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Energy - where next?

Nordic regional developments

Burning fossil fuels: Every evening at 1800 Birka Paradise leaves Stockholm harbour for a Baltic Sea mini-cruise. Photo: Odd Iglebaek

NORDREGIO
Nordic Centre for Spatial Development

Contents

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(Kulturgeografiskt seminarium 1/2007)

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The energy bonanza will continue

Numerous debates and political initiatives have over the years taken place in the Nordic countries with a view to reducing energy usage. Thus far, with little or no result.

Sure enough, cars use less petrol, but we drive more while more and more offices are constructed as glass-houses shining luminously, but to little purpose, throughout the night. Houses are definitely better insulated though our living quarters continue to grow in size to the extent that what is gained by having thicker walls is soon lost by having more walls. Many of us, in reality, own two or even three houses with holiday homes included.

Perhaps worst of all in terms of energy spending is the difficult political question of air-travel. Here we are all currently enjoying a bonanza as real prices continue to fall and thus we all fly more and more. In fact, for some time now the majority of us have been expending more energy on holiday air-travel than on the heating of our homes while the actual monetary cost of travel is less than half that of heating.

For energy producers high market demand is advantageous. For the public the same could be the case – that is – if the production, distribution or consumption of energy did not cause pollution or accidents. In many ways this summarizes the debate on energy where costs must be measured against environmental hazards.

This is well known. On the other hand many of us know less about energy as a commodity. With this issue of the *Journal of Nordregio* we hope to provide some insight into this question. For example, for those of us living in the Nordic countries it is becoming increasingly important to understand how the Nord Pool Spot Market, the bourse for electricity, functions as this market more or less determines the price of all of the electricity we consume. What makes prices go up and down and what are the most likely future trends?

In this context one issue in particular is of regional importance, namely, if prices become too high, will this lead to power intensive industries moving to low-cost countries. China, India and the Gulf countries are attractive as are Iceland and Greenland. New power-hungry aluminium plants are being planned or at least considered in both countries. In many ways, this is something of a parallel to developments in Norway some seventy to eighty years ago when hydro-electricity, provided at secure low prices, led to huge investments being made in melting-plants and other similar industries.

An increasing number of international electric connectors have been established or are being planned between the Nordic countries and continental Europe. For hydro-producers in Norway and Sweden this is definitely an advantage. Prices are still relatively higher in these more southern areas. For contracts one year ahead, by some twenty percent. Therefore it is probably just a question of time before overall prices for Nordic consumers will rise. Is that an advantage with respect to climate change?

The EU has agreed plans to reduce CO_2 emissions and to make more efficient use of energy. At the same time the Union is heavily dependent on Russian gas supplies. Norway and Algeria are the two other major suppliers. The new pipeline planned through the Baltic Sea will increase Russian giant *Gazprom's* access to the European market. At the same the demand for gas is also high and increasing in Russia itself. Prices on the other hand are much lower. As such any prediction that assumes that energy prices will continue to rise across Eastern Europe seems well placed.

The Baltic countries find themselves in the situation where they can produce a lot more energy than they currently consume. They want to remain in such a position while also becoming an energy hub between east and west as this would see them benefit from the high profits associated with these commodities. In other words, they are acting as the rational market demands and just like their counterparts in the Nordic countries, in *Gazprom, Exxon or Shell.* This should not be a surprise to anyone. ■

By Odd Iglebaek
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Nordic commuting to work

Commuting to work in the Nordic countries; for the first time ever a systematic overview is now available. It is in the first chapter of the new Regional Development in the Nordic countries publication for 2007 that the information is to be found. The publication has just been released and can now be ordered. See back-cover for more information.

In Denmark almost every second employed person commutes to work across a municipal boundary whereas in Finland, Norway and Sweden it is around every third person. For Iceland exact statistical information on commuter flows is not available. However, today some 70% of the Icelandic population resides in commuting distance to Reykjavik city.

The map on page 5, which is one of the illustrations in the new report, depicts the main commuter flows towards those municipalities maintaining a commuter surplus. In 2004 this was the case for roughly one in five municipalities in Denmark, Finland, Norway and Sweden. The major part of these municipalities are either cities or nearby municipalities.

Significant commuter ties beyond the local level exist between capitals and second or third-order urban centres in particular but also from/towards the other regional administrative centres.

In Helsinki the accumulated number of in-commuters from all regional administrative centres in Finland comes to around 9% of all in-commuters on the capital labour market. The corresponding figures for Tampere and Turku are 7% and 5% respectively.

On the Stockholm labour market the importance of this group is almost the same as in Helsinki while Gothenburg and Malmö clearly attract less commuters from other Swedish regional centres as compared to the Finnish proportions.

In Denmark the pattern is the opposite with Århus (7.5%) having more than twice as many of this group of commuters as compared to Copenhagen.

Norway stands out with a generally high share of long distance commuters on its labour markets. Around one in ten (9-11%) of in-commuters on the Oslo, Bergen and Trondheim labour market originate from the other respective Norwegian regional administrative centres.

Intra-Nordic

On an intra-Nordic scale the volumes of commuter flows are lower but of particular regional relevance in two Nordic cross-border areas, namely in the Øresund area (Denmark/Sweden) and along the southern Norwegian-Swedish border. In the latter area more than half of all cross-border commuting in the Nordic countries is taking place.

In 2004 a total of 20 593 persons commuted from Sweden to either Norway or Denmark. In the opposite direction commuter flows amounted to a mere 1 153 and 692 persons respectively.

While commuters to Denmark mainly target greater Copenhagen and Helsingør, it is Oslo and its eastern surroundings (Akershus, Østfold and Hedmark County) in the case of Norway.

In a Swedish border municipality like Strömstad (Västra Götaland and Värmland) more than 10% of the employed population out-commutes to a Norwegian destination. Moreover noteworthy mutual commuter flows also exist between Oslo and Gothenburg.

The establishment of the Øresund fixed link at the beginning of the decade has favoured both Copenhagen and Malmö's labour markets by contributing to the solveing of labour shortages in the Danish capital while reducing unemployment in the Malmö area.

At the Swedish-Finnish border minor commuter flows arise between the adjacent municipalities of Haparanda (SE) and Tornio (FI) as well as in respect of the Finnish Åland islands and the region of Södra Österbotten (Vaasa). Those flows, being small in a Nordic context, can nevertheless be important at the local level. In Haparanda commuters from neighbouring Tornio occupy more than one out of ten jobs. Flows in this direction are double those the other way around.

Nordic capitals

Commuting between the Nordic capital labour markets is less intensive and mainly takes place between Helsinki and Stockholm (1 400 commuters).

The same holds true for commuting from/to adjacent EU labour markets. At the Danish-German border the number of commuters in the main flow from Schleswig-Holstein (DE) towards Sønderjylland (DK) amounts to a mere 1 694 (2003) but has significantly increased since the end of the 1990s.

Another issue discussed in Regional Development in the Nordic countries 2007 is jobless growth, while the loss of jobs in the core cities is also examined. For example, between 2001 and 2003, Helsinki, Oslo and Stockholm lost some 4 500, 14 700 and 19 000 jobs respectively. In Helsinki and Oslo the core city comprises 85 % of all jobs on the capital labour market. In comparison, in Copenhagen city roughly half of all jobs are located inside the city and the loss was less.

Primarily the core cities are challenged by their own surroundings, though larger regional centres are also gaining jobs. Among these, in particular universities seem to have played a distinct role in facilitating job creation. ■

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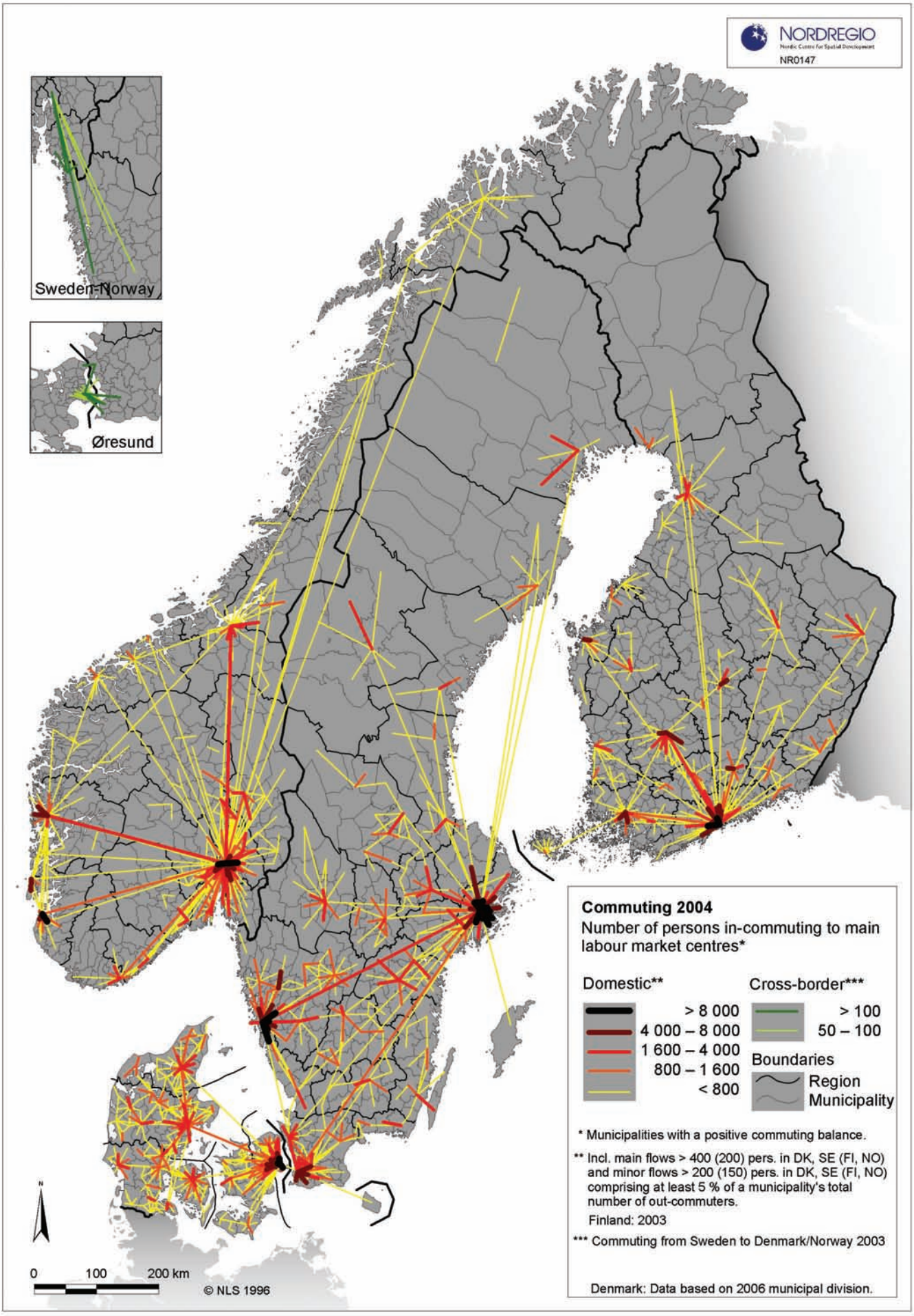
NORDREGIO
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NR0147
Sweden-Norway
Øresund
Commuting 2004
Number of persons in-commuting to main labour market centres*
Domestic**
> 8 000
4 000 – 8 000
1 600 – 4 000
800 – 1 600
< 800
Cross-border***
> 100
50 – 100
Boundaries
Region
Municipality
* Municipalities with a positive commuting balance.
** Incl. main flows > 400 (200) pers. in DK, SE (FI, NO) and minor flows > 200 (150) pers. in DK, SE (FI, NO) comprising at least 5 % of a municipality's total number of out-commuters.
Finland: 2003
*** Commuting from Sweden to Denmark/Norway 2003
Denmark: Data based on 2006 municipal division.
0 100 200 km
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Nordic viewpoint:

Regions should trade on how not what

Unlike Norway, Sweden will not re-centralise healthcare while Finland's structural reform process is becoming more consensual like that of the Swedes, Norway however may, like Iceland, need a push from above to enact structural reform. It seems that the Nordic countries can learn more from one another by trading experiences of how things are done, rather than what is done. Included below are examples of lessons learned in this context as presented in the seminar on "The Role of Regions" organized by *Nordregio* on 8 March 2007.

Processes of municipal and regional reform are currently on the agendas of all Nordic countries. The need to find new modes of territorial responsibility, to cope with globalization to manage an ageing population and to provide for effective and efficient service provision while addressing the challenges of both regional competition and cohesion drive the process. The means by which these goals are pursued however differ markedly as witnessed by the emergence of varying national processes of structural reform.

The paradox of decentralization
In parallel with these pressures 'decentralization' has emerged as a policy antidote. Paradoxically however the most active "decentralizers" are those that already enjoy the highest degree of decentralization. Although the Nordic countries are already rather decentralized, it is clear that a significant level of variation exists.

Territorial coherence
On 27 February 2007 the Swedish Committee for Public Sector Responsibility concluded that, for three reasons, fewer counties are necessary: (1) the state should be reconstructed to achieve a territorial rather than sectoral division of responsibilities; (2) the process of knowledge acquisition in health and medical services was to be better facilitated and restructured and (3) regional growth would be promoted by adapting regional borders to future local labour market regions. Each of these tasks entails the drawing up of a different map. Achieving territorial coherence thus remains a difficult task.

No one size fits all solution
While the similarity of shared pressures and experiences provides the context for reform such justifications only scratch the surface of the debate. In reality specific national discourses have emerged from endogenous not exogenous concerns and as such remain specific to each country. Finland focuses on regional competitiveness and growth-oriented aspects. Iceland is concerned with municipal amalgamation to create economies of scale. Denmark has focused on simplifying citizen access to public sector services and on the "marketisation" of the welfare state. In Norway focus remains on the unique nature of regional and local competencies, regional distribution and intersectoral integration. In Sweden the need for more knowledge-based and coherent governance structures and equality among the regions is stressed.

Regional policy - a non-issue in the reform processes?
The Danish process is distinct not only because of its speed but also because of the political commitment of the government. Indeed the Minister of the Interior was decisive in driving the reform through in a rather "non-Danish" manner.

In Norway structural reform implementation is largely a bottom-up process focussing on voluntary amalgamations driven by the counties and municipalities. Imbedded interests can however stymie the process with decisions not leading to action as a coherent pro-reform alliance does not exist while supporters of central government and sectoral interests remain both numerous and vociferous in their opposition. In Sweden and Denmark the process is driven by the central level even though the cumulative effect is to increase responsibility and participation at lower levels. In the Finnish case the original initiative for the reform was driven by the government though implementation has relied on bottom-up and local/

Regions a là Sweden

The main point of the proposal from the Swedish Committee on Public Sector Responsibility was that the current regional level of 21 county councils should be replaced by 6 to 9 directly elected regions.

These regions should have the former responsibilities of county councils (hospitals, health care, and public transport), as well as participating in the shared task of regional development and growth, including industrial and infrastructure development, administration of EU Structural Funds, culture, equal opportunities, environment, and public health. The previous state regional level (county administrative boards) will follow the same geography as the new regions, as will all other state authorities on the regional level. In order to improve effectiveness and efficiency, the interaction between the regional and state levels becomes essential. The Committee recommended that each region should include 1-2 million inhabitants (and not below 500,000), one regional hospital or institutionalised co-operation in the hospital sector, as well as one major university.

The new model could be implemented, at the earliest by 2010, after the next elections, requiring the rapid mobilisation of all of the levels involved. Central government is to support the process by employing three process managers to support the reform in the southern, northern and central parts of the country. ■

sub-national processes. Only in Denmark and Norway is the issue of regional reform highly politicised.

In Iceland the regional question is effectively a non-issue while local governance and municipal mergers generate heated debate. Little has been achieved while the reasons for this are revealing. Referenda, thought to be the "democratic way" were more or less forced upon the municipalities, rather than being initiated from below while the task portfolio the municipalities were to inherit after amalgamation was never specified. The future of municipal reform in Iceland thus remains uncertain.

Although interest in the territorial dimension of various policies is increasing, interest in regional development *per se*, is not. The regional level is simply not where the money is. At the same time a growing discrepancy is emerging between functional and administrative regions, potentially hampering such processes and making policy challenges such as transport, energy use and the ramifications of climate change more difficult to address.

Finland – regional reform the "Nokia way"?
The new Finnish model was, it is often argued, originally inspired by *Nokia*, which saw the traditional top-down regulative model replaced by 'network governance', even though 'networking' is facilitated through a top-down initiative. The national government plays the role of facilitating the interplay between the different actors within regional development seeking to foster the conditions for more bottom-up initiatives to emerge. European policies, e.g. the Structural Funds may however be partly responsible for this change.

Norway – a need for crisis management?
In contrast to Finland where new solutions have emerged as responses to external threats and internal crisis it may, paradoxically, be the 'wealth' of the welfare state that is the problem in Norway. Despite numerous reports and proposals from the government on the need for regional reform, decisions remain to be followed by action. The reasons for this are numerous but are perhaps most often linked to the fact that the need for reform has, thus far at least, simply not been pressing enough. As such a coherent alliance of vested interests at the regional and local levels has not yet emerged while the supporters of sector interests have been able to mobilise significant opposition to the new proposals. Moreover, compared to Denmark, in Norway a clear process-owner or "manager" at the national level has simply not emerged.

Size does matter in Denmark - bigger is better?
The need to improve quality and effectiveness in the healthcare sector was the main Danish reform driver accompanied by the argument that "bigger is better". Easy access and transparency have also emerged here as governance-based ideals. Ensuring the quality of services remains a priority, but the tax level simply cannot be increased further: improved efficiency and "cutting red tape" remain at the core of the process.

The notion that "money follows the task" is not central to the Danish process. The newly instigated regional level has similar responsibilities, but no tax levying powers to implement them, although block grants from the centre and contributions from the municipalities remain. Regional development responsibility became something of a concession to the regions as the power associated with this issue is more symbolic than substantive: the share of the regional budget for regional development is 2-3% while the role of the regions remains that of "process consultant" or facilitator. Is the weak role given to regions then attributable to the underlying 'conspiracy theory' entertained by some, namely, that the politicians actually want the regions to fail, so that the project can be conveniently terminated in eight to twelve years time?

Lessons for the central level: A new role for the state?
What then is the role of the regions? Perhaps it is to aid the state in renewing the Nordic welfare systems? The regional level provides a natural arena for debate and economic activity by, for instance, facilitating new forms of network governance, positive dynamics and creative solutions. This 'model' however demands that a new role for the state is also crafted.

And the Swedish regions - what will happen to them?
The current Conservative government thinks that there should be no 'regions' at all. Swedish industry has however reacted positively to the regional proposals, reflecting an understanding within the Swedish business community that growth has a 'regional logic'. The first action to be taken here is the appointment of three 'promoters', with the regional map being settled in late spring 2008 and, in theory, the formal decisions being taken in December 2009. For constitutional reasons however, the issue could be delayed until after the next elections, i.e. in 2010, with the brand new Swedish regions emerging by 2011. ■

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Balancing Russian gas supply

Russia holds the world's largest natural gas reserves. This make it the largest exporter of natural gas and stokes its ambition to portray itself as an energy superpower. Paradoxically however Russia continues to face domestic gas shortages.

Today around 25% of the natural gas consumed in the EU comes from Russia, while gas consumption in some EU countries, including the Baltic countries and Finland, depends entirely on supplies from Russia.

Russia is however also a major consumer of natural gas. Russia's own domestic demand for natural gas is high and the share of gas in indigenous energy consumption in Russia is above 50%. In 2005, 220 billion cubic meters (bcm) out of the 598 bcm of natural gas produced in Russia was exported to the CIS and Europe with the rest being consumed domestically. Thus, it is important to realize that the continuing supply of gas to its own domestic market is a key condition for the stable and predictable delivery of Russian gas to Europe.

The European gas market is lucrative for Russia. Russian dominance in the European gas market produces high earnings for the country while also potentially remaining an important instrument of Russian foreign policy. While, on the one hand, *Gazprom* - the Russian gas monopoly- has repeatedly signalled its plans to boost gas exports to Europe the Russian government, on the other, has now admitted that there is a shortfall in gas production for domestic consumption.

The deficit in natural gas became a severe problem for the Russian power generating industry last winter when, in Central and Northwest parts of Russia, the temperature fell below -30°C for several weeks, while the demand for electricity significantly increased.

The Russian power generation sector consumes around 25% of all gas produced in Russia, while the share of natural gas in total fuel consumption

Energy consumption in 2005 (Million tonnes oil equivalent)
*Source: BP Statistical Review of World Enegry, June 2006 **

European Union	Oil	Natural Gas	Coal	Nuclear Energy	Hydro electric	Total
1. Austria	14,2	9,0	2,5	-	9,0	34,6
2. Belgium & Luxembourg	39,5	15,2	6,4	11,1	0,6	72,7
3. Bulgaria	5,0	2,9	7,4	4,2	0,8	20,3
4. Cyprus	-	-	-	-	-	-
5. Czech Republic	9,9	7,7	20,5	5,6	0,7	44,4
6. Denmark	9,1	4,5	3,6	-	^	17,2
7. Estonia	-	-	-	-	-	-
8. Finland	11,0	3,6	2,5	5,5	3,1	25,6
9. France	93,1	40,5	13,3	102,4	12,8	262,1
10. Germany	121,5	77,3	82,1	36,9	6,3	324,0
11. Greece	20,9	2,3	9,0	-	1,3	33,5
12. Hungary	7,0	12,1	2,7	3,1	^	24,9
13. Ireland	9,4	3,5	1,9	-	0,2	14,9
14. Italy	86,3	71,1	16,9	-	9,6	183,9
15. Latvia	2,7	2,9	0,2	2,3	0,2	8,3
16. Lithuania	-	-	-	-	-	-
17. Luxembourg			-	-	-	-
18. Malta			-	-	-	-
19. Netherlands	49,6	35,5	8,7	0,9	^	94,7
20. Poland	21,9	12,2	56,7	-	0,9	91,7
21. Portugal	15,3	2,7	3,8	-	1,1	23,0
22. Romania	11,3	15,6	7,1	1,3	4,6	39,8
23. Slovakia	3,5	5,3	4,3	4,0	1,1	18,2
24. Slovenia	-	-	-	-	-	-
25. Spain	78,8	29,1	21,4	13,0	5,2	147,4
26. Sweden	15,1	0,7	2,2	16,3	15,5	49,7
27. United Kingdom	82,9	85,1	39,1	18,5	1,7	227,3

* *In this Review, primary energy comprises commercially traded fuels only. Excluded, therefore, are fuels such as wood, peat and animal waste which, though important in many countries, are unreliably documented in terms of consumption statistics. Also excluded are wind, geothermal and solar power generation, as well as biofuels.*

^ *Less than 0.05*

for power generation and centralized heating is about 40%.

Hand in hand with the economic growth that Russia has experienced in recent years, its energy demand has also grown. The Russian power generation sector consequently foresees the emergence of serious challenges in respect of the provision of natural gas to the new power stations.

The challenges of Shtokman

The three giant West Siberian gas fields - Medvezhye, Urengoy and Yamburg - currently accounting for roughly 63% of *Gazprom's* production, have passed their production peak and are now experiencing a production decline. In order to meet growing demand both domestically and in respect of export markets, Russia is now heavily dependent on a number of new gas developments.

The giant Shtokman offshore field in the Barents Sea and the fields of Yamal Peninsula have vast deposits and are the next large-scale sources of production. Difficult mining conditions require huge investments and gas extraction from these fields has been consistently postponed. On the 9th of October 2006 *Gazprom* surprisingly ruled out the possibility of cooperating with foreign partners and announced that it would develop Shtokman alone.

Gazprom however lacks experience of developing Arctic offshore fields and the company may find it difficult to begin production from Shtockman in 2011 as is currently projected.

Turkemenistan is the saviour

The importation of natural gas from Turkmenistan became important for *Gazprom's* delivery commitments to domestic and European users. Turkmenistan is the country with the second largest gas resources in the former Soviet Union. Turkmenistan's gas production is now being actively expanded after several years of serious decline following the collapse of the Soviet Union.

According to a long-term agreement, which Russia signed with Turkmenistan in 2003, Russia will buy up to 60-80 bcm of Turkmen gas annually until 2028. For the country that produced 58bcm in 2005, this means that for the next 20 years Russia will secure to itself basically all Turkmenistan's gas left over after Turkmen domestic consumption.

The Central-Asian gas pipeline that goes to Russia through Uzbekistan and Kazakhstan is practically the only way for Turkmen gas to flow outside its own market. Turkmenistan has however tried to diminish its dependence on Russia by building pipelines to Turkey and China. Indeed Turkmenistan plans to begin gas delivery to China by January 2009.

In the short term however it will be difficult for Turkmenistan to find excess gas for export to the Chinese market while not violating its contract with Russia.

The creation of an alternative export route for Turkmen gas will however make the import price of Turkmen gas, which is currently relatively low, higher for Russia. Turkmenistan recently demanded that the gas price for Russia be raised from 65$/mcm to 100$/mcm starting from January 2007, otherwise Turkmenistan threatened to stop delivery to Russia.

The sudden and unexpected death of Turkmen president Saparmurat Niyazov in December 2006 however raised some anxiety that the new Turkmen government might reconsider its obligations to Russia such that maintenance of control over future Turkmen gas exports suddenly became an urgent geopolitical issue for Russia.

Low gas prices in Russia

The availability of gas resources is an essential condition for Gazprom enabling it to supply all of its consumers. Russian gas pricing policy however reflects the fact that *Gazprom* prioritizes European consumers over and above it own domestic customers. This is not hard to understand given the economics of the situation. In 2006 the average regulated gas price for Russian industrial consumers was 40$ /mcm while to the EU *Gazprom* sells at a price of 240$/mcm. Low energy pricing is the main non-market feature from the Soviet era that still remains in the Russian economy.

As the Russian economy recovered the government steadily began to raise Russian gas prices. The Russian government however is still reluctant to push for significant price increases, which would restrict the domestic growth of demand for natural gas. The main reasons here are inflation and the fear that Russian products will lose their competitiveness. In 2008 Russia will undergo presidential elections to find a successor to President Putin and the current Russian government obviously wants to delay the negative consequences of a rise in the domestic price of energy beyond the election.

Although Russian gas output is expected to grow there are problems with its production and with its ability to satisfy domestic gas demand. Russia thus faces a significant challenge in maintaining its dominant position in Europe and in avoiding energy crises domestically. ■

By Marina Tsygankova, Senior Executive Officer, Statistics Norway
www.ssb.no

Viewpoint:

A need to cut EU-dependence on Russian gas

The recent gas price 'confrontations' that Russia engineered with the Ukraine and Belarus have exacerbated European concerns in respect of energy supply security. The EU needs to increase it supply from other exporters in order to diminish Russian dominance of the European gas market.

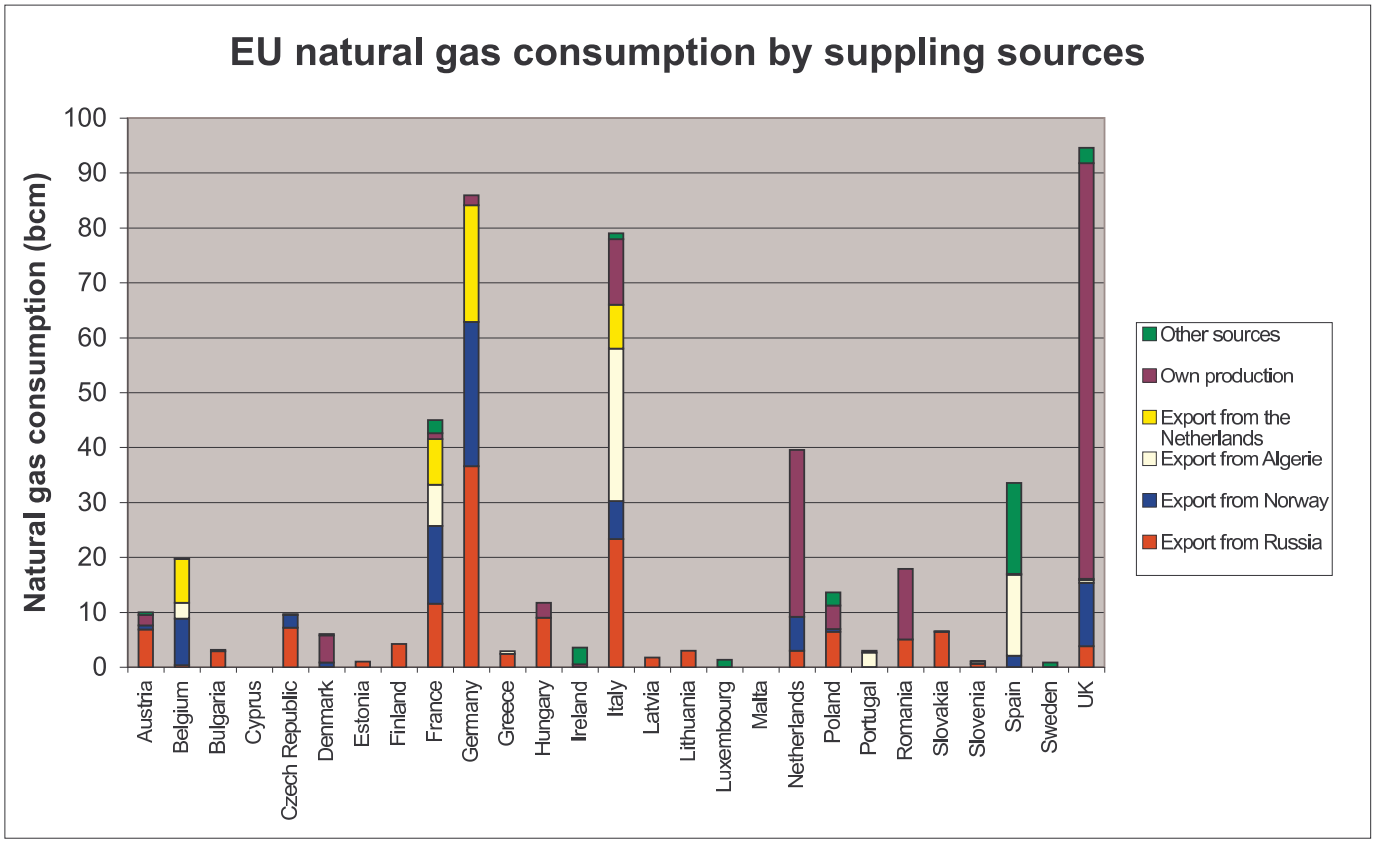
The European Union is highly dependent on the import of natural gas from Russia. 60% of all the gas consumed in the EU is imported, and 46% of the EU's gas imports come from Russia. Russia exports natural gas to 19 EU countries. In certain EU members, namely, Bulgaria, the Czech Republic, Estonia, Finland, Latvia, Lithuania and Slovakia, Russia almost provides the entire amount of gas imported. Among these countries, Finland, at 14%, has the lowest share of natural gas in its total energy usage while in Slovakia natural gas accounts for almost 30% of total energy consumption.

Countries that satisfy more than half of their demand need with Russian gas make up some 16% of the EU's population while 60% of the EU's population live in countries where Russia satisfies more than 25% of gas demand. Spain is currently the only large gas consumer in the EU that does not import natural gas from Russia.

Stable and predictable gas supplies from exporters are important for import dependent Europe. Lately however Russia has twice acted in such a way as to question its reputation as a reliable natural gas supplier to the European Union. In January 2006 the Russian-Ukrainian gas price conflict disrupted gas supplies to some parts of Europe for several days. In January 2007 a similar gas price conflict between Russia and Belarus briefly affected Russian oil supplies to some EU countries.

Russia has clearly demonstrated how its abundant natural gas resources can be turned into a handy instrument of political leverage. As such then the reduction of Europe's dependence on Russian natural gas is becoming a crucial issue in EU energy security policy.

The EU's own gas production comes mainly from the UK and the Netherlands who together control much of the gas resources of the North Sea. Gas production in both countries has however already reached its peak and is now thought to be declining. Gas consumption in Europe is steadily growing however and is expected to continue rising for the forseeable future. Natural gas is a very attractive substitute for oil since it is less carbon intensive compared to oil and coal. The Kyoto agreement and the EU's own requirements to reduce CO_2 emissions will put stronger pressure on the industry to use more natural gas instead of oil and coal. The natural pace of economic growth in the EU is another factor that will increase natural gas demand in terms of absolute volumes.



EU natural gas counsumption in 2005 (billion cubic meters)

European Union	Export from Russia	Export from Norway	Export from Algerie	Export from the Netherlands	Own production	Other sources
1. Austria	6,80	0,78	-	0,0	1,9	10,00
2. Belgium	0,30	8,50	2,90	7,95	-	0,08
3. Bulgaria	2,85	-	-	-	0,31	-
4. Cyprus	0	0	0	0,0	0	-
5. Czech Republic	7,13	2,35	-	-	0,16	0,00
6. Denmark	-	0,80	-	-	5,0	0,2
7. Estonia	0,97	-	-	-	-	-
8. Finland	4,20	-	-	-	-	-
9. France	11,50	14,20	7,50	8,30	1,11	2,4
10. Germany	36,54	26,30		21,30	1,8	-
11. Greece	2,40	-	0,46	-	0,02	-
12. Hungary	9,00	-	-	-	2,68	-
13. Ireland	-	-	-	-	0,52	3,05
14. Italy	23,33	6,90	27,73	8,00	12,0	1,04
15. Latvia	1,75	-	-	-	-	-
16. Lithuania	2,93	-	-	-	-	-
17. Luxembourg	-	-	-	-	-	1,3
18. Malta	-	-	-	-	-	-
19. Netherlands	2,97	6,16	-	-	30,4	-
20. Poland	6,40	0,54	-	-	4,3	2,36
21. Portugal		-	2,62	-	-	0,38
22. Romania	5,00	-	-	-	12,9	-
23. Slovakia	6,40	-	-	-	0,1	-
24. Slovenia	0,56	-	0,44	-	-	0,1
25. Spain	-	2,10	14,68	-	0,2	16,58
26. Sweden	-	-	-	-	-	0,8
27. UK	3,80	11,55	0,45	0,30	75,7	2,8

Source: World Oil and Gas Review 2006

Therefore, Europe's continuing dependence on Russian gas suppliers is likely to become ever more problematic in the future. Access to a wider range of suppliers is needed to reduce Russian dominance in the European gas market.

Norway and Algeria are two of the other main suppliers of natural gas to the EU. Indeed, both of these countries have almost doubled their gas exports to the EU over the last ten years and each has the potential for further export growth.

The shares of Norwegian and Algerian gas consumed in the EU increased from 7% and 8% respectively in 1995 to 16% and 12% in 2005. Nevertheless, Norwegian and Algerian gas resources are several times smaller than those owned by Russia while neither of these countries has sufficient supply potential to significantly threaten the Russian position as the largest gas exporter to the EU.

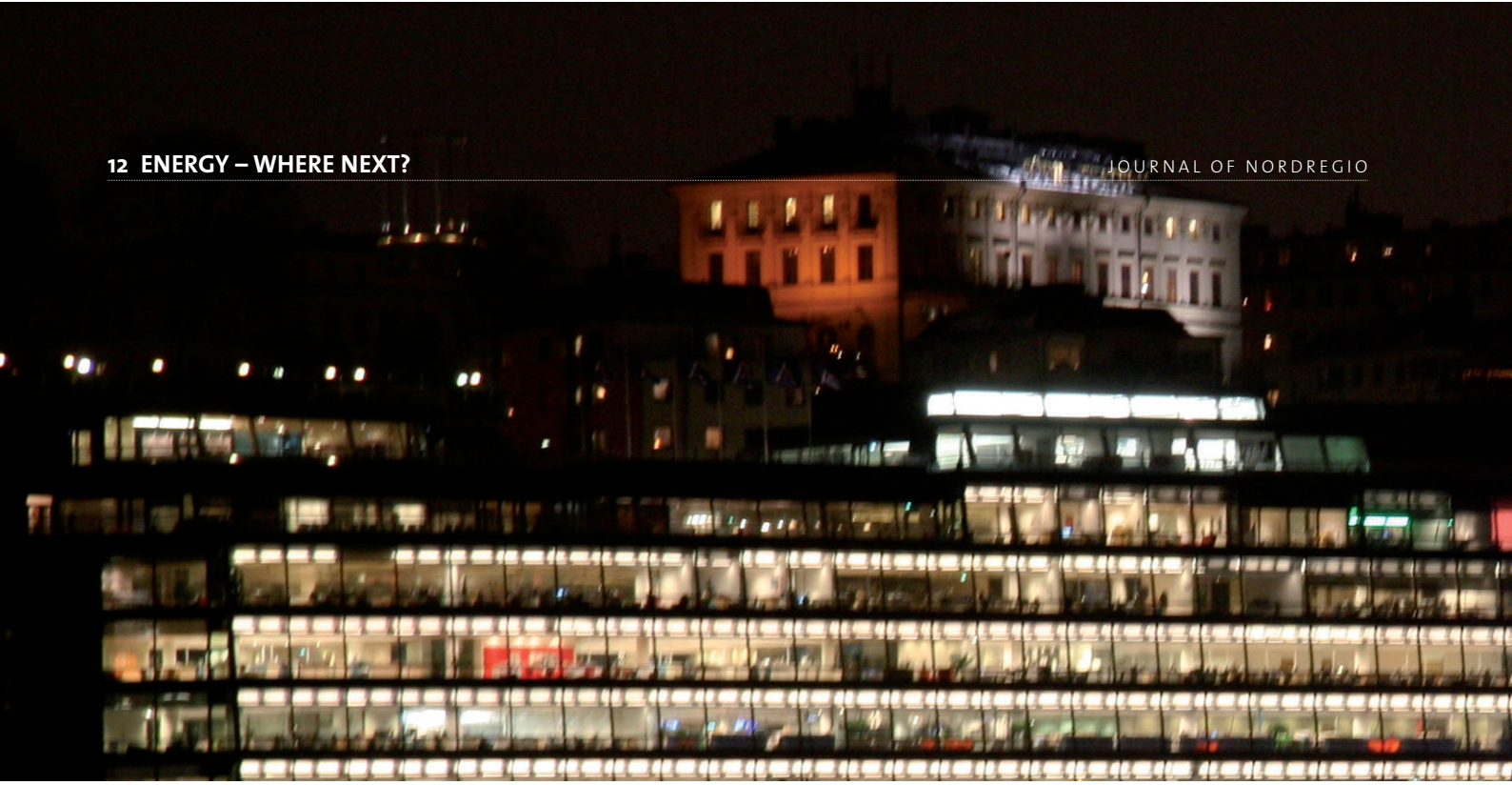
On the other hand, the recent technological developments that have reduced the price of liquefied natural gas (LNG) enable Europe to diversify its energy supply sources and to import natural gas more easily from the African and Middle Eastern countries (Egypt, Libya, Nigeria, Qatar, Yemen, Iran, the UAE and Oman) plus Latin-American Trinidad and Tobago, which are rich in fossil fuels. LNG technology enables natural gas to be condensed into liquid form and then transported by tankers.

Today the largest part of Europe's LNG supply comes from Algeria. The ability to supply a greater volume of LNG to the European market from other LNG suppliers is however constrained by the lack of import terminals for LNG re-gasification in Europe. Due to their close proximity to LNG exporters, France, Spain and Italy have the largest LNG import capacities, including both those currently operating and those under construction. These countries' supply sources have historically been the most diversified in Europe.

Several other countries, including Germany, Poland, Latvia and Romania that are currently rather dependent on Russian gas supply, have however recently considered constructing LNG import terminals.

The cost of supplying LNG is higher than that of supplying gas via pipelines. In addition, political uncertainty in the Middle East and North Africa ensures that Russian gas remains, at present, more attractive for many EU members, while the reality remains that the future European gas market would be unthinkable without Russian suppliers. Nevertheless, the availability of several potential gas suppliers for each particular country in the EU would however challenge the current market dominance of Russian gas on the European gas market. ■

By Marina Tsygankova, Senior Executive Officer, Statistics Norway
www.ssb.no



Spending electricity – evening at the Glass House on Stockholm´s water front. Photo: Odd Iglebaek

The challenges for energy research

Increasing global energy consumption, the liberalisation of energy markets, and the need to take action on climate change are producing new challenges for the energy sector. At the same time, increasing pressure is being placed on the need for research to produce new technologies and industrial products which are socially acceptable and able to generate economic wealth and a better quality of life. The result is a complex and dynamic set of conditions affecting decisions on investments in research and new energy technologies.

The challenge for energy research is thus to reconcile these conflicting pressures and to seek to address:

- The security and diversity of energy supply
- Global climate change and environmental degradation
- Economic competitiveness, and
- Social benefit

A new energy era?

In January 2007 the European Commission published a new energy strategy for Europe[1]. The aim of the strategy is to balance sustainable development with energy security and economic competitiveness. In the strategy the Commission lists several reasons for adopting a renewed focus on energy-related issues. Among the most significant are: changes in the demand for energy, import-dependency, rising prices for oil and gas, and the imminent global climate crisis. The proposed ten point action plan includes among other things reference to well-functioning energy markets, a better EU emissions trading scheme, energy efficiency, increased use of renewable energy and a strategic energy technology plan.

In terms of political rhetoric the document is in line with other policy statements documenting the emergence of a new energy era. The cost of doing nothing in response to the global climate crisis was recently outlined by both the Stern Review[2] and the most recent IPCC report[3].

It is not only in the EU that this so-called 'new era' has taken hold. We see movement in the USA as well. Although much of the proposed legislation seems weak, the US Congress is now trying to tackle the environmental and economic challenges ahead. Prospective legislation focuses on some of the most crucial elements in relation to energy provision: the role of nuclear energy, clean coal and alternative fuels, the emissions trading programme and the depth of the US commitment to reducing greenhouse gas emissions[4].

Current trends in energy research

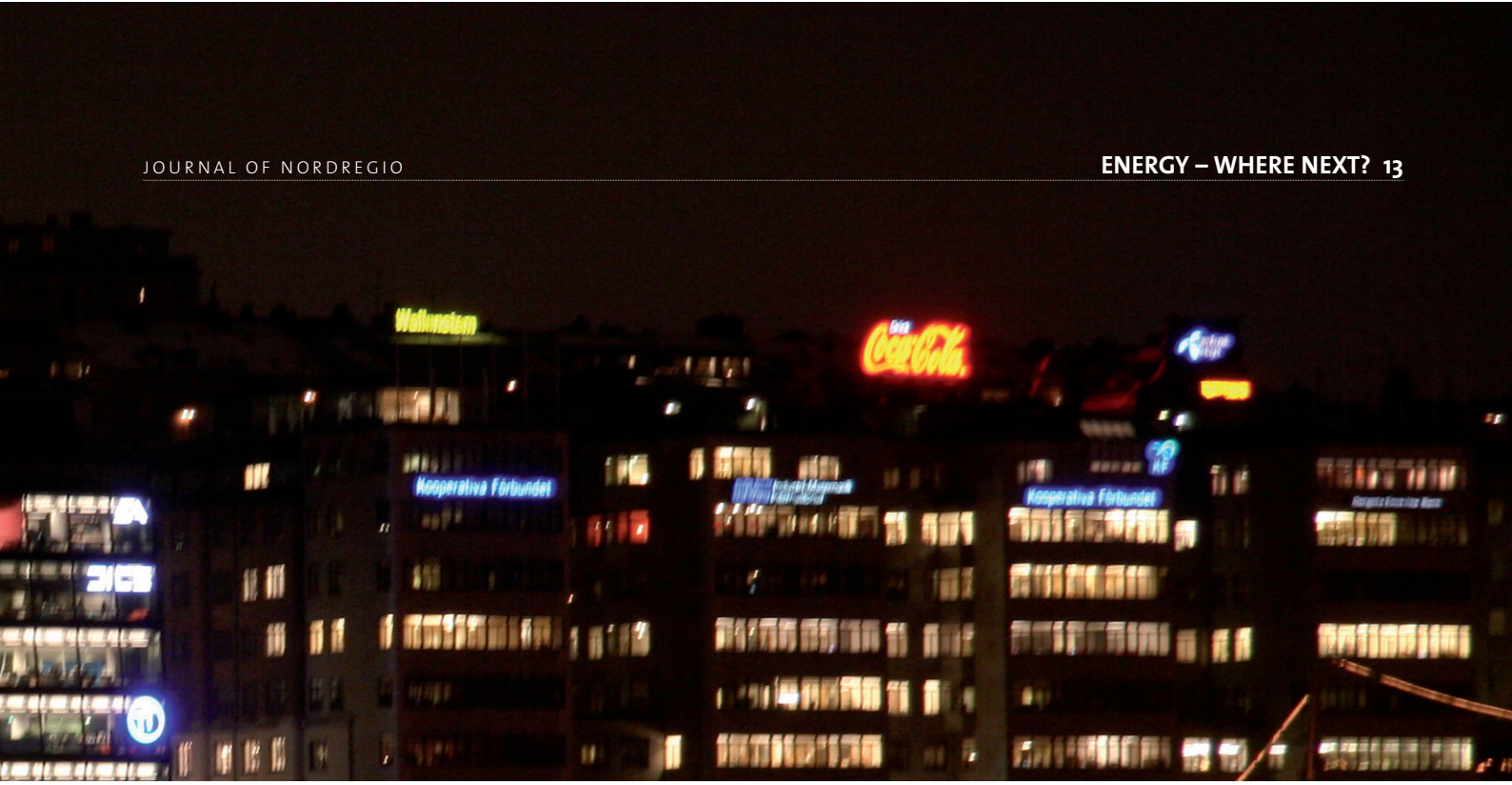
Naturally, our primary focus is on developments in the Nordic countries. The oil crisis that occurred during the 1970s served to kick-start energy research throughout the world. However, since the beginning of the 1980s, spending on energy R&D has declined.

The drastic reductions in government spending on energy-related R&D in the Nordic countries are in large part due to reduced spending on nuclear research; e.g., Denmark and Sweden together reduced their spending on nuclear R&D by over 80% from 1975 to 2005.

Today more than 90% of total energy research spending in the Nordic countries is undertaken in non-nuclear energy areas. In total the Nordic countries (excluding Iceland) spent approximately 212 mill. euros on non-nuclear energy research in 2005, of which spending on renewable energy research accounts for 30% of that total.

During the last 2-3 years Denmark and Norway in particular have increased their energy R&D invest-

1) EU Commission. A European Strategy for Sustainable, Competitive and Secure Energy (Com (2007)1).
2) Sir Nicolas Stern. Stern Review: The Economics of Climate Change. www.Sternreview.org.UK. 2006.
3) IPCC. Climate Change 2007: The Physical Science Basis. Summary for Policymakers. http://ipcc-wg1.ucar.edu/wg1/docs/WG1AR4_SPM_PlenaryApproved.pdf
4) Stratfor: Public Policy Intelligence Report, February 1, 2007. "U.S. Climate Policy: Defining the Second Commitment Period".



ments to "historically" high levels with a new focus on hydrogen and fuel cells. Sweden saw a drastic cut in its energy R&D spending in 2005, but for 2006 spending was again increased to what is now a near historically high level.

Nordic Energy Research has over the last 20 years funded energy research in the Nordic countries and with a Nordic Perspective. Our current strategy focuses on five main areas of research:

- Energy efficiency
- Renewable energy technologies
- Hydrogen and fuel cell technologies
- Energy markets, and
- Impacts of climate change on energy systems

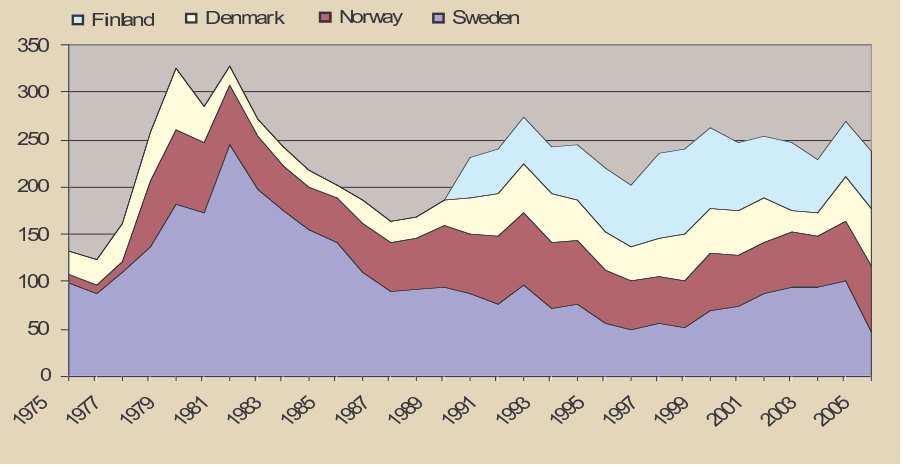
Nordic funds are however limited – approximately 3.4 mill. euros per year – while demand surpasses the funds available. In the last call for research proposals in 2006, 115 expressions of interest asked for more than 100 mill. euros. In the end 16 new projects received 10 mill. euros over the next 4 years.

The future of energy: A 2025 perspective

No matter how we view current global geopolitical trends it appears highly unlikely that the energy sector will not continue to dominate political and economic and developments over the next 20 years.

Global warming and the demise of the petroleum era could make the quest for new sustainable energy solutions the new 'moon project' of our century. The Nordic energy research communities are well positioned to create and diffuse new knowledge on such energy solutions, especially if they are supported by an ambitious Nordic strategic energy technology plan backed by a sufficient level of public and private funding. ■

By Birte Holst Jørgensen, Managing Director of Nordic Energy Research, and Amund Vik, Project Assistant, Nordic Energy Research



Nordic Energy Research

Since 1985, *Nordic Energy Research* has supported energy research and innovation in the Nordic countries. Its funds come from national energy organisations of the five countries, including the Danish Energy Authority (DK), TEKES – Finnish Funding Agency for Technology and Innovation (FI), Orkustofnun – National Energy Authority (IS), Norwegian Ministry of Petroleum and Energy (NO) and the Swedish Energy Agency (SE).

Website: www.nordicenergy.net

Hydro magazine at Bykle in southern Norway. Photo: SCANPIX

EU-integration may increase prices

In the future it is likely that the current balance within the Nordic electricity market will change. A new factor potentially influencing prices could be the upcoming NorNed cable connecting the Dutch and Nordic power markets. This makes it possible to increase the export of hydro-electric power from the Nordic highlands to the southern parts of Europe, where the wholesale price of electricity is usually higher than the equivalent Nord Pool Spot, especially during peak hours.

In 2006 the average electricity price on the Dutch power exchange (APX) was 9.6 euros/MWh, or 20 percent higher than the average system price at Nord Pool (APX at 58.25 euros/MWh compared to Nord Pool Spot at 48.64 euros/MWh.)

A higher degree of integration may lead to more correlated Nordic and European electricity prices, and even increased prices in the Nordic area. On the other hand there are several new generation facilities under construction in the Nordic countries. New generation increases supply, and will in general put negative pressure on electricity prices.

Future electricity prices will also of course be influenced by the costs of CO_2 emissions and other climatic-motivated additions. Similar effects will come from fuel prices. If they increase electricity will also become more expensive.

Wind power remains volatile

If wind power energy production increases its share of the Nordic electricity market, both the supply and the price of energy may become more volatile. The reason here is simple. Wind power generated electricity is most efficient when the winds are neither too weak nor too strong. In others words, the output of this type of electricity is much more difficult to regulate than that for instance of hydro-power or traditional fuels. On the other hand, the inherent flexibility of hydro-power contributes to a smoothing of possible variations in market supply.

If a wind power station has been established it will remain profitable to maintain as long as the selling price of the energy generated is higher than the cost of facility maintenance. But as the Nordic electricity market is diversified, and wind power generation accounts for a small part of the total Nordic generation capacity, increased wind power is not likely to have a major impact on overall Nordic electricity prices. However, prices in regions with a relatively high share of wind power production and limited transmission capacity may become more volatile.

Hydro-power is easy to regulate
An overview of the production of electricity in the Nordic area would see hydro-power dominating in mountain-areas, that is, in most of Norway and Northern Sweden, while in the lowlands, that is, Southern Sweden, Denmark and Finland, electricity is mostly generated from nuclear, gas or coal (thermal).

The supply of water is easy to regulate and therefore the cost of changing the output of hydro-generated electricity is relatively cheap. Power stations run on nuclear, gas or coal on the other hand, are most profitable if they run at an even speed. To change their output-volumes is thus rather costly and can be compared to constantly altering the speed of a running car.

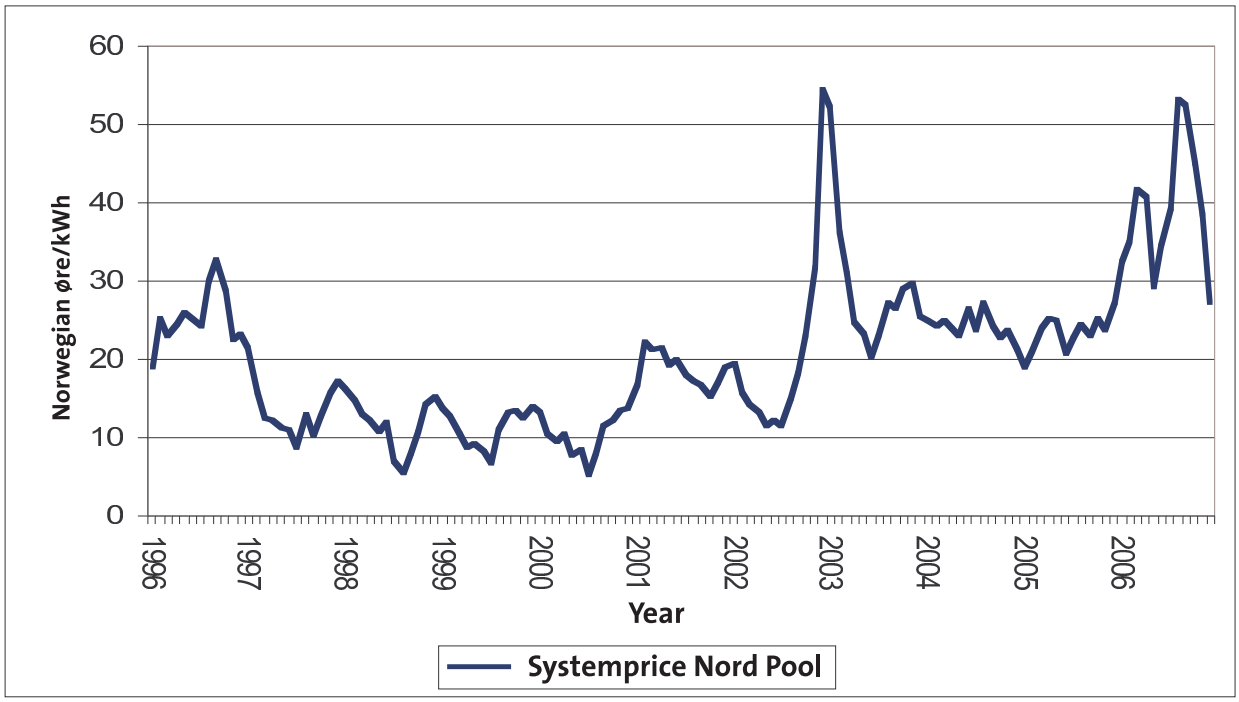
There are always peaks in electricity usage, which is higher during the day, particularly in the mornings and afternoons, as compared to during the night. Colder winter days also see increased usage.

"Lowlands-producers"
For what we term above the 'lowlands-producers' it will quickly become unprofitable to cater for the ups and downs in consumption. Rather they will buy hydro- generated electricity for the peaks. This costs them less than to attempt to alter the capacities of their power plants run on gas, coal or nuclear fuel. There is then usually a night-time power-surplus available in the lowlands. This is bought by the hydro-producers in the highlands, as at night they can purchase it at a lower price than it would cost them to increase their own hydro-power generation.

On the other hand, if rainfall is extensive and the magazines are full, it is better to sell hydro- generated electricity at low prices, rather than just letting water run through for nothing. Such a situation will normally also result in fewer requests for energy from the lowlands, i.e. from nuclear, gas or coal. ■

By Håkon Mørch Korvald (left) and Tor Arnt Johnsen, Norwegian Water Resources and Energy Directorate
www.nve.no

Development of the Nordic system price 1996 – 2006.



Source: Nord Pool

The winter peak of 2002-2003 was primarily related to a severe drought in Norway and Sweden. The high increase in the summer and autumn of 2006 was related to little rainfall during summer in combination with high oil prices. Heavy rains and mild weather towards the end of 2006 rapidly led however to lower prices.

Wind power is constantly increasing and in Northern Germany is now equivalent to that of nuclear power in Sweden. Photo: Odd Iglebaek

Modest Nordic supply growth

Electricity supply to the Nordic market has remained stable in recent years. It is expected however that supply will increase by a little over 10 percent in the next 20 years.

The outlook for new production capacities in the Nord Pool area can be summarized as follows. Finland has decided to build a new nuclear power plant with a net capacity of 1600 MW. The unit is expected to be operative at the turn of 2010-2011. This will balance supply and demand in Finland making the country less dependent on imports from Russia and Estonia.

A recent prognosis published by the Swedish energy authorities predicts growing production capacities for combined heat and power (CHP), wind power and nuclear power production under certain assumptions. According to the report, Sweden will have a power surplus of 21.3 TWh in 2015 and 16.6 TWh in 2025.

Future additional supply of power in Norway will primarily consist of natural gas, wind power, and small scale hydro-power producers. There are currently 3 natural gas units under construction. Taken together this will see an increased net capacity of 915 MW.

Danish energy authorities expect the Danish production of power to grow to between 50 and 60 TWh in 2025. Total Danish power production in 2006 was 43 TWh.

Highest nuclear utilization

Generation as measured in TWh depends on plant utilization. Utilization differs significantly among the different types of power generation units. Roughly speaking, wind power production units utilize around 3000 hours a year, while nuclear units utilize around 7800 hours a year. The utilization of Gas- and coal fired units also varies significantly. Hydro-power plants depend greatly on inflows but are usually around the 4000 – 5000 hours level. A year with 365 days has 8760 hours. Utilization of CHP (combined heat and power) units depends on heat demand and electricity prices.

Power production in the Nordic area depends on rainfall meaning that the production shares of different types of power units will vary from year to year. Hydro-power is the main source accounting for about half of the total installed capacity. ■

By Håkon Mørch Korvald and Tor Arnt Johnsen

Nord Pool takes two-thirds of market

Nord Pool Spot is a physical delivery electricity market. The total transaction volume for 2006 was 250 TWh, with a turnover value of 52.3 billion Euros. (Figures include Elbas, the balancing market for Finland, Sweden, Eastern Denmark and Germany). The volumes going through the system have been constantly rising. In 2006 Nord Pool Spot accounted for no less than 63.3 percent, almost two-thirds, of the Nordic wholesale electricity volume.

Nord Pool, the Nordic electricity exchange was established in 1993 following the deregulation of the Norwegian power market. It started out as a Norwegian power marketplace, but is now the world's only multinational marketplace for trading electric power, covering Norway, Sweden, Finland, Denmark and part of Germany. Nord Pool handles a variety of both physical and financial contracts.

Nord Pool Financial Markets provide trades in standardized financial contracts up to 4 years ahead in time. In 2006 the turnover value of financial contracts was 79.2 billion Euros covering a volume of 766 TWh.

At Nord Pool Spot consumers and producers bid in their offers one day in advance. Based on these Nord Pool calculates aggregate demand and supply curves, and thus prices are produced for every hour of the following day.

If the supply and demand of electricity in the Nordic market satisfies transmission capacities within the system, electricity flows freely, and prices in all price areas will be identical. In 2006 this only happened for 16 percent of the hours.
If the market requires transmission that exceeds the capacity between two or more price areas (bottlenecks) however the markets will be cleared regionally giving price differences within the system. ■

By Håkon Mørch Korvald and Tor Arnt Johnsen

Nordic production capacities *Source: Nordel 2005*

Capacity	Nordic	Norwegian	Swedish	Danish	Finish
Total (MW)	91.299	28.793	33.212	12.677	16.617
Hydro	52%	98%	49%	0%	18%
Nuclear	13%	0%	27%	0%	16%
Other thermal	31%	1%	23%	75%	65%
- condensing	(7%)	(0%)	(7%)	(9%)	(20%)
- CHP, district heat	(16%)	(0%)	(8%)	(59%)	(23%)
- CHP, industry	(5%)	(0%)	(3%)	(4%)	(17%)
- gas turbines	(3%)	(0%)	(5%)	(2%)	(5%)
Wind	4%	1%	2%	25%	0%

Market shares of main producers in the Nordic power market, pr. 2005.

	Capacity (MW)	Share
Denmark		
- Energy E2	4.300	5%
- Elsam	4.250	5%
Finland		
- Fortum	5.032	6%
- PVO	3.332	4%
- TVO	1.972	2%
Norway		
- Statkraft	8.677	10%
- E-CO	2.092	2%
- Agder	1.682	2%
- BKK	1.612	2%
- Norsk Hydro	1.527	2%
- Lyse	1.544	2%
- Skagerak	1.282	1%
Sweden		
- Vattenfall	13.903	15%
- E. ON Sweden	7.092	8%
- Fortum	6.238	7%
Others	26.541	29%
Total Nordic Area	**91.076**	**100%**

Source: Swedenergy and annual Reports[1] ([1] Numbers may deviate to some extent from reality as cross ownership and different ways of reporting renders the statistics uncertain.)

The paper industry is one of the highest energy consumers. Pictured above a paper-factory in Piteå, Sweden. Photo:SCANPIX

Power industries to leave Norden?

At the onset of Nordic electricity market de-regulation, about a decade ago, huge over-supply existed in the market, i.e. the production capacity exceeded peak demand by a large margin. Can we expect to see a similar situation re-emerge in the near future?

Market oversupply meant that consumers benefited from low prices. The de-regulation and consequent combination and interconnection of several national markets also meant that it was unnecessary to cater for large national oversupply. This means that demand can increase without an equivalent increase in supply because better utilisation of the assets and the system exists. A well functioning liberalised market can operate with a tighter balance of supply and demand than a strictly monopolised market with little or no trade with other markets. De-regulation has led to lower prices for all consumers compared to what the prices would otherwise have been, particularly in the first years after de-regulation.

The demand side in the Nordic market has, broadly, three types of consumers; households, power intensive industry and other businesses. Each accounts for roughly 1/3 of total consumption.

It is however probably the power intensive industry sector in particular that is likely to present the greatest challenges. For many years these industries have benefited from low (subsidised) power prices. Latterly, however, these beneficial power contracts have been phased out. The argument here is that the market should be equal for everyone.

On the other hand, if these industries have to pay market price for electricity, their profitability will plummet. In fact the consequence may be that the whole sector simply relocates away from the Nordic region. This in turn would see the Nordic electricity market once again having a massive over capacity of supply.

The power-intensive industry sector across Europe is however faced with the same problems as their Nordic counterparts. As such European industry bodies are lobbying intensively to avoid paying market price for their power. Whether this debate can influence future scenarios for the Nordic power intensive industry sector remains however to be seen. ■

By Vivi Mathiesen, Senior Adviser, *Nordic Energy Research*
www.nordicenergy.net

New infrastructure: Prioritised cross sections

- Fenno-Skan 2 (800 MW, Finland-Sweden, commissioning autumn 2010)
- Nea-Järpströmmen (200 MW, later 750 MW, commissioning mid 2009)
- Sydlänken, cross section 4 (4-600 MW, commissioning 2011/12)
- Storebælt (600 MW, connecting east and west Denmark, commissioning 2009)
- Skagerrak IV (600 MW, southern Norway-Denmark, commissioning 2012 at the earliest)

Source: Nordel (2006)

Generation mix[1]

Power generation in the Nordic market comes from the following sources:

- 50% hydro-power (mainly Norway and Sweden)
- 10% gas and oil-fired power (mainly Denmark and Finland)
- 10% coal-fired power
- 20% nuclear power
- 10% wind power, bio-fuels and other small scale renewables (mainly Denmark and Finland)

Source: E-CO Energi (2006) www.e-co.no

1) These are approximate numbers as the generation mix will vary with the level of rainfall: heavy rainfall will result in a higher share of hydro-power.

Viewpoint:

The "good" electricity market

The Nordic electricity market is often referred to as a good example of a well-functioning international electricity market. Internationally, the Nordic electricity market was indeed a pioneer, opening up for cross border trade and inaugurating a common electricity *bourse* as far back as 1996.

Since de-regulation the market's transmission and inter-connector capacity has been expanded. Measured in consumption terms (TWh) inter-Nordic transfers accounted for 4.8 percent in 1995. By 2005 the proportion had almost doubled to 9.0 percent (Source: Nordel Statistics 1995 and 2005).

Throughout the liberalisation process, the Nordic power market has been granted general political support from the national authorities and from the *Nordic Council of Ministers*. This consensus over de-regulating the market may be one of the main reasons why the Nordic power market remains a "best case" example compared to other de-regulated power markets.

It has been suggested that the high level of state ownership in the Nordic energy market has led to more responsible market behaviour in respect of the overall security of supply.

With the exception of *Fingrid* and *Fortum* in Finland the largest national actors in the Nordic energy market, that is to say, *Stanett* and *Statkraft* in Norway, Svenska *Kraftnät* and *Vattenfall* in Sweden and *Energinet.dk* in Denmark, are owned by the Norwegian, Swedish and Danish states respectively. On the other hand, in for example California or the England-Wales market, the main assets were privatised at the onset of liberalisation.

On the supply/production side of electricity the Nordic market is blessed with a huge proportion of hydro power, which is cheap and clean. On the negative side, this means that the Nordic market, especially Norway, is sensitive to variations in rainfall. A very dry year will make the Nordic region dependent on imports from continental Europe and/or Russia, and this will typically lead to higher electricity prices. Indeed, even the possibility that this may occur, some time in the future, results in higher prices – as a sort of insurance premium.

Hydro power is not sufficient to meet all demand in the Nordic region and the remainder is produced by a mix of nuclear, fossil fuels and renewable generation.

As a large proportion of continental Europe's energy is generated by the burning of fossil fuels the price of fossil fuels is clearly an important driving factor also for Nordic power prices. In 2006 fuel prices reached new highs, thus contributing to higher energy prices in the Nordic market.

Because the Nordic market is interconnected with the continental power markets, a "spill-over" effect on prices occurs: High power prices on the continent will typically lead to a heightened price in the Nordic market. As a large proportion of the power in continental Europe is fired by fossil fuels, the price of fossil fuels is clearly also a defining factor for Nordic power prices. ■

By Vivi Mathiesen, Senior Adviser,
Nordic Energy Research
www.nordicenergy.net

Thermal plants and windmills at Copenhagen harbour. Photo: Odd Iglebaek

Viewpoint:

The Baltic states want to join the western

Continuing dependence on primary energy imports from one country, ageing, and an infrastructural endowment inherited from Soviet times, as well as the absence of network connections with the Nordic and other Western countries all create a significant risk of supply interruption while blocking the possibility of integrating the Baltic energy market more closely with its neighbouring Nordic and European markets. The commissioning of the first 350 MW capacity electricity inter-connector between Estonia and Finland, in December 2006, was thus of some significance as it opened up the possibility of the future fusion of the Baltic and EU energy markets. Much more however needs to be done.

The governments of the three Baltic States strongly emphasise the need for additional links while much preparatory work has already been done in the context of the construction of powerful electrical interconnectors between Lithuania and Poland (1000 MW) and Lithuania, Latvia and Sweden (approximately 700 MW).

As natural gas will continue to be one of major primary energy sources in near future, the Baltic States are currently investigating a number of different possibilities in relation to reducing the risks of full reliance on the one supplier – Russia. Lithuania, as such, is considering the possibility of connecting into the Polish natural gas supply system while it has also strengthened its connections with Latvia with a view to better utilising its underground storage facilities. The construction of the common liquid natural gas LNG import terminal is also under discussion while possible connection to the Nord Stream pipeline would improve the technical reliability of supply.

In summary the Baltic States' energy goals are as follows:

- To fully comply with EU environmental regulations and obligations
- To promote utilisation of renewable energy
- Full liberalization of the energy markets including increasing integration with Western Europe
- Diversification of imports to create new environments for future developments and higher security of supply.

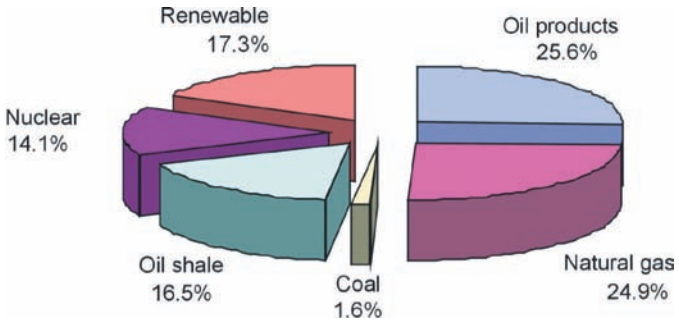
On the basis of very detailed energy demand, supply and environmental analysis using advanced modelling tools, and taking into account the security of supply issues, future energy development road maps are currently under construction in all three countries.

New nuclear plant

By the end of 2009 the Ignalina Nuclear Power Plant (INPP) in Lithuania will close. Parallel to this the governments of the three Baltic States decided, jointly, to begin preparations for the construction of a common nuclear plant with a completion date in 2015-2017. The final capacity of that plant may reach 3000 MW, bringing total production capacity in Lithuania back to its pre-2005 level.

In Latvia a large combined cycle gas turbine (CCGT) district heating plant is currently under construction with a commissioning date in 2008. Lithuania is planning to complete, before 2009, full modernisation of its existing thermal plant, producing 1500 MW. The construction of new modern 450 MW CCGT units will also be undertaken on the same site. In addition, small (less than 50 MW) combined heat and power plants are expected to be built in many places,

Primary energy structure of the Baltic States (2005)



Structure of primary energy resources, 2004 (%)

	Estonia	Latvia	Lithuania
Oil products	20.1	29.3	28.7
Natural gas	11.1	29.1	25.2
Coal	0.9	1.6	1.6
Peat	2.8	0.7	0.2
Oil shale	53.8	1.1	–
Biomass	10.9	29.0	7.8
Hydro	0.2	4.8	0.3
Nuclear	–	–	42.8
Net electricity import, TWh	-0.3	4.4	-7.0

energy market

where district heating systems already exist. Consequently it is very likely that Lithuania and Estonia will remain large exporters of electricity.

Possible transit hub

The geographical position and the diversity of the existing energy systems retain a remarkable potential for enhanced cooperation in that part of Europe and would be beneficial to all countries in the region. Successful cooperation, stimulated by their geographical base and old historical traditions, must comprise the involvement not only of the business community, but also of political, research and development actors.

More active political cooperation is however needed to help utilize the potential opportunities. The position of this region, situated between the gas and oil reserves of Northern Russia and the major consumer areas of Western Europe, and given the interconnections between the Russian, Baltic and Western European power networks, opens up the opportunity to transform the Baltic Region into a transit hub for energy exchange between Russia and Western Europe.

Underground gas storage

The development of already highly favourable geological structures in Latvia for natural gas underground storage (more than 20 billion. m3) coupled with the possibility of a large new transit pipeline or connection to the Northern pipeline further strengthens the potential of this idea. The development of an integrated gas grid would therefore provide increased security of supply for both Western Europe and the Baltic States.

The official planning documents of the three Baltic States indicate the following new installations for power production:
In Estonia – modernization of one power unit with a capacity of 200 MW at the Estonian thermal plant with the installation of a new fluidized bed combustion boiler on oil shale. The expected capacity here will be in the range of 2010 – 2400 MW with an annual production of 8.5 TWh. The decision on possible new installations will be taken when the fate of the common new nuclear power plant in Lithuania becomes clearer.

In Latvia the new energy strategy emphasises the necessity of attaining full self-sufficiency in power production by 2016. For that reason a new CCGT CHP with a capacity of 400 MW is currently under construction with a commissioning date for the end of 2007. Construction of a new coal burning 400 MW power plant in Western Latvia is also expected to be completed before 2016. Additionally, 135 MW of wind generated power and 80 MW of biofuel produced power should also be attainable before 2013. These capacity additions will be enough to make Latvia self-sufficient and thus able to achieve the expected 7.5 TWh demand in 2010.

The most significant new installations are however planned for Lithuania. According to the latest energy strategy (2007) the following new generation capacities should be built: A 450 MW CCGT on the site of the existing thermal plant in Elektrenai before 2011; A number of wind power plants with total capacity up to 240 MW in the coastal regions of the country by 2010; while about 150-200 MW of CHP generated by different fuels will be produced in small towns. This is all in addition to the largest project which is of course the construction of the new nuclear power plant at Ignalina. ■

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Capacities and demand in 2005

Market	Installed capacities (MW)	Maximum demand (MW)
Estonian	3.029	1.400
Latvian	2.167	1.300
Lithuanian	4.980	1.900
Sums	10.176	4.600

Comparison of indicators

	ESTONIAN	LATVIAN	LITHUANIAN	BALTIC	EU-15	EU-25
Total primary energy consumption per capita (toe/capita)	3.83	2.66	2.00	2.67	4.01	3.82
Electricity consumption (MWh/capita)	5.48	3.14	2.55	3.39	6.93	6.47
TPES/GDP (toe/000 $2000)	0.72	0.61	0.44	0.58	0.18	0.20
CO2/GDP (kgCO2/$2000)	2.31	0.84	0.69	1.11	0.39	0.44
GDP growth rate (%/year) 2004-2006	~8	~8	~9	~8		
Energy consumption growth rate (%/year)	~3	~3	~3	~3		

The Ignalia nuclear power plant in the early 1990s. Photo: SCANPIX

The Soviet inheritance

A key feature of the Baltic States' energy systems is their common Soviet inheritance: A combination of nuclear power, natural gas and oil with capacities significantly exceed by current needs. In addition, all three countries remain heavily dependent on energy inputs imported from only one country, Russia.

In Estonia 60% of primary energy resources are local, mainly oil shale, wood and peat. In Latvia and Lithuania the situation is the opposite where respectively 70% and nearly 90% of these countries' primary energy resources are imported. Major imported resources include natural gas and oil products. In addition nuclear fuel is also imported from Russia for the one remaining unit at the Ignalina nuclear power plant in Lithuania.

In fact more than 40% of all energy production in Lithuania is nuclear. In Latvia, on the other hand more than 70% of energy production is hydro-based, while in Estonia almost 100% of energy production is thermal.

Lithuania has an oil refinery with a capacity of 10 million tons per year. The country sells its products across all three Baltic countries as well as to Western Europe. Latvia possesses a well developed infrastructure for oil and oil products transit and export: pipelines, railroads and oil reloading terminals in the port of Ventspils. Its capacity is more than 30 million tons per year. A second major oil terminal is located in Butinge (Lithuania) – with a capacity of 10 million tons per year. In addition Lithuania and Estonia each have additional oil products export-import capacities of about 7 million tons per year. Only a fraction of those capacities are however utilized.

Natural gas is imported from Russia. The Russian gas giant *Gazprom* owns stock, approximately 30%, in the gas supply companies of all three countries. Currently the natural gas transmission networks of the Baltic States are not connected to the networks of any other EU member states.

Estonia and Lithuania are currently self-sufficient in electricity generation and maintain significant export potential. Latvia is a net importer mainly from Lithuania and Russia. All three countries, in general, posses a good mix of generation capacities: thermal (oil, shall, heavy oil and natural gas) nuclear, hydro and gradually also a growing share of renewables. In Latvia almost 30% of primary energy production comes from renewable energy sources. The equivalent for Estonia is 12 percent and for Lithuania less than 8 %. The majority of thermal plants are however older than 30 years.

All three countries have very strong internal electricity network inter-connections with their neighbours to the East. Each country can import almost 100% of their internal electricity demand from their closest neighbours. The first 350 MW interconnector between Estonia and Finland, commissioned in December 2006, was jointly financed by the three Baltic countries. The interconnector between Lithuania and Poland is on the EU priority projects list with strong political support in both countries and is expected to be implemented by 2012. In addition, it is expected that an inter-connector between Sweden and Lithuania will be constructed at about the same time.

The Baltic States are also connected by cross-country pipelines for natural gas transportation while Latvia has a large underground gas storage facility, which after modernisation will render it capable of supplying its neighbours with their necessary seasonal gas reserves. Latvia has very favourable geological conditions for several large underground storage facilities. Total gas consumption in 2006 exceeded 6.0 billion m^3.

While the Baltic States have a well developed energy infrastructure, energy consumption *per capita* and energy efficiency remain low in comparison to other EU countries. By 2006 the total production capacity of the three Baltic countries combined was just over 10 000 MW. Maximum demand, on the other has not exceeded 4 600 MW. For comparison we can note here that Denmark alone has a production capacity of almost 13 000 MW. The population of Denmark is almost 5.5 million as compared to the 7.2 million total of the three Baltic States combined. ■

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Book review: Cities for Children

Creating Child Friendly Cities - Reinstating Kids in the City, 2006, Brendan Gleeson and Neil Sipe (eds.), London: Routledge, 164 p.

The field has recently been witness to a stream of British and American books dealing with children and the urban environment. This Australian book provides something of a contrast to the dominant writers. The anthology brings together a number of Australian researchers mainly from within the geography and planning fields, with an early childhood educator and the Director of UNESCO's *Growing up in Cities Project*. These contributors write from varying perspectives such as planning, design, transport, social policy and housing.

The key hope of the book, as expressed by the editors, is that children will be reinstated at the centre of debate and analysis of urban conditions. It is this hope that set this book apart from many other similar publications in the field. This book does not seek only to display and discuss, it also seeks to make a difference. Perhaps, this is the result of having a key target group consisting of professional planners and policy makers 'seeking answers to the challenges of creating cities that work for and include children.'

The book is divided into three parts 'Scales of Analysis,' 'Policies, Professionals and the Environment,' and 'Spheres of Action'.

The first part consists of three contributions dealing with the different levels involved in conditions in respect of children and urban environments. It stretches from Malone's contribution on the UN's role as a key player in achieving 'child-friendly cities', to Gleeson's contribution on Australia's cities and the conditions that children face as they grow up, and Ivesson's chapter dealing with the exclusion of 'angry young people' i.e. young people displaying 'anti social behaviour'. Ivesson argues that the exclusion of young people should not be met with efforts aiming at 'inclusion', as these concepts draw upon un-democratic definitions of the city and city life. This is a crucial, if often neglected, issue. What does it mean to 'include' children and young people? Is the adult community willing to re-define the concept of 'good' city life if it is necessary in order to include the interests of children and young people?

The second part of the book consists of Freeman's contribution on the colliding worlds of planners and young people, that is, participant planning with children and young people. The chapter includes a discussion of why children need to participate, what constitutes a good environment and the changing contexts of the environment, in relation to both society and childhood. What is particularly intriguing in the context of this chapter is that Freeman brings up the crucial issue of 'the colliding worlds'. What happens when planners need to change focus from the 'public good' to the actual people (adults or children) they plan for? This, I would argue, speaks to a central issue in achieving well-functioning participant planning. The contribution of Sipe, Buchanan and Dodson contains reference to a literature review that ranges through crucial research from the 1970's up until the present. It is a short review but it contains a treasure-trove of information on children and urban environments. Although some crucial references are missing (due to the format) it serves as a solid background to the debate on children and cities.

The third part of the book is perhaps particularly interesting as it focuses on 'spheres of action'. It deals with the 'walking school bus' (Kearns and Damien) and how to overcome difficulties relating to 'social traps' (Tranter). 'Social traps' are exemplified through the difficulties parents face if they want their children to walk to school when all other parents drive their children, while Tranter discuss how these 'social traps' can be overcome. This is crucial as this behaviour sets standards for 'good parenting' and, hence, forms children's lives.

The final chapter, written by Walsh, presents a range of planning principles, guidelines and design specifications enabling policy makers and practitioners to better understand children's play needs. This is a chapter that some academics may perhaps find overly focused on practical issues. However, in the end, this is what is needed to achieve change in children's lives; concrete examples that help improve everyday life for planners as well as for children.

Thus, it is necessary to ask whether this book contains something extra to distinguish it from the rest within this vast field. Well, yes it has, as it consists of vivid texts that maintain a good balance between the perspectives of academics and of professionals. This balance ensures that the book will be successful in both environments.

Who then constitute the target audi77ence for this book – who can we recommend it to? If you are an academic well-acquainted with the literature on children and urban environments, then, will you learn much that is new? Perhaps not, but you will gain a breath of fresh air, inspiration and learn about the wider debate and ongoing research in this area in Australia and New Zeeland. If you are a professional wanting to learn more about the research field on children and urban environments – read it, it is full of research findings, practical suggestions, and ideas. The same advice goes for academics within other fields of research who want to attain a thorough overview of research and debate within this expanding field. ■

By Sofia Cele, PhD, Department of Human Geography, Stockholm University, Stockholm.

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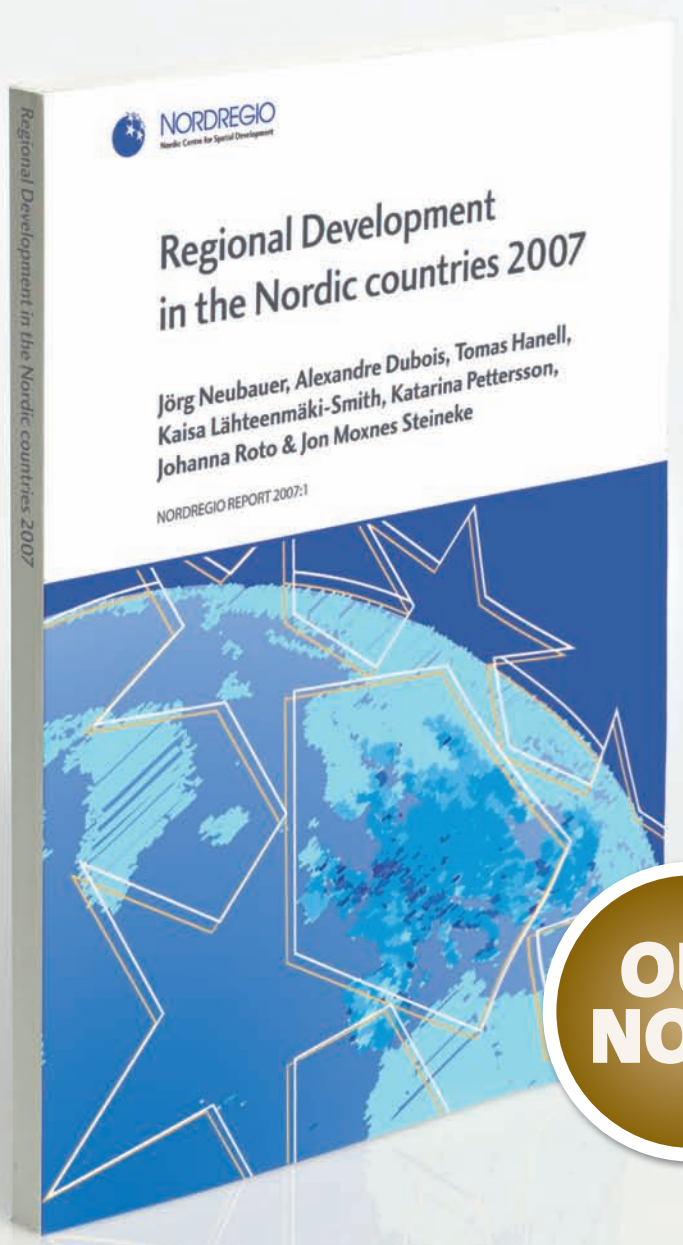

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