The Utility System

Generation/Commodity:
- To serve customer energy needs (energy)
- To serve System Reliability needs (generation capacity)

Transmission:
- Safety, repair, relocation, communication, grid visibility and control
- Economic Efficiency
- Public Policy
- Reliability Requirements to meet System Peak
- Interconnect new generators

Distribution Grid:
- Safety, repair, relocation, communication, grid visibility and control
- Maintain the delivery of safe and reliable service at the local level

Customer Set-up:
- To ensure customers are ready to receive energy services
Rate Design Tools

Price Signal and Cost Recovery

Energy Rates
- More Conventional
  - Flat
  - Tiered
  - TOU
  - RTP - Hourly

- More Advanced
  - On-peak Demand Charges
  - Maximum or Non-Coincident Demand Charges

Demand Charges
- TOU/Hourly
- System/Circuit

Other Alternatives
- Critical Peak Pricing

Fixed Charge
- Daily Demand Charges
- Fixed Charge varies by Demand or Customer size

Cost Recovery

Fixed Charge

Advanced Rate Design Workshop - July 2019
Design of an Hourly Dynamic Rate

Advanced technologies partnered with more complex and granular rate design can create more opportunities for low cost hours.

CPP Hourly Adders applied to the top 150 System Load Hours for the recovery of generation capacity costs to serve CPP Adder applied to the top system peak load 200 Circuit Load Hours for the recovery of distribution circuit peak capacity costs.

CPP is an energy rate option that provides a "capacity" price signal.

Circuit-level CPP provides a locational price signal while preserving customer equity by still charging all customers the same price.

CAISO day-Ahead Hourly energy price to better approach real-time cost of electricity.

Flat base energy rate for the recovery of all other utility costs.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Energy Rate</td>
<td>CAISO Day-ahead Energy</td>
<td>Circuit Adder</td>
<td>System Adder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparison of System and Circuit Peaks

The timing of circuit peaks may not align with system peak.
The Myth of the Average Customer

A holistic approach to rate architecture is needed to treat each customer fairly and avoid cost-shifting as customer needs continue to diversify.
Residential Customer Before and After Solar

Net Energy Consumption after Solar Installation

One year after the installation of solar, 56.9% of customers decreased consumption and 43.1% increased consumption.

Average Consumption

Before and After Solar

Customers with increased consumption increased by a larger percentage (19.1% in Year 1, 18.2% in Year 2) than those who decreased consumption (14.6% in Year 1, 10.8% in Year 2).

On average, overall consumption of solar customers decreased in Year 1 (-0.8%) but increased after two years (1.1%).

On average, customers with decreased consumption in Year 1, increased consumption in Year 2.

n = 14,592
52% of residential customer with solar decreased maximum hourly demand by an average of 14% 1 year after installation, while 48% increased their maximum hourly demand by an average of 17%.
33% of residential customer with solar decrease maximum hourly demand by an average of 14% 2 years after installation, while 67% increased their maximum hourly demand by an average of 22%.
Customer adoption is transforming customer energy needs

While the adoption of solar results in lower net consumption, the average residential customer with solar has significantly higher demand, over 80%, than the average residential customer. Customers with solar and EV have an average demand over 3 times the average residential customers.

The average residential customer has a peak of 0.86 kWh at 8 pm.

The average residential solar customer has a peak of 1.55 kWh at 8 pm.

The average residential solar + EV customer has a peak of 2.83 kWh at 1am.
Customer Adoption is a key driver behind SDG&E’s Sales Forecast

Customer adoption of energy efficiency (EE), solar (PV) and electric vehicles (EV) are primary drivers behind SDG&E’s sales forecast.

1. Sales increase absent EE and self-generation
2. Including EE causes sales to be relatively flat
3. Self-generation results in declining future sales
4. EV adoption mitigates decline or increases sales

Illustrative Sales Trend

- **Base Consumption (1)**
- **Base Sales with Energy Efficiency (EE) (2)**
- **Base Sales with EE, Self-Gen, and EV (4)**
- **Base Sales with EE and Self-Gen (3)**

Total sales dependent on EV adoption.
Policy goals, customer engagement, and technology trends have encouraged the emergence of an increasingly decentralized landscape of consumers, retailers, and suppliers who engage with the electricity system in divergent ways, expect different levels of service and find value in distinct products and services.
Key MRA Principles Informing Rate Design

Modern Rate Architecture

Key Principles

**Transparency**
- Costs are clearly allocated to products and services
- Subsidies are clear and measurable

**Equity**
- Maintain affordable average rates
- Rates are fair and minimize cost shifts
- Customers are credited appropriately for providing value

**Sustainability**
- Rates represent cost of service
- Customer pay for costs incurred on their behalf

**Access**
- Customer have options to manage their energy services
- Customers have equal access to options
New Rate Architecture Needed

A new rate architecture is needed to address technology evolution and customer choice in a way that clearly identifies the value of utility services distinct from the costs and benefits of policy mandates.

Value of Utility Services

- Meter installation
- Metering and billing services
- Customer service
- Emergency response
- Distribution and transmission of energy
- Level access to energy
- Conveyance of energy from customer-owned DER
- Competitive generation or CCA
- IOU energy supply

Policy Premium

- Policies for socio-economic justice (CARE)
- Payments for explicit CA subsidies to support policy goals (NEM)
Case Study: California Solar Initiative

A sustainable policy subsidy is direct and transparent and declines as policy objectives are achieved.

CSI Incentives Declined as the Program progressed