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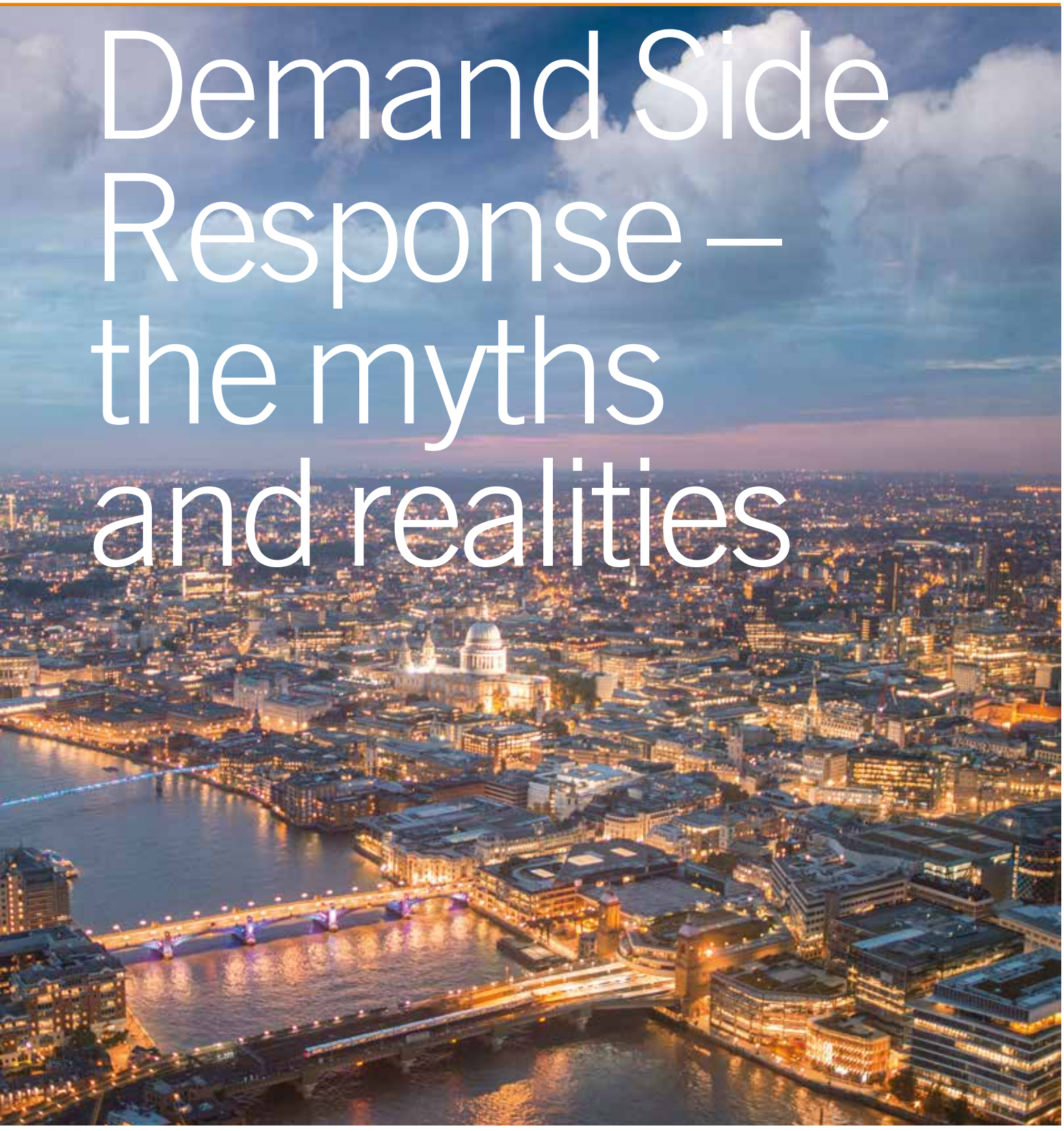
PÖYRY POINT OF VIEW - NOVEMBER 2014

Demand Side Response – the myths and realities



The need to coordinate DSR: Myths and Reality

As renewable penetration increases, more flexibility will be needed to securely and economically operate the energy system. Demand Side Response ("DSR") can be used directly or via aggregators by different parties: Transmission System Operator (TSO), Suppliers, or Distribution Network Operator (DNO), who may have competing needs for the flexibility that DSR can provide.

The different timeframes over which the various actors (especially TSO, Suppliers or DNOs) may use DSR can lead either to synergies or conflicts in the use of a particular DSR resource. This could in turn undermine the ability of a particular DSR resource to serve multiple parties/purposes and ability of different DSR users to service their needs.

Pöyry has previously produced ground breaking analysis of the role of DSR in GB, firstly for DECC[1] examining conflicts between supply and network driven DSR optimisation and secondly for Electricity North West/ National Grid[2] assessing the effectiveness of various DSR price signals.

Our latest analysis, presented in this Point of View, is the result of a study carried out for UK Power Networks using real trial data to understand the conflicts and synergies which may arise in the use of Industrial and Commercial (I&C) DSR by the TSO, Suppliers and DNOs to manage their various requirements. We have used the data to expose key myths and realities about the use of DSR. Providers of I&C DSR can include chilling loads in supermarkets, air conditioning loads in hotels and manufacturing sites with processes which can be stopped, reduced or shifted.

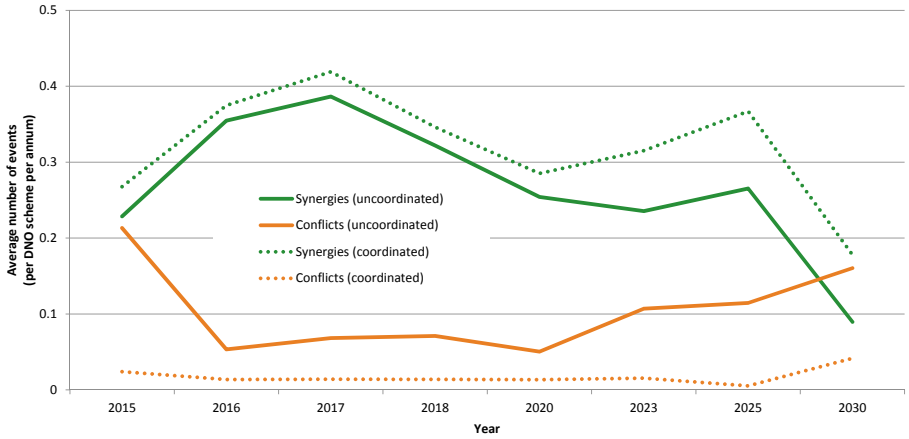
Myth #1 – Lots of conflicts will occur when DSR is used by various parties

Reality #1: Conflicts are rare but material from the DNO's perspective

Our analysis has shown that the TSO and Suppliers would both call DSR far more frequently than the DNOs. The number of national usage events (by TSO and Suppliers) typically ranges from 50 to 100 in any one year for a given DSR resource, compared to the DNO calling a specific DSR resource, on average, less than once per year. Synergies or conflicts only occur (on average) 0.2 times per year per shared resource of DSR across all network types with synergies accounting for 65% of these occurrences. Thus whilst the TSO's or supplier's use of DSR is rarely affected by DNOs, the DNO faces the prospect of national DSR calls impacting them at least 20% of the time they need to use a specific DSR resource.

Myth #2 – Complex co-optimisation will be needed in the future to co-ordinate the multiple uses of DSR resources

FIGURE 1 – IMPACT ON SYNERGIES AND CONFLICTS UNDER CO-ORDINATION OF DISPATCH (SUBURBAN NETWORK)



Demand Side Response (or "DSR") is a reduction and/or shift in demand achieved by customers.

DSR will be a key source of flexibility in the future energy system and will be used by various parties for various purposes. The regulatory framework for distribution network operators (DNOs) now incentivises DNOs to use DSR as part of their business activities. At the same time, TSOs and suppliers will seek to use DSR to meet their own business needs

Reality #2: Simple co-ordination of dispatch of DSR eliminates 60% to 85% of all conflicts

Suppliers and the TSO can use DSR (in general) regardless of location. However, DNOs need to use DSR at specific locations on their networks to manage local constraints. Therefore, where a specific DSR provider is used, for example, to meet a national issue, conflicts with the DNO's local need for that specific DSR provider can arise.

Our modelling has shown that simple co-ordination of dispatch of DSR eliminates 60% to 85% of the conflicts and reduces the impact of many of the remaining conflicts. Figure 1 shows the significant difference in number of conflicts between a world with coordinated dispatch of DSR versus uncoordinated dispatch on a suburban network.

[1] http://www.poyry.com/sites/default/files/imce/151_optimal_demand_side_response_v3_0_decc.pd
[2] http://www.poyry.co.uk/sites/www.poyry.uk/files/717_DSR_Price_signals_Report_v1_0.pdf

Myth #3 – DNOs will only use DSR during winter or summer periods depending on type of demand supplied; and supplier use of DSR will be low.

Reality #3: It is not that simple – DNOs will need to use DSR albeit infrequently at times all year round; and suppliers will use DSR a lot throughout the year.

At present, suppliers do not use DSR to manage their wholesale costs. However, in the future, suppliers may use Time-of-Use tariffs to hedge their wholesale risks.

Whilst, from a DNO perspective "summer peaking" locations (e.g. Central London where commercial premises air conditioning dominates) only require DSR in the summer, the requirements for DSR on winter peaking network substations (e.g. suburban areas where domestic heating/lighting demand dominates) extend into the spring and summer months by 2023 as penetration of renewables and flexible demand increases, (see Figure 2).

Supplier usage of DSR is concentrated in the winter when peak prices are at their highest, extending into spring and autumn as intermittent generation becomes more prevalent. Therefore, the use of DSR by suppliers is most likely to conflict with the use of DSR by the DNO at locations which have winter peak demands.

The TSO uses DSR (and other flexible capacity) to manage the operation of the system throughout the year. The use of DSR by the TSO (~2000 MW) will conflict with the use of DSR by the DNO on all network types.

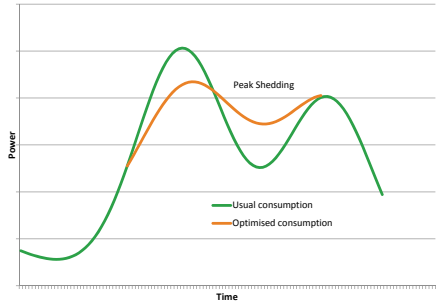


FIGURE 2 – EXAMPLE OF POTENTIAL LOCAL VERSUS NATIONAL USE OF DSR IN 2023

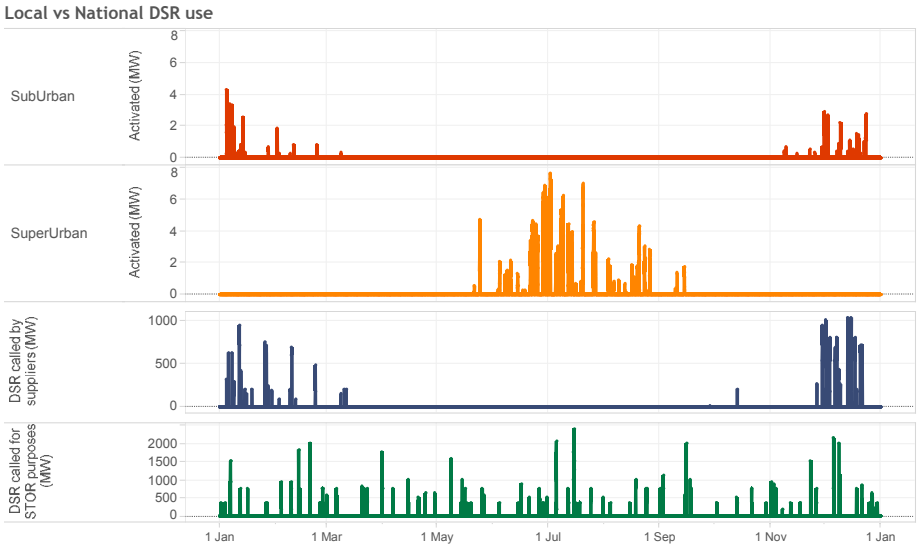


Figure 2 shows the use of DSR on the suburban and super-urban networks in London as well as supplier and TSO use of DSR in 2023.

Myth #4 – Availability prices offered by DNOs will need to be very high to attract customers

Reality #4: Availability prices only need to be more attractive than those available from the TSO to provide an incentive for parties to contract with the DNO

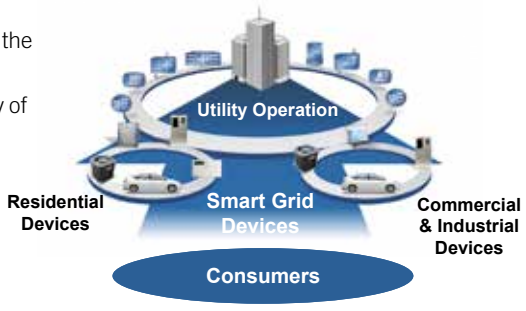
Our analysis has shown that:

- cumulative savings for the DNO and therefore the end consumer are much more significant with lower availability prices;
- the highest savings can be made when a large incremental capacity of network reinforcement is needed in the absence of the DSR; and
- using DSR has a greater benefit when the amount of DSR procured is small in proportion to the incremental capacity of network reinforcement otherwise needed.

So what are the key conclusions from our analysis for Distribution Companies?

Conflicts in the use of a particular DSR resource by various parties can be minimised through coordination of dispatch. The burden of responsibility in determining an appropriate framework to facilitate the use of DSR in the future lies with the DNOs as they are the most impacted by conflicts.

Our analysis shows the complexity of understanding the impact of DSR use in a multiple stakeholder environment. With its combination of sector expertise and modelling capability, Pöyry can help industry participants to understand the value, role and complexities of DSR use and to advise on how they can most effectively exploit DSR to add value to their business in the future.



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