STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF DUKE ENERGY INDIANA, LLC PURSUANT TO IND. CODE §§ 8-1-2-42.7 AND 8-1-2-61, FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE THROUGH A STEP-IN OF NEW RATES AND CHARGES USING A FORECASTED TEST PERIOD; (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, GENERAL RULES AND REGULATIONS, AND RIDERS; (3) APPROVAL OF A FEDERAL MANDATE CERTIFICATE UNDER IND. CODE § 8-1-8.4-1; (4) APPROVAL OF REVISED ELECTRIC DEPRECIATION RATES APPLICABLE TO ITS ELECTRIC PLANT IN SERVICE; (5) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING DEFERRAL RELIEF; AND (6) APPROVAL OF A REVENUE DECOUPLING MECHANISM FOR CERTAIN CUSTOMER CLASSES	)	**CAUSE NO. 45253**

VERIFIED DIRECT TESTIMONY
OF
LANG W. REYNOLDS

On Behalf of Petitioner,
DUKE ENERGY INDIANA, LLC

Petitioner's Exhibit 31

July 2, 2019

DIRECT TESTIMONY OF LANG W. REYNOLDS
DIRECTOR OF ELECTRIC TRANSPORTATION
DUKE ENERGY CAROLINAS, LLC
ON BEHALF OF DUKE ENERGY INDIANA, LLC
BEFORE THE INDIANA UTILITY REGULATORY COMMISSION

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Lang W. Reynolds, and my business address is 550 South Tryon Street, Charlotte, North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed as Director of Electric Transportation for Duke Energy Carolinas, LLC, a utility affiliate of Duke Energy Indiana, LLC ("Duke Energy Indiana," or "Company") and an indirect subsidiary of Duke Energy Corporation ("Duke Energy").

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I hold a Bachelor of Arts from Swarthmore College and Masters of Business Administration from the University of Colorado. I have been employed by Duke Energy since July of 2015 and worked previously for Morgan Stanley. During my time at Duke Energy I have worked within the Distributed Energy Technology organization and also Duke Energy Renewables before assuming the role of Manager of Electric Transportation in January of 2017.

Q. PLEASE DESCRIBE YOUR DUTIES AND RESPONSIBILITIES AS DIRECTOR OF ELECTRIC TRANSPORTATION.

A. My responsibility as Director of Electric Transportation has been to establish a team at Duke Energy tasked with developing and implementing projects and programs to facilitate broader adoption of electric transportation in a manner that drives economic and utility customer benefits across all of our utility service territories. Specifically, I oversee the design and implementation of Pilot EV Programs for the various Duke Energy jurisdictions, including Indiana. Members of my team are located throughout Duke Energy's various service territories.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony to describe the components of Duke Energy Indiana's Electric Transportation Pilot Programs ("Pilot" or "Pilot Program"). Specifically, I will provide details of each program, including a program description, what the Company hopes to learn from each program in the Pilot, and our estimated cost for each program.

Q. PLEASE GENERALLY DESCRIBE DUKE ENERGY INDIANA'S ELECTRIC TRANSPORTATION PILOT PROGRAM PROPOSAL.

A. Based on the research conducted by MJ Bradley, attached as Petitioner's Exhibit 31-A (LWR), the Duke Energy Indiana believes that the increasing adoption of electric transportation will provide strong economic and utility customer benefits over the long term. At the same time, new electric vehicles ("EV") are entering the market and strong year-over-year sales growth continues nationwide, including in Indiana. Duke Energy Indiana is proposing an Electric Transportation Pilot Program that will allow Indiana to join other states in deploying EV infrastructure to meet growing market needs. Duke Energy Indiana's proposal consists of five distinct programs. The proposed programs are designed to deploy a foundational level of fast charging infrastructure, research the effects of increasing adoption of different types of electric vehicles on the electric system, research customer EV charging behavior, and ascertain the potential benefits to the state of Indiana.

The five programs are as follows:

- Direct Current Fast Charge Program
- Electric School Bus Program
- Electric Transit Bus Program
- Residential EV Charging Rebate Program
- Commercial EV Charging Rebate Program

Q. HOW DOES DUKE ENERGY INDIANA PROPOSE TO SHARE THE DATA OBTAINED THROUGH THE PILOT WITH THE COMMISSION AND OTHER STAKEHOLDERS?

A. To the extent possible, while protecting customer privacy, aggregated data will be made available to the public through annual reports submitted to the Commission every twelve months, for a three year period, following the start of the Pilot. A table of potential data metrics Duke Energy Indiana intends to gather through the Pilot are attached as Petitioner's Exhibit 31-B (LWR).

II. DIRECT CURRENT FAST CHARGE ("FAST CHARGING") PROGRAM

Q. PLEASE EXPLAIN THE FAST CHARGING PROGRAM.

A. Duke Energy Indiana plans to install, own, and operate a network of up to 30 Fast Charging locations, totaling 60 charging ports at 30 locations.

The Fast Charging locations include charging equipment with electrical demand requirements of 100 kW or greater. Each location will include a minimum of two Fast Charging Electric Vehicle Supply Equipment ("EV Supply Equipment") capable of charging all mass-market plug-in electric vehicles intended for use on public streets and highways.

In order to facilitate development of a competitive market, charging services at company-operated stations will be available for public charging for a "Fast Charge Fee" developed to align with the statewide average price for fast charging services at all publicly-available, open standard Direct Current Fast Charging locations. The proposed Fast Charge Fee is composed of the Rate LLF secondary energy charge of $0.205690 per kWh plus all applicable riders listed on Appendix A – List of Applicable Rate Adjustment Riders. See the testimony of Duke Energy Indiana witness Mr. Roger A. Flick, Petitioner's Exhibit 9-A (RAF) and 9-B (RAF), Rate LLF for a description of the fast charging fee. This amount currently aligns with the statewide average for fast charging of $0.216/kWh as calculated by Duke Energy Indiana, and the Company will review on a quarterly basis to ensure continued alignment. If the Fast Charge Fee deviates from the statewide average by more than 20%, the Company will add a market adjustment to Rate LLF to bring the Fast Charge Fee in alignment with the statewide average.

The Fast Charge Fee may be adjusted throughout the Pilot, in accordance with Commission approved tariffs, as needed, but no more than once per quarter. Payment may be made by Smart Phone App, radio-frequency identification ("RFID") card, or by credit/debit card swipe at the site. The Fast Charge Fee is intended to recover, at a minimum, the cost of electric service plus transaction and network service costs.

Q. WHY IS DUKE ENERGY INDIANA PROPOSING A MARKET ADJUSTMENT TO ESTABLISH THE FAST CHARGING FEE?

A. By creating the "market adjustment", which may in the future be used to adjust Rate LLF, Duke Energy Indiana is attempting to ensure that the Pilot Program supports the development of a real competitive market rather than simply passing along the cost of electricity, which would be lower than the price other third-party operators could reasonably charge.

Q. HOW WILL DUKE ENERGY INDIANA HANDLE ANY ADDITIONAL NET REVENUE RECEIVED FROM THE FAST CHARGE FEES?

A. Any additional net revenue, over the cost of providing energy, from the Fast Charging Program will be applied as an offset to the cost of the program, but is not anticipated to recover the full cost of the charging infrastructure within the term of the Pilot. Duke Energy Indiana will report on this amount in an annual report, to be described later in my testimony.

Q. WHAT IS THE LENGTH OF THE TERM OF DUKE ENERGY INDIANA'S PROPOSED FAST CHARGING PROGRAM?

A. Duke Energy Indiana is proposing a term of 36 months, following Commission approval. Prior to the end of the 36-month program, the Company will prepare a final report and propose an appropriate structure to ensure the network remains operational for the full useful life of the Fast Charging hardware, which may be a permanent program, disposition of the charging assets to a third party, or another option proposed at that time.

Q. WHAT IS THE USEFUL LIFE OF THE FAST CHARGING INFRASTRUCTURE?

A. Based on independent third-party analysis[1] and Duke Energy experience, Duke Energy Indiana is currently projecting a ten (10) year useful life for the Fast Charging infrastructure. The Company proposes to continue operating the Fast Charging units for the life of each unit, or ten years, whichever comes first. This is to protect the units from being a stranded asset if the site host is unable to maintain a Fast Charging unit.

Q. HOW WILL DUKE ENERGY INDIANA DETERMINE THE PLACEMENT OF THE FAST CHARGING STATIONS?

A. Charging stations will be dispersed at key interstate and highway corridor locations throughout Duke Energy Indiana's service territory. This will enable intra- and inter-state electric vehicle travel and build driver confidence in EV

[1] https://luskin.ucla.edu/sites/default/files/Non-Residential%20Charging%20Stations.pdf

range. Locations within one mile of interstate and highway exits with existing three-phase electrical service, safe and ideal parking, lighting, and customer attractions will be given preference to ensure the stations are utilized effectively. Charging services will be available to all electric vehicle owners that travel through Duke Energy Indiana's service territory.

Q. DO YOU HAVE A MAP OF SPECIFIC PROPOSED FAST CHARGING LOCATIONS?

A. Yes. Please see Petitioner's Exhibit 31-C (LWR).

Q. PLEASE DESCRIBE WHAT DUKE ENERGY INDIANA EXPECTS TO LEARN FROM THE FAST CHARGING PROGRAM?

A. Duke Energy Indiana proposes to learn the following from the Fast Charging Program:

- Data on the effects of charging multiple types of electric vehicles
- Data regarding utilization rates of the network and geographic patterns of utilization
- The proportion of patrons using stations who live within Duke Energy Indiana's service territory, the state of Indiana, and/or out of state
- Charging station reliability data
- System impacts related to Fast Charging
- Indiana Light Duty EV sales percentage change during the Pilot period

- Customer experience information

Q. HOW DOES DUKE ENERGY INDIANA PROPOSE TO SHARE THIS INFORMATION WITH THE COMMISSION AND OTHER PARTIES TO THIS PROCEEDING?

A. To the extent possible in keeping with protecting customer privacy, aggregated data will be made available to the public through annual reports filed every twelve months, for a three year period, following the start of the Pilot.

III. ELECTRIC SCHOOL BUS PROGRAM

Q. PLEASE EXPLAIN DUKE ENERGY INDIANA'S PROPOSED ELECTRIC SCHOOL BUS PROGRAM.

A. The purpose of this pilot program is to support procurement of Electric Vehicle School Buses ("EV School Bus") by public school transportation systems, install supporting EV Supply Equipment, including charging infrastructure, to facilitate market adoption, collect utilization and other load characteristics to understand grid and utility impacts, and explore potential for bi-directional power flow from EV School Bus batteries. Duke Energy Indiana is proposing to fund up to $215,000 per bus, for procurement, delivery, and installation of EV School Buses and associated EV Supply Equipment. The proposed program will be limited to 20 electric school buses. Duke Energy Indiana will install and retain ownership of the EV Supply Equipment while the participating School Corporation will be responsible for proper operation and maintenance of EV Supply Equipment according to manufacturer guidelines. Duke Energy Indiana will establish and maintain charging station network connectivity for load control capabilities during the full 36-month Pilot. The School Corporation will own the EV School Bus and shall operate and maintain all EV Supply Equipment components for the duration of the Pilot. At the conclusion of the Pilot, Duke Energy Indiana will retain ownership rights to the EV School Bus battery and may remove and repurpose it at the end of its useful life.

Q. WHO WILL BE ELIGIBLE FOR THE ELECTRIC SCHOOL BUS PROGRAM?

A. The proposed Program will be available, on a first-come-first-served basis, to customers operating public school transportation systems in Duke Energy Indiana's electric service territory.

Q. WILL PARTICIPANTS BE SUBJECT TO ADDITIONAL TERMS AND CONDITIONS?

A. Yes. Participants must utilize one or more EV School Buses and provide transportation services to a public-school system. Overall, incentives will be available for 20 buses, with no more than three buses per school system. Participants must grant Duke Energy Indiana access to all vehicle charging data throughout the program term and allow implementation of load management capabilities to reduce charging speeds, up to and including full curtailment and bi-directional power flow, provided such control activities do not impact the necessary duty cycle of the EV School Bus. Prior to participation under this Program, the School Corporation and Duke Energy Indiana will execute an

Electric Vehicle School Bus Supply Equipment Site Agreement to establish the terms and conditions of EV Supply Equipment and School Bus installation and ownership.

Q. PLEASE DESCRIBE WHAT DUKE ENERGY INDIANA PROPOSES TO LEARN FROM THE ELECTRIC SCHOOL BUS PROGRAM?

A. Duke Energy Indiana expects to learn the following from the EV School Bus Program:

- Amount of energy used by a EV School Bus
- Electricity consumption and customer charging behavior
- System impacts of EV School Bus charging
- Capability for bi-directional power events
- EV School Bus reliability statistics
- Impacts of various EV School Bus applications, such as geographic route differences
- Customer and student experience information

IV. ELECTRIC TRANSIT BUS PROGRAM

Q. PLEASE EXPLAIN THE ELECTRIC TRANSIT BUS PROGRAM.

A. The purpose of this Pilot Program is to deploy EV Supply Equipment, including charging stations, for Electric Vehicle Transit Buses ("EV Transit Bus") to support EV Transit Bus adoption while collecting utilization data and other load characteristics to understand potential grid and utility impacts. Duke Energy Indiana is proposing to fund installation of charging equipment for EV Transit

Buses procured within the preceding 24 months of the Pilot commencing. Duke Energy Indiana will retain ownership of EV Supply Equipment for the duration of the Pilot, while customers shall be responsible for proper operation and maintenance of EV Supply Equipment according to manufacturer's guidelines. A participating customer will request a new service with a dedicated meter for the EV Supply Equipment. Upon request, Duke Energy Indiana will install EV Supply Equipment on the customer's side of the Company's meter. Any usage will be billed under the customer's existing commercial rate or applicable LLF or HLF Time-of-Use ("TOU") service schedule, as discussed by Duke Energy Indiana witness Mr. Jeffrey R. Bailey, and other riders, if applicable, for the billing demand and kilowatt-hours registered or computed by or from the Company's metering facilities during the current month.

Q. WHO WILL BE ELIGIBLE FOR THE ELECTRIC TRANSIT BUS PROGRAM?

A. Participation will be available on a first-come-first-served basis to non-residential customers receiving electric service from Duke Energy Indiana. Participants must operate a commercial transit bus system utilizing one or more EV Transit Buses, including but not limited to transit agencies, universities, airports, and non-profit/municipal entities. Company-sponsored incentives are available for no more than 15 total charging stations to support a single or multiple transit systems.

Q. WILL PARTICIPANTS BE SUBJECT TO ADDITIONAL TERMS AND CONDITIONS?

A. Yes. Participants must allow Duke Energy Indiana to install, own, and operate EV Supply Equipment at the customer site and measure customer's electrical charging characteristic on an individual or collective basis and to obtain any other data necessary to determine the operating characteristics of the customer's use of electricity. This program shall end 36 months after the date of installation, unless extended by the Company. Prior to participation, the customer and Duke Energy Indiana will execute an Electric Vehicle Transit Bus Supply Equipment Site Agreement to establish the terms and conditions of the installation.

Q. PLEASE DESCRIBE WHAT DUKE ENERGY INDIANA PROPOSES TO LEARN FROM THE ELECTRIC TRANSIT BUS PROGRAM?

A. Duke Energy Indiana expects to learn the following from the Electric Transit Bus Program:

- Electricity consumption and customer charging behavior for EV Transit Buses
- System impacts of EV Transit Bus charging
- Customer operational savings associated EV Transit Bus deployment
- EV Transit Bus reliability statistics
- Customer and passenger experience information

V. RESIDENTIAL EV CHARGING REBATE PROGRAM

Q. PLEASE EXPLAIN THE RESIDENTIAL EV CHARGING REBATE PROGRAM.

A. The purpose of the Residential EV Charging Rebate Program is to collect utilization characteristics of EV charging behavior, understand potential grid, and utility impacts from EV charging, and investigate technological capabilities for controlling residential EV-charging loads. Upon acceptance of the customer's application and verification of proper installation of approved Level 2 EV Supply Equipment, including charging infrastructure, customer shall receive a one-time rebate of $500. EV Supply Equipment will be installed on the customer's side of the meter. Usage will be billed under the applicable residential schedule and other riders, if applicable, for the billing demand and kilowatt-hours registered or computed by or from Duke Energy Indiana's metering facilities during the current month.

In addition, the Residential EV Charging Rebate Program is designed to evaluate a utility-offered option to of facilitating residential customer EV adoption and home charging. The Company will provide ongoing quarterly participation payments ($40/quarter over three years totaling $500) for up to 500 residential customers in exchange for utility management of home charging during defined hours. This method will test residential customer's willingness to react to utility demand response signals to charge their EVs but will not affect other energy usage patterns in the home. All electricity usage will be billed under the customer's current residential rate. During the first year Duke Energy Indiana will gather "unmanaged charging" data to achieve a baseline for comparison with our "managed charging" events. During the second and third years, the Company will include no more than five (5) load control events per month (15 per quarter). Load control events will occur during weekdays between the hours of 6-8 a.m. and 4-6 p.m. Load control events will consist of reduction in charging power up to and including full curtailment for up to 30 minutes. Participants will be notified of events 24 hours in advance and have the option to opt out of any event. Customers are not eligible for a quarterly payment if the customer opts out of eight (8) or more events per quarter. Data gathered includes the proportion of customers available for load control at different times of day, the proportion of customers who opt out of load control events, and the actual amount of load reductions achieved during events. Additionally, the Company will be looking for locations where multiple EVs are charging via the same transformer in a neighborhood, to further understand charging impacts on the distribution system.

Q. WHO WILL BE ELIGIBLE FOR THE RESIDENTIAL EV CHARGING REBATE PROGRAM?

A. Applications will be considered on a first-come-first-served basis from the date and time of submittal after Commission approval, up to 500 total customers. Customers will be eligible for only one rebate per residence. The customer must own, lease, or otherwise operate on a regular basis, one or more plug-in EVs per installation. A plug-in vehicle includes plug-in hybrids ("PHEV") and battery electric vehicles ("BEV"). Customers must prove purchase and installation of eligible level 2 EV Supply Equipment at their residence.

Q. PLEASE DESCRIBE WHAT DUKE ENERGY INDIANA PROPOSES TO LEARN FROM THE RESIDENTIAL EV CHARGING REBATE PROGRAM?

A. Duke Energy Indiana expects to learn the following from the Residential EV Charging Rebate Program:

- Number of load management incentives issued
- Annual change in percentage of EV sales in Duke Energy Indiana service territory and Indiana
- Cost of residential EV Supply Equipment hardware and installation.
- Proportion of PHEV vs. BEV operated by Duke Energy Indiana customers
- Amount and timing of electricity consumption for residential EV charging (managed and non-managed)
- Patterns of electricity consumption associated with different models and types of EVs
- System impacts of residential EV charging, such as residential transformers with more than one EV charging, number of distribution upgrades that were needed and the power quality of EV-impacted circuits and localized service feeds off a single transformer
- Managed charging data

- Customer EV charging behaviors

VI. COMMERCIAL EV CHARGING REBATE PROGRAM

Q. PLEASE EXPLAIN THE COMMERCIAL EV CHARGING REBATE PROGRAM?

A. The purpose of this pilot program is to support installation of EV Supply Equipment, including charging stations, for any public or private entity, government, or workplace fleet operators to support EV adoption, collect utilization characteristics of EV charging-behavior for a variety of EV types and weight-classes and better understand potential grid and utility impacts of this EV market segment.

Q. WILL PARTICIPANTS BE SUBJECT TO ADDITIONAL TERMS AND CONDITIONS?

A. Yes. Participants must request new service to separately meter all EV Supply Equipment funded by the fleet rebate. Duke Energy Indiana will analyze load characteristics and customer behavior in connection with the EV charging program. Upon acceptance of customer's application and verification of proper installation of all EV Supply Equipment behind a separate meter, the customer will receive a one-time rebate for $2,500 per EV Supply Equipment. This program shall end on and after thirty-six (36) months following the initial effective date of the program, unless renewed or extended by the Company.

Q. WHO WILL BE ELIGIBLE FOR THE COMMERCIAL EV CHARGING REBATE PROGRAM?

A. Applications will be considered on a first-come-first-served basis from the date and time of submittal. This Program is available on a voluntary basis, at Company's sole option, to no greater than 1000 total EV Supply Equipment rebates during the Pilot term, with a maximum 20 EV Supply Equipment rebates per any one customer location and 40 EV Supply Equipment rebates per any one customer, for customers receiving electric service from the Company. Customer must own, lease or otherwise operate on a regular basis, one or more plug-in electric vehicles per installed EV Supply Equipment. A plug-in vehicle includes plug-in hybrid and battery electric vehicles. On-board vehicle charging communication is not eligible. The Customer's charging station(s) shall be installed on Customer's side of a new Company meter. Customer must select (LLF, LLF-TOU, HLF, or HLF-TOU) and any usage will be billed thereunder with other applicable riders, for the Billing Demand and kilowatt-hours registered or computed by or from Company's metering facilities during the current month.

Q. PLEASE DESCRIBE WHAT DUKE ENERGY INDIANA PROPOSES TO LEARN FROM THE COMMERCIAL EV CHARGING REBATE PROGRAM?

A. Duke Energy Indiana expects to learn the following from the Commercial EV Charging Rebate Program:

- Number of rebates issued
- Change in percentage of state EV sales and percentage of EV registrations in Duke Energy Indiana's service territory

- TOU rate summary and charging behaviors
- Data regarding the geographic diversity of charging locations
- Amount and timing of electricity consumption for commercial EV charging
- Comparison of fleet charging with residential and fast charging
- System impacts of commercial EV charging

VII. RATES AND CUSTOMER PROTECTIONS

Q. IS DUKE ENERGY INDIANA PROPOSING ANY SPECIFIC RATE STRUCTURES TO ACCOMPANY ITS EV PILOT PROPOSAL?

A. Yes. The Company is seeking Commission approval of a Fast Charging Fee. This rate is what the Company will charge EV drivers who charge at the Fast Charging stations. To help the Fast Charging market mature in Indiana, the proposed Fast Charging Fee will include a "market adjustment" to avoid underpricing of Fast Charging services.

Q. WHAT TYPES OF CONSUMER PROTECTIONS DOES DUKE ENERGY INDIANA PROPOSE TO BUILD INTO ITS PROGRAMS?

A. The Company has multiple consumer protections in place. First, the proposal is limited in time. The Pilot will cease after thirty-six (36) months, at which time Duke Energy Indiana may propose to extend certain program elements based on data gathered during the Pilot and the state of the marketplace at that time. Second, the Pilot is limited in scope. The Company proposes to continue operating the Fast Charging units for the life of each unit, or ten years, whichever comes first. This is to protect the units from being a stranded asset if the site host is unable to maintain each Fast Charging unit. Each program is limited to a number of participants necessary to generate the data necessary to inform Duke Energy Indiana on customer EV behaviors. Finally, the Pilot is limited in costs. The Company's proposal for cost recovery is capped at $15.3 million plus carrying costs, which is comprised of approximately $11.4 million of capital spend and approximately $3.9 of O&M spend. Duke Energy Indiana witness Ms. Suzanne Sieferman discusses the ratemaking proposal for these costs in her direct testimony.

One hundred and eighty days after the conclusion of the Pilot, Duke Energy Indiana will file a report with the information discussed above. Before or after the Pilot concludes, the Company may seek approval of newly developed EV customer offerings or continuation of EV pilot programs. Furthermore, all capital installations associated with the Pilot will be coordinated with other Company planned work to improve efficiencies.

VIII. PILOT COSTS

Q. WHAT ARE THE PROJECTED COSTS OF THE ELECTRIC VEHICLE PILOT?

A. The overall projected costs for the Pilot, as provided in Table 1, is $15,299,250.

Table 1

Annual Program Budgets		2019	2020	2021	2022	2023	Program Totals
Residential L2 Rebate	Capital	$ -	$ -	$ -	$ -	$ -	$ -
	O&M	$ -	$ -	$ 333,333	$ 83,333	$ 83,333	$ 500,000
School Bus & Infrastructure	Capital	$ -	$ 2,150,000	$ 2,150,000	$ -	$ -	$ 4,300,000
	O&M	$ -	$ 5,000	$ 10,000	$ 10,000	$ 10,000	$ 35,000
Transit Infrastructre	Capital	$ 150,000	$ 750,000	$ 225,000	$ -	$ -	$ 1,125,000
	O&M	$ 2,000	$ 12,000	$ 15,000	$ 15,000	$ 15,000	$ 59,000
Commercial L2 Rebate	Capital	$ -	$ -	$ -	$ -	$ -	$ -
	O&M	$ -	$ -	$ 1,250,000	$ 1,250,000	$ -	$ 2,500,000
DCFC Infrastructure	Capital	$ -	$ 6,000,000	$ -	$ -	$ -	$ 6,000,000
	O&M	$ -	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 120,000
G&A	O&M	$ 210,500	$ 285,500	$ 146,750	$ 8,750	$ 8,750	$ 660,250
Annual Totals		**2019**	**2020**	**2021**	**2022**	**2023**	**Overall Total**
	Capital	$ 150,000	$ 8,900,000	$ 2,375,000	$ -	$ -	$ 11,425,000
	O&M	$ 212,500	$ 332,500	$ 1,785,083	$ 1,397,083	$ 147,083	$ 3,874,250
							$ 15,299,250

Q. WHAT IS THE VOLKSWAGEN TRUST?

A. The Indiana Volkswagen Environmental Mitigation Trust Program is a statewide program aimed to support the deployment of newer, cleaner alternatives of vehicle transportation. The program is supported by Indiana's $41 million portion of the Volkswagen Mitigation Trust Fund.[2] Duke Energy Indiana is most interested in helping our customers pursue electric transit buses, school buses and any other mode of electric transportation. In addition, Duke Energy Indiana has been working with the Indiana Department of Environmental Management, Indiana Energy Association, our interested customers, and other state electric utilities to refine the development of the Indiana Beneficiary Mitigation Fund.

Q. DOES DUKE ENERGY INDIANA PLAN ON APPLYING FOR FUNDS FROM THE VW TRUST TO FUND THE PILOT, PLEASE EXPLAIN?

A. Duke Energy Indiana is actively supporting customer-submitted applications for the purchase of electric transportation vehicles through the Indiana Volkswagen Mitigation Trust Fund. Furthermore, Duke Energy is watching the Light Duty

[2] Indiana Volkswagen Mitigation Trust Program. Accessed by https://www.in.gov/idem/airquality/2712.htm

EVSE Infrastructure funding segment of the Beneficiary Mitigation Fund as it develops and is considering a submission to recover any eligible Fast Charging infrastructure costs. Any award received from the VW Trust will be used to offset the amount of the deferral requested in this pilot within the Fast Charging program. Budgeted amounts requested in this pilot do not include any relief from the VW Trust.

IX. PAST DUKE ENERGY EV PROJECTS

Q. HAS DUKE ENERGY INDIANA CONDUCTED EV PROJECTS IN THE PAST?

A. Yes. Duke Energy Indiana participated in Project Plug-In from 2010 through 2013. Project Plug-In was an EV charging station project where the Company contracted the installation of charging stations and up to $1,000 of installation fees to 85 residential customers who bought or leased a EV in the Company's service area in exchange for collecting data about their charging behaviors for a two-year period. The Company also installed 45 commercial charging stations at no cost to the site host.

By the conclusion of the project, the Company was able to analyze and begin to understand the distribution impact and potential ways to mitigate impacts of EVs; the technical capabilities that charging stations offer to help mitigate potential impacts; and when, where, how long, and how often a customer charges their EV. Additionally, when asked about their EV, 80 percent felt strongly they saved money in fuel costs. However, only 32 percent of participants used their EV to travel distances greater than 100 miles.

Q. WHAT HAS CHANGED SINCE 2013 IN THE EV MARKET?

A. The Company anticipates accelerated deployment of EV technology and the potential customer benefits of increased EV adoption in the State of Indiana. As of November 2018, there were 6,160 Plug-In Electric Vehicles registered in Indiana, and an estimated 2,225 (36%) of which were registered in the Duke Energy Indiana service territory. In 2018 alone, nearly 800 EVs were registered in the Duke Energy Indiana service territory. A Duke Energy study suggests that by 2030 Duke Energy Indiana could have nearly 116,000 EVs registered with five (5) percent light duty vehicle market share. If this growth rate remained steady, the state would need over 900 Fast Charging stations and over 14,000 Level 2 workplace and public charging stations to provide partial EV infrastructure support according to the U.S. Department of Energy's EVI-Pro Lite calculator[3]. However, we anticipate high growth, approximately 25%, which would bring closer to 575,000 EVs in Duke Energy Indiana's service territory by 2030. At this growth rate, the state would need over 2,800 Fast Charging Stations and over 50,000 Level 2 charging stations to provide partial support.

Auto manufacturers are racing to release new electric vehicle models at an astounding pace. In 2013, there were under 20 EV models available. At the time of filing, there were currently around 43 EV models for sale in the U.S. By the

[3] US Department of Energy. Alternative Fuels Data Center. EV Infrastructure Projection Tool available at: https://afdc.energy.gov/evi-pro-lite

end of 2022, over 130 models are projected to be available for sale in the U.S. from nearly every major auto manufacturer. For example, Ford has stated they are investing $11B on electrification technology with plans to introduce 16 all-electric models by 2022 and Honda has announced plans to electrify two-thirds of their vehicle lineup.[4]

Furthermore, battery costs have been falling from $1,000/kWh in 2010 to around $200/kWh in 2017, and are projected to fall below $100/kWh in 2025. Lithium-ion battery demand is growing exponentially and manufacturing capacity is expanding quickly as well. Advancements with solid-state, nickel-based, and cobalt-based battery technologies are being developed to help meet future demand.[5] The faster battery costs come down, the faster electric vehicles reach cost parity with their gasoline counterparts. Many projections show this happening in the 2022-2026 timeframe.

With EVs becoming a reality, the time is now to ensure multiple types of charging technologies for EVs are integrated safely, reliably and cost-effectively. The Company needs to better understand the grid impacts of serving EV charging equipment, customer charging behavior and the viability of utility-managed charging methods.

Furthermore, around the country, utilities are investing in EV charging infrastructure as new vehicles enter the market and strong sales growth continues

[4] EPRI. Consumer Guide to Electric Vehicles. March 2019. https://www.epri.com/#/pages/product/000000003002015368/?lang=en-US
[5] Bloomberg New Energy Finance, Electric Vehicle Outlook, 2019, https://about.bnef.com/electric-vehicle-outlook/

nationwide. Since 2013, over $1 billion of utility investment in EV programs has been approved by state utility commissions. However, lack of charging station infrastructure is still commonly cited as a barrier to purchasing an EV. The limited revenue potential due to the current EV population and the high upfront cost of Fast Charging installations—particularly at highway corridor locations where they are most needed—results in challenging economics, leading to few installations. The Company believes that it is well-suited to deploy and maintain a foundational level of Fast Charging infrastructure to facilitate long-distance travel throughout the service territory. As a long-term owner-operator of power infrastructure, Duke Energy Indiana has expertise in ensuring assets are used and useful for public benefit throughout the full useful life of the asset. By owning the charging infrastructure, the Company can ensure that chargers will remain well-maintained and useful for the long term.

Lastly, the Company believes that a utility can also ensure that Fast Chargers are located such that they are available to all customers rather than only to those of certain demographics or locations that are early adopters of new technology. With managed charging, this Pilot provides visibility into EV charging behaviors to ultimately build a smarter energy future.

Q. HAS DUKE ENERGY PROPOSED EV PROGRAMS IN OTHER JURISDICTIONS?

A. Yes. Duke Energy Florida has an approved EV pilot in Florida[6] and proposed EV pilots in Duke Energy Carolinas in North Carolina[7] and South Carolina.[8] Additionally, Duke Energy subsidiaries have implemented smaller pilot programs in other jurisdictions between 2012-2014.

Q. HAVE STATE COMMISSIONS IN OTHER JURISDICTIONS APPROVED DUKE ENERGY'S PROPOSALS?

A. Yes. The Florida Utility Commission approved Duke Energy Florida's proposal in Docket No. 20170783-EI. Duke Energy Carolinas has a proposal pending before the North Carolina Utilities Commission in Docket Nos. E-2, Sub 1197 and E-7, Sub 1195, and before the South Carolina Public Service Commission in Docket Nos. 2018-321-E and 2018-322-E.

Q. ARE YOU AWARE OF EV PROPOSALS IN OTHER JURISDICTIONS?

A. Yes. Over $1 billion of utility EV programs has been approved in the US since 2010. For example, Puget Sound Energy in Washington has received approval for a five year plan to increase EV charging accessibility by owning and operating eight (8) DC Fast Charging stations that include 32 charging units. Puget Sound Energy is also helping customers install Level 2 charging stations for commercial fleet and residential charging programs. Consumers Energy in Michigan has proposed PowerMiDrive, a three year pilot program that will provide rebates of up to $5,000 to install up to 200 Level 2 public chargers, as well as incentives of

[6] Florida Public Service Commission Docket No. 20170783-EI
[7] North Carolina Utilities Commission Docket Nos. E-2, Sub 1197 and E-7, Sub 1195
[8] South Carolina Public Service Commission Docket Nos. 2018-321-E and 2018-322-E

up to $70,000 for up to 24 DC Fast-Charging stations. Maryland's four electric utilities combined to propose a statewide electric vehicle portfolio consisting of residential, non-residential, and public charging solutions. Many of these solutions included utility ownership of EV Supply Equipment.

Most recently, on May 14, 2019, Indiana Michigan Power Company ("I&M") submitted a proposal for a three year, $2.1M pilot plan in Indiana to provide rebate incentives for residential, commercial, and industrial customers who own and install level 2 EV charging stations. I&M also proposed a customer education and awareness program to help make customers aware of their pilot program.[9]

Q. HAVE ANY OF THOSE PROPOSALS BEEN APPROVED BY THE RESPECTIVE STATE COMMISSION?

A. On December 13, 2018, the Washington Utilities and Transportation Commission approved Puget Sound Energy's five new electric vehicle charging schedules that establish a portfolio of EV Supply Equipment programs and services over a five year pilot term.[10] On January 9, 2019, the Michigan Public Service Commission issued an order approving Consumers Energy Company's request for a three-year pilot program to invest in EV charging infrastructure.[11]

[9] Indiana Michigan Power Company. Pre-filed Verified Direct Testimony of Jeffrey W. Lehman. Cause No. 45235. Found at: https://www.in.gov/oucc/2926.htm

[10] https://www.utc.wa.gov/docs/Pages/DocketLookup.aspx?FilingID=180877

[11] *In the Matter of the Application of Consumers Energy Company for Authority to Increase Its Rates for the Generation and Distribution of Electricity and for Other Relief, Order*, Case No. U-20134, Mich. Pub. Serv. Comm'n., issued Jan. 9, 2019, *available at* https://www.michigan.gov/mpsc/0,4639,7-159-16400_17280-487034--,00.html .

On January 15, 2019, the Maryland Public Service Commission granted BGE, Potomac Electric Power Co., Delmarva Power, and Potomac Edison Co. authority to move forward with a modified, five-year pilot program of residential, workplace and public charging stations.[12]

Q. PLEASE EXPLAIN WHY DUKE ENERGY INDIANA'S PROPOSED EV PILOT PROGRAMS WILL BENEFIT ALL CUSTOMERS, DESPITE THE FACT THAT INDIVIDUAL CUSTOMER PARTICIPATION WILL BE LIMITED.

A. Savings to all customers are anticipated to result from increasing EV adoption due to incremental net revenue received by selling electricity to charge EVs in excess of any increases in costs of service related to the additional load. Significant state-wide financial benefits are possible from increased EV adoption as shown in Petitioner's Exhibit 31-A (LWR). For example, growth to five percent light duty electric vehicle market share provides cumulative net benefits of more than $3.6 billion state-wide by 2050 ($500 million will accrue to electric utility customers in the form of reduced electric bills and $3.2 billion will accrue directly to Indiana drivers in the form of reduced annual vehicle operating costs). High growth (95% market share) would provide more than $32.2 billion in cumulative net benefits state-wide by 2050 ($5.6 billion to electric utility customers and $26.5 billion to Indiana drivers).

[12] *In the Matter of the Petition of the Electric Vehicle Work Group for Implementation of a Statewide Electric Vehicle Portfolio*, *Order No. 88997*, Pub. Serv. Comm'n. of Md., issued Jan. 14, 2019, *available at* https://www.psc.state.md.us/wp-content/uploads/Order-No.-88997-Case-No.-9478-EV-Portfolio-Order.pdf.

Increasing the rate of EV adoption in Indiana is the pathway to realize these benefits. Duke Energy Indiana believes it has an opportunity and obligation to help customers achieve these potential benefits associated with higher EV adoption by investing in programs that deploy electric vehicle infrastructure and EV load management methods in the near term. Lastly, the Pilot will provide the Company with valuable EV charging information that will be utilized to help Duke Energy Indiana develop the appropriate product offerings for the forthcoming future of electric vehicle transportation.

X. CONCLUSION

Q. WERE PETITIONER'S EXHIBITS 31-A (LWR) THROUGH 31-C (LWR) PREPARED OR ASSEMBLED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes, they were.

Q. DOES THIS CONCLUDE YOUR PREFILED DIRECT TESTIMONY?

A. Yes, it does.

Electric Vehicle Cost-Benefit Analysis

Plug-in Electric Vehicle Cost-Benefit Analysis: Indiana

MJB & A

June 2018

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About M.J. Bradley & Associates

M.J. Bradley & Associates, LLC (MJB&A), founded in 1994, is a strategic consulting firm focused on energy and environmental issues. The firm includes a multi-disciplinary team of experts with backgrounds in economics, law, engineering, and policy. The company works with private companies, public agencies, and non-profit organizations to understand and evaluate environmental regulations and policy, facilitate multi-stakeholder initiatives, shape business strategies, and deploy clean energy technologies.

Our multi-national client base includes electric and natural gas utilities, major transportation fleet operators, clean technology firms, environmental groups and government agencies.

We bring insights to executives, operating managers, and advocates. We help you find opportunity in environmental markets, anticipate and respond smartly to changes in administrative law and policy at federal and state levels. We emphasize both vision and implementation, and offer timely access to information along with ideas for using it to the best advantage.

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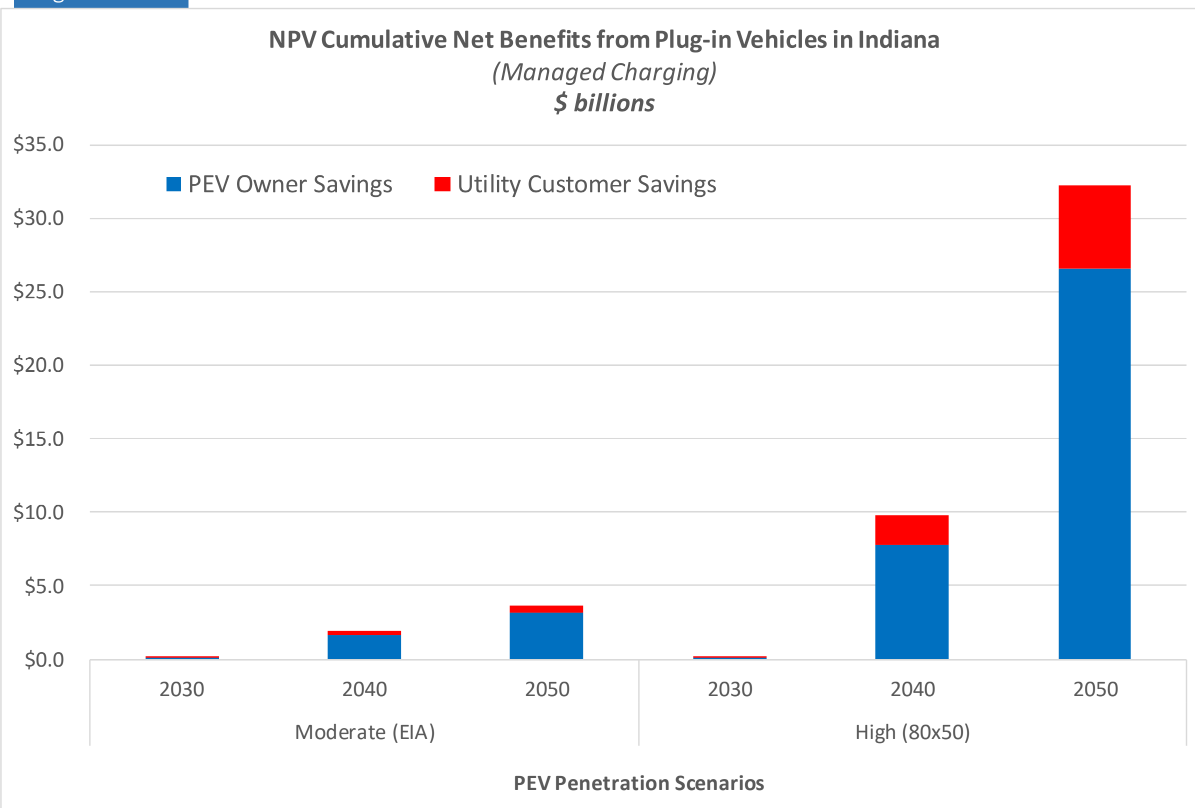
Executive Summary

This study estimated the costs and benefits of increased adoption of plug-in electric vehicles (PEVs) in the state of Indiana. The study estimated the financial benefits that would accrue to all electric utility customers in Indiana due to greater utilization of the electric grid during low load hours and resulting increased utility revenues from PEV charging. In addition, the study estimated the annual financial benefits to Indiana drivers from owning PEVs—from fuel and maintenance cost savings compared to owning gasoline vehicles. The study also estimated reductions in gasoline consumption, and associated greenhouse gas (GHG) and nitrogen oxide (NOx) emission reductions from greater use of PEVs instead of gasoline vehicles.

Figure 1 NPV Cumulative Societal Net Benefits from IN PEVs



This study evaluated PEV costs and benefits for two distinct levels of PEV adoption – essentially a "business as usual" scenario of modest PEV penetration (EIA), and a much more aggressive scenario based on the PEV penetration that would be required to get the state onto a trajectory to reduce light-duty GHG emissions by 70 – 80 percent from current levels by 2050 (80x50). The levels of PEV penetration in the high 80x50 scenario are unlikely to be achieved without aggressive policy action at the state and local level, to incentivize individuals to purchase PEVs, and to support the necessary roll-out of PEV charging infrastructure.

As shown in Figure 1, if Indiana PEV adoption follows the moderate trajectory currently assumed by the Energy Information Administration (EIA), the net present value of **cumulative net benefits from greater PEV use in the state will exceed $3.6 billion state-wide by 2050**.[1] Of these total net benefits:

[1] Using a 3% discount rate

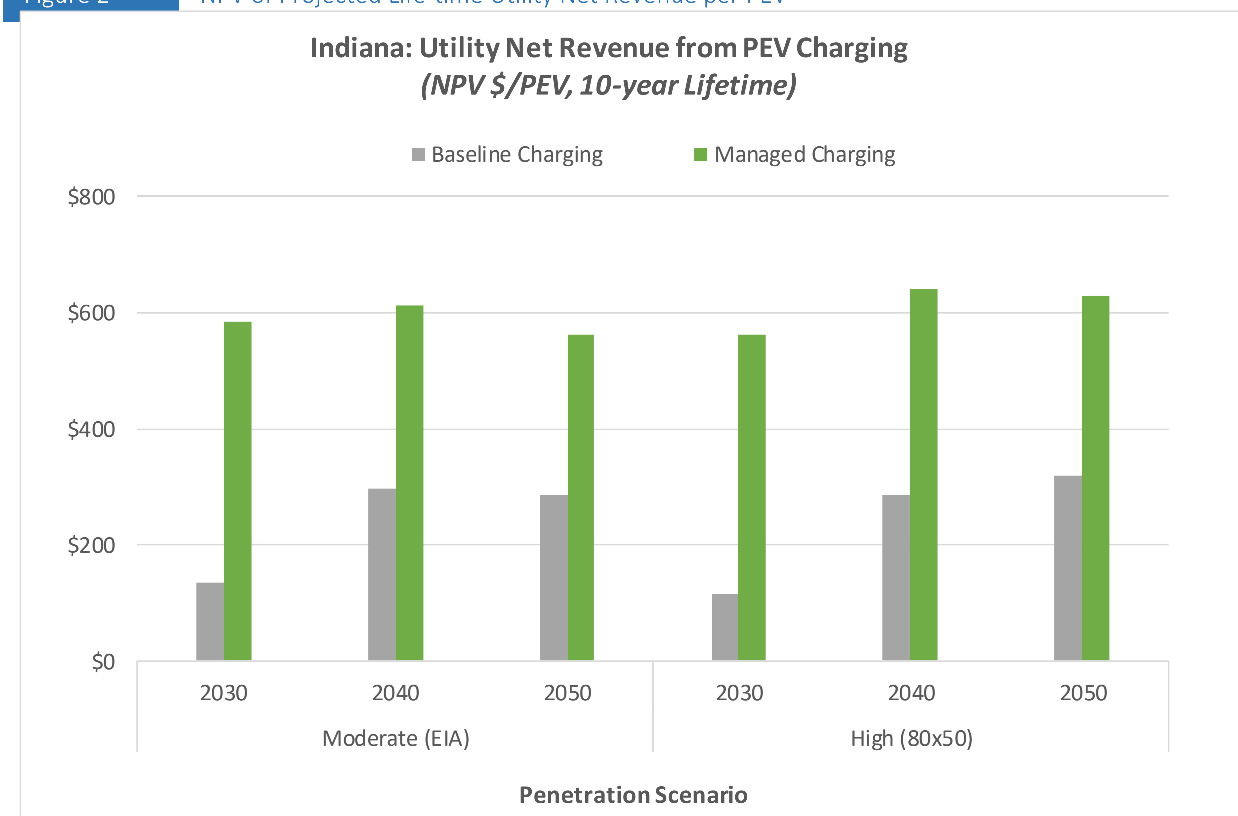
- $0.5 billion will accrue to electric utility customers in the form of reduced electric bills, and
- $3.2 billion will accrue directly to Indiana drivers in the form of reduced annual vehicle operating costs.

Also shown in Figure 1, if PEV sales in Indiana were high enough to get the state onto a trajectory to reduce light-duty GHG emissions by 70 – 80 percent from current levels by 2050 (80x50), the net present value of **cumulative net benefits from greater PEV use in Indiana could exceed $32.2 billion state-wide by 2050**. Of these total net benefits:

- $5.6 billion would accrue to electric utility customers in the form of reduced electric bills, and
- $26.5 billion would accrue directly to Indiana drivers in the form of reduced annual vehicle operating costs.

Utility customer savings result from net revenue received by the state's utilities, from selling electricity to charge PEVs. This net revenue is net of additional costs that would be incurred by utilities to secure additional generating capacity, and to upgrade distribution systems, to handle the incremental load from PEV charging. The NPV of projected life-time utility net revenue per PEV is shown in Figure 2. Assuming a ten-year life, the average PEV in Indiana in 2030 is projected to increase utility net revenue by about $570 over its life-time, if charging is managed. PEVs in service in 2050 are projected to increase utility net revenue on average by about $600 over their life time (NPV) if charging is managed.

Figure 2 NPV of Projected Life-time Utility Net Revenue per PEV



In addition, by 2050 PEV owners are projected to save more than $950 per vehicle (nominal $) in annual operating costs, compared to owning gasoline vehicles. A large portion of this direct financial benefit to Indiana drivers derives from reduced gasoline use—from purchase of lower cost, regionally produced electricity instead of gasoline imported to the state. Under the Moderate PEV (EIA) scenario, PEVs will reduce cumulative gasoline use in the state by more than 1.2 billion gallons through 2050 – this cumulative gasoline savings grows to 14.7 billion gallons through 2050 under the high PEV (80x50) scenario. In 2050, annual average gasoline savings will be approximately 144 gallons per PEV under the Moderate PEV (EIA) scenario, while projected savings under the High PEV (80x50) scenario are nearly 193 gallons per PEV.

This projected gasoline savings will help to promote energy security and independence, and will keep more of vehicle owners' money in the local economy, thus generating even greater economic impact. Studies in other states have shown that the switch to PEVs can generate up to $570,000 in additional economic impact for every million dollars of direct savings, resulting in up to 25 additional jobs in the local economy for every 1,000 PEVs in the fleet [1].

In addition, this reduction in gasoline use will reduce cumulative net GHG emissions by over 12 million metric tons[2] through 2050 under the moderate PEV scenario, and over 154 million metric tons under the high PEV scenario. The switch from gasoline vehicles to PEVs is also projected to reduce annual NOx emissions in the state by over 361 tons in 2050 under the moderate PEV (EIA) scenario, and by over 5,630 tons under the high PEV (80x50) scenario.

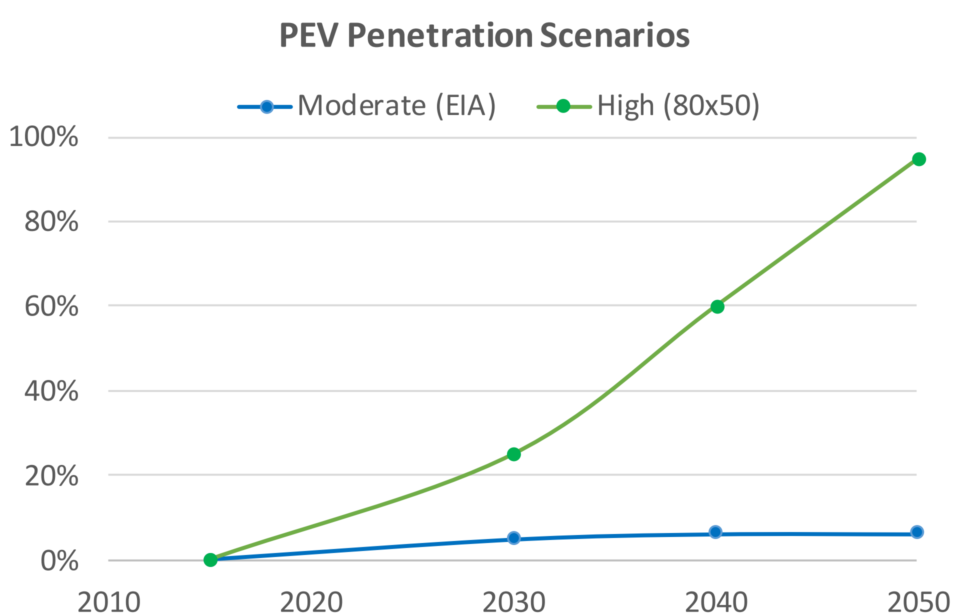
[2] Net of emissions from electricity generation

Study Results

This section summarizes the results of this study, including: the projected number of PEVs; electricity use and load from PEV charging; projected gasoline savings and GHG reductions compared to continued use of gasoline vehicles; financial benefits to utility customers from increased electricity sales; and projected financial benefits to Indiana drivers compared to owning gasoline vehicles. All costs and financial benefits are presented as net present value (NPV), using a 3 percent discount rate.

Two different PEV penetration levels between 2030 and 2050 are utilized to estimate costs and benefits.[3] The "Moderate PEV" scenario is based on current projections of annual PEV sales from the Energy Information Administration (EIA). The "High PEV" scenario is based on the level of PEV penetration that would be required to get onto a trajectory to reduce light-duty GHG emissions in the state by 70 - 80 percent from current levels by 2050. The moderate PEV (EIA) scenario is essentially a "business as usual" scenario that continues current trends. However, the significantly higher levels of PEV penetration in the high 80x50 scenario are unlikely to be achieved without additional aggressive policy action at the state and local level, to incentivize individuals to purchase PEVs, and to support the necessary roll-out of PEV charging infrastructure. See Figure 3 for a comparison of the two scenarios through 2050.

Figure 3 Comparison of PEV Penetration Scenarios



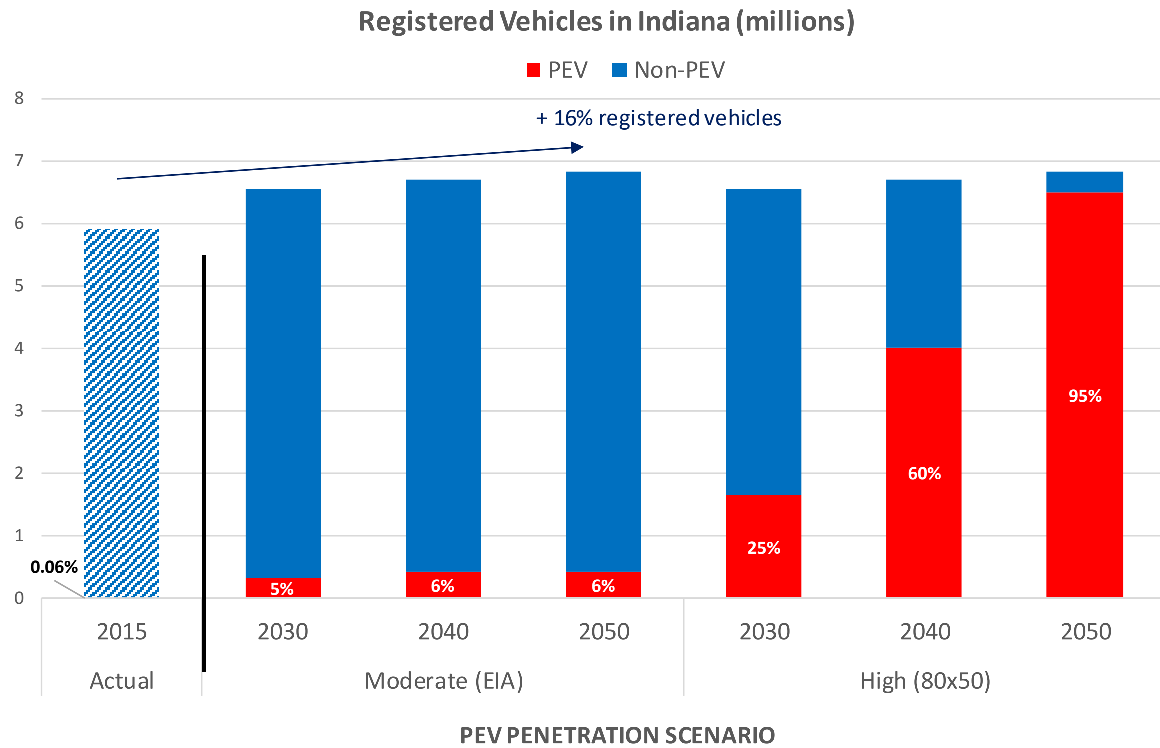
[3] PEVs include battery-electric vehicles (BEV) and plug-in hybrid vehicles (PHEV). This study focused on passenger vehicles and trucks; there are opportunities for electrification of non-road equipment and heavy-duty trucks and buses, but evaluation of these applications was beyond the scope of this study.

Plug-in Electric Vehicles, Electricity Use, and Charging Load

Vehicles and Miles Traveled

The projected number of PEVs and conventional gasoline vehicles in the Indiana light duty fleet[4] under each PEV penetration scenario is shown in Figure 4, and the projected annual miles driven by these vehicles is shown in Figure 5. Under the Moderate PEV (EIA) scenario, the number of PEVs registered in Indiana would increase from approximately 3,700 today to 321,600 in 2030, 414,900 in 2040, and 424,000 in 2050. Under the High PEV (80x50) scenario there would be 1.6 million PEVs in Indiana by 2030, rising to 4.0 million in 2040, and 6.5 million in 2050. This equates to 25 percent of in-use light duty vehicles in Indiana in 2030, rising to 60 percent in 2040 and 95 percent in 2050. [5]

Figure 4 Projected Indiana Light Duty Fleet

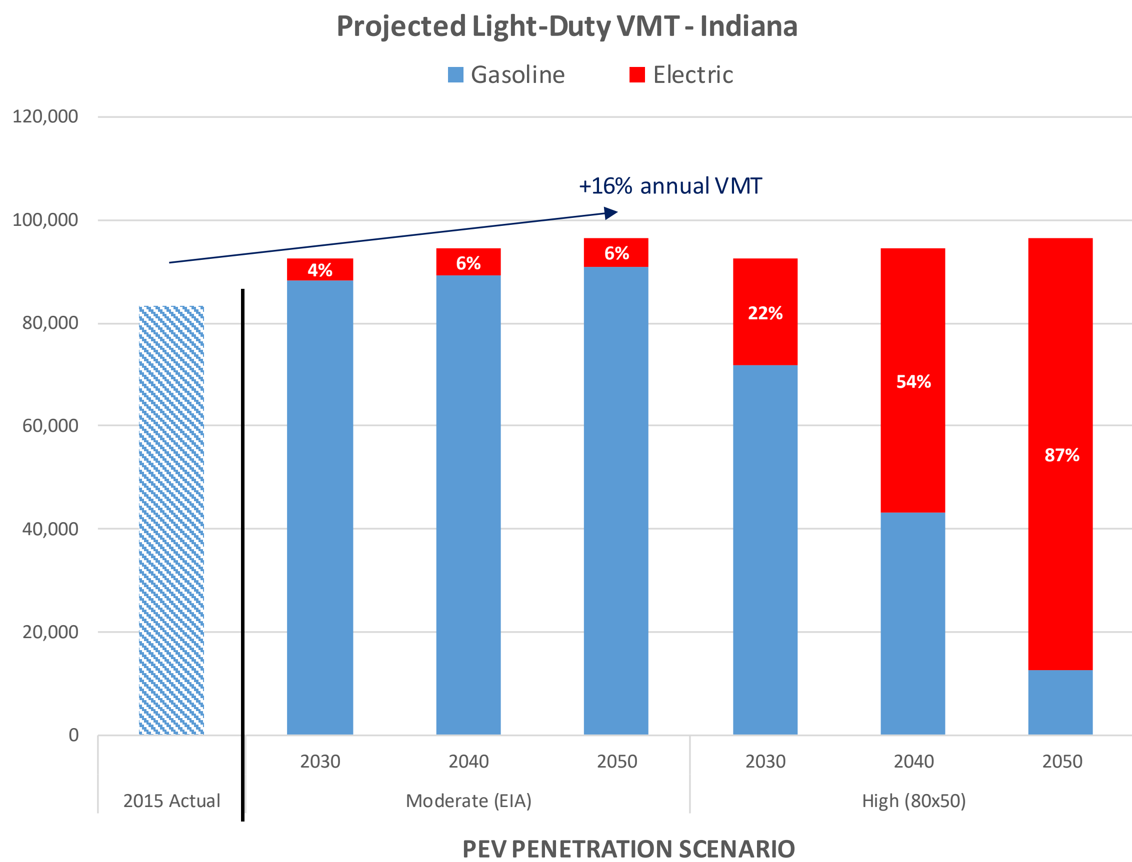


[4] This analysis only includes cars and light trucks. It does not include medium- or heavy-duty trucks and buses.

[5] Note that under both PEV penetration scenarios the percentage of total VMT driven by PEVs on electricity each year is lower than the percentage of PEVs in the fleet. This is because PHEVs are assumed to have a "utility factor" less than one – i.e., due to range restrictions a PHEV cannot convert 100 percent of the miles driven annually by a baseline gasoline vehicle into miles powered by grid electricity. In this analysis PHEVs are assumed to have an average utility factor of 85 percent.

This analysis estimates that under the High PEV (80x50) scenario Indiana will reduce light-duty fleet gasoline consumption in 2050 by 49 percent compared to a baseline with no PEVs, due to 87 percent of fleet miles being driven by PEVs on electricity (Figure 5). However, to achieve this level of electric miles, 95 percent of light-duty vehicles will be PEVs, including PHEVs (Figure 4).

Figure 5 Projected Indiana Light Duty Fleet Vehicle Miles Traveled (million miles)



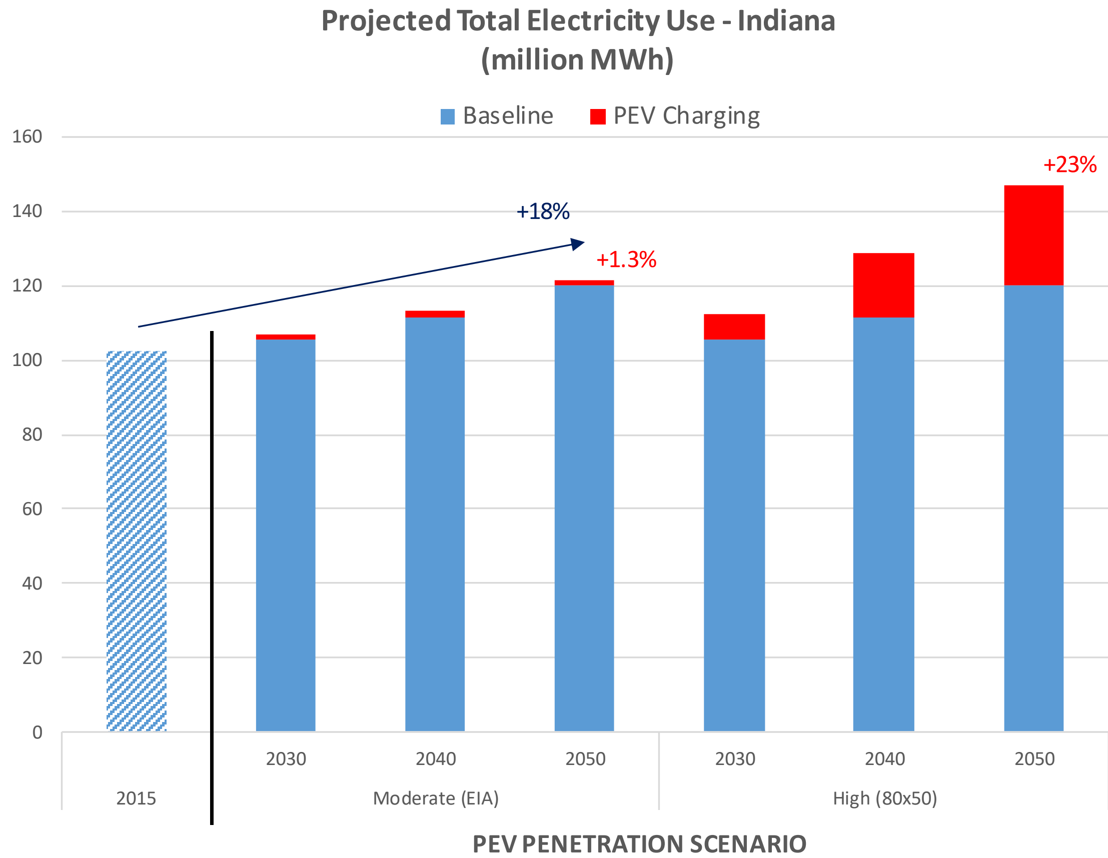
PEV Charging Electricity Use

The estimated total PEV charging electricity used in Indiana each year under the PEV penetration scenarios is shown in Figure 6.

In Figure 6, projected baseline electricity use without PEVs is shown in blue and the estimated incremental electricity use for PEV charging is shown in red. State-wide electricity use in Indiana is currently 102 million MWh per year. Annual electricity use is projected to increase to 106 million MWh in 2030 and continue to grow after that, reaching 120 million MWh in 2050 (18 percent greater than 2015 levels).

Under the Moderate PEV penetration scenario, electricity used for PEV charging is projected to be 1.36 million MWh in 2030 – an increase of about 1.3 percent over baseline electricity use. By 2050, electricity for PEV charging is projected to grow to 1.6 million MWh – an increase of 1.3 percent over baseline electricity use. Under the High PEV (80x50) scenario electricity used for PEV charging is projected to be 6.7 million MWh in 2030, growing to 27.2 million MWh and adding 23 percent to baseline electricity use in 2050.

Figure 6 Estimated Total Electricity Use in Indiana



PEV Charging Load

This analysis evaluated the effect of PEV charging on the Indiana electric grid under two different charging scenarios. Under both scenarios 77 percent of all PEVs are assumed to charge exclusively at home and 23 percent are assumed to charge at locations other than at home (i.e. at work or at other "public" chargers). Under the baseline charging scenario all Indiana drivers who charge at home are assumed to plug-in their vehicles and start charging as soon as they arrive at home each day, while under the managed charging scenario a significant portion of PEV owners are assumed to participate in a utility managed charging program to minimize PEV charging load in the late afternoon and early evening when other electricity demand is high.[6]

See Figure 7 (baseline) and Figure 8 (managed) for a comparison of PEV charging load under the baseline and managed charging scenarios, using the 2040 High (80x50) PEV penetration scenario as an example. In each of these figures the 2016 Indiana 95th percentile load (MW)[7] by time of day is plotted in orange, and the projected incremental load due to PEV charging is plotted in grey.

[6] Utilities have many policy options to incentivize managed PEV charging. This analysis does not compare the efficacy of different options. For this analysis, managed charging is modeled as 85% of PEV owners that arrive home between noon and 11 pm delaying the start of charging until between Midnight and 2 am. This is only one of many managed charging program options that are available to utilities.

[7] For each hour of the day actual load in 2016 was higher than the value shown on only 5 percent of days (18 days).

Figure 7 2040 Projected Indiana PEV Charging Load, Baseline Charging (High PEV [80x50] scenario)

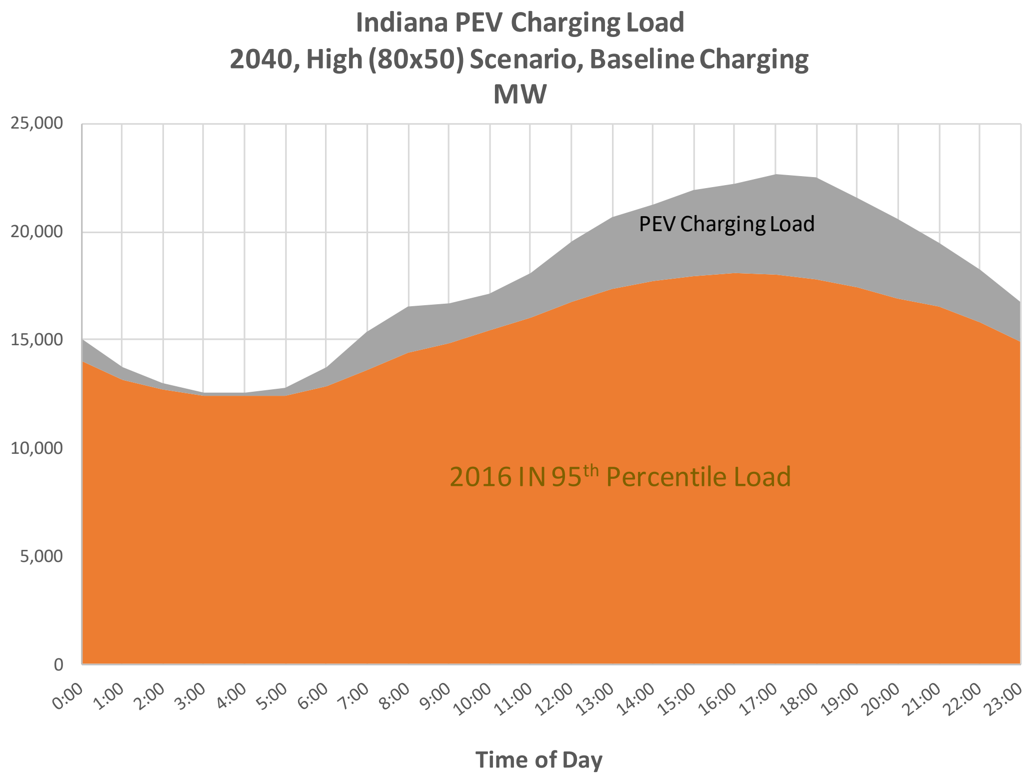
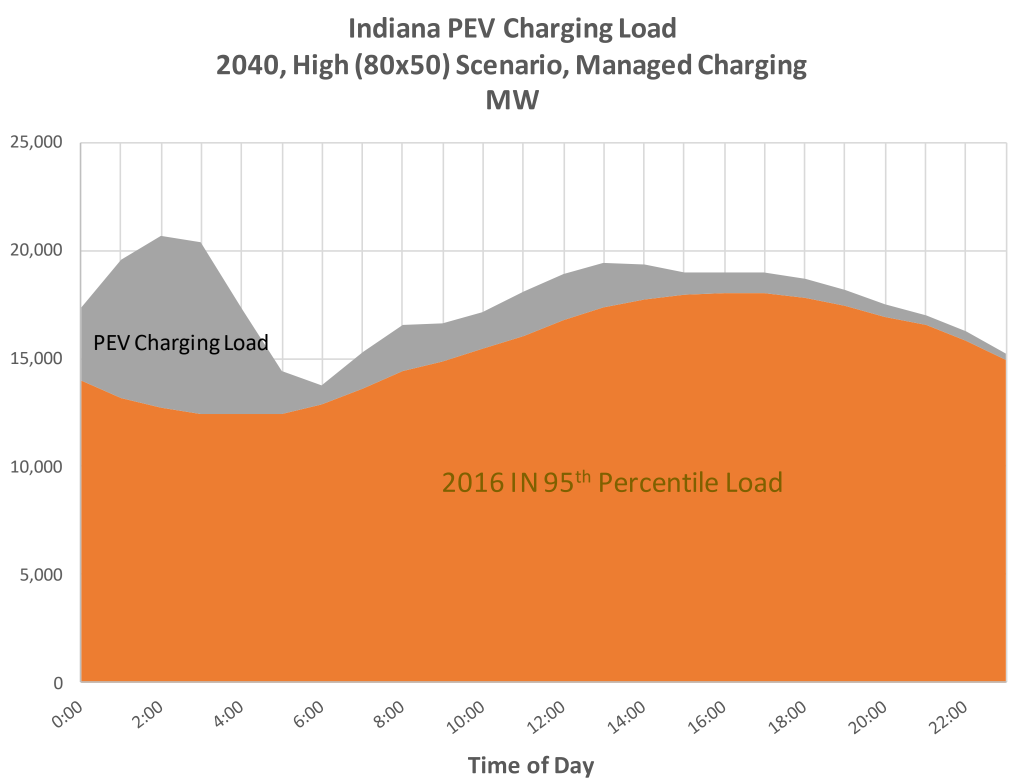


Figure 8 2040 Projected Indiana PEV Charging Load, Managed Charging (High PEV [80x50] scenario)



In 2016, daily electric load in Indiana was generally less than 13,000 MW from midnight to 5 AM, ramping up to about 15,000 MW at 8 or 9 AM, and continuing to climb up to peak at approximately 18,000 MW between 3 PM and 5 PM, and then falling off through the evening hours.[8]

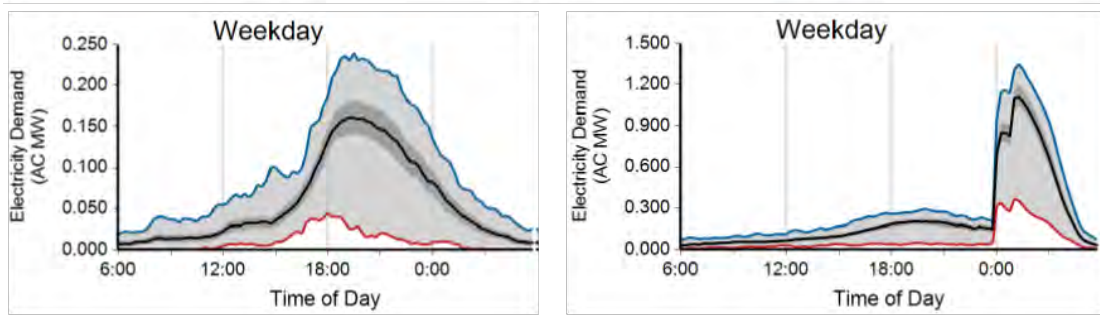
As shown in Figure 7, baseline PEV charging is projected to add load primarily between 8 AM and 8 PM, as some people charge at work early in the day, but most charge at home in the late afternoon and early evening. Under the baseline charging scenario, the PEV charging peak coincides with the existing summer afternoon peak load period between 3 PM and 5 PM.

As shown in Figure 8, managed charging significantly reduces the incremental PEV charging load during the summer afternoon peak load period, but creates a secondary peak in the early morning hours, between midnight and 4 AM. The shape of this early morning peak can potentially be controlled based on the design of managed charging incentives.

These baseline and managed load shapes are consistent with real world PEV charging data collected by the EV Project, as shown in Figure 9. In Figure 9 the graph on the left shows PEV charging load in the Dallas/Ft Worth area where no managed charging incentive was offered to drivers. The graph on the right shows PEV charging load in the San Diego region, where the local utility offered drivers a time-of-use rate with significantly lower costs ($/kWh) for charging during the "super off-peak" period between midnight and 5 a.m. [2]

Figure 9 PEV Charging Load in Dallas/Ft Worth and San Diego areas, EV Project

Blue line = maximum demand Black line = median demand Red line = minimum demand



Dallas/Ft Worth (standard rates) San Diego (time-of-use rates)

See Table 1 for a summary of the projected incremental afternoon peak hour load (MW) in Indiana, from PEV charging under each penetration and charging scenario. This table also includes a calculation of how much this incremental PEV charging load would add to the 2016 95th percentile peak hour load. Under the Moderate PEV (EIA) penetration scenario, PEV charging would add 378 MW of load during the afternoon peak load period on a typical weekday in 2030, which would increase the 2016 baseline peak load by about 2.1 percent. By 2050, the afternoon incremental PEV charging load would increase to 450 MW, adding 2.5 percent to the 2016 baseline afternoon peak. By comparison the afternoon peak hour PEV charging load in 2030 would be only 77 MW for the managed charging scenario, increasing to 94 MW in 2050.

[8] In Figures 7 and 8, 95th Percentile Load is shown for the entire state of Indiana across the entire year.

Under the High PEV (80x50) penetration scenario, baseline PEV charging would increase the total 2016 afternoon peak electric load by about 42 percent in 2050, while managed charging would only increase it by about 9 percent.[9]

As discussed below, increased peak hour load increases a utility's cost of providing electricity, and may result in the need to upgrade distribution infrastructure. As such, managed PEV charging can provide additional net benefits to all utility customers, by reducing the cost of providing electricity used to charge PEVs.

Table 1 Projected Incremental Afternoon Peak Hour PEV Charging Load (MW)

		Moderate PEV (EIA)			High PEV (80x50)		
		2030	**2040**	**2050**	**2030**	**2040**	**2050**
Baseline Charging	PEV Charging (MW)	378	440	450	1,927	4,724	7,638
	Increase relative to 2016 Peak	2.1%	2.4%	2.5%	10.7%	26.2%	42.3%
Managed Charging	PEV Charging (MW)	77	92	94	390	956	1,546
	Increase relative to 2016 Peak	0.4%	0.5%	0.5%	2.2%	5.3%	8.6%

Utility Customer Benefits

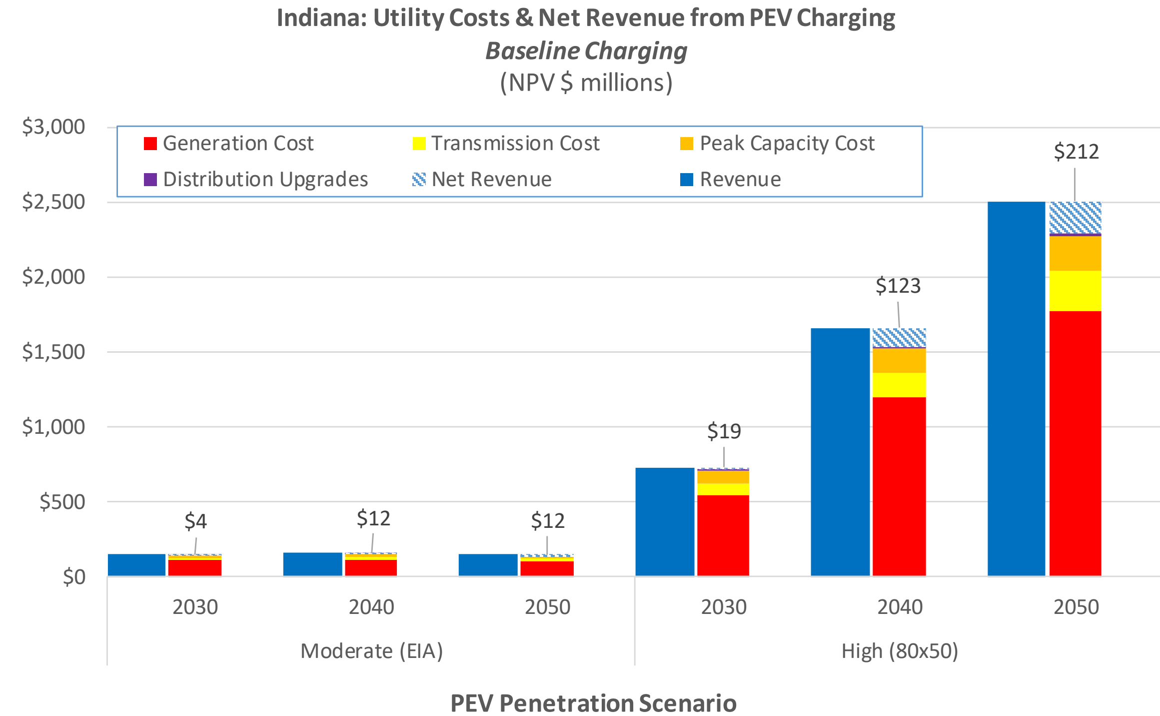
The estimated NPV of annual revenues and costs in 2030, 2040, and 2050, for Indiana's electric utilities to supply electricity to charge PEVs under each penetration scenario are shown in Figure 10, assuming the baseline PEV charging scenario.

Under the Moderate PEV penetration scenario, the NPV of annual revenue from electricity sold for PEV charging in Indiana is projected to total $148 million in 2030, and $145 million in 2050. Under the High PEV (80x50) scenario, the NPV of annual utility revenue from PEV charging is projected to total $730 million in 2030, rising to $2.5 billion in 2050.

In Figure 10, projected annual utility revenue is shown in dark blue. The different elements of incremental annual cost that utilities would incur to purchase and deliver additional electricity to support PEV charging are shown in red (generation), yellow (transmission), orange (peak capacity), and purple (infrastructure upgrade cost). Generation and transmission costs are proportional to the total power (MWh) used for PEV charging, while peak capacity costs are proportional to the incremental peak load (MW) imposed by PEV charging. Infrastructure upgrade costs are costs incurred by the utility to upgrade their distribution infrastructure to handle the increased peak load imposed by PEV charging.

[9] Given projected significant increases in total state-wide electricity use through 2050, baseline peak load (without PEVs) is also likely to be higher in 2050 than 2016 peak load; as such the percentage increase in baseline peak load due to high levels of PEV penetration is likely to be lower than that shown in Table 1. The incremental costs of adding this peak capacity are accounted for in the analysis. As discussed below, even when accounting for these costs there are still net rate-payer benefits from high levels of PEV penetration. As the analysis shows, the net rate-payer benefits are higher with managed charging, because the cost of serving the incremental peak load is lower.

Figure 10 NPV of Projected Annual Utility Revenue and Costs from Baseline PEV Charging

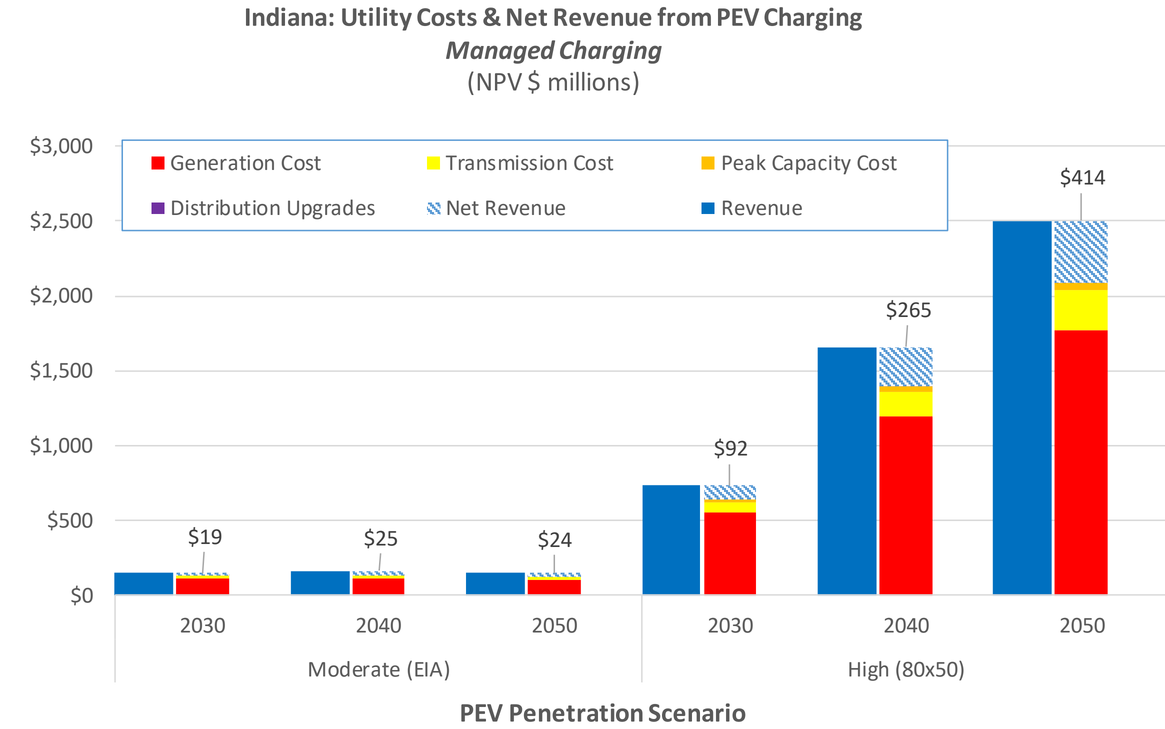


The striped light blue bars in Figure 10 represent the NPV of projected annual "net revenue" (revenue minus costs) that utilities would realize from selling additional electricity for PEV charging under each PEV penetration scenario in these years. Under the Moderate PEV penetration scenario, the NPV of net annual revenue in Indiana is projected to total $4 million in 2030 and $12 million in 2050. Under the High PEV (80x50) scenario, the NPV of utility net annual revenue from PEV charging is projected to total $19 million in 2030, rising to $212 million in 2050. The NPV of projected annual utility net revenue averages $13 per PEV in 2030, and $29 - $33 per PEV in 2050.

Figure 11 summarizes the NPV of projected annual utility revenue, costs, and net revenue for managed charging under each PEV penetration scenario. Compared to baseline charging (Figure 10) projected annual revenue, and projected annual generation and transmission costs are the same, but projected annual peak capacity and infrastructure costs are lower due to a smaller incremental peak load (see Table 1).

Compared to baseline charging, managed charging will increase the NPV of annual utility net revenue by $14 million in 2030 and $12 million in 2050 under the Moderate PEV penetration scenario, due to lower costs. Under the High PEV (80x50) scenario, managed charging will increase the NPV of annual utility net revenue by $73 million in 2030 and $202 million in 2050. This analysis estimates that compared to baseline charging, managed charging will increase the NPV of annual utility net revenue by $45 per PEV in 2030 and $28 - $31 per PEV in 2050.

Figure 11 NPV of Projected Annual Utility Revenue and Costs from Managed PEV Charging



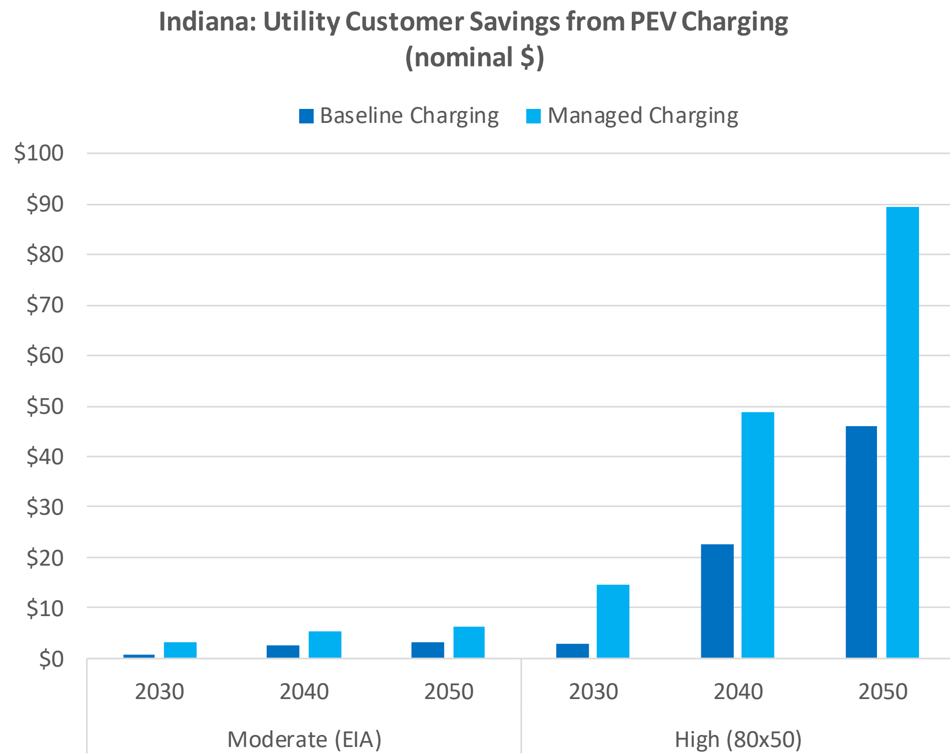
In general, a utility's costs to maintain their distribution infrastructure increase each year with inflation, and these costs are passed on to utility customers in accordance with rules established by the Indiana Public Utility Commission (PUC), via periodic increases in residential and commercial electric rates. However, under the PUC rules net revenue from additional electricity sales generally offset the allowable costs that can be passed on via higher rates. As such, the majority of projected utility net revenue from increased electricity sales for PEV charging would in fact be passed on to utility customers in Indiana, not retained by the utility companies.

Under current rate structures this net revenue would in effect put downward pressure on future rates, delaying or reducing future rate increases, thereby reducing electric bills for all customers. See Figure 12 for a summary of how the projected utility net revenue from PEV charging could affect average annual residential electricity bills for all Indiana electric utility customers.[10] As shown in the figure, under the High PEV (80x50) scenario projected average electric rates in Indiana could be reduced up to 3.2 percent in 2050 due to net revenue from PEV charging, resulting in an annual savings of approximately $89 (nominal dollars) per household in Indiana.

It must be noted that how this utility net revenue from PEV charging gets distributed is dependent on rate structure. Potential changes to current rates - to specifically incentivize off-peak PEV charging - could shift some or all of this benefit to PEV owners, thus reducing their electricity costs for vehicle charging without reducing costs for non-PEV owners. In either case, rate payers who do not own a PEV will not be harmed by transportation electrification, and may benefit indirectly even if they continue to own gasoline vehicles.

[10] Based on 2016 average electricity use of 11,308 kWh per housing unit in Indiana

Figure 12 Potential Effect of PEV Charging Net Revenue on Utility Customer Bills (nominal $)



Indiana Driver Benefits

Current PEVs are more expensive to purchase than similar sized gasoline vehicles, but they are eligible for various government purchase incentives, including up to a $7,500 federal tax credit. These incentives are important to spur an early market, but as described below PEVs are projected to provide a lower total cost of ownership than conventional vehicles in Indiana by about 2035, even without government purchase subsidies.

The largest contributor to incremental purchase costs for PEVs compared to gasoline vehicles is the cost of batteries. Battery costs for light-duty plug-in vehicles have fallen from over $1,000/kWh to less than $300/kWh in the last six years; many analysts and auto companies project that battery prices will continue to fall – to below $110/kWh by 2025, and below $75/kWh by 2030. [3]

Based on these battery cost projections, this analysis projects that the average annual cost of owning a PEV in Indiana will fall below the average cost of owning a gasoline vehicle by 2035, even without government purchase subsidies.[11] See Table 2 which summarizes the average projected annual cost of Indiana PEVs and gasoline vehicles under each penetration scenario.

All costs in Table 2 are in nominal dollars, which is the primary reason why costs for both gasoline vehicles and PEVs are higher in 2040 and 2050 than in 2030 (due to inflation). In addition, the penetration scenarios assume that the relative number of PEV cars and higher cost PEV light trucks will change over time; in particular the High PEV (80x50) scenario assumes that there will be a significantly higher percentage of PEV light trucks in the fleet in 2050 than in 2030, which further increases the average PEV purchase cost in 2050 compared to 2030.

[11] The analysis assumes that all battery electric vehicles in-use after 2030 will have 200-mile range per charge and that all plug-in hybrid vehicles will have 50-mile all-electric range.

Table 2 Projected Fleet Average Vehicle Costs to Vehicle Owners (nominal $)

GASOLINE VEHICLE		Moderate (EIA)			High (80x50)		
		2030	2040	2050	2030	2040	2050
Vehicle Purchase	$/yr	$5,306	$5,911	$7,235	$4,496	$6,329	$8,527
Gasoline	$/yr	$1,460	$1,656	$1,987	$1,425	$1,813	$2,361
Maintenance	$/yr	$322	$390	$482	$319	$402	$509
TOTAL ANNUAL COST	**$/yr**	**$7,088**	**$7,957**	**$9,704**	**$6,240**	**$8,544**	**$11,396**

PEV -IN Baseline Charging/Standard Rate		Moderate (EIA)			High (80x50)		
		2030	2040	2050	2030	2040	2050
Vehicle Purchase	$/yr	$5,306	$5,911	$7,235	$5,091	$6,579	$8,726
Electricity	$/yr	$717	$804	$965	$695	$865	$1,085
Gasoline	$/yr	$97	$116	$137	$95	$125	$159
Personal Charger	$/yr	$81	$99	$122	$81	$99	$122
Maintenance	$/yr	$197	$239	$295	$196	$244	$305
TOTAL ANNUAL COST	**$/yr**	**$6,398**	**$7,168**	**$8,754**	**$6,158**	**$7,912**	**$10,396**
Savings per PEV	**$/yr**	**$690**	**$789**	**$950**	**$82**	**$632**	**$1,000**

As shown in Table 2, under the High PEV Scenario (80x50) even in 2050 average PEV purchase costs are projected to be higher than average purchase costs for gasoline vehicles (with no government subsidies), but the annualized effect of this incremental purchase cost is outweighed by significant fuel cost savings, as well as savings in scheduled maintenance costs. For the Moderate PEV Scenario in 2030, the average Indiana PEV owner is projected to have annual operating savings of $690 due to reduced maintenance as well as electricity costs being lower than gasoline[12]. For both scenarios, this annual savings is projected to increase to $950 - $1,000 per PEV per year by 2050, as projected gasoline prices continue to increase faster than projected electricity prices.

The NPV of total annual cost savings to Indiana drivers from greater PEV ownership are projected to be $142 million in 2030 rising to $143 million in 2050 under the moderate PEV penetration scenario. Under the High PEV (80x50) scenario, the NPV of total annual cost savings to Indiana drivers from greater PEV ownership are projected to be $86 million in 2030, rising to $2.3 billion in 2050.

[12] Under the moderate PEV (EIA) scenario, this analysis assumes that PEV owners will pay the same net purchase price for gasoline vehicles and PEVs, despite the higher projected purchase price of comparable PEVs. There is evidence that current PEV purchasers are foregoing the purchase of more expensive vehicles to purchase higher-priced PEVs within their target budget. With only modest future PEV penetration this analysis assumes that this behavior will continue. However, for the High PEV scenario net PEV owner benefits reflect the fact that PEV purchasers will pay a higher price for their PEVs than they would have paid for a similar gasoline vehicle.

Other Benefits

Energy Security and Emissions Reductions

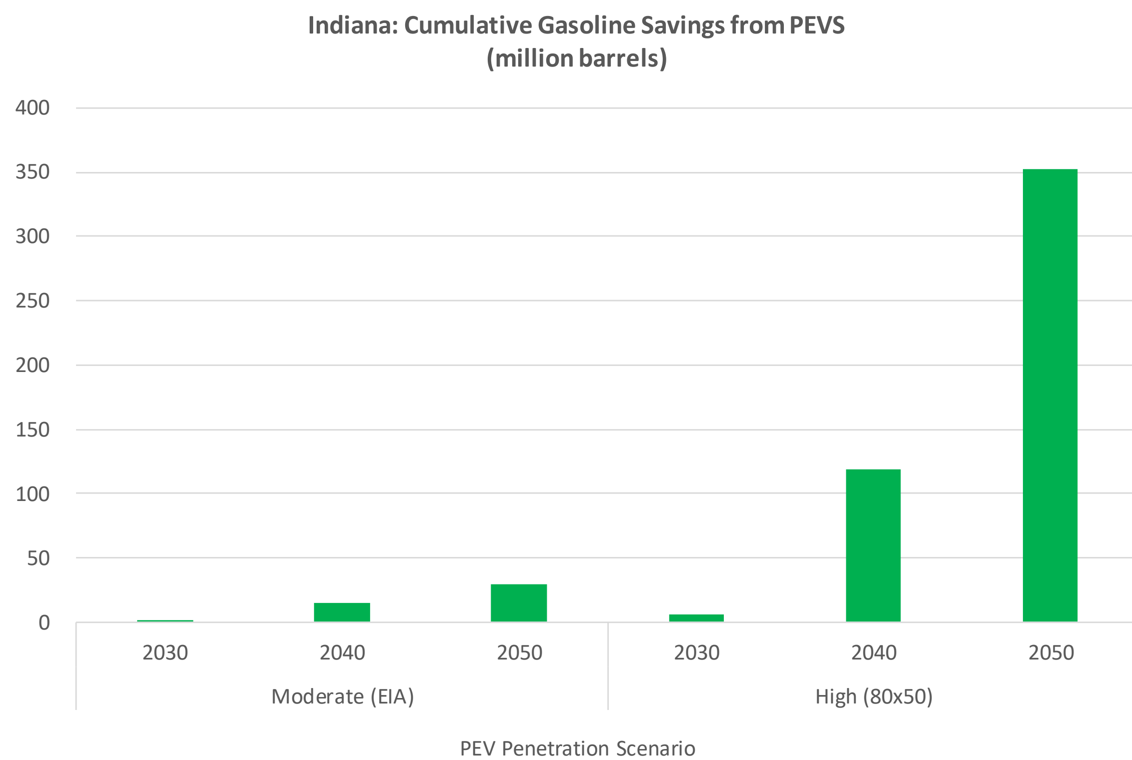
Along with the financial benefits to electric utility customers and PEV owners described above, light-duty vehicle electrification can provide additional benefits, including significant reductions in gasoline fuel use and transportation sector emissions.

The estimated cumulative fuel savings (barrels of gasoline[13]) from PEV use in Indiana under each penetration scenario are shown in Figure 13. Annual fuel savings under the Moderate PEV penetration scenario are projected to total 1.3 million barrels in 2030, with cumulative savings of more than 29 million barrels by 2050. For the High PEV (80x50) scenario, annual fuel savings in 2030 are projected to be 6.1 million barrels, and by 2050 cumulative savings will exceed 352 million barrels.

These fuel savings can help put the U.S. on a path toward energy independence, by reducing the need for imported petroleum. In addition, a number of studies have demonstrated that EVs can generate significantly greater local economic impact than gasoline vehicles - including generating additional local jobs - by keeping more of vehicle owners' money in the local economy rather than sending it out of state by purchasing gasoline.

Economic impact analyses for the states of California, Florida, Ohio and Oregon have estimated that for every million dollars in direct PEV owner savings, an additional $0.29 - $0.57 million in secondary economic benefits will be generated within the local economy, depending on PEV adoption scenario. These studies also estimated that between 13 and 25 additional in-state jobs will be generated for every 1,000 PEVs in the fleet. [1]

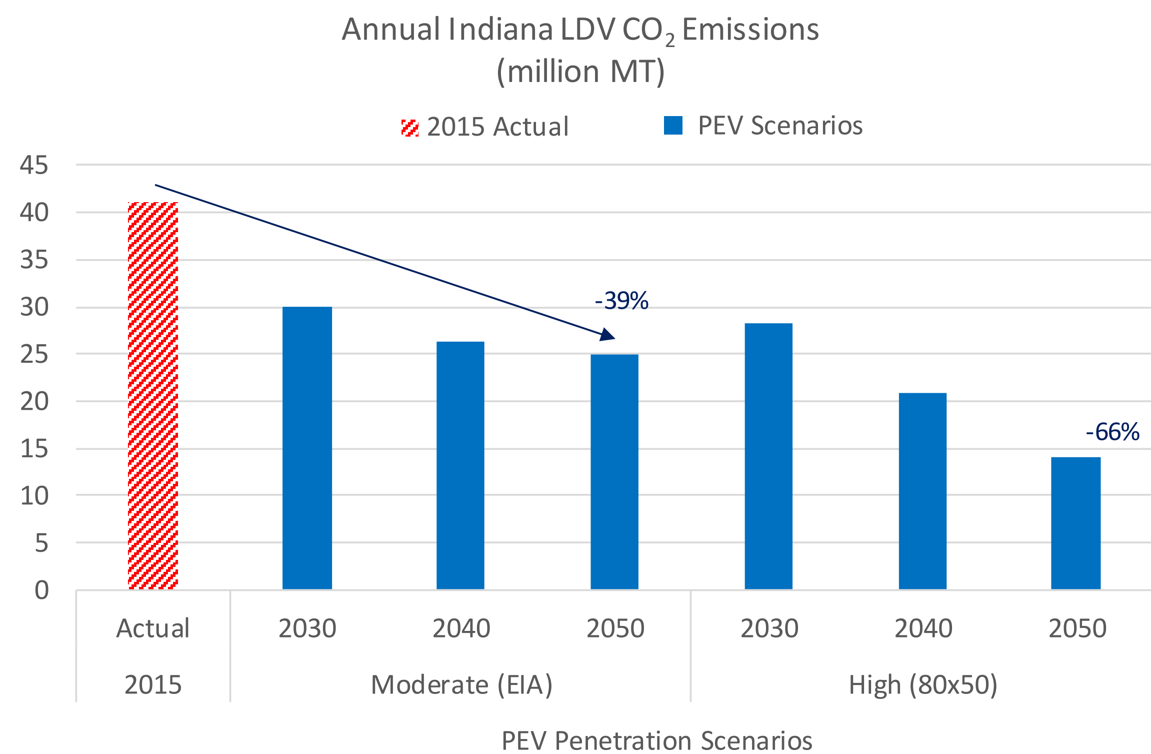
Figure 13 Cumulative Gasoline Savings from PEVs in Indiana



[13] One barrel of gasoline equals 42 US gallons

The projected annual greenhouse gas (GHG) emissions (million metric tons carbon-dioxide equivalent, CO_2-e million tons) from the Indiana light duty fleet under each PEV penetration scenario are shown in Figure 14. In this figure, projected emissions under the PEV scenarios are shown in blue. The values shown represent "wells-to-wheels" emissions, including direct tailpipe emissions and "upstream" emissions from production and transport of gasoline. Estimated emission for the PEV scenarios includes GHG emissions from generating electricity to charge PEVs, as well as GHG emissions from gasoline vehicles in the fleet. Estimated emissions from PEV charging are based on EIA projections of average carbon intensity for the Reliability First Corporation / West electricity market module region, which includes Indiana.

Figure 14 Projected GHG Emissions from the Light Duty Fleet in Indiana



As shown in Figure 14, GHG emissions from the light duty fleet in Indiana were approximately 41 million metric tons in 2015.

Compared to 2015 baseline emissions, in 2050 GHG emissions are projected to be reduced by up to 16.2 million tons under the Moderate PEV penetration scenario and as much as 27 million tons under the High PEV (80x50) scenario. Through 2050, cumulative net GHG emissions are projected to be reduced by nearly 299 million tons under the Moderate PEV penetration scenario and 421 million metric tons under the High PEV (80x50) scenario.

NOx Emissions

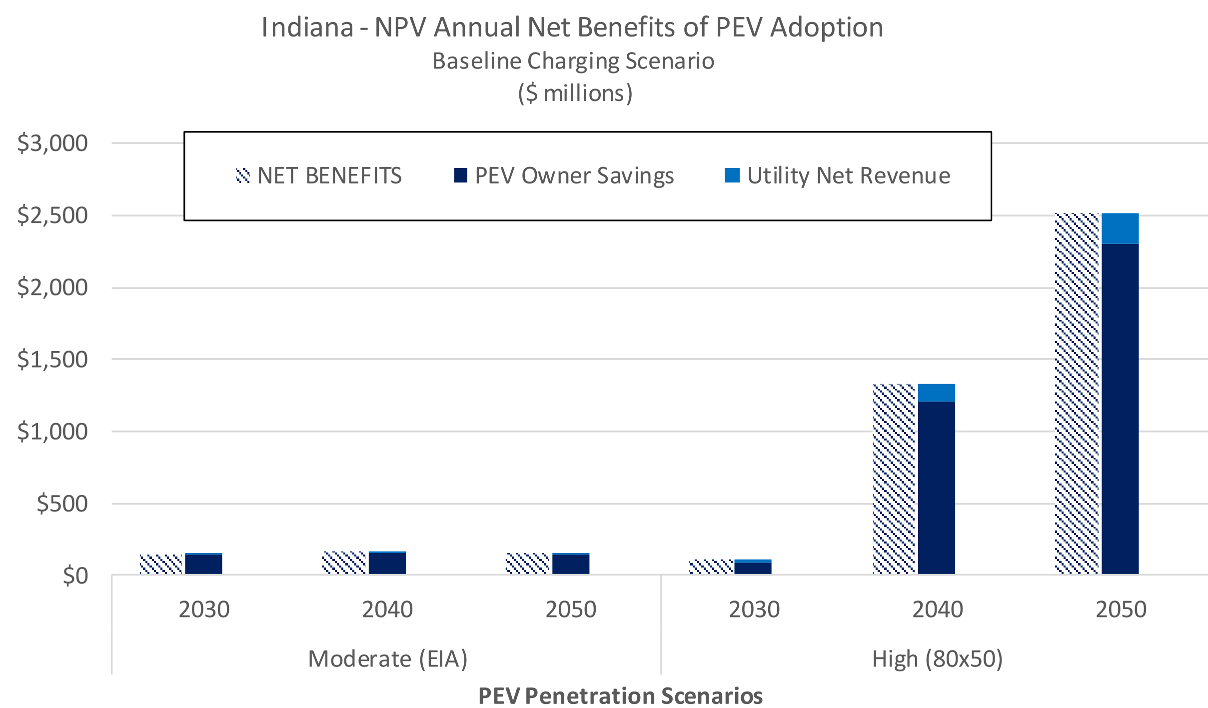
In 2015 the Electric Power Research Institute (EPRI), in conjunction with the Natural Resources Defense Council (NRDC), conducted national-level modeling to estimate GHG and air quality benefits from high levels of transportation electrification [4]. Under their electrification scenario EPRI estimated that NOx would be reduced by 11.4 tons and VOCs would be reduced by 5.5 tons, for every billion vehicle miles traveled[14].

Extrapolating from this data, under the Moderate PEV Scenario (EIA), by 2050 light-duty vehicle electrification in Indiana could reduce annual NOx emissions by 361 tons and reduce annual VOC emissions by 174 tons. Under the High PEV Scenario (80x50), total NOx reductions in 2050 could reach more than 5,630 tons per year, and total VOC reductions could reach almost 2,720 tons per year.[15]

Total Societal Benefits

The NPV of total annual estimated benefits from increased PEV use in Indiana under each PEV penetration scenario are summarized in Figures 15 and 16. These benefits include cost savings to Indiana drivers and utility customer savings from reduced electric bills. Figure 15 shows the NPV of annual projected societal benefits if Indiana drivers charge in accordance with the baseline charging scenario. Figure 16 shows the NPV of projected annual benefits with managed charging.

Figure 15 Projected NPV of Total Societal Benefits from Greater PEV use in IN – Baseline Charging



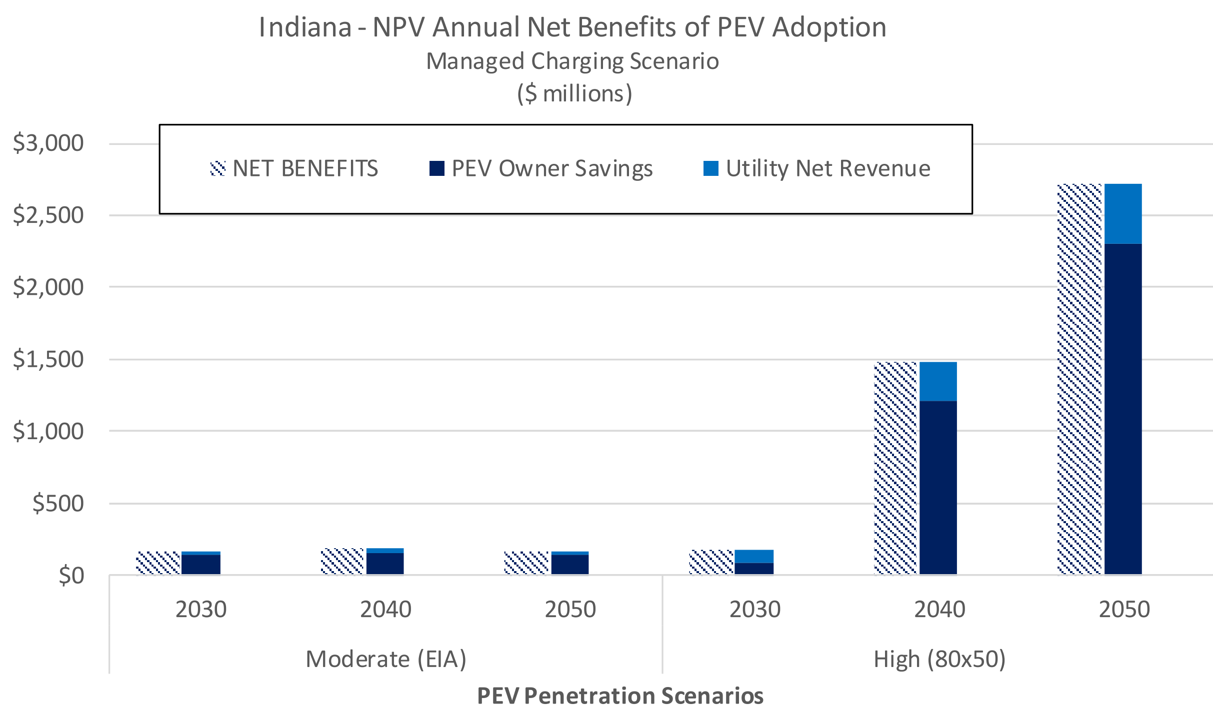
[14] For light-duty vehicles the analysis assumed that by 2030 approximately 17 percent of annual vehicle miles would be powered by grid electricity, using PEVs. Based on current and projected electric sector trends the analysis also assumed that approximately 49 percent of the incremental power required for transportation electrification in 2030 would be produced using solar and wind, with the remainder produced by combined cycle natural gas plants.

[15] Across the entire state, estimated annual light-duty vehicle miles traveled (VMT) totals 0.96 trillion miles in 2050. Of these miles approximately, 6 percent are powered by grid electricity under the EIA penetration scenario, and 87 percent are powered by grid electricity under the 80x50 penetration scenario

As shown in Figure 15, the NPV of annual benefits is projected to be a minimum of $155 million per year in 2050 under the Moderate PEV penetration scenario and $2.5 billion per year in 2050 under the High PEV (80x50) scenario. Approximately 92 percent of these annual benefits will accrue to Indiana drivers as a cash savings in vehicle operating costs and 8 percent will accrue to electric utility customers as a reduction in annual electricity bills.

As shown in Figure 16, the NPV of annual benefits in 2050 will increase by $11.8 million under the Moderate PEV (EIA) penetration scenario, and $202 million under the High PEV (80x50) scenario with managed charging. Of these increased benefits, all will accrue to electric utility customers as an additional reduction in their electricity bills.

Figure 16 Projected NPV of Total Societal Benefits from Greater PEV use in IN – Managed Charging



Study Methodology

This section briefly describes the methodology used for this study. For more information on how this study was conducted, including a complete discussion of the assumptions used and their sources, see the report: *Mid-Atlantic and Northeast Plug-in Electric Vehicle Cost-Benefit Analysis, Methodology & Assumptions* (October 2016).[16] This report can be found at:

http://mjbradley.com/sites/default/files/NE_PEV_CB_Analysis_Methodology.pdf

This study evaluated the costs and benefits of two distinct levels of PEV penetration in Indiana between 2030 and 2050, based on the range of publicly available PEV adoption estimates from various analysts.

Moderate PEV Scenario –EIA: Based on EIA's current projections for new PEV sales between 2015 and 2050, as contained in the 2017 Annual Energy Outlook (AEO). Under this scenario approximately 4.9 percent of in-use light duty vehicles in Indiana will be PEV in 2030, rising to 6.2 percent in 2040 and remaining steady through 2050.

High PEV Scenario – 80x50: PEV penetration levels each year that would put the state on a trajectory to reduce total annual light-duty fleet GHG emissions by 70 – 80 percent from current levels in 2050. Under this scenario 25 percent of in-use vehicles will be PEV in 2030, rising to 60 percent in 2040 and 95 percent in 2050.

Both of these scenarios are compared to a baseline scenario with very little PEV penetration, and continued use of gasoline vehicles. The baseline scenario is based on future annual vehicle miles traveled (VMT) and fleet characteristics (e.g., cars versus light trucks) as projected by the Energy Information Administration in their most recent Annual Energy Outlook (AEO 2017).

Based on assumed future PEV characteristics and usage, the analysis projects annual electricity use for PEV charging at each level of penetration, as well as the average load from PEV charging by time of day. The analysis then projects the total revenue that Indiana's electric distribution utilities would realize from sale of this electricity, their costs of providing the electricity to their customers, and the potential net revenue (revenue in excess of costs) that could be used to support maintenance of the distribution system.

The costs of serving PEV load include the cost of electricity generation, the cost of transmission, incremental peak generation capacity costs for the additional peak load resulting from PEV charging, and annual infrastructure upgrade costs for increasing the capacity of the secondary distribution system to handle the additional load.

For each PEV penetration scenario this analysis calculates utility revenue, costs, and net revenue for two different PEV charging scenarios: 1) a baseline scenario in which all PEVs are plugged in and start to charge as soon as they arrive at home each day, and 2) a managed charging scenario in which a significant portion of PEVs that arrive home between noon and 11 PM each day delay the start of charging until after midnight.

Real world experience from the EV Project demonstrates that, without a "nudge", drivers will generally plug in and start charging immediately upon arriving home after work (scenario 1), exacerbating system-wide evening peak demand.[17] However, if given a "nudge" - in the form of a properly designed and marketed financial

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[16] This analysis used the same methodology as described in the referenced report, but used different PEV penetration scenarios, as described here. In addition, for this analysis fuel costs and other assumptions taken from the Energy Information Administration (EIA) were updated from EIA's Annual Energy Outlook 2016 to those in the Annual Energy Outlook 2017. Finally, for projections of future PEV costs this analysis used updated July 2017 battery cost projections from Bloomberg New Energy Finance.

[17] The EV Project is a public/private partnership partially funded by the Department of Energy which has collected and analyzed operating and charging data from more than 8,300 enrolled plug-in electric vehicles and approximately 12,000 public and residential charging stations over a two-year period.

incentive - many Indiana drivers will choose to delay the start of charging until later times, thus reducing the effect of PEV charging on evening peak electricity demand (scenario 2). [5]

For each PEV penetration scenario, this analysis also calculates the total incremental annual cost of purchase and operation for all PEVs in the state, compared to "baseline" purchase and operation of gasoline cars and light trucks. For both PEVs and baseline vehicles annual costs include the amortized cost of purchasing the vehicle, annual costs for gasoline and electricity, and annual maintenance costs. For the Moderate PEV Scenario, it was assumed that PEV vehicle costs are the same as baseline gasoline vehicles, with the reasoning that consumers have a set budget and will purchase what they can afford, regardless of technology type. For the High PEV Scenario, the same logic could not be applied, as it is assumed that nearly all vehicle purchases will be PEV. For PEVs it also includes the amortized annual cost of the necessary home charger. This analysis is used to estimate average annual financial benefits to Indiana drivers.

Finally, for each PEV penetration scenario this analysis calculates annual greenhouse gas (GHG) emissions from electricity generation for PEV charging, and compares that to baseline emissions from operation of gasoline vehicles. For the baseline and PEV penetration scenarios GHG emissions are expressed as carbon dioxide equivalent emissions (CO_2-e) in metric tons (MT). GHG emissions from gasoline vehicles include direct tailpipe emissions as well as "upstream" emissions from production and transport of gasoline.

For each PEV penetration scenario GHG emissions from PEV charging are calculated based on an electricity scenario that is consistent with the latest Energy Information Administration (EIA) projections for future SERC Reliability Corporation / Virginia -Carolina.

Net annual GHG reductions from the use of PEVs are calculated as baseline GHG emissions (emitted by gasoline vehicles) minus GHG emissions from each PEV penetration scenario.

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[5] Idaho National Laboratory, *2013 EV Project Electric Vehicle Charging Infrastructure Summary Report*, January 2013 through December 2013

Acknowledgements

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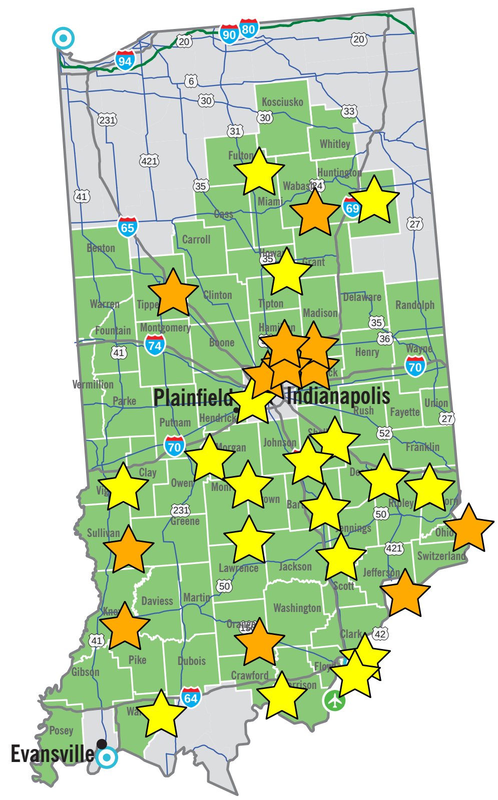
This study was conducted by M.J. Bradley & Associates for Duke Energy. It is one of six state-level analyses that will be conducted of plug-in electric vehicle costs and benefits in the different U.S. states in which Duke operates. These studies are intended to provide input to state policy discussions about actions required to promote further adoption of electric vehicles, as well as to inform internal Duke planning efforts.

Reporting Metric	DCFC	School Bus	Transit Bus	Residential L2	Commercial L2
Data on the effects of charging multiple types of electric vehicles	Y				
Network utilization rates and geographic patterns of utilization	Y				
User demographics who live within DEI service territory, Statewide, and/or out of state	Y				
Impacts of various EV School Bus applications, such as geographic route differences		Y			
Capability for bi-directional power events		Y			
Electricity consumption and customer charging behavior		Y	Y		
EV School and Transit Bus reliability statistics		Y	Y		
Customer operational savings associated EV School and Transit Bus deployment.		Y	Y		
Amount of energy used by a EV School and Transit Bus		Y	Y		
Charging station reliability data	Y	Y	Y		
Amount and timing of electricity consumption for EV charging				Y	Y
Proportion of PHEV vs. BEV operated by Duke Energy Indiana customers				Y	Y
Number of rebates issued				Y	Y
Comparison of fleet charging with residential and fast charging				Y	Y
System impacts	Y	Y	Y	Y	Y
Customer experience information	Y	Y	Y	Y	Y
Cost of EV Supply Equipment hardware and installation.	Y	Y	Y	Y	Y
Change in percentage of state EV sales and percentage of EV registrations in Duke Energy Indiana's service territory	Y	Y	Y	Y	Y

Indiana Service Territory



Service Territory
Counties Served*

- Duke Energy Indiana
- Shipping Port
- Major Airport
- Interstate Highways
- Toll Roads and Bridges
- State Roads

**Portions may be served by other utilities.*

VERIFICATION

I hereby verify under the penalties of perjury that the foregoing representations are true to the best of my knowledge, information and belief.

Signed: ______________________
Lang Reynolds

Dated: 7/2/2019