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UPRIGHT, OPTIMALLY-INCLINED AND TRACKING GRID-CONNECTED PV SYSTEMS PERFORMANCE IN MALTA

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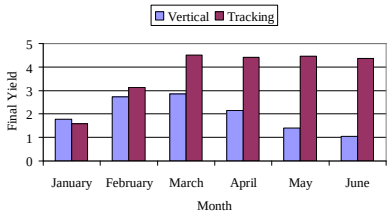
THE "UPRIGHT" & TRACKING PV SYSTEMS

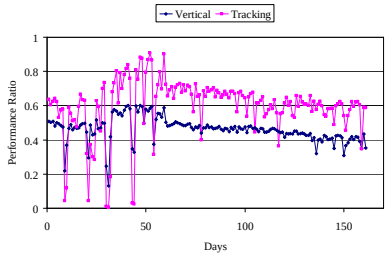
The potential for rooftop installations of PV systems is gradually decreasing, as higher buildings are constructed in place of traditional two-storey terraced houses, with priority given to rooftop building services installations and other traditional practices, such as drying clothes. However, these same buildings now offer larger façades than the demolished houses, which could be utilised for PV cladding.

A solar tracking system has the potential of offsetting some of the high initial PV capital of stationary systems. This implies that for a certain energy demand, less solar modules, less roof area and lower capital would be needed.

The 0.36 kWp tracking system had a more homogenous output throughout the first 6 months of 2006, while the 1.8 kWp vertical system peaked at 2.8 kWh/kWp/day in March and steadily dropped towards summer.

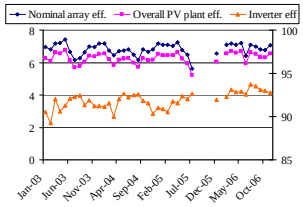


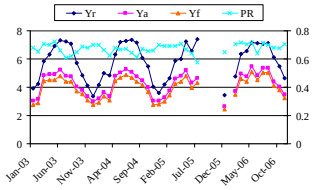
The vertical system stands at a disadvantage when compared to the tracking system, as it is more sensitive to the reflected component of solar radiation. Since the system was only few tens of metres away from the sea, it could happen that the reflected radiation onto the vertical plane created a strong mismatch for the output of the different modules, due to inhomogeneous incidence of radiation on the array plane and this lead to lower Performance Ratio.



THE "OPTIMALLY-INCLINED" PV SYSTEM

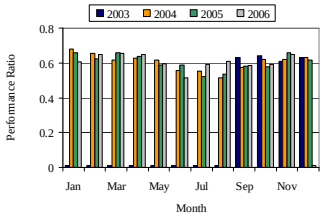
A 3 kWp PV grid-connected system installed at a factory in Malta, since August 2002. The PV array is facing south and inclined at 25° to the horizontal.

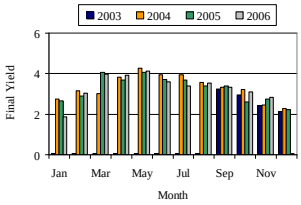




Another PV System with a "Compromise"

The "Madliena" PV system is a 2.268 kWp PV grid-connected system installed at a residence in Madliena, Malta, since August 2003. The PV array is inclined at 30° to the horizontal but its orientation is S40°W, for aesthetical reasons.





CONCLUSION

A final yield of 3.97 kWh/kWp/day has been achieved by the "optimum" PV system. This value is higher than the result obtained from the tracking system and sets a new record for scientifically monitored systems in Malta. The last documented value for a 5-year performance analysis was found to be 3.33 kWh/kWp/day, for a stationary system with an inclination of 36° (equal to the latitude of Malta) and azimuth 0°.

PV systems on facades offer an attractive alternative to glass and could enhance the aesthetics of buildings. Moreover, such systems could provide clean power that could contribute towards a better energy rating for the building. But further studies are needed to confirm the final yield of 2.1 kWh/kWp/day of such systems.

PV System	Vertical	Tracking	Optimum	Optimum "compromised"
PV Array Size (kWp)	1.8	0.36	3	2.27
Cell type	Poly-Si	Poly-Si	Poly-Si	Mono-Si
Inverter Size (kW)	1.7	0.7	3	1.7
Array Azimuth (°)	0	0	0	S40°W
Array Inclination (°)	90	36	25	30
Performance Ratio	0.46	0.6	0.67	0.61
Final Yield (kWh/kWp/day)	2.1	3.7	3.97	3.37
System Efficiency (%)	5	6	6	7