

Meeting 3: drivers' experience
Thursday, June 22, 2023 | 1–3:30 p.m.
via Zoom

EVICC members or designees present

- **Mike Judge**, Undersecretary, Executive Office of Energy and Environmental Affairs (chair)
- **State Senator Mike Barrett**, Chair, Joint Committee on Telecommunications, Energy, and Utilities
- **Eric Bourassa**, Director, Transportation Division, Metropolitan Area Planning Council
- **Brian Ferrarese**, Assistant Commissioner of Operations and Environmental Compliance, Department of Environmental Protection
- **Sean Donaghy**, Manager of Energy Programs, Massachusetts Bay Transit Authority
- **Cobi Frongillo** for State Representative Jeff Roy, Chair, Joint Committee on Telecommunications, Utilities, and Energy
- **Caleb Oakes** for State Representative Jeff Roy, Chair, Joint Committee on Telecommunications, Utilities, and Energy
- **Staci Rubin**, Commissioner, Department of Public Utilities
- **Aurora Edington**, Electric Grid Policy Manager, Department of Energy Resources
- **Layla D'Emilia**, Undersecretary, Office of Consumer Affairs and Business Regulation, Division of Standards
- **Hayes Morrison**, Assistant Secretary, Policy and Strategy, Transportation and Infrastructure Division, Massachusetts Department of Transportation

Additional attendees and presenters

- **Bill Ehrlich**, Senior Policy Advisor for North America Charging Policy and Rates, Tesla
- **Richard Ezike**, Program Communication Specialist, Joint Office on Energy and Transportation
- **Asa Hopkins**, Vice President, Synapse
- **Anna Vanderspek**, Electric Vehicle Program Director, Green Energy Consumers Alliance
- **Daniel Gatti**, Director of Clean Transportation Policy, Executive Office of Energy and Environmental Affairs
- **Jennifer Haugh**, Vice President of Planning and Customer Engagement, GreenerU
- **Daniela Miranda**, Project Coordinator, GreenerU
- **Sharon Weber**, Deputy Division Director, Air and Climate Programs, MassDEP
- **Alison Felix**, Senior Transportation Planner and Emerging Technologies Specialist, Metropolitan Area Planning Council

Meeting resources

- [EVICC website](#)
- [EVICC contact information](#)
- [EVICC data needs](#)
- [Summary of state and federal EV charging station programs](#)

Meeting goals

- Approve meeting minutes from June 1 meeting
- Provide a brief update on baseline data collection efforts
- Briefly go over findings on driver experience data
- Provide an overview of the challenges and solutions to improve charging station uptime and reliability
- Provide time for public discussion / comment

Meeting agenda

1. **Call to order:**

1. Judge called the meeting to order at 1:04 p.m.
2. **Review of meeting agenda / attendance**
 1. Judge went over the meeting agenda.
3. **Review and approve meeting minutes of June 1, 2023**
 1. Weber proposed the following changes to the minutes of June 1, 2023:
 1. Under EVICC members: Sharon Weber and Christine Kirby attended on behalf of Brian Ferrarese
 2. Additional stakeholders: Sharon Weber, Deputy Division Director, Air and Climate Programs, MassDEP; Christine Kirby, Assistant Commissioner, Bureau of Air and Waste, MassDEP
 3. 3.a.iii. Change to MassDEP
 4. 4.g.i. Weber's notes are different: "Donaghy noted that MBTA will triple load, mostly overnight charging, so not peak. MBTA also a wholesale utility themselves. V2G feasibility study thru MassCEC grant, but already a struggle to meet route blocks, have had to shorten route blocks to equal battery capacity. Trying to stay away from V2G now because a bus needs to be charging from the moment the bus parks to when it leaves. Maybe a small amount of V2G capacity would be available in shoulder months, but that's not when it would help. The L1s went from MBTA's distribution system and MBTA's high voltage electrical room, but can't give the EVSE maintenance contract immediate access to cycling the system: take months or years to get on MBTA electrician's schedule to cycle system. So, better to connect to the Eversource grid, not the MBTA grid."
 5. 6.a.iii Change to "Weber questioned, 'why are we limiting ourselves to public chargers?' and that MassDEP posts reports online of public and non-public chargers funded through MassDEP's MassEVIP. Chargers that are not funded by MassDEP or through utilities (non-public) would be difficult to determine."
 6. 6.b.i. Change to "Weber reminded that she provided links, including to light-duty vehicle regulations that have been adopted that require certain technology (e.g., a charging cord)."
 7. 7.c.: Change to:
 1. Gold stated that they need to subtract third-party funding from the make ready funding. Now applicants are required to apply for MassEVIP.
 2. Judge asked whether applicants would receive more than their costs if they got MassEVIP.
 1. Weber responded that this would not happen because MassDEP receives invoices and does not fund more than the actual costs.
 2. Gold added that the utility and MassEVIP teams coordinate, so as not to pay more than the total cost.
 3. Sondhi stated that National Grid would love to be able to fund the entire cost of the project with no out-of-pocket costs for the municipalities and that unfortunately, due to this new policy, National Grid is required to subtract the MassEVIP grant before giving out a utility-side grant.
 4. Gold also stated that all utility applicants are required to apply to MassEVIP and that if applicants choose not to move forward as a MassEVIP eligible applicant, National Grid would still subtract what the MassEVIP funding would have been from the utility grant funding.
 8. 7.3.c.: Change EVIP to MassEVIP
 9. 10.a.iii. Change to MassDEP

4. **Presentation: Synapse—Update on EVI Demand Modeling**, prepared by Asa Hopkins, Reid Haefer (RSG), and James Tamerius (CSE)
 1. Asa Hopkins is the lead on the analysis team doing a deeper dive into some of the EV charging information. He prepared and shared some preliminary results.
 2. Travel analysis:
 1. Start with current traffic volumes (annual average daily traffic and locations with continuous monitoring) to understand where peak travel conditions are in the state (traffic count analysis). This gives a sense of average traffic conditions and when combined with growth trends, you get a sense of future traffic volumes, which can then help predict best locations for chargers.
 2. Hopkins shared a graphic analysis of 2030 forecasted average roadway volumes. There will likely be a different picture depending on the seasonality of travel. Hopkins requested that MassDOT work with Synapse et al. to share data.
 3. Charging infrastructure demand:
 1. As of 2022, Massachusetts had approximately 66,000 EVs. By 2030, approximately 980,000 EVs are anticipated (15 times today's number). Thus, the analysis is to determine what is needed for charging. The majority of chargers will be Level 2 at single-family homes. For public charging ports, we will need approximately seven times more Level 2s and 15 times more DCFCs. EVI Pro Lite has different recommendations for today's number, but the numbers aren't too different (30,000 vs. 35,000 Level 2, 2,000 vs. 637 DCFC). Some factors that may affect these numbers relate to behavior and the technical capabilities (range) of future EVs. Note that California and Norway each have a lower ratio of DCFCs per EV, so the current number is probably closer to being on track. That said, it's important to think about infrastructure staying ahead of adoption. Another data point to remember is NEVI recommends far fewer DCFCs than the 10,000 recommended.
 2. Factors driving EVI locations: see slide 9.
 1. Important considerations: where new cars will "live" (where they spend the night), multi-family vs. single-family homes and observed market behavior.
 2. Other adjustments: where people work and how they get there, public charging, proximity to highways, etc.
 3. Slide 10 shows a map of population density of single-family homes in Massachusetts.
 4. Slide 11 shows a similar map of multi-family housing.
 5. Slide 12 shows a map of workplaces in Massachusetts.
 6. Slide 13 shows retail, roads with higher levels of travel, and where public Level 2 charging is. Slide 14 shows where DCFC ports are located.
 4. Next steps
 1. Refine EVI demand and locations; create a detailed assessment of long-distance travel for DCFC demand; understand grid impacts of different EVI distributions, including Level 2 vs. DCFC and DCFC in more small groups vs. fewer larger concentrations; and policy recommendations and business model evaluation.
 2. Hoping to get the council's insights on policy recommendations.
 5. Judge is interested to see how this data might inform the GMAC and identify where clusters of charging are going to be within the distribution system as this information will be useful to utilities, the council, and the DPU. Judge stated how the council wants to make sure that the utilities take this into account if they are going to make major upgrades.
 6. Gatti invited people to share any things that the group would like this analysis team to be thinking about.
 7. Frongillo suggested that Caleb Oakes replace Frongillo. Frongillo states that when considering and predicting future growth, we need to look at the potential for a change-development pattern and that MBTA communities come to mind. Frongillo used the example of building more housing near transit, to explain that fewer vehicle miles traveled. Frongillo asked whether there is a way to model out what happens if there's a different transit-oriented pattern.

1. Hopkins shared another slide on VisionEval that breaks the example state into different regions, factoring in employment and population changes. Hopkins states that Synapse has not figured out how to downscale the weight of downtown Boston and that changes of a few percent don't make a big difference in some of these respects—some people may commute more by transit, but if they still have a car, they're still going to park and drive it somewhere. Hopkins added that a way to consider transit is the error bars on the port count numbers (slide 7), which could be swamped with growth. Ultimately, Hopkins doesn't think any plan that will be so precise that we'll have 7 vs. 10 chargers, rather there will be on-the-ground considerations, and that it's best to think about which things will be the largest effects vs. small and be informative about that.
 8. Edington echoed Judge's thoughts and reminded the Council of GMAC's September 1 deadline of recommendations which includes a draft outline on the GMAC website with electric demand forecasts including EV assumptions. Edington is considering doing a cross analysis of the forecasts and numbers Synapse is seeing vs. what the EDCs are looking into for distribution planning processes. She pointed out the hex shapes: do you have a sense right now of what level of data would be available at the end of this research? Hopkins responded that there is geographic data with the model. Edington is curious if there's a way to use some of the hex level data with distribution feeders and something of that nature. Hopkins responded that deliverables include giving broad GIS output for that data; each hex shape has granular data. Hopkins finished by saying that National Grid shared data that would be helpful in reviewing the impact of charging stations on the grid so that we can identify T&D challenges.
 9. Edington asked whether this analysis considers fleet charging? Hopkins responded that the analysis does not consider medium to heavy-duty fleet charging questions as that is driven by very different drivers, e.g., what is going on with delivery and long-haul trucking is not related to the same kinds of questions that are driving light-duty demand. Hopkins stated that Synapse may be able to say some general things on that front.
 10. Sen. Barrett raised the question about primary constraints or drivers in deciding where chargers go, stating that the subtext seems to be that the primary determinant ought to be the need or demand. They asked whether the primary factor is the grid (grid significantly limits the amount of attention paid to traffic patterns and demand) and what ultimately drives citing considerations on the distribution level? Hopkins responded that Synapse's analysis is based on drivers and demand and the grid is part of the equation. Barrett asked where a third factor that could loom just as importantly as the grid availability. Hopkins responded that the driver is the primary driver and the grid is a known secondary factor (no other factor has been identified). Hopkins said that because cars are taking up space now, land availability has not been a key factor and that Synapse might uncover other factors.
 11. Judge emphasized that this process is trying to establish a process to address the needs of drivers and there are going to be situations where constraints will arise when trying to bring charging infrastructure to different areas. Judge reminded everyone that the council hopes to limit where we run into those challenges.
5. **Presentation: GreenerU research on drivers' experience**
1. See slide deck
6. **Presentation and discussion:**
1. Anna Vanderspek, Green Energy Consumers Alliance
 1. GECA has run a program called Drive Green since 2016, which has helped EV sales and made presentations across the state for consumers.
 2. Slide 4 summarizes how there is a learning curve with EV charging and that to comfortably drive an EV, there must be an understanding of levels, charging standards, and what you can install at home, how, where and how you can find public charging, costs, etc.

3. Slide 5: public charging is a big concern until you're able to charge at home—BUT it's harder for folks who don't own their own home or don't have off-street charging. But in more evolved markets than Massachusetts, there is more anticipation of public needs and regular adjustments. Charging at home is the cheapest and most convenient when it's possible.
 4. Slide 6 discusses accessibility of charging and the challenges renters face. When you don't own your own home, you need to persuade other decision-makers to install charging. Incentives are good, but it's not enough to overcome inertia. On-street parking poses a number of challenges.
 5. Slide 7 highlights how public charging can be challenging to find—it can be tough to navigate the brands of charging stations, apps, etc. Non-smart phone users can have a difficult time using charging stations and EVSEs can be difficult to find if you haven't identified one before.
 6. Slide 8 discusses locations of chargers, safety measures, accessibility to restrooms and businesses to occupy time. There's a distinction between Level 2 vs. DCFC.
 7. Slide 9 covers the pricing for parking vs. charging itself—both could be free or have a flat or per-hour or per kWh charge. Consumers may not understand what kWhs are.
 8. Slide 10 covers the reliability of stations and that DCFCs are frequently reported as unreliable. The slide also asks whose responsibility is it to fix stations?
 9. Slide 11 states that EV drivers want smarter rates and the specificity of off-peak demand.
 10. Slide 12 discusses the North American Charging Standard (GM/Ford partnerships with Tesla) and how it fundamentally shakes everything up.
2. Bill Ehrlich, Tesla
1. There are different types of charging: supercharging, destination (Level 2), and residential. For this conversation, we're focused primarily on public and residential for light-duty vehicles.
 2. The Tesla network began about ten years ago, but has accelerated in the past couple of years. It's getting easier to drive to more places.
 3. The supercharger network is there to help you feel like you're driving anywhere and not feel like you're driving an EV. PlugShare is also a convenient third-party platform that aggregates different networks. What Tesla has done well is focus on the EV driver experience and convenience of driving an EV.
 4. There are three main aspects to reliability: site design, service and maintenance, and customer communication. If you own and operate EV chargers, you shouldn't need an incentive or punishment to maintain chargers. When you own and operate chargers, you should be motivated to keep them operating and as reliable as possible.
 1. **Site design is a big one**—the more chargers per site, the better experience EV drivers will have and it will help mitigate the unavoidable circumstances of downtime.
 2. **Site-level reliability** is what's most important, as that's what drivers will experience. At Tesla, there are crews whose full-time job is to go out and fix and maintain chargers. In addition to corrective maintenance, there's often an annual check-up.
 3. **Customer communication**—giving real-time updates to drivers when a site or port is down. If a site is down or in need of maintenance, that is communicated through the in-vehicle app and phone app to reduce frustration, increase transparency, and improve customer satisfaction.
 5. Tesla's primary driver: their people care and want the EV driver experience to be a positive one. Tesla prioritizes the customer experience above all else.
 6. Ehrlich recommends that reliability reporting requirements not be too onerous or administratively burdensome. The hope is that those owning and operating sites are

motivated to keep them in working order.

3. Layla D’Emilia, Office of Consumer Affairs and Business Regulation, Division of Standards
 1. Slide 3: review of regulatory agencies within OCABR
 2. DOS is empowered by statute to annually test all weighing and measuring devices used in commerce.
 3. Slide 5: D’Emilia went over the regulatory language for registration, inspection, compliance, and enforcement for EV chargers—but the DOS will need statute updates and resources to meet this new legal affirmative obligation. Shared that after 9 p.m. the rates are lower in Raynham.
 4. Julia Gold, National Grid, shared that National Grid offers an off-peak charging program.
4. Richard Ezike, Joint Office of Energy and Transportation—Presentation: Building a Future Where Everyone Can Ride and Drive Electric and Reliably
 1. The Joint Office was established in late 2021 with nine areas of emphasis, with the top area of support being providing technical assistance for zero-emission vehicle charging and refueling infrastructure.
 2. Slide 4: supports four programs: NEVI, Charging and Fueling Infrastructure Discretionary Grant Program, Low or No Emission, school bus program
 3. NEVI formula program guidance:
 1. That EV charging stations are installed every 50 highway miles and within 1 travel mile of the highway or interstate
 2. Each state is asked to submit their updates
 4. Minimum standards:
 1. Predictable and reliable; working when drivers need them; drivers can easily find them; can use just one app; and chargers continue to support drivers’ needs well into the future
 5. The CFI program made \$700 million available in FY22 and FY23; corridor grant program and community grant program. Localities, states, municipalities, tribes, government entities can apply. Applications are now open and winners should be announced in November.
 6. Technical assistance strategies
 7. Improving the reliability of fast charging
 1. Poor DCFC reliability is an existential threat to the EV industry. This is an opportunity for the JO to help the industry to help measure, improve, and maintain reliability; ensure interoperability; and improve the charging experience.
 2. Three ways: simplify the ecosystem; facilitate reliability standards, data collection, and sharing (share best practices); create game changers and shortcuts (taking advantage of national labs and select contractors).
 3. To improve something, you must be able to measure it.
 4. How we’re going to get there: simplify, provide solutions and shortcuts, and use data and certification.
 5. ChargeX Consortium is led by Idaho National Laboratory, Argonne National Laboratory, and NREL, with a couple dozen committed organizations made up of a range of players from utilities, automakers, and other EV-related manufacturers.
 6. ChargeX helps to simplify the charging ecosystem by mapping minimum standards to the charging ecosystem.
 8. Visit DriveElectric.gov for more information.

7. Questions for discussion:

1. What can we do to ensure the reliability of charging infrastructure?

2. What regulations may be useful to put in place for charging services?
3. What other entities, if any, have regulatory language we can use as a starting point (e.g., gas stations)?
4. What are common issues EV drivers experience that may be barriers to adoption?
5. What standards should we apply for registration, inspection (annual?), and compliance (spot checks)?
6. How might the recent GM/Ford agreement with Tesla affect EV charging reliability, accessibility, and costs?
7. Discussion:
 1. Judge stated that the Division is responsible for identifying where the gaps are, meaning that testing equipment will be needed, which could be provided through the \$50 million from the legislation. Judge asked the question: what do we need for the ongoing operating budget, what type of staff do we need, and what other statutory authority or new regulations are needed?
 2. D'Emilia spoke to the work of the Division of Standards (DOS) saying that everything is moving very fast and that some of the statutory language could be informed by the State of Washington such as (a) registering the device for possibly a \$20–40 fee, depending on the type of commercial EV charger. D'Emilia suggested a legacy period so there's a runway for compliance, allowing the division to figure out for example: how long it takes to do an EV charger inspection, where they are in the state, what it looks like for staffing needs, fining authority (scope and specifics), requiring that all commercial EVs use the same connectors that can fit any electrical vehicle to create a universal system for commercial charging capabilities. D'Emilia added that Washington has also addressed updates to pricing, fees and taxes disclosure, signage, overhead signage, multiple payment methods availability, not requiring membership all of which related to consumer protection. Testing equipment is a device of about \$60K–\$80K with training required. There are inspectors at DOS, but these would be done by electricians which DOS currently does not have on staff since this testing is electrical.
 3. Judge asked if any registration fee or fines get put back into the general fund?
 1. D'Emilia responded that there are ways to create an account to fund the division's work and that we should work with the Legislature.
 2. Gatti added that we could find initial grant funding from our pot, but we will want to find a sustainable source.
 4. Edington highlighted the issue of charger outages (specifically with DCFCs) and the extent of problems that are related to Level 2 and Level 1. She is curious if Vanderspek could speak to whether there are complaints about at-home charging infrastructure because there are fewer users. (Vanderspek reported that she has not heard any complaints about at-home charging.) Not just understanding baseline data, but speaking to O&M protocols; Tesla manages their own, but are other groups doing that?
 5. Bourassa stated the importance of understanding the business model of EVSE, the timeline for charging to be profitable, and the role of government in subsidizing infrastructure and pricing. Gatti agreed—we're going to want these chargers to need more O&M work than what the state government can provide.
 6. Gatti raised the question of how charging is profitable and asked how Tesla profits (aside from auto sales). Gatti asked Ehrlich: Do you have thoughts about business models for DCFC uptime and reliability?
 1. Ehrlich responded to Bourassa stating that the business model has been an important question considering stations cannot dictate utility rates. Ehrlich summarized how making EV charging rates and mitigating demands coupled with a utilization factor allows stations to be financially sustainable. Rates and usage are key to financial viability. Ehrlich finished by stating that O&M plays a key role in operating public DCFCs and that owning and maintaining chargers inhouse allows for better control and easier scalability.

7. Gatti followed up with: where is your range of load factor, and are you right now seeing the charging aspect of your business as intended to be financially sustainable on its own, or are you looking to be subsidizing it?
 1. Ehrlich responded saying the network needs to be sustainable and that Tesla hopes to 3X the network. Ehrlich explained that Tesla is currently investing any revenue in expanding its charging network. Ehrlich stated that he would need to find and confirm a public number for the load factor and that in general the average network increases over time in the DCFC business model.
8. Judge asked: how much do you think the new commercial rates put into effect for DCFC in Mass will help in the interim here?
 1. Ehrlich responded saying that the utility rates are critically important as knowing up-front costs and the price of electricity per kWh allows servicers to price out charging at a reasonable rate while also operating financially sustainable chargers. Knowing these costs allows servicers to not sell electricity at a loss.
9. Gatti: asked whether the next CCS will play an important role in EV charger reliability and whether any challenges are anticipated as Tesla starts to expand for other vehicle types?
 1. Ehrlich spoke about how the Tesla network is open to non-Tesla EVs in Europe and that it appears to be going well. Ehrlich reiterated that testing needs to be done to ensure that it works for other vehicles. Ehrlich also spoke about CCS vs NACS standards saying that simple design aspects are advantageous—e.g., it doesn't have the latch that can get broken, and the pin actually comes from the car to lock the charger—that may slightly increase reliability. Ehrlich finished by clarifying that maintenance and the timing of repairs have a greater impact on reliability rather than the type of charger used (CCS vs NACS) – upkeep and repairing broken chargers play a larger role in reliability than anything else.

8. Public comment / Q&A

1. James Penfold, ReVision Energy asked Ehrlich: at 20%+ to achieve financial sustainability, once you get there, you get a time of the day where it's a peak rush hour. At that point, you end up having to invest in more ports. You drive by, most superchargers are empty most of the day, but at peak times, there's enough ports there to sustain it. In California, we're seeing some lines. Any thoughts on at what point to invest in more ports, which impacts the financial sustainability?
 1. Ehrlich responded that the 20% is a rule of thumb—a rough number—it's the point where people are using the station. He continued by discussing the financials as a function of three things: utility rate, usage, price; as well as the upfront cost, capital investment, and O&M. Ehrlich also touched upon utilities and that some utility rates take a load factor tranche model where the 15-30% load factor looks more like a regular commercial customer which is still a low load factor for a commercial customer, but you're not necessarily seeing the same sort of punitive electricity rate that you would see at a really low load factor when you're paying demand charges. Ehrlich finished by stating that load factor depends on how big the site is—30-charger sites will instill more confidence than a two-charger site and that adding ports is a function of how many waiters there are and for how long.

9. Meeting wrap-up / adjourn

1. Next meeting is June 29, 2023, 1–3:30 p.m. with the topic of transmission, distribution, financing, etc.
2. We will also be aiming to share an outline of the initial assessment and identify who among the Council should be tasked with writing which section. The goal is to have a draft assessment completed in advance of the first meeting in August to dig in to identify gaps, issues, and edits.

Then we will finalize the initial assessment in our final meeting. We are still lining up speakers for next week, but we're looking forward to reconvening then.

3. D'Emilia moved to adjourn; Rubin seconded. Judge read the roll call:
 1. D'Emilia: yes
 2. Rubin: yes
 3. Edington: yes
 4. Ferrarese: yes
 5. Morrison: yes
 6. Oakes: yes
 7. Barrett: yes

The meeting adjourned at 3:18 p.m.

Respectfully submitted,
GreenerU