

Wind-Power in Iceland

Wind-power with access to large thermal based power systems in countries like UK, Central Europe and USA can always be sold at high priority. The production of oil, coal and gas power stations can then be reduced, which is extremely economical.

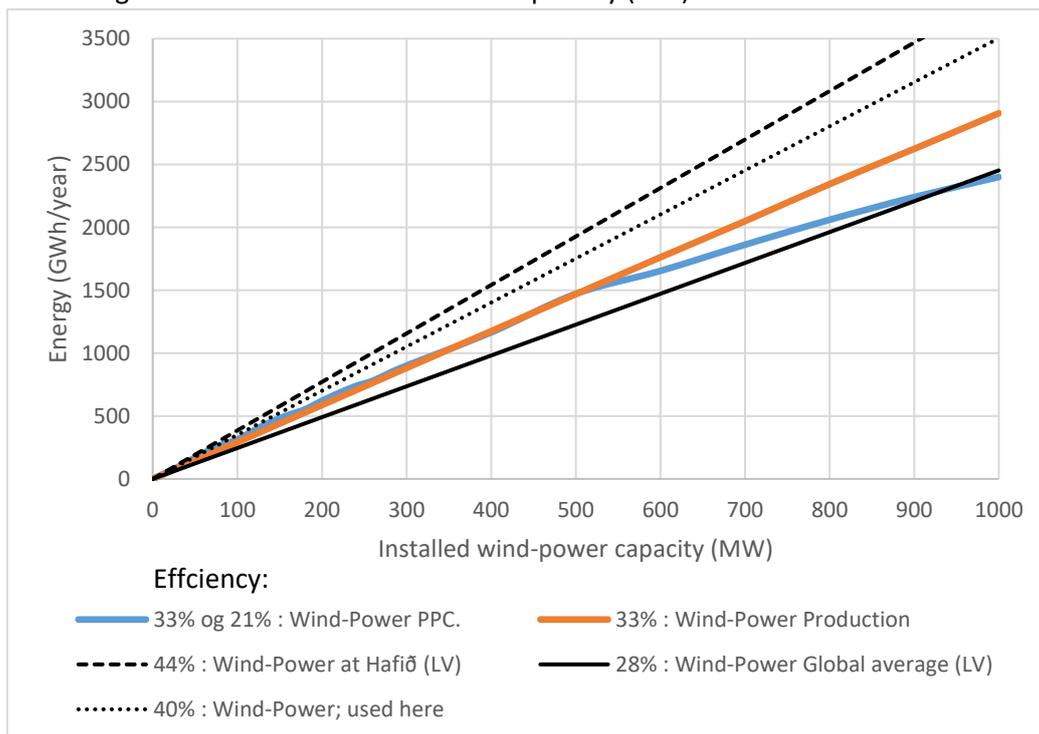
The situation is different in the Iceland's isolated energy system, where almost all of the electricity is produced from renewable energy sources. If wind turbines are started, it is necessary not to spill water past hydroelectric power plants when production is reduced. The excess water must rather be kept in storage to be used at a later time e.g. late in the winter. This may not be possible at many hydro power stations. The study addresses this problem.

We estimate Power Production Capability (PPC) of wind-power stations as the difference between System PPC before and after the new wind-power addition.

A unit in our simulation/optimization program was selected 1 day (24 hours).

The relationship between efficiency (η), Power Production Capability (PPC) in GWh/year and installed capacity (P) in MW is: $\eta = \text{PPC} / (P \cdot 8,76)$.

Figure 1. Wind-Power Production Capability (PPC) and Power Production



The results in figure 1 can be summarized as follows:

1. Landsvirkjun has claimed 44% efficiency of the wind-power resource at Hafid (dashed black line).
2. They also have claimed that 28% is the world average (dotted black line).
3. We have used 40% for the wind-power resource in this study (whole black line). This is considered a cautious overall estimate.

4. A simulation model was used to estimate production of the wind-power resulting in efficiency of 33% for the whole interval of 0 – 1000 MW (orange whole curve).
5. The PPC has efficiency of 33% up to 500 MW and 21% between 500 and 1000 MW (blue whole curve).