

Customer Choice: End-Use Energy

EPRI's 2018 National Electrification Assessment

Committee on Critical Infrastructure July 15, 2018

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Integrated Energy Network



What is the objective of EPRI's assessment?

Customer Choices for End-Use Energy:

- Economy-wide assessment Residential, commercial, industrial and transport
- Customers have broad technology choices and control
- Customer decisions integrated with detailed electricity supply model



Source: EPRI 3002009917 February 2017

Power System Evolution...

PRODUCE CLEAN ENERGY

EVOLVE TO DYNAMIC GRID

ADOPT ELECTRIC END-USES







End Use (Final) Energy Use By Sector

Quad BTUs



* Excludes upstream and midstream energy use, e.g., power generation, oil and gas extraction, refining, and pipelines

EPRI's US National Electrification Assessment Scenarios

CONSERVATIVE	Slower Technology Change	 AEO 2017 growth path for GDP and service demands, and primary 	
REFERENCE	Reference Technology	fuel pricesEPRI assumptions for	
PROGRESSIVE	Reference Technology + Moderate Carbon Price	cost and performance of technologies and energy efficiency over time	
TRANSFORMATION	Reference Technology + Stringent Carbon Price	 Existing state-level policies and targets 	

Efficient Electrification: Reference Scenario





U.S. National Electrification Assessment (USNEA) - Results

TRANSFORMATION (21% & 47%)	32%	52%	18%	67%
PROGRESSIVE (21% & 39%)	27%	35%	31%	57%
REFERENCE (21% & 36%)	22%	32%	40%	20%
CONSERVATIVE (21% & 32%)	20%	24%	33%	19%
SCENARIO (Electricity Portion of Final Energy in 2015 & 2050)	Total Final Energy	Electric Load	Natural Gas	Economy Wide

What are the Implications for end-use energy, electricity, CO2 and gas?

SCENARIO (Electricity Portion of Final Energy in 2015 & 2050)

REFERENCE (21% & 36%)

Overall Economy-wide Energy Efficiency Decreases Total End-Use Energy – Electricity and Natural Gas are a Larger % of End-Use Energy

Total Final

Energy

22%

Electric

Load

32%

Natura

Gas

40%

CO

Economy

Wide

20%



Overall, cost of end-use energy is less, but the electricity and natural gas components are a larger part of final energy and, thus, a larger part of the energy costs.

Efficient Electrification...Reference Scenario



Energy Efficiency + Cleaner Electricity = Efficient Electrification



US EV sales exceed 782k through end of February 2018





Range of battery electric vehicles (BEVs) is also increasing



Updated 1/15/2018

Reference Projections for US Light-Duty Vehicles



Critical Trends – Electric Vehicle

TRANSPORT MARKET PROFILE 4440/0 PERCENTAGE OF FINAL ENERGY

96% PERCENTAGE OF FINAL ENERGY PROVIDED BY FOSSIL FUEL 666%

ENERGY CONSUMED BY LIGHT DUTY VEHICLES



6

SIGNPOSTS 1 POLICY & RREGULATION 2 AUTONOMOUS VEHICLE

3 INCREASE IN MODEL OPTIONS

EXPANDING PUBLIC INFRASTRUCTURE

INNOVATION IN FAST CHARGING

COSTS



Comparison for Final End-Use Energy Sectors



Key Take Away Messages from National Electrification Assessment

Electrification Trend Continues	Driven by technological change and consumer choice, further bolstered by policy	
Efficiency Increases Emissions Decrease	Efficient electrification + end-use efficiency lead to falling final energy use	Key Takeaways
Natural Gas Use Grows	Remains a key fuel for end-use and electric generation	
System Impacts	Changing load shapes and new flexible loads create challenges and opportunities	

Meeting Future Customer Energy Expectation

Integration can Improve Reliability, Increase Efficiency, Create New Opportunities, and Expand Customer Choice





Critical Trends – Data Analytics/Artificial Intelligence



Critical Trends: "Shared" Integrated Grid

Customer Engagement Connected Devices =

Shared Economy

Community Resiliency













Does EPRI's Research Have Policy Implications?



- Cleaner Energy
 Production
- Grid Modernization and Protection
- Continuous Technology
 Advances



- Increased Energy-Efficiency
- Cleaner Energy
- Affordable Customer Choice
 Will need an economywide perspective of final energy use
- Integrated Regulation, Codes and Standards
- Cost Benefit Models and Metrics
- Market Designs



Efficient Electrification Benefits/Cost Framework... Leveraging Efficiency Cost-Effectiveness Tests... KEY QUESTIONS



IS THE PARTICIPANT BETTER OFF? (PCT)

IS RESOURCE EFFICIENCY IMPROVED? (TRC)

ARE RATES LOWERED? (RIM)

ARE SOCIETAL COSTS LOWER? (SCT)

ARE REVENUE REQUIREMENTS LOWERED? (PAC)

LEVERAGE EFFICIENCY COST EFFECTIVENESS TESTS...FOCUS ON REGULATORY SUPPORT





State and Utility Electrification Projects in

State and Utility Electrification Projects in Development

³⁰ June 30, 2018





ELECTRIFICATION 2018 INTERNATIONAL CONFERENCE & EXPOSITION www.electrification2018.com

SAVE THE DATE

AUGUST 20-23, 2018 LONG BEACH, CALIFORNIA

- To gain an understanding of the quantifiable customer and environmental benefits of efficient electrification
- To learn about best practices for implementing efficient electrification programs to maximize customer benefit
- To experience the latest electrification-related technologies in action
- To collaborate with industry, government, and academic leaders

For more information, contact Info@Electrification2018.com

Scan here for the latest EPRI Efficient Electrification newsletter





Together...Shaping the Future of Electricity

