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

GERMANY

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A report to the European Commission
Directorate-General Regional Policy

CONTENTS

LIST OF ABBREVIATIONS

- BB – Brandenburg
- BE – Berlin
- BW – Baden-Württemberg
- BY – Bayern
- Bund – ERDF Programme on Federal level (Transport)
- EEG – Erneuerbare Energien Gesetz (Renewable Energies Act)
- EEWärmeG – Erneuerbare Energien Wärmegesetz (Renewable Energies and Heat Act)
- EEN – Expert Evaluation Network
- EEnV – Energieinsparverordnung (Energy Saving Ordinance)
- ERDF – European Regional Development Fund
- EAFRD – European Agricultural Fund for Rural Development
- ESF – European Social Fund
- HB – Bremen
- HH – Hamburg
- HE – Hessen
- MAP – Marktanreizprogramm (Market Incentive Programme for Renewable Energies)
- MV – Mecklenburg-Vorpommern
- NI(1) – Niedersachsen, Objective Convergence
- NI(2) – Niedersachsen, Objective Competitiveness
- OP – Operational Programme
- R&D – Research and Development
- RP – Rheinland-Pfalz
- SH – Schleswig-Holstein
- SL – Saarland
- SN – Sachsen
- ST – Sachsen-Anhalt
- TH – Thüringen

1. EXECUTIVE SUMMARY

Major instruments for the support of both renewable energies and the improvement of energy efficiency in residential housing are available at national level. The most important means of supporting renewable energies is through guaranteed feed-in tariffs financed by charging all electricity users an additional amount per kW/h (EEG – Renewable Energies Act). Complementary measures providing grants and support for research also exist.

The amount of finance provided by these measures far exceeds that from the ERDF: ERDF allocated to renewable energy amounts to EUR 227 million for the whole period 2007-2013 while transfers under the EEWärmeG amount to several billion EUR per year.

ERDF is used for complementary measures at Länder level. Different types of instrument are available to support renewable energy 1) as the subject of R&D 2) in its application and introduction on the market 3) for local or regional solutions for self-sufficient energy supply and 4) for new plants to produce renewable energy. Instruments vary from Land to Land. Normally a broad approach covering all different types of renewable energy is pursued, but some Länder focus on particular types, which often depends on existing activities in the region.

If renewable energy is part of the regional development strategies of ERDF programmes, this is not only because of energy policy or environmental objectives, but because of the expectation that such investment will contribute to the overall development of the region. A first rationale links the development of renewable energies with technological development: investment in R&D or pilot projects can support innovation systems. The second rationale sees energy efficiency as an element of competitiveness.

Most of the money spent under the federal instruments goes currently to biomass, wind power and solar energy. For national instruments at federal level supporting renewable energy, a complex system of adjusting the rate of support to need by taking profitability into account has been established.

There is no ERDF investment in energy efficiency of residential housing. The most important domestic instrument is a regulative one (EEnV – Energy Saving Ordinance) with complementary incentives provided by grants and loans.

2. NATIONAL POLICY

Major policy instruments for support of both renewable energies and incentives for increasing energy efficiency in residential housing exist at federal level, while there are certain complementary activities at Länder level. As the European Regional Development Fund (ERDF) is almost entirely implemented by Länder programmes, it largely goes to support these complementary Länder activities.

RENEWABLE ENERGY

According to national policy goals, renewable energies are to account for 18% of gross final energy consumption by 2020 (30% by 2030, 45% by 2040 and 60% by 2050) (Bundesministerium für Wirtschaft und Technologie und Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010:5)

There are three main instruments to promote renewable energies in Germany. The first is the Renewable Energies Act (*EEG*) which provides a guaranteed feed-in tariff (Bundesministerium für Wirtschaft und Technologie und Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010). The *EEG* has since 2000 combined a guaranteed price for producers of renewable energies with an obligation on network operators to accept energy from renewable sources. The tariffs are financed by an additional charge per kWh for all electricity users. Currently this additional charge is some 2 cents per kWh (less than 10% of the total price of electricity)[1]. The feed-in tariffs are guaranteed for 20 years. The tariffs for new facilities have declined over time as the share of renewables has risen. In 2009, the *EEG* was complemented by a similar law on the production of heating (Renewable Energies and Heat Act – EEWärmeG) . Secondly, the Market Incentive Programme for Renewable Energies (*MAP*) supports investment in renewable energy plants through grants or loans. Thirdly, support is provided for research in renewable energies.[2]

Both *EEG* and *MAP* differentiate between different sources of energy. In general, there is support for all relevant sources, which varies according to the actual costs (*EEG*) and/or the rate of progress in developing capacity. Feed in-tariffs are higher for facilities producing electricity at higher cost, the extent depending on the technical optimum of the technology concerned. This is the reason why tariffs also vary with the size of facilities (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit et al. 2007:26). In 2010, feed-in tariffs varied between 0.00 and 39.14 cents per kWh (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010 – see Annex Table E for more details).

[1] This additional charge is not fixed. It is calculated as the difference between the feed-in tariffs and the (changing) cost of energy (at the electricity stock exchange). A specific regulation defines the way the additional charge is calculated.

[2] These are the three most important instruments. There are others like for instance support for export.

EEG transfers several billion EUR per year in this way. In 2010, some EUR 12,700 million were paid in feed-in tariffs (Arbeitsgruppe Erneuerbare Energien Statistik 2011:11 - more information see Annex Tables C and D). Compared to this amount, public expenditure under the *MAP* (EUR 426 million in 2009, EUR 346 million in 2010) and an estimated amount of some EUR 220 million in public support for research are of minor importance (Arbeitsgruppe Erneuerbare Energien Statistik 2011: 15f.).

Policy measures in these areas are subject to continuous, mostly incremental, adjustment. This mainly relates to the way feed-in tariffs are calculated and the rate of their reduction.[3] The support for renewable energies, however, has not been changed in principle, either in response to the economic downturn or as a result of subsequent constraints on public finances.

While there is no explicit territorial preference in the measures mentioned above, there is a certain political emphasis on the development of wind power, and specifically on offshore wind farms. This in practice favours the northern parts of Germany, where the conditions for wind farms are more suitable than in the south.

The fact that the **Länder** have their own measures to support renewable energy leads to some regional variation. The main types of measures at Länder level are (Metz et al. 2007:173ff.):

- Programmes to support the market introduction of technologies using renewable energies, which have been implemented since the 1990s with shifting emphasis; the main focus being at present on biomass, where the European Agricultural Fund for Rural Development (EAFRD) plays a role.
- Support for R&D as well as pilot projects, in the form either of specific programmes focusing on renewables or of the inclusion of renewable energies in general R&D programmes.
- Support for the development of concepts or consultancy.[4]
- Support for the development of research institutes specialising in renewable energies.

[3] In the recent report on the EEG (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2011a) a new element is being proposed: The introduction of an optional feed-in premium. Operators of facilities could then chose between the traditional feed-in-tariffs which are fixed and a premium model. The premium would be calculated as the difference between the average market prices for renewables and the feed-in-tariffs. Simultaneously the operator of a facility is free to produce and sell it's energy at market prices - depending on the market price he can end up with higher income from market price + premium compared to the feed-in-tariff. The premium has the goal to establish a closer link between operators of facilities and the market. The proposal has been accepted by the cabinet but needs to be taken up in the next reform of EEN.

[4] The concepts are partly used for the development of self-sufficient local or regional energy systems.

As ERDF is implemented at Länder level the European Funds are mostly invested in these types of complementary activities instead of spending the money for direct investment in new capacities of renewable energy. So, only a small share of the EUR 227 million supports direct investment, for the most part is supporting R&D and market introduction instruments.

ENERGY EFFICIENCY OF RESIDENTIAL HOUSING

An objective of national policy is to put in place a stock of buildings that is "almost climate neutral" by 2050 (Bundesministerium für Wirtschaft und Technologie und Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010:22): "By 2020 we want to reduce the heating requirement by 20%. Furthermore, by 2050 we aim to reduce primary energy demand by an order of magnitude of 80%" (ibid.). The most important instrument is the *Energieeinsparverordnung* (Energy-Saving-Ordinance EEnV), which is a comprehensive regulatory tool governing different aspects of energy-efficiency and energy-consumption in relation to different types of building. The most important elements are first, that it sets strict and obligatory standards for the energy-efficiency of new buildings (the most important one being a standard for annual primary energy consumption). Secondly, it sets similar standards for modernisation of buildings (such as a reduction in energy consumption by a fixed percentage compared to the ex-ante situation). Thirdly, it sets specific rules for different types of facilities (boilers, thermal insulation and air conditioning, in particular)[5].

There are important complementary measures which provide financial incentives for new buildings and the modernisation of existing buildings (CO_2-modernising of buildings programme)[6], support being given on an increasing scale to those which outperform the EEnV standards. For new buildings, the highest level of support is given to so-called "passive houses" (i.e., those constructed in a way not requiring active heating or cooling). Support is in the form of grants or loans depending on the type of measure concerned. From 2006 when the programme has been started up until end-2010, EUR 7,100 million of public subsidies were invested[7] and some 900,000 grants and loans were agreed inducing investment of EUR 75,000 million. For 2011, EUR 936 million of subsidies are available.

The set of measures has developed continuously. The EEnV has increased the standards set and, as a consequence, the criteria for grants or loans have also been tightened. The last

[5] EEnV also comprises elements to improve transparency. For instance the obligation to have so called energy passes for buildings.

[6] There are other, smaller instruments, e.g. for energy efficiency in protected historical monuments, or for council estate.

[7] http://www.bmvbs.de/DE/BauenUndWohnen/EnergieeffizienteGebaeude/Energieeinsparverordnung/energieeinsparverordnung.node.html (last visit 3 May 2011).

revision of EEnV was in 2009 when standards were raised by some 30% and the next is planned for 2012, when they will be raised by a further 30%.

In 2008 and 2009, reacting to the economic crisis, the federal government introduced an economic stimulus packages, amounting to EUR 19,700 million. Some 10% of this amount was allocated to energy-related modernisation of buildings (EUR 2,000 million - (Pavel und Proske 2009). Not all of this is intended for housing, public buildings also being covered. The above mentioned programmes were expanded from this budget. There are no signs that the crisis and the constraints on public finances have reduced the funding available[8].

There is no regional differentiation in Federal policies in this area, but in different ways, several Länder complement federal programmes through their own measures. This means that there is some regional variation in both the focus and conditions of support.

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

Support for both renewable energies and energy efficiency are secondary areas for investment for German ERDF programmes:

- On average, Convergence Objective programmes allocate 0.9% of their budget to Codes 39-42, Competitiveness Objective programmes, 2.8%
- The average allocation to energy efficiency is 1.3% for Convergence Objective programmes and 2.5% for Competitiveness Objective ones.

In both cases, there is significant variation in the share between programmes.

RENEWABLE ENERGY

Renewables play a more important role in programme strategies than would be expected from the financial allocation[9]. First, there are activities related to renewables that go beyond simply supporting investment in additional capacity. Secondly, the issue of renewable energy plays an important role in different types of intervention, e.g. R&D.

In most programmes, measures to support the production and/or use of energy from renewable sources go hand in hand with incentives to save energy or at least reduce climate relevant emissions. Those measures are not included here, but it is important to note that the programmes follow a more comprehensive strategy in relation to energy – often subsumed under climate protection objectives.

[8] There were, however, reductions in the budget of the Ministry of Transport, Building and Urban Development. For instance, federal programmes for urban development have been cut by 50%.
[9] See Annex for a synopsis of the rationale and measures mentioned in the Programmes.

ERDF-financed support for renewable energies in Germany is not simply providing financial incentives for the creation of additional capacity for energy production. Instead, ERDF is spent in a number of different ways to promote renewables:

- *Renewable energies as the subject of R&D* (e.g., MV, BB, SN, ST, SH, TH, BW, BY, BE, HB, HH, NI, NW, RP): Support of R&D is one of the core elements of ERDF interventions and there is a specific emphasis on renewables. One starting-point is to support the development of (public) research capacity. Another approach is to support R&D-projects of enterprises or cooperative projects in renewable technologies as well as the development of services in relation to renewables. An important aspect is the development of clusters for renewable energy technologies.
- *Application of renewable energies* (e.g., MV, BB, SN, ST, BW, BE, HB, HE, NI, NW, RP): Support is provided for the use of renewable energies, mainly in SMEs, most commonly through finance models or pilot projects for new potential applications, though also through specific measures such as energy performance certificates for SMEs. The general aim is to support the diffusion of relevant technologies, and information activities and energy management systems as well.
- *Local/regional solutions for self-sufficient energy supply* (e.g., in SN, TH, BW, BY): The development of integrated local or regional concepts for a self-sufficient energy supply is supported in a few Länder. This approach addresses local authorities or networks of local actors, whilst for the other approaches, the target groups are predominantly SMEs and research institutes[10].
- *New facilities for production of renewable energy*: Only a few Länder directly support investment in new capacity. In any case these activities are of minor importance.

Measures to support renewable energy as the subject of R&D and the application of renewable energies are the most common ones and are present in nearly all Länder programmes.

As the German ERDF programmes are regional, a focus on specific forms of renewable energy is associated with regional differentiation, where specific emphasis is given to certain forms of renewables; the choice depends on regional conditions and/or existing economic potential. For instance the Bremen OP is focused on off-shore wind power which is favoured by its location and a developing economic cluster. In the southern parts, there is tendency to give some emphasis to geothermic energy. Not all programmes, however, accord specific emphasis to a particular type of renewable. If they do so, it is usually on wind power or geothermic energy, though this strategic preference does not exclude support for other types of renewable.

[10] See www,eule-bw,eu for an example.

Compared to national programmes, ERDF programmes tend to emphasise complementary aspects. They are not so focused on developing the potential and expanding the capacity for established and well-known technologies, like on-shore wind power, but on developing those sources requiring new technological solutions, unlocking new areas of application or integrating the development of renewables into local or regional strategies.

On the assumption that the expenditure allocated to the Codes 39-42 is a reliable indicator[11] for the financial resources spent on renewables, a total of EUR 227 million of the ERDF is allocated to this (including national co-financing, this results in total investment of EUR 383,865 million).[12] These are the figures for the indicative financial allocation for the whole period 2007-2013.[13] National programmes providing direct grants under *MAP* and Research programmes amount to some EUR 500- 600 million a year – and are significantly smaller than the amount spent under the *EEG* (several EUR billion a year). So ERDF investment is very much smaller than national funding – around 10% of the annual grants from *MAP* plus Research funding and only 1% of the financial resources redistributed through the *EEG* .

The share of funds planned to be spent for activities directly linked to renewable energy (codes 39-42) is largest in Baden-Württemberg (6.3%) and Hessen (4.2%) and among Convergence regions in Brandenburg (2.9%) and Niedersachsen (2.9%). Given the blurred borderline between these codes and others (e.g. R&D-related) on the one hand, and, on the other, the fact that programmes with little or no allocation to these codes nonetheless state that they have a strategic focus on this policy area, we refrain from interpreting the variation as direct expression of a strategic choice.

ENERGY EFFICIENCY OF RESIDENTIAL HOUSING

No German ERDF programme includes measures to support energy efficiency of residential housing, though a few include support of investment in the energy efficiency of public buildings (e.g., BB, BY, BE). There is some funding planned to be spent under Code 43 "Energy Efficiency", 1.3% of the total in Convergence Programmes and 2.5% in

[11] The fact that programmes where no finances are allocated to these codes don't really differ in what they say in the text about support for renewables (e.g. TH, SH) raises doubts. Obviously the allocation of funds to the codes is not consistent. But in fact similar activities like for instance specific R&D-Programmes for renewable energy can either be assigned to the R&D or the renewable code.

[12] Meanwhile, some programme changes occurred or are on their way. For instance, we know that the programme of Saxony increased the amount allocated to Codes 39-42 from EUR 14.0 million to EUR 33.73 million. This change has been confirmed by DG Regio only in April 2011. Changes of this kind affect the totals as well as the share of the financial allocation. We don't have a complete overview of the programme changes but as far as we see the changes in different programmes (SN, BY, RP, BE) lead to a certain shift of resources, but they don't challenge the overall picture as we draw it here.

[13] In the implementation, we see that for many programmes the actual spending differs. A number of programmes are spending funds in codes for renewables where they had no indicative allocation when the programme was drafted.

Competitiveness Programmes. This goes mainly to improving energy efficiency in enterprises.

4. RATIONALE FOR PUBLIC INTERVENTION

RENEWABLE ENERGY

The way Programmes refer to renewable energy differs. In general, energy is not seen as an independent objective but it is integrated in a more comprehensive strategy for regional development. For instance the OP from Baden-Württemberg states explicitly the ambition to support measures "offering specific opportunities to combine environmental and economic objectives" (Ministerium für Ernährung und Ländlichen Raum Baden-Württemberg 2007:99)[14]. Two main arguments are used to link the economic and ecological dimensions:

1) Renewable energy is important for the development of regional innovation systems, which is the strategic focus of policy. Renewable energy is seen as one area (among others) where new technologies need to be developed. Renewable Energies are seen as technology field. The statement that there is a "deficit of innovation in energy efficiency and renewable energy" illustrates the point (Ministerium für Wirtschaft, Arbeit und Tourismus Mecklenburg-Vorpommern 2007:30).

2) Energy efficiency and/or the use or production of renewable energy is an important factor for a region's competitiveness. There are different ways this is specified. First, existing competencies in the energy economy or technology are seen as strengths (e.g. BB or NW defining Energy as a "lead market"). Often this perception is linked with ideas of cluster or network development (e.g. HH, HB, SH). In several programmes, the cost-reducing effect of investment in energy efficiency is mentioned, so leading to improvements in the competitiveness of enterprises. In this context, the production of energy from renewable sources is often part of a more comprehensive package of measures to improve the energy efficiency of enterprises.

In general, this twin rationale with a focus on innovation and competitiveness is coherent with the measures selected.

Certainly the cross-cutting objectives to support sustainability or to improve environmental quality give grounds for investing in renewable energy. In this respect, such investment is usually linked to climate change and reduction of greenhouse gases.

[14] Other programmes contain similar statements, e.g. HB. See also TAURUS ECO Consulting 2010 giving an overview of the role of environmental innovation in German ERFD programmes.

ERDF support for direct investment in facilities to produce renewable energy is minor compared to interventions in R&D or applications and product development. Accordingly, the profitability of investment is not really an issue so far ERDF intervention is concerned.

Beyond the narrow scope of ERDF interventions, the huge amount of resources being redistributed by domestic policies, the fact that consumer have to pay for the feed-in tariffs and the (obligatory) involvement of electricity companies create wide public interest in the issue, though not so much in ERDF-co-financed measures as such[15].

5. RATE OF SUPPORT AND PROFITABILITY

As direct ERDF investment in new capacity is subordinate to support for R&D, pilot projects, and so on, the question of profitability is of minor importance for the ERDF-programmes and the policy instruments applied.

In contrast, for the most important national measures, the question of the rate of support and profitability is critical. The EEG is designed to take profitability aspects into account when defining the rate of support. The mechanism used to determine the extent of support is complicated, so only the main elements are mentioned here (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010):

- Feed-in tariffs vary between the different sources of energy (see Annex Table E).
- Feed-in tariffs vary with the size of facilities and are lower for larger ones.
- Feed-in tariffs are digressive over a 20 year-period for some of the sources of renewable energy. The rate of degression varies between 0 and 1.5 %. For solar power, degression is dynamic, depending on the new capacity created, but is far higher than for other sources: from a minimum of 9% up to 21%. In 2011, the reduction in feed-in tariffs for solar power was 13%.
- The whole system is continuously being adjusted. For instance, the compensation for energy from solar power has been significantly reduced in the last year due to an increase in capacity. But another decrease has recently been postponed in response to slower development of new capacities.
- There is no regional differentiation.

[15] Recently the debate about the future role of renewables has become highly political through the link to the debate about future use of nuclear power. The catastrophe of Fukushima initiated a new debate about an exit from nuclear power. A first consensus was found in 2000 under the red-green government to exit the use of nuclear power by 2021. In 2010, the government of Christian democrats and liberals prolonged the operation of nuclear power plants by up to 14 years. It is this prolongation that is now under debate. On 30 May 2011, the federal government decided to end the use of nuclear power by 2022, which is more or less the schedule before the revision of the policy in last October. This decision gives a strong impetus for the development and use of renewable energy. All national instruments mentioned here are currently under revision – as the policy mix is. One important concern is the growing need to adjust the grid to the new pattern of producers and consumers.

The ERDF is not used to support energy efficiency in residential housing. Here, there is also an adjustment mechanism built in to the national system of funding, the required level of increase in energy efficiency being raised over time.

6. COSTS, PUBLIC SUPPORT AND PRICES

It is difficult to assess the overall amount of public support by type of renewable energy. For the two main measures, *EEG* and *MAP*, relevant figures are as follows (see Annex Tables C and D):

- EUR 235 million of allowances was spent under *MAP* in 2010 on 145,742 projects with a total investment of EUR 1,808 million. Public support amounts to EUR 235 million in 2011. Of this, EUR 119 million goes to solar energy, EUR 61 million to biomass and EUR 55 million to investment in heat pumps. Additionally EUR 338 million in loans have been spent, EUR 198 million for investment in the heating grid and EUR 53 million on biomass projects (for heating).
- Although it is not financed from public budget, it is important to take account of the fact that in 2009, EUR 10,780 million was spent under the *EEG*, which far exceeds public spending under *MAP*. The largest share, EUR 3,700 million, went to biomass and only slightly smaller amounts to onshore wind power (EUR 3,389 million) and solar energy (EUR 3,156 million).

The calculation of the cost of producing electricity is too complicated to be presented in a few simple figures. Too many different factors affect it: the year when operations began, the assumed time-span for capital consumption, the size of the facility, and the number of full load hours per year. These factors vary according to the type of energy source. Reference can be made to Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2007; 2011a), where the costs are presented in detail (see Annex Table F).

The relation between the cost of producing electricity and the feed-in tariffs under EEG is being monitored continuously. On a regular basis, specific studies are undertaken on different technologies or other questions (relating to the development of the grid for instance).[16] On this broad basis of evidence, regular reports to the cabinet and the Parliament are presented. A comparison between the level of the tariffs and the actual costs is an essential part of this report.[17] So the policy is closely linked to continuous scientific monitoring and based on evidence.

[16] See for example the recent set of studies: http://www.erneuerbare-energien.de/inhalt/47459/

[17] According to the latest report, it is an exceptional case that the feed-in tariffs exceed the actual cost. For most types of facilities, the tariffs are well adjusted.

Beyond this continuous fine-tuning there is an ongoing debate about how the market can be organised in a more efficient way and how production from renewable sources can be neatly integrated. The recent proposal of an optional premium model as alternative to the tariff system is an result of this debate (see footnote 3).

The major question concerning energy efficiency in housing (market prices and market rents) is also very complicated[18]. In general, prices and rents for housing depend on a wide range of factors. Those interviewed agree that energy efficiency is becoming increasingly important in relation to other factors. But it is difficult to isolate its influence: For example, renovation in most cases changes various features of the house, not only energy-related ones, so the contribution of improvements in energy efficiency to the development of prices and rents is almost impossible to distinguish. The growing importance of energy efficiency in residential housing is reflected in the fact that energy-related factors are being increasingly integrated into rent indices – and this in turn has some influence on the development of prices and rents. Although it is difficult to estimate the effect on prices, it is clear that the issue of energy consumption is becoming more and more important as a criterion the market. Transparency instruments like the obligatory energy passes for buildings on the basis of EEnV support this development.

7. CONCLUSIONS

The following conclusions can be drawn concerning the role of the ERDF in the development of renewable energy and energy efficiency in residential housing in Germany:

- The ERDF does not play any role in supporting improvements in energy efficiency in residential housing. All measures are national ones.
- The ERDF contributes to the development of renewable energies, but not by directly supporting investment but by contributing to the financing of R&D, pilot projects, and so on. The ERDF is focused on the development of technology rather than capacity.
- With this focus, German ERDF programmes integrate issues relating to renewable energy into more comprehensive regional development programmes: Development of renewable energy is seen as improving competitiveness, either by developing innovation or by improving energy efficiency.

The current political debate about the exit strategy from nuclear power and the need to boost renewables is mainly a national one, not a regional. It might happen that as a consequence some of the OPs emphasise to renewable energy in the future stronger than

[18] For this point, we interviewed two colleagues from IfS analysing the housing market (development of rent and prices for residential housing).

they do so far, but a general change in the rationale or measures supported is not expected: On regional level, the issue of renewable energies is predominantly seen as a matter of technology development and innovation system or as field of economic competence with the potential to strengthen competitiveness.

For the next funding period, we can expect the issue of energy becoming more important part of the strategies. Issues like “smart grids”, decentralised energy production, and others may gain importance.

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INTERVIEWS

On the relevance of energy related issues for prices on the housing market, we interviewed internally two colleagues working in the analysis of housing markets: Jürgen Veser and Thomas Thrun.

The draft report has been circulated to the MAs for comments. Feed back has been given by three of them, mainly pointing out mistakes in the financial data or synopsis of the programme's strategies.

ANNEX

SYNOPSIS – ENERGY RELATED RATIONALE AND MEASURES FROM THE OPS

Most of the OPs refer to energy related issues in an number of different sections: The analysis of the situation covers energy-related issues. It makes reference to energy-relevant parts of European or national policy strategies with cross-reference to other programmes (ESF, ELER). Strategies and measures are described. The following synopsis extracts energy relevant aspects form the strategy and the description of priority axes and measures other parts of the programmes are not taken into account.

As the programmes in the current period are not required to describe the measures in detail, programmes vary significantly in how extensive they are describing the activities below the level of priority axis. For those programmes giving only very limited information on this level, we might not have grasped all the measures actually being implemented by analysing the OPs. But the synopsis gives an idea of what is supported in the programmes and which strategic objectives the programmes aim at.

	Rationale	Measures
MV (Convergence)	A deficit of innovation in the field of energy efficiency and renewable energies is identified as weakness (30) Energy Efficiency is seen as a key for long-term competitiveness (40), Support for innovative climate protection projects is expected to a reduction of greenhouse gas emissions enhancement of the share of renewables (71) Support for investment in enterprises is expected to save energy (71) Support for innovation to protect natural resources is a specific objective under Priority 1 (Innovation, R&D, education) (78)	Research in energy technology shall be supported (83), Measure V,A,7 "support for innovative climate protection projects" allows funding of (86): - Using solar energy - Using biomass energy - Geothermal energy - Local/regional solutions for self-sufficient energy supply - Infrastructure to use renewable energy - Process optimisation to save energy - Investment in alternative fuel and engines - Hydrogen infrastructure Precondition for funding is high quality of projects exceeding current norms and standards, Measure V B 1 "Support for productive investment" includes support for climate protection projects (90) Measure V B 2 "revolving fund" allows loans for energy efficiency and renewables. (91f),
BB (Convergence)	Energy Economy/Energy Technology is one of the competence fields identified (70)	Measure "Introduction and testing of innovative technologies for energy production and application" supports: technology for more efficient energy use and production, technologies for

	Rationale	Measures
	Part of the strategy is a limitation of energy induced pollution (81) A strategic objective is to use energy related innovation to combine environmental and ecological effects (83f), The same approach with energy efficiency (84)	brown coal power plants, technologies for renewable energy, energy-efficiency (122) Measure "pollution control and limitation of energy related environment pollution" supports: Mainly support for local authorities' investment both in use of renewable energy and improvement of energy efficiency of public buildings, 20% to 30% are preserved for model projects in SME (159) There is a major project planned (Conergy – research in use of solar energy – 194)
NI (Convergence)		Under priority "Environment and sustainable urban development": - To reduce emission of greenhouse gases, projects to expand the use of renewables and improve energy efficiency will be supported (69)
SN (Convergence)	SWOT sees the reduction of pollution by increasing the use of renewables as opportunity (154) Under the heading of "improving competitiveness", an improvement of energy efficiency of SME is an objective (162), The need-oriented development of transport infrastructure states that the development of environmental friendly transport carriers can help to save energy (162) To support climate protection, the use of renewable energy shall be strengthened (in enterprises, local authorities and private persons (163)	Research projects shall put emphasis on energy technology (202ff,) Under the measure 4,3,6 "Energy Efficiency in SME", an energy performance certificate for enterprises will be introduced, but also investment in energy efficiency in SME is supported, Pilot projects are being supported (241) Under the heading for "climate protection/renewable energy", investment in facilities to produce energy from renewable sources is supported, energy or climate protection concepts (for local authorities) can be supported, but also management oriented projects,
ST (Convergence)	Under the cross-cutting objective of environmental protection, the support for renewable energy is seen as contribution to a more sustainable development (72)	As part of investment in research infrastructure, research capacities for biomass and solar energy shall be developed – this is a main focus of this measure, Mainly for the investment in education infrastructure , energy efficiency and energy saving are cross-cutting objectives (125)
TH (Convergence)		In the first field of activity (Support for R&D), R&D in the area of renewable energies is part of several measures from R&D in enterprises to public research institutes (67f), Also in priority 4 (protection of the environment), support for sustainable economic activity includes energy management and use (91f,) Furthermore, local sustainability projects are being supported (including studies and workshops) (91),
BW (Competitiveness)	SWOT - Renewable Energies are becoming more and more important to substitute fossil fuels, to reduce CO_2-Emissions and preserve non-renewables, There is potential in geothermal energy, hydro power, and biomass (76)	Table 37 Measures by codes: - Codes 40, 41, 42, 43: Maßnahmenbereich 3-1 - Code 43: Maßnahmenbereich 2-2 Measure 2-2: innovative local development - Model projects for local development (www,EULE-bw,eu) - Climate protection can be achieved by energy saving (thermal insulation), or improvement of

	Rationale	Measures
	- There is a potential for cluster development in Energy technology (75) - Energy-intensive and inefficient technologies interfere with the abilities of the ecosystem thus reducing competitiveness, (81) OP Strategy – Specific Targets - Priority 3 is focused on measures offering synergies between environmental objectives and economic development, Particularly renewables and geothermic energy and other environmental technology, and improving energy efficiency are seen to offer these synergies (99)	energy efficiency (cogeneration of heat and power, renewables or energy management) (139) Measure 3-1 Resource protection (145ff,) - Measures in SME and local authorities to reduce cost and risk: geothermal, hydrothermal - Renewables: potential in research and application, Support for model and pilot projects advancing the state of the art by increasing energy saving or improving capabilities of renewables - Investment in SME and public infrastructure for first-time application - Use and application of new, resource protecting services and technologies in enterprises - Support for SME to develop, produce and apply new resource efficient products and services - -> synergies with priority 1: Networks and cluster, and Research and transfer
BY (Competitiveness)	The programme defines as fourth strategic objective the "sustainable development", Under this heading, a reduction of climate-relevant emissions is planned (55)	There is a measure to support R&D in technical environmental protection (90), which amongst others also includes funding of R&D projects to improve energy efficiency, In Priority 3, investment to improve energy efficiency in old buildings can be financed – Residential buildings are explicitly excluded (95), In Priority 4, funding for enterprises and local authorities is offered to improve energy efficiency, Studies, pilot and model projects, specifically new methods to use geothermic energy (including Cartography) are being supported (99)
BE (Competitiveness)	Energy Efficiency and reduction of greenhouse gas emissions as a cross-cutting objective,	In Priority 4 it is planned to improve energy efficiency (100), It is foreseen to invest in energy efficiency of buildings (excluding housing), the use of renewable energies, development of environment technologies, A joint energy concept with Brandenburg is being announced,
HB (Competitiveness)	Energy Efficiency as part of the cross-cutting objective "sustainable development" (69)	In Priority 1 Knowledge and Technology transfer shall be supported, Part of this are measures of cluster development, of which renewables, and mainly offshore wind power is central (but also energy efficiency, process optimisation, etc., (77) Investment in enterprises shall also contribute to improve energy efficiency (81)
HH (Competitiveness)	A network in the field of renewable energies is part of the cluster concept (22), Investment in increasing energy productivity is seen as one approach to improve innovation (35) Besides this, the programme defines energy as a self-standing development factor: the comparatively high energy productivity, a good position in competition in the	In the priority "Innovation and knowledge based economy", a field of activity is devoted to "environmental technology, resource efficiency and renewable energy", A focus is on hydrogen technology, Measures include introduction of less resource intensive production processes and management systems, model projects in the field of renewables (with the aim of mainstreaming the idea of using renewables), R&D activities (e.g., installing an application centre) – (67f,)

	Rationale	Measures
	field of renewable energy allows to link economic growth and economic effects (38) Energy is integrated in the objectives of the programme (42, 46)	
HE (Competitiveness)	Strategic targets - Under the objective of improving innovative capacity of enterprises, the development and use of technologies to use and apply renewables and improve energy efficiency is explicitly mentioned (71)	Energy Efficiency and Renewables (105) - To guarantee a secure, cheap environment-friendly energy supply, energy efficiency and use of renewables shall be improved, - Support will be given to prepare market introduction of innovative technologies as well as to information and qualification campaigns,
NI (Competitiveness)		R&D in SME - As part of a more comprehensive approach, support is granted for innovations in using renewables, developing technologies for energy production, improving energy efficiency or saving (54) Under priority "Environment and sustainable urban development": - To reduce emission of greenhouse gases, projects to expand the use of renewables and improve energy efficiency will be supported (68)
NW (Competitiveness)	Energy is one of the leading markets which have been identified in order to develop clusters, Two Clusters are energy-related: Energy-Economy and Energy-Research (20) Energy saving and energy efficiency are important aspects of the cross-sectional objective "climate protection", (35f) Amongst the strengths is the competitiveness of enterprises in the energy sector (47) And there is a potential identified in the environmental sector, mainly energy related, although there are accumulated needs in energy efficiency and the use of renewables (48) NW sees itself in a key role in developing effective measures to slow down the climate change, Improving energy efficiency, energy related research, and use of renewables are the keys,	In Priority 2 "Innovation and knowledge based economy", Ecological innovations shall contribute to develop competitiveness by reducing costs and stimulating innovation, Energy efficiency is an important part in this respect (116), Support is given for ecological innovation and investment, improving energy efficiency and develop renewables technologies (! - 117) - Specific target of this priority is to develop environmental-friendly technologies and improve energy and resource efficiency (118), Projects with relevance for energy efficiency can also be supported in relation to the cluster strategy (123), The following measures are planned to support energy efficiency: - Application oriented research - Pilot projects - Workshops etc., - PR-activities The supporting institutions (Energieagentur and Landesinitiative) shall be merged, different funding instruments integrated in one coherent framework (130), Focus of funding instruments shall be on renewables, A broad range of activities can be supported: development of energy concepts, development of networks, R&D, competence building in the field of construction, etc., Model regions shall be developed, (131)

	Rationale	Measures
RP (Competitiveness)	Measures to support energy efficiency and development of energy management systems are identified as area with "great need for support" (37) The potential to produce renewable energies is seen as one of the development factors for rural areas (47) Energy efficient production and energy-sensitive management systems, relevance for innovation, Synergies with waste treatment and agriculture are emphasised (50)	In Priority 3 "support for local and regional development potential", innovation is aimed at increasing energy efficiency and use of renewable energies (biomass), (84) The field of activity "increasing resource and energy efficiency and supporting renewable energies" is supporting different measures, Measure "increasing energy efficiency" can support a range of activities from R&D, information, model projects, etc., A specific measures is targeting integrated product policy and materials flow management with the aim to reduce the consumption of energy and materials in production, Support is given to regional materials flow management systems, and innovative procedures in SME or local authorities,
SH	Renewable Energies as an opportunity to restructure the energy related sector of the economy (58) The SWOT treats environment and energy own issue: The issue of energy is related to different strategic aspects: 1) climate change, 2) stability of energy supply (70f.). Renewables offer specific chances, mainly wind, biogas and geothermic sources (71) The strategy aims at developing energy related clusters (wind energy, but also energy efficiency – 81f.) The cross-sectional objective "environment" emphasises renewable energies as specific field and emphasises potential synergies.	In Priority 1, the funding of R&D in enterprises emphasises renewable energy as important technology field (121) In Priority 2, it is planned to develop infrastructures of economic relevance by demonstrating the specific competencies in the field of energy efficiency (133).

TABLES

Annex Table A – Financial allocation (ERDF) according the indicative plan in the OPs in Codes per Programme

EUR million	Renewables (Code 39-42)	Energy Efficiency (Code 43)	Other	Total
Convergence	**104.2**	**143.2**	**1,113.8**	**11,361.0**
MV	18.8	6.3	1,227.4	1,252.4
BB	43.0	14.5	1,441.2	1,498.7
NI(1)	17.0	17.9	554.1	589.0
SN	14.0	50.0	3,027.2	3,091.1
ST	11.4	54.6	1,865.8	1,931.8
TH	0.0	0.0	1,477.7	1,477.7
Bund	0.0	0.0	1,520.3	1,520.3
Competitiveness	**122.0**	**108.8**	**4,142.2**	**4,373.0**
BW	9.0	9.0	125.4	143.4
BY	12.7	9.8	553.4	575.9
BE	14.5	14.5	846.6	875.6
HB	3.1	1.0	137.9	142.0
HH	1.4	0.3	33.7	35.3
HE	11.0	11.0	241.6	263.5
NI(2)	17.8	33.2	587.8	638.8
NW	48.3	25.4	1,209.7	1283.4
RP	3.4	0.5	213.7	217.6
SL	0.8	4.2	192.5	197.5
SH	0.0	0.1	373.8	373.9
% share	**Renewables (Code 39-42)**	**Energy Efficiency (Code 43)**	**Other**	**Total**
Convergence	**0.9**	**1.3**	**97.8**	100.0
MV	1.5	0.5	98.0	100.0
BB	2.9	1.0	96.2	100.0
NI(1)	2.9	3.0	94.1	100.0
SN	0.5	1.6	97.9	100.0
ST	0.6	2.8	96.6	100.0
TH			100.0	100.0
Bund			100.0	100.0
Competitiveness	**2.8**	**2.5**	**94.7**	**100.0**
BW	6.3	6.3	87.4	100.0
BY	2.2	1.7	96.1	100.0
BE	1.7	1.7	96.7	100.0
HB	2.2	0.7	97.1	100.0
HH	3.9	0.7	95.4	100.0
HE	4.2	4.2	91.7	100.0
NI(2)	2.8	5.2	92.0	100.0
NW	3.8	2.0	94.3	100.0
RP	1.6	0.2	98.2	100.0

EUR million	Renewables (Code 39-42)	Energy Efficiency (Code 43)	Other	Total
SL	0.4	2.1	97.5	100.0
SH			100.0	100.0

Recent programme changes might have changed the figures. For instance in the programme of Saxony (SN), the allocation to the codes 39-42 increased from EUR 14.0 million to EUR 33.7 million, the allocation for energy efficiency from EUR 50.0 million to EUR 72.0 million.

Annex Table B - Financial allocation (ERDF) in codes (renewable energies) according to the indicative plan in the OP per Programme

EUR million	Wind (Code 39)	Solar (Code 40)	Biomass (Code 41)	Hydroelectric, Geothermic, other (Code 42)	Total
Convergence	**10.0**	**30.7**	**46.7**	**16.7**	**104.9**
MV	0.0	8.8	5.0	5.0	18.8
BB	0.0	18.0	25.0	0.0	43.0
NI(1)	10.0	2.0	5.0	0.0	17.8
SN	0.0	2.0	6.0	6.0	14.0
ST	0.0	0.0	5.7	5.7	11.4
TH	0.0	0.0	0.0	0.0	0.0
Bund	0.0	0.0	0.0	0.0	0.0
Competitiveness	**15.7**	**16.9**	**34.0**	**55.5**	**122.0**
BW	0.0	1.0	4.0	4.0	9.0
BY	0.3	0.9	1.0	10.6	12.7
BE	0.0	3.6	3.6	7.3	14.5
HB	3.1	0.0	0.0	0.0	3.1
HH	0.1	0.1	0.1	1.0	1.4
HE	2.2	2.2	0.0	6.6	11.0
NI(2)	4.4	3.0	10.4	0.0	17.8
NW	5.1	5.1	12.7	25.4	48.3
RP	0.5	0.5	1.9	0.5	3.4
SL	0.0	0.4	0.3	0.2	0.8
SH	0.0	0.0	0.0	0.0	0.0
% share	**Wind (Code 39)**	**Solar (Code 40)**	**Biomass (Code 41)**	**Hydroelectric, Geothermic, other (Code 42)**	**Total**
Convergence	**9.5**	**29.3**	**44.5**	**15.9**	**100.0**
MV		46.7	26.7	26.7	100.0
BB		41.9	58.1		100.0
NI(1)	56.2	11.2	28.1		100.0
SN		14.3	42.9	42.9	100.0
ST			50.0	50.0	100.0
TH					
Bund					

EUR million	Wind (Code 39)	Solar (Code 40)	Biomass (Code 41)	Hydroelectric, Geothermic, other (Code 42)	Total
Competitiveness	**12.8**	**13.8**	**27.8**	**45.5**	**100.0**
BW		11.1	44.4	44.4	100.0
BY	2.0	7.1	7.5	83.5	100.0
BE		25.0	25.0	50.0	100.0
HB	100.0				100.0
HH	9.9	9.9	9.9	70.2	100.0
HE	20.0	20.0		60.0	100.0
NI(2)	24.7	16.9	58.4		100.0
NW	10.5	10.5	26.3	52.6	100.0
RP	14.7	14.6	56.2	14.6	100.0
SL	14.6	14.6	30.0	14.6	100.0
SH					

As a consequence of recent programme changes, the figures for single programmes might have changed. For instance the programme of Saxony allocates EUR 22.5 million instead of EUR 2.0 million to Solar energy and EUR 5.3 million instead of EUR 6.0 million to Hydroelectric, Geothermic and other.

Annex Table C –Spending from the Market Incentive Programme in 2010

	Number of projects	Public Finance (EUR million)	Total Investment (EUR million)
Grant(Allowance)	**145,742**	**235**	**1,808**
Solar	88,443	119	945
Biomass	34,161	61	451
Heat pump	23,138	55	412
	Number of projects	**Volume of Credits (EUR million)**	**Volume of grant graces (EUR million)**
Credit	**2,263**	**338**	**104**
heating grid	1,319	198	70
biomass (heating)	493	53	4
thermic solar facilities	105	8	2
biogas lines	212	39	12
heat storage tank	111	4	1
Other	23	36	15
Sources: (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2011b)			

Annex Table D –Spending from the EEN by sources of energy

	2009		2008		2007	
	Amount of energy (GWh)	Payment (EUR million)	Amount of energy (GWh)	Payment (EUR million)	Amount of energy (GWh)	Payment (EUR million)
Hydroelectric	4,877.2	382.4	4,981.5	378.8	5,546.8	417.7
Gas from renewable sources	2,019.5	142.6	2,208.2	155.9	2,751.1	192.9
Biomass	22,979.9	3,700.0	18,947.0	2,698.7	15,923.9	2,162.1
Geothermic	18.8	3.7	17.6	2.6	0.4	0.1
Wind onshore	38,542.2	3,388.9	40,473.7	3,561.0	39,713.1	3,508.4
Wind offshore	37.5	5.6				
Solar energy	6,578.3	3,156.5	4,419.8	2,218.6	3,074.7	1,597.5
Total	**75,053.4**	**10,779.8**	**71,047.8**	**9,015.7**	**67,010.0**	**7,878.7**
Sources: (o.A. o.J.)						

Annex Table E – Feed-in tariffs by sources of energy – band with between 2009 and 2018

	Minimum	Maximum	Degression
Hydroelectric	3.20	12.67	Yes, only > 5 MW
Gas from renewable sources	3.63	9.00	Yes, for all
Biomass	11.67	7.12	Yes, for all
Geothermic	9.59	16.00	Yes, for all
Wind onshore	4.59	9.20	
Wind offshore	2.85	3.5	Yes, for all Plus an additional starting tariff of 10.59 to 13.00 ct/kWh for the first 12 years
Solar energy	0.00	39.14	
Bandwidth of Feed-in tariffs for different sources of energy between 2009 and 2018. Additional boni are possible for innovative or very efficient technologies. Partly there is also a repowering bonus (wind). Source: (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2010)			

Annex Table F – Cost for the production of energy from different sources in ct/KWh- Mean per group of plants of different capacities

	Minimum	Maximum
Hydroelectric	5.68 (50 MW capacity)	24.41 (100kw)
Gas from renewable sources	~ 5 (2.7 MW capacitiy)	~ 30 (specific types of small facilities with 100kW capacity
Biomass	12.0 (specific types of facilities)	29.7 (specific types of facilities)
Geothermic	19.8 (specific types of facilities)	27.00 (specific types of facilities)
Wind onshore	~ 7 (very good location, 2-2.9 MW)	~ 10 (modest location, 3-4.9 MW)
Wind offshore	~ 10	~ 13
Solar energy	21.04	30.78
Cost fort he production of electricity in new facilities. Only the highest and the lowest value are given here. Several groups of facilities of each type lie between the extremes. All calulculations are model calculations. Comparability between groups is limited as the methods of calculation differ. Source: (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 2011a)		