Actions for sustainable energy development for Latvia, until 2020

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This is an overview of activities to realise the first steps for a transition to sustainable energy in Latvia, with main focus on the period until 2020. The purpose is the realisation of a Sustainable Energy Vision for Latvia with phase out of fossil fuels and net energy imports until 2050. The authors welcome comments (see page 11).

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Windpower

It is proposed to install a total of 600 MW of windpower until 2020. The official plans are to install 298 MW of windpower until 2010. To realise the capacity of 600 MW, installations should continue with about 30 MW/year 2010 – 2020. This level is not high enough to attract windpower production to Latvia. Instead Latvia could look for regional cooperation to have one windpower production located in the Baltic States as well as the production in Latvia of components for windpower. With those two strategies, Latvia could benefit more from the employment in windpower.
When large parts of the first 298 MW of windpower are installed, it is important to clarify where the next 300 MW of windpower can be situated and is larger use of windpower than a total of 600 MW is feasible.

Requirements:
-Political decision to continue installations after 2010;
-Agreement for production of windpower components etc. in Latvia;
-Study on further use and potentials of windpower, from 300 MW to 600 MW and also above the 600 MW.

Economy:

- Installation of 300 MW windpower 2010-2020 will require an investment of 30 mill. €/year in the period 2010-2020 (30 MW/year, 1000 €/kW given a part if off-shore), in total 300 mill. €
- Energy Production: (0.75 TWh with 2500 full lead hours), replacing other electricity production.
- Operating and maintenance costs: expected 1 €-cent/kWh.
- Energy costs with 20 year lifetime and 5% interest and depreciation: 42 €/Mwh, equal to 0,029 Lat/KWh.

Even though the cost price of windpower without profit is an average of 0.29 Lat/kWh, it is necessary to pay investors a higher price for the first years, both as a risk premium and because of the bureaucratic obstacles that they have to overcome.

Biomass

Biomass is currently the most important form of renewable energy, and this will remain so until 2020, and also beyond. The current use of biomass is mainly wood used for room heating. 60% is used for domestic heating while 28% is for district heating, 10% is for heating in the service sectors, and the rest for industry and agriculture (2000 figures, IEA Energy Statistics).

Improve existing Biomass Use

An important first step is to introduce efficient use of biomass with clean and user-friendly combustion technologies and practices, to ensure continued popularity of wood use for heating. This requires training of those currently involved in biomass use (wood-stove producers and installers, chimney cleaners etc.) and introduction of clean, efficient and user-friendly technology. Given the size of the residential market (28 PJ = 8 TWh/year for heating), there is scope for a high-quality, Latvian equipment industry, adopting best available technology. Currently there is a lack of biomass heating equipment manufacturers on the European market, so it is possible that a good equipment production could also lead to exports, if the quality is high enough.

<u>Requirements:</u>
-Establish a centre of expertise of biomass use for heating (building on existing structures) with knowledge of Latvian, Baltic and European biomass markets: supplies, equipments etc;
-Free information to users about technology available (efficiency, environmental parameters, user-friendliness, suppliers, etc.) and good practices in biomass use such as appropriate drying and handling of wood, and firing;
-Training programme for current equipment manufacturers, installers, chimney cleaners etc;
-Labelling system for equipment;
-Promotion of high-quality biomass heating.

<u>Economy:</u>
-An expertise centre also in charge of web-based information will require about 5-10 full time staff;
-User information with outreach to biomass users including rural users will require 5-10 full time staff depending on level of ambitions;

-Training programmes will require 5-10 full time staff, and can be combined with above functions.
-Replacement of oil and gas with biomass for heating will save import of oil and gas. With replacement of about, 1.3 PJ of LPG use, 1 PJ of coal use, and 4.5 PJ of natural gas use, the fuel swift will save money for fuel import, money that are used instead to create employment in Latvia;
-Renewal of installations will increase efficiency from current 50-70% efficiency to 80% or more (annual average), increasing heat output with about 1/3. It is not known if this improvement will actually lead to less wood consumption or rather be used for better heating comfort (assuming some of the rural houses that use wood today are not heated fully to a satisfactory level such as 20'C).
-Renewal of installations will also reduce emissions, including particulate emissions from installation, thereby contributing to lower environmental costs and to the EU strategy to reduce particulate emissions.

Increase Biomass Use from Existing Wood Production
It is estimated that there is an unused potential of wood for energy of at least 10 PJ (2 mill. m^3). The sustainable use of this potential should be organised as a first step. This will by and large be done by the commercial sector; while the involvement of the district heating sector as a stable buyer could support the process and also help to establish a supply structure for biomass CHP.

Increase Biomass Availability with Energy Plantations and Straw Use
To make more biomass available for the proposed increases, straw and energy plantations should be used.

Regarding straw from grain is estimated an annual use of 375,000 tons/year for energy in 2020. The practical handling can be done by making the straw into large bales of 300 – 500 kg that is stored on the fields near roads and covered with strong plastic. Then they are sent by truck or eventually by train to CHP and heating stations during the heating season. This is normal practice in Denmark and other countries.

For straw from rape-seed is estimated an annual use of 650,000 tons/year in 2020. Existing practices exist in the Scandinavian practices for harvesting, collecting and transporting this straw to heating stations, where it is a useful fuel for heating of institutions, district heating networks etc. It's combustion properties are similar to straw from grain; but handling has to be adapted to this kind of straw that is more course than straw from grain and can give more ash.

For energy plantations (energy crops) is proposed that 2200 km^2 (220,000 ha), is planted with energy crops, partly unused agricultural area, partly about 6% of present agricultural area, including some pastures. There are a number of possible energy crops such as willow and elephant grass (*miscanthus*) for solid fuel and fast-growing grasses for biogas production. In this report as an example is used willow, but probably a combination of different energy plantations will be the optimal solution.

For energy plantations with fast growing willow, it is assumed that the yield will reach 7 ton of dry matter per hectare. The plantation and cutting can be done with machines, while there can be need for manual weeding the first year, depending on use of pesticides. The requirement for fertilisers is substantial less than for grain and most other crops; but there can be needs for fertiliser. Waste-water sludge can be used as fertilizer, if the sludge has low contents of heavy metals and persistent organic pollutants (POPs). Such substances can pollute the soil, which can be a problem for future use of the land for food production. If fertiliser requirements become substantial (because of poor soil), more permanent forests can be an alternative to short rotation crops. Use of pesticides is limited to the use of herbicides in the start and after each harvest every third year and it is possible to avoid the herbicides with manual weeding. Sweden and other countries have substantial experience with willow as an energy crop.

By 2020 the energy yield from energy plantations is expected to reach 35 PJ annually.

Requirements:
-expertise must be increased on energy crops and straw for energy use. Beside expertise on the technologies, experts should also evaluate how energy plantations are best integrated in Latvian agriculture: in larger areas, or smaller fields among existing farmlands;
-careful evaluation of the start of energy plantation investments is important, as energy plantations are only economically viable when biomass prices reach a certain level, coinciding with the full use of available wood residues;
-full-scale demonstration plants must be built, demonstrating energy plantation and straw use for district heating for one or two towns, engaging farmers and the municipality in the process;
-political decisions for the development should ensure a market so farmers can invest in machines and in conversion into energy plantations;
-for energy crops loans for farmers for transition is needed because there is no income the first 2-3 years with coppice;
-market – building with standard contracts and agreed price levels, to ensure the economy for farmers as well for the energy installations;
-use of EU Common Agricultural Policies to support energy plantations as much as possible. With the EU agricultural policy reform 2003 was introduced a support of 45 Eur/ha for farmers growing energy crops; this must also become available in Latvia. In some cases farmers can use set-aside land for energy crops and receive set-aside entitlements for the land with energy crops. (Source: http://ec.europa.eu/agriculture/markets/sfp/index_en.htm)

Economy:
-investment in straw balers and machines to plant and cut willow and other energy crops. Willov harvesting equipment for large-scale use is estimated to 100,000 -200,000 €;
-investment in energy plantations (work, time without income);
-annual work to bale the straw and cover it, to harvest energy plantation, and to transport to heating stations.

A Danish estimate is that energy plantation costs on sandy soil are:
-materials including establishment and herbicides: 100 €/ha annually;
-machine and wage costs including transport from field: 290€/ha annually.

Total 390 €/ha annually = 56€/ton dry matter = 3 €/GJ = 11 €/MWh. To this should be added land-use cost (rent of land); but the economy is 20% better on clay soil and with Latvian wages the wage costs will be lower. Thus, it seems reasonable to assume a price of 10€/MWh in Latvia for large-scale use.

Increased use of biomass for CHP and district heating, partly with energy plantations
With the plan is proposed to increase biomass use. The main increases until 2020 are in district heating stations and in CHP plants.

For CHP stations is proposed an increase in use of solid biomass from 1.28 PJ in 2005 to over 30 PJ in 2020, effectively creating a new power sector that provides 64% of the power from CHP plants (remaining 4% from biogas, 32% from gas and oil, no coal), resulting in power production of 18.2 PJ (5 TWh). Based on modelling of the energy system is found a need for construction of about 1150 MW-electric of CHP plants until 2020, including the current gas-fired CHP plant under construction in Riga that will have a capacity of 400 MWe. Based on current heat loads in Latvian district heating systems, this capacity could be distributed in the way described in the table below.

Possible expansion of CHP plants in Latvia, 2000 - 2020

Site	Heat load (GWh)	CHP nominal heat capacity* (MW-heat)	Electric efficiency	Electricity /heat ratio **	CHP nominal electric capacity (MW-electric)
Riga	4000	489	48%	1.50	733
Daugaupils	820	100	43%	1.16	123
Liepaja	655	80	42%	1.11	93
Ventspils	330	40	40%	1.00	42
Rezekne	245	30	40%	1.00	32
Smaller	1095	134	38%	0.90	127
Total					1150

* Nominal capacities are derived from heat capacities given in the background note from the vision, page 2 and 23, based on information from Latvijas Siltumuzņēmumu asociācija, AS „Rīgas siltums", AS „Latvenergo".
** On the assumption of a total efficiency of 80%, electric efficiencies from "*Technology Data for Electricity and Heat Generating Plants*"[1].
*** With this vision we only propose that just above half of the potential CHP capacity of smaller towns (250 MWh) is installed.

The electric capacities of the proposed power plants are considerably larger than the capacity of the existing gas-fired CHP stations. This is possible because of the higher electric efficiency of the new, state-of-the-art power plants and therefore a much higher electricity/heat ratio.

In addition to the CHP plants should be constructed heat storages in the form of hot water tanks to allow flexibility in heat delivery independent of power production, up to 26 hours of storage capacity can be beneficial in some cases.

For heating stations for district heating is proposed an increase in use of solid biomass from 10.85 PJ in 2005 to 23 PJ in 2020. The increase of biomass consumption for heating with 12 PJ

[1] Report published by the Danish Energy Authority et.al. March 2005, ISBN: 87-7844-503-5 (available from www.ens.dk), data for solid biomass fired power plants, of 10 MW and 400 MW.

will require installation of heating plants with of capacity of 750 MW-heat under the assumption of average use of 4000 hours/year. The use of 4000 hours/year (46% capacity factor) is an average for a few boilers used as main source in smaller district heating systems and boilers used as medium load together with biomass CHP plants and gas-fired boilers as peak plants.

Requirements:
-feasibility studies for individual installations in existing district heating grids, also studying opportunities to combine existing heat loads from district heating, industry, etc;
-financing packages for installations;
-political decisions.

Economy:
The investment of biomass CHP varies between 1.3 mill. €/MW-electric for large plants (i.e. 400 MW-electric) to 2.5 – 3.5 mill €/MW for small plants (1-10 MW-electric)[2]. It is proposed that there will be 610 MW-electric of large plants with an investment of 900 mill € and 200 MW of smaller plants (including Ventspils and Rezekne) with an investment of 500 mill. € (2.5 mill. €/MW), total investments about 1400 mill. €.

In the table below (next page) is an overview of possible biomass power plants with indicative costs and technical parameters. The source for technical and economic parameters is "*Technology Data for Electricity and Heat Generating Plants*"3. Capacities are derived from heat demands and electricity/heat ratios of the proposed plants. Operating hour estimations are based on modelling of the Latvian energy system with hourly modelling with EnergyPlan[4] for 2020. Biomass fuel costs are assumed from market conditions and above estimate of 10€/MWh for energy plantations.

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[2] These data and other data on biomass power plants are taken from the report "*Technology Data for Electricity and Heat Generating Plants*", published by the Danish Energy Authority et.al. March 2005, ISBN: 87-7844-503-5 (available from www.ens.dk), data for solid biomass fired power plants, of 10 MW and 400 MW. Another source for power plant costs is a report by Nuclear Energy Agency and international Atomic Energy Agency (IAEA) "*Projected Costs of Generating Electricity – 2005 update*", available from OECD bookshop; but that report has few relevant plants. It has only two biomass-powered CHP plants, of which only one is actually ordered: a 485 Mwe multifuel plant with stated investment costs of 1,13 mill. €/Mwe (2003 - €). A not realised 8 MW plants is quoted in that study to have investment costs of 3,25 mill €/MW. For a biomass plant without heat use, that study states a price of 1,49 mill €/Mwh for a 100 Mwe plant (2003-€) and based on a paper study 1,9 mill. €/MW for a 10 MWe plant with low efficiency. The same source gives for number of solid fuel plants (on coal) that are comparable with solid biomass-fired plants investments costs ranging from 1,06 – 1,19 mill €/Mwe for large coal-fired power plants, with the lower level of low-efficient plants (38-41% efficiency) and the higher end for a plant with higher efficiency: 46,3% efficiency for a 550 MW plant (coal boilers are cheaper than biomass bu flue gas cleaning more expensive).

[3] Report published by the Danish Energy Authority et.al., see previous note.

[4] EnergyPlan model, developed by Aalborg University, Institute, prof. Henrik Lund et.al.; modelling with 600 MW windpower and estimated energy demands for for 2020.

Possible Biomass Power plants		Riga	Daugaupils	Liepaja	Smaller plants
Specific invest. Costs	mill. € / MWe	1.3	2.12	2.18	2.5
Capacity installed	MWe	400	100	80	200
Total investment	mill. €	520	212.31	175	500
Lifetime	years	30	30	30	30***
LFCC	€/MWe	84567	138109	142112	162629
O&M-1	€/MWe/year	25000	59615	61923	70000
O&M-2	€/MWh	2.7	12.1	12.7	15
Eq.full load	hours/year	5606	5606	5606	4292
O&M costs	mill €/year	35.9	12.7	10.6	26.9
Eff-el	%	48	40	40	38
Eff-total	%	80	78	78	78
Fuel costs	€/MWh	10	10	9	6
Energy costs	€/MWh - total energy	26	37	37	41
Electricity costs*	€/MWh - electricity	33	49	48	56
Electricity costs*	LV/kWh	0.022	0.033	0.033	0.038
Heat costs*	LV/kWh	0.011	0.017	0.016	0.019
Electricity costs**	€/MWh - electricity	31	55	54	66
Electricity costs**	LV/kWh	0.021	0.038	0.037	0.045
Heat costs @E=.024 LV/kWh, in LV/kWh		0.008	0.027	0.026	0.032
Heat costs @E=.030 LV/kWh, in LV/kWh		-0.001	0.020	0.019	0.026
Heat costs @E=4,36 €cent/kWh in LV/kWh		0.000	0.021	0.020	0.027

* LFCC = Levelised fixed cost charge, the annual payment to pay back a loan with fixed annual. In this case it is a loan with 5% interest rate to be paid over 30 years.
** Electricity and heat costs on the assumption that the electricity price is the twice the heat price. The prices are "gate prices" and do not include distribution losses and distribution costs.
*** Only 20 year lifetimes for straw-fired stations.

In the last row in the table above is indicated a price of 0 for heat from the proposed CHP plant for Riga, this is not mistake, but it simply indicates that with the assumption used, the sale of electricity can pay for all costs of the plant.

The smaller CHP plants will be more expensive than the larger ones per produced energy unit; but we expect that they can have cheaper fuel because they are closer to the biomass resources. Even with the cheaper fuel assumed in the calculations, they will produce more expensive energy.

The cost of biomass boiler plants can be estimated to 200,000 €/MW-heat for plants above 2 MW, wood-fired and 20% more for straw-fired plants[5]. Installation of 750 MW, half wood-chip fired, half straw-fired will be 150 mill. €. Operating and maintenance is estimated to be 15,000 – 25,000 €/MW annually in Denmark. In Latvia wages are lower and O&M costs are therefore estimated to be 10,000 €/MW, leading to total O&M costs of 7.5 mill. €/year. The heat price from the plants is estimated to be 18€/MWh (gate cost without distribution losses), equal to 0.012 Lat/kWh with a fuel price of 10€/MWh. Some of this kind of investments have already taken place and is found to be cost-effective with wood residues as fuel. With the increasing gas and oil prices, also straw-fired heating stations are expected to be cost-effective today, even though they are 20% more expensive in investment than wood-fired stations.

Liquid biofuels

The proposal is to plant 180,000 ha (1800 km^2) with rape-seed by 2020 as part of Latvian agriculture. The rape-seed can be used for oil and the remaining press-cake that can be used as fodder. The straw can be used for energy (and be part of above-mentioned straw use for district heating and other energy purposes) or for agricultural purposes. The oil can be used directly in converted diesel engines or be made into biodiesel that either can be used directly or in a mixture with normal diesel. It is a political decision if the use should focus on use of pure plants oil, on biodiesel, or of blending biodiesel with normal diesel.

Alternatively can be produced other kinds of biofuels, such as grain-based ethanol or second-generation biofuels.

The strategy will depend on the choice of biofuels. Here is proposed a dual strategy with pure plant oil/ethanol for rural use and blending into diesel and petrol of respectively biodiesel and ethanol. Currently the official policy has most focus on blending.

Requirements:

-building a knowledge base and a practical advice service on environmentally benign growth of rape seed and other biofuel crops, with minimal use of fertiliser and pesticides in Latvian circumstances, optimal use of all products from the cultivations;

-practical advice and training in use of pure plants oil, motor conversions, production of biodiesel and blending with fossil diesel;

-political decisions to excempt pure plant oil from excise tax under certain conditions (such as local use, small-scale production etc.).

Economy:

While rape seed is already grown in Latvia, there will be need for additional investment in machinery for harvest. There will be need for investments in oil press and storage facilities for the oil. This can be decentralised at farm/village levels or it can be centralised. If ethanol production is chosen, there will be need for investment in ethanol production facilities.

Conversion of vehicles to run on pure plant oil is about 1000 €/vehicle. If the average vehicle runs 10,000 km/year, has a fuel efficiency of 10 km/l and operates for 10 years, its consumption is 10,000 l (10 m^3) of fuel, and the conversion costs 100 €/ m^3 of fuel (10 €-cent/l). Some commercial vehicles have substantial higher use than 10,000 km/year and therefore lower conversion costs per l of fuel used.

5 Based on REKA plant, 1.7 MW, wood-chip fired, hot-water or low pressure steam, including building and inlet/storage of wood-chips.

Conversion of plant oil into biodiesel for blending in ordinary diesel can be done centrally or at village level. The costs are moderate.

Biogas

The estimated gas production from biogas plants is 3 PJ in 2020 and later. We propose that the plants are to be constructed in the period 2010 – 2020.
The production of 3 PJ of energy as gas can supply 40 MW-electric of CHP plants, with the assumptions of 8000 operating hours/year and 39% electric efficiency. The net energy output is 2.7 PJ (heat +electricity) as the own consumption for heating of the plants is 10% of the heating value of the gas produced (process heat). Alternatively some of the biogas can be used in transportation, as is increasingly done on Sweden.

Requirements:
Since there is very little previous experience with biogas from agricultural materials, there is a need to try the technology with a number of demonstration plants and
There is a need to build capacity to operate and maintain biogas plants with training etc.
A political decision to use landfill gas for energy should be part of the climate plan (currently the gas is just collected).
Support for construction of biogas plants should be introduced, including preferential loans.

Economy:
The investment in biogas can be estimated to about 5 mill. €/MW-electric, or a total investment of 200 mill. €. This is for agricultural plants of capacity of 1 MW electric (medium-large plants). Other plant sizes will have different prices e.g. a plant with a capacity of 3 MW- will have an investment cost of 3 mill. €/MW. Landfill gas plants have lower investment per MW than biogas plants.

With investment of 5 mill. €/MW-electric, 20 years lifetime, 8000 operating hours/year, 5% interest rate, the investments cost per MWh-electric are 50 €, equal to 25€/MWh total energy. Operating and maintenance costs are estimated to 30 €/MWh-electric equal to 15 €/MWh total energy for Denmark; but this figure can be lower for Latvia.

Total costs can then be estimated to 25+15 = 40 €/MWh of total energy delivered; but can be lower for Latvia, and will depend on plant size. An assumption for this is that manure and waste is delivered for free at the biogas plant, and the produced sludge is taken away for free by farmers that can use it as fertiliser.

If the power is sold to the grid for 0.06 Lat/kWh (current feed-in tariff up to 4 MWe), the remaining cost (expenses minus income from sale of electricity) is only 0,005 €/kWh for the heat. Thus, if the biogas plant can sell the heat for more than 0.005 €/kWh (5 €/Mwh), the investments will be profitable on the above conditions.

Hydropower and Geothermal

There is no expansion planned of hydropower and geothermal energy use, so no additional actions are expected.

Solar Energy

There is no market for solar energy installations in Latvia for the moment. This is expected to change after 2010; with the development of solar heating expected to start and result in average installations of 10,000 m^2/year 2010 - 2020 (total 110,000 m^2 installed in 2020).

Requirements:
-Demonstration program for solar energy;
-Support scheme for solar heating in selected applications.

Economy:
-Installation of solar heating will require investments of (2 mill. €/year (200 Eur/m2));
-Energy Production: 48 GWh/year in 2020, replacing heat from gas with an efficiency of 80%, leading to gas consumption reduction of 60 GWh/year.

Heating efficiency

It is proposed that a 33% reduction of specific heat use in residential buildings will be implemented until 2020 (realisations of proposals from Statement of Energy Supply). Similar reductions is proposed for the service sector. This will require investment in a number of heat conversation measures such as improvements of building envelops (roofs, windows, floors, walls) and of heating systems (insulation and renovation of heat pipes, better regulation). These measures will in general be economically beneficial. With the increasing fuel prices, an increasing number of advanced measures will become cost-effective, such as more insulation and advanced regulation.

After 2020 is proposed a long-term effort leading to reductions in specific heat demand of 2%/year. This will require further improvements of building codes, continued information on energy efficiency, and in general an ambitious implementation of the EU “buildings directive” on energy efficiency in buildings.

Heat pumps are not included in this vision as they do not increase overall efficiency and they increase electricity consumption, which goes against the aim of reducing electricity import to Latvia.

To realise the heat demand reductions is needed:
-a strong program for heating efficiency with free public advice and training of building companies, building managers, municipal building authorities and others;
-subsidies for low-income households to increase efficiency;
-use of EU funds to increase energy efficiency of public buildings;
-promotion of loans for energy efficiency including development of low-interest loans, and state guarantees when appropriate;
-gradual increase of building standards for new buildings to reach Western European levels;
-an national energy efficiency program with regular update, including some of the above proposals and financed from a small levy on fossil fuel use for heating.

Energy efficiency in Electricity

For energy efficiency in electricity use is proposed an increase of 2%/year. To realise that is proposed:

-immediate stop of installation of electric heating, including installation of electric water heaters as the prime source of hot water heating. Electric heating increases the waste of the overall energy system and goes against the realisation of this vision;

-a levy of 2% of electricity consumption to be used to improve electricity efficiency with information and subsidies;

-information campaigns on the savings possible with energy efficiency in electricity use for all sectors including the residential sector. As part of that should be specific campaigns for the different industry and service sectors. The campaigns should use existing EU labelling schemes, but also include equipment that is not yet covered by labelling;

-a special campaign to replace electric heating with other forms of heating.

-targeted subsidies for purchase of the most efficient equipment, for avoiding inefficient equipment, and for replacing electric heating with other forms of heating.

The proposed measures are expected to be cost-effective, including the payment of the 2% levy. Regular evaluations should monitor the cost-effectiveness of the schemes to ensure the maximum benefits for the users and for the environment.

Energy efficiency in Industry and Private Service

While private sectors are covered by above-mentioned activities for space heating and electricity, there is a need for additional actions to improve energy efficiency in the commercial sectors. The above-mentioned sector specific information campaigns for electric efficiency can be expanded to cover all types of energy. In addition can be introduced energy taxes, voluntary agreements of implementation of all cost-effective measures, special financing etc.

Energy Efficiency in Public Service

The public sectors are covered by above-mentioned activities for space-heating and electricity; but also for the public sectors special additional actions will be beneficial. Public institutions should carry out all energy efficiency measures with simple pay-back periods below 6-10 years. To enable this, funding must be available for the investments. As an incentive, public institutions should be able to keep a part of the economic savings from energy efficiency measures for the first years after the investment.

Further, institutions should always purchase equipment with the highest efficiency, or at least the highest cost-effective efficiency. If the energy efficiency equipment is more expensive, the investment budgets must be increased with the cost-effective part of the extra cost.

Energy efficiency in Transport

It is proposed that energy efficiency for cars is increased 1.5%/year 2010-2020, increasing to 3%/year 2020-2030. It is recognised that can be difficult for personal cars due to the large import of inefficient used cars. Thus, it is important to address the energy efficiency of imported cars.

Energy efficiency in transport can be increased in a number of ways:

-taxation for car use and for car registration/import shall be graduated according to energy consumption;

-public transport companies shall have incentives to increase energy efficiency, e.g. by a levy of their fuel use that is recycled to energy efficiency improvements in public transport. It is important that such a levy is set on a level where it will not harm public transport compared with individual transport;
-tax incentives to use public transport to and from work, and to use bicycling;
-eventually tax penalties for long-distance commuting;
-campaigns on real cost of buying inefficient cars, such as old, imported cars.

In addition, urban and national planning should minimise transport needs and favour rail transport and bicycling over motorised road transport, in particular personal cars.

About this note
This note was developed by Gunnar Boye Olesen, INFORSE-Europe in cooperation with Janis Brizga, Green Liberty, for the Vision2050 for Latvia.

When no other **sources** are given, the following sources are used:
-use of renewable energy and increase of energy efficiency in Latvia "Vision for a sustainable energy development for EU – 25, 2000 – 2050"
- A vision for Latvia based on INFORSE's Vision2050. Background note, INFORSE-Europe.

-costs and efficiencies "Technology Data for Electricity and Heat Generating Plants" by Danish Energy Agency and others, March 2005. Available from www.ens.dk

Read more about the vision for other countries at www.inforse.org/europe. Please send comments to ove@inforse.org and/or

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