TECHNICAL NOTE: Estimating Reference Wind Technology Market Prices for the Greek Interconnected Power System in the period 2014-2017

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New wind projects in Greece governed by Law 4414/2016 will receive a premium in the form of a variable (sliding) premium on top of their income from the market. To calculate this premium one needs to know the so called Special Market Price of Wind Technology (in Greek Ειδική Τιμή Αναφοράς για την αιολική τεχνολογία-ΕΤΑ Αιολικής Τεχνολογίας). Such SMP_Wind values are not publicly available today but will be provided in the future by the Electricity System or Market Operators on a monthly basis.

To make revenue projections for future wind farms using historical data, iWind has developed two alternative methods for estimating SMP_Wind monthly values, employing public data from LAGIE (the Greek Electricity Market Operator). These data refer to the interconnected system and comprise, among other, hourly values of Load and total RES production. The categorization of total RES production into wind, solar etc. is not available.

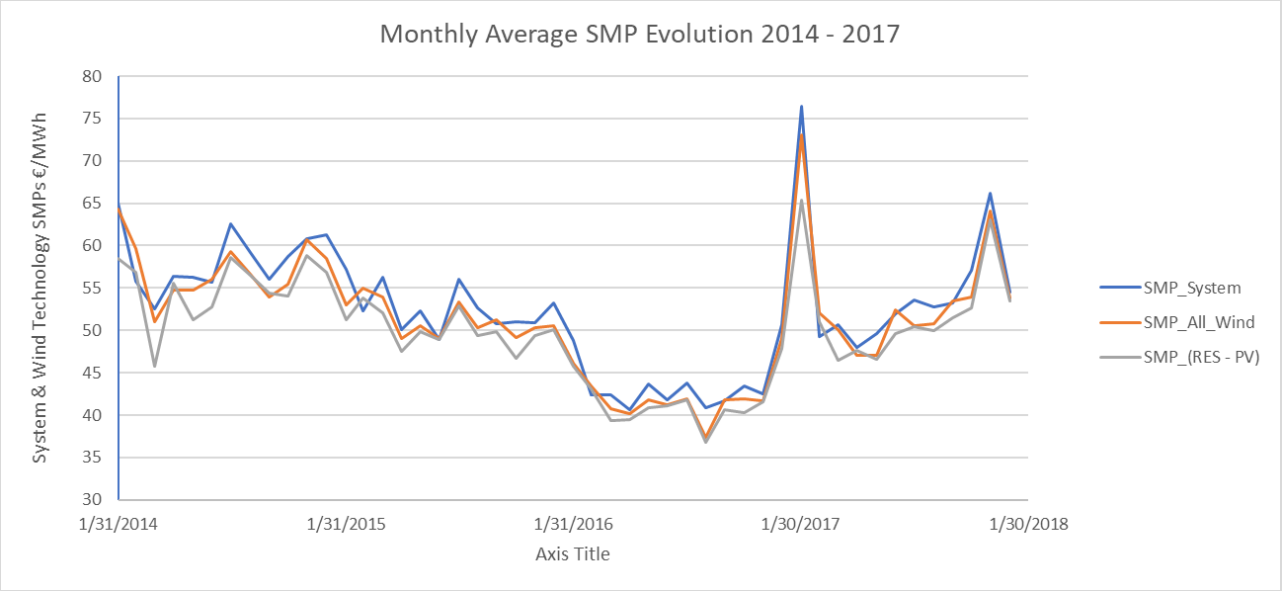

Figure 1 Monthly averaged values of system's SMP and wind technology SMP calculated from historical data with two alternative methods for the Greek interconnected system in the period 2014-2017. SMP_(RES-PV) refers to the subtraction of the typical PV year from total RES, while SMP_All_Wind comes from the MERRA2 dataset

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The first method developed employs hourly values of a typical photovoltaic production year and estimates hourly wind production by subtracting solar from total RES, neglecting smaller contributions from other RES technologies. The second method, which is deemed more representative for wind, builds up a numerical network of wind farms spread over Greece according to RAE's data and evaluates their total energy injected in the interconnected system using a grid of nearly 100 wind speed nodes over Greece from the MERRA2 reanalysis dataset.

Results obtained for the interconnected system in the period 2014-2017 are shown in Figure 1. The two alternative methods tested have similar trends and they both predict lower values than system's SMP with SMP_(RES-PV) yielding, in general, the lowest.

Another interesting finding of the analysis is the correlation among the different variables for the time-period considered. The symetric correlation matrix is shown in Table 1. All PVs is the production of the photovoltaic power plants injecting energy into the mainland system and grid.

Table 1 Correlation matrix of Load, system SMP, all RES and PV and Wind technologies

	LOAD	SMP	RES	ALL_PVs	ALL_WFs
LOAD		46%	34%	31%	7%
SMP	46%		-13%	-1%	-6%
RES	34%	-13%		75%	31%
ALL_PVs	31%	-1%	75%		5%
ALL_WFs	7%	-6%	31%	5%	

As expected system's SMP (called SMP in the Table) and system's LOAD are strongly correlated (46%). There is also a good correlation of the LOAD with total RES production (34%) mostly coming from the PVs (31%) and to a second extent by Wind (7%). The correlation of system's SMP with RES is negative. This suggests that, as expected, when RES penetration increases SMP reduces. A good part of that negative correlation is due to wind. PVs and Wind are positively correlated to 5%. This implies that the two main RES contributions are statistically near-independent.