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Bulgaria
National Renewable Energy Action Plan
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General Feedback

- The NREAP refers to investment guarantees as a qualifying criterion for projects. From experience, only bank guarantees and similar instruments would be economically viable. It is, however, unclear whether the guarantee could be fulfilled by provision of a bank guarantee.
- There is no particular commitment and no plan for grid development.
- It is mentioned several times that there are final grid connection contracts for “more than 2.500 MW” wind farms. On page 66 it is stated that this value is 2.200 MW. This does not correspond to the statistics provided by NEK, SWERC and the Ministry of Energy until now. If such a value has to be mentioned in this document then it should be the exact value of existing and still valid connection contracts and it should be based on official statement issued by NEK and the distribution companies.
- It is stated that there will be a future mechanism for filtering the applications for grid connection based on "investment guarantee" while no further elaboration is provided.
- The NREAP appears to fail to take into account the recently published National Energy Strategy for 2020 by the Ministry of Economy, Energy and Tourism
- The suggested measures (table 5) appear overly restrictive toward renewable energy project development.
- The suggested measures have a time horizon (2011-2015), which would lead to the postponement and delay of investments which in turn would hinder the reaching of interim targets

Specific Feedback on Individual Sections of the Action Plan

- The document does not explain in detail how the prognosis for the different technologies is calculated. On page 23-24 it is stated that “the prognosis is based on general indicators and criteria, as well as on specific assumptions for each RES technology”. Further, on page 46, article 13 in Table 5 (part 2) states that in the future RES development will be based on a competitive mechanism and technologies providing for “lowest-cost”. Obviously this approach is not considered in defining the prognosis in Table 10 as otherwise the contrast between solar and wind power, for example, does not match the contrast in their respective cost.
- On page 136 it is stated that until the middle of 2010 more than 12.000MW wind and solar projects have received permits. This is not true all these “more than 12.000 MW” are just intentions or applications and are not projects that have obtained permissions.

Specific Feedback on Table 1 (p. 20-21) and Table 10 (p. 181-184)

1) Final Energy Consumption and Energy Efficiency

The gross final energy consumption numbers assumed by the action plan appear to be too low to be realistic. At the same time the energy efficiency improvements that underlie the action plan appear to be rather optimistic. Both lead to an understatement of future energy consumption. Additionally, such over-estimation of energy efficiency improvements and under-estimation in the prognosis for RES development will soon result in a situation where Bulgaria will have to pay for statistical transfers of electricity generated from renewable energy sources. This will be paid by the national budget and will not add any value to the economy. In contrary, higher RES prognosis will attract more foreign investments and will create local jobs and added value to the economy. This in turn means that the

amount of energy to be provided by renewable sources needs be significantly higher to achieve the same, predicted interim targets.

In detail:

GDP Growth
The implied assumptions on economic growth of the action plan are too low. The action plan assumes an average annual rate of economic growth of 1.37 %.

Calculation: without energy efficiency considerations final gross energy consumption in 2020 is predicted at 13,091 ttoe while 2010 stands at 10,671 ttoe. This amounts to an increase of 23 % over 10 years. This implies a compounding annual rate of growth of 1.37 %

This number appears to be unrealistically low. From 2000 to 2010 the Bulgarian GDP has increased by 82.77 %. This equals a compounding annual rate of growth in Bulgaria from 2000 till 2010 of 6.22 %

This means when relying on historical data the action plan underestimates economic growth by a factor of 4.54.

Energy Efficiency
The action plan assumes that the energy intensity (energy/GDP) of Bulgaria will decrease significantly until 2020. The assumptions stand at an overall reduction to 80 % of the 2005 level of energy intensity for gross final energy consumption. For electricity consumption individually the assumption stands at 88 % of the 2005 level.

A reduction of energy intensity to 80 % over the next 10 years would mean that Bulgarian energy intensity would continue to decrease at the same rate at which the EU 27 average energy intensity has decreased from 1996 to 2007. It needs to be considered though, that Bulgarian energy intensity in 2007 already stood at 56.7 % of the 1996 level and that this decrease was in significant parts due to the collapse of heavy industry, a singular event that cannot be expected to repeat over the next ten years. Further the development of energy intensity in countries such as Lithuania and Estonia, which in 1996 stood at approximately the same level of energy intensity as Bulgaria does nowadays, show a decreasing rate of reduction of energy intensity. This is the natural consequence of the law of decreasing marginal rates of return.

Therefore, the energy intensity, respectively the energy efficiency, assumptions underlying the action plan should be seen sceptically.

Net Effect
When correcting the 2020 predictions to use an annual growth rate of 6.22 % instead of 1.37 % the predictions for final energy consumption increase as follows:

	base case at 1.37 %	at 6.22 %	change
Gross Final Energy Consumption	10,411 ttoe	15,516 ttoe	+ 49 %
Electricity Consumption	3,148 ttoe	5,008 ttoe	+ 59 %

When further adjusting the 2020 predictions to work on a reduction of energy intensity to 90 % of 2010 levels (in line with the 1996-2007 reduction of the EU 15 economies) the predictions for final energy consumption increase as follows:

	base case at 80 %	at 6.22 % growth at 90 % intensity	change
Gross Final Energy Consumption	10,411 ttoe	17,559 ttoe	+ 69 %

Electricity Consumption	3,148 ttoe	5,151 ttoe	+ 64 %

Conclusion
The underlying assumptions of action plan regarding both economic growth and reductions in energy intensity appear to be overly optimistic. As a result future energy consumption is significantly underestimated. This in turn means, that in order to achieve the same predicted contributions of renewable energy the gross amount of installed capacity and energy generated by renewable energies needs to be significantly higher than predicted by the report.

2) Contribution, Capacity Factor and Lifespan of Hydro Power

As the national action plan foresees hydro power to be the main contributor (56.2 %) of renewable energy to the electricity production, the predictions and underlying assumptions made with regard to hydro power are of particular importance. The assumptions and predictions exhibit flaws both in the level of predicted generation and installed capacity.

In detail:

Generation / Contribution of Hydro Power
The numbers of installed hydro power capacity both nowadays as well as the predicted capacity for 2020 does not match the information of NEK and UCTE.

The action plan further assumes an increase of installed hydro power capacity over the next ten years by 14.8 %. This runs in contrast to predictions by NEK which see a reduction of installed capacity over the next ten years. This assumption appears doubtful when considering statements of the Ministry of Environment and Waters that virtually all hydro power capacity is currently exhausted already. It runs counter to recent legal restrictions on the construction on cascade hydro power stations passed by the Bulgarian Parliament.

It also stands in stark contrast to the systems adequacy report statement of UCTE that:

"There will be slight increase of the unavailable capacity in the period 2015 – 2020 due to the expected increase in non-usable capacity and the outage rates of older units."

Capacity Factor and Lifespan
This statement derives from the fact that the vast majority of Bulgarian hydro power capacity is already beyond the end of its typical technical and economic lifespan. The Belmeken, Sestrimo, Chaira, Batak, Vacha and Dolna Arda hydro power systems account for the vast majority of generating capacity (96.8 %) and with the exception of the Chaira dam all installations are older than 30 years with the Batak and part of the Arda installations dating back more than 50 years.

The high age of the installations is reflected in their low capacity factor, amounting to 13.1 %. By contrast the action plan assumes a capacity factor of 17.9 % in 2010 rising to 19.0 % in 2020. This means that the action plan assumes a capacity factor, respectively availability, of the hydro power plants that is 36 % higher in 2010 than the current state of affairs and as much as 45 % higher in 2020.

Conclusion
These two underlying assumptions, the overstated and increasing capacity factor paired with significantly higher figures for future installed capacity than appear realistic, both mean that the gross contribution of hydro power to the electricity production from renewable energy sources must, realistically be expected to be significantly lower than predicted in the report.

3) Ramp-Up and Capacity Factor of Biomass Power Plants

The contribution of biomass to the generation of electricity from renewable energy sources appears to be overestimated. This largely stems from the assumption of an excessively high capacity factor paired with optimistic assumptions for the ramp-up for a thus non-existent power source.

Ramp-Up

The action plan assumes that from contribution 0.1 % in 2010 biomass will undergo a ramp-up sufficient to supply 11.6 % of all electricity from renewable energy sources over the 9 following years. This assumption appears optimistic given the crucial supply and logistics dependence of biomass which the other sources of renewable energy do not face.

In detail:

While the other sources of renewable energy power generation – hydro, solar and wind – all feature in situ power sources, this is not the case for biomass. Hydro, solar and wind power plants are located where the power source (water flow, irradiation, wind) is, hence these power sources involve no supply logistics. In contrast to this biomass projects depend on need to have their power source – the biomass material – transported to them. This means that the power generation of a biomass project is crucially dependent both on the supply of biomass from the source (forestry, agriculture, waste gas etc.) and in most cases on the availability of transportation for the biomass from the source to the generation site.

Given the fact that biomass power generation is non-existent at the moment, the assumption that the entire supply chain will be operating continuously and reliably – as documented by the assumption of an 88.8 % capacity factor in the first year of biomass generation (2011) – appears to be unfounded.

As the financial viability, respectively the bankability, of biomass projects hinges on the supply chain reliability, a fast ramp up should not be expected.

Capacity Factor

The action plan assumes an exceptionally high capacity factor for biomass power plants. The capacity factor in the last draft of the action plan started out at 88.8 % in 2011 and reached 91.6 % in 2020. The final version of the draft assumes 63.9 % and 62.9 % respectively. While the above mentioned supply chain dependence already casts significant doubt on these figures, they still stand in contrast to globally accepted capacity factor (i.e. availability) figures for biomass power generation. Further the change of the assumed capacity factors by 24.9 % and 28.7 % respectively suggests an arbitrary approach to significant assumptions of the NREAP.

In detail:

International practice distinguishes between three different types or modes of operation for biomass power generation projects, each with corresponding capacity factors and supply chain challenges:

	Capacity Factor	Supply Chain Demands
1) Continuous Operation (i.e. power plant)	80 %	higher
2) Larger Co-Generation (large buildings)	50 %	medium
3) Small Co-Generation (houses, small buildings)	20 %	lower

The assumption that Bulgarian biomass power plants will all be planned as continuous operation plants and that they will, in a country that has no established supply chain or continuously available biomass, operate more than 10 % above the globally accepted standard appears excessive.

Conclusion

The ramp-up of biomass power plant capacity appears optimistic while the assumed underlying capacity factor and the assumption that the vast majority of biomass plants will be intended for continuous power generation appear unrealistic and counter to internationally established experience. This means that the gross contribution of biomass power to the electricity production from renewable energy sources must, realistically be expected to be significantly lower than predicted in the report.

Consolidated Conclusion

1) Gross Final Energy Consumption in 2020 will be higher than the action plan predicts
2) The contribution of hydro power to electricity production from renewable sources will be lower than predicted
3) The contribution of biomass power to electricity production from renewable sources will be lower than predicted

Therefore and in order to reach the interim and 2020 targets the amount of energy generated by solar and wind power needs to be significantly higher than predicted in the action plan.

Realistic levels of installed capacity by 2020 could be expected in the range of:

Solar:	500 – 1000 MW
Wind:	2000 – 3000 MW

Sofia, 26.07.2010

Sources:

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