

The Energy Internet and Data Privacy

Surprising insights about personal health and lifestyle preferences can be drawn from energy usage data. Energy consumption information can provide improvements in quality of life when value is added by third parties; it also has the potential to introduce new risks into an individual's life if it is shared with third parties without that individual's full understanding and agreement of how the data will be used. Energy data may be shared through intentional and unintentional actions; likewise, sharing energy data has intentional and unintentional consequences. This paradox makes establishing effective third-party sharing rules both critical and challenging.

Implications of residential energy data on privacy

Whole home energy consumption profiles are collected by most electric power utilities. These profiles take the form of electric power consumption read by the utility meters typically on 15 minute increments. Data analytics capabilities are now being developed that can "disaggregate" the whole home energy usage into a detailed breakdown of which appliances are being used and the precise time of their usage. Gas and water usage may also be disaggregated in a similar way.

Some examples of the type of information that may be extracted from this utility data stream include:

- Time of day that meals are prepared, baths are taken, and lights turned off
- When the residence is unoccupied
- If there is a gathering of people in the residence
- When and how often the toilet flushes
- If a particular appliance may be in need of repair or replacement
- The relative energy efficiency of a residence and what improvements may be recommended to improve efficiency
- The size of the monthly residential utility bills

These are just a few examples of how utility data alone may provide information on the lifestyle and occupancy habits of residents. In addition, other devices are being deployed which will add to the richness of the data stream including smart appliances, electric vehicles, home automation systems and home healthcare systems. Unlike data about product or entertainment purchases, people will not necessarily understand what this information might reveal about their preferences and lifestyle.

Pecan Street's experiences in anonymizing personal energy data

Pecan Street has a robust, DOE-approved cyber-security policy in place to protect participants' energy use data. In Pecan Street's R&D operations, authorization has been obtained from

residential volunteers to collect residential energy data along with personal demographic and residential construction data. While Pecan Street has the rights to share this data with consortium members and UT researchers for R&D purposes, the organization has instituted a cyber-security policy that anonymizes the data from each residence so that the detailed data cannot be readily linked to a specific person or street address. This is accomplished by linking the individual residential data to a unique project number with no personal identification information or address attached. The file that links the identity to the unique project number is kept in a separate secure data base accessible only to limited Pecan Street staff. Consortium members that require identity information to install experimental systems and provide services must execute a separate agreement with each residential customer and maintain their own secure customer database that includes the unique Pecan Street project ID for mutual reference.

Discussion of the Green Button Initiative

Green Button is a rapidly accelerating model of gaining value from energy data without risking identity. Pecan Street is working to discover how this model can be implemented to the benefit of all parties.

The Green Button Initiative, proposed by the Obama administration and being pursued by regulators in California and elsewhere, suggests that utilities should enable individuals free access to their energy data and that individuals should be able to easily grant trusted third parties access their energy data form the purpose of providing value added service.

An example of this would be allowing Home Depot access to one's residential energy data for the purposes of recommending home improvements that would have a rapid payback based on energy savings.

To implement this on a widespread basis, Pecan Street is constructing a virtual utility backhaul connecting participating homes to a head-end at the Texas Advanced Computing Center(TACC). Data analytics systems for conducting research on information extraction and development of products and services that utilize utility data will be paired with the TACC virtual utility backhaul. Pecan Street will work with technology companies to demonstrate how a policy like Green Button can be implemented from a technical perspective.