



Clallam PUD Meter Strategy Update

February 2019

Definitions

- RF – Radio Frequency
- PLC – Power Line Carrier
- AMR – Automatic Meter Reading
(Meter transmits one-way using RF or PLC)
- AMI – Advanced Metering Infrastructure
(Meter transmits two-way using RF or PLC)
- EV – Electric Vehicle

Analog or Electromechanical Meters

Technology developed in 1930s

Advantages:

- Rugged and Reliable
- Service life > 30 Years
- Inexpensive, cost about \$30/unit in 2008
- Works as part of the 6,000 meter AMR Power Line Carrier implemented by PUD in the 1980s
- Negligible RF

Analog or Electromechanical Meters

Disadvantages:

- Slows and loses accuracy after 10 years, roughly:
 - 1/2% between 10 and 15 years
 - 1% between 15 and 20 years
 - 2% between 20 and 30 years
 - 3% or more beyond 30 years
 - \$342 total unregistered energy over 30 years
- Major manufactures no longer produce analog meters
- Corrective recalibration cost several times meter cost
 - At least every 5 years

Electronic or Digital Meters

First generation developed 1980s

Advantages:

- Retained metering accuracy over life of meter

Disadvantages

- Fragile
- Short Service Life, as little as 5 years
- Relatively expensive, 2-3 times cost of analog meters
- No solution for Power Line Carrier AMR available

Electronic or Digital Meters

Mature Technology, circa 2008

Advantages:

- Retains metering accuracy
- Longer service life, 15 years
- Inexpensive, about \$35/unit in 2008
- Solution for Power Line Carrier AMR available
- Negligible RF

Disadvantages

- Relatively fragile
- Less service life than analog meters

Digital Meters

- In 2009 PUD switched to digital electronic meters based solely on economics and fairness
 - Digital meters: $2 \times \$35 = \70 meter cost over 30 years
 - Analog meters: \$30 meter cost and \$342 unregistered energy over 30 years
 - Recalibration cost prohibitive
 - Note that meter material cost is a very small fraction of meter reading cost
- More than 4,000 digital meters installed between 2009 and 2013 with very few failures to date
- Service life expected to equal at least 15 years
- Our cool climate with few thunderstorms may result in service life exceeding 15 years

Drive-by RF

- Developed in 1990s
- Utilizes an electronic meter with RF module
- Early implementations often did experience RF module failures before meter failure
- Today RF modules are rated for the life of the meter and are expected to last 15 years
- In 2013 PUD installed a small number of drive-by meters as a trial

Drive-by RF

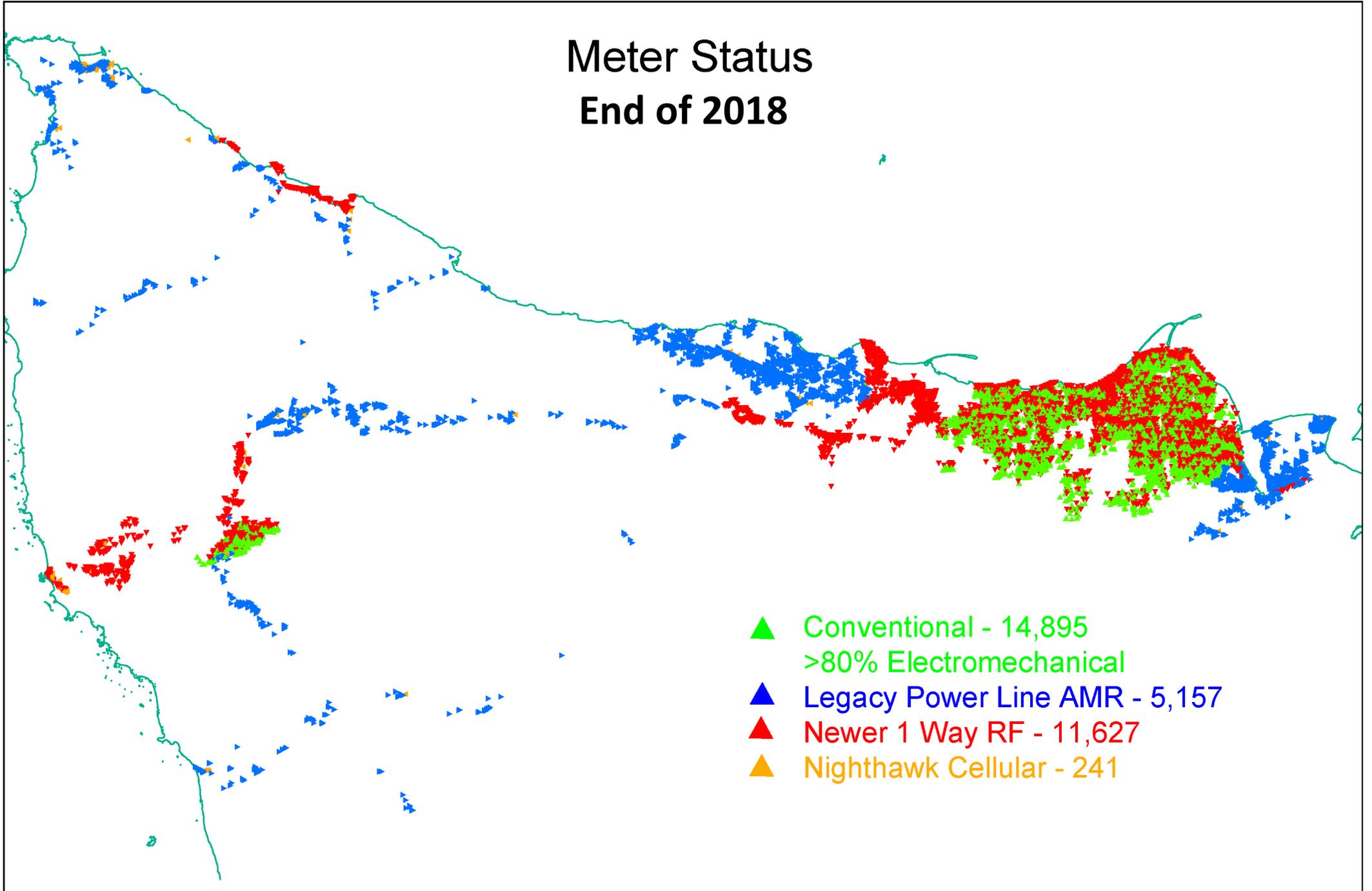
- In 2014 the PUD implemented a Meter Strategy to transition to electronic meters with a one way RF module
- Concurrently the PUD developed its Residential Meter Policy which included the cost based opt-out and fee in consultation with customer groups over several meetings
- In late 2015 the PUD accelerated the conversion to drive-by RF meters to create drive-by routes due to net reduction in metering cost of almost \$45/year per meter
 - For the additional \$31 in meter material cost for RF module
 - A reduction in meter reading labor of almost \$2/month
 - Elimination of up to \$2/months in unregistered energy
- By mid-2017 almost 12,000 RF meters had been installed reducing routes with 3 of 9 meter readers transitioned to other positions at the PUD or have retired.

Meter Strategy History

In 2017 Clallam suspended purchase of RF and cellular meter procurement to conduct a comprehensive evaluation based on rapidly changing industry trends

- 1990s drive-by technology is old and functionally limited
- No RF solution for our legacy AMR
- Substantial reduction in two-way meter unit cost (half 2009 costs)
- Availability of a substantial history of documented successes and failures associated with two-way meter implementation projects
- Recent introduction of a reliable and cost-effective remote disconnect feature for almost all self contained meters
- Committee tasked to review all available options
- Concurrent viability of RF water meters

Meter Status End of 2018



Optimum Solution

By November 2018 the District completed analysis and review of multiple competitive vendor options

- For materials, equipment and infrastructure upgrades valued at about \$3,750,000 we can convert 67% of existing older meters to new two-way meters, most with remote disconnects
- The project can be done over 5 years with existing labor resources and within the current meter procurement budget of \$750,000/year
- Relatively new existing 1-way meters will be consolidated into convenient drive-by routes
- 1-way meters can be replaced with 2-way meters after 2023
 - As a continuation project at \$750,000/year
 - Or as they reach end of life
- Annual control software licensing and subscription costs minimized

Optimum Solution

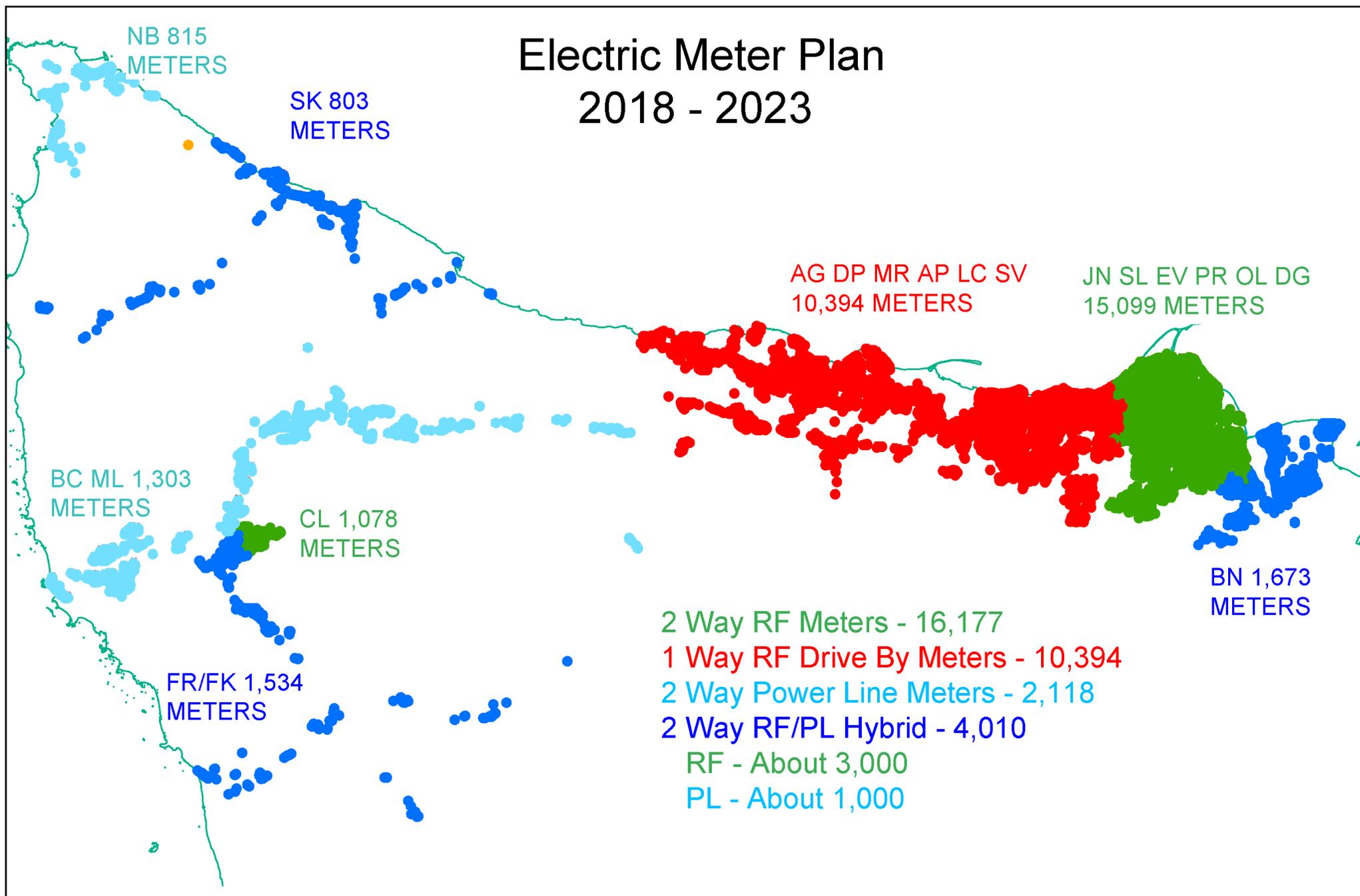
- Landis & Gyr evaluated as most cost-effective vendor for 2-way meters with remote disconnect feature
- Landis & Gyr North American AMI market share = 38%
- Per unit meter cost quoted \$36 below nearest competitors
- Clallam terrain, vegetation and exposure effectively precludes cost effective RF communications in some areas
- Landis & Gyr only vendor that directly offers:
 - Single user interface for both Power Line Carrier (PLC) and Radio Frequency (RF) Mesh options
 - Option of RF or PLC based on total ownership cost.
- PUD already has Landis & Gyr Command Center application for existing “Turtle” PLC AMR installed in 1980s
- Numerous examples of NISC (PUD core software system) integration, including the recent Mason PUD 3 implementation
- 2019 pilot projects for Neah Bay (815 PLC units) and Dungeness (3500 RF units)

Power Line Carrier (PLC) versus RF

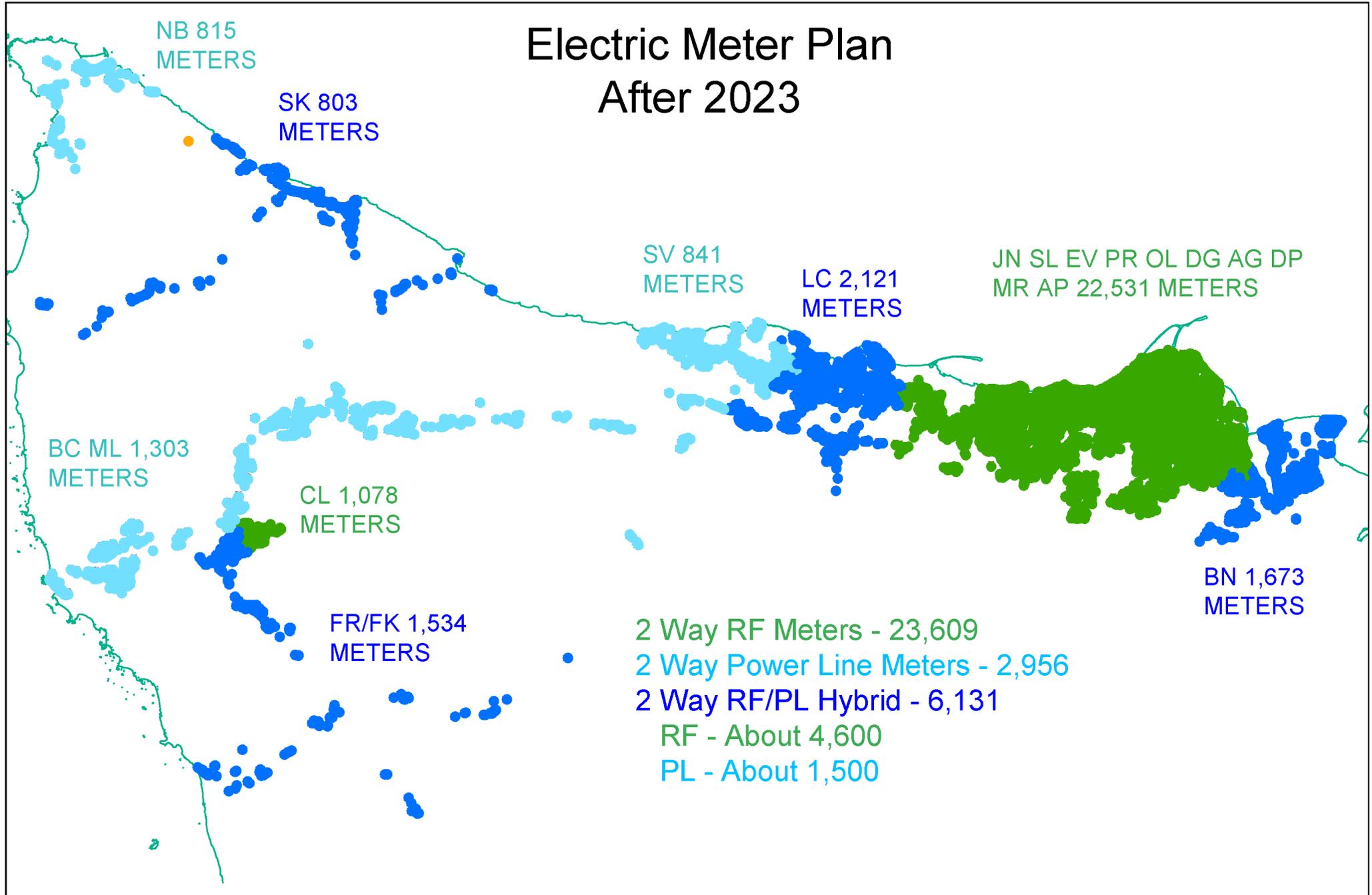
PLC communicates with meters via communication signals on electrical conductors

- Much slower data transfer rates than RF communications
- PLC Meters 70% more costly than RF Meters
- Less infrastructure required with lower risk of storm damage
- Can reach meters where RF is unreliable or not cost feasible
- Hybrid PLC and RF substations are planned when at least 600 meters on a PLC station can be reached by RF with no more than a repeater to meter ratio of 400:1

Electric Meter Plan 2018 - 2023



Electric Meter Plan After 2023



Economic Advantages for AMI

- Clallam still has 17,900 old mostly electromechanical and AMR “Turtle” Meters,
>\$290,000/year unregistered kWh
- 4,200 manual “truck roll” disconnects and reconnects/year
\$126,000/year reduction in labor for remote capability
- Direct, meter reading equipment and labor cost
\$240,000/year net reduction labor, 3 positions (6→3)
\$60,000/year net reduction in equipment
- Reduction in response to customer side problems
\$45,000/year
- \$761,000/year net reduction

Comparative Economics

Current Drive-by Versus Proposed 2-Way

- Average Meter Costs (Type 2S 240V)
 - 1 Way RF Drive-by Meter, \$66 (\$35 meter, \$31 RF Module)
 - 2 Way RF, \$85
 - 2 Way RF with remote disconnect \$111
 - 2 Way PLC with remote disconnect \$190
- Material cost difference between 1-way drive by and full 2-way with remote disconnect is now only **\$45/meter** for the vast number of meter types used.
- Five years ago this difference exceeded \$120/meter
- Difference in drive-by without remote disconnect and 2-way with remote disconnect is only about **\$855K** for remaining 19,000 meters.

Comparative Economics

Drive-by Versus 2-Way AMI

- Unregistered energy – no difference between Drive-by and 2-Way
- 4,200 manual disconnects and reconnects/year
 - \$126,000/year reduction in labor for remote disconnect capability
- Direct meter reading equipment and labor cost
 - \$96,000/year net reduction labor (1 Drive-by meter reading position)
 - \$50,000/year net reduction in equipment
- Reduction in response requirements for customer side problems
 - \$45,000/year
- **\$317,000/year** net reduction in metering costs
- Almost \$6,000,000 reduction over 15 year meter life at 3% escalation
- Project cost:
 - Increase meter capital cost of \$855,000 over 5 years
 - Total increase of about \$1,200,000 including infrastructure
- Net Reduction in cost of **\$4.8 million** over 15 year life

Additional 2-Way Benefits

(Value Excluded from Core Financial Analysis)

- Better OMS response, near real-time status of outages (\$40,000/year)
- Some service diagnostics without field visit “truck roll” (\$20,000/year)
- Enhanced load and power quality information for planning purposes (\$25,000/year)
- Immediate alarms for dangerous fire related load additions such as new crypto currency or grow operations (\$15,000/year)
- Enhanced voltage optimization and CVR potential (\$20,000/year)
- Effectively eliminate power diversion (\$14,000)
- Will allow implementation of time-of-use rates (???)
- Enhanced ability to integrate electric vehicle charging (???)
- Total Additional value = \$134,000/year (probably more)
- Total value = \$317,000 + \$134,000 = **\$451,000/year**
- Potential net reduction in costs of **\$7.3 million** over 15 year life assuming 3% cost escalation

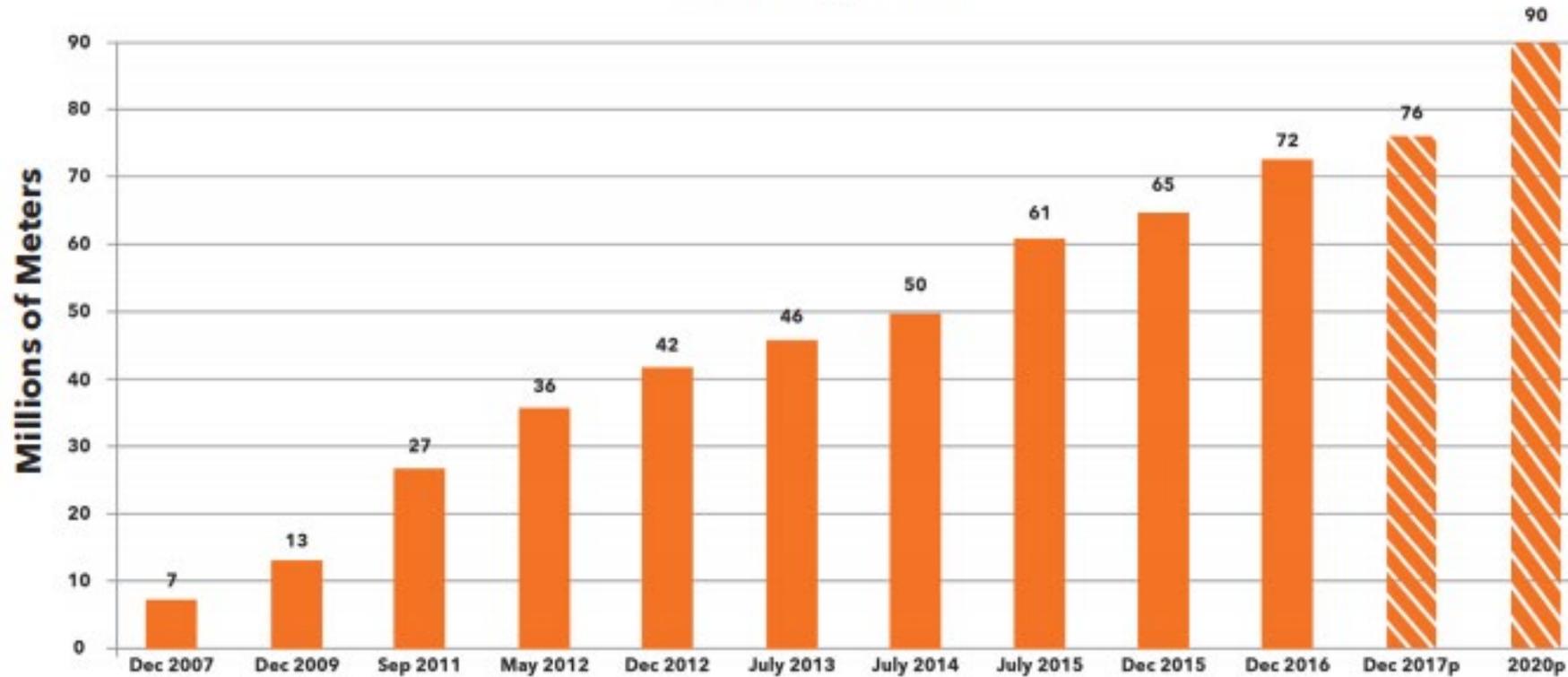
Time of Use (TOU) Rates

- The electric industry expects mass adaptation of Electric Vehicles (EVs) over the next 2 decades
- For Clallam PUD this may result in an increase in electric consumption on the order of 15%.
- Studies suggest and most experts believe that a smart grid will provide the primary means to integrate EVs without the need for major infrastructure additions
- Advanced meters as part of the smart grid is currently the only viable way to implement Time of Use rates to:
 - Incentivize the smart use of electricity
 - Shift customer energy use and demand from peak to off peak times
 - And avoid 10s of millions of infrastructure upgrades otherwise needed for substantial load increases
- At some point it may also become impossible for conservation and local generation to indefinitely offset our 1% meter growth and other load additions during our system peak

Staffing

- As of 2018 we have 6 meter reader positions down from 9 positions prior to 2013
- By implementing a conversion project over 5 years, existing staff can be utilized for conversion labor and thereafter transitioned to new positions
- 3 new Meter Helper positions will be created in the Meter Shop to be filled by current Meter Readers
- Remaining Meter Readers will have opportunities to transition to other PUD jobs or retirement between 2020 and 2023
- If we were to continue with the previous 2014 plan for 1-way drive-by conversion the need for meter reading would be reduced to one position in 2020
- Unlike many conversions elsewhere, the Clallam PUD Meter Strategy implements AMI without a substantial negative impact on meter reading employees

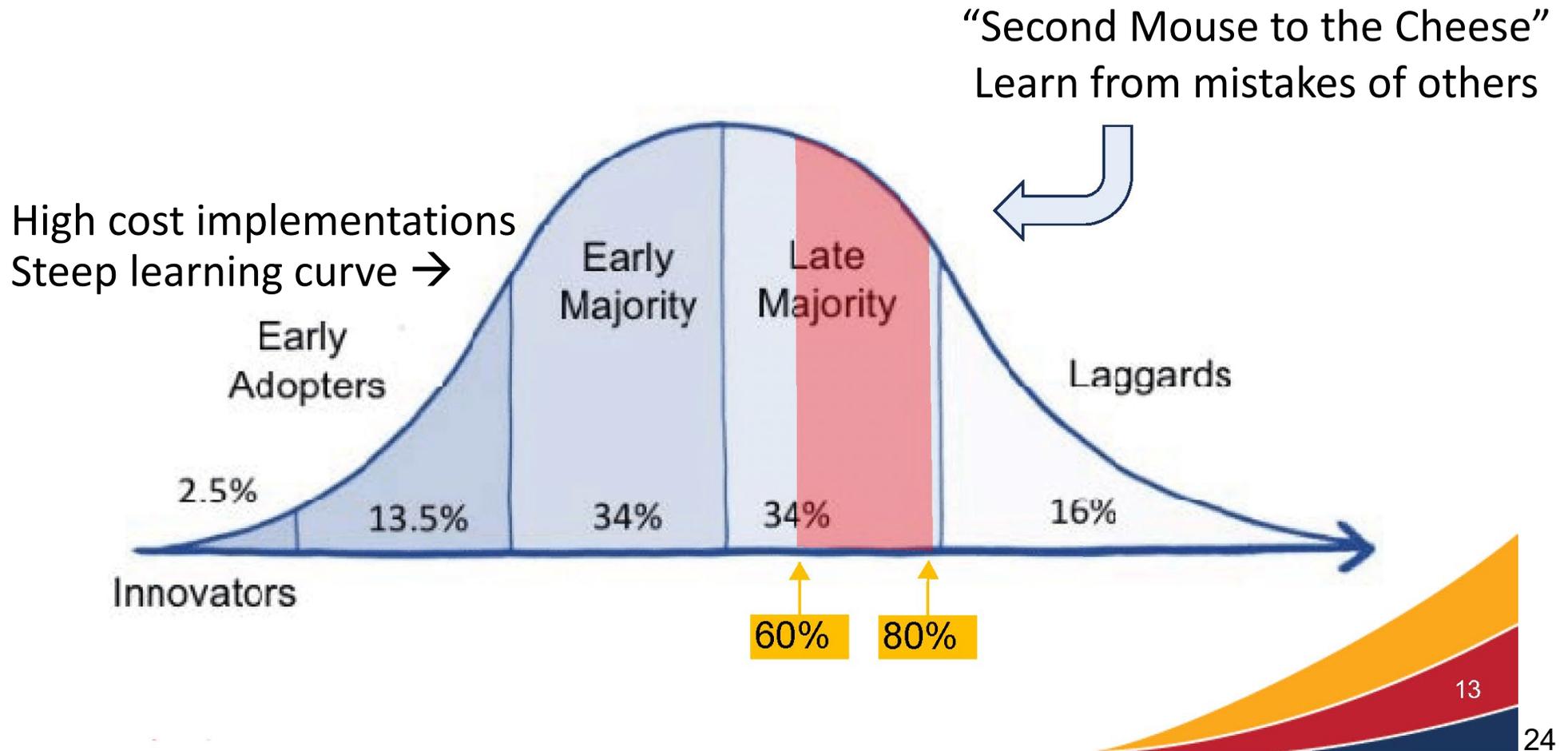
Industry AMI Trends



Edison Foundation

- By the end of 2018 two-way meters account for almost 60% of all US electric meters
- In 5 years two-way meters expected to be around 80%

Innovation Adoption Curve



Radio Frequency (RF)

- The AMI RF is 900MHz in the unlicensed UHF band
- 900MHz is primarily used for local communications
- Generally considered line of sight with limited penetration through most materials
- Low Power, up to 425mW (only when transmitting)
 - Similar to 4G LTE where cell phones range from 840MHz to 2.1GHz bands and wireless routers in 802.11 A,B,N,AC,AX.

RF Transmissions?

- The average meter read transmission is at 425mW and occurs within a range of 300ms to 2000ms once per day in our configuration
- Communication checks or acknowledgements totaling up to several milliseconds per day
- Based on the average reads total transmitting period:
 - Total period transmitting over a full year will average about 12.2 minutes

Comparative Exposure

- Standing several feet in front of an AMI meter for an entire year is roughly equivalent to the RF exposure from:
 - 6 minute 4G cell phone call or wirelessly streaming anything
 - 6 minutes in a vehicle that includes a wireless hot spot
 - 12-24 minutes of web browsing with a tablet, phone or PC on a wireless network
 - 10-60 minutes inside of almost any government building, school, or commercial business that has a wireless network, security systems, PA systems, and or retail rfid (scanner) systems.

Security and Privacy

- District residential meters will only transmit the following information:
 - Total power consumed or consumed in the previous day (KWh)
 - Instantaneous Voltage (Volts)
 - Device identification (Numeric)
 - Disconnect Position (on or off)
 - Meters do not contain or transmit customer information

Security and Privacy

- The meter does not “know” nor can communicate any other information
- There is no knowledge of what particular equipment in home contributed to the recorded KWh or if the customer is even present
- AMI system utilizes proprietary protocol/encryption
- Not designed for integration to other networks for control purposes
- The chance of hacking an individual meter is exceptionally remote compared to almost all other wireless communications

Opt-out Costing

- Staff is investigating ways to reduce the cost-based Opt-out fee
- Staff is also exploring an Opt-out based on a per service address instead of per meter – this means that a property with multiple meters would have a proportionally lower Opt-out fee
- One potential cost-based solution is to only read meters once every two months with an estimated billing between, similar to Mason PUD 3
- This may reduce the Opt-out fee to about \$18/month
- Opt-out fees at other PUDs range from \$15 to \$64.34 per month with additional one-time fees between \$80 and \$250
- Clallam is the only PUD that offers a cost-based fee to allow analog meters
- The Opt-out fee will go into effect when the associated service becomes part of a remote read meter reading route

Cost of Manually Reading Meters

- It cost roughly \$1,000,000/year to visit and read 32,000 meters 12 times a year in our 2,000 square mile service territory
- This is about \$3/month per meter
- Why is the Opt-out fee not \$3/month?
- In the future we will be reading as few as 100 meters in the same service territory
- Distances separating read meters will increase from 100s of feet to miles
- Per unit meter reading cost dramatically increases and is no long accurately represented in the fixed portion of the monthly bill.

Transparency

- 2014 adoption of Residential Meter Policy included work with concerned citizens group to ensure opt-out availability. Minutes document discussion about then-current drive-by meter technology
- Future meter strategy presentation and resolution adopting current Residential Meter Policy was publicly noted on the website and paper in November 2018
 - Commission affirmed entering into a contract with Landis & Gyr
- All project budgets were presented to and approved by the Commission in December 2018, including specific meter strategy projects
- Two preceding Commission meetings on cost-of-service included meter strategy discussion
- In January 2019 the Commission approved the sole source procurement resolution for AMI metering equipment
- HotLine article announced approval and that workshops would be held.
- District has maintained a proactive, rather than reactive approach, specifically using the word “meter” rather than other common terminology that could be misinterpreted

Why are we doing this?

- Staff has annually reviewed and evaluated AMI options every year since 2009
- During various reviews we have evaluated Landis & Gyr, Itron based Tantalus, Sensus, and Twacs
- Significant meter and infrastructure cost reductions occurred over the last 2 years that totally changed the financial analysis
- Provides for future customer choices, innovation and flexibility, including time of use rates and other service functionality and convenience
- AMI has effectively become an industry best practice and is integral to the requirements of a smart grid
- Substantial improvements in electric system reliability
- Staff truly believes that AMI is necessary to ensure we adhere to our Mission:
“Providing reliable, efficient, safe and low cost utility services in a financially and environmentally responsible manner”

Questions?

Additional questions
may be submitted to
info@clallampud.net