Electricity Transmission Policy for America
-- Enabling a Smart Grid, End-to-End --

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Electric Power Industry; Revenues and Assets

- Annual revenues from electricity consumers: $250 billion
- Total asset value: $800+ Billion

Percent of Asset Value

- Power Generation: 60%
- Electricity Distribution: 30%
- High Voltage Transmission: 10%
Electric Power Industry: Ownership

Percent Ownership (3,100 Utilities)

- Co-Ops: 30%
- POUs: 63%
- IOUs: 7%

Percent of Total Customers Served

- IOUs: 73%
- POUs: 15%
- Co-Ops: 12%
Electric Power Industry: Energy Resource Mix

2007 U.S. Electric Resource Mix

- Coal: 49%
- Nuclear: 19%
- Natural Gas & Misc Gases: 22%
- Petroleum Products: 2%
- Hydroelectric Conventional: 6%
- Other Renewables: 2%
- Wind: 31%
- Solar: 1%
- Geothermal: 14%
- Waste: 16%
- Wood: 37%
## Power Generation; CO2 Emissions: 2006

<table>
<thead>
<tr>
<th>Total</th>
<th>(~ 5890 \text{ Million Metric Tons})</th>
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<tbody>
<tr>
<td>Electric Power Generation</td>
<td>40%</td>
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<tr>
<td>Transportation</td>
<td>33%</td>
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<tr>
<td>Industry</td>
<td>17%</td>
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<tr>
<td>Commercial</td>
<td>4%</td>
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<tr>
<td>Residential</td>
<td>6%</td>
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### Electric Power Generation  
\(~ 2344 \text{ Million Metric Tons}\)

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<thead>
<tr>
<th>Source: Lawrence Livermore National Laboratory, U.S. DOE</th>
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<tbody>
<tr>
<td>Coal</td>
<td>82%</td>
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<tr>
<td>Natural gas</td>
<td>15%</td>
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<tr>
<td>Petroleum</td>
<td>3%</td>
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<tr>
<td>Nuclear</td>
<td>0%</td>
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<tr>
<td>Hydro (conventional)</td>
<td>0%</td>
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<tr>
<td>Renewable energies</td>
<td>0%</td>
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</table>
2008 California Total System Electric Energy in Gigawatt Hours

Natural Gas: 45.7%
Coal: 18.2%
Large Hydro: 11.0%
Renewables: 10.6%
Nuclear: 14.4%
Biomass: 2.1%
Geothermal: 4.5%
Small Hydro: 1.4%
Solar: 0.2%
Wind: 2.4%
Figure 1. Renewable Resource Mixes in 2020 under Different Cases

Source: CPUC/E3
A High Voltage Transmission Corridor
Western U.S. Transmission System
Electric Power Industry: System Interconnections

High Voltage Transmission Ownership

- 66% Investor Owned Utilities
- 14% Federal
- 14% Investor Owned Transmission Co.
- 7% Other Public Power
- 6% Cooperative
- 4% Independent Transmission Co.

Miles:
- Investor Owned Utilities: 111,223
- Federal: 23,544
- Investor Owned Transmission Co.: 11,098
- Other Public Power: 10,784
- Cooperative: 6,036
- Independent Transmission Co.: 4,609
- NA: 3%

Millions $2007

Year

Electric Transmission Grid: Operating Responsibilities

- Alberta Electric System Operator
- Midwest ISO
- Ontario Independent Electric System Operator
- New Brunswick System Operator
- ISO New England
- New York ISO
- California ISO
- PJM Interconnection
- Electric Reliability Council of Texas
- Southwest Power Pool
- Midwest
Control Room: California Independent System Operator
# Electric Industry Policy Oversight

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<tr>
<th>Electric Industry Structure</th>
<th>Federal</th>
<th>State</th>
<th>Local</th>
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<td>Reliability Standards</td>
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<td>Wholesale Rate Design</td>
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<td>Resource Adequacy</td>
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<td>Retail Rate Design</td>
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<td>Resource Mix</td>
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<td>Transmission Cost Recovery</td>
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Electric Power Industry: Share of Installed Generating Capacity by Type of Ownership

Federal Reliability Oversight

FERC

Delegated certain responsibilities to the North America Electric Reliability Corporation (NERC)

NERC

Oversees reliability standards applicable to all owners, operators and users of the bulk transmission system

IOUs
POUs
Direct Access Providers
Wholesale Generators
Independent Transmission Owners
Independent System Operators
North American Electric Reliability Corporation
A Federal Framework for Electric Transmission
Policy

- Transmission planning and siting
- Transmission cost recovery and allocation
- Transmission grid modernization
- Smart Grid
- Independent System Operator (ISO) coverage