Aggregation: Appropriate or not?

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8th March of 2009

SUMMARY

An Aggregator is a buyer's agent that joins two or more customers into a single purchasing unit and negotiates on their behalf for the purchase of electricity service to a Retail Electric Provider. Aggregator can help to customer to save time, effort, and money. In this paper a general definition of aggregator is shown including most important aspects of the aggregators like: roles, types, and a simple example of aggregations to show the benefit and disadvantage of two different ways to implement aggregations.

Key words: Aggregator, definition, roles, types, benefit, disadvantage.

Introduction

The deregulation of electricity markets has a strong impact on the behavior of electricity customers and stimulates the use of tools for increasing the flexibility of consumption, since markets encourage price responsive demand [1].

The customer aggregation and load control can improve the role of demand within markets, if consumers are able to respond to price signals by handling load. In this paper, a general review of some important aspects to understanding the concept of aggregator is shown. More relevant characteristic are shown, including an example of appropriate and inappropriate aggregation.

Definition

An aggregator is a buyer's agent that joins two or more customers into a single purchasing unit and negotiates on their behalf for the purchase of electricity service.

Generally an aggregator will be compensated by the *Retail Electric Providers* (REPs), but may take payments from the customers in certain circumstances-either way the aggregator must inform the customer of its compensation method [2].

Aggregators shop for their customers and often help them save time, effort, and money. An Aggregator conducts research on electricity prices, contract terms and conditions, and other services that their customers want, and recommends a REP.

The Aggregator is any person, municipality, political subdivision corporation that aggregates customers together as a single purchasing unit.

Aggregator roles

The aggregator's primary role is to act as a catalyst or agent, introducing interested customers to a suitable supplier. The aggregator determines the service constituents want to acquire, solicits bids, and chooses a supplier. Once formed the aggregation and its participants enter a service agreement with the chosen supplier. At this point, the aggregator's role is monitoring and overseeing the contract.

The supply service and distribution service used by members of an aggregation are subject to the same laws, regulations and tariffs as the service used by other retail customers [2].

Differences between aggregators and REPs

A *Retail Electric Provider* (REP) is a person or corporation, generator, broker, marketer, or any other entity that sells electricity to end-use customers over regulated transmission or distribution facilities. A retail electric provider (REP) [2]:

- Takes ownership of the power it sells and
- Bills and takes payment for power.

An aggregator:

- Does not actually sell power,
- Does not take ownership of the power and
- Does not collect payment or prepayment for electricity service as distinguished from aggregation service.

Both aggregators and REPs:

- Must comply with customer protection provisions,
- Must comply with the terms and conditions of service and
- Must be licensed by the Public Utility.

Types of aggregators

Load aggregation is the formation of a group of consumers into a single buying pool for the direct purchase of electricity supply [2]. There are two basic types of aggregation:

- *Private aggregators* – A person or organization that joins two or more customers, other than municipalities or political subdivisions, into a purchasing unit to negotiate the purchase of electricity. More common are aggregations of like entities pooling their load to attract favorable rates. This aggregation type is referred this form of aggregation as *market aggregation*.
- *Public aggregators* – A person or organization that joins two or more municipal governing bodies or two or more political subdivisions governing bodies into a purchasing unit(s) to negotiate the purchase of electricity. A municipality, or group of municipalities, may aggregate the entire electric load within the boundaries of the participating communities and solicit contracts to serve that load. This is a public aggregation (*Municipal Aggregation*).

The aggregation activities, theoretically, can be executed by any company, including players already operating in the system. An aggregator can also be an independent company, however very often the aggregation tasks are combined with another core business.

The purest form of aggregator is a company that makes its core business of the aggregation itself without owning any aggregated devices or having an internal business case. In

some countries the aggregators are a part of the business as: *transmission system operator* (TSO), *distribution system operator* (DSO), *balance responsible party* (BRP).

Aggregation's potential benefits

Load aggregation may offer retail customers several purchasing advantages, such as [A]:

- *Lower Transaction Costs*. By alleviating most of the effort associated with the screening and selection process, the load aggregator enables individual consumers to choose a *Competitive Supplier* at either little or no transaction cost to those individuals. Aggregating individual customers lowers these costs
- *Competitive Opportunity*. Load aggregation may foster better competition by allowing low-use consumers to take advantage of the market. Suppliers are more willing to compete for a large group of individual consumers by responding to a single *Request for Proposal* (RFP). Because of the high cost of customer acquisition, relatively few suppliers are willing to compete for low-use individual customers one at a time.
- *Greater Buying Power*. The aggregation is a way to obtain services or products at favorable prices and terms. The same is true for the purchase of electricity. Because of economies of scale, load aggregation may increase the buying power of participating consumers; particularly if they seek customized service. The load aggregation may enable the Competitive Supplier to capture market share at a relatively low transaction cost.
- *Savings from Load Diversity*. The best way to understand energy consumption patterns is to create an annual load profile. Residential, commercial and industrial customers use electricity differently at various times of the day. Residential and small commercial sector's electricity use can vary substantially during the day, resulting in erratic load profiles. Generally, supplying an even load profile is less expensive than serving an erratic one. Offering a larger, more diverse load (one that is more even) increases the possibility of receiving better prices than individual consumers receive.

Reason to aggregate

The aggregation provides a several advantages in both directions: consumers and utility. Considering both points of view the reasons for aggregating can be split in two categories:

- *Consequences of the electricity infrastructure, sometimes in combination with legislation*. In some countries, frequently some areas have more demand at times than can be supplied by the existing electricity network. At the same time, the legislation for new electricity infrastructures requires a lot of time, compared to the speed at which demand is growing. In these cases there are two solutions; either adds local generation to that area, or implement some form of demand response. The aggregation looks a strong possibility to coordinate consumer to get concerted operation of the demand response.
- *The market opportunities, rules and improved access for small players.* The market rules in a lot of countries require a relatively large amount of power to gain access to a certain market. Aggregation of smaller generation or demand response units allows access to markets on which they would not be allowed

to trade normally. Aggregation of consumer is a potential way to permit access to of these to a better prices and products thought

Aggregators and distributed energy resources (DER)

An aggregator could be an intermediate between the owners of DER on the one hand and one or more of the other market parties on the other. In this case aggregator increases the competition in the electricity sector (not being a monopolistic player as DSO or TSO).

Nevertheless, DER is useful to aggregator if these satisfy some aspects:

- *Location*. It's relevant when an aggregator offers its services to a TSO or DSO. Restrictions in the connection between aggregated power and the rest of the grid it is an important consideration, and the location of DER is important to prevent congestions.
- *Characteristics*. The Characteristics of a DER device are the load or generation characteristics like availability and controllability of consumption or generation capacities that is relevant for the usability of DER. Some DER technologies have constrained by primary process. These restrictions are relevant for the moment when a cluster of devices is supposed to respond.
- *Retailer*. The retailer of DER is a relevant parameter since it is in general the only party that has a direct contract with the DER owner.

Aggregation example

Aggregation is a means of combining the loads of more than one electricity account with the goal of shopping the electricity supply market to get a better price for power.

The "*idea*" is that all members of an aggregation pool could benefit from the lower prices made possible by a large economy of scale. Ideally the aggregation must benefit all parties, but if the aggregation procedure is not correctly developed some distortion emerge and make bas results.

- When *appropriate* aggregation is made aggregation helps customers save money on electricity supply costs in deregulated markets.
- When *inappropriate* aggregation is made, o if the process is not performed properly, electricity demand aggregation does not help all customers save money.

Not all consumers of power are equal in the eyes of utility companies. From the utility's viewpoint, the best customer uses a constant amount of power all day long, throughout the year. This means that the perfect customer's peak demand for electricity is equal to the customer's average demand for electricity. This customer would have what we call a 100% "*load factor*" (see Annex A.1).

Such customers are rare or utopian, because in the real world, load consumption in directly correlation with consumers behavior (especially in residential customer), leading to varying consumption of power throughout the day.

A typical office building might have a load factor around 49%, because the vast majority of power to operate such a facility would be consumed during the day, while the office tenants are in the building (Figure 1).

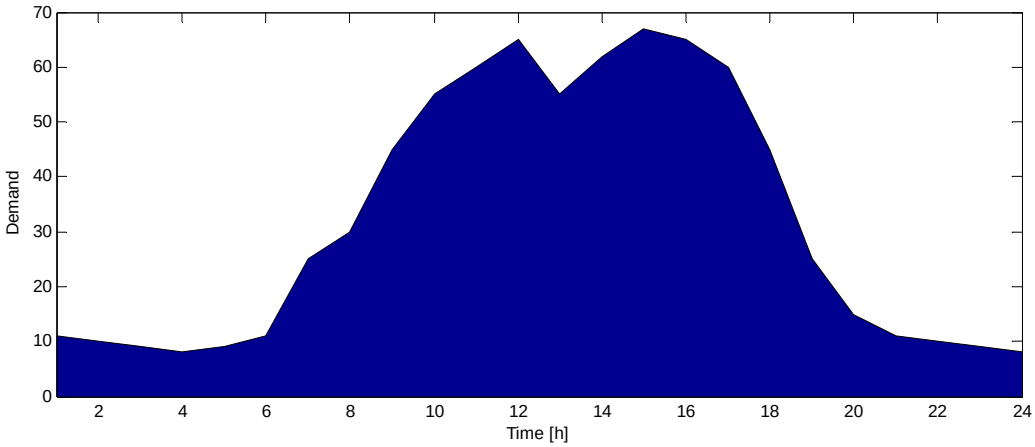

Figure 1. Load curve of a typical office building, load factor 49% [3]

A hotel might have a load factor around 84%, (which is much better from a power-shopping standpoint), because occupants of the facility would be using power from the early morning, throughout the day and into the night (see Figure 2).

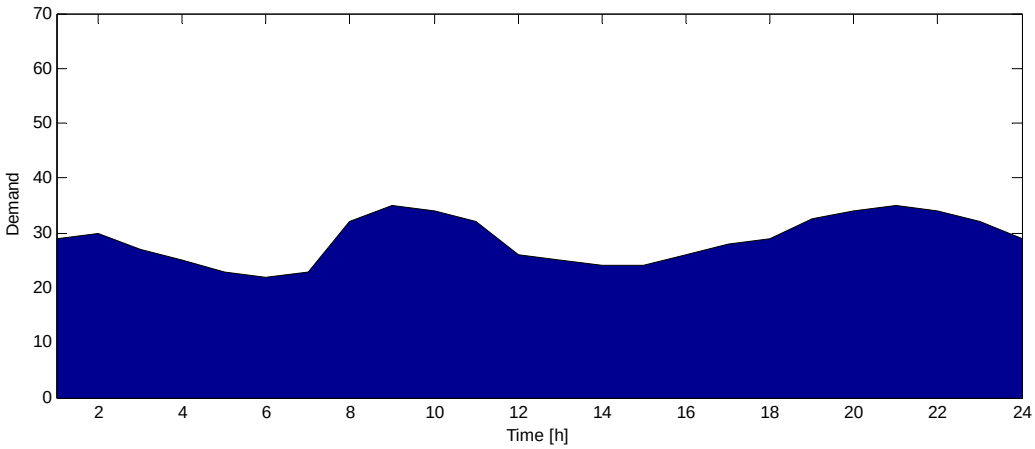

Figure 2. Load curve of a typical hotel, load factor 84% [3]

A theatre might have a load factor similar to that of an office building, (48%), but most of the power consumed by a theatre would be immediately before, during and immediately after the performance, (in the evening), which means that the peak demand for power would not coincide with that of the office building [3].

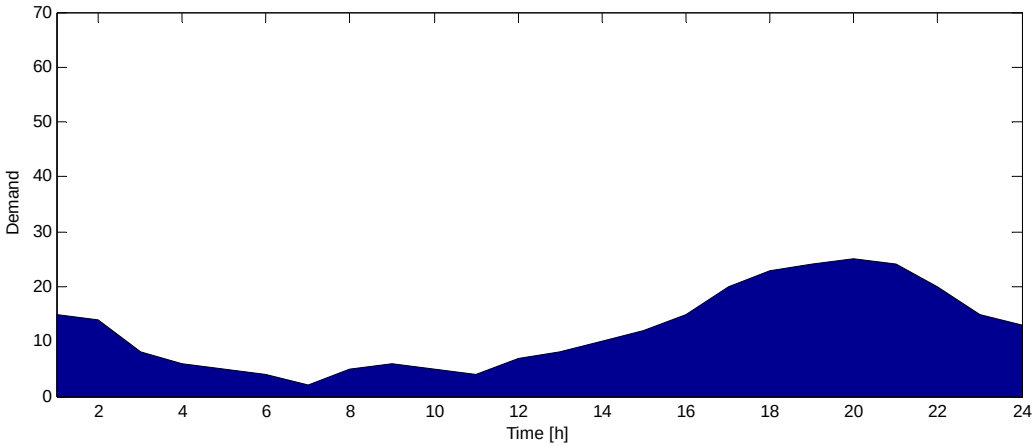

Figure 3. Load curve of a typical theater, load factor 48% [3]

Appropriate aggregation

Non-coincident peak demand for power is sometimes the key to successful aggregation. For example, if we add up the usage for the office building and the theater, we get a combined load factor of 58%, which is a good improvement over the customers' individual load factors. Both of these customers will get a better deal for power supply if they shop the power supply market as one.

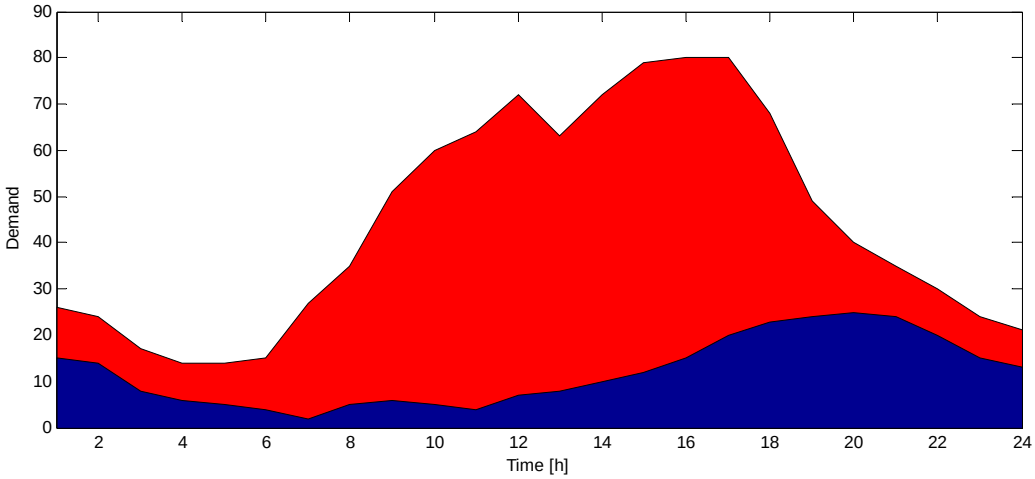

Figure 4. Aggregated load curve of theater and office building, load factor 58% [3]

This case an example of a appropriate aggregation of consumers, the final load factor is higher than individual load factors. Both consumer win.

Inappropriate aggregation

Inappropriate aggregation is obtained if coincident peak loads are lumped together. For example, if the hotel (Figure 2) and the theater (Figure 3) were to shop for power together, the theater would get a better deal, but the hotel might be shooting itself in the foot.

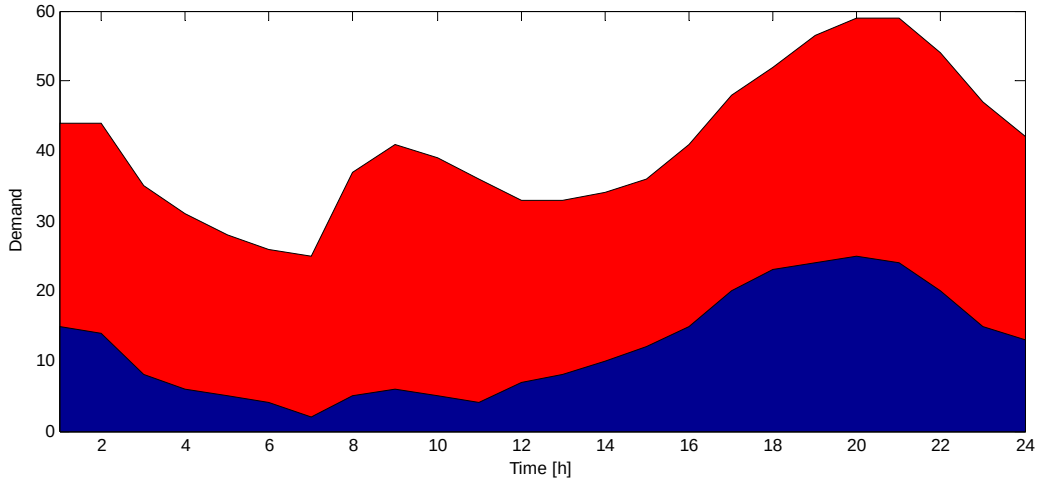

Figure 5. Aggregated load curve of theater and hotel building, load factor 69% [3]

The combined load factor for the hotel and the theater would be 69%, which is respectable, but a far cry from the hotel's existing load factor of 84% (Figure 5) [3].

Conclusions

In this paper an Aggregator is defined as buyer's agent that joins two or more customers into a single purchasing unit and negotiates on their behalf for the purchase of electricity service to a Retail Electric Provider.

The benefit of the aggregation is shown in this paper. Result evident that the aggregator can help to customer to save time, effort, and money.

A simple example of aggregation to show the benefit and disadvantage of two different ways to implement aggregations is shown. The non-coincident peak demand for power looks like the key to successful aggregation.

References

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Annex A

A.1. Definition of load factor

Load factor (expressed in terms of percentage) is a measure of the uniformity and efficiency with which electrical energy is being used. Load factor is the average load divided by the peak of load power demand over a period of time. In the electricity industry, load factor is a measure of the output of a power plant compared to the maximum output it could produce.

$$\text{Load Factor} = \frac{\text{Average Load}}{\text{Peak Load}}$$

$$\text{Average Load} = \frac{\text{Energy (kWh)}}{\text{Time (number of operating hours)}}$$

$$\text{Average Load} = \frac{\text{Energy (kWh)}}{\text{Maximum Demand (kW)}} \times \frac{1}{\text{Time (number of operating hours)}}$$

A.2. Supply Portfolio Structuring

In the wholesale electricity market there are a variety of services or "*products*" that can be purchased to meet one's energy needs. For example, suppliers offer *base load*, *peaking load*, *super peak load*, and other products to meet consumer demand over a given time period. These products have different prices as can seen in Figure A.1.

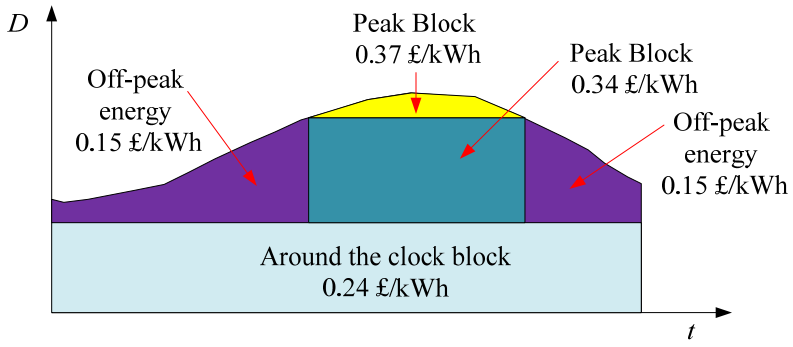

Figure A.1.

Figure A.1 is an example of various energy products available to meet one requirement of energy throughout a given day including a general view of costs.

These energy products are typically traded in volumes that far exceed the demand of most individual consumers. By aggregating the loads of multiple facilities it becomes feasible to purchase the larger blocks of power and take advantage of price signals associated with using power at different times of the day.

Improving the load factor

In Figure A.2, a typical load curve of a household is shown. Two different types of load are shown: cooling and other loads.

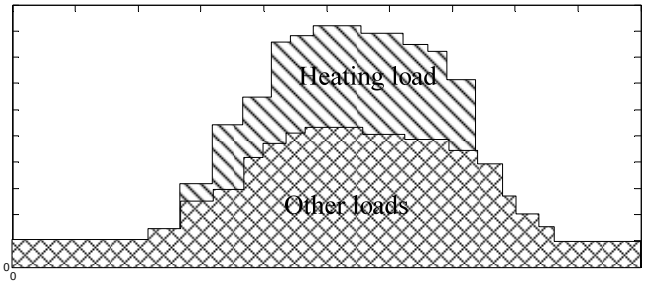

Figure A.2. Typical load curve of a household: Cooling and other loads

The consumer may improve his load factor in several ways. Among of these are:

- Arranging a work schedules to reduce peak load by shifting some electrical use to other time periods.
- Using interlocks to prevent simultaneous operation of selected equipment.
- Using heat and cool storage equipment (to reduce peak load).
- Staggering preheating times on process or space heating applications.
- Using demand controllers to limits kW demand in facilities where some power load can be deferred.
- Adding off-peak energy usage.

In Figure A.2 a shifting strategy is implemented over the cooling load. The use of cooling load in off-peak time reduces the overall load factor. Although cool storage may not necessarily reduce the building overall energy consumptions, it can significantly reduce the building on-peak demand and lower this consumption. Figure A.2 illustrate the reduction of on-peak demand, the cooling load is shifted to off-peak hours.

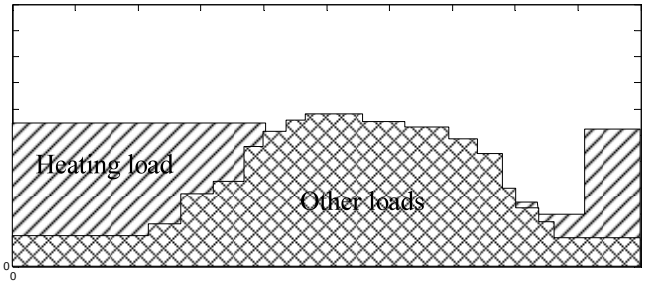

Figure A.3. Typical load curve of a household: Cooling and other loads