ELECTRIC POWER RESEARCH INSTITUTE

EFFICIENT ELECTRIFICATION AT EPRI

SEPTEMBER 2018 NEWSLETTER

"We stand at the precipice of major change in the way we generate and use energy in our society. This event served as a launching point to explore the big ideas about how we will shape the future of electricity, together,"

EPRI President and CEO Mike Howard, speaking at Electrification 2018

What a great event in Long Beach!

We assembled utilities, regulators, equipment manufacturers, utility customers, government, academia, media, and more from around the world. In five pre-conference workshops and 42 break-out sessions in seven concurrent tracks, we discussed broad issues, as well as specific benefits and opportunities of electrification. The range of perspectives, fresh ideas, and enthusiastic participation was exciting to see.

In this special issue of *Efficient Electrification*, we're highlighting a few of the many compelling presentations and activities from the conference:

- Edison International President and CEO Pedro Pizarro set the tone for the conference during his opening keynote address.
- Presenters at a Tuesday plenary session provided insights on electrifying transportation.
- Alabama Power Company's Cheryl McFarland walked attendees through six specific industrial case studies of "LEAN manufacturing through electrification."
- A "Shark Tank" style pitch panel provided a forum for 13 global energy entrepreneurs to describe their innovative solutions for the electric power industry.
- Dr. Jennifer Weeks of BEworks gave an engaging presentation on how utilities can use behavioral economics approaches to improve customer adoption of electrification and energy efficiency programs.
- EPRI Senior Program Manager Naresh Kumar led a panel of experts that focused on the air quality impacts of electrification.

We'd like to take this opportunity to thank our sponsors and supporting organizations, 115 exhibitors, 225 speakers/moderators, and most importantly, the more than 1,800 registrants, who made Electrification 2018 such a success.

Arshad Mansoor
Senior Vice President,
Research and Development

Rob Chapman
Vice President,
Energy and Environment

Featured Video of the Month:

This video provides highlights from EPRI's inaugural Electrification 2018 International Conference and Exposition, held August 20-23, 2018, in Long Beach, California, to facilitate a collaborative discussion about the benefits, costs, and implications of increasing the share of end-use energy consumption that is served by electricity.

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INTRODUCTION

Edison International President and CEO Pedro Pizarro

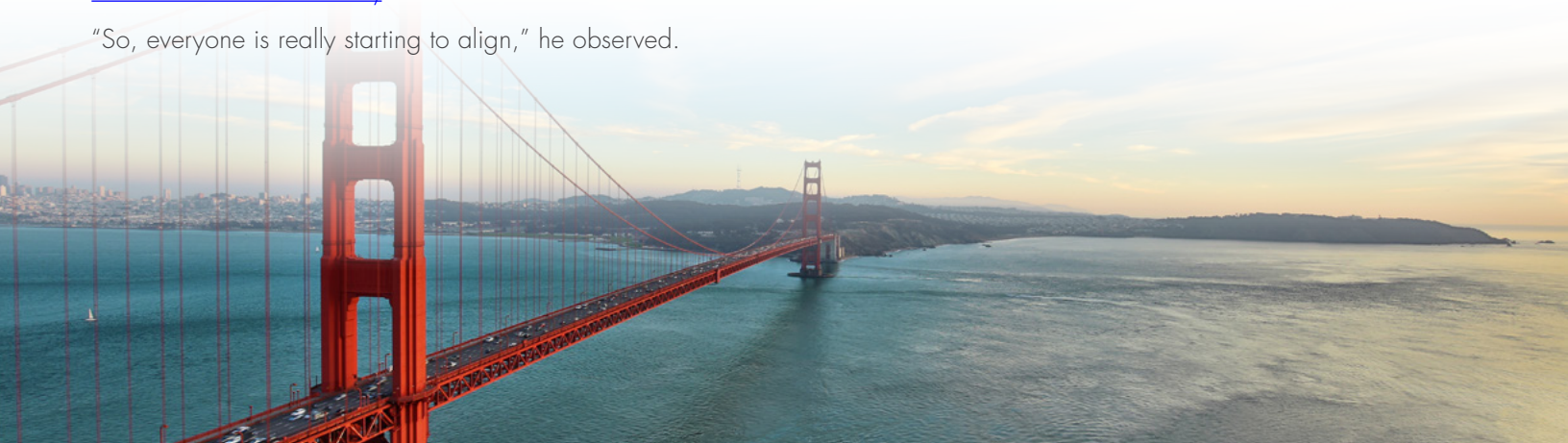
In his opening keynote talk, Edison International President and CEO Pedro Pizarro put the Electrification 2018 conference into context. "Around the world," he said, "transformative trends are converging: climate change and air quality, a transportation revolution, and the accelerating progress of digitization and automation." Pizarro then explained the opportunity this presents. "All of this provides a tremendous opportunity for electric power companies to be a major part of the solutions."

Regarding the scope of electrification, Pizarro explained that, "Efficiency gains from the application of electric technologies could increase productivity and product quality while improving the environment, health, and safety and reducing emissions and water consumption."

From the front entrance of the Long Beach Convention Center where Electrification 2018 was held, attendees could see the nearby container cranes at the Port of Long Beach–part of Edison's service territory. "There's a great example right here…where we are working with the Port of Long Beach to electrify port operations," Pizarro explained. "We are also developing charging infrastructure to support electrification of goods movement that comes out of the port. Many of these goods move in trucks on freeways through disadvantaged communities, which are disproportionately impacted by pollution. Electrifying goods movement out of the port has multiple benefits."

With regard to climate change, Pizarro cited a long list of studies and visions that link electrification and decarbonization, including EPRI's National Electrification Assessment, Portland General Electric's vision for meeting Oregon's environmental goals, National Grid's 80x50 Pathway, the California Energy Commission's Decarbonization Strategy, and Edison's own Clean Power and Electrification Pathway.

"So, everyone is really starting to align," he observed.

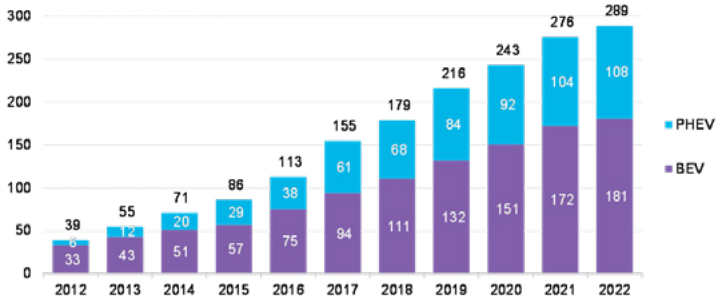


Electric Transportation: Is it Going to Happen this Time?

Not surprisingly, a major topic of presentations and discussion at Electrification 2018 was electric transportation. EPRI Senior Vice President of R&D Arshad Mansoor kicked off the Tuesday afternoon plenary session on electrifying transportation. Reflecting on the origins of electric vehicles (EVs) a century ago, he quipped that "Thomas Edison was playing the long game." Following are highlights of that session.

GM Says "Yes"

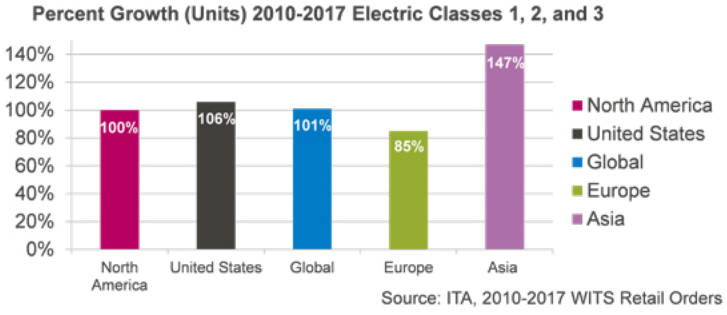
General Motors (GM) Vice President of Global Strategy Mike Ableson repeated the question that he is often asked today about electric vehicles: "Is it going to happen this time?" Ableson and GM's answer is "yes." He described GM's commitment to a future of zero crashes, zero emissions, and zero congestion. The company's four-pronged approach includes alternative (electric) propulsion, autonomous operation, shared EVs, and connectivity of vehicles. Ableson pointed out the importance of customer choice of vehicles; to address this, GM plans to launch at least 20 new all-electric vehicles by 2023. Bloomberg New Energy Finance projects that cumulative EV models available worldwide will reach 289 in 2020. GM also announced at the conference that its Maven EV car sharing program will grow from 350 current Bolt EVs in Los Angeles to nearly 500 by year end.



A Different Spin on EVs: Electric Forklifts

Vincent Halma, President and CEO of KION North America, explained the benefits of electric forklifts. In addition to eliminating emissions, they are quiet, require few spare parts and less maintenance, and are energy efficient. Worldwide orders for electric forklifts are increasing rapidly. Citing the Industrial Truck Association's worldwide statistics program, Halma indicated that retail orders in North America for electric forklifts have increased by 100% from 2010 to 2017 (for the smaller class 1, 2, and 3 types) and by 88% for the larger class 4 and 5 models.

Electric Buses



Proterra President and CEO, Ryan Popple, showed a video that demonstrated how electric bus technology has improved significantly, enabling it to match the performance of combustion engine vehicles, even in harsh conditions. Equipped with the Proterra DuoPower™ drive train, the bus was able to climb the sometimes steep grades (up to 17%) from Ogden to the Powder Mountain Ski Resort in Utah. A spokesperson for the ski resort explained that an electric bus would address two principal challenges they face in the canyon: traffic and air quality.

Electric Vans

Mike Whitlatch, UPS vice president of global energy & procurement, described the company's fleet of approximately 9,300 alternative fuel and advanced technology vehicles (one of the largest in the world). Driven a total of about 1 million miles per day, this fleet is composed primarily of natural gas vehicles. However, the parcel company has a long history with electric vehicles (EVs) as well – first introducing them in the 1930s. In 2001, UPS reintroduced modern electric vehicles, and today, the company has deployed more than 1,000 EVs and hybrid electric vehicles in the U.S. and Europe. In May 2018, UPS announced a partnership with UK-based technology company ARRIVAL to develop a pilot fleet of 35 electric trucks. Whitlatch observed that EVs can require very little maintenance – primarily tires. In the long-term, the potential for EVs at UPS is very large, as the company drives about 96,000 vehicles, many of which operate in the range of 80-120 miles per day.

In the Trenches with Industrial Customers:

EPRI Principal Technical Leader Perry Stephens led a pre-conference workshop on LEAN manufacturing through electrification. The workshop was one of five that successfully kicked off Electrification 2018 on Monday August 20.

Pioneered by Toyota, LEAN manufacturing involves, among other aspects, minimizing eight specific types of wastes to enhance or improve productivity, product quality and cost, delivery, safety, energy use, sales/profits, and sustainability. These wastes (mnemonically listed as "DOWNTIME") are:

- **D**efects that cause rework or generate scrap
- **O**verproduction
- **W**aiting for parts, information, instructions, or processes
- **N**on-utilized skills such as underutilizing capabilities
- **T**ransport, including moving people, products, and information
- **I**nventory
- **M**otion that is unnecessary, such as bending, turning, reaching
- **E**xtra processing that is unnecessary

LEAN methodologies offer a significant opportunity; studies have shown that typically 95% of total lead time (i.e., from order to shipment) is non-value added (much of which is unnecessary).

LEAN and Electrification at APC Industrial Customers

In one of the workshop presentations, Alabama Power Company (APC) Commercial and Industrial Sales & Technical Support Manager Cheryl McFarland walked attendees through six specific industrial case studies of "LEAN through electrification" in APC's service territory. Industrial specialists from the utility's Technology Applications Center (TAC) work with customers to conduct process/product tests using efficient electric technologies as alternatives to other fuel systems. In each case, this process identifies potential energy savings, while eliminating various types of LEAN wastes. The end-to-end TAC process includes identifying the problem (typically at the customer site), evaluating available resources, investigating solutions (typically at the TAC), developing a business case, and then implementing the solution at the customer's facility. (For more on the TAC, see a related article in the November/December 2017 issue of Efficient Electrification.)

In one example of this process, Cheryl explained that a material coating company in APC's service territory was using a large natural gas-fired convection oven for drying and curing. The industrial customer sought an alternative as they relocated to a new facility. In response, TAC specialists along with the customer tested the following at the TAC:

- Ultraviolet (UV) clear coat paint curing in seven seconds (reduced from 20 minutes using a natural gas convection oven)
- Infrared heating for efficient drying
- An automated conveyor line to reduce manual part movement
- The array of resulting customer benefits included:
  - Increased production
  - A smaller footprint
  - A cooler plant
  - Better product quality
  - Improved energy efficiency

At this customer facility, reduced types of LEAN wastes included defects, motion, non-utilized skills, and waiting.

Working with the TAC and Account Manager Buddy Parker, a material coating company was able to improve production, product quality, and energy efficiency by implementing UV paint curing and infrared drying.

Happy Industrial Customers

Cheryl described a wide range of other industrial customers that benefited from the TAC's aid in identifying, testing, and implementing efficient electric technologies. Case studies she described covered solutions for weld defects, plaster drying, powder coating, veneer drying, and even mop handle production.

APC reports praise from its customers on the TAC service. One customer said that the TAC's assistance, "improved a critical manufacturing process that has plagued us for the past few years." One customer joked, "We have a new problem, has anyone contacted that lady at Alabama Power?"

The hands-on approach saves APC customers money, benefits vendors working with the TAC, and further enhances the utility's relationships with its customers. At the Electrification 2018 conference, the examples served to illustrate how infrared heating and drying, UV curing, induction heating, and other methods provide real savings, reduce environmental impacts, and have other benefits in real-world customer settings.

A broom handle manufacturer returns to the TAC for assistance with a new project after working with the TAC to fully automate its production line.

Startup Pitch Panel Demonstrates Innovation in Energy

"Electricity is no longer business as usual," explains EPRI Senior Technical Leader Eric Harvey. "It's cool, hip, futuristic, and yes, fun. I think we captured that here at Electrification 2018, especially with our pitch panel."

Entrepreneurs in the "Shark Tank"

Most attendees of the "Shark Tank" style pitch panel of startups at the conference would agree with Eric. On Tuesday, August 21, thirteen global energy entrepreneurs gave time-limited presentations of their solutions for the electric power industry. In groups of three to four companies, a distinguished panel of "judges" from BP Ventures, the California Clean Energy Fund, Elemental Excelerator, Exelon/Constellation, and National Grid questioned the startups on their technology, business plan, challenges they face, implementation status, and more. The startups pitched their solutions in a broad range of subject areas, including battery storage, electric vehicle charging, smart buildings, and even electrifying aviation.

The conference exhibit hall also featured energy entrepreneurs. "Some conferences in this industry can be a bit dry," explains Harvey. "Not Electrification 2018. We brought in more than 30 startups to the exhibit hall–many run by young professionals. A fresh generation of young people (and a few industry veterans as well) displayed exciting and even inspiring technologies and approaches."

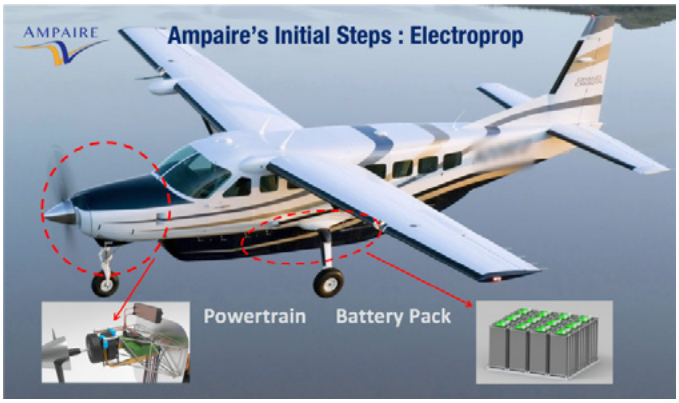
The entity that made this all happen at Electrification 2018 is the EPRI Incubatenergy Network. This national consortium of 20 leading energy-focused incubators and accelerators–resources that support entrepreneurs–was a key part of the "Breakthrough Technologies" conference track. To date, the network has collectively supported more than 500 companies. These innovative technology startups have raised more than $1.6 billion in funding, generated over $440 million in revenue, and supported more than 3300 jobs.

incubatenergy network

A Sampling of Presenters

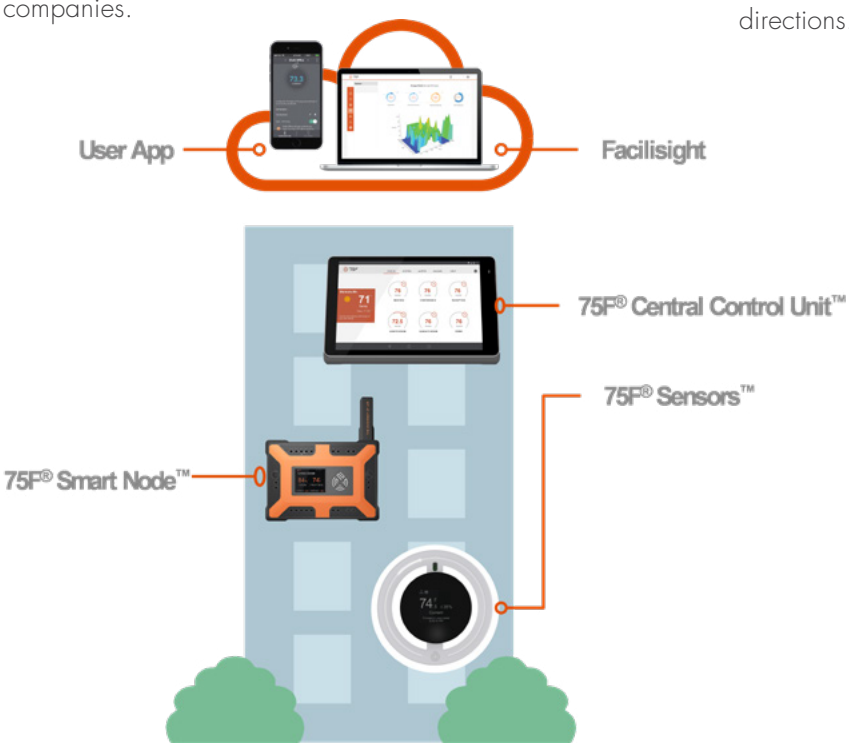
Selecting the "best" or "most promising" of the 13 presenters and 32 exhibitors is subjective at best. However, two sample presenters illustrate the ambition and innovative solutions presented.

Kevin Noertker, CEO of Ampaire, which the LA CleanTech Incubator supports, described its bold mission of becoming "the world's most trusted developer of practical, compelling electric aircraft from short haul cargo to supersonic passenger transport." Its initial step is to develop electroprop powertrains and battery packs to retrofit into existing 9-19 passenger single and twin engine aircraft. Ampaire's business model is to sell its electroprop powertrains at a lower price than a new turboprop engine, lease its battery packs at a price less than the cost of fuel, and provide lifetime product support. Noertker says that the company's greatest challenge is "regulatory approval."



Ampaire's initial step: retrofitting existing turboprop aircraft.

Deepinder Singh, CEO of 75F, which the Clean Energy Trust supports, described his vision of making "commercial building controls as ubiquitous and easy to install as setting up an iPhone." He describes 75F as "an intelligent building solution that utilizes the internet of things and the latest in cloud computing to create systems that predict, monitor, and manage the needs of buildings." 75F's target market is buildings from 5000-200,000 square feet–a size that cannot typically afford custom solutions from established building automation companies.



75F's Turnkey out-of-the-box solution for building automation.

Just the Beginning

On the last day of the conference, participants enjoyed a tour of the local LA CleanTech Incubator with 60,000 square feet of wet labs, prototyping space, 3D printing and co-working space, and more. But for Harvey and the rest of the Incubatenergy team, the end of the event marks the beginning of new and innovative ideas. "This event highlighted the many opportunities for innovation in our industry," said Harvey. "I'm proud of the collaboration and of the diversity of cultures and ideas presented by this group," he said. "It's clear that these visionary, hard-working entrepreneurs will take our industry in some interesting directions."

Kicking the Tires on the Exposition Floor at Electrification 2018

Electrification 2018's exposition hall was a feast for the senses. Attendees felt the leather seats in electric vehicles, immersed themselves in a virtual tour of an operating vertical farm, and shook hands with a broad array of 1800 enthusiastic colleagues. And then there was the aroma (and great taste) of fresh cookies (baked with FirstEnergy's electric convection oven). Between the breakout sessions and plenaries, the exposition hall was the place to be.

The 115 exhibitors included utilities, equipment manufacturers, consultants, associations, and more. They covered transportation, buildings, industrial/indoor agriculture, infrastructure, and service companies. In a separate area, 30 startups–part of the Incubatenergy network of energy entrepreneurs–eagerly presented their vision and solutions (see related story). Michael Kurzeja of EZ-EV summed it up: "Being here means being part of the future."

A Taste of the Exhibit Floor

Local Roots Agricultural Project Engineer Jack Piper provided tours of a working indoor vertical farm inside a tractor-trailer. He described his company's business model of co-locating modular indoor farms (typically 12-36 pods) at retail distribution centers. He explained that Local Roots supplies the working pods/farms, pays land lease fees, and purchases the electricity to power the LED lights. The retailers minimize their upfront costs in exchange for committing to purchase farm-fresh, pesticide/herbicide-free lettuce over a contract period.

Tropos Motors displayed an example of its electric commercial utility vehicles. These low-speed small trucks are street legal, but are designed primarily for a variety of commercial and institutional site uses. Current applications include small trucks for facilities and campuses, last-mile delivery, emergency response, and agriculture. The company offers seven different body configurations, with nine more in development. Tropos CEO John Bautista explained their decision to exhibit at the conference: "We're looking to partner with utilities to provide fleet vehicles for their internal use and to identify potential applications for their customers." He added that they "received very helpful feedback from utilities" at the conference.

Attendees taking Notice

Attendee reaction was positive. "This has been a really cool event," said FirstEnergy's Randy Frame. "I've heard, like 1700 people are here. That's amazing that we've got that many people interested in what we're doing to electrification." One consistent sentiment that attendees expressed was the uniqueness of the conference. "The ability to learn and gain the latest and greatest knowledge about it [electrification] is unprecedented," said James Ellis of Chargepoint. "You can't learn this anywhere else."

American Electric Power (AEP) highlighted its Energy Conversion Hub at its exhibit booth. The recently launched Hub helps customers learn the benefits of using electricity and make informed energy choices. "It was exciting to speak with visitors at our booth and hear their interest in electrification," said AEP Director of Strategic Marketing Teri Kerrigan. "We want to work with customers to find the best energy solution for their needs. Our Hub empowers customers with resources that help their business thrive."

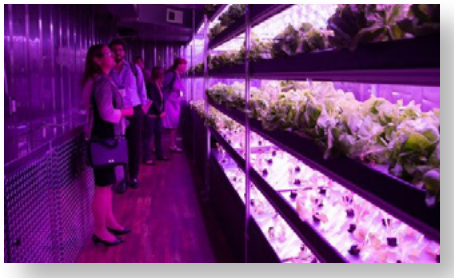


Photo Credit: Sarah Bryce, Edison International

Understanding Customer Behavior

Dr. Jennifer Weeks of BEworks gave an engaging presentation on behavioral economics–how utilities can change customers' behavior by changing their "environment." She had the Thursday morning audience laughing and nodding with interest as she described "customers behaving irrationally, but predictably," customers exhibiting "status quo bias," and commercial customers deferring energy saving decisions due to a "diffusion of responsibility." The talk was one of four insightful presentations in the Understanding Residential and Commercial Customers session that EPRI Sr. Program Manager Erin Erben moderated in the "Residential and Commercial Electric Technologies" track.

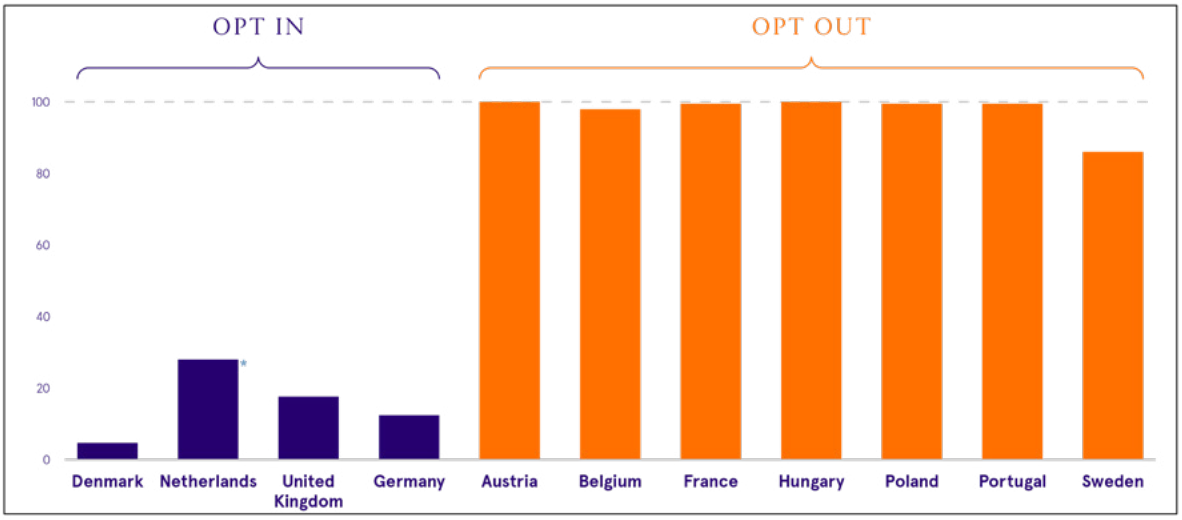
Learning from Other Industries

To illustrate how consumers respond in some situations, Dr. Weeks first drew from other industries. For example, a study showed that organ donation rates varied dramatically between two sets of European countries. Denmark, the Netherlands, the U.K., and Germany had donation rates of 5-25%, while seven other European countries had donation rates of almost 100%. Was this due to a markedly different desire to help their fellows after they pass or some other reason? A closer look revealed that the difference was simply due to the way the countries' departments of motor vehicles presented the donation signup option to its citizens:

- Opt In. In the countries with low adoption rates, the DMV used an opt-in form; citizens needed to check a box to donate.
- Opt Out. In the countries with high adoption rates, the DMV's default was donation; citizens needed to take no action to donate.

This shows that citizens took the easy path to make the decision: no action. This is an example of status quo bias, in which the default option heavily affects consumer behavior.

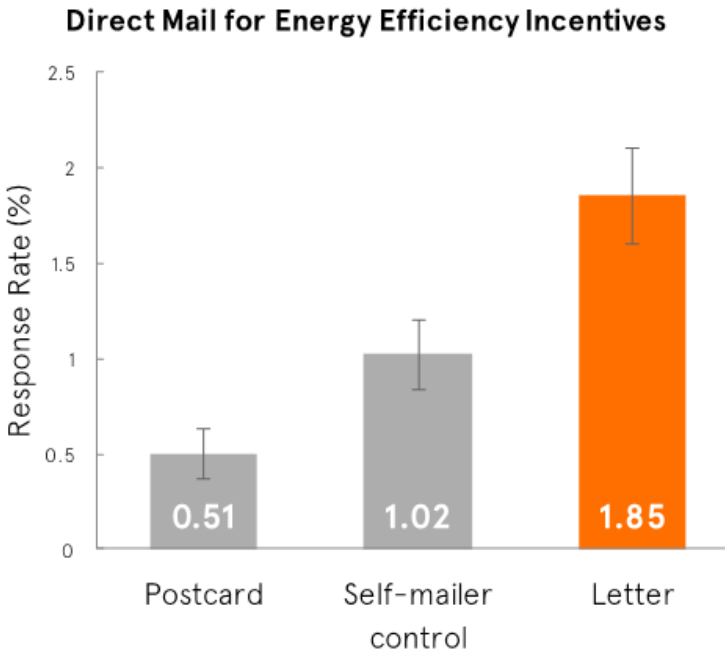
In a second insightful example of consumer behavior in another industry, Dr. Weeks described research on how financial disincentives can backfire. At a daycare center, parents were habitually late picking up their children. In an attempt to discourage this behavior, the center introduced a fine for late arrivals. To the dismay of center operators, late parent arrivals almost doubled after the fine was established. The reason is that the fine acted as a price for additional daycare after regular business hours. Parents felt entitled to take advantage of this additional care option. The lesson here is that penalties can backfire by giving customers moral license to engage in bad behaviors.



Utility Case Study: Behavioral Economics in Action

Dr. Weeks then described a utility case study in which commercial customers were offered incentives for energy efficient upgrades that led to significant savings when adopted. However, only 34% of the customers took advantage of the incentives. In an attempt to improve adoption, BEworks applied the following three-step behavioral economics approach:

1. Research: Understand commercial customers through a behavioral lens (e.g., determine decision points in the customer journey and identify behavioral barriers).
2. Strategy: Develop hypotheses on where and how to improve adoption (e.g., increase information accessibility or increase information credibility).
3. Experiment: Build evidence-based solutions and try them out (e.g., by conducting an in-field trial with the customers).



In this study, BEworks tested two "behavioral interventions":

- Increased accessibility: mailing a simple postcard to commercial customers that did not require opening.
- Increased credibility: sending these customers business-like letter by mail.

BEworks randomly assigned customers to a control group, the first behavioral intervention (postcard), and the second behavioral intervention (letter). Results showed the following customer response rates (unique web visitors) to the mailing:

- The postcard response (increased accessibility) was 50% lower than the control group.
- The business-like letter (increased credibility) was 81% higher than the control group.

Dr. Weeks added that following the evidence in this way "democratizes" the decision-making approach and enables innovation while minimizing risk. To learn more about this presentation, contact Dr. Jennifer Weeks, Associate at BEworks, 416.920.1921. To learn more about EPRI research in this area, contact EPRI Sr. Program Manager Erin Erben, 541.214.8549.

Air Quality Impacts of Electrification

EPRI Senior Program Manager Naresh Kumar led a panel that focused on the air quality impacts of electrification. Four panelists presented papers that included a review of previous air quality progress, insights from recent electrification studies, an assessment of impacts from electrified trucks, and potential strategies for air quality standards attainment in California's South Coast Air Basin. The four papers shared an underlying optimism about the potential for reducing pollution in some areas most deeply affected. Speakers evaluated several strategies and scenarios to achieve lower emissions through electrification, particularly in the transportation sector.

Recent Declines in Air Pollution

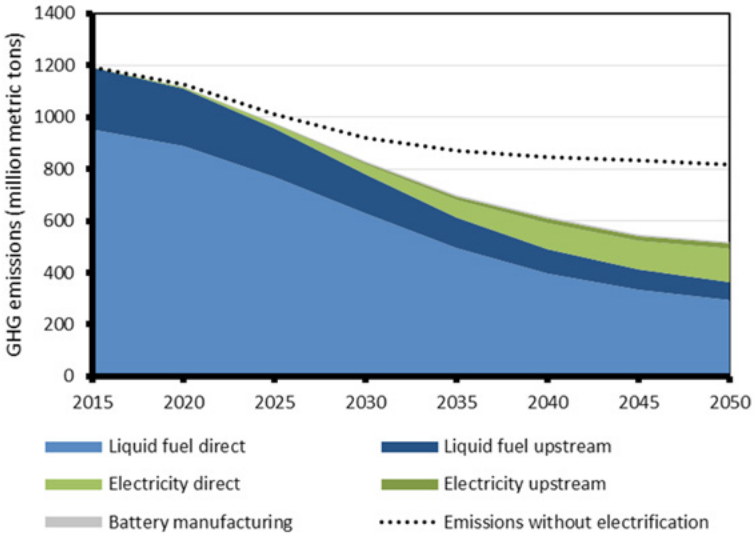
Over the last decade, a shift to cleaner sources of electric power generation has contributed significantly to a decline in U.S. air pollution. This shift has included reduced fossil generation, a switch from coal to natural gas, and installation of pollution abatement technologies. In a presentation entitled "The Remarkable Decline in Air Pollution from the U.S. Electricity Sector over 2010-2017," Dr. Nicholas Z. Muller of Carnegie Mellon University offered preliminary results showing that "air pollution damages from electricity have fallen approximately 50% since 2010."

This shift is important because increased electrification–using cleaner electric power generation–sets the stage for further improvements in air quality. In fact, electrification can be viewed as a major means of improving air quality going forward.

Insights from Electrification Studies

EPRI Principal Technical Leader Eladio M. Knipping's presentation, "Insights from the EPRI-NRDC and CEC-Supported Electrification Studies," was based on results from a study conducted in cooperation with the Natural Resources Defense Council (NRDC) and preliminary results from a study that the California Energy Commission (CEC) supported.

A major conclusion of the EPRI-NRDC study was that "for passenger vehicles, transportation electrification increases the reduction in passenger vehicle greenhouse gas emissions between 2015 and 2050 by 32% to 57%." Preliminary results of the CEC study (limited to July 2050) demonstrate that "aggressive electrification can lead to large air quality benefits in the non-attainment area of the South Coast Air Basin, with significantly lower ozone and fine particulate matter levels than a scenario without electrification."



Impacts of Electrified Drayage Trucks

Drayage trucks–typically used to carry heavy loads for relatively short distances, as between a port and inland storage facilities–contribute a disproportionate share of truck emissions in the surrounding region. Michael MacKinnon of the University of California, Irvine, discussed the benefits of electrifying these trucks in his presentation, "Assessment of the Air Quality and Health Impacts of Fuel Cell Electric Drayage Trucks in California." MacKinnon concluded that "electrification in drayage applications is an effective and efficient strategy to reduce pollutant emissions from heavy duty transportation."

Attainment Strategies

Sang-Mi Lee of the South Coast Air Quality Management District presented a broader study to attain ozone and PM2.5 standards in southern California in a presentation entitled, Air Quality in the South Coast Air Basin and Potential Strategies for Attainment. "Focusing on nitrogen dioxide emissions reduction strategies, the presentation concluded that significant reductions from mobile sources are needed, because "even if emissions from all stationary sources [were] brought to zero, [the region] would still not meet its goals." Lee indicated that attainment requires deployment of advanced cleaner zero and near-zero technologies, including electric vehicles, via incentive programs and technology demonstration.

For more information on the air quality impacts of electrification, contact EPRI Senior Program Manager Naresh Kumar, 650.855.8758.

ELECTRIFICATION IN THE NEWS

Leading Articles

- *Greentech Media's* August 22 article, "The Utility Industry Marvels at the 'Profound' Impact of Economy-Wide Electrification," took its cue from the Electrification 2018 opening address of EPRI President Mike Howard, that "The shift toward the electrification of everything is 'going to be profound' for the utility industry." The article concluded that "utility execs are enthusiastically embracing the electrification vision."
- At the Global Climate Action Summit in San Francisco September 12-14, *GreenBiz* reports that the Climate Group and 26 states, cities, regions, and businesses committed to the "ZEV Challenge."
- In September, a *Forbes* article by Jeff McMahon explains that implementing electric alternatives to natural gas in homes for smaller jobs than space conditioning and water heating, such as induction cooking and ultrasonic clothes drying, could "cinch electrification" because it could completely eliminate the need for natural gas service.
- In an August article, *Hellenic Shipping News* explains why the "the marine industry is at a turning point" as electrification gains momentum.
- According to *MPR News*, a McKnight Foundation study released in July concluded that Minnesota can meet its 2050 goal of reducing greenhouse gas emissions by 80% from 2005 levels by transitioning to wind and solar and adopting electrification.

Other News

- The *E&E News* article, "Industry sees big opportunity, challenges with electrification," emphasized that the Electrification 2018 conference "showed that electrifying more of the nation's economy could, under certain scenarios, reduce total U.S. energy consumption by almost a third by 2050 and cut economy-wide greenhouse gas emissions by as much as two-thirds."
- On August 27, Garrett Hering of *S&P Global Market Intelligence* posted "'80% to go': Utilities eye electrification of almost everything" on Twitter, concluding that, in terms of electrification, "what matters most right now is electric transport, fueled by breathtaking advances in lithium-ion batteries. Progress on batteries 'opens up the frontier' for electricity suppliers to double their share of the total energy market to 40%," citing the presentation given by Arshad Mansoor, EPRI's Senior Vice President of Research and Development.
- The Volvo Group demonstrated a cab-less, autonomous electric truck at its Innovation Summit in Berlin.
- A GreenBiz 350 Podcast in August "Episode 137: Greener plastics, electrifying everything and (yes) another blockchain app" interviewed Southern California Edison's Vice President of Customer Programs and Services Jill Anderson on the company's master plan that includes electrifying infrastructure.
- On September 5, New York Governor Andrew Cuomo announced the state will use $127.7 million from the Volkswagen settlement to install electric vehicle charging infrastructure and increase EVs in the state, including buses, trucks, locomotives, ferries, tug boats, and cargo handling equipment.

UPCOMING EVENTS

- Oct. 16–17, 2018: Energy Storage STUDIO Conference, Hilton Charlotte Center City, Charlotte, NC
- Oct. 24–25, 2018: National Electric Transportation Infrastructure Working Council Meeting, Salt River Project's PERA Club, Tempe, AZ
- Oct. 24, 2018: The Linux Foundation's LFEnergy Summit, Sheraton Grand Hotel and Spa, Edinburgh, Scotland
- Nov. 6–8, 2018: Energy Storage North America, Pasadena, CA
- Dec. 4–6, 2018: GridConnext, The Liaison Capitol Hill, Washington, DC
- Electrification 2020, April 6-9, 2020, Charlotte Convention Center, Charlotte, NC

Get Involved

How can efficient electrification benefit you? To learn more or get involved in one of EPRI's programs, contact Jimmy Herren (West), Brian Fortenbery (East), or Kevin East (International).

EPRI RESOURCES

- Report: *Developing a Framework for Integrated Energy Network Planning (IEN-P): Executive Summary* (July 2018)
- Report: *Electric Vehicle Driving, Charging, and Load Shape Analysis: A Deep Dive Into Where, When, and How Much Salt River Project (SRP) Electric Vehicle Customers Charge* (July 2018)
- Technology Innovation: *Electricity Reinventing Agriculture: Insights from EPRI's Ongoing Research Into Indoor Agriculture* (June 2018)
- Technology Innovation: *Quick Insights: Bitcoin Mining, Blockchain, and Electricity Consumption* (April 2018)
- Report: EPRI's *U.S. National Electrification Assessment* report, a recorded webcast of the release event, and presentations from the release. (April 2018)

For access to all of EPRI's efficient electrification-related R&D materials and other information, visit our website.

- *T&D World* quoted EPRI Vice President, Integrated Grid R&D Mark McGranaghan in an article about how NYPA will test, model, and develop the innovative solutions to energy systems at its Advance Grid Innovation Laboratory for Energy (AGILe) in White Plains, N.Y. "This is part of the industry-leading effort to make wind, solar, storage and customer resources (like flexible loads, batteries and electric vehicle charging) all part of an integrated grid," he said.
- EPRI Senior Vice President of R&D Arshad Mansoor was quoted in a *New York Times* article about efforts by the City of Orlando to wean itself from fossil-generated electricity. "There's a fundamental disconnect on what 100 percent means," he said. In the electricity industry's calculus, 100 percent carbon-free may not mean 100 percent zero emissions. In Orlando's case, it means buying credits produced from carbon-free power plants elsewhere—a benefit used to encourage development of clean power sources.
- *Greentech Media* posted an article about how utilities are maintaining the course in decarbonizing their generation portfolios despite the administration's proposed Affordable Clean Energy (ACE) rule. The publication compiled comments from representatives of American Electric Power, Southern Company, and FirstEnergy, who attended EPRI's recent electrification conference in Long Beach, California.
- *S&P Global News* posted an article about EPRI's recent electrification conference and how electrification may affect the industry in the future. The article focused on electrification efforts of the Port of Long Beach, the second busiest in the United States. EPRI President and CEO Mike Howard, Arshad Mansoor, and Edison International's president and CEO Pedro Pizarro were quoted. Howard cited the combination of "micro-efficiency advancements" in power electronics and "macro-efficiency gains" of battery energy density as "probably the single biggest technical advancement that has occurred over the last 10 years." Over the next 5 to 10 years, Howard expects the power sector to undergo more change than in the previous 30 years.
- EPRI energy storage team research on maximizing energy storage lifecycle value was featured in an *Energy Storage News* article. The article said the fact that lithium-ion batteries experience degradation over time should not necessarily limit their widespread use in stationary storage systems, but requires long-term strategies for their management.
- *Microgrid Knowledge* posted an article about how the California Energy Commission (CEC) wants to make microgrids more bankable—meaning developing creative metrics to allow bankers and the investment community feel comfortable investing in distributed energy resources (DER) and microgrid projects. The commission provided a $2 million grant to EPRI that will be used to create software that allows DER and microgrid developers to quantify the costs of their projects.
- Mark McGranaghan was quoted in a *Utility Dive* article about the Ohio Public Service Commission's PowerForward Initiative, which aims to level the playing field for innovations in utility distribution systems. Part of building the "iPhone" of the grid is anticipating interoperability for new services between other providers and utilities. "Everyone and their brother is going to plug into that platform," McGranaghan said.

About EPRI's Efficient Electrification Initiative

"Electrification" describes the adoption of electric end-use technologies. EPRI's Efficient Electrification Initiative explores electrification in the context of the global energy system, analyzing the customer value–lower cost, lower energy use, reduced emissions, improved indoor environment, and increased productivity–provided by advanced, end-use technologies that efficiently amplify the benefits of cleaner power generation portfolios. Coupling EPRI's modeling capabilities with extensive research on end-use technologies and grid operations, the initiative also will assess interdependencies among increased adoption of efficient electric technologies, their potential to provide enhanced control and flexibility, and their impact on grid operations and planning.

3002013713 September 2018

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