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Re: Comments on Workshop on System Driven Approach for Solar Applications of Energy Storage

From: Albert Landgrebe

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It was an interesting workshop and I will only make a few comments and ask some questions that should be helpful in development of a System Driven Approach for Solar Applications of Energy Storage.

Industrial involvement includes battery developers, battery manufacturers, system developers and system manufacturers. What near term markets are they interested in?

At what level of PV penetration into utilities are the utilities interested in storage?

For utilities what location and characteristics of PV generation system are they interested in---distributed that is close to the load or centralized?

For energy storage should it be located at load site or central point? Storage can be operated in either a dedicated mode or a system mode. Will the storage system use solar PV output, utility output, or both?

Solar and storage can be complementary and competitive! Are daily and seasonal load pattern available?

What are the requirements for low storage penetration?

The inclusion of storage could have a profound effect on the amount of backup generation required. The System Driven Approach for Solar Applications of Energy Storage could study this.

Most likely there will be a need for short term buffer storage to smooth out the operation of PV generation plants to make it acceptable to utilities. The buffer storage acts like spinning reserve generation capacity and perhaps about one hour of storage capacity will be required.

Is it true that for low level of penetration of PV that the solar and storage are decoupled and economically independent?

What are the storage functions backup, buffer or both?

For high level of PV penetration, the decision to provide storage can no longer be made independently from the decision to add PV power systems. Will the system driven approach for solar applications of energy storage include alterative energy generation systems?

What information is needed to decide how best to match supply to demand?

For PV and storage applications the capacity factor has to be defined. The capacity factor is the ratio of the actual energy generation to that that could be generated if the unit was run continuously at peak out put. For PV power generation this will vary hourly, daily, monthly, and by seasons of year. For storage it will vary by state of charge.

It is important to calculate the cost of energy storage. This is how I calculate the cost of energy storage:

$C_T = C_p + t \times C_s$

Where C_T ($/ kW) = Total capital cost of energy storage system.

C_p ($/ kW) = The part of the capital cost proportional to the power rating. That is power Conditioning, etc.

C_S ($/ kWh) = the part of the capital cost proportional to the systems' energy storage capacity.

T (hours) = Average time per day during which energy is delivered from storage.