

Virtual Power Plants – At the heart of the energy transition

*Increased competition and ongoing consolidation: A survival game for aggregators?
Opportunities for utilities and investors?*



Energy utilities are evolving towards greater reliance on flexibility to respond to an increasing supply-and-demand imbalance. In that context, the role of aggregators has become predominant in optimizing electricity generation and demand through virtual power plants (VPPs) and complementing traditional power plants in the provision of flexibility. Meanwhile, aggregators face strong competition from traditional retailers: these are developing similar demand-side response (DSR) solutions, leveraging their portfolios of customers and generation assets or acquiring promising aggregators altogether. In our broad project experience, we have supported utilities and investors in addressing the question of how to build up a successful aggregator model.

VPP development was, until now, facilitated by regulation and opening of energy markets to flexibility

Regional and local regulators are encouraging and facilitating participation of demand response and aggregators in all organized energy markets. In parallel, transmission system operators (TSOs) in some countries have redesigned their market rules to accommodate DSR in the system. This has generated a broad range of mechanisms and programs in recent years, allowing aggregators to ramp up revenues over short periods in order to benefit from acceptable market conditions (e.g., minimum bid size, no consent from final customer's supplier required, technology-agnostic market rules) and get access to real-time price signals. The combination of favorable regulation and opening of energy markets has led to a proliferation of aggregators across the globe in the last years. In the UK alone, around 20 players have developed aggregation activities.

Although some markets, such as the UK, France and Belgium, are very dynamic for favoring DSR flexibility development, substantial efforts still need to be made in other regions of the world, such as Germany and Spain. Conditions of participation in lagging markets are often quite strict, and therefore limit the aggregated load to compete with traditional generation assets.

Market consolidation is ongoing

The Demand Side Management (DSM) market is facing significant consolidation and attracting large investments from utilities and private equity firms. Some recent acquisitions of aggregators by retailers in Europe and the US were the results of win-win searches for synergy (e.g., EnerNOC was acquired by Enel, REstore by Centrica). This demonstrates great interest from retailers in integrating agile start-ups and technical solutions into their own large, complex organizations. Aggregators on their side can directly benefit from market access offered by retailers through their customer portfolios, which become potential flexibility sources.

Meanwhile, the business climate for aggregation becomes more sophisticated and less stable, creating multiple effects.

Capacity auction results in the UK demonstrate the volatility of expected revenues for energy asset investors and aggregators. Record-low clearing prices for capacity market auctions (£8.40 per kW in 2018 T4 auction) raises questions over the sustainability of the mechanism and the level of incentives developers can expect for new-generation assets.

On top of revenue instability, energy suppliers and aggregators (and distribution system operators in some markets) are competing for access to flexibility from the same pool of

List of aggregators per country (selection)

SELECTION



Source: Arthur D. Little

customers, with higher cost of customer acquisition for aggregators.

Finally, the DSR market is constantly evolving, with the introduction of **new mechanisms and existing ones being rationalized and simplified**. This drives the need for VPPs to be on top of each of their regional market dynamics and ahead of any upcoming developments.

The ongoing consolidation trend is likely to be confirmed in the next months if uncertainty of revenues occurs, making the business model less stable for aggregators.

Different levels of maturity across aggregators

From a commercial and technical perspective, aggregators are spread along a maturity spectrum, based on geographical footprint, scope of services, portfolio of customers and technology.

We distinguish three types of European and US players:

1. **Embryonic:** These typically focus on either aggregated generation or load control. Due to their early developmental

stage, flexibility is sourced from a limited number of assets and geographic expansion is opportunistic, with no deployment of sales force abroad. Partnership with retailers is key for their development, to open market potential and access to portfolios of customers.

2. **Active and developed:** These demonstrate capacity to generate profit in a short time with ambitions to geographically expand their activities. They are usually perfect targets for acquisition by large-scale energy companies.

3. **Self-sufficient:** These firms have considerable capacity under management, sizable presence around the world and developed flexibility portfolios composed of broad varieties of buyers and assets, ensuring ability to supply all types of flexibility needs.

Recent acquisitions show that each of the three categories of companies are potential targets for investors as a function of the investor's need.



Source: Arthur D. Little

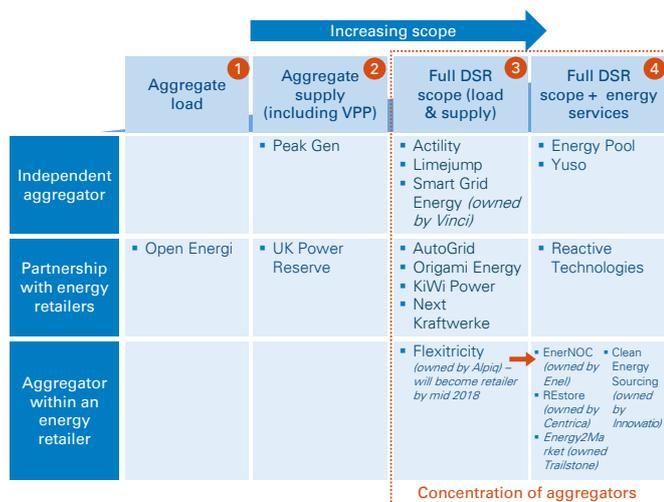
Key success factors: What is required for aggregators to survive in this rapidly evolving and hyper-competitive environment

We distinguish multiple key success factors to thrive in this business. On top of developing a large scope of services to offer flexibility to users, the combination of the right skills and technology solution constitute the key differentiator to be a “winning market player”.

1. Extended scope of activity and offering

The analysis of the aggregator landscape shows a concentration of players offering full DSR scope (load and supply aggregation), as illustrated by the figure below. In some cases, their aggregation offerings are complemented by energy services. Only a limited number of providers can offer this large offering spectrum, unless they have strategic partnerships with energy retailers or were acquired by one of them.

Mapping of aggregators against go-to-market strategies and scope of offering (selection)



Source: Arthur D. Little

2. Reactiveness and flexibility

Aggregators able to respond quickly to any evolution of markets (e.g., local regulation, evolution of market design) from a technical and commercial point of view can catch low-hanging fruit. Indeed, the DSR market is evolving fast, and TSOs continuously review and update DSR mechanisms in their control zones. This requires aggregators to stay up to date and adapt their solutions rapidly to avoid missing opportunities or paying penalties.

3. Diversification

A diversified portfolio of geographical markets, flexibility users and providers, and access to multiple DSR mechanisms enables aggregators to minimize risks such as power-price volatility, DSR product evolution and regulation change.

4. Innovation and technology

With increased pressure from competition, innovation is a differentiator and enables access to untapped market segments (e.g., to new types of flexibility sources, such as residential). The technological edge (software and hardware) is a key enabler in this business.

5. The right skill set

The aggregator needs to have the right skill set, including engineering, commercial, trading, legal and financial profiles. All capabilities matter, and need a foundation of sound market knowledge for each served energy market.

6. A low-cost solution

Affordable access to markets will increase profit for flexibility providers and allow aggregators to be successful in a very competitive environment.

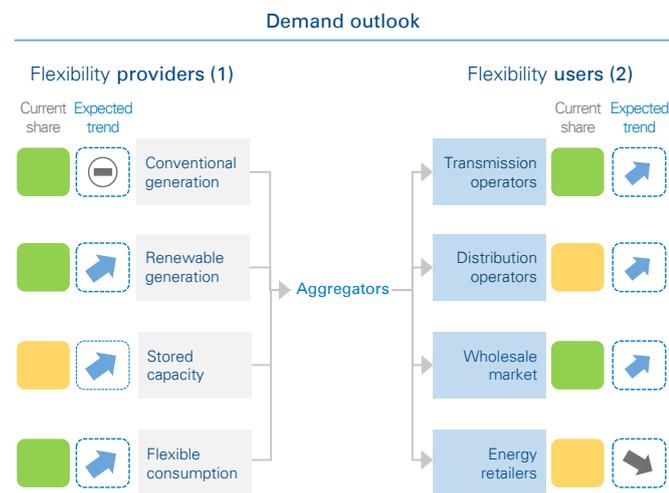
Outlook

The role of aggregators in the VPP/DSR market is on the rise in the US and Europe, where market design and regulation are increasingly favorable to supporting this flexibility source in the energy system. Our research and project experience in this area highlight the attractiveness of Europe, especially the French and UK markets, for their maturity and continuous willingness to improve conditions for DSR to participate in the flexibility market. Flexibility monetization is ongoing in Asia, with the Japanese market as an example of how a new DSR market is being shaped based on US and EU learnings. Although some other geographies are still lagging behind, we anticipate increasing supply and demand for flexibility, driven by most of the energy market players.

On the provision side (1), we expect that renewable generation, battery storage and load from industrial and residential segments will increasingly provide flexibility in the coming years. Conventional generation has been the single source of flexibility for years, and related provision volume is

expected to stabilize, as investment for that category of asset is limited (except for gas-fired flexible conventional generation).

Current and future flexibility trends – Breakdown by provision and consumption types



Source: Arthur D. Little

On the consumption side (2), system operators will constantly need more flexibility since development of intermittent generation is still growing. On the retail side, more and more energy retailers are developing or integrating aggregation activities into their businesses; therefore, we do not expect them to still need intermediaries in the future to get access to flexibility.

The flexibility market, and more specifically, VPPs, present opportunities on different fronts. Some geographies start shaping their markets based on key learnings from more mature markets and should open theirs to aggregators soon. In parallel, in markets where aggregators are successful and more or less established, consolidation is happening, mainly driven by utilities looking to complement their businesses with VPPs relying on proven technologies. Finally, private investors will carry on leveraging the ongoing market consolidation, pushing additional revenue streams (such as “software-as-a-service”) in these maturing flexibility markets.

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Arthur D. Little

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