

Below, please find the Department’s responses to the Attachment B worksheet circulated by the Vermont Public Utility Commission on August 22, 2019. Overall, the Department does not support the proposal to have the net-metering registration form also serve as the interconnection form. Rather, the Department recommends resorting to Rule 5.500, as amended in Case No. 19-0856-RULE, as the sole rule for interconnection.

Should the Commission enact its proposal to have Rule 5.105 registrations and Rule 5.106 applications also serve as interconnection applications, the Department notes that Attachment B lacks critical information. The Department recommends that the information included in the current Rule 5.500 application form, available [here](#), be included to ensure complete and proper interconnection studies may be conducted. There appears to be other fundamental information that has been omitted in the Attachment B worksheet. For example, there is no provision for the stability and dynamic data of the hydro units (e.g. sub synchronous reactance) or for their fault contributions. The Department requests further stakeholder input as to the necessary information for interconnections studies if Rule 5.100 (5.105 and 5.106) is to be used for this purpose.

The Department also has concerns about the ability of interconnecting utilities to conduct adequate studies in the time allowed under Rule 5.105. Rule 5.500 contains timelines for studies that are at odds with the timing in Rule 5.100. This is especially true for larger roof-mounted projects; whose grid impacts are no less substantial than their ground-mounted counterparts. It could become common practice for utilities to object to all larger projects in order to allow all interconnection studies to be conducted. However, organizing registrations around the interconnection concerns of large projects could prove unduly burdensome to smaller projects, while tailoring the rules to smaller projects would prevent full review of larger projects. The Department therefore recommends that registrations be reorganized by size (as determined by AC capacity) and that the review and timing be adjusted accordingly. The rationales underpinning the size category differences between Rule 5.106 and 5.107¹ could be useful in devising size-based review thresholds in registrations. Another possibility would be to require larger projects, for example 100 kW and up, to undergo an interconnection application under 5.500 prior to filing a registration. In that case, the registration period could be shortened as the chief issue for most roof mounts would have been addressed. Finally, should the Commission decide to add solar canopies to registrations, the Department maintains additional information, especially safety information need also be reported.

Department of Public Service Responses to Attachment B:

The Net-Metering Registration Form (available at https://puc.vermont.gov/sites/psbnew/files/doc_library/NMRegistrationFormFINAL06-26-19.pdf) contains fields to capture required information for the Interconnecting Utility’s review. The Commission requests that participants answer the following questions about each field. The Commission has provided a worksheet to facilitate participant’s responses. The Commission has identified several fields that the Commission assumes are necessary information; participants do not need to address whether those fields are necessary unless they disagree with the Commission’s assumption that they are necessary.

¹ Rule 5.106 includes ground mounted projects over 15 kW up to, and including, 50 kW. 30 V.S.A. § 248(b)(3) is reviewed for Rule 5.106 projects, but under the guidelines of Rule 5.106(D) and (H) the review is less stringent and directs utilities to raise interconnection concerns where they exist. Conversely, Rule 5.107 includes ground mounts over 50 kW, up to 500 kW, and has more robust interconnection review.

Field	Is it necessary to collect this information? Why or why not?	Do changes to this information need to be reviewed before a CPG is deemed issued? Why?	Is there a threshold for de minimis changes to this field that do not require review?	If a change to this field needs review, how much time is necessary to review the change? Why?
Applicant/Customer Name	[The Commission assumes this is necessary] The Department agrees.	Yes. Changes in customer or applicant name should be reported and filed with the Commission and interconnecting utility for tracking, notice, and accountability purposes. Moreover, if this information is not kept up to date a CPG can be deemed issued to the wrong entity.	Not for substantive changes. However, a minor change, such as correcting a spelling error, would be de minimis.	The Department considers this a reporting requirement. Generally, a reporting requirement would include information that is important to record, but whose nature is not substantive enough to require lengthy review. A ten-day comment period would allow parties to identify issues that could arise from a change in applicant, such as a change in ownership.
Applicant Mailing Address, Daytime Phone, and E-mail Address	[The Commission assumes this is necessary] The Department agrees.	Not necessarily, this is a reporting requirement for tracking purposes. However, these changes could have implications for notice and ePUC communications.	Not for substantive changes. However, a minor change, such as correcting a spelling error, would be de minimis.	The Department considers this a reporting requirement. Generally, a reporting requirement would include information that is important to record, but whose nature is not substantive enough to require review. However, it is incumbent on applicants to keep their information up to date to allow for proper notice and ePUC function.
Name of Interconnecting Utility	[The Commission assumes this is necessary] The Department agrees.	Yes, a change in the utility to which the project interconnects would be of fundamental and crucial importance.	If a change was simply to correct a misspelling or other clerical error, that would qualify as de minimis. Anything more substantive (such as a change in the interconnecting utility that is not merely nominal) would not qualify.	A new application would be required if the change in utility name alters the point of interconnection, the relevant circuit, or other substantive concerns.
Consumption Meter Number	[The Commission assumes this is necessary] The Department agrees.	If this changes prior to CPG issuance, it should be recorded as it might impact accounting, tracking, and net-metering offtake limits. As this is predominantly a reporting requirement, it can also be filed in a post-construction compliance document.	This change is de minimis in most circumstances and would require reporting and not review.	This would typically be de minimis. If the consumption meter change was problematic it would likely be an element of another issue (e.g. the consumption meter number is already attributed to a customer who has reached the net-metering offtake limit).
Whether the System is a Group System or Individual System	The Department recommends recording this information. At a minimum, utilities should track it, if it is not reported on ePUC. This is because, this information could have implications on usage, any net-metering allocation caps, and billing concerns.	If this changes prior to CPG issuance it should be reported.	This change is de minimis. Should this have a meaningful impact, it would be as a component of another concern.	No review would typically be necessary. This information could be confirmed in a post-construction compliance filing.
System Location	[The Commission assumes this is necessary] The Department agrees.	Yes. A change in project location could have a range of impacts from de minimis, to those requiring refiling. For example, a change in point of interconnection, or from roof to ground mounted, would require extensive review. Moderate shifts in the placement of panels on the same rooftop, that don't impact interconnection, would need less review. If registration forms are expanded to include parking lot canopies, shifts within the parcel could also have significant implications.	A project is not de minimis if the project is no longer located on the originally proposed property or has a change in its point of interconnection (POI), this would be a substantial change. If the project is still located on the original site, and is substantially similar in physical attributes, equipment, and configuration, then it may be considered de minimis.	Substantial changes would need refiling as they would be profound enough that the Project would be entirely different. De minimis changes would need to be reported only. The level of review, and time needed, is also size dependent. A 5 kW roof mounted project and a 500 kW roof mounted project have very different grid impacts, such that a location shift could be more significant in larger projects. The inconsistency this creates could be addressed

			However, system location is one of several concerns that underscores that grouping large and small roof mounted projects together presents disadvantages.	by differentiating registration categories according to nameplate size and creating intermediate levels of review for medium sized changes with size-appropriate review periods. The Department recommends that this concern also be considered in Rule 5.500, which the Department maintains is a better pathway for all interconnection issues.
System Technology (Solar, Solar plus Storage, Storage, or Hydro) (The Department has included and entire row for storage, below)	[The Commission assumes this is necessary] The Department agrees. The Department is drafting separate recommendations, pursuant to Act 31, addressing the regulation of storage that could have bearing here. Net-metering systems are increasingly likely to be paired with (at the outset or as retrofits) storage, which should be reviewed for potential grid (and other) impacts. Additionally, the Rule 5.100 could be used as the pathway for assessing the impacts of standalone and aggregated storage systems. This would require adding a separate “Storage System Information” section to this form, below. The Department also recommends that storage be considered and evaluated under Rule 5.500 and be discussed in Case No. 19-0856-RULE.	A change as fundamental as solar versus hydro would effectively require an entirely new filing. Even a technological change to a somewhat lesser degree (e.g. addition of a battery storage facility to a solar plant) would require a review, as the storage facility would require a modified SIS or feasibility study and possibly other added or revised analyses.	No. This is a binary determination, not a question of degree. However, in cases where small amounts of storage are added or removed to an existing project it could be de minimis. However, the question of reviewing the addition of storage changes is somewhat contingent on the size of the storage facility (e.g. small storage will have minimal impact whereas storage that can charge/discharge at greater speed, or with greater capacity, could change the project enough to require a new application) coupled with the size of the generation facility.	A change in technology would require a new application. A change in storage should have the level of review tailored to size, with major changes requiring a new application, whereas small amounts of storage could have a short comment window, perhaps 10 days, after which it is deemed approved. The level of review, and time needed, is also size dependent here as well. When storage is discharging to the grid, it functions as a generator of comparable nameplate capacity and can be viewed as increasing the total size of a paired net-metered generator unless operationally restricted. Like in other aspects of this rule, smaller projects generally need less review for changes than larger ones. The inconsistency created by this difference could be addressed by differentiating registration categories according to nameplate size and creating intermediate levels of review for medium sized changes with size appropriate review periods. The Department recommends that this concern also be considered in Rule 5.500, which the Department maintains is a better pathway for all interconnection issues.
Whether the System is Owned or Leased	The Department recommends that this information be filed with ePUC or at least tracked by interconnecting distribution utilities.	If this information is recorded or reported, it need only be considered prior to CPG issuance if it could trigger a violation of the Rules.	This is only relevant if a violation of size threshold or ownership rules is presented. As such, this would typically be a de minimis reporting requirement that would not need extensive review. It could be filed in a post-commissioning compliance document.	Any review period, if necessary, should be long enough for notice and processing. The Department recommends 10-14 days as a minimum to any review periods under this Rule.

Whether the Application is an Amendment	[The Commission assumes this is necessary] The Department agrees. An amendment should specify all underlying and associated case numbers.	Yes, in many, but not all, instances. This is dependent on the nature of the amendment. A substantial change which could present an adverse impact under 30 V.S.A. § 248, or Commission Rules, would require extensive review and approval.	Yes. For example, substituting a project component for a different but functionally equivalent component would often be de minimis. However, such changes should be reported as this information could prove useful (e.g. if a model of solar panel had a defect or if a certain type of inverter posed a risk to the grid).	This depends on whether the amendment is de minimis, moderate, or extensive enough to render it a functionally different project. Generally, de minimis changes would only need to be recorded, not reviewed. Moderate changes, which might impact § 248 criteria, will require 10-14 days of review, depending on project size. Large amendments, such as a massive change in output, would require 30 days or refileing. Again, size is of critical concern here. For example, a 25% increase to a 5 kW project would result in a 6.25 kW project. The extent of a 6.25 kW project’s impacts on system stability and reliability, and the level of review required, would be inherently different than a 25% nameplate increase to a 400 kW project (rendering it 500 kW). This makes crafting thresholds of review for all projects eligible for net-metering registrations difficult. What would be appropriate for large projects could prove unnecessary and unduly burdensome for smaller ones. The tension created by this difference could be addressed by differentiating registration categories by nameplate size and creating intermediate levels of review for medium sized changes with size appropriate review periods. The Department recommends that this concern also be considered in Rule 5.500, which the Department maintains is a better pathway for all interconnection issues.
Photovoltaic System Information				

System Capacity AC kilowatts (AC Nameplate Capacity of the Inverter(s))	[The Commission assumes this is necessary] The Department agrees.	Yes. The combined capacity (kW) of the inverters is necessary for a variety of reasons including a determination of project size, for evaluating eligibility for net-metering, and as a key component in the analysis of project impacts on the local distribution system, among others. Finally, this data would be crucial in identifying a potential mismatch between inverter capacity, PV panel capacity, and transformer capacity, which could lead to equipment overloading if unresolved.	De minimis changes need to be reported but do not require substantive review. This would generally include small decreases but would not include most increases or large changes in capacity in either direction. De minimis changes could be reported in post-construction compliance filings.	For consideration and discussion, the Department submits this straw proposal that a change is de minimis if it is a $\leq 5\%$ change in AC capacity AND if ≤ 5 kW change in AC capacity. 2 weeks for review is required if there is a $> 5\%$ (but $\leq 20\%$) change in AC capacity OR if there is a > 5 KW (but ≤ 20 kW) change in AC capacity. Complete refiling is required if there is $> 20\%$ change in AC capacity OR if there is a > 20 kW change in AC capacity. Any AC capacity change that exceeds any net-metering threshold (500 kW) will require refiling. However, this again demonstrates that project size is of critical concern in revising registrations. For example, a 25% increase to a 5 kW project would result in a 6.25 kW project. The extent of a 6.25 kW project’s impacts on system stability and reliability, and the level of review required, would be inherently different than a 25% nameplate increase to a 400 kW project (rendering it 500 kW). This makes crafting thresholds of review for all projects eligible for net-metering registrations difficult. What would be appropriate for large projects might prove unnecessary and unduly burdensome for smaller ones. The inconsistency created by this difference could be addressed by differentiating registration categories by nameplate size and creating intermediate levels of review for medium sized changes with size appropriate review periods. The size thresholds contained in Rules 5.106 and 5.107 may be useful in determining the appropriate boundaries. The Department recommends that this concern also be considered in Rule 5.500, which the Department maintains is a better pathway for all interconnection issues.
PV Module Manufacturer and Model	The Department recommends that this information, plus year, be a de minimis reporting requirement. This information could prove useful if future problems arise with a make or model.	Changes of this nature should be reported as soon as they are known for tracking purposes. This could be addressed in a CPG compliance filing after project construction or commissioning.	The Department recommends a de minimis reporting requirement with no substantive review unless an issue is raised.	The Department recommends a de minimis reporting requirement with no substantive review unless an issue is raised.

Number of Modules	Reporting of the number (and individual capacity) of modules (PV panels) is necessary to verify total system capacity. The Department acknowledges that the number currently reported is often estimated and that minute changes sometimes occur. It may prove useful to require the filing of the post-construction configuration in a compliance filing. There’s some interaction between the # of modules, power rating per module, and total array output (as addressed in the following rows), so the Department recommends that this be considered when revising the registration.	Yes. A change in panel number necessarily results in a change in total panel capacity (or at least a change in individual panel capacity) which has possible implications for interconnection study results, aesthetic assessment, limits of disturbance, fencing requirements, environmental impact, and other considerations.	Yes, mild changes will occur, the primary concern being confirmation of nameplate capacity. De minimis changes need to be reported but do not require substantive review. This would generally include small decreases but would not include most increases or large changes in capacity in either direction. De minimis changes could be reported in post-construction compliance filings.	This would depend on the scope of the change, ranging from a few business days to a complete reassessment of the project. Once again, the ranges of sizes for registration of eligible facilities presents difficulties in crafting universal rules. Different forms, or at least thresholds, for example systems ≤ 15 kW and > 15 kW could prove useful. Projects over 50 kW, and over 150 kW, also could have separate consideration. If the change in panels causes no change, or a change in total array output that is negative but minor (e.g., less than 10%), de minimis treatment may be appropriate.
Power Rating per Module (DC Watts)	The individual capacity (and number) of modules (PV panels) are necessary to determine and verify total system capacity. There’s some interaction between the # of modules, power rating per module, and total array output (as addressed in the adjacent rows), so the Department recommends that this be considered when revising the registration.	Yes. The combined capacity (kW) of the PV panels is necessary for a variety of reasons including coordination with AC ratings and use as data in the analysis of project impact on the local distribution system.	Yes, mild changes will occur, the primary concern being the relationship to nameplate capacity. De minimis changes need to be reported but do not require substantive review. This would generally include small decreases and would not include most increases or large changes in capacity in either direction. De minimis changes could be reported in post-construction compliance filings.	This would depend on the scope of the change, ranging from a few business days to a complete reassessment of the project. Once again, the range of sizes for registration eligible facilities presents difficulties in crafting universal rules. For example, different forms, or at least thresholds, for systems ≤ 15 kW and > 15 kW could prove useful. Projects over 50 kW, and over 150 kW, also could have separate consideration. If the change in panels causes no change, or a change in total array output that is negative but minor (e.g., less than 10%), de minimis treatment may be appropriate.
Total Array Output DC kilowatts (no. of modules x power rating)	[The Commission assumes this is necessary] The Department agrees. There’s some interaction between the # of modules, power rating per module, and total array output (as addressed in the preceding rows), so the Department recommends that this be considered when revising the registration. The DC output also has relevance in confirming the AC output.	Yes. This data would be crucial in identifying a potential mismatch between inverter capacity, transformer capacity, and PV panel capacity, which could lead to equipment overloading if unresolved.	A de minimis change would be an array output decrease that is less or equal to a 10% reduction in magnitude. De minimis changes need to be reported but do not require substantive review. This would generally include small decreases and would not include most increases or large changes in capacity in either direction. De minimis changes could be reported in post-construction compliance filings.	This would depend on the scope of the change, ranging from a few business days to a complete reassessment of the project. Once again, the ranges of sizes for registration eligible facilities presents difficulties in crafting universal rules. For example, different forms, or at least thresholds, for systems ≤ 15 kW and > 15 kW could prove useful. Projects over 50 kW, and over 150 kW, also could have separate consideration. If the change in panels causes no change, or a change in total array output that is negative but minor (e.g., less than 10%), de minimis treatment may be appropriate.

Inverter Manufacturer and Model	The Department recommends collecting this information. It is important when evaluating project impact under 30 V.S.A. § 248(b)(3) to ensure inverters and their settings comply with various standards (e.g. requirements under Rule 5.510 such as IEEE 1547, UL 1741, and the ISO-NE Source Requirements Document). It is also possible that a make or model of inverter could have a technical or security issue.	Yes, because it is possible that the changes are not complaint with applicable rules and standards.	No.	Review would need to be at least ten days. Complicated changes to larger arrays with more inverters could take more time.
Interconnection Configuration (generation meter or behind consumption meter)	[The Commission assumes this is necessary] The Department agrees.	Yes. Such a change can indicate an alteration in the nature of the Project and its use.	However, it would generally be a de minimis reporting requirement. Post-construction compliance filings could be appropriate if applicable. If this change provokes an issue, additional review could be requested by parties to the case.	This would generally be a de minimis reporting requirement with no additional review required in most circumstances. A post CPG change could generally be filed as a post-construction compliance filing on an expedited amendment review.
Installation Type (roof mount or ground mount)	[The Commission assumes this is necessary] The Department agrees.	Yes. A change from ground to roof or vice versa has potential safety effects (e.g. NEC and NESC compliance, etc.) as well as aesthetic and environmental effects.	No. This is a binary determination, not a question of degree.	This change would require at least 10 additional days. This could require a new filing, such as if a large roof mounted project moved to ground mount.
System Orientation Circle one: fixed mount 1-axis tracking 2-axis tracking	The Department recommends that this needs reporting.	This should be noted prior to CPG filing but would generally be a de minimis review reporting requirement.	This would rarely require additional review but should be reported.	This should be afforded de minimis review with the opportunity to request further review if an issue is raised.
Paired (and possibly standalone & aggregated) storage (suggested adding a field) -Nameplate AC capacity (kW) -Duration capacity at maximum discharge rate (kWh) -Operating mode(s) -Market participation(s) -Maximum charge rate (kW) -Aggregate export capacity of solar + storage (kW)	Yes. Residential PV systems are already being paired with storage in Vermont and understanding how the devices will be used – and thus how they will interact with each other and the grid – is important.	Yes. A change in capacity or operating mode has potential impacts to the grid.	Yes, anything under a small % of nameplate (depending on size and operating mode). Again, registrations should be categorized based on size and Rule 5.500 is the Department’s recommended mechanism for all interconnection review. Storage will also need refiling for major changes, review for moderate changes, and reporting without review for de minimis changes. For example, bifurcation into ≤ 15 kW and > 15 kW (a 5% change to the capacity of a 5 kW system is different than a 5% change to a 500 kW system) systems, and perhaps those over 50 kW and 150 kW could be appropriate groupings. Also adding a requirement to file an as-built compliance document with final specs & interconnection date could potentially eliminate the need for filing for de minimis (and perhaps some minor) amendments & associated review periods.	Storage capacity could be thought of as like net-metered generator nameplate capacity. For generators paired with storage, the capacity of each should be considered in unison. For consideration and discussion, the Department submits this straw proposal that a change is de minimis if it is a ≤ 5% change in AC capacity AND if ≤ 5 kW change in AC capacity. 2 weeks for review is required if there is a > 5% (but ≤ 20%) change in AC capacity OR if there is a > 5 KW (but ≤ 20 kW) change in AC capacity. Complete refiling is required if there is > 20% change in AC capacity OR if there is a > 20 kW change in AC capacity. Any AC capacity change that exceeds any net-metering threshold (500 kW) will require refiling, unless a combined project output of >500 kW is <i>precluded</i> by an operating agreement. However, this again demonstrates that project size is of critical concern in revising registrations. For example, a storage based 25% increase to a 5 kW project would result in a 6.25 kW project. The extent of a 6.25 kW project’s impacts on system stability and

				reliability, and the level of review required, would be inherently different than a 25% nameplate increase to a 400 kW project (rendering it 500 kW). This makes crafting thresholds of review for all projects eligible for net-metering registrations difficult. What would be appropriate for large projects might prove unnecessary and unduly burdensome for smaller ones. The inconsistency created by this difference could be addressed by differentiating registration categories by nameplate size and creating intermediate levels of review for medium sized changes over size appropriate review periods. The size thresholds contained in Rules 5.106 and 5.107 may be useful in determining the appropriate boundaries. The Department recommends that this concern also be considered in Rule 5.500, which the Department maintains is a better pathway for all interconnection issues.
Hydroelectric System Information				
System Capacity AC kilowatts (AC Nameplate Capacity)	[The Commission assumes this is necessary] The Department agrees. While the Department broadly recommends that interconnection be addressed via Rule 5.500 and not net-metering registrations, net-metering registrations are even more undesirable when reviewing the interconnection of hydroelectric facilities.	Yes. A change in generator capacity can have potentially dramatic effects on the reliability and stability of the system to which it is interconnecting. Moreover, real power (MW) capacity changes are often accompanied by reactive power (MVAR) capacity changes on hydro units, causing voltage and/or thermal effects. A significant change in hydro capacity may also have important civil engineering impacts.	A reduction in real power (MW) capacity of less than 10% or less than 100 kW (whichever reduction is LESS) can be considered de minimis. No increase can be considered de minimis.	A de minimis change would require 10 additional days. A non-de minimis change would require at least two additional weeks for review and refiling for large changes.
Generator Manufacturer and Model	This information is necessary to verify that any dynamic or stability models that may be needed to simulate the project are accurate.	If no dynamic/stability simulations are required by the interconnecting utility, then this information is not a prerequisite for CPG issuance but should be reported, at least in a post CPG compliance filing.	No. This is a binary determination, not a question of degree.	At least 10 days for review, large changes may require refiling.
AC Source (inverter, induction generator, or synchronous generator)	[The Commission assumes this is necessary] The Department agrees.	Yes. Any change to the fundamental technology of the source (e.g. changing from synchronous to induction) would have significant implications for dynamic/stability simulations and probably for reactive power capability. The change would require engineering review before CPG issuance.	No. This is a binary determination, not a question of degree.	At least 10 days for review, large changes may require refiling.

Physical Location of Facility’s Lockable Disconnect Switch	[The Commission assumes this is necessary] The Department agrees.	Yes. The location of the disconnect switch has safety implications.	No. This is a binary determination, not a question of degree.	This would require 10 days to determine whether this is safe.
Interconnection Configuration (generation meter or behind consumption meter)	[The Commission assumes this is necessary] The Department agrees.	Yes. This is important in classifying project and could be an element, or indicator, of an engineering concern.	No. This is a binary determination, not a question of degree.	This would require ten days.
Installer Information				
Company Name, Address, E-mail	[The Commission assumes this is necessary] The Department agrees.	Yes. There may be a need to ask technical or other questions of the installer. This is also important to ePUC process, notice, and accountability.	No. This is a binary determination, not a question of degree.	This should be reported as soon as practicable but does not need any additional review in most instances.
Installer Name	[The Commission assumes this is necessary] The Department agrees.	Yes. There may be a need to ask technical or other questions of the installer. This is also important to ePUC process, notice, and accountability.	No. This is a binary determination, not a question of degree.	This should be reported as soon as practicable but does not need any additional review in most instances.