February 2, 2024

Commissioner Elizabeth Mahony
Massachusetts Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114
Email: DOER.SMART@mass.gov
Re: SMART Stakeholder Questions 12/21/23

Dear Commissioner Mahony,

Hyperion Systems, LLC ("Hyperion") appreciates the chance to offer written comments to the Department of Energy Resources ("DOER") questions regarding the SMART Program regulations, structure, and definitions.

Hyperion is a project development and research organization based in Massachusetts. Hyperion has been in business in the Commonwealth for the past decade investigating the dual-use concept. Hyperion has strong working relationships with many of the stakeholders within the agrivoltaic industry including agricultural producers, research institutions, and other developers. Our comments are guided by our personal experience and those of the overall industry.

SMART Stakeholder Questions 12/21/23

1. The SMART program currently provides added incentives for certain project types, including building mounted, canopy mounted, landfill, brownfield, agricultural, floating, community solar, and projects serving low income or public entities, projects with energy storage, and axis tracking. DOER seeks additional feedback on changes or improvements that will advance achievement of the Commonwealth's 2050 GWSA mandates while balancing land use, equity, and economic considerations.

a. What project type incentive changes could improve program outcomes?

Hyperion recommends amending the ASTGU requirements to allow for array height based on agricultural needs. Currently, the agricultural adder has prescriptive requirements for height based on single axis tracking and fixed tilt designs, 10' to module horizontal and 8' to leading edge, respectively. There is a waiver request process, however we feel that becomes unnecessarily cumbersome and adds further complexity to these projects. We see yearly innovation in all areas of solar equipment and one that is specifically relevant to ASTGUs is the ability to manually change single axis tracker panel tilt should the farmer need added space along the rows. In this example, an 8' to module horizontal single axis tracker would still meet the 50% shading requirement and the farmer would be able to change the panel tilt to allow for up to 10 ½' to panel edge. This is done by the farmer using the tracker equipment application on their phone with the wifi that is setup at the array equipment pad. This 8' to module horizontal is ample space for small and medium size tractors to pass with their equipment attachments.

Further, Hyperion recommends eliminating the requirement that energy storage be included for projects above 500kW. We believe developers should have the autonomy to decide whether energy storage is technically feasible for their project and whether the ESS adder is financially feasible for their project. If the ESS adder is sized appropriately, then developers will be incentivized to include energy storage on their own and will do it whenever possible, not just because they are required to. Removing this provision ensures that generation potential is not lost if the energy storage economics do not pencil.

We recommend making the performance standards for projects on agricultural land under 20.05(5)(e)6. applicable to all project sizes, not just ones over 500kW. We believe these performance standards are best practices and necessary to promote and preserve farmer-first agrivoltaics.

We propose removing the maximum nominal useful energy cap of 6 hours for energy storage under 20.06(1)(e)1. Long duration energy storage systems (6+ hours) can have significant benefits to grid reliability, especially as more renewable generation projects are added to the energy mix. Most long duration energy storage technologies (ex. iron air, pumped hydro, lifted weight storage) have round trip efficiencies of 65% or better, so they would be eligible for the ESS adder under the SMART program. We don't believe that projects that can store energy for long durations should be limited in their ability to receive the ESS adder given their technological advantages.

b. Should other project types also be prioritized?
Standalone energy storage. These projects can have significant benefits to grid reliability while still supporting greenhouse gas emission reduction targets. Clearer guidance would need to be provided to justify how the price adders apply for grid charging/energy arbitrage applications. See our response to question 10 below for more details.
Long duration energy storage. See our response to question 1a above for more details.

2. The current SMART program structure includes a declining block model. Is a structure with fewer blocks and a greater decline between blocks preferable to a greater number of blocks with a smaller decline between blocks? Are there any other modifications to the declining block model structure that could more effectively support solar development?
We believe that a greater number of blocks with a smaller decline between blocks is better than fewer blocks with a greater decline between blocks. That's because a smaller decline between blocks reduces the risk of a declining block to the developer since being subjected to a declining base compensation rate is less likely to kill or significantly harm a project's economics in this scenario compared to a larger decline between blocks. This would ensure that many projects subjected to a declining block can still be financed and ultimately constructed. While the likelihood of being subjected to a declining base compensation rate may be higher under this scenario, it is less likely that said declining rate can make a project completely uneconomic if/when it does happen.

Further we recommend DOER review base compensation rates on a biennial basis. The last time the rates were updated was in 2016, we have all realized considerable utility rate changes since then while the payment to developers has remained stagnant, or in fact declined as the blocks have reached capacity.

3. Are any eligibility criteria in the SMART program a barrier to participation? What are they, and how would you address these barriers? How would you streamline these eligibility criteria?
We believe that the eligibility criteria are reasonable and do not create barriers to participation. However, the provision under 20.05(5)(e)2.a.v. that a facility can only qualify as category 1 agricultural if its electrical production is less than or equal to 200% of the farm's annual operation load can significantly limit ASTGU project sizes. In other words, it isn't a barrier to participation, but it is a barrier to scale, which effectively puts a cap on the income of the agricultural partner (via lease rates and/or profit sharing mechanisms), and it indirectly caps the earning potential of the farmer since it caps potential for increased agricultural production that's created from the benefit of the agrivoltaic microclimate. A farm might have dozens or even hundreds of acres but not the equipment and infrastructure to process and package their produce (so much of MA agricultural products are handled in CT). In this example, that farm will likely have limited behind the meter energy use and will therefore not be able to realize a greater solar potential and impact for the broader MA community. This 200% policy is a hinderance to the farms that don't have their own processing or cold storage equipment.

4. Is the current SMART reservation period (excluding any blanket extensions) adequate given current development and construction timelines? If possible, please provide a representative project timeline inclusive of key project milestones, such as permitting, procurement, and interconnection, to help inform DOER's understanding of the development process and current project timelines.

The current reservation period could be extended given some of the ongoing procurement challenges the industry is still facing as the fallout of COVID. For example, new and custom transformers are being quoted as 52 weeks to build. Other electrical components have been challenging to procure, like CT cabinets or SEL Panels, but most of this has smoothed out over the past 2 years. Our recommendation would be to extend the reservation period to a timeline of 15 months.

5. Are there any emerging technologies or project types that are not currently eligible for SMART that DOER should consider making eligible for the program? Please describe potential project applications, any suggestions for eligibility requirements, and what level of incentives if any would be needed spur project development of the project type.

Semi-transparent modules. These modules would likely already be eligible under the SMART program in most cases, but there may be potential use cases for semi-transparent modules that would be considered a grey area or ineligible under the SMART program. For example, one potential application of semi-transparent modules is using them as an alternative to glass for greenhouses or windows. The greenhouse application may not qualify as an ASTGU clearly/easily, and the window application may not qualify as a building mounted installation clearly/easily. We believe these cutting-edge applications should not be excluded from SMART program eligibility. At the moment, very few semi-transparent modules are commercially available, but the manufacturing of semi-

transparent modules is becoming increasingly robust. This means that these may become commercially available soon. Small-scale projects, like ones that fit within the size restrictions of the SMART program, may be the first to feasibly adopt this technology. We encourage the SMART program to prepare for this in advance. The SMART program should also explore if an adder for this technology may need to exist to make these projects financially feasible. These adders may be able to be on a declining block schedule, similar to SMART base rates, but DOER should do research to determine the duration and magnitude of these declining rates, if these are deemed appropriate compared to fixed rates.

Semi transparent modules will impact how agrivoltaic projects are deployed. Rather than casting substantial shade directly below single axis tracker projects and behind fixed tilt projects, semi transparent modules would provide a fraction of that shade. We recommend the DOER shading analysis tool be updated to include a design input for semi transparent modules.
Perovskite modules. Like semi-transparent modules, perovskite modules are in development and may eventually be able to be used in atypical applications that may not be eligible for the SMART program. Perovskite modules are flexible, so they can theoretically be used to wrap things (e.g. walls, curved bus stop roofs, etc.). While perovskite modules are not currently commercially available or technically feasible due to durability issues, many teams around the world are working to solve those problems quickly, and we believe that the SMART program should look ahead and be prepared to accept projects with this cutting-edge technology and its unique applications. Perovskite adders may need to be considered as well, like in our semi-transparent modules response above (under the same question).

Green hydrogen production. Green hydrogen production is when 100% of energy input in the hydrogen production process comes from renewables. While a solar project in a green hydrogen production environment would qualify for the SMART program, perhaps the SMART program could make a green hydrogen adder, where the solar project receives additional compensation if its production is used behind the meter to produce green hydrogen. We also believe that the green hydrogen adder should apply to energy dispatched by a co-located energy storage project for hydrogen production that occurs outside of solar-producing hours. We believe significant research and consultation with hydrogen industry professionals is needed to determine an effective price of this green hydrogen adder, including if it's best to structure the green hydrogen adder on a per production basis (similar to how the greenfield subtractor is on a per acre basis, only the hydrogen incentive would have a positive value unlike the greenfield subtractor) or as a fixed premium (like the ASTGU adder).

6. Are program compliance requirements clear prior to program enrollment? What are the key challenges with satisfying the data and/or documentation requirements for various program compliance checks, such as compliance with the energy storage, low-income, or community solar requirements? Are there any modifications you would suggest to DOER's compliance processes, or alternative data/ documentation you believe could satisfy the requirements?

Yes, program compliance requirements are clear from the outset. Specifically to the agricultural adder, DOER and MDAR have protected the program, and ultimately the rate payer, from

"greenwashing" or bad actors who might be attempting to bend the rules in order to move a project through development. We recommend DOER in collaboration with MDAR to continue the current level of oversight and scrutiny of these agricultural projects.

7. Are SMART application processes and requirements clear? Is communication between applicants, the Solar Program Administrator, and DOER clear and effective? Please describe any improvements you believe could be made to the SMART application process.
The SMART application processes and requirements are clear. In our experience, communication with DOER is always fair and questions are responded to in a reasonable timeframe.

It would be helpful for a SMART representative to participate in the ongoing conversations with the utility and developer when a project is being developed. As it currently stands, these communications are directly between the utility and developer and a lot of inconsistencies can occur with limited oversight or enforcement given the size of these entities. Utilities are now passing telecommunications upgrades onto developers after Interconnection Services Agreements have already been agreed upon. In one example, Eversource had confirmed an ISA price with Hyperion and months later determined that Eversource did not own the utility poles in this jurisdiction and pushed the cost of the telecommunication involvement onto us, the developer. This is one example of the lack of continuity that could be alleviated with third party oversight.

8. Are there solar canopy project types that currently fall outside the SMART program's definition of Solar Canopy that you believe should be eligible for the Canopy adder? Please provide example project types and describe their benefits.
Currently small projects, <25kW AC, cannot participate in the carport adder. Hyperion recommends amending this to allow for a residential carport adder. Perhaps it's not the full $0.06/kWh adder, but these array deployments should be included. As electrical vehicles become increasingly more common, it'd be great to have an onsite energy generation unit for personal use electric vehicles.

9. Are there examples of dual use agrivoltaics policies in other jurisdictions that align with Massachusetts' solar and agricultural objectives? Please provide citations and summaries of those policies.
Giving cost-side incentives in addition to the ASTGU adder can have significant financial impacts. For example, Colorado's SB23-092 exempts qualifying agrivoltaic equipment from property taxation. This can have significant financial impacts for a solar asset owner and/or landowner. A link to this legislation is below.
https://leg.colorado.gov/bills/sb23-092

Alternatively, creating and awarding certifications/claims for agrivoltaic projects can create value for a project via marketing and/or community engagement. In other words, the SMART program could create agrivoltaic equivalents of certifications (e.g. pollinator-friendly, cow-friendly, no till, organic, pesticide free, etc.), much like certifications in ag (e.g. cage free, pasture raised, organic, etc.).

No financial commitment for MDAR/DOER but provides value to developer and farmer. This might provide consistency for industry and avoid corner cutting from "bad players."
Certifications, definitions, and marketing claims like this can have significant value from a community's and/or investor's perspective, so using policy to define, establish, and audit incentives for desired outcomes and management practices at a solar project can create an opportunity for the SMART program to contribute to the commonwealth's goals.

For example, Illinois has a pollinator scorecard which incentivizes developers to promote pollinator-friendly activities within a ground-mounted solar site. A link to the legislation and policy scorecard are below. The SMART program may not necessarily pursue a pollinator-friendly scorecard specifically, but it could use a similar structure/format to incentivize other important practices to MDAR, DOER, etc. Illinois decided it was important to create a pollinator-friendly scorecard because some bees were endangered in Illinois, and some other pollinators were at risk of becoming endangered. Illinois does not require that solar developers complete a scorecard to build a solar project, however, the scorecard is necessary for a project to claim that it's pollinator friendly. Despite the optional nature of the scorecard and the fact that there is not a financial incentive to complete a pollinator scorecard, the majority of developers still fill one out and adapt their management practices to be pollinator friendly. To us, this showcases the value/ power of using marketability to achieve desired outcomes.
https://dnr.illinois.gov/conservation/pollinatorscorecard.html

New Jersey's Dual-Use Solar Pilot Program is aligned with MA solar and agricultural objectives. In November of 2023, New Jersey Board of Public Utilities released their straw proposal for the program. While incentives are still being ironed out, the program initiatives align well with DOER and MDARs intention of the Agricultural Adder. We believe New Jersey's program should be closely considered over the next 3 years of their pilot program.

https://www.nj.gov/bpu/library/Dual%20Use%20Solar%20Energy%20Pilot%20Straw%20Proposal. pdf

10. What modifications to SMART incentive payment calculations, as currently set forth in 225 CMR 20.08, if any, are needed? Please provide examples formulas or calculations for DOER review.

We recommend that SMART incentive payment calculations are reviewed on a biennial basis. The last time the incentive payments were updated was in 2016. This is too long of a duration to balance declining industry prices with market changes and inflation.
It is unclear how energy storage payments work (i.e. when SMART adders apply), especially in the context of grid charging/energy arbitrage, and whether there is a difference in payment structure for DC-coupled systems with bidirectional inverters or AC-coupled systems. For example, does electricity charged from the grid exclude SMART adders and electricity dispatched back to the grid include adders? If so, this would be a major incentive for developers to pursue energy storage projects. If not, what does it look like?
Please note that if SMART adders are included in both the charge and discharge economics, then the benefit of energy arbitrage is less than it would be if SMART adders are excluded in both the

charge and discharge economics. In other words, energy arbitrage revenue with SMART adders included is a smaller percentage of the charging/purchased energy price compared to if SMART adders are excluded from the charge and discharge prices (because the energy arbitrage on market rates is the same in both scenarios), effectively resulting in increased risk to the developer when SMART adders are included.

11. How could the program be designed to insulate projects and participants from unforeseen market circumstances that materially impact the value of the SMART program incentive? For example, global events impact supply chain and energy costs.
The SMART program could give developers an option to use an inflation adjustment to the base compensation rate. This option would likely need to be exercised before the project's commercial operation date. If the option is exercised, then an adjustment to the base compensation rate could occur annually on the anniversary of the project's commercial operations date. This would adjust the base compensation rate up/down based on a pre-determined/specified inflation index. This could protect developers from inflation risk.
Similarly, the SMART program could also give developers an option to use a materials index adjustment to the base compensation rate. This option would likely need to be exercised at the time of application for the Statement of Qualification. For example, the SMART program could offer some key index adjustments based on common raw materials used in construction of solar and/or storage projects (ex. steel, copper, lithium, etc.). The base compensation rate could then be adjusted up/down based on the difference in a pre-determined/specified index between the time of application for a Statement of Qualification and the time of procurement (as documented with invoice date). This approach would be most meaningful to the developer if they can pick their allocation/exposure percentages for each key commodity in advance because there isn't a one-size-fits-all ratio that would properly cover the developer's risk here. Applicable compensation rate adders would be added to the adjusted base rate at their usual rate. An example is below.

Developer A, who is applying for a conventional solar + storage project, opts to participate in the materials index adjustment, and they choose the following percentages/exposures: 50% steel, 25% copper, and 25% lithium. Developer B, who doesn't have a storage project and is applying for an ASTGU (which would have more steel exposure than a conventional solar project given the 10-foot height requirement) also opts to participate in the materials index adjustment with the following percentages/ exposures: 70% steel, 30% copper, and 0% lithium. Both developers apply for a statement of qualification on the same day and have identical procurement timelines. Let's say that the pre-determined/specified steel index rose from 2,000 to 2,200 (+10% change), the pre-determined/specified copper index dropped from 4 to 3 (-25% change), and the pre-
determined/specified lithium index increased from 96,500 to 115,800 (+20% increase) between the time of application for statement of qualification and time of procurement. If the base rate was $0.01381/kWh, then Developer A's base rate would be adjusted up to $0.01432788/kWh, and Developer B's base rate would be adjusted down to $0.01374095/kWh. See the math below.

Developer A: $0.01381/kWh * [(2200/2000)*50% + (3/4)*25% + (115,800/96,500)*25%] = $0.01381/kWh * [0.55 + 0.1875 + 0.3] = $0.01381/kWh * 1.0375 = $0.01432788/kWh

Developer B: $0.01381/kWh * [(2200/2000)*70% + (3/4)*30% + (115,800/96,500)*0%] = $0.01381/kWh * [0.77 + 0.225 + 0] = $0.01381/kWh * [0.995] = $0.01374095/kWh

As you can see, the developers that choose to exercise this materials index option can ensure that they receive a base rate that effectively adjusts to mirror their capital cost, but this approach is only effective/worthwhile to the developer if they can choose their materials allocation/exposure percentages.

Making these adjustments optional gives developers autonomy to participate in these index adjustments, meaning they can instead choose not to exercise their option and take the base compensation rate at its fixed rate.

12. What additional consumer protection measures or modifications to existing measures should the SMART program incorporate to ensure such protections are achieving their objectives, especially as they pertain to low-income customers?
No comment.

13. Are there any Commonwealth policies (e.g., renewable energy goals, land use priorities, housing policy) that you believe the SMART program inadvertently conflicts with? Please describe any potential modifications to SMART that would alleviate these conflicts.

We believe that ASTGUs represent an opportunity to preserve farmland for a specified period of time. This is similar to a "term easement" or the equivalent in Massachusetts to the Farm Viability Enhancement Program ("FVEP") where farmland is protected from development for a specific amount of time. Massachusetts, led by MDAR, has clear farmland protection goals, currently 10% of MA land is in agricultural use and of that only 15% is permanently protected. We believe that ASTGUs can be a vehicle for farmland protection. ASTGUs have annual reporting requirements which provides surety that farmers and projects owners will continue to farm that land or otherwise lose out on the critical agricultural adder.

Currently the FVEP and the Agricultural Preservation Restriction ("APR") Program only allows for solar deployment up to 200% of the behind the meter energy use for a farm. We described an example under question 3. where a farm may have dozens and dozens of acres they own and produce on, but are limited to the amount of solar they can deploy because they don't process or cold store their produce. This is an unintended consequence of the policy and limits farmer participation. Many farmers are hesitant to permanently protect their land as it reduces the future real value of the property. ASTGUs represent a term easement where farmers are still producing on their land, this will yield positive results for both farmland protection goals and renewable energy deployment goals.

Further, we believe the FVEP and APR guidelines don't make a distinction between agrivoltaic arrays and traditional arrays which are installed low to the ground and take land out of production. Both installation methods are limited to the same 200% behind the meter energy use, but use underneath the arrays are inherently different. Farms and farmers can play a significant role in how our solar is deployed here in Massachusetts, they have a huge potential to diversify their revenue

streams and enhance their farm viability by implementing solar on their farm. We recommend that DOER recognize the ability to grow crops directly under ASTGUs when designed correctly. These microclimates can enhance growing potential by reducing heat stress during warm days and by reducing water needs during periods of drought. In the last 8 years in MA we've experienced 3 significant droughts (2016, 2020, 2022). As the climate becomes increasingly more unpredictable ASTGUs will enhance farm viability by diversifying their revenue streams.

14. Is there any additional feedback you wish to provide to DOER?

It's recommended that the Agricultural Adder be broken down into further sections with a tiered incentive. Larger ASTGU projects, 2-5MWs, are likely to achieve economies of scale and shouldn't be awarded the same adder as a 500-750kW ASTGU project which should not receive the same incentive as a 100kW ASTGU.
To avoid unnecessary steel costs which can hinder project economics for an ASTGU, make variable height limits which can accommodate certain agricultural practices and machinery. For example, if the owner agrees to never use the site for specific agricultural uses that would be above a certain height (ex. orchards, beef cattle, tall crops, etc.), then the developer could construct the site to something less than 10 feet which could accommodate certain, limited agricultural practices. Essentially, the SMART program (DOER and MDAR collectively) can create module height tiers for specific agricultural practices, agricultural products, and machinery. The ASTGU adder would be lost if there was ever a breach in these height regulations. This way, developers don't need to eat the project economics to build 10-foot-tall solar panels if the intended farm use is only for chickens or low-growth vegetables that are farmed exclusively with hand tools, which could coexist effectively with 6-foot-tall solar panels. This would significantly improve the project economics and expand the number of ASTGUs that are feasible as a result.

We recommend tying the ASTGU incentive to the panel edge height.

Furthermore, a greater incentive could be given to projects that go higher in lower panel edge, given the greater material cost these projects incur. For example, there could be a greater ASTGU incentive for a project that is 14' to lowest panel edge than a project that is 6' to lowest panel edge.

Sincerely,

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