The NOIRLab Sustainability Program

AAAC Meeting

September 2022

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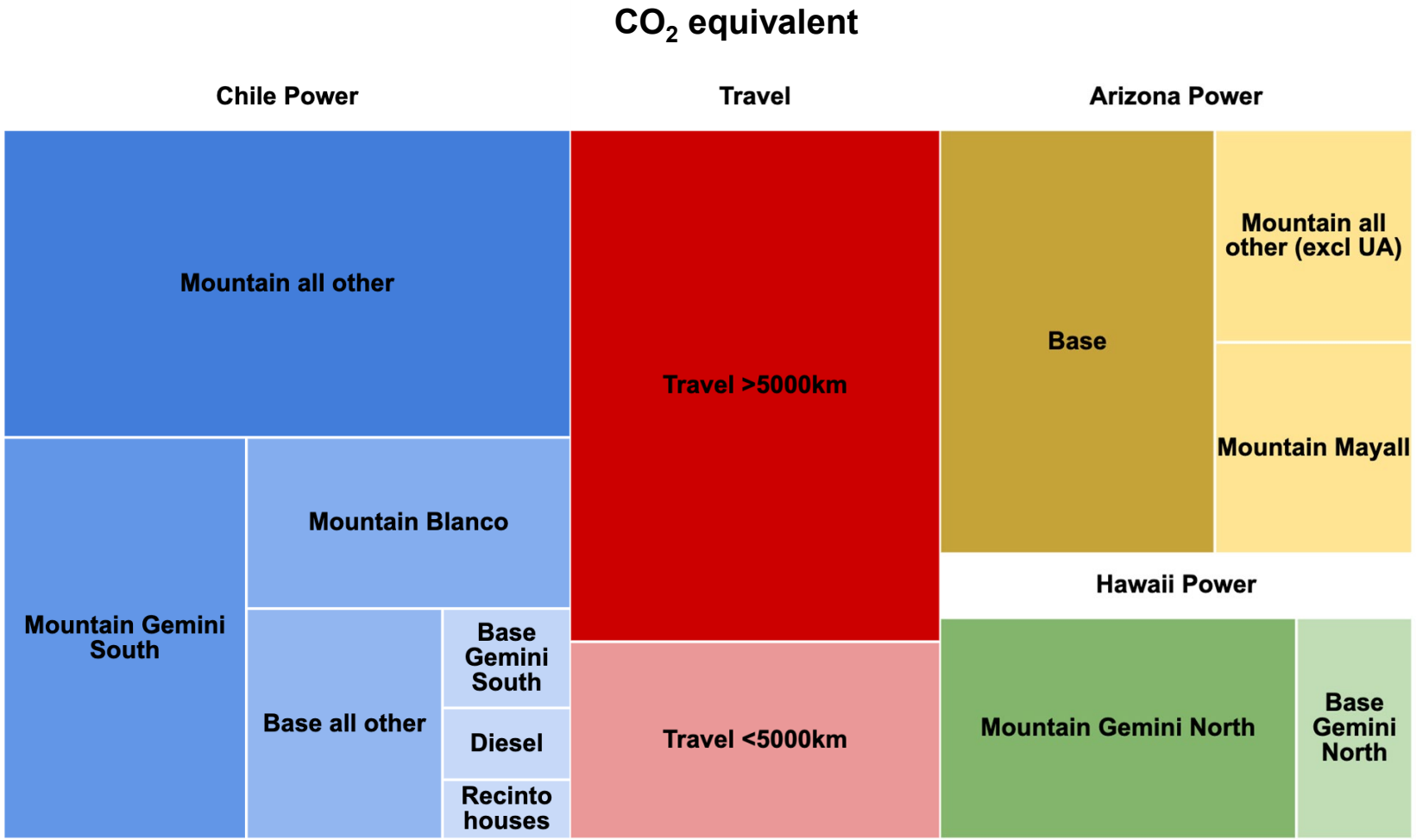
NSF's NOIRLab

Discovering Our Universe Together

NOIRLab Carbon footprint

Includes electricity (incl. diesel for backup power) + travel paid by NOIRLab - FY2019 baseline: **8700 tons CO_2 equivalent**



Areas of rectangles are proportional to the carbon footprint in each area

Gemini PV panels (3 systems) + other energy savings projects implemented in the period 2015-2018 currently offset 690 tons CO_2 equivalent per year (equal to 80% of the current carbon footprint from grid electricity usage at Gemini North).

NOIRLab's Sustainability Program

5-year renewal proposals

NOIRLab's target is to lower our carbon footprint from its estimated size of ~8700 tons CO_2 equivalent in FY2019 to a target value of ~6200 tons CO_2 equivalent by the end of FY2027, a ~30% reduction.

This reduction will be equivalent to the footprint from the annual electricity consumption of 500 wasteful US houses.

Two-tiered approach included in the NOIRLab 5-year renewal proposals:

- Reduce NOIRLab funded travel by approximately 50% by the start of FY2027
- Invest funds from reduced travel into
  - Energy efficient equipment
  - Additional photovoltaic panels

Decadal Survey: *Pathways to Discovery* recommendation on addressing climate change:

… increase the use of remote observing, hybrid conferences, and remote conferences, to decrease travel impact on carbon emissions and climate change.

Sustainability Projects - summary

In 5yr renewal proposal:

- High efficiency transformers
- LED lights
- Window replacements
- Variable frequency exhaust fan
- Data centers hot/cold zones
- Photovoltaic systems:
  - 222 kW - Tucson
  - 100 kW - Hilo
  - 193 kW + 200 kW - La Serena
  - 200 kW CTIO - Tololo
  - 200 kW Rubin - Pachón

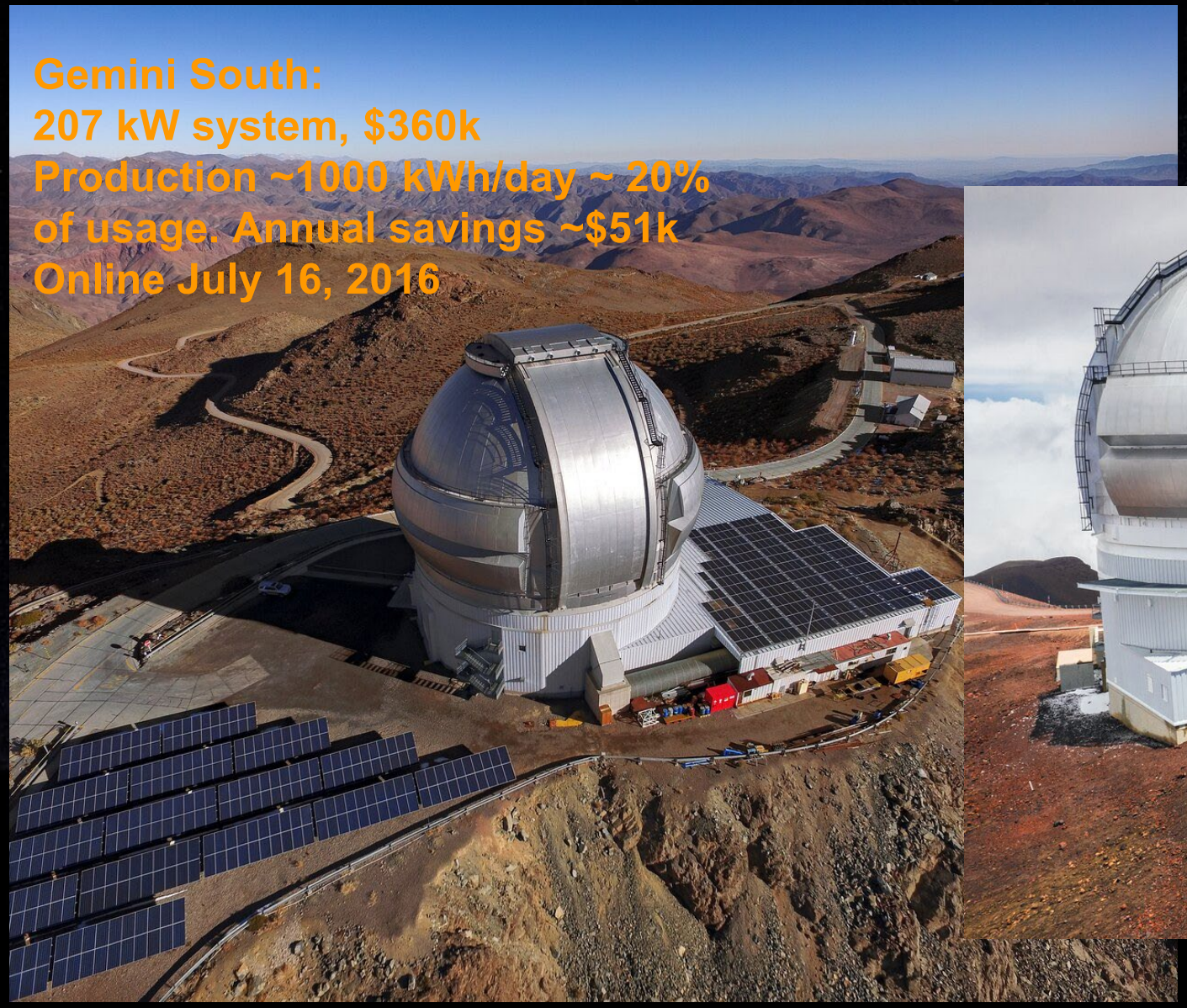
Funded (NSF supplemental funding):

- 810 kW PV system - Pachón

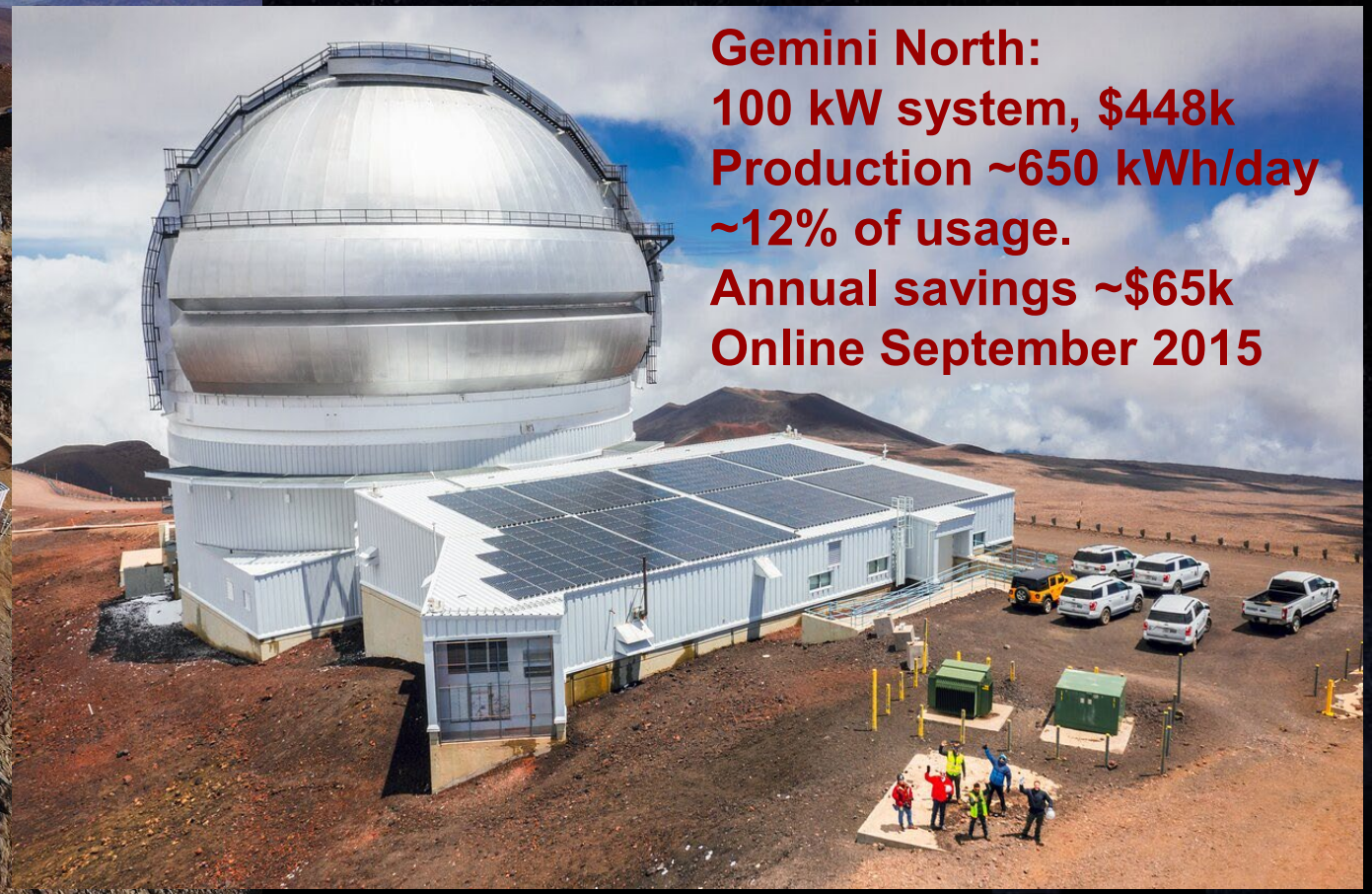
Additional funds needed:

- Battery storage for 810 kW PV system
- Additional high efficiency transformers and window/door replacements - Kitt Peak + Tucson
- Window replacements - KP
- HVAC replacement - Tucson
- Photovoltaic system serving Kitt Peak
- EV chargers - all sites
- Larger PV system to fully power Rubin summit operations

Gemini/NOIRLab Photovoltaic Systems



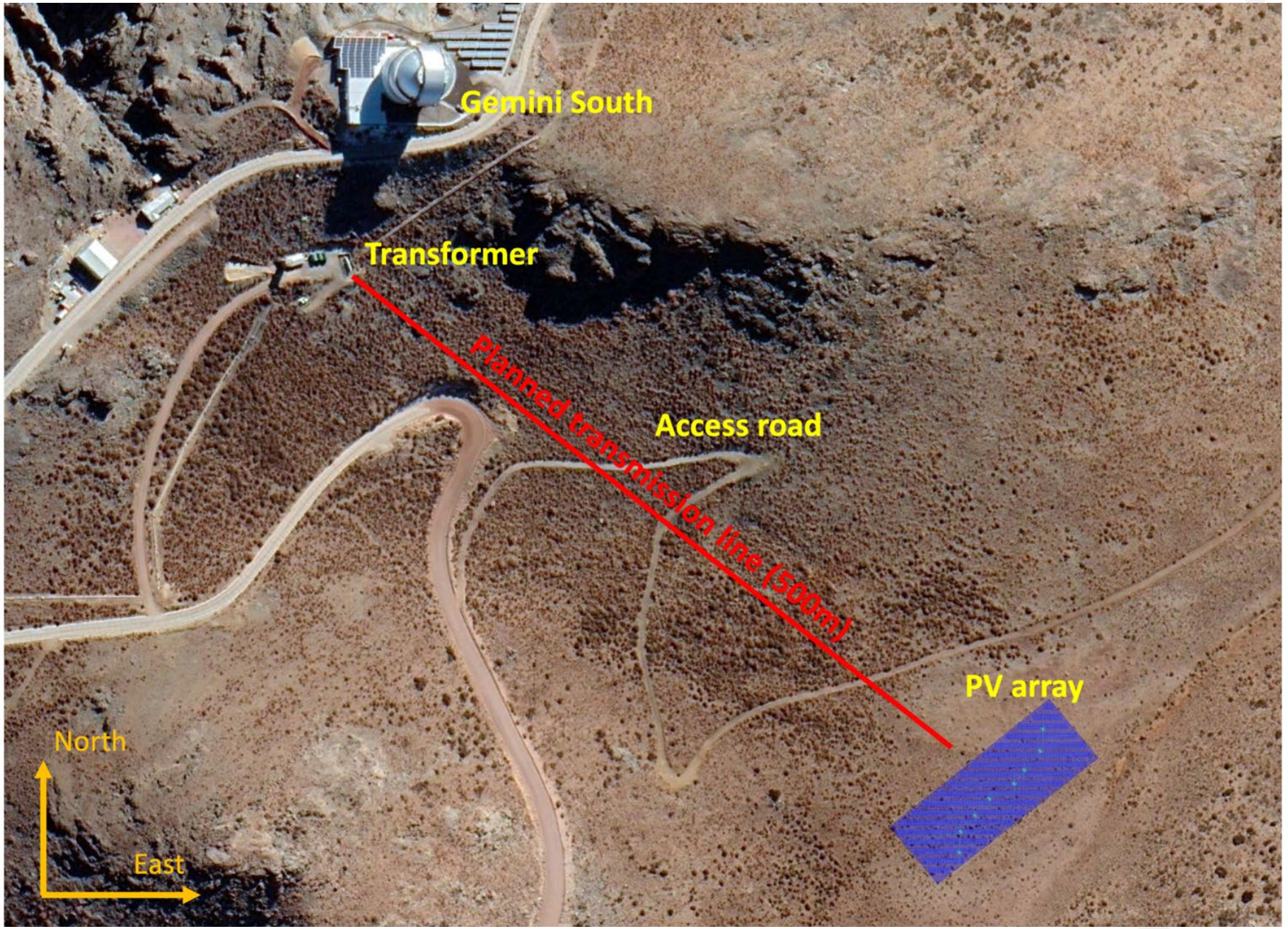
Gemini South:
207 kW system, $360k
Production ~1000 kWh/day ~ 20%
of usage. Annual savings ~$51k
Online July 16, 2016



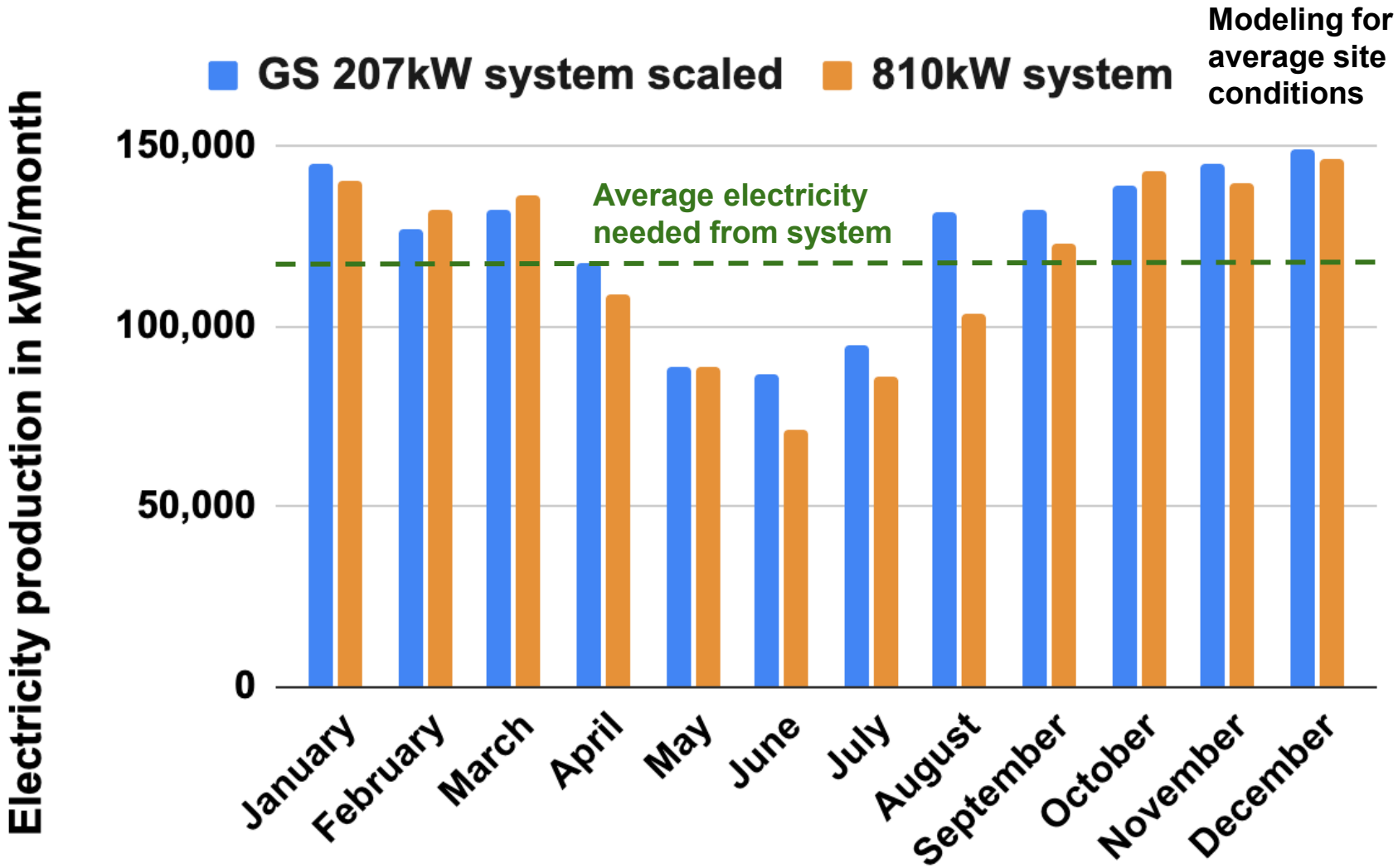
Gemini North:
100 kW system, $448k
Production ~650 kWh/day
~12% of usage.
Annual savings ~$65k
Online September 2015

Site map for 810 kW PV system in Chile.

Funding has been approved from NSF as supplemental funding.



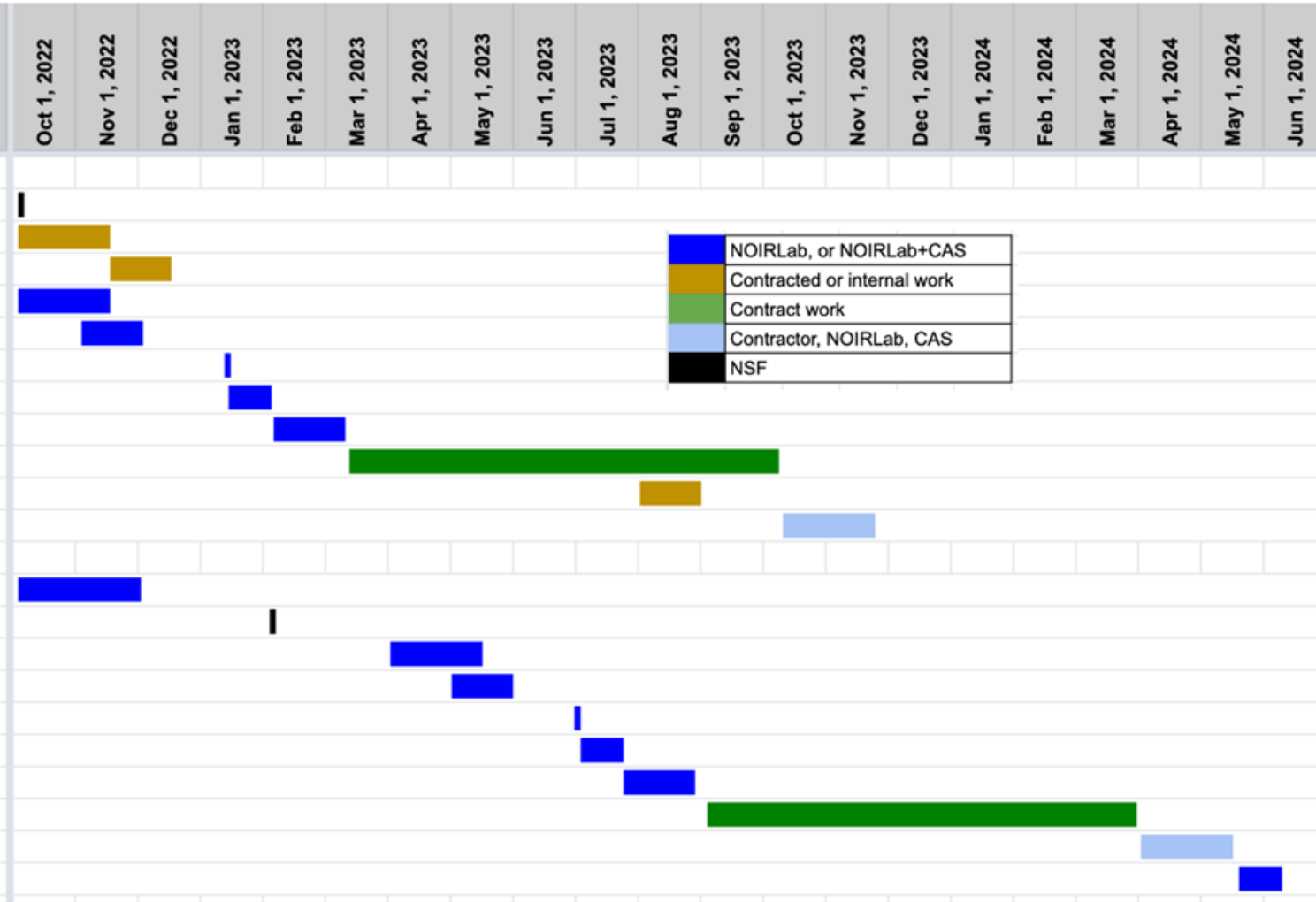
GS zero CO_2 emissions - Production



- During southern winter production is less than the needs (GS is grid connected)
- During southern summer production is more than the needs (excess to be used by SOAR)

GS zero CO_2 emissions: Top-level schedule

#	Activity	Est. Duration days	Start Date	End Date
	GS at zero CO2 emissions - phase 1			
1	Assumed funding action from NSF on phase 1	3	10/1/2022	10/4/2022
2	Enginering site evaluation	45	10/1/2022	11/15/2022
3	Site preparation, flexible can move later	30	11/15/2022	12/15/2022
4	NOIRLab preparation of technical material for RfP	45	10/1/2022	11/15/2022
5	CAS preparation of RfP	30	11/1/2022	12/1/2022
6	Deadline for contractor submission of proposals	3	1/10/2023	1/13/2023
7	Evaluation of contractor proposals	21	1/12/2023	2/2/2023
8	Contract preparation and approvals	35	2/3/2023	3/10/2023
9	PV system design and installation by contractor	210	3/12/2023	10/8/2023
10	Transmission line installation, within PV system installation time	30	8/1/2023	8/31/2023
11	Commissioning and final signoff: contractor+NOIRLab+CAS	45	10/10/2023	11/24/2023
	GS at zero CO2 emissions - phase 2			
12	Proposal preparation for phase 2 NOIRLab+CAS	60	10/1/2022	11/30/2022
13	Assumed funding action from NSF on phase 2	3	2/1/2023	2/4/2023
14	NOIRLab preparation of technical material for RfP	45	4/1/2023	5/16/2023
15	CAS preparation of RfP	30	5/1/2023	5/31/2023
16	Deadline for contractor submission of proposals	3	6/30/2023	7/3/2023
17	Evaluation of contractor proposals	21	7/3/2023	7/24/2023
18	Contract preparation and approvals	35	7/24/2023	8/28/2023
19	Battery system design and installation, incl delivery time	210	9/3/2023	3/31/2024
20	Commissioning and final signoff: contractor+NOIRLab+CAS	45	4/2/2024	5/17/2024
21	Final report to NSF: NOIRLab+CAS	21	5/20/2024	6/10/2024



NOIRLab Carbon footprint reduction

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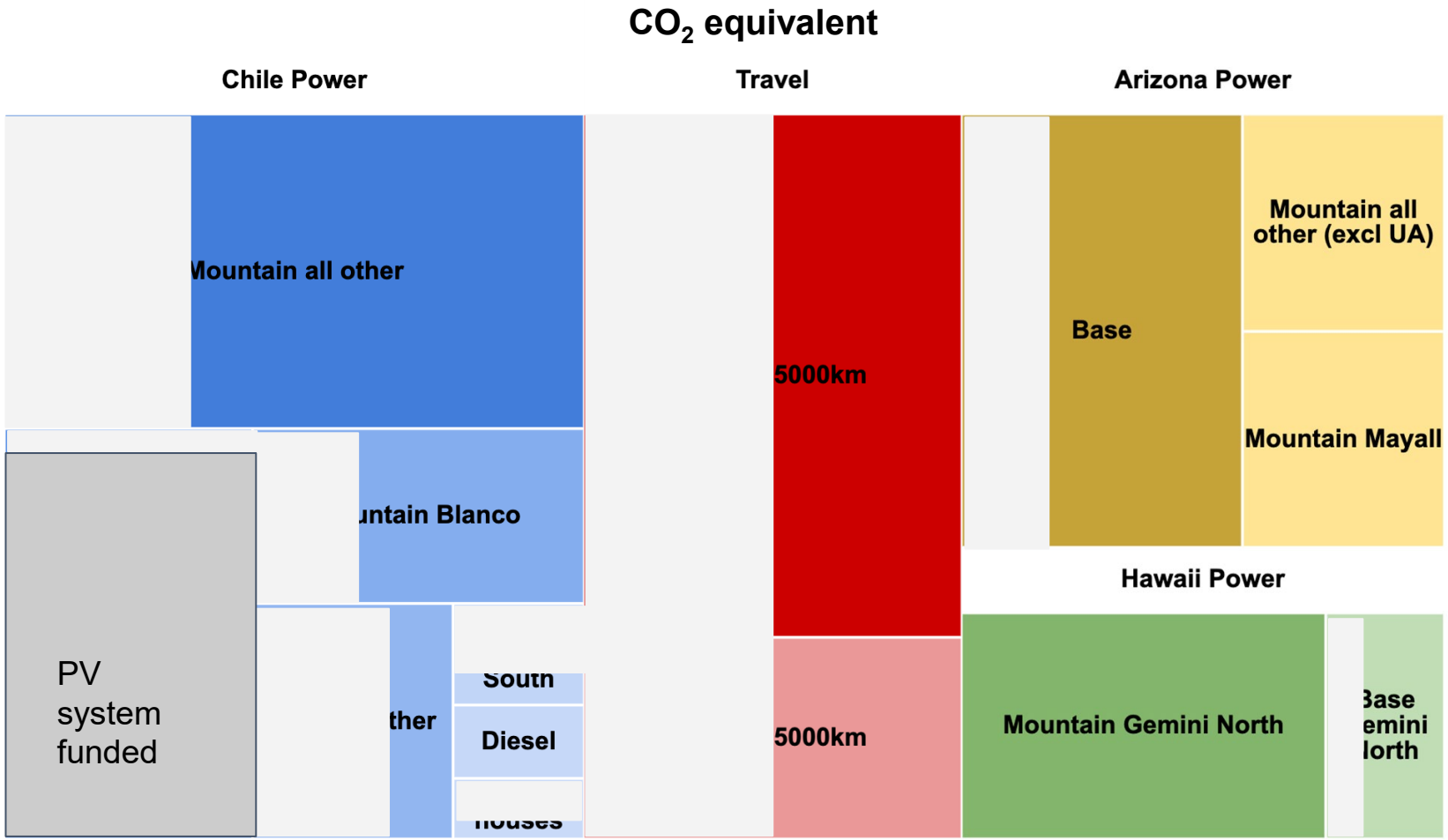

Masked areas in grey show the carbon footprint reduction from all projects in the 5yr renewal proposals, ~30% reduction.

Dark grey shows the additional reduction from the Gemini South 810 kW photovoltaic system

Summary

NOIRLab believes astronomy of the future must be sustainable.

Working with NSF and other partners to take action now.
Significant new infrastructure work starting in FY23.

Changing the way we work and interact with the community.

We need the support of the community to succeed.