REALISE-Forum

Renewable energy and liberalisation in selected electricity markets-Forum

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Final conference "Renewable Energy and Liberalisation in Electricity Markets: Lessons and Recommendations for Policy"

Berlin, November 2-3, 2006

The conference has been cofinanced by The German Federal Environment Ministry.

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Proceedings

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Foreword

The REALISE-FORUM project analyses the interaction between liberalised/ liberalising markets and focuses on instruments supporting the market penetration of RES-E, concentrating on Feed-in Tariffs (FITs) and quota systems with tradable green certificates (TGCs). In doing so, REALISE has tried to establish a basis for coherence for national policies in the view of a co-ordination of supporting mechanisms.

REALISE-Forum in a nutshell

The general objectives of the project are:

- to improve the knowledge and understanding of the RES-E market and incentives and of their economic and social acceptability;
- to investigate regulatory frameworks that at the same time render profitability and efficiency compatible with sustainability;
- to discuss steps to pave the way for a possibly co-ordinated support system for renewables;
- to initiate an organised dialogue of various stakeholders and discuss steps on the way to future incentive schemes compatible with market criteria, sustainability and social acceptability;

In doing so REALISE has attempted to:

- develop a novel actor focused analysis;
- investigate the level of national cohesion on the prevailing support schemes;
- identify existing barriers for a co-ordinated approach;
- establish a platform for stakeholders and decision makers to discuss in a balanced way specific support policy issues and promote the exchange of information and experience;
- initiate an organised dialogue to discuss steps on the way to future incentive schemes compatible with market criteria, sustainability and social acceptability;
- draw lessons for policy.

The project is in line with the aim of the Commission to accelerate the rate of growth of the EU renewable energy market and to encourage a broad debate on the best ways to achieve the goals of

- a 12%-share of renewable energy in EU final energy consumption and
- a 21% share of RES in EU gross electricity consumption by 2010.

REALISE-FORUM has also looked into the changed institutional framework and market players' structure and discussed steps towards a possibly co-ordinated support system for renewables at EU level.

Major results are an actor-focused analysis of the interplay between liberalisation and RES-E markets, an appraisal of the consensus on national support schemes, the establishment of a RES-E stakeholders' platform, guidelines and recommendations for policy.

The project has been managed by a Joint Contact Point in Berlin and 5 Country Desks, established by the project partners in their respective countries (D, NL, I, SI, NO). They have been managed either directly or together with other actors (NGOs, RES-producers, RES Associations, etc), according to the national peculiarities.

The national desks have acted as national contact points with the following functions:

- Networking;
- Gathering of national data / analyses for the country reports;
- Initiation of a dialogue with major national stakeholders;
- Organisation of national/ international hearings and workshops.

The national desks have organised stakeholder consultations in the participating countries and prepared country reports. These have analysed the relationship between RES-E support policies and their interaction with the reform of the national electricity markets, especially from the angle of the impact of liberalisation on “greening” the power market. Central chapters illustrate viewpoints and expectations of national stakeholders.

A comparative survey summarises the results of the national consultations, maps and assesses national barriers to coordinated support systems.

Stakeholder participation

REALISE has launched an organised dialogue of various stakeholders to discuss steps on the way to future incentive schemes compatible with market criteria, sustainability and social acceptability. The project has offered a platform for various interest groups and academia to discuss in a balanced way such requirements.

To complement the survey carried out at national level, two mid-term international workshops have been organised in Italy and Slovenia in order to involve additional experts / stakeholders also from non participating countries and widen the exchange of expertise on some key topics.

The work of the project team has been flanked by a steering group with 12 members providing a good representation of European institutional / market actors and experts on RES policy. These have played an important role in:

- creating the link between the project partners and the major actors in the European RES arena;
- establishing a continuous dialogue on important environmental and regulatory aspects;
- supporting the dissemination of the project´s results within their respective organisations and
- advising the consortium on specific technical issues in their competence field.

The members of the steering group have taken actively part in the international events.

Following two international dissemination workshops organised in Italy and Slovenia, the former on quota and certificate schemes and the latter on feed in incentives also involving additional experts from non participating countries, the final conference aimed at a wider exchange of views among experts and stakeholders.

The final conference

The final Conference in Berlin aimed at raising discussion on the feasibility of co-ordinated paths as indicated in the communication of the European Commission, “The Support of Electricity from Renewable Energy Sources” of December 7, 2005. The conference highlighted the preliminary results of REALISE-Forum, examined the two pillars co-ordination and optimisation of support systems and discussed future steps.

The preliminary findings of the project have been discussed with public officials from the EU and members states in charge with green power, key market actors and institutional actors.

Following conclusions were put to discussion:

- There is a general consensus on the rejection of harmonisation of European support systems.
- Most stakeholders show dissatisfaction with the state of competition in the home market.
- The consensus on national support schemes and/or (un)willingness to change them is dependent on the degree of competitiveness, risk and specification of the respective systems.
- There is a perceived compatibility of FIT and TGC systems with the liberalised electricity market.
- There is a certain acceptance (though not a complete satisfaction) of the national RES-E support systems in use.
- There exist a certain willingness to change current support systems, but only for the benefit of reduction of investment risks.
- The co-existence of current support systems is not perceived as a barrier, rather as a point of departure for a coordinated approach.
- The choice of support mechanisms should be made in relation with the maturity of the technology.
- TGC and FIT systems could be complementary rather than competing.
- A coordinated approach might benefit from the introduction of a (minimal) set of common rules for disclosure, redemption and labelling based on a standardised Guarantee of Origin (GO).

The conference has promoted a lively exchange of viewpoints between policy-makers, researchers and major stakeholder groups and provided a controversial discussion. The richness of standpoints and approaches has provided interesting “food for thought” for drawing the final recommendations for a possibly co-ordinated and transparent RES-support in line with liberalisation and cost-efficiency criteria. The conference has been organised under the patronage of the German Federal Ministry of Environment.

The structure of the proceedings

The present proceedings follow the structure of the conference. In order to facilitate the access and handling for the user, the proceedings were parted into three separate files. Part A contains the contents, conference programme, list of participants, and the opening session as well as session 1 “The role of RES-E within the framework of liberalisation”. Part B deals with sessions 2 “RES-E promotion strategies and liberalisation – Lessons learned from REALISE Forum and related projects”, and session 3 “Round Table: ‘Attaining of the RES-E target - Are we on the right track?’” Part C finallly documents session 4 “Market perception of coordination of support schemes: Stakeholders viewpoints and expectations” and session 5 “Co-existence of various instruments or co-ordination? Options for regional cooperation”. Key statements delivered at round tables and the respective following discussion have been summarised under Part B nd part C.

We gratefully thank the Federal Ministry for Environment, Nature Conservation and Nuclear Safety and the industrial sponsors for their support.

Maria Rosaria di Nucci, Lutz Mez, Sybille Tempel

Berlin, February 2007

Contents: Part A

Opening session and session 1: The role of RES-E within the framework of liberalisation

Conference Programme

Thursday, November 2, 2006

09:00	*Registration and welcome coffee*
10:00	***Opening Session*** Chairperson: H.-J. Ziesing, DIW, Germany & Chairman of the REALISE-Forum Steering Group
10:10	*Welcome by the REALISE-Forum Co-ordinator and opening remarks* L. Mez, Environmental Policy Research Centre, Freie Universität Berlin, Germany
10:15	*Welcome address by the Permanent Secretary for Environment and Transport* M. Krautzberger, Ministry of Urban Development of the Land Berlin
10:25	***Keynote address*** *The influence of national policy instruments and targets on the EU renewable energy development* M. Schöpe, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany
10:45	**Coffee break**
11:00	***Session1*** *The role of RES-E within the framework of liberalisation* Chairperson: R. Goldmann, Berlin Energy Agency
11:00	*The support of electricity from Renewable Energy Sources: the latest developments* W. Gillett, Intelligent Energy Executive Agency
11:30	*The effects of liberalisation and regulatory issues on the development of Renewable Energies* A. Verbruggen, University of Antwerpen, Belgium
12:00	*Green Power: The role of the consumers* H. Krawinkel, Federation of German Consumer Organisations, Germany
12:30	*Questions and answers*
13:00	**Lunch**

	Session 2
14:00	*RES-E promotion strategies and liberalisation – Lessons learned from REALISE Forum and related projects* Chairperson: L. Mez, Environmental Policy Research Centre, Freie Universität Berlin, Germany
14:00	*General findings and lessons from REALISE Forum* M.R. Di Nucci, Environmental Policy Research Centre, Freie Universität Berlin, Germany M. Arentsen, CSTM, University of Twente, The Netherlands
15:00	*Questions and answers*
15:30	**Coffee break**
16:00	*Optimal promotion strategies – Lessons learned from the OPTRES Project* R. Haas, Technical University Vienna, Austria
16:30	*Lessons from the project "A European Tracking System for Electricity (E-Track)"* C. Timpe, Öko-Institut, Germany

	Session 3
17:00	*Round Table: "Attaining of the RES-E target – Are we on the right track?* Chairperson: H. May, New Energy, Germany Panellists: C. Casale, CESI RICERCA, Italy; D. Fionon, CIRED, France; U. Büsgen, Federal Ministry for the Environment, Nature Conservation and Nuclear Safeta, Germany; G. Wiśniewski, EC BREC, Poland; N.I. Meyer, Denmark's Technical University, Denmark; Andrej Klemenc, Slovenski E-Forum, Slovenia
18:30	*Questions and answers*
19:00	*Closing of the first day*

Friday, November 3, 2006

	Session 4
09:00	*Market perception of coordination of support schemes: Stakeholder's viewpoints and expectations* Chairperson: R. Vigotti, IEA Renewable Energy Working Party
09:00	*Chairman's introduction and summary of the previous day* R. Vigotti, IEA Renewable Energy Working Party
09:10	*Statements of:* S. Zisler, Vattenfall Europe; O. Schäfer, EREC; Claudia Grotz, BWE; M. Hegg Gundersen, NVE, Norway; F. Santokie, Natsource, UK; S. Schurig, Greenpeace, Germany
11:10	**Coffee break**

	Session 5
11:30	*Co-existence of various instruments or co-ordination? Options for regional cooperation* Chairperson: A. Verbruggen, University of Antwerpen, Belgium
11:30	*The International Feed-In Cooperation* U. Büsgen, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany
12:00	*The Nordic coordination: The road not taken?* A. Midttun, BI Norwegian School of Management, Oslo, Norway
12:30	*How to bridge the gap between different support systems?* J. Vorrink, CertiQ, The Netherlands
13:00	*Questions and answers*
13:10	**Lunch**
14:00	*Round Table: The two pillars co-ordination and optimisation – The next steps?* Chairperson: O. Schäfer, EREC, Brussels, Berlgium Panellists: H. Nilsson, 4Fact, Sweden; T. Schneiders, E.ON, Germany; A. Madurga, Iberdrola, Spain;igotti, IEA Renewable Energy Working Party, Italy; H. Randen, NordPool, Norway
16:00	**Coffee break**
16:30	*Summing up: Recommendations for policy* H.-J. Ziesing, DIW, Chairman of the Steering Group, Germany M. Arentsen, CSTM, University of Twente, The Netherlands
16:50	*Concluding remarks* L. Mez, Environmental Policy Research Centre, Freie Universität Berlin, Germany
17:00	*Closing of the Conference*

List of Participants

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Welcome address by the Permanent Secretary for Environment and Transport

Maria Krautzberger

Permanent Secretary, Ministry of Urban Development of the Land Berlin

Ladies and Gentlemen,

It is a great pleasure for me as a member of the Berlin Government to welcome such a distinguished international audience.

In the national climate protection programme, the Federal Government set its objectives for the climate protection policy. In the new energy programme for Berlin, we as regional government specify how the city can contribute to achieve these goals. Berlin has always considered combined heat and power and renewables, especially solar energy, as the pillars for its urban development. Most representative buildings in the “new Berlin” are best practice buildings and demonstrate the integration of renewables. We have just passed an Energy Action Plan that should help us reaching our ambitious objective of reducing our CO2 emissions by 25% by the year 2010. It falls to public authorities to lead the way in climate protection. Berlin is well aware of its responsibility. As the greatest potential for energy savings and related actions is to be found in the building stock, the Berlin government has initiated exemplary actions in public buildings – the so-called Energy Saving Partnership (ESP).

But also renewables are for us of crucial importance. Determined action by public authorities in close cooperation with citizens´ solar initiatives will be the right track for persisting in our declared objective. One of our initiatives is the promotion of the installation of photovoltaic systems on the roofs of public buildings. Private operators invest in this technique and reinvest through the feed-in revenues under the Renewable Energy Act.

The choice of adequate instruments of support is not only relevant for the European Union and the national states. Also for regional governments like the Land Berlin for example coordinated actions in order to overcome the existing barriers to the further development of renewables are increasingly important. Beside that, energy efficiency and renewables have become also in Berlin a notable economic factor and a job-creation sector.

Today policies regarding renewables have to cope with new structural challenges: national and EU targets for greenhouse gases (GHG), targets for increasing the share of renewables and liberalised markets are not necessarily compatible.

For the market for renewable energy technologies, the liberalisation of the power market, access to electricity grids, electricity feed-in rates, planning regulations, financing schemes, standards and labelling have a significant influence. Despite a general consensus that investments in RES generation should be increased, there is little agreement as to the instruments. We hear all the time that green power is more costly than “conventional electricity”. We do not often hear about the negative external effects related to fossil (and nuclear) fuels. Liberalisation has made some progress and rendered some planning and support instruments and approaches of the past out of date. However, also in liberalised electricity markets incentives are still needed to foster investments and reach our sustainability targets.

Against this background, REALISE-Forum has the merit of discussing the interaction between liberalised or liberalising energy markets and policies and measures supporting the market penetration of renewable generated electricity, concentrating on and feed in and quota systems. But its merit is especially in the involvement of stakeholders in five different countries that the project has managed to set into motion. And the way the project has managed to deal with relatively “ideological” position in a balanced way. In the participating countries, REALISE Forum has established a regular dialogue and platform for exchanging viewpoints among policy makers, energy providers, associations, consumer associations and NGOs and other stakeholders beyond predetermined positions. Today this dialogue will be continued at an international level. I wish the organisers and the participants a fruitful discussion and lot of success.

The influence of national policy instruments and targets on EU renewable energy development[1]

Dr. Martin Schöpe

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany

Ladies and Gentlemen,

Thank you very much for your invitation to participate in today's Realise Forum conference. A feature of this Forum is that it provides a discussion platform for different approaches to the promotion of renewables within the European Union. I am therefore very happy to comment on how national policy instruments and targets influence the development of renewable energies at the EU level from the point of view of the German government.

We are currently in a very exciting phase regarding the development of renewable energies at the EU level. In the European Council in March 2006 heads of state and government decided to take the spring summit 2007 as an occasion to adopt a comprehensive action plan for energy policy in Europe, in order to strengthen the EU's leading role in the fields of renewable energies and energy efficiency. Based on this decision the Commission will adopt a preparatory energy package in early January next year. Among the contents of this energy package will be a strategic energy report, outlining the roadmap for renewable energies including measures for reaching the 2010 targets, long-term expansion targets for the period up to 2020, a proposal for a directive in the area of heating/cooling and the revision of the Biofuel Directive.

National policy instruments and targets play an important role when framing policies on these issues. During our EU Presidency, we will advocate ambitious legislative proposals and expansion targets for renewable energies at the EU level that are designed for the long term. For example, the potential of biomass and wind, geothermal and solar energy should be used EU-wide as quickly as possible to enable renewables to cover 20% of EU energy consumption by 2020. However, the development of renewable energies in Europe substantially depends on the success of national policies and developments that are defined by each Member State individually. In order to achieve new and ambitious goals at the EU level and initiate further-reaching developments in a credible way, existing national provisions and goals have to be complied with first.

To this end, it is crucial that

- Member States facing deficits with regard to their targets for 2010 intensify their efforts to reach these national goals,
- appropriate support instruments or incentive programmes for renewable energies are launched or existing instruments and programmes are optimised and
- remaining barriers are swiftly dismantled, in particular with a view to non-discriminatory grid access as well as planning and approval procedures.

With these approaches, resolute and documented commitment including ambitious targets and the use and development of adequate support mechanisms, the Member States provide the decisive impetus for boosting and accelerating the expansion of renewable energies at the EU level.

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[1] Check against delivery.

Ladies and Gentlemen,

With this in mind, Germany is just the right example to illustrate the influence that national policy instruments and targets can exert on the development of renewable energies at the EU level. In its last report on the status of renewable energies development in the EU, dating from 2004, the European Commission gave a positive assessment of Germany's performance. Together with Denmark, Spain and Finland, Germany is one of the few EU countries to be well on the way to reaching the national targets for 2010.

Let us take a look at the successes and the impressive results that we can demonstrate in the field of renewable energies:

- We are currently already covering more than 10% of our electricity demand from renewable energy sources and with a share of 4.6% in primary energy consumption, last year we already exceeded our 2010 target of 4.2%.
- In the area of biofuels, last year we were able to double the quantities used to 2 million tonnes and have already reached two thirds of our target for 2010.
- We hold the leading position worldwide when it comes to installed capacities for wind energy and photovoltaics and the production of biodiesel.
- Last year, more than 80 million tonnes of carbon dioxide emissions were avoided through the use of renewable energies.
- And, last but not least, 170,000 people in Germany have jobs in this sector and generate an annual turnover of more than 16 billion euro.

I am convinced that we will also reach our renewable energy targets in the electricity sector which provide for a share of at least 12.5% by 2010 and even at least 20% by 2020.

All in all, Germany has demonstrated political, technological and industrial leadership in the promotion of renewable energies at the international level over the past few years.

Ladies and Gentlemen,

What are the reasons for this development? Without any doubt, the Renewable Energy Sources Act has played the biggest part in this success story. Its adoption was hard-fought and a lot of resistance had to be overcome. In retrospect, however, it is fair to say that the two amendments of 2000 and 2004 both brought about the much-needed further development of the 1990 Electricity Feed Act and thus laid the foundations for the continued rapid expansion of all renewable sources of energy in the years to come.

Let me go over the core elements of the Renewable Energy Sources Act:

- Prioritised connection of plants for electricity production from renewable energies or mine gas to the grids for general electricity supply. This is a key condition for success, since in many countries there are massive obstacles preventing the connection of competitors to the grid due to well-established monopolies or oligopolies,
- Priority purchase and transmission of electricity produced from renewable sources and
- Laying down of a fixed tariff for this electricity, usually for a period of 20 years, by the grid operator. The tariff is cost-oriented and varies by branch, technology and location. This creates investment security at a low cost to society.
- A degressive tariff system that anticipates technological progress.
- And a national equalisation scheme for the electricity purchased and the corresponding tariffs.

The differentiated tariff system plays a decisive role in the effectiveness of the system. It prevents a situation where some operators earn a fortune while for others it is not worth investing in the first

place. In addition, there is the degressive tariff system. If operators invest at a later stage, they receive less money and must take into account technological progress. At the same time, the system ensures that nobody gets rich at the expense of electricity consumers.

The very successful application of the Renewable Energy Sources Act was and continues to be an important contribution of a national policy instrument to the development of renewable energies at EU level. It has become an export hit, not only in Europe: Today, 18 EU Member States are already using the instrument of feed-in tariffs to promote electricity generation from renewable energy sources.

Feed-in provisions such as the German Renewable Energy Sources Act are currently the most effective and the most affordable method of promoting the expansion of energy generation from renewables. This is also the finding of last year's European Commission report.

However, the application of a feed-in system alone does not necessarily guarantee the successful promotion of renewable energies. This is another result of the report. Additional factors such as non-discriminatory access to the grid, adequate spatial planning or public approval procedures play an important role in determining if a feed-in system will be successful or not. The BMU has commissioned several studies that are currently examining these additional factors and that are aimed at contributing to the optimisation of existing support mechanisms.

By December 2007 at the latest, the European Commission will present a report on the status of the systems for the promotion of electricity from renewable energies in the Member States and in particular evaluate the need for harmonisation with regard to the promotion of ecological electricity.

In the analysis of support mechanisms, the European Commission has come to the conclusion that a harmonised system is not necessary in Europe at present. Instead, the Commission prefers a coordinated approach towards support schemes for renewable energies, which includes not only the previously described optimisation of the effectiveness of national support mechanisms, but also cooperation among the European Member States. This view also corresponds to our position.

One way of cooperating is increased collaboration in the area of feed-in provisions, the so-called International Feed-in Cooperation. This cooperation was initiated by Germany and Spain in June 2004 during the International Conference for Renewable Energies, renewables2004, in Bonn. One of its goals is to facilitate the exchange of experience between both countries, for example on issues such as the level and determination of tariffs, grid integration, equalisation arrangements among grid operators etc.

Further objectives are support of other countries in the improvement and development of feed-in systems and the presentation of useful findings in international forums. Other Member States which have established feed-in systems are invited to participate as well. Lately, Slovenia has expressed a strong interest in joining the Feed-in Cooperation, and we are very pleased with this idea.

Both national initiatives for optimising the effect of existing support mechanisms and regional or bilateral cooperation have a strong influence on the overall development of renewable energies at the European level.

Despite the focus on the electricity sector, it should not be overlooked that Germany is also actively involved in the heating/cooling sector and in the area of biofuels in Europe.

The promotion of solar panels and biomass boilers through the market incentive programme particularly exhibits considerable growth rates. In the first half of this year, applications for more than 160,000 investment projects were submitted, a 50% increase as compared to the whole year

of 2006, which unfortunately means that capacities have already been exhausted. With the introduction of the blending obligation on 1 January 2007, we will also take over a leading role in the area of biofuels in Europe. It is vital that we agree on an international certification system as quickly as possible in order not to throw the baby out with the bath water.

Ladies and Gentlemen,

As I pointed out at the beginning, next year key foundations for European energy policy will be laid, in particular for renewable energies at European level. During the German EU Presidency we will advocate ambitious legislative proposals and expansion targets for renewable energies with a long-term perspective. These will include:

- A general target for renewable energy – based on the European Council proposal of 15% by 2015 – of a share of 20% by 2020;
- Sectoral targets to be reached by 2020 for biofuels, electricity from renewables and heating/cooling;
- ·A heating/cooling directive that sets binding EU-wide and national expansion targets;
- ·And a revision of the biofuel directive including a binding target of 12.5% for the year 2020.

In order to reach these ambitious goals, we need every possible support: not only support from the Member States, but also from interested associations and research institutes.

Ladies and Gentlemen,

In the pursuit of these aims I am also relying on you and your commitment. Only this will enable us all to consolidate the security of energy supply in Europe and at the same time make a valuable contribution to climate protection.

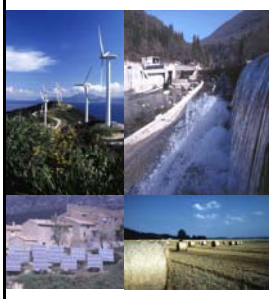
Thank you very much for your attention!

The support of electricity from Renewable Energy Sources: The latest developments

Dr. William Gillett

Intelligent Energy Executive Agency

European Commission



"The support of electricity from renewable energy sources"

William Gillett
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Intelligent Energy Executive Agency
IEEA-ALTENER
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Slide 1

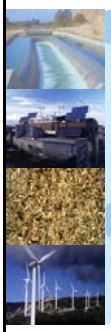
Renewable electricity directive 2001/77/EC

Promotion of electricity from renewable energy sources through:

- Quantified national targets for % **consumption** of electricity from renewable sources of energy
- National support schemes plus, if necessary, a harmonised support system
- Simplification of national administrative procedures for authorisation
- Guaranteed access to transmission and distribution of electricity from renewable energy sources

Slide 2

Setting Targets



Setting of national targets

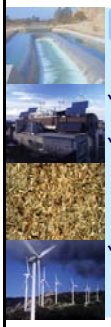
- ✓ All EU15 Member States have adopted national targets, in line with the reference values listed in Annex I of Directive 2001/77/EC.
- ✓ The New EU10 have set up national targets published in the Accession Treaty in April 2003.
- ✓ 2010 Targets have been agreed with Bulgaria and Romania.

The 2010 target

- ✓ If EU-25 Member States meet these national targets, the 2010 target of 21% will be achieved.

Slide 3

Reporting on progress



Commission assessment reports:

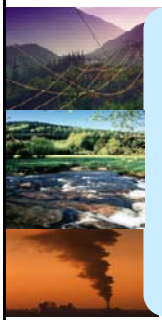
- ✓ Commission has approved COM(2004) 366 final "The share of renewable energy in the EU".
- ✓ Commission Staff Working Document SEC(2004) 547: EU-25 country reports

Commission will report on the share again soon and every two years in accordance with the requirements of the Directive

- ✓ Commission has approved COM (2005) 627 final "The support of electricity from renewable energy source

Slide 4

COM (2004) 366 : The share of renewable energy in the EU



- ✓ **Progress in achieving the national targets differs strongly between the Member States**
- ✓ **Not all Member States have adopted complementary proactive measures**
- ✓ **Success of wind energy is not outweighing the slow growth of biomass electricity**
- ✓ **Biomass is lagging behind**

Slide 7

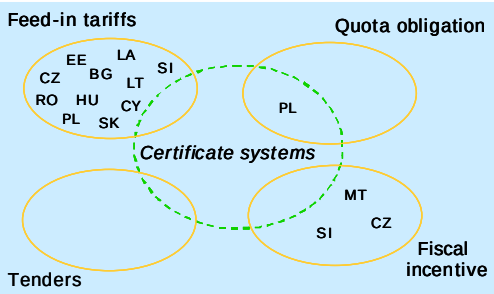
COM (2005) 627: Evaluation of support schemes

Based on analysis of schemes and impacts

- Type of support scheme in each country
- Market growth by country and technology
- Prices by technology in each country
- Remaining administrative and grid barriers

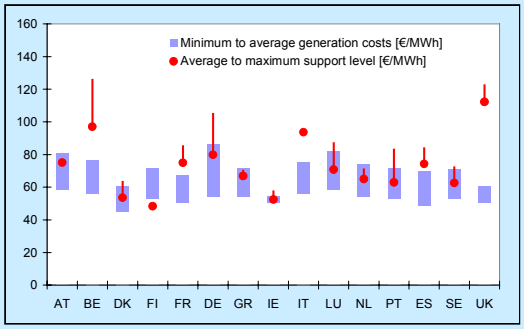
Slide 8

Status of support schemes for RES in EU10 + (2)



Slide 9

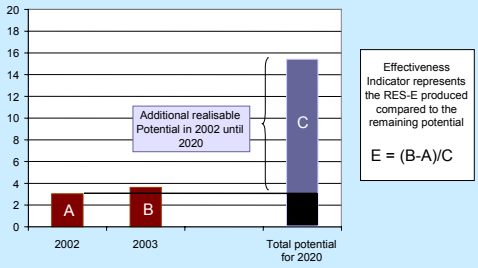
Price ranges for direct support of wind onshore in EU-15 compared to long term marginal generation costs



Slide 10

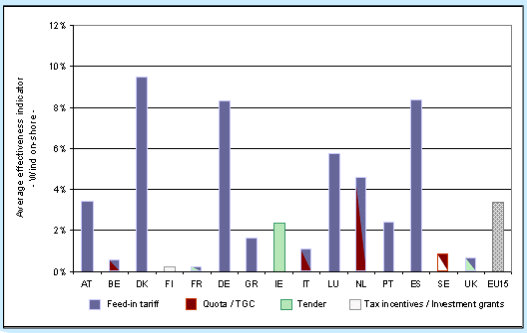
Definition of effectiveness indicator "E"

E = ratio of Growth to remaining Potential



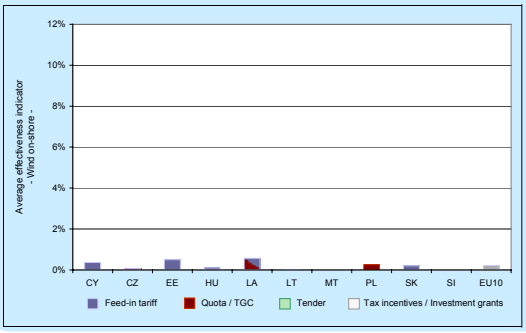
Slide 11

Effectiveness indicator for onshore wind electricity (1998-2004) EU-15



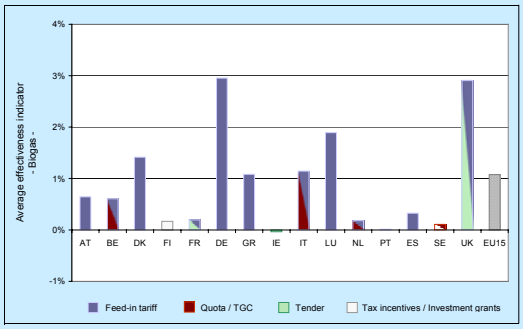
Slide 12

Effectiveness indicator for onshore wind electricity (1998-2004) EU-10



Slide 13

Effectiveness indicator for biogas electricity (1998-2003) EU 15



Slide 14

COM (2005) 627: Evaluation of support schemes

Main conclusions

- Feed-in tariffs have been more effective and more efficient than quota systems in wind energy.
- Other sectors are more complex
- High prices for tradable green certificates due to higher risk cost and immature certificate markets?
- Harmonisation would be premature, more experience needs to be gained, especially with quota systems.
- Administrative and grid barriers need to be addressed.

Slide 15

Time for coordination

1. Optimise the support scheme

- Adapt the support level to the generation costs
  - Half of the Member States give not enough support to ensure deployment of RES-E
- Increase stability
  - Instability increases risk costs
  - Avoid stop-and-go nature of the support
- Reduce investment risk
  - Especially green certificate markets need confidence
- Allow for technology specific support
  - Not all technology markets are equally mature

Slide 16

Time for coordination

RE support scheme in context

- enable compatibility with internal electricity market
  - disclosure, GoO, trading …
- promote employment, and other local and regional benefits
- coordinate with actions on energy efficiency and demand management

Slide 17

Time for coordination

Reduce administrative barriers

- one-step authorisation agencies
- clear guidelines for authorisation procedures with a clear attribution of responsibilities.
- pre-planning mechanisms requiring regions and municipalities to assign locations for RES
- Lighter procedures for small projects
- Guidance on related EU environmental legislation, such as water directive, habitat, etc

Slide 18

Time for coordination

Ensure fair grid access

- Grid connection, grid use conditions as well as cost bearing and sharing must be transparent and non-discriminatory.
- Grid infrastructure enforcement and development needs to be planned and developed in advance
- Associated costs should normally be covered by grid operators
- Pricing of electricity throughout the network should be fair and transparent and take into account the benefits of embedded generation

Slide 19

EUROPEAN COMMISSION:
March 2006

GREEN PAPER ON A EUROPEAN STRATEGY FOR SUSTAINABLE, COMPETITIVE & SECURE ENERGY

WHAT IS AT STAKE – BACKGROUND DOCUMENT

Directorate-General for Energy and Transport 1

Slide 20

Green Paper: six priority areas for common action

1. **Internal market ? completing the internal EU electricity and gas market**
2. **Internal market and Security of Supply? solidarity between Member States**
3. **A more diverse, efficient & sustainable energy mix**
   - **Renewable Energy Roadmap**
   - **Energy Efficiency Action Plan**
   -
4. **Environment ? integrated approach to climate change**
5. **Innovation ? a strategic European Energy Technology Plan**
6. **Towards a coherent external energy policy**

Directorate-General for Energy and Transport 21

Slide 21

ACTION PLAN FOR ENERGY EFFICIENCY: Realising the potential - Saving 20% by 2020

19th October 2006

Note: Targets for **% consumption** of electricity from RES can be more easily achieved if total consumption is reduced !!

Slide 22

Renewable Energy Road Map

European Council (Presidency Conclusions, March 2006) refers to EU leadership on RES, Renewable Road Map, long term perspective

Commission is currently preparing Renewable Road Map

Long term target for renewable energies and other measures.

- Report on electricity from renewable energy sources.
- Report on Biofuels for transport and possible revision of the Biofuels Directive
- Possible Directive on Heating and Cooling.

Slide 23

EU programmes : Converting Policy to Action

Directives / Legislation	Research / Demo Programme	Intelligent Energy – Europe Programme	
Regulation Rights, requirements, duties, obligations, objectives	**Technological innovation & "hardware"** Material, equipment, technologies, product development, R&D	**Social & institutional innovation** Skills, tools, methods, education, training, best practice, standards, studies, monitoring, evaluation	**Communication** Exchange, learning, networking, promotion, coordination, feedback to EU and national policy makers

Intelligent Energy Europe

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Intelligent Energy Europe (IEE) Programme

Renewable Electricity – Objectives

- address the objectives and priorities of the Directive 77/2001 and support its implementation
- address the non-technological issues in order to accelerate market introduction of RES-E technologies
- analyse related policy initiatives : e.g. agriculture, forestry and wood sectors, environment and fiscal policies, problems of remote regions

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Intelligent Energy Europe

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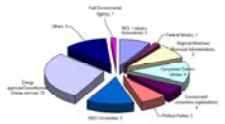
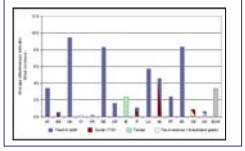
IEE RES-E Projects



REALISE FORUM
-> aims to establish a coherent basis for national policies in view of a coordinated RES-policy at EU level; analyses experience gained with feed-in tariffs + tradable green certificates.

OPTRES
-> assesses the effectiveness and efficiency of support mechanisms; identifies barriers + investigates optimisation



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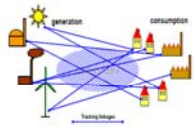
IEE RES-E Projects

PV Policy Group
-> establishes a Core Group of „solar nations" to define common actions for improving national regulatory frameworks, support schemes and monitoring systems for PV

Eur'Observ'ER
? monitors up-to-date the progress in RES sectors as wind, PV, biofuels, biogas, wood, solar thermal, small hydro and geothermal



E-TRACK
-> investigates the feasibility of a harmonised standard for tracking electricity in Europe

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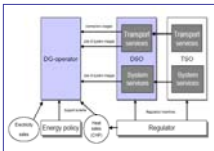
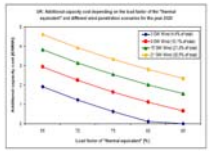
IEE RES-E Projects



DG GRID
-> improves the coordination between distributed generation and the electricity distribution network.

GreenNet EU 27
-> derives least cost strategies for integration of RES-E into European electricity grids



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Intelligent Energy Europe

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Future IEE projects (to start late 2006)

Support Schemes & Targets:
- **Futures-e**
- **RES2020**

Distributed Generation & Grid issues
- **Tradewind**
- **Respond**
- **GreenNet-Incentives**
- **SMART-A**

Technology-specific projects:
- **Windskill**
- **Gasification Guide**
- **Sherpa**

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Intelligent Energy Europe

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CIP Structure: 3 pillars

Entrepreneurship & Innovation (EIP)	Intelligent Energy Europe (IEE)	ICT Policy (ICT)
EIP committee	IEE committee	ICT committee
€ 2.170 million incl. **€ 430** for eco-innovation	**€ 720 million**	**€ 730 million**

Intelligent Energy Europe

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Timescale for IEE-II

- CIP adopted by EP and Council (June)
- Setting up of the "new" IEE-2 Committee
- Informal meeting of IEE-2 Committee in November, and vote on 2007 WP (January)
- Formal adoption of 2007 WP by EC (March)
- Launch of Call for Proposals (spring 2007) AS SOON AS POSSIBLE !

Intelligent Energy Europe

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IEE WEBPAGE: A GOOD SOURCE OF INFORMATION

- **Call for proposals 2006**
- **Details of ongoing projects**
- **List of supported events**
- **Intelligent Energy News**
- **Support for project partners**
- **Contacts & help**

http://ec.europa.eu/energy/intelligent/index_en.html

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The effects of liberalisation and regulatory issues on the development of Renewable Energies

Prof. Dr. Aviel Verbruggen

University of Antwerpen, Belgium

Abstract

Liberalisation is occurring very differently in different member states submitted to the same EU Directives (1996, 2003). The five components of a comprehensive liberalisation – competition, harmonisation, transparency, unbundling, regulation – are implemented unevenly and linear progress is not evident. The liberalisation turmoil brings positive and negative effects on the development of renewable energy in Europe. Most negative is the worshipping of the Golden Calf of low electricity end-use prices, while end-users need the signal of high (tax loaded) end-use prices to foster continuously improving efficiency. Today unseen efficiency performance only makes an almost complete renewable backstop supply affordable.

Keywords: renewable electricity, electricity sector liberalisation, local energy utility, backstop supply, efficiency

Introduction

The title points to 'liberalisation' and 'regulatory issues' as driving forces for the 'development of renewable energies'. This is a very broad and complex question and all aspects require attention although an extensive coverage is impossible in this brief address. Section I reminds some highlights of the liberalisation discussion in Europe, now about 20 years old. A normative model of restructuring is also reminded (section II). In section III, main effects of the liberalisation processes on the development of renewable energies, are assessed. The second part of the contribution focuses on the meaning of backstop supply solutions (section IV) and on the role and impact of end-use electricity prices on the intensity (and efficiency) of the electricity use in a panel of wealthy OECD nations. It is shown in section V that the long-run price elasticity of the electric intensity is almost -1. This opens perspectives of increasing the efficiency of electricity use to a level that makes an almost complete renewable backstop supply affordable in the future. A conclusion rounds up the arguments.

1 Liberalisation and regulatory issues

Although hundreds of books and articles were written and thousands of experts have gathered on the topic of liberalisation of the electricity sectors in Europe and in other parts of the world, there remains a wide variety in models, opinions and practices [see Glachant and Finon, 2003, and Newbery, 2005 for recent reviews]. Let us remind some highlights and apologize immediately that this is but an incomplete coverage of a 20 year history spanning such colorful power landscape as the European one.

First eye catch was the term **competition**, often accompanied by terms as privatisation and deregulation. Up to the 1980s competition in the electricity sector was unknown. Progress and

benefits in the sector came from cooperation and mutual learning[1] in carefully franchised distribution, transmission and correlated generation sectors. New-lighters came to talk about 'leveled playing fields' and about 'third party access' to the neatly franchised playing fields, and about electricity markets and competition.

Most power company CEOs had to go and buy Adam Smith's works. They learned that market exchanges can generate an economic surplus when 'comparative advantages' between the market parties exist. In fact, the comparative advantages should be natural in a sense that they should be due to particular endowments of the country (e.g. large hydro potentials) or due to special skills developed in the country (e.g. mastering particular technologies such as the construction and exploitation of nuclear power stations), or due to exceptional managerial skills of CEOs that could extract more value from the available production factors, etc. When comparative advantages are not drawn from natural assets or form private endeavours, the advantageous position of particular market suppliers is the result of artificial factors, i.e. factors that consume in some or another way economic resources without being paid for by the suppliers.

In order to avoid distorted markets with dumping and other evils, artificial factors should be excluded. This is one of the major challenges to every governmental official or regulator, supervising the proper functioning of markets. The boundary between natural assets and artificial factors providing an advantageous position to a market supplier is often very thin or difficult to identify. Some artificial factors are very obviously created to bias normal market rules in favour of some party, e.g. when subsidies are given. Blunt subsidies are not acceptable, but rooting out hidden subsidies is very difficult. Hidden subsidies take on many forms and flow through many channels (e.g. advantageous tax regimes in private-public partnerships).

Harmonisation was the next step-stone in the debate. All European participants in the electric power play should face the same terms of reference. This lovely idea accords the educational background and feelings of most people in Europe since the French revolution in 1789.

Early in the debate "reciprocity" was advertised as an important standard of harmonisation because it reflected symmetry in the conditions among national champions. In reality one observed some of the absolute monopolies in Europe (EDF, ELECTRABEL) pursuing the strategy of fencing the own market tightly while conquering plants and assets in countries with a more open regime. This all in the absence of any real intervention by public authorities at the EU or at the national levels to prevent such anti internal market moves. In the 2003 Directive article 21 (EU, 2003) reciprocity is confined to eligibility and market opening between trading partners. "Non-discriminatory" is now often used to refer to harmonisation.

Improving harmonisation can be done by e.g. submitting all electricity suppliers to an equal or comparable legislative system (e.g. for obtaining construction licenses, for obeying environmental protection rules, etc…). Even here disagreement arises when the principle is extended to the social sector, because some will argue that cheap labour is a 'natural' asset of some nations while others will argue that all, or a major share of, labour cost difference is due to a lack of harmonisation in the legal and social systems. In a diversified Europe with private and public utilities, some governed top-down and others bottom-up, with different cultural, social, economic, institutional, political histories and customs and with different natural endowments, etc. installing a workable level of harmonisation is a long and difficult task. One must strike the precarious balance between

[1] Because there was no fear of competition most electric utilities were quite open with information and willing to share know-how and experience. European sector institutions and conferences contributed to the mutual learning process.

on the one hand diversity that enriches a continent and on the other hand uniformity that easies integration and productivity.

Because borders between natural and artificial and optima between diversity and uniformity are difficult to identify, there is a high need for transparency. In the electricity supply sectors of Europe one would like to have transparency about the capital supply, working conditions, cost structures, pricing practices, etc.

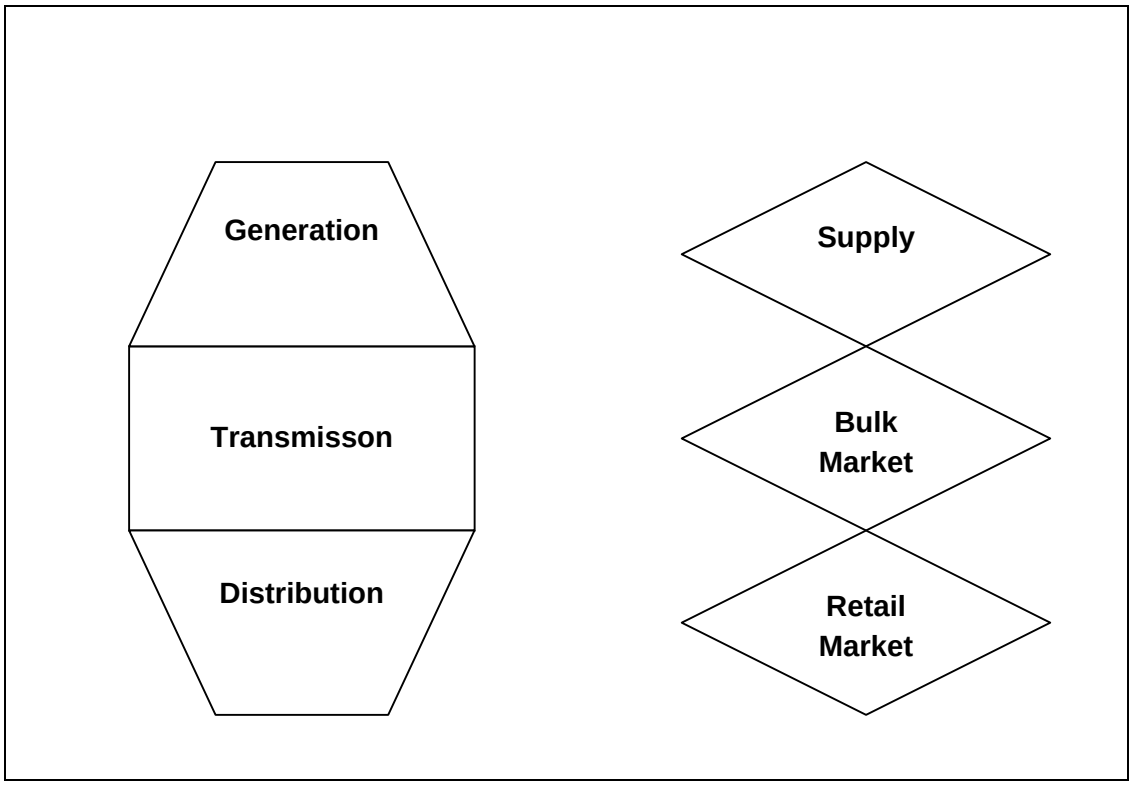
Transparency increases in case of non-integrated companies operating in a competitive environment. However, the electricity sector in most member states was covered by vertically integrated power companies with franchised monopolies for whole or part of the country. Today vertical interconnection is substituted for vertical integration and franchising is limited to the natural monopolies of distribution and transmission of the current. In vertically integrated or interconnected structures, transfers between generation and distribution activities can be hidden, e.g. by manipulated transfer prices, by shifting expertise among the separate entities, etc. Jamasb and Pollitt (2005, p.38) also observe that “there is, for example, a shortage of data on ownership interests of companies, cost information, subsidies, and measures of security of supply” and that “in the post-liberalisation era, some type of data have been deemed commercially sensitive and are not made available even to regulators” (sic!). Maybe they conclude too early that we live in a post-liberalisation era.

Unbundling was one crucial requirement for improving transparency. In the first years of the liberalisation discussion unbundling was the restructuring of the vertical power column into three components: GENCOs, TRANSCOs and DISCOs that had to balance activities through market rules rather than by internal company conventions (Figure 1). Because an important share of the European power suppliers was (and some still are) opposing the idea of such unbundling, the EU first introduced some type of weak unbundling by obliging a separate cost accounting and management for the three main functions. Further unbundling is the creation of separate companies for generation, transmission and distribution. The 2003 Directive requires legal unbundling but does not impose unbundling in ownership. Important links between such companies often remain in capital and personnel (the formal rules on independency cannot impede personal relationships and rotating job positions).

Within the three levels further unbundling took place. At the power transmission level a separation between the functions of independent system operator (ISO) and of high voltage grid provides advantages, although now transmission system operators (TSO) that cover more services such as expansion and maintenance of the grid are favoured [EU, 2003; Joskow, 2003, p.12; Newbery, 2005, p.4].

At the distribution level the distribution grid activities were separated from the supplier activities in order to offer households and other small customers a freedom of choice in power suppliers.

Figure 1: Vertical integration (left) versus unbundling (right) of main power sector functions



While unbundling of the three main functions (generation, transmission and distribution) and of the system operator (the central broker of the power system) from the high voltage grid are meaningful for installing workable competitive conditions in the electricity markets, I remain [Verbruggen, 1997] convinced that breaking up the distribution utilities was and is a bad move.

Arguments to oppose such move are:

- The **transaction costs are high**. The creation of a multitude of organisations (network companies, suppliers, metering companies, marketing and advertising agents, etc.) costs more than it creates value. The small customers are bombarded with advertisements and commercials and the searching costs for finding out the best offers are much higher than the small differences in prices and conditions they can gain from. Joskow (2003, p.12) states: “Retail competition initiatives have often worked well for large industrial and commercial customers. But the benefits for residential and small commercial customers are yet to be demonstrated compared to alternative procurement arrangements that retain distribution company responsibilities for supplying smaller customers by procuring power in competitive wholesale markets.”
- By disintegrating the distribution utilities **economies of scope are lost**. In particular in some countries the distribution utilities offered a full range of local services such as electricity, gas, district heat, telecom, water, sewerage, and/or were allied with other local services such as public transport, sports facilities, etc. Many of such local companies offered a high level of utility service and of luxury to the constituency, while they also took care of the broader public interest (environment, local distributed resources, cogeneration, renewable energy).
- **Real competition is reduced** by placing small individual customers on the same playing field as large industrial customers. Workable competition requires parties of about equal strength under about equal circumstances. Were the distribution utilities not broken up but regulated to act as agents of the small customers, real competition could function at the level of the high

voltage transactions. The demand side of such market would consist of large industrial and commercial end-users and of locally franchised and strictly regulated distribution utilities.

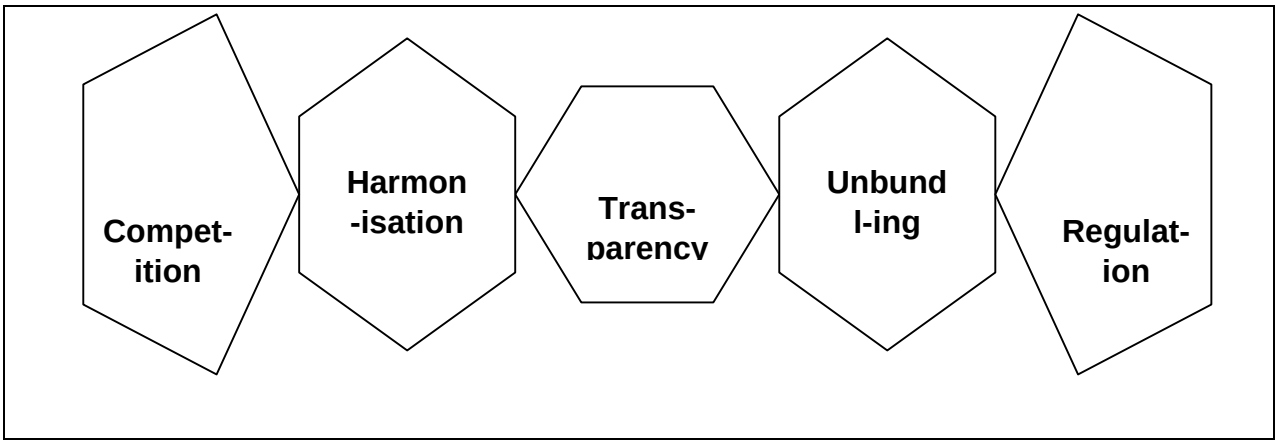
- The regulator better can install *diverging objectives and targets for the three main functions* (profit making for the generators, brokerage for the system operator, and *energy service activities for the distribution companies*). Where necessary distribution activities had to be transformed from the sales departments of the vertically integrated monopolies to **public interest utilities** that maximize energy efficiency, realise local renewable electricity generation, redistribute opportunities and results among the customers, etc. Because of their access to capital, know-how, technology on the one hand and because of the close relationship they can build with the inhabitants in an area, such utilities can provide a solid basis for materializing sustainable development. This requires new and clear regulatory models rewarding performance on sustainability indicators rather than on sales volumes.

Regulation is the fifth closing step-stone in restructuring the electricity sectors in Europe. Giving up monopoly control by e.g. vertical unbundling is not a natural drive of power companies. In order to establish and to safeguard real unbundling, firm regulatory intervention is necessary. While submitting proposals of market reform, one also should have presented the main lines of the regulatory system that governs the reforms. Many observers emphasized there was a need for re-regulation not for de-regulation (equalling at the end no-regulation). Regulatory effectiveness and efficiency is important for realising the goals of unbundling, transparency, harmonisation and so competition in the power sectors (as in many other markets). Regulation is also a necessity for redirecting our societies towards a sustainable future.

In 1996, the EU (commission, parliament, council) did not come up with a clear blueprint of the regulatory institutions necessary to realise the liberalisation ideals. The 2003 Directive (article 23) fills the gap, but still today shortfalls in regulatory capability and independency gives free way for the incumbent power companies to maintain monopoly positions and advantages (Jamasb and Pollitt, 2005, p.37-38).

Figure 2 shows how competition and regulation have to be balanced through the linking components of harmonisation, transparency and unbundling. Every next step-stone is a prerequisite of the preceding one, and so it is obvious that regulation is the ultimate prerequisite for competition in the electricity industry.

Figure 2: Competition and regulation balanced



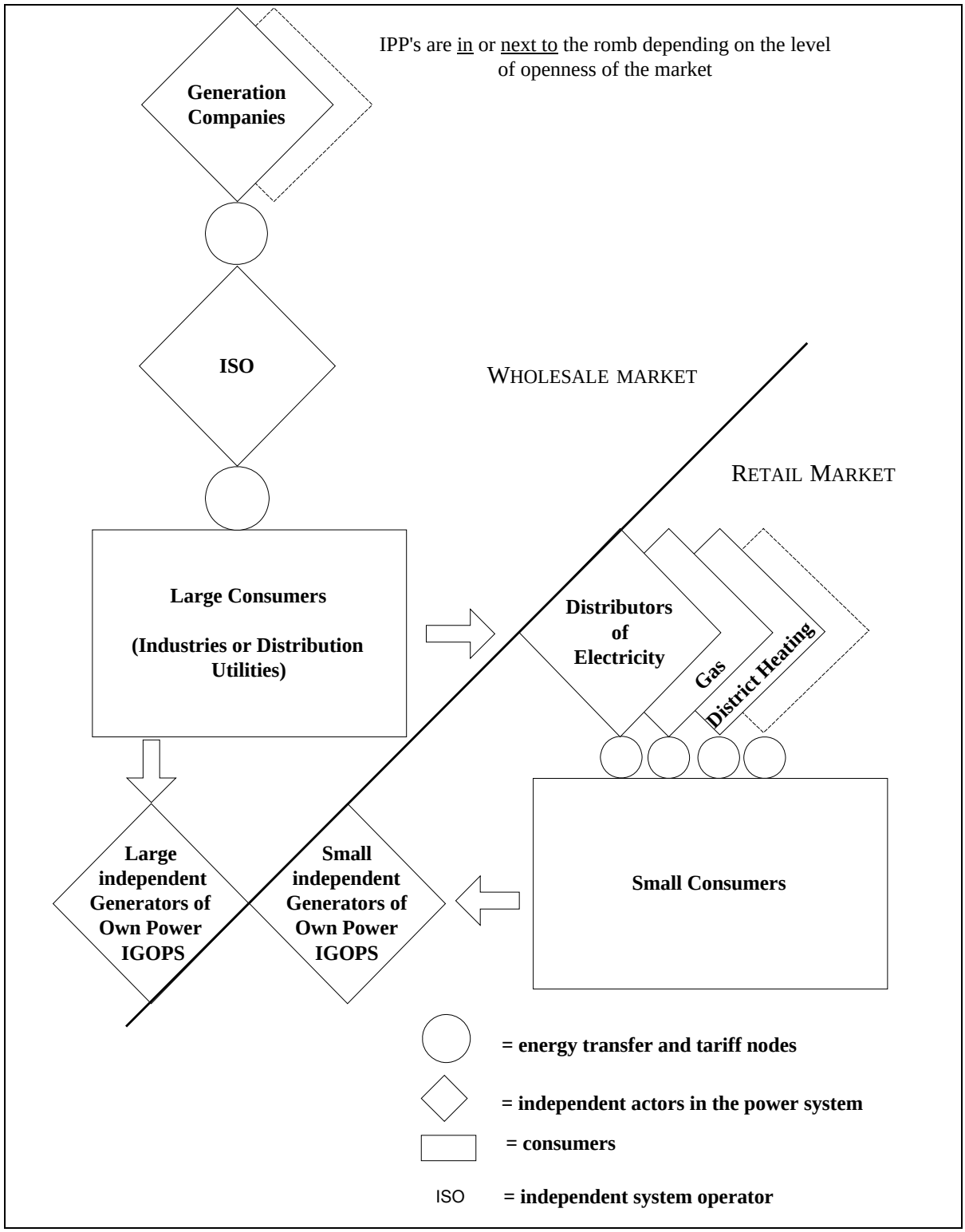
2 Blueprint of a normative structure for the electricity sector

A blueprint of a particular normative open structure for the electricity sector is shown in figure 3 (Verbruggen, 1997). Several attributes of the structure are commonly accepted and realised by now in many countries. There are also important differences between the proposed normative structure and the actual developments in the field. Without a detailed discussion, some of the differences should here be mentioned:

- Figure 3 shows the distinction between 'Generation Companies', being producers of power to sell to third parties, and '**Independent Generators of Own Power'** (IGOPs) that mainly produce power for own needs (cogeneration, local renewable sources). IGOPs may turn up in the electricity market once as suppliers of power, and once as demanders for power. Mostly IGOPs cannot guarantee capacity availability, and therefore often refrain from participating in power exchanges. Also IGOPs buy back-up power at the grid when the own units fail, and generally will purchase complementary power from the grid. In a sustainable future IGOPs, as part of distributed generation supplies have to cover an increasing share of electricity consumption. Figure 3 shows that a distinction between large scale and small scale IGOPs is helpful. The EU 2003 Directive does not identify IGOPs as a separate category within the group of distributed generators (definition 31, article 2).
- **Wholesale and retail markets are neatly distinguished**. The blueprint favors the suitable levels of unbundling and competition in both market levels, considered to be a high level in the wholesale markets and a low level in the retail markets. In the wholesale market only large customers deal and small consumers are best represented there by distribution companies regulated to be their agents. Contrary to the actual practices small customers are not loaded with the responsibility and transaction costs of finding the best supplier. In the normative model it is the regulator that takes care of controlling suppliers and of providing the right incentives so that public service levels are high while costs stay low.
- Independent generation of own power, in particular small sized projects (rooftop PV, small biomass converters, small scale wind and hydro, etc.), needs stimuli. Utilities pursuing the public interest can play a crucial role in such development, e.g. by lifting all barriers to a fair network access, by supplying know-how, by offering investment capital, by supplying maintenance contracts, etc. Because high performance in the efficient use of energy is dependent on the height and the stability of the energy end-use prices, significant and steadily increasing energy taxes are necessary. Part of the tax revenues can be invested in

the service activities the local utilities have to offer to the customers, in particular the financially less well-of part of the population.

Figure 3: A normative open structure for the electricity industry



3 Effects of the liberalisation on the development of RES-E

In a 2005 Special Issue of The Energy Journal on “European Electricity Liberalisation”, Jamasb and Pollitt state that it is ‘too early to quantify the performance and effects of electricity reforms’. They describe the evolution in market structure. Performance is measured by 1) electricity prices with also reference to consumer switching, 2) investment adequacy, 3) security of supply, 4) environmental impact and 5) social impact. Under the caption “environmental impact” the ½ page text is fully spent on renewable electricity sources. The relationship between liberalisation and the development of RES-E is characterized by following statements: ‘The long-term effects of liberalisation on the choice of low-carbon technologies will depend on the level and predictability of the subsidy they receive’, and ‘It is clear that liberalisation across Europe does not stand in the way of differences of national emphasis on renewable policy’ [Jamasb and Pollitt, p.36]. The statements suggest that the link between liberalisation and the development of renewable energy has been weak. In addition, as different countries have liberalised their electricity sector differently, the (weak) effects of the liberalisation on the development of RES-E were different too. Because liberalisation occurred over a long period (the discussion lasts 20 years; in most countries the reforms are undertaken since 10 years) it is difficult to identify the base-line, i.e. how would RES-E have developed without liberalisation. When the baseline is fuzzy, hard conclusions on the effects of liberalisation are even more difficult to state.

For discussion purpose I identify some generic positive and negative effects of liberalisation on the development of RES-E in Europe.

At the positive side:

- *More public awareness about electricity supply affairs.* The liberalisation process has raised the public and political interest in the structure and working of the electricity industries in the various member states. By this enhanced interest some countries have found out that the availability of some independent regulatory capability is worthwhile or necessary. Other countries learned that the production mix can be more varied than only the national champion technology. And more countries found that their electricity companies had evolved into lame ducks specialized in gold-plating and wining and dining. Past evolutions and incumbent positions were challenged by other models and by other technologies, and by competitors from abroad.
- *Modest development of independent regulatory capability.* Very few European nations had developed real independent regulatory capacities (as e.g. the US public utility commissions offered). Although the way to go is still long, some countries have set up progressive experiments with an open mind to alternative solutions.
- *Expansion thrift in large-scale coal and nuclear plants checked.* The growth of the power sectors in the 1950-1990s was based on a rushed construction of ever larger base-load plants to meet expansionist forecasts in demand for power. Externalities of all kind were rolled-off on present and future societies. The expansive construction of base-load capacities pre-emptied the balanced development of electricity efficiency, renewable sources and distributed solutions in general. A variety of factors next to liberalisation contributed in choking this expansionist behavior. But also the liberalisation process in particular tested nuclear investments on their market congruency, and halted further too blunt state supported projects, e.g. in the use of particular domestic fuels (coal) or technologies (nuclear).

- *Adoption of a specific renewable energy directive*. After the adoption of the 1996 directive on the internal electricity market, the EU commission felt the need to complete the regulatory job with complementary directives on renewable energies, CHP and energy efficiency / services. Although the link among the directives may be weak, the pressure to adopt the latter three directives after the internal market one was published in February 1997 was real. For some countries the renewable energies directive felt short of their expectations and ongoing plans, but for others the statement of the indicative targets has triggered processes to develop renewable resources.

At the negative side:

- *The disintegration of many local public utility companies*. A normative view on the structure of the European electricity sector and on paths to more sustainable futures, assigns local energy utility companies important roles in overcoming or attenuating barriers towards more energy efficiency and more RES-E deployment. The particular roles of local utilities imply locally integrated resource planning with full priority for energy efficiency and distributed generation. From the policy side the utilities have to be regulated tightly, on the one hand by incentive regulation rewarding efficiency and RES-E success and penalizing growth in sales of non-sustainable supplies, on the other hand by conduct regulation. Positive stimuli are also expected from procedures empowering end-users in filing claims and in getting payment for shortcomings in service by the utilities. In most countries the liberalisation has worked in the opposite direction. Local utilities are split up, disintegrated, reformed to commercial entities making profit by boosting sales of whatever can be sold.
- *The golden calf of low electricity prices.* Next to assessed levels of monopolistic power in the member states' electricity markets, the height and evolution of electricity prices in the various member states, is the final test of liberalisation success (Jamasb and Pollitt, 2005; Joskow, 2003). Such price analyses and comparisons are mostly forgetting about the diversity in natural resource endowments, subsidy regimes, inherited assets, etc. Most importantly there is an almost total neglect of incorporating the full external costs in the kWh price, because the market myopia does not consider global long-term impacts. Because the present unsustainable development is to a large degree the result of low energy prices fueling an ever increasing expansion of production and consumption systems, our argument is that only ever increasing energy end-use prices[1] can pave the way for a sustainable future. This argument is developed in the next sections.

4 Electricity backstop supply sources for a sustainable future

In the high days of the first oil crisis Nordhaus [1973] introduced the concept of a backstop supply technology. By definition such technology can deliver an unlimited amount of energy at a given high/very high cost. In 1973 all focus was on energy exhaustibility, sustainability being at that time the concern of academic and societal minority groups. Nordhaus described nuclear power with breeders, followed up by fusion, at that time as the evident backstop candidate.

[1] Arguments for high end-use prices are not in conflict with arguments for low generation and delivery costs as a result of improved productive and allocative efficiency. The gap between low costs and high end-use prices must be filled by taxes that express the distance between the actual development of the economy (mostly neglecting externalities in particular the ones with global and long-term impacts) and the targeted sustainable development. Because such taxes will generate significant cash it is necessary to rebound the income back in the economy by reducing taxes on goods and raising R&D and other public good spending.

Because today the exhaustibility issue is complemented by the discussion about a sustainable development including next to economic also democratic, environmental and social concerns [WCED, 1987], one adds “globally accessible”, “environmental benign” and “low-risk and affordable” to the “unlimited” property of backstop supply solutions. Today, nuclear power fails on the criteria to pass the test as a reliable backstop technology (Turkenburg, 2004), as commented in table 1.

Table 1: Evaluation of nuclear power on the criteria of backstop supply technology

Criteria	*Nuclear power performance*
Unlimited	Nuclear power on earth can be considered as an unlimited resource only when *fusion* will be technically, economically and safely possible. The second best unlimited nuclear source (*breeders*) has failed the demonstration tests. The once-trough use of uranium in fission processes will exhaust the recoverable reserves.
Globally accessible	The huge capital and technology intensity of the nuclear option makes this option inaccessible for developing economies. In addition, *proliferation* of know-how and nuclear capabilities creates a more dangerous world than the containment and reduction of its spreading.
Environmental benign	Nuclear power is almost carbon free, and other emissions in the air are not zero but not as massive and diverse as from fossil fuel combustion. Release of radioactive isotopes is a constant source of contamination, but significant releases only happen by accident.
Low risk	Given the probability of accidents, and given the – from a human perspective – eternal lifetime of radioactive waste, nuclear power is not without risks. Some will consider the risks as minor, some as huge. Risk perception and assessment are very personal matters, and therefore one should call upon societal risk processing institutions and procedures, i.e. the insurance sector. However, given that the risks of nuclear accidents and the eternal horizon of nuclear waste fall out of the range accepted by underwriters, it is difficult to argue that the societal risks of nuclear power are minor, and should be accepted by the present and future generations.
Affordable	Safe nuclear power always will be expensive, but when societies accept particular kinds and levels of risk, large amounts of nuclear power can be generated at affordable resource costs. These costs however neglect the externality costs of major accidents and of the eternal concern for the high-level waste. Even our instruments to assess such costs fall short.

Renewable electricity sources are arguably the only candidate for passing most of the criteria of the sustainable backstop supply technology, except perhaps for the aspect of financial affordability when compared to the present low prices of fossil and nuclear power. E.g. photovoltaic power is unlimited as long as the earth circles the sun but expensive to collect, convert and store, as several other renewable power resources are (wave, tidal, wind, small hydro, biomass).

Let us assume that the cost price of the kWh form the renewable backstop technology equals $0.40/kWh in 1995 prices [UNDP 2000, p.16][1]. This conservative position is the outcome of the interaction of opposite forces. On the one hand technological progress will increase the performance and lower the investments in renewable energy appliances (wind turbines, PV cells, hydro stations, etc.). On the other hand the full phasing out of cheaply priced fossil fuels will raise the costs to provide goods and services in the economy, also the costs of constructing, placing and operating renewable energy installations. When in addition renewable sources must take care also of ancillary services in a continuous supply of power, the cost of the average kWh delivered by a full or almost complete renewable electricity system will remain at the high end.

The crucial and ultimate question about RES-E remains: **is an almost complete RES-E backstop supply affordable?**

5 Affordability of an almost complete RES-E backstop supply

"Affordable" is a loose concept, depending on people's willingness to pay, itself dependent on income (ability to pay), preferences, customs, etc. Considered from a more societal point of view and limited to the power supply issue, one can define affordable as what consumers are used to pay for the current. Households, industries, organisations and whole countries consider the bills of goods and services acceptable as long as the share of their budget they must spend on continuing their consumption patterns remains about constant.

This is investigated for a panel of high income OECD nations. The panel data show no correlation between GDP/capita (indicator of income) and electricity intensity. Also all countries have an equal access to electrical technologies, but their different intensities show that they make a different use of this access, i.e. the adoption and implementation of the various electrical technologies differs, what is for a minor part (about 1/5) due to structural differences and for the major part (about 4/5) reveals differences in end-use efficiencies. Because next to income and technology, price is the third main determinant of consumption and production optimisation, the electricity intensities of 14 OECD countries are regressed on the average end-use prices (year 1997[2]). A hyperbolic function $EI = \alpha.P^{\beta}$ [EI = Electricity Intensity; P = Price] has been estimated, leaving 12 degrees of freedom. Results of the regression are:

Elasticity β		Constant α		R^2	Sum Squares of regression
estimate	standard error	estimate	standard error		
-1.04	0.15	3.41	0.37	80	1.28

Figure 4 shows the 1997 observed market equilibriums (squares) in the 14 countries and the fitted curve (solid black line). The statistical results indicate that the assumed hyperbolic relationship between electricity intensity of an economy and the end-use electricity price fits the observed data points well. Deviations from the curve can be seen as the result of e.g. the spread of natural gas

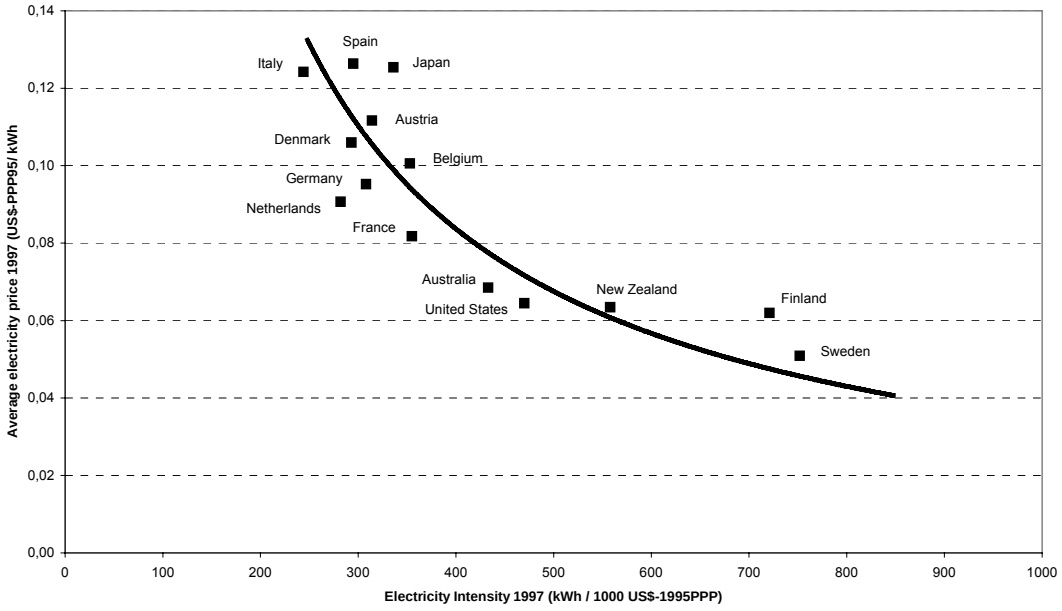
[1] A capacity cost of $5,000/kW is annualized with a 6% annuity, covered by an average annual production of 750 kWh/kW installed. The assumed constant marginal cost of the non-exhaustible renewable supplies does not entail that there are no large quantities of renewable power available at a lower cost.

[2] This is the most recent year with an acceptable number of wealthy OECD members that provide also sufficient electricity price information. Because price regimes and intensity levels do not vary a lot over time within the given countries, regressions on other years deliver similar results, while a pooling of cross-sectional with time-series data did not bring better results.

distribution in the country, the intensity of government policies in the field of efficiency promotion, etc. The curve approaches the form of an orthogonal hyperbole given the value of parameter β is near to -1.

Given the exclusion of income and of access to technology as explanatory variables, the specification $EI = \alpha.P\beta$ can be interpreted as a demand curve where β equals the price elasticity of electricity intensity and the %-share of the GDP that is spent on the electricity bill is given by $\alpha.P\beta+1$. In particular, when $\beta \sim -1$ this 'budget share' is independent of the height of the price and given by the a parameter. With a unitary elasticity countries spend in the long run[1] about equal shares of their GDP on electricity use whatever end-use price levels are adopted.

Figure 4: The 1997 demand curve for electricity intensity (wealthy OECD countries)



Analysing electricity intensity as a "demanded good" is an unusual way of explaining people's real behavior, although this unusual way bridges the gap between on the one hand an inelastic demand for electricity services [light, cooling, entertainment, etc.] and on the other hand obvious indifference of people regarding the physical product kWh [voltage, current, frequency]. While we observe a very inelastic demand for the services providing wealth and comfort, there is no personal interest by people to bother about how many kWhs are consumed by the services [the reality is that the overwhelming majority of the population has not the faintest idea of how much electricity a particular service consumes; even experts don't know well]. While there is no interest in the quantity of kWhs, companies and households are sensible for the height of their electricity bill at the end of the month or of the year. When the bill exceeds expected levels they take measures to lower their consumption of kWh by becoming more efficient. When the bill is low or decreasing they will not care about efficiency because being efficient requires attention, learning, understanding, time and often some specific change in behavior or investment. Mostly the latter efforts and investments are paid back by a decreased electricity bill and several other spill-over benefits (e.g. safer and healthier living climate). The length of the payback period of every efficiency effort depends on the price of the electricity saved, and therefore the demanded intensity depends on this price too. Intensity as a demanded "good" reflects the preference of rational consumers and

[1] Regression results based on a cross-section sample show long-run effects, i.e. effects after countries have had full time to adapt to the impact of the driving variables.

producers not to bother about efficiency or spillage. Indeed, electricity intensity is a truly neutral variable without passion or personal commitment for the overwhelming majority of people. Here rational behavior prevails and the electricity price balances the rational choice of people between efficiency effort and paying the power supplier.

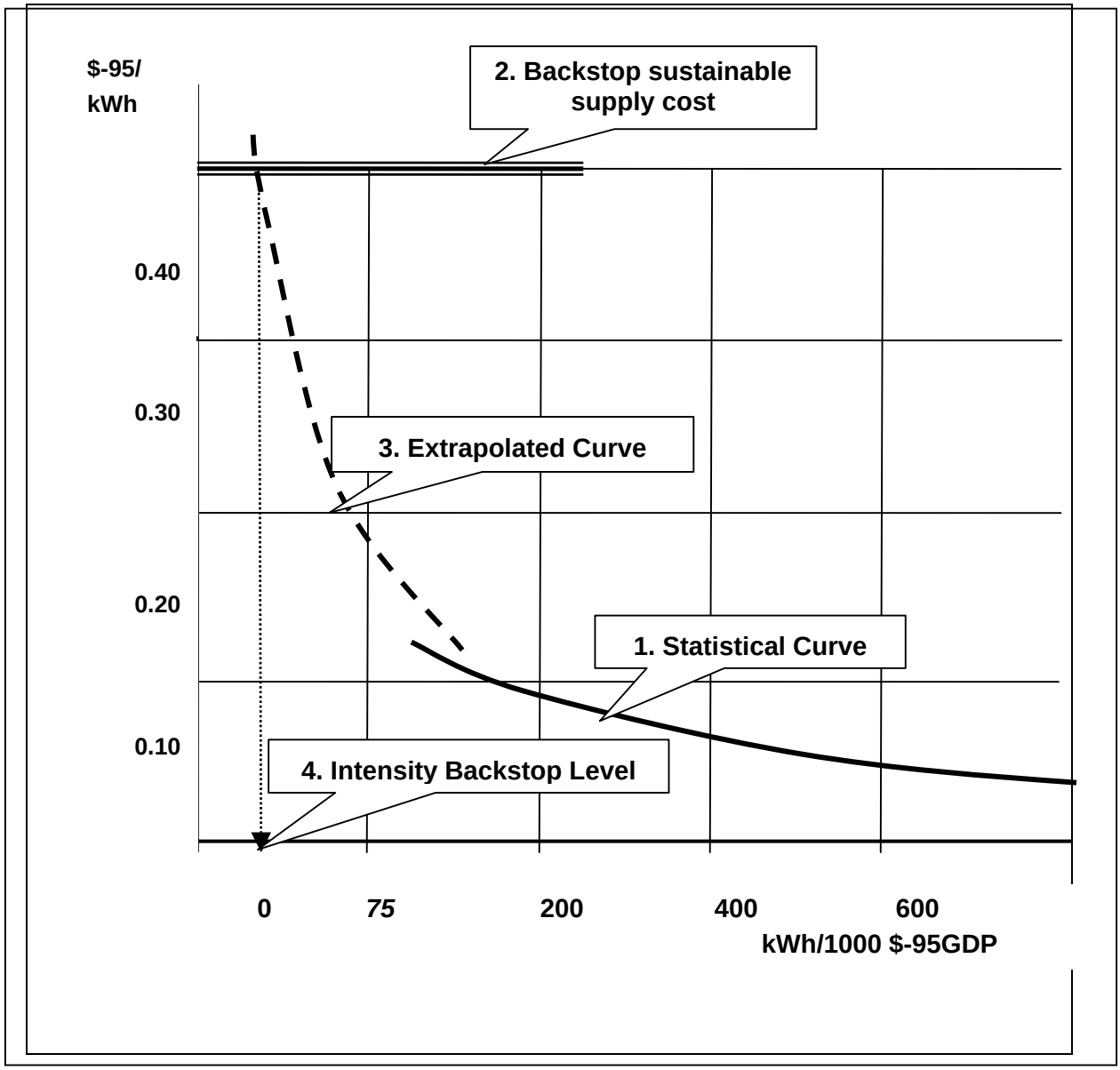
The rather tight relationship between intensity and price teaches that countries (i.e. their households and companies) will only reach low intensity (high efficiency) if and only if the end-use prices are set at a high level.

Figure 5 brings the backstop supply and demand for electricity intensity together. The statistical demand curve for electricity intensity reveals the long-run behavior of households and companies in high income countries. It shows the likely intensity attained after these had the time to adapt to a given electricity price height.

At the 0.40 $-95/kWh ordinate the constant long-run cost price of a fully renewable electricity supply is shown by the horizontal bar. When this price, well above the market prices we are accustomed to since decades, would be established without time for the economies to adapt, the share of their GDP spending on electricity would more than triple for all economies. This is why at present there is a strong argument against renewable supplies as being economically not affordable. It can also be seen as an argument that our economies are too electric intensive and that the efficiency in using electricity should be increased. However, figure 4 shows that intensity only comes down (or efficiency goes up) when the end-use price stimulates the numerous decision makers – households and companies – to change decisions and behavior.

The statistical demand curve and the backstop supply do not cross, so there is no equilibrium yet. One must extrapolate the statistical demand curve and refer to the literature whether such extrapolation is acceptable. Bottom-up electricity efficiency specialists [Lovins et all, 2002; Hennicke, 2004] argue that the necessary efficiency performance of such extrapolation is feasible, also given the technological development expected. Innovation specialists however also point to the diminishing returns to research in a given field [Popp, 2002]. In addition the lingering performance of the best practice countries gives food to arguments that some technical ceiling could be hit, i.e. the demand curve cannot be extrapolated far enough because it faces a kink before the backstop level is attained.

Figure 5: Backstop end-use intensity level at given Backstop supply price



A major question remains what attaining the backstop end-use efficiency level costs to the economies of the OECD member states. Will the present situation of countries, companies and households using electricity efficiently not facing (significantly) higher investment costs than the spilling ones, endure into the future? I.e. will technological progress bring timely rescue? Many will argue 'yes, if 50% of the R&D efforts are directed towards efficiency technologies and solutions' [Jochem et all., 2002]. For such redirection to happen an enduring and stepping-up price signal is necessary, one can learn from Popp's analysis [2002].

When the demand curve cannot be extrapolated but is kinked somewhere in the 75 ~ 250 kWh intensity interval, society will face higher electricity budget shares and must transcend the purely technical efficiency discourse. This means also the energy conservation[1] question is addressed when electricity bills are to be ceiled at a constant share of GDP. Physical limits on intensity reduction lift the discussion about energy use to non-energy policies (redirecting social activities and consumption patterns). However, when societies bring up the flexibility to adapt and the technological focus is redirected to efficiency and to the development of environmental benign, low-risk and unlimited supplies, energy and climate doomsday can be removed from the agenda.

6 Conclusion

“Europe is liberalysing electricity in accordance with the European Commission’s Electricity Directives. Different countries have responded differently, notably in the extent of restructuring, treatment of mergers, market power, and vertical unbundling.” [Newbery, 2005, p.1]. The actual state is more and more difficult to monitor because more and more relevant information is withhold by the incumbent and powerful players in the field (that looks not really leveled for ‘third party access’). Competent energy regulators are still missing in most countries and also at the EU level. Perhaps the prior building up of regulatory capability is a prerequisite for an effective and efficient reform of an activity sector characterized by natural monopolies and public services.

The effects of the liberalisation processes on the development of renewable energy in Europe are unequal in various member states. One can identify positive and negative effects. One of the main negative effects is the growing worshipping of the Golden Calf of low electricity prices. This conflicts directly with the necessity of high end-use prices to maintain a sufficient drive for energy efficiency. It is shown that high end-use electricity prices are responded by countries with lower electricity intensities to keep budget shares spent on power bills almost stable. This offers the opportunity to design efficient taxing reforms to improve efficiency and reduce intensity in electricity use so that we can afford an almost complete renewable backstop supply in the future.

[1] Energy or electricity conservation affects the way end use goods and services are delivered or consumed. Conservation eventually requires the reduction of some services. Conservation is not neutral as efficiency is.

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REALISE Forum
Berlin, November 2-3, 2006

Liberalisation & Regulation Effects on RE Development

Prof.Aviel Verbruggen
University of Antwerp, STEM

Universiteit Antwerpen

Slide 1

Contents

1. Liberalisation(s) revisited
2. Effects (+/-) for RE development
3. Backstop supply solution(s)
4. Is the renewable backstop affordable?
5. Backstop End-Use Efficiency
6. How to become hatred?

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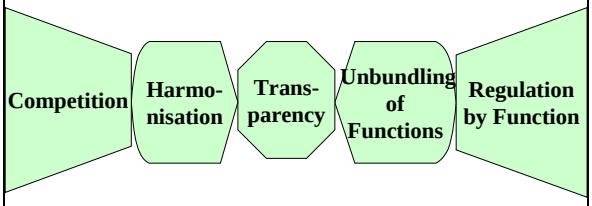
Competition and Regulation Balanced



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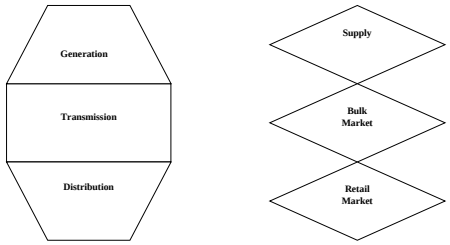
Unbundling GEN-TRANS-DIS



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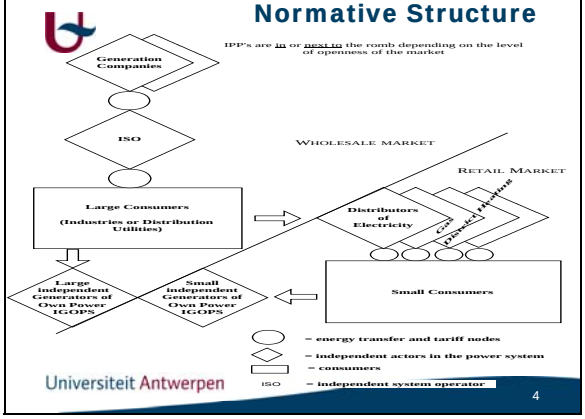
Normative Structure



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+ effects of liberalisation

- ☑ More public awareness about electricity supply affairs
- ☑ (Modest) Development of independent regulatory capability
- ☑ Check on Expansion thrift in large-scale coal and nuclear plants
- ☑ Adoption of a specific renewable energy directive

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- effects of liberalisation

- ☑ Disintegration of many local public utility companies
- unbundling network and supply functions
- destroying economies of scope
- high transaction costs (small consumers)
- reducing competition in bulk markets
- local IRP/DSM opportunities lost
- ☑ Golden Calf of low electricity prices

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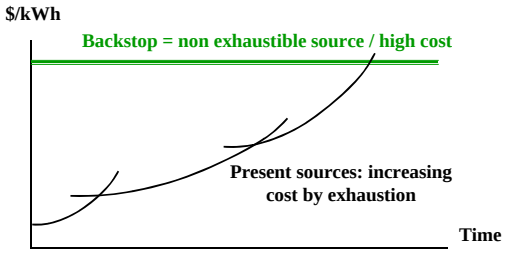
1973: Exhaustion Agenda Search for "Backstop" Supply



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Backstop Supply Technology 1987

1987: *Our Common Future*
"Sustainable Development"
adds three extra dimensions: democratic – social – ecological to economic.
Therefore the supply backstop must be:

- **Accessible to all (nations and people)**
- **Low-risk, affordable**
- **Environmentally benign**
- **Unlimited in supplying energy**

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Characteristics of Options

	OPTIONS		
PROPERTIES	Nuclear	Fossil fuels	Renewable sources
Energy density	Very dense (E = mc²)	Dense	Mostly diffuse except some Hydro and Biomass H&B
Scale	Centralised, gigantic	Divisible, all scales	Distributed except H&B
Control (modulation)	Inflexible, always full load	At command	Intermittent, partly unpredictable except H&B
Cost price	Expensive	Cheap	Very expensive
Acute risks	High: nuclear accidents; radioactive releases; proliferation of weapons	Manageable although severe accidents can happen (mines, tankers; pipelines)	Tiny (major risks from large scale hydro)
Chronic pressures	Nuclear waste; Minor emissions; landscape (more HV lines)	CO2 emissions; air pollution; leakages ; solid waste (coal ashes)	Landscape and land-use impacts
Sustainability	Critical (will fusion deliver?)	Climate Change; Exhaustion of premium sources	Global and eternal

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Renewables Affordable?

? Is an almost complete renewable supply affordable as backstop?

Affordable = what "we" are used to pay
~willingness to pay
~income (ability to pay)
~customs, habits

Affordable is what keeps budget shares stable

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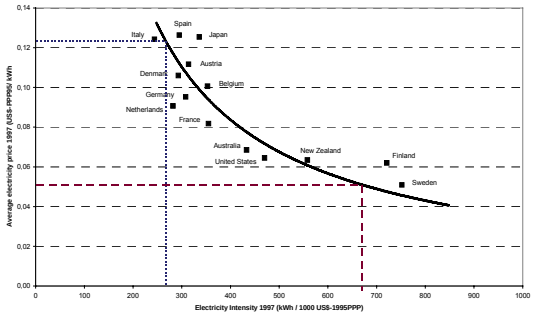
Price x Intensity ? constant (1997)



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Observations

- **Sample uniform for income (GDP/capita) and for access to technology (global industry)**
- **Significant correlation between 'Intensity' and the end-use price of electricity**
- **Long-run price elasticity of intensity ≅ -1.0**
- **GDP-Share of electricity bills [real costs] stays about constant independent of end-use prices applied**

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Policy Lessons

- **No <u>persistent</u> and <u>overall</u> efficiency without high end-use prices (taxes!)**
  >< Main goal of liberalizing electric sector
  >< Carbon Emission Trading with free permits
- **Prices do matter: households / companies behave rational and keep electricity bills / budget shares "affordable"**
- **High end-use prices are not devastating economies**

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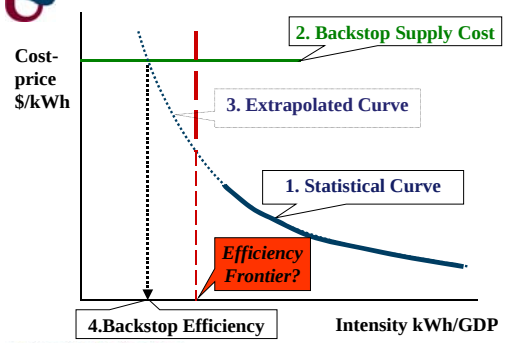
Backstop End-use Efficiency



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Time for coordination

Reduce administrative barriers

- one-step authorisation agencies
- clear guidelines for authorisation procedures with a clear attribution of responsibilities.
- pre-planning mechanisms requiring regions and municipalities to assign locations for RES
- Lighter procedures for small projects
- Guidance on related EU environmental legislation, such as water directive, habitat, etc

Slide 18

Green Power: The role of the consumers

Dr. Holger Krawinkel

Federation of German Consumer Organisations, Germany

Ladies and Gentlemen,

Thank you for the invitation and the option to represent the view of the consumers. Let me first say some words about our organisation. The Federation of German Consumer Organisations - vzbv - is a non-governmental organisation acting as an umbrella for 40 German consumer associations. We represent the interests of consumers in public and vis-à-vis legislators, the private sector and civil society. Our goal is to protect and empower the consumer. We do this by lobbying and campaigning at national and European levels, by taking collective legal action on behalf of consumers and by ensuring that our message receives broad media coverage.

Yesterday evening I had the opportunity to see Al Gore's movie about climate change. For experts like us, it's perhaps not ambitious enough. But I hope many "normal" consumers will have this opportunity, too. There is no doubt, that the development and impact of energy consumption worldwide highlights the need for a dramatic change in energy usage. Renewable energies provide alternative methods for ensuring sustainable energy production and the equitable distribution of energy in the future. Consumers are an essential part of this turnaround. Not only do they consume energy; they also consume technology, which in turn makes them individual producers of renewable energy. Local energy production enabled a bigger independence of conventional energy sources as well as of the traditional electricity supplier, sometimes called for national champions, who earn a lot of money by misusing their market power. Beside the extension of renewable energies is the promotion of energy efficiency an important part of a sustainable energy policy.

1 The current situation

It may seem unnecessary in this context to point out the impact of current energy consumption and resource management. Nevertheless, I would like to briefly outline the current situation.

Today no one seriously contests the fact that the use of fossil energy sources and the associated emissions into the atmosphere have lead to a global change in the world's climate. We see the occurrence of extreme weather conditions in certain regions, flood catastrophes and the melting of our glaciers and polar caps.

But the general conditions of the energy and economic policy get worse.

With this scenario in mind, it is important to recognize that global energy needs will continue to increase due to mechanisation in industrial countries and economic growth in developing countries. Without a significant turnaround the global impact of energy consumption will continue to become more acute.

Increasing energy demands will be accompanied by a growing shortage of conventional energy sources and higher extraction costs. The most recent price hikes on the crude oil market have caused petroleum prices to hit record highs. Energy poorness gets a more and more relevant problem also in industrial countries. Is energy going to become a luxury item? Or are we going to achieve the necessary turnaround in time?

The so called Stern-Report on behalf of the British government underlined the need of a fundamental change in energy policy. There is not much time left.

And as I mentioned earlier, there is another problem, which hinders a fundamental change in energy production: The current situation of the energy market provides no competition. High prices and a lot of obstacles for network-access close the market and make the entrance of new energy suppliers difficult, also for renewables. Nevertheless ownership unbundling which divides the energy supply side from the networks is more and more in sight. Neutral networks will be a central issue for establishing a new, sustainable energy system which satisfied ecologic and consumer challenges.

2 Potentials of renewable energy: Options and problems

We already possess the knowledge necessary to generate renewable energy on a decentralized basis precisely in the areas where the energy is used. In industrial countries the technology is available to produce household electricity through photovoltaic devices or the conversion of biogas into electricity. Current technologies with great potential include the use of heat exchange by tapping geothermal energy or solar thermal processes. Modern technology can also be incorporated into the development of new products. Renewable energy can be integrated into product-specific energy production. Nowadays we already have solar-powered calculators, computer keyboards and electric bicycles.

But there are some limitations of use of renewable energy.

In spite of the huge possibilities to use renewable resources, the current situation shows structural defects with the consequence that profitability is not always given in local energy production and the potential of green energy is not depleted. For Example:

- In the area of wind power we find sub-optimal allocation in Europe. Instead of establishing expensive national off shore wind parks in the North Sea, there a lot of windy locations on shore in many European countries, where the production of electricity can be realised at lower costs and with proved technology. National frontiers have to overcome in sense of cost effective energy production. A transborder levelling is necessary.
- Otherwise does the production of green power by biomass lead to a rivalry of use: transport versus heat or electricity production. Increasing prices will be a consequence. Beside of that we are confronted with a new problem: The import for example of biofuels from Brazil can lead to new dependence and sets also a question mark on the security of supply by using imported renewables from other continents.
- Green energy by hydro power shows also unwished effects: The imports of hydro power from Austria for example lead to the effect that Austria has to buy “grey” electricity from nuclear power plants to cover its own demand.
- Despite of many incentives of the market solar power is not yet economically feasible. Prices have rose up to now. One reason for that was the strong promotion which effected a great demand and lead to a bottle neck at the beginning of the production chain. The promotion subsidized the enormous profits of the producers of the raw material. Thus a more balanced proportion of promotion and research is essential. Strengthened research is also important because the reserve of raw material for solar cells like indium and tellurium is limited. Beside of the solar industry the raw material is asked for the mobile and flat screen production. As well increasing prices are the consequence. Recycling, improved process engineering and substitute material have to be developed.

Nevertheless an increase of the demand is necessary.

For example, the supply of local power generation is not implemented in such an extension as it could be. In the building industry solar architecture is not yet widespread. For example public buildings should use solar power systems in sense of a role model. On the other hand up to ten million family houses just in Germany could provide with ten million micro heat and power plants on base of bio gas or vegetable oil, if the houses are built in an energy efficient manner – otherwise this will lead to the mentioned rivalry of use. This is a big challenge and should be target. For the implementation of this efficient heat generation an adequate infrastructure has to be built up.

One hurdle, among others, is the lack of consumer information. Consumers need information and advice about specific product solutions. In addition, there is a need for qualified engineers, architects and craftsmen, who are familiar with the technical possibilities of renewable energy and can put them to use on a regular basis. In 2005 for instance the energy saving consultants of the German consumer associations advised 75.000 households in the field of energy efficiency and renewable energies like solar heating, heat pumps and reduction of CO2-emissions.

3 Making the turnaround happen

In brief: The availability of energy is of fundamental importance for public welfare and the well-being of consumers worldwide, and there is a particular need in developing countries. The before mentioned advantages of renewable energy must be recognised and put to use now, in order to improve quality of life and preserve the environment for future generations. We have to convince the consumers that a sustainable turnaround in energy usage is an absolute necessity and possible, too. We must pursue the goal of preserving resources, reducing greenhouse gases, reducing risks to people and the environment and guaranteeing a supply of energy – at the most reasonable cost possible. Renewable resources must get a high priority in the daily choice of the consumers – whether using solar, wind or water power, geothermal or atmospheric heat – that do not put a strain on the environment. Increased energy efficiency is an additional essential prerequisite for bringing about a turnaround in the way energy is used. The consumers must and can utilize untapped potential to increase the efficient use of energy.

4 A new role for consumers

This energy turnaround requires that renewable energy technologies gain a foothold in the market. An increasing output of energy and the creation of new applications through technological development are also important contributing factors, along with sufficient financial resources. Ultimately, it is only possible to affect a turnaround with the help of consumers. Until now political strategies have not fully recognized the role of consumers, and instead the products on the market have been the main objects of attention. In the end, renewable energies must find acceptance among consumers - in demand and in use. An increase in demand is an impetus for setting the right course for innovation and implementing it successfully on the market. Consumer demand can make a beneficial innovation an economic success.

A sustainable technology based energy system is asked in which the consumer of energy is investor of energy technology. For that capital is required for the development of efficiency technology and the implementation of renewable energies. This includes also advanced accumulator technology – as a long term alternative to the grid based supply system.

Consumers are currently stuck in a passive role within traditional energy supply processes. A new attitude must be developed. The increased use of renewable energy requires active consumers.

The potential of renewable energy and its various applications must be actively integrated into the daily life of consumers. Neighbourly cooperation will be required in order to provide a region with decentralized heat and electricity by using biomass or solar energy.

This automatically changes the position of the consumer. Consumers then become energy producers, which in turn creates new opportunities for the realisation of profits.

5 Requirements

In conclusion, I would like to formulate some requirements from the consumer standpoint:

- Administrative barriers for the use of renewable energies must be prevented. At the same time, the scope for legal regulations, e.g. for the use of solar technologies in construction, should be taken advantage of.
- Demanding goals (e.g. quotas) for the use of renewable energies need to be set at national and European level. As well competition in energy market and in future for renewable energies is necessary on national and on European level.
- Joint ventures between researchers and businesses are required in order to implement the existing possibilities of renewable energy usage and in order to further advance development. The focus in this case must be on user-friendliness and cost-cutting.
- Political strategies should enable the consumer to demand renewable energies. An active consumer policy is required. Information deficits have to be reduced by the provision of free information and advice by a neutral party. A stronger awareness of the possibilities and advantages of renewable energies has to be created.
- In the implementation of proper policies, attention needs to be paid to the lowest sustainable energy prices and to universal access to energy supplies. There needs to be an equitable distribution of costs between domestic and industrial consumers and special measures to protect the energy-poor.
- Many small solutions are required in order to ensure basic power supply. For this purpose, small loans for example for building cooperatives must be made available to facilitate the acquisition of technology for the decentralized generation of renewable energies.
- To support the consumers purchase decisions product information and advice is important.
- The increasing energy demand of developing and emerging nations offer a unique chance for green power. These options have to use by the political framework.
- To achieve a sustainable energy system no more billiards via monopoly profits as consequence of a closed market should flow in the old energy system. It’s also the consumers’ choice to choose the right, the green(er) supplier.

Thank you for your attention!

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Green Power: The role of the consumers

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Energy-poor:

High energy prices make energy-poor a more and more relevant problem also in industrial countries

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Renewable energy and energy efficiency Options:

- Major independence of conventional, fossil resources and the electricity industry
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Renewable energy - Problems

Wind power: expensive off-shore versus lower cost on-shore locations

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