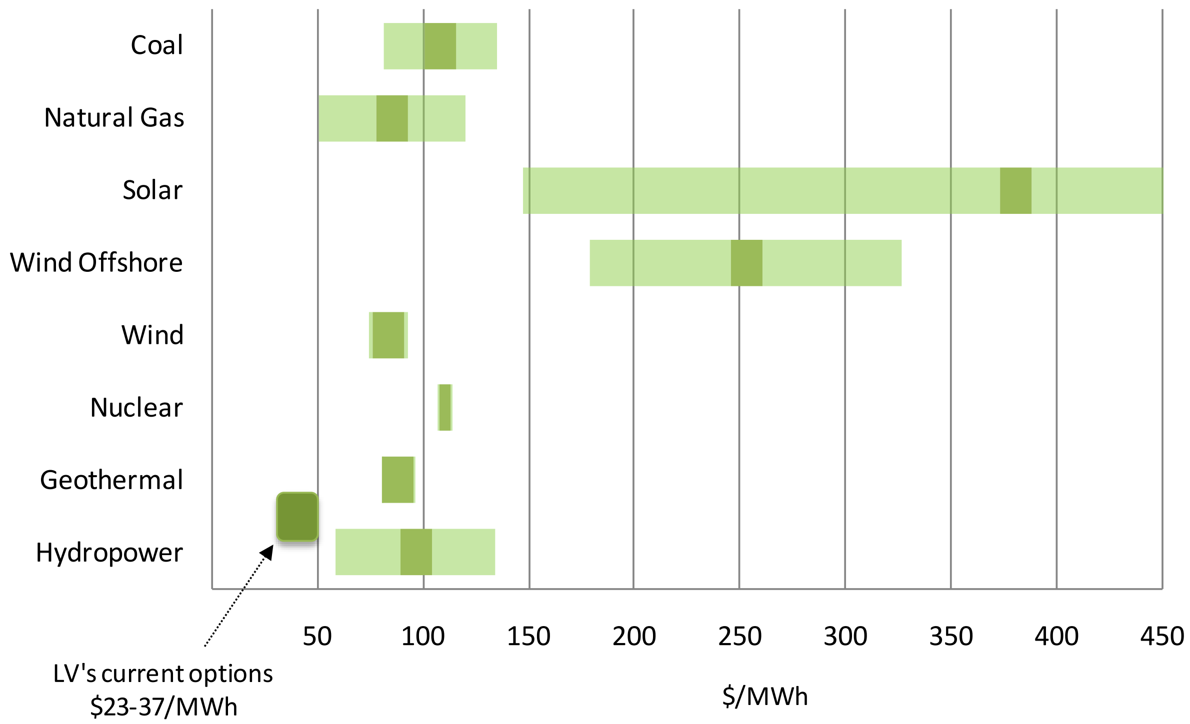
Graph 45: Price of electricity on Nord Pool (90 day average)



Source: Bloomberg, GAMMA

One of the reasons for the rise in electricity price is that the cost of new production has increased. The US Energy Information Administration (EIA), which collects information on energy related matters and assists the US Government in forming its energy policy, estimates that the average cost of new generation within the US creeping toward $100 per megawatt hour (levelized cost of new generation resources). Costs for new energy plants are presented in Graph 46. Due to how expensive it is to build and operate new plants it is unlikely that much downward pressure will be exerted on energy prices due to new construction. The levelized costs represents the present value of the total costs of building and operating the plant and includes construction costs, maintainance and operating costs, costs of fuel and adjusts for factors such as financing, utilization, time of construction and likely plant life. As can be expected the cost varies significantly by region/location of the plant. It should be noted that there remain less expensive production options, in particular in developing nations (and Iceland). Coal-, gas- and solar powered plants come in different configurations e.g. in respect to carbon control and sequestration which in large part explain their wide bands in the graph.

Graph 46: Estimated cost pr MW/h from new energy plants in USA 2016 (excluding transmission)

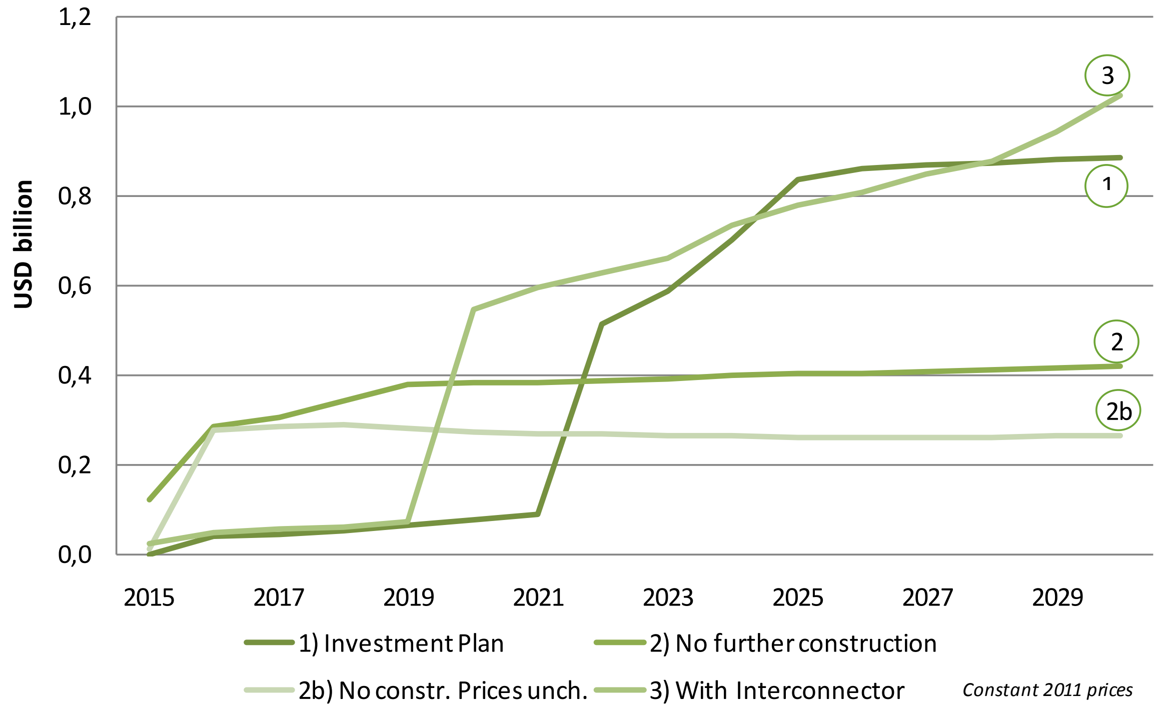


Source: EIA Annual Energy Outlook 2010, GAMMA

OVERVIEW OF FINDINGS – LANDSVIRKJUN IN 2030.

LV is on solid footing and even though recent investments in Fljotsdalur have called for a considerable increase in debt, its free cash flow and debt service capacity is strong. An important factor has been the development of aluminium prices, which have been rising after two depressed years (2009 and 2010). Higher aluminium prices contribute heavily to LV's bottom line, since roughly half of its revenues are linked to aluminium. Graph 47 shows that in all of the scenarios there is a significant increase in dividends and taxes paid by LV to the Icelandic state.

Graph 47: Dividends and tax payments by LV under different Scenarios



Source: GAMMA

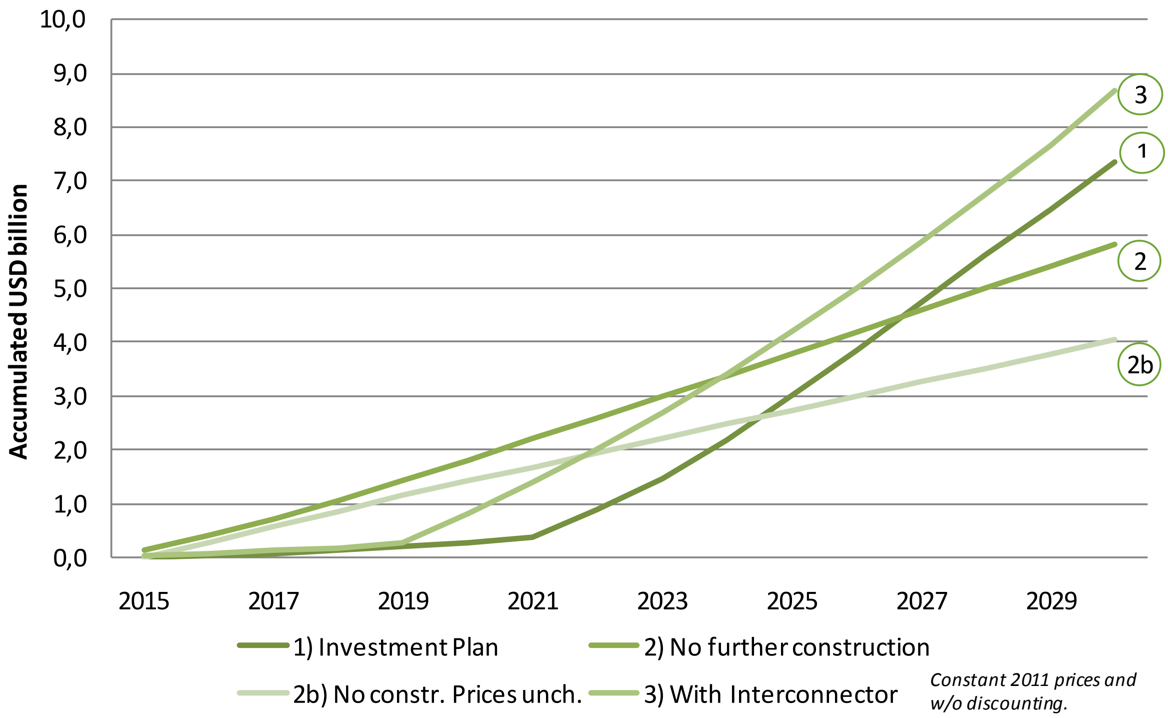
Assuming a sustained increase in electricity prices, as projected by industry experts, and assuming that LV re-negotiates its prices accordingly (with discounts) with industry users as contracts expire, the scope for increased dividend payments will increase. Scenario 1 shows that at the end of the investment period in 2021, dividends and tax payments will have increased substantially. Thus the investment plan would increase dividends in the long term, due to the higher prices LV would be able to extract from the additional energy. The investments would, however, push the payments back by approximately 5-7 years.

In the case of no new investment, i.e. Scenario 2, increased dividend payments will kick in earlier, but will be significantly lower in the future than in, for example, Scenario 1. Furthermore, in Scenario 2 there are no derived economic effects from investments in energy and related industry projects.

Assuming aluminium prices remain constant at their 2011 level in real terms and that interest rates develop in line with the LIBOR forward curve, LV will be able to pay down its debts relatively quickly. Assuming LV does not embark on further investments, as in Scenario 2b, the company should be able to start paying dividends at around 2015. Given the above assumptions, dividend payments under Scenario 2b would, however, be considerably lower than in other Scenarios.

Graph 48 shows accumulated dividends and tax payments in constant 2011 prices (non discounted). It is noteworthy that accrued dividends and tax payments to 2030 will differ to a degree of 3 to 5 billion US dollars, depending on which Scenario is chosen.

Graph 48: Accumulated dividends and tax payments according to different Scenarios

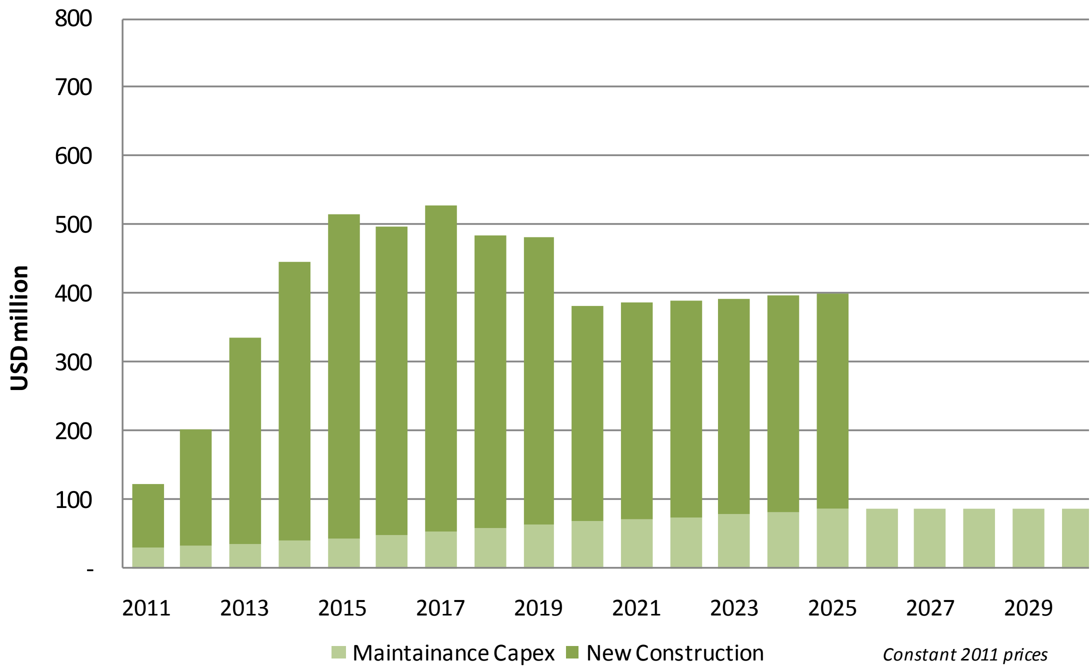


Source: GAMMA

Scenario 1

In Scenario 1 it is assumed that LV embarks on its investment plan and that investments will peak in 2017, when new investment will amount to $475m and maintenance capital expenditure to $50m. No additional investment has been modelled post 2025.

Graph 49: Investments (Scenario 1)

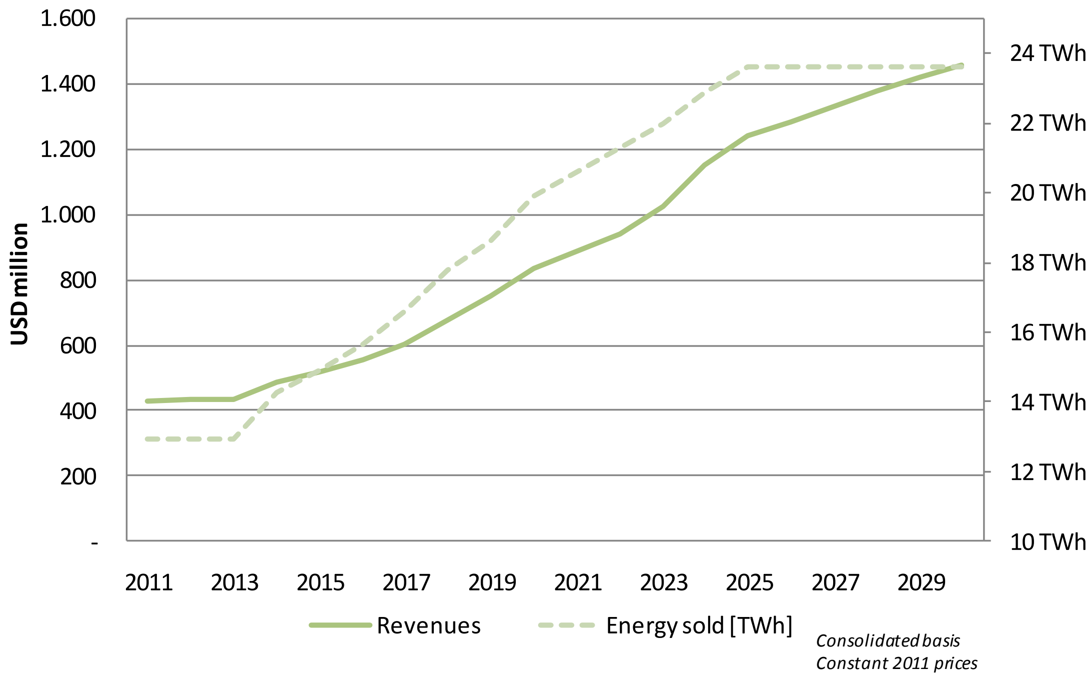


Source: Landsvirkjun og GAMMA

Graph 50 demonstrates how LV's investment plan will almost double its production capability in a decade. LV's revenues would be increased from $425m in 2011 (were $378m in 2010) to $1,250m in 2025 (in 2011 prices). In deriving this estimate for the revenue stream it is assumed that the wholesale price (excluding transmission costs) will increase from $25/MWh in 2011 to $35/MWh in 2020. Furthermore, it is assumed that the average wholesale price in 2030 will reach $55/MWh.

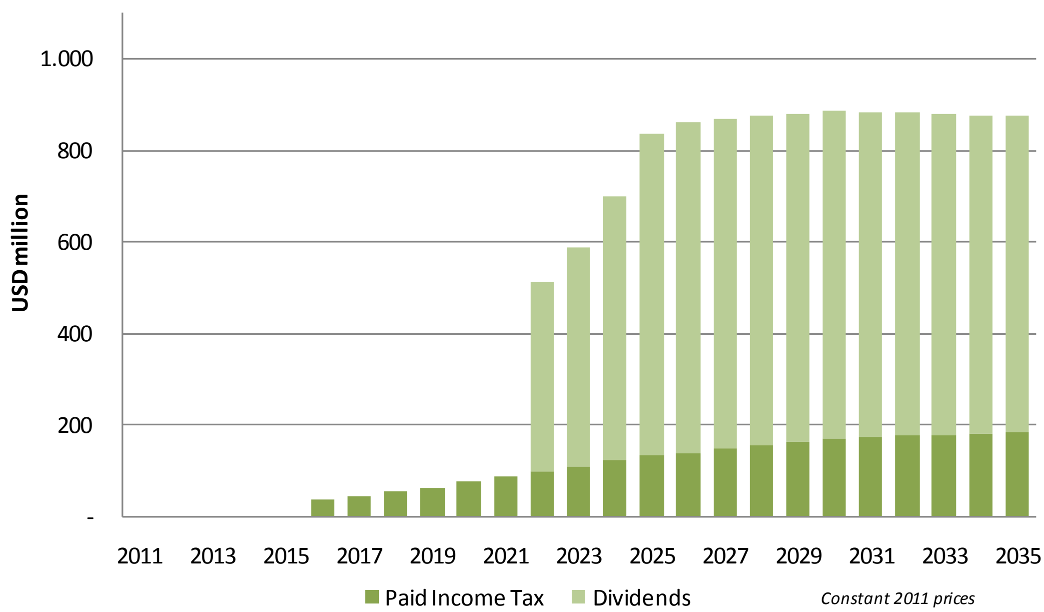
If the price of energy changes according to the above notions, LV will be able to pay considerable dividends. Assuming target leverage ratio of 4.0x (Net Debt / EBITDA) while maintaining an equity ratio above 30%, one can expect dividend payments to start in 2022 and that they will soon reach $700m per year in 2011 prices. Adding tax payments, the total contribution to the Icelandic Treasury can be expected to be close to $900m in the second part of the investment period. Due to LV's deferred tax asset it is unlikely the firm will pay significant income tax until 2016.

Graph 50: Forecasted revenues and average wholesale electricity price (Scenario 1)



Source: GAMMA

Graph 51: Dividends and tax payments (Scenario 1)



Source: GAMMA

It goes without saying that forecasts about possible dividend payments are sensitive to numerous assumptions about, for example, the development of energy and commodity prices, the size and scope of the investment plan, interest rate levels and interest rate margins. LV's ability to pay dividends should still be considerable, even under different interest rates and wholesale prices assumptions. Below is a sensitivity analysis on dividend payments in terms of lower/higher interest rates and average wholesale prices based on slightly stylized calculations.

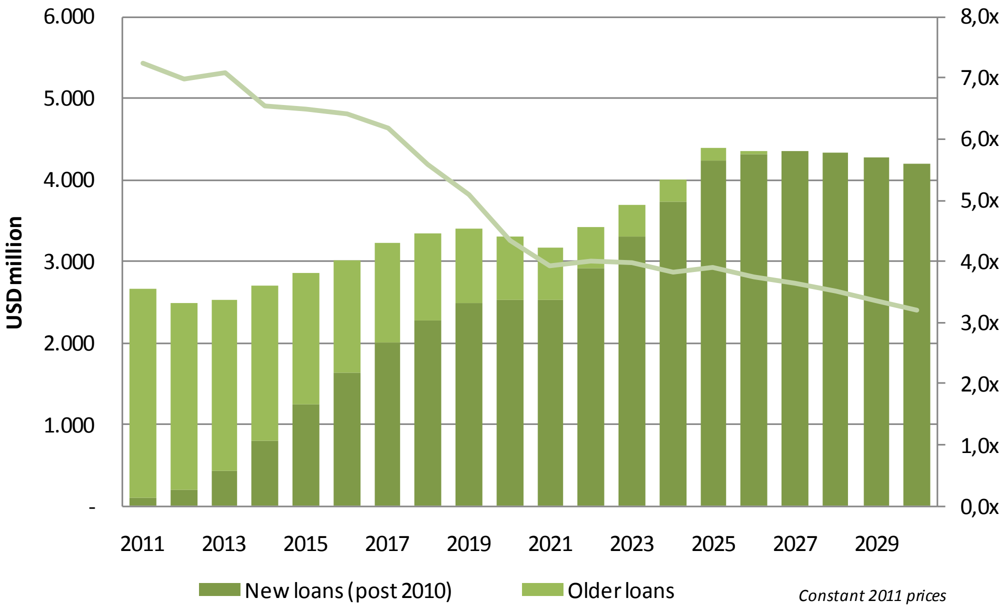
Graph 52: LV's dividend payments in 2025 - Sensitivity analysis

		Average wholesale price ($/MWh)				
				45,9		
		-$5,0	-$2,5	$0,0	+$2,5	+$5,0
	+2,0%	483	550	618	686	753
Average nominal	+1,0%	525	592	660	728	795
interest rate 6,7%	0,0%	567	634	702	770	837
	-1,0%	609	676	744	812	879
	-2,0%	651	718	786	854	921

Source: GAMMA

Without new equity the proposed investment plan will result in higher debt levels. As the new plants come online, however, the new investments will increase LV's capacity to service its debts. In the latter part of the period, the equity ratio is the main restrictive factor in dividend payments, since free cash flow is significantly more than sufficient to maintain a solid debt service ratio.

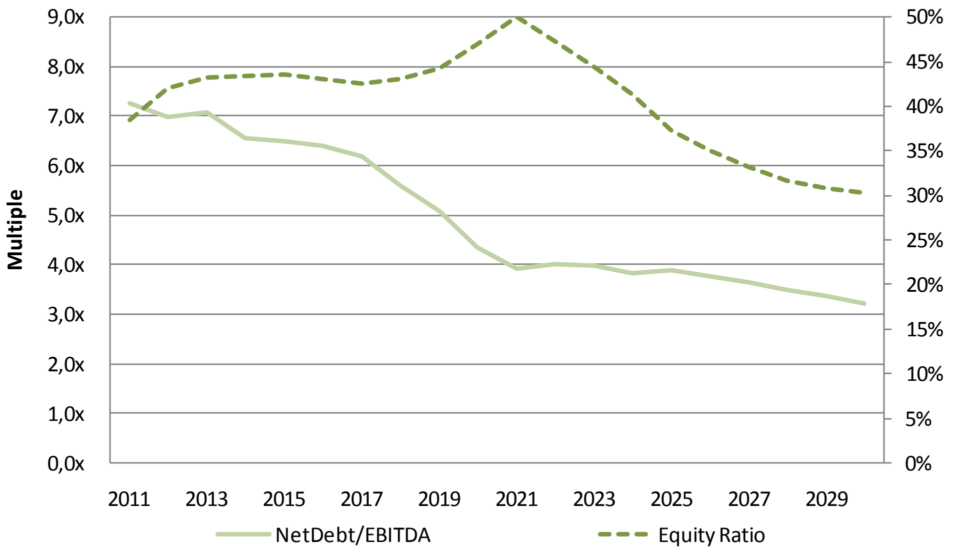
Graph 53: Forcasted interest bearing debt (Scenario 1)



Source: GAMMA

Graph 54 shows the development of equity and debt ratios under Scenario 1. The equity ratio rises and reaches approximately 50% before dividend payments start. From then on, dividends maintain a constant leverage ratio of 4.0x. Approaching the end of the modelling period, dividend payments will be constrained by a minimum 30% equity ratio.

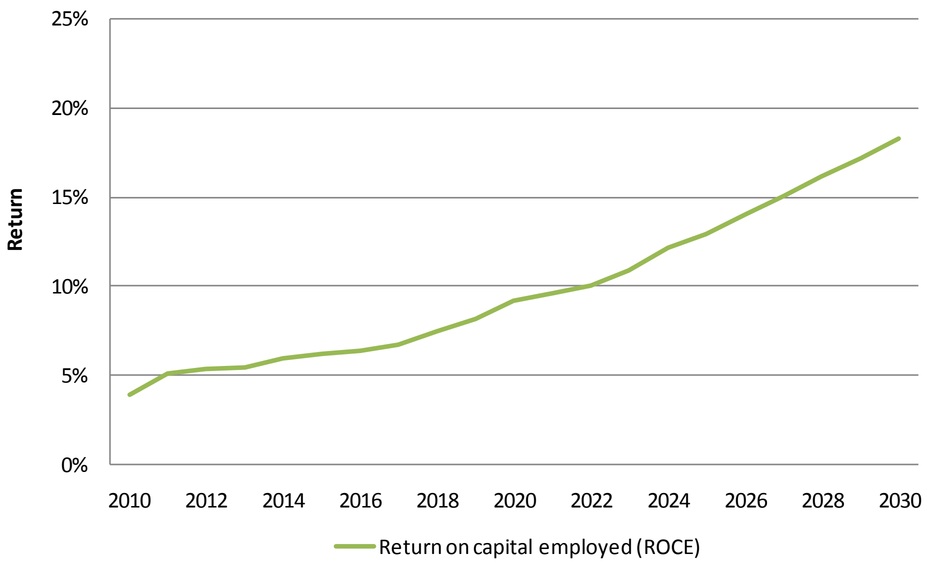
Graph 54: Debt ratios (Scenario 1)



Source: GAMMA

Several ratios are available to calculate the return on invested capital. Here a simple version of ROCE (return on capital employed) was chosen with the definition EBIT divided by total assets. Most agree that current return on employed capital is inadequate. As older contracts expire and average wholesale price increases, the return increases and should reach 10% in 2020 under Scenario 1.

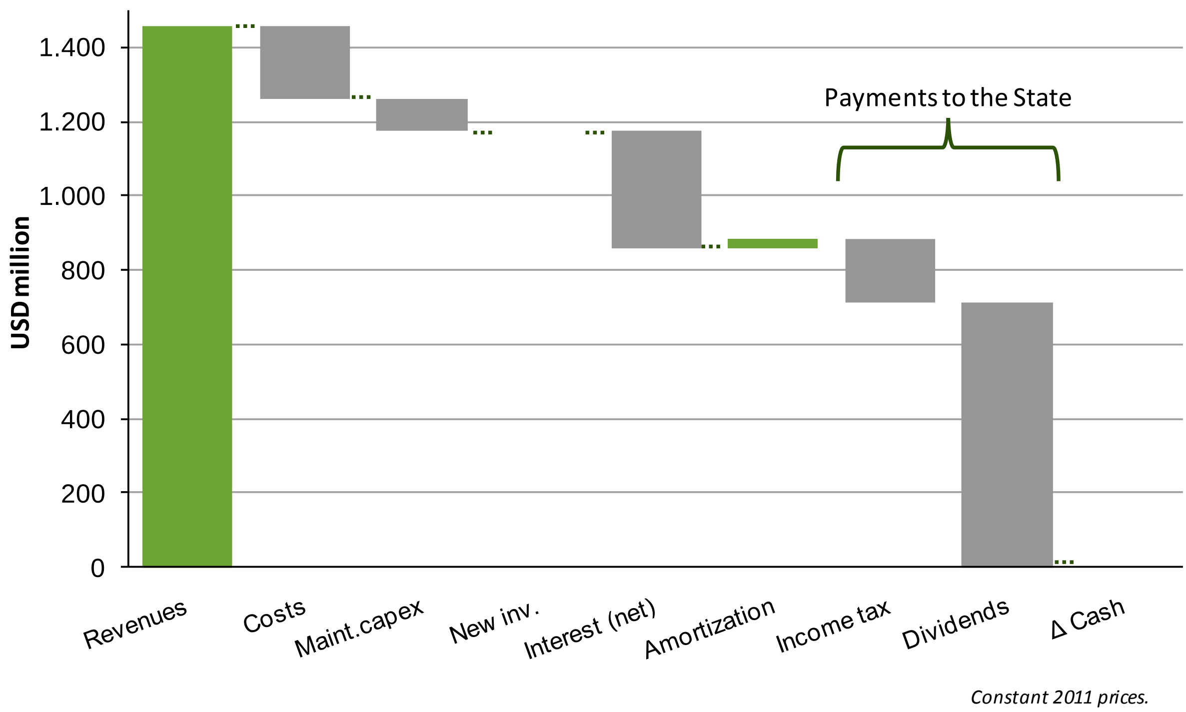
Graph 55: Return on capital employed (ROCE) (Scenario 1)



Source: GAMMA

Graph 56 explains the assumptions underpinning the forecasted dividend payments from LV by showing, at 2011 price levels, a bridge demonstrating the size of individual cash flow components affecting changes in cash over one year period in 2030. Based on Scenario 1, it is estimated that LV's revenues might exceed $1,400m per year in 2030. After an estimate of costs, maintenance capex, interest charges and close to zero changes in debt, the remainder, approximately $900, is available for tax and dividend payments to the Icelandic Treasury.

Graph 56: Changes in cash flow over the year 2030 and potential source of dividends (Scenario 1)

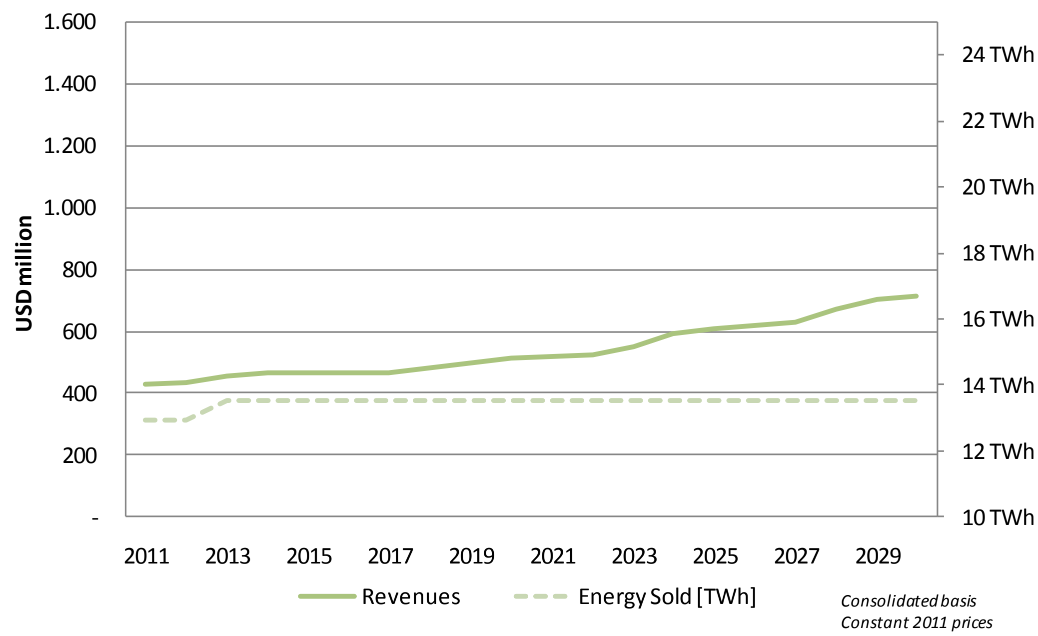


Source: GAMMA

Scenario 2

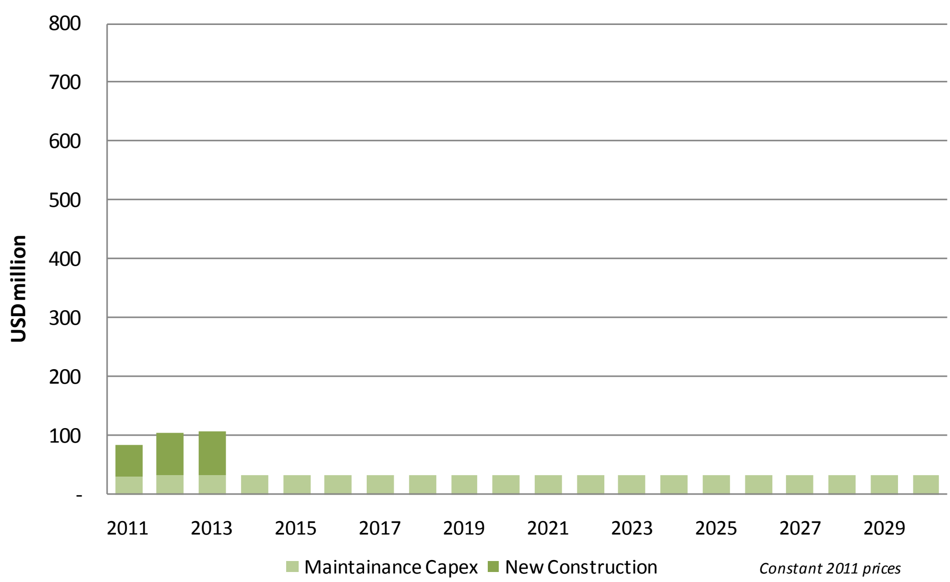
In Scenario 2 no new investments are planned and no additional energy sales are anticipated, except for those entailed in the Budarhals project. Only minimal investment is carried through and maintenance is consequently lower. It is assumed in Scenario 2 that the energy sold will amount to 13.5TWh per year. The wholesale price will rise as long-term contracts come up for renewal.

Graph 57: Revenue and energy sold (Scenario 2 – No new investments)



Source: Landsvirkjun og GAMMA

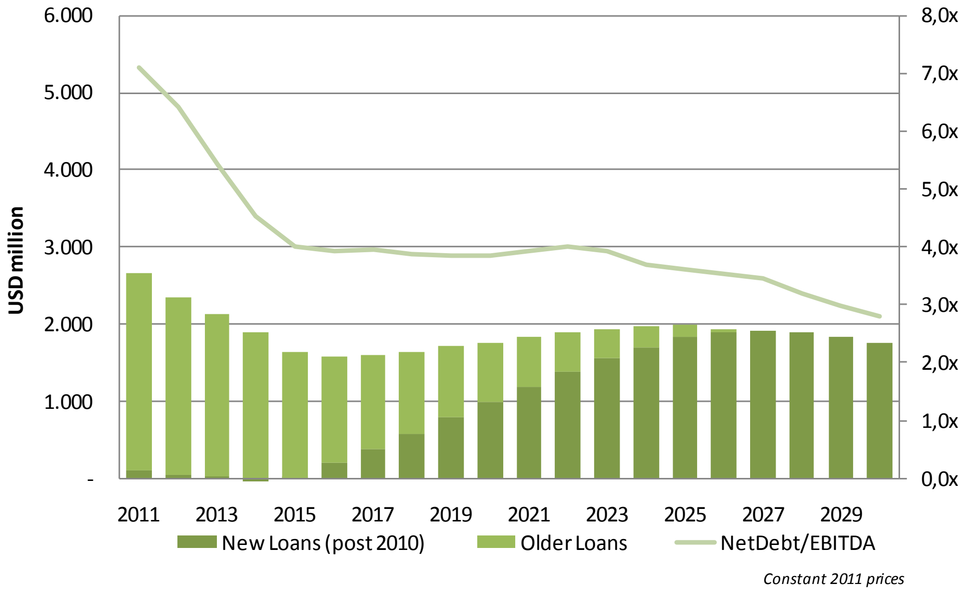
Graph 58: Investments (Scenario 2)



Source: Landsvirkjun og GAMMA

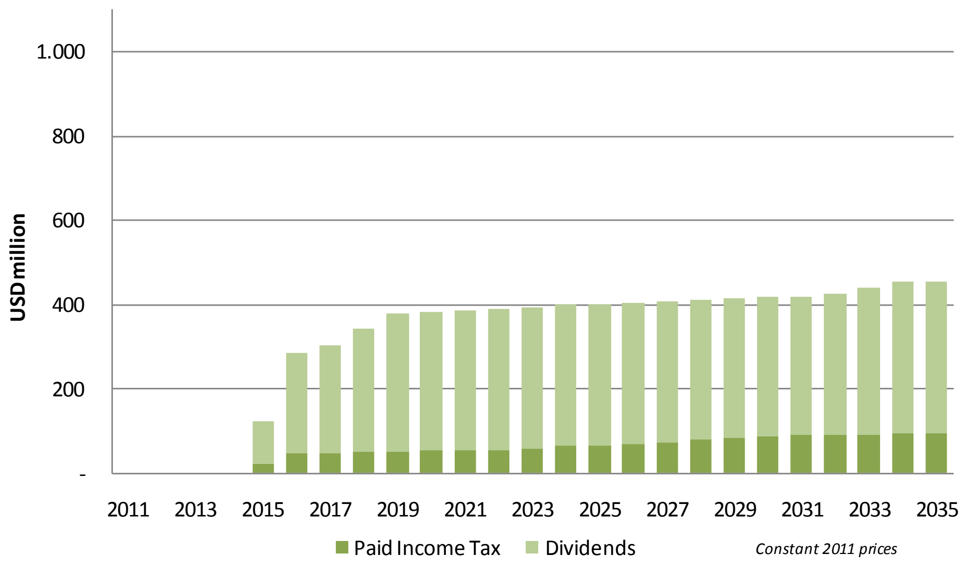
If it is decided not to invest further, as described in Scenario 2, debt will be repaid relatively quickly. It is assumed that dividend payments will start when the debt ratio ND/EBITDA reaches 4.0x, while after that the ratio will be maintained by dividend payments and new loans. Due to low investment, LV will quickly lower its debt ratios to comfortable levels. It will therefore be possible to pay dividends, although it will be on a smaller scale than would be possible under Scenario 1. Tax payments will also be considerably lower or around half of what is estimated in Scenario 1.

Graph 59: Forecasted change in interest bearing debt (Scenario 2)



Source: GAMMA

Graph 60: Development of dividend and tax payments (Scenario 2)

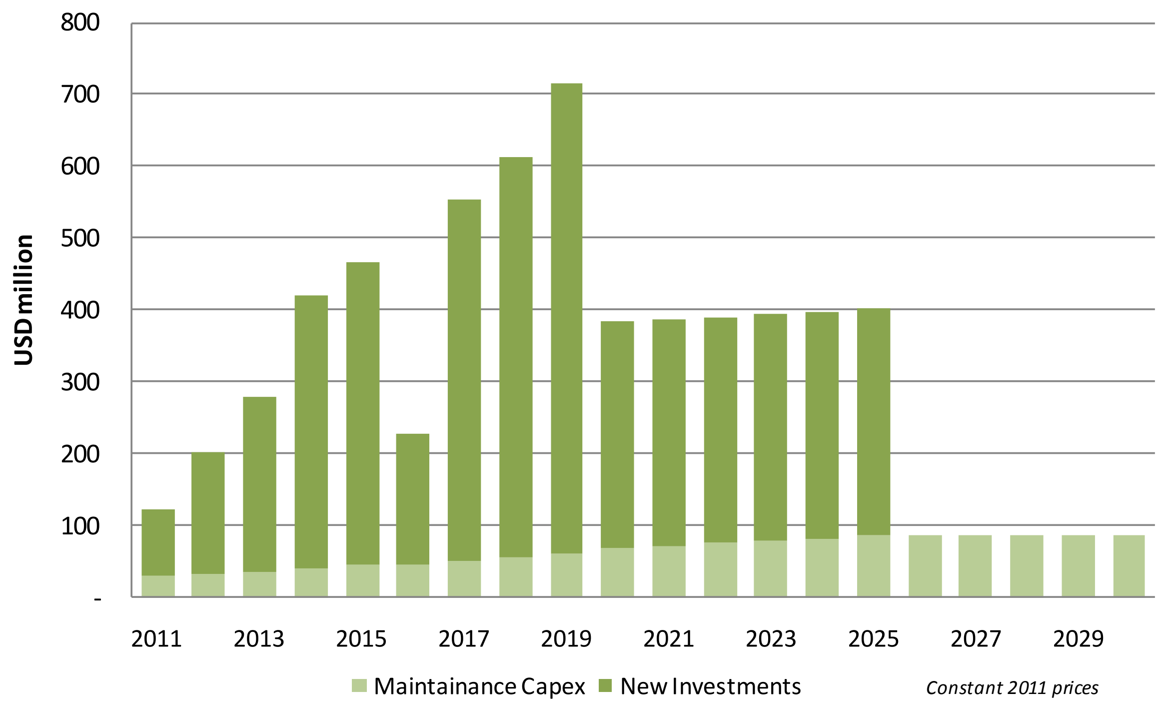


Source: GAMMA

Scenario 3

In Scenario 3 the investment plan accommodates possible sales through a submarine interconnector between Iceland and Europe in line with an investment plan under consideration by LV. Under Scenario 3 higher average prices can be expected. On one hand, this will be because of sales through the interconnector and, on the other, because of the stronger bargaining position the cable will create. Therefore, it is assumed that the average wholesale price will have risen to \$40/MWh in 2020, ending at \$60/MWh in 2030.

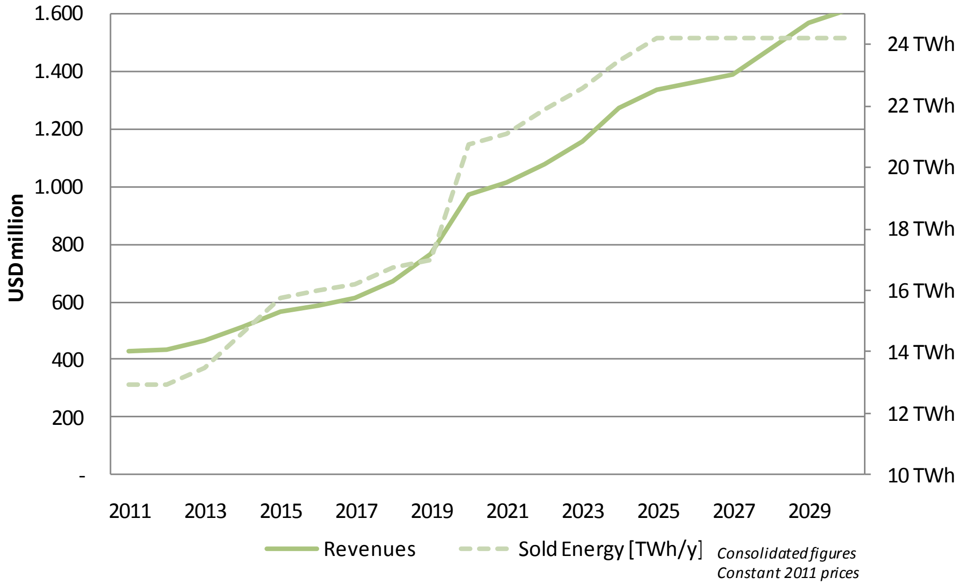
Graph 61: More irregular investment plan in line with interconnector launch date (Scenario 3)



Source: GAMMA

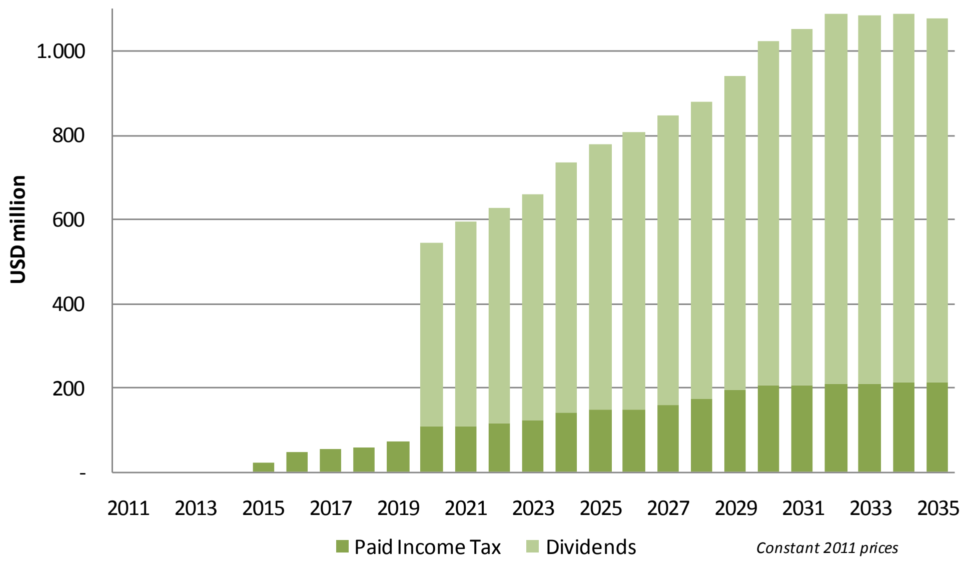
Due to higher average electricity prices and the improved use of underutilized power, LV's revenues in Scenario 3 should be roughly \$1.6bn in 2030 (approx. ISK 185bn at USD/ISK 115), which is \$200m higher than in Scenario 1. In the model it is assumed that an additional 600 GWh/y of otherwise underutilized power is sold. LV's ability to pay dividends will be considerable if average prices develop in line with forecasts. Under scenario 3, dividend payments will start in 2020. In 2025-2030 the scope to increase dividend payments will be further enhanced as a result of several factors, such as the reduced need for investment, the fact that new investments will have started to generate revenues, and because of higher average prices deriving from re-negotiated energy contracts. In line with these arguments, our model predicts that LV could pay just under \$450m in dividends and roughly \$100m in taxes in 2020. Total payments to the Government should steadily increase to roughly \$1bn in 2030 in 2011 prices.

Graph 62: Revenues and energy sold (Scenario 3)



Source: Landsvirkjun og GAMMA

Graph 63: Payment of dividends and tax (Scenario 3)



Source: GAMMA

LANDSVIRKJUN AND COMPARABLE ENERGY COMPANIES

Table 9 compares four Scandinavian energy companies, which are in many ways similar to LV in terms of their business model and ownership. They are, therefore, relatively suitable to benchmark LV against.

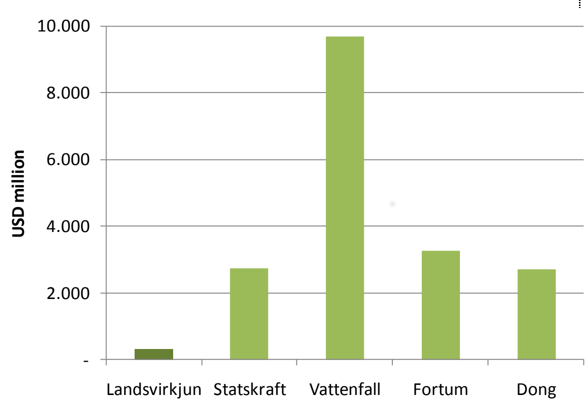
Even though LV has a dominant position in the Icelandic energy market, the company is small on international standards. LV's EBITDA ratio is high compared to its peers which might be explained by several factors such as low production costs in its hydro plants and the composition of its balance sheet as LV owns its assets instead of leasing them.

LV has taken on debt in order to finance the building of the Fljotsdals hydro power plant and low aluminium prices made a dent in its cash flow in 2009 and 2010 which explains in part why LV's ND/EBITDA ratio is somewhat higher than that of its peers. One of the goals set by LV's management team is to lower the leverage ratio in order to reduce the company's financial risk and strengthen its credit rating and increase access to the international financial market. Notwithstanding the low cost base, return on assets is not as high as is with the peers. Measured as ROCE (EBIT/Total assets), the return from LV's assets is approximately 4.1%, whereas the peer group's average is 7.6%.

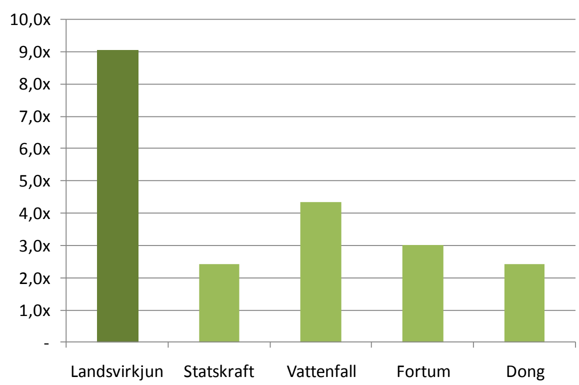
Table 9: Comparison of foreign energy companies

STATSKRAFT	VATTENFALL
• A Norwegian energy company, wholly owned by the Norwegian state. • Operations in 20 countries, mainly in Scandinavia and in the Baltic. • 3rd largest energy producer in Scandinavia and biggest in Europe in terms of renewable energy. • Produces 57TWh/year (90% by hydro).	• A Swedish energy company, state owned. • Generates both electricity and heat for Sweden, Germany, Central Europe and the Netherlands. • 21% of electricity produced by hydro power and remainder by fossil based power and nuclear. • Generates 172TWh/year.
FORTUM	**DONG**
• A Finnish energy company, listed on the stock exchange. The Finnish state owns just over half of the shares. • Business areas include generation, district heating, distribution and sales. • Operations mainly in Finland, Sweden, Russia and the Baltic Rim area. • Fortum's own power generation in 2010 was 70 TWh. Thereof 31% was produced by hydro and reminder by Nuclear/Thermal.	• A Danish energy company, active in generation, distribution and wholesale trading across Northern Europe. • Business areas include oil/gas exploration, electricity production (via coal, gas, hydro and wind). A market leader in offshore wind farms. • Produces 4TWh of electricity using wind and withdrawal rights on hydro and 16TWh via means of fossil fuel.

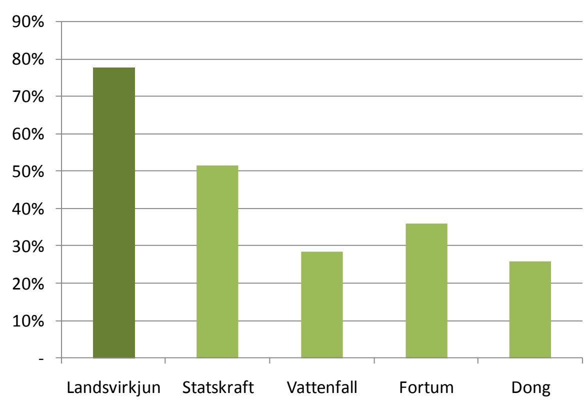
EBITDA 2010



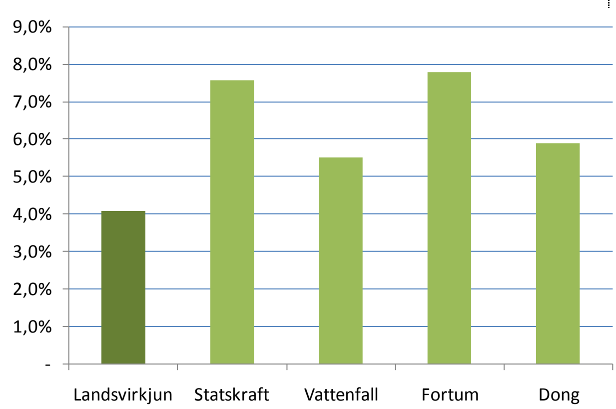
ND/EBITDAx



EBITDA as ratio of sales



Return on Capital Deployed (ROCE)



FINANCIAL MODEL'S KEY ASSUMPTIONS

The cash flow model is based on a consolidated group level and includes both Landsvirkjun and Landsnet (the grid operator/distributor). This approach was deemed appropriate due to the ownership of Landsnet. Landsvirkjun owns 64.7% and Rarik, which is fully owned by the Icelandic government as well, holds a further 22.5%. For the sake of clarity, the model omits hedging, e.g. derivatives to mitigate risk of adverse movements in aluminium prices or exchange rate. One cannot overemphasise the fact that the future cannot be predicted with certainty and several of the assumptions made will, no doubt, not turn out to be completely accurate when put against the test of history.

Below are key assumptions used in the model.

1) Average wholesale price of energy sold

In all the scenarios energy prices is determined by the following assumptions.

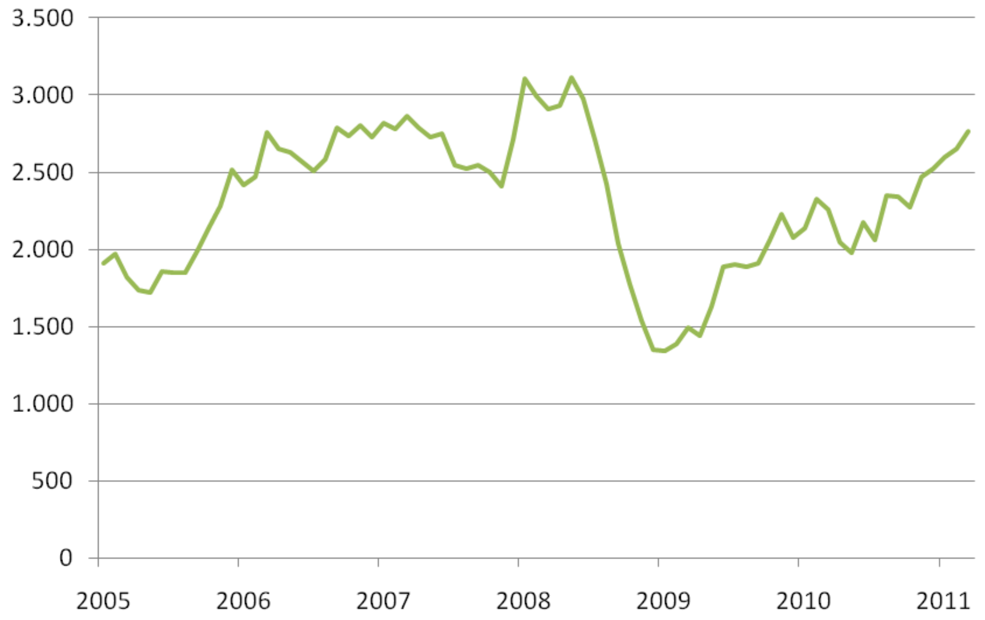
- **Electricity prices in Northern Europe.** In the scenarios involving further capital investment the development of electricity prices in Northern Europe is one of the most important assumptions made. In this report the price development is based on forecasts done by industry experts working with Landsvirkjun[59]. Even though there are varied opinions on how much energy prices will rise, most lean toward a continuous rise in foreseeable future. Energy prices in Europe have risen quite dramatically during last decade, as can be seen in Graph 45. At this point in time wholesale prices on the volatile Nord Pool market are around €40-€60/MWh ($55-$85) compared to around €20/MWh a decade ago. The forecast used by GAMMA's model predicts that energy prices in the UK, Netherlands and Germany will rise by approximately 40% in fixed terms in the next 10 years. According to this forecast, wholesale prices will be around $110/MWh in 2030. The development of international electricity prices has an indirect effect on the prices of new long-term sales agreements, as well as when older contracts are renewed with customary discounts.

- **Aluminium prices**. Around half of LV's long-term sales contracts are linked to the price of aluminium. LV's management has stated that its long-term goal is to reduce this ratio further so that its energy prices will reflect changes in international energy prices. In pursuit of this goal, LV made an agreement with ALCAN, linking energy prices to the aluminium smelter in Straumsvik with the US CPI. By doing so, the share of aluminium-indexed contracts dropped from 76% to around 50%.[60] Notwithstanding any correlation between the price of aluminium and energy, the model assumes the price of aluminium will remain unchanged in 2011 in real terms. Average sale prices in LV's long-term contracts will therefore maintain pace with inflation until they are renegotiated. New prices will then reflect international price

[59] See e.g. LV's 2010 annual report page 25
[60] Landsvirkjun Annual Report 2010, note 51.

developments, discounted by distance from bigger markets and the longevity of new contracts.

Graph 64: Aluminium prices (monthly data in USD)



Source: Bloomberg

- **Increased energy production**. Due to a significant rise in energy prices in Europe in recent years, every new MWh is sold at a considerable higher price than is the case in existing long-term contracts. The strong demand for electricity, stability of delivery, and physical presence of heavy buyers in Iceland indicate that a convergence between domestic and international prices is to be expected in the next decades. Adding to this trend, energy buyers are increasingly aware of the importance of having access to green energy and the delivery security LV can offer its customers.

- **Extension of energy contracts.** Current contracts held by LV do not come up for renewal for many years. Buyers might find it advantageous to enter negotiations earlier, if LV can offer additional energy that could be used for a profitable expansion of their operations. Furthermore, it could also be sensible for them to enter discussions in the earlier stages, since analysts generally lean toward rising electricity prices in the future.

- **Support for new green energy projects**. In our forecasts we do not assume any payments or subsidies from the EU for green energy projects. It is, however, worth mentioning that the EU has set an ambitious target for its member states for 20% of their energy to come from renewable sources by 2020.

2) Interest rates and financing

The effective nominal interest rates are separated into a base rate and a risk premium. Due to several factors, it is assumed that LV will not enjoy the same low risk premium as it did in the past.

- **Nominal base rate**. The base rates are derived from the forward LIBOR rates implicit in USD interest rates swaps. The yield curve is therefore estimated as a future floating LIBOR rate that rises rather sharply in a few years to above a nominal rate of 5%. LV's financing is 35% in USD, 40% in EUR, 15% in ISK and the remainder in various other currencies. To simplify calculations, it is assumed the rate differential between currencies will remain constant.

- **Risk Premium.** It is expected that risk premium on existing loans will remain constant at approximately 0.8%. For new financing, it is assumed that the premium will be comparable to LV's newest issue, i.e. 3.5-4.0% on base rates. It is also assumed that the premium will drop to close to 1% before 2020, in the wake of a lower debt ratio and improved investor confidence in the country.

- **Refinancing.** It is assumed that existing loans will be paid on schedule, as stated in LV's annual report. The premise that LV is able to successfully enter the bond market is an important one regarding new investment, since it is foreseeable that LV will mostly use cash available from operations to pay down existing loans and thus reduce its debt. In Scenarios 1 and 3, it is assumed that LV will have access to the bond market and that the company will enjoy the rates discussed above. These assumptions are most likely realistic, since LV has managed to demonstrate their credibility over the last two years by securing a number of sizeable funding agreements through, for example, two $50m bond issues, a $100m committed credit line with EIB, which is valid until 2013, and another $70m line with NIB, which is valid until 2027. Some of those loans have not been drawn upon yet.

3) Other important assumptions

- When assessing LV's capacity to pay dividends, it is assumed that debt will be reduced until the ratio of net debt to EBITDA reaches 4.0x. This figure is, of course, subjective, but is deemed appropriate, based on judgement and the public risk criteria applied by rating agencies and it is comparable with its peers as shown above. The level can be said to be prudent, especially in light of the steady cash flow from operations, high EBITDA margin, financially strong customers and relatively low maintenance costs in proportion to operating profits. Furthermore, GAMMA's model assumes the equity ratio will not fall below 30%. It should be noted that dividend payments are smoothed out.

- It is assumed that the capital expenditure falling on Landsnet in addition to LV's investment amounts to approximately 15% of estimated cost of building new generation capability.

- The amount of capital expenditure as well as the amount of sold energy per year under each scenario is based on LV's internal plans.

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