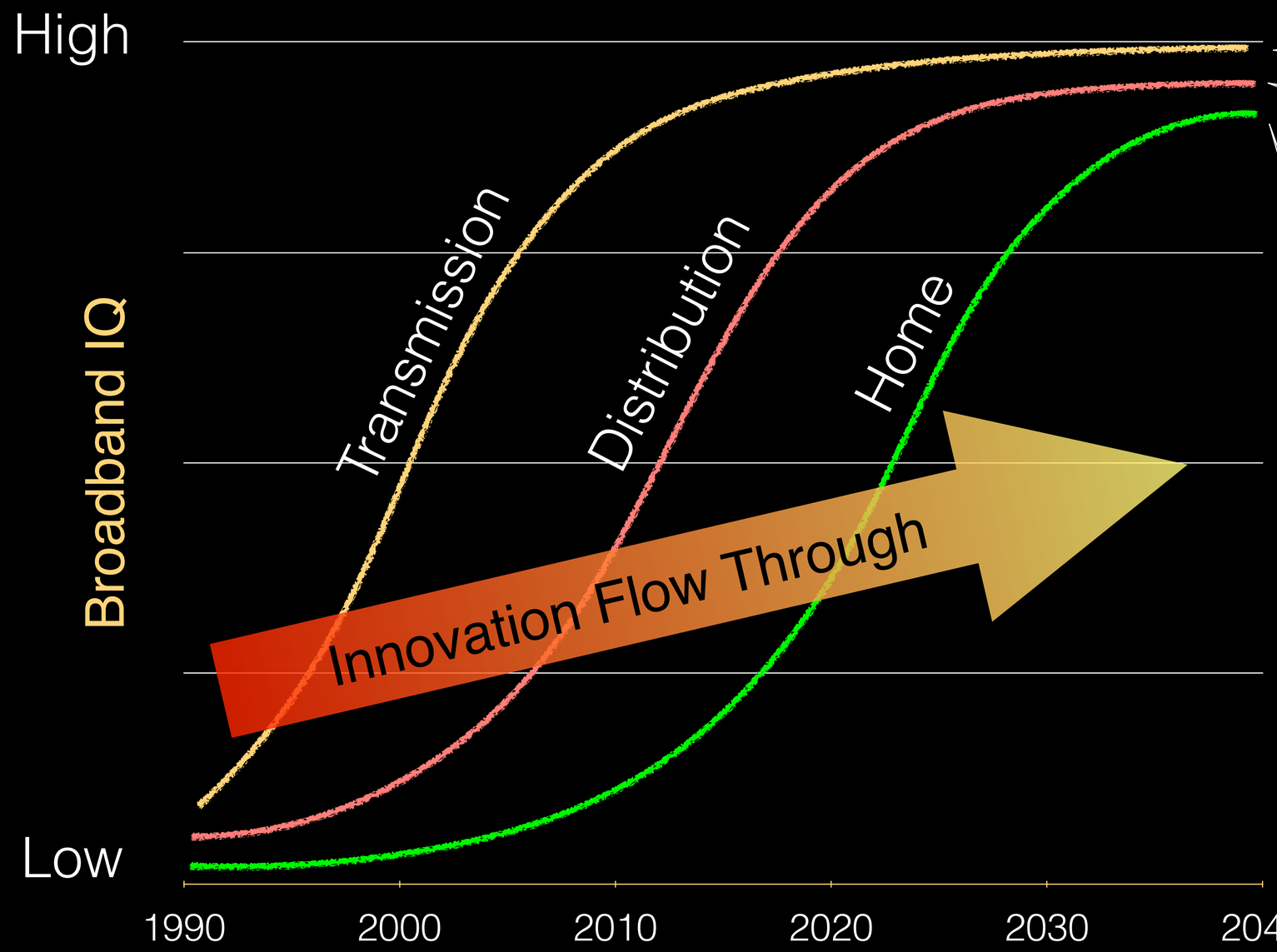
OPALCO

Board Meeting - August 2015

OPALCO Grid in the 21st Century

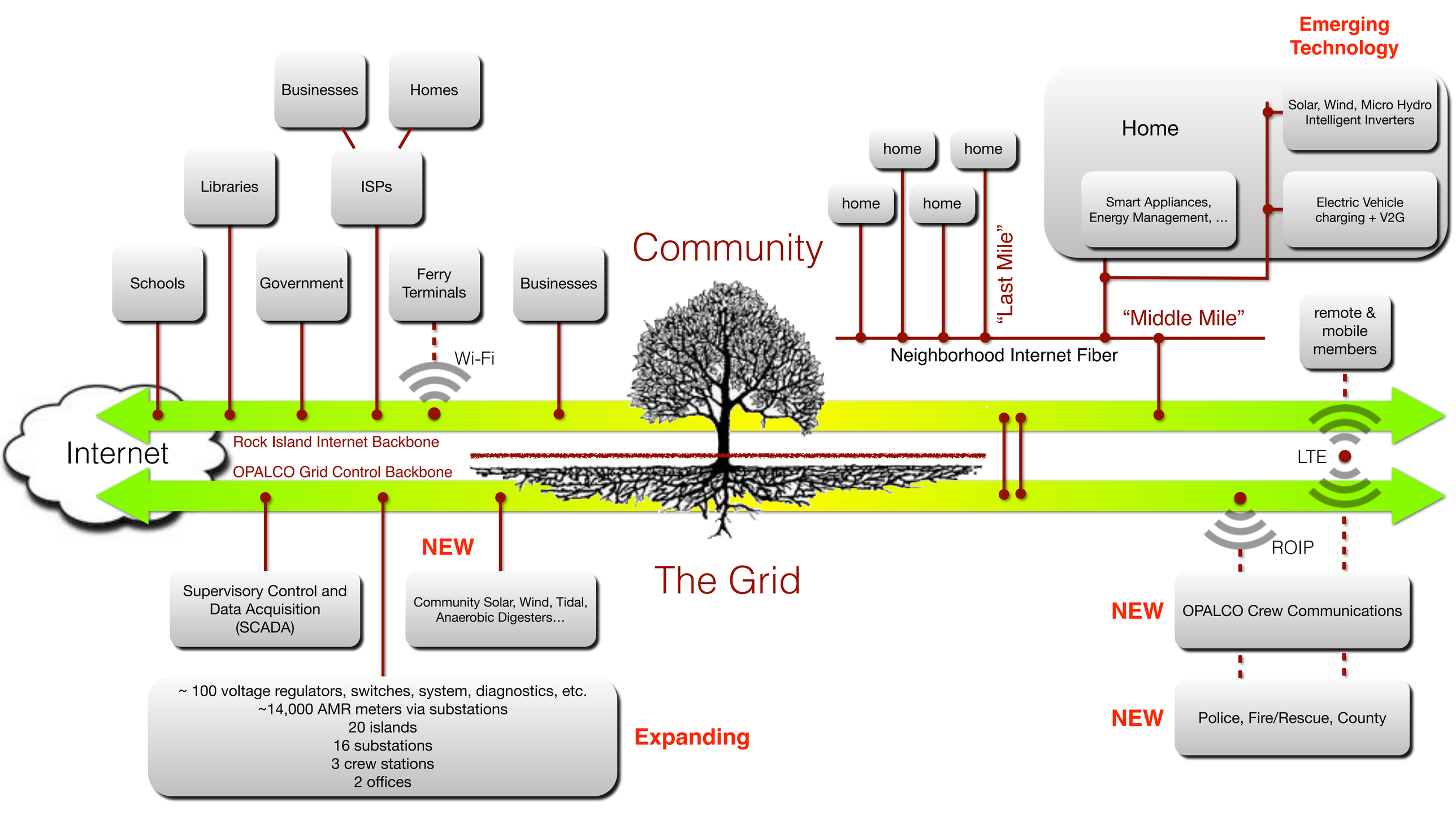
Evolution of Broadband Grid IQ



- Fewer blackouts
- More reliable
- More efficient energy markets

- Improved crew safety
- Increased reliability
- Reduced system loss
- Extend SCADA deeper into field
- Proactive fault avoidance
- Rapid fault isolation
- Precision crew dispatch

- Better member visibility into home and business energy profile
- Wise energy use and management
- Robust integration of local renewables
- Two-way energy - buy and sell
- DRU’s


Emerging Technology
Businesses
Homes
Libraries
ISPs
Schools
Government
Ferry Terminals
Businesses
Wi-Fi
Community
home
home
home
home
"Last Mile"
Home
Solar, Wind, Micro Hydro Intelligent Inverters
Smart Appliances, Energy Management, …
Electric Vehicle charging + V2G
"Middle Mile"
Neighborhood Internet Fiber
remote & mobile members
Internet
Rock Island Internet Backbone
OPALCO Grid Control Backbone
LTE
ROIP
NEW
The Grid
Supervisory Control and Data Acquisition (SCADA)
Community Solar, Wind, Tidal, Anaerobic Digesters…
NEW
OPALCO Crew Communications
NEW
Police, Fire/Rescue, County
~ 100 voltage regulators, switches, system, diagnostics, etc.
~14,000 AMR meters via substations
20 islands
16 substations
3 crew stations
2 offices
Expanding

How does OPALCO's Grid Control Backbone benefit members?

Electric System

- Improved reliability and safety
- 24/7 remote monitoring and control of 26 submarine cables and 1,339 mile of power lines (95% underground) over 20 islands
- Managing hundreds of field devices (switches, voltage regulators, meters, sectionalizing on both transmission and distribution systems, and more)
- Allows future two-way communication to local renewable generators (inverters) for grid stabilization
- Collects device and system data that can be used to delay or offset future system improvements and capital investments
- Provides crew communications and safety in the field
- Brings monitoring technology into the field (minimize outage restoration time and revenue loss)
- Networking three offices (and 20 islands) together
- Provides an additional revenue source for the cooperative to pay for future capital infrastructure (post 2021)

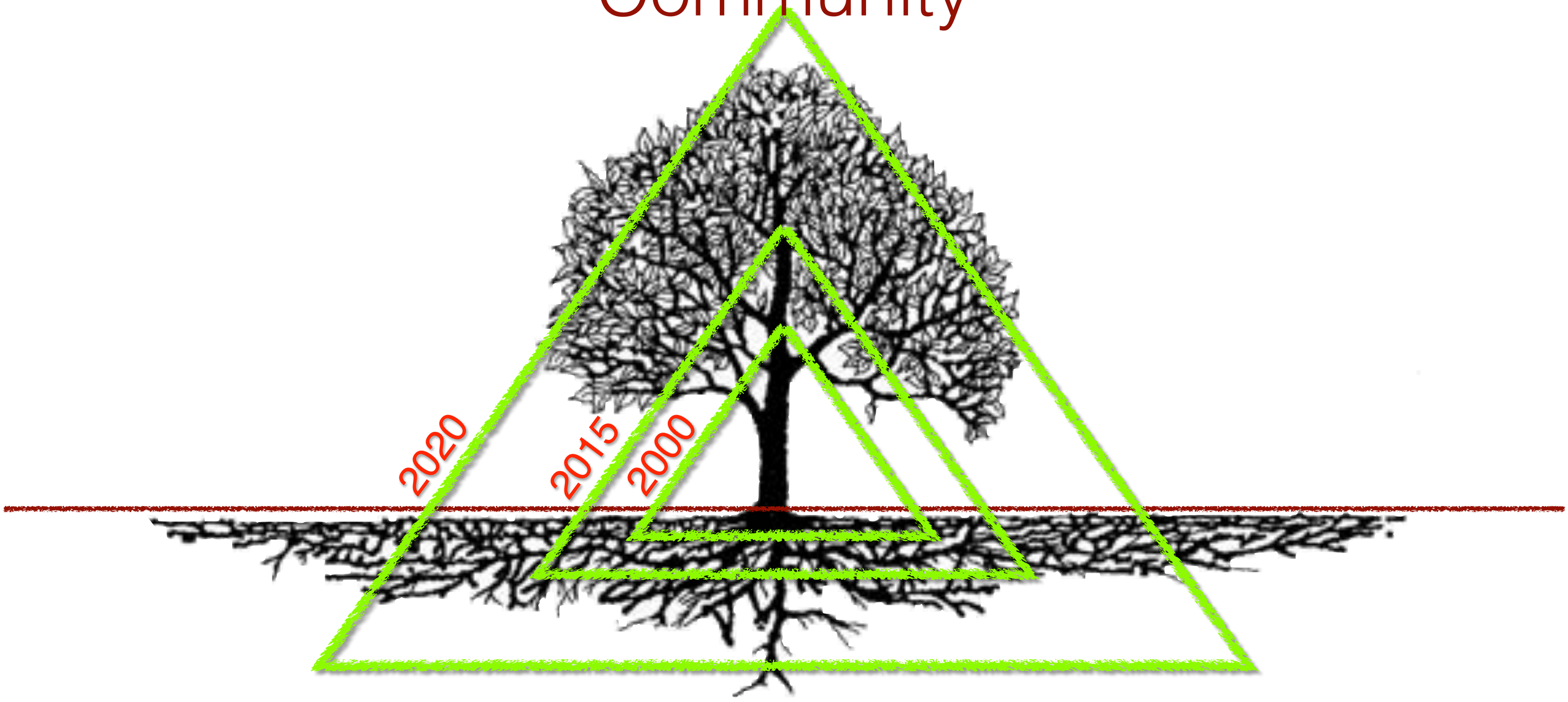
Public Safety

- Improved field communications for all first responders
- Allows for coordination of emergency services providers
- Better connections to physicians, hospitals and mainland resources during an emergency
- Platform for improving cell coverage

Internet Services

- Provides very fast internet services with future expansion capability
- Improves economic development through increased telecommuting and mainland connectivity
- Improves reliability and redundancy
- Improves community services
- Increases property values

Community

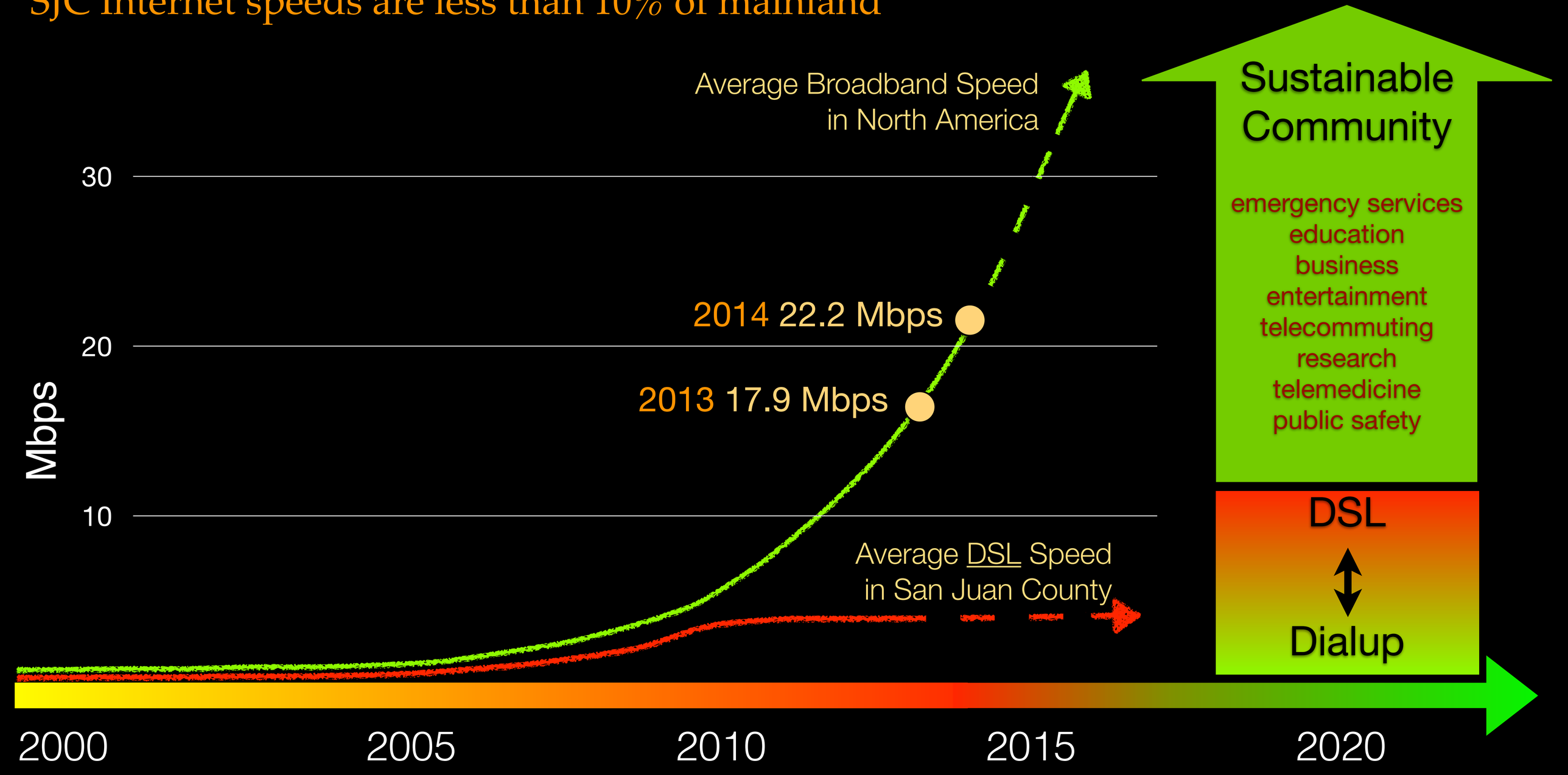


OPALCO Grid

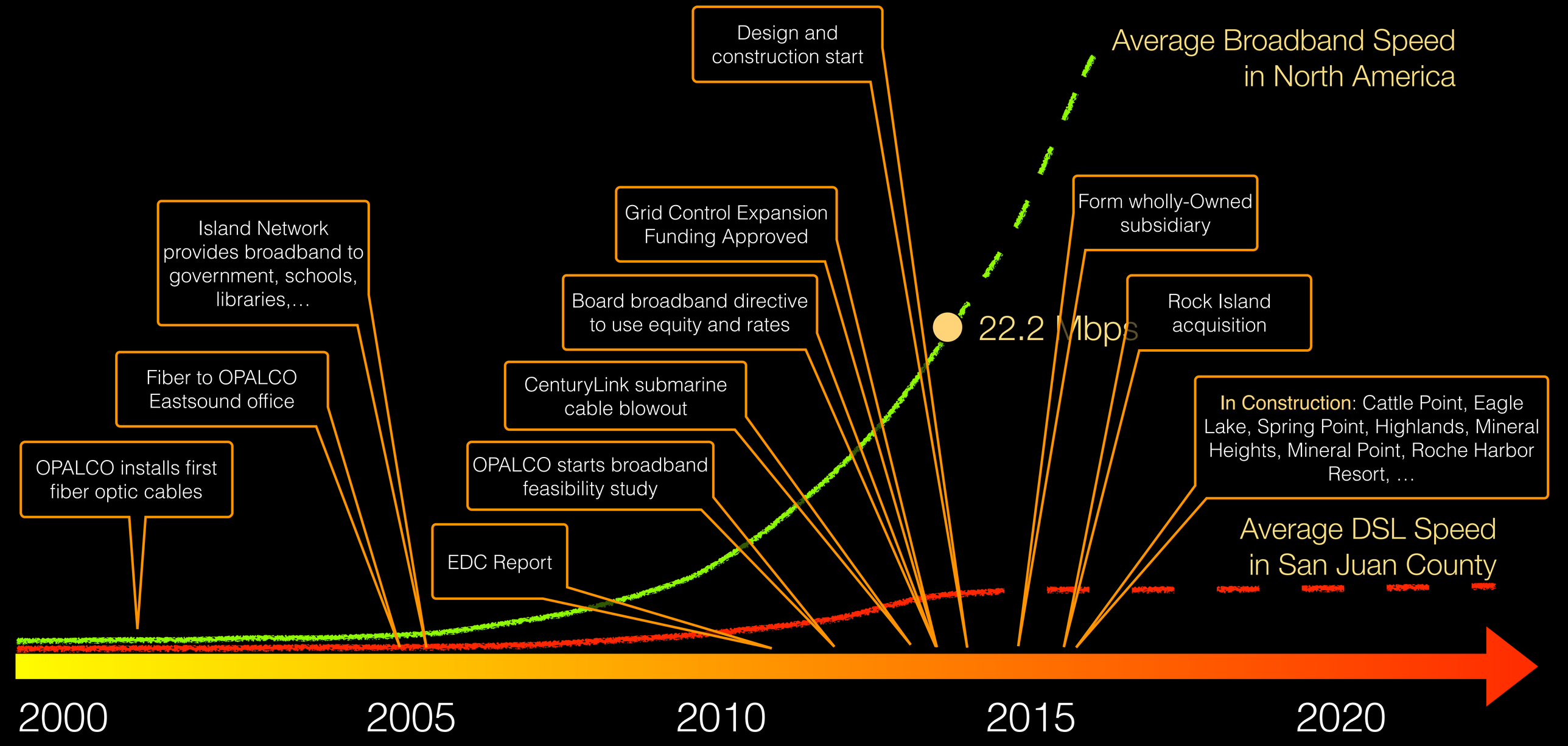
OPALCO Community Grid

Current Internet Solutions are Inadequate

SJC Internet speeds are less than 10% of mainland



A Brief History of Broadband in San Juan County



Rocky Mountain Institute on *The Customer-Centric Electricity Grid*

Communication between the utility and customers becomes critical when distributed energy resources (solar, wind, micro-hydro) enter the mix.

The "distributed system platform" places the customer at the center of the grid equation as never before. This is not by any means incremental…[utilities are] taking a very whole-systems transformative approach.

Lena Hansen, a principal in RMI's electricity practice

Rocky Mountain Institute on *The Customer-Centric Electricity Grid*

This two-way flow of electrons, services, and values won't happen without the communications infrastructure to relay all that data and decision making. Adding a layer of IT to the grid is essential.

Smart grid is a term you could interpret many different ways and means many different things, but at the most basic level, it's a question of how you make the grid intelligent using IT.

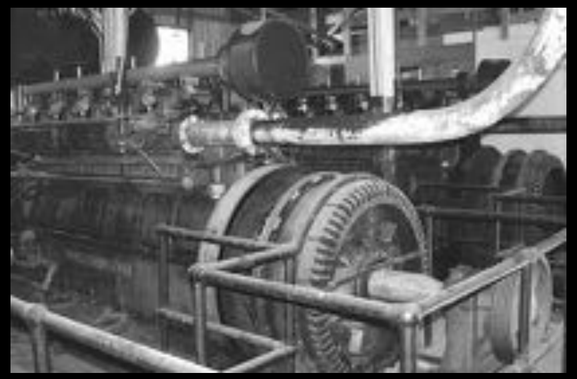
Which way are electrons flowing?

Who is providing or consuming what energy services, at what times, in what places?"

Dan Cross-Call, a senior associate in RMI's electricity practice

Grid Evolution: Generators

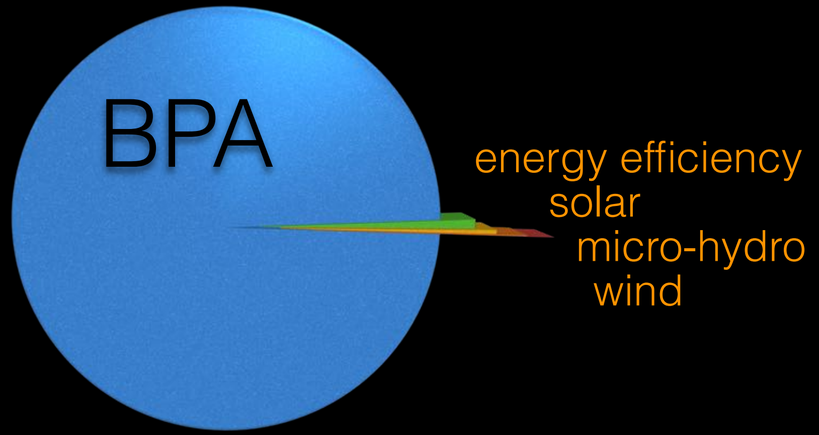
Past



Local Diesel Generators

Present

Hydro Turbines
+
emerging local distributed renewable generators



Future

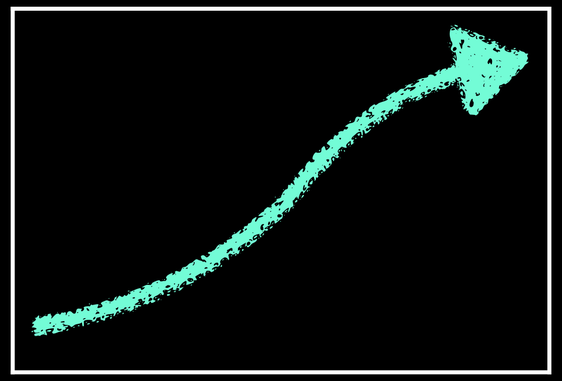


Hydro Turbines
+
local distributed renewable generators

solar, wind, micro-hydro, tidal, community solar, …

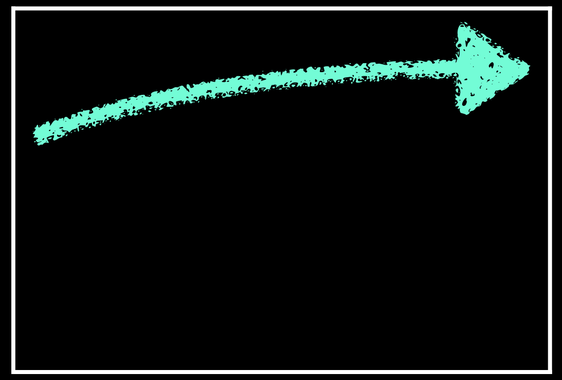
Grid Evolution: Load

Past



Exponential Growth

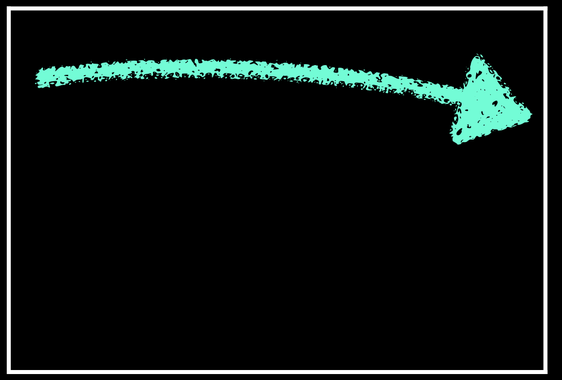
Present



Zero Load Growth

increasing efficiency

Future



Flat to Declining Load

warming world
increasing efficiency

Grid Evolution: Grid

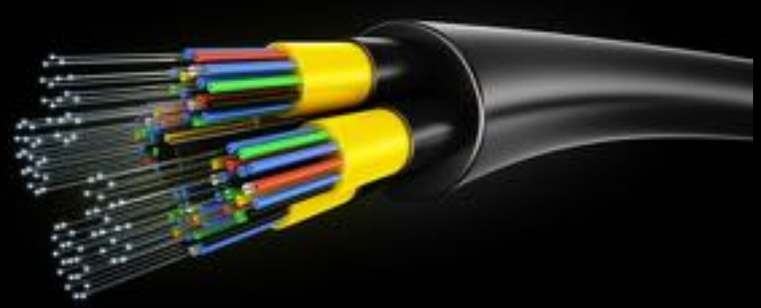
Past → Present → Future

Aerial Cable

fast growth and build out of grid to rural membership

Submarine Cable
Buried Cable

increasing capacity
Increasing reliability



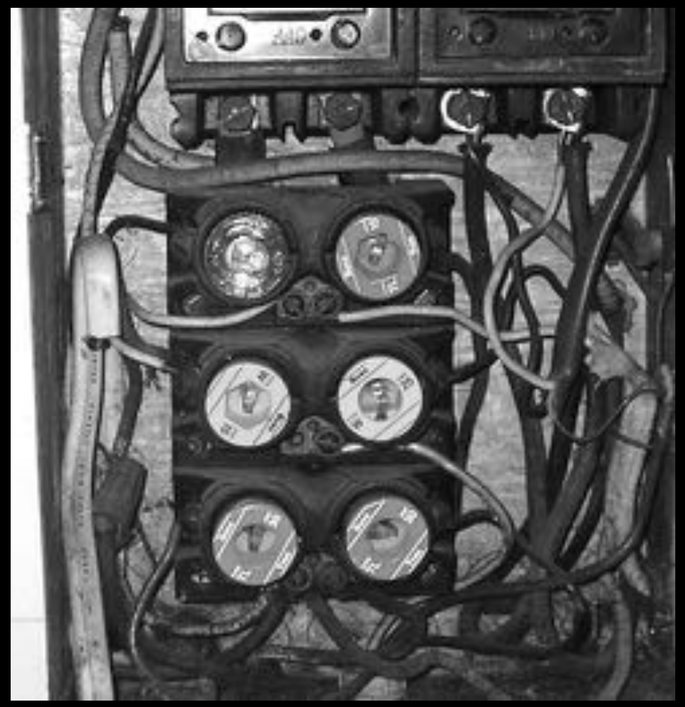
Fiber
Wireless LTE

manage increasingly smart grid and distributed local generation

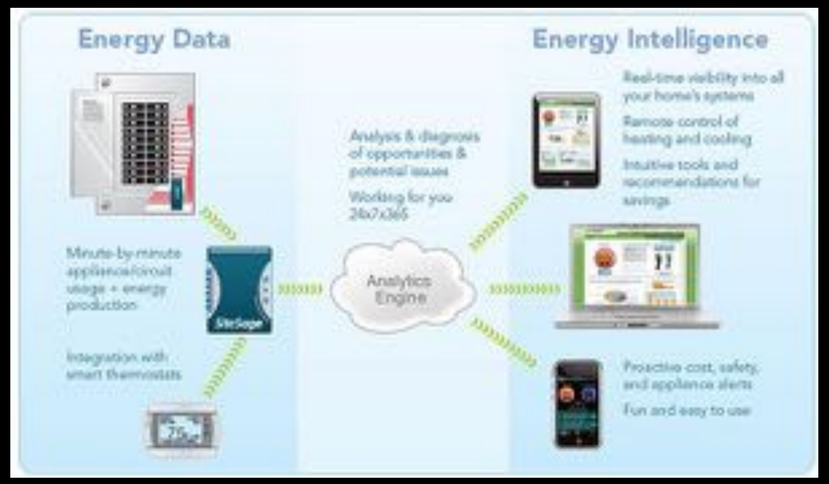
fast reliable community internet

Grid Evolution: Home

Past → Present → Future



Home inspector Tim Hance looking for hot breakers



Smart breakers allow monitoring for potential overload and faults, and homeowner monitoring for energy efficiency improvements

Grid Evolution: Home

Past → Present → Future

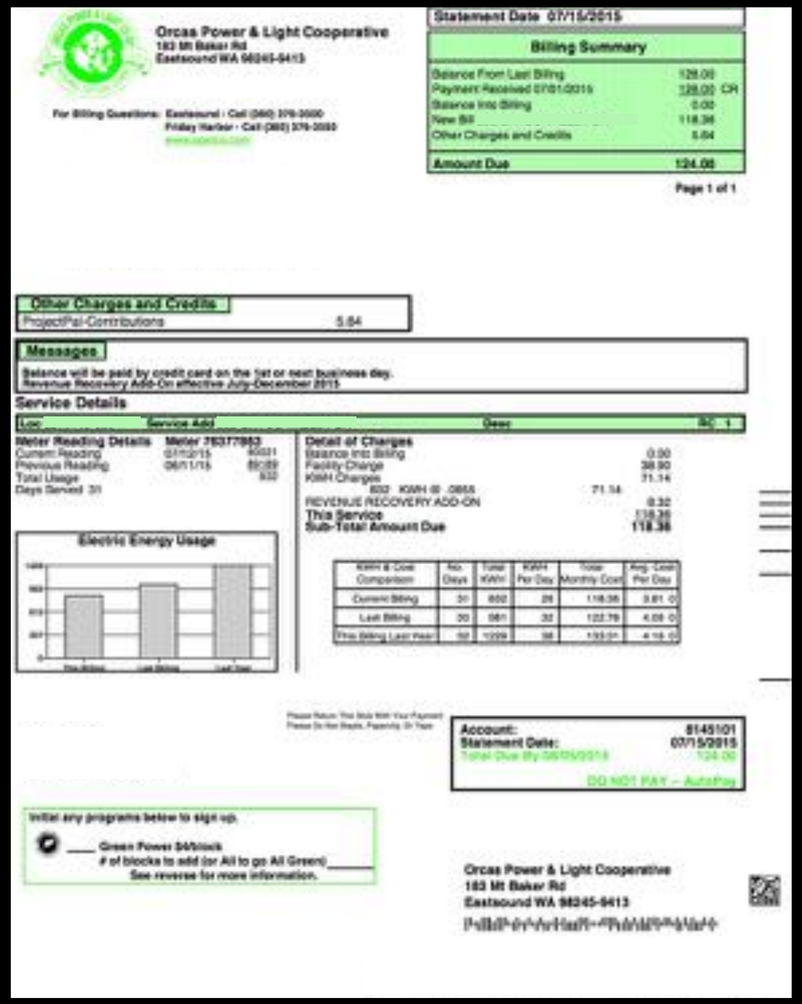
Program sets back temperatures during home dweller absences to save energy

Manage thermostat remotely, learns lifestyle to maximize energy efficiency

By the end of this year, nearly half of all thermostats sold will be internet connected smart thermostats

Grid Evolution: Home

Past → Present → Future



Orcas Power & Light Cooperative
183 Mt Baker Rd
Eastsound WA 98245-9413

Statement Date 07/15/2015

Billing Summary

Balance From Last Billing	128.00
Payment Received 07/01/2015	128.00 CR
Balance Into Billing	0.00
New Bill	118.36
Other Charges and Credits	5.64
Amount Due	**124.00**

Page 1 of 1

For Billing Questions: Eastsound - Call (360) 376-3500
Friday Harbor - Call (360) 376-3500

Other Charges and Credits
ProjectPal-Contributions 5.64

Messages
Balance will be paid by credit card on the 1st or next business day.
Revenue Recovery Add-On effective July-December 2015

Service Details

Loc | Service Add | Desc | RC 1

Meter Reading Details — Meter 76377853
Current Reading 07/15/15 80031
Previous Reading 06/11/15 79199
Total Usage 832
Days Served 31

Detail of Charges
Balance Into Billing 0.00
Facility Charge 39.90
KWH Charges 71.14
832 KWH @ .0855 71.14
REVENUE RECOVERY ADD-ON 0.32
This Service 118.36
Sub-Total Amount Due 118.36

Electric Energy Usage

kWH & Cost Comparison	No. Days	Total KWH	KWH Per Day	Total Monthly Cost	Avg. Cost Per Day
Current Billing	31	832	26	118.36	3.81 C
Last Billing	30	961	32	122.79	4.09 C
This Billing Last Year	32	1209	38	133.01	4.16 C

Account: 8145101
Statement Date: 07/15/2015
Total Due By 08/05/2015 124.00
DO NOT PAY – AutoPay

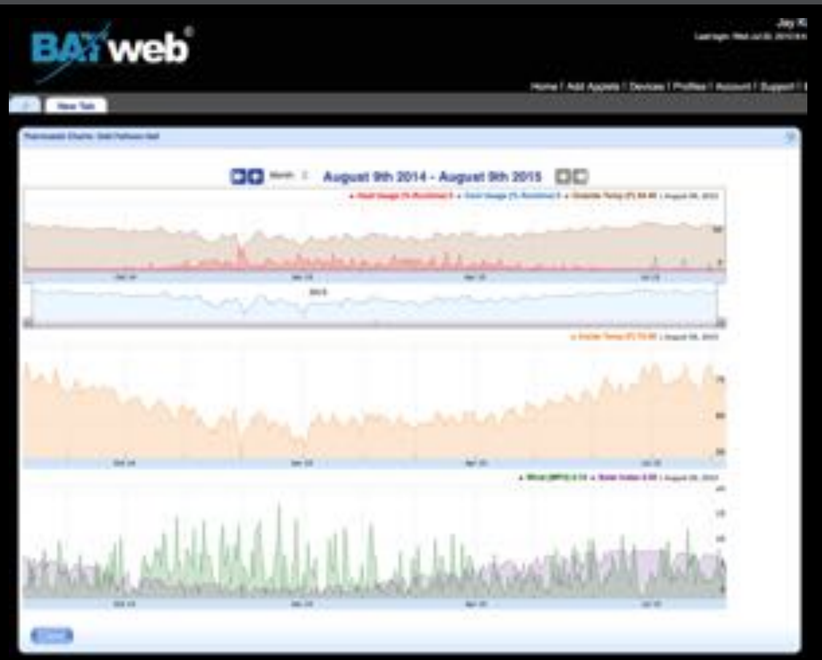
Initial any programs below to sign up.
___ Green Power $4/block
# of blocks to add (or All to go All Green)_____
See reverse for more information.

Orcas Power & Light Cooperative
183 Mt Baker Rd
Eastsound WA 98245-9413

Paper Bill

SmartHub

Explore usage and learn ways to reduce energy use



Smart Energy Management

- Explore usage down to the appliance level
- Optimize solar and wind generation
- Minimize energy cost and maximize energy sales during peak demand periods

Grid Evolution: Home

Past → Present → Future

Fossil Fuel

Electric Vehicle

Electric is a fraction of gasoline cost, per mile.

Vehicle-to-Grid (V2G)

Sell electricity back to the grid at premium prices during periods of peak demand.

Grid Evolution: Local Renewables

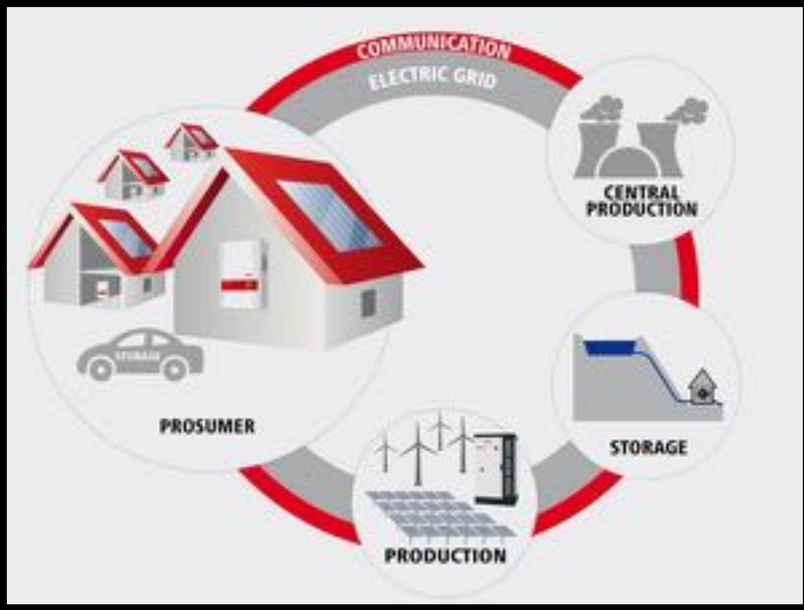
Past → Present → Future

Off Grid

Expensive

Net Metered

Subsidized by
federal, state,
and OPALCO members

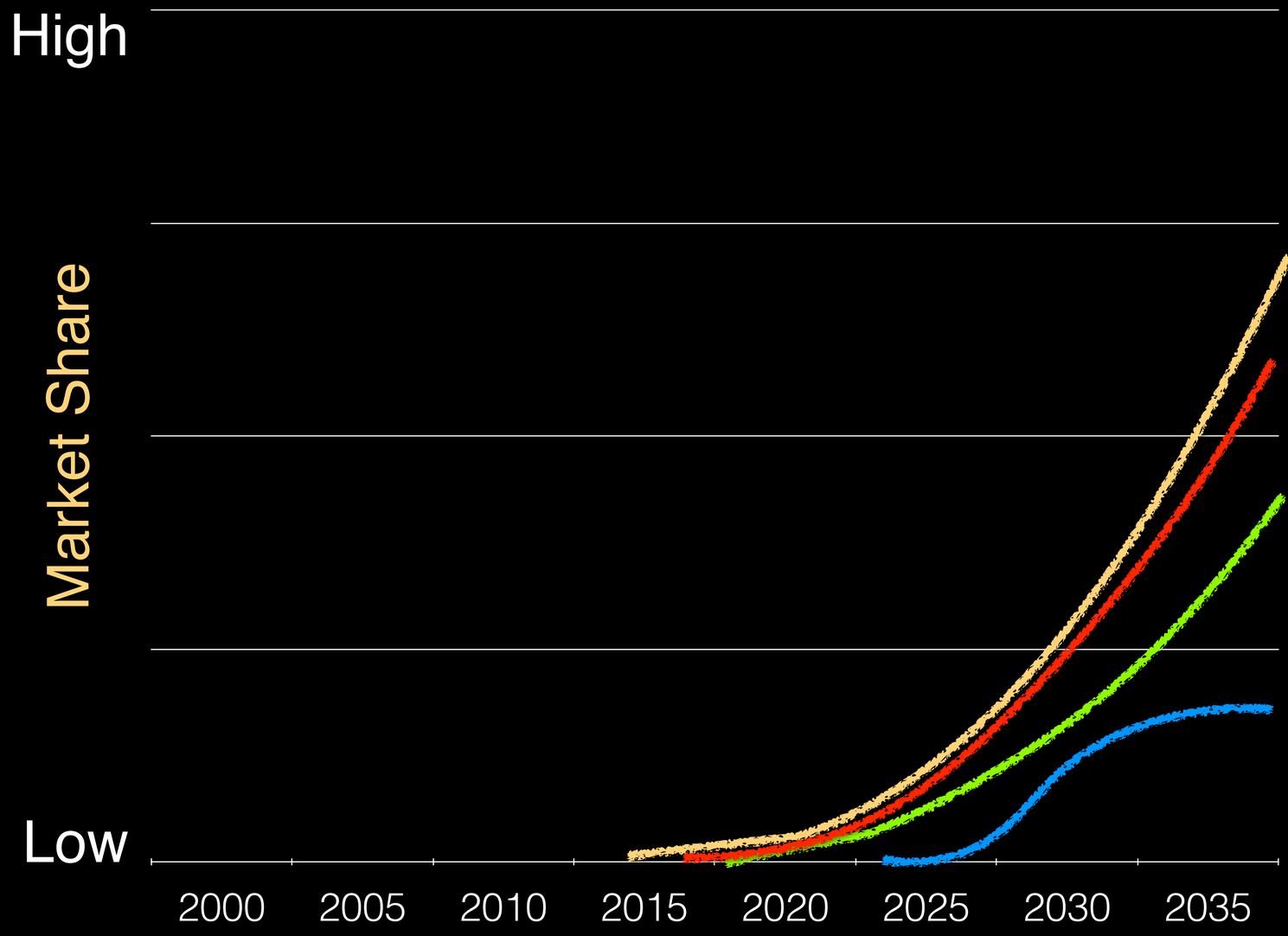


Two-Way Interactive Pricing

Buy low, sell high

Grid parity in coming decades according to RMI. Added diversity of wind, tidal, and other sources to balance solar winter peak load low sun problem.

Smart Grid: Representational SJC Trends



Market Drivers

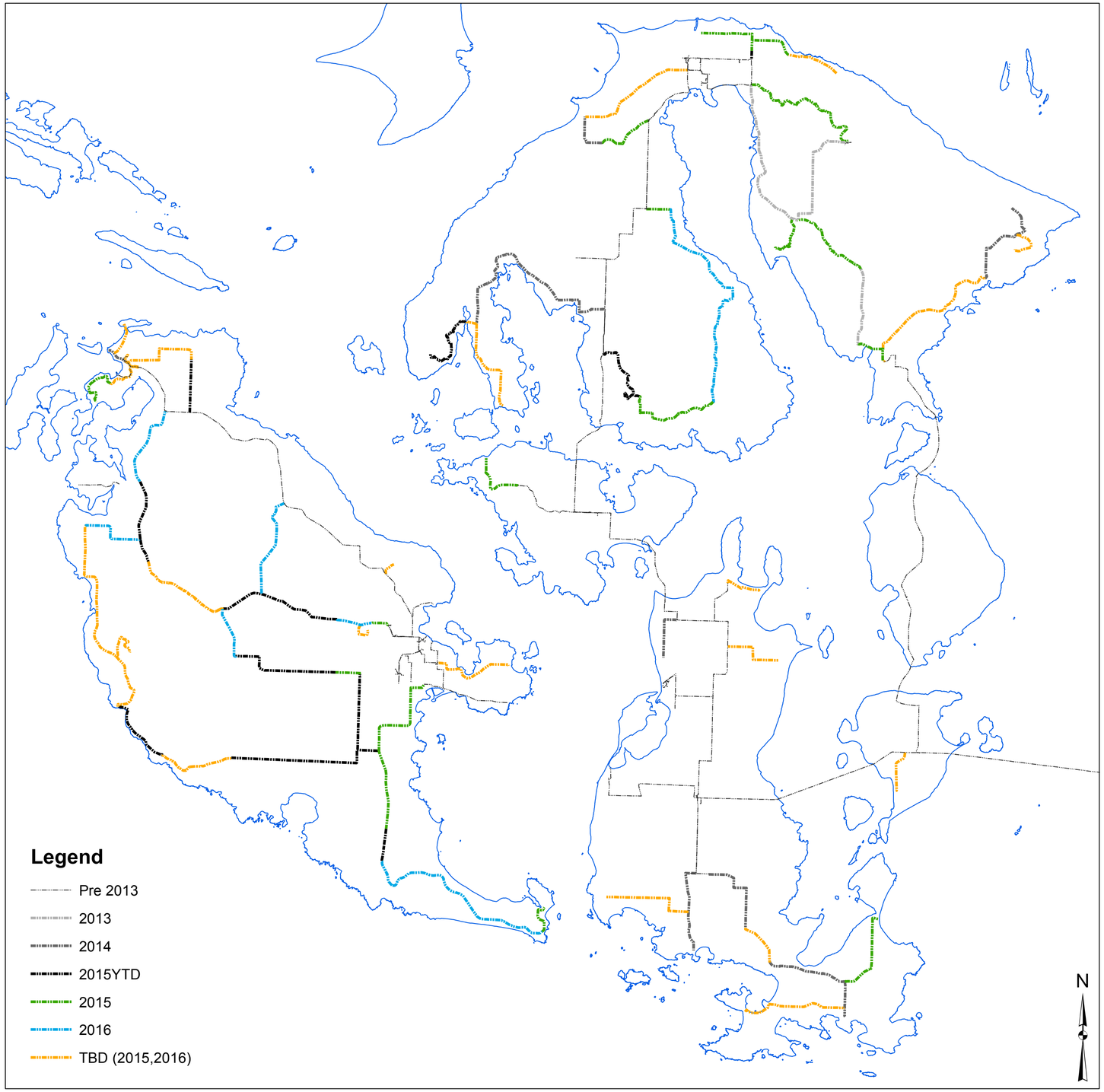
- Internet and grid of things trends
- Interconnected sources and loads
- Increasing intermittent energy sources
- Increasing peak demand costs

Synergy

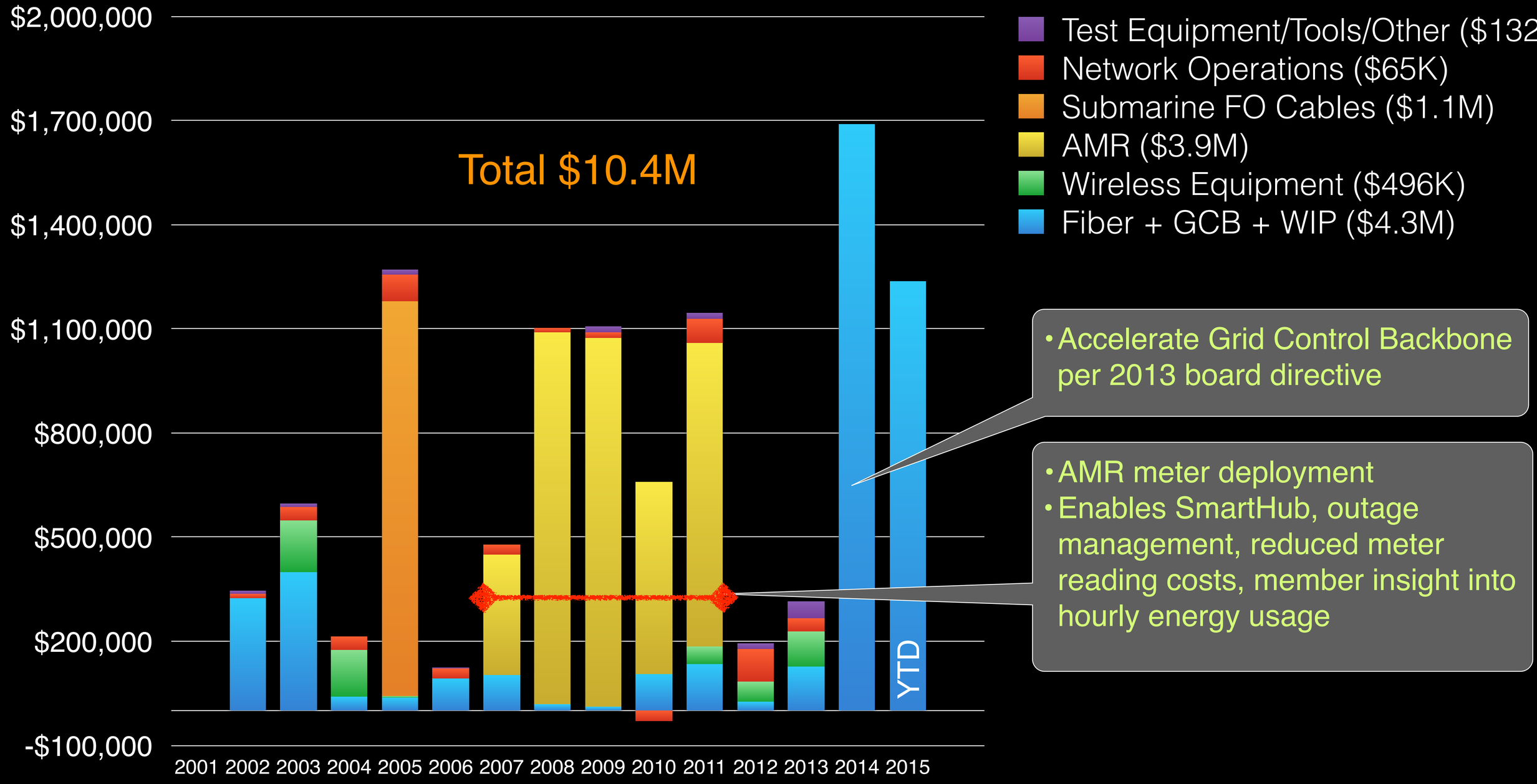
As the grid becomes more distributed, maintaining reliability, resilience and affordability will be challenging.

OPALCO's grid control backbone integrates member Distributed Energy Resources, creating a whole that is greater than the simple sum of its parts.

Grid Control Roadmap



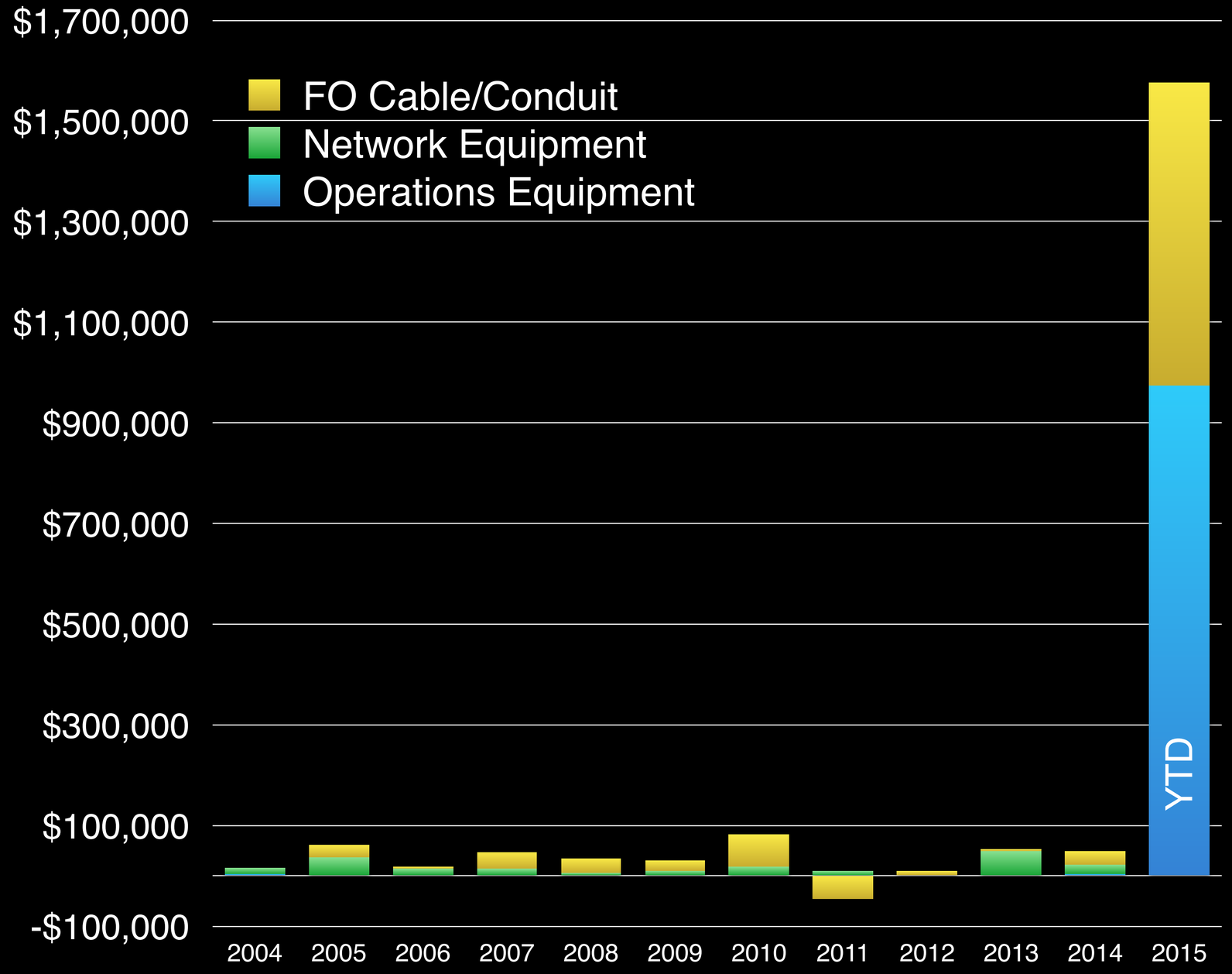
Grid Control Backbone Asset Additions



- Accelerate Grid Control Backbone per 2013 board directive

- AMR meter deployment
- Enables SmartHub, outage management, reduced meter reading costs, member insight into hourly energy usage

Rock Island Asset Additions

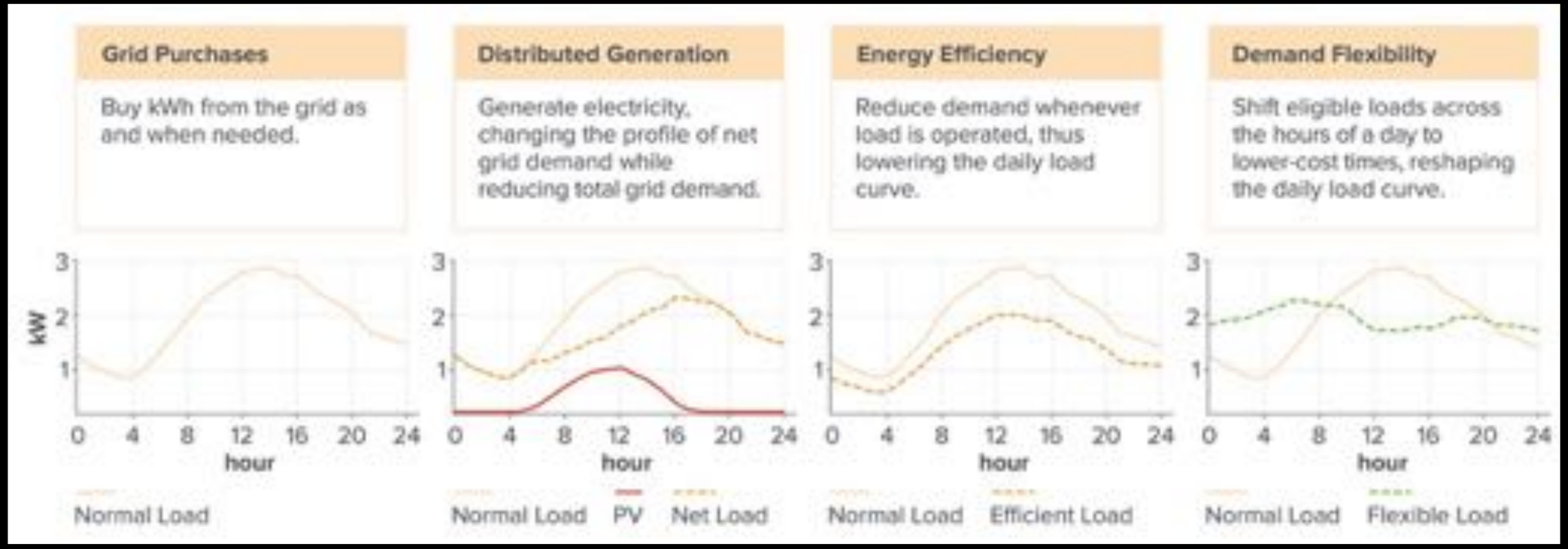


Appendix

Demand flexibility offers substantial net bill savings of 10–40% annually for **members**

"Customers have an increasing range of choices to meet their demand for electrical services beyond simply purchasing kilowatt-hours from the grid at the moment of consumption. Now they can also choose to generate their own electricity through distributed generation, use less electricity more productively(more-efficient end-use or negawatts), or shift the timing of consumption through demand flexibility."

Rocky Mountain Institute



Managing increasingly distributed diverse and intermittent energy sources for increased reliability