FIREFLY: ENERGY EFFICIENCY BENEFITS FOR UK POWER NETWORKS

INTERNATIONAL EE PROGRAMME SCAN

19 NOVEMBER 2019

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COMPARATORS

Four case studies were chosen to understand and learn from international best practices for energy efficiency (EE) programmes where the distribution network operator (DNO) played a leading role.

DNO/Utility	Con Edison	Puget Sound Energy	SIG	PG&E
EE Programme	**BQDM**	**Bainbridge Island**	**éco21**	**OCEI**
Location	New York, NY, USA	Bainbridge, Washington, USA	Geneva, Switzerland	Oakland, California, USA
EE Measures	EE incentives and rebates, LED lighting, EE assessments	Appliance incentives & rebates	EE incentives (Res, C&I, and Gov), EE services / solutions, low income lighting	EE data, rebates, incentives
Regulatory Model	Investor owned, vertically integrated	Investor owned, vertically integrated	Publicly owned, distribution provider	Investor owned, vertically integrated
Network Impact Objective	Defer grid investment	Reliability, defer grid investment	Reduce energy consumption & CO_2 emissions	Retiring aging power plant, defer grid investment
Procurement Model	RFP, auction	Internal programmes, RFP	éco21 Partners programme	Competitive solicitation

EE & NWA: GLOBAL MARKET OVERVIEW

Navigant Research estimates that almost $75 million was spent on non-wires alternatives (NWAs) globally in 2018. By 2026, a global total of $580 million in annual spending is anticipated.

Chart 1.1 NWA Spending by Region, World Markets: 2017-2026

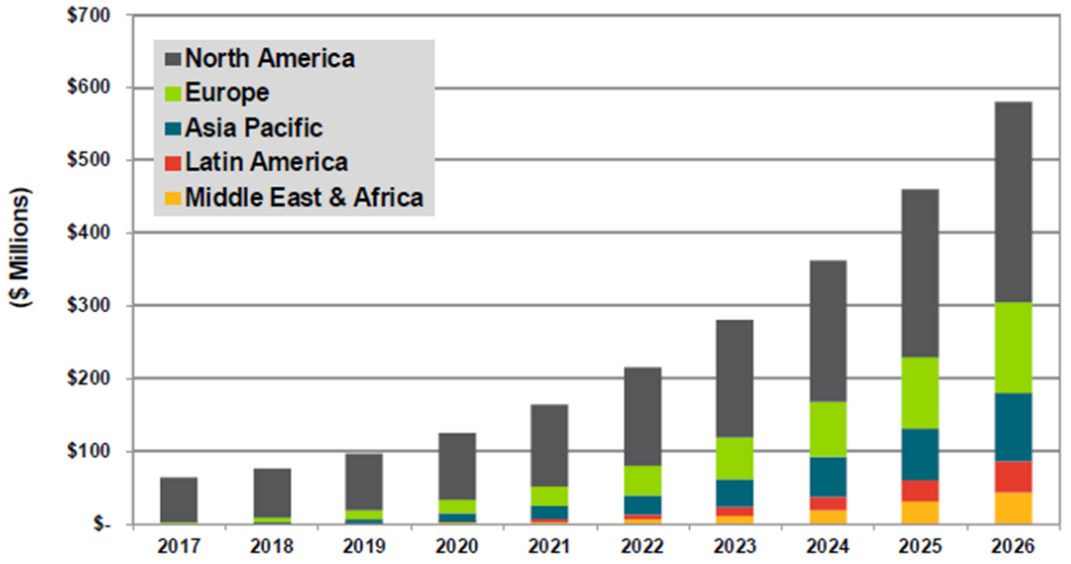
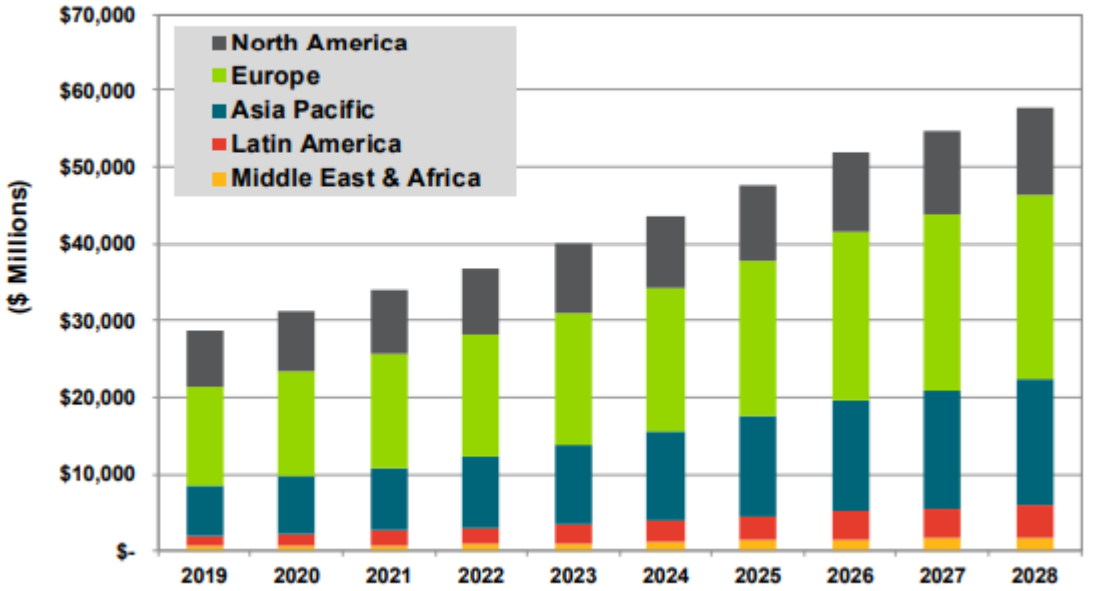


Chart 4-1. Energy Efficiency Spending by Region, World Markets: 2019-2028



(Source: Navigant Research)

While flexibility procurement by DNOs will likely take other forms in Europe due to fundamental differences in market setup and regulation, overarching lessons can be drawn from NWA implementation in the US.

Source: Navigant Research, https://energypost.eu/non-wires-alternatives-for-grid-expansion-what-the-u-s-can-teach-europe/

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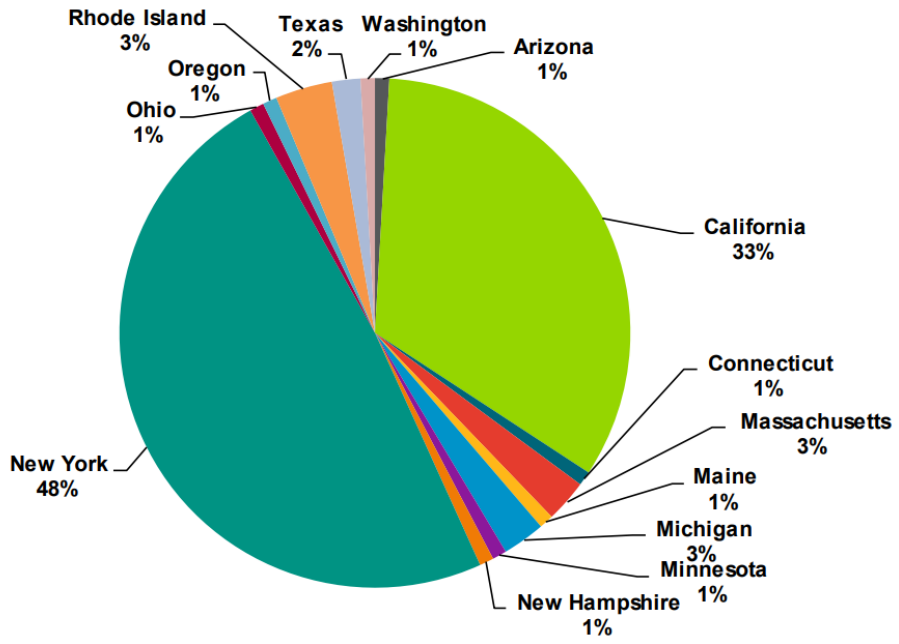
EE & NWA: US MARKET OVERVIEW

The US market for targeted energy efficiency and other non-wires alternatives is more mature than other regions, with New York and California leading the way in NWA and EE.

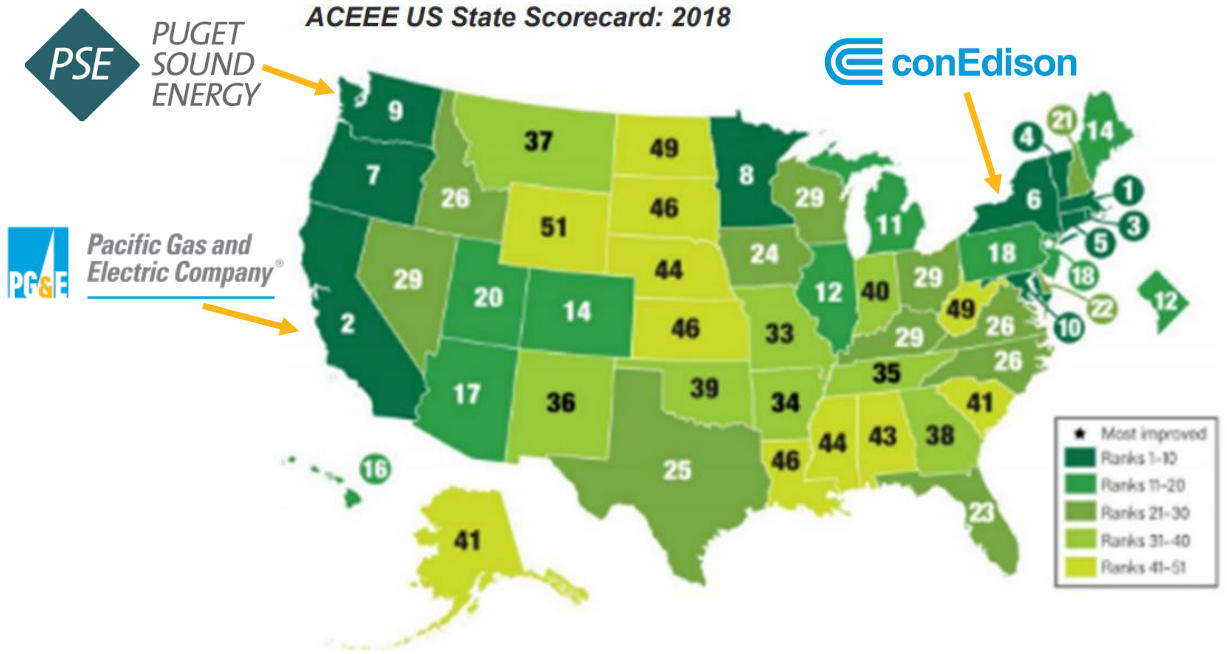
Share of NWA Projects by State, US: 3Q 2019



(Source: Navigant Research)

Navigant Research identifies over 100 NWA projects in the US, the majority of which are in the planning / RFP phase.

ACEEE US State Scorecard: 2018



(Source: American Council for an Energy-Efficient Economy)

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TARGETED ENERGY EFFICIENCY PROGRAMME: INSIGHTS

Energy efficiency programmes are best paired with other strategies (demand response, storage, etc.) to form a cost-effective portfolio that satisfies distribution planning needs.

- EE is a popular NWA where there are existing mature programmes
- It is critical to assess EE potential in the area of interest
- EE increases in cost as you implement more programmes (diminishing returns)
- It is critical to consider regulatory and policy issues of customer satisfaction and/or cross-subsidisation if you want to offer an enhanced incentive to a particular geographic subset
  - For example, there can be equity concerns if financial incentives are offered to particular customer and not others

TARGETED ENERGY EFFICIENCY PROGRAMME: DRIVERS

- **Policy:** Regulations and policies can provide incentives to utilities to implement NWAs (Targeted EE Programmes).
  - In the United States, New York, California, Michigan, and Massachusetts promote the exploration of NWAs to reduce overall costs to the customer and, in some cases, support a more sustainable system.

- **Economics:** T&D upgrades are traditionally made on a least-cost basis.
  - Most significant locational economic benefit of a NWA is typically the deferral benefit of a large capital investment.
  - System-wide benefit streams can also be realised depending on the resource type (e.g., avoided generation capacity, reduced line losses, increased reliability, etc.).

- **Technology:** EE should not be considered in isolation, but as part of the DNO's suite of options.
  - Increased adoption of various DER types can allow for broad and diverse technology inclusion within NWA projects.
  - With a wide suite of options for NWAs, utilities have more flexibility to meet specific identified needs or problems on their grid.
  - More DER types provide more tools in the toolkit for grid planning and operations.

TARGETED ENERGY EFFICIENCY PROGRAMME: BARRIERS

- **Lack of regulatory incentives:** By using NWAs to address grid needs, utilities may have little to gain, but much at risk.
  - In contrast with utilities' traditional investment models and regulated returns.

- **Business case:** Cost-benefit for a NWA is more complex than a traditional poles and wires solution.
  - Factors like programme marketing and customer adoption of technologies can make it challenging to determine whether a NWA is cost-effective.

- **Customer engagement:** For NWAs to be most successful, customer loads and resources must be incorporated into the solution through programmes or offers.

- **Cross-subsidisation:** If utilities are offering enhanced incentives to a subset of customers, they generally need to demonstrate that the system reinforcement savings are benefitting all customers (through lower revenue requirements/rates).

TARGETED ENERGY EFFICIENCY PROGRAMME: PROCUREMENT MODELS

- **No standard approach:** At this early stage in NWA development, there is no single standard business model or procurement process.

- **Leading models:** Currently, there are various procurement models being used and considered.
  - Internal DNO resource deployment
  - Procurement with current programme implementation contractors
  - Open Solicitation (RFP)
    - Request for solutions and associated cost from potential suppliers to meet needs; evaluated based on pre-defined criteria
  - Auction
    - Identifies lowest market value for energy savings and customers' minimum acceptable incentive amount for each unit of energy saved

- **The Three Ps:** The NY Joint Utilities suggested **pricing**, **program**, and **procurement** (the 3Ps) as a framework to help look at how NWAs are acquired
  - There is no one right answer for all situations; each case will depend on the DNO's internal structure and capabilities and its regulatory environment.

CASE STUDY:

CON EDISON
BROOKLYN QUEENS DEMAND MANAGEMENT

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EE PROGRAMME & UTILITY/DNO OVERVIEW

Designed to defer the construction of a new substation beyond initial load relief projections, BQDM includes a variety of resources including energy efficiency, demand response, fuel cells, and others.

Brooklyn Queens Demand Management (BQDM) Project	
DNO	Con Edison
Location	Brooklyn & Queens, New York, USA
Programme Budget	$200 million (£159 million)
Programme Duration	January 2015 to June 2018 (3.5 years)
EE Measures	Incentives and rebates for EE appliances / heating, LED lighting, home / business energy assessments
Other Measures	Distributed generation, energy storage, demand response, advanced controls, fuel cells
Savings Goal / Objective	Defer $1B new substation, 52 MW peak load
Lessons Learned	Importance of local load forecasting, challenges in customer acquisition, importance of project foundation, need for diverse set of technology solutions

ENABLING TECHNOLOGY COMPOSITION

BQDM program consists of a mix of "smaller, cheaper, nontraditional and ideally more environmentally friendly solutions" and includes load reduction to be sourced via competitive auction.

Free Lighting Upgrades

- Free LED lightbulbs and installation for residential customers
- Free in-unit LEDs for multifamily housing
- Free lighting upgrades for commercial customers
- *Target customers*: residential, multifamily, commercial

Smart Thermostat Rebates

- Smart thermostat rebate up to $210 for residential customers
- Smart thermostat rebate up to $160 for commercial customers
- *Target customers*: residential

Refer a Neighbor Incentive

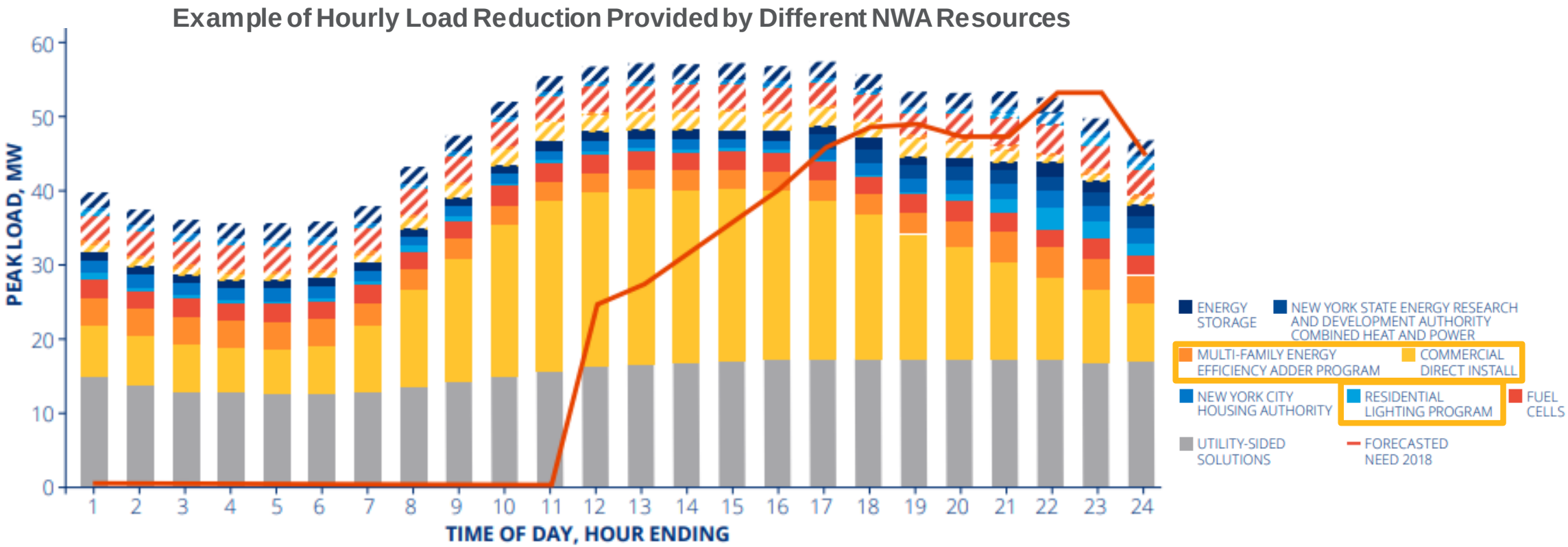
- Refer a neighbor incentive
- Goal is to reach as many customers in the targeted area
- *Target customers:* residential

Free Energy Assessments & Upgrade Installation

- Free energy assessments for commercial customers
- Free install of approved upgrades and resources for qualified participating contractor process for multifamily housing
- Pre and post installation incentives for C&I
- *Target customers:* multifamily, commercial, industrial

ENABLING TECHNOLOGY COMPOSITION

BQDM program consists of a mix of "smaller, cheaper, nontraditional and ideally more environmentally friendly solutions" and includes load reduction to be sourced via competitive auction.



Sources: Con Edison

ENABLING TECHNOLOGY COMPOSITION

Technology by resource type:

	Sector	kW Savings	kWh Savings*	Cost (USD)	Participants	Timeline	% Peak Area Reduction	Cost per kW Reduction (USD)
Commercial Direct Install Program	EE - C&I	12,500	155,000,000	$82,730,000	7,600	2018-present	1.55	$1,882
Multi Family Energy Incentive Program	EE- R	5,600	40,000,000		11,400	2015-present	0.69	
Residential Energy Efficiency	EE- R	4,400	-		29,500	2015-present	0.54	
Wi-Fi Thermostat Program	DR	285	-		662	2015-present	0.03	
NYCHA Lighting Program	EE- R	2,230	-		23	2017-present	0.28	
Low Income EE Program	EE- R	56	-		150	2017-present	0.01	
Direct Customer Activities	EE - C&I	540	-		19	2015-present	0.07	
Phase Change Material	EE - C&I	0	0		7	2015-present	0	
Dynamic Resource Auction	DR	2,630	-		4	2015-present	0.33	

*Some kWh savings reported as part of energy efficiency filings and not with BQDM filings

Source: Con Edison

ENABLING TECHNOLOGY COMPOSITION

Cost per kW and Percent Peak Load Reduction by Program Resource

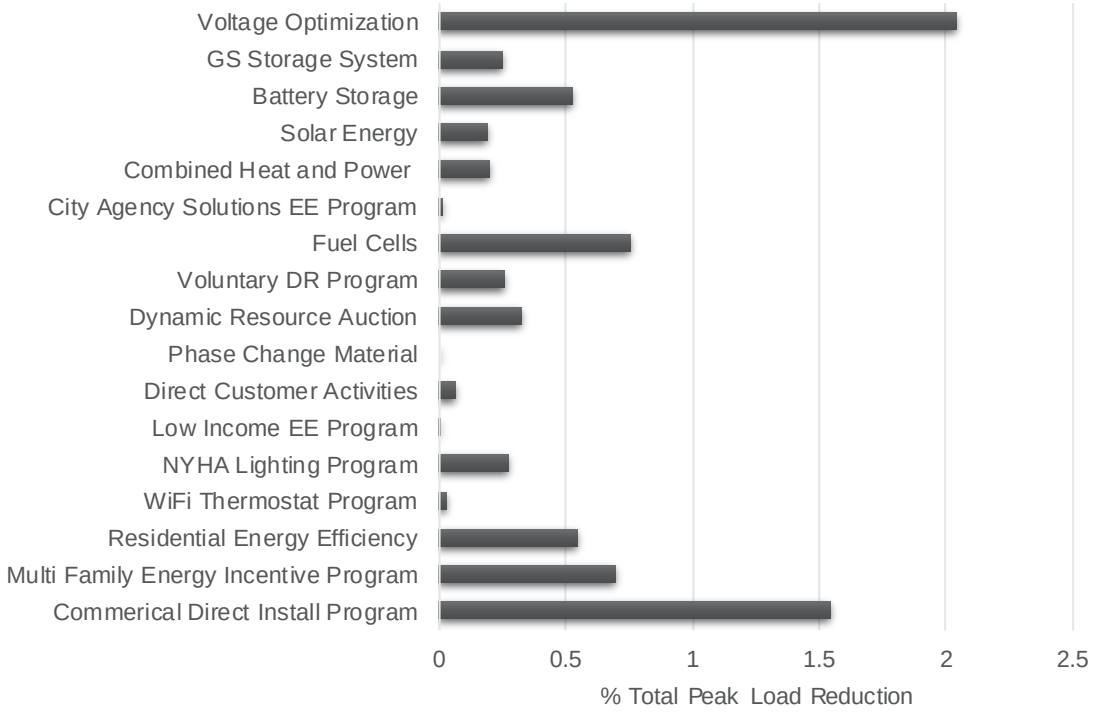
	Sector	kW Savings	kWh Savings	Cost (USD)	Participants	Timeline	% Peak Area Reduction	Cost per kW Reduction (USD)
Voluntary DR Program	DR	2,090	-		-	2015-present	0.26	
Fuel Cells	Fuel Cells	6,100	-		6	2015-present	0.75	
City Agency Solutions EE Program	EE - C&I	89	-		-	2015-present	0.01	
Combined Heat and Power	DER	1,590	-		13	2015-present	0.20	
Solar Energy	Solar Energy	1,550	-		2	2015-present	0.19	
Battery Storage	Battery	4,300	-		2	2015-present	0.53	
Customer Side Total		43,960	195,900,000	$82,730,000	49,335	2015-present	5.44	$1,882
GS Storage System	GS	2,000	-	$13,340,000	-	2015-present	0.25	$6,670
Voltage Optimization	Voltage Optimization	16,500	-	$4,980,000	-	2015-present	2.04	$302
Overall Total		62,460	195,900,000	$101,050,000	49,365	2015-present	7.73	$1,618

Source: Con Edison

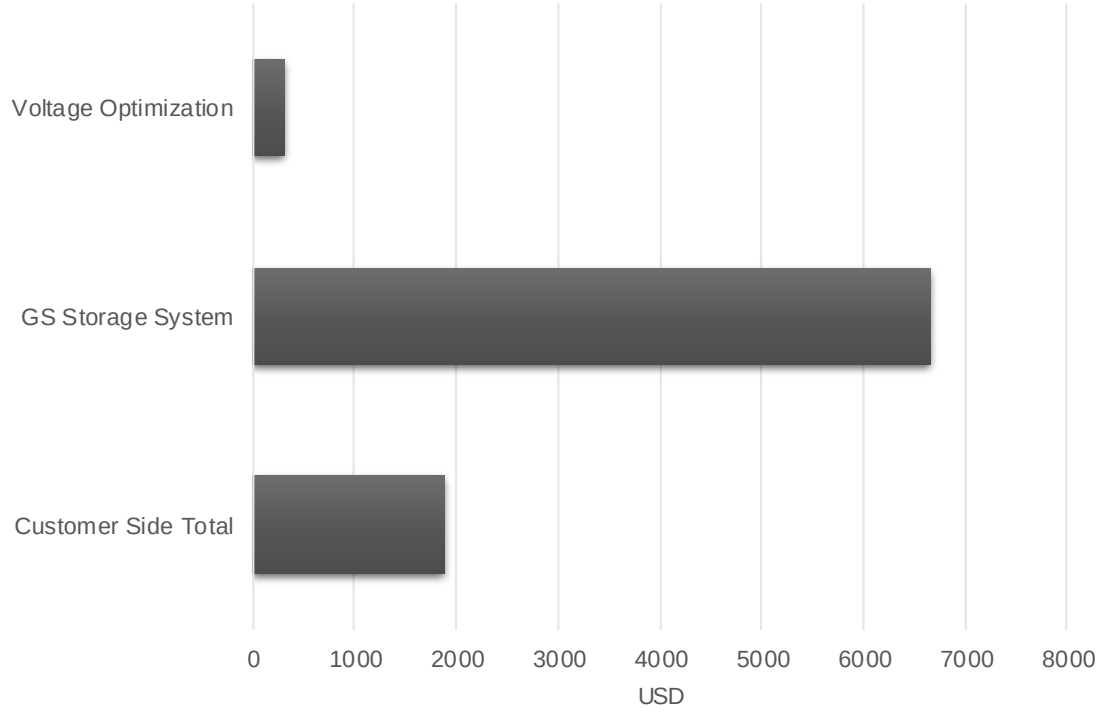
ENABLING TECHNOLOGY COMPOSITION

Technology by resource type (continued):

Percent Peak Load Reduction in Peak Load in New York BQDM Program



Cost per kW Load Reduction in New BQDM Program



Source: Con Edison

UNDERLYING REGULATORY POLICIES

"This is the first time that the Commission is requiring a utility to actively and vigorously work to address growth in system demand in a manner other than through traditional utility investment."

- On December 12, 2014, the Commission approved Con Edison's BQDM Plan
- Con Edison planned to use a $200 million incentive program to defer nearly $1 billion in capital upgrades to build a new substation
- Utility expenditures treated as 10-year capital assets with regulated return, includes performance incentives
- "…Commission is making a significant step forward toward a regulatory paradigm where utilities incorporate alternatives to traditional infrastructure investment when considering how to meet their planning and reliability needs."

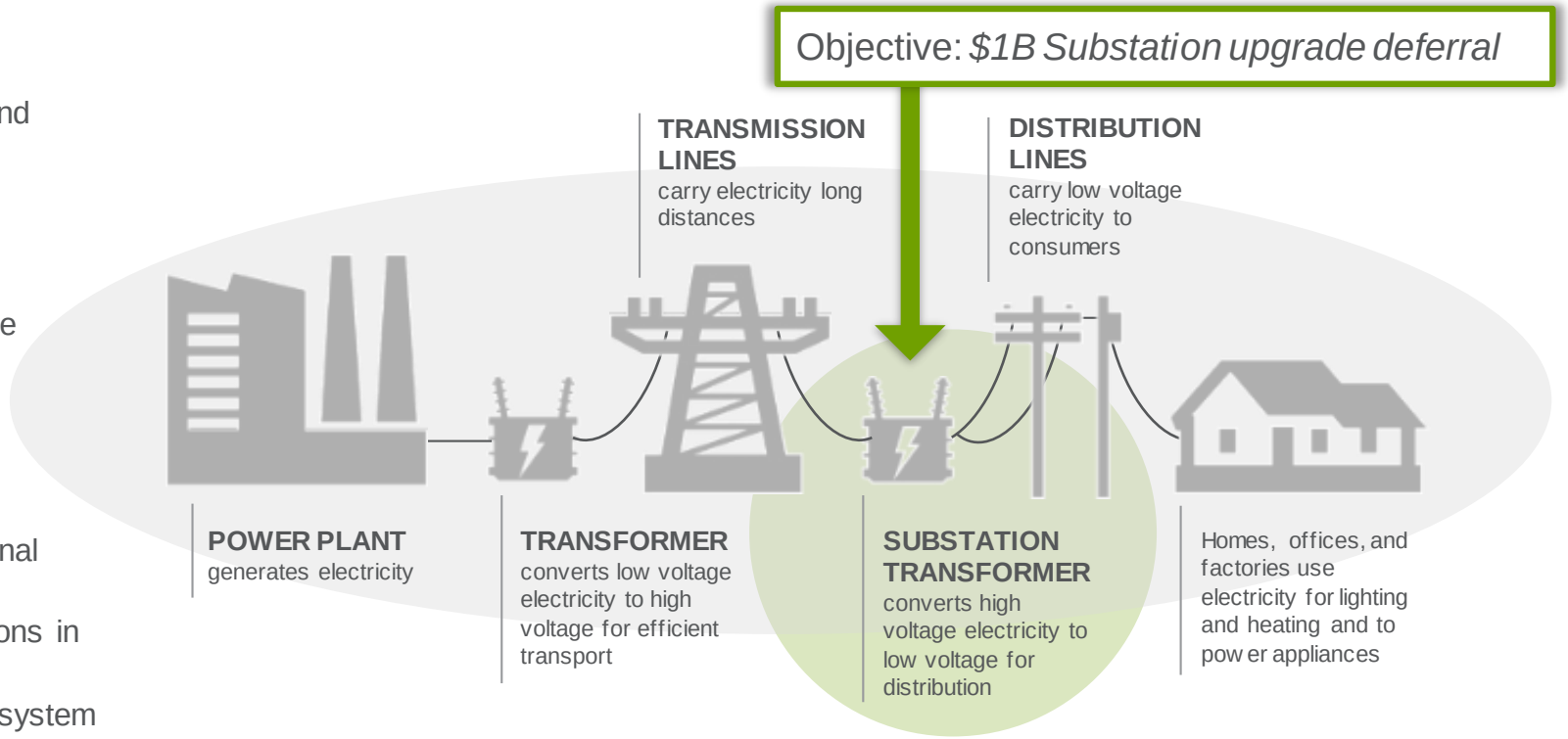
Regulating Entity	• New York State Public Service Commission • Federal Energy Regulatory Commission (FERC)
Relevant Policies/ Regulations	• E.g., benefits sharing between customers and utility, integrated resource planning, "energy efficiency first" approach
Successes	• Con Ed created an NWA process to screen solutions and compare them to traditional strategies • The market can provide successful NWA solutions • Creating a portfolio of NWA solutions that are CBA-positive and manage risk • Treatment of NWA as a regulatory asset
Lessons Learned	• Utilities can adapt to DER trends and incorporate them into integrated resource planning and operations without disrupting current model (safe, reliable, affordable power) • The structural shift in terms of customer choice, physical flows/operations and financial flows/incentives are reasons to revisit regulatory mechanisms • Emphasis should be on how the structure of ratemaking is aligned to the composition of costs and revenues

Source: CASE 14-E-0302 - Petition of Consolidated Edison Company of New York, Inc. for Approval of Brooklyn Queens Demand Management Program. ORDER ESTABLISHING BROOKLYN / QUEENS DEMAND MANAGEMENT PROGRAM (Issued and Effective December 12, 2014)

NETWORK IMPACT OBJECTIVES & ECONOMICS

BQDM's target was to defer a $1B multi-component distribution upgrade in an approximately 800 MW load area. Aggregate target load reduction is 52 MW of customer and utility-side solutions.

- Con Ed successfully deferred the large traditional solution.
- Con Ed successfully leveraged existing EE programs, supplementing rebates to make zero cost to customer.
- Financials
  - Traditional consumption patterns are changing
  - Customer-load driven revenue is eroding, nationally and globally
  - C&I DER will impact utilities first
  - Volume-based rate models under pressure as DER penetration increases
  - Pricing must become dynamic, accounting for resource TOU and geography
- Operations
  - Two-way power flow leads to a much more complex operating environment
  - Grid-edge visibility and control must enhance operational awareness
  - Dynamic adaptability, adjusting in real time to fluctuations in load and supply
  - Optimizing dynamic resources to serve load, balance system



PROCUREMENT MODELS

Con Ed used the energy auction model, supplemental to RFP procurement. Objectives of the auction were to meet a certain set of criteria or fill gaps in current portfolios.

- RFP used for energy efficiency measures
  - Typical RFP to find various implementation contractors, ConEd does this often for other business-as-usual projects requiring RFPs
- Demand Response (DR) was sourced through a competitive market acquisition process, i.e. auction, that would enable Con Edison to meet its BQDM program objectives.
- Con Ed was able to use the auction to acquire DER to achieve specific load shape objectives.
  - In its petition for BQDM, Con Edison acknowledged that per-MW unit costs are generally higher than previous network-oriented programs due to the complicated nature of the network conditions and the demographics of the area.
  - Con Edison notes that the network peak is significantly longer than the peak durations of other targeted programs.
  - Auction mechanism was therefore a tool to create a market event, drive participation and for price discovery.

Procurement Model Type	• Request for Proposals (RFP) • Auction
Challenges	• Procuring the right combination of measures to address the peak load for varying durations • Procuring advanced solutions within a more traditional procurement model framework
Lessons Learned	• Keep technology open. Using a technology agnostic approach was a success factor as judged by the strong participation of energy storage system providers. • Open, market facing, incentive-oriented frameworks can support innovation and modernization as well as operations investments • Utilities need to devote significant resources to foundational elements like RFI/RFP, resource evaluation tools, marketing and outreach, measurement and verification

CASE STUDY:

PUGET SOUND ENERGY
BAINBRIDGE ISLAND

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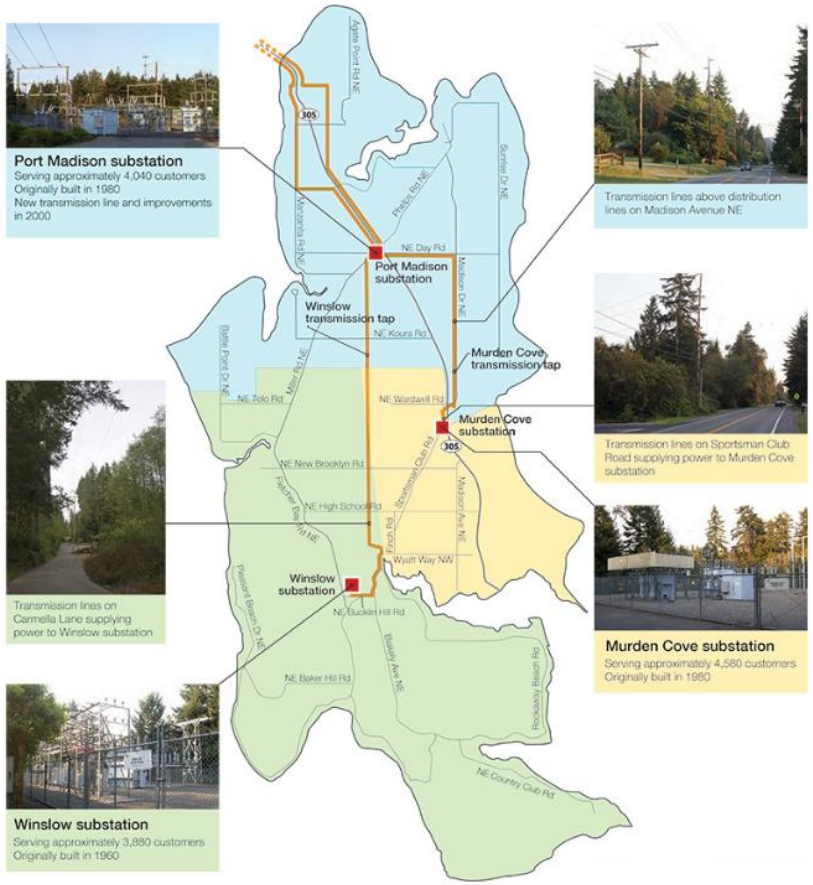
EE PROGRAMME & UTILITY/DNO OVERVIEW

PSE supports energy efficiency programmes on the island of Bainbridge to reduce demand on the system and defer traditional grid investments.



Bainbridge Island Non-Wires Alternative	
DNO	Puget Sound Energy (PSE)
Location	Bainbridge, Washington, USA
Programme Budget	$3.3 million (£2.6 million)
Programme Duration	2010 to 2015 (5 years)
EE Measures	Rebates and incentives on various EE appliances and products, home and business energy retrofit resource
Other Measures	Demand response, distributed generation (solar and combustion), energy storage systems
Savings Goal / Objective	Address capacity, reliability, and aging infrastructure needs
Lessons Learned	Hybrid solution must be used to meet capacity needs, more time intensive than planned, being agile is key

ENABLING TECHNOLOGY COMPOSITION

Bainbridge Island implements utility-run efficiency measures, augmented by demand response and distributed generation resources to address the island's electricity needs.

EE Rebates and Incentives

- Energy efficiency measures are considered Bainbridge's largest and most diverse DER
- Rebates and incentives apply to various EE appliances and products
- Energy retrofit resources for residential and commercial were also included
- *Target customers:* residential, commercial

Distributed Generation – Solar and Combustion

- Customer-side solar installation resource adoption is growing
- Renewable and non-renewable combustion resources are a robust option for peak reduction
- Non-energy benefits such as lowering carbon emissions for renewable resources
- *Target customers:* residential, utility

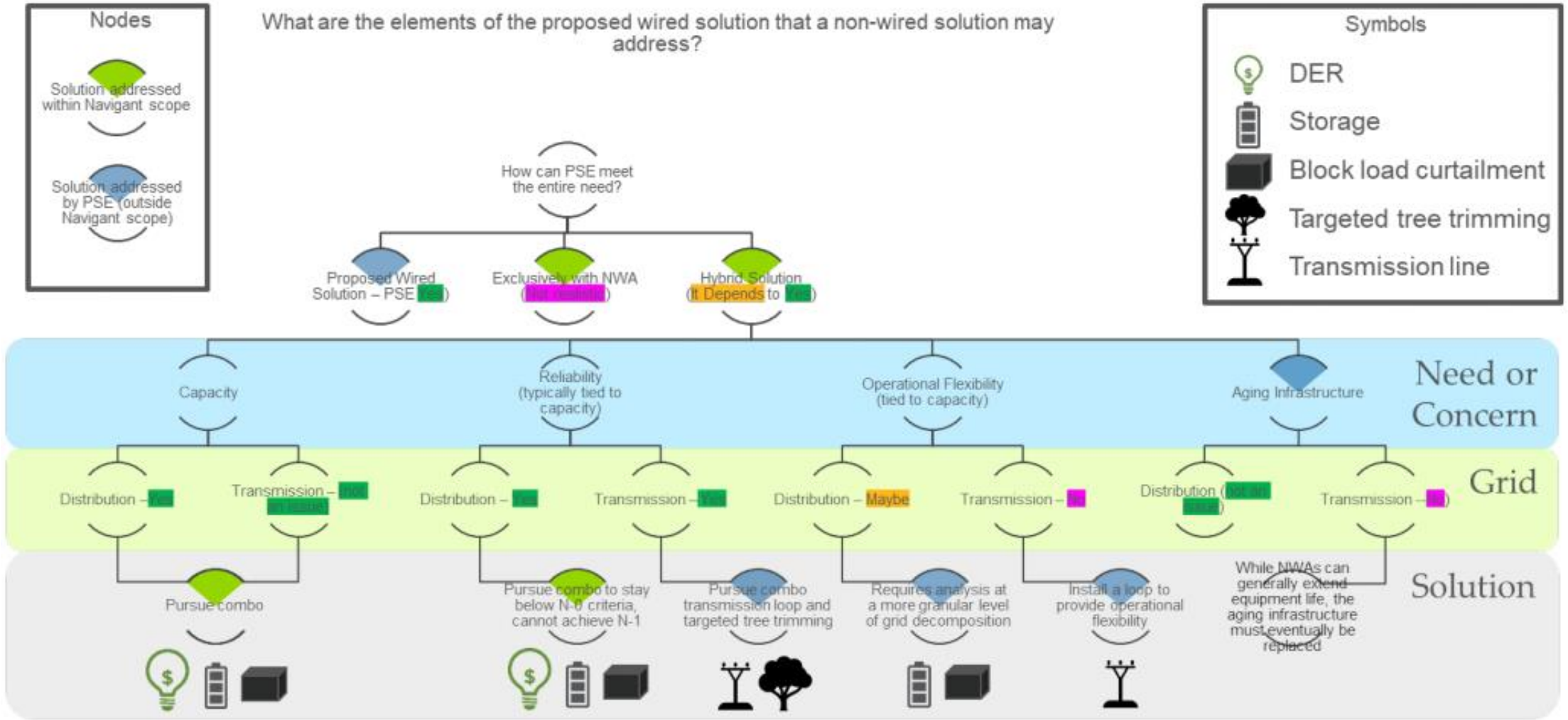
Demand Response

- Flexible, price-responsive loads which can be curtailed
- Potential for targeted peak curtailment
- Four-hour duration for DR events
- *Target customers:* residential

Battery Storage

- Grid-scale battery storage provides a highly flexible resource
- Increases bulk system generation capacity
- Benefit from hourly avoided energy costs
- *Target customers:* utility

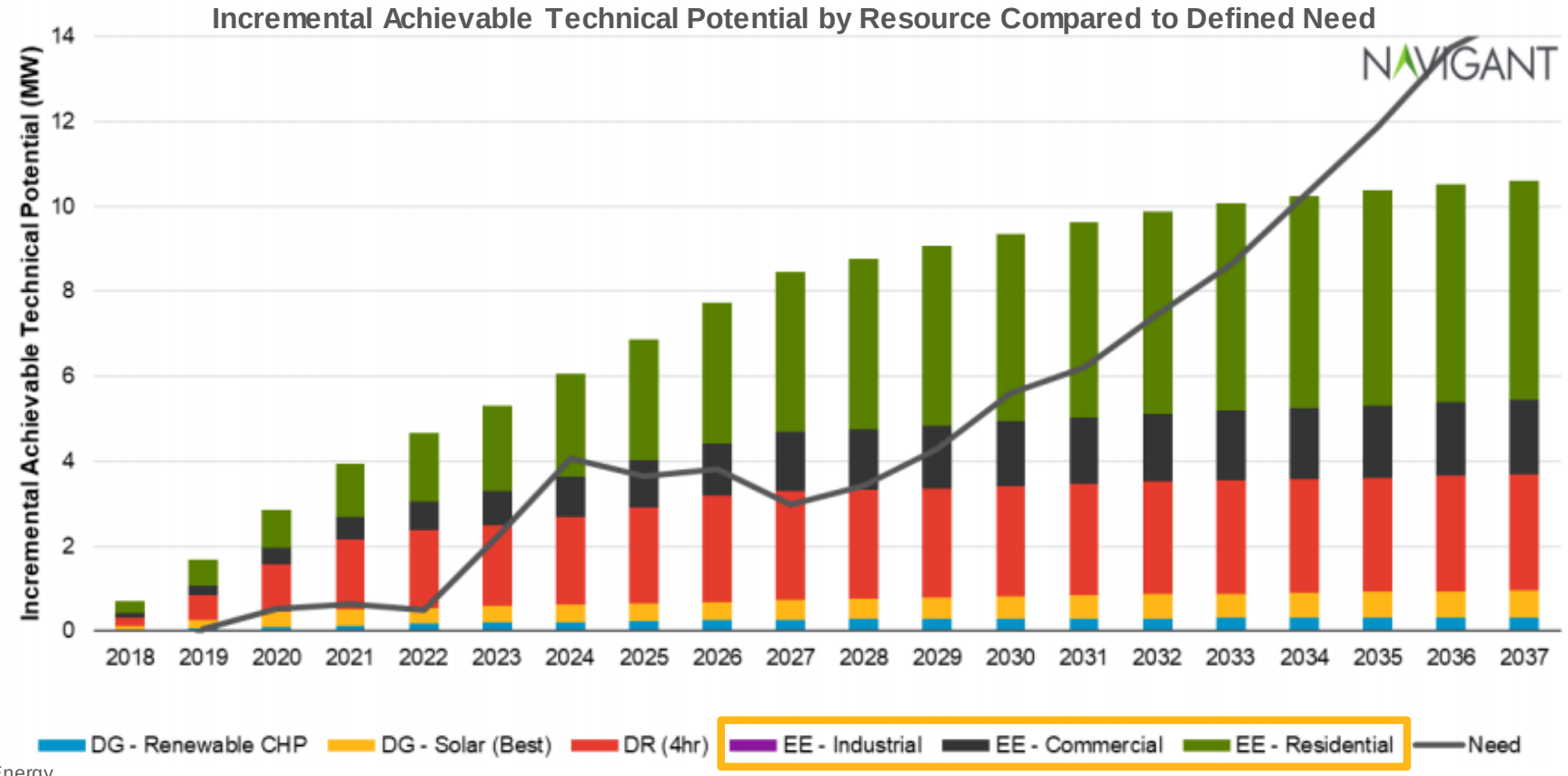
ENABLING TECHNOLOGY COMPOSITION



Source: Navigant, Puget Sound Energy

ENABLING TECHNOLOGY COMPOSITION

Pre-implementation analyses showed the largest portion of achievable incremental capacity potential comes from energy efficiency measures, and secondly from demand response.



Source: Navigant, Puget Sound Energy

UNDERLYING REGULATORY POLICIES

Regulatory requirements were one of the key drivers for updating the traditional planning process to include NWA project planning.

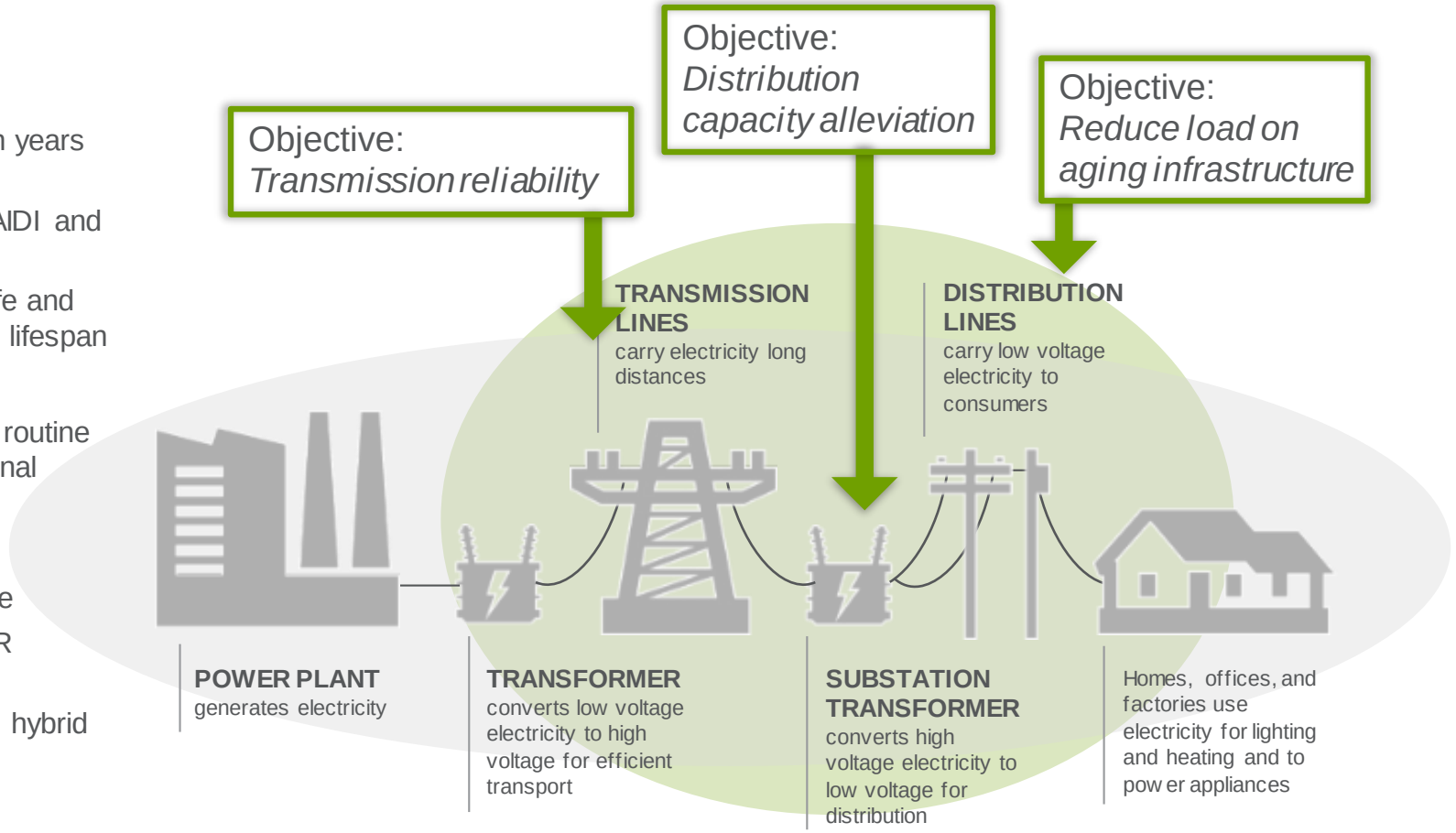
- Key process updates:
  - Involvement of project manager and team much earlier in process, including staff with expertise in our energy efficiency portfolio
  - NWAs studied in greater depth
  - New role of DER Planner
  - Involvement of consultants, EPRI
- Energy storage inclusion driven by policy statement by the Washington State Utilities and Transportation Commission in October 2017 calling for electric utilities to pursue cost-effective opportunities to incorporate energy storage into their systems (Docket UE-151069 and U-161024).

Regulating Entity	Washington Utilities and Transportation Commission (UTC)
Relevant Policies/Regulations	• Washington State Utilities Energy Storage Policy • For all traditional distribution upgrade projects in Washington, a non-wires solution must first be considered
Barriers	• Working within traditional planning process • Utility siloes make it difficult to integrate EE programmes and other DER with traditional distribution planning
Lessons Learned	• Planning is more time intensive than planned • Collaboration across utility siloes is essential

NETWORK IMPACT OBJECTIVES & ECONOMICS

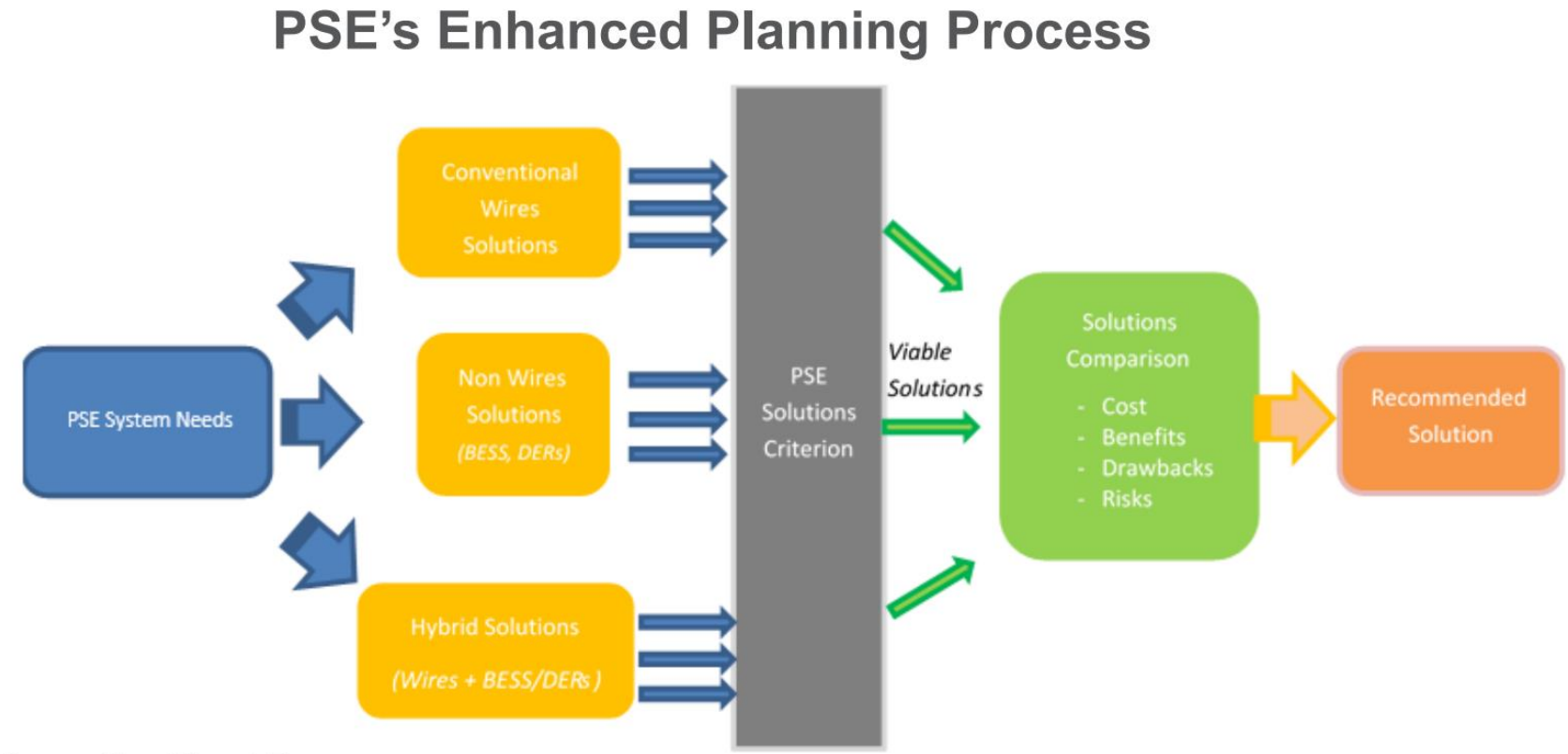
Needs and concerns on transmission and distribution system included three distribution substations and radial transmission lines.

- Needs
  - Capacity: distribution capacity shortfall over the next ten years (normal operation)
  - Reliability: transmission reliability items including the SAIDI and SAIFI metric reduction and transmission outages
  - Aging Infrastructure: equipment nearing end of useful life and reduction of loading on equipment to effectively prolong lifespan
- Concerns
  - Operational Flexibility: ability to transfer load to support routine maintenance, outage management, and planned seasonal switching
- General learnings
  - Requirements for new local level data posed a challenge
  - Incremental achievable potential can include EE and DR programs
  - Better understanding of how to apply NWA and develop hybrid solutions



NETWORK IMPACT OBJECTIVES & ECONOMICS

PSE's enhanced planning process compares all solution types (traditional and non-traditional) using the same screening criteria.



Source: Puget Sound Energy

NETWORK IMPACT OBJECTIVES & ECONOMICS

Economic analysis parameters:

Storage

Sources include: Navigant, PSE, and Quanta

BENEFITS:

- Bulk system generation capacity deferral
- Hourly avoided energy costs

COSTS:

- Capital Cost
- Fixed O&M
- Variable O&M
- Charging Energy
- Augmentation

DR, PV, EE, DG

Sources include: PSE IRP, 2017 DER Potential Study

BENEFITS:

- O&M Savings
- Hourly avoided energy costs
- Bulk system generation capacity deferral
- Non-energy benefits

COSTS:

- Incremental measure cost
- Incremental O&M costs
- Administrative costs (assumed as 20% of incremental measure costs)

Source: Navigant Analysis

PROCUREMENT MODELS

PSE leveraged existing internal EE programmes and potential studies in the NWA and then augmented EE with specific RFPs for storage projects which reduced the overall cost of the NWA.

- PSE procured all EE that was cheaper than storage. Having robust experience with EE potential studies and EM&V enabled them to be reasonably confident in the amount of EE they could procure on Bainbridge.
- Leveraging existing EE programmes allowed PSE to focus on other aspects of the planning process
- PSE was able to use their own internal expertise on EE to apply to the new use within the NWA on Bainbridge Island
- For energy storage needs to go beyond what their internal EE programmes provide, PSE plans to publish RFPs with specific durations and timings of energy storage

Procurement Model Type	• Internal procurement (already established EE programmes standard to usual business operations) • RFP for specific energy storage needs
Challenges	• Integrating traditional distribution planning with existing EE programmes and EE expertise • Tailoring existing programme to specific location on Bainbridge Island • Comparing and applying EE savings potentials to traditional distribution upgrade solutions
Lessons Learned	• Leveraging existing programmes instead of procuring externally lowers costs • Use external RFPs for remaining savings needed through energy storage at specific durations and times

CASE STUDY:

SERVICES INDUSTRIELS DE GENÈVE (SIG)
SIG-ÉCO21

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EE PROGRAM & UTILITY/DNO OVERVIEW

Since 2007, the SIG-éco21 programme has been successfully supporting Geneva residents in reducing their energy consumption and their CO2 emissions.

SIG-éco21 Programme	
DNO	Services Industriels de Genève (SIG)
Location	Geneva, Switzerland
Programme Budget	Approx. 100 million CHF (£79 million) over 12 years
Programme Duration	2007 to present (12 years)
EE Measures	• Financial incentives (residential, commercial, industrial) • Energy efficiency solutions, tools, and services • Optiwatt, Négawatt programmes • Nouvelle Lumière • éco21 Partner
Other Measures	None (EE only)
Savings Goal / Objective	200 GWh saved (as of September 2019)
Lessons Learned	M&V is very important, share best practices with other progressive utilities, lobbying for more regulations

ENABLING TECHNOLOGY COMPOSITION (1/2)

The SIG-éco21 energy efficiency programme offers tailor-made action plans for each client segment: individuals, local governments, companies and the real estate sector.

Residential Financial Assistance

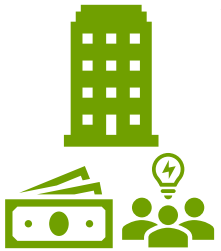
- Tax rebates and other financial aid to residents for installing renewable / energy efficiency heating or water heaters
- *Target customers:* residential

Energy efficiency solutions and services for commercial business managers and owners

- Solutions adapt to customers' energy approach and integrate sustainable, innovative and turnkey solutions with a commitment to performance.
- SIG Customer Manager helps in four steps: 1. Diagnosis, 2. Action Plan, 3. Implementation, and 4. Monitoring
- *Target customers:* commercial

Optiwatt

- Provides tailored financial support and the services of a Delegated Power Manager (EDM). This energy professional, specialist in customers' sector of activity, allows the customer to implement the most appropriate actions.
- For companies with an electrical energy consumption of less than 1GWh/year
- *Target customers:* commercial, industrial



Ambition Négawatt

- Financial incentives, training, and energy efficiency tools to allow companies to develop and implement coherent energy policy.
- For companies consuming more than 1 GWh of electricity and/or 4 GWh of heat per year
- *Target customers:* commercial, industrial

ENABLING TECHNOLOGY COMPOSITION (2/2)

The SIG-éco21 energy efficiency programme offers tailor-made action plans for each client segment: individuals, local governments, companies and the real estate sector.

Nouvelle Lumière

- Energy-saving equipment replacement and energy savings awareness campaigns for the most exposed households
- 17,000 homes visited since 2009
- 6 GWh decrease in energy consumption
- 19,000 tons CO_2 saved
- *Target customers:* low-income residential, multifamily

éco21 Partners

- SIG provides tools, client support, and training to companies and local governments to implement an energy efficiency action plan.
- Assessment of potential (CHF 21,000 cost to customer)
- Selection of action plans (CHF 21,000 cost to customer)
- Implementation of programme
- *Target customers:* commercial, industrial, municipal

UNDERLYING REGULATORY POLICIES

SIG voluntarily implements and evaluates their energy efficiency programme because there is currently no regulatory oversight in Switzerland for EE.

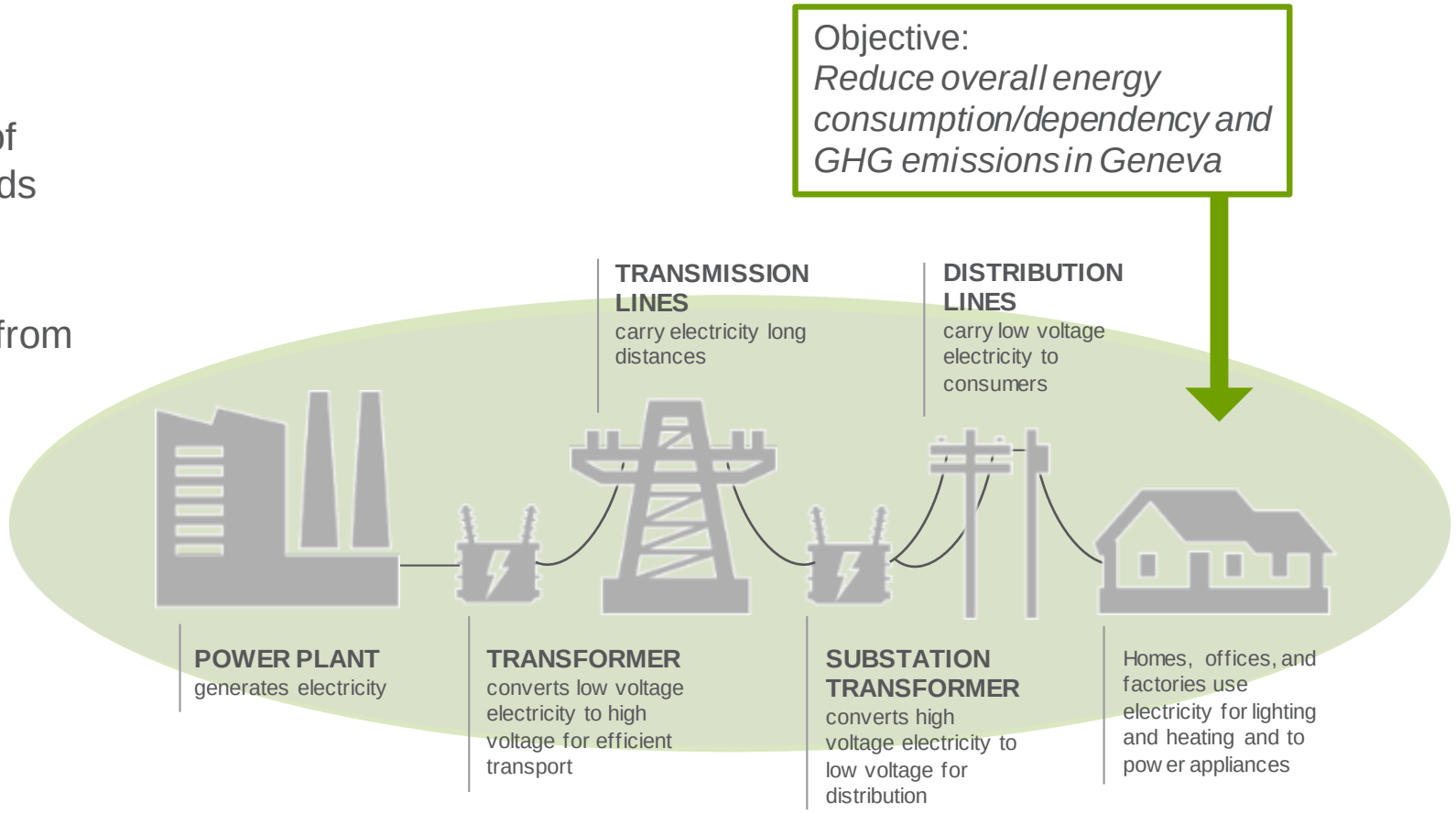
- Aligned with the objectives of the Confederation (Energy Strategy 2050) and of the Canton of Geneva (Société à 2000W)
  - CHF 35 million available in the form of subsidies to accelerate the energy transition across the Canton
  - This amount comes mainly from CO_2 tax revenue
- Without proper regulatory policies to adhere to, SIG implements EE voluntarily.
- Measurement and verification (M&V) is voluntary and important for credibility of the programme results.
- The University of Geneva is evaluating the programme.
- SIG is responsible for distribution network business only, not generation or transmission within the Swiss energy market structure.
  - For distribution, grid-only unbundling in accounting is required
  - For transmission, ownership unbundling is compulsory

Regulating Entity	• City of Geneva, publicly owned • Swiss Federal Office of Energy (BFE) • Federal Electricity Commission (EICom)
Relevant Policies/Regulations	• Energy Strategy 2050 • Société à 2000W
Barriers	• Lack of regulatory structure for EE programmes of this nature • No levy for financing, finance only through savings benefits
Lessons Learned	• It is important to lobby for a national scheme/policy for EE and NWA-type programmes. • It is more robust to have something which is described in law or policy, rather than voluntary actions. • Measurement & verification is important for programme credibility

NETWORK IMPACT OBJECTIVES & ECONOMICS

SIG's goal is to reduce overall network energy dependency and to be a frontrunner in the energy transition.

- 200GWh saved (as of September, 2019)
- Programme saved Geneva the equivalent of electricity consumption for 45,000 households and created over 400 sustainable jobs
- Goal is to reduce energy dependency and decouple economic and population growth from energy consumption
- They do not have grid congestion or aging problems, only a question of kWh, not kW.
  - SIG has a small grid, so no problem with management



PROCUREMENT MODELS

SIG leverages their existing vendor partnerships to procure various EE programmes, and includes this procurement model as a programme within éco21.

- SIG relies on local partnerships to implement and run their specific EE programmes.
- SIG develops partnerships with local firms or with Industrial Services in other Cantons in Switzerland to promote the éco21 programme solutions.
- In 2018, nearly 500 businesses and communities saved more than 22GWh, equivalent to the annual electricity consumption of about 7,500 households in Geneva. SIG-eco21 rewards them by organizing for the first time the SIG Trophies of the energy transition.
- SIG aims to help private companies and end users to expand businesses and increase the number of EE programmes available. They do not implement the programme themselves.

Procurement Model Type	éco21 Partners programme
Description	SIG provides tools, client support, and training to companies and local governments to implement tailor-made energy efficiency action plans.
Challenges	Lack of regulatory structure or incentives
Lessons Learned	• Sharing best practices with other partners and energy companies across Switzerland and Europe • It is preferable to have partnerships with energy companies rather than having a commercial war for lowest prices • Successful M&V to justify programmes

CASE STUDY:

PACIFIC GAS & ELECTRIC

OAKLAND CLEAN ENERGY INITIATIVE

UK Power Networks

NAVIGANT
A Guidehouse Company

EE PROGRAM & UTILITY/DNO OVERVIEW

OCEI provides a green and innovative option that uses local clean-energy resources, including energy efficiency, to ensure transmission grid reliability in Oakland when an existing peaker plant is retired.

Oakland Clean Energy Initiative (OCEI)	
DNO	Pacific Gas & Electric (PG&E)
Location	Oakland, California, USA
Programme Budget	Less than alternative cost: $367 M - $547 M
Programme Duration	April 2018 to mid 2022 (3.5 years)
EE Measures	EE data, rebates, incentives
Other Measures	Demand response, PV distributed generation, and energy storage, net metering infrastructure
Savings Goal / Objective	Replace a 165 MW Dynegy gas peaker plant with projects sized at 10-20 MW / 40-120MWh
Lessons Learned	Engage in broad community/stakeholder engagement, integrate programme with existing utility programmes

ENABLING TECHNOLOGY COMPOSITION

PG&E partners with East Bay Community Energy to provide programmes to residential, commercial, and municipal customers.

Energy Efficiency Data

- Powerful database that enables administrators and implementers of energy efficiency, demand response, and energy management programs to access information that increases building upgrades in the county.
- This data is also valuable to local government partners who are developing greenhouse gas inventories.
- *Target customers:* residential, municipal

Reach Codes

- PG&E and community is committed to the electrification of the built environment and transportation sector to meet California's climate action goals.
- Local government partners develop supportive codes, and EBCE is providing technical assistance and a $10,000 grant to communities that successfully pass Reach codes that would be implemented by January 1, 2020.

Net Metering Infrastructure

- All solar customers are enrolled in Net Energy Metering (NEM) rate
- Partner, East Bay Community Energy (EBCE) provides an additional incentive to low income and municipal customers who have installed a solar system after 6/1/18
- *Target customers:* residential, municipal

Battery Energy Storage Demand Response Pilot

- To reduce peak energy procurement costs, EBCE is offering customers with existing battery energy storage systems and operators/aggregators of those systems the opportunity to participate in this pilot program.
- Systems that discharge power during peak energy periods will receive compensation from EBCE.

UNDERLYING REGULATORY POLICIES

CPUC's guidance for developing distribution resource plans (DRPs) requires utilities to assess the grid impacts of DERs and optimize utility operations and planning processes.

- The California Public Utilities Commission (CPUC) has approved a number of NWA-related actions, including:
  - Providing guidance to the state's investor-owned utilities (IOUs) regarding development of distribution resource plans (DRPs) that "identify optimal locations for the deployment of distributed resources."
  - Approving a pilot regulatory incentive mechanism that awards a 3-4% pre-tax incentive to utilities deploying cost-effective DERs that defer or displace traditional distribution investments.
  - Directing California IOUs to procure at least 150 MW of "preferred resources," such as EE, solar PV, or energy storage resources.

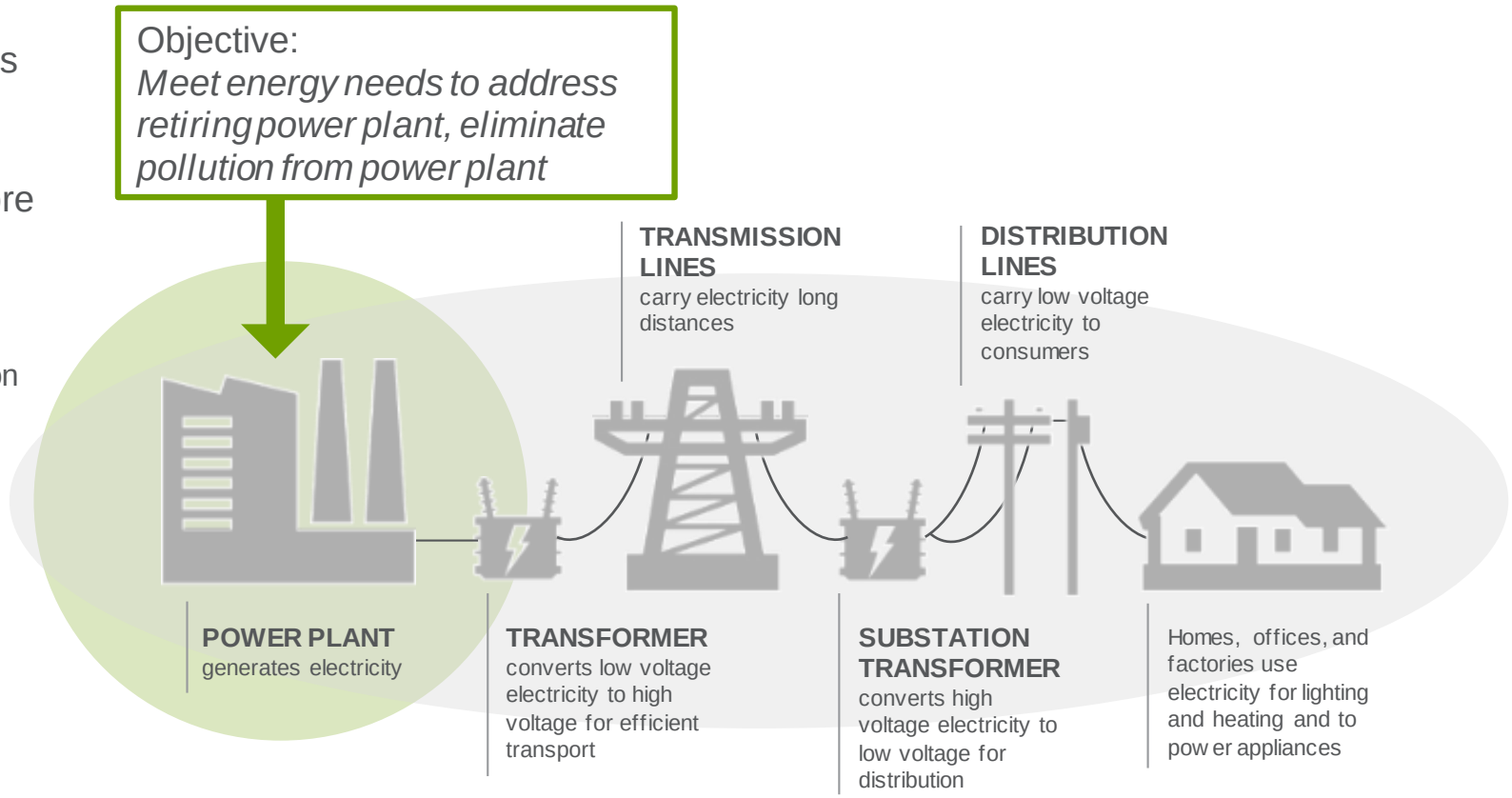
Regulating Entity	• California Public Utilities Commission (CPUC) • Federal Energy Regulatory Commission (FERC)

Relevant Policies/Regulations	• CPUC guidance and policies
	  • CPUC Public Utilities Code Section 769 issued on August 14, 2014
	  • Decision Addressing Competitive Solicitation Framework and Utility Regulatory Incentive Pilot, Decision 16-12-036, CPUC, December 15, 2016
	  • Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long Term Procurement Plans, California Public Utilities Commission, 2014.
	• Energy Upgrade California - statewide program that offers incentives to homeowners who complete comprehensive energy-saving home improvements on a single-family residence.

NETWORK IMPACT OBJECTIVES & ECONOMICS

Oakland Dynegy Power Plant is approaching retirement age causing the transmission network operator to identify a local reliability concern.

- OCEI programme is a combination of substation upgrades, energy storage and preferred resources (including EE) all located within ~7 miles of the current power plant
- Local clean resources meet community needs more effectively:
  - Increasing reliability and energy resilience in downtown Oakland in a timely fashion
  - Building portfolio of clean energy sources in collaboration with local stakeholders
  - Eliminating local pollution from Dynegy plant
  - Engaging broad participation amongst a number of important stakeholders, including the city, community organizations, businesses, regulators, East Bay Community Energy, etc.



PROCUREMENT MODELS

PG&E opened a two-month request-for-offers process to invite providers of distributed energy resources to propose innovative and competitive solutions for the portfolio.

- Contractor offer had to include pricing depending on the agreement/product type:
  1. Market Resources Agreement: price in ($/month)
  2. Energy Efficiency: energy savings in ($/kWh)
  3. Utility Ownership: Purchase price in $ and operations and maintenance in $/year
- Total contract amount: $102 M estimated cost of NWA projects
- Award criteria: Project viability (experience, technology viability, interconnection, site control, customer acquisition plan), technology and counterparty concentration, safety, project size requirement (10-20MW / 40-120MWh)

Procurement Model Type	Pay-for-performance competitive solicitation
Description	RFPs for energy efficiency programmes that are incremental to existing programs and CAISO's forecast for the local sub-area.
Challenges	• Reaching market sectors of commercial large offices and residential programs that serve low and/or middle income customers • Incorporating innovative new offerings in other market sectors • Determining value of benefits of incremental EE programme participation
Lessons Learned	• Benefits of leveraging existing EE programmes • Stakeholder engagement is important since programmes are often dependent on customer participation

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