Electrification: Past and Future

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EPRI – Born in a Blackout

Founded in 1972 as an independent, nonprofit center for public interest energy and environmental research

New York City, The Great Northeast Blackout, 1965

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Our Members...

- 450+ participants in more than 30 countries
- EPRI members generate approximately 90% of the electricity in the United States
- International funding – nearly 25% of EPRI’s research, development, and demonstrations
Electricity Use Has Grown Faster than Total Energy for More than A Century… What Will or Could Happen Next?

Growth Driven By Efficiency, Convenience, Safety, and Low Cost
Two Fundamental Analysis Approaches

**FOCUS ON TODAY**
**PROSPECT-BY-PROSPECT**

**FORWARD LOOKING**
**AGGREGATE POTENTIAL**

Mission accomplished: Promontory Point, Utah, May 10, 1869.

**THE TIGHTER THE CO₂ CAP, THE GREATER THE ROLE ELECTRICITY PLAYS**

Electrification Potential – Depends on Fuel Use and Technology
(2014 US Energy Use, Quad BTUs)

Cars and light trucks
Space heating
Cool / Light / Appl. / Elec.
Industry process
Heavy-duty trucks
Buildings other
Industry boilers
Constr. / Ag. / Min.
Aviation
Bus / Transit / Rail
Industry other
Maritime
Military

Quad BTUs

- Electricity
- Coal
- Petroleum
- Natural Gas
- Bioenergy
U.S. Final Energy...Drivers of Growth – Based on DOE AEO 2017

- GDP Growth (AEO)
- Structural Change (AEO)
- Energy Service Growth
- Efficiency Improvements

Hypothetical Energy Use with no change in fuel/technology choice
Energy Declines…Share of Electricity Increases

Structural Change (AEO)

Efficiency Improvements

Electrification

Non-Electric Energy

Electricity

2015 2020 2025 2030 2035 2040 2045 2050

Quad Btus

Energy Declines…Share of Electricity Increases

20%

32%
For Traditional Electric Loads, Efficiency Gains Likely to Exceed Population and Economic Growth

-5%  
2015 → 2050  
Efficiency Gains Outweigh Economic Growth

Buildings (before electrification)

Industry (before electrification)
Load Growth Driven by Electrification

Consumer Adoption of Economic Electrification Technologies Displaces Direct Use of Fossil Fuels

Efficiency Gains Outweigh Economic Growth

Assumes technology-driven adoption only
Load Shape Changes...Electrification and Efficiency Impact

SE-Central 2015

Heating Peak Exceeds Cooling Peak in Some Regions

- Space Heating
- Non-Seasonal
- Cooling
- Vehicle Charging
Load Shape Changes...How Will This Impact Supply Mix/Grid Assets?

SE-Central 2050

- Space Heating
- Cooling
- Vehicle Charging

Non-Seasonal
Hourly Load Shape Aggregated Across Uses

SE-Central 2015

GW
Load Shape Changes...How Will This Impact Supply Mix/Grid Assets?

SE-Central 2050

Winter Peak

Summer Peak

Aggregate Load

GW

2015
EPRI Initiative on Efficient Electrification – Much More to Come

National Assessment
Q1 2018

Regional Assessments

Efficient Electrification Newsletter

International Conference
August 20-23, 2018
Long Beach, CA
www.electrification2018.com

Industrial Centers of Excellence

Efficient Electrification Research Project Portfolio

Together...Shaping the Future of Electricity
Together...Shaping the Future of Electricity