An Action Plan for Implementation and a Transition with Biomass in the NETHERLANDS

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ABSTRACT:
On the short term, bioenergy is considered the main resource to contribute to the Renewable Energy goals for 2010, as set by European Directives and the national policy. However implementation is hindered by a lot of barriers and an action plan is being carried out to remove these barriers and enable an accelerated implementation by more than doubling the present contribution. On the long term biomass is seen, as a sustainable resource for products, chemistry, fuels and power and a major transition is required. Together with market parties a vision is developed where an ambitious target of 30% energy supply from biomass in 2040 is set. In the years-ahead transition paths and experiments will be developed by these market parties to explore these innovative new ways of energy supply. This paper describes both the action plan and the biomass transition in the Netherlands.

1. ACTION PLAN BIOMASS

If the Netherlands would ? achieve its domestic targets in 2010 of 9% electricity consumption and 5% renewable energy with domestic production a drastic acceleration of implementation of projects will be required. The policy and strategy to achieve the targets is described earlier; see [1]. In order to speed up the implementation, the Ministry of Economic Affairs has initiated a project to develop an Action Plan for Biomass Implementation. An analysis has shown that in order to achieve more national production with biomass all market segments: Waste incineration, cofiring in coal fired power plants and small scale combined heat and power have to contribute. A 2 to 3 fold increase of domestic production will be achieved, see Table 1.

A Bio-energy Realisation Forum (BERK) was installed by the Minister in February 2004, where government and main market players and NGO's will meet on a regular basis to monitor the progress of the action plan, identify problems and initiate new actions and solve problems. Working groups will support the BERK, dealing with the problem areas. The following working groups are active:

1. **Financial**: to evaluate the financial support system and optimise the support system and find a balance between profit in the market and tax burden by the government
2. **Legislation/Permission**: to evaluate the procedures for permissions and legislation. Optimise information flows.
3. **Biomass Availability**: Realise a clear view on national and international availability and sustainability criteria
4. **Technology**: Identify best technologies, at low risk.
5. **Communication**: A standard message on bio-energy to local governments and consumers.
6. **Level Playing Field**: In a liberalised market Waste and biomass will flow to the economic most profitable location in Europe.

The Biomass Action Plan will be concluded by the end of 2005 and have an effect on the implementation up till 2010.

PJ	*2002*	*2003*	*2010*
Waste Incineration	12.3	13.0	20
Co-firing	9.7	6.7	34
CHP biomass combustion	9.0	9.0	15 - 25
Anaerobic Digestion	5.4	5.4	6 - 8
Transport Fuels	0	0	8 - 10
TOTAL	**36.4**	**34.1**	**83 -97**

Table 1: Bioenergy in the Netherlands; Targets for 2010

2. FINANCIAL SUPPORT.

Since the introduction in 1996, the energy tax has been increased substantially for small consumers to a level of about 6 Eurocents/kWhe.

The favorable fiscal support for renewable electricity through an ecotax exemption on final electricity consumption and a production subsidy from the ecotax revenues, in combination with the opening of the retail market for renewable electricity led to a dramatic increase of the demand as of July 2001. As domestic supply was limited in the short run the majority of the demand growth was met with by importing renewable electricity.
The demand for green electricity increased from 800.000 to 1.400.000 consumers, with a demand of 6000 GWh in 2003, of which about 25% was produced domestically

These imports, however, created several adverse effects, which recently led to changes in the renewable electricity policy framework. The surge of renewable electricity imports primarily led to considerable tax revenue losses for the Dutch government. Furthermore, the fiscal incentives provided by the ecotax regulations in the Netherlands

hardly stimulated additional capacity investments abroad. As imports principally came from existing installations, the added value of the policy was very questionable**.**
Thus the ecotax regulations no longer provided an effective long-term incentive for investment in renewable generating capacity in the Netherlands.

In November 2002 the anticipated policy changes came in the form of a proposal for an amendment to the Electricity Law of 1998, called 'environmental quality of electricity production' (MEP). The MEP aims to increase certainty for investors and improve the cost effectiveness of renewable electricity support. The MEP provides operational support through a combination of feed-in tariffs and a reduced ecotax exemption. The feed-in tariffs are financed by means of an annual levy on electricity connections. They are the primary means to increasing certainty for investors.?? The reduction of the ecotax exemption seeks to reduce the level of imports. This will make national tax money available for production support and the dynamics of the renewable electricity market and associated green certificate trade will be maintained.

Under the MEP the total level of operating support is determined by the sum of the MEP feed-in tariff and the value ecotax exemption. However, the law does contain a maximum feed-in tariff, which is set at 7 • ct/kWh (Article 72p). The government guarantees this total level of support for a period of 10 years after entering into operation. The table 2 gives an overview of the MEP feed-in tariffs, the ecotax exemption, and thus the total level of operating support per renewable electricity category.

This MEP support took effect as from July 1st 2003. In September 2003 it was announced that the ecotax reduction for green electricity would be reduced over the next years.

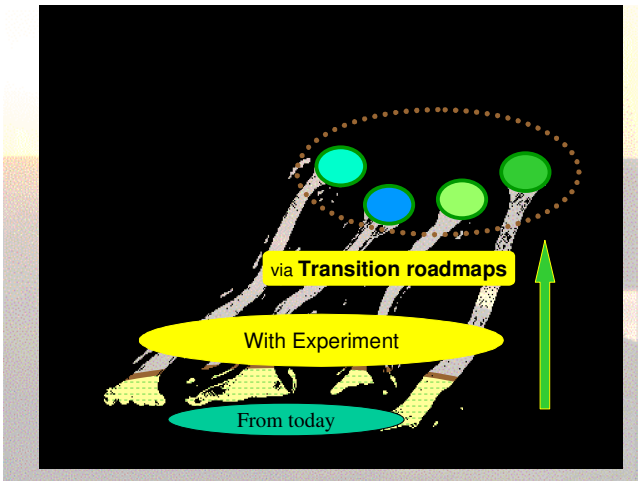
Change after to • ct/kWh	**Juli 2003**	**Jan 2004**	**Juli 2004**	**Jan 2005**
Ecotax reduction Green electricity	2.9	2.9	1.5	0
Biomass > 50MW (3yr)	4.8	4.0	5.5	7.0
Mixed waste/biomass	2.9	2.9	2.9	2.9
Biomass <50 MW	6.8	6.7	8.2	9.7
Wind at sea/solar	6.8	6.7	8.2	9.7
Wind at land	4.9	4.9	6.4	7.8

Table 2 Feed-in tariffs support Renewable Electricity after July 2003 (• ct/kWh)

3. Biomass transition

The Netherlands have committed to change the existing fossil based energy infrastructure into an infrastructure with strong requirements with respect to sustainability and renewability of the fuels and energy carriers. Transition management has been introduced to realise this process. The Biomass Transition project was initiated by the Ministry of Economic Affairs and forms part of the transition to a sustainable energy supply. Although the ministry initiated the project, it is a close co-operation between government, industry, NGO' s and research institutes. The project aims to start a process of social change that produces the large-scale and sustainable application of biomass for energy generation, transport fuels and products. In the Transition approach first a long term collaborative vision is defined and afterwards the transition paths leading toward that vision and the experiments needed to solve the bottlenecks on that path.

Fig. 1. The Transition Management Approach



The Biomass Transition project started in 2002 and in 2003 a large enthusiastic group of committed individuals and organizations wishing to assist in getting the transition off the ground were established. We started to call this the Dutch biomass community.

3.1. Biomass Vision

The basis for this project lies in the widely supported vision of biomass in the future, which provides the direction and support for all biomass activities. The Biomass Transition vision has been defined in a dialogue with all those involved, and is entitled Biomass 2040: the green driving force behind a knowledge economy and sustainability. This vision includes an ambition and a set of norms/standards. The ambition is that in 2040 biomass will provide 30% of the energy supply and 20-45% of the raw materials for the chemical sector. These developments should also contribute to the knowledge economy, where the focus is on high-grade technological developments. In the long term biomass applications should be measured on an open market against competing sustainable fossil applications or with other non-fossil energy systems. Here the government can compensate for extra

social or environmental benefits. Within the biomass applications there will also be competition on the open market for the available biomass.

3.2 Sustainable Biomass Applications

The ecological, social and economic sustainability conditions form an important framework for the large-scale use of biomass. For economic sustainability biomass applications have to be able to survive in an open market The main factors for environmental sustainability are a considerable reduction in greenhouse gas emissions across the entire application chain, and non-CO_2 emissions will have to comply with strict regulations. Biomass for energy or raw materials should never jeopardise the food supply chain – this is particularly important for biomass from developing countries. This is the main social constraint.

3.3 Transition Paths

The biomass community has been asked to develop transition paths that describe possible routes that could contribute to the long term vision. This has resulted in 14 extensive proposals being submitted by various consortia in October 2003. These cover a wide range of subjects and also the whole value chain of biomass application.

The Biomass Transition project group has advised to include six of these transition paths in Energy Transition, and to activate these paths via a number of experiments. Four other paths are considered very important for the transition of biomass, but the specific implementation in the coming years is not foreseen, more technological research is needed before market introduction is possible. These paths should be included in the next study, under the framework of the long-term EOS Energy Research Programme (ERS). Four paths will not be followed up by Biomass Transition, partially because they currently provide a contribution to energy transition and because other initiatives can also be supported, e.g. the Biomass Action Plan.

The six paths that have been assessed as positive and where market-oriented experiments can be expected, concern:

- Pyrolysis oil. Converting biomass into an oil using the pyrolysis process, whereby the biomass (as semi-manufactured product) is easier to transport and can be better applied as raw material for energy generation and products;
- Ethanol from biomass. Producing ethanol from biomass and using bio-ethanol as transport fuel, as raw material for the chemical industry and as input for fuel cells;
- Bioplastics. Introducing biomass as a replacement for plastics produced from fossil energy carriers. The energy efficiency improvements of the production, marketing, application and recycling of polymers (plastics) from biomass are thereby central terms;
- HTU chain. Converting the biomass, primarily watery and polluted flows, into HTU® diesel via hydrothermal upgrading and hydroprocessing, to replace existing fossil-based diesel fuels;
- Biomass and coal. Introducing biomass as partial replacement for fossil energy carriers in ‘new generation’ coal-based electricity plants. An important objective is to improve the energy efficiency by developing high-return conversion techniques to convert biomass into electricity (including auxiliary and co-incineration), which also requires large-scale imports of biomass;
- Bio saline or saltwater agriculture. Producing biomass without conflicting with food production, by cultivating salt-loving and salt-tolerant plants in areas that are no longer fertile due to silting and bad water management, which can thus become productive once again.

In addition to the above, the project group also recommends that the following four transition paths be included inthe Energy Research Program (EOS). The uncertainties and risks for these paths are currently considered to be greater than for the aforementioned paths that have been selected for experiments. These transition paths are:

- BioSyngas. Large-scale and inexpensive production of synthetic gas (hydrogen and carbon monoxide) from biomass, possibly followed by the production of Fisher Tropsch (FT) diesel, methanol, hydrogen, SNG (Synthetic Natural Gas) and chemical raw materials, etc.;
- Bio refining. Introducing biomass as a replacement for fossil energy carriers, by generating and separating biomass flows into various, application-specific components, plus further processing into energy, raw materials, products and materials.
- Aquatic biomass. Introducing aquatic biomass (algae, seaweed, water plants) in the production of fuels, raw materials (chemicals) and high-quality content materials (fatty acids, colourings);
- Hydrogen from biomass. Introducing hydrogen from biomass as a replacement for fossil energy carriers, by developing biomass gasification techniques, product generation techniques and usage opportunities for synthetic gases from biomass;

During 2004 the outset of the transition paths will be put into practice through a series of experiments. These experiments take the first steps along these paths. The proposals are extremely varied and on a large scale, not just with a technological focus, but also including other elements such as social, organisational, ecological and economic aspects. These non-technical elements are essential to move towards a change in the energy system.

3.4. Governmental Policy

A good collaboration between the various government bodies is crucial for the success of the Biomass Transition. There are many strategies for, and with, biomass but they are usually given another title, e.g. energy policy, waste policy, fertiliser policy, innovation policy etc. The latest example concerns the implementation of the European biofuel directive that is currently being finalised by the Ministry of Housing, Spatial Planning, and the Environment (VROM The transition approach is used in the implementation of this directive. The long-term possibilities and the transition paths set the framework for short-term measures.

3.5. Energy Research

Considering the long period over which the transition is expected to take place, there is a clear relationship between research and development and the Transition. Almost all the transition paths include a clear research component. The project group therefore recommends that the following subjects be included in the ERS:

- Bio refinery: separating and converting raw biomass;
- Gasification technologies: converting biomass into synthetic gas;
- Technologies concerning the auxiliary and co-incineration of biomass on coal-fired electricity generation plants;
- Biomass production and extraction, primarily biosaline agriculture and algae cultivation.

There are also relations between the Biomass Transition and non-energy research programs as catalysis and separation technology.

3.6 Evaluation

The Biomass Transition project is really a policy experiment – the motto from the start has been 'learning by doing and doing by learning'. What lessons can be learned from the first years? Firstly, that the approach taken has generated a great deal of enthusiasm among those involved. Many found the collaboration between the various organisations and the coupling between long-term and short-term objectives to be inspiring. Probable the strengthening of the network and better understanding of the various organisations is at the moment the most valuable result of the project. In addition, the process has been set up successfully, often under extreme time pressure. The dynamic approach chosen did not always allow the criteria and procedures to be predefined as. For example, it was not always clear exactly how a vision or transition path would progress and on the other hand how it would be evaluated. This resulted in a certain amount of unpredictability for everyone participating in the process. The bonus was that this openness provided the opportunity to achieve maximum results and minimised generally predictable rituals.

3.7 Recommendations for follow up

Finally, the Biomass Transition project group recommends that this course be continued next year, and that it should be more ambitious. Maintain the current biomass community network and use it as a transition arena

- Priority should be given to market implementation of successful experiments.
- Increase the industrial involvement for transition – this is necessary to ensure that good experiments (if successful) can immediately be followed up or expanded;
- Develop the sustainability conditions further and ensure that they can be specifically applied to the transition paths and experiments. Ratify these agreements between the Biomass Transition participants.

These recommendations provide a considerable challenge for the biomass community in 2004, as they enthusiastically work towards the realisation of the Biomass Transition Vision.

4. CONCLUSION

In general it can be stated that Biomass is seen a key factor to achieve a sustainable energy supply. Both on the short term and the long term its resources need to be exploited. On the short term actions are needed to create an interesting market for investors in projects. On the long term industries and researchers are needed to exploit the biomass resources. The government facilitates the proces and guides the proces towards increasing sustainability. At present the mind is set, the direction is clear and the implementation of projects and experiments is foreseen for the next years.

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