

# **Floating Solar PV & Battery Storage for Botswana**

**Nov 2024**

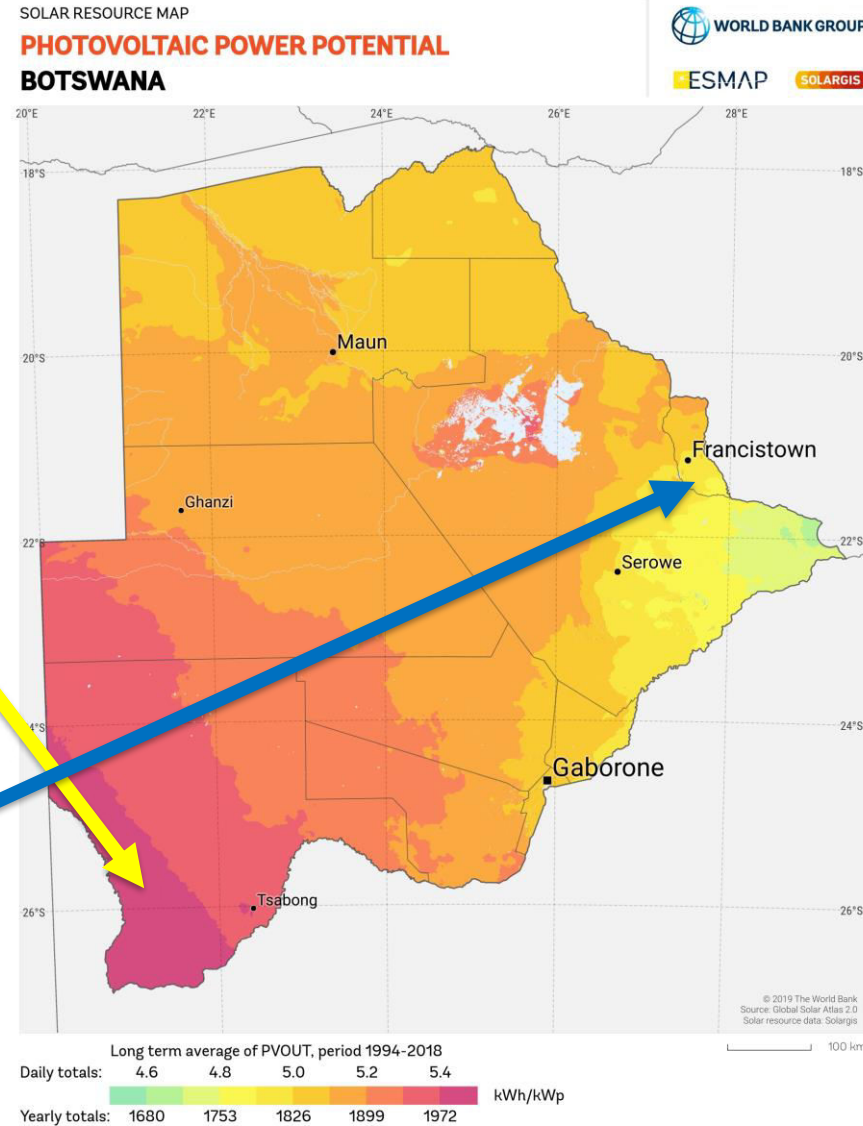
# Background

- We have looked at possible locations for Floating Solar PV in Botswana since 2018.
- Mega Solar is a partnership between the Governments of Botswana and Namibia, and others, which is expected to generate up to 5 gigawatts of solar power, funded by the World Bank (IFC) and others:  
<https://www.afrik21.africa/en/botswana-namibia-agreement-with-investors-for-a-5-000-mwp-solar-complex/>
- IFC's involvement means that the solar complex will be open to investment by the private sector, independent power producers (IPPs)



# Solar Radiation & Heat

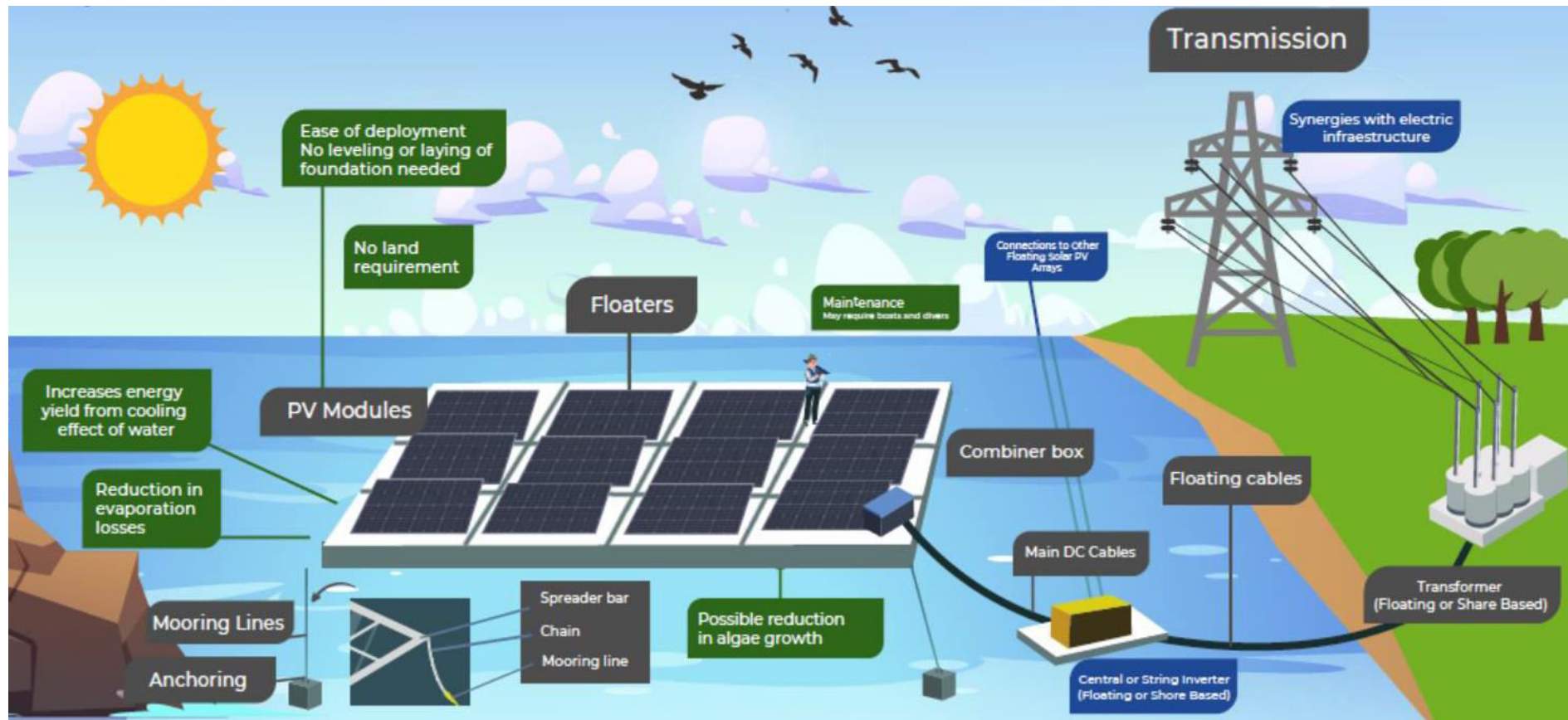
- Solar PV does not perform well when it is too hot. The chosen location has excellent radiation stats but it also a very hot location.
- Floating Solar PV is a superior strategy to land based Solar – especially in hot regions such as Botswana and Namibia.



# Why Floating Solar PV

- SA is a water scarce country and requires more electricity generation. Floating solar offer both a reduction in evaporation and electricity generation.
- Dam surfaces offer high value space for solar PV projects with no impact on use of the water for others
- More efficient: proximity to water cools the panels, which gives greater efficiency (20%) and, possibly, doubles the life span of panels – effectively halving the generation cost.
- Advantageous for the water resource: solar panels covering the surface reduces algal growth and evaporation (up to 2 m/y), in this case 20 million m<sup>3</sup>/y. If dam has fish, less losses to bird predation.

# A Floating Photovoltaic System (FPV)



# Floating Solar PV Panels



# Why Storage

- Most areas of Africa have an abundance of sun and Solar PV is “flooding” the market
- However, Solar PV is a highly variable energy resource
- Solar only produces electricity 6-8 hours per day and not much when it is a rainy day
- Peak in Botswana is 7:00 am to 12:00 am & 17:00 pm to 20:00 pm – in all 40 hours Mon-Fri.

# Different Storage Technologies

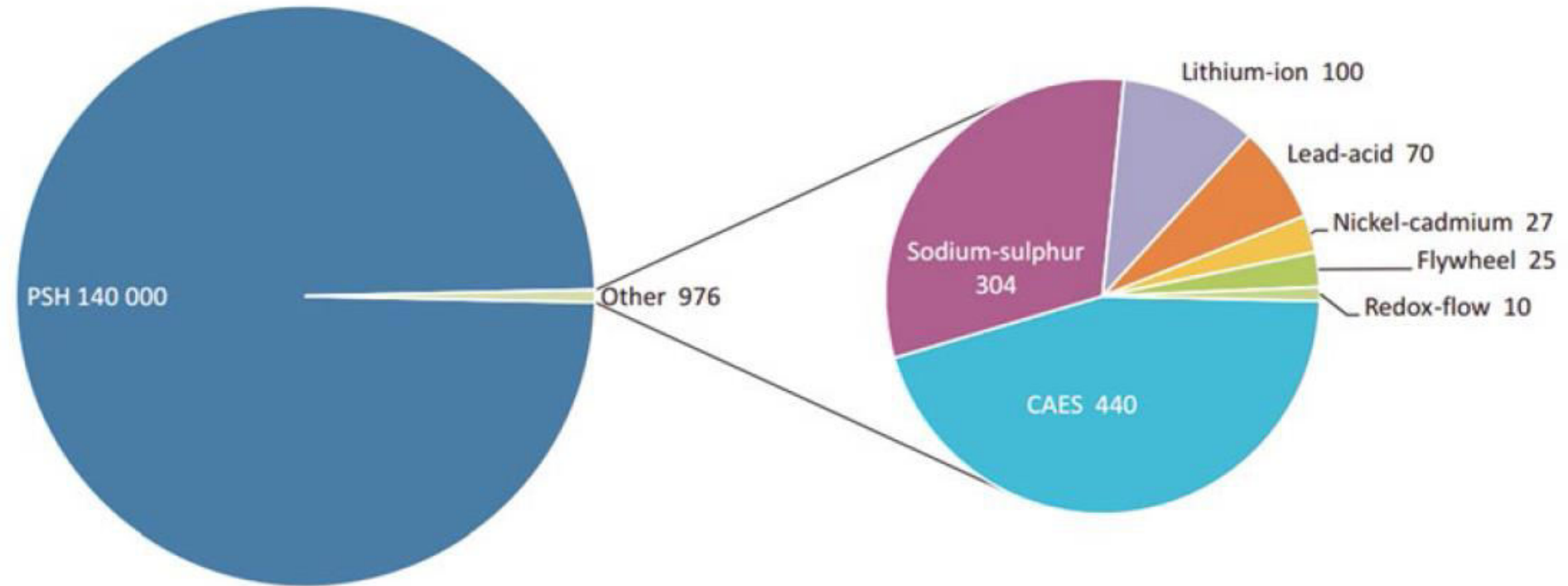


Fig 1. Current capacity grid connected storage worldwide (CAES – Compressed air energy storage)

# Lotsane Dam



Altitude 853 m

Lotsane Dam head 30 m 40 m m3 no Hydro

Maunatlala

Upper dam 1100 m 3 km away

# Design Example Lotsane

- 500 MWp Solar PV, requires 500 ha of surface of dam, for Floating Solar PV panels
- 100MW/400 MWh Battery storage
- The dam water will cool the panels, which gives higher efficiency and the panels covering the surface water reduces algae growth and evaporation – 10 million m<sup>3</sup>/yr is saved (i.e. 2m of water level per year)
- Solar USD 500m + Batteries USD 1 Billion

# Other Dams and Capacity

| Total incl. Lotsane | 2 600+ MWp |
|---------------------|------------|
| Letsibogo Dam       | 500+ MWp   |
| Shashe Dam          | 500+ MWp   |
| Ntimbale Dam        | 100+ MWp   |
| Dikgathong Dam      | 1000+ MWp  |

Total potential savings of water due to decreased evaporation is 50 million m<sup>3</sup>/y @ 2+ m/year

# Way Forward

- Surface Water and Non Consumptive water use agreements, between a SPV and WUC, for the 5 dams and free use of up to 50% of the water saved from evaporation for the irrigation of Bana grass Farms, down stream
- Feasibility Study – 6 months
  - Water level fluctuation
  - Grid proximity and capacity
- ESIA and any permits
- When all permits are in place the project is bankable, we have a commitment from <https://www.dbsa.org/>
- Floating Solar PV can start to be implemented and in production 12-18 months later.
- Battery storage as soon as generation is in place

# Road Map

Lol to set up SPV

Surface Water and Non Consumptive Water Use Agreements

Feasibility Study

EISA and permits

Solar PV implemented  
(12 months)

Battery storage  
(18 months)

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