

School Rooftop Solar & Battery Storage

60 kW solar & 54 kWh battery

Penelakut Tribe



The Team



Josh James
Penelakut Tribe
Economic & Development

Crystal Alcorn
Penelakut Tribe
Climate Action Coordinator

Janelle Flett
Barkley Project Group
Project Coordinator

Mary Vasey
Barkley Project Group
Development Lead

Penelakut Tribe

Spune'luxutth community

- ✓ Hul'qumi'num speaking
- ✓ Penelakut Island
- ✓ >1,000 members



Barkley Project Group

Specializes in
renewable energy and
community
infrastructure for First
Nations communities



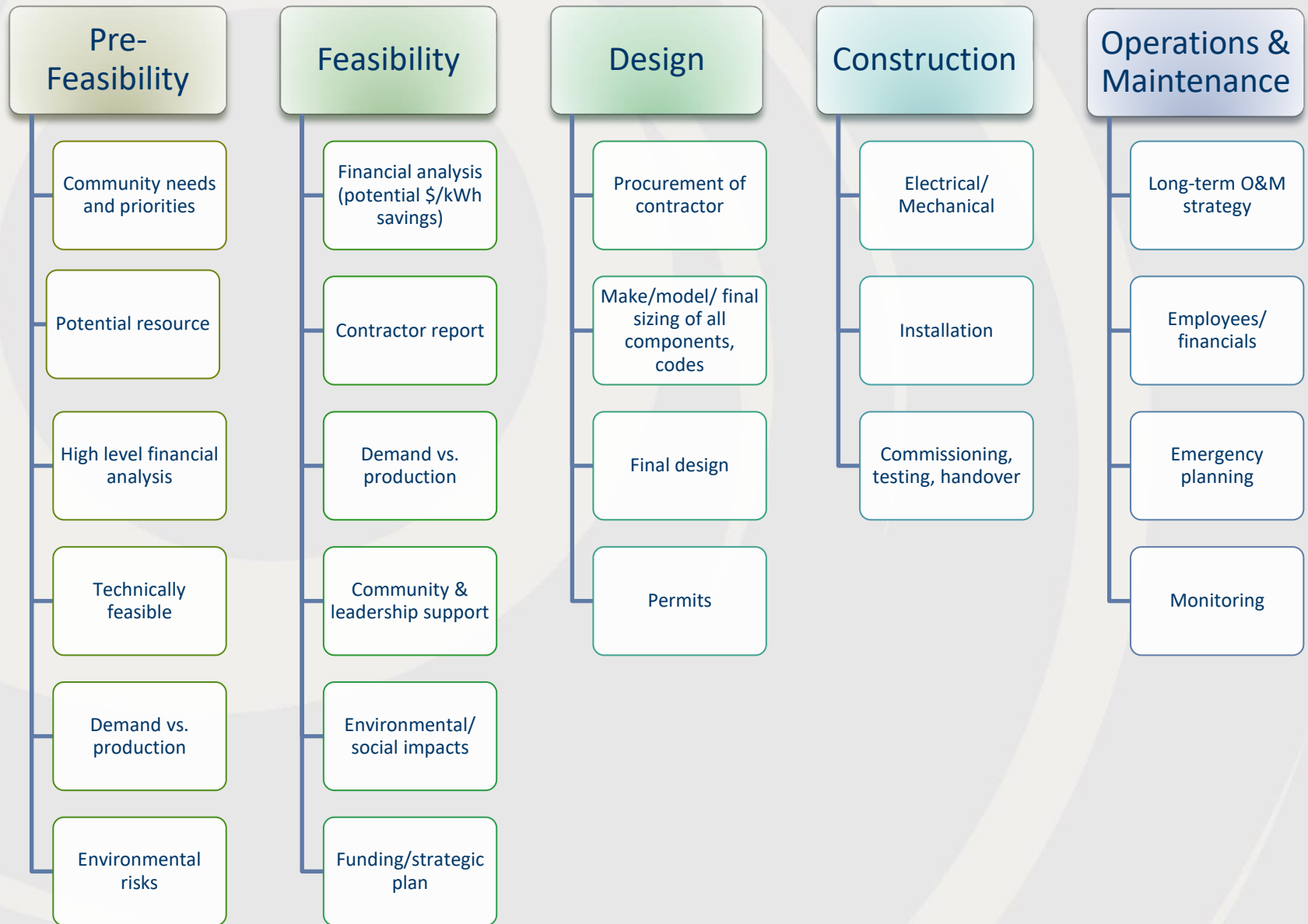
Pre-
Feasibility

Feasibility

Design

Construction

Operations &
Maintenance



Community Energy Plan

Pre-
Feasibility

Feasibility

Solar Project

Design

Construction

Asset Management

Operations &
Maintenance

Community Energy Plan

Pre-Feasibility

Feasibility

- Community needs and priorities
- Potential resource
- Technical feasibility
- Environmental/cultural risks
- Financial analysis
- Funding/strategic plan

Solar Project

Design

Construction

- Procurement of contractor
- System sizing and draft design
- Final design
- Permits
- Construction
- Electrical/ Mechanical
- Commissioning, testing, handover

Asset Management

Operations & Maintenance

- Monitoring
- M&V
- Maintenance

PRE-FEASIBILITY & FEASIBILITY

- Community Energy Plan (2018-2019)



Community needs and priorities

- ✓ Community engagement
- ✓ Leadership meetings
- ✓ Land Use Plan
- ✓ Comprehensive Community Plan



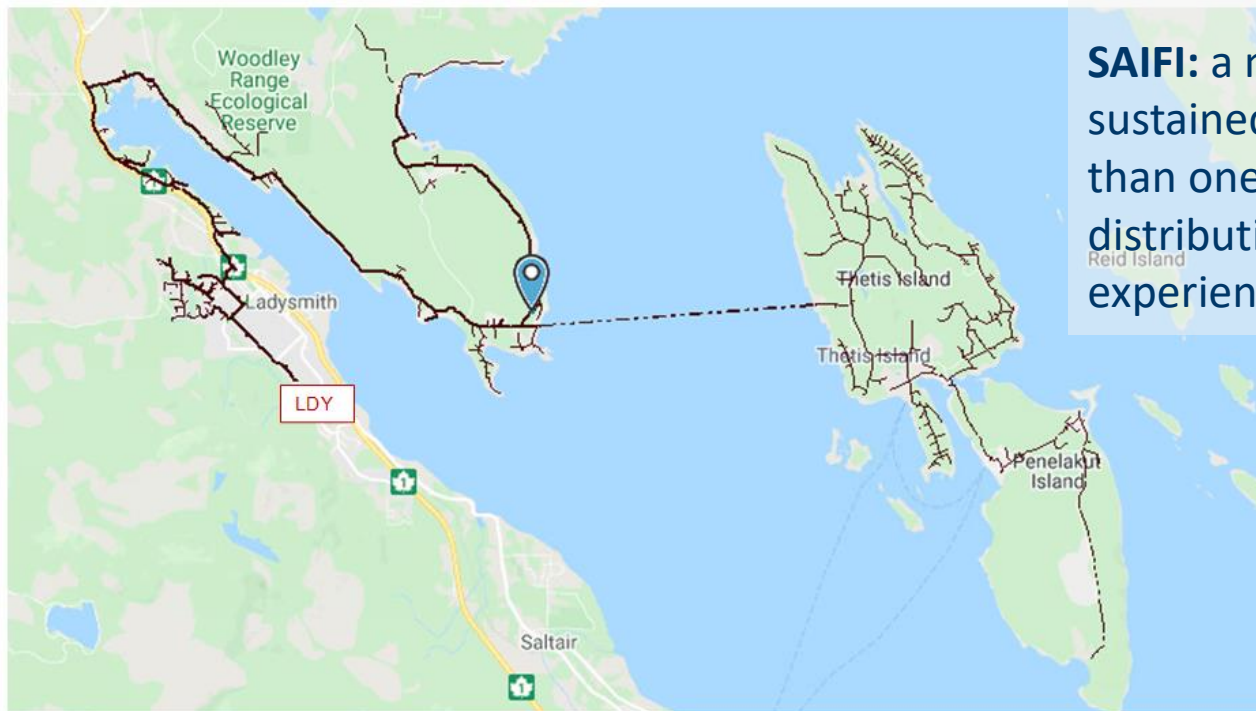
Community needs and priorities

- Reliability of electrical system

Fiscal Year	CI.	CHL.	SAIFI.	SAIDI.	CAIDI.	%ASAI
2017	2,371	7,923	14.0	46.9	3.3	99.465%
2018	1,638	6,167	9.7	36.5	3.8	99.583%
2019	1,477	27,789	8.7	164.4	18.8	98.123%
2020	346	1,552	2.0	9.2	4.5	99.895%
2021	1,267	3,330	7.5	19.7	2.6	99.775%

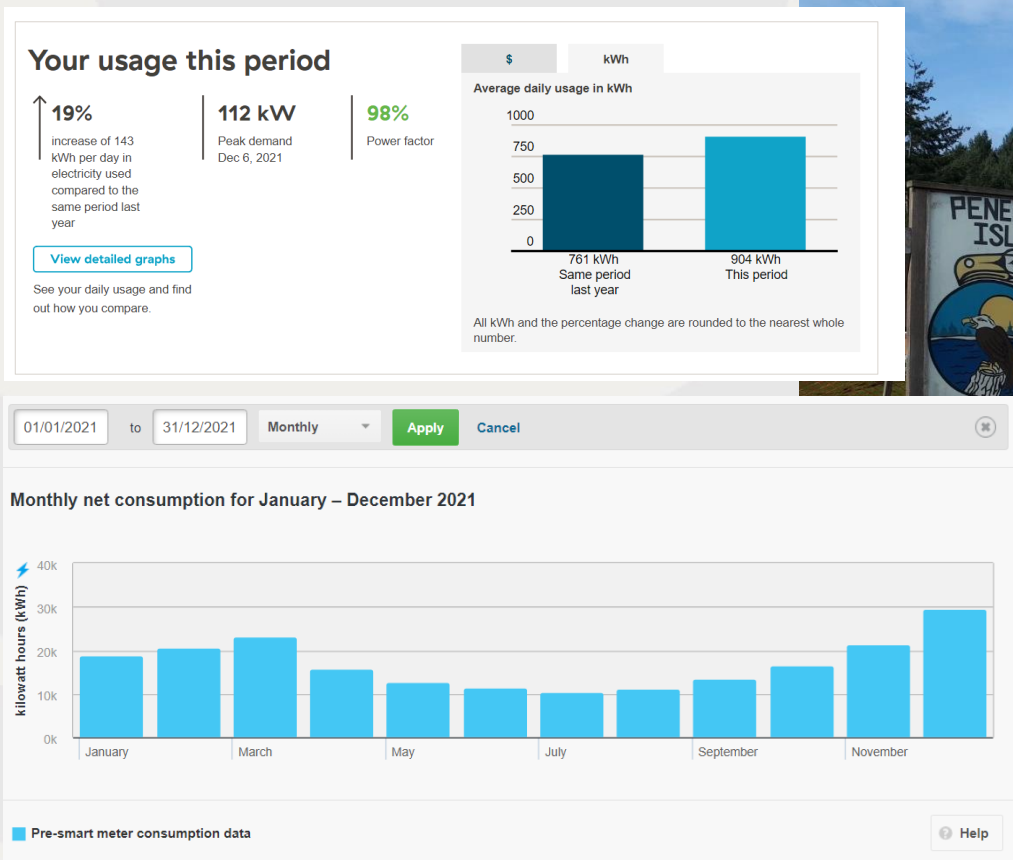
SAIDI: a measure of the amount of time, in hours, an average distribution customer is without power in a year

SAIFI: a measure of the number of sustained interruptions (longer than one minute) an average distribution customer will experience in a year



Community needs and priorities

- High cost of community buildings operations: utilities, repairs, etc.
- Comfortable, safe gathering spaces (meetings, emergencies, other)
- Economic development

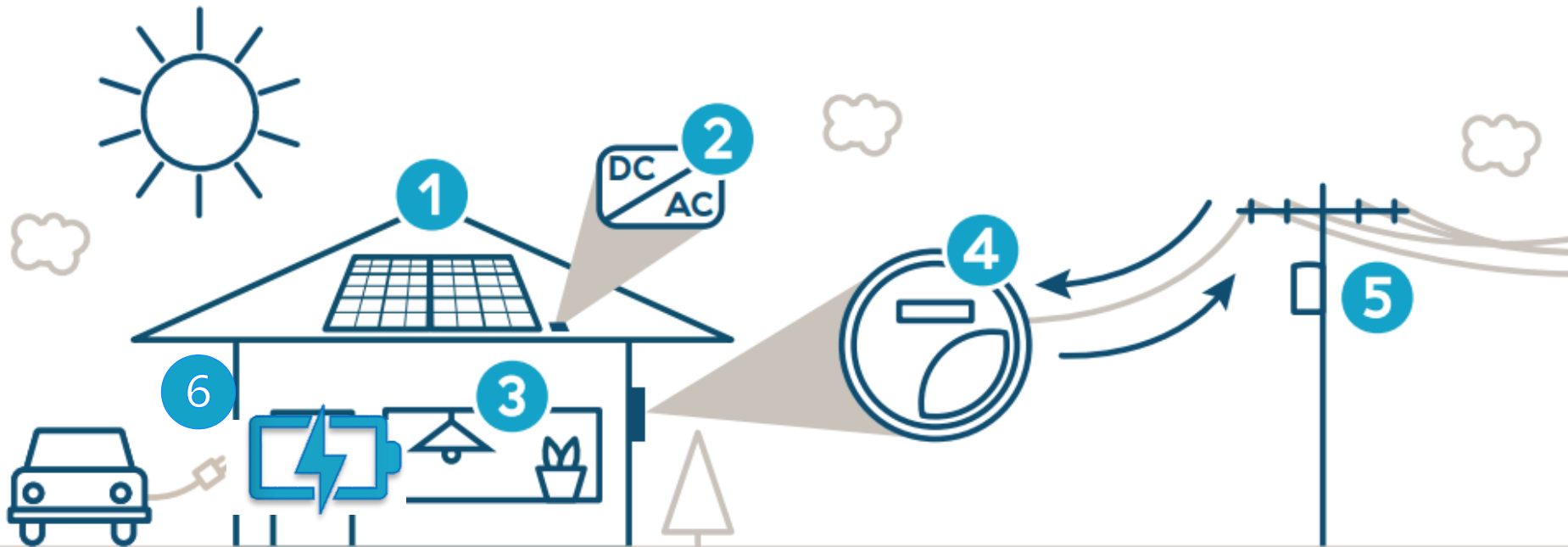


Penelakut Island Elementary School (PIES)

Community needs and priorities

Net-metering with energy storage

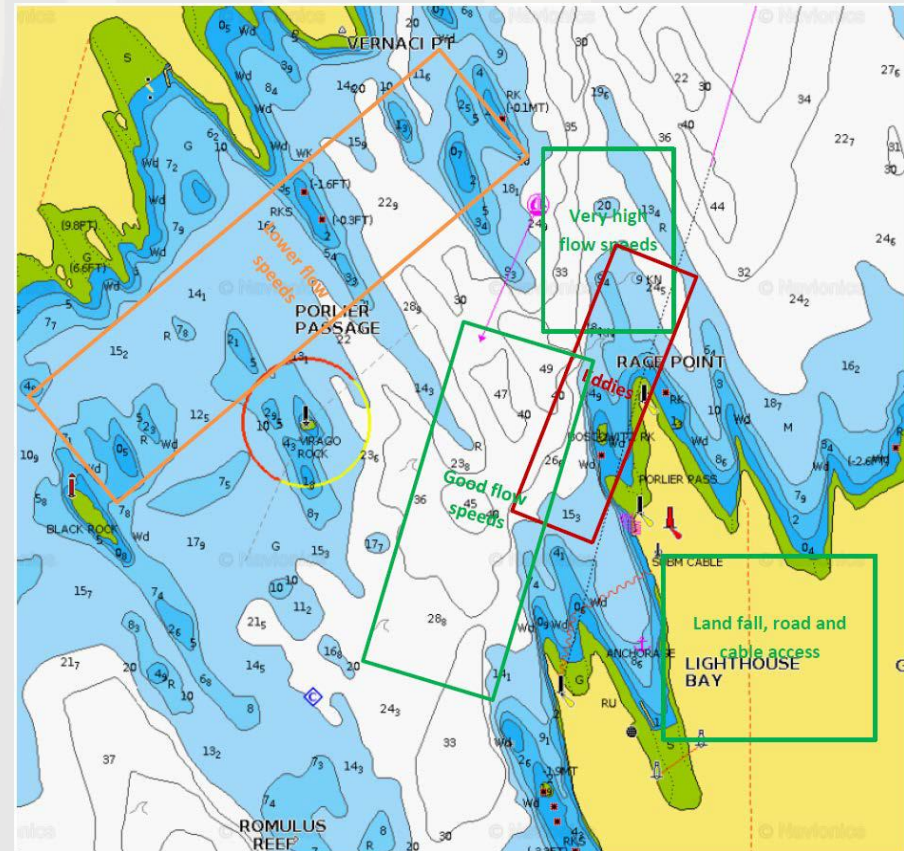
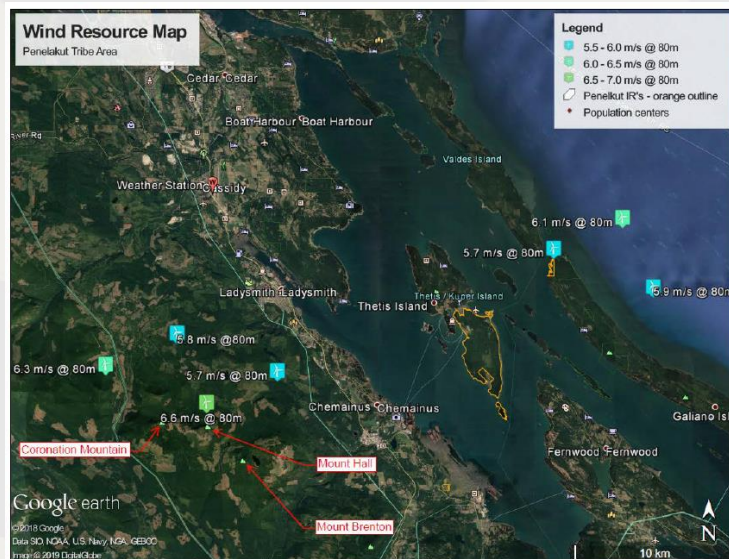
- ✓ Use electricity produced for the building's electrical load
- ✓ Send excess power back to battery bank and/or the grid
- ✓ 1:1 BC Hydro account credit (annual)
- ✓ Can access battery power during outage and recharge with solar



Potential Resource

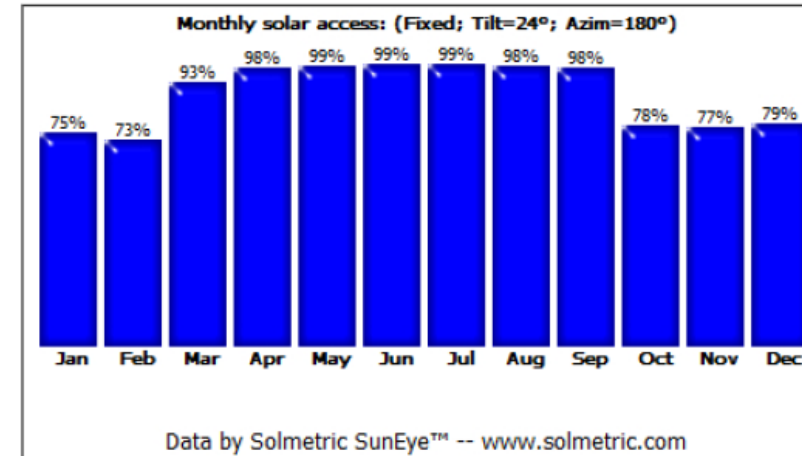
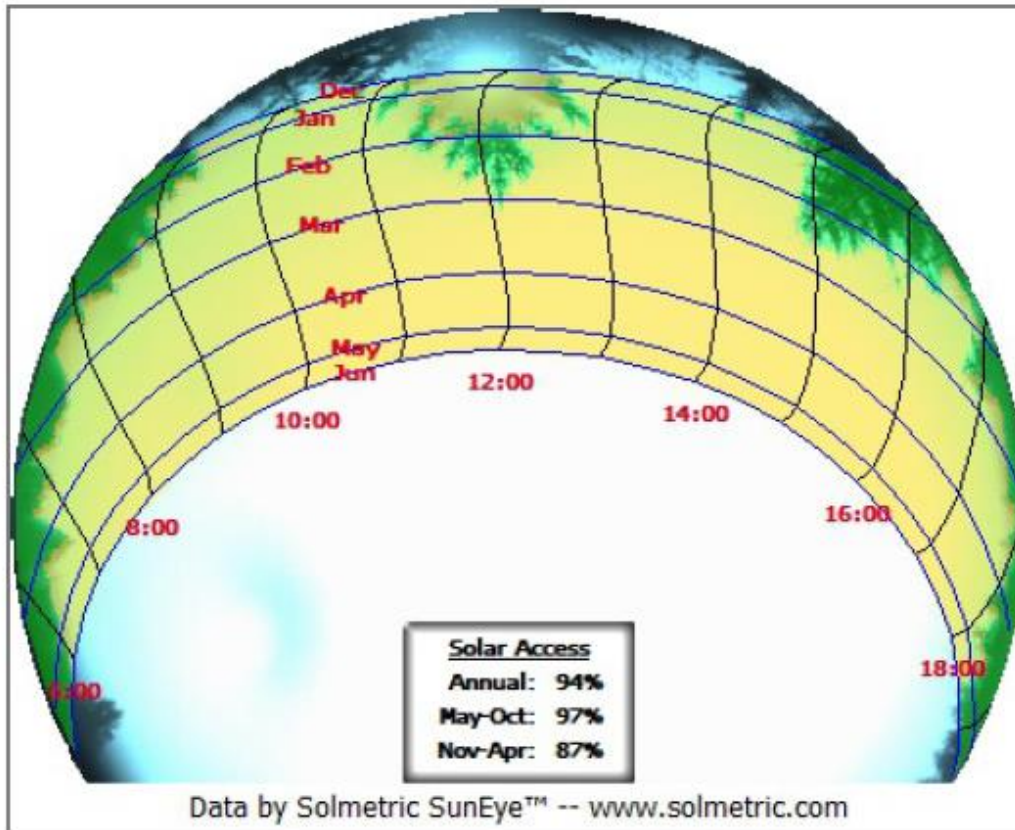
Renewable opportunities considered:

- Solar
- Wind
- Tidal
- Hydropower



Potential Resource

Solar Detail



Potential Resource

Solar Detail

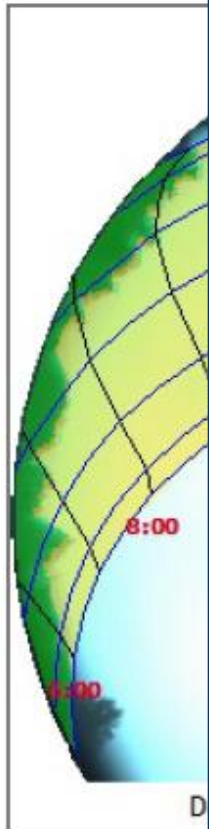
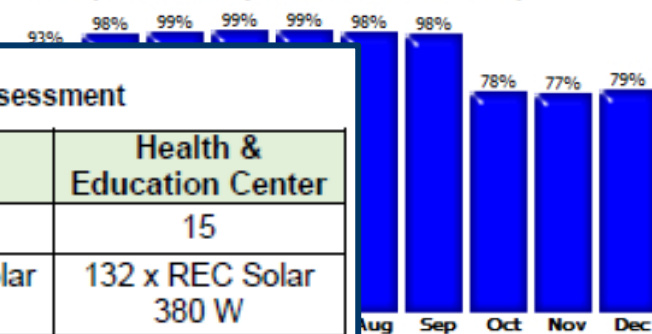


Table 11: Summary of Solar Photovoltaic Feasibility Assessment

	Band Office	Penelakut School	Health & Education Center
Capacity (kW)	20	60	15
PV modules	40 x Canadian Solar 380 W	132 x REC Solar 380 W	132 x REC Solar 380 W
Inverters	2 x Huawei 7.6 KTL	1 x Huawei 45KTL	1 x Huawei 30KTL
Racking system	Kinetic	Kinetic	Unirac
System monitoring included?	Yes	Yes	Yes
Energy production- Year 1 (kWh/year)	21,010	66,100	16,125
Annual savings- Year 1 (\$/year)	\$2,034	\$6,398	\$1,561
Installed cost (\$)	\$44,600	\$124,500	\$36,950
Installed cost (\$/W)	2,230	2,075	2,464
Simple payback period (years)	17.5 years	15.9 years	18.6 years

Monthly solar access: (Fixed; Tilt=24°; Azim=180°)



www.solmetric.com



Technical Feasibility

How do the proposed technologies match my specific needs for generation?

- ✓ Seasonal
- ✓ Daily
- ✓ End-use (heat / lighting /electricity)

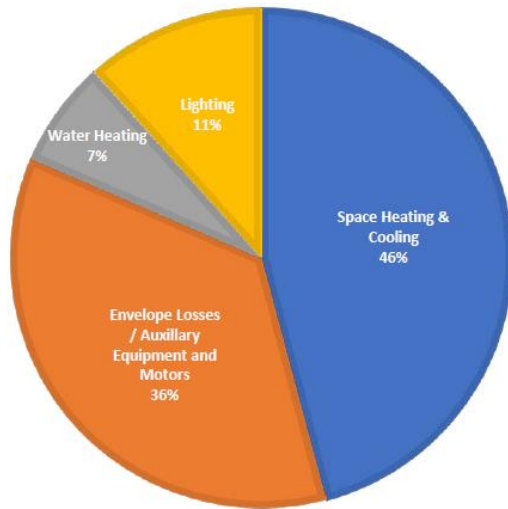


Figure 13: Commercial Energy Usage

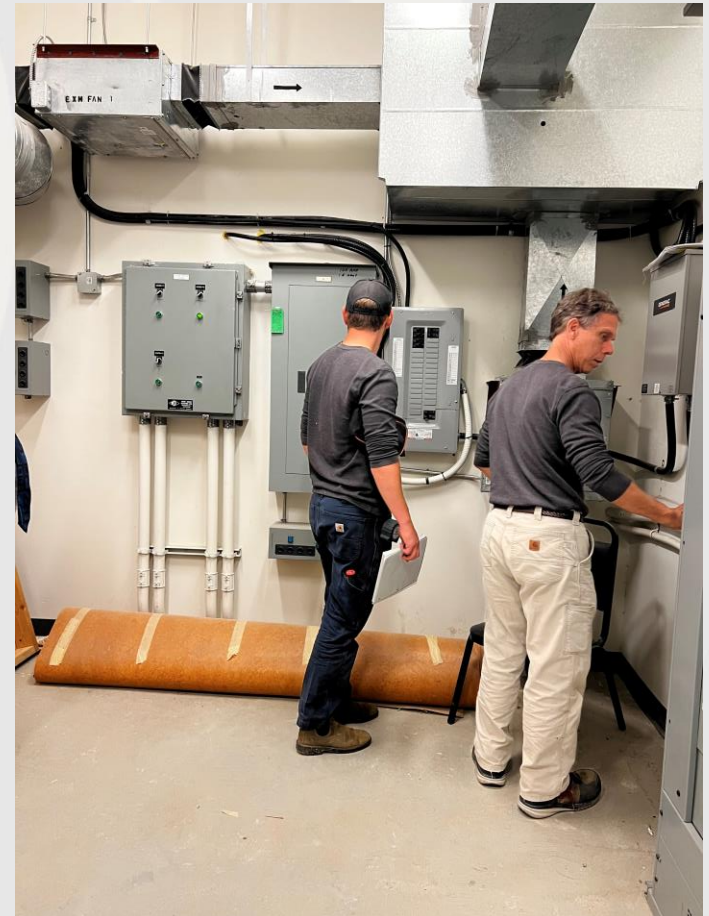
Table 7: Commercial Building Current and Potential Energy Consumption

Consumption (kWh/year)	Current	After Upgrades	Savings
School	288,600	208,657	79,943
Day Care	31,967	16,879	15,088
TOTAL	320,567	225,536	95,031

Technical Feasibility

What are the operations and maintenance requirements and are they realistic?

- ✓ Day-to-day operations
- ✓ Annual maintenance
- ✓ Replacement costs
- ✓ Risk to operations of O&M delays*



Technical Feasibility

Is the technology a suitable solution?

- ✓ Appropriate “readiness” level for project scale and risk



- 7: Prototype ready for “real-world” demo
- 8: Actual technology completed & tested
- 9: Actual technology deployed & operational

<https://ised-isde.canada.ca/site/innovative-solutions-canada/en/isc-technology-readiness-level-scale>

Environmental & Cultural Risks

*How will my project impact the environment?
Are there permitting/regulatory components?*

- ✓ “Valued Ecosystem Components”
- ✓ Traditional Ecological Knowledge
- ✓ Protected areas
- ✓ GHG emissions
- ✓ Mitigation requirements/options



Environmental & Cultural Risks

How will my community receive this project?
Does it align with key priorities and needs?

- ✓ Identify key “authorities”: administration, Chief and Council, Elders
- ✓ Identify end users
- ✓ Community support
- ✓ History of the area
- ✓ Review deliverables with key authorities



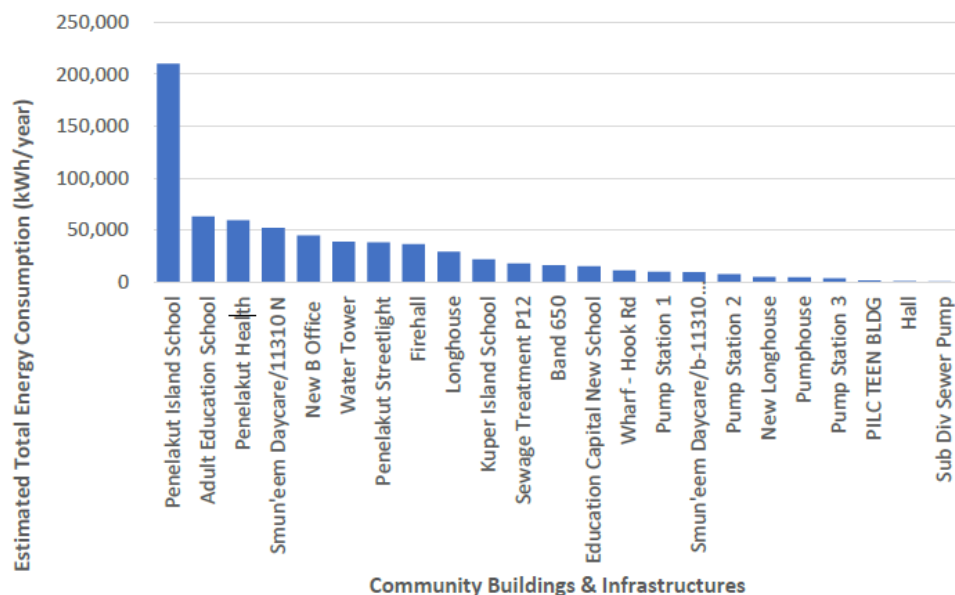
Financial Analysis

What are the best savings opportunities?

- Current costs
- Savings opportunities
- Rebates/grants/funding
- Payback periods

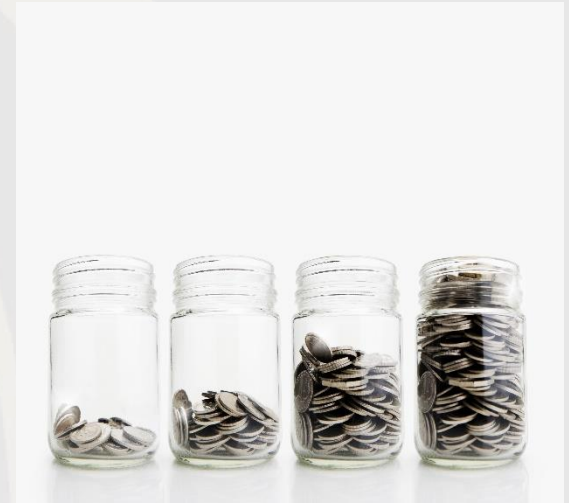
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Funding /Strategic Plan

- Granting Programs
- Nation Investment



Supporting Docs

Capital cost
O&M strategy
Justification of project scope



Funding strategy

Timeline
Requirements/specs
Reporting

Funding / Strategic Plan

BC Indigenous Clean Energy Initiative (BCICEI)

Investing in Canada
Infrastructure Program-
Clean BC Community Fund

Nation Contribution



Conclusion of CEP Pre-Feasibility

PIES Priorities:

- **Solar**
 - Reduce energy bills
 - Emergency preparedness
- **Energy efficiency retrofits**
 - GSHP recommissioning
 - Lighting

Homes:

- **Energy efficiency retrofits**
 - ICCP Program (BC Hydro)
 - Heat pumps
 - Insulation
 - Windows and doors
 - Ventilation

Community Energy Plan

Pre-Feasibility

Feasibility

- Community needs and priorities
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Solar Project

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Asset Management

Operations & Maintenance

- Monitoring
- M&V
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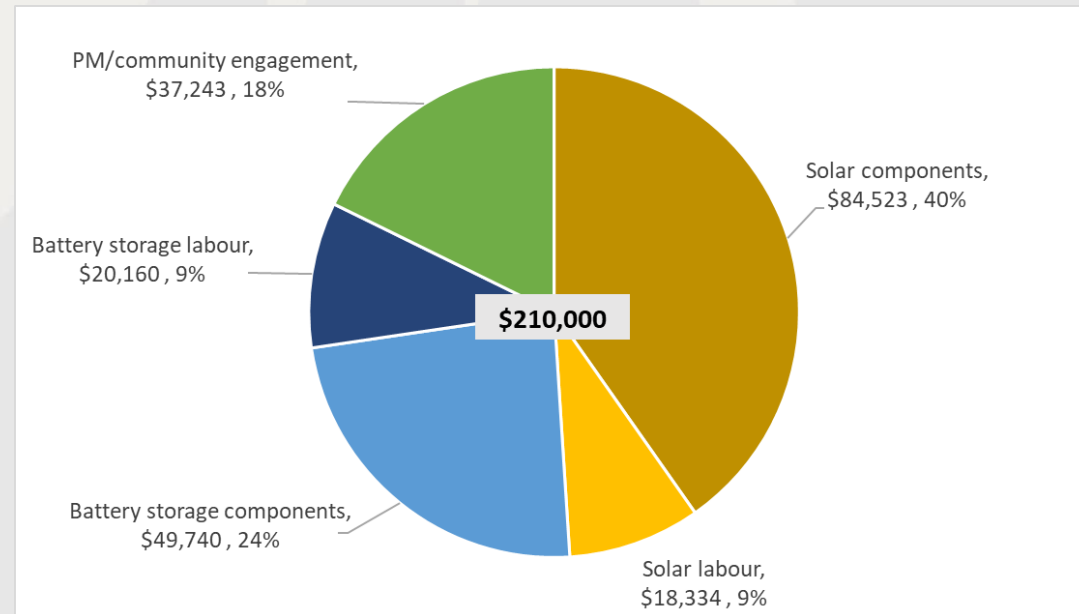
Procurement of Contractor

- ✓ Invited RFP
- ✓ Reflects project and community needs

Decision matrix						
	Scoring criteria	Scoring mechanism	Requirements	[Contractor]	[Contractor]	[Contractor]
Mandatory	Design	Yes- green, No-Red	Site specific (consider parameters)			
	System monitoring	Yes- green, No-Red	Specsheet for system			
	Project schedule	Yes- green, No-Red	Ability to meet timeline			
	Safety	Yes- green, No-Red	Proper insurance, safety work plan			
	Train/hire members	Yes- green, No-Red	Budget and plan			
	Community engagement	Yes- green, No-Red	Budget and plan			
	Experience with solar PV	Yes- green, No-Red	Provide reference project			
	Cost panels and battery	Yes- green, No-Red	Budget for each			
	Experience with Indigenous projects	Yes- green, No-Red	Provide reference project			
Warranty	Panel efficiency	Yes- green, No-Red	Greater than 20% = green			
	Panel warranty- performance	Rank (stoplight)	10 yr= red 10-20 yr= yellow 20+ yr=green			
	Panel warranty -material	Rank (stoplight)	10 yr= red 10-20 yr= yellow 20+ yr=green			
	Battery warranty - performance	Rank (stoplight)	10 yr= red 10-20 yr= yellow 20+ yr=green			
	Inverter warranty- performance	Rank (stoplight)	10 yr= red 10-20 yr= yellow 20+ yr=green			
Assessed parameters	Warranty - workmanship	Rank (stoplight)	10 yr= red 10-20 yr= yellow 20+ yr=green			
	Solar component cost/watt	Rank (stoplight)	Score weighted x5			
	Budget	Rank (stoplight)	Within given budget			
	Inverter to panel ratio	Rank (stoplight)	Panels>invert (kW) = green			
	Battery capacity	Rank (stoplight)	Properly sized for given load			
	Battery cost/kwh	Rank (stoplight)	Score weighted x5			
	Indigenous partners	Rank (stoplight)	Suggested by Nation, existing relationships,			
	[Other]	Rank (stoplight)	Specific to project			
Score				0	0	0
Scoring (not weighted): Green=2, Yellow=1, Red=0			Y= 1 N=0			
	2	1				
	1	0				
	0					

Procurement of Contractor

- ✓ Total Project Cost \$210,000
- ✓ Contractor Cost \$172,757
 - ✓ 49% solar
 - ✓ 11% labour
 - ✓ 29% battery
 - ✓ 12% battery labour



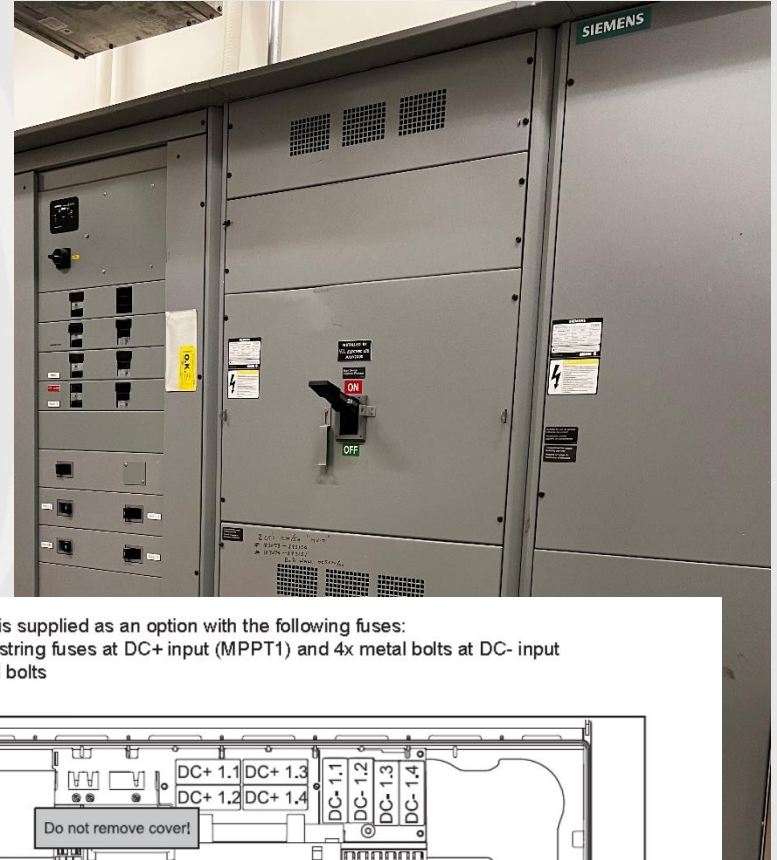
Procurement of Contractor

✓ Lifetime planning

ITEM	QUANTITY	STANDARD WARRANTY	EXTENDED WARRANTY	USEFUL LIFE
Fronius Primo 15.0 Inverter	3	10 years	20 years	15 years
Longi 455W Modules	126	25 years	-	30 years
Kinetic Racking System	1	20 years	-	30 years
S-5-S Standing Seam Clamps	357	Lifetime	-	Lifetime
Tesla Powerwall 2	4	10 years	-	10 years
Tesla Backup Gateway 2	1	10 years	-	10 years
250A Interconnection Breaker	1	1 year	-	25 years

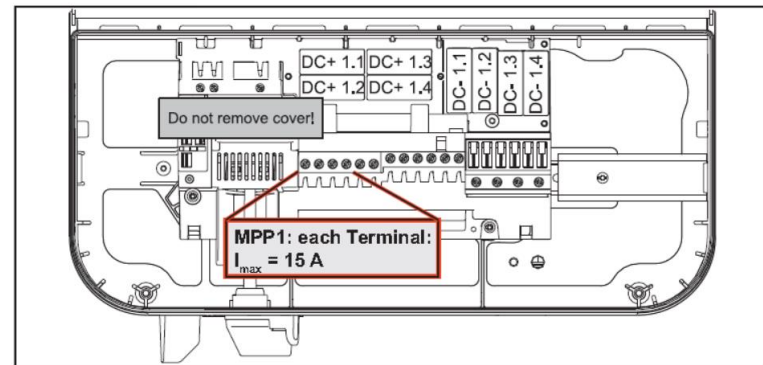
Sizing & Draft Design

- ✓ Budget
- ✓ Net-metering simple/complex
- ✓ Roof size/suitability
- ✓ Critical panel sizing



The inverter is supplied as an option with the following fuses:

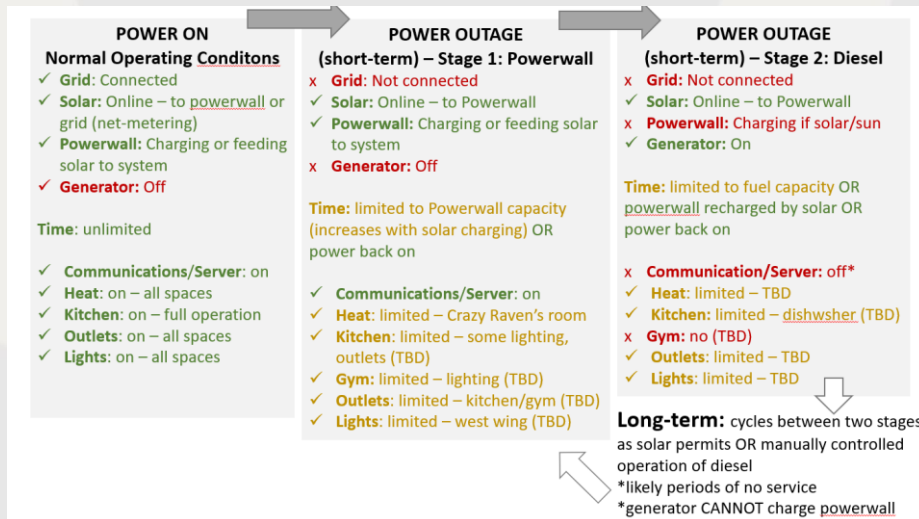
- 4x 15 A string fuses at DC+ input (MPPT1) and 4x metal bolts at DC- input
- 8x metal bolts



Emergency Shelter – Critical Panel Loads

✓ Critical loads

- ✓ Stage 1: Solar & Powerwall
- ✓ Stage 2: Diesel generator
- ✓ Range and heating



LOAD	QUANTITY	POWER (W)	HOURS/DAY	kWh/DAY
Server	1	160	24	3.8
ISP Router	1	22	24	0.5
Network Switch	4	289	24	6.9
Reception Area Lighting	2	71	8	0.6
Boy's Washroom Lighting	1	36	8	0.3
Girl's Washroom Lighting	1	36	8	0.3
Office Area Restroom Lighting	1	36	8	0.3
Health Room Lighting	1	36	8	0.3
Kitchen Lighting	2	71	8	0.6
Gym Lighting	1	278	8	2.2
Crazy Raven's Lighting	1	36	8	0.3
Outdoor Lighting	13	361	8	2.9
Crazy Raven's Outlets	1	278	8	2.2
Kitchen Outlets	1	278	8	2.2
Reception Area Outlets	1	278	8	2.2
Principal's Office Outlets	1	278	8	2.2
Outside Roadside Outlet	1	278	8	2.2
Main Entrance Hall Outlet	1	278	8	2.2
Electrical Room Outlet	1	278	8	2.2
Public Address System	1	278	8	2.2
Outdoor Siren	3	50	24	1.2
Fire Alarm Annunciator	1	100	24	2.4
Smokies	50	167	24	4.0
Fire Alarm Bell	2	7	24	0.2
Crazy Raven's Heat Pump	1	2222	4	8.9
Crazy Raven's Microwave	1	778	2	1.6
New Chest Freezer	1	222	24	0.8
Older Frigidaire Chest Freezer	1	167	24	1.0
TOTAL		8469		65.3

Emergency Shelter – Critical Panel Loads

- ✓ Energy backups last up to 2 days on restricted use
- ✓ Diesel generator used for cooking, largescale heating



Final Design

- ✓ Site visit
- ✓ All parties involved
- ✓ Final design



Permits

- ✓ Technical Safety BC
- ✓ BC Hydro net-metering complex system
- ✓ Interconnection agreements



Inspection Details

ASSESS: EL: Final Inspection

INSPECTION STATUS	Passed
INSPECTION NUMBER	ELIN-3125622-2022
INSPECTION TYPE	ASSESS: EL: Final

Construction

✓ Training

- ✓ Local Involvement
- ✓ Online and hands-on



Construction

✓ Procurement

- ✓ Equipment, materials
- ✓ Transportation to site
- ✓ On-site storage



Construction

✓ Installation

- ✓ Panels
- ✓ Inverters
- ✓ Battery (plus future proofing)
- ✓ Remote monitoring system







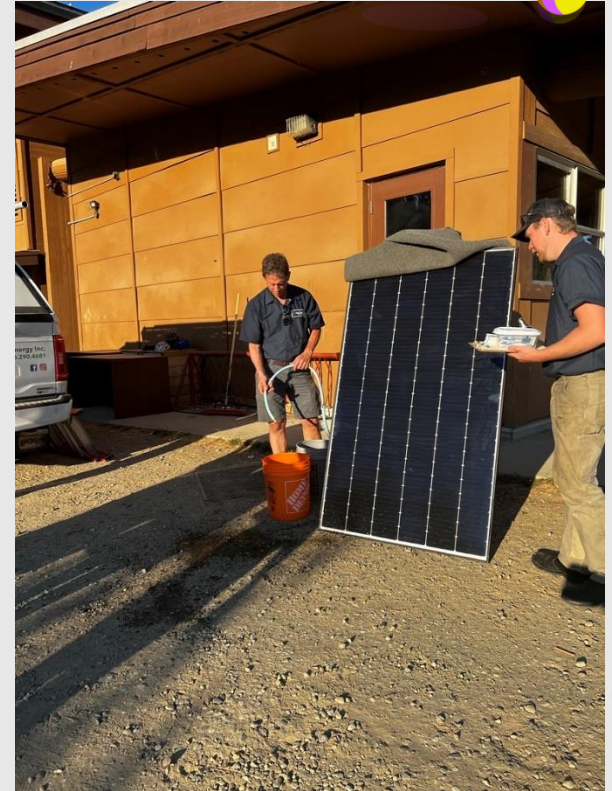
Construction

✓ Installation

- ✓ Colour coding outlets
- ✓ Critical load panel install
- ✓ Diesel generator recommissioning
- ✓ Appliance upgrade recommendations
- ✓ In tandem with EE upgrades



Solar Celebration





Community Energy Plan

Pre-Feasibility

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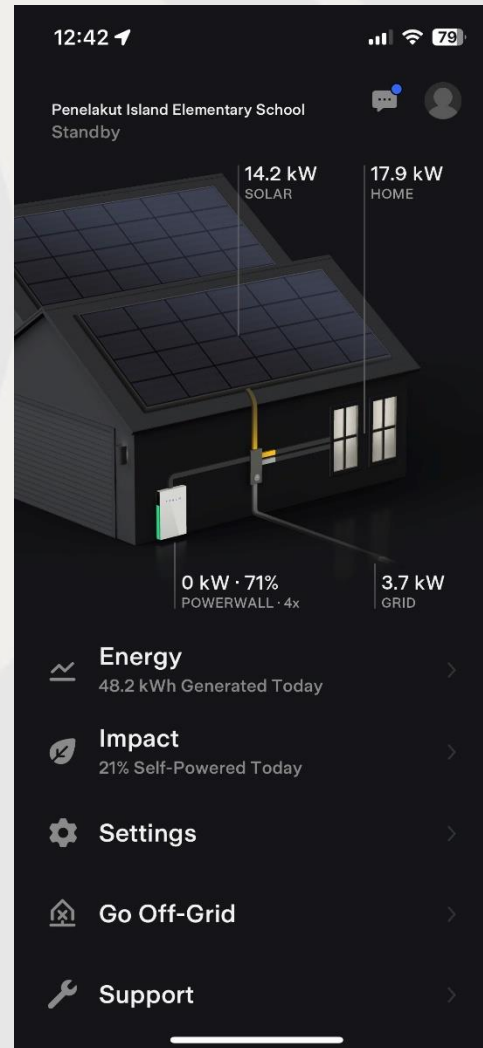
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Operations & Maintenance

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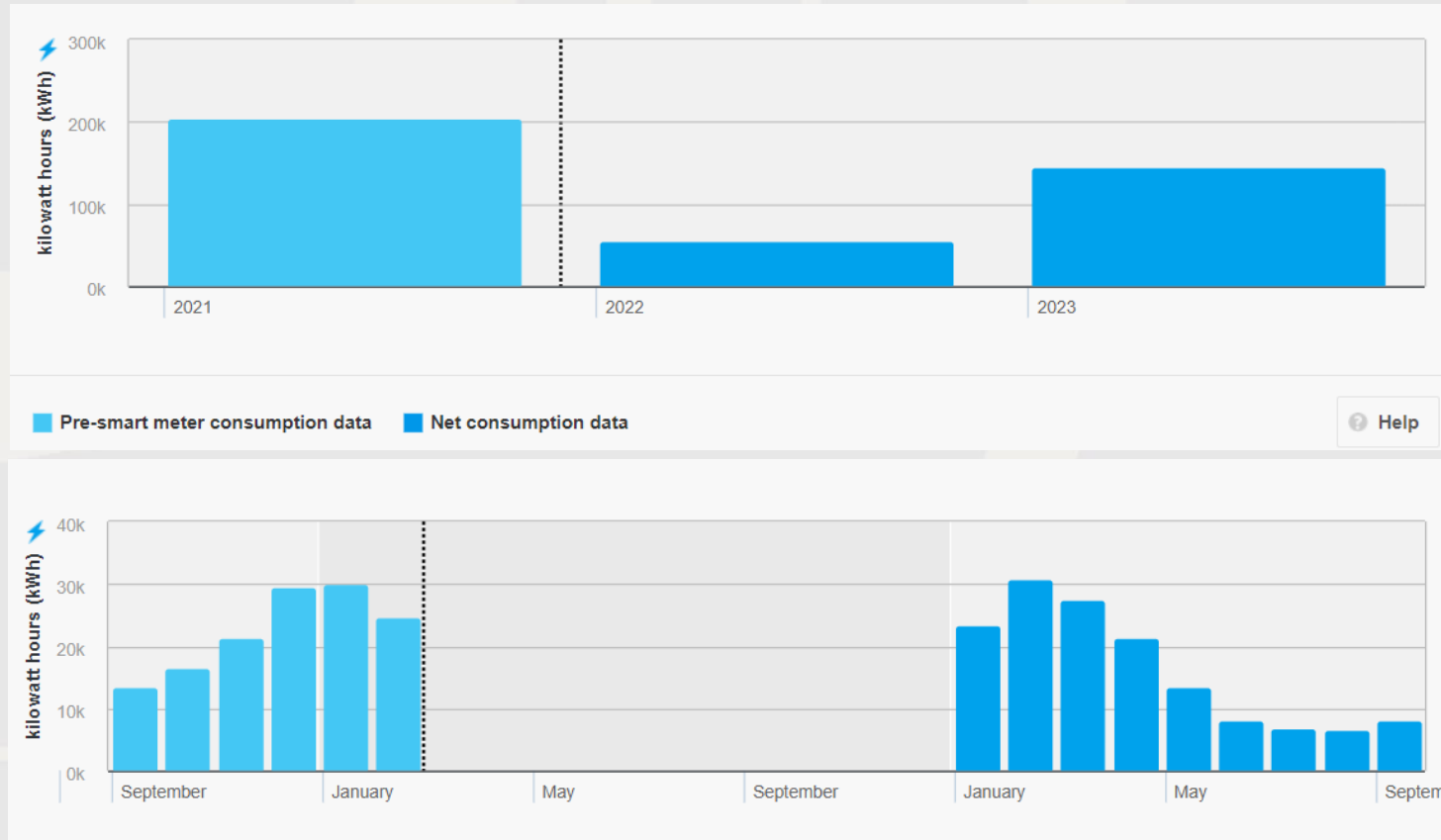
Monitoring

- ✓ Phone/ tablet apps
- ✓ Real time
- ✓ Charge and deployment of batteries



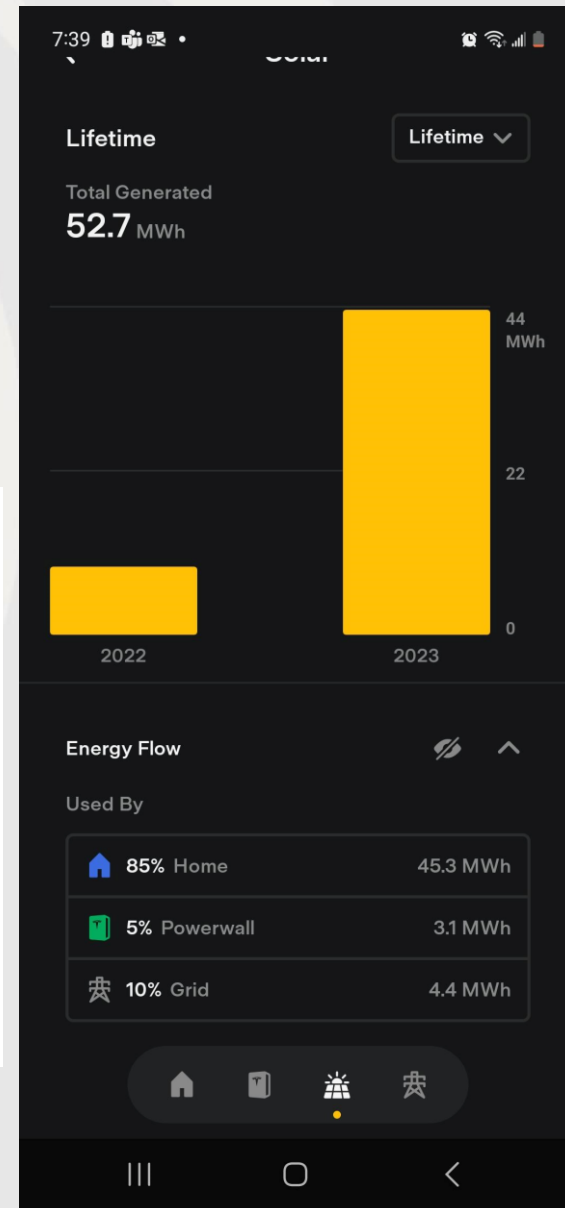
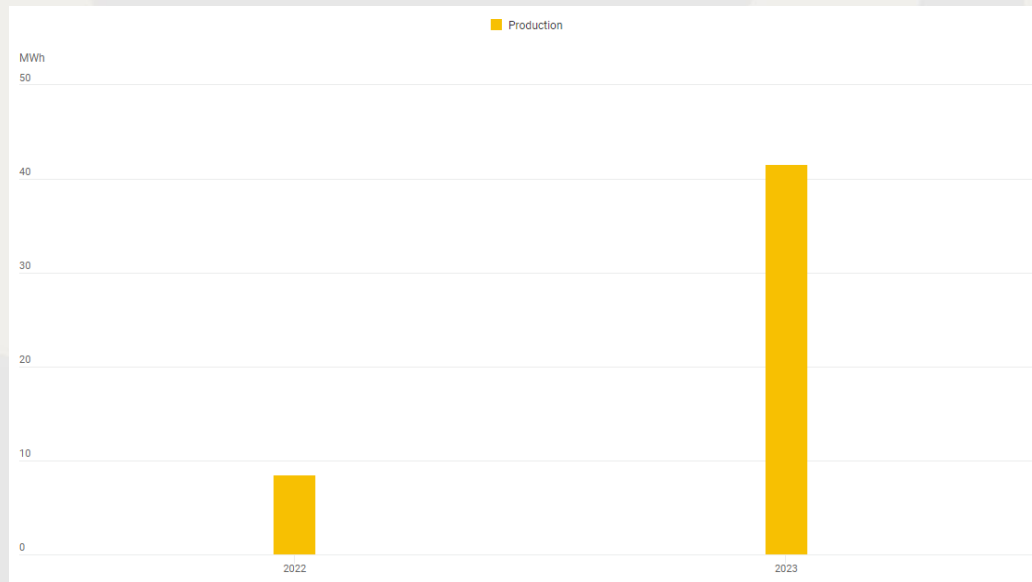
Measurement & Verification

- ✓ Estimated VS. actual performance
- ✓ My Hydro + remote monitoring system



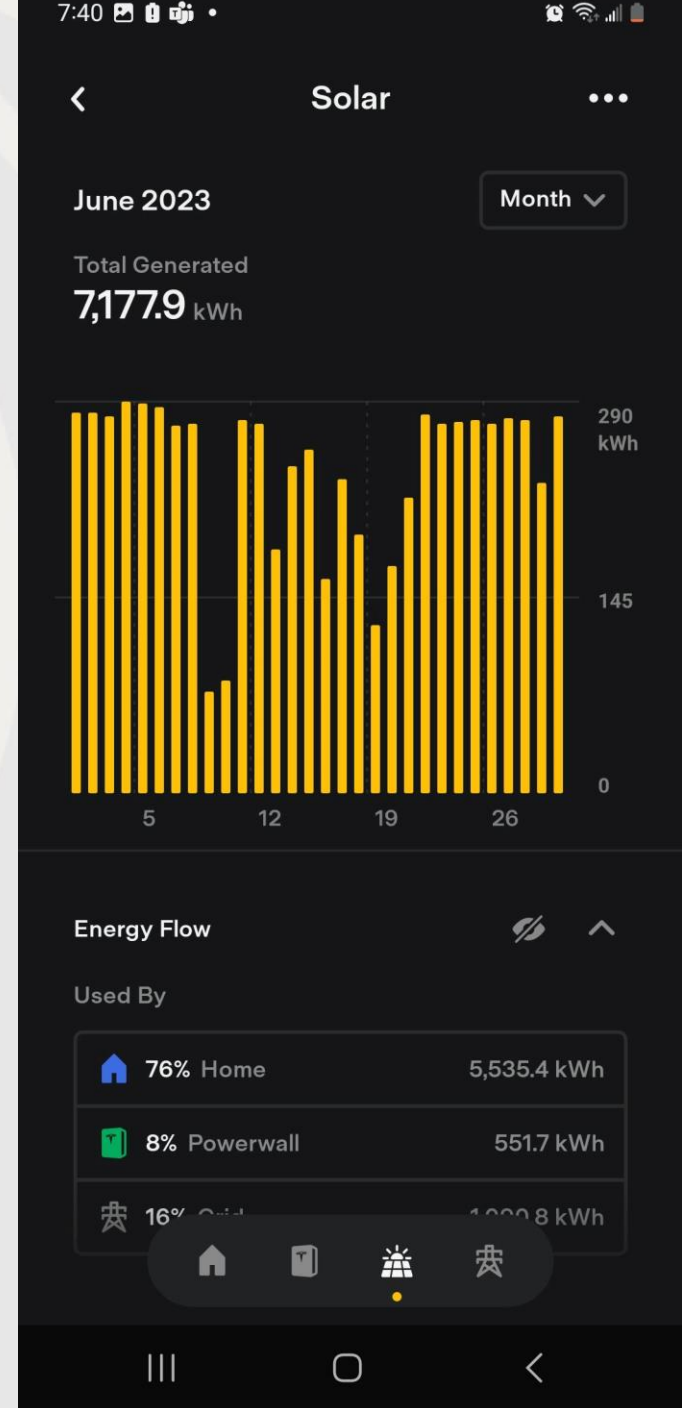
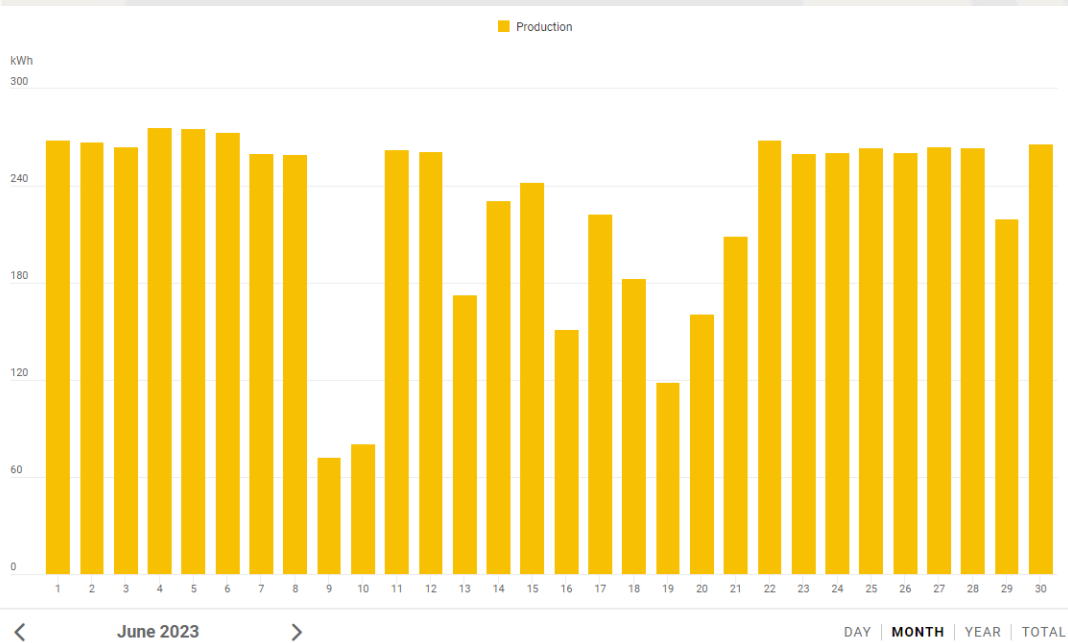
M&V

✓ Lifetime production 52.7 MWh



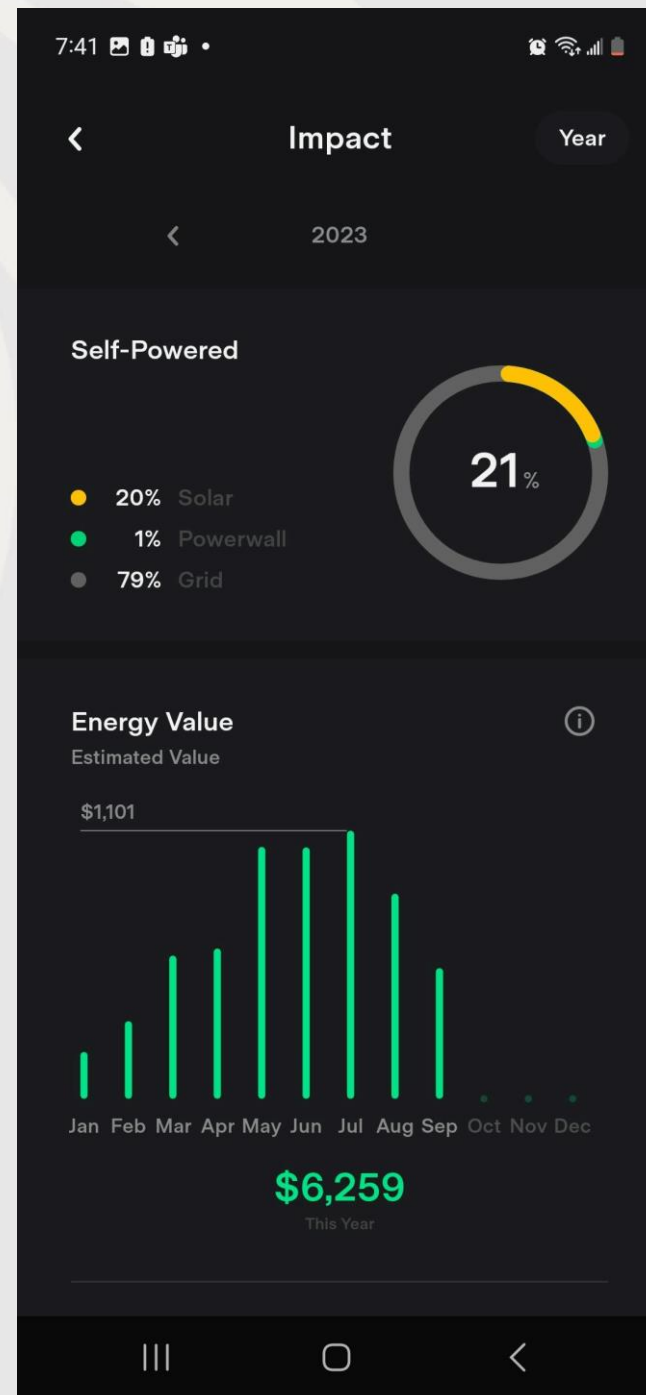
M&V

✓ June 2023 generation



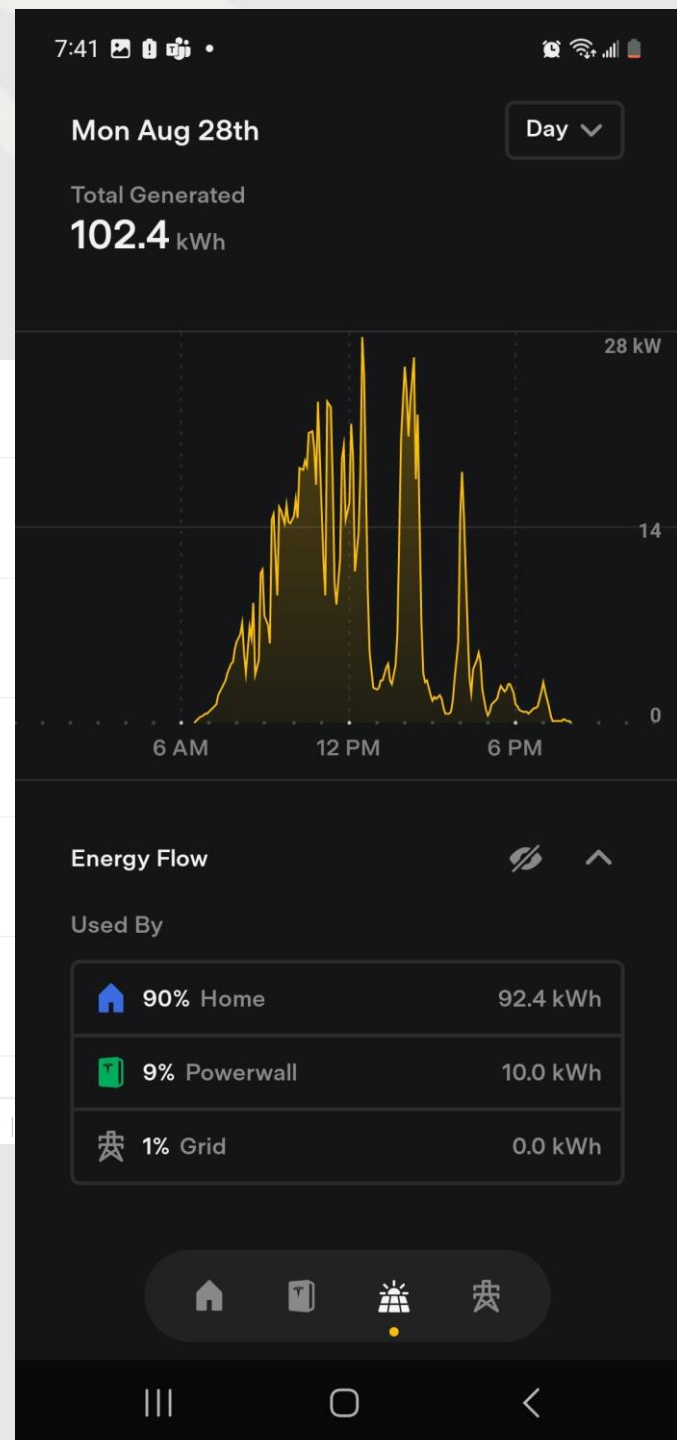
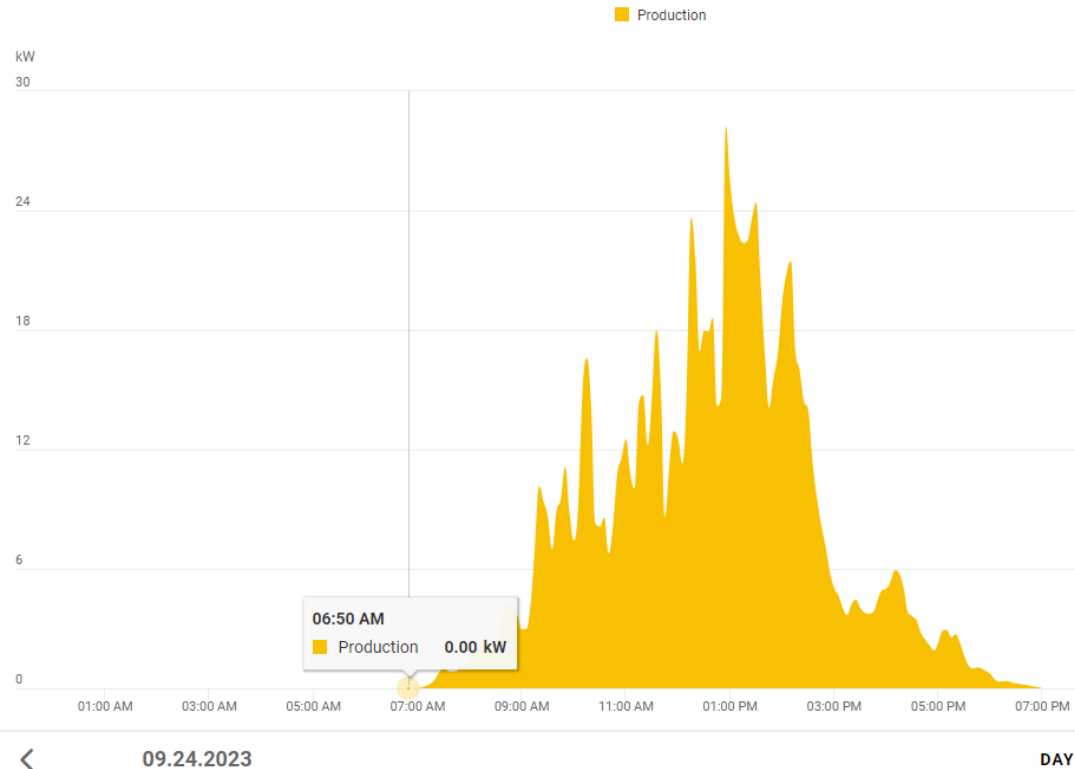
M&V

✓ Saved \$6K this year



M&V

✓ Daily production in late summer



Maintenance

- ✓ Monitoring
- ✓ Cleaning
- ✓ Troubleshooting



Impacts

- ✓ Keep kids in school
- ✓ Emergency center
- ✓ Lower energy bills
- ✓ Increased capacity



Other CEP work



- ✓ ICCP stream 1
- ✓ Heat pumps & ventilation upgrades
- ✓ School LED lighting and GSHP

Next steps

- ✓ Energy efficiency upgrades to homes
- ✓ Solar PV system on the daycare



Thank you! – Questions?

