Fossil-fuel conversion and improved energy efficiency made quick, affordable and reliable in the Baltic states

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1. SYNOPSIS

Energy Efficiency can be improved and Renewable energy sources more utilised in the Baltic states, if support could take local skills and conditions more into account.

2 ABSTRACT

Countries with markets in transition in Eastern Europe have largely been perceived as developing countries which are in need of foreign aid. Assistance has been tailored accordingly, with less regard of existing local skills. A skill which might be less familiar with market economy functions but have a good professional knowledge. The result seems to have been to much use of western experts and western hardware and less development of domestic markets to pull the changes. "Bankable" projects have been given priority and less interest put in activities to make projects affordable for the users. The Swedish experience, however, shows that an active handling of projects can foster markets for renewable energy and energy efficiency. Such markets are forming a ground for Joint Implementation and tradeable emission rights which will be forceful instruments in the future work for a sustainable energy system.

3. PERCEPTIONS OF THE THE REALITY

The transition of economies in eastern Europe is not easily understood. In most respects there is a lack of theory and empirical data to explain and calculate the changes. The economies are changing from being planned to being market based. They change from being ruled from one remote centre to being monitored from democratically governed regional and local authorities. When this happens there is a need for assistance which is readily provided from the western world. A lot of doubts have, however, been raised concerning the advice because of the overall lack in experience from such a swift transition. It needs to be recalled that the growth of market economies in the west came slowly out of the agriculturally dominated societies having a relatively well working environmental balance (Satre Åhlander, 1994).

Naturally, the perception of the reality governs the activities and the suggestions of all parties engaged in the improvement of these economies. The change towards a market economy is not necessarily a natural one. The "blueprints" for the transition are mostly based on an idealistic version of market economy functions either to be provided at short notice (by chock treatment) or to be used as benchmarks for the cures to be used. It is however more likely that all changes will be gradual and more evolutionary than revolutionary (Gligorov, 1993) since the circumstances in the countries concerned are very different from ours. An indicator, showing the need for transformation at a pace and the necessity for training, is the fact the many eastern european languages lack the words for simple financial transactions. The Russian language instead uses words related to power and hierarchy (Hedlund, 1993).

The institutions to assist the development (such as the multinational banks) have normally been set up and been working in somewhat different circumstances. Much knowledge has been gained in dealing with developing countries in the traditional sense (IBRD, 1993). The eastern Europe countries are, however, not developing countries. They have a high proportion of technically very well trained staff on all levels and a functioning, though worn down, infrastructure.

Technology transfer is another issue often mentioned, beside the market economy institutions, as a key to success. The European Union is setting up different agencies and undertaking several projects aiming at dissemination and transfer of technology. When acting on the field many of these are arguing a use of technologies which is overshooting the actual situations by far. Studies of technology transfer shows that such projects have to be carefully crafted to the prevailing situation (Martinot, 1994). Studies also from developing countries indicate that more

emphasis should be put in enhancing the demand for renewables rather than in token changes in institutional framework (SEI, Newsletter Vol 8, No1)

4. OBSTACLES IN PRESENT HANDLING

The multilateral institutions have been criticised for bureaucracy and for being slow in their operations, much because of the limitations they have in their organisation and routines (Sigurdsson, 1995). There seem to be three major obstacles in the process of the institutions in getting more energy efficiency and more use of renewable fuels on the market in countries with markets in transition.

* Administration; The administration of loans and support from multinational organisations have to be simplified not to burden the lending institution unnecessarily. Most often the institutions channels the money through local banks which have to add their riskmargins. The resulting rate of return will then be relatively high.

* Project assessment and definition; The lending institutions have difficulties in defining the projects or portfolio of projects in terms valid to their own risk assessment. Most often an intermediary consultant, working out of conditions similar to those of the institution, is hired to make feasibility studies and tender documents. The result can be projects and/or procedures which are too standardised and not relevant to the local situation.

* Risk level; The associated risk is often treated by risk sharing methods. More than one institution is called in to share financing of the projects to limit the risk exposure of each party involved. The result can be lengthy procedures to put a financing package together and still leave a project with a high risk.

To all these problems a closer cooperation between the multinational institutions and the operator (partner country), working closely to the project, could be a solution. The administration could be simplified by use of existing structures in the partner country. The project assessment should then use a partner consultant from the partner country to serve the receiving project and act as facilitator. The risk level would thereby be treated actively to be lowered.

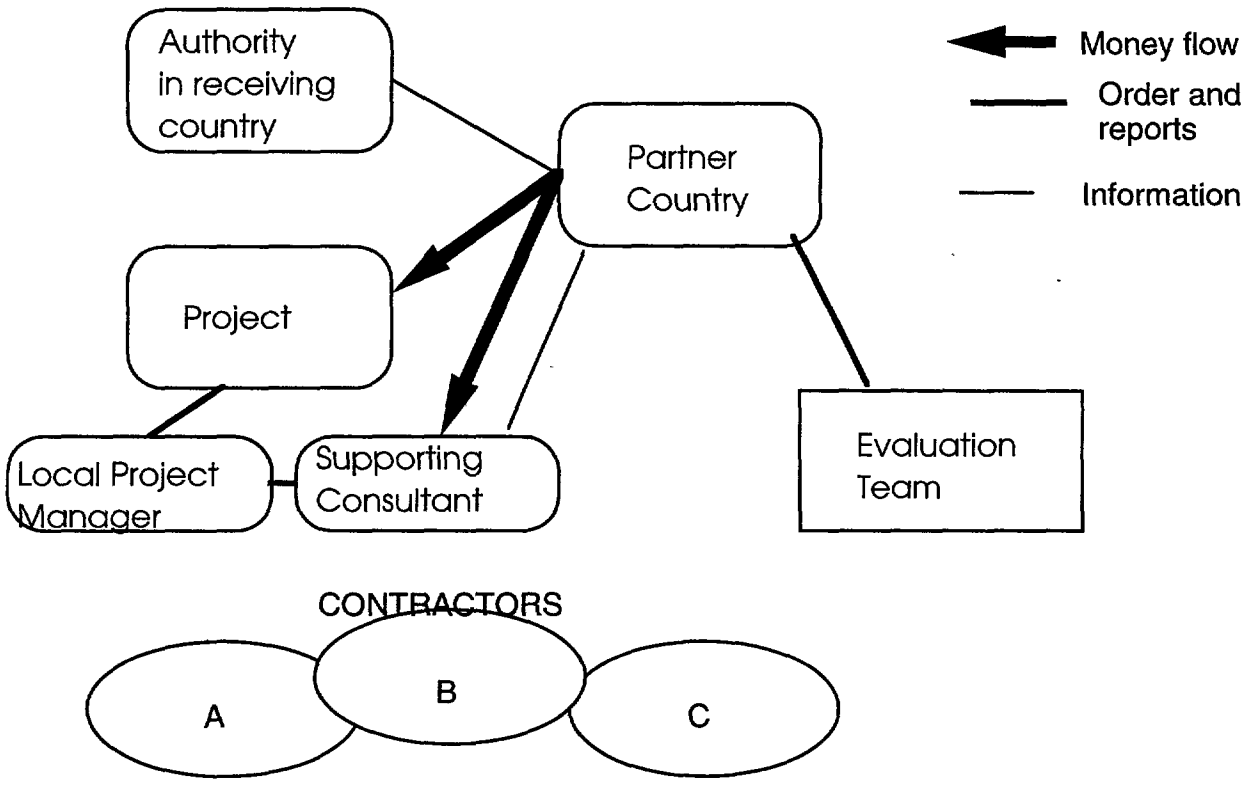

Figure 1: Relations between partners in conversion projects

5. THE SWEDISH EXPERIENCE.

In April 1993 Sweden decided to assist the Baltic countries (Estonia, Latvia and Lithuania) in their efforts to improve the energy systems in terms of economy and reliability. In June 1993 it was further decided to expand the programme to the entire Baltic Sea area, thereby including Poland and Russia. The Swedish programmes aimed for improvements in the environment by targeting the use of fossil fuels and the inefficiencies in end-use of energy, as well as in the distribution of heat. By shifting from fossil fuel to biofuel, the release of carbon (tied in the fossils) is stopped. By increasing energy efficiency in end-use and distribution, the supply of primary fossil energy is lowered and hence the emission of CO2. As a slogan and a simplification the programme is said to, "take away the dirty kilowatthours and reduce the wasted ones".

Very soon it was clear that, if there is to be an impact also for the future, the programme will have to be shaped to spread the improved technology on its own economical merits. The Swedish programme is able to give grants, but is basically formed to support business agreements by giving loans.

5.1 The setting.

Considering the magnitude of the problems in most of the economies in transition, where the dependence on imported fossil fuel is heavy and draining currency from the economy, and furthermore existing equipment often is old and badly maintained, it was necessary to establish some operative guidelines. Guidelines which should direct not only the present activities but also the following, whether they stem from this programme or not. We should preferably find a way to release an avalanche of new projects which could be justified on their own merits with low foreign assistance, if any at all.

The set of goals were established as follows:
* Quick
* Simple and affordable
* Reliable technology

The use of these key words has shown to be of great importance both in shaping the projects and in communicating the programme to participants. Quick means that we do not want to engage in too big projects which call for complicated coordination or require lengthy feasibility and design work. Simple and affordable means that the avoided cost of the formerly used fossil fuel pays for the new equipment and the new fuel in a reasonable time. Reliable means that the technology used should have proved to function well in earlier projects and that there will be no experimenting on the behalf of the receivers of the assistance.

When searching for projects, we started a process mainly to find the local responsible partner, a municipality or an energy company delivering heat to buildings where the cost has forced them to reduce the standard of delivery. We also made a point to choose the partners in cooperation with the energy ministry in the country but make sure that the ministry should not have to face negative consequences in case something went wrong with the project. All the detailed decisions should be in the hands of the owner of the plant who will get the support from our consultant in design, tender requests, evaluation and negotiation of tenders, commissioning and testing. Since all hardware is paid for by the plant owner by taking the loan, he has to appoint a local project manager from the beginning and face this responsibility. The project management support, as mentioned above, is given as a grant by the responsible Swedish administration (NUTEK).

All contracting for projects is open for full competition and it is the aim of the programme to have a substantial and growing share of work undertaken by companies in the receiving countries, thus making full use of the potential advantage that differences in wages can give to the projects. The full competition in contracting of equipment has also shown result in low costs so far.

All work has also been followed by an independent evaluation team having participants from each of the countries.

5.2 Track record.

The first three conversion sites, Valga in Estonia (6 MW oil to 5 MW wood chips), Balvi in Latvia (4 MW coal to 2.4 MW wood chips) and Birzai in Lithuania (8 MW oil to 6.2 MW wood chips) were finally chosen in early June 93 and were put into operation 6-7 months later. All were equipped with preovens to fire wood-chips. The biofuel comes either from a local source, with which the owners have a three year optional contract, or from own chopping since all projects have also equipment for local fuel production. The converted boilers are all serving base load and the

investments have been fairly equal and have an average cost <100 USD/kW (or <20 USD/ yearly MWh). The contracted biofuel has a price of 6-7 USD/MWh. The pay-back time is ranging from 3 to 5 years. The three projects have required in total investments of 11 MSEK which equals approximately 1.4 MUSD (1) and the results are predicted to be as follows (2).

Item		Specific value
Investment (USD)	1 400 000	-
Output (MWh/year)	75000	18.5 (USD/MWh)
Capacity (kW)	14000	100 (USD/kW)
CO2-reduction (ton/year)	25000	
Sulphur reduction (ton/year)	155	
Dust reduction (ton/year)	36	-
NOx reduction (ton/year)	21	-
Saved fuel cost (USD/y)	340 000	-

The investments are roughly 2/3 imported equipment and 1/3 domestic works (civil and building). Project management amounts to Å10%.

By the end of 1994 further 8 conversions were carried out, giving a total of 11 since the start (3), and at least another 12 are under consideration (4) and will be put in operation during 1995. For those put into operation so far the following data are tracked, see the appendix for details.

Item		Specific value
Investment (USD)	5 480 000	-
Output (MWh/year)	253 000	21.7 (USD/MWh)
Capacity after (kW)	49 600	110 (USD/kW)
CO2-reduction (ton/year)	80 000	
Sulphur reduction (ton/year)	700	

Some of the newer sites have been more demanding on capital since also some boilers have been exchanged for new ones.

The projects have further been extended with a set of improvements of district heating in ten places. In most cases these are dealing with installation of substations following a simplified concept. The much talked about high losses seems to be overstated and a lot of economical measures can be made without changing the pipes. In some cases it should rather be considered to introduce a new local heating plant instead of pipe replacement. If pipe replacement should be considered after all it should also take into account the advantages of lower local labour costs.

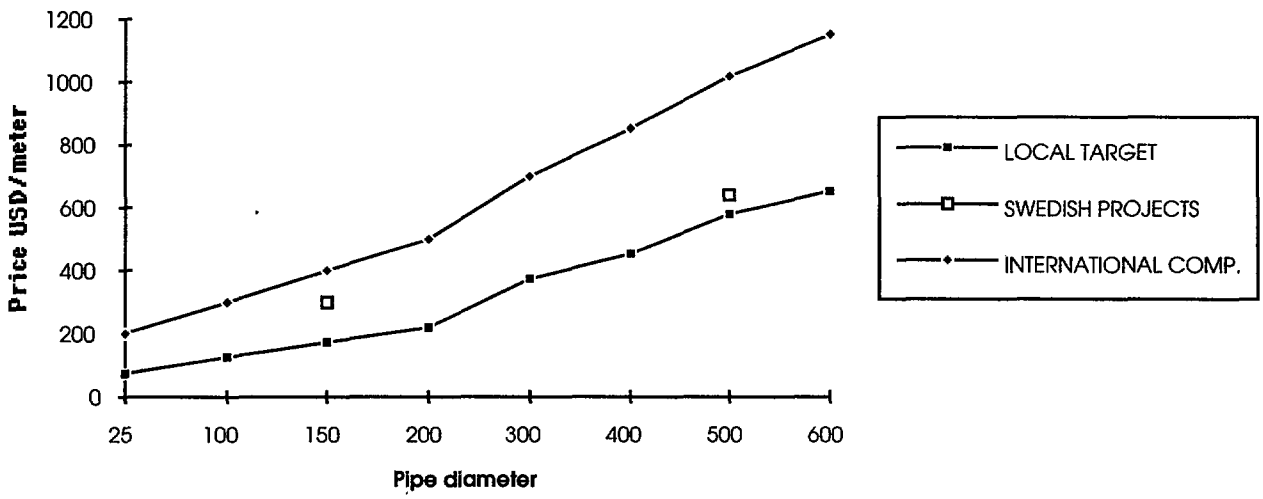

Figure 2: Comparison of pipe costs all costs included. (Data compiled and calculated by Peter Dannbring, ÅF-Syd, Malmö.)

In the catalogue of projects are also 6 projects to improve energy efficiency in buildings (5). Both multi-family houses, schools and hospitals. The technology in these cases will be simple insulation (of roofs), reducing draught from windows, adding panes to windows, improving control of heat in the building distribution, improving hot tap-water distribution, heat exchanging in substations and adding metering to monitor the result and enhance maintaining possibilities. The first one, Mustamäe in Tallinn, Estonia, is estimated to save 30% of the energy use at an investment of 180 USD/MWh.

5.3 Profitability.

The dimensioning of the base load capacity for fuel conversion has followed standard rules, see figure 3. Since this often is a new routine to the local participants, and surprisingly also to some of the western actors proposing alternative solutions, the idea needs to be stressed. If conversion is undertaken also for boiler units operating above the optimum capacity these units can not justify their own costs. If the entire solution still is profitable the second unit has stolen profit from the first one.

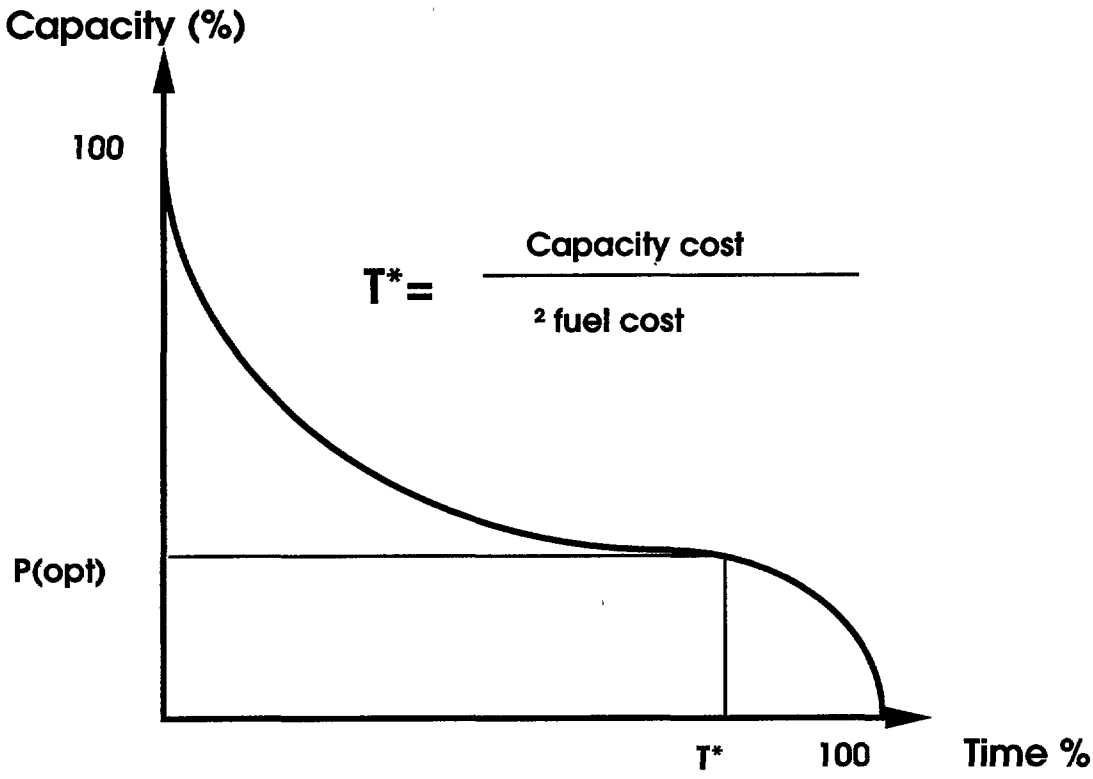

Figure 3: Determination of optimal base-load capacity

The profitability of the projects is measured against the avoided cost of the fossil fuel, see figure 4. Admittedly there are great problems in having proper incentives since energy have been heavily subsidized in all the countries concerned. Nevertheless someone is paying for the fossils. There is then overall profitability if the new costs are less than those for a continued operation with fossil fuels.

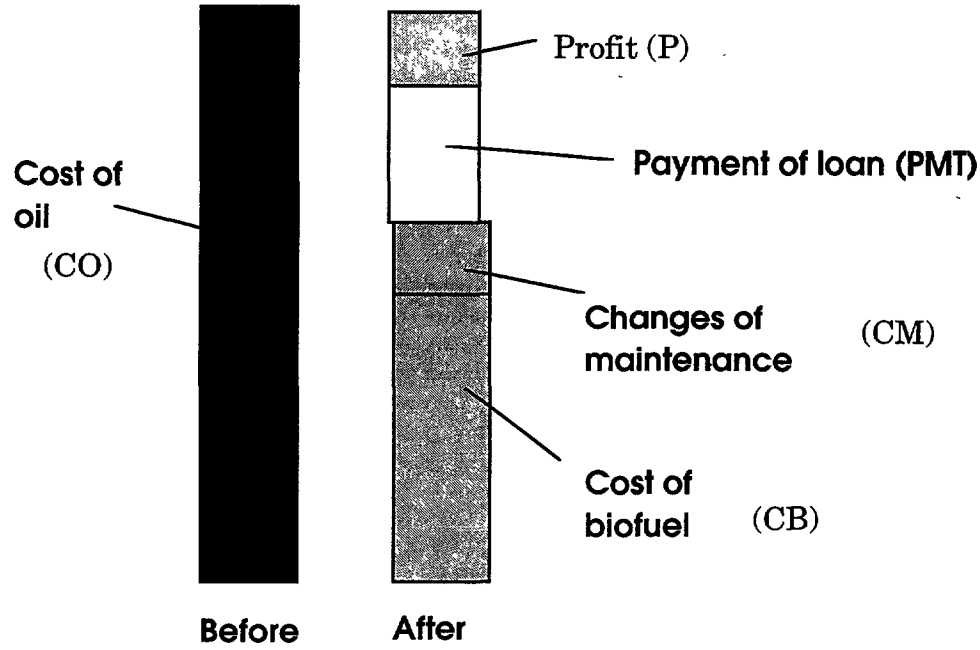

Figure 4: Division of costs for a fuel conversion and comparison to the avoided cost.

The conditions for the loans given are favourable but equal to the terms used by the World Bank. It means an interest rate (6) at the level of 8%, a grace period of 2 years and a maturity period of 10 years. Security for the loans is required either as mortgage in the plant or as guarantee by the state. The big problem seems not to be the terms of the loan but the concept and procedure of borrowing/lending money since the ownership structure is either unclear or changing. During the grace period the loan will accrue according to the rate but the companies will be given time to consolidate their economy. The Swedish support will have the form of a loan where the repayments go into a revolving fund. So far, the entire project is tentative though the building of such a fund would be advantageous for the future.

The participation of the evaluation team has been of great importance since they have helped to bridge the cultural gap. There are a lot of issues where misunderstanding is a rule rather then an exception since we have different ways of calculating, organizing and preparing of projects. These cases have however easily been smoothened out since we have had multiple communication channels between Sweden and the local plant management.

6. THE PROCESS.

Even more interesting than the technology is the process of establishment. Our conclusion is that there is far to much of an aid attitude in most projects today. It is either assumed that "Market Economy", as we know it in the west, will be easily established as being a form of "natural way of life". Or it is assumed that shipment of knowledge or products will fill an empty gap. Our experience is that we are facing a learning process during which the proper institutions, supporting the market economy, will develop and will do so more as a result of cooperation which allows for trial and error. We would prefer to name this the partnership attitude.

Since we have been approached with many different suggestions for alternative projects we find it appropriate to mention what sorts of aid attitudes we have tried to avoid. There is of course in other areas, including some energy related, good reasons for aid but not to develop business relations.

The aid attitude results in a lot of projects emphasizing not the institutions of market economy but the signs of institutions. It is asked for quick adjustment of prices to a world market level, and hence projects are developed which are aiming at large scale installation of meters giving a projected economy with very short pay-back time. Since peoples´ wages are not developed equally fast, the result could be counterproductive. People learn not to react on price signals but to disregard them and trick away the bill.

The aid attitude also develops projects where standardized solutions are developed and expected to be delivered in great quantities. This could very well be the case after some piloting projects but can be equally disastrous if applied only on assumption and with small possibilities to make the necessary adjustment to the local situation. Some projects with procurement of heat exchangers for buildings have shown such features. Finally the aid attitude brings about lots of reports and seminars where fancy technology is displayed but meets low demand, either because of high costs or of low reliability.

The aid attitude is sometimes disguised in a demand for new technology expressed by a high level representation from the recipient. The request can in some of these cases be built on a desire for new technology (which is good) delivered from companies which have not yet tried it sufficiently on their home ground (which is bad). The receiver might end up with a pile of equipment not working but showing a good intention.

The partnership attitude, as applied in the Swedish projects, builds on the local specific situation, regarding economy and technology, and on the local ambition to participate. Since it is the local owner of the plant that will finally have to face the realities of the investment, its operation and its economy, it is also quite easy to get the necessary commitment. So far it has been an even bigger achievement to see how people are learning-by-doing, than to see the projects´ physical appearance.

7. TOWARDS A CLEARINGHOUSE IN THE BALTIC SEA REGION

It must be emphasized that the entire project from the Swedish side is environmentally justified. From the receiving countries it has quite another dimension. The projects mean affordable and sufficient amount of heating energy. From this point of view it is also aimed to have a multiplicative effect. The pilot projects and their successors are to serve as demonstration objects. There have been seminars and training courses held in conjunction to the projects, and specific information material have been developed. The technology used so far is affordable and profitable compared to the use of oil and coal even if it was to be financed with locally obtained loans. Thus the Swedish projects can be releasing an avalanche once the institutions of the market economy are there.

There is a lot of interest connected to the possibility of Joint Implementation (JI) or Trade of Emission Rights (TER) as means in the Carbon Dioxide Abatement. Most models for these activities are based on assumptions of cost effectiveness and on vague draft structures for the institutions of implementation. There is still a lot of work to be done to elaborate the institutional structure and to find suitable technology to secure cost effectiveness and durability in the measures. Such work would greatly benefit from full-scale experimental work carried out with the clear goal to establish a long term form for cooperation.

Especially around the Baltic sea there is an urgency to find such solutions since many countries are sharing the environment and depends on it for future welfare and survival. The Nordic countries are all deeply involved in cooperative projects with countries on the east coast of the Baltic sea. There are good causes for better coordination between the countries and their respective operation agencies. Such coordination will have different perspectives in time, short/immediate, medium and long as described below:

* The Immediate perspective.
a. Better networking. All countries have a network of people and organisations which could benefit the others in their need to solve their tasks. Being able to take and check contacts is essential.
b. Better knowledge. Ongoing projects could both by the experience they create and in their own right be of great interest to other countries in shaping their own ones.
c. Develop transition tactics. Since the markets in transition does not always perform properly (according to textbook ideas) there is a need to establish tactics for development of institutional capacity or mock-up institutional behaviour.

* Medium time perspective.
a. Shaping of projects could be better if they are using mutual knowledge. A project can intentionally be based on the other since countries have different possibilities to act.
b. Using Demo experience to link information into the large financing organisations and especially to persons on government level taking part in steering of such organisations
c. Develop instruments for future JI. If JI should work, there is a need to develop skills for assessment of projects, accounting principles, incentives, enforcement etc. Such must be done with extensive experiments to make sure that the final instrument will work properly.

* Long perspective

a. Create a "clearinghouse" where projects, companies, methods, persons etc meet and mingle to solve tasks based on the concepts of JI and of Tradeable Emission Rights.

8 END-NOTES

(1) 1 USD=8 SEK
(2) Based on measured values after installation. The Sulphur content in used oil has been astonishingly low, 1.3-2.4% compared to 3.5% predicted and quoted from local sources.
(3) Estonia 4, Latvia 5, Lithuania 2.
(4) Estonia 3, Latvia 2, Lithuania 2, Poland 2, Russia 2
(5) Estonia 2 residential areas, Latvia 2 residential, Lithuania 2 hospitals
(6) Actual STIBOR rate
(7) Includes a new boiler
(8) Only reconstruction of existing crate

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----------Appendix ----------

Site	Country	Size (MW)	Investm. (USD/kW)	Pay-back (Years)
Birzai	Lith.	6.2	81	4
Kazlu RudaLith.		3	104	4
Balvi	Latv.	2.4	110	4
Slampe	Latv.	3	148	5.5
Aluksne	Latv.	5	142	4
Janmuiza	Latv.	3	190	5.5
Ugale	Latv.	3	64	2
Valga	Est.	5	96	4
Aardla	Est.	6	112	6
Haabneeme	Est.	6	99	5.5
Vörusoo	Est.	7	90	5.5