

2012

OIL & GAS SECURITY

Emergency Response of IEA Countries

Sweden

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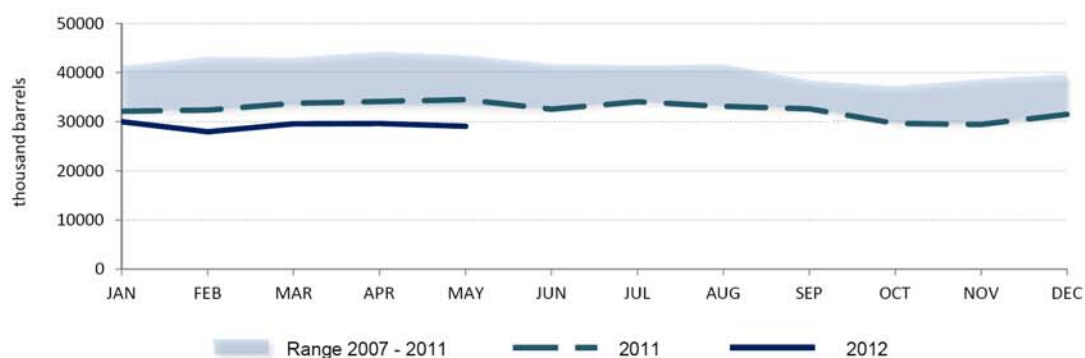
International
Energy Agency

Sweden

Key Oil Data

	1985	1990	1995	2000	2005	2009	2010	2011
Production (kb/d)	-	-	-	-	-	-	-	-
Demand (kb/d)	357.2	335.7	387.8	362.0	359.6	318.3	335.6	316.0
<i>Motor gasoline</i>	86.8	96.4	98.4	91.8	94.0	84.1	79.0	71.7
<i>Gas/diesel oil</i>	123.2	107.3	113.2	111.0	102.3	94.1	106.9	104.1
<i>Residual fuel oil</i>	94.9	49.6	64.4	55.6	57.5	55.3	55.0	47.9
<i>Others</i>	52.3	82.3	111.8	103.6	105.7	84.8	94.7	92.4
Net imports (kb/d)	357.2	335.7	387.8	362.0	359.6	318.3	335.6	316.0
Import dependency	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refining capacity (kb/d)	439	428	428	427	434	437	443	443
Oil in TPES	37.2%	30.2%	30.4%	29.0%	27.5%	26.5%	27.3%	-

End-Month Total Oil Stock Levels¹ - Five Year Range

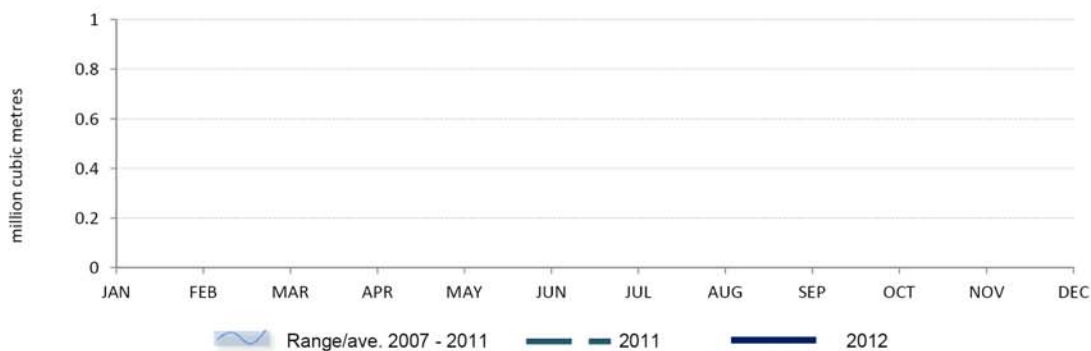


Key Natural Gas Data

	1985	1990	1995	2000	2005	2009	2010	2011 *
Production (mcm/y)	-	-	-	-	-	-	-	-
Demand (mcm/y)	95	616	796	805	820	1 124	1 530	1 296
<i>Transformation</i>	13	235	376	297	255	609	818	-
<i>Industry</i>	75	287	284	344	375	333	502	-
<i>Residential</i>	4	39	71	86	51	73	87	-
<i>Others</i>	3	55	65	78	139	109	123	-
Net imports (mcm/y)	95	616	796	805	820	1 124	1 530	1 296
Import dependency	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Natural Gas in TPES	0.2%	1.2%	1.5%	1.7%	1.6%	2.4%	2.9%	-

* based on monthly data submissions to the IEA.

End-Month Natural Gas Stock Levels² - Five Year Range



1 -Primary oil stocks on national territory; these exclude utility stocks and including pipeline and entrepot stocks where known.

2 -Stocks held on national territory, as reported to the IEA in monthly data submissions.

OVERVIEW

Oil and natural gas represented respectively 27% and 3% of Sweden's total primary energy supply (TPES) in 2010. With coal representing 5% of TPES, Sweden has the lowest share of fossil fuels in the energy supply mix among IEA member countries. This is a significant difference from the mid-1970s, when fossil fuels made up three-quarters of Sweden's energy supply, and is the result of a concerted effort to move away from the use of oil through the development of nuclear and renewable energy sources. Sweden's energy policy seeks to further increase the share of renewable energy sources, including having them provide half of all energy, and 10% of all transport needs, by 2020. The share of fossil fuel is also to be further reduced, through plans to fully eliminate their use for heating purposes by 2020 and having a vehicle stock in Sweden that is "independent" of fossil fuels by 2030. Under this policy, demand for both oil and natural gas is anticipated to decline from current levels.

Oil demand in Sweden was nearly 330 thousand barrels per day (kb/d) in 2011. While fully dependent on imports to meet domestic oil demand, Sweden is a net exporter of refined oil products. Overall oil demand will likely decline in the coming decade, however demand for oil in the transport sector is expected to grow. At the same time, oil demand will be ever more concentrated on transport diesel, with demand for the fuel reaching over 110 kb/d by 2020 compared to just under 80 kb/d in 2011.

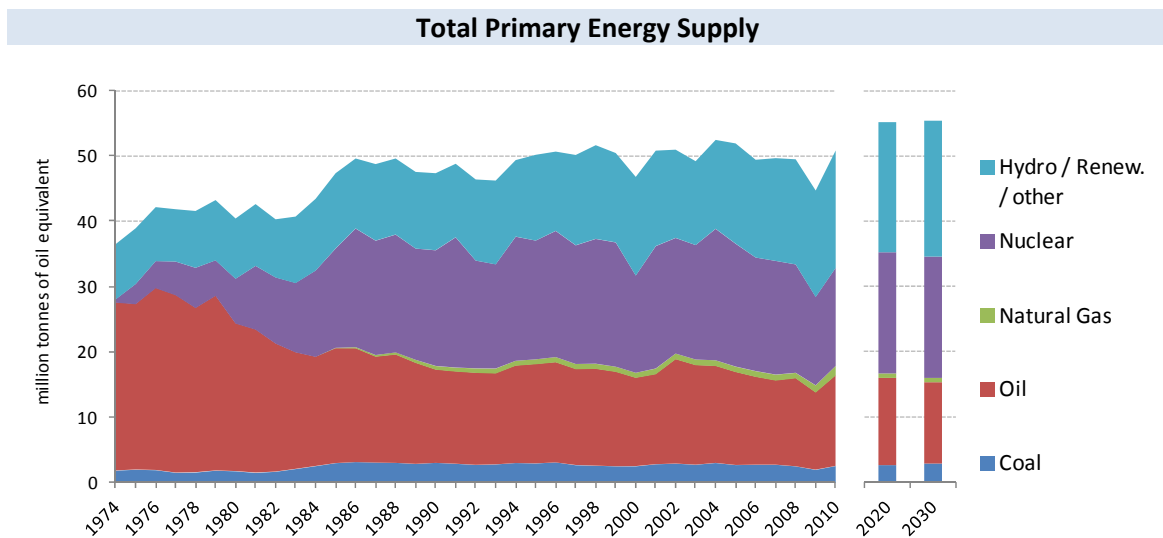
Concerning natural gas, consumption in Sweden totalled 1.3 billion cubic metres (bcm) in 2011, all of which was supplied via a single interconnector with Denmark. While natural gas plays only a minor role in Sweden's TPES, its role in the energy supply of southern and western Sweden is much more substantial, accounting for around 20% of the area's total energy use. Around 30 large consumers, including CHP plants, account for roughly 80% of total gas demand in the country, while households and other small consumers, numbering over 33 thousand, account for 2% of the total.

The Swedish Energy Agency (SEA), under the Ministry of Enterprise, Energy and Communications, has the main responsibility for both oil and natural gas emergency response policy. Sweden fulfils its oil stockholding requirements to both the IEA and the European Union by placing minimum stockholding obligations on industry and major consumers. During a supply disruption and as a contribution to an IEA collective action, Swedish authorities would reduce the minimum obligation, thereby granting operators permission to draw stocks below the minimum level.

In a natural gas crisis, supplies to protected customers (i.e. households) are safeguarded while the physical balance of the gas system would be maintained by restricting or discontinuing supplies to non-protected customers in a crisis. System operators are obliged to have in place crisis plans for dealing with emergency situations, including a strategy for reducing supplies to customers.

1. Energy Outlook

Oil and natural gas represented respectively 28% and 3% of Sweden's total primary energy supply (TPES) in 2010. With coal representing 5% of TPES, Sweden has the lowest share of fossil fuels in the energy supply mix among IEA member countries. This is a significant difference from the mid-1970s, when fossil fuels made up three-quarters of Sweden's energy supply, and is a result of the concerted effort to move away from the use of oil through the development of nuclear and renewable energy sources. Nuclear accounted for nearly 30% of TPES in 2010, while renewable energy sources, principally biomass and hydro, provided 35% of the country's energy supply.



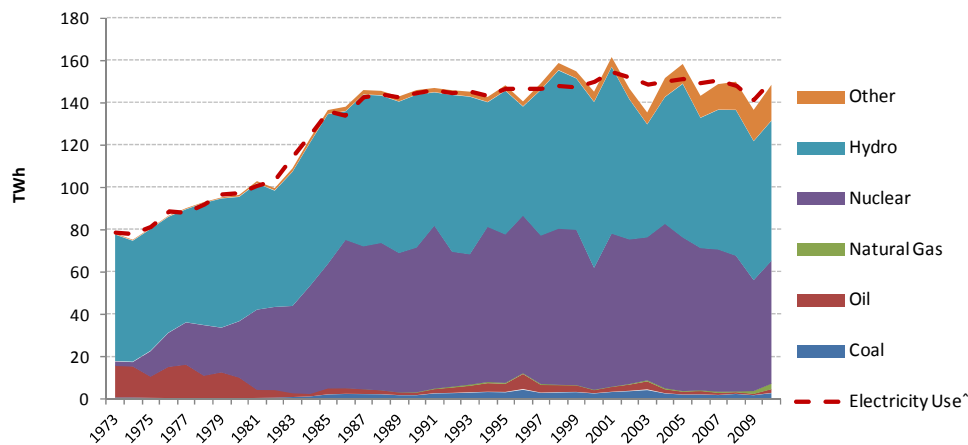
Source: Energy Balances of OECD Countries, IEA; Swedish Administration

Sweden's TPES has remained relatively stable at around 50 million tonnes of oil equivalent (Mtoe) since the mid-1980s. The Sweden's energy supply outlook envisions TPES rising to 55 Mtoe by 2020 and remaining at this level to 2030. Renewable energy sources are expected to meet the bulk of this increase in primary energy needs.

The vast majority of electricity production in Sweden comes from two main sources; nuclear and hydro, which contributed respectively 39% and 45% to total power generation in 2010. Fossil fuels have contributed only marginally since the 1980s, typically representing between 2-3% of total generation, however this share rose to 5% in 2010 following the start-up of a large gas-fired CHP plant. Other sources, primarily wind, have increased substantially in recent years, rising from 3% in 2000 to 11% in 2010.

In 2010, Swedish Parliament approved the joint climate and energy policy, which sets specific targets for increasing the share of renewable sources in the total energy consumed by end-users. This includes 2020 objectives such as having renewable sources reaching at least 50% of total final consumption, having 10% of supplies of the transport sector coming from renewable energy sources, and eliminating the use of fossil fuels for heating purposes. Beyond 2020, the Swedish government has set a goal of having, by 2030, a vehicle stock in Sweden that is "independent" of fossil fuels.

Electricity Generation, by Fuel Source



[^] Total electricity consumption, including own use, distribution losses, pumped storage, etc.

Source: Energy Balances of OECD Countries, IEA

The 2010 climate and energy policy also signifies a change in the Swedish government's nuclear policy, making it now possible for the renewal of nuclear reactors, provided that the old plant is fully closed and that the new plant is situated at the same location. At the same time, the policy does not allow for any form of subsidy to be provided to nuclear power.

2. Oil

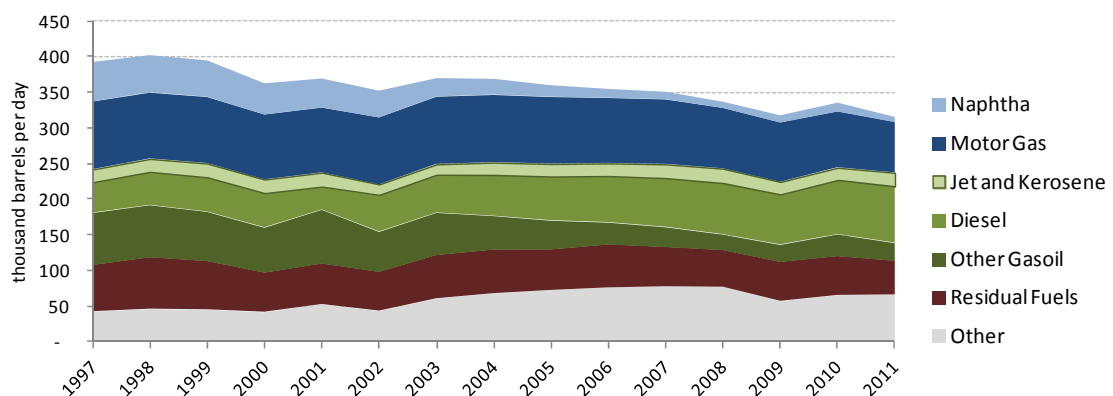
2.1 Market Features and Key Issues

Domestic oil production

Sweden has no indigenous oil production and is thus 100% import dependant. While Sweden depends fully on imports to meet domestic oil demand, the country is a net exporter of refined oil products. In 2011, Swedish refineries processed some 18.6 million tonnes (Mt) of crude oil, or roughly 378 kb/d. Total product output from refineries was 19.5 Mt, or 395 kb/d.

Oil demand

Oil Consumption, by Product



Source: Monthly Oil Statistics, IEA

Oil product demand in Sweden averaged nearly 330 kb/d in 2011. The vast majority of this was consumed in the transport (61%) and industry (22%) sectors (see figure *Oil Consumption by Sector* in 3.1 *Demand Restraint* section below). Total oil use has declined at an annual average rate of nearly 1% since 2000. The decline in oil demand has been driven by trends to switch away from oil, for example replacing fuel oil and gasoil used for heating with district heating and heat pumps. The largest decline in oil use has been in the industry sector, which has moved towards greater use of electricity and biofuels.

While overall oil consumption has been on the decline, demand in the transport sector has continued to increase gradually, rising at an annual average rate of 0.6% over the period from 2000 to 2010 (the latest year for which consumption by sector is available). At the same time, the mix of transport fuels has shifted substantially towards a greater share of diesel. The relatively rapid transition from gasoline to diesel in road transportation can be largely attributed to EU regulations regarding CO₂ emissions for new cars (which favour diesel engines) and growth in the use of heavy goods vehicles. Demand for diesel grew at an annual average rate of 4.7% from 2000 to 2011, compared to a decline in demand for motor gasoline (-1.2% p.a.) over the same period.

Oil Demand (kb/d)			
kb/d	2000	2011	% change p.a.
LPG and Ethane	25	43	5.0%
Naphtha	43	8	-13.8%
Gasoline	92	80	-1.2%
Kerosene	19	20	0.2%
Diesel	48	79	4.7%
Heating/other Gasoil	64	30	-6.5%
Residual Fuels	56	45	-1.9%
Other Products	16	22	3.0%
Total Products	362	329	-0.9%

Source: Monthly Oil Statistics, IEA

Total oil demand is expected to continue to decline in the coming years at an annual average rate of -0.4%. This rate would infer oil demand of around 315 kb/d by 2020. At the same time, demand for diesel is expected to continue to rise, reaching to over 110 kb/d by 2020, compared to just under 80 kb/d in 2011.

Imports/exports and import dependency

In 2011, Sweden imported nearly 18.8 Mt of crude oil, or an average of roughly 380 kb/d, primarily from Russia (50%), Norway (20%), and Denmark (15%). Additionally, Sweden imported some 0.5 Mt of feedstocks in 2011. Russia's share in Sweden's total crude imports has risen significantly over the past decade, having represented less than 10% of total crude imports in 2000.

As refining output exceeds domestic demand, Sweden is a net exporter of refined products. In 2011, product exports averaged 223 kb/d compared to product imports of 183 kb/d. This was mostly made up of reciprocal trade with Denmark, Norway and the UK of the main products, however in the same year Sweden was a net importer of ethane (16 kb/d), jet/kerosene (16 kb/d), and LPG (30 kb/d).

Based on the IEA's methodology for calculating emergency reserves, Sweden's daily net imports for 2011 were 34.8 thousand tonnes of crude oil equivalent (ktcoe). To meet the consequential 90-day commitment, between 2.9 and 3.6 Mt of reserves are required (depending on the mix of crude and product), the equivalent of some 21 to 27 million barrels (mb), or 3.4 to 4.2 million cubic metres (mcm), of oil stocks. This compares to the 2.5 Mt obligation which Swedish authorities set as the stockholding obligation on industry in 2011/2012.

Oil company operations

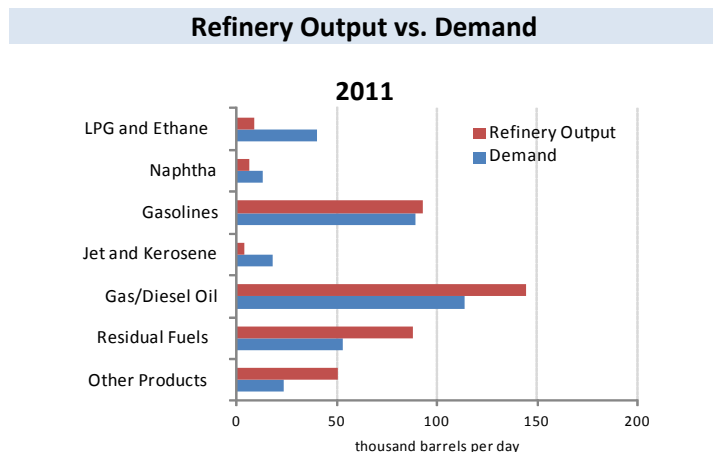
Three companies operate refineries in the Sweden, with Preem AB operating the country's two largest refineries which together represent about 80% of the country's total distillation capacity. St1 operates the third largest refinery, located in Göteborg, which was formerly operated by Shell until being acquired by St1 at the end of 2010. Nynas Refining also operates two smaller refineries which are specialised in producing bitumen and lubes.

The Swedish oil retail market is dominated by 4 companies; Preem, Statoil, QK-Q8 and St1 (with retail stations branded Shell), which together accounted for roughly three-quarters of the market. Companies operating on the Swedish oil market are represented by SPBI, the Swedish Petroleum and Biofuels Institute.

2.2 Oil Supply Infrastructure

Refining

There are five refineries in Sweden with a total crude distillation capacity of roughly 435 kb/d. The largest of these, the refinery at Lysekil (Preem), has a crude capacity of 210 kb/d. Three of the refineries (Preem, St1 and Nynäs Refining) are located in Göteborg and together account for 45% of the country's total crude capacity. The fifth refinery (Nynäs Refining) is located south of Stockholm, at Nynäshamn.



Sweden introduced environmental classifications in 1991 which divided diesel into three classes, Mk3, Mk2 and Mk1. Mk3 followed the European diesel standard, EN 590, while Mk2 and Mk1 held more stringent requirements on specific parameters. Mk2 was a fuel specification that some of the refineries could produce with minor upgrades, while Mk1, with a sulfur content of less than 5 ppm (parts per million), required large upgrades of all refineries. Within a few years Mk1 became the major diesel fuel used in Sweden and in 2010, some 97% to 99% of the diesel fuel sold is of Mk1 quality.

The Preem refinery at Lysekil underwent major upgrading over the past decade in order to produce greater volumes of sulphur-free gasoline and diesel oil. This has positioned Preem to be the biggest supplier of Mk1 diesel in the Swedish market.

Sweden applies an energy tax on diesel which is differentiated according to classification; since 1 January 2011 the environmental tax on Mk1 is 0.17 Euros per litre, compared to 0.20 and 0.21 Euros per litre for Mk2 and Mk3 respectively. Additionally, a CO₂ tax is levied at a constant rate for all three classifications, at 0.33 Euros per litre. At the same time, motor gasoline has an energy tax of 0.34 Euros per litre and a CO₂ tax of 0.27 Euros per litre.

Ports

There are three main ports for importing crude oil and refinery feedstocks necessary to supply the country's refineries. The combined total capacity of these ports is roughly 450 kb/d, with the individual port capacities commensurate with the capacities of the refineries they serve.

Imports of refined products flow primarily through six main ports, three of which are in the Stockholm area. The six ports have a total combined capacity to import over 190 kb/d of refined products.

Oil Infrastructure Map



Pipelines

Due to Sweden's small market and sparse population, the oil distribution infrastructure relies on road distribution rather than pipelines. Some 800 road tankers carry out secondary distribution to consumers and retail outlets.

Storage capacity

Oil Storage Capacity, by Main Storage Areas						
(thousand barrels)						
Main storage areas	Crude Oil	Gasoline	Distillates	Fuel oil	Total Refined Product	Total Oil (crude & product)
Göteborg	12 045	3 516	9 271	4 768	17 555	29 600
Lysekil	10 441	1 547	2 132	-	3 680	14 121
Gävle		937	5 950	440	7 328	7 328
Stockholm		1 572	2 484	-	4 057	4 057
Norrköping		1 289	3 277	-	4 566	4 566
Malmö		447	1 900	2 629	4 975	4 975
22 other storage areas		4 843	22 505	3 705	31 053	31 053
Total Sweden	22 486	14 152	47 519	11 542	73 213	95 699

Source: Swedish Administration

Sweden has approximately 30 coastal and inland storage facilities with a combined total oil storage capacity of 15.2 mcm, or nearly 96 mb. Major depots are located in Göteborg, Lysekil, Gävle, Stockholm, Norrköping and Malmö, with a total storage capacity of nearly 65 mb (10.3 mcm). These facilities play an important role in the domestic distribution of oil products from domestic refineries and import terminals. The remaining storage capacity (31 mb) is spread over 22 storage sites located across the country.

2.3 Decision-making Structure for Oil Emergencies

The Minister of Enterprise, Energy, and Communications is responsible for oil and natural gas emergency policy in Sweden. The Swedish Government states that its energy policy should be built on the same foundations as the wider energy cooperation in the EU, i.e. ecological sustainability, competitiveness and security of supply. It considers key areas of work to be security of supply, improving the efficiency of energy use, promoting renewable energy and efficient energy technology.

Sweden's response to an oil supply crisis would be the lowering of the compulsory stockholding requirements set on industry. Specific demand restraint measures have not been prepared and would not be part of an initial response. However in a severe and long lasting crisis, Swedish authorities would likely consider light handed measures to supplement the use of compulsory industry stocks.

The Swedish Energy Agency (SEA), under the Ministry of Enterprise, Energy and Communications, has the main responsibility for emergency response. Within the agency, the Central Office of Security of Energy Supply team is the core of Sweden's National Emergency Strategy Organisation (NESO). There are 12 to 15 people working in the core NESO in normal times; this can be expanded in times of crisis to include relevant expert staff from both inside and outside the SEA. Close co-operation with industry is a key element in the Swedish NESO and the industry is represented in the regular work of the NESO by the Swedish Petroleum and Biofuel Institute. Other players, such as independent oil consultants and institute researchers, interact with the NESO team when appropriate.

During a crisis, the NESO would analyse the situation and provide recommendations to the Ministry of Enterprise, Energy and Communications regarding possible response measures. In the case of an IEA collective action, Ministry officials would consult the Energy Minister and, based on the outcome, draft a formal decision to be adopted by the government at its weekly meeting, or potentially at an extraordinary meeting of ministers. Once approved, the SEA would be responsible for immediate implementation of the agreed response plan.

2.4 Stocks

Stockholding Structure

Sweden meets its stockholding requirements to both the IEA and the European Union by placing compulsory stockholding obligations (CSO) on oil industry participants. Compulsory stocks are commingled with commercial and operational stocks.

Sweden bases the industry CSO on deliveries to the domestic market of the main refined product categories (i.e. motor gasoline, kerosene, diesel and fuel oils). In addition to importers and domestic refiners, major consumers of these fuels (defined as consuming annually over 50 000 cubic metres or roughly 314 kb), such as manufactures and CHP plants, are subject to the stockholding requirement. According to Swedish legislation, the Swedish government decides annually on the type and quantity of emergency stocks to be held in order to meet Sweden's needs for emergency stockholding. In 2011/2012 this was set at 25% of the volumes delivered in the previous calendar year.

Each year, the SEA determines which companies are subject to a CSO and communicates to them the size and specific composition of stocks to be maintained from July 1 to June 30 of the following year. The individual company obligations are based on declarations which they must submit to the SEA by February 1st of each year, regarding their sales or use of the relevant oil product in the previous calendar year. The SEA adjusts the overall stockholding obligation across importers, refiners and major consumers, such that the same amount of oil use does not generate more than one obligation.

For the period 1st July 2011 to 30 June 2012, the total domestic stock obligation was 2.5 Mt (this is roughly the equivalent of 20 mb; exact conversion from mass to volume would depend on the actual mix of crude and products used to fulfil the CSO). A total of 29 companies had CSOs in this period. Over 90% of the total CSO has been attributed to 5 companies, consisting of the 4 major oil companies and one major consumer from the mining industry. Roughly half of the remaining 23 companies with CSOs are combined heat and power (CHP) plants.

Crude or Products

Subject to approval from the SEA, companies can meet their CSO for oil products with the substitution by either crude oil or a product other than the one obligated (when this is determined by the SEA to provide the same level of security).

Location and Availability

Ticket arrangements are also allowed, both domestic and abroad, according to specific rules set out in SEA regulations. Such arrangements must be granted beforehand by the agency and formalised by a contract covering a period of no less than three months and no more than one year. Bilateral agreements for stockholding abroad are subject to a maximum of 20% of an

organisation's total stockholding requirement for each stock category. Sweden has formal bilateral agreements with Denmark, Estonia, Finland, Ireland, the Netherlands and the United Kingdom. Stocks held in those countries on behalf of a Swedish company must be owned by the Swedish company or by a company in the country involved.

Total stocks in Sweden at end-2011 were 38 mb (4.96 Mt). Of this amount, some 6 mb (0.8 Mt) of refined products (almost entirely diesel) were being held for the benefit of other countries, primarily for the benefit of the United Kingdom. At the same time, 2.4 mb (0.3 Mt) of products were being held for the benefit of Sweden in other countries, principally motor gasoline in the Netherlands and diesel in Finland. Thus at end-2011 a total of 34.4 mb (4.49 Mt) of oil stocks was being used to cover Sweden's operational, commercial and emergency stockholding needs. This figure includes some 6.5 mb of oil being held by major consumers to meet their CSOs.

Under normal operating conditions, the minimum operating requirements (MOR) of the Swedish oil industry is estimated to be approximately 19% for crude oil stocks (roughly 6 days forward cover of refinery intake) and 32% of refined product stocks (roughly 33 days of forward demand cover).

Monitoring and Non-compliance

Companies subject to CSOs must report monthly to the SEA, indicating the amount of fuel stocks held at the end of the previous month, as well as the locations and methods of storage. The SEA (or its designated inspectors) is entitled to inspect the stocks held under the obligations, and can also examine the accounts and other documents relating to company stockholding operations.

Any company failing to maintain compulsory stocks must pay the state a special storage penalty charge. This penalty charge corresponds to the estimated capital cost of the product for one month, plus a surcharge of 60% for failing to meet the requirement.

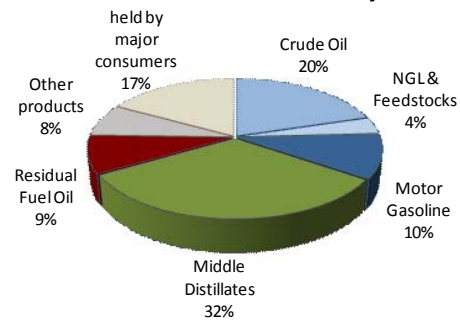
Stock Drawdown and Timeframe

The authority to alter the industry stockholding obligation rests with the Swedish Government. This would be a decision taken by all ministers, based on a draft government decision presented by the Energy Minister, either at a regular scheduled weekly meeting or potentially at an extraordinary meeting of ministers. Depending on the circumstances, a government decision on whether to authorise the lowering of the CSO can be expected to take 7 to 14 days.

Immediately following the government decision, the SEA would decide the maximum stock draw of relevant stocks for each company as well as other specific conditions. The government and agency decisions would normally be distributed to oil companies the same day. Each individual

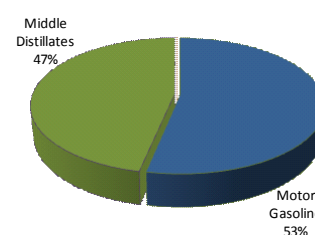
Swedish industry oil stockholding, end-2011

Stocks held domestically



38 million barrels

Stocks held abroad



2.4 million barrels

Source: Monthly Oil Statistics, IEA

company would be left to make the commercial decisions on how to deal with the volumes of oil no longer bound by stockholding obligations.

Financing and Fees

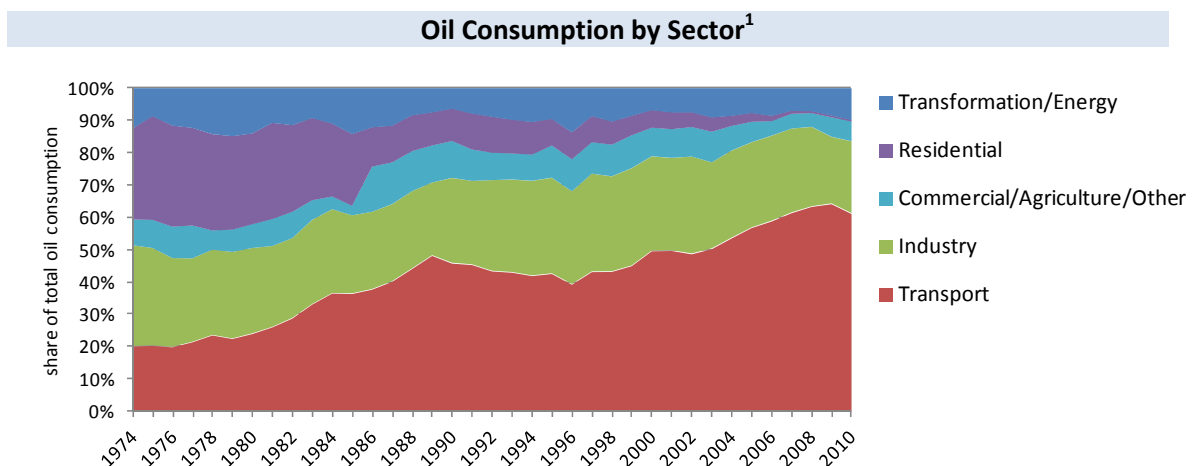
No financial support is given to oil companies or large consumers which are subject to compulsory stockholding obligations. Thus costs are implicitly passed on to final consumers in market prices.

3. Other Measures

3.1 Demand Restraint

In a severe and long lasting crisis, Swedish authorities would likely consider light handed measures to supplement the use of compulsory industry stocks. The SEA would advise the government on possible measures to be implemented in the crisis while the government would take the final decision on the measures deemed appropriate. The SEA has the overall responsibility for the implementation of energy demand restraint measures, with the 2007 Ordinance (2007:1153) serving as the legal basis. This provides the SEA with the ability to implement a variety of light handed demand restraint measures. Stronger measures such as rationing would first require receiving parliamentary approval.

In a crisis, Swedish authorities would begin by focusing on an information campaign to encourage oil savings, while making assignments on fuel savings to all governmental agencies in order to set an example for the general public. Administrative instruments, such as speed reductions and Sunday driving bans, could be utilized in order to strengthen demand restraint measures. Economic instruments, such as modifying fuel taxes or subsidising alternative travelling options, could also be contemplated, while a rationing system would be considered as a policy option of last resort.



Source: Oil Information, IEA

As in other IEA countries, the transport sector makes up the single largest share of oil consumption in Sweden and would therefore be the most likely sector for demand restraint measures to target. In 2010, the latest year for which data on consumption by sector is available, the transport sector represented 61% of total oil use in the country. The industry sector, primarily the petrochemical sector, accounted for the second largest share with 22%. The transformation sector accounted for 10% of oil use in 2010, mostly as refinery fuel but also as input to CHP and heat plants. The remainder of oil consumed in Sweden in 2010 was in the commercial/agriculture sector (6%) and a small amount (1%) in the residential sector for home heating.

¹ Total Consumption (including refinery consumption), does not include international marine bunkers.

3.2 Surge Production

With no domestic production, short-term surge production is non-existent in Sweden.

3.3 Fuel Switching

Short-term fuel switching capacity in Sweden is considered inconsequential and there are no incentives or policy options to incite such switching in an oil crisis. Only a small portion of oil use is for power generation in Sweden. In instances where oil is used, this is primarily for peak production hours and when regular power production is shut-in. In the case of an oil crisis, no environmental regulations would be altered to allow for greater use of fuel switching.

4. Natural Gas

4.1 Market Features and Key Issues

Gas production and reserves

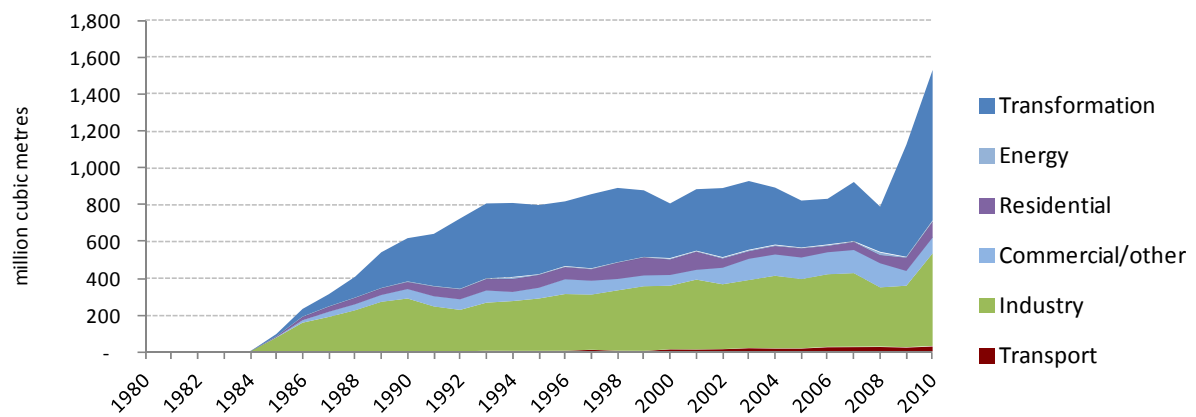
Sweden has no indigenous production of natural gas.

Sweden does have biogas production, which in 2009 totalled 135 million cubic metres (mcm), primarily coming from sewage plants in the area of Stockholm. Around half of this production was consumed in heat plants, while over a third was used for upgrading to vehicle gas. While biogas production in Sweden is relatively small, industry sources in Sweden consider the potential for biogas production to be on a scale of over ten times the current levels.

Gas demand

Domestic gas consumption in Sweden totalled some 1.3 billion cubic metres (bcm) in 2011, compared to over 1.5 bcm in 2010, the latest year for which data on consumption by sector is available. In that year, 53% of total gas use was consumed in the transformation sector and 33% in the industry sector, which includes non-energy use. The residential and commercial sectors each accounted for another 6%, while the remainder of gas use was in the transport sector (2%).

Natural Gas Consumption, by Sector



Source: Natural Gas Information, IEA

Natural gas plays only a minor role in Sweden's energy supply, where in 2010 it represented 3% of TPES and 3% of total electricity generation. However, the role of natural gas in the energy supply of southern and western Sweden is much more substantial. In the 30 municipalities in Sweden which have access to natural gas supplies, natural gas accounts on average for around 20% of total energy use.

Roughly 80% of total gas use is consumed by 30 large consumers. This includes 9 cogeneration plants (CHP and district heating) which account for 55% of all gas use in the country. Around 2% of total gas use in Sweden is from smaller consumers (i.e. households) which are considered protected customers and which total around 33 thousand consumers.

Daily gas consumption in Sweden typically ranges between 6 and 7 million cubic metres per day (mcm/d) in the winter, compared to around 1.2 mcm/d in the summer. On the basis of the European standard of a 1 in 20 year for exceptional cold winter weather causing peak demand, Sweden's maximum daily gas demand is calculated at 7.8 mcm.

Gas import dependency

Sweden has no indigenous production of natural gas and is thus 100% import dependant. All natural gas supplies come from Denmark via a single interconnector in the south-west of the country. As Sweden is at the end of the gas supply line from Denmark, there is no transit of natural gas through Sweden.

Gas company operations

The company Swedegas is the owner and operator of the transmission system and storage facility. At present the role of transmission system operator (TSO) is split between two parties, Swedegas and the public body Affärsverket svenska kraftnät (SvK). SvK is currently responsible for maintaining physical balance within the system, however Swedish authorities are at present considering moving this responsibility to Swedegas during the course of 2013.

There are five distribution system operators (DSO) in Sweden, the largest being E.ON Gas Sverige. There are only five traders selling natural gas for use in the Swedish gas network. The largest players are DONG, E.ON Försäljning Sverige and Göteborg Energi. The Swedish gas market requires that at each withdrawal point there be a balance responsible party which has financial liability for ensuring that the gas system is balanced. Typically, it is the traders that are responsible for balancing the gas, but traders may also buy this service from another. There are four balance responsible parties for the Swedish market: E.ON Gashandel, DONG Energy, Göteborg Energi and Modity Energy Trading AB.

4.2 Natural gas supply infrastructure

Ports and Pipelines

The Swedish transmission system for natural gas begins at Dragør in Denmark, crosses the Öresund via the Öresund pipeline to Klagshamn, south of Malmö, from where the trunk pipeline heads northward to Stenungsund. The technical capacity of the Öresund trunk line is 8.4 mcm/d while the technical capacity of the entry point of Dragør is 7.8 mcm/d.

The Swedish natural gas network consists of approximately 620 km of transmission lines and roughly 26 000 km of distribution lines. Branch pipes lead off from the trunk pipeline to various consumption areas. There are 39 metering and control (MC) stations connected to the branch lines, where the gas is metered and the pressure reduced. Local distribution systems are then connected to the MC stations. These systems distribute the gas to the end-consumers.

Natural Gas Transmission System



Source: Energigas Sverige

An LNG receiving terminal at Nynäshamn, south of Stockholm, has been in operation since mid-2011. This port has a maximum capacity to supply 6 mcm/d, however it is not connected to the gas transmission system in the south west of Sweden.

Storage

There is only one small storage facility in Sweden which is used for meeting peak demand. Located at Skallen, in southern Halland, it is a lined rock cavern with total working capacity of 8.8 mcm and a maximum withdrawal capacity which varies from 0.6 to 0.9 mcm/d. The variation depends on the pressure in the storage facility and the trunk pipeline. The withdrawal capacity corresponds to 10-20% of the gas requirement of the Swedish market under winter conditions.

Sweden does not have any storage to provide for seasonal swings in natural gas demand. This is primarily provided for with the assistance of storage facilities in Denmark (at Stenlille).

4.3 Emergency Policy for Natural Gas

Swedish emergency response policy for natural gas is based on the European Directive 2004/67/EC. The 2005 Natural Gas Act gives powers to the system balancing authority to order system operators to increase or reduce the input or off-take of gas flows and to restrict or discontinue the transmission of natural gas to customers. This provides the statutory powers for physically balancing the domestic gas network in times of crisis.

The 2006 Natural Gas Ordinance establishes responsibilities under the Natural Gas Act, making the SEA the competent authority for establishing and maintaining a national strategy for gas emergencies and appointing the public body Affärsverket svenska kraftnät (SvK) as the system

balancing authority (a role that Swedish government is presently considering moving to the TSO, Swedegas, in 2013).

The Natural Gas Ordinance also sets the circumstances under which supplies to protected customers are to be safeguarded. This is defined as being in at least the following cases: a partial disruption of supplies for up to 24 hours; supplies during the winter period (running from the beginning of December to the end of February); and during periods when temperatures are 4-5° C less than the normal winter temperatures (1 in 20 winter).

Sweden defines protected customers as all households and small consumers connected to the gas distribution network. Approximately 33 thousand customers fall under this definition and collectively these consumers account for 2% of total natural gas consumption in Sweden.

Measures for responding in a gas crisis

Means for responding in a crisis include utilizing line pack, maximizing the input of biogas supplies into the network, and drawing on available volumes in storage. Swedish authorities estimate that these measures could maintain supplies to the entire Swedish gas market during a total cut-off lasting less than 24 hours during high demand. However, disconnecting large users of natural gas remains the most important means for safeguarding supplies to protected customers in a gas crisis. In this case, supplies to protected customers are estimated to be maintainable for one month in the case of high demand, and for several months in the case of low demand.

A total of some 60 large natural gas consumers can potentially be cut-off from supplies very rapidly in an emergency, the equivalent of nearly 85% of total gas demand in Sweden. Large CHP-units which constitute almost half of all gas demand in Sweden have the capacity to quickly switch from natural gas to gasoil. Large industries, representing another quarter of total gas demand, also have capacity to switch to other fuels, primarily fuel oil. There are no requirements on gas users with fuel switching capability to keep specific stocks of alternative fuels.

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

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