Winter Solar Panel Shade Analysis
Chris Jones Santa Rosa, CA 1/13/2022

We have two shade trees in the back yard, a taller deciduous valley oak and a shorter evergreen magnolia, that are critical for not needing air conditioning in summer (as well as cultivating our lawn mushrooms ☺). But they are shading our house roof which impacts solar energy production that we want to expand along with adding batteries, and the valley oak is growing into the power lines which is a fire hazard. We need to decide two things:

1. Whether to remove one or both of the trees and replant one or more shorter trees, or build a shade structure.
2. How many new solar panels to get, where to put them, and where to put the old ones which are currently in the shade.

Based on the following analysis, it looks like cutting down the valley oak would solve the SE house roof problem where we want to expand in to. By 2 PM in January the magnolia would still shade the existing SW house roof panel installation, but this shade will decrease and should be low for most of the rest of the year. And if we leave the old panels there we can buy 25 American made Solaria panels that would fill the SE roof which would increase our off-grid potential with a 38 kWh battery pack from 64% to 69% for only $3K additional solar panel cost. ***See if renting local Solmetric Suneye with leaves currently off the valley oak can confirm SW house roof performance will be acceptable with the valley oak removed but not the magnolia; perhaps post-processing software can do this.***

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House SW Roof
1/10/2022

Time	Voltage	Power	kWh	Observations with both trees present	Projection if valley oak removed
8 AM				Full shade from roof; remove roof? ☺	Full shade from roof
9 AM	277	85	0	Partial shade from roof	Partial shade from roof
10 AM	421	470	.31	No shade	No shade
11 AM	276	328	.79	Partial shade from valley oak	No shade
Noon	256	80	.99	Mostly shady from valley oak	No shade
1 PM	381	33	.99	Mostly shady from valley oak	No shade
2 PM	379	0	.99	Half shade from magnolia, partial shade from valley oak	Half shade from magnolia
3 PM	365	0	.99	Half shade from Magnolia	Half shade from Magnolia
4 PM	337	0	.99	Almost all shade from neighborhood trees, but production would be low anyway due to angle	Almost all shade from neighborhood trees, but production would be low anyway due to angle
5 PM	329	0	.99	Sunset	

House
SW roof
8 AM

Full shade
from roof

House
SW roof
9 AM

277V
85W
0 kWh

Partial
shade
from roof

House
SW roof
10 AM

421V
470W
0.31 kWh

House
SW roof
11 AM

276V
328W
0.79 kWh

Partial shade from valley oak

House
SW roof
Noon

256V
80W
0.99 kWh

Mostly shady from valley oak

House
SW roof
1 PM

381V
33W
0.99 kWh

Mostly shady from valley oak

House
SW roof
2 PM

379V
0W
0.99 kWh

Half shade from magnolia, partial shade from valley oak

House
SW roof
3 PM

365V
0W
0.99 kWh

Half shade
from
magnolia

House
SW roof
4 PM

329V
0W
0.99 kWh

Almost all shade from neighbor-hood trees, but production would be low anyway due to angle

House SW roof shade trees

1 PM from top of panels:

Blocked only by valley oak

House
SW roof
shade trees

1 PM
from
bottom
of panels:

Blocked by
valley oak,
and barely
by magnolia

House SE Roof
1/10/2022

Time	Observations with both trees present	Projection if valley oak removed
8 AM	Partial shade on far surface from neighbor's house	Partial shade on far surface from neighbor's house
9 AM	No shade	No shade
10 AM	No shade	No shade
11 AM	No shade	No shade
Noon	No shade	No shade
1 PM	Telephone pole shade; remove telephone pole? ☺	Telephone pole shade
2 PM	Valley oak starting to shade	No shade
3 PM	Valley oak shading most of near surface over family room and part of far surface	No shade
4 PM	Almost complete shade from valley oak, and partial shade from magnolia; but SE panel angle sub-optimized by this point	Partial shade from magnolia; but SE panel angle sub-optimized by this point
5 PM	Sunset	Sunset

House
SE roof
8 AM

Partial shade on far surface from neighbor's house

House
SE roof
9 AM

House
SE roof
10 AM

House
SE roof
11 AM

House
SE roof
Noon

House
SE roof
1 PM

Telephone
pole shade

House
SE roof
2 PM

Valley
oak
starting
to shade

House
SE roof
3 PM

Valley oak shading most of near surface over family room and part of far surface

House
SE roof
4 PM

Almost complete shade from valley oak, and partial shade from magnolia; but SE panel angle sub-optimized by this point

Garage SE Roof
1/10/2022

Time	Observations
8 AM	No shade
9 AM	No shade
10 AM	No shade
11 AM	No shade
Noon	No shade
1 PM	Telephone pole shade
2 PM	Telephone pole shade
3 PM	No shade
4 PM	No shade
5 PM	Sunset

Garage
SE roof
8 AM

Garage
SE roof
9 AM

Garage
SE roof
10 AM

Garage
SE roof
11 AM

Garage
SE roof
Noon

Garage
SE roof
1 PM

Telephone
pole shade

Garage
SE roof
2 PM

Telephone
pole shade

Garage
SE roof
3 PM

Garage
SE roof
4 PM