From Past to Present: Energy Efficiency Programs and Industry Trends

CEE 2018 Annual Industry Report
Preliminary Data

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New Orleans, LA
Evolution of Energy Efficiency

Preliminary Annual Industry Report Insights
How Efficiency Programs Began

1970s
- Energy crisis and OPEC oil embargo
- “Conservation”

1980s – Least cost planning

Mid-1990s
- Deregulation
- Some abandon least cost planning
- Implement EE resource standards

2000s
- Industry maturing to serve a host of objectives in a more sustaining way
Energy delivery has used the same business model for decades.

**EVOLUTION of ENERGY**

**NEXT 25 YEARS**

<table>
<thead>
<tr>
<th>Period</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>1890 – 1920s</td>
<td>Cities and homes lit by electricity</td>
</tr>
<tr>
<td></td>
<td>Electric appliances becoming commonplace</td>
</tr>
<tr>
<td></td>
<td>More reliable service</td>
</tr>
<tr>
<td>1950s</td>
<td>Rates remain stable, cleaner air</td>
</tr>
<tr>
<td>1970s – 1980s</td>
<td>Natural gas shortage contributed to higher energy prices</td>
</tr>
<tr>
<td></td>
<td>Greater awareness of energy conservation measures</td>
</tr>
<tr>
<td>2000s – present</td>
<td>Environmental stewardship and energy conservation became mainstream</td>
</tr>
<tr>
<td></td>
<td>Reduction in air emissions: sulfur dioxide about 90%; nitrogen oxides about 80%</td>
</tr>
</tbody>
</table>

- First power plants
- Nuclear and hydro scale up
- More efficient plants built
- Scrubber technology to reduce emissions introduced
- Installation of scrubbers on some older units
- Increase in renewables (wind and solar)
- Increase in natural gas combined-cycle generation

**Energy Ecosystem**

- Fast charging
- Battery storage
- Interoperability
- EVs
- Rooftop solar
- Harnessing power of electronics
- Power plants
- Excess power sales
- Plug and play
- Grid balancing
- Digital platform
- Fiber networks
- Microgrids
- Grid standards
- Hourly forecasts
- Internet of Things
- Low-cost batteries
- Wind
- Smart appliances
- Energy conservation measures
- Intermittency
The utility industry is consolidating

NUMBER OF UTILITIES
Investor-owned utility parents

- Electric
- Gas

Some Dynamics Utilities Face

Declining Electric Load
- Energy efficiency and conservation have become a part of the general culture
- Growth of customer self-generation
- Increases to codes and standards

Need for Increased Investment
- Customers desire greater reliability, resiliency after Superstorm Sandy, etc.
- Generally aging infrastructure
- Use control technologies, Smart Grid
- Cybersecurity

Disruptive Trends
- Communicating products
- Dynamic products
- Energy storage and accessibility to renewable sources
- New market entrants

Utilities are challenged under the existing regulatory model

Grid Quality
Credit Quality
What is emerging integrated demand-side management (IDSM)?

- Integration of technologies at end user homes and facilities
- Integration of programs, delivering customer solutions
- Integration of DSM for power planning, acquisition, transmission planning, and reliability

Demand-side management refers to, and encompasses, both energy efficiency and demand response programs.
Potential Benefits of Integration

CUSTOMER BENEFITS
- Enhanced engagement
- Financial savings from new DSM opportunities
- Nonenergy benefits: remote control, comfort, safety, convenience, health, wellness, etc.

GRID BENEFITS
- Grid balancing and load management
- Grid signals, e.g. spinning reserve, load delay, etc.
- Program M&V data
- Enhanced customer engagement
- New IDSM Program Offerings

ENVIRONMENTAL BENEFITS
- Enhanced air quality
- Carbon reduction
State and provincial regulatory policy is in motion

Key considerations:

• Emerging utility business models
• Inclusion of nonenergy benefits
• Increased grid resiliency and efficient use of grid capital
Evolution of Energy Efficiency

Preliminary Annual Industry Report Insights
CEE Annual Industry Report

- **Purpose**
- **Scope**
- **Collaboration**
- **Preliminary Data**
US and Canadian Expenditure Trends

Preliminary data as of September 5, 2018

- **Gas**
- **Electric**
US Electric Energy Efficiency and Demand Response Expenditures

Preliminary data as of September 5, 2018

BILLIONS USD

- Demand Response
- Energy Efficiency

2009: $3.8
2010: $4.8
2011: $5.7
2012: $6.1
2013: $6.0
2014: $6.7
2015: $6.7
2016: $6.7
2017: $7.1

Preliminary data as of September 5, 2018
Canadian Electric Energy Efficiency and Demand Response Expenditures

Preliminary data as of September 5, 2018

MILLIONS USD

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand Response</th>
<th>Energy Efficiency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$615</td>
<td>$500</td>
<td>$1115</td>
</tr>
<tr>
<td>2010</td>
<td>$745</td>
<td>$612</td>
<td>$1357</td>
</tr>
<tr>
<td>2011</td>
<td>$712</td>
<td>$696</td>
<td>$1408</td>
</tr>
<tr>
<td>2012</td>
<td>$696</td>
<td>$700</td>
<td>$1496</td>
</tr>
<tr>
<td>2013</td>
<td>$626</td>
<td>$562</td>
<td>$1188</td>
</tr>
<tr>
<td>2014</td>
<td>$562</td>
<td>$572</td>
<td>$1134</td>
</tr>
<tr>
<td>2015</td>
<td>$572</td>
<td>$572</td>
<td>$1144</td>
</tr>
<tr>
<td>2016</td>
<td>$572</td>
<td>$572</td>
<td>$1144</td>
</tr>
<tr>
<td>2017</td>
<td>$737</td>
<td>$626</td>
<td>$1363</td>
</tr>
</tbody>
</table>
US Energy Efficiency Expenditures by Customer Class

Electric

- Commercial and Industrial: 35%
- Residential: 32%
- Commercial: 16%
- Low Income: 7%
- Industrial: 4%
- Cross Sector: 6%
Program Categorization

Residential Customer Class

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank by % of category expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Product Rebate - Lighting</td>
<td>30%</td>
</tr>
<tr>
<td>Whole home - Retrofit</td>
<td>20%</td>
</tr>
<tr>
<td>Prescriptive - HVAC</td>
<td>10%</td>
</tr>
<tr>
<td>Whole home - Audits</td>
<td>0%</td>
</tr>
</tbody>
</table>

Preliminary data as of September 5, 2018
Program Categorization

C&I Customer Class

Rank by % of category expenditures

Mixed Offerings

Custom

Prescriptive

New Construction

Preliminary data as of September 5, 2018
Program Categorization

Cross Sector Customer Class

Rank by % of category expenditures

Planning, Evaluation
Other Program Support
Marketing, Education, and Outreach
Codes & Standards
Voltage Reduction / Transformers

Preliminary data as of September 5, 2018
Project DSM program expenditures suggest investment increased in 2017.

At CEE, members act as an industry, accounting for about 80% of total DSM expenditures.

Final report will be available in 2019.
Kevin Bright  
CEE Board Chair  

Watch for full report on www.cee1.org