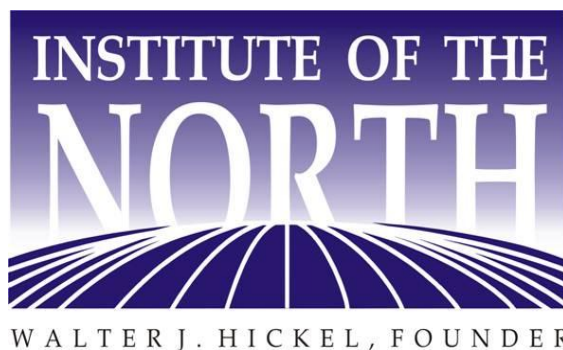


Governor Hickel tasked the Institute of the North with the mission to understand the reality, richness and responsibility of the North. He would have been first in line to join us this year to learn about Norway's model for doing exactly that.

Introduction

The rough notes below describe the information 45 Alaskans gleaned from six intense days filled with meetings, presentations and visits with a multitude of Norwegian agencies, industries, and government leaders. The notes are not a comprehensive technical overview of Norway's model, nor has the Institute of the North taken any position on the ideas herein, but they do serve to illustrate the broad themes addressed during this experience. The reader should see these as participants heard them, from Norwegian experts as tips and insight into how Norway approaches resource extraction, fiscal policy and economic development.



Outwardly similarities made Norway a target of our consideration, yet it is important to keep in mind that Norway is different than Alaska. The government is at all sides of the table, but it's a reasonable table with reasonable discussions and decisions. Norwegians look at the world differently – people are content, though with high expectations. To accommodate this different way of looking at things, we have to change our mindsets.

Another early lesson was that we shouldn't begrudge people working together to solve problems; instead, we should promote this approach. A collaborative process includes trips like the Norway Policy Tour – where people from different backgrounds come together and learn new approaches while building strong relationships with one another.

- Norway is a country that is plugged in to media networks – Norwegians typically read three newspapers a day.
- All seven Norwegian political parties would be considered left/progressive in the US.
- Norwegians work to live, rather than living to work. People are productive but also enjoy life.
- Social welfare is an important part of the Norwegian culture – free education (through PhD), healthcare, retirement, maternity leave (women get a year at full pay; men get 12 weeks paternity leave).

- The Norwegian Government is very conservative about how it spends money (they don't plow streets – often or well – for example).
- Until they are 12 years old, kids are not allowed to keep score in football games.
- Oslo is at roughly the same latitude as Juneau; Hammerfest as Barrow.
- The export value of goods and services in the petroleum support sector is second to actual development of those resources.
- Statoil employees working offshore rigs have a schedule of two weeks on/four weeks off (47% higher salary for offshore workers).
- At one point, Statoil could be considered the largest “hotel” in Norway, with more rooms on oil rigs than any hotel chain.
- Snohvit was developed with the US gas market in mind. Because the US market no longer exists due to shale gas, Snohvit gas is now sent to Japan. It is the world's northernmost LNG operation; there is no platform, and it is at a depth of 300 meter.
- 234,000 people work in the oil and gas sector in Norway compared to 5,000 in fishing and 50-60,000 in agriculture. Because people don't see oil and gas, the general perception is that fishing/farming is much more important.
- Norwegian consumption of electricity is 3x that of Europe, which is already high.

Quotables

- We know that oil and gas is in the ground now, and that there is a commercial demand; so develop, but don't spend the money on this generation. (Ministry of Petroleum and Energy)
- We don't spend time looking at other countries to compare ourselves to – if it's working here then there's no need. If you have investment, then don't

change things. If you don't... (MPE)
[Statoil does work with other tax regimes around the world – dealing with all kinds of different processes – including production agreements, leases and signing bonuses]

- The High North is a natural meeting area for long term cooperation. (Statoil)
- Never underestimate the culture of where you're doing business. (PSA)
- Companies care for themselves; the Norwegian Petroleum Directorate cares for society. (NPD)



Economy/Resource Development

Norway's oil ministry starts with two basic premises -- if you're going to develop make sure you can stand the quality test of international measures. Secondly, it is possible to have sustainable petroleum development. Norway is planning on (and expecting) stable and long-term production.

Norway is a petroleum nation – and it's only half developed. Politicians have done a good job of not using this resource immediately, and limiting themselves. It is the third largest exporter

of oil and second largest exporter of gas in the world. As the global need for energy continues to rise – and fossil fuels remain dominant in the energy mix—Norway is contributing heavily to the security of supply. Norway’s Ministry of Petroleum and Energy (MPS) was very clear in that “a renewable world is not just a few easy political decisions away.”

We need to have more than one strategy:

- Oil countries should produce and consume fossil fuels in more environmentally friendly ways.

One barrel of oil developed in Norway has half as much pollution as the world average

- Too little emphasis has been placed on energy conservation and efficiency. We should include energy development as corresponding to community development.
- We must increase renewable energy development and renewables must stand test of life-cycle analysis.



Norway’s North Sea is well-developed, as is the Barents to some extent. There were early doubts about expanding in the Barents, but continued exploration has led to a substantial new find. While the area between the two may have deposits, it is a major fishing area and is environmentally sensitive. It makes sense to connect north and south via pipeline and to increase oil/natural gas development.

Connecting its oil and gas resources to one another, to refineries and to markets has meant an incredible network of seabed gas pipelines reaching 7000 km – the distance from Oslo to Anchorage. Sub-sea oil pipelines span a shorter distance from the platform to the onshore facility (approximately 50-60 km) compared to gas (which is more like 150-200 km).

The discussion of developing some areas and not others sounded very familiar to Alaskans. Local people are interested in development while people in Oslo and other urban areas are interested in protecting it; fishing interests are open to discussion/mutual benefit while environmentalists are committed to no development. Generally, petroleum activity is not mentioned in the press except in a pejorative context; it is environmentally contentious and there remains an urban sensitivity. Petroleum development is not recognized as a key factor of Norway economic success.

The Norwegian government is on all sides of Norway’s resource development – regulator, owner, service, safety and taxation. While people move between these sectors, there is no “leakage”. The government invests heavily up front, thereby costing independent explorers very little. The independent explorers are then bought up by larger companies.

The Storting’s view of oil and gas issues recognizes that energy and environmental issues are at conflict in Norway and works to find balance. In Norway, it is the national government that is in the driver’s seat, which is quite different from Alaska’s competing local and state government agendas.

The Norwegian Parliament’s energy committee travels to other countries to learn best practices, and has been to Alaska. However, the committee adopts whatever the government (MPE and NPD) recommends, using its agencies’ technical expertise. Parties do approach issues differently, though, and there are often fierce debates in Parliament that are open and trans-

parent to the public. It is important for the public to see this dialogue taking place. Parliament's goal is to maximize the utilization/production of its oil and gas resource, recognizing peak oil. Parliament acknowledges the importance of creating good conditions for oil companies in search of resources.

Large oil companies have good relationships with the government and Statoil; they don't have anything bad to say about that process. In this, the government assures their active participation. There are some countries where contact between industry and government is forbidden, others where it's more mingled—in Norway, commercial activities respond to policy, legislation and administration and Norwegian politicians understand what makes commercial activities tick.

The overall aim for Norway is sustainable development – which shouldn't be confused with conservation or preservation. Development requires economic activities to address the social dimension, while also taking care of environment. With implied risk, the conversation must also address probability and possible damage. It's a conversation that requires a good cost/benefit analysis that examines both aspects rather than focusing on one.

States should make sure they get the full value from the resource, rather than trying to get it all at once. Many governments don't have the capacity/knowledge to do it all. Industry will always think that taxes are too high; they made a strong push many years ago to reduce Norway's taxes. The government refused but production did not decrease. Steady production may be explained by the fact that exploration is covered by big incentives; 100% of development costs are deductible.

Norway doesn't have lease auctions or signature bonuses. Instead, they have high expectations and want the best management and expertise; companies are there to perform resource management. Each development project

is very individualized. Three questions drive the selection process: 1) How good are you? 2) How extensive is your knowledge? and 3) How competitive are you in this area?

Companies have six years to fulfill their scope of work. It's "drill or drop" after two or three years—if a company doesn't perform, its license is automatically relinquished. The government does not allow area "squashing" because it's not in their interest.

In its role as a facilitator resource development the government conducts the initial seismic. The initial broad analysis (2D or regional mapping) is funded by general taxation with a budget of 80million NOK. Companies are then responsible for more detailed seismic to determine where to explore.



The nation's economic development strategy – and Statoil's as well – is to recognize the key realities outside of Norway, including:

- Continued and increased European demand;
- IEA estimates of production decline – supplies will have to come from Russia, Norway or Algeria; and
- The Barents Sea as a gateway to the Arctic

In country, Statoil and Petoro are developing 50% of the resource and big international companies are developing an additional 35%. Statoil is very dominant in currently producing fields;

but the mix will look more diverse in the future. Petoro, Norway's SDFI (State Directed Financial Interest) is owned and operated by the state, which retains 100% of the value. The company doesn't operate anything; it creates value through investment.

Statoil

Statoil is a private company. The state owns 68% of Statoil shares, which it can buy or sell just like any other shareholder. More importantly, Statoil acts like a private sector company. Almost all of the crude produced by Statoil is sold globally, with only very small volumes going to Norwegian refineries. The Board of Directors (who are all Norwegian, except for one) sets corporate strategy. While the Board is more or less selected by the government, corporate strategy is not directed by government – there are strict organizational lines in decision-making.

Statoil is the second largest exporter of gas to Europe, after Russia. There is a general feeling that the European market would prefer Norwegian gas. Norway is almost exclusively powered by hydro and doesn't use much gas internally.



Norway's oil development began on the Norwegian Continental Shelf, beginning with Ekofisk in 1979. There was an original expected 20 year/46% recovery from the field; this has now been upgraded twice with current projections at 75%. They do use gas to increase recovery – but then sell it when they're done – and

also use water-flooding (90% water/10% oil). Good reservoir management is their key to high recovery.

Statoil has transitioned over 40 years from shallow to deep water; from oil to oil and gas; from simple to complex reservoirs; from fixed platforms to sub-sea; and from south to north

The company is the largest operator in the world in waters deeper than 100 meters. Their goal is to also be the world leader in CO₂ capture and storage (including at Snøhvit, which some in the group visited). Snøhvit has a complete sub-sea network including 130 kilometers of sub-sea pipelines with multi-phase flow that take gas from the reservoir to the sea-bed platform, where the CO₂ is removed and sent to a separate reservoir, while the gas is sent to the onshore platform. This type of sub-sea network is a great example of the technology for arctic development.

Offshore production means delivery of oil/gas straight to markets through pipelines (gas)/tankers (oil). The 7,000 km of seabed pipelines are approximately 1 meter in diameter. Oil is taken to underground storage areas where the appropriate quality oil can then be drawn out as demanded by the market.

To work offshore you have to change your mindset and focus on safety. The strategy offshore must be safe and efficient operations in order to maximize the potential. With 34 offshore installations, 18 mobile rigs, plus marine vessels, helicopters and chartered planes it is understandable that Statoil would focus on safety. (See also Regulatory Environment)

For each project, Statoil solicits inquiries and builds partnerships with other companies (such as Shell, BP, ConocoPhillips, etc.). Apart from a small administrative fee, companies don't pay anything for the license; rather, they commit to drilling wells in certain amount of time – and they don't pay taxes until the wells are producing.

Statoil will go where they have better competence than their competitors and where there is a market (Europe or East Asia). They have clearly identified their competencies as being able to operate in very harsh environments, operating in deep water, recovering heavy oil (most easy oil is owned by state-owned companies in other countries with no access for outside companies), and developing gas value chains.

Regulatory Environment

Norway recognizes that its oil and gas industry has a complicated industrial environment – it can't afford to have anything go wrong. Regulatory environments should focus on risk, environment and stakeholder management.

Norway is unlike the US where there is an adverse interest when making regulations. The meaning of compliance is also different. Norway values client understanding of the purpose and importance of the regulator to create an alliance between industry and regulator. This common understanding of the regulator's approach means a cooperative interest in the development of regulations and the production of a framework for the overall regulator environment. A cooperative interest also means up-front work in identifying and managing stakeholder (association, workforce, authority) relations. To have stakeholder involvement, you have to put in place systems for engagement – monthly meetings, working groups, trainings and regular reviews regulations.

In Norway, the stated common purpose is safety. Safety includes personnel, the environment, and the financial value of a company's investment. Safety provides increased income if you are able to create alignment around the issue:

- At the ministerial level – with a national plan, legal basis, and licensing;
- With oil companies – field development, contracting, operations, and marketing; and
- Through the PSA and NPD – detail regulations, guidelines and standards.

Norway didn't come to this common purpose immediately. In the late 1970s Norway had more than 200 people killed in industry accidents. They responded with risk-based thinking, a new system for regulation-making, coordination between agencies, clear lines of reporting to ministries and clarified lines of responsibility. The government shifted from many different regulators to multipurpose regulations/regulators under one agency (NPD). The government bears the burden of cost and communication, but by doing so can stand up to industry as one body.

The Norwegian Petroleum Directorate (NPD) and the Petroleum Safety Authority (PSA) oversee many of the regulation of the oil and gas industry in Norway. The PSA used to be part of the NPD, but the two were split up in 2003 to better separate roles and responsibilities. The government delegated power to both as professional independent bodies – separate from political decision-making – to foster continuity and effectiveness while ensuring that powers aren't overstretched.

The NPD is subordinate to the Ministry of Petroleum and Energy and exercises management authority in specific areas. The NPD's mission is to create the greatest possible value for society from oil and gas activities by means of prudent resource management. They can do this by leveraging their technical expertise, which is very different than that of the policy/political employees at MPE. The NPD also communicates reliable information to build public confidence in oil industry.

Both the NPD and PSA made strong arguments for Norway being the most transparent country in the world because of the amount of information they are willing to sharing – with academics, with community stakeholders and with industry! A great example is their commitment to data management – data comes to the NPD from all sectors, especially industry. The NPD receives all by-logs, core data, and seismic data

and then posts all of it on their website. Companies can also visit NPD to see core samples (2000 NOK covers administrative costs).

A core precondition for sound petroleum management is capacity in the public sector. There must be policy administrators and regulators who understand the risks and the rewards of the industry. Sound petroleum management also requires fully competent companies. For Norway, that also means companies who move their business model to incorporate Norway's model of social welfare.

To operate in Norway, companies must demonstrate their competence. They must apply for formalized PSA approval (a company like Statoil doesn't need to do this as it is already an experienced operator) prior to being considered for operation. Prequalification is conducted by NPD, who audits the company based on its:

- Financial capacity;
- Technical competence; and
- HSE – management system.

Competence also includes the huge technological advances that need to be incorporated into processes. Regulators must also understand the ongoing changes in the business (parts of production moves onshore, integrated onshore/offshore with intelligent fields – ICT, video conferencing)--competent regulators are experts in their fields. The state can't pay talented individuals as much as the private sector, but people move to government for good reasons (back and forth, very often).

At PSA, there are teams of supervisors/experts who manage various groupings of industry (i.e., Statoil is monitored by one group; new explorers managed by another group; big international companies by another; etc.). These teams are able to evaluate competence regularly, including conducting on-site audits of rig operations.

The NPD, on the other hand, is responsible for finding new fields. It works to:

- Gather data and map unopened areas

- Open new areas
- Award exploration licenses (it can grant directly)
- Award production licenses (decision rests with the MPE, with the NPD as an advisor)

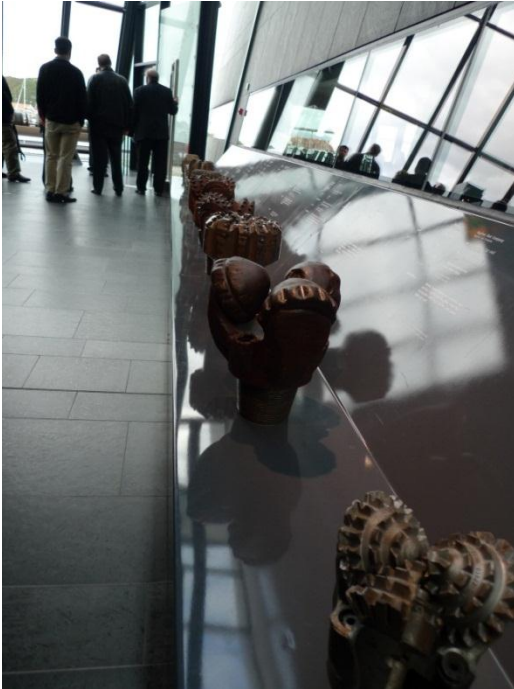


The decision regarding which fields are “mature for opening” is political, thus production awards are political. However, which fields are opened first is a technical decision, incorporating elements such as technical knowledge, expectancy of success, and supportive infrastructure.

Norway has developed a predictable licensing system:

- The company covers administration costs (100,000 NOK) of application.
- There are annual licensing rounds depending on which fields are mature for opening; anything that wasn't developed from the last round goes back into the pool for the next round (there is very strict application of develop or drop, though there can be good reasons for an extension of a year being granted).

- Companies are not allowed to sit on licenses without commitment
- If dropped, a company can re-bid
- Frontier areas have biannual rounds.



Early in the process companies nominate which blocks they would like to see in the next round. The NPD incorporates these recommendations into its decision. After the MPE announces which are actually open, the companies are allowed to apply. What follows is a negotiation period – the NPD goes through the application and gives a technical expertise ranking (with project-based criteria). The negotiation includes commitment to develop and to work for state interest. Following the negotiation, MPE announces the final award. Companies rarely refuse, and they can't appeal.

Norway's SDFI level of investment is based on a recommendation by industry and the NPD. State involvement reflects the high potential of the prospect and risk involved.

The NPD also works to keep companies from only exporting gas and leaving oil; working with industry to get both out. Increasing CO₂ emissions from petroleum industry has meant increased attention to carbon capture and storage. The NPD has a role in working on this issue as well.

Statoil case study in Alaska

In 2010 Statoil conducted seismic testing of its 2008 acquisition offshore Alaska. This was the first Chukchi lease sale since 1991.

Marine seismic acquisition is conducted by sending a pressure wave generated by compressed gas that bounces off the bottom and hits a hydrophone (generally 10 cables of solid streamer, 6000 meters long, 100 meters apart) where data is collected. Using the time and velocity they calculate depth, thereby mapping the sea floor and reservoir level.

To conduct the seismic acquisition Statoil used a seismic vessel (12,000 tons; 5 MMO), supply vessel (for fuel/crew; 1800 tons; 3 MMO), and monitoring vessel (197 tons; 3 MMO). Each had marine mammal observers (MMO) on board. They surveyed 2600 sq. km using 12 streamers, more than historic streamer usage in Alaska by other companies (eight)..

For the Marine Mammal Observer program, they used visual observation plus towed and fixed passive acoustic monitoring (hydrophones or streamers). They also conducted the first industrial test of IR camera for detection. The IR proved whale and walrus tracking – walrus had avoidance technique (200 counts). Statoil stopped seismic for three days during the walrus migration, with “heads popping up like mushrooms.” It is interesting to note that permitting in Alaska is very focused on marine mammals; in Norway it is fisheries.

Permitting was required 12 months before operations. The company felt it had a good dialogue with authorities. The lack of infrastructure in Alaska was challenging, with Statoil having

additional considerations of finding a location for crew change (Nome) and being able to assure response capacity. Challenges in the operations phase included marine mammal observation, shallow water, limited open water season, and harsh weather. Notably, there were no safety incidents, no oil released, and the survey was immediately stopped (halt pressure release) upon observation of marine mammals. The acquisition resulted in excellent data quality.

Compared to Norway, Alaska's permitting process was very "comprehensive." (It might also be referred to as burdensome, though Statoil was too polite to say so.) It was a lot of work, and in several instances more complicated than Norway's process – it takes five weeks and goes through one agency, which involves many other departments in the decision. But rules and regulations are there to be followed – no further discussion.

Many details emerged from the baseline studies going on in the Chukchi Sea, with cooperation and sharing between Conoco, Shell and local communities, including acoustics monitoring, fisheries ecology, benthic and plankton ecology, mammals, seabirds and physical oceanography.

Fiscal Policy

Norway's government commits 100% of its resource development revenue to its Government Pension Fund, which is much like the Alaska Permanent Fund. They withdraw only 4% of its value to support government, feeling that this is the right long-term fiscal policy.

In the early years of the oil industry, the government had a royalty system but grew concerned that this didn't result in investment. They moved to a system that focused on raw income, and developed the State Directed Financial Investment (SDFI). SDFI is an investment fund, which renders larger revenue to the government. The government is a silent partner.

There are no property taxes on oil and gas facilities.



Not everything is owned by the government. The majority shares in pipeline facilities have historically been owned by the oil companies, who are now selling to equity investors as a good long-term rate of return. The state invests 46% in pipeline facilities, with a 7% return. Transportation not supposed to be a high profit enterprise – it is a public utility.

Government Take System for Petroleum

The Minister of Finance answers to Parliament; there are 300 civil servants (economists and lawyers) who work for MOF and are managed by a Director General. There are seven departments within MOF – 1) administrative affairs, 2) economic policy, 3) asset management, 4) financial markets, 5) tax policy, 6) tax law, and 7) budget.

When developing natural resources, oil companies have to recognize that the resource is immobile, finite, and that it belongs to the people (and that this is a good, legitimate and stable tax base for government). At the same time, government has to recognize that a tax regime should attract investment – giving extra weight to stability, simplicity, competence and predictability (Norway's process has stayed the same since 1992).



The petroleum industry accounts for 27% of share of investments, 46% share of exports, 22% share of GDP, and 28% share of state revenues. Government take is only on upstream activity, through direct taxation and indirect taxes (CO₂ tax, area fee, and state-owned enterprises).

Royalties, a gross-based tax, were phased out because they de-incentivize investment. Companies claimed they wouldn't invest during royalty period. Investment is maximized by taxing net profit. Profits are self-assessed – companies report production, what they're selling for, what they make, etc. There is an audit of self-assessment in the second round (30 staff for this in oil tax department). All information gained is publicly available (ITI aggregate report).

Norway's marginal tax rate on direct production is 78%. Out of \$1 million profit, the government gets \$850,000 and the company gets \$150,000. Oil and gas is taxed separately; offshore and onshore is split as well. Norway taxes the super-profit – or the "resource rent," as it should be termed (the extra-ordinary profit achieved by developing a finite natural resource) – at 50%. Corporate income tax is 28% - combined to produce marginal tax rate.

The SDFI took a loss in its four early years – viewed as a capitalization cost – but has seen strong gains since. The SDFI only takes shares in the most promising fields (20% investment

most recently). Average SDFI investment is 44%. The only objection by companies is when they re-license, having found a field to be more promising than originally planned and then have the government come in.

The SDFI also plays a role in asking good/hard questions of owner/operator. Government has a seat at the table. The SDFI share is talked about prior to lease decision, but then the government (Prime Minister) decides the amount of share in each license, which isn't negotiable once it's offered.

In determining taxes, capital investment is recovered through depreciation over 6 years

- An additional "uplift" deduction is included in order to compensate the producer for the time value of the delayed recovery of its capital investment. In Norway, the uplift is not intended to provide an additional incentive for capital investment.
- The intended effect of the uplift is to create the same result as if 100% of the capital investment was recovered in one year. In the Norway model, any additional "uplift" would result in the recovery of more than capital costs.

There is a personal income tax – 28% general tax, 7.8% in social security, plus a surtax (the total is roughly 50% for highest income bracket, and the employer takes some too). Municipal funds come from property taxes and a part of the wage tax goes to local government – no company tax revenue goes to communities (national budget covers rest).

Government Pension Fund

The goal of the Government Pension Fund is to separate spending from current revenues – this supports long-term considerations and future liabilities.

All revenues go to the state budget, and petroleum revenues are transferred to the Fund from there. Returns on investments are also trans-

ferred to the Fund. There is an annual transfer from the Fund to finance non-oil deficit (fiscal policy means the Fund should only spend expected real return; est. at 4%). In good times they use less than 4%, in bad time they use more. Roughly 10% of the government budget is covered by that 4% each year (100 NOK).

A big pile of money requires a good governance system. The Government Pension Fund Act directs the Fund to be managed by the MOF. Day-to-day management is done by the central bank of Norway (Norges Bank), which reports to the MOF quarterly, and the MOF reports to Parliament. The MOF spends a significant amount of time educating Parliament and public about its long-term strategy and risk.

MOF's investment strategy derives from investment beliefs and fund characteristics

- There are clear owner and manager roles and responsibilities
- The principal-agent has strong mandates of detailed benchmarks (which are presented to, and discussed in, Parliament)
- MOF exercises its ownership rights through this process

Since the move to equity investments, there has been public debate about which companies to invest in. It is generally felt that investments should produce a return as well as behave ethically (according to guidelines developed by identifying overlapping consensus among Norwegian population). This process has excluded 50 companies out of more than 8,000.

Points to remember:

- The Fund is not invested at all in Norwegian assets.
- The central bank has an inflation target of 2%, managed through currency management.
- The Fund will continue to grow for 20 years – up until 2030 it will have positive inflow.

- Investment allocations are decided by regional markets.



There is also a much smaller Norwegian sister fund. The original allocation was invested in Norwegian assets in the early 1970s. The “how to use this fund” debate went away when oil was discovered – it was decided to use this wealth to improve Norwegian society.

Arctic

The Arctic is a huge area (almost 30 million square kilometers) with only 4 million people and huge natural resources, most of which belong to Russia. When the continental shelves are claimed, 90% of resources will have been claimed by nations. Climate change results in a more accessible Arctic; 80% of the Arctic is accessible this year. There will be significant impacts to consider as access to oil, gas and mineral resources; fishing (though no current stocks exist); shipping; and research increases.



In the Arctic, Norway builds relationships with its northern neighbors through the Arctic Council and facilitates activities that support its agenda in the High North. The High North is an area with a low level of tension – it is not a region of conflict, but of cooperation--“There will be no race to resources.” Disputes that do arise can be addressed through existing structures, laws and forums. Science cooperation is a priority, especially in the realm of climate, fisheries and energy.

The Arctic Council is a consensus body that specifically addresses Arctic issues; its members cover much of the world and account for much of the global economy. Traditionally, the Arctic Council has not been a political decision-making body, but rather a decision-shaping organization. It produces recommendations for the eight Arctic nations to act upon. It is important to highlight that the Arctic belongs first and foremost to Arctic states; which are fully capable of handling issues that arise. At the same time, Norway realizes that other countries may/do have legitimate interests.

At the Nuuk Ministerial of the Arctic Council, members established and signed on to search and rescue protocols. Now, we should expect to see the Council moving into disaster preparedness, in particular, disaster preparedness in response to resource development. Of particular concern is any nation’s ability to surge resources into a remote area and have the infrastructure in place to respond.

There is a clear effort to avoid militarization of the Arctic Council, but Arctic nations have been cooperating with one another to determine response scenarios and responsibilities (in fact, the Alaska National Guard recently participated in an exercise). There is a need to move beyond military stakeholders to training and responding to changing environment, fisheries, natural resource management, UNCLOS, search and rescue, shipping efforts, and oceanography. Ap-

proaches in the Arctic must be multi-disciplinary.

Norway’s Storting also highlighted its participation in the Arctic Parliamentarians (Alaska’s Parliamentarian is Sen. Murkowski) and noted this forum as a good example of cooperation.

Resource development in the Arctic presents an important part of our future. The region is politically stable and increasingly accessible. The coastal states agree that the area is governed by Law of the Sea with no need for new treaties. The MPE was strong in its assertion that there is absolutely no reason to lock it up as common heritage or protected environment site. 30% of world’s undiscovered natural gas and 13% of its oil are in the Arctic – to support Arctic peoples. It’s not a question of “can we go ahead with this?” but rather, “on what terms?”

Most people cannot grasp the magnitude of the acreage of the arctic and northern continental shelf, nor do they understand that there is an increasingly good understanding of Arctic sub-sea geography and oil/gas reservoirs. Two challenges remain, of course, in Arctic resource development – ice and distance. There are two solutions to ice – withstand or avoid. With deep water you can have sub-sea development and avoid ice; shallow water is more problematic.

Development in the Arctic will be extremely difficult – there will be delays, there will be disappointment—but with patience and persistence there will be success. Successful development north of Norway – where it’s not exposed to ice – is a small step toward developing in ice.

A major area of discussion was US ratification of the U.N. Convention of Law of the Sea (UNCLOS). The US is the only major nation not a member of UNCLOS; even though all defense agencies would like the US to join, we have not yet ratified it. It is difficult to explain to our Norwegian counterparts the reasoning. Alas-

kans shared the view that we are losing out on the benefits of ratification.

It was interesting to learn that Russia has as much icebreaker capacity in the Arctic as the rest of the world combined, even including China's seven new icebreakers in production. Russia will have half the continental shelf and more than half the resources. Critically, they have committed to follow existing treaties and international law, which means that competing claims are settled reasonably through bi-, tri-, multi- lateral negotiations.

Moreover, Russia recently hosted a tour of the Northern Sea Route on Yamal (75,000 hp), the world's largest icebreaker. The route was completely ice-free. Russian mapping of the route was fantastic and their navigation systems (GPS and Glosnost) were top of the line. All vessels traveling the route must have icebreaker assistance, oftentimes tied to back of icebreaker traveling at 20 knots. Russia is strongly promoting use of this route, which has implications for Bering Strait and Alaska coastal zones.

The University of Tromsø

Here, you can feel like you're in a special part of the globe, where there is room to grow as a people. "We" think that we are at the very center of the world; the north is content, and happy with what they have. Being at the center of the world is partly a joke, but also increasingly true with climate change, shipping, media, and economic considerations.

In 2006, Norway's High North strategy was presented at the University of Tromsø. Prior to the presentation of the strategy, the north was considered rural and remote, provincial, with little geopolitical interest. Some have said no-one cares about High North – it's too secure, and the US hasn't paid enough attention or given it resources to respond (but it is increasingly doing so, which means it's more important).



The High North strategy's overall aim is to increase presence, scope of activities, and knowledge. Key drivers for a renewed focus in High North include:

- Climate
- Russia
- Energy
- Arctic Dimension

With sea ice extent shrinking and increased shipping opportunities (40% reduction in time and cost; no pirates) – one of challenges is mapping and incorrect data/depth of waters. There is a need for search and rescue infrastructure, as well as emergency/medical response. Norway established the Fram Centre as a Center of Knowledge to address these issues.

The development of petroleum resources in the north is a hot topic in Norway right now. There is new optimism, which is a response to global need and new finds. Snøhvit is a beautiful example of what high oil prices can do when coupled with new technology (they also used the example of Chinese investment). All indicators point to extreme interest in Arctic resources.

The North needs a research infrastructure to support that interest. UIT has developed five PhD schools with a strong Northern focus. They also run the Centre for Remote Technology, where satellites can send signals down 24 times a day. These signals can sense and spot an oil spill from tanker, as well as monitor changing environments from space.

Energy, Communities and Fisheries

(We've combined a few themes that complement but were outside the stated goals of the Tour.)



Coastal Affairs and Communities

Norway has balanced development and care for the environment for decades – they have coexisted without any significant incidents. Strict safety standards have played a big role in their success. There is no tolerance for oil spills. Years of experience shows Norway that oil development can occur at the same time as successful fisheries (e.g., the North Sea). At the same time, local communities have a well-established process for submitting input into oil development. In the hearing process, local authorities and organizations are asked to submit comments, as well as participate in parliamentary committee meetings.

Interestingly, the Norwegian Petroleum Directorate manages the conflict between seismic testing and fishing by allocating areas that take into account spawning/migration seasons. They are also responsible for mandatory course for fishery experts and oversee a system for reporting and tracking seismic operations.

Until recently, wild fisheries were larger than aquaculture. With increasing volumes/profits from fish farming (there was pressure to create jobs/income for local communities) the balance shifted recently. Aquaculture is still a young in-

dustry that depends on a long coastal tradition. It provides 20,000 jobs along the coast, with an export value of \$5 million in salmon, rainbow trout and cod. Aquaculture is a partnership between government, research and industry; and the relationship between the environment and competitiveness is one of a) carrying capacity of the sea, b) public interest, and c) long-term economic perspective.

In Norway, many interests use coastal zones. Interests are balanced when compatible and, when not, priorities are decided by Parliament. Seemingly, if a development project were to affect the environment in ways that couldn't be mitigated, the Norwegians don't appear ready to sacrifice their environment.

With only 110 employees, the Ministry of Coastal and Fisheries Affairs is the smallest ministry in Norwegian government. They depend on subordinate agencies and institutions, including the Fishery and Aquaculture Industry Research Fund. The Fishery and Aquaculture Industry Research Fund is industry run and industry financed—it disburses research grants funded by export tax..

The starting point for modern fisheries management was the eye-opening depletion of herring, the largest fish stock in the North Atlantic in the 1960s. It served as a point of departure for national fisheries' policy. Stocks have since come back to old heights, plus some. The modern management of fishery resources is capable of protecting and enhancing species - when one is willing to make the necessary changes. Norway built its management around science, keeping it independent of politics and asking for international input. Norway's fisheries management is focused on research, regulations and control.

Norway cut off its subsidies to the industry in 1990; export values increased and with fewer fishermen, the catch per fisherman increased. A decline in fishermen was intentional – Norway's government prioritized keeping up with the ef-

efficiency taking place in the rest of society. With that in mind, the focus was on earning money, not keeping jobs that don't respond to efficiency. The shift in focus was the only way to maintain competitiveness.



The government used regulatory instruments and strict control measures (sophisticated management) to ensure sustainability; and drew on economic instruments to enhance efficiency. Rather than using subsidy or decommissioning, the government used as “user pays, user gets” model.

Norway has only a small mining industry. However, with demand from East Asia, activity has increased recently. Coal development in Spitzbergen, Svalbard started as private enterprise, but was bought by government and is currently running a small profit. To encourage people to live there, the project was heavily subsidized from the beginning. Svalbard, much like all Norwegian communities, has infrastructure that is paid for by government – roads, energy for local use, schools, universities, hospitals, as well as an Arctic research station that is shared by eight countries.

In terms of research, it is worth noting that there is a research dollar commitment by oil companies as part of their development license – as required by the Norwegian government. The total research budget in Norway is 41.9 billion NOK; of which, 46% is public funding. For marine research, public funding is 64%. Each

sector is responsible for research in its own area, but coordination/integration is imperative.

Norway values knowledge-based ocean management and using the best available science. This means that there are:

- Demands on science – with an emphasis on quality and relevance; and
- Demands on authorities – who have to know what to ask for.

The Norwegian government's greatest challenge is how to meet the high expectations of its people. There has been so much success that people don't have a good understanding when they don't see it and demand more from government to ensure the quality of life they are used to. Two other challenges are also worth mentioning: 1) post-oil future and 2) an increasingly multi-cultural society.

Norway has a political national energy strategy. They adhere to the European Union's decision to move to more renewables by 2020, though this is difficult when the country is run primarily on hydropower already. Therefore, they have begun investing in other European countries to help them reduce their emissions and make the shift to renewables.

All communities are connected to the grid, though some farms still use generators. Norway's commitment to equity in energy costs has developed over time (“we are all social democrats”). All communities pay relatively equal energy costs. A provision in law even gives extra weight to rural areas/remote voters. In general, Norway makes sure that pricing is the same all over country – everyone is entitled to electricity, 98% of which is hydropower. It's a part of the social contract – the government/people support the right to live in remote communities and maintains those benefits/rights.

It's important to remember, however, that Norway before oil and gas was a fully developed society/economy (unlike Alaska). Recent trending, though, points toward people moving to

regional centers or Oslo. The government is using money, information and policy to keep people in rural areas.

Renewable Energy

Statkraft is Norway's largest hydropower and renewable energy company, contributing 33% of Norway's power generation. Statkraft is also the largest company in renewables in Europe and is in more than 20 countries worldwide. Statkraft produces 89% renewable energy with 283 power and district heating plants.

Much of Norway's success rests on its energy production. The company began over 100 years ago, with hydro plants in fjords where industry was located. Many hydro plants were funded by the Marshall Fund after WWII. The company didn't become private until 1992, but is still 100% government-owned.

Until 1970 the goal was to build the country; hydro was used to modernize. There was some pushback in the 1980s against large projects and the 1990s brought no new investment. Today we're seeing very small projects, but even small projects have environmental challenges. That said, the company provides a great deal of benefit to municipalities – Statkraft is the biggest property tax payer in Norway, and an important employer in small communities.



A big share of the 98% hydro in Norway is from very large installments, many in remote, unpopulated areas. Large reservoirs are hard to fill

up after a couple years of draught, so a lot of time is spent on planning methods for doing this – all of which is impacted by climate variability.

Not surprisingly, the company is focused on competencies – wind, international hydro, district heating, small-scale hydro, flexible European generation and market operations. Moreover, Statkraft realizes that the future depends on its ability to innovate, with a recognized need for investment in research and development (hydro, osmotic, wind). Meeting future energy and climate needs requires high growth and investments in a broad range of renewables.

Global investment in renewables has increased by 100% in the last ten years. In Europe, there is 600 TWh currently, with an EU goal of 1200 by 2020, and by 2050 adding 800 to 3000TWh (which isn't accomplishable with the technologies of today).

Statkraft's core competency is hydro. Many newer stations are being built inside mountains so all you see is lake/river and transmission lines. Storglomvann, for instance, is underneath a glacier that feeds a mountain lake. With snow being the raw material, Statkraft invests heavily in measuring snow and water content using sophisticated methods.

Osmotic power is a new research area for Statkraft, based on EU demand for renewables. They believe that osmotic power should be part of the renewable energy portfolio because of its baseload energy supply with little environmental impact.

What is Osmotic Power? When fresh and salt water meet they have different salt contents – nature requires balance and works to equalize concentrations, therefore releasing energy during that process. Energy companies can capture this by placing a membrane (that blocks salt) in between salt and fresh water, with intent of water still to pass between. Energy capture can

run a turbine that produces electricity, using existing infrastructure.

The technology is well-known for electricity production and transmission – the new element is the membrane and module. The membrane is located in the module/turbine, not in actual river/ocean. Testing in winter environments has been successful but the faster the water flow the better, which may not be the case in the winter as water flows better at higher temperatures.

Osmotic power ensures constant power generation (“baseload”) that will run continuously, thereby complementing wind and solar, which are based on weather. There is only a small ecological footprint (used water put back into ocean safely, thus far); it is a decentralized source of energy, excellent for remote areas that don’t have access to other resources (though the membrane requires clean water – silt would be problematic); and it is a proven technology, which uses current technology in a new way.

The resource potential is significant – global potential (mapping river location and flow) is 1600-1700TWh (about half of energy need of Europe). Work in the coming years is to scale it up and decrease cost.

Wind power is another resource that is increasing. In Norway, there are 245 MW in operation (with 2500 MW under development). All of this is onshore as there is no support scheme offshore. However, Statkraft is currently building the world’s largest offshore wind farm in the UK (9 GW – 5 MW machines, 10 MW under development; and GE just announced a 15 MW turbine).



There are still challenges in wind development, including in HSE – wind doesn’t have a good history of addressing these issues so a large amount of research, study, and education is needed. There remain conflicts of interests to resolve, and offshore wind adds to the complexity with support vessels, infrastructure, competency, and high costs.