Europe – lessons learned.

The statement - Central to the current policy framework are the three headline targets to be achieved by 2020: (1) an EU based target for GHG emission reductions of 20% relative to emissions in 1990; (2) a 20% share for renewable energy sources in the energy consumed in the EU with specific target for the Member States; (3) 20% savings in energy consumption compared to projections [http://ec.europa.eu/energy/consultations/20130702_green_paper_2030_en.htm] – is not backed up by present experiences of this policy implementation. Moreover biomass combustion processes, despite the fact that environment and human health friendly combustion process does not exist, do not reduce carbon dioxide flux if LCA is considered.

The share of installed electricity capacity by source is given in table below [EU Energy in Figures, Luxembourg: Publications Office of the European Union, 2012 http://ec.europa.eu/energy/publications/doc/2012_energy_figures.pdf].

Table 4. Installed electricity capacity* and generation** in EU-27 by source [%].

Fossil fuels	Nuclear	Wood, w. waste	Municipal waste	Industrial waste	Liquid biofuels	Biogas	Hydro	Wind	Solar	Geo-thermal	Tide wave	Other
1	2	3	4	5	6	7	8	9	10	11	12	13
* 54.0	15.4	1.6	0.7	0.1	0.1	0.6	16.7	8.7	1.9	0.1	0.0	0.1
**50.9	27.7	20.9 (so called renewables)										0.8

Analysis of this tables shows that share of installed capacity based on combustion processes is equal to 57.1 %, the wood, municipal and industrial waste, biofuels and biogas combustion is counted as "renewable", what is rather a trick, since the combustion process friendly to the environment does not exist. Cherubini and coauthors propose that CO_2 emissions from biomass combustion for bioenergy should no longer be excluded from Life Cycle Assessment studies or be assumed to have the same global warming potential as anthropogenic CO_2 emission [F. Cherubini, G.Guest, A.H. Strømman, Application of probability distributions to the modeling of biogenic CO_2 fluxes in life cycle assessment, Bioenergy, 4(6),784 – 798, 2012].Therefore installed capacity of real clean renewables (hydro, wind, solar and geothermal) is equal to 27.4 % , but real input to the total share give hydro (16.7 %) and wind (8.7%). Interesting that these tragicomic data seems to be well understood by the authors of the document since the generation input for "renewables" is given as a total number only. The 78.3 % of electricity produced in EU – 27 in 2010 came from fossil fuel combustion and nuclear power. Unfortunately 23.6% electricity production was based on gas combustion what is not in any agreement with suistanable development philosophy. The gas is a raw material for chemical/other industries and household applications, gas combustion in big power blocks should be considered as a crime against next generations. Two countries in Europe pointed out as the leaders in the renewable

energy utilization are Denmark and Germany. In Denmark in 2011 39.7% of total electricity production was generated by coal. Natural gas accounted for 16.5% of electricity production. Oil and nonrenewable waste accounted for 1.3% and 2.2% of the electricity production respectively. Wind 28.1%, combustion of straw 2.2%, wood 6.6%, waste 2.7% and biogas 1.0%; solar and hydro 0.0% [Danish Energy Agency, Energy Statistics 2011,Copenhagen, Denmark, December 2012 http://www.ens.dk/enUS/Info/FactsAndFigures/Energy_statistics_and_indicators/Annual%20Statistics/Documents/Energy%20Statistics%202011.pdf]. In Germany the production of electricity was based on hard coal – 19%, lignite – 25%, natural gas – 14%, nuclear energy – 18%, heating oil & pumped storage 5%, wind 8%,biomass 5%, water 3%, photovoltaic 3%, biogenic household waste 1%. The annual full load hours of German power stations in 2010 were; photovoltaic 900 h, pumped storage installations 1,100h, petroleum 1,210 h, wind 1,380h, natural gas 3,180h, storage and run-off-river hydroelectric installations 3,820h, hard coal 3,870h, biomass 6,400h,lignite 6,600h, nuclear energy 7,330h [Federal Ministry of Economics and Technology (BMWi), Germany's new energy policy – Heading towards 2050 with secure , affordable and environmentally sound energy, Berlin, April 2012, http://www.bmwi.de/English/Redaktion/Pdf/germanys-new-energy-policy]. The Germanys Federal Government plans that renewable energy will provide the main source of electricity by 2030: the government projects that 58% of total electricity will be sourced from renewable energy, with wind being the dominant source, at 30.6%, in 2030. Electricity from wind is expected to triple over the next years, while electricity from solar will double. Hydro will grow by 35.8% to account for 5.2% of generation, as will the use of biofuels, growing by 39.1% to reach 13.3% of the total. The use of natural gas in electricity generation will also increase over the period to 2030, growing to 22.6% of the total. Coal-fired generation is expected to contract to less than 20% of the total, with nuclear power use being completely phased-out by 2022 [Energy Policies of IEA Countries – Germany (2013 Review), OECD/IEA, Paris, 2013]. The numbers from 2010 show that a program should consider good import - export relations with neighbors, since the main source of renewable energy will be wind – for which the full load hours equal to 1,400 hours annually will not assure continuous electricity supply all over the year. Imports from new constructed nuclear power plant in Kaliningrad via Baltic Sea route may be a solution. The combustion technologies still will cover 56 % (coal 20% + gas 23% + biofuels 13%) of electricity production, what exclude a country from the countries which may claim that they follow sustainable development policy. One may expect that biomass combustion will be excluded from the list of renewable energy sources and natural gas combustion in the big power blocks has been always considered as a rubbery of raw material used by many sectors of economy and household appliances. The example of Denmark and especially Germany is a proof that Trianer is right, renewables will not solve the greenhouse problem and will not provide sufficient electricity supply for the future [T.Trainer, Can renewables etc. solve the greenhouse problem? The negative case, Energy Policy, 38,4107 – 4114, 2010 http://www.dieoff.com/_Energy/TrainerRenewables.pdf].

The other example of electricity production mix is illustrated, now and in the future, by Finland one of the most innovative countries in the world, its economy is highly industrialized, with sizeable high-tech manufacturing, electronics and chemical sectors operating alongside a significant forestry and paper industry. Finland's energy consumption per capita is the highest in the OECD -International Energy Agency (IEA) countries. Finland's electricity supply mix is very well diversified, with nuclear, hydro and bioenergy accounting for around 31.6%, 16.9% and 15.6% of electricity supply respectively, and gas, coal and peat also contributing to the energy mix. Furthermore, as part of the Nordic electricity system, Finland is one of the most advanced electricity markets in the world. Yet security of electricity supply remains a high priority concern. Supply concerns are exacerbated by the fact that Finland currently imports up to 2 000MW of electricity from its neighbors during peaking hours, as domestic electricity supply is limited. In 2010, the Parliament adopted decisions-in-principle for two new nuclear power stations, in addition to Olkiluoto 3 currently under construction. Finland hopes to achieve relative self-sufficiency, being able to cover peak load situations and possible disturbances of imports, through the development of biomass-fired power and particularly the construction of additional nuclear power capacity [Energy Policies of IEA Countries – Finland (2013 Review), OECD/IEA, Paris, 2013].

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