

Rural Energy Resiliency for a Washington Tribe IACC 2019 Conference

Wenatchee Convention Center
Wenatchee, WA

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**Acknowledgements to Jack Newman, REP, VMA,
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Introductions





QIN Climate Adaptation & Resilience

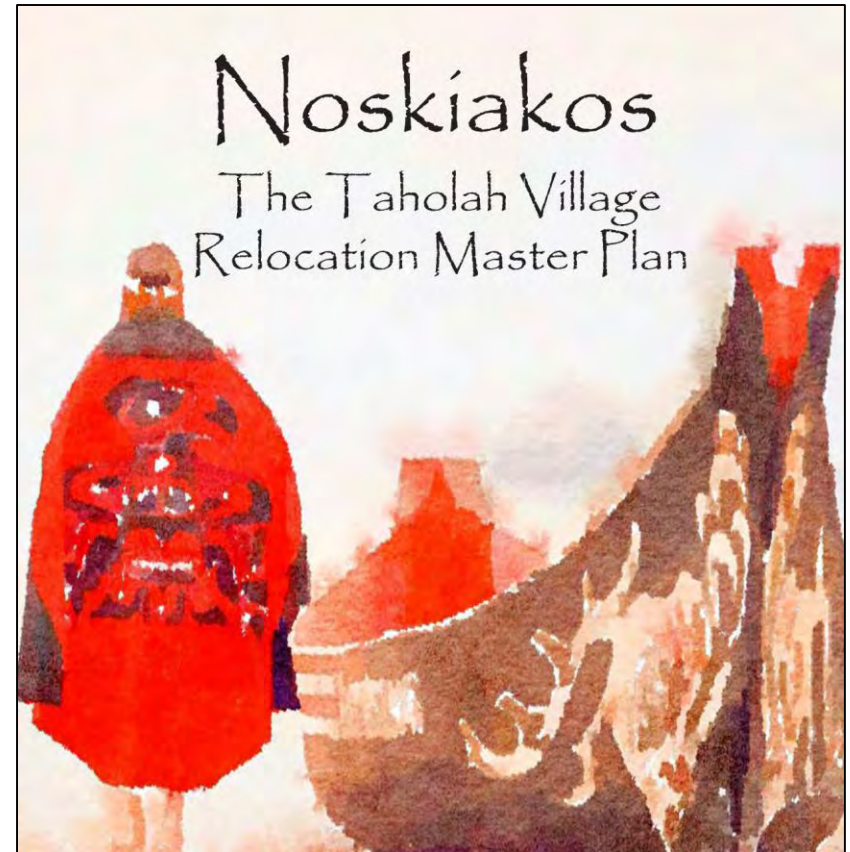
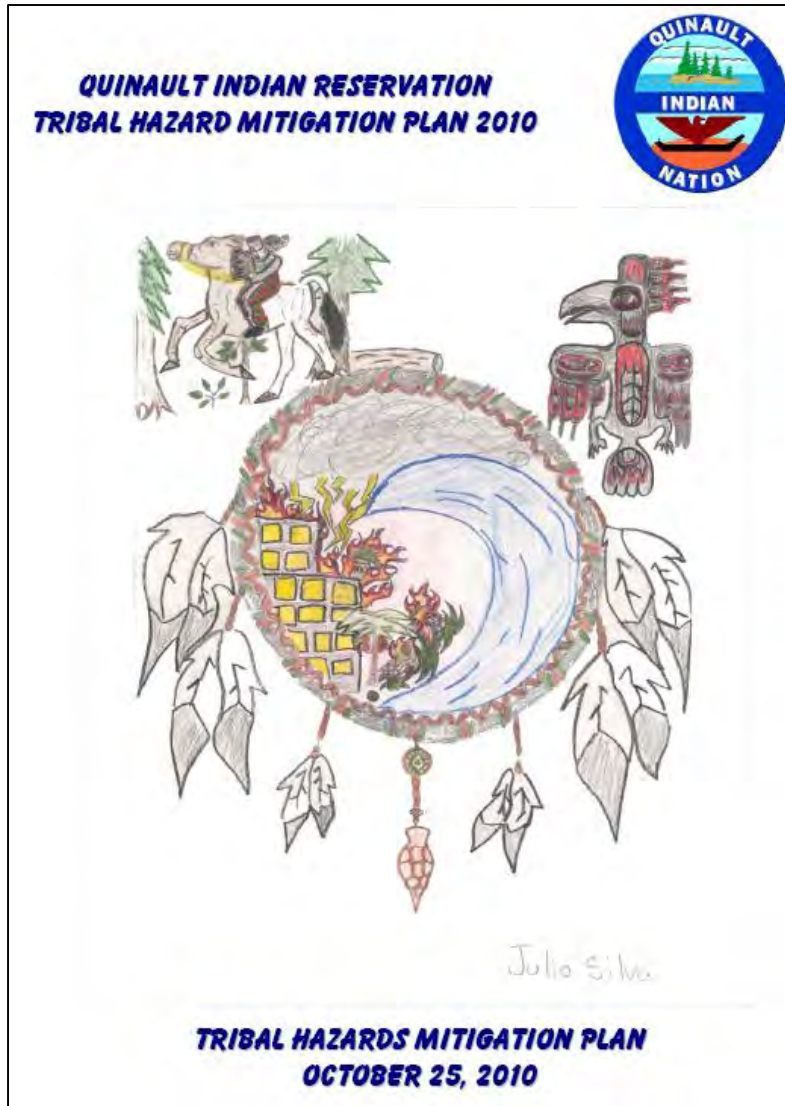
Localized Flooding on First Avenue After a Storm. Photo by QIN Planning Dept.



Sea Wall during a Storm, 2015. Photo by QIN Planning Dept.



c. 1885 Sketch of Taholah by Sarah Willoughby



- QIN Tribal Hazard Mitigation Plan
- Taholah Village Relocation Master Plan
- Energy Resiliency Overview



Lower Village Inundation Map with Various Community Buildings

Legend

Important Community Buildings	Inundation Depth (meters)	6.1 - 9 (20 to 30 ft)	15.1 - 18 (49 to 59 ft)
Other Community Buildings	0.1 - 3 (<10 feet)	9.1 - 12 (30 to 40 ft)	18.1 - 21 (59 to 69 ft)
Relocationbndyw3062	3.1 - 6 (10 to 20 ft)	12.1 - 15 (40 to 49 ft)	21.1 - 23.1 (69 to 76 ft)



Quinault Indian Nation Renewable Energy Feasibility Study



Quinault Indian Nation Comprehensive Biomass Strategy Final Report

- **Tsunami Inundation Assessment**
- **Upper Village Relocation Plan**
- **Renewable Energy Studies**



QIN Microgrid – Project Background



ENVIRONMENT

Washington's coastal tribes are working to escape rising sea levels. A bill in D.C. could help

In Washington, coastal tribes have long labored to relocate. Potential access to federal aid could be the key to mitigating climate disaster.

by Manola Secaira / October 2, 2019

Photos by Dorothy Edwards

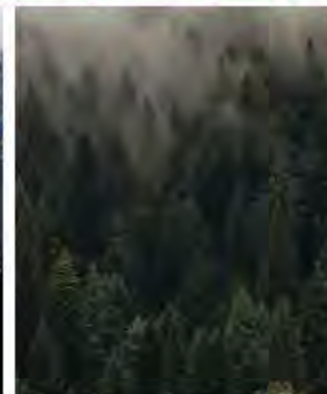


Fawn Sharp, president of the Quinault Indian Nation, greets potential voters in the Quinault nation village of Taholah on Oct. 29, 2018. (Dorothy Edwards/Crosscut)



QIN Microgrid – Project Goals

- Energy Resiliency
- Workforce Development
- Energy Sovereignty & Reliability
- Funding Opportunities
- Utility Cost Savings



QUINULT INDIAN NATION

Solar Microgrid Report

FINAL • September 2019

SÄZÄN
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QIN Microgrid – Project Background





Problem Statement:

- Geographic location of QIN is subject to loss of power due to:
 - Reoccurring seasonal storms
 - Major seismic events
 - Tsunami events
 - Worsening storm surge impacts
 - Long-term sea level rise
- New Village of Taholah will require a resilient, economically viable, sovereign and environmentally sustainable energy supply



QIN Microgrid – Project Background



Säzän Environmental Services



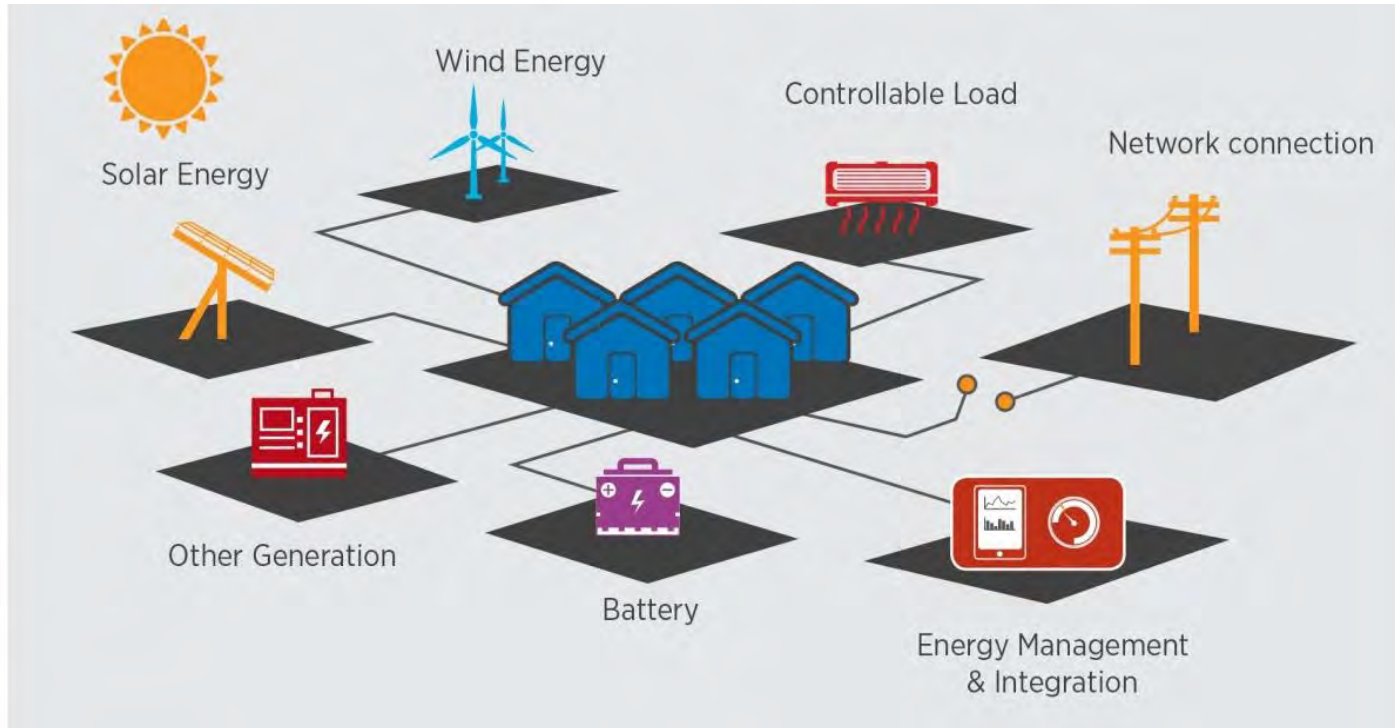


Consulting Scope:

- Village energy assessment
- Microgrid concept design
 - 1 MW solar PV array
 - Utility scale battery storage
 - Calibrated to support village loads
 - Microgrid Controls System
- Financial assessment for project development
 - Cashflow Modeling
 - Grant Funding Matrix
- Construction drawings for (2) 99 kW arrays
 - Queets Head Start Building
 - Generations Building



What is a Microgrid?



Microgrid Project Development

- Energy Loads, Generation, Storage, Distribution Controls
- Providing Demand Management and Energy Resilience
- Aligned with Grid Modernization Initiatives, Energy Sovereignty
- Grants and Funding Resources Available!



Quinault Microgrid

Potential Energy Sources

- Solar
- Biomass CHP Cogeneration
- Wind
- Diesel Generator (existing)

Prioritized Critical Facilities

- Administration Building
- Generations Building
- Roger Saux Health Center



Site Solar Assessment

RESULTS



Print Results

1,062 kWh/Year*

System output may range from 1,018 to 1,131 kWh per year near this location.
Click [HERE](#) for more information.

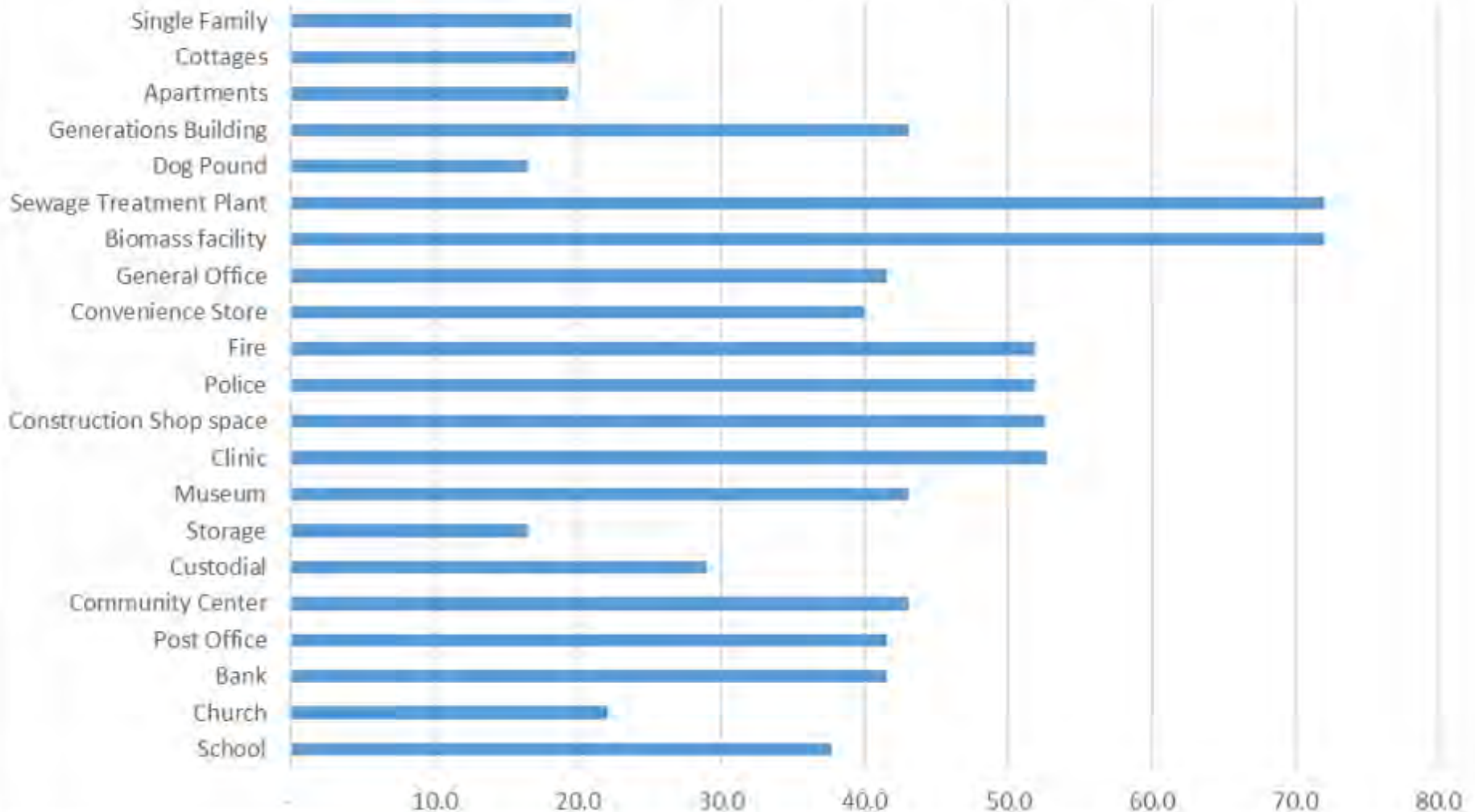
Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Value (\$)
January	1.52	39	3
February	2.09	49	4
March	3.17	80	6
April	4.63	112	9
May	5.34	131	11
June	5.77	137	11
July	5.98	143	12
August	5.29	127	10
September	4.58	107	9
October	2.76	68	5
November	1.48	37	3
December	1.32	34	3
Annual	3.66	1,064	\$ 86





Energy Assessment

Energy Use Intensity by Building Use, EUI [kBtu/ft².yr]





Energy Assessment

Building Use	Bldg Area [ft2]	CBECS/RECS Total Bldg EUI [kBtu/ft2]	Estimated Total Bldg EUI minimum [kBtu/ft2]	Estimated Total Bldg EUI Maximum [kBtu/ft2]2	Electricity Use Minimum [kWh]	Electricity Use Maximum [kWh]2
School	86,000	62.8	25.1	50.2	633,127	1,266,254
Church	3,000	36.7	14.7	29.4	12,907	25,814
Bank	1,600	69.2	27.7	55.4	12,980	25,959
Post Office	1,300	69.2	27.7	55.4	10,546	21,092
Community Center	15,000	71.7	28.7	57.4	126,079	252,158
Custodial	1,700	48.3	19.3	38.6	9,626	19,251
Storage	6,800	27.4	11.0	21.9	21,842	43,684
Museum	5,000	71.7	28.7	57.4	42,026	84,053
Clinic	45,000	87.8	35.1	70.2	463,169	926,339
Construction Shop space	17,800	87.6	35.0	70.1	182,792	365,584
Police	20,000	86.4	34.6	69.1	202,571	405,141
Fire	14,000	86.4	34.6	69.1	141,799	283,599
Convenience Store	7,600	66.7	26.7	53.4	59,425	118,851
General Office	77,100	69.2	27.7	55.4	625,451	1,250,902
Biomass facility	11,000	120.0	48.0	96.0	154,741	309,483
Sewage Treatment Plant	1,600	120.0	48.0	96.0	22,508	45,016
Dog Pound	4,200	27.4	11.0	21.9	13,491	26,981
Generations Building	30,000	71.7	28.7	57.4	252,158	504,317
Apartments	29,490	32.2	12.9	25.8	57,946	115,892
Cottages	13,200	33.0	13.2	26.4	26,582	53,163
Single Family	502,794	32.6	13.0	26.1	1,000,233	2,000,467
TOTAL	894,184	48.38	19.35	38.70	4,072,000	8,144,000



Energy Assessment for Battery Storage Sizing

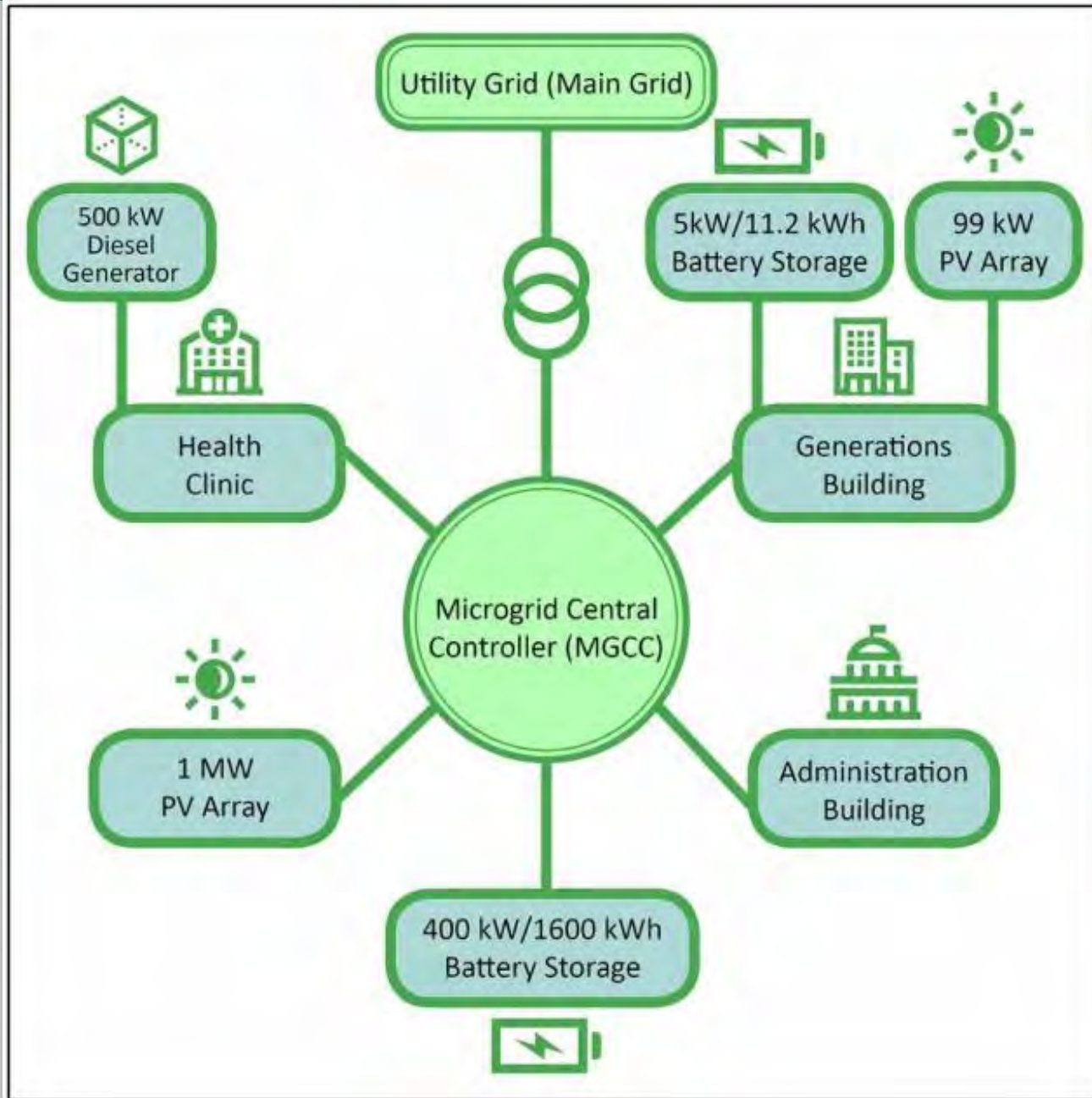
Generations Bldg			Clinic		Admin Building		Combined	
Month	kWh	kW	kWh	kW	kWh	kW	kWh	kW
Jan	53,949	311	117,306	260	37,280	203	174,449	571
Feb	47,325	319	97,774	252	30,240	186	149,583	571
Mar	43,392	251	117,420	239	36,000	177	168,566	491
Apr	29,189	144	79,270	233	27,040	97	119,237	377
May	21,883	134	66,249	162	26,560	101	101,490	295
Jun	23,970	91	68,990	176	29,440	71	106,574	267
Jul	16,378	86	45,003	119	23,680	71	73,539	204
Aug	18,325	83	42,605	120	25,600	71	72,451	203
Sep	25,308	84	53,113	130	30,240	71	89,001	214
Oct	31,521	175	57,111	169	41,760	194	94,801	344
Nov	37,534	184	66,020	162	42,240	190	106,995	346
Dec	55,679	264	115,478	256	41,120	185	173,969	520
Totals	404,453	+	926,339	+	391,200	=	1,721,992	

Combined Monthly kWh Consumption and kW Demands for 3 Prioritized Critical Buildings



QIN Microgrid – Project Background







Microgrid Elements

- Microgrid distribution system connects all 3 buildings with a motorized automatic transfer switch (ATS) installed at the point of common coupling (PCC) with the PUD utility grid
- Microgrid Central Controller is installed with compatible controls on all buildings, storage and generation assets, with a sequence of operations developed for outage scenarios
- 1 MW + 99 kW solar array, 400 kW / 1600 kWh centralized battery storage system + 5 kW distributed battery system, and 500 kW (existing) diesel generator are flexibly managed to provide power where and when it is needed



QIN Microgrid System

- Solar + Storage
- Controls System
- Demand Management
- Emergency Response



RESULTS

1,062,441 kWh/Year*

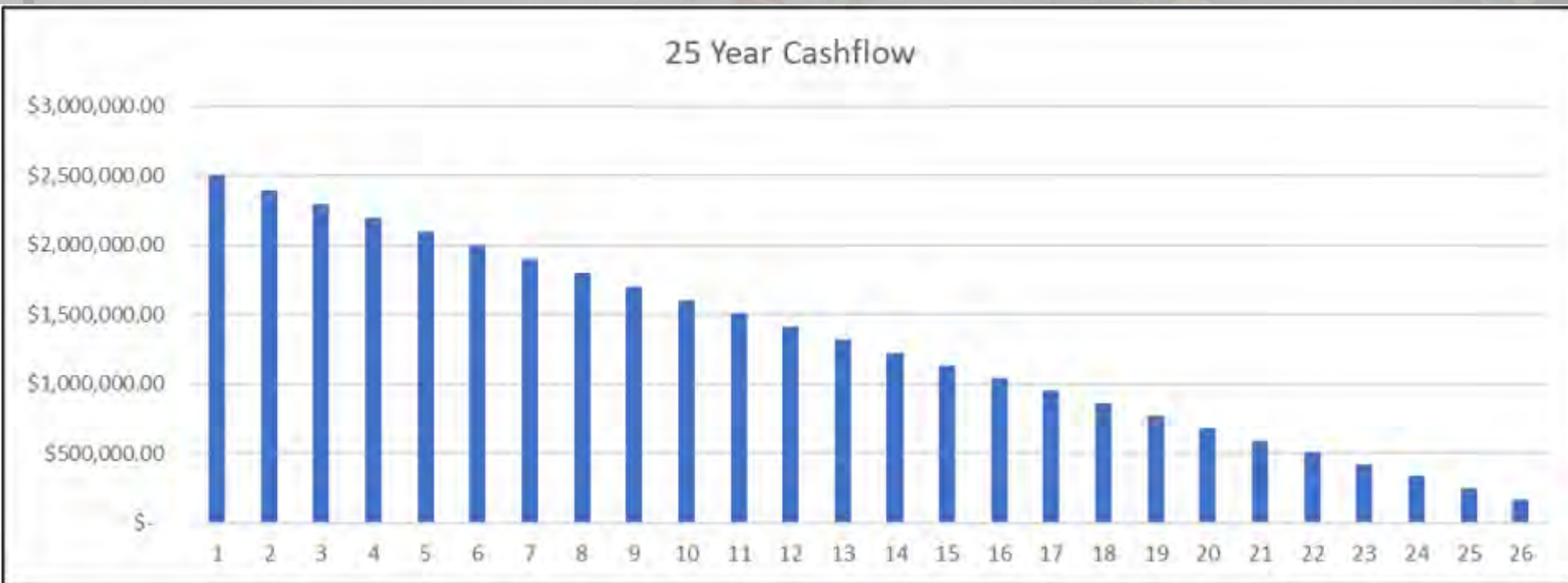
System output may range from 1,017,606 to 1,130,756 kWh per year near this location.

Microgrid Concept Design: 1 MW

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Value (\$)
January	1.52	38,608	3,104
February	2.09	48,847	3,927
March	3.17	80,301	6,456
April	4.63	111,900	8,997
May	5.34	131,073	10,538
June	5.77	136,599	10,983
July	5.98	143,312	11,522
August	5.29	126,705	10,187
September	4.58	106,724	8,581
October	2.76	68,259	5,488
November	1.48	36,564	2,940
December	1.32	33,549	2,697
Annual	3.66	1,062,441	\$ 85,420



Financial Analysis

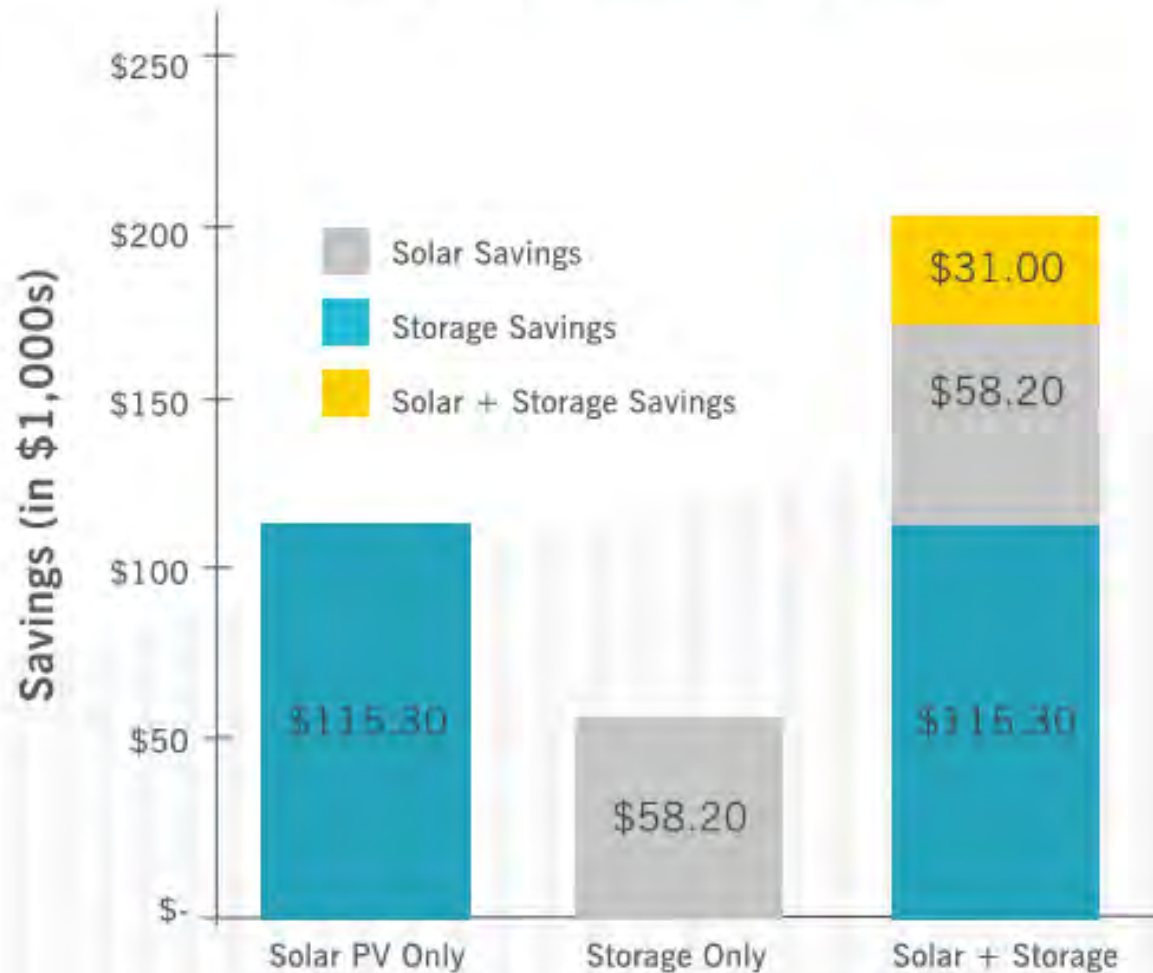


25-year Cashflow Estimate for 1 MW Solar PV Array using installed cost of \$2.50/Watt



Benefit of Solar PV + Battery Storage

Estimated annual savings for solar, storage and combined systems



QIN MICROGRID PROJECT DEVELOPMENT ROADMAP

[illegible]



Tribal Microgrid Projects

- Blue Lake Rancheria
- Citizen Potawatomi Nation
- Rincon Indian Reservation
- Colusa Indian Community
- Alaska Igiugig Village Council
- Lake Superior Tribe of Chippewa Indians



Department of Commerce
Innovation is in our nature.





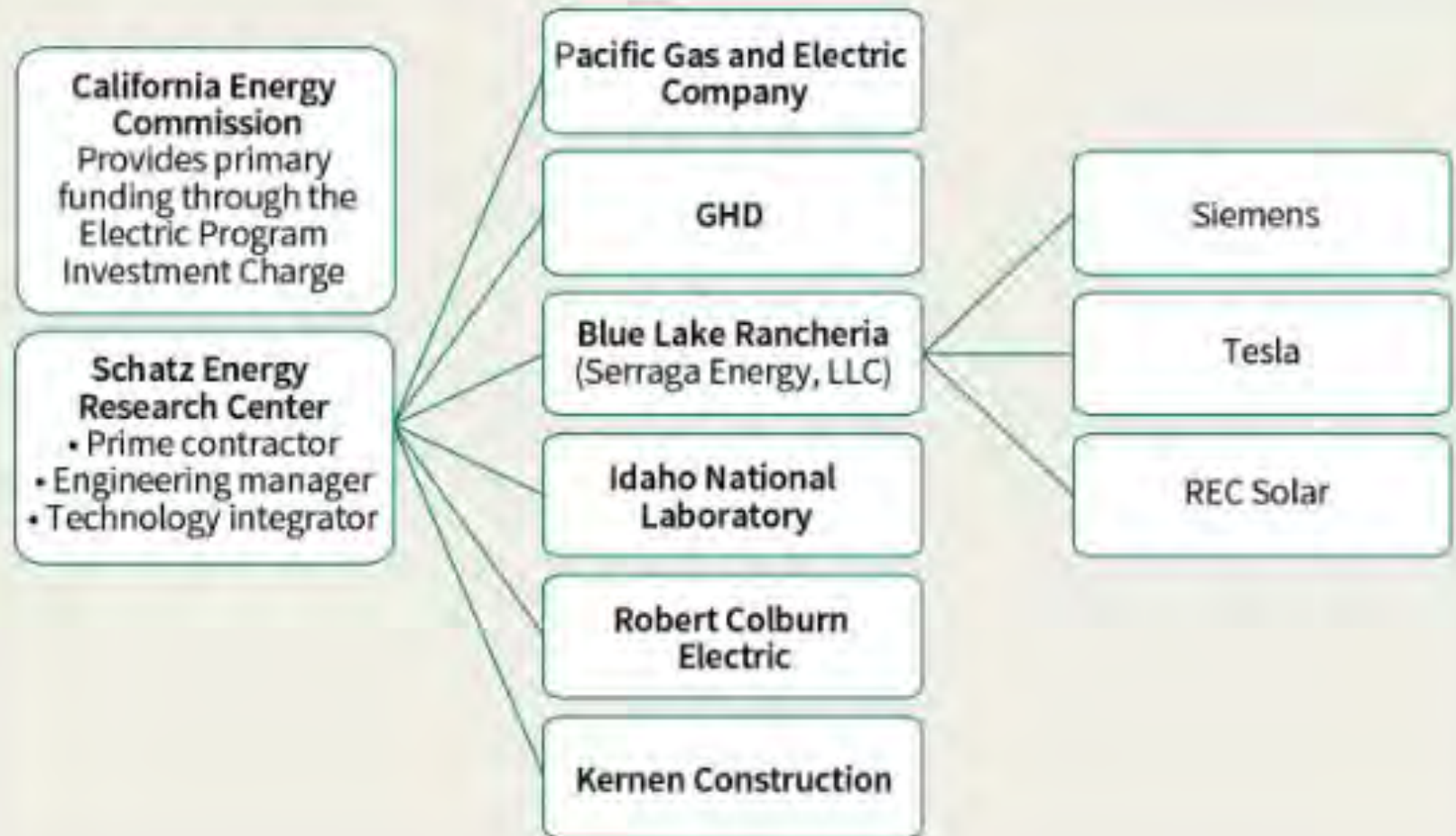
Courtesy of Blue Lake Rancheria



GRID INNOVATIONS > SMART GRID

Microgrid Serves Multiple Purposes

Blue Lake Rancheria pairs mitigation for the environment with adaptation for resilience.



The Blue Lake Rancheria partnership was critical to the successful completion of the microgrid.



Quinault Microgrid Development Strategy



Säzän Environmental Services



Organization	Program Name	Grant / Incentive Amount	Eligibility	Timeline	Notes / Links
WA Department of Commerce	Clean Energy Fund	\$1,700,000 for Grid Modernization	Y	TBD	https://www.commerce.wa.gov/growing-the-economy/energy/clean-energy-fund/energy-grid-modernization/
WA Department of Commerce	Clean Energy Fund	\$350,000 for Solar PV	Y	TBD	https://www.commerce.wa.gov/growing-the-economy/energy/energy-efficiency-and-solar-grants/
WA Department of Commerce	Clean Energy Fund	\$7,000,000 for Research Development & Demonstration	Y	TBD	https://www.commerce.wa.gov/growing-the-economy/energy/clean-energy-fund/energy-rdd-clean-energy-fund/
U.S. Department of Agriculture	Rural Energy for America Program (REAP) - Energy Audit and Renewable Energy Development Assistance Grants	Grant up to \$100,000	Y	Expected 2020 deadline in January	https://www.rd.usda.gov/programs-services/rural-energy-america-program-energy-audit-renewable-energy-development-assistance
GRID Alternatives	Tribal Solar Accelerator Fund	Provides funding to tribes to install solar on solar ready structures	Y	2019 deadline passed, but funding is currently available through 2021; deadline TBD	https://tribalsolaraccelerator.org/
U.S. Office of Energy Efficiency & Renewable Energy - Building Technologies Office (BTO)	Advance Building Construction with Energy-Efficient Technologies & Practices (ABC)	Grant	Y	Expected 2020 deadline in August	https://www.energy.gov/eere/buildings/articles/funding-opportunity-advanced-building-construction-energy-efficient
U.S. Bureau of Indian Affairs	Grant to Build Tribal Energy Development Capacity	Grant	Y	2019 deadline passed; 2020 deadline TBD	https://www.indianaffairs.gov/as-ia/ieed/division-energy-and-mineral-development/tedcp
U.S. Department of Energy	Energy Infrastructure Deployment on Tribal Lands	Grant	Y	Expected 2020 deadline in May	https://eere-exchange.energy.gov/Default.aspx?Archive=1#Foald19c6b408-a335-4b1e-bbcc-bb58d0c2ccdf
U.S. Department of Agriculture	Community Facilities Direct Loan & Grant Program	Direct loan, grant, or a combination of the two	Y	Applications accepted year round	https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program
U.S. Department of Agriculture	Rural Community Development Initiative Grants	Grant between \$50,000 and \$250,000	TBD	Applications not currently being accepted	https://www.rd.usda.gov/programs-services/rural-community-development-initiative-grants



Prioritized Grant Opportunities

- WA Department of Commerce
 - Clean Energy Fund – Grid Modernization Grants
 - Clean Energy Fund – Solar Energy Grants
- U.S. Department of Agriculture
 - Rural Energy for America Program (REAP) grant
- Grid Alternatives
 - Tribal Solar Accelerator Fund

Alternative Funding Strategies

- Tax Equity Investment Strategy
 - External Investor
- Design Build Operate Maintain (DBOM)
 - DBOM Investor/Developer
 - Energy Service Company (ESCO)



Next Steps

- Presentation to Bureau of Indian Affairs – Department of Energy and Mineral Resource Development (DEMD) and QIN Business Council
- Load study using data loggers on critical facilities and (4) cell towers
- Utility infrastructure upgrade assessment for microgrid development
- WA Department of Commerce ‘Clean Energy Fund’ Grid Modernization grant application with Grays Harbor PUD
- Partnership facilitation with PNNL, NOAA, UW Clean Energy Institute and industry partners
- QIN microgrid project development, supporting energy resilience



Q&A



Thank You!

