

CASBO WEBINAR

Solar Development 201

From Construction to Commissioning

January, 28th at 10:00 am PST

Meet Your Speakers



Nate Roberts
Sr. Director, Development

14+ years experience working in general construction and renewable energy development and construction. Oversees development and construction for all Distributed Generation assets in North America



Casey Miller
Director, Development

14+ years experience working in renewable energy. Oversees development and construction for behind-the-meter projects in California.



David Granlund
Sr. Project Manager, Development

4+ years experience developing solar for CA school districts, resulting in close to 50 MW of capacity across dozens of districts



Madeline Milani
Marketing Manager

Focus on expanding renewable energy beyond energy savings by impacting the classroom and indirect stakeholders

Our goals for the webinar:

- Know the steps that a solar developer takes once construction begins.
- Understand information a solar developer might need to complete tasks.
- Learn how solar and storage integrate into your campus environment.

Webinar Outline

Introductions

Case Study: Sample Project Schedule

1. Pre-Construction Planning
2. Construction
3. Start-up, Operation and Commissioning
4. Closeout

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Project Schedule

Let's look at a sample project schedule to orient ourselves to the development process.

Recapping from Part I

- Kick-Off Meeting
- Introduce Project Team
- Gather Stakeholder Needs
- Review Project Schedule

SITE DILIGENCE

UTILITY INTERCONNECTION

PV + STORAGE DESIGN

EQUIPMENT PROCUREMENT

CONSTRUCTION

OPERATION

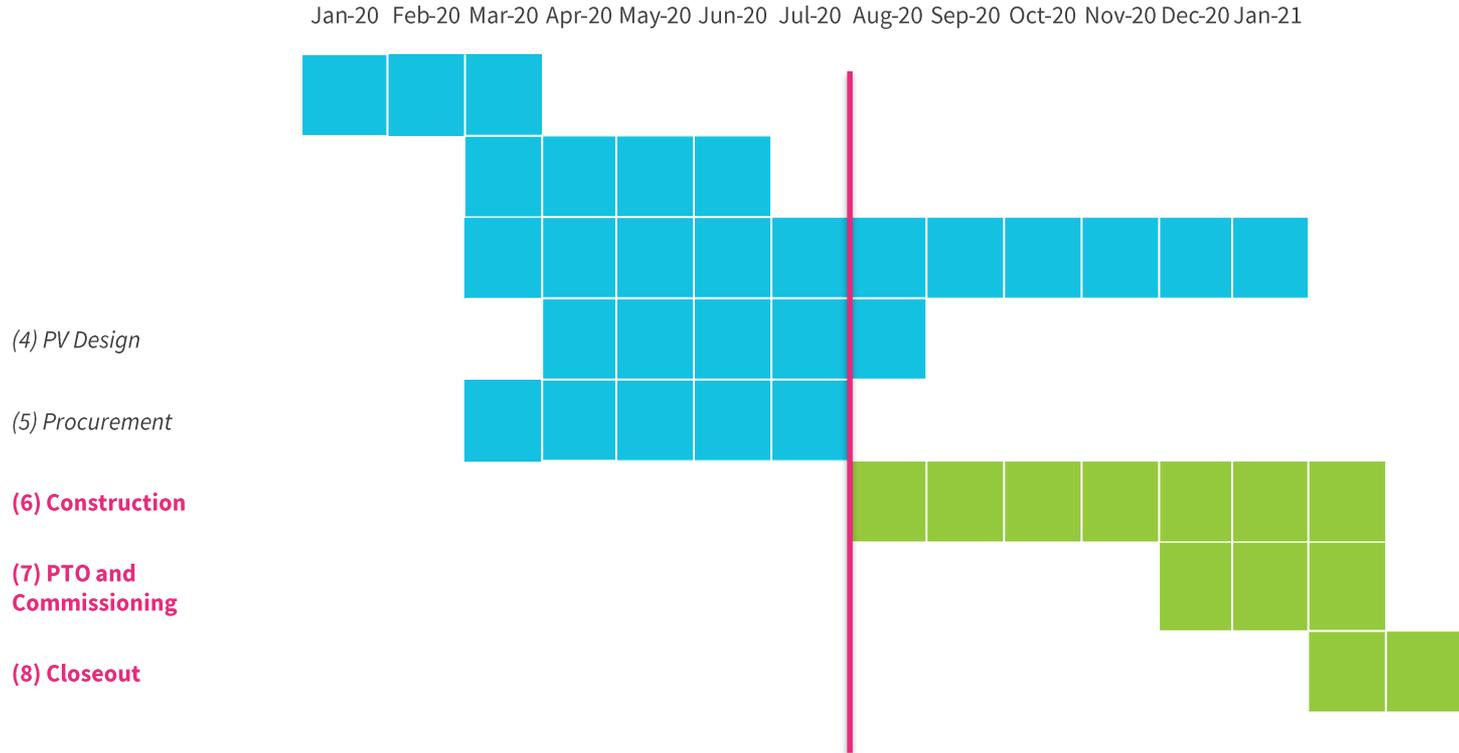


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1. Pre-Construction

What goes down before we dig holes in the ground.

Schedule: 2.8 MW Solar Parking Canopy



Pre-Construction Meeting

Once near permit submission, the agenda switches to construction topics. These include:

- Phasing and sequencing
- Temporary constructs
- Schedule adjustments
- Other checklist items

MATERIAL AND EQUIPMENT SUBMITTALS

PERMIT DRAWINGS

DSA FORMS



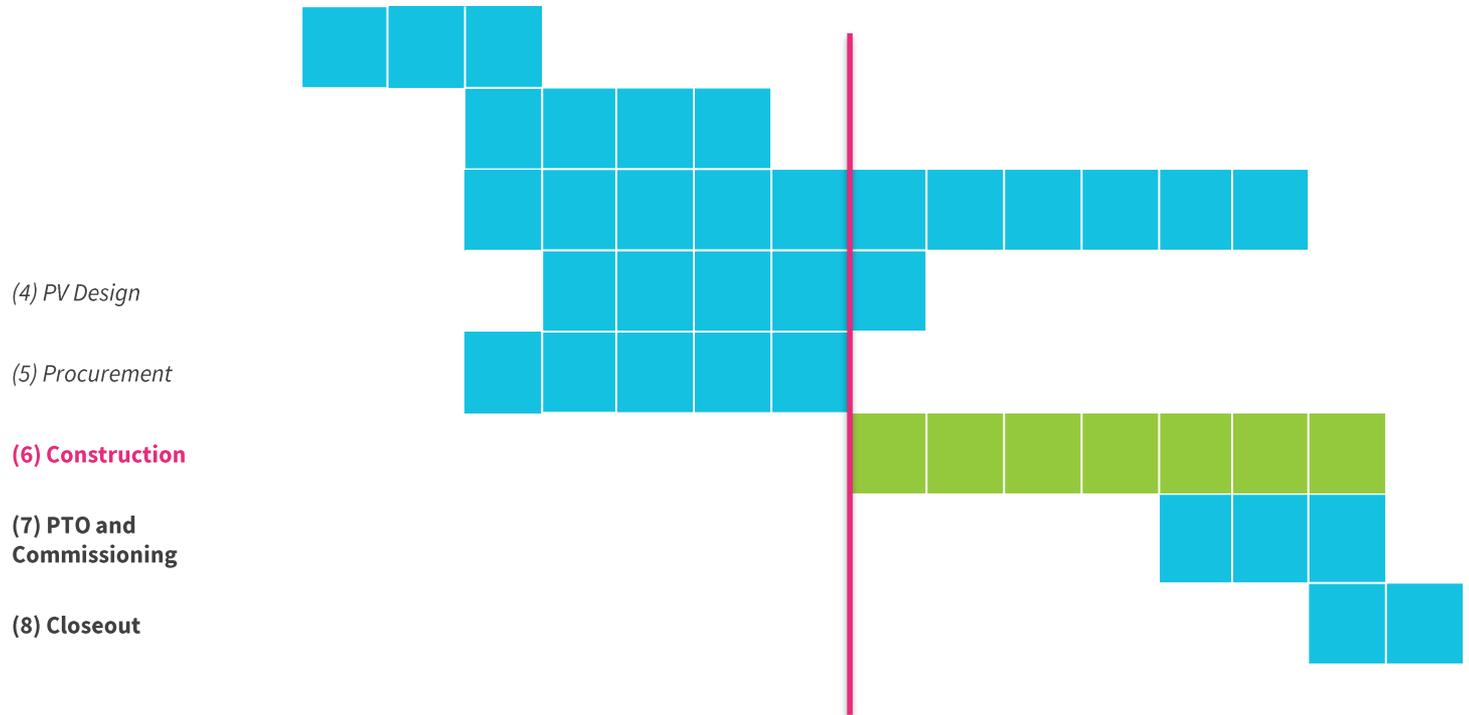
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2. Construction

Lights, Panels, Action!

Schedule: 2.8 MW Solar Parking Canopy

Jan-20 Feb-20 Mar-20 Apr-20 May-20 Jun-20 Jul-20 Aug-20 Sep-20 Oct-20 Nov-20 Dec-20 Jan-21



Site Modification and Material Staging

- **Site Modification:** At certain projects sites and locations, trees and/or light poles may need to be removed to facilitate array placement or to address shading concerns. Temporary construction fencing, traffic patterns, and fire lane access may be required as well.
- **Material Staging:** Equipment and material staged only in approved areas.



Coordination, Assembly, and Inspections

- **Coordination:** Weekly construction update and coordination meetings are held with facility personnel, design and construction partners, Inspector of Record, and testing and special inspection laboratory.
- **Array Assembly:** Includes foundations, structure, panels, DC/AC electrical work, and directional boring/trenching.
- **Inspections:** Facilitated concurrently with construction.



LED Lighting, Energy Storage, and Data Acquisition

- **LED Lighting:** Light poles that are removed due to array placement will be replaced with under canopy LED lights. We look to utilize a customer's existing lighting circuit in order to maintain consistent lighting operations to a given campus or facility.
- **Battery Energy Storage System (BESS):** May be installed in parallel with the balance of the PV system; all in effort to maintain projected Commercial Operation Dates.
- **Installation of data acquisition system (DAS) equipment:** May include a kiosk/dashboard, metering, weather instrumentation and power controllers.



Finishing Touches

- **Shutdown/Tie-in:** A Method of Procedure (MOP) is developed to safely shut down power and connect the system to the grid. Shutdowns typically occur during off hours (nights and/or weekends).
- **Installation of Utility Upgrades (where applicable):** Including substation/transmission upgrades, as well as SCADA recloser or telemetry unit installations, if applicable.
- **Full Site Cleanup:** Restoring construction areas back to our documented pre-construction conditions.



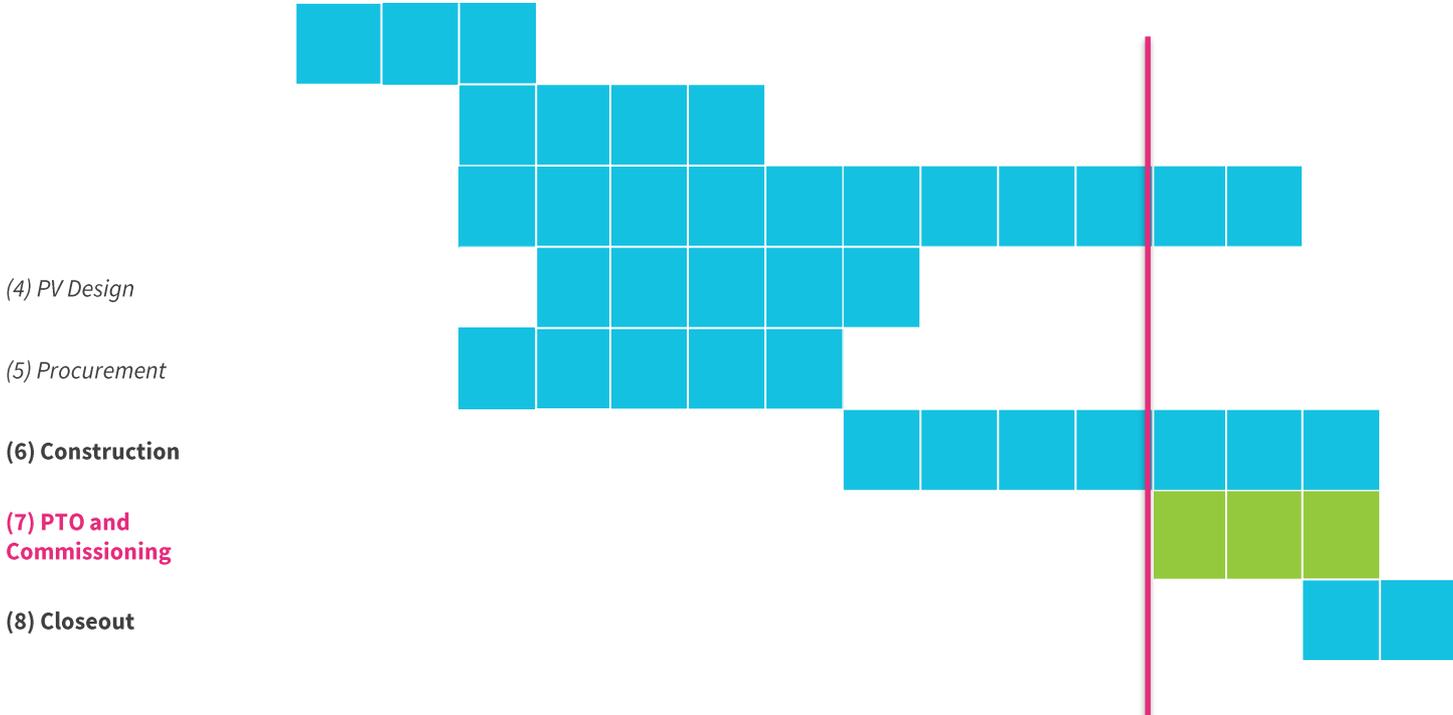
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3. Start-up, Operation, and Commissioning

It's time to start generating solar power!

Schedule: 2.8 MW Solar Parking Canopy

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Following Mechanical Completion

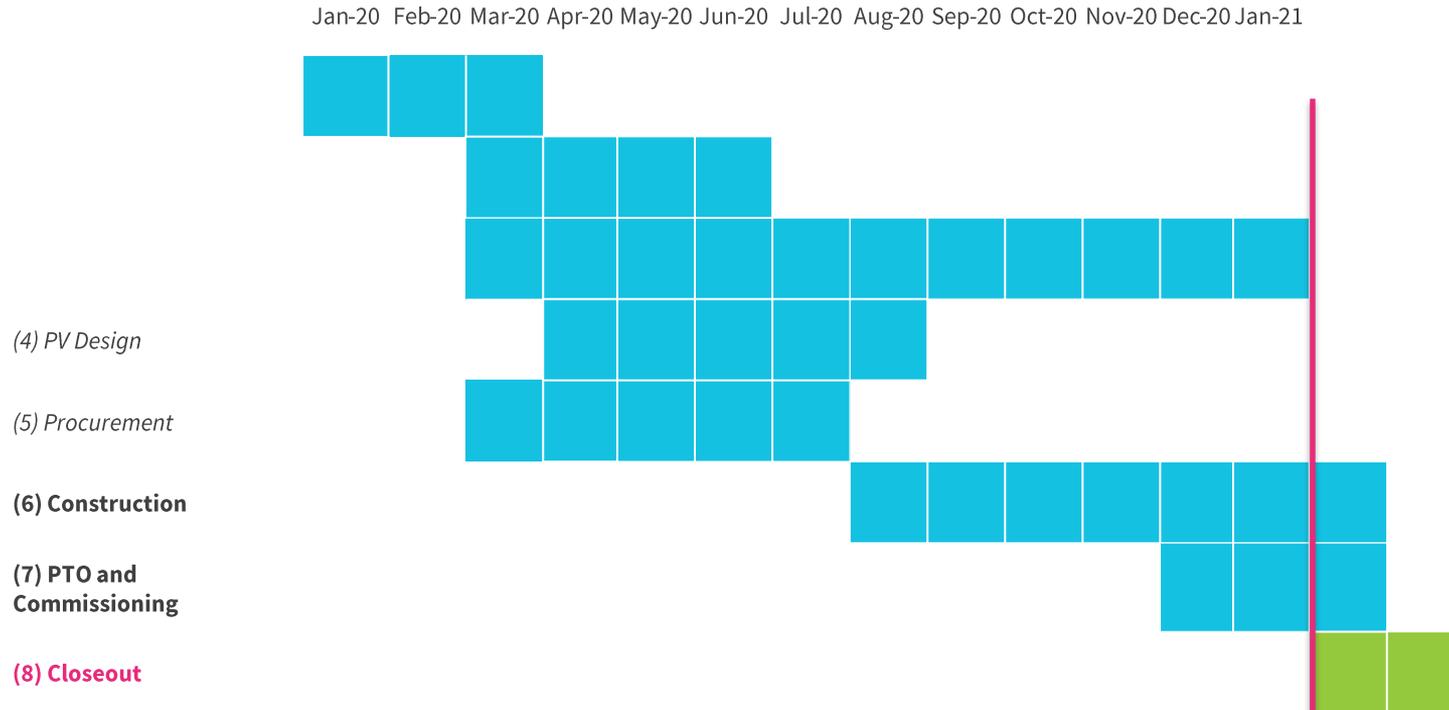
- **Start-up:** Confirmation that all operating equipment is checked-out and ready to be commissioned once the system is started up.
- **Request for and declaration of Permission to Operate:** Also known as PTO, which is submitted to the utility
- **System Commissioning and Performance Testing:** Acceptance Testing will take place after the system receives Permission to Operate.
- **Notice of Commercial Operation:** Issued after the determined performance acceptance period; and upon the system passing all required performance metrics

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4. Closeout

Checking off the final boxes

Schedule: 2.8 MW Solar Parking Canopy



Project Closeout

- **Closeout Documentation:** Includes Record Drawings, Product Documentation, and miscellaneous documents to support the project financial transaction
- **Site Safety Walk:** Ensure all key facility personnel are trained on how to shut the system down in the event of an emergency
- **Live Demonstration of Data Acquisition System (DAS):** View real-time system production and a variety of pre-formatted or customizable reports
- **Punchlist and Final Site Clean-Up:** The goal is to have a given site restored as construction progresses and as soon as possible upon the notice of Commercial operation.
- **Hand off to Asset Management:** Introductions are made to the internal asset management and operations and maintenance team.

Sample Punchlist

PUNCH ID	SITE	TASK NAME	ENTITY RESPONSIBLE	STATUS (OPEN/CLOSED)	DATE COMPLETED	APPROVED BY	COMMENTS	BEFORE PHOTO	AFTER PHOTO
8.14.2019_01	School 1	Padlock all disconnects.	ForeFront	CLOSED	8.28.2019	ForeFront, School 1	None.		
8.14.2019_02	School 2	Fill in holes/trenches and grade fill along west edge of system.	ForeFront	CLOSED	8.28.2019	ForeFront, School 2	None.		
8.14.2019_03	School 3	Remove spare modules.	ForeFront	CLOSED	8.28.2019	ForeFront, School 3	None.		

Let's revisit our goals for the webinar.

- Know the steps that a solar developer takes before beginning construction.
- Understand information a solar developer might need to complete tasks.
- Learn how solar and storage integrate into your campus environment.

Questions?



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Thank you