# Meeting Notes: Bidirectional EV Working Group – Meeting 5 – Incentive Structure

**Date:** May 29, 2026 | **Time:** 9:00 AM ET

On May 29, 2026, Customized Energy Solutions (CES) facilitated the fifth meeting of the Bidirectional EV Working Group (Bidirectional EV WG). The meeting was held via Microsoft Teams. This memo summarizes the major topics of discussion, questions, and comments raised by participants.

## 1 Current ESS Structure

CES opened the meeting by orienting participants to the existing incentive structure within the Energy Storage Solutions (ESS) Program, framing it as necessary context for the meeting's primary focus on incentive design for bidirectional EVs.

CES explained that, for the majority of the program's history, the ESS incentive structure consisted of two main component. First, a performance-based incentive, paid based on average kilowatts discharged during active events throughout the given season. Resources were not penalized for non-participation in any given active event but received no compensation for events in which they did not discharge.

Second, an upfront incentive, denominated in dollars per kilowatt hour of installed capacity, accompanied by an obligation to dispatch at least 80% of nameplate kilowatt hours over the course of passive events (occurring every non-holiday weekday during the summer season). Resources failing to meet this threshold could be subject to clawbacks of portions of the upfront incentive. Under this legacy construct, total compensation was relatively evenly split between the upfront and performance components over the ten-year participation period.

CES noted that this structure changed significantly with the Year 5 Final Decision issued by the Public Utilities Regulatory Authority (PURA), which introduced what the program documentation refers to as "Construct 5." The primary change under Construct 5 was a substantial shift in total compensation away from the upfront incentive (referred to as the "enrollment incentive" in Construct 5) and toward the performance-based incentive.

Under Construct 5, the enrollment incentive remains available in some cases, particularly for residential customers and certain priority C&I customers, but at substantially more modest values than under the legacy construct. For non-priority commercial customers, there is no enrollment incentive. Performance incentive rates are substantially higher than under the legacy construct and continue to be based on average discharge during active events.

A participant asked CES to clarify the Grid Edge customer designation. CES confirmed that Grid Edge eligibility is based on whether the customer falls within the top decile of their circuit for frequency or duration of outages.

# 2 Benefit-Cost Analysis Framework

CES provided background on the benefit-cost analysis (BCA) framework used to evaluate the ESS program. CES explained that this context is important for understanding what benefits the program is designed to deliver as well as how incentive levels are assessed and calibrated by PURA.

## 2.1 Test Perspectives

CES described the range of BCA test perspectives used in Connecticut, highlighting two in particular: the Participant Cost Test (PCT) and the Ratepayer Impact Measure (RIM).

The PCT evaluates program economics from the perspective of the project owner or participant, assessing whether available incentives and other benefits are sufficient to offset system costs. A PCT ratio of 1.0 is a key threshold: a ratio below 1 suggests the incentive may be insufficient to make projects financially viable, while a ratio substantially above 1 may signal that the incentive is more generous than necessary.

The RIM evaluates the effect of the program on non-participant ratepayers. The primary cost under the RIM is the incentive itself, which must ultimately be recovered from ratepayers, while the primary benefits are avoided costs experienced by ratepayers (such as reduced capacity and transmission costs). PURA has traditionally used a RIM threshold of 1.4, meaning the benefits to non-participants should exceed costs by at least that margin.

CES noted the fundamental trade-off between the two tests: reducing incentive levels improves the RIM (lower costs to ratepayers) while reducing the PCT (lower compensation to participants), and vice versa. A participant observed that this trade-off is not fully symmetrical, as incentive levels also affect the level of participation and, by extension, the magnitude of grid benefits actually delivered.

## 2.2 Benefit Drivers

CES noted that the vast majority of ESS program benefits are denominated in kilowatts or megawatts and fall into three primary categories. The first is avoided generation capacity, reducing the total capacity that needs to be procured in ISO New England and Connecticut's share of those costs. The second is demand reduction induced price effects (DRIPE), or reductions in coincident peak demand that lower the marginal clearing price for capacity, benefiting all ratepayers. The third is transmission and distribution (T&D) value, consisting of consistent demand reductions that defer or avoid investments in the distribution and transmission systems.

A participant asked CES to confirm that benefit values are derived from the Avoided Energy and Supply Cost (AESC) study conducted by Synapse Energy Economics for New England states. CES confirmed.

## 2.3 Current Program Performance

CES briefly presented program-level benefit-cost results from the most recent annual report (filed August 2025, updated October 2025). Key observations included the following. At the overall program level, the PCT is hovering near 1.0 and the RIM is noticeably above the 1.4 target. Benefit-cost ratios are stronger for C&I participants than for residential participants; this difference is driven primarily by the lower per-unit cost of commercial systems, which allows for lower per-unit incentive levels while still maintaining favorable PCT ratios, whereas the higher system costs on the residential side result in a residential PCT below 1.0, even as overall program ratios remain within acceptable ranges. Despite a residential PCT below 1.0, residential participation remains robust.

# 3 Incremental Cost Framework for Bidirectional EVs

## 3.1 Incremental vs. Full System Costs

CES introduced the conceptual framework it is proposing for evaluating the economics of bidirectional EV participation in ESS. Unlike stationary storage, where the full system cost is attributable to the program because the battery's primary purpose is grid services (plus resiliency), an EV is primarily a transportation asset. The ability to provide grid services is a secondary benefit. CES proposed that the appropriate cost basis for evaluating bidirectional EV participation in ESS is the incremental cost of moving from a unidirectional EV to a fully V2G-capable system including EVSE – i.e., the costs that would not be incurred absent the desire to participate in ESS.

CES noted that this framing is the primary cost lens that would be applied in a participant cost test for bidirectional EV projects.

Participants generally endorsed the incremental cost framing, with several observations. A participant raised the concern that framing V2G capability as a peripheral or secondary use of the EV may inadvertently diminish its importance. The participant observed that an EV serves multiple purposes and none of these purposes is inherently more primary than others that incentives should be attractive enough to encourage customers to opt into V2G capability at the point of purchase. CES agreed with the broader intent, and noted that the ESS program is specifically designed to incentivize the grid services dimension of EV capabilities; it acknowledged that V2G-specific incentives within ESS should be attractive enough that a customer choosing between a unidirectional and bidirectional EV would see a meaningful financial rationale for choosing V2G capability – not that the program is designed to incentivize EV adoption broadly.

Another participant echoed this framing, describing the EV as both a form of clean transportation and a distributed energy resource (DER), with Connecticut programs providing incentives for each dimension separately. Another participant noted an asymmetry between stationary storage and EVs: with stationary storage, there is no additional behavioral ask of the customer beyond enrollment, whereas an EV owner must actively ensure their vehicle is parked and plugged in during dispatch events, which may warrant additional compensation beyond what the strict financial calculus would imply. CES agreed with this point and suggested it could be reflected in the analysis either as an additional incremental cost item, or by setting a PCT target slightly above 1.0 for bidirectional EVs (e.g., 1.1) to account for the behavioral friction not captured in purely financial terms.

A participant asked whether data exists on whether stationary storage customers are purchasing batteries specifically to participate in ESS, or whether they already had storage for other reasons; CES noted it has not conducted recent surveys on this question and acknowledged the data would likely differ between residential and commercial customers, and the participant noted that this matters because the program is currently asking customers to make an incremental purchasing decision specifically to access ESS, which is a different dynamic from participating with equipment they already own.

## 3.2 Cost Categories

CES identified several categories of incremental cost relevant to bidirectional EV participation. Incremental EVSE costs are the difference in cost between a standard, unidirectional charger and a bidirectional-capable EVSE; CES noted that for residential light-duty customers, illustrative figures are based on comparing the Wallbox Quasar 2 to a non-bidirectional equivalent, while for commercial applications preliminary figures suggest incremental costs of approximately $10,000–$15,000 for a Level 2, 30–40 kW commercial charger.

Interconnection costs are highly location-specific and subject to significant uncertainty, particularly on the commercial side, and CES acknowledged that very limited data specific to bidirectional applications is available. Labor and project management costs are associated with incremental project management, monitoring, and other upfront activities related to bidirectional capability. Charging costs may arise because increased cycling of the vehicle battery can lead to incremental electricity costs, though CES noted these are likely modest relative to overall charging costs, given that the number of full equivalent cycles attributable to ESS events is small compared to total vehicle usage. Battery degradation was assessed by CES as likely minimal in the context of ESS participation, citing estimates of approximately five equivalent full cycles per season attributable to ESS, compared to well over 100 equivalent cycles annually for a typical electric school bus or fleet vehicle, though CES noted these numbers are highly illustrative. Finally, customer friction is the behavioral cost associated with ensuring the vehicle is available and plugged in during dispatch events; CES discussed this as a potential cost category, acknowledging it has real financial dimensions (missed events, opportunity cost of constrained vehicle use) as well as non-financial ones.

A participant raised the issue of the number of ESS dispatch events and its relationship to both participation risk and compensation. CES noted that this is a genuine design question: more events reduce the risk that any single absence meaningfully reduces annual compensation, but also dilute the per-event compensation rate. CES cited the Connected Solutions program, which offers both a targeted pathway (approximately 3–8 events per year) and a daily pathway (approximately 30–60 events), with substantially different per-kilowatt compensation rates reflecting the different frequency of demand. A participant from Eversource Energy affirmed that program design should remain anchored in grid value: more events are not inherently better if they are less valuable to the grid, and PURA will focus on what the program is actually delivering.

## 3.3 Data Gaps and Sources

CES noted that available data on the incremental cost of bidirectional EV systems is extremely limited. Most cost data address the incremental cost of moving from an internal combustion engine (ICE) vehicle to an EV, but comparatively little addresses the move from a unidirectional EV to a V2G-capable system.

Participants identified several potential data sources and considerations. A participant noted that the Massachusetts Clean Energy Center (MassCEC) is funding a V2X pilot program involving approximately 80 deployments across residential and medium/heavy-duty (MHD) applications, which may yield relevant cost data; CES noted the tight timeline – the working group report must be filed by August 1, 2026, with a draft due by end of June – and asked whether any data might be available in time, and a participant that is enrolled in the MassCEC pilot indicated that while it has projects in the MassCEC pilot, installations are unlikely to be complete before approximately Q1 2027. A participant offered to share data on site-level costs associated with transitioning switchgear from unidirectional to bidirectional capability, noting that these hardware costs are a meaningful component of incremental project costs.

A participant raised the importance of specifying the reference point for incremental cost comparisons, as costs differ significantly depending on whether the bidirectional EVSE being evaluated is a first-generation product requiring a fundamental redesign versus a mature product that has been in production for some time; early bidirectional models reportedly carried cost premiums on the order of 30% or more due to the redesign required to integrate bidirectional components, whereas mature products would carry a smaller incremental premium.

A participant noted that economies of scale are a major factor on the commercial MHD side, with incremental costs looking very different on a per-port basis for a single-charger installation versus a 15-charger depot. Another participant noted that, for commercial MHD applications that require higher-power DC fast charging, the incremental cost of going from a unidirectional to a bidirectional DC fast charger is reportedly in the range of 10–30%.

# 4 Incentive Structure Design

## 4.1 General Framework

CES asked participants to share their views on how an incentive structure for bidirectional EVs should be designed, and specifically whether the current Construct 5 approach – a modest enrollment incentive paired with a substantially higher performance incentive – is an appropriate model for bidirectional EVs.

The discussion surfaced a range of perspectives, reflecting differences in stakeholder priorities and the varying characteristics of residential versus commercial MHD applications. Key themes included the following. Several participants, expressed support for an enrollment incentive with a performance component – a structure that combines a modest upfront (enrollment) incentive to help offset the incremental cost of bidirectional hardware with a substantial performance-based incentive; a participant noted that the upfront component helps customers overcome the incremental hardware cost at the point of purchase, while the performance component addresses the ongoing friction of making the vehicle available during dispatch events.

Several participants also emphasized the importance of ROI clarity, noting that regardless of incentive structure, the program must enable customers and project developers to clearly calculate their expected return on investment; one participant observed that uncertainty about future incentive levels – particularly what rates will be available for projects enrolling one or two years from now – is a significant barrier to investment decisions, and CES acknowledged this and noted that the ten-year incentive rate lock currently available in ESS, along with the program's defined participation structure, provides important certainty for project economics.

On the question of incentive form, a participant expressed a preference for performance-based incentives in commercial MHD applications, favoring pay-for-performance structures over upfront incentives; the participant cited the current political and policy environment around ratepayer-funded programs, noting that performance-based programs are more defensible as they demonstrate a clear link between compensation and delivered grid value, and referenced concerns about the trajectory of Connected Solutions in Massachusetts as an example of the vulnerability of programs that do not demonstrate clear ratepayer benefit.

On voucher-based disbursement, a participant from suggested that, where upfront incentives are provided, structuring them as vouchers (reducing the purchase price at the point of transaction) rather than rebates (requiring the customer to advance the full cost and seek reimbursement) would be more accessible, particularly for commercial fleet operators managing capital budgets, citing the New York State Energy Research and Development Authority (NYSERDA) program structure as a model.

Offering a caution on clawback provisions, a participant strongly recommended against any performance obligation attached to an enrollment incentive, noting that even the prospect of clawback provisions would be a significant deterrent for residential EV owners, who need to be able to prioritize transportation over grid participation; CES clarified that under Construct 5 the enrollment incentive does not carry a performance-based clawback (though disenrollment may have consequences), and the participant affirmed that this structure is appropriate.

Turning to alternative incentive structures, a participant encouraged the group to consider structures that are more intuitive and easily understood by customers, suggesting that a "plug-in incentive" model – where customers are rewarded simply for having their vehicle plugged in and available, rather than for specific V1G or V2G actions – could support long-term participation; CES acknowledged this concept, noting it is under consideration in the MassCEC pilot, but identified a fundamental tension in that ESS must ultimately deliver kilowatts to the grid, so any incentive structure that does not directly tie compensation to kilowatt delivery requires a mechanism – such as an aggregator intermediary compensated on a kilowatt basis – to ensure program benefits are actually realized.

On incentive levels and EV adoption, a participant argued that incentives should be structured to be meaningfully more attractive than what is available to customers with unidirectional EVs, in order to create a genuine financial pull toward V2G-capable purchases. CES agreed that ESS should create a financial pathway compelling enough to influence purchase decisions toward V2G-capable systems while noting that ESS is one of multiple programs (including Managed Charging and CHEAPR) that collectively provide incentives across the EV investment chain.

Finally, framing V2G as a grid service, a participant emphasized that, regardless of the framing around EV adoption broadly, the ESS program should be understood as compensating a grid service; the participant expressed the view that the market is already moving in the direction of bidirectional EVs and that ESS does not need to create that trend and suggested that the enrollment incentive need not fully cover incremental costs, as program reliability and the ability to lock in performance incentive rates over a ten-year period allow customers and developers to make the economics work through financing or forward-looking revenue projections.

## 4.2 Denomination of Upfront Incentives

CES raised the question of how any potential upfront (enrollment) incentive for bidirectional EVs should be denominated. The current ESS approach uses dollars per kilowatt hour of installed battery capacity. CES noted that this may not translate well to bidirectional EVs for several reasons. First, the effective capacity available to ESS during an event is constrained by the EVSE inverter capacity rather than the full vehicle battery, making kilowatt hours of vehicle battery less meaningful as a unit. Second, enrollment may be structured around the EVSE rather than the vehicle, making the vehicle battery capacity potentially unavailable or irrelevant to the incentive calculation. Finally, participation rates for EVs relative to stationary storage are not well understood.

Discussion surfaced two primary perspectives on the appropriate unit. The first favored kilowatts (kW): a participant from argued that, because ESS is fundamentally a capacity program and because the effective power output of bidirectional EVs during events is constrained primarily by the EVSE inverter capacity rather than vehicle battery size, the enrollment incentive should be denominated in kW, illustrating the point by noting that a vehicle with a very large battery (e.g., 100 kWh) running through an 11.5 kW inverter will not be able to discharge its full battery in a typical two-to-four-hour event window; another participant agreed, also noting that customers will typically discharge from approximately 80% to 20% state of charge rather than from full to empty, further limiting the effective energy throughput. The alternative perspective favored kilowatt hours (kWh): a participant argued that battery capacity (kWh) is also a relevant factor, since higher-capacity batteries tend to be associated with higher vehicle costs, and an incentive denominated in kWh would reflect this relationship.

## 4.3 Illustrative Economics

CES presented a high-level illustrative model to provide a sense of how the participant cost test might be applied to bidirectional EV projects, acknowledging significant uncertainty in all input assumptions. The model assumes that approximately one quarter of nameplate vehicle battery capacity would be discharged during events, driven in part by the power constraints of the EVSE inverter. Participation rates were assumed at approximately 30% of active events for residential customers and 75% for commercial MHD customers; CES noted that commercial fleet operators with lower event participation rates are unlikely to find the economics of bidirectional EVSE investment compelling, suggesting that the MHD customer base that does participate will tend to have higher availability. Results, expressed as IRR and NPV, vary considerably depending on customer type, incentive tier (standard versus low-income residential, large versus medium/small commercial, grid edge versus non-grid edge), and incremental cost assumptions, with the range of outcomes substantially wider on the residential side, where the spread in available incentive levels is larger. CES emphasized that the model is illustrative and intended to convey the key input drivers and sensitivities rather than to recommend specific incentive levels.

A participant raised the point that any forward-looking BCA must acknowledge significant uncertainty in participation projections, particularly for a new category of resources.

# 5 Action Items and Next Steps

CES asked that working group members who have not yet responded to the survey on the straw proposals from Meeting 3 (device enrollment, qualified product list structure, and standards and certifications) do so promptly. Members with available incremental cost data for bidirectional EV systems were encouraged to share it with CES as soon as possible, given the report drafting timeline.

Meeting 6 will be a two-hour meeting with two primary goals: (1) reviewing areas of consensus and non-consensus from across the full working group process, and providing another opportunity for discussion on unresolved questions; and (2) presenting the Program Administrators' high-level recommendations to PURA regarding if and how different vehicle classes should be incorporated into the ESS program. CES indicated that these preliminary recommendations will be shared in advance of Meeting 6 to allow for substantive discussion during the meeting. CES noted that the working group report will document the full range of perspectives expressed across meetings, highlighting areas of significant consensus and clearly noting areas of divergence along with the reasoning behind differing views.

# 6 Attendee List

An attendee list is provided below. Organizational information was not collected for all participants; information below reflects CES's best effort to associate individuals with their organizations based on available information.

| Name | Organization |
|---|---|
| Alex Wang | OCC |
| Amanda Stevens | Eversource |
| Amy Findlay | ChargeScape |
| Brendan Smith | CGB |
| Brian Morris | UI |
| Devin Sorgi | Uplight |
| Dominic Gatti | Tesla |
| Ella Roseman | EnergyHub |
| Emmett Werthmann | WRI |
| Frances Bell | Bidirectional Energy |
| Jacqueline Piero | Mobility House |
| Jennifer Runyon | Eversource |
| Kevin Matthews | First Student |
| Lean Brams | Highland |
| Logan Taricani | UI |
| Madeline Frierson | Customized Energy Solutions |
| Mark Scully | People's Action for Clean Energy |
| Max Clarke | EV.Energy |
| Michael Crowley | UI |
| Nachum Sadan | GridEdge Networks |
| Nikhon Schuler | Eversource |
| Nitin Satish | Zum |
| Pallava Prakash | Zum |
| Prabisha Bhandari | OCC |
| Rick Rosa | UI |
| Sara Harari | Connecticut Green Bank |
| Sara Pyne | Connecticut Green Bank |
| Sergio Carrillo | Connecticut Green Bank |
| Stephan Wollenburg | CES |
| Steve Letendre | VGIC (Vehicle Grid Integration Council) |

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|---|---|
| Tiffany Hammond | First Student |
| Toni Berlandy | Eversource |
| Walter Barozi | DEEP |