

Techno-commercial Comparison of Inbuilt lithium ion Vs lead acid based solar outdoor lighting solution

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Solar based outdoor lighting is a terrific wireless option and a reliable solution has the potential to replace all grid based lights. Lead acid (LA) based systems have been the only choice traditionally for solar based outdoor lighting. Users have seen the benefits associated with solar systems like no cabling, no electricity bills, no blackouts and safety due to avoidance of grid. However, there are issues associated with an external battery and due to lower system efficiency requiring the need for bigger batteries and solar panels to provide autonomy. Lithium ion (LI) based outdoor lights have been breaking ground in the past few years and are now emerging as the best solution for replacing not only lead acid but even grid based outdoor lights.

We have put together a techno commercial comparison of our inbuilt lithium ion based system with the typical lead acid based system when matching the lux specification.

The key specifications are as follows:

System	LI (9W)	LA (12W)	LA (9W)	Comment
Lux (at 4m height)	21	21	15	
Lumen Output	1050	1200	900	LI produces 20% higher lux for same lumen due to use of lenses
LED efficiency (lumen/W)	150	100 to 120	100 to 120	
Charge controller cum driver efficiency	>90%	70 to 80%	70 to 80%	
System Peak Wattage (W)	8	12	9	
Dimming	inbuilt	NA	NA	
Autonomy	Self	2 day	2 day	See white paper on autonomy
Battery Size	14.8V, 5.2AH	12V, 60AH	12V, 40AH	70% DOD on LA
Battery life	>1000cycles	TBD	TBD	LA battery life varies from 300 to 1000cycles depending on state of charge, ambient temperature and maintenance
Solar panel	26W	75W	40W	
IP Rating	65 on full system	65 on luminary only	65 on luminary only	

Below are the cost comparisons of the above system:

System	LI (9W)	LA (12W)	LA (9W)	Comment
Luminary	Rs13000	Rs3000	Rs1800	
Battery	Incl	Rs4500	Rs3700	
Charge controller	Incl	Incl	Incl	
Solar panel	Incl	Rs3400	Rs2000	
Cable	Incl	Rs400	Rs400	
Battery Box	inbuilt	Rs400	Rs400	
Pole+mounting structure	Rs500 to 2500	Rs3500	Rs3000	See NOTE 1
Total Cost	Rs13500 to Rs15500	Rs14200	Rs11300	
5 year Maintenance	Rs5000	Rs10000	Rs8500	1 LI and 2 LA battery changes; See NOTE 2
Total cost of ownership (5yr)	Rs18500 to Rs20500	Rs24200	Rs19800	

NOTES:

1. Smaller panel and inbuilt battery allows lighter poles and even wall mounting
2. LA battery life can vary from 300 to 1000cycles depending on battery state of charge, ambient temperature and maintenance. 1000cycles would require water topping every 3 months at Rs500/visit or Rs2000/year.

SUMMARY: The total cost of ownership of the inbuilt lithium ion compared to external lead acid battery based solar system is 15 to 25% lower for the same lux levels and within 5% for the same wattage levels.

Additionally the inbuilt lithium ion battery based systems help avoid theft in the rural/remote and unmanned urban areas.

In summary, the inbuilt Lithium Ion based solar outdoor lighting is the most advanced and reliable lighting system for all outdoor applications.