Trends in utility-scale applications

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Market segmentation has been dominated by utility-scale PV plants in the last 6 years, with a change coming from China in 2017.

2019 growth shared
- Floating < 1 GW
- BIPV < 1 GW
- AgroPV is new and growing slow
Utility-scale PV?

No univocal definition

- It started with ground-mounted PV installations, sometimes with small sizes
- It used to be remunerated with feed-in tariffs (even in case of local self-consumption)

Characteristics?

- Ground-mounted, but large-scale roofs have been seen (up to 50 MW)
- Electricity injected into the grid (distribution, transmission) but some self-consumption can be defined

Three majors drivers:

- Call for tenders, competitive, with or without additional constraints
- Options for virtual self-consumption with UPV delivering into the distribution grid for smaller consumers’ self-consumption
- Merchant PV: electricity sold either through PPAs or directly on the wholesale market

Floating, agro-PV...
Some Global Market Trends 2019-2020

- Market continues to develop in key locations with new countries being added to the list, mostly for utility-scale PV applications until tenders.

- Some key examples: Egypt, UAE, Morocco, Vietnam, Mexico...

- Middle-East sees a fast development in UPV, driven by competitive call for tenders.

- China is again the major unknown equation but the market should reach at least 30 GW with new tenders, front-runner program and poverty alleviation policies.

- Europe sees a tender-driven development, starting from Germany and the Netherlands with opportunities in France and Turkey.
Statistics depend on the country
Some use system size, others use the qualification
Some use AC, others DC to report system size
But in general systems above 10 MW are ground-mounted, utility-scale in their large majority

In general, utility-scale refers to large ground-mounted, or floating power plants, injecting either in the grid or for self-consumption, with a size > 1 MW.
Europe is the leading region for distributed PV, with Japan following and China depending on the year.

New markets are developing in the utility-scale segments before moving slowly (when they do) to distributed PV.

Complexity of distributed PV is the main « undriver » to their development.
Technology trends

- Trackers 1-axis
- Bifacial becomes mainstream
- New module formats
- Diversification per region
- More string inverters
- Mono > Multi
- Cdte
- Storage? Competitiveness?

Source: ITRPV 2020
Prices
HOW TO READ RECENT TENDERS

0.0157 USD/kWh in Qatar
Could be achieved with 2500 kWh/kW/Y – Capex at 0.5 EUR) 3% WACC etc.
In theory: doable

0.0112 EUR/kWh in Portugal
Out of reach without additional grid revenues, storage revenues and permanent grid connection after the 15 years of the tariff.
Average PV modules spot prices are now below 0.2 US$/Wp

A rapid price decline is always followed by a stabilization period: “the reality check”

Market and production imbalances always end up in profit making periods.

Further gains will require technology push, not only economies of scale

Transport costs can become a key factor for modules

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Source: Becquerel Institute
CAPEX indications

- CAPEX target is 0.5 EUR/Wp in most European countries.
- 0.5 USD/WP could be reached in locations with lower labor costs.
- Tracking adds up to 0.1 EUR/Wp
- Technology is important
- Bifacial is offered at roughly the same price as monofacial mono-PERC
- Historically the decline of systems prices was in line with module prices decline

Graph showing the decline of CAPEX costs from 2019 to 2022 for different scenarios.
CAPEX for floating PV

Perpetum confirms cost estimation

Source: Perpetum

US$ 0.70-0.80 per Watt-peak
LCOE depends on many factors, starting with CAPEX, OPEX costs and the cost of capital.

How to be the most competitive? Select the best combination of technologies: but new constraints are coming: local content, sustainability, ... This will influence choices.

Competitiveness with wholesale prices is a moving target (and duck curve)
Business models
How solar projects are financed

“Balance sheet” (equity) vs. “non-recourse” (debt) (1/2)

Large projects are typically developed through a standalone project company
- Owned by the project investors
- With its own revenues & balance sheet and thus the ability to raise debt on its own merits

There are only two discrete sources of funding
- By the owners (directly via equity or shareholder loans, or indirectly via guarantees)
- By banks without recourse to the equity investors – this is “project finance”

The way a project is funded will have a material impact on how it deals with contractors
- In a project finance deal, you need to deal with the senior lenders’ requirements!
- Tax, accounting, consolidation and rating issues

Source: Green Giraffe Energy Bankers
How to realize subsidy-free solar? PPA options may be used

Source: Tilia
Some key Challenges

- Which business model for utility-scale plants? Centralized or distributed? Remunerated through tenders or through the market?
- How to deal with the variations of the wholesale market price?
- The repowering case: after 15, 25 or more years? What about 50 years lifetime for PV plants with repowering steps.
- Bankability becomes a key issue: quality is not a given, so what rules to follow to be on the safe side? And what is the safe side?
- Technology choices: how to decide what to install with a number of technologies exploding in the coming years? Bifaciality, a new degree of complexity.
- Competing in tenders: forecasting PV modules, PV batteries and BoS prices?
- Local content: the return?
PV for hydrogen production (Green Hydrogen)

PV+storage, with Li-Ion battery storage can be competitive depending on the uses.

PV for large-scale virtual or collective self-consumption

Can we move a PV plant (PV for mining sites)?

Is merchant PV without PPA viable and how? Does it implies daily storage in any case?

PV for energy intensive applications (data centers...)

Agricultural PV: protect crops, double source of income, technology?

Floating PV: 2 GW installed. And growing fast.
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