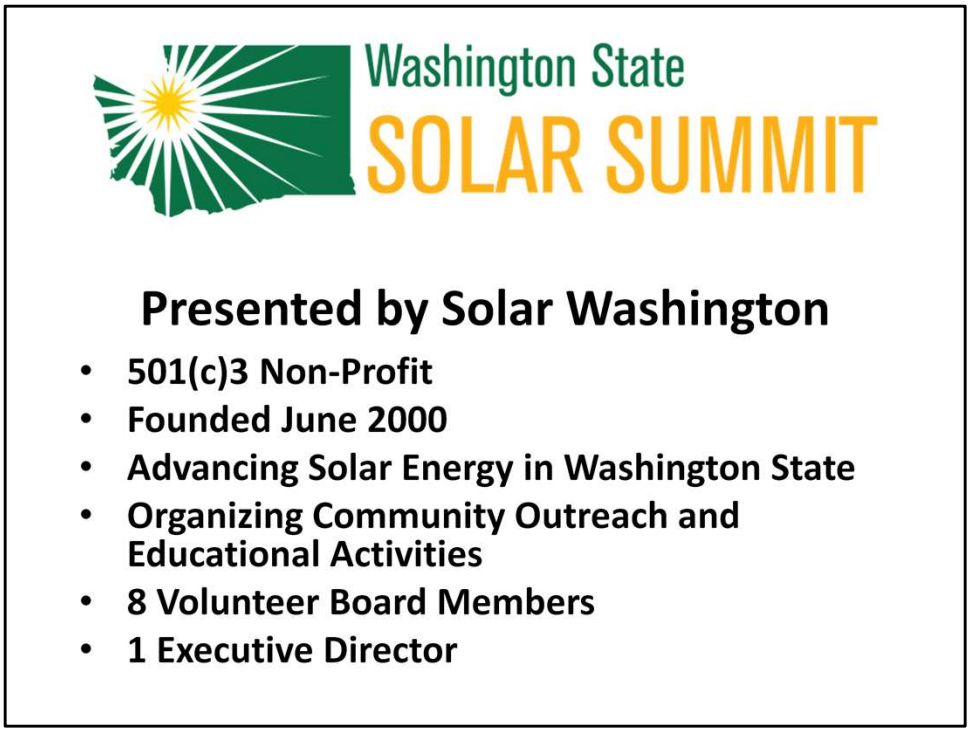
Greetings and welcome.
Thank you all for being here.



I would like to welcome you to the 20th annual Washington solar Summit, brought to you by Solar Washington.

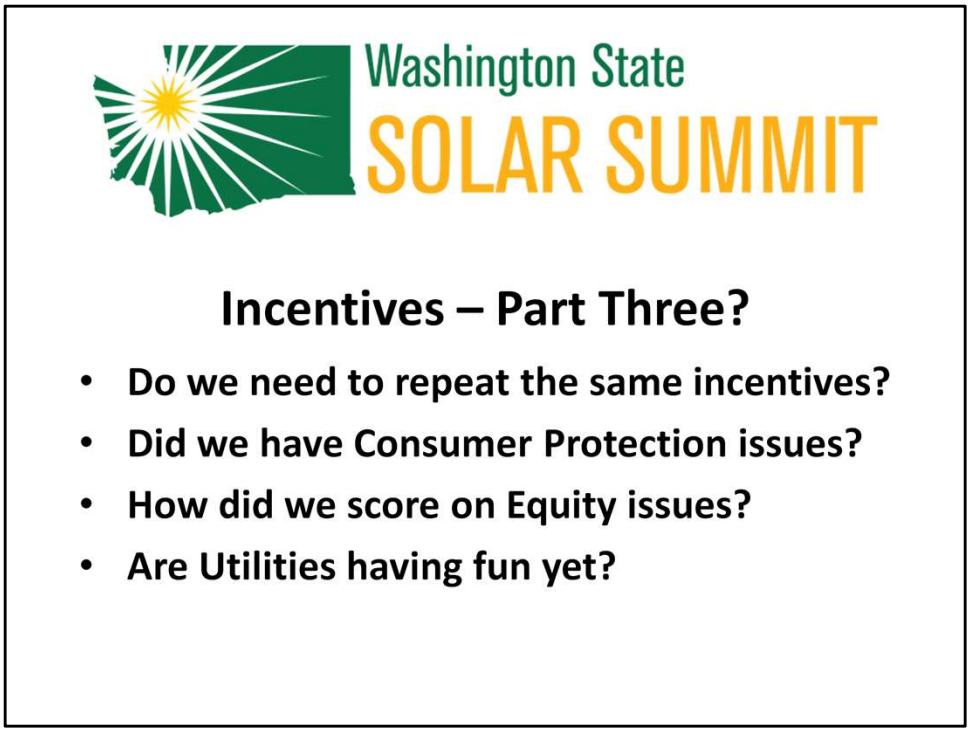
For two decades now solar enthusiast and utilities have come together at summits to discuss the future of solar, but more importantly, how it can play a role in the Washington energy mix and the climate we live in.

In that time a lot has changed. Back then Solar was mostly a hobby or an interest that a few played with to make an environmental statement. Some made businesses out of these interests. And some talked of making an incentive to continue this adoption of solar.

At Summits long ago we discussed how incentives could be used to grow a new solar industry for the State. The utilities were on board, with actually the majority of them volunteering and joined in.
Colleges prepared classes for a new generation of installers. And all seemed good.

Along this path we've heard lots of opinions if the incentives were structured right, and if they would have the Washington Solar industry ready to survive in a post incentive world as we experienced this year.
But likely more importantly now, is being ready to play a role in the 100% Clean Energy Law.

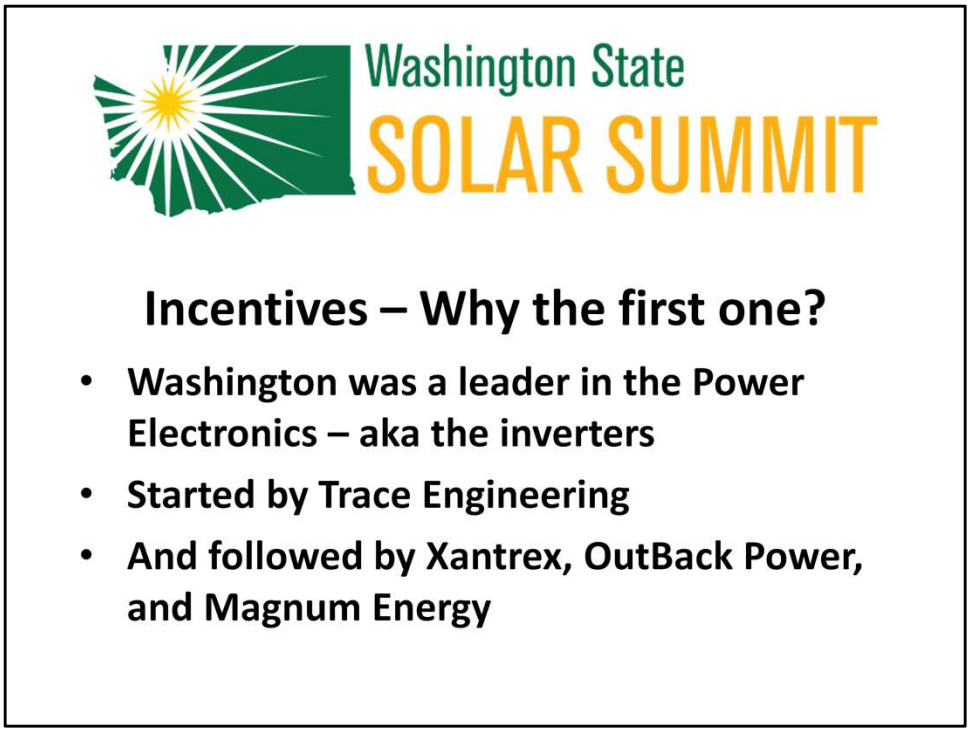
The Clean Energy Transformation Act, as it's formally known, will put solar head to head with other qualifying renewables in the effort to provide the lowest cost clean energy for the State. But keep in mind that "net zero" doesn't cut it anymore, "getting to zero" is the new requirement. Past differences aside, now's the time to put our collective efforts together and move forward with the best solutions.



I've heard a few say we need to repeat the same incentives, but is another round of identical incentives the right thing? There were a few issues that came up with the incentives that lead to a slippery slope of consumer protection and equity issues.

Unfortunately, and unfairly, some utilities are getting dragged into these issues simply because they have the continued monthly business relationship with these customers. Utilities also get dragged into the equity question, as only a certain class of people could participate in the incentives by the simple nature of their structures.

Incentives are great to help motivate people into doing something, but when they become a quick cash grab on the sales side and broken promises later, requires us to reevaluate what we proposed.



Those 14 years ago when we created the first incentive, it was functionally to attract clean-tech companies to Washington. Less than 50 miles north of here, Arlington was a major center of inverter design and manufacturing as started by Trace Engineering 30 years ago. Later Xantrex bought Trace and was busy building and testing inverters as big as 1MW every day, and then shipping them off to the US and European PV markets.

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Incentives – Why the first one?

- **Washington was alive with competition**

Also in Arlington, Outback, founded by a group of former Trace employees, was ramping up about the same time, but with smaller, scalable, battery based, bidirectional, grid-tie inverters. And in Everett, Magnum Energy had similar battery based Inverters for the off grid and mobile power markets, but with plans for grid tie products eventually.

For those of you that don't know what "battery based" means, today's hip kids are calling it "energy storage"

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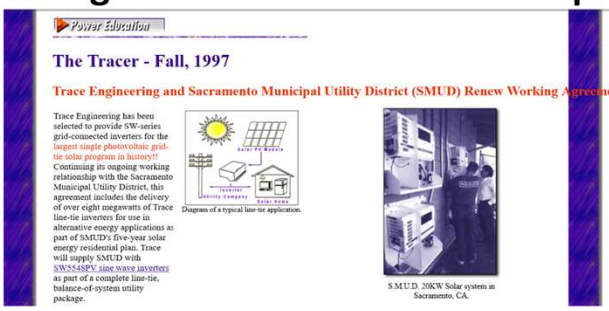
Incentives – Why the first one?

- **Washington had the intellectual capital**



Power Education

The Tracer - Fall, 1997

Trace Engineering and Sacramento Municipal Utility District (SMUD) Renew Working Agreement

Trace Engineering has been selected to provide SW-series grid-connected inverters for the largest single photovoltaic grid-tie solar program in history!! Continuing its ongoing working relationship with the Sacramento Municipal Utility District, this agreement includes the delivery of over eight megawatts of Trace line-tie inverters for use in alternative energy applications as part of SMUD's five-year solar energy residential plan. Trace will supply SMUD with SW5548PV sine wave inverters as part of a complete line-tie, balance-of-system utility package.

Diagram of a typical line-tie application.

S.M.U.D. 20KW Solar system in Sacramento, CA.

I know not everyone is interested in this history… but actually for a period of time, every grid tied PV system in California used Trace inverters. Washington clearly had its place in the US and international PV markets, which at the time, laid the foundation for these very incentives.

History can show things that are only history and won't be coming back, or we can look at them and review what we had, and possibly rekindle something similar.

The incentives got us up to 4 PV companies and 5 inverter companies,

But today most are gone or not "building" products in Washington.

However, on the flipside we now have a much larger and well-advertised installation industry. And to the installers benefit, the global PV industry has innovated and pushed hardware costs to mere fractions of what we paid during the first Summits, as well as greatly reducing the installation time. But uncertainty of working in this post incentive situation weighs heavy on the minds of installers'.

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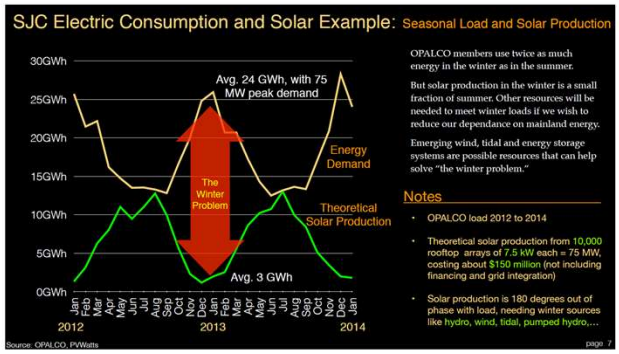
- **We still need to acknowledge our electrical load history – and how solar fits into it**



Graph by Orcas Power & Light Cooperative (OPALCO)

History can also show information and trends. Utilities use history all the time to establish and forecast how we consume energy, and now, actually how customers produce it. And despite climate change happening, we are still in a winter peaking market and solar will clearly have competition for its slice of the 100% Clean Energy pie.

Storage has been a buzzword lately, but storage won't automatically bailout solar by itself in our markets, but it will begin to play a changing role in all of our lives.

So with that, we've added a new topic and session at the summit this year, and that is Storage.

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- **Breaking News! – Storage industry ready to come to Solar's rescue!!**

Whoops – wrong kind of storage…

Welcome to the new kind of storage… Either by lead acid, pumped hydro, or billions of cordless tool batteries, storage will come. Eventually…

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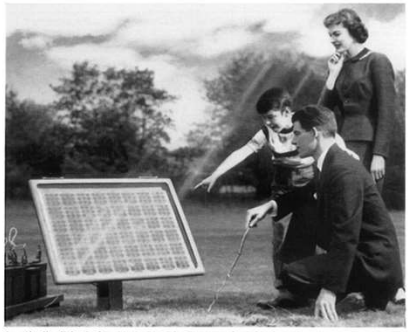
- **Or is it yesterday's news?**



Something New Under the Sun. It's the Bell Solar Battery, made of thin discs of specially treated silicon, an ingredient of common sand. It converts the sun's rays directly into usable amounts of electricity. Simple and trouble-free. (The storage batteries beside the solar battery store up its electricity for night use.)

Bell System Solar Battery Converts Sun's Rays into Electricity!

Bell Telephone Laboratories invention has great possibilities for telephone service and for all mankind

Actually Solar's heritage was battery based, and solar's future will undoubtedly go back there, but the big question is when. Particularly in Washington.

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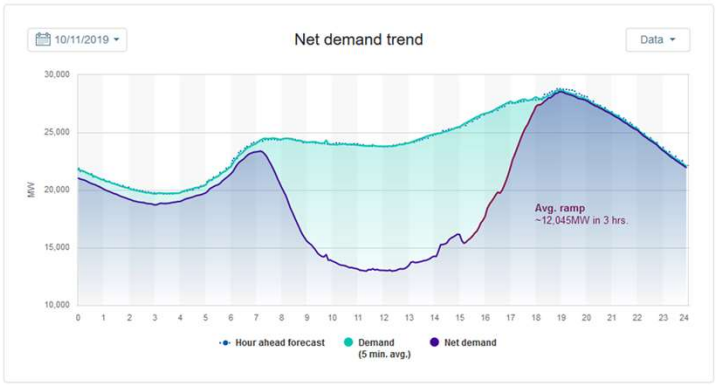
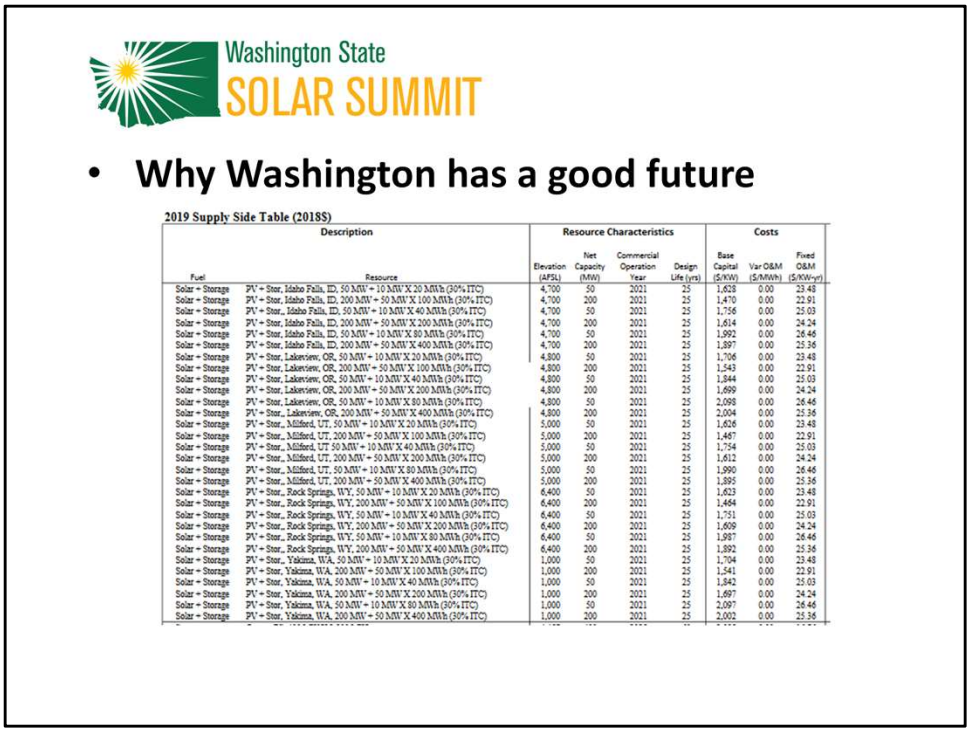
- **Why California is using Storage now**

Net demand (demand minus solar and wind)

This graph illustrates how the ISO meets demand while managing the quickly changing ramp rates of variable energy resources, such as solar and wind. Learn how the ISO maintains reliability while maximizing clean energy sources.

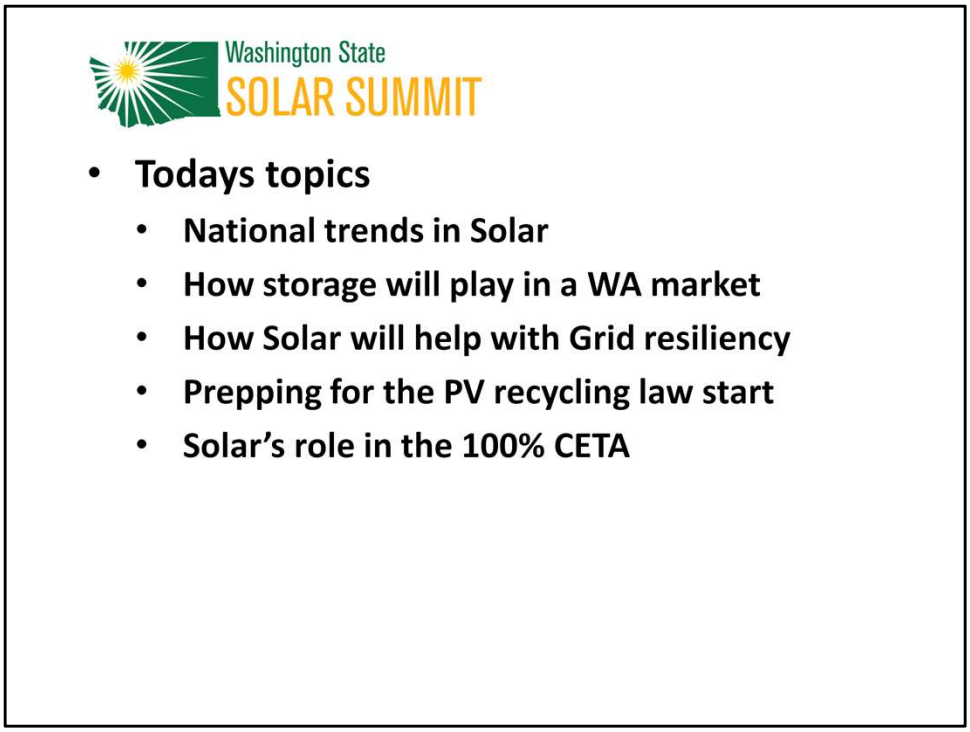


But while battery-less inverters have solved one problem on the sales and install side, they realistically will create a new one when everyone has them. Such is with the growing issues in California



Description		Resource Characteristics				Costs		
Fuel	Resource	Elevation (AFSL)	Net Capacity (MW)	Commercial Operation Year	Design Life (yrs)	Base Capital ($/KW)	Var O&M ($/MWh)	Fixed O&M ($/KW-yr)
Solar + Storage	PV + Stor, Idaho Falls, ID, 50 MW + 10 MW X 20 MWh (30% ITC)	4,700	50	2021	25	1,628	0.00	23.48
Solar + Storage	PV + Stor, Idaho Falls, ID, 200 MW + 50 MW X 100 MWh (30% ITC)	4,700	200	2021	25	1,470	0.00	22.91
Solar + Storage	PV + Stor, Idaho Falls, ID, 50 MW + 10 MW X 40 MWh (30% ITC)	4,700	50	2021	25	1,756	0.00	25.03
Solar + Storage	PV + Stor, Idaho Falls, ID, 200 MW + 50 MW X 200 MWh (30% ITC)	4,700	200	2021	25	1,614	0.00	24.24
Solar + Storage	PV + Stor, Idaho Falls, ID, 50 MW + 10 MW X 80 MWh (30% ITC)	4,700	50	2021	25	1,992	0.00	26.46
Solar + Storage	PV + Stor, Idaho Falls, ID, 200 MW + 50 MW X 400 MWh (30% ITC)	4,700	200	2021	25	1,897	0.00	25.36
Solar + Storage	PV + Stor, Lakeview, OR, 50 MW + 10 MW X 20 MWh (30% ITC)	4,800	50	2021	25	1,706	0.00	23.48
Solar + Storage	PV + Stor, Lakeview, OR, 200 MW + 50 MW X 100 MWh (30% ITC)	4,800	200	2021	25	1,543	0.00	22.91
Solar + Storage	PV + Stor, Lakeview, OR, 50 MW + 10 MW X 40 MWh (30% ITC)	4,800	50	2021	25	1,844	0.00	25.03
Solar + Storage	PV + Stor, Lakeview, OR, 200 MW + 50 MW X 200 MWh (30% ITC)	4,800	200	2021	25	1,699	0.00	24.24
Solar + Storage	PV + Stor, Lakeview, OR, 50 MW + 10 MW X 80 MWh (30% ITC)	4,800	50	2021	25	2,098	0.00	26.46
Solar + Storage	PV + Stor, Lakeview, OR, 200 MW + 50 MW X 400 MWh (30% ITC)	4,800	200	2021	25	2,004	0.00	25.36
Solar + Storage	PV + Stor, Milford, UT, 50 MW + 10 MW X 20 MWh (30% ITC)	5,000	50	2021	25	1,626	0.00	23.48
Solar + Storage	PV + Stor, Milford, UT, 200 MW + 50 MW X 100 MWh (30% ITC)	5,000	200	2021	25	1,467	0.00	22.91
Solar + Storage	PV + Stor, Milford, UT 50 MW + 10 MW X 40 MWh (30% ITC)	5,000	50	2021	25	1,754	0.00	25.03
Solar + Storage	PV + Stor, Milford, UT, 200 MW + 50 MW X 200 MWh (30% ITC)	5,000	200	2021	25	1,612	0.00	24.24
Solar + Storage	PV + Stor, Milford, UT, 50 MW + 10 MW X 80 MWh (30% ITC)	5,000	50	2021	25	1,990	0.00	26.46
Solar + Storage	PV + Stor, Milford, UT, 200 MW + 50 MW X 400 MWh (30% ITC)	5,000	200	2021	25	1,895	0.00	25.36
Solar + Storage	PV + Stor, Rock Springs, WY, 50 MW + 10 MW X 20 MWh (30% ITC)	6,400	50	2021	25	1,623	0.00	23.48
Solar + Storage	PV + Stor, Rock Springs, WY, 200 MW + 50 MW X 100 MWh (30% ITC)	6,400	200	2021	25	1,464	0.00	22.91
Solar + Storage	PV + Stor, Rock Springs, WY, 50 MW + 10 MW X 40 MWh (30% ITC)	6,400	50	2021	25	1,751	0.00	25.03
Solar + Storage	PV + Stor, Rock Springs, WY, 200 MW + 50 MW X 200 MWh (30% ITC)	6,400	200	2021	25	1,609	0.00	24.24
Solar + Storage	PV + Stor, Rock Springs, WY, 50 MW + 10 MW X 80 MWh (30% ITC)	6,400	50	2021	25	1,987	0.00	26.46
Solar + Storage	PV + Stor, Rock Springs, WY, 200 MW + 50 MW X 400 MWh (30% ITC)	6,400	200	2021	25	1,892	0.00	25.36
Solar + Storage	PV + Stor, Yakima, WA, 50 MW + 10 MW X 20 MWh (30% ITC)	1,000	50	2021	25	1,704	0.00	23.48
Solar + Storage	PV + Stor, Yakima, WA, 200 MW + 50 MW X 100 MWh (30% ITC)	1,000	200	2021	25	1,541	0.00	22.91
Solar + Storage	PV + Stor, Yakima, WA, 50 MW + 10 MW X 40 MWh (30% ITC)	1,000	50	2021	25	1,842	0.00	25.03
Solar + Storage	PV + Stor, Yakima, WA, 200 MW + 50 MW X 200 MWh (30% ITC)	1,000	200	2021	25	1,697	0.00	24.24
Solar + Storage	PV + Stor, Yakima, WA, 50 MW + 10 MW X 80 MWh (30% ITC)	1,000	50	2021	25	2,097	0.00	26.46
Solar + Storage	PV + Stor, Yakima, WA, 200 MW + 50 MW X 400 MWh (30% ITC)	1,000	200	2021	25	2,002	0.00	25.36

So while incentives have come and gone, and our climate and power prices make it a challenging market, there is still a strong desire within Washington to address how clean our energy is and that undoubtedly contributed to the passage of the 100% Clean Energy Law. So in seeing this month that Portland-based Pacific Corp announced approximately 3,000 Megawatts of PV projects, with ~800MW of that installed Washington, as well as knowing the world PV market is aggressively driving down the installed costs, gives me great hope that Washington's solar adoption will continue to grow at a strong rate after a renewed approach to the market.



Today we will discuss the national trends.
How and where storage is becoming a part of that.
Solar's role to help with grid resiliency.
Our soon to start PV recycling law.
And how solar will play a part in scaling up to a 100% fossil free grid.

At times you might not agree with what you hear today, and hopefully not yet, but this is a good time to remind you of what a Summit is.

Similar to the summit of a mountain top, one can look down upon the many valleys below.

Washington State
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- **It can be a long way from our comfort zones**

A view from Seattle

Photo credit – Jay Huang Photography

Each of us likely calls one of those valleys our home, because we are most comfortable there…

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- **But we have to make the effort**

A view from SW Washington

Photo credit – Anthony Koopman
Storm King Photography

Those valleys can represent **our** expertise, **our** views, **our** beliefs… **our** stubbornness.

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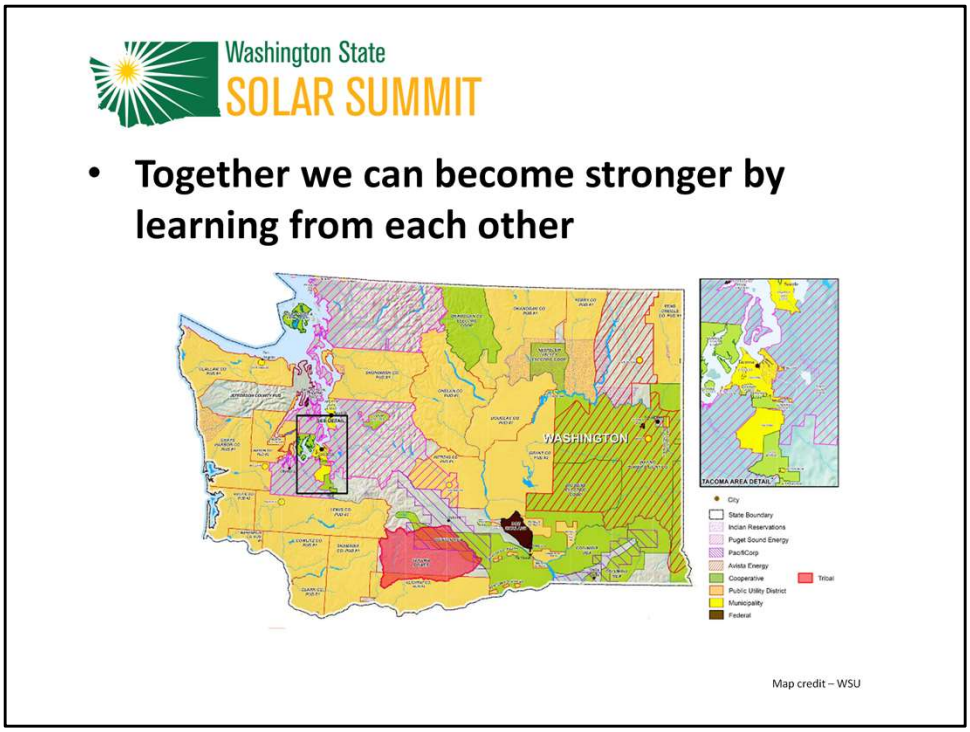
- **Including listening to others**

A view from Olympia

However when you are at a summit and meet with others, you learn **their** expertise, **their** viewpoints, **their** beliefs. And maybe **their** stubbornness too…

A Summit is a place to learn more about your neighbor and the challenges they face. Together we can become stronger by learning from each other.

History shows that great societies come from those who learn to work with each other for a common goal.



Before much of this land was called Washington, it consisted of many different tribes for centuries. We have much to learn from these tribes as they likely found times of challenge too, but clearly found ways to work together in this region, based from the history passed down to us.

Today the Meydenbauer Center stands on land of the Coast Salish People, and I ask you to consider their history, and wisdom today, as we discuss ways to work together for returning to a sustainable environment that they were able to maintain for centuries.

Washington State
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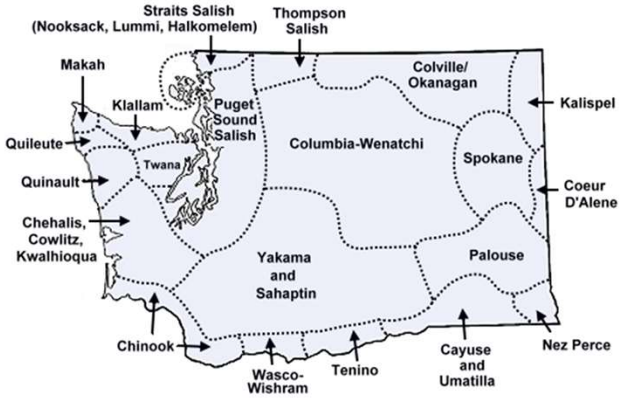
- **Together we can become stronger by learning from each other**



Map credit – native-languages.org

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So with that, let's begin our summit and continue working together to make solar the lowest cost renewable on the roadmap to a 100% renewable Washington.

Next up is Sarah Vorpahl of the Washington State Department of Commerce who will be our emcee for the day and will share her thoughts to frame the conversations for us.

Thank you, and enjoy the Summit.