Integrating solar electric into the architectural design process

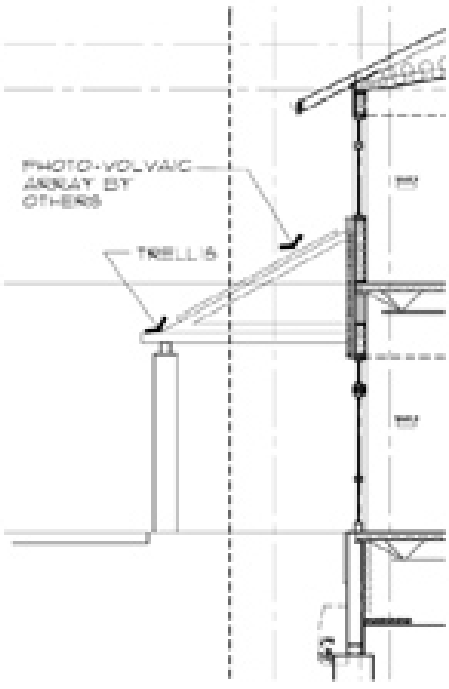
SunJuice
INTEGRATED SOLAR DESIGN

Design Process

For the most successful incorporation of solar technology into a building, the solar designer must participate in the initial design discussions. Architect Steve Steinbicker (Architecture West LLC) knew his client wanted photovoltaics to be part of his building (Sundance Professional Center in Loveland, Colorado) so he invited SunJuice Solar to some early design meetings. We helped refine the design team's ideas of where to place the PV panels based on panel dimensions, costs, and routing of wires.

SunJuice worked with closely with the architects, structural engineers, and electrical engineers to integrate the PV system seamlessly into the building design.

As design parameters changed and various constraints forced changes to the building, SunJuice was ready with solutions to each challenge.



Permit Process

Some of the greatest challenges to the solar project were presented by the electric utility and the building department. Being the first grid-connected photovoltaic system in Loveland (see Loveland Herald article), everybody wanted to be sure it was done right. SunJuice worked with the utility to develop an interconnection agreement for photovoltaic generators and completed all of the documentation to obtain the building permit.

PV Watts Results

Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.97	124	10.42
2	4.54	126	10.58
3	5.86	178	14.95
4	6.21	176	14.78
5	6.34	182	15.29
6	6.55	178	14.95
7	6.46	176	
8	6.44	175	
9	6.17	166	
10	5.33	154	
11	4.17	123	
12	3.80	119	
Year	5.49	1876	157.58

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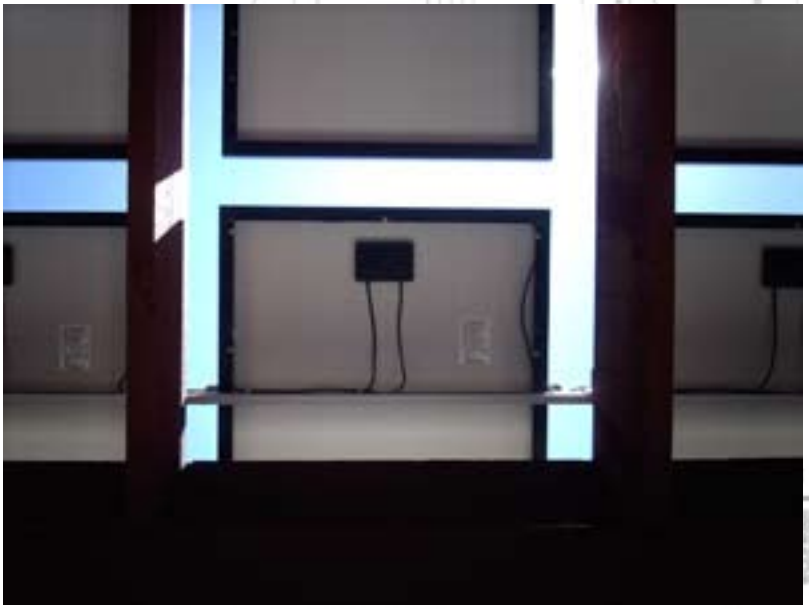
Installation

Once the design was complete, the building permit and interconnection agreement were ready, and the equipment was ordered, it was time for the easy part – installation.



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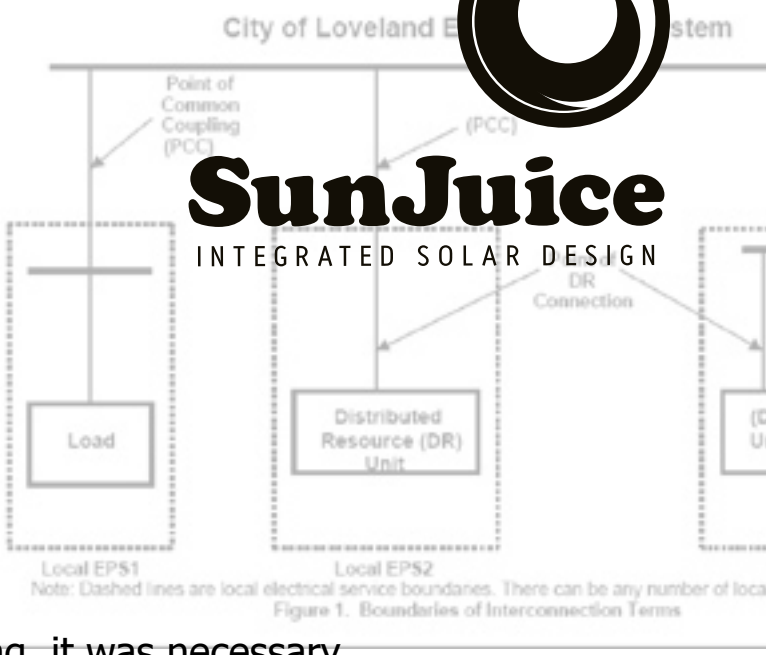


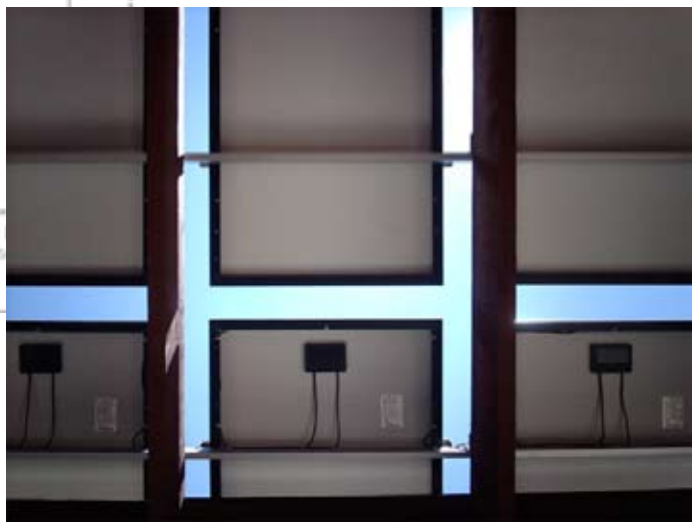
Note: Dashed lines are local electrical service boundaries. There can be any number of loca
Figure 1. Boundaries of Interconnection Terms

LEED Certification

Since this was to be a LEED-certified building, it was necessary to complete documentation for the USGBC. We used the on-line submittal system.

Commissioning

The final step for this LEED-certified project was commissioning. SunJuice provided full commissioning documentation and on-site support for the commissioning team.



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SOLAR PHOTOVOLTAIC SYSTEM COMMISSIONING NARRATIVE

The photovoltaic system has been designed to produce grid-quality electricity. The system consists of 20 Kyocera 130 multicrystalline photovoltaic modules wired in series with a SMA Sunny Boy 2500 grid-interactive inverter. The photovoltaic array, mounted on the south facing awning, is capable of producing 2600 watts (352 volts and 7.39 amps at maximum power) of DC electricity under full sun conditions. The Sunny Boy inverter turns the DC current into AC current, following the waveform from the grid. The Sunny Boy cannot operate without the grid present to model the waveform and shuts down within two cycles if it does not sense the grid within voltage specifications. The Sunny Boy puts out a maximum power of 2500 watts at 12 amps and is connected to the main electrical service through a 15 amp circuit breaker. The inverter is required by National Electrical Code to have disconnecting means on both sides (DC and AC). The utility requires a lockable, visual "open" AC disconnect adjacent to the utility meter. The system is expected to produce 3752 kWhrs of AC electricity each year, based on PV Watts – the industry standard modeling software from the National Renewable Energy Laboratory.

-prepared by SunJuice Solar LLC