



**EXPERT EVALUATION NETWORK
DELIVERING POLICY ANALYSIS ON THE
PERFORMANCE OF COHESION POLICY 2007–2013
YEAR 1 – 2011**

**TASK 1: POLICY PAPER ON RENEWABLE ENERGY AND
ENERGY EFFICIENCY OF RESIDENTIAL HOUSING**

SWEDEN

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JAN-EVERT NILSSON

JENA AB

**A report to the European Commission
Directorate-General Regional Policy**

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LIST OF ABBREVIATIONS

- EEN – Expert Evaluation Network
- ERDF – European Regional Development Fund
- ESF – European Social Fund
- OP – Operational Programme

1. EXECUTIVE SUMMARY

Sweden has the largest share of renewable energy in final energy consumption in the EU and has experienced one of the largest increases in renewable energy since 2000. The goal of the government is to increase the production of electricity based on renewable sources by an additional 35% between 2002 and 2020. General economic measures, such as a tax on carbon dioxide, international emissions trading and electricity certificates, are the key elements in the long-term national energy policy, the main element being the last one, which is a market-based means of supporting renewable energy production.

The use of energy in residential housing, retail premises and offices accounts for more a third of total energy consumption in Sweden and this share has been stable since the 1970s. An estimated 56% of energy used in residential housing was from renewable sources in 2005, a share that is expected to increase to 69% by 2020. The goal is to reduce total use of energy per unit of heated area in dwellings by 20% in 2020 and 50% in 2050 relative to 1995.

Renewable energy is not a major priority in the Swedish ERDF programmes. Only 5.6% of total ERDF-funding in the regional programmes is allocated to this. At the end of 2010, funding has been committed to only 17 energy projects. The resources budgeted to energy efficiency in housing are small, accounting for only 1% of the total ERDF available.

The ERDF programme documents are primarily policy documents in which the arguments take the form of statements. There is no critical assessment of the justification for public intervention. The case for intervention is based on an implicit assumption that market forces by themselves are not able to manage the transition to an energy system based on renewable sources. The main rationale for public intervention to promote renewable energy expressed in the programmes is that it constitutes national policy.

The general measures which form the basis of long-term Swedish energy policy discriminate between renewables and non-renewables but not different types of renewable. The rate of support is not linked to variations in the profitability of renewable energy production or with the ways energy efficiency is improved in residential housing, and there is no link between variations in the market price of energy and the rate of support.

2. NATIONAL POLICY

The Swedish government introduced a new combined Climate and Energy policy in 2009, which strengthened the promotion of renewable energy and energy efficiency and combined this with a strategy for a generation shift in nuclear power production. In 2007, 37% of energy supply was oil and carbon based, 30% came from nuclear power plants and 31% from renewable energy sources, predominantly biofuel.¹ The Government's vision is that in 2050 Sweden will have a sustainable and resource efficient supply of energy without greenhouse gas emissions. Included in this vision is the ambition to develop, along with existing hydroelectric and nuclear power production, a third pillar consisting of renewable energy production. Sweden has the largest share of renewable energy in final energy consumption in the EU and experienced one of the largest increases in renewable energy in the period 2000–2005. The goal is to increase the production of electricity based on renewable sources by an additional 35% between 2002 and 2020.

According to the Government, general economic instruments, such as taxes, international emissions trading and certificates, are fundamental to the long-term energy policy. A number of taxes are imposed on energy, specifically a general energy tax, a carbon dioxide tax and sulphur tax. These are levied on the consumption of fuels, electricity and the thermal output of nuclear reactors. In addition to this there is also a charge levied on nitrous oxide emissions in the generation of electricity. The purpose of these taxes is to reduce environmental damage by applying the 'polluter pays' principle.

A key element in the policy of supporting production of renewable energy is the electricity certificate scheme. Producers of electricity from renewables in plants built after 2003 receive for a period of 15 years a certificate for each MWh produced which they can sell in order to generate extra income thereby stimulating further expansion of production.² Demand for certificates is created by the fact that all suppliers of electricity and some users have to buy a specified amount of them corresponding to a certain share of their sales or consumption. The amount concerned increases year by year, creating a growing demand for certificates which in turn tends to raise their price. The extra income the producers of renewable energy receive through the sale of certificates is intended to stimulate further investment in renewable-based production.

The electricity certificate scheme was introduced in May 2003 and the production eligible for certificates had grown to 8.5 TWh by 2008. The National Energy Agency estimates that it will grow by further 6.3 TWh between 2009 and 2020. The goal is to reach 25 TWh.

¹ Government Proposition 2008/2009:163 A Coherent Climate- and Energy Policy; Energy

² Energimyndigheten *Elcertifikatsystemet 2010*

In order to achieve the target of at least 50% of energy consumption from renewables by 2020, the Government has put forward a number of proposals, including the further development of the electricity certificate scheme.³ The scheme does not cover all kinds of renewables, such as large-scale hydro-electric power stations in operation prior to the scheme being introduced as well as certain bio-fuel plants.

In addition to the income from electricity certificates, certain kinds of production of renewable energy (bio fuels for heating, combined heating and power plants, district heating and peat) receive direct financial support from the government. Public expenditure on renewable energy amounts to EUR 319 million in 2011, two-thirds of this going to energy research.

In addition, renewable energy production is supported by tax concessions which are worth almost three times as much as the public expenditure.⁴

Due to the climate conditions energy efficiency in residential housing has been a prioritized issues since the oil crisis in the 1970s. The use of energy in residential housing, retail shops and offices accounts for more than a third of the total consumption of energy in Sweden.⁵ This share has been broadly unchanged since the 1970s while the number of dwellings has increased by 40%. In the last few years, a weak tendency towards a reduction in the use of energy is evident. Over the same period radical changes in the relative importance of different sources of energy have taken place. The use of oil has been drastically reduced while district heating, biofuel and electricity has increased. District heating is the dominant form of energy in residential blocks and offices while electricity is the most common one in one-family houses. The increased use of electricity for heating is an important factor in the growing share of electricity in the total energy consumption. Half of energy consumed now comes from electricity. An estimated 56% of energy used in residential housing was from renewable sources in 2005 and this share is expected to increase to 69% in 2020.⁶

The goal is to continue to reduce the total use of energy per unit of heated area in dwellings by 20% by 2020 and 50% by 2050 compared to 1995. In parallel with this, the share of energy from renewables is expected to continue to increase.

The government uses three types of measure to stimulate the use of renewable energy. The main one consist of energy and carbon dioxide taxes, that, through the effect on prices,

³ The Swedish National Action Plan for the promotion of the use of renewable energy in accordance with Directive 2009/28/EC and the Commission Decision of 30.06.2009. Stockholm 2010.

⁴ PROP. 2010/2011:1 Utgiftsområde 21

⁵ Swedish Energy Agency 2010

⁶ The Swedish National Action Plan for the promotion of the use of renewable energy in accordance with Directive 2009/28//EC and the Commission Decision of 30.06.2009. Stockholm 2010

gives an economic incentive for more efficient use of energy as well as reducing the like solar cells, that have yet to become commercially viable.

The government has also imposed binding regulations on energy use in new buildings. These vary between different climate zones and between dwellings and for other kinds of buildings and are progressively being tightened.

The third measure is voluntary classification. A number of classification schemes based on environmental and energy standards have been introduced and it is up to the real estate companies to decide if they want to join. A growing number of companies have seen the advantage of doing so. One of the schemes is the Green Building programme, which is an EU initiated system which requires that the use of energy in new buildings is 25% lower than stipulated in the national regulations or that energy use in existing buildings is reduced by 25%.

Direct support for improving energy efficiency in residential housing is directed at encouraging conversion from electricity based heating to district heating or individual heating based on bio fuels, heat pumps or solar energy. Grants are available to cover up to 30% of the cost of conversion up to a maximum of EUR 2,900 per dwelling. There is also general support for the renovation of dwellings covering 50% of labour costs up to EUR 11,000.

3. ERDF AND COHESION FUND SUPPORT AND CONTRIBUTION TO NATIONAL POLICY

Renewable energy is not a major priority in Swedish ERDF programmes. In the national strategy⁷, renewable energy is only mentioned as an attractive option because it can reinforce regional development by providing scope for innovation, new businesses and employment.⁸ Only 5.6% of the total ERDF-funding is allocated to this area. At the end of 2010, a total of 17 projects – among them 7 bio-fuel, 4 wind power, two hydro-electric and one solar energy project – had been financed, the overall amount corresponding to 1.2% of the total ERDF available.⁹ Some 60% of this amount went to the biomass projects and only 4% to the one solar energy project.

The budgeted allocation between different energy sources shows a radically different picture with a much more even distribution between different forms of renewable energy, though biomass still accounts for the largest share, absorbing 34% of resources, followed by wind power (24%), hydroelectric (22%) and solar (21%). The main reason for this relatively even

⁷ A National Strategy for Regional Competitiveness, entrepreneurship and Employment 2007–2013. Stockholm

⁸ *ibid.* page 16

⁹ Tillväxtverket Samlad lägesrapport per 2010–12–31. En investering för framtiden. Stockholm 2011 page 105.

distribution is that Upper Norrland, which accounts for 60% of the total allocation to renewable energy in Swedish ERDF programmes, has allocated the same amounts to wind, solar, biomass and hydroelectric power. At the end of 2010, Upper Norrland had made commitments to only two projects, one wind power and one hydroelectric.

The relative amount of support allocated to different renewable energy sources varies between the programmes. Mid Norrland is the only region that explicitly includes energy as a priority area, "Renewal of business, energy and environmentally driven development", in its programme. One of the aims of the programme strategy is to take advantage of the region's natural resources, which are well suited to renewable energy production, as a means of strengthening regional competitiveness. Renewable energy is seen as an important element in the transition to a sustainable society as well as a source of employment. The ambition is for the region to become a leader in Europe in renewable energy.¹⁰

Mid Norrland and Upper Norrland together account for 75% of the ERDF resources committed to renewable energy in Sweden, though in Mid Norrland 80% of the funding committed has gone to biomass, reflecting the region's efforts to specialise in this, while in Upper Norrland, 70% of the funding committed has gone to hydro-electric. The INTERREG Botnia-Atlantica programme is contributing to this. Three of the Swedish regions – Stockholm, West Sweden and East Mid Sweden – are not allocating any of the ERDF to renewable energy.

The ERDF resources allocated to energy efficiency in housing are insignificant, amounting to only 1% of the total. Again Upper Norrland and Mid Norrland are the two regions that give highest priority to this, together their allocation accounting for 79% of the total funding going to this area in Sweden. Four regions – Stockholm, West Sweden, East Mid Sweden and Smaland and Islands – do not allocate any resources at all to energy efficiency in residential housing.

The Swedish energy policy focusing with its strong focus on green certificates makes renewable energy a regional issue only in the two regions that look upon this area as a promising field for innovations and future specialisation. Considering the strong belief in a national energy policy in Swedish the small attention paid to renewable energy in the Swedish ERDF programmes makes sense.

¹⁰ Regionalt strukturfondsprogram och regional konkurrenskraft och sysselsättning i Mellersta Norrland 2007–2013. Stockholm 2007.

4. RATIONALE FOR PUBLIC INTERVENTION

The ERDF programme documents are primarily policy documents in which arguments take the form of statements. There is no critical analysis of the justification for public intervention. The case for intervention is based on an implicit assumption that market forces alone are not able to ensure the transition to an energy system based on renewable sources. The main rationale for public intervention to promote energy expressed in the programmes has to do with national policy. In the documents setting out national energy policy, no arguments for public interventions are presented, the statement being made is that climate change is one of the greatest challenges of our time and Sweden has the ambition to show leadership through a far-seeing energy policy.¹¹

Promotion of renewable energy is the key element in national energy policy, the aim of which is to tackle climate change. Given climate change, transformation of energy production from fossil fuels is seen, without further analysis, as necessary. Based on this, goals for 2020 and 2050 are determined, which have then become a unquestioned rationale for public intervention.

Public debate revolves around two distinct issues. One concerns nuclear power, one group arguing that if the main goal of energy policy is to eliminate greenhouse gas emissions, nuclear power needs to be part of the solution and, therefore, the construction of new nuclear plants is necessary. Opposed to this, another group claims that the goal in fact is to develop a sustainable energy system and nuclear power does not meet the sustainability criterion. For them, the challenge is to shift from fossil and nuclear fuels to renewables. The Swedish government has not taken a firm position in this dispute, but has stated that it is not willing to subsidise nuclear power, leaving it open to the private sector to invest in new nuclear power plants if it considers it profitable.

The second debate, which has been initiated primarily by economists, is about the long-term consequences of support for renewable energy. Support is necessary for the expansion of renewable energy since it is not competitive at the moment. Policy is based on a belief that renewable energy will become more competitive over time as production costs decline and/or the costs of fossil fuels increases. According to policy, growth in energy production will primarily be in wind power and biomass. At present, subsidies to wind power amount to over half the market price, corresponding to EUR 110 million a year. However, it is not

¹¹ Government Proposition 2008/2009:163 A Coherent Climate- and Energy Policy; Energy

known if wind power will be competitive in the future, but if it is not, the planned expansion will increase the amount of subsidy considerably.¹²

It may be that other energy forms will prove to be more competitive than wind and biomass or that the production costs of the latter will not decrease as assumed. Under these circumstances, the country will have large non-competitive production of wind and bio energy and the Government will have either to continue to subsidise this or to accept rising prices of energy. The economists' argument is that the Government should not select and subsidise specific forms of energy because of the risk of becoming locked into particular technologies. Instead, it is argued that policy should be technology neutral, leaving the choice of energy sources to private producers and investors, thus shifting the risk from the State to the private sector.

5. RATE OF SUPPORT AND PROFITABILITY

The rate of support for renewables and energy efficiency is not linked to variations in the profitability of its production or with the ways energy efficiency is improved in residential housing. In addition, there is no link between changes in the price of fossil fuels and the rate of support. The rising price of electricity in the last few years has, therefore, resulted in large profits for the three dominant producers who generate electricity from hydroelectric plants and from old nuclear power stations.

6. COSTS, PUBLIC SUPPORT AND PRICES

Public support for renewable energy does not in general discriminate between different renewable energy forms. The Government did, however, allocate EUR 7.8 million to supporting the market introduction of wind power in 2011. The production cost of energy production, renewable as well as non-renewable, varies between plants depending on their age, technology, and location. There is no easily accessible overview available of production cost in existing generating plants in Sweden. However a research centre makes regular calculations of the costs of producing from new renewable as well as non-renewable energy plants. The results are of course affected by the assumptions made. Table A shows the result of these calculations for 2010. The range reflects different assumptions about technology and other factors.

¹² Marian Radetzki & Jonny Fagerström Vindkraft, en tvivelaktig affär. (Wind energy a doubtful business) Svenska Dagbladet 3 augusti 2010.

Table A – Calculated production cost for new production plants based on commercial technology

Energy form	Production	Cost (SEK/kWh)*
	<i>Interest rate 6%</i>	<i>Interest rate 10%</i>
Waste combined power and heating	0.03 – 0.82	0.53 – 1.28
Hydro electric power	0.36– 0.46	0.59 – 0.71
Coal condensation	0.44	0.53
Nuclear power	0.44	0.53
Natural gas, combined power and heating	0.53 – 0.78	0.61 – 0.89
Natural gas combi condensation	0.56	0.61
Wind power, on shore	0.57 – 0.59	0.57 – 0.59
Biomass, combined power and heating	0.72 – 1.44	0.94 – 1.91
Natural gas engine	0.81 – 1.08	0.87 – 1.16
Wind power, off shore	0.87 – 0.96	1.15 – 1.26
Solar cells (semi-commercial technology)	5.21	6.69

* 1 SEK = EUR 0.10–0.11

Source: Elforsk El från nya och framtida anläggningar. Stockholm 2011

7. CONCLUSIONS

Given the experience of the unsuccessful “pick-the-winners” industrial policy in the 1980s, the Swedish Government has chosen to use a general policy approach to stimulating the transition to a renewable energy system. Based on a strong conviction that energy prices will increase in the future, an electricity certificate scheme has been put in place to strengthen the competitiveness of renewable energy. One major advantage of the scheme is that it achieves a transfer from non-renewable to renewable energy production without affecting public expenditure. Budgetary constraints are, therefore, not an issue. The aim is to increase the production of renewable energy in the expectation that in the future it will be competitive without subsidies. The policy discriminates between non-renewables and renewables without discriminating between different forms of renewable energy, leaving the market to decide which will expand by most.

This approach means that the development of renewables is only of interest to regions that have a comparative advantage in production and have the ambition to exploit this. This is why in most regions in Sweden energy has a low priority Structural Funds programmes. According to programme budgets, renewable energy is allocated a significant share of funding primarily in Upper Norrland and Mid Norrland, the former having a strategic focus on biomass energy, the latter lacking a focus on any particular type of renewable. The low commitment rate in Upper Norrland, moreover, raises a question over the region’s ability to realise its plans to use the ERDF to develop renewables.

REFERENCES

A National Strategy for Regional Competitiveness, entrepreneurship and Employment 2007–2013. Stockholm

Elforsk El från nya och framtida anläggningar. Stockholm 2011 (Electricity from new and future plants.) Energimyndigheten Elcertifikatsystemet 2010 (The Swedish Energy Agency The electricity certificate system. 2010)

Radetzki, M. & J. Fagerström Vindkraft, en tvivelaktig affär. (Wind energy a doubtful business) Svenska Dagbladet 3 augusti 2010

Reg. Prop. 2008/09:163 En sammanhållen klimat- och energipolitik: Energi. (Government Proposition 2008/2009:163 A Coherent Climate- and Energy Policy; Energy)

Reg. Prop. 2010/2011:1 Utgiftsområde 21 (Government Proposition 2010/2011:1 Expenditure Area 21)

The Swedish National Action Plan for the promotion of the use of renewable energy in accordance with Directive 2009/28/EC and the Commission Decision of 30.06.2009. Stockholm 2010.

Tillväxtverket Regionalt strukturfondsprogram och regional konkurrenskraft och sysselsättning i Mellersta Norrland 2007–2013. Stockholm 2007 (Regional structural funds programme and regional competitiveness and employment in Mid Norrland 2007–2013.)

Tillväxtverket Samlad lägesrapport per 2010–12–31. En investering för framtiden.

TABLES

Annex Table A – Allocation of resources according to the programme budgets (EUR million)

NUTS 2 region	Renewable energy: total	Energy efficiency in residential housing
Upper Norrland	32.1	5.6
Mid Norrland	7.4	1.7
North Mid Sweden	3.0	0.5
East Mid Sweden	0.0	0.0
Stockholm	0.0	0.0
West Sweden	0.0	0.0
Smaland and Islands	4.2	0.0
Skåne–Blekinge	5.6	1.4
SWEDEN	52.3	9.2