ENERGIE Project "BASE"

'Baselines for Accession States in Europe - Promoting Clean Energy Investments through Joint Implementation in Central and Eastern European Countries (CEECs)

Contract ENK6-CT2001-00582

Finland Country Report

1. ENERGY SECTOR OVERVIEW

Finland has 5.18 million inhabitants (2000) i.e. around 17 inhabitants per square kilometre. 65% of the population live in towns or urban areas, 35% in rural areas. Principal cities are Helsinki (555,000), Espoo (213,000), Tampere (195,000), Vantaa (178,000), Turku (172,000) and Oulu (118,000). Around one million people live in the Helsinki metropolitan area (i.e. Helsinki, Espoo, Vantaa and Kauniainen). The total area is 338,145 square kilometres, of which 10% is water and 68% forest, and 6% under cultivation. Finland has 1269 km of border with Russia, 727 km with Norway and 586 km with Sweden, and 1100 km of coast.

Finland's GDP per capita in 2001 was 26,210 €. In 1990-1993 there was a serious depression in the Finnish economy. After that the GDP has been increasing with an annual rate ranging from 3.8% (1995) to 6.3% (1997). The growth was 6.1% in 2000, and around 0.7% in 2001 (Ministry of Finance 2002). According to current views, the growth is expected to remain at 1-3% between 2002-2003 and over 2% in the long-term (Ministry of Trade and Industry 2001a). The proportion of exports in GDP was 40% in 2001 (Statistics Finland 2002). Around 75% of foreign trade (both imports and exports) take place with other European countries.

The general objective of Finland's energy policy has been to ensure a reliable supply of energy at competitive prices. The energy supply is quite diversified and energy imports cover about 70% of total use. During the past two decades, energy supply has shifted away from oil and coal towards nuclear energy, wood-based fuels, peat and natural gas. Finland also imports a considerable proportion of its electricity.

Since the industry uses a high proportion of the total energy, the energy consumption and CO_2 emissions per capita are fairly high. The emissions per primary energy supply are, however, lower than in the world or OECD-countries on average: 1.94 tCO_2/toe in 1997 compared to 2.41 in the OECD-countries. This is achieved with a high proportion of combined heat and power generation (CHP) and an extensive use of biomass, hydropower and nuclear power in energy production.

The energy market in Finland is partly regulated. Power trading is a totally competitive market and it is traded in the Nordic Power Exchange (www.nordpool.no). No licence is required for selling electricity. Installations are mainly owned by private companies or by municipalities (especially CHP plants). The construction of new capacity is allowed after fulfilling the environmental criteria and building license requirements. Electricity market includes around 400 power plants owned by some 120 power producers.

Power transmission and distribution is, however, strictly regulated. Transmission network is owned and operated by Fingrid Oyj. Electricity network operation is subject to licence, and the Electricity Market Authority grants a network licence for network operation. The construction of a cross border power line requires a licence from the Ministry of Trade and Industry. District heating networks are local monopolies. They compete, however, with other heating options.

The main authority in energy policy is the Ministry of Trade and Industry, and the functioning of the electricity market is supervised by the Energy Market Authority. District heat market is supervised also by the Finnish Competition Authority. The task of the Finnish Competition Authority is to enhance the efficiency of the economy by promoting competition. It takes measures to abolish competition restrictions and implements the control of concentrations. The main legislation consists of Electricity Market Act, 1995; The Electricity Market Decree, 1995; Natural Gas Market Law, 2000; Act on Competition Restrictions, 1992, 1998; Land Use and Building Act, 2000; Building Code, 2000. Also the environmental legislation has important influence on energy sector.

The total consumption of energy was 1308 PJ in 2000 (Statistics Finland 2001b) and 1327 PJ in 1999. A detailed energy balance is attached in Annex 1. Energy consumption is spread fairly evenly between various fuels (Table 1). Industry accounts for about half of total energy use and its share is increasing over time. The forest industry is the largest energy consumer, but it produces more than 40% of its needs from waste wood and other by-products (i.e. black liquor). The proportion of wood and derived products of total energy supply is the highest in Europe, 327 PJ in 2000 and 384 PJ if peat were considered as renewable. 20% of the total consumption is used by space heating. The role of district heating is important, 49% of the consumption.

Table 1. Energy consumption by source and consumer group of the total (1 308 PJ) in 2000 (Statistics Finland 2001b).

By source	%	By sector	%
Oil	27	Industry	52
Coal & coke	10	Space heating	20
Natural gas	11	Transport	14
Nuclear power	18	Others	15
Hydropower (incl. wind power)	4		
Peat	4		
Wood fuel	21		
Other	2		
Net imports of electricity	3		

Table 2. Electricity generation by source in 2000 of the total of 79.2 TWh (Statistics Finland 2001b).

Source	%
Hydro	18.3
Wind	0.1
Nuclear	27.3
Hard coal	10.6
Oil	1.9
Natural gas	10.0
Peat	5.0
Other fuels	11.7
Net imports	15.0

The net supply of electricity from various sources in 2000 was 79.2 TWh (Table 2). The net supply and use of electricity has increased steadily and by 27% compared to the 1990 level. The electricity consumption is expected to increase to some 92 TWh by 2010 and 97 TWh by 2015 (Finergy 2000). Similar estimates are also found in the National Climate Strategy (Ministry of Trade and Industry 2001b). The industry is estimated to create circa two thirds of this growth.

2. ENERGY SECTOR PLANS AND STATISTICS

Direct government intervention to steer the choice of energy sources is rare, apart from decisions regarding the use of nuclear power. However, economic instruments, taxation and subsidies, have been used to improve energy efficiency and to favour the development of domestic energy sources such as peat and biomass. Peat, in particular, as one of the few indigenous energy resources, was given substantial support in the form of R&D and investment subsidies, and tax exemptions. The use of peat has, however, declined in the late 1990s mostly due to increased wood-based fuel subsidies and liberalization of the electricity market.
Finland was the first country to introduce a CO_2 tax in 1990. Since its introduction the tax system has been modified and tax rates adjusted several times in the 1990s. The present energy taxation consists of three tax components: A basic excise tax is levied on oil products, an additional CO_2-based excise tax is levied on transport and heating fuels and an additional differentiated (industrial and other use) excise tax is levied on electricity consumption.

The main policies and measures in the energy sector are Electricity Market Act, Energy Taxation, Energy Conservation Programme, Voluntary agreements on energy conservation and energy auditing, Action plan for renewable energy and Energy and climate technology R&D. National Climate Strategy also includes updated P&Ms i.e. Revised Energy Conservation Programme and New action plan for renewable energy. The Finnish government made its favourable decision-in-principle on the fifth nuclear power unit (1,000 – 1,600 MW_e) in January 2002. The Parliament ratified the decision-in-principle with votes 107-92 on 24 May

2002. The applicant, TVO, is now authorised to continue the preparation for the construction and will make the final decision on the construction on the basis of technological and economic factors. TVO still needs a construction permit for the plant.

Statistics Finland is responsible for annual, published energy statistics (i.e. Statistics Finland 2001b). Emissions statistics is a joint effort of Finnish Environment Institute and Statistics Finland supervised by Ministry of the Environment.

3. ENERGY SECTOR MODELLING ACTIVITIES

Ministry of Trade and Industry is the main official body conducting modelling work in the energy sector. The Ministry has used its own model in combining various sector programmes. A general description of the model is published by MTI (Ministry of Trade and Industry 1997). In the climate policy formulation, sectoral reports have provided input material for further calculations with the MTI model. The main economic and policy parameters are estimated in the MTI model as exogenous variables, and the model returns annual energy balances for a chosen time span, even for long-term scenarios. Calculations for the input data for the MTI model were based on several other models and projects supervised by sectoral ministries.

In order to study the effects of the climate strategy two major research projects were launched at the beginning of 1999. In one project the Government Institute for Economic Research (VATT) studied the effects in collaboration with the Technical Research Centre of Finland (VTT), and in the other project, the Research Institute of the Finnish Economy (ETLA) and VTT produced joint estimates of the effects (Kemppi *et al*. 2001, Forsström & Honkatukia 2001).

ETLA and VTT have developed a computable general equilibrium model that combines a top-down approach of economic behaviour with a bottom-up description of energy and paper industries. The model facilitates a simultaneous analysis of both economic and technological choices. In the VATT/VTT project two large models were used in an iterative manner. The energy sector calculations are carried out by means of the EFOM model, managed by VTT Energy (Lehtilä & Tuhkanen 1999). The economic evaluation is largely based on calculations with KESSU model (Hetemäki & Kaski 1992).

4. REVIEW OF NATIONAL COMMUNICATION

Finland's Third National Communication under the United Nations Framework Convention on Climate Change was published by Ministry of the Environment in 2001. The third communication includes emissions projections until 2020 for 'with measures' scenario and until 2010 for 'with additional measures scenario' disaggregated by sectors and GHGs.

National communication is based on the National Climate strategy as far as energy policy and climate change policy is concerned. The Strategy was processed in the ministries by government officials in 1999 – 2001 in co-operation with other stakeholders. Each ministry was responsible for the measures in its field of administration. The main responsibilities were allocated as follows:

Ministry of Trade and Industry: Energy use in industry, construction business, households and services, energy production and its emissions.
Ministry of the Environment: Infrastructure planning, heating in buildings, waste management, mobile machinery (excl. agricultural and forestry equipment).
Ministry of Transport and Communications: Transport emissions.
Ministry of Agriculture: Agriculture and Forestry (incl. emissions from related machinery), Land use changes.

The Ministry of Trade and Industry combined the sectoral programmes into a single report (background report to the National Climate Strategy) in March 2001 (http://www.vn.fi/ktm/eng/3/3_6.htm). Based on the report and other studies – including the above mentioned VATT/VTT and ETLA/VTT studies - the Government prepared the National Climate Strategy. Strategy was adopted by the Government on March 15, 2001, and supported by Parliament in its statement on June 19, 2001.

The National Climate Strategy consists of four major policy packages (Table 3). The strategy has been so far based on a premise that 100% of the measures will have to be carried out domestically. The Strategy contains two major options concerning electricity supply. Scenario 1 (KIO 1) assumes that hard coal will be replaced to a remarkable extent with natural gas. Scenario 2 (KIO 2) includes a new nuclear power plant that would operate in the beginning of the Kyoto commitment period in 2008.

Revision of the National Climate Strategy started in Spring 2003 and will be completed by Autumn 2004. The of Kyoto Mechanisms will, among other issues, probably be defined in new strategy. Currently EU Emissions Trading Scheme is dominating the discussion.

Table 3. Policy packages and projected emissions reductions of the National Climate Strategy in 2010.

Policy Package	Projected Emissions Reduction in 2010 - in Mt CO_2eq / year -
Energy saving	3-4
Promotion of renewable energies	4-5
Other GHGs	Over 1
Measures in electricity supply (i.e. a new nuclear power unit after May 2002)	6-10
TOTAL	**14**

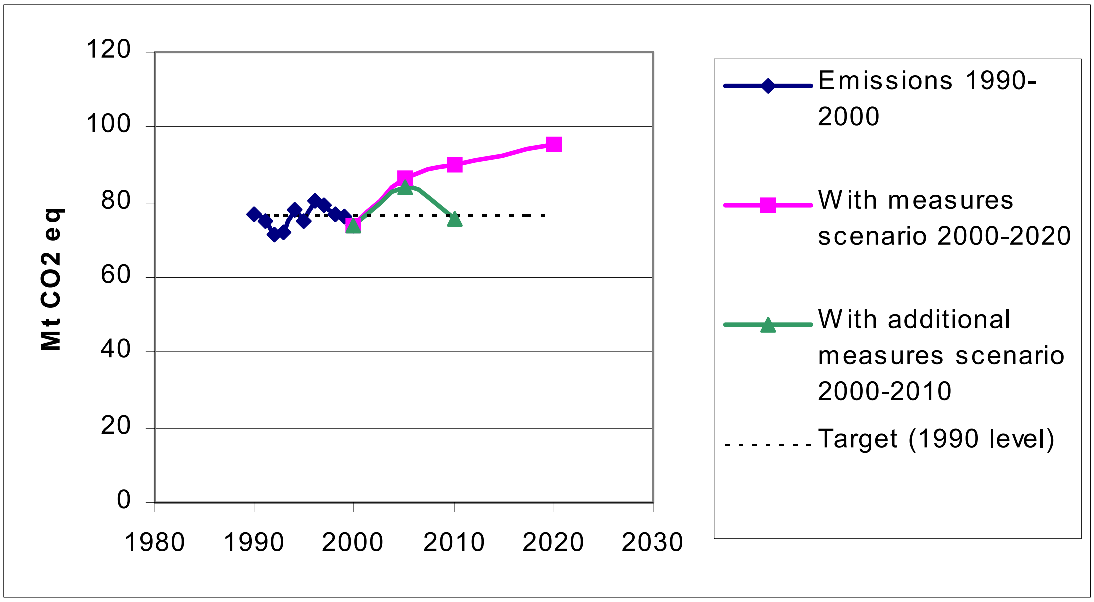

Figure 1. Comparison of the 'with measures' scenario for the years 2000 – 2020 with the 'with additional measures' scenario of National Climate Strategy for the years 2000 – 2010. All GHG emissions.

GHG emissions from Finland have decreased from 1990 to 2000 (Table 4). The 2001 figures, were, however higher (Table 4).

Table 4. Updated GHG emissions in Finland (Ministry of the Environment 2003)

Million tonnes CO_2eq	1990	2000	2001
CO_2			
- fuel combustion	53.9	54.9	60.5
- fugitive emissions	3.5	3.5	3.5
- industrial processes	1.2	1.1	1.0
- agricultural soils	3.2	2.0	1.9
- others	0.6	0.7	0.7
CH_4	6.3	5.4	5.4
N_2O	8.3	7.1	7.1
SF_6, HFCs, PCFs	0.09	0.58	0.73
TOTAL	77.2	75.4	80.9

Mainly due to the growth in electricity consumption, the GHG emissions are expected to increase with around 17% by 2010 compared to 1990 in the business-as-usual scenario and by 24% by 2020 (Ministry of Trade and Industry 2001a). The business-as-usual scenario assumes that new coal condensing power is built in order to meet the growing demand on electricity. This scenario is, however, improbable (see chapter 2). The costs of GHG emissions abatement have been estimated as part of the National Climate Strategy.

The cost of the National Climate Strategy was estimated at between 0.2 and 1.4 % of the GDP depending on the taxation option, electricity supply scenario and institute committing the estimations.

5. ONGOING ACTIVITIES IN JOINT IMPLEMENTATION & EMISSIONS TRADING

Finland has signed (29.04.1998) and ratified (31.5.2002) the Kyoto Protocol as a member of the European Union. The focal point for UNFCCC is the Ministry of the Environment (MoE). The programme of the present government (1999-2003) states the following:

"*Threats to the global environment will be countered by international co-operation in accordance with the UN Rio Declaration and the Kyoto Protocol … emissions of greenhouse gases will be reduced in accordance with Finland's international commitments. Sector-specific preparations will be compiled into a joint action programme. Joint implementation projects will be included as part of Finland's development Cupertino and the Co-operation with neighbouring areas. Proportionately more biomass will be used in energy production*."

Key players

Key players in national climate policy consist of:

- Ministries, in particular those involved in the national climate policy programme (http://www.vn.fi/vn/english/index.htm).

- Industry associations, such as:
  TT - The Confederation of Finnish Industry and Employers (http://www.tt.fi/english/)
  Metsäteollisuus ry - The Finnish Forest Industries Federation (http://www.forestindustries.fi/)
  MET - The Federation of Finnish Metal, Engineering and Electrotechnical Industries (http://www.met.fi/english/index.html)
  Finergy - The Finnish Energy Industries Federation Finergy (http://www.energia.fi/finergy/eindex.htm)
  Sener - The Finnish Electricity Association (http://www.energia.fi/sener/)
  Sky - The Finnish District Heating Association (http://www.energia.fi/sky/eindex.htm)
  Finbio - The Bioenergy Association of Finland (http://www.finbioenergy.fi/index_english.html)

- Trade Unions:

SAK - The Central Association of the Finnish Trade Unions (http://www.sak.fi/english/index.htm)

- NGOs:
  Suomen luonnonsuojeluliitto ry - the Finnish Association for Nature Conservation (http://www.sll.fi/yleista/whoweare.html)
  Maan ystävät ry - Friends of the Earth Finland (http://www.maanystavat.fi/english.html)
  Dodo ry - An environmental NGO (http://www.dodo.org)
  Greenpeace Nordic (http://www.greenpeace.se)
  WWF Finland (www.wwf.fi)

Private sector

Most influential private sector players in the national climate policy are:

- Energy producers (Fortum, Vattenfall, Pohjolan Voima (PVO), Teollisuuden Voima (TVO), Helsinki Energy, Graninge)
- Forestry companies (UPM-Kymmene, M-Real, StoraEnso)
- Basic metal industry (Rautaruukki, Outokumpu)
- Chemical industry (Kemira)

Trading

The working group on Kyoto Mechanisms has carried out studies on an emission marketplace in Finland. The studies have analysed marketplace models and potential parties in domestic emissions trading. The studies conclude that a domestic marketplace would be characterised by a low trading volume and high price volatility. It would, however, support the international use of the Kyoto mechanisms.

Kyoto mechanisms in National Climate Strategy

A part of the preparation of the National Climate Strategy, a working group looking at the Kyoto Mechanisms was set up. The task of the group was to formulate a proposal about the implementation of the Kyoto Mechanisms as part of the national climate policy. The working group concluded its work in a final report in January 2001 (http://www.vn.fi/ktm/eng/3/3_6.htm). Due to the uncertainties related to the use of the mechanisms, the working group concluded that national climate policy must be based on domestic measures. Preparations should however be made for future participation in the mechanisms. Finland is now updating its climate strategy regarding, for example, the mechanisms.

The Government of Finland has launched a CDM/JI Pilot Programme in order to prepare for the implementation of Joint Implementation as well as Clean Development Mechanism of the Kyoto Protocol. The Ministry for Foreign Affairs is in charge of the implementation of the programme in co-operation with other relevant ministries. The aim of the programme is to gain experience in the issues specific to the JI/CDM project cycle. It is expected that the pilot projects implemented under the Programme will also result in high-quality emissions reductions or carbon removals by sinks. Two projects have been implemented and several (approximately 10) are in the pipeline (Ministry for Foreign Affairs 2003a). Finland has Memoranda of Understanding with Estonia, Latvia, Lithuania, Poland and Ukraine.

Projects

Kyoto mechanisms arouse a lot of interest in Finland. So far, there are two JI projects implemented within Finnish CDM/JI Pilot Programme and several projects are being developed. The Finnish government and the energy company Fortum have joined the Prototype Carbon Fund. The UNFCCC focal point at the Ministry of the Environment actively follows the international negotiations, but there has not been much work on baselines or AVM. Several companies are interested in JI and the CDM.

On 27 June 2002, the energy ministers of the Nordic countries decided to establish a Testing Ground Facility which will invest in JI projects in the Baltic Sea Region. The fund will amount to at least 10 million Euro and will be established from contributions by the Nordic countries. Other investors in the region are invited to participate.

6. ONGOING ACTIVITIES IN BASELINES

Activities in baselines in Finland are mainly related to Finnish CDM/JI Pilot Programme. In addition major energy producers and some other companies have their own activities, which are not public at the moment.

Several baseline studies have been conducted for the projects within Finnish Pilot Programme. There are no major research projects in baselines. Finnish CDM/JI Pilot Programme has published guidelines for CDM and JI projects (Ministry for Foreign Affairs 2003b).

BASE Country team can be considered as an important forum for baseline discussion. The following experts have worked in Finnish BASE Country team during the BASE project.

Mr. Seppo Oikarinen, Counsellor, Ministry of Trade and Industry
Mr. Mika Sulkinoja, Senior Adviser, Ministry of the Environment
Mr. Mikko Laakkonen, Director, Helsinki Energy
Mr. Ismo Ulvila, Programme Manager, Finnish CDM/JI Pilot Programme
Ms. Kati Kulovesi, Legal Adviser, Finnish CDM/JI Pilot Programme
Mr. Tommi Tynjälä, Programme Manager, Finnish CDM/JI Pilot Programme/Executive Vice President, GreenStream Network Oy
Mr. Kari Hämekoski, Senior Consultant, Electrowatt-Ekono Oy/Programme Manager, Finnish CDM/JI Pilot Programme
Mr. Harri Laurikka, Consultant, Electrowatt-Ekono Oy
Mr. Tomas Otterström, Vice President, Electrowatt-Ekono Oy/ Executive Vice President, GreenStream Network Oy

The first Country team meeting was held in 18.1.2002, the second in 16.5.2002 and the third in 29.08.2002. In addition, a National Stakeholder meeting was held 7.2.2002. Country team and all other major players in the field of JI in Finland were invited.

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Energy Balance 2000, ktoe

	Coal	Crude oil and NGL	Petroleum products	Natural gas	Nuclear power	Hydro power*	Peat fuel	Wood**	Electricity	District heat	Total
Indigenous production					5622	1249	1210	6663			14744
Imports	3558	11606	3720	3431					1050		23365
Exports			-5045				-15		-28		-5088
International marine bunkers			-646								-646
Stock changes	39	-168	-180				190				-119
Total primary energy supply	**3598**	**11439**	**-2151**	**3431**	**5622**	**1249**	**1385**	**6663**	**1022**	**0**	**32256**
Statistical difference	-1		-184	9							-176
Electricity generation	-1186		-48	-40	-5622	-1249	-286	-99	3682		-4848
Combined district heat and power	-1010		-50	-1423			-619	-303	1094	1823	-488
Cogeneration electricity in industry	-40		-115	-212			-96	-904	1009		-358
District heat production	-61		-203	-145			-62	-221		664	-28
Oil refinery		-11439	11361								-78
Coal transformation	-542										-542
Transmission and dist. losses									-237	-210	-446
Total final energy	**757**	**0**	**8611**	**1619**	**0**	**0**	**321**	**5136**	**6570**	**2277**	**25291**
Industry	755		1696	1508			299	3983	3752	227	12219
Transport			4287	15					46		4349
Residential	2		786	21			10	997	1405	1276	4498
Agriculture			663	14			10	98	71	8	864
Commerce and public services			332	27			2	58	1142	766	2327
Other consumption			177						154		330
Non-energy use			670	34							703

* incl. wind power,

** inc. recycled fuels