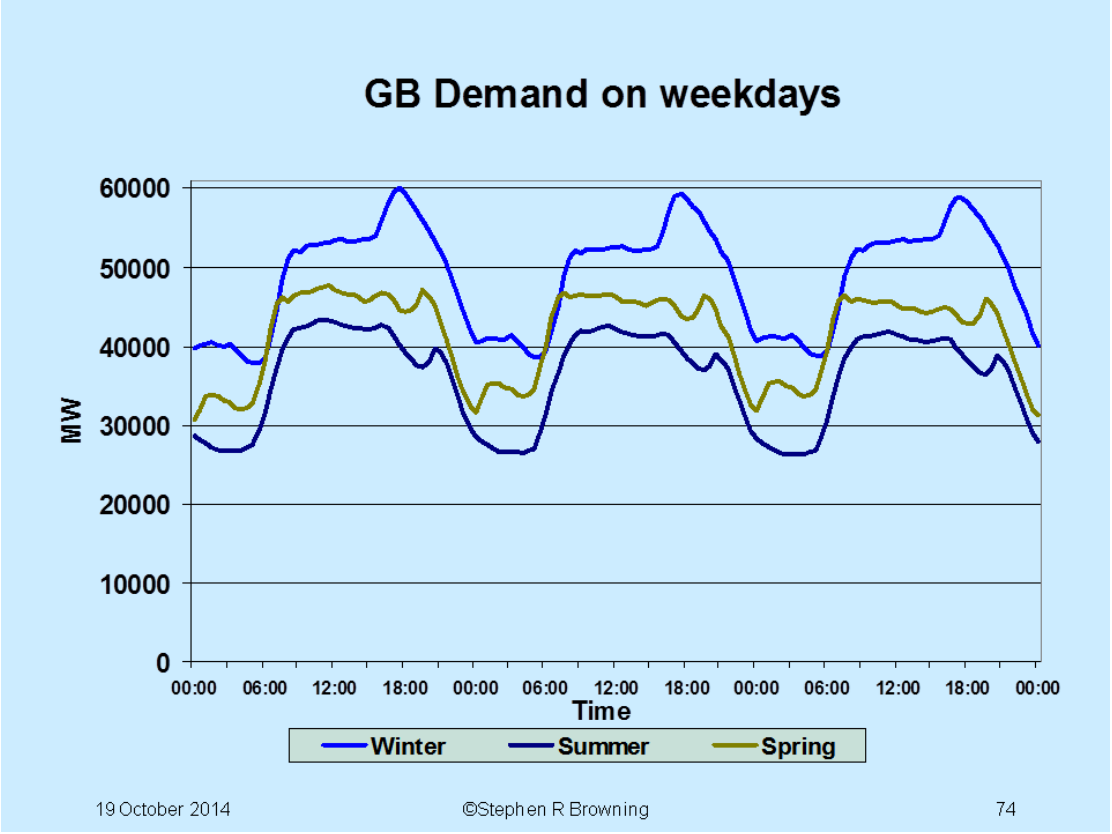
The main issue with DER management will be monitoring, trading and control at all levels. Let us look at the overall objective again:

From the point of view of the market and the operator, there is a need to monitor by location and time what the demand is expected to be and what generation outputs are programmed, together with data on the ability to instruct changes to generation and demand power profile, with energy and notice restrictions as appropriate, plus reserve capability so that timely instructions can be made to ensure demand and generation match with adequate reserve and spare to cover the error margins.

All this needs to be managed within a framework of continually changing demand as in these examples of different Great Britain weekday profiles.



The objective is to both reduce and smooth the power output of fossil fired generation while making the residual requirement for such plant predictable. This will not only reduce the energy requirement, but also, when such a plant is required, ensure it runs at peak efficiency to avoid unnecessary fuel burn and emissions.

As we get more generation at distribution level and variable DER that can participate, a system matching a two-way communication system is required to monitor and also trade where feasible.

At DER level, RES generation normally operates at full achievable (albeit variable) output, except where distribution or transmission security and quality limitations

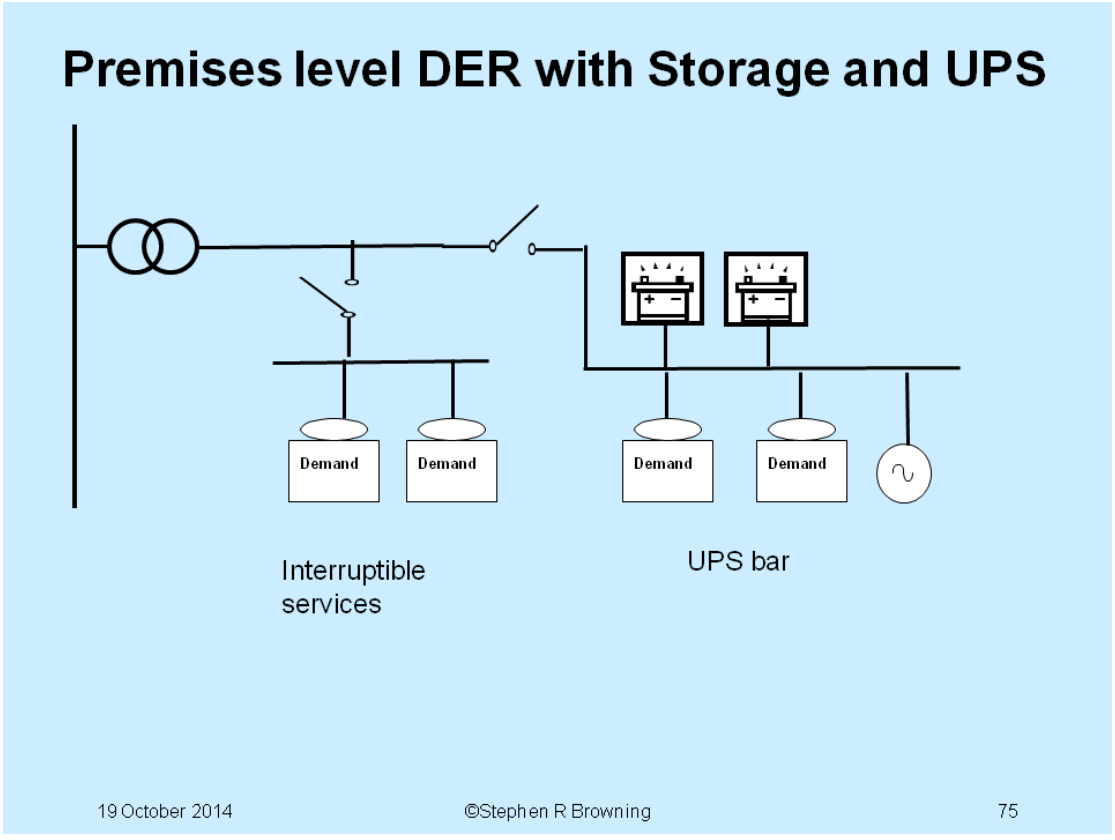
apply. To do otherwise for system matching purposes is inappropriate as we are simply reducing 'free' output, which has zero pollution/emission effects.

It is appropriate to vary CCHP unit output for system matching, but the degree of action may be limited by the associated heat or cooling requirement.

Electrical storage can be employed to smooth out excursions in the import or export profile to assist system matching and where located appropriately, to avoid overloading or assist with maintaining voltage levels. However, this adds additional cost and some energy loss. For CCHP, heat stores can also be used to permit variation of plant electrical output and can be very efficient.

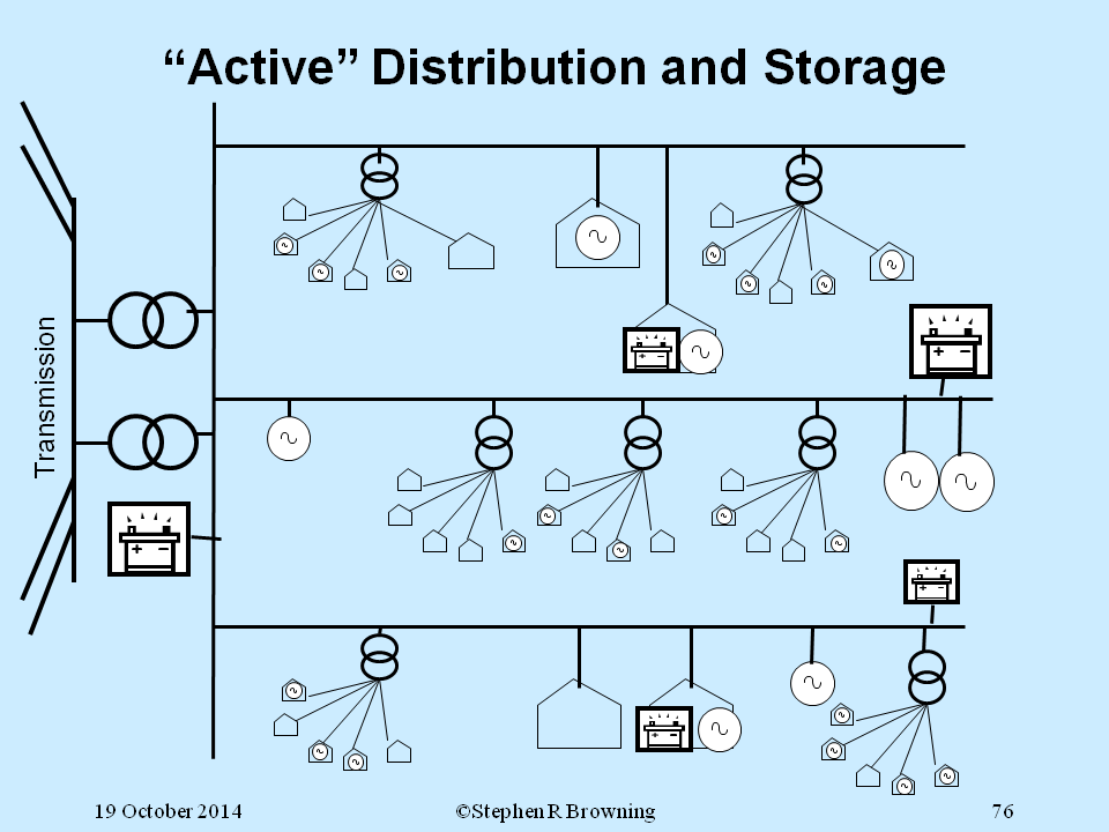
Domestic premises loads and RES generation, with inherently fluctuating profiles may not be suitable for major participation in power profile management, except for large time variable demand such as laundry.

Businesses and community CCHP systems are suitable for electricity or heat storage, to benefit the customer and the system. Distributed Generation must disconnect from the distribution system if supply is lost. Therefore, electricity storage at premises level can also be configured to provide UPS support and allow the premises generation to keep running.



So, with large DG penetration, we have the need to monitor and be able to exercise control, where available, over a large range of premises and devices below each supply point. We have premises with demand, generation and/or storage, individual

generation sites (e.g. wind farms) and possibly system connected storage and power conditioning. This combination of premises, individual generating plants and devices, forms a microgrid.



A lot of individual data is required for distribution system (microgrid) security management, and the aggregated information by supply point is then required by the market and the system operator for demand-generation matching and to maintain transmission integrity.

From the customer's perspective, there needs to be a considerable change in their relationship with the electricity supply business to achieve a tariff benefit from DER control.