Non-cost barriers to renewables

– *AEON* study

Luxembourg

Client: DG TREN

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1 Introduction

The case for renewable energy in Luxembourg

The Grand Duchy of Luxembourg is after Malta the smallest EU country. It is divided into 3 districts, which are further divided into 12 cantons and then 116 communes. With respect to RES, the mayors of the communes are important actors as they are often the bottleneck in approving the development of new RES installations.

Luxembourg, although well known for its cheap fuel at the petrol stations, has only very few indigenous energy resources (primarily hydro, with the biggest pumping station in Europe). More than 90% of the electricity consumed is imported from Belgium and Germany (the national grid is adapted in that way).

The renewable energy share (in function of gross final energy demand) is currently around 2% of which nearly half is coming from RES Transport (biogas and biodiesel), around 25% from RES-heat and the rest from RES-electricity. The share of renewable energy sources has remained more or less static over the last years. Wood and waste, mainly used for electricity generation, provide the vast majority of Luxembourg's renewable energy supply, although small amounts of solar heat are also used.

Mainly due to its geographical features, Luxembourg has a relatively low RES target for 2020: 11%. This is however very relative as it will be very difficult to reach this target. Even under the most ambitious scenario (with the Green X model) the target cannot be reached (cf. table 1). Remarkable is also that 197 ktoe in 2020 should come from biofuels (this is 54% of the proposed target of 8.7%) and only 64ktoe from renewable electric generation (or 17% of the proposed target).

Table 1: Contribution of Renewables (in ktoe and %)

Type of energy	2006	2011-2012	2013-2014	2015-2016	2017-2018	2020
Final energy cons.	4525	4672	4522	4394	4315	4219
Share of RES	1.0%	3.5%	4.7%	5.6%	6.7%	8.7%
Renew electric generation	21	30	39	48	55	64
Share of RES (in elec. cons.)	3.6%	5.2%	6.6%	8.0%	9.2%	10.5%
Renew heat generation	21	35	44	58	76	106
Share of RES (in heat cons.)	1.7%	2.8%	3.7%	4.9%	6.5%	9.0%
Biofuels generation	3	101	131	140	157	197
Share of RES (in transport fuels)	0.1%	4.3%	5.9%	6.6%	7.6%	10.0%
Source: Draft Lux. RES industry roadmap, Green X model, 2009						

Interesting is that the renewable electricity sector is dominated by hydro electricity (until the 90s hydro accounted for about 80% of the RES-elec. generation). Currently, it still accounts for 44% of the total renewable electricity generation, followed by on shore wind, biogas and biowaste. The last technology is PV systems, which was introduced only recently. Logically, the barriers discussed below will only focus on these technologies (excluding hydro as the extra potential is limited and there are no barriers indicated).

The national electricity target for Luxembourg is based on the target of 702GWh of renewable electricity production by 2020. This should come from biomass (from 61GWh in 2007 up to 243GWh in 2020 – solid 95GWh, biogas 125GWh), PV (from 21 to 80GWh), hydro (from 116 to 140GWh) and finally from wind (from 64 to 239GWh). It is therefore clear that the focus will be on biomass, wind and PV.

Table 2 gives an overview of the recent development of renewable electricity generation in Luxembourg.

Table 2: Renewable electricity generation from 1990-2007 (in GWh)

Type of technology	Generation			Growth rate (CAGR)	
	1990	2000	2007	1990-2007	2000-20007
Biogas	0	4	37		37.4
Biowaste	16	19	24	2.2%	3.4
Hydro-small scale	67	120	116	3.3%	-0.5
Photovoltaic systems	0	0	21		
Wind turbines onshore	0	27	64		11.5
Total	83	170	262	6.8%	6.0

Source: Eurostat (2009)

The picture for RES-heat generation is quite straightforward: until 2007 only solid biomass (grid and non-grid) was used (thus no biogas, solar thermal, heat pumps or biowaste). The national scenario (2020) is very ambitious regarding RES-heat production: the 157MWth capacity installed in 2006 should increase to 1043MWth in 2020. The majority of this increase should come from (solid) biomass but the biggest increase is expected to come from solar thermal (from 11 to 376MWth) and from heat pumps (from 0 to 234MWth).

Promotion schemes in Luxembourg

For RES-E, the main supporting schemes in Luxembourg derive from the 1993 Framework Law (amended in 2005). It provides basically the following:

- Preferential tariffs are given to the different types of RES-E for fixed periods of 10 to 20 years. The feed-in system might be subject to change due to further liberalisation of the sector.
- Subsidies are available to private companies that invest in RES-E technologies, including solar, wind, biomass and geothermal technologies.

In order to promote RES-transport, tax exemptions are given for the use of biofuels in the transport sector. The setting of maximum levels of tax exemption is foreseen at 23€ per 1000 litres of unleaded petrol and at 10€ per 1000 litres of diesel. Pure biofuels were tax-free from 2007 to encourage captive fleets to switch. However, this measure proved to be unsuccessful. Therefore, the government decided to establish a compulsory blending of biofuels in 2007. The blending obligation was 2% in 2007, and could only be met with imported biofuels in that year.

Finally, in order to promote RES-H, Luxembourg provides investment subsidies for CHP, for the installation of heat pumps, biomass central heating, pellet stoves and solar thermal systems (when used for one-family dwellings).

2 Issue 1 Administrative Procedures

Barrier 1.1 – Inefficient general administrative procedures

Permits and the permitting process

There is a lack of coordination between different authorities. In many cases project developers need to submit similar information several times to different authorities. A suggestion to reduce the administrative burden for RES development would be to standardise procedures, such as standardised administrative requirements and application forms between different authorities.

Usually long lead times are needed to obtain the necessary permits. Time needed to obtain all necessary permits for the construction of a large RES plant can take many years, such as solid biomass plants used to generate electricity. Also it can be unclear what the exact length of a procedure will be. Clear guidelines for authorisation procedures are currently lacking.

Stakeholders indicate explicitly that the requested requirements are not appropriate for most technologies (except – more or less – for biogas). The information provided for the administrative process (rules, procedures, requirements) is most of the time available but there is not enough exchange between the different actors in order to optimise the procedures in general and according to the different projects (especially for biomass projects).

The number of permits required

The number of permits required ranges from 3 (for onshore wind), to 4 (for PV) to at least 3 (for biogas projects).

Wind projects are obliged to start with a scoping study. The permits as such are related to the environmental impact assessment, the 'comodo' or noise study, the construction (this permission is given by the local authority) and finally the exploitation. For PV it is often the installer who will take care of the permit procedures.

Time for authorisation

The renewable energy project authorisation procedures currently take too long, except for PV installations.

Most stakeholders are complaining about the lengthy procedures, which make the process to realise a RES project in a given timeframe very uncertain.

Technology	Time for authorisation (from application to obtaining the final permits)
On shore wind	On average 24 months (but could go faster or slower in function of legal procedures).
PV	Less than 3 weeks for installations < than 30kWp; up to 6 months for installations > 30kWp.
Biogas	12 to 36 months

Public actors involved
Generally, a high number of authorities need to be involved for obtaining the final authorisation. Often many authorities are involved in both permitting as well as support related procedures for renewable energy projects. Responsible authorities usually comprise several administrative bodies at national and local level. An important improvement would be to reduce the number of local and national administrations involved in the authorisation processes for permits and financial support.

Some stakeholders said that the number of public actors involved for advisory purposes (related to onshore wind projects) can amount to 10 and up to 8 for biogas projects. For PV systems it is limited to 3.

On the question if the involved public actors have sufficient knowledge about the considered technology, most said that this is the case except for biogas projects.

Estimated costs of the administrative process
The cost related to the administrative process differs significantly between RES technologies and is highly correlated to the required authorisation time.

Technology	What are the estimated costs involved in the administrative process?
On shore wind	On average it is around 40k€.
PV	The cost for Installations <30kW is negligible, for installations >30kW it is most of the time limited to 2000€.
Biogas	From 15k€ up to 200k€; depending on the size of the project and the investment costs. The procedures cost about 30% of the engineering costs which again account for about 8% of the total investment.

Barrier 1.2 – Inexistent or insufficient spatial planning
RES are currently insufficiently taken into account in spatial planning. At this point in time no spatial planning map or something similar exists. Most of the time spatial planning is done on an ad hoc basis, taking into account technology related legislation (like minimum distance from housing for wind turbines, etc.).
Spatial planning programs have thus to be adopted in order to allow for the implementation of a RES project in a specific area, especially when there is a high RES potential involved in that particular area. This process can take a very long time. Often the acquirement of permits related to spatial planning is the longest trajectory of the overall period needed for development of the project. This is especially the case for projects in the field of wind (an example was given on the necessity of the impact of wind turbines on bats).

Responsible authorities should be stimulated to anticipate the development of future RES projects in their region by allocating suitable areas in spatial planning processes[1].

[1] REPAP2020 - Renewable Energy Policy Action Paving the way towards 2020. 2009. The case of Luxemburg.

Barrier 1.3 – Competing public interests

None of the interviewed stakeholders indicated a competing public interest (like military zones, airports, etc.).

However, several stakeholders indicated that it is not easy to develop bigger RES installations in Luxembourg. Different reasons were mentioned:

- Luxembourg is a densely populated country;
- Suitable areas for wind parks are frequently situated in or closely to natural reserves or restricted areas for industrial activities;
- The government is very sensitive for public protest; from the moment that there is a minimum of public opposition, there is a high chance the project will never happen (even the very important grid link with France did not go through due to public opposition);
- Some stakeholders colour the map of Luxembourg in with red or green dots; the red dots are communes where the mayor is totally opposed; the NIMBY factor pushes stakeholders to become more and more active abroad.

3 Issue 2 Technical Specifications

Barrier 2.1 – Weak definitions
All stakeholders indicated that the technical specifications are clearly defined except for grid connection (see supra). Practically speaking, the technological evolution is faster than legislation ('specifications') so it seems not to be a barrier.

Barrier 2.2 – European standards
A few technologies are in use in Luxembourg and for those, all requested technical specifications are expressed in terms of European standards.

Barrier 2.3 – Specified locations for testing and/or certification
In short, no relevant barrier exists for the technologies in use.

Barrier 2.4 – Technical specifications that impede the operation of the internal market
Nearly all stakeholders indicated this is not a problem as conformity with all technical specifications of the outlets is compulsory.

4 Issue 3 Building integrated technologies

Campagne de sensibilisation du grand public sur le certificat de performance énergétique pour les bâtiments d'habitation

Barrier 3.1 – Administrative procedures

We couldn't find legal information on this topic, but the stakeholders confirmed that there is no permitting policy for most building integrated technologies and installations.

Barrier 3.2 – No/insufficient specific rules for building integrated/small scale RES installations

For the time being, there are no specific rules for building integrated scale RES installations (except if it involves a major adaptation at the building; in that case a building permit is needed).
Luxembourg started already in 2000 to promote, for example, building integrated photovoltaics and with success because it is currently number 1 in Europe having achieved the highest market penetration level for BIPV. Less good news is that in recent years the market share has been dropping: in 2008, the installed capacity of PV was only = 0.5MWp (for Belgium it was 50MWp)[2].

Some stakeholders indicated that for some technologies the rules are not clear or do not exist. For geothermal, for example, there is no legislation.

Barrier 3.3 – Competing public interests

The stakeholders are not aware about any competing public interest, other than buildings with a cultural, historical significance.

Barrier 3.4 – Renewables obligations insufficient

There is no obligation for minimum levels of renewable energy in new and newly refurbished buildings (only for energy efficiency). However, the need for such an obligation is recognised by the government, as stated in the national RES energy roadmap for Luxembourg. The installed capacity of PV in 2008 was only 0.5MWp (with 50MWp in Belgium)[3].

[2] Photovoltaic barometer, 2009
[3] Photovoltaic barometer, 2009

5 Issue 4 – Promotion of energy efficient renewable energy equipment

Barrier 4.1 – Non-compliant promotion schemes
Existing promotion schemes seem to be compliant and therefore are not considered as a barrier.

Barrier 4.2 – Lack of substitution of existing inefficient systems
There is no policy framework to substitute less efficient older systems.

Barrier 4.3 – Use of national procedures
The national regulation on energy performance in buildings ("Règlement grand-ducal modifié du 30 novembre 2007 concernant la performance énergetique des bâtiments d'habitation") envisages that the planning phase of larger construction projects needs to include a study on the various energy supply possibilities, including renewable energy technologies. It is not clear, however, whether this national procedure poses a barrier.

Barrier 4.4 – Insufficient information
'Myenergy' – the national structure for providing information on renewable energy and energy efficiency - provides interested stakeholders with information on public funding opportunities for the promotion of energy efficient renewable energy equipment in electricity, heating and cooling, as well as transport sectors. Additionally, the website www.guichet.lu offers private citizens and companies the relevant application forms for download.
For farmers, the national agriculture administration ("Administration des Services Techniques de l'Agriculture" (ASTA)) serves as the key contact point for questions regarding promotion schemes and funding opportunities in the field of renewable energy.

Furthermore, since February 2009, the so-called 'Cluster EcoDev' guarantees that environmental technology companies and those focused on sustainable development related business receive sufficient and far-reaching guidance and assistance when opening offices or aiming to invest in Luxembourg.

6 Issue 5 Information/awareness raising

Barrier 5.1 – Insufficient availability of information on support measures & of guidance for planners and architects

Different Ministries, agencies (like My Energy) and the 'Chambre des Métiers' provide information related to support measures. However, different stakeholders indicated that the information is not clear, easily accessible, accurate and sufficient enough.
For the information related to guidance for planners and architects it is more worrisome as most is not even clear in a legal way.

Positive is that the 'Chambre des Métiers' promotes the existence of the certification scheme (to customers) with different communication tools (specialised newspapers articles including interview of best practices, press conference, press releases, fairs, internet). Technicians / installers can receive such certification labels (entitled "Energie für die Zukunft") by participating in a training course (organised on an annual basis); the training also informs participants on financial support measures.

Since 2003, the Union of Architects and Engineers (OAI) organises a training cycle "Building and Energy", which covers energy-relevant topics from the planning phase to technical equipment of interior design; it also provides information on the latest EU and national guidelines as well as on available financial support measures.

Barrier 5.2 – Insufficient public funding for campaigns/programmes

This issue does not seem to pose a barrier in Luxembourg. 'Myenergy' as the national structure for providing information and advice in the areas of renewable energy and energy efficiency ensures at least a certain level of campaigns and programmes is available across all regions. For example, the Myenergy 'Infopoints' are regional support centres of Myenergy. These are present in many communes and thus provide a sufficient network to reach citizens and stakeholders in the entire country in a quick and effective manner.

Barrier 5.3 – Insufficient campaign-/programme-design

While there is no indication on the quality of the final design and delivery, there are certainly various efforts providing information and awareness raising campaigns on climate protection, renewable energies and energy efficiency – offered primarily via Myenergy as well as local communes.
There are concrete plans to extend the current education and training programmes that are offered in the area of renewable energies, in particular for planners and technicians. Especially, apprenticeship opportunities in the area of low-energy and passive houses will be expanded.

7 Issue 6 Certification of installers

Barrier 6.1 – Lack of a Certification body

Already in 2001, the Ministry of Environment and the skilled craft organisation (Chambre des Métiers) created the label 'Energie für die Zukunft' which aims at helping consumers identify qualified installers in the field of renewable energy (for RES applications in the building environment). Although the certification scheme has been developed for solar thermal and photovoltaic systems, biomass heating systems and heat pumps, in practice it is nearly only used for PV systems and biomass heating systems as the demand for the other technologies was very weak until 2008).
There is thus no official public certification body but the skilled craft organisation is taking up this role with the consent of the Ministry.

Barrier 6.2 - Lack of guidelines

The certification is based on the incentives scheme implemented by the State. A label Committee, composed of a representative of the Ministry of Environment, the Chambre des Métiers, and two experts has been created and decides whether to grant the label to the installers or not.

To obtain this label the company must be a member of 'Chambre des metiers' and the installer must have a "Brevet de maîtrise" or equivalent qualifications or provide evidence of professional experience. The installer has to follow a training organised by the 'Chambre des Métiers' and it is mandatory to attend the general module at the Chambre des Métiers. It is possible to attend the two other modules in another training centre approved by the Committee. At the end, the installer has to pass a final examination.

The guidelines are thus clear. The only hick up is that this certification is not compulsory. Somebody with a 'Brevet de maîtrise' or similar could install a RES installation without having the certification. The initiators try to solve this issue by promoting this certification scheme with different communication tools.

Barrier 6.3 Lack of training

It seems that the label 'Energie für die Zukunft' and the linked trainings/workshops organised by the Chambre des Métiers works pretty well. By the summer of 2010, more than 1000 installers and 240 companies received the label (and thus passed the exam).[4]

[4] Programme de FORMATION s pour entreprises 2009 / 2010 ; http://www.cdm.lu/pls/CDM/download_file?id=97543

8 Issue 7 Infrastructure Development

Barrier 7.1 - Problems concerning development of electricity network infrastructures according to a long-term strategy

Just like most other EU countries, there is also a need in Luxemburg to invest in the electricity network infrastructure which is the responsibility of Creos (as TSO) and the 6 DSOs (of which different are also supplier).

Although the modified law of the first of August, 2007, regarding the organisation of the electricity markets, stipulates that each transmission system operator and each operator of an industrial network is required, where appropriate together with the neighbouring transmission system to ensure the long-term capacity of the network to meet reasonable demands for electricity transmission capacity while taking into account adequate reserves to ensure a stable operation and to contribute to the security of supply through adequate transmission capacity, system reliability and security of network operations, the law does not indicate anything which relates to renewable energies.

Article 11 of the same law indicates that distribution system operators should update bi-annually their development plans. Based on an estimate of the evolution of the electric charge and injections, the plan should include information on planned investments of the network. However, as the DSO's in Luxembourg are also electricity providers, it is the question if they will be sufficiently pressured by this Article to invest in new capacity for e.g. new injections which could compete with their role as supplier?

Some stakeholders also indicated that the government is not eager to let RES development increase fast enough as an increased cost for the TSO and DSOs will have an impact on the feed-in tariffs. To limit investments in grid infrastructure, stakeholders indicate that there are certain quotas per technology which may not be passed.

Barrier 7.2 - Problems concerning grid expansion processes of existing electricity networks

This barrier faces the same issues as under 7.1

Barrier 7.3 - Problems concerning development of a Trans-European Electricity Network

Art. 11, 3 d of the modified law of the first of August, 2007, regarding the organisation of the electricity markets mentions that the biannual reports should take into account the investment projects of the TSO and DSOs concerning the establishment of a cross-border interconnection capacity.

It is quite an interesting Article in light of the calvary by the Luxembourg TSO to try to develop a new grid between Luxembourg and France. Until today, Luxembourg's authorities refused to give the necessary permits due to public protest.

9 Issue 8 Power Grid Issues

Barrier 8.1 - Problems concerning grid connection

The current law dealing with the rules concerning the production of renewable energies was changed in 2008. Interesting is that the previous law[5] indicated that the TSO or DSO had the obligation to connect the RES installation on the demand of the owner of the installation. The current law[6] stipulates now that the RES owner should ask permission to the grid operator. The grid operator can decide not to connect at the nearest point but further away due to grid capacity issues (or not at all). The cost for connection is to be paid by the RES owner. Different stakeholders (especially for PV) complained about the fact that the DSOs say too easily that there are capacity problems and thus are not willing to connect them or at a too high cost (due to the long distance to the grid).

There is thus no guarantee for grid connection. Above, only the basic elements (like the feed in-tariff and the fact that use of the grid is for free) are dealt with by the law; most other issues are sorted out between the RES owner and the grid operator on a bilateral basis.

Technology	After how long from receiving the installation permit can electricity be connected to the grid?
On shore wind	3 to 6 months
PV	For systems < 30kWp it takes from 1 to 3 months; systems >30kWp it takes between 3 and 6 months.

Barrier 8.2 - Problems concerning grid access

The law made in 2008 does not stipulate as such that RES do have priority or guaranteed grid access. However, it indicates that the RES owner and the grid operator should on the one hand conclude a bilateral contract about the modalities how to use the grid and on the other hand negotiate a supply contract. As different stakeholders mentioned, the current situation is too reliant on personal relations. Legislation should be made clearer and more detailed.

Barrier 8.3 - Problems concerning TSOs and DSOs

Different stakeholders indicated that the (shareholders) link between the TSO Creos and the most important energy supplier in Luxembourg is too weak.

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[5] Règlement grand-ducal du 14 octobre 2005 1) concernant la fourniture d'énergie électrique basée sur les énergies renouvelables et 2) modifiant le règlement grand-ducal du 30 mai 1994 concernant la production d'énergie électrique basée sur les énergies renouvelables ou sur la cogénération ainsi que le règlement grand-ducal du 22 mai 2001 concernant l'introduction d'un fonds de compensation dans le cadre de l'organisation du marché de l'électricité.

[6] Règlement grand-ducal du 8 février 2008 relatif à la production d'électricité basée sur les sources d'énergie renouvelables - CHAPITRE IV – RACCORDEMENT AU RÉSEAU ET FOURNITURE D'ÉLECTRICITÉ

10 Issue 9 Gas Network Issues

In Luxemburg, two pilot projects for the feed-in of biogas have been put into practice. In the town of Kielen in Capellen, a plant with an entry capacity of 310 standard cubic meters per hour has been built. More than 30 farmers and local entrepreneurs will supply the project with about 50.000 tons of renewable raw materials, manure and waste from the food industry. The second pilot project is built in the town of Mondercange. Construction started in march 2009 and is scheduled to finish around October 2010. The project will feed about 180 standard cubic meters into the gas system. The feeding-in of biogas into the natural gas network is therefore at an embryonic stage of development in Luxemburg.

Barrier 9.1 – Problems related to the upgrading process

The Renewable Energy Action Plan of 2010 mentions that Article 9 in the Luxemburg Gas Market Law postulates that:

- All natural gas network operators have to assess the technical possibility and constraints of a biogas production facility to be connected to the natural gas network.

A study, aiming at providing insight into support mechanisms for biogas feed-in instruments, came to the conclusion that, from a technical point of view, the provision, preparation, feeding and conveyance of biogas into natural gas networks would not pose major problems in Luxemburg.[7] .

Barrier 9.2 – Lack of information

The technical provisions for connecting biogas plants to the natural gas networks as well as the corresponding tariffs have been formulated and put forward in the Gas Market Law of Luxemburg in 2009.

Barrier 9.3 – Inefficient authorisation procedures

Not applicable yet, as only two pilot projects are being build in Luxemburg at the moment. The Renewable Energy Action Plan 2010 of Luxemburg states that an analysis of relevant procedures is needed.

Barrier 9.4 – Insufficient cooperation of grid operators

The Gas Market Law postulates that all natural gas network operators are obliged to assess the technical requirements of feeding-in biogas into their natural gas networks.

[7] Institute for Energy and Environment, “Förderung der Biogaseinspeisung in Luxemburg“, 2006.

11 Issue 10 District Heating

In Luxemburg, only certain areas possess a district heat network infrastructure. The economically advantageous potential of district heating amounts to about 1051 GWH. In 2006, 277 GWh of that potential were already covered by CHP-heating coming from conventional energy sources. According to the forecasts made under the Renewable Energy Action Plan in 2010, about 544 GWh of district heat could be produced by renewable energy sources by 20200.

Barrier 10.1 – Lack of positive conditions for the increase of the share of renewables in existing DH systems

The expansion of district heating, especially from renewable energy sources, is promoted through public investment support for municipalities and businesses as well as through a "heating-bonus", linked to the feed-in tariff for renewable electricity.

Barrier 10.2 –Lack of positive conditions for the initiation and expansion of DH systems largely based on renewables

Not applicable according to the above mentioned funding scheme.