

Longhedge DC Sizing Breakdown Note

1. I have been asked to provide the Inquiry with a breakdown of the contributions of the DC elements of the proposal into three different parts:
 - a) The contribution representing the fact that a PV module has an output power defined under the Standard Test Conditions (STC) (irradiance = 1000W/m² – Cell temperature = 25deg C- Air Mass =1.5) which differs from the actual meteorological conditions of the site,
 - b) The contribution representing the PV module performance degradation over time; and
 - c) The contribution representing the maximization of the number of hours of production at the maximum authorized power capacity (49.9MWac) and the maximization of the energy production.
2. Before offering answers to those three questions, I can illustrate the issues behind them with two calculations:
3. First, to better appreciate the fact that the modules have a power expressed in conditions different from those outdoors, I have calculated the average irradiance that would be received by the modules and the average temperature of the modules when they produce energy, reaching a value of 440W/2 and 16deg C. With these 2 values I then calculated the power that a 610Wdc (STC) module could deliver if it was subject to these 2 conditions and I reached a value of 276Wdc, **55% less than its rated power output at STC.**
4. Second, I have also calculated the average injection power from the development in the first year, which is 33MWac. **This average injected power is 58% less than that of the maximum injected power of 49.9MWac.**
5. When considering the above figures, and the percentage contributions I give in answer to the questions in 1 a) to c) above, there will be comparison with the 78.5MWdc of proposed panels (at their STC ratings) for the appeal scheme, which is 60% greater than the maximum injected power of 49.9MWac.
6. My answers to the three questions 1 a) to c) below are made on the assumption that the percentage contributions I allocate to each purpose in total represent the 60% figure on paragraph 5 above :
7. Concerning point a), it is difficult to take this effect into account separately from point c) because they are both based on the same practical consideration, illustrated in paragraph 3 above, that panels will not perform at their STC ratings. However, it is a standard design assumption for a solar plant to have a DC/AC ratio >1 for STC reasons, as previously

explained in my technical note (CD 7.10.2). In order to allocate a value to this factor I have calculated what additional DC power can be installed without having clipping losses (which is an additional 6.5MWdc, bringing the total scheme to 56.4MWdc) which produces a value of 13% for this project. **It is therefore considered that point a) is estimated at 13%.**

8. For point b), as stated during my cross-examination, the value of 0.5%/year of degradation for the first 30 years is generally accepted and in line with the module manufacturer's performance guarantees. For the following ten years the degradation is difficult to assess due to the strong and non-linear acceleration of the degradation. I considered an interval of 10 to 20% additional power losses for this period. **This results in an estimation of point b) to be between 25 and 35%.**

9. For point c), I have assumed this will be the balance of the of the total sizing percentage in paragraph 5 above, 60%, minus the contribution of parts a) 13% and b) 25 – 35%, **that is to say an estimate between 12 and 22%.**

10. These results are summarised in the following table (in which additional to the percentage figures above, those amounts are also expressed as percentages of the full appeal proposal):

Sizing breakdown	Related to 49.9MW	Related to 78.5MW	In MWP
No inverter clipping losses (STC)	13%	8%	6.5
Module degradation	25 to 35%	16 to 22%	12.5 to 17.5
Maximisation of time at 49.9MWac + energy production maximisation	12 to 22%	8 to 14%	6 to 11
Total	60%	38%	30MW
Module Level			
Module Wattage under STC conditions	610Wdc		
Average module wattage with real site conditions	276Wdc		
Plant Capacity Level			
Installed DC Capacity	78.5MWdc		
Average AC injected	33MWac		

Jean-Christophe Urbani on behalf of RES

28.6.24