Privacy in the Smart Grid

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Where we are going . . .

- The Smart Grid
- Privacy legal issues
- Privacy Strategies
The Smart Grid

- Promise of the Smart Grid (Tendril Inc.)
- From a legal perspective, the Smart Grid Combines
  - Data network (collection and analysis)
  - Telecommunications network (multi directional)
  - Utility (Power generation, transmission and distribution)
American Recovery and Reinvestment Act of 2009
$4.5 BILLION
Smart Grid as a Data Network
Patterns of Appliance Use

Peak = 7.18 kW  
Mean = 0.49 kW  
Daily load factor = 0.07  
Energy consumption = 11.8 kWh
## Information Available through the Smart Grid

<table>
<thead>
<tr>
<th>Data Element(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Party responsible for the account</td>
</tr>
<tr>
<td>Address</td>
<td>Location where service is being taken</td>
</tr>
<tr>
<td>Account Number</td>
<td>Unique identifier for the account</td>
</tr>
<tr>
<td>Meter reading</td>
<td>kWh energy consumption recorded at 15–60 (or shorter) minute intervals during the current billing cycle</td>
</tr>
<tr>
<td>Current bill</td>
<td>Current amount due on the account</td>
</tr>
<tr>
<td>Billing history</td>
<td>Past meter reads and bills, including history of late payments/failure to pay, if any</td>
</tr>
<tr>
<td>Home area network</td>
<td>Networked in-home electrical appliances and devices</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>When the home is occupied and unoccupied, when occupants are awake and asleep, how much various appliances are used</td>
</tr>
<tr>
<td>Distributed resources</td>
<td>The presence of on-site generation and/or storage devices, operational status, net supply to or consumption from the grid, usage patterns</td>
</tr>
<tr>
<td>Meter IP</td>
<td>The Internet Protocol address for the meter, if applicable</td>
</tr>
<tr>
<td>Service provider</td>
<td>Identity of the party supplying this account (relevant only in retail access markets)</td>
</tr>
</tbody>
</table>
A Network of Networks
Smart Grid as a Data Network

Federal

- **NIST** in the Department of Commerce
  - Guidelines
  - Federal Information Security Management Act of 2002
    (Security includes confidentiality, as well as integrity and availability)

- **FERC** in the Department of Energy

State

- Smart Grid Legislation in a few states
- Public Utilities Commissions
Smart Grid as a Telecommunications Network

**Federal**
- Constitution – Fourth Amendment
- Electronic Communications Privacy Act
- Computer Fraud and Abuse Act
- Federal Trade Commission Act
- Federal Communications Commission
  - Broadband over Powerline Regulations

**State**
- Constitutions – Privacy Guarantees
- Deceptive Practices Acts
AT&T View

**Before: Today’s grid**

One-way exchange of energy, information (monthly phone bill)

One rate at all times

**After: Smart grid**

Two-way exchange of energy, information

Variable-pricing (cheaper at non-peak times)

Smart meter turns backward for sending power from home to grid
Smart Grid as a Utility

- Electricity
- Gas & Electricity

- Some states do not regulate power generation and distribution at all
  - CoOps and Public Power
Smart Grid as Economic and Environmental Protection
Energy Efficiency and Demand Management

GE Targets Net Zero Energy Homes by 2015

Home Energy Manager
The central nervous system for the net zero energy home helps homeowners optimize energy consumption.

Solar Photovoltaic
3 kW to 4 kW solar array on the roof to meet energy requirements of the home.

Small Wind
Supplementary renewable generation.

Energy Efficient Lighting
High efficiency CFL, LED and OLED lighting.

Demand Response Appliances
High efficiency Energy Star Appliances shed load from the grid and help consumers save money during peak demand.

Energy Storage
Battery storage for backup power and peak loads.

GE Water Filtration
Filters, conditions and monitors home water usage.

GE Heat Pump Water Heater
Uses less than half the energy of a conventional electric water heater.

Geothermal Heat Pumps
Reduces HVAC and water heating energy requirements by 30%.

Smart Meter
A communication gateway between the Smart Grid and the home.
Balancing Supply and Demand for Electricity
Privacy’s Place in the Smart Grid

Central to user Trust

• Concerns about control over home life
  – Taking over appliances, shutting down AC
  – Autonomy

• Concerns about surveillance of the home

• Concerns about personal information related to electricity use
  – Identity theft
  – Stalking
  – Marketing
What to do about privacy in the Smart Grid

• Cybersecurity
  – FERC guidelines

• Fair information Practices

• Privacy by Design
Fair Information Practices
FIPs Principles

Adopted by the California Public Utilities Commission
July 14, 2011
(Derived from the Department of Homeland Security)

1. Transparency (Notice)
2. Purpose Specification
3. Individual Participation (Access and Control)
4. Data Minimization
5. Use and Disclosure Limitation
6. Data Quality and Integrity
7. Data Security
8. Accountability and Auditing
Privacy by Design
3 Smart Grid Domains
Thank you for joining me in thinking about the Place of Privacy in the Smart Grid!

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