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# How to Value a Solar Development Pipeline (Part 2 of 4)

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Recently, in a quiet moment between energy transactions, I pondered: When does a solar project become a solar project?

It's a philosophical question, perhaps. Thankfully (and not surprisingly), my colleagues in engineering had a few opinions. While no two opinions were the same (also not surprising), each opinion did tie to one concept — interconnection.

In this second installment of How to Value a Solar Development Pipeline (read Part 1 here), we will explore the second pillar of project success: interconnection.

It is estimated that there are about 150 gigawatts of solar projects in interconnection queues across the United States. Compare that to the 12.1 gigawatts expected to be installed in this year. Clearly, a queue position is not in itself an indicator of project success. Interconnection provides the physical path to deliver power and imposes the physical constraints of such delivery. Interconnection also represents one of the critical fixed costs of a project.

These features naturally lend themselves to old-fashioned wildcat speculation. While some developers chase power-purchase agreements in search of demand for their power, other developers seek out ideal localities (or nodes) from which to supply their power. Skilled developers can do both.

In order to determine a pull-through rate for a project and to properly value a pipeline, we will explore strategic considerations related to interconnection development and evaluate the various stages of the interconnection process. Finally, we'll consider trends that may factor into the interconnection process in the years ahead.

### Interconnection as a Strategy

Because interconnection costs do not have a one-to-one correlation to system size and are even less tied to revenue, projects with low interconnection costs provide distinct advantages. Developers with site control and low-cost interconnection may speculate on these queue positions and wait for projects to find them, in a sort of "if-you-interconnect-it,-they-will-come" strategy.

There are plenty of reasons to be optimistic. Module prices and build costs continues to fall. Corporate offtakers are buying at record rates and becoming increasingly more comfortable with contracts for differences (see Part 1, Pillar 1, Revenue Streams). Political will at the municipal and state level continues its steady push to incentivize renewables development.

The strategy may be sound. Nevertheless, site control and interconnection are but two of four pillars of project success.

The value of assets without offtake and permitting ought to reflect the outstanding binary risks and associated pull-through rates. For investors with the patience and appetite to warehouse or hold assets, this style of development may provide long-term, outsized returns. For investors looking for a quarterly or annual returns on capital and/or investors with high carrying costs, on the other hand, this strategy may be too risky.

Alternatively, investors looking for a platform that does both (recycles capital with near-term gains and places a few long-term strategic bets) may consider pipelines that combine varying levels of interconnection speculation.

## Stages of Interconnection

Within a single development pipeline, you may encounter projects of various stages of interconnection development:

- Application submitted
- Feasibility study
- System impact study
- Facilities study
- Interconnection agreement executed
- Commencement of construction of interconnection facilities

Each of these stages vary from utility territory to utility territory. Nevertheless, there are some technical and economic commonalities. A typical progression for territories in the Pacific Northwest, Southwest, Northeast, Mid-Atlantic and Southeast may look like this:

1. **Application submitted**: With a basic level of design and engineering, a developer may submit an application to the utility to interconnect a system. At this stage, the project is assigned a queue position. For congested feeders, this queue position is valuable, but it is just the beginning. It is important to recognize that, while utilities are governed by public service commissions and while interconnecting to the grid may be a matter of right where technically feasible, the utility maintains broad discretion to determine what is and is not technically feasible. The utility's primary function as an interconnecting authority is to ensure the safety and reliability of the grid. That focus will shape its responses (and response times). Upon its review of the application, a utility will either suggest a study or (for lucky behind-the-meter projects) move straight to the interconnection agreement.
2. **Feasibility study**: At this stage, the utility will do a high-level assessment as to whether the project could interconnect to the grid. The utility's engineering team will analyze the impact of the generation on existing grid infrastructure and may determine where thermal, voltage, or short circuit contributions would shape the manner in which the project is to be interconnected. This study will inform the scope and contours of a system impact study, if necessary.
3. **System impact study**: This study will determine if any upgrades to the grid (on the utility's side of the meter) are necessary in order to interconnect the project. If upgrades are necessary, the utility will provide a cost and schedule estimate for any work related to such upgrades. This provides insight into the earliest date by which the system may achieve commercial operation. With a schedule and costs now in hand, developers may refer to interconnection at this stage as "de-risked."
4. **Facilities study**: Certain utilities may perform a separate study known as a "facilities study." This study may be required or optional and may be performed concurrently or following a system impact study. The purpose of this study is to devise equipment lists, technical specifications, a detailed schedule of costs and a granular construction schedule, which will be incorporated into the interconnection agreement.
5. **Interconnection agreement executed**: The project must execute the interconnection agreement within a certain period of time from receipt of the system impact study and/or facilities study in order to maintain its queue position. And generally, execution of the interconnection agreement requires a deposit or down payment on the necessary upgrades. For many developers, this stage provides an inflection point for monetization of the asset.
6. **Commencement of construction of interconnection facilities**: If utility upgrades are required, the utility will likely commence its work upon receipt of the full estimated interconnection costs (plus a characteristically conservative contingency). For larger utility-scale projects, interconnection costs may be paid on milestones agreed to by the utility and project.

## Time and Money

### *Money: Before System Impact Study, High Risk*

Before the system impact study is completed, a developer may have a view on interconnection costs and the utility may have a view, as well. A developer may input its view into the financial model and a utility may express its view on paper. However, until a utility has performed a full system impact study, interconnection costs are unknown. The critical features of the system impact study are that (a) the project pays for the study, (b) the study's results are the work product of an engineer (typically a third-party engineer), and (c) the utility sets a dollar value for the anticipated costs. If the developer's financial model reflects a value for interconnection costs before the system impact study has been completed, consider it a hopeful placeholder.

***Time: Before the Interconnection Agreement Is Executed, High Risk***

When reviewing any timelines or Gantt charts of a development pipeline, it is important to ask where the dates come from. These dates may have their basis in law or tariff. A utility or the public service commission may set timelines within which the utility is to review and/or provide responses. Given this statutory patina, these dates feel reassuringly firm. They are not; they are aspirational. A utility may fully comply with the timelines, but the process is iterative at nearly every stage.

A response from a utility may call for a new submission or clarification, and you will suddenly find that the clock has started over again. Other times, a utility may miss a deadline by a few days (or weeks). These slips hardly rise to the level of a public service commission hearing, and there is generally no practical recourse for these slips that does not have the perverse effect of delaying the project further.

Therefore, it is critical to understand what development milestones are tied to utility action. Questions to ask include (a) whether utility action is a gating item for another development task on the project schedule (e.g., the execution of interconnection agreement is a condition precedent to application for an incentive), (b) whether utility delay could present a binary risk (e.g., tax equity deadlines), or (c) whether utility delay could present a cost adder (e.g., liquidated damages in the offtake agreement).

Once an interconnection agreement is executed, the utility may be contractually bound to act within set timelines. Most typically, utilities take these contractual obligations seriously. Therefore, dates based on an executed interconnection agreement are more truly firm. Before the executed interconnection agreement is in hand, however, time may not be on your side.

***Trends: Congestion, Storage and Additional Revenue Streams***

Congestion is of particular concern for distributed generation projects. Certain regional markets that have fostered renewable development for many years have high concentrations of systems net-metered to the grid. In these areas, utilities may impose export restrictions. Even rooftop systems now face such restrictions. In such cases, a storage solution may preserve project value. If storage is too expensive, developers need to weigh the economics of downsizing capacity against building beyond the export restriction, using a combination of reverse power relays and/or inverters that are programmed to self-curtail energy.

Developers that choose the latter path will need to convince the utility of the effectiveness of such a solution. (This is just one area in which in-house engineering is a critical value-add.) Even if a utility greenlights the larger capacity, the utility still may require that a utility-owned reclosure device be installed to ensure that the system is curtailed when it reaches the export limit. It is important to model out such curtailment when financing such a system.

The race is on to pair storage with solar at scale. It is important to consider what information was submitted in the interconnection application and what systems were studied, if the project has been studied, to determine if adding any particular type of storage would require a revised application or study. Either case may result in a loss of queue position.

Solar assets are expected to produce revenue for decades. It would be rather shortsighted to assume that the grids to which they connect will remain static. As more renewable assets come online, grid operators will need generation that can be flexible and respond in a second (or split second) to signals from the regional transmission organization. Most grids have already monetized such services. Historically, this has been assumed to be where "baseload" power (e.g., natural gas or nuclear) steps in. However, a solar project (especially where paired with storage) can be incredibly flexible and responsive to the intermittency of other generators on the grid. It's a "clean get cleaner" sort of world. Therefore, early engineering should contemplate flexibility with respect to the grid and interconnection applications should build in as much optionality as is commercially reasonable.

## Bonus: Note on Interconnection Agreements

Interconnection agreements, by and large, are form agreements. Their legal terms are concise at best, lacking at worst. Nevertheless, with certain exceptions, there is generally no opportunity to negotiate. For investors looking to cover over any and all risks associated with the interconnection agreement, it is important to note that seeking an executed estoppel from a utility can be a lengthy and fruitless process. If an estoppel is not forthcoming, the business team ought to find alternative ways to confirm that the utility is ready to work with the project company.

So, if the legal terms are sparse, there is no room to negotiate, and an estoppel is out of the question, should your lawyer skip over the “interconnection” folder in the data room? No.

Legal diligence is necessary to determine the mechanics and ramifications of milestone dates and cliff dates, particularly with regard to deposit payments and placed-in-service dates. Your legal team should also read the interconnection agreement in the context of the applicable utility tariff.

Finally, interconnection agreements are peppered with various obligations during construction and operations, which should be considered when drafting the various construction contracts and operation and maintenance agreements for the project. Keep your lawyer out of this data room at your own peril.

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*Joe Song, vice president of project operations at Sol Systems, also contributed to this piece.*