L.E.K.

EXECUTIVE INSIGHTS

VOLUME XVII, ISSUE 3

Shifting the Load: Using Demand Management to Cut Asia's Eletricity Bill

Electric utilities and power retailers in Asia are feeling the heat from households and industrial users whose electricity bills have risen sharply over the past decade. Between 2002 and 2012, average per unit power prices have increased by 100% in Hanoi, 120% in Colombo, 134% in Sydney, 170% in Manila and 300+% in Shanghai. However, the numbers don't tell the whole story: some of the price rises have been implemented because of factors out of the control of the billing utilities.

In Australia, increased consumer costs are at least partly the result of heavy investment in the transmission and distribution infrastructure, sometimes described as the "gold plating" of the electric power business because of the sizeable capital spending required. In Malaysia, a reduction of government subsidies for fuel is a major cause. In the Philippines, it is rampant increases in wholesale energy prices that are being passed on to consumers.

Explaining such factors to disgruntled customers is a difficult task, but there is something that utilities can do to limit the damage: they can develop and implement programs that will allow them to mitigate the rising underlying costs of the energy that they procure. The key is to manage demand for electricity, especially at peak times, by putting in place incentives that change user behaviour.

Strategies to achieve this are widely used in the United States, Canada and Australia. There's no reason why utility companies in Southeast Asia can't achieve similar successful outcomes, reaping the benefits of demand-side management for themselves at the same time as reducing their frustrated customers' bills – or at least slowing the price increases.

Shifting Load Away from Peak Times

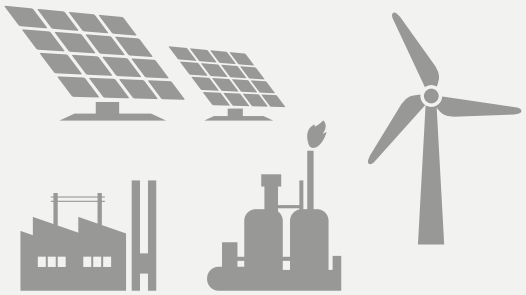
Broadly speaking, there are two main categories of demand-side management: energy efficient initiatives (see figure 1), and so-called Demand Response (DR) initiatives. Energy efficiency measures aim to achieve a permanent reduction in energy usage, for example with the use of LED lighting, which uses less power than incandescent bulbs. Demand response initiatives seek to achieve a temporary reduction in load on power plants during peak times. They do this in part by creating incentives for customers to shift their usage to off-peak hours.

[1] Euromonitor 2013

Shifting the Load: Using Demand Management to cut Asia's Electricity Bill was written by **Manas Tamotia**, a Partner in L.E.K. Consulting's Singapore office and, **Simon Horan**, a Partner in L.E.K. Consulting's Melbourne office. For more information, contact energy@lek.com.

Figure 1

Examples of non-tariff demand-side initiatives



Demand Response *Reduction in Peak Demand*	**Energy Efficiency** *Permanent Reduction in Demand*
• Reschedule industrial load	• Energy efficient appliances
• Direct control air conditioning	• Energy efficient buildings
• Reset thermostats of air conditioners	• Power factor correction
• Off-peak hot water systems	• Switch to gas

Source: L.E.K. Consulting analysis

In this ***Executive Insights,*** we examine how Southeast Asia utility companies can reap the benefits from implementing demand response programs tailored to their markets.

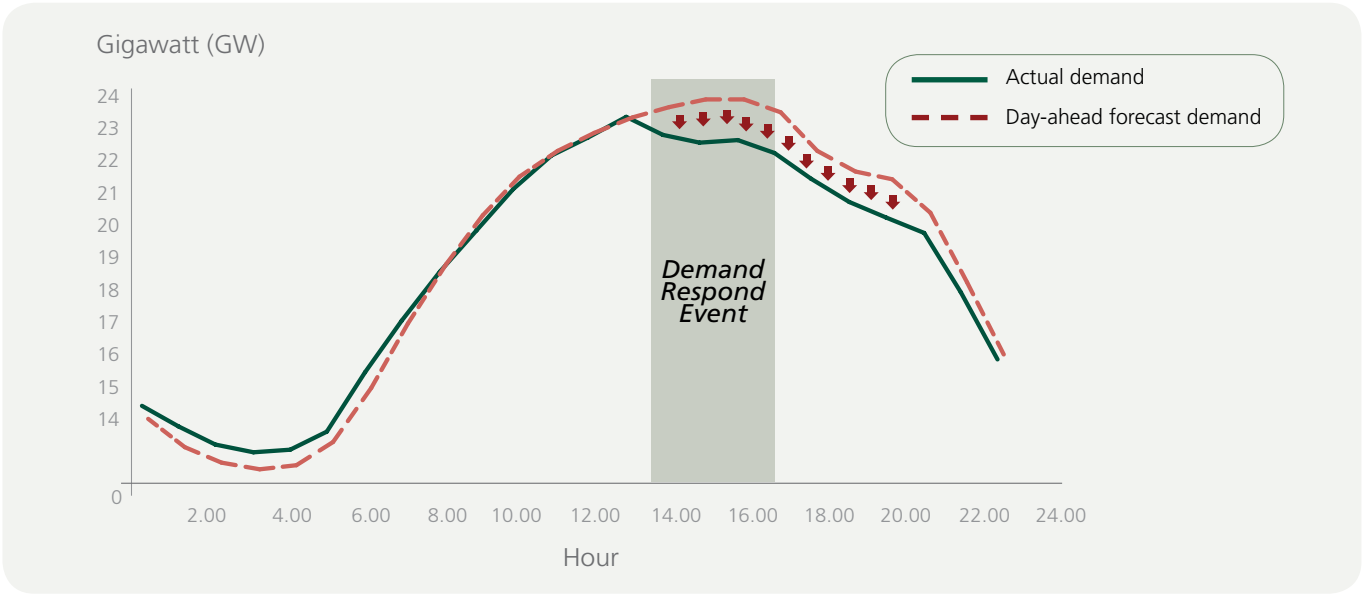
The California Energy Commission defines demand response as "a reduction in customers' electricity consumption over a given time interval relative to what would otherwise occur in response to a price signal, other financial incentives, or a reliability signal."

Energy demand is volatile. It rises sharply at certain times of the day, particularly a hot day when there is heaviest use and drops just as sharply at other times, such as during the night. However, it is the peaks that determine the infrastructure requirements for energy generation, transmission and distribution (example figure 2). In an analysis of a utility's residential load, L.E.K. Consulting found that the highest 10% of demand takes place during less than 40 hours a year.

Demand response strategies aim to reduce the load during periods when demand is traditionally at its highest by shifting a portion of it to other times of the day.

Figure 2

Examples of non-tariff demand-side initiatives



A successful demand response strategy has a beneficial impact in several key areas:

- **Avoided energy costs:** Utility companies can make substantial savings if they don't have to procure energy on wholesale markets during peak usage periods when prices spike. For example, a utility may not need to call on its oil peaking plants during a hot summer day.

- **Avoided capacity costs:** By reducing peak demand, or at least curbing the rate of its growth, utilities can proportionally decrease their need for electricity generation capacity. ASEAN countries with substantial capacity expansion plans could divert scarce resources to other areas if they were able to reduce these capacity costs.

- **Deferred T&D costs:** Utilities that successfully reduce peak demand are able to delay their capital spending on transmission and distribution (T&D) infrastructure. Utilities usually require a heavy infrastructure to transport electricity from their generation plants to populated areas where it is most needed. Transmission lines require a substantial investment and typically also need to overcome significant regulatory and environmental hurdles. Savings on avoided or deferred transmissions and distribution could therefore be substantial.

- **Incentives for energy users:** Consumers who curtail their energy use can benefit directly through cash payments. In the U.S., households and businesses are estimated to have earned US$2.2 billion in payments from demand response programs.

Demand Response Implementation in Southeast Asia

Successful demand response programs are typically found in jurisdictions with deregulated wholesale power markets. That's especially the case when these programs have functioning capacity markets that explicitly allow demand response participation. Examples of highly active direct response markets include PJM Interconnection in the mid-Atlantic region of the U.S., ISO New England in the North Eastern U.S. and WEM in Western Australia. In the PJM Interconnection, the largest wholesale power market in the U.S., demand response resources in the 2014-15 year totaled more than 14,000 MW or about 10% of total generation resources. Southeast Asia, including Singapore and the Philippines could materially benefit from demand response strategies given their established and competitive generation markets.

However, much of the recent growth globally in direct response measures has been in bilateral programs in markets that have traditionally been vertically integrated. These bilateral programs are often structured as Power Purchase Agreements. In the Southern United States, the Tennessee Valley Authority (TVA) has a 10-year agreement with EnerNOC, a load aggregator to supply 560MW of electricity through "load shaving" – schemes that eliminate peaks and valleys in the load profile. In this case EnerNOC has signed up a number of commercial and industrial customers to this program. TVA looks to EnerNOC to deliver the desired demand reduction and it imposes penalties if this reduction is not achieved. Similar models could be adopted by most countries in Southeast Asia. Implementing successful demand management strategies can be challenging and it can be difficult to know where to start. L.E.K. has observed four catalysts that can lead to faster adoption and lasting change.

Figure 3

Driving faster uptake of demand response in ASEAN

A number of key factors can be considered to promote greater uptake of demand response strategies in ASEAN (Figure 3).

1. Government and regulatory actions

Government policies and regulatory regimes can significantly drive the growth of demand management strategies. Policies may take the form of eligibility for capacity payments or by mandating minimum demand response procurements annually. A first step in Southeast Asia would be to educate energy regulators about the value of demand response initiatives.

Implementation in markets with some form of deregulation (where there is a separation between generation, transmission and distribution) such as Thailand, Singapore and the Philippines should be relatively straightforward. In vertically integrated markets such as Indonesia and Malaysia, it will be important to design programs that not only cover the costs of demand response programs but also provide a reasonable return on their opportunity cost (for example, the investment in capacity, transmission and distribution that would earn the utility a rate of return).

2. Pricing

Distribution utilities can encourage the desired user behaviour by adopting pricing that fluctuates according to the time of use for residential customers, and by signing up interruptible load for commercial and industrial customers. L.E.K.'s global experience shows that time-of-use pricing and interruptible load are not necessarily the most effective tools, as the voluntary nature of such programs makes them less reliable. Dynamic pricing options such as real-time pricing could be the next step in pricing. Feasible only where functioning wholesale markets exist, this involves prices being set by utilities in near real time, based on conditions in the wholesale market. Customers would then either choose to accept the price being offered by their provider or reduce their consumption to avoid high prices. Real-time pricing is currently undergoing testing in pilot phases in various parts of the world.

3. Load aggregators

Evidence from other countries demonstrates that the existence of load aggregators is an important facilitator of demand-response success. Load aggregators can help utilities to shed load when necessary. These aggregators take on the compliance risks and mitigate them by taking advantage of portfolio effects. For example, a company such as Meralco could work with a load aggregator to provide "virtual capacity" when needed so that it does not have to buy high-priced spot power during times of peak demand. Similarly, Tenaga Nasional Berhad (TNB) could work with a load aggregator to avoid paying high gas or oil prices and defer spending on infrastructure.

4. Smart meters

A key risk for utilities seeking to deploy demand response measures is whether they actually work when called upon. New technologies such as smart meters provide an opportunity to improve performance of demand response initiatives. For example, these meters could allow a utility company or a load aggregator to modify a household's air conditioning cycles automatically by a pre-specified amount during periods of high electricity demand and system stress.

Implementing demand response strategies could be a valuable tool to help Southeast Asia better manage its rapidly growing energy needs. The track-record of U.S. utilities that deploy such strategies – and households and businesses who have earned money from participating in them – is evidence that they can be successful. Southeast Asia could achieve a similar outcome, if stakeholders including governments, regulators, utilities and customers unite around the goal. Certainly, given the region's growing demand for power, the introduction of comprehensive demand response initiatives is both useful and necessary.

INSIGHTS@WORK®

L.E.K. Consulting is a global management consulting firm that uses deep industry expertise and analytical rigor to help clients solve their most critical business problems. Founded more than 30 years ago, L.E.K. employs more than 1,000 professionals in 21 offices across the Americas, Asia-Pacific and Europe. L.E.K. advises and supports global companies that are leaders in their industries – including the largest private and public sector organizations, private equity firms and emerging entrepreneurial businesses. L.E.K. helps business leaders consistently make better decisions, deliver improved business performance and create greater shareholder returns.

For further information contact:

Singapore
Level 27, Prudential Tower
30 Cecil Street, Singapore 049712
Telephone: 65.6631.2755
Facsimile: 65.6631.2880

Sydney
Level 26, Aurora Place
88 Phillip Street, Sydney NSW 2000
Telephone: 61.2.9323.0700
Facsimile: 61.2.9323.0600

Melbourne
Level 35, Freshwater Place
2 Southbank Boulevard
Southbank, VIC 3006
Telephone: 61.3.9270.8300
Facsimile: 61.3.9270.8350

International Offices:

Beijing
Boston
Chennai
Chicago
London
Los Angeles
Milan
Mumbai
Munich
New Delhi
New York
Paris
São Paulo
San Francisco
Seoul
Shanghai
Tokyo
Wroclaw