Why do utilities want smart meters?

What are the reasons the utilities want the smart meters, despite all the problems?

The U.S. government has given large grants to utilities to install smart meters. In some countries, such as Sweden, the government has essentially mandated they be installed. In many cases, the utility companies are also interested on their own, though the investment cost has slowed them down.

Why are governments and utilities interested in these meters, despite the cost, the problems and the customers who refuse to have them?

Utilities and governments do have different reasons to promote smart meters. They fall into these categories:

- they are much cheaper to read
- they allow the electricity to be cheaper at off hours
- they encourage using less electricity
- they encourage shifting usage to off-peak hours
- they are more accurate (when working correctly)
- the utilities have better usage information
- they allow the utility to better manage the grid
- they allow more solar and wind power to be used
- they help locate line breaks
- disconnect/reconnect of service is much simpler
- they deter theft

Not all meters have all these functions. It is up to the utility which will be available.

The new meters are cheaper to read

There is a large cost savings in no longer needing employees to visit each meter once a month. With the old meters, a meter reader comes by once a month and reads off the number. In some cases, this is done from a car, where the meter's dial is photographed using a camera with a tele-lens. The digital photo is then inspected at a central location, by a person who enters the number into a computer. In some areas, the meter reader must walk to each meter, which takes a lot of staff time. In older houses in Europe and the eastern United States, the meters are located inside people's houses, making reading them manually very time consuming.

The new meters require much less staff. One type is read from a car that drives through the neighborhood without stopping. One manufacturer boasts that a single person can read off 100,000 meters in a day with this method.

Other types of meters communicate directly with the utility home office, without any meter readers at all.

One rural utility serving 20,000 households has stated they could eliminate their three meter reading jobs at a savings of $65,000 a year (one meter reader was retiring, the two others would be given other duties).

This is probably the main reason why utilities like smart meters, though they usually prefer to downplay the lost jobs.

Customer education for energy savings

Some utilities have a web site where customers can see how their consumption of electricity changes by the hour — sometimes even by the minute.

The idea is that customers will be able to see how cranking up the air conditioner in the afternoon affects their monthly bill. How deferring running the clothes dryer to off-hours might save them money.

This may get people to use less electricity during the peak hours, where the utilities have to use expensive power plants to cover the peak electrical usage. It can save the utility money if the usage of electricity is more even across the day.

Utilities typically offer this information a day later, as they receive the data during a nightly download from the smart meter. More sophisticated smart meter networks, which communicate very frequently, may offer the customer the information in nearly real-time.

Another educational tool is a wall display, which shows the consumption of electricity in real-time, as well as how much has been used that day. The wall display gets the information directly from the smart meter mounted on the house.

Whether such "customer education" actually has much of an effect is hotly contested. Busy families are probably not able to defer cooking their meals and washing clothes until late in the evening and people who are home during the day may not be able to turn off their air conditioners.

The utility gets better information

Managing an electrical grid is like walking a tightrope. The grid must be in perfect balance at all times between what the consumers use and what the power plants produce. When they fail, we have brownouts where the voltage gets too low, which can damage household electronics and appliances. Or we may see total blackouts.

This balancing act will become more complicated in the future when there will be more power coming from wind turbines, solar power plants and other sources.

Having more detailed information about how electricity is consumed helps with these balancing acts.

Some models of the meters monitor the line voltage and report it to the utility. This information can be used to decide where to upgrade or reconfigure their distribution lines, which means more reliable and better service to their customers.

In some cases, the line voltage is reported every few seconds and is used to detect line problems or power shortages as they are happening.

Much more controversial is that this wealth of data can be sold to marketers and be used for surveillance of a household. The value of this data can be very high and may be a central reason why some utilities invest in smart meters.

Even the non-partisan congressional investigative office, GAO, has raised serious privacy concerns.

The utility can better manage consumption

The consumption of electricity varies across the day and night. The least electricity is consumed late at night, while the most is used on hot summer afternoons when air conditioners are running everywhere.

The power companies have to use special plants that can rapidly increase and lower their power output to meet these afternoon peaks. These plants are much more expensive to operate than those plants that run 24 hours a day.

If the utility can slow the rise of such peaks, or even remove the top some, that helps lower their cost. It can also help prevent brownouts and outages.

As more renewable energy is put on the grid, it becomes more complicated to manage supply and demand. If the wind suddenly stops blowing in an area with big wind farms, the utilities will have to find a replacement immediately, or there will be a blackout. If they can lower the electrical use dramatically for just a few minutes, that may give them enough time to get some of their peak plants up to full speed.

The smart meters can help with this problem in at least three ways:

- time-of-use billing
- dynamic pricing
- load shedding

The time-of-use billing is already in use in many places. Instead of having a fixed rate for electricity, the rate depends on the time of the day. The electricity will then cost more in the afternoon than in the morning, encouraging people to use the clothes dryers and air conditioners less in the afternoon when the power companies have to produce electricity more expensively.

In the future, we may see a more advanced version where the price of electricity fluctuates unpredictably. The meter constantly receives information on the current price from the utility company and the customer can then decide whether to defer doing a load of laundry, or turn down the a/c. In the future, special versions of thermostats, clothes dryers, refrigerators and water heaters will be able to communicate with the electrical meter and based on the current price of electricity, they may turn themselves down or off.

Electric cars can use the information to only charge their batteries when the price of the electricity is the lowest.

The person living in the house or apartment will have the choice whether to use these features or not. The utility will only provide the current price of electricity via the smart meter. It is up to the person whether to set the thermostat to use the information, and save money.

Equipment that should not be turned off, such as medical equipment, will not be affected.

The use of dynamic pricing will require the purchase of new thermostats and other devices. Some new appliances will have the electronics built in, while older ones can possibly be retrofitted. The use of them will most likely be voluntary, as it would be impossible to force people to program their thermostats, and probably unlawful as well. Instead, lower prices on electricity will make people convert over time.

The new appliances will likely have these features turned on by default, and many people may not even know they are active.

A more controversial issue with the smart meters is that they could be used to turn off certain equipment in people's homes. If a utility company finds itself short on power, because a power plant had a sudden failure or the wind stopped blowing at several large wind farms, they will have to shed consumption or they will have brownouts or blackouts. What they may do today is rolling blackouts, where they disconnect whole neighborhoods or areas for awhile, then disconnect another area for awhile, while the first area gets their power back.

The idea with the smart meters is that instead of causing total blackouts, they only turn off some things that are not essential. It is much less disruptive to have heating/cooling, hot water, etc., turned off for an hour or two, than having a total blackout for that period.

The meters will not be able to turn off individual appliances if they are not modified for it, so the owner of a home or business will have the choice.

The shedding of loads may be done by setting the price of electricity so high anyone's smart meter-enabled appliances will turn themselves off. But then there is the ethical issue of what price should people pay for electricity used by light bulbs and medical equipment during such an emergency.

And what about people in poor health who need air conditioning on hot summer days — during peak hours? Some may be forced to turn it off and may actually die because of the heat. When there are unusual heat waves in countries where air conditioning is not common, there is often a significant loss of life.

These smart grid functions are still being developed, both technically and politically.

Faster to recover from a blackout

When a blackout does happen, it is hard on the utility to restore the power again. When they throw the power back on, everything starts at the same time. Air conditioners, water heaters and refrigerators all start up together, creating a tremendous power surge on the grid, so the utility can only restore power to smaller areas, one at a time. This is called "cold load pickup". If the water heater and air conditioner could be instructed to wait a few minutes after the power was restored, the utility can restore power much sooner to the next area.

Faster locating power outages

Some smart meters can help the utility discover and locate power outages. Otherwise, the utility has to rely on customers to call to report an outage, and then

send out a crew to try to locate it. With some models of smart meters, the utility may be able to locate the cause within a couple of minutes so a crew can be dispatched directly to the site, saving much time.

There are a variety of methods used.

Some utilities receive frequent "hello, I'm alive" reports from each smart meter, sometimes every 15 seconds. These are sometimes called "beacons". If a meter has not reported in for awhile, an alarm is generated.

If an outage is reported by a customer, the utility can send out signals ("pings") to all meters in the area. Those not reporting back are assumed to be without power.

Some models of meters are able to transmit a distress signal after the power has been lost.

Easier to connect/disconnect service

When an apartment, house, office or retail shop is vacated, the electrical service is often disconnected. The service is then reconnected when the space is occupied again. The service may also be disconnected if the bills are unpaid for several billing cycles. Each disconnect and reconnect requires a utility truck and crew to go to the site and do the disconnect or reconnect.

Some smart meters have an electronic disconnect inside, which can be controlled from the utility company's office, without a crew going to the site.

Having such a remote-controlled shutoff switch is a serious security risk. Terrorists, hostile governments and others can misuse them to cause city-wide blackouts that can take many days to recover from.

The new meters can be more accurate

The old meters were totally mechanical. The magnetic field created by the current going through the meter turned a wheel inside the meter. The revolutions of this wheel were counted via a gear and displayed as electricity consumed. Very simple and reliable.

These mechanical meters work well for electricity that feeds well-designed electrical motors and regular light bulbs. But they do not accurately show electricity consumed by some types of electrical motors, fluorescent light bulbs and electronics, such as computers (this phenomenon is called "reactive power" and is too complicated to explain here).

The new digital meters are not fooled by fluorescent lights and electronic computers, but show the real consumption. Some people have seen their electrical bills go up a little after the meters were installed, but it really just means they got a free ride before. The reports of faulty meters that suddenly double or triple people's electrical bills are a totally different matter, of course.

However, there have also been many cases where a faulty meter doubled or tripled people's electrical bills, with the utility refusing to accept the obvious problem.

Theft is more difficult

Utilities report problems with theft of electricity, where customers have tampered with mechanical meters to slow down or halt the rotor, or make it run backwards. It is difficult to tamper with the digital meters and they have software that detects attempts at tempering with them.

The drawbacks to smart meters

The drawbacks to smart meters are serious and potentially life threatening in multiple ways. There are technical or political solutions to most — if not all — of the problems, but so far the utilities and politicians prefer to deny the problems.

In short, the problems are:

- Vulnerability to cyber attack
- Privacy
- Health effects (direct and indirect)
- Cost of replacing meters
- Malfunctions causing fires
- Malfunctions causing overbilling
- Predatory pricing schemes

These serious issues are covered elsewhere.

More smart meter articles

See www.eiwellspring.org/smartmeter.html

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