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INDIANA MICHIGAN POWER COMPANY

PRE-FILED VERIFIED DIRECT TESTIMONY

OF

JEFFREY W. LEHMAN

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**PRE-FILED VERIFIED DIRECT TESTIMONY OF JEFFREY W. LEHMAN
ON BEHALF OF
INDIANA MICHIGAN POWER COMPANY**

1 **Q. Please state your name, position, and business address.**

2 A. My name is Jeffrey W. Lehman. I am the Electric Transportation Program Manager
3 for American Electric Power Service Corporation (AEPSC). AEPSC supplies
4 engineering, financing, accounting, planning, advisory, and other services to the
5 subsidiaries of the American Electric Power (AEP) system, one of which is Indiana
6 Michigan Power Company (I&M or the Company). My business address is 1
7 Riverside Plaza, Columbus, Ohio 43215.

8 **Q. Please briefly describe your educational background and professional
9 experience.**

10 A. I earned a Bachelor of Science Degree in Electrical Engineering from Kettering
11 University in 2005, and have been a Professional Engineer registered in Michigan
12 since 2010. Prior to joining American Electric Power I worked for electric utilities in
13 Michigan in various roles related to substation and protection and controls design,
14 construction, commissioning, and management. I joined American Electric Power in
15 2011 as a contract engineer for our Transmission organization, and worked on
16 protection and controls standards, design, commissioning, and support through
17 2015. At this time I transitioned to our Generation organization, where I focused on
18 distributed energy resources and technologies, research and development, and
19 identification and vetting of emerging technologies. During 2018 I transitioned to our
20 Customer organization, where I worked on maximizing value for customers related
21 to electrification – industrial and transportation sectors specifically. I have been in my
22 current role focusing exclusively on electric transportation since November 2018.

1 **Q. What are your responsibilities as Electric Transportation Program Manager?**

2 A. As the Electric Transportation Program Manager, my responsibilities include
3 monitoring industry technologies and evolution, participating in program design,
4 advising internal and external stakeholders on vehicle and charging technologies and
5 systems, and supporting all AEP subsidiary companies in their transportation
6 electrification efforts.

7 **PURPOSE OF TESTIMONY**

8 **Q. What is the purpose of your testimony in this proceeding?**

9 A. The purpose of my testimony is to introduce context around electric transportation,
10 the reasons for I&M to engage in this space, and the background and details of the
11 Company's proposed "IM Plugged In" pilot program.

12 **Q. Are you sponsoring any attachments in this proceeding?**

13 A. I am sponsoring the following attachments to my direct testimony:
14

- Attachment JWL-1: IM Plugged In Pilot Program Details

15 **Q. Are you sponsoring any work papers in this proceeding?**

16 A. I am sponsoring the following work papers to my direct testimony:
17

- WP JWL-1: IM Plugged In Home Charging Benefit to All Customers
- WP JWL-2: PEV Power and Energy Requirements

19 **Q. Were the attachment and work papers that you are sponsoring prepared by
20 you or under your direction?**

21 A. Yes.

PROGRAM SUMMARY

Q. Please briefly summarize the components of the IM Plugged In pilot program.

A. I&M is proposing a three year pilot program that consists of several elements that each play an important role in encouraging plug-in electric vehicle (PEV) adoption in a way that optimizes the overall electric system:

1. Residential and small commercial PEV charging;
2. Multi-unit dwelling (MUD) PEV charging;
3. Commercial and industrial fleet and workplace PEV charging; and
4. Electric vehicle education and technical development.

Figure JWL-1 provides a summary of the proposed components within the IM Plugged In Pilot Program.

**Figure JWL-1
IM Plugged In Pilot Program Summary**

Program Component	Annual Customer Cap	Total Annual Ports	Enrollment Incentive	New Proposed Rate	Total Annual Cost
Residential / Small Commercial	1,000	1,000	\$500	Yes (RS-PEV / GS-PEV)	\$500,000
MUD	100	400	\$250*	No	\$100,000
C&I Fleet and Workplace	100	400	\$250*	No	\$100,000
*Customers can choose either \$250 per port or five year revenue credit				Total	\$700,000

See Attachment JWL-1 for additional details on each component of the electric transportation program.

MARKET FACTORS

1
2 **Q. Please describe the current state of the electric transportation market.**

3 A. Adoption of electric transportation options has been accelerating since 2010. During
4 2018 the United States eclipsed the one million PEV mark, and by 2021 more than
5 2 million PEVs are expected to be on U.S. roads.¹ Although electric vehicle sales are
6 accelerating substantially, they still represented less than 2% of new car sales
7 nationally in 2018.² Looking back to 2013, only 0.61% of new car sales were PEVs
8 nationally – market share has continued to accelerate toward PEV models even as
9 the quantity of new car sales has contracted slightly.³

10 Indiana is in the middle of the pack regarding state adoption levels with 0.82%
11 of new car sales sold as PEVs in 2018, but is well behind California where nearly 8%
12 of new car sales were PEVs in 2018.⁴ PEV adoption levels in non-California Zero
13 Emission Vehicle (ZEV) states ranged from 2.35% to 6.69% of new car sales sold in
14 2018.⁵

15 The variety of PEVs now produced is growing rapidly – where only three
16 models within limited segments were available to purchase in 2011, there are now
17 over 30 models available nationwide spanning all major vehicle segments, with 132
18 models projected to be available by 2022.⁶

¹ Edison Electric Institute, “EEI Celebrates 1 Million Electric Vehicles on U.S. Roads”, available at: <http://www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/EEI%20Celebrates%201%20Million%20Electric%20Vehicles%20on%20U-S-%20Roads.aspx>

² Auto Alliance, “Advanced Technology Vehicle Sales Dashboard”, available at: <https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/>

³ *Id.*

⁴ *Id.*

⁵ *Id.*

⁶ Electric Power Research Institute (EPRI), “Consumer Guide to Electric Vehicles”, available at: <https://www.epri.com/#/pages/product/000000003002015368/?lang=en-US>

1 **Q. Please describe the underlying factors facilitating the adoption and product**
2 **availability trends.**

3 A. There are three fundamental factors facilitating these trends:

- 4 • Governmental policy;
- 5 • Battery price declines; and
- 6 • Consumer preference and demand.

7 Initially, California Air Resources Board vehicle efficiency and ZEV mandates
8 spurred interest in development and adoption of electric vehicle technologies. More
9 recently policy mandates became the key driver, especially due to the largest new
10 car market in the world – China. If automakers want to compete, they will need to sell
11 significant amounts of zero emissions vehicle options.⁷ This is a key driver for
12 automakers investing heavily in research and development and retooling their supply
13 chain and manufacturing processes, which is allowing them to produce more
14 varieties of compelling PEVs.

15 Battery prices for PEVs declined 85% between 2010 and 2018, and cost
16 reductions are expected to continue.⁸ As the battery represents a significant cost
17 component of a PEV, this reduction has allowed automakers to produce models that
18 offer increased range and performance while reducing price.

19 As consumer awareness has increased, demand has risen primarily due to
20 two main benefits: continued reductions in ownership costs, and desire to choose
21 sustainable transportation options. Consumers find that PEVs only cost

⁷ The International Council on Clean Transportation (ICCT), “China’s New Energy Vehicle mandate policy (final rule)” available at: <https://www.theicct.org/publications/china-nev-mandate-final-policy-update-20180111>

⁸ BloombergNEF, “A Behind the Scenes Take on Lithium-ion Battery Prices”, available at: <https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/>

1 approximately one-third as much as a similar combustion gasoline vehicle to
2 operate.⁹ As initial plug-in vehicle prices continue to decline, they will go from
3 competitive on a total-cost-of-ownership basis today, to financially beneficial in every
4 way. Early adopters have also been motivated by concern for the environment.¹⁰ A
5 current generation PEV emits less than half the equivalent carbon dioxide of the
6 average new combustion gasoline vehicle in Fort Wayne.¹¹ As PEV efficiencies
7 continue to improve with industry maturity and electric grid carbon intensity continues
8 to decline, the sustainability advantage of electric transportation will continue to
9 improve. Stated differently, customers' PEVs provide immediate local sustainability
10 benefits, and are likely to become *less* carbon intensive over time.

11 **UTILITY ENGAGEMENT**

12 **Q. Given the accelerating adoption of electric transportation, why is it important**
13 **for I&M to engage in the electric transportation space?**

14 A. It is important that load from electric transportation be integrated into the grid in a
15 manner that minimizes or eliminates additional system costs. This is generally
16 accomplished by programs and rates that incent charging behavior to occur during
17 off-peak times. When this happens, additional energy sales occur without requiring
18 additional fixed assets to be deployed. This increases I&M's system utilization, and
19 can provide downward price pressure on electricity rates for *all* I&M customers as the

⁹ US Department of Energy, "eGallon | Department of Energy", available at:
<https://www.energy.gov/maps/egallon>

¹⁰ AAA, "Green Car Guide", available at: <https://newsroom.aaa.com/wp-content/uploads/2018/GreenCarGuide/>

¹¹ FuelEconomy.gov, "Beyond Tailpipe Emissions", available at:
<https://www.fueleconomy.gov/feg/Find.do?zipCode=46802&year=2019&vehicleId=40520&action=bt3>

1 fixed system asset costs are spread over those additional energy sales. Incentivizing
2 PEVs to charge off-peak not only benefits those who drive electric, but each and
3 every I&M customer.

4 Conversely, if I&M does not engage to align incentives for customers to
5 charge PEVs during off-peak times, the I&M system is highly likely to see greater
6 peak capacity demands as default charging behavior coincides with existing system
7 peaks, therefore reducing overall system utilization. This increase in peak capacity
8 demand will require additional system investments and maintenance needs – from
9 generation sources through distribution feeders and customer transformers.

10 **Q. Given the accelerating adoption trends and need for I&M engagement on this**
11 **topic, is it important that this engagement happen as quickly as possible?**

12 A. Absolutely. It is important for I&M to have robust and scalable programs and outreach
13 in place as PEV adoption continues to accelerate. PEV drivers may only pay attention
14 to their charging options leading up to their purchase decision, which could result in
15 significant quantities of vehicles charging during system peaks – either because
16 programs do not exist, or have not been communicated to raise awareness
17 sufficiently. Beginning this engagement as quickly as possible ahead of the PEV
18 adoption curve will allow I&M the greatest chance of success in achieving benefits
19 for all I&M customers.

20 **Q. Please describe how I&M can encourage efficient electric transportation load**
21 **integration.**

22 A. To effectively integrate electric transportation into its electric system, I&M is
23 proposing the IM Plugged In Pilot Program which will provide value to customers who

1 drive electric vehicles and enable their PEVs to charge during times when the
2 distribution and bulk electric system is not coincident with or adjacent to peak
3 demands. These programs focus on customer needs, experience, and value to
4 ensure maximum customer interest and participation. Concurrently, the program
5 design also ensures that off-peak PEV charging provides contribution to fixed system
6 costs, therefore benefitting all I&M customers with downward electricity rate
7 pressure.

8 **Q. Please describe the benefits of electric transportation, and the constituents to**
9 **whom these benefits accrue.**

10 A. There are four primary benefits of electric transportation:

- 11 1. Downward electricity rate pressure: This benefit accrues if programs are in
12 place to ensure efficient electric transportation load integration. The benefit
13 value accrues to all who drive electric vehicles, as well as all customers of
14 the same utility as the electric driver.
- 15 2. Reduction of transportation costs – fuel and maintenance: This benefit
16 accrues directly to those that choose to drive electric, and also has potential
17 to accrue to ride-hailing customers of shared mobility (i.e. Lyft, Uber) as the
18 expenses involved in ride-share enterprises decline.
- 19 3. Reduction of transportation emissions: This benefit accrues to many parties,
20 including:
 - 21 a. Electric vehicle drivers;
 - 22 b. People that regularly ride with and live in immediate proximity of the
23 electric driver (i.e. family);

- 1 c. People that live within close proximity to the electric driver (i.e.
 - 2 neighbors);
 - 3 d. Individuals within the community adjacent to regular routes of the
 - 4 electric driver; and
 - 5 e. The broader region surrounding the electric driver.
- 6 4. Improved system information from program participation: This benefit
- 7 accrues to I&M and all I&M customers as it allows I&M to better understand
- 8 emerging impacts to the electrical system, and plan for the system and its
- 9 maintenance more effectively and efficiently.

10 **Q. Please describe whether the benefit to all electric utility customers in the form**

11 **of downward rate pressure is scalable and sustainable.**

12 A. If electric load from transportation is integrated efficiently through utility programs to

13 increase system utilization, this downward rate pressure is extensively scalable and

14 sustainable. This is because the electric grid currently has significant available

15 capacity in off-peak periods. While not specific to Indiana, the illustration for Texas is

16 representative and shows the general significance of this off-peak opportunity.¹² If

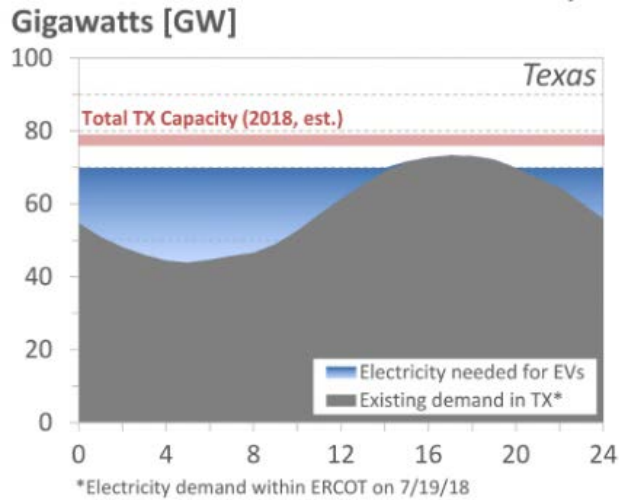
17 the Texas electric grid were fully utilized, Davidson, Tuttle, Rhodes and Nagasawa

18 show that it could accommodate 120% of all current Texas passenger vehicles if they

19 were to immediately become all-electric and charge off-peak as illustrated in Figure

20 JWL-2.

¹² CityLab, "Is America's Power Grid Ready for Electric Cars?", available at:
<https://www.citylab.com/transportation/2018/12/americas-power-grid-isnt-ready-electric-cars/577507/>

Figure JWL-2¹³

1 Downward rate pressure from electric transportation will be sustainable for
 2 many years, if not decades. Faster adoption of electric transportation technologies
 3 when paired with utility programs that accomplish this downward rate pressure
 4 benefits all electric utility customers. Electric utilities can achieve the greatest
 5 downward rate pressure benefits by raising awareness with our customers and
 6 communities of the benefits of driving electric, along with customer program offerings
 7 that align incentives for off-peak PEV charging – both independently and through
 8 collaboration with other stakeholders.

9 **Q. Please describe whether the benefit to all electric utility customers in the form**
 10 **of downward rate pressure can occur without utility engagement.**

11 A. If electric utilities are not engaged to create customer program offerings that align
 12 incentives for off-peak charging, it is highly unlikely that the outcome of increased
 13 system utilization and downward rate pressure will occur.

¹³ *Id.*

1 A PEV is fundamentally an electric appliance that follows its owner/driver –
2 when the owner/driver is at work, the vehicle is also at work; when the owner/driver
3 is at home, the vehicle is also at home. It is most simple and convenient for the
4 owner/driver to connect the vehicle to an Electric Vehicle Supply Equipment (EVSE,
5 commonly referred to as a charger) if one is available, upon arrival at their
6 destination. By default, unless the owner is encouraged with utility program
7 incentives, the vehicle will begin to charge at this time at the full power allowed by
8 the connected EVSE. This is the same time when the owner/driver will be using lights,
9 cooking appliances, space heating, space cooling, and many other electric
10 appliances – thereby adding the PEV load coincident to their existing electricity
11 demand.

12 If this increase in coincident peak demand occurs, it is highly likely to cause
13 energy generation from higher cost sources, require additional system capacity, and
14 cause additional system equipment wear. These all add to system costs, which are
15 then recovered through all electric utility customers, and do not allow downward rate
16 pressure for all customers to occur.

17 It is highly unlikely that the outcome of increased system utilization and
18 downward rate pressure will occur unless electric utilities are engaged to create
19 customer program offerings that align incentives for off-peak charging.

20 **PLUG-IN ELECTRIC VEHICLE CHARACTERISTICS**

21 **Q. Please describe whether PEVs are different than other electrical appliances.**

22 A. PEVs are fundamentally different than other current electrical appliances in the
23 following ways, as provided in work paper JW-1:

- 1 • They are electrically large power consuming devices that require between 3
2 to 20 kilowatts, with a median of approximately 7 kilowatts.¹⁴ This median
3 value is approximately equivalent to the demand expected of a traditional
4 household (with no PEV);
- 5 • They are electrically large energy consuming devices. For a 15,000 mile per
6 year all-electric driver, approximately 4.7 megawatt-hours of electricity would
7 be consumed. This is approximately equivalent to half the annual energy
8 consumption of a traditional household (with no PEV); and
- 9 • They are mobile. The electrical needs for these devices can be met at various
10 locations including home, work, school, retail locations, community centers,
11 or interstate corridors for long distance travel.

12 **Q. Can all of these various locations for charging meet customer needs, and**
13 **achieve benefits to all electric utility customers in the form of downward rate**
14 **pressure?**

15 A. No. Only locations with long vehicle dwell times present the opportunity to both meet
16 customer needs and allow grid integration optimization that will result in downward
17 rate pressure for all utility customers. It is important to understand that PEVs follow
18 the travel habits of their owner/driver, and that they reside for the longest periods of
19 time at home, then at work.¹⁵ For fleet vehicles, their “home” will typically be a
20 business location. It is important for I&M to focus on these location applications to
21 achieve maximum value for customers.

¹⁴ ClipperCreek, “How long does it take to charge an electric car?”, available at:
<https://www.clippercreek.com/charging-times-chart/>

¹⁵ EPRI, “Transportation Statistics Analysis for Electric Transportation”, pp. 2-8, available at:
<https://www.epri.com/#/pages/product/1021848/?lang=en-US>

1 **Q. Please describe the importance of home charging.**

2 A. Customer behavior studies have consistently found that when available, home
3 charging comprises 80% or more of the transportation energy needs. This was
4 recently substantiated in an EPRI study in collaboration with Salt River Project.¹⁶ The
5 data again shows that when home charging is available, it dominates customer
6 choice. Consumers have good reason to prefer charging at home – it is the low cost
7 energy location, and it is extremely convenient. Customers typically simply plug in
8 the vehicle when arriving home, and leave for work the next morning with a full
9 charge.

10 Home charging is also critically important to allow efficient load integration and
11 improve electric system utilization, leading to downward rate pressure and benefitting
12 all utility customers. To be most effective, customers should have access to a
13 dedicated 240 volt circuit. This will allow them to charge their vehicle overnight within
14 small windows of time. A driver using a median 7 kilowatt vehicle with 240 volt
15 charging at home who drives 40 miles each day would only need approximately two
16 hours to charge their PEV each night.

17 This added flexibility – the ability to quickly charge at home – is important, yet
18 most homes do not have dedicated 240 volt circuits at their vehicle parking spaces.
19 The cost of this electrical installation by a qualified professional can become a barrier
20 for customers who could otherwise choose to charge their PEV using a 120 volt
21 source for much longer. Using the same daily drive distance of 40 miles, a PEV
22 charging with a 120 volt source would require approximately 12 hours instead of only

¹⁶ EPRI, “Electric Vehicle Driving, Charging, and Load Shape Analysis”, available at:
<https://www.epri.com/#/pages/summary/000000003002013754/?lang=en>

1 two when using 240 volt charging. This extended charging time would significantly
2 increase the probability that this vehicle contributes to the coincident peak of the
3 electrical system, does not allow for maximum downward rate pressure and benefit
4 to all utility customers, and is also less energy efficient for customers.

5 **Q. Please describe how fleet charging is similar to or different than home**
6 **charging.**

7 A. Fleets, which can be light, medium or heavy-duty vehicles in return-to-base
8 operations for commercial, industrial, or municipal customers, largely have a use
9 pattern that fits within typical societal working hours – especially one or two shift
10 operations. These return-to-base fleets discharge during use, and require charging
11 during the evening and overnight period when they are returned to base. They can
12 contribute to downward rate pressure and benefit to all utility customers in the same
13 way as home charging.

14 These customers currently have tariff options that are logically justified with
15 capacity and time-based demand charges, so incentives already exist to integrate
16 and manage charging of these fleets to achieve benefits for all utility customers.

17 While rate structures already exist to guide intelligent and efficient load integration,
18 fleets of modest to large size likely cannot serve their PEV fleets with their existing
19 service, and will need to consider increasing existing capacity or adding an additional
20 service. These costs can be expensive, and can act as a barrier to fleet adoption.

IM PLUGGED IN PILOT PROGRAM COMPONENTS

1
2 **Q. What is I&M proposing for residential and small commercial home charging?**

3 A. I&M is proposing two new tariffs to encourage beneficial residential and small
4 commercial home charging behavior – tariffs RS-PEV and GS-PEV. Please see
5 Attachment JWL-1 and the respective tariffs (sponsored by Company witness
6 Cooper) for full details on these components.

7 Home charging is incredibly important to customers, and is a key opportunity
8 for providing downward rate pressure and benefits to all customers. Residential and
9 small commercial customers are currently billed volumetrically, with relatively small
10 customer charges and no demand charges. As a result, they have no incentive to
11 alter their PEV charging behavior to benefit all customers. I&M is proposing to provide
12 customers with appropriate and aligned incentives by separately metering and billing
13 the electricity consumption of a PEV without requiring a new additional electrical
14 service. This will require an additional AMI meter for each participant, and will allow
15 the application of a new PEV tariff that provides electricity for the PEV when energy
16 costs are lower, i.e. during times when the system is underutilized – away from
17 existing system peaks, which enables greater system utilization and drives benefit
18 for all utility customers. Customers who choose to enroll in this program will receive
19 a \$500 rebate incentive at the time of enrollment. This helps to accelerate interest
20 and offset the cost of electrical installation the customer may require. Without 240
21 volt electrical service at the parking location, a typical driver will not be able to charge
22 their PEV entirely away from the system peak.

1 **Q. What advantages does I&M's proposal for home charging provide?**

2 A. This approach allows the following distinct advantages:

- 3 1. Eliminates the requirement for and cost of a new additional service;
- 4 2. Allows customer choice in charging hardware, using the device that may have
5 come with the vehicle or by purchasing one of the many third-party options
6 available;
- 7 3. Utilizes the only available equipment that has accuracy acceptable for billing
8 and also is compatible with I&M communication and billing systems;
- 9 4. Provides seamless integration with the existing I&M AMI meter
10 communication network;
- 11 5. Provides seamless integration with the existing I&M billing system;
- 12 6. Eliminates requirements for I&M customers to pay network fees to private
13 third-party hardware providers;
- 14 7. Provides accurate measurement information to customers for their
15 transportation electricity directly on their bill;
- 16 8. Utilizes meter hardware that can be calibrated and tested within I&M existing
17 programs and procedures; and
- 18 9. Provides the ability to study the accuracy and feasibility of potential future
19 measurement methods, such as household meter data end-use
20 disaggregation.

1 **Q. How does I&M’s proposal for home charging benefit all customers, and how**
 2 **much benefit per participant is projected?**

3 A. The I&M proposal establishes pricing incentives for residential and small commercial
 4 customers to use the scheduling technology in their PEVs, charging equipment, or
 5 associated smartphone apps to charge their PEV during the off-peak hours specified
 6 in the proposal. Importantly, it provides a \$500 rebate incentive for participating in the
 7 program which helps customers offset initial electrical costs that may be required to
 8 provide a dedicated 240V circuit. This dedicated circuit allows the PEV to charge
 9 entirely during the off-peak period. By helping customers who drive electric remove
 10 cost barriers to electrical installation and understand RS-PEV and GS-PEV off-peak
 11 incentives, all PEV charging can occur within the off-peak period, maximizing benefits
 12 to all I&M customers.

13 Figure JWL-3 provides a summary of the benefits to all I&M customers per
 14 residential and small commercial home charging participant, as provided in work
 15 paper JWL-2.

16 **Figure JWL–3**

IM Plugged In Summary of Benefits: Home Charging										
Year	1	2	3	4	5	6	7	8	9	10
Benefit To Participant	\$104	\$104	\$104	\$104	\$104	\$104	\$104	\$104	\$104	\$104
Benefit To All I&M Customers	\$108	\$108	\$108	\$108	\$108	\$108	\$108	\$108	\$108	\$108
Enrollment Incentive Cost	-\$500	-	-	-	-	-	-	-	-	-
Cumulative Total	-\$392	-\$284	-\$176	-\$68	\$40	\$148	\$256	\$364	\$472	\$579
TEN YEAR TOTAL BENEFIT TO ALL INDIANA MICHIGAN POWER CUSTOMERS:										\$579

1 **Q. What is I&M proposing for fleet and workplace charging?**

2 A. I&M is proposing a choice of incentives to offset some of the costs of establishing
3 charging infrastructure to support fleet and workplace PEVs. Please see Attachment
4 JWL-1 for full details on this component.

5 Employers and fleet managers are becoming more interested in electrifying
6 their fleets and helping their employees drive electric for many reasons, but are
7 finding equipment and installation costs that did not exist with conventional
8 combustion vehicles. These costs can become a barrier to choosing PEV options,
9 and may prevent these customers from adopting and operating PEVs that will provide
10 benefit to all I&M customers. I&M is proposing to provide these customers either a
11 \$250 per-port rebate or an increased revenue credit calculation period, whichever
12 the customer chooses. Both options help customers with charging infrastructure cost
13 barriers, and allow for customer flexibility and choice. As more vehicles are deployed
14 in these applications with the existing appropriate commercial rates, all I&M
15 customers benefit.

16 At this time it is not certain whether additional components are desired by
17 these customers. As the company works with these fleet and workplace charging
18 customers I&M will aggregate customer needs and preferences to consider for future
19 programs and/or filings.

20 **Q. How does I&M's proposal for fleet and workplace charging benefit all**
21 **customers?**

22 A. These customers have existing tariff options that align price signals with the needs
23 of the electrical system via demand and energy charges. This incents fleet and

1 energy managers to charge their fleet PEVs at times that improve system utilization
2 and ultimately benefit all I&M customers.

3 **Q. What is I&M proposing for MUD charging?**

4 A. I&M is proposing to offer a choice of incentives to encourage installation of PEV
5 charging facilities at MUDs. Please see Attachment JWL–1 for full details on this
6 component.

7 MUDs are an important home application to address, as they have the same
8 potential to provide benefits to all customers as residential and small commercial
9 charging, previously addressed above. However, these relatively new amenities are
10 difficult or impossible for facility owners to install within their existing electrical service.
11 Facility owners/operators have limited options that can all be very costly. I&M is
12 proposing to provide these customers either a \$250 per-port rebate or an increased
13 revenue credit calculation period, whichever the customer chooses. Both options
14 help customers overcome charging infrastructure cost barriers and allow for
15 customer flexibility and choice to assist owners/operators in adding this capability for
16 their tenants.

17 At this time it is not certain whether additional components are desired by
18 these customers. As the company works with these MUD owner/operator customers,
19 I&M will aggregate customer needs and preferences to consider for future programs
20 and/or filings.

21 **Q. How does I&M's proposal for MUD charging benefit all customers?**

22 A. If PEV charging facilities are not provided at MUDs, tenants who drive electric
23 vehicles will be unable to charge their PEV at home, overnight. This eliminates the

1 primary charging application that provides the most benefit for system utilization and
2 downward rate pressure, and vastly increases the probability that these vehicles will
3 charge at a time that coincides with system peaks, increasing system costs to I&M's
4 customers.

5 MUD owner/operator customers have existing tariff options that align price
6 signals with the needs of the electrical system. These existing tariffs, when coupled
7 with the installation of charging facilities the IM Plugged In Pilot Program will
8 encourage, incent facility owners/operators and tenants to charge their PEVs at times
9 that improve system utilization and ultimately benefit all I&M customers.

10 **CUSTOMER EDUCATION, TECHNICAL DEVELOPMENT,**
11 **AWARENESS, AND OUTREACH**

12 **Q. Please describe the importance of utility engagement with information and**
13 **awareness on PEV technology and use, and an overview of this expected**
14 **engagement.**

15 A. I&M's customers are similar to most consumers throughout the United States when
16 it comes to awareness of PEV technologies and their benefits, but can be expected
17 to be less informed than consumers in California due to the increased regional activity
18 on this topic for more than a decade. UC Davis found that as many as 80% of
19 Californians had no awareness of PEVs.¹⁷ This is a problem that I&M can help to
20 solve by engaging with our customers and communities.

21 I&M will create educational materials, including bill inserts, social media posts,
22 videos, and physical handouts. I&M also proposes to conduct a series of customer

¹⁷ UC Davis, "Automakers and Policymakers May be on a Path to Electric Vehicles; Consumers Aren't", available at: <https://its.ucdavis.edu/blog-post/automakers-policymakers-on-path-to-electric-vehicles-consumers-are-not/>

1 education workshops with local car dealerships explaining the pilot programs and
2 provide information that can be shared with individuals that are considering
3 purchasing a PEV.

4 Through this program, I&M will also work directly with commercial and
5 industrial customers to share the benefits of the commercial and industrial electric
6 fleet vehicle pilot program and workplace charging pilot program. I&M will provide
7 consultative services on evaluating charging infrastructure locations, conducting
8 financial analysis, potential employee programs, and an assessment of potential
9 environmental benefits.

10 The I&M EV education and technical development team will also actively
11 participate in industry discussions, working groups, relationships with auto
12 manufacturers, and leverage the work taking place across AEP to stay abreast of the
13 latest information on PEV adoption and best practices. This will allow I&M to provide
14 our customers access to highly valuable information as the industry evolves.
15 Additional details of the electric vehicle education and technical development
16 program are in Attachment JWL-1.

17 **INTERSTATE CORRIDOR CHARGING**

18 **Q. Please describe interstate corridor charging and its value.**

19 A. Interstate corridor charging describes PEV fast-charging equipment installed along
20 major highway corridors. This equipment enables drivers with battery electric
21 vehicles to travel long distances away from their home. This equipment is typically
22 not used by plug-in hybrid electric vehicles, as they would instead visit gas stations
23 along their driving route similar to conventional vehicles. Tesla has been a pioneer

1 of interstate corridor charging, which has enabled coast-to-coast electric long
2 distance travel for many years.¹⁸ The Tesla Supercharger network can only be used
3 by Tesla vehicles however, due to their proprietary connector.

4 Significant work is underway through the Volkswagen Settlement¹⁹ and
5 Electrify America,²⁰ but long distance electric travel for non-Tesla vehicles is still quite
6 limited. To date, this equipment is not sufficiently installed along corridors because
7 the business case is extremely challenged: equipment and installation are very
8 expensive, and an already low utilization case (long distance travel) is compounded
9 by the current environment of relatively low PEV adoption.

10 Interstate corridor PEV charging may be an important area for electric utilities,
11 I&M included, to engage in to provide consumers with a solution faster than the
12 market may otherwise address. The comparatively long investment horizons, low
13 return threshold, highly localized grid capacity requirements, and reliable service and
14 presence within local communities makes I&M uniquely well suited to execute on
15 behalf of our customers and communities. I&M will continue to evaluate the market
16 and this application to consider possible future programs and/or filings.

17 **I&M ACTIVITIES**

18 **Q. Please describe activities I&M is undertaking in this area.**

19 A. I&M has been collaborating with the Indiana Energy Association, Indiana Department
20 of Environmental Management, and all stakeholders including other electric utilities

¹⁸ Tesla, "Find Us | Tesla", available at: <https://www.tesla.com/findus?v=2&bounds=46.2881684085389%2C-71.08494227938075%2C34.18232538319406%2C-105.95554774813075&zoom=6&filters=supercharger>

¹⁹ U.S. EPA, "Volkswagen Clean Air Act Civil Settlement", available at: <https://www.epa.gov/enforcement/volkswagen-clean-air-act-civil-settlement>

²⁰ Electrify America, "Locate a Charger", available at: <https://www.electrifyamerica.com/locate-charger>

1 since 2017 to assist in refining the framework of the Indiana Beneficiary Mitigation
2 Plan, related to the Volkswagen Mitigation Trust.²¹ The company will continue to stay
3 engaged in this project and collaborate with stakeholders in the interest of achieving
4 a successful project for the communities within Indiana as well as I&M customers.

5 I&M is evaluating company fleet vehicles for opportunities to reduce our fleet
6 transportation costs by driving PEVs. As of the date of this filing, one vehicle has
7 been deployed, with many additional opportunities currently under consideration.
8 This effort is helping to uncover barriers and difficulties that all fleet managers face,
9 and allowing I&M to provide information that will help our customers better
10 understand their options, benefits, and impacts.

11 The company is also analyzing our facilities to determine where to deploy
12 workplace charging – AEPSC has installed large-scale load management workplace
13 charging pilots, and learnings from this effort have informed our approach, and will
14 also provide valuable lessons and guidance for our customers.

15 In addition, I&M has participated in multiple community events that help bring
16 awareness to electric transportation technologies, how they are used, and what they
17 mean for our customers and communities.

18 **Q. Does this conclude your pre-filed verified direct testimony?**

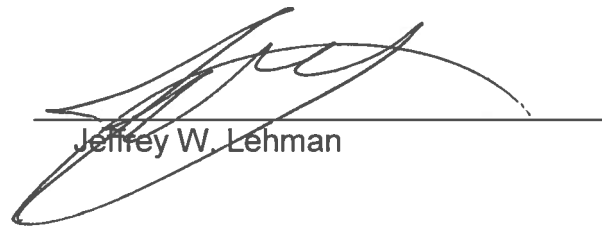
19 **A.** Yes.

²¹ Indiana Department of Environmental Management, “IDEM OAQ: Volkswagen Mitigation Trust”, available at: <https://www.in.gov/idem/airquality/2712.htm>

VERIFICATION

I, Jeffrey W. Lehman, Electric Transportation Program Manager for American Electric Power Service Corporation (AEPSC), affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information, and belief.

Date: MAY 9, 2019



Jeffrey W. Lehman



INDIANA MICHIGAN POWER IM PLUGGED IN PILOT PROGRAM DETAILS

Residential and Small Commercial Plug-In Electric Vehicle Charging Pilot

Summary:

I&M is proposing a three-year pilot program (2020 – 2022) for residential and small commercial customers in good standing. The purpose of the program is to encourage the adoption of electric vehicles by promoting charging behaviors that allow I&M to integrate the increased electric usage in a way that benefits all customers.

Details:

Rebate

Under I&M's Residential and Small Commercial three-year pilot program, I&M would provide up to 1,000 customers per year a \$500 rebate to offset wiring and charger costs. There would be a limit of one rebate per customer and premise during the term of the three-year pilot. In order to be eligible for the rebate, the customer must provide proof of purchase of a qualified plug-in electric vehicle with a purchase date after the start of the three-year pilot.

Metering

For customers enrolled in the three-year pilot program, I&M would install a separate AMI meter specifically for the electric vehicle load.

Tariff

I&M is proposing a new tariff that would be for the load associated with the meter installed specifically for the electric vehicle charger. To encourage the optimal charging behavior from a system perspective, the load associated with the electric vehicle would be eligible for an effective rate of \$0.0725/kwh for all charging that takes place between 11:00PM and 6:00AM.



Multi-Unit Dwelling Plug-In Electric Vehicle Charging Pilot

Summary:

I&M is proposing a three-year pilot program (2020 – 2022) for commercial customers who own and operate multi-unit dwelling facilities in good standing. The purpose of the program is to encourage the adoption of electric vehicles by promoting charging behaviors that allow I&M to integrate the increased electric usage in a way that benefits all customers.

Details:

Incentive Options

Under I&M's Multi-Unit Dwelling three-year pilot program, I&M would provide up to 100 customers per year the opportunity to take advantage of one of two incentive options to offset some of the costs of establishing plug-in electric vehicle charging systems for their tenants. The incentive options include:

- \$250 rebate per port installed: This option requires a separate meter, either individually or for a bank of chargers; OR
- Reduction in amount of Contribution in Aid of Construction (CIAC) by increasing the revenue credit, currently set at 2.5 times the estimated annual revenue, to 5 (five) times the annual revenue.

Eligibility

Commercial customers who own and operate multi-unit dwelling facilities in good standing are eligible to submit one application per year.

Customers would be required to submit their system design, including equipment selection and electrical design, for I&M review to collaborate on best practices and take advantage of shared lessons learned through the pilot program.

I&M reserves the right to review and approve all applications based on the availability of the program, the program design, the ability to install the appropriate infrastructure, or the cost effectiveness of the proposed design.



Commercial and Industrial Fleet and Workplace Plug-In Electric Vehicle Charging Pilot

Summary:

I&M is proposing a three-year pilot program (2020 – 2022) for commercial and industrial customers in good standing. The purpose of the program is to encourage the adoption of electric vehicles by promoting charging behaviors that allow I&M to integrate the increased electric usage in a way that benefits all customers.

Details:

Incentive Options

Under I&M's Commercial and Industrial three-year pilot program, I&M would provide up to 100 customers per year the opportunity to take advantage of one of two incentive options to offset some of the costs of establishing a fleet of plug-in electric vehicles.

The incentive options include:

- \$250 rebate per port installed: This option requires a separate meter, either individually or for a bank of chargers; OR
- Reduction in amount of Contribution in Aid of Construction (CIAC) by increasing the revenue credit, currently set at 2.5 times the estimated annual revenue, to 5 (five) times the annual revenue.

Eligibility

Commercial and Industrial customers in good standing are eligible to submit one application per year.

Plug-in electric fleet vehicles for the purposes of this pilot program are not limited to the light-duty passenger vehicle segment.

Customers would be required to submit their system design, including equipment selection and electrical design, for I&M review to collaborate on best practices and take advantage of shared lessons learned through the pilot program.

I&M reserves the right to review and approve all applications based on the availability of the program, the program design, the ability to install the appropriate infrastructure, or the cost effectiveness of the proposed design.



Electric Vehicle Education and Technical Development

Summary:

I&M will work with customers to increase awareness and knowledge of electric vehicles in general and I&M's proposed pilot programs specifically.

Details:

Customer Education and Awareness

I&M will create educational materials, including bill inserts, social media posts, videos, and physical handouts focused on the increasing awareness of electric vehicles. I&M will also conduct a series of customer education workshops with the sales teams at local car dealerships throughout the I&M service area to explain the I&M pilot programs.

I&M's dedicated electric vehicle resources will also work directly with I&M's commercial and industrial customers to share the benefits of the commercial and industrial electric fleet vehicle pilot program and workplace charging pilot program. I&M will provide resources to these customers in designing their program, conducting financial analysis, evaluating environmental benefits, and communicating industry best practices.

EV Industry Engagement

I&M will also be actively engaged in industry discussions, regulatory working groups, benchmarking with other utilities, and will leverage the work across AEP to stay abreast of the latest information on electric vehicle industry adoption and best practices. This will allow I&M to provide our customers with access to highly valuable information in an evolving industry.