ELECTRICAL SYSTEM SIMULATOR TESTS

Posted on 15/08/2011 by Naider

Via Pedro Linares I have reached simulator of the Spanish electricity system created by Alberto Ferrero Cándenas for the Technological Research Institute of the Comillas Pontifical University. The tool, still in testing, offers the possibility of playing with different parameters (efficiency and % of national and imported technologies for electricity generation) to simulate what the electricity generation mix will be like in 2020, estimating CO2 emissions and the cost provided. I have done two blocks of simulations: one without conditioning the mix but varying the efficiency; and another block conditioning the mix so that it is less carbon intensive, and at the same time playing with efficiency.

Mix without conditioning, varying the efficiency

As a first test I have done a free simulation, leaving the tool as it is to see what results it offers.

In the second test I have only varied the efficiency, indicating 20% for 2020. As can be seen, the improvements in terms of emission reduction and cost savings are evident. Gas decreases to a great extent with respect to the previous simulation to the detriment of nuclear and coal that increase their %; hydro and wind (which in the first free simulation decreased its % in 2020 compared to 2009) also increased their proportion compared to the previous simulation.

In other words, without conditioning any of the mix parameters and with an efficiency increase of 20%, the tool considerably reduces the contribution of gas, favoring carbon-based technologies above all.

Mix eliminating coal and nuclear and playing with efficiency

In the first simulation of this block, by eliminating coal and nuclear energy, the tool invariably forces the possibility of gas to be left open (the horizon is 2020, so gas must still be a central fuel in the mix). Without reducing the demand, the percentages of the mix that is offered does not reach 100%, (it remains at 95%, I suppose that it is a subject to debug); Leaving the efficiency equal to that of 2009, the resulting generation mix in 2020 is as follows:

As can be seen, with this simulation the expected cost in 2020 is almost triple the current cost, and the reduction in CO2 emissions is barely 5 million tons.

In the following simulation, keeping the phase out of coal and nuclear power, increasing efficiency by 20%. The result is as follows:

Compared to the previous simulation, hydraulic and wind power increase their percentage in 2020, while gas remains in the same proportion and solar thermal and photovoltaic as well as biomass disappear completely. In terms of emissions, the reduction is considerable, more than 20 million, and the cost in 2020 increases slightly, much less than in the previous simulation.

Summary table

As a summary of the simulations I have compiled the results in a comparison table which also exposes the reference model in 2009. As exposed in the comments from Pedro Linares's blog, it would be interesting to know the internal details of the tool in terms of scenarios and trends that have been used.

Even so, we see how, logically, the simulator rewards efficiency in terms of reducing CO2 emissions and minimizing the cost of the system in 2020.

There are no comments yet.