Work package 2- Historical and recent attitude of stakeholders

Case 9:
Pannonpower biomass conversion

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*C*ultural Influences on *R*enewable *E*nergy *A*cceptance and *T*ools for the development of communication strategies to promot*E* ACCEPTANCE among key actor groups

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1. Introduction

This case study describes the fuel-switch project of Pécs Power Plant (Southwest Hungary). It focuses on the biomass part of the project, especially on the coordination and communication of Pannonpower Rt. with the different groups and delegates of stakeholders. This research is based on factual technical documents of the project (for example: Project Information Document, Project Design Document and Baseline Study for Joint Implementation under Article 6 of the Kyoto Protocol, etc.), and on interviews with representatives of Pannonpower Rt. and other stakeholders, as well.

2. Country overview: Energy from biomass in the Hungarian context

The Hungarian electricity market is a hybrid of a regulated and competitive market. On the one hand there is a regulated market with 'captive' consumers, who are not yet entitled to choose their suppliers, as well as consumers who are entitled but not yet decided to leave the regulated market (the 'public utility' market segment). On the other hand, there is a fully liberalised free market segment with entitled consumers and numerous new traders that serve them. This market model has been operating since January 1, 2003, and the duality will last till 2007, when - in line with the EU Electricity Directive 2003/54/EC - all consumers - including households - will be eligible to purchase electricity in the competitive market (Figure 2.1) (HEO, 2006).

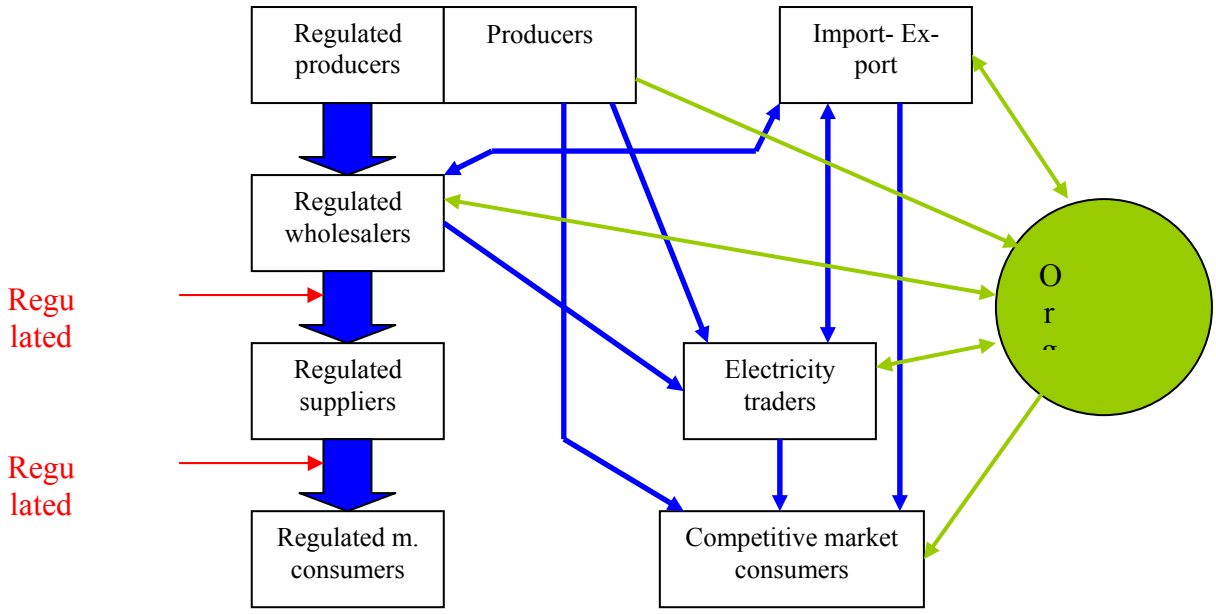

Figure 2.1 *The Hungarian electricity market*
Note: Green arrows represent possible connections that are not functional at present.

In Hungary the per capita energy consumption (2004: 1720 toe) is relatively low compared with the average of EU25 (2004: 2488 toe). The country is heavily dependent on energy import, especially on crude oil and natural gas import. The net import of primary energy was in 2004 15,914 toe, while the total production of primary energy was 10,132 toe (Eurostat 2006). The reason is that Hungary does not have enough good quality, clean and cheep energy resources. The most important electricity producer in Hungary is the Nuclear Power Plant in Paks, it ensures about 40% of Hungary's electricity production. The extension of use of renewable energy sources is important not only because of environmental protection (reduction of greenhouse

gases and for example SO_2 emission) but it helps to reduce import dependency and thus raise the security of supply, as well. In Hungary, the share of renewable energy use sources is low, but increasing. The country has significant biomass and geothermal potential, but at present it just partly takes the advantages. The share of renewable energy of gross electricity consumption in 2005 was about 4%, so Hungary has already fulfilled her EU target of 3.6% for 2010 (Figure 2.2 and Figure 2.3) (MAVIR, 2006).

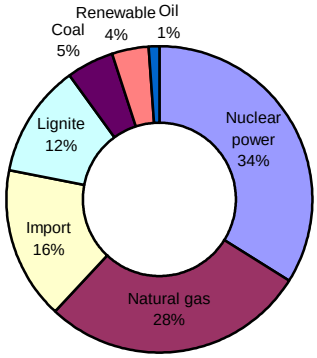

Figure 2.2 *Share of sources of gross electricity consumption*

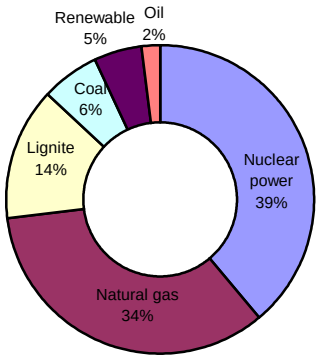

Figure 2.3 *Share of sources used for electricity production in Hungary*

Investment (and in some cases operating) costs in renewable plants are very high. Renewable energy sources cannot compete with other sources without support of the state, for example with investment subsidies or takeover obligation at preferential feed in tariff. Furthermore support from consumers and people is significant factor in go ahead decisions, as well. The spread of utilization of renewable energy sources is influenced not only by the geographical and economic conditions, but also by the attitude of the public. Most people of Hungary do not have sufficient information about renewable technologies and the effects of such plants. They are concerned about 'novelty'; it can cause uncertainty and opposition. According to a survey - made in the countryside area of Tiszazug (Ekéné Zamárdi and Baros, 2004) - 19% of people have never heard about renewable energy sources. The most known technologies are solar, wind, and hydro energy. Those people who know about renewable energy sources consider environmental protection the most important advantage, but some of them mentioned cheaper energy, local energy production and improvement of security of supply, as well. Only 11% think that a renewable investment does not generate any advantage for their settlement, but 32% think that it does not bring any advantages for themselves. Six percent of people are opposed to renewable investments, 37% of people would not offer any money for such developments, but 32% would contribute with taxes.

The geographical conditions of Hungary make the spread of producing energy from biomass promising. The greatest growth among renewables was experienced in biomass utilization; in 2004 it was tenfold compared to the previous year (HEO, 2004). Biomass used for energy purposes in Hungary includes firewood, energy crops, agricultural and forestry by-products and wastes. The most important users of bio-energy sources are: households (firewood), institutions (firewood, shredded wood), industrial, agricultural processing plants (by-products, firewood) and district heating (shredded wood, biogas).

Bio fuels (bio diesel, bio ethanol) are highly topical in Hungary, but the establishment of the technology is in its initial phase. Production of biogas is spreading as well. The wide-ranging use of wood for energy production is a very important way of biomass utilization in Hungary. Biomass utilisation from wood processing waste is expected to increase with investments in modern wood-fired boilers and small power plants. In Hungary, several fuel-switch projects

were carried out: Borsod Power Plant (Kazincbarcika), Pécs Power Plant, and Bakony Power Plant. These power plants use at present mainly shredded wood, but they are looking for other fuels, for example energy crops, wood residues.

The main difficulty of large-scale use of shredded wood to produce energy is that the population and chipboard producers are worried about the available quantity and price of wood. Forested areas accounted for only about 20% of the territory of Hungary in 2005 (RIAE, 2006), and it is being enlarged with subsidised forestation programs and tree plantations. In an average year in Hungary, about 12 million m^3 wood increment is produced, and about 9 million m^3 can be exploited because of sustainable sylviculture requirements (MET and HEO, 2004). More effective exploitation and collection of wood and better utilisation of other types of biomass can raise the amount of available wood. Compulsory takeover with at preferential feed in tariffs causes that power plants are supported while chipboard producers and population are not. This way the plants can pay more for the wood than other users, whereby causing tensions in the biomass input market. Firewood prices have doubled since the aforementioned coal boilers were converted to biomass.

Another difficulty is the special approach of Hungarian people to forests. The main function of forests is recreation and observing the living world, the utilitarian exploitation of forests is criticized. The emphasis is on assuring diversity. In addition, people consider the use of wood for energy production a kind of prodigal activity (Baros Z., 2004). According to a survey (Baros, 2003), biomass is not well known (only 40% of people knows about it), and knowledge on energy-forests is only at about 16% among the people asked.

Despite these problems, energy production from biomass is a significant possibility for Hungary to raise the share of renewable energy sources.

3. Summary: Pannonpower biomass project

The Pécs Power Plant (Pannonpower) provides the total district heat supply for the second largest district heating system in Hungary. Annual heat supply is about 2200 TJ, while annual electricity supply to the regional grid is about 550 GWh. The Plant had used high sulphur content coal from Mecsek for several decades (from 1962), therefore SO_2 concentration in the city many times exceeded the allowed limit. The environmental protection authority fined the plant heavily each year. To implement EU Directive 2001/80/EC (Large Combustion Plant Directive), the Ministerial Decree of KvVM 10/2003. (VII.11.) came into force in the summer of 2003. According to this decree, power plants (greater than thermal input capacity of 50 MW) have to comply with strict emission restrictions. Plants were offered a preparation period till the end of 2004, but faced closure if they were not going to comply afterwards.

In order to extend the operational time of the plant beyond 2005, the owners of Pannonpower Rt. decided to implement a complex fuel-switch and refurbishment project (PDD, 2003). At the same time, they decided to close down the last coalmine in the surrounding Mecsek Mountains.

4. STEP ONE: Possible futures

The Pannon Group includes a holding company, Pannonpower Rt and the following major subsidiaries: Pannonenergia Kft, Pannontrading Kft and Pannongreen Kft. Each of these subsidiaries had a central role in the project. Pannonpower Rt intended to continue to supply heat to the City and electricity to the grid. The biomass conversion project was realised in the framework of Joint Implementation under the Kyoto protocol. Primary decision-making authority for the project was vested in Pannonpower Rt, which is the project owner. Pannongreen Kft, the proposed owner and the operator of the biomass project, acted as the contracting party and owner

of any carbon emission reductions attributable to the project (Baseline Study, 2003). The other contracting party, the buyer of the CO_2 credits was the World Bank.

The following Table 4.1 shows the project alternatives, their advantages and disadvantages according to the Environmental Impact Assessment of the project (EIA, 2003).

Table 4.1 *Project alternatives*

	Advantages	Disadvantages
The project is not carried out	- No emission on site	- The electricity has to be produced elsewhere; overall net environmental load may be higher - On site production is needed for heat supply reasons
Local coal firing continued (boiler refurbishment, installation of a desulphurizer)	- May be connected to the currently operating system - The utilization of coal from the Mecsek Mountains may be ensured in the future - Current employment may be maintained	- High capital cost requirement - Expensive operation, competitive disadvantages - Deposition of wastes is to be solved (fly ash, solid ash, gypsum)
Boiler conversion to fluid bed combustion (coal firing)	- The utilization of coal from the Mecsek Mountains may be ensured in the future - Current employment may be maintained - Advanced technology - The emission of air pollutants significantly decreases, the standards may be met	- The project may be implemented at high costs - Not supported by the energy policy of the Government
Boiler conversion from coal to natural gas firing	- May be carried out with the conversion of the current boilers - Provides a flexible operation mode - The air quality control requirements can be fully met - The strip mines are abandoned, reclaimed and utilized - The deposition of fly ash and solid ash as sludge would cease, areas may be handed over for 'brown field' urban development	- The utilization of coal from the Mecsek Mountains ceases - The number of employees is reduced - The security of gas supply is to be increased
Combined cycle gas turbine	- Advanced, flexible technology providing competitiveness even in the long run - The air quality control requirements can be fully met - Strip mining and sludging can be terminated, the areas can be utilized after land reclamation	- Extremely expensive project in high market uncertainty - The utilization of coal from the Mecsek Mountains ceases - The number of employees is reduced to a very large extent - The security of gas supply is to be guaranteed to a large extent
Biomass and gas-firing	- Advanced, flexible technology providing competitiveness even in the long run - Some of the fuel comes from renewable sources (forests) of the region - The air quality control requirements can be fully met - The strip mines are abandoned, reclaimed and utilized - The deposition of fly ash and solid ash as sludge ends, areas may be handed over for 'brown field' urban development - The fuel supply provided from the region provides security	- The utilization of coal from the Mecsek Mountains ceases - The number of employees is reduced but to a lower extent - The security of gas supply is to be guaranteed - Regulatory risk of renewable electricity policy changes

PANNONPOWER Group and their financial investors-owners can be best characterized by the following set of motivations: They wanted to provide a highly secure, long-term heat supply, they desired to maximize electricity production flexibility in the light of the highly uncertain future market prices. They had limited ability and willingness to make large, risky investments, and preferred conservative investments with relatively certain returns. These resulted in a long decision process, with calculations, life-cycle analysis. (Baseline study, 2003)

At first Pannonpower planned the conversion of the three boilers from coal to gas firing. However, while they were waiting for the authorisation of the project, the conditions changed:

- The increasing policy significance of renewable energy sources brought the possibility of a support scheme of renewable electricity (including biomass based) very close to reality (eventually put into force at the end of 2002).
- Forestries contacted the power plant and offered their redundant fire wood.
- The project could be qualified as a Joint Implementation (JI) project[1] under the Kyoto Protocol.

Therefore the first conception was modified: The Project included the conversion of two pulverized coal CHP (combined heat and power) units to gas firing; conversion of one unit to biomass (woodchips) firing, and temporary suspension of the operation of one unit. The project also included the establishment of a biomass chipping, supply and storage system (Table 4.2) (PDD, 2003).

Table 4.2 *Fuel-switch and refurbishment project*

Unit	Present			Future		
	Electric capacity	Heat capacity	Combustion	Electric capacity	Heat capacity	Combustion
III	35 MW_{el}	114 MW_{th}	Local hard coal	35 MW_{el}	90 MW_{th}	Conventional natural gas
IV	35 MW_{el}	114 MW_{th}	Local hard coal	35 MW_{el}	65 MW_{th}	Conventional natural gas
V	60 MW_{el}	171 MW_{th}	Local hard coal	Temporary cease of operation		
VI	60 MW_{el}	171 MW_{th}	Local hard coal	49 MW_{el}	65 MW_{th}	Biomass firing

The decision about the project was made at the end of 2001, and implementation started at the beginning of summer of 2003. As a JI project, it was endorsed by the Ministry of Environment and Water in January 2003, and it was approved in June 2003. The planned deadline was 1st of October 2004, however, the trial period of installations ended successfully by 30 November 2004.

The total investments cost were about US$ 36.3 million. It included the biomass conversion of one of the boilers and some retrofit activities. Financing was provided by the project owner Pannonpower Rt./Pannonpower Holding Rt. and by a leading domestic bank through a long-term loan. The Prototype Carbon Fund (PCF) bought emission reduction credits whereby contributed to the project with US$ 1.3 million.

The most important environmental impact of the project was the reduction of CO_2 (Table 4.3) (PDD, 2003).

[1] Joint Implementation (JI): Mechanism provided by Article 6 of the Kyoto Protocol, whereby a country included in Annex I of the UNFCCC l may acquire Emission Reduction Units when it helps to finance projects that reduce net emissions in another industrialized (Annex I) country (including countries with economies in transition).

Table 4.3 *Estimated CO_2 reductions*

Period	Emission reductions
2005-2007	730,288
2008-2012	1,193,759
2013-2019	1,647,204
2005-2019	3,571,251

The project was supposed to generate revenues from the sale of heat and electricity and from the sale of CO_2 reduction credits as well. The sale of CO_2 emission reductions from 2008 through 2012 has been established in an emission reductions purchase agreement with the Prototype Carbon Fund (PCF). The purchase price is contracted at $4.20 per tonne of verified CO_2 Emission Reductions delivered to PCF. Significant economic benefits were expected in the forestry management, logging and transportation sectors because of new business opportunities and employment changes (PAD, 2004).

It has to be mentioned here that the project described above was the first phase of the whole fuel-switch development. Now in 2006, the second phase is in its initial phase. The plan is to start two more biomass-firing units. The fuel would not be fire wood, but energy crops, straw and herbaceous plants. The application for the permission has been already given to the authority. Preliminary examinations were carried out; according to them, it is possible to realize this second phase as well.

5. STEP TWO: What were the various expectations of the case?

The project had a lot of stakeholders who had very different approach to and expectations from the planned changes. Figure 5.1 shows the network of stakeholders of the project.

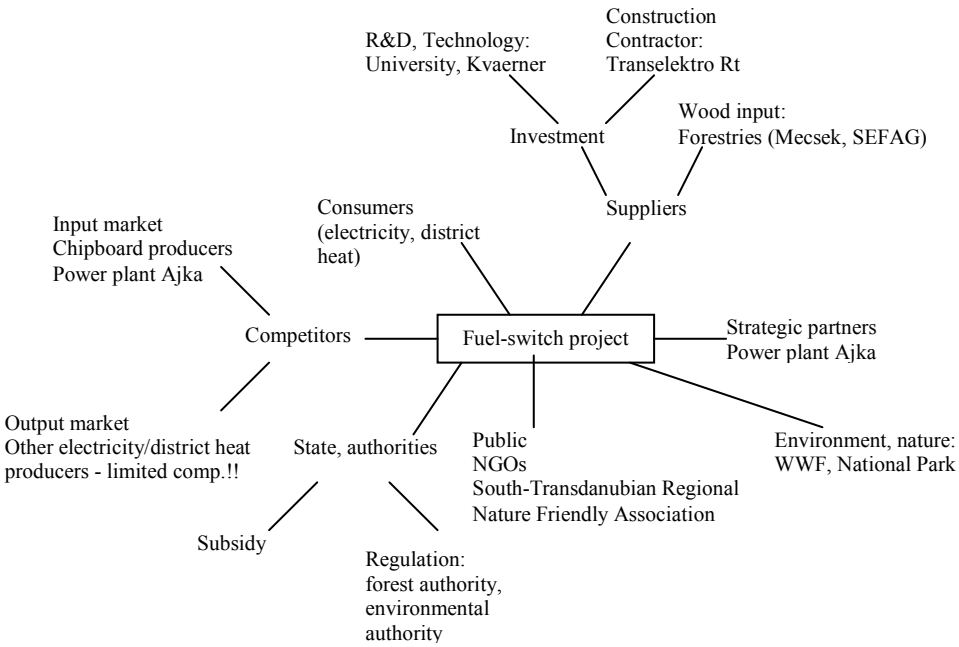

Figure 5.1 *Stakeholders of the fuel-switch project*

One of the most important consequences of the project was the change of the fuel suppliers of the power plant. The plant entered a (for it) new input market whereby generating conflicts. Use of firewood for large-scale energy production has caused radical changes among the actors of the wood market. The project began amidst sales problems of *forestries.* Forestries played a ma-

jor role in the start of the project. Beforehand, they could not sell their wood in Hungary and neither was export economically feasible. In this coincidence met the intentions of forestries and Pécs Power Plant. They intensively looked for ways of cooperation, and they were able to conclude agreements. Pannonpower purchases wood based on long term contracts, thus forestries could rely on predictable revenues. With the implementation of the project they could also count on the increasing price of fire wood elsewhere, due to the increasing demand.

In connection with the project, the two most significant forestries are Mecsek Forestry Co. Ltd. and SEFAG Forestry and Timber Industry Co. Both forestries are certificated by Forest Stewardship Council (FSC) as ones following sustainable cultivation practice. The power plant purchases wood from other sources as well. Foreign forestries, if they wish to deliver wood to Hungary by regulatory obligation have to be certified by FSC. Domestic wood-suppliers do not have this obligation.

Authorities require to keep the relevant rules and to meet the quantitative limits. The most important problem with the operation of authorities is that the lead-time is too long. The regional forestry authority (State Forest Service, regional office at Kaposvár) did not have any objection to the project. For them the most important was that forestries should submit acceptable annual and long-term cultivation plan and they have the required permissions. A representative of Pannonpower told that he had positive experience with authorities: they were helpful, they were willing to consult with the power plant.

For those firms, that use shredded wood for their production, for example *chipboard producers* (Falco Rt. and MOFA Rt.), the fuel-switch project of the power plant was disadvantageous. They expected to pay more for their input because of increasing wood prices. They were unsatisfied because the power plant was subsidised (compulsory takeover), and their products were not. They were concerned about increasing demand as well, they did not know if wood would be sufficient for both them and the power plant.

The *population* of the power plant's region had similar fears about price and quantity of available firewood. However, population was also worried about forests. People wished to preserve the forests, and they would like to see that forested areas are increasing. In general, they feared that demand of the biomass plant would lead to increased rate of cutting out of trees.

NGOs mostly considered the project beneficial for the environment; they emphasised the decreasing CO_2 and SO_2 emissions, and improving air quality in the neighbourhood. Large NGOs are well informed about forestry regulations, thus they were not heavily concerned about this question.

Prototype Carbon Fund is an important stakeholder of the project as well, due to the emission reductions purchase agreement, and the delivery risk of the emission reduction units PCF became exposed to. Carbon credit buyers usually prescribe numerous conditions of their purchase. PCF also required good sound business and environmental performance.

The construction was organised by a *principal contractor*, Transelektro Rt, a Hungarian manufacturer of turbines and builder of power plants. A Finnish company, called Kvaerner, provided the fluid bed combustion technology for the boiler to be converted.

Table 5.1 *Actors of the Pécs biomass conversion project*

Actor	Expectation	Speaking for 'publics'
Pannonpower Rt.	Producing renewable electricity, reduce greenhouse gas emissions and local pollution, and creating economic benefits as well	National biomass quota, Kyoto Protocol - spreading of clean energies, renewable energy sources
Authorities	Unconcerned, focus is on having relevant rules kept, plans	State, politicians - social interest
SEFAG, Mecsek Forestry	Positive: increasing of price of wood - long term, predictable revenues, the additional demand and revenues beneficially contribute to forest management	Protection of forests, nature protection - 'future generations', forest management
Falco, MOFA (Chipboard producers)	Negative: they are worried about the price and available quantity of wood	Wood processing industry, furniture industry
NGOs	Positive environmental impacts	Local population, environmental protection - 'future generations'
The World Bank Carbon Finance Unit - PCF	Decreasing of greenhouse gas emissions	Kyoto protocol, joint implementation
Transelektro Rt.	Profit from the construction works	Managers and owners of the company

In the first phase of the project, R&D was not so important as in the second phase. That is why Pannonpower started cooperation with *universities* of the neighbourhood, University of West-Hungary at Sopron and University of Pécs. The research topics address technical, social, environmental and logistical questions. Two of the most important issues are how to grow various energy plants and how to prepare and burn biomass fuel other than wood.

Two other power plants which implemented similar projects have to be mentioned among the alliances. They could share their experiences with Pannonpower Rt., and the three power plants could join with each other to have stronger lobby force. However, Pannonpower had to pay attention to the protection of its individual business interests. Due to the purchase obligation of the regional suppliers, these plants do not compete with their output; however, they might have some competition for the biomass input.

6. STEP THREE: Understanding 'participatory' decision-making: negotiating expectations

Pannonpower Rt. conducted a well-organized communication procedure (Communication Campaign, 2002). The company continuously informed the public about its development concepts since 2001 through regional TV, local and county press and public hearings held in nearby communities. Several meetings for a broad range of stakeholders were held in Pécs. The cooperation between Pannonpower Rt. and forestries was a significant point of the Communication Campaign. Tools of communication of the project are listed in Table 6.1.

Table 6.1 *Forms of participation*

Type	Organisers	Target groups	Purpose
Media campaign	Pannonpower, Forestries	Public Decision makers Agencies Adversaries	'Super positive' positioning of the project, demonstration of consensus, of power
Communication forums	Pannonpower, Forestries	Vocational organisations Decision makers	Create and demonstrate consensus
Approach shaping action (PR)	Pannonpower, Forestries	NGOs Public Adversaries	Wide social base, positive publicity in a cost-efficient way
Conference	Pannonpower, Forestries	Decision makers	Participation
Conference	WWF Hungary	Public	Information, against misbeliefs
Conference	FAGOSZ	Vocational organisations	Information, discussion
Creative event	Pannonpower	Local decision makers Media	Participation
Objects, brochures with the brand name	Pannonpower	Decision makers	Image building, modulating
CD ROM	Pannonpower	'VIP Public'	Information, Image building

The most important part of communication strategy of Pannonpower was three forums in 2003 where representatives of two regional and three national media were also present. The first meeting was a civil forum organised for local NGOs, pedagogues. Most important topics were local problems, noise pollution, road transport, problems of forests, available amount and price of firewood. There were no offensive questions, only constructive need for information. The meeting was successful (participants were satisfied) according to the evaluation of Ferling Press, the mediating communication company.

For the second meeting delegates were invited from NGOs, from the whole country (for example: WWF Hungary, Energy Club, Clean Air Action Group). The main topic was the strategic management of forests in Hungary. The participants were well prepared and creative. This meeting was very important; the issues that were raised and discussed had caused concerns widely, were hot and widely debated.

The third meeting was organised for relevant decision makers from the country. Among others, representatives of various authorities, four ministries and the local government were at present. The main purpose of this meeting was to make decision makers feel that they have indeed been involved into the project, that they can be informed about the project and that they can express their views and requirements ex ante. A site visit to the power plant and to the forests affected were also organised for them.

Pannonpower evaluated all forums very successful. They were expecting some problems, but there were no suggestions that would have taken the project to an alternative direction. However, there were some questions and problems raised, but these came in the right time and could still be solved. (For example: erecting an additional noise insulation wall). The most important message of the forums for Pannonpower was that the role of the energy forests and energy crops has to be increased, whereas the role of firewood decreased.

Other organisations also consider these forums very important and useful, but they say that there are problems which have not been solved. For example, according to representatives of Duna-

Dráva National Park, the deposit of ash or the lack of microelements because of taking out twigs and sprigs from the forests causes problems. It would have been worthwhile to analyse the turnover of microelements in the forests, but this analysis has not been carried out yet. Another example is that the State Forest Service claimed that forestries do not have enough capacity and infrastructure for cutting trees and transporting them. Out of the forums it emerged that the power plant had to invest in these fields. However, it has not taken place so far (August 2006).

Although Pannonpower and the forestries organised these meetings together, forestries feel that they were dominated by Pannonpower. According to SEFAG, these meetings were very useful in the beginning, but later they seemed to be a kind of advertising publicity for Pannonpower.

The nature protection risks of use of firewood were mainly addressed mostly by WWF Hungary. It organised a conference in Pécs about the risks of using biomass from forests. Participants were the delegates of the power plant, of forestries, of the State Secretariat for Nature and Environmental Protection, and of NGOs. The purpose was creating possibility for stakeholders to challenge the power plant. However, this conference was not successful enough, due to several reasons. People were lacking and in need of information, but they could not formulate their questions, because they only had fuzzy notions of forest management, environmental and nature protection issues. The forestries and the power plant always answered the 'routine answers' (for example: "the rate of clear-cutting is very low"), which did not calm people down. NGOs would have had the necessary skills, but they were not active participants; either they were not present on the meeting or they did not ask relevant questions.

With the beginning of the new project phase a new problem has arisen: the network of connections to fuel suppliers has to be built up. Farmers have to be convinced to produce energy plants instead of their accustomed regular plants. However, farmers fear to change for new unbeaten paths, especially that there is no market pressure on them for this. Pannonpower devised a strategy to handle this problem: a demonstration energy plantation was created on an area of 45 hectares. Its main purpose is to foster R&D and show the viability of energy plant cultivation. Thus, information can be collected and spread about these plants, and the uncertainty can be reduced.

7. STEP FOUR: From visions to actualities

Before realising the project, Pannonpower Rt assessed the risks of the project, and tried to mitigate it with different measures. The results are summarised in the Table 7.1 (PAD, 2004).

Table 7.1 *Risks and risk mitigation measures associated with the biomass conversion project*

Risks	Risk Mitigation Measures	Risk Rating with mitigation
Reputational Risks		
Environmental/ reputational risk	• The wood suppliers are both FSC and ISO 14001 certified. • Stakeholder consultations have been held re: wood supply chain as well as overall project, with positive results. • EIA has been performed to assess the production and ash disposal process.	Low or Negligible
Project Risks		
Fuel supply risk - wood	• Signed long-term wood supply contracts, covering over 90% of fuel needs, with the two major regional forestry companies. • The power plant has wood storage capacity for 24 days of production.	Low or Negligible
Electricity off-take price risk	• Nothing can be done except lobbying. (Obligatory off-take and expected premium tariff is in effect for sale of renewable electricity. The off-take price for renewable-based electricity is set periodically by Ministerial Decree, and is indexed to the Consumer Price Index through 2010. The precise size of this price support is expected to be also subject to availability of state funds in future.)	Substantial
Heat off-take risk	• PANNONPOWER has a long-term heat supply contract with the local district heat company until 2015; PANNONPOWER Group owns 49% of the district heating company. Heat demand could decrease, but the biomass project relies very little on heat supply for its viability.	Low or Negligible
Technology risk	• Well-known technology relying heavily on conversion of existing equipment to accommodate new fuel. Fluidized bed boiler for biomass is of low risk. • PANNONPOWER has operated these units as CHPs for more than 20 years and has been the dominant regional power supplier in that period. The major change here is from coal to biomass and to gas. Biomass operation should not be more complex than coal operation.	Low or Negligible
Financing risk	• Experienced project sponsor. • Project leverage is reasonable: PANNONPOWER contributes 27% of equity in the form of existing plant and is contracting debt from a leading domestic bank for the remaining 73%.	Low or Negligible
Carbon Asset Risks		
Kyoto Protocol Ratification risk	• PCF committed to pay for verified emission reduction units (ERUs) regardless of whether KP was going to be ratified. Without KP, the ERUs would be worth much less than the contracted PCF payments.	Modest
Baseline risk	• Grid mix could move toward gas more rapidly than assumed. If tracking data are available from the Hungarian Energy office (HEO), the ERUs will reflect the actual grid evolution. If HEO does not publish data, the default values will be used which could overstate the ERUs.	Low or Negligible
Regulatory risk	• Elimination or reduction of green price premium in future years could lead to reduced electricity production and consequently reduced ERUs.	Substantial

To manage the implementation of the project and to handle the risks above, Pannonpower devised a business organisation model, which worked very well. They created a Project Integration Board that consisted of experts (for example financial, legal, technical experts), and also a PR section.

The contract with the principal contractor of the construction (Transelektro Rt, a Hungarian manufacturer of turbines and other power plant parts) was signed at the beginning of March 2003. The three described forums were organised in February, April and August 2003. The construction and the trial period of installations ended successfully in November 2004. The Pannonpower Holding received the Hungarian innovation award in 2004 for 'energy production based on renewable energy sources'.

Only a few problems arose while realising the project: According to the permits, a wastewater treatment system had to be built, but it was not finished by the deadline. The utilization of ash suffered delay as well; therefore it must be stored on a place protected from precipitation. It is planned to be used in agriculture, but it is possible only after obtaining the relevant permits.

There are three categories of stakeholders:

- Those, who have always doubted the advantages and usefulness of the project. The forums were useful for them, their doubts decreased, but still they are not satisfied.
- Those, who had doubts, but could be fully convinced.
- There were stakeholders, who considered the project advantageous at the beginning and at the end as well.

No participant is disappointed because of the results. Follow up civil forums are organised nowadays, generally initiated by the public. The most important problem is clear cutting of trees. People think that there is a close connection between the use of wood for electricity processing and the 'larger than necessary' scale clear cutting as they perceive. They do not believe that it is a tool of forest management and sometimes it must be carried out on some places.

In the beginning of electricity production from biomass, there were some difficulties with one of the major the wood-suppliers, SEFAG. Their contracts were signed at the beginning of 2003, with a starting price of wood, and a formula with some variables so that the price could later also be calculated. They agreed that the starting price could be changed when the wood market or the economy of the country changes significantly. The first delivery of wood to the power plant took place in May 2004. Since then, mainly due to the increased demand that new biomass power plants pose, the price of wood in the market has increased significantly. Therefore, SEFAG wanted to negotiate the alteration of the contracted price of wood, but Pannonpower was disinclined to discuss. In order to achieve the price alteration, SEFAG sued Pannonpower Rt., but SEFAG has lost the case. In the summer of 2006, negotiations began about the price, which show signs that SEFAG and Pannonpower may come to an agreement.

According to several stakeholders, a significant problem of green energy production is now the origin of wood. The power plant promised to control the origin of the wood, but it is not possible to do it completely. Wood from private forests can be transported into the plant, some claim sometimes stolen wood as well. Stealing of wood became more frequent, and some people associate it with the high demand of the power plant. The other point is the question of protected forests. In Hungary the law allows cutting trees from protected forests, but it cannot be fully controlled either.

Other difficulties emerged from storage and transport of the fuel. The power plant need dry wood, so wood must be stored for a relatively long time to get it dried on a place protected from precipitation before transporting to the plant. It must also be guarded to avoid stealing. Besides, generally it must be transported to a significant distance.

Many stakeholders hold that one biomass unit at Pécs is enough, and they are opposed to another one. They say that the area around the power plant cannot supply more biomass units. They are distrustful; they do not believe that energy plants can really be used as fuel. Some of them mentioned that it is not a good strategy to develop few big plants and transport the fuel and the power/heat. They consider the decentralisation of electricity production a better solution.

8. Lessons learned

The biomass project of Pannonpower was on the one hand a 'routine innovation', because there were not challenging new technologies involved, and the product is basically the same as was before (electricity and district heat). However, on the other hand it can be considered as a niche innovation, because an important attribute of the product has changed: it became 'green'.

The fuel-switch project of Pannonpower can be considered as a very successful project, not only from environmental and economic aspects, but also from social aspect. The reasons for success were that the company had a well-organised Communication Campaign, and a well-organised change-management. Still there are some important lessons.

Most effective way of communication was meetings. The bigger is a project, the more targeted forums have to be organised. The communication has to be continuous, between meetings the project manager has to inform stakeholders about important developments and events.

Organisers have to pay attention to the place and time of meetings. They are most advantageous when stakeholders can put forward their suggestions, ideas and problems at a time when these can still be sold with fewer or less challenging difficulties. It is important to handle problems quickly, otherwise they can spread among stakeholders, generate misbelieves and conflicts can escalate. The best case is when the project manager can recognize the problem before the stakeholders do, and the manager can find a solution before the problem gets public. Organisers have to prevent or correct misunderstandings, dispel misbelieves. It is helpful if the project manager communicates with stakeholders, but some stakeholders should get in touch with each other, as well.

The project manager has to listen to all stakeholders, but it is important, that he does not try to follow all their suggestions. He has to define, which opinions of which actors he has to take into consideration. Competence, expertise and experiences of stakeholders play an important role in this question. An example is the case of clear cutting. It is not possible to put an end to clear cutting because of the opinion of people. The solution in such cases is more and more information, communication, and if it is possible, demonstration with examples, pictures.

For Pannonpower local people were the hardest to handle. They have a notion of forests, which is not compatible with their conception of firewood. This way of thinking cannot be changed easily. People need time to revise their 'theories'. The problems of the second phase of the biomass project seem similar. Farmers should have to change their centuries old accustomed plants (for example wheat, corn) to new energy plants, which they have never grown yet. To solve such problems the project manager has to be patient, has to give as much information and demonstration as they can, and they have to support practice switching of stakeholders. It must be done delineating the economic and social benefits of their project while addressing and mitigating the disadvantageous impacts at the same time.

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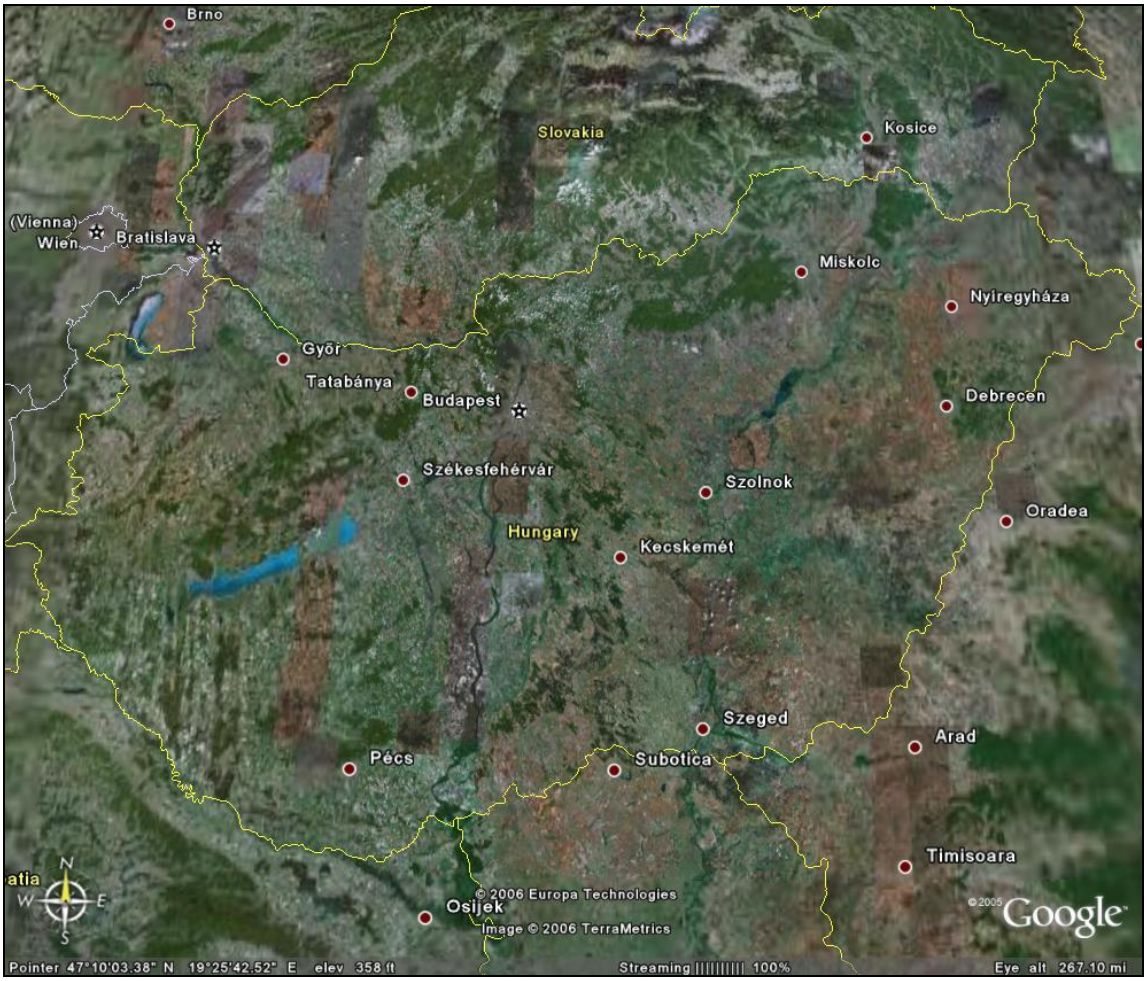
Appendix A Satellite picture of Hungary, with Pécs indicated in the South



Source: Google Earth.