American-Made Solar Prize **Round 7**
Ready! Contest Submission

Technical Assistance Request

What we need to know to go Beyond the Green Button

The Jigawatters have set out to develop a time-of-use calculator to quickly craft payback projections for PV systems. Whereas a straightforward, net metering calculation has traditionally sufficed for most residential markets, utilities–perhaps most relevantly a consortium in California–have begun pivoting to "net billing" models, where variable rates have further compounded complexity. In order to demonstrate to homeowners how adding solar panels and battery storage will save them money, The Jigawatters are aggregating immensely more data and developing far more complex calculations than we utilize for 1:1 net metering scenarios.

Our team has developed a number of impressive software tools to date and we are confident in our ability to build the required framework, integrations, and interface. Yet there are a number of areas in which our expertise comes up short, and we will need to solicit the help of experts in order to be successful.

Peak solar production hours

Since time-of-use is relevant to energy cost under this new model, the specific time of day when solar energy is being produced is equally important. As we understand it, the PVWatts API is limited to returning monthly data. Due to the complexity of this very calculation and its myriad inputs, we assume that hourly (or similar interval) data is generated before monthly values are aggregated, yet we've been unable to tap into such a source.

As a secondary option, we've identified an available data source with a strong API that we think can be overlaid on the standard PVWatts object to model reliable hourly estimates: NREL's National Solar Radiation Database (NSRDB). We believe that by capturing historical, hourly GHI for the location, averaging radiation for each calendar day from the available history, and modeling a comparative curve by calendar month, we can extrapolate hourly PV production from the monthly data PVWatts provides.

Needless to say, there are unknowns. Is there a source we can access that simply provides hourly data in a tidy JSON object? Is GHI the best metric for this purpose? Does NSRDB even have the best metric, or do we need to look to another laboratory to solve this problem specifically? And for another rabbit hole, to what degree do west-oriented panels push the production curve later in the day, versus east-facing panels? We have no doubt that NREL is the organization best suited to help answer these diverse questions, and are seeking contacts there.

API access to interval data

We're pretty familiar with the structure of interval usage data, but where to get it is another matter entirely. The Green Button initiative seems to have made mere *access* a thing, but there seems to be a mountain of integration yet to be done to obtain data systematically. We've identified two paid sources, Genability and

Utility API, that appear to have fronted the development to access this caliber of data, but both seem cost prohibitive and have proven surprisingly difficult to get in touch with. A free source, OpenEI, seems to be barking up the same tree, but output seems limited to rates by utility, rather than interval data by customer. Presumably, the paid sources have an edge, which is why they're able to stay in business. Consultation on the current state of the Green Button, and how to best obtain customer's interval data could save our team weeks of research (or years of development that we haven't budgeted for).

Avoided Cost Calculator

Honestly, we don't even know how this thing works yet, but we know it's imperative to modeling time-of-use rates in California. The downloadable Excel file–apparently an empirical public document–has a dozen or so large, flat data sets storing a dollar value for every hour of every year through 2050, for every climate zone in the region. Apparently it's updated annually, but we don't know if columns are revised or simply added to the back end. We also don't yet know how effectively it could be reengineered as a web service, or how reliable the values in question promise to be long-term; we imagine the rates we store–should we go that route–will likely need regular updating, and are possibly only projections in and of themselves.

Not knowing what we don't know, we don't have a very sophisticated ask here. We'll almost certainly need some light consulting to wrap our heads around the permanence of this data set (the formula seems to have been passed via a Herculean political initiative, and thus is probably here to stay for a while). Of course, the Avoided Cost Calculator is only one formulation and one data set; we expect to have to analyze a number of similar models as we program for more and more utilities. Unless a reliable service already exists, of course.

NEM 3.0

There's plenty of buzz and explanations on this program in and of itself, from reliable organizations like SEIA. It seems fairly consistent at a glance. But do we even understand this problem correctly? We're assuming that because rates are applied hourly, import and export amounts are billed hourly, but have yet to qualify that assumption. Utility interval usage is typically recorded in 15-minute increments; will net billing apply to that schedule instead? And if so, how important is it to calculate a 15-minute offset from 15-minute PV production estimates? GHI from the NSRDB is provided in minimum 30-minute increments–can we in good faith run a smoothing formula to extrapolate 15-minute increments?

The Ask

We feel we have a decent grasp of the problem and its complexity, and have identified viable, legitimate-seeming sources. But while we specialize in solar software and we do have a mathematician on the team, climate science is still something of a frontier for us. We request grown-ups from a few different disciplines to–at the very least–check our work, and most likely offer substitutes to some of our solutions.