Clean Coalition

Making Clean Local Energy Accessible Now

Electrification 101

John Sarter
Program Manager, NBCRI
Clean Coalition
415-342-7199 mobile

North Bay Community Resilience Initiative: Aims

- Track, publicize, and support cutting-edge resilience-creating energy efficiency, electrification, and microgrid incentives, plus policy advancements by SCP, MCE, BayREN, BAAQMD, and others.
- Procure and develop a database of model structures with “Community Microgrid–ready” designs: For new and retrofit residential, commercial, and municipal bldgs.
  - Develop “Electrification & Community Microgrid–Ready” (ECMR) document for homeowners and installers
- Develop Community Microgrid roadmap beginning with critical facility microgrid pilots such as fire stations, hospitals, and places of refuge.
  - Position these pilots in areas that are conducive to expansion into Community Microgrids.
- Develop <u>all</u> as a model for decarbonization through electrification; creating resilience in rebuilding, and **proactive resilience** for community modernization.

Introducing Sean Armstrong : Redwood Energy

Sean Armstrong

Managing Principal
at Redwood Energy
seanarmstrongpm@gmail.com
707.826.1450

Resilience as we Electrify and Decarbonize

CRITICAL that we enhance resilience as we electrify

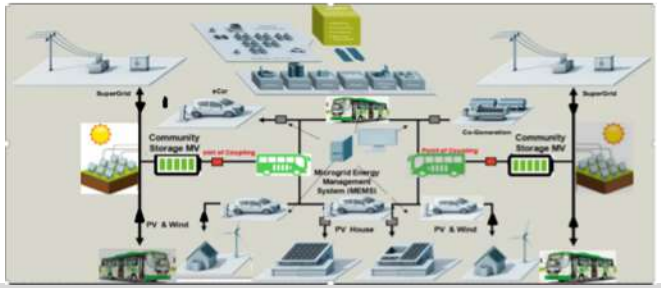
- PSPS and other grid outage events highlight the need for resilient energy systems

- Add DER's (Distribute Energy Resources) at the building and community level

- DER's – **Generation**: Solar, Wind, Hydro, Geothermal

- DER's - **Energy Storage** @ Buildings : Stationary ESS, EV's, Appliances, Building as a "thermal battery"

- DER's – **Energy Storage** @ Community : Large batteries Pumped Hydro, aggregated building level systems, aggregated EV "fleets"



Electrification & Community Microgrid–Ready (ECMR) document

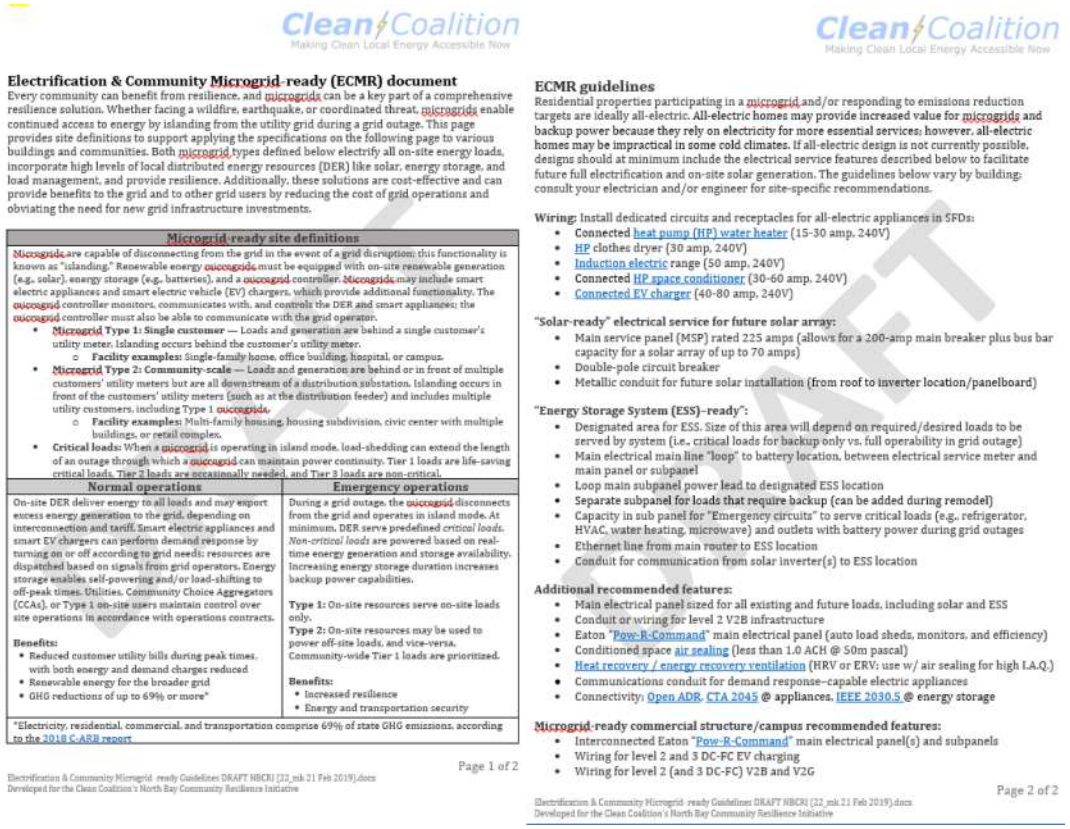
Developed by the Clean Coalition and a team of industry experts, as a guideline for homeowners, trades installers, and electrical engineers to easily plan and install necessary wiring and communications to be all-electric and communitymicrogrid-ready.

Stone Edge Farm Microgrid

ECMR document

Simple 3 page document

- Page 1: Definitions and Operations
- Page 2: Wiring for;
  - Connected Appliances
  - Solar/Solare ready
  - Energy Storage
  - Connectivity
  - Additional recommendatio
  - Commercial Buildings



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Making Clean Local Energy Accessible Now

Electrification & Community Microgrid-ready (ECMR) document

Every community can benefit from resilience, and microgrids can be a key part of a comprehensive resilience solution. Whether facing a wildfire, earthquake, or coordinated threat, microgrids enable continued access to energy by islanding from the utility grid during a grid outage. This page provides site definitions to support applying the specifications on the following page to various buildings and communities. Both microgrid types defined below electrify all on-site energy loads, incorporate high levels of local distributed energy resources (DER) like solar, energy storage, and load management, and provide resilience. Additionally, these solutions are cost-effective and can provide benefits to the grid and to other grid users by reducing the cost of grid operations and obviating the need for new grid infrastructure investments.

Microgrid-ready site definitions

Microgrids are capable of disconnecting from the grid in the event of a grid disruption; this functionality is known as "islanding." Renewable energy microgrids must be equipped with on-site renewable generation (e.g., solar), energy storage (e.g., batteries), and a microgrid controller. Microgrids may include smart electric appliances and smart electric vehicle (EV) chargers, which provide additional functionality. The microgrid controller monitors, communicates with, and controls the DER and smart appliances; the microgrid controller must also be able to communicate with the grid operator.

- Microgrid **Type 1: Single customer** — Loads and generation are behind a single customer's utility meter. Islanding occurs behind the customer's utility meter.
  - **Facility examples:** Single-family home, office building, hospital, or campus.
- Microgrid **Type 2: Community-scale** — Loads and generation are behind or in front of multiple customers' utility meters but are all downstream of a distribution substation. Islanding occurs in front of the customers' utility meters (such as at the distribution feeder) and includes multiple utility customers, including Type 1 microgrids.
  - **Facility examples:** Multi-family housing, housing subdivision, civic center with multiple buildings, or retail complex.
- **Critical loads:** When a microgrid is operating in island mode, load-shedding can extend the length of an outage through which a microgrid can maintain power continuity. Tier 1 loads are life-saving critical loads, Tier 2 loads are occasionally needed, and Tier 3 loads are non-critical.

Normal operations	Emergency operations
On-site DER deliver energy to all loads and may export excess energy generation to the grid, depending on interconnection and tariff. Smart electric appliances and smart EV chargers can perform demand response by turning on or off according to grid needs; resources are dispatched based on signals from grid operators. Energy storage enables self-powering and/or load-shifting to off-peak times. Utilities, Community Choice Aggregators (CCAs), or Type 1 on-site users maintain control over site operations in accordance with operations contracts. **Benefits:** • Reduced customer utility bills during peak times, with both energy and demand charges reduced • Renewable energy for the broader grid • GHG reductions of up to 69% or more*	During a grid outage, the microgrid disconnects from the grid and operates in island mode. At minimum, DER serve predefined *critical loads*. *Non-critical loads* are powered based on real-time energy generation and storage availability. Increasing energy storage duration increases backup power capabilities. **Type 1:** On-site resources serve on-site loads only. **Type 2:** On-site resources may be used to power off-site loads, and vice-versa. Community-wide Tier 1 loads are prioritized. **Benefits:** • Increased resilience • Energy and transportation security

*Electricity, residential, commercial, and transportation comprise 69% of state GHG emissions, according to the 2018 C-ARB report

Page 1 of 2

Electrification & Community Microgrid_ready Guidelines DRAFT NBCRI (22_mk 21 Feb 2019).docx
Developed for the Clean Coalition's North Bay Community Resilience Initiative

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Making Clean Local Energy Accessible Now

ECMR guidelines

Residential properties participating in a microgrid and/or responding to emissions reduction targets are ideally all-electric. All-electric homes may provide increased value for microgrids and backup power because they rely on electricity for more essential services; however, all-electric homes may be impractical in some cold climates. If all-electric design is not currently possible, designs should at minimum include the electrical service features described below to facilitate future full electrification and on-site solar generation. The guidelines below vary by building; consult your electrician and/or engineer for site-specific recommendations.

Wiring: Install dedicated circuits and receptacles for all-electric appliances in SFDs:

- Connected heat pump (HP) water heater (15-30 amp, 240V)
- HP clothes dryer (30 amp, 240V)
- Induction electric range (50 amp, 240V)
- Connected HP space conditioner (30-60 amp, 240V)
- Connected EV charger (40-80 amp, 240V)

"Solar-ready" electrical service for future solar array:

- Main service panel (MSP) rated 225 amps (allows for a 200-amp main breaker plus bus bar capacity for a solar array of up to 70 amps)
- Double-pole circuit breaker
- Metallic conduit for future solar installation (from roof to inverter location/panelboard)

"Energy Storage System (ESS)-ready":

- Designated area for ESS. Size of this area will depend on required/desired loads to be served by system (i.e., critical loads for backup only vs. full operability in grid outage)
- Main electrical main line "loop" to battery location, between electrical service meter and main panel or subpanel
- Loop main subpanel power lead to designated ESS location
- Separate subpanel for loads that require backup (can be added during remodel)
- Capacity in sub panel for "Emergency circuits" to serve critical loads (e.g., refrigerator, HVAC, water heating, microwave) and outlets with battery power during grid outages
- Ethernet line from main router to ESS location
- Conduit for communication from solar inverter(s) to ESS location

Additional recommended features:

- Main electrical panel sized for all existing and future loads, including solar and ESS
- Conduit or wiring for level 2 V2B infrastructure
- Eaton "Pow-R-Command" main electrical panel (auto load sheds, monitors, and efficiency)
- Conditioned space air sealing (less than 1.0 ACH @ 50m pascal)
- Heat recovery / energy recovery ventilation (HRV or ERV; use w/ air sealing for high I.A.Q.)
- Communications conduit for demand response–capable electric appliances
- Connectivity: Open ADR, CTA 2045 @ appliances, IEEE 2030.5 @ energy storage

Microgrid-ready commercial structure/campus recommended features:

- Interconnected Eaton "Pow-R-Command" main electrical panel(s) and subpanels
- Wiring for level 2 and 3 DC-FC EV charging
- Wiring for level 2 (and 3 DC-FC) V2B and V2G

Page 2 of 2

Electrification & Community Microgrid_ready Guidelines DRAFT NBCRI (22_mk 21 Feb 2019).docx
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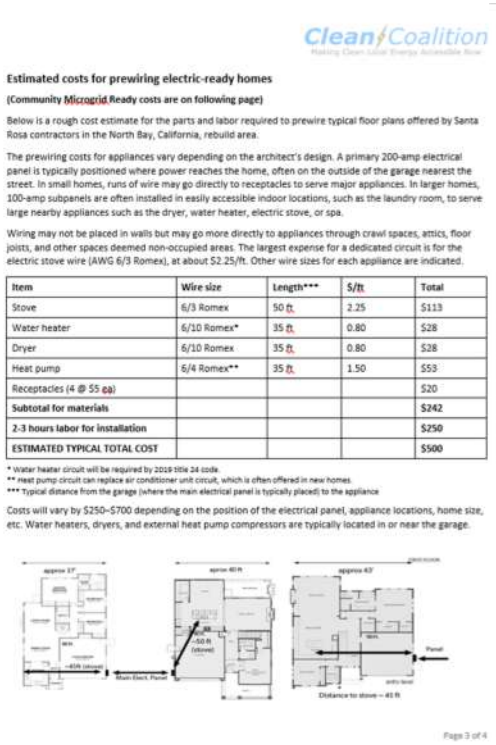
ECMR document

- Page 3: Costs to wire for electrification
- Page 4: Costs to wire for “Community Microgrid Ready”



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Estimated costs for prewiring electric-ready homes

(Community Microgrid Ready costs are on following page)

Below is a rough cost estimate for the parts and labor required to prewire typical floor plans offered by Santa Rosa contractors in the North Bay, California, rebuild area.

The prewiring costs for appliances vary depending on the architect's design. A primary 200-amp electrical panel is typically positioned where power reaches the home, often on the outside of the garage nearest the street. In small homes, runs of wire may go directly to receptacles to serve major appliances. In larger homes, 100-amp subpanels are often installed in easily accessible indoor locations, such as the laundry room, to serve large nearby appliances such as the dryer, water heater, electric stove, or spa.

Wiring may not be placed in walls but may go more directly to appliances through crawl spaces, attics, floor joists, and other spaces deemed non-occupied areas. The largest expense for a dedicated circuit is for the electric stove wire (AWG 6/3 Romex), at about $2.25/ft. Other wire sizes for each appliance are indicated.

Item	Wire size	Length***	$/ft	Total
Stove	6/3 Romex	50 ft	2.25	$113
Water heater	6/10 Romex*	35 ft	0.80	$28
Dryer	6/10 Romex	35 ft	0.80	$28
Heat pump	6/4 Romex**	35 ft	1.50	$53
Receptacles (4 @ $5 ea)				$20
Subtotal for materials				**$242**
2-3 hours labor for installation				**$250**
ESTIMATED TYPICAL TOTAL COST				**$500**

* Water heater circuit will be required by 2019 title 24 code.
** Heat pump circuit can replace air conditioner unit circuit, which is often offered in new homes.
*** Typical distance from the garage (where the main electrical panel is typically placed) to the appliance

Costs will vary by $250–$700 depending on the position of the electrical panel, appliance locations, home size, etc. Water heaters, dryers, and external heat pump compressors are typically located in or near the garage.

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Estimated costs for additional features to make homes Community Microgrid Ready

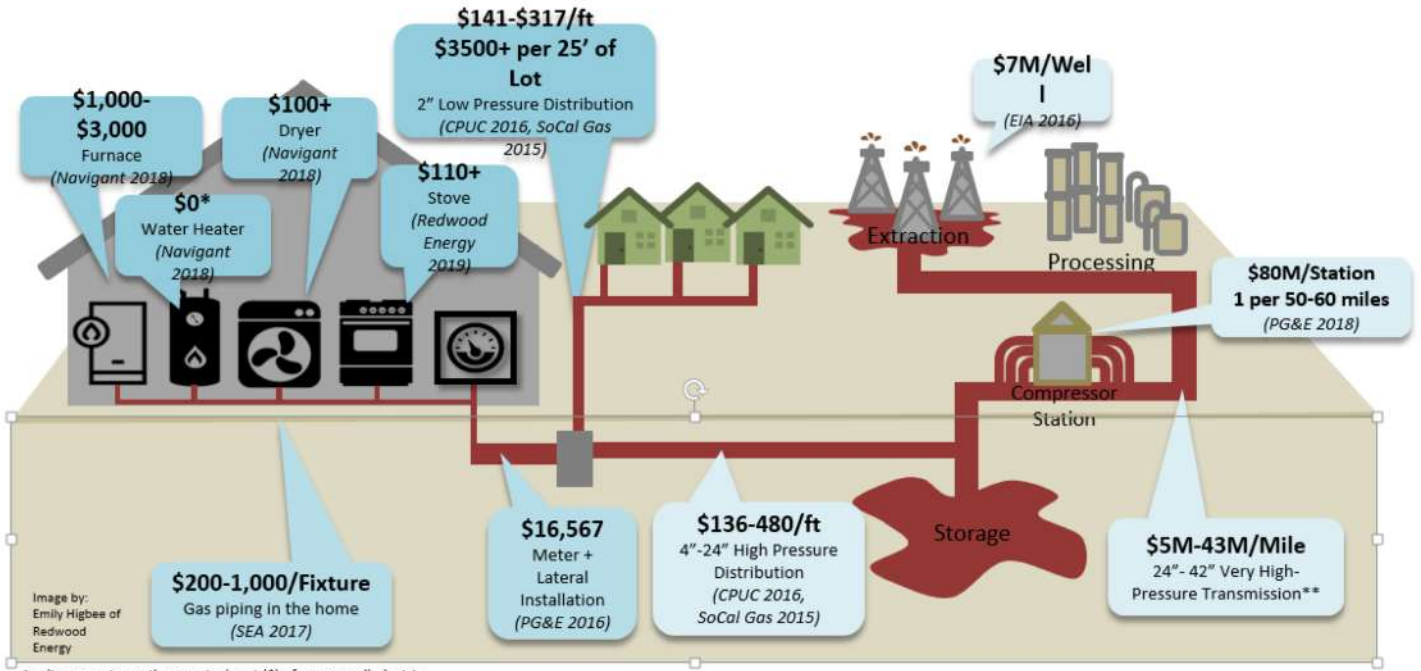
ITEM	APPX COST
Energy Storage System (ESS) ready:	
• Designated area for ESS; size of this area will depend on required/desired loads to be served by system (i.e., critical loads for backup only vs. full operability in grid outage); keep near “smart” main and/or backup loads subpanel	$0
• Main electrical main line “extra loop” (8 feet) to ESS location, between electrical service meter and main panel or subpanel; keep ESS near main and subpanel	$50
• Separate subpanel for loads that require backup (can be added during remodel); keep next to main panel and ESS	$200
- OR -	
Capacity in subpanel or “smart” main panel (Eaton, Leviton, or similar) for emergency circuits to serve critical loads (e.g., refrigerator, HVAC, water heating, microwave, lights and outlets with ESS battery power during grid outages, including EV-ready)	Incl. above
• Ethernet communications line from main router to ESS location (60')	$60
• Ethernet line for communication from solar inverter(s) to ESS location	$100
• Upgrade to certified smart inverter for islanding, plus ESS export to grid (optional); this is included in the ESS package price and user interface	$300
V2B bi-directional EV charge/inverter ready	
• No additional costs required; same electrical cable as for EV charging	$0
COMMUNITY MICROGRID READY TOTAL	**$410 – $510**

Page 4 of 4

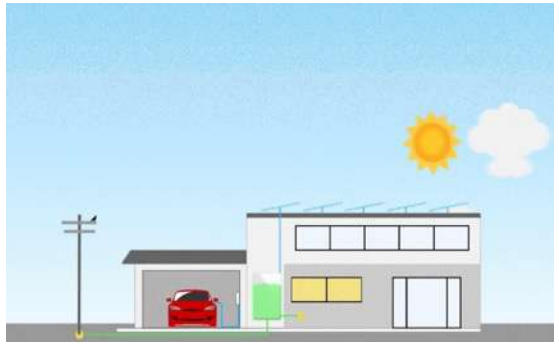
Savings going All Electric and Microgrid Ready

$25,000+ per Home for Contractor-Paid Natural Gas, Plus On-Bill Repayment

Owner paid cost increases due to more expensive gas appliances and infrastructure additions are in darker blue, while "rate based" cost increases are in lighter blue.



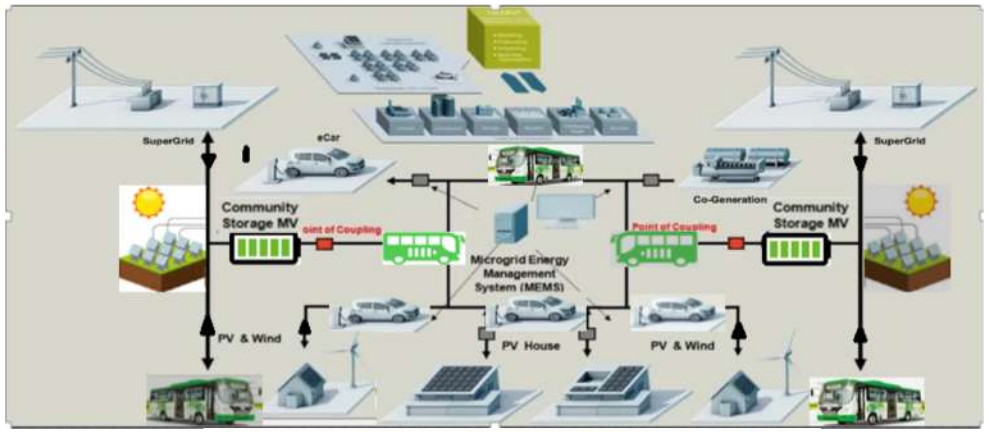
Appliance costs are the marginal cost ($) of gas over all-electric
*heat pump water heater equal in cost to on demand gas water heating
** Average of various sources *(Cochran 2018, Lennon 2019, SoCalGas 2014, Nemec 2015, Nogueras 2011)*



- Savings eliminating gas = $25,000
- Total Costs to be ECMR = $1000 +-
- **Total Savings = $24,000 !!**

$24,000 = Cost of Solar + Storage or Solar + V2H with Ossiaco dcbel !

Renewable Energy Community Microgrids = Safer, Clean, and Resilient energy future for all California



Residential Electrification 101


An all electric kitchen in the Hilton Grand Islander Hotel in Hawaii.

Ryobi electric backpack blower


Dimplex Opti-Myst


Kenyon electric grill

A Cleaner, Safer, Less Expensive Lifestyle

Sean Armstrong

Managing Principal
at Redwood Energy
seanarmstrongpm@gmail.com
707.826.1450

- **1995-2019** The Campus Center for Appropriate Technology
- **2002-2005** High School Science Teacher
- **2005-2011** Affordable Housing Project Manager, Pacific West Communities
- **2011-Today** ZNE Design Management and Building Science at Redwood Energy

Gold Nugget AWARDS GRAND AWARD

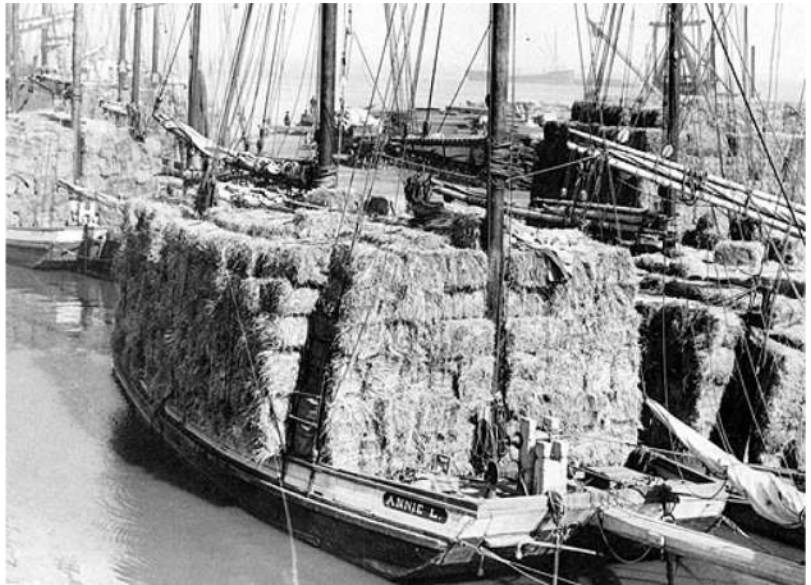
world habitat awards WINNER 2017

The Analogy of a Previous Methane Emitting Technology: Disease, pollution, and high costs for housing, infrastructure, and pasture.

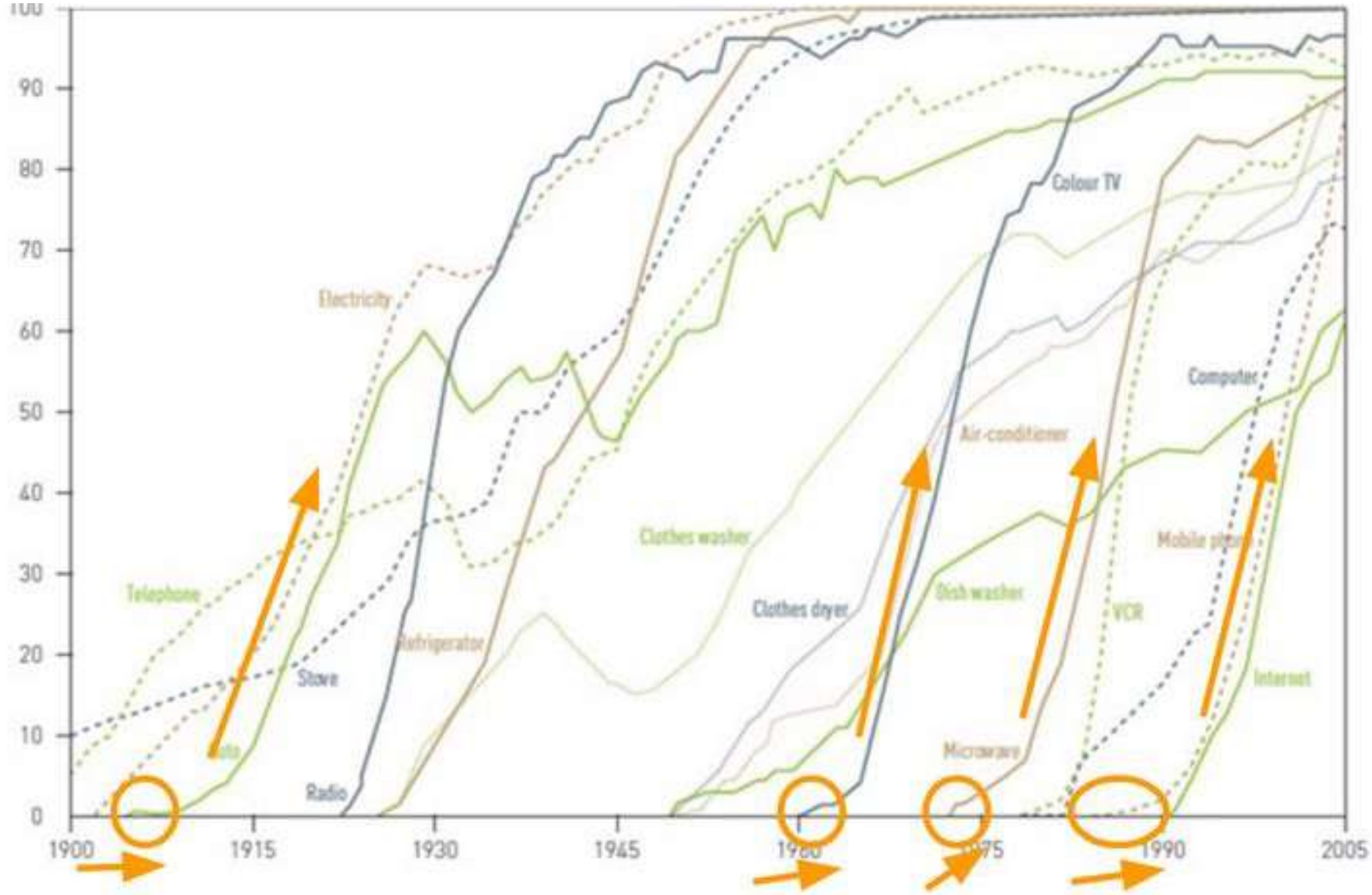
ARCHIVES | 1872

THE NEW HORSE DISEASE.; Dropsy and Glanders Prevalent Several Deaths Reported in Up-TownStables. Virulent Type of the Horse Disease at Baltimore Reports From Other Places.

"The horse has become unprofitable. He is too costly to buy and too costly to keep."—Munsay Magazine, late 1800s

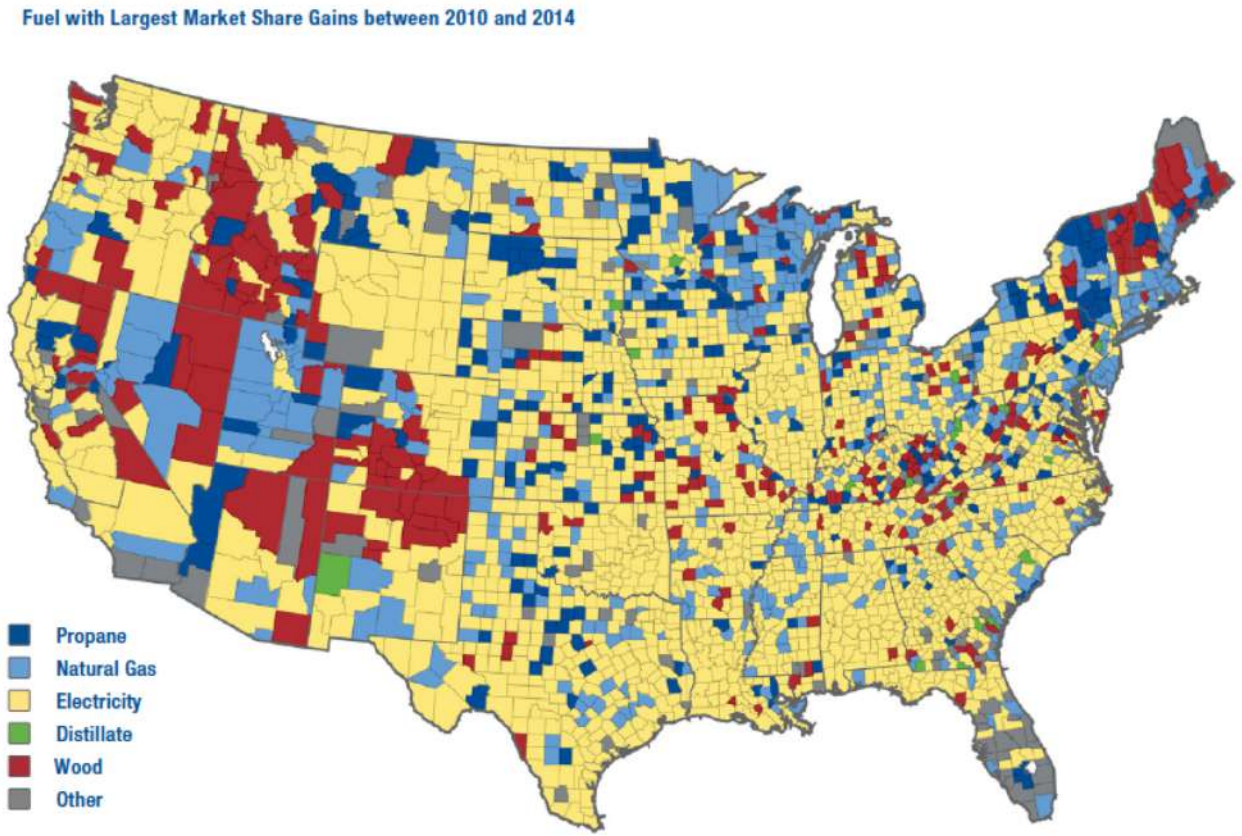


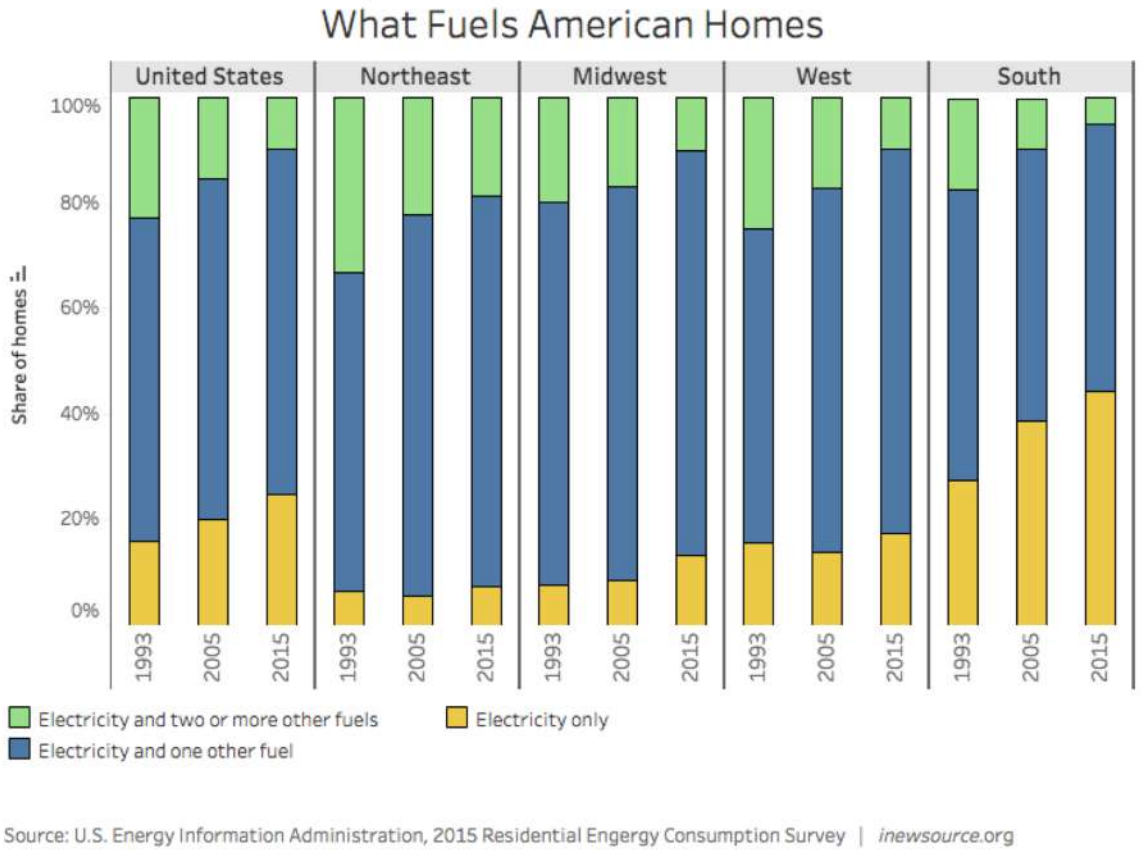
Rapid Adoption Curves Take 15 Years: Autos, Color TVs, Microwaves and Computers



Nation-Wide Electrification Trend Dates from 1993, Accelerating Since 2010 with New “Cold Climate” Heat Pumps

Fig. 1





$25,000+ per Home for Contractor-Paid Natural Gas, Plus On-Bill Repayment

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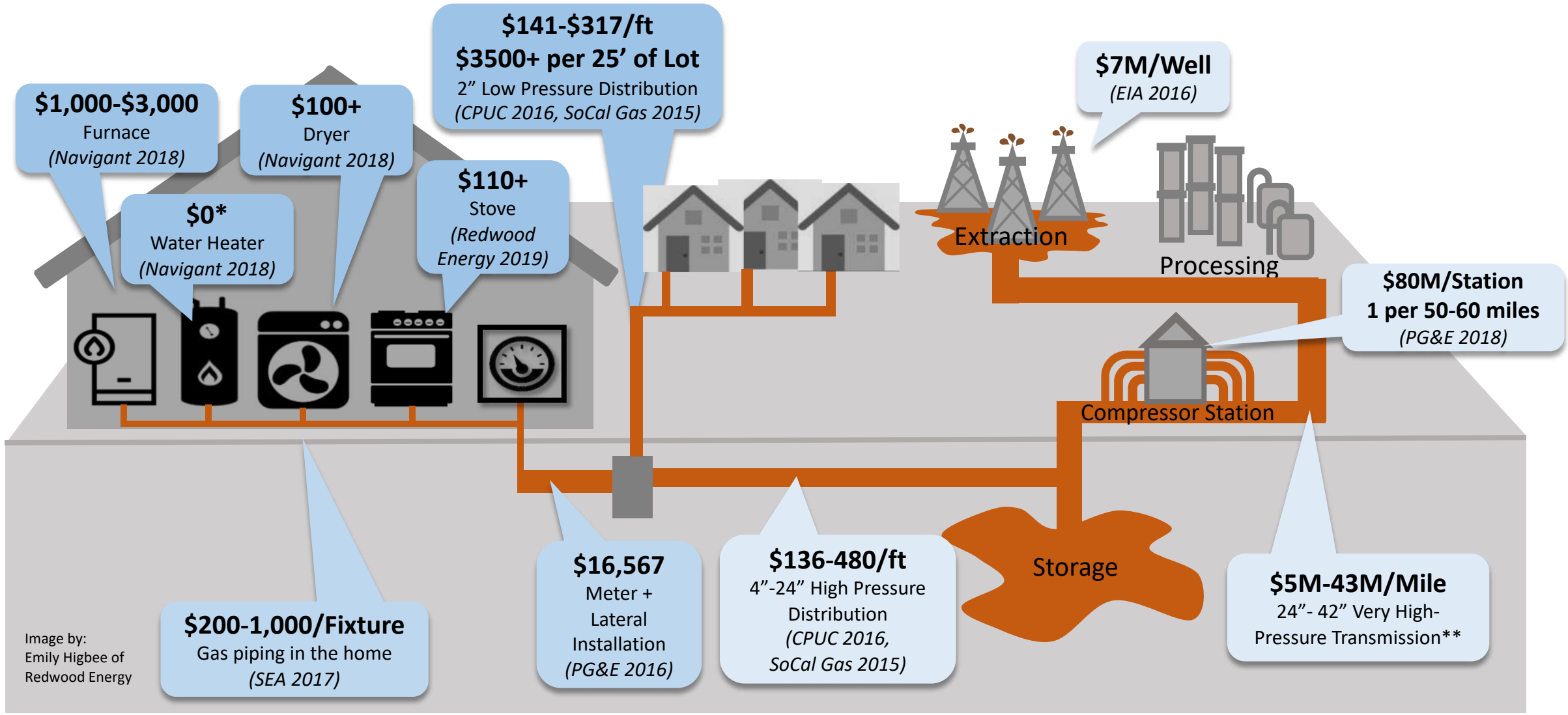

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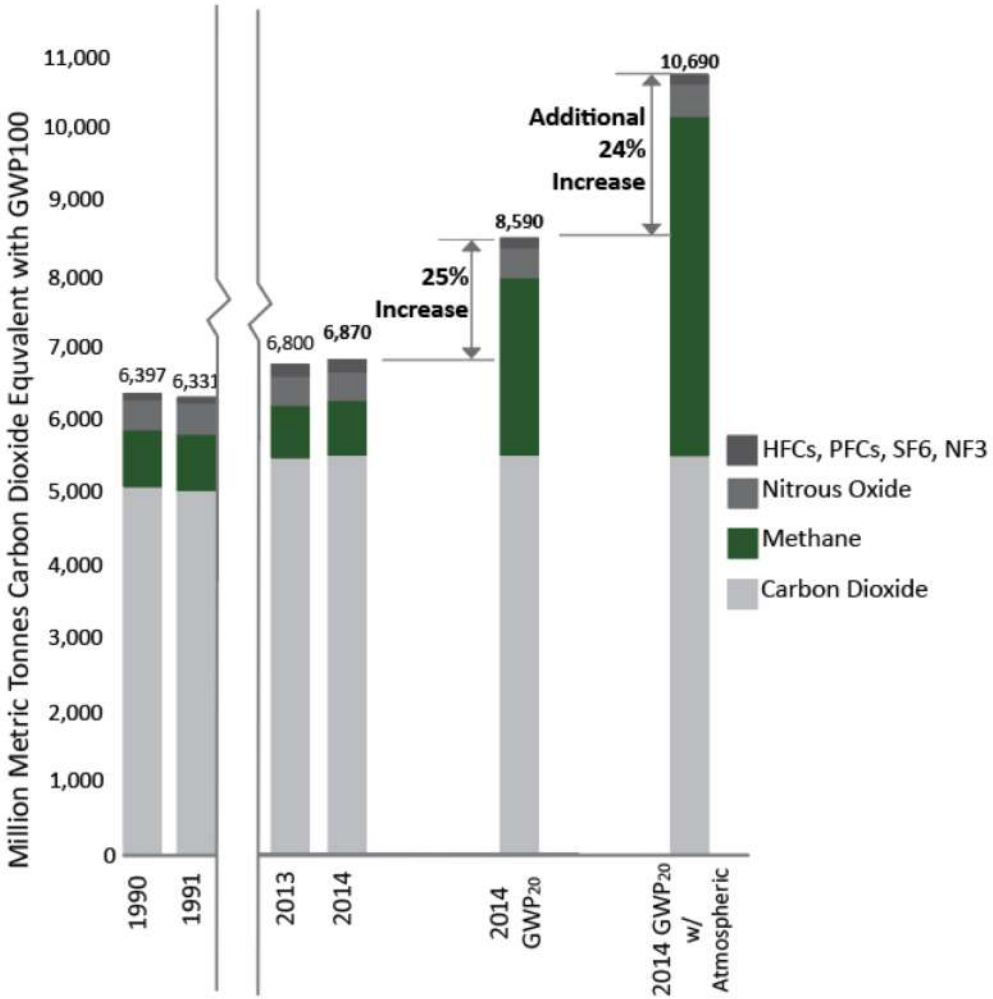
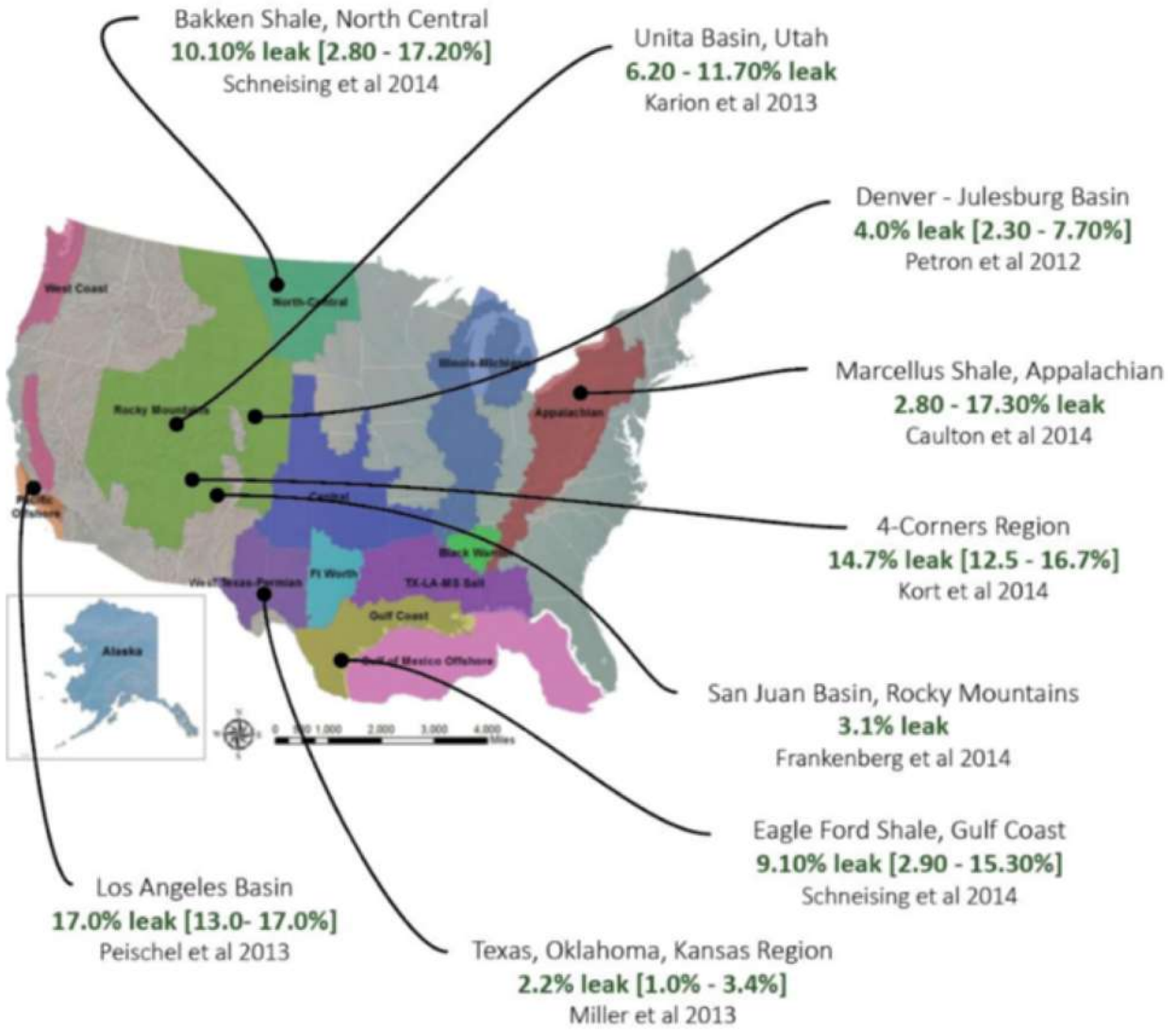
*heat pump water heater equal in cost to on demand gas water heating

** Average of various sources *(Cochran 2018, Lennon 2019, SoCalGas 2014, Nemec 2015, Nogueras 2011)*

IPCC Update of Methane's Global Warming Potential and New Leakage Data Illustrates Causes of Near Term Climate Change

Figure 7: USGHGI Increase with Atmospheric Measurement





“Supper Smog” From Gas Stoves

Sean Armstrong: A New Yorker article in April of 2019 about the hidden air pollution in our homes[26] said kitchen air during cooking was so dirty that there is actual smog formation after twenty to thirty minutes of cooking on a gas stove. Was that an exaggeration?

Dr. Brett Singer: If you add pollutants like NO2 from gas stoves to the cooking emissions, it is a mixture of pollutants deserving of a name like “smog,” although that name is already taken by outdoor air pollution.

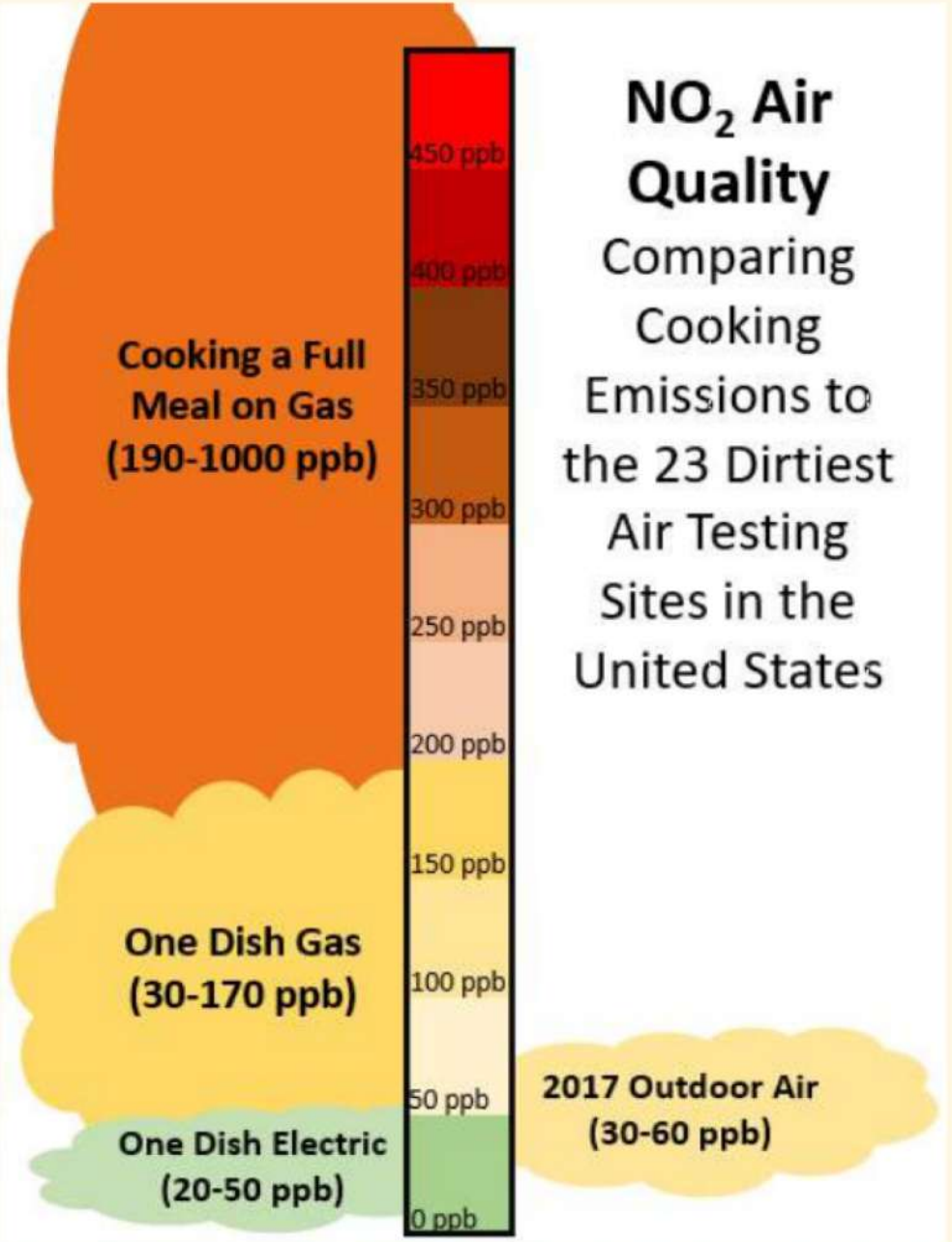


Figure 9: Comparison of 2017 outdoor NO2 air quality data[24] and cooking NO2 emissions for various tests: full meal on gas and single dishes (stir fry, tortillas, French fries)[25].

Cooking with Gas Can Harm Children:

Cooking with gas stoves is associated with increased risk of childhood respiratory illnesses, including asthma

Andee Krasner, MPH* and T Stephen Jones, MD, MPH

EARLY LIFE

Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children

Weiwei Lin,[1] Bert Brunekreef[1,2] and Ulrike Gehring[1]*

[1]Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands and [2]Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands

Pollutant concentrations and emission rates from natural gas cooking burners without and with range hood exhaust in nine California homes

Brett C. Singer*, Rebecca Zarin Pass, William W. Delp, David M. Lorenzetti, Randy L. Maddalena

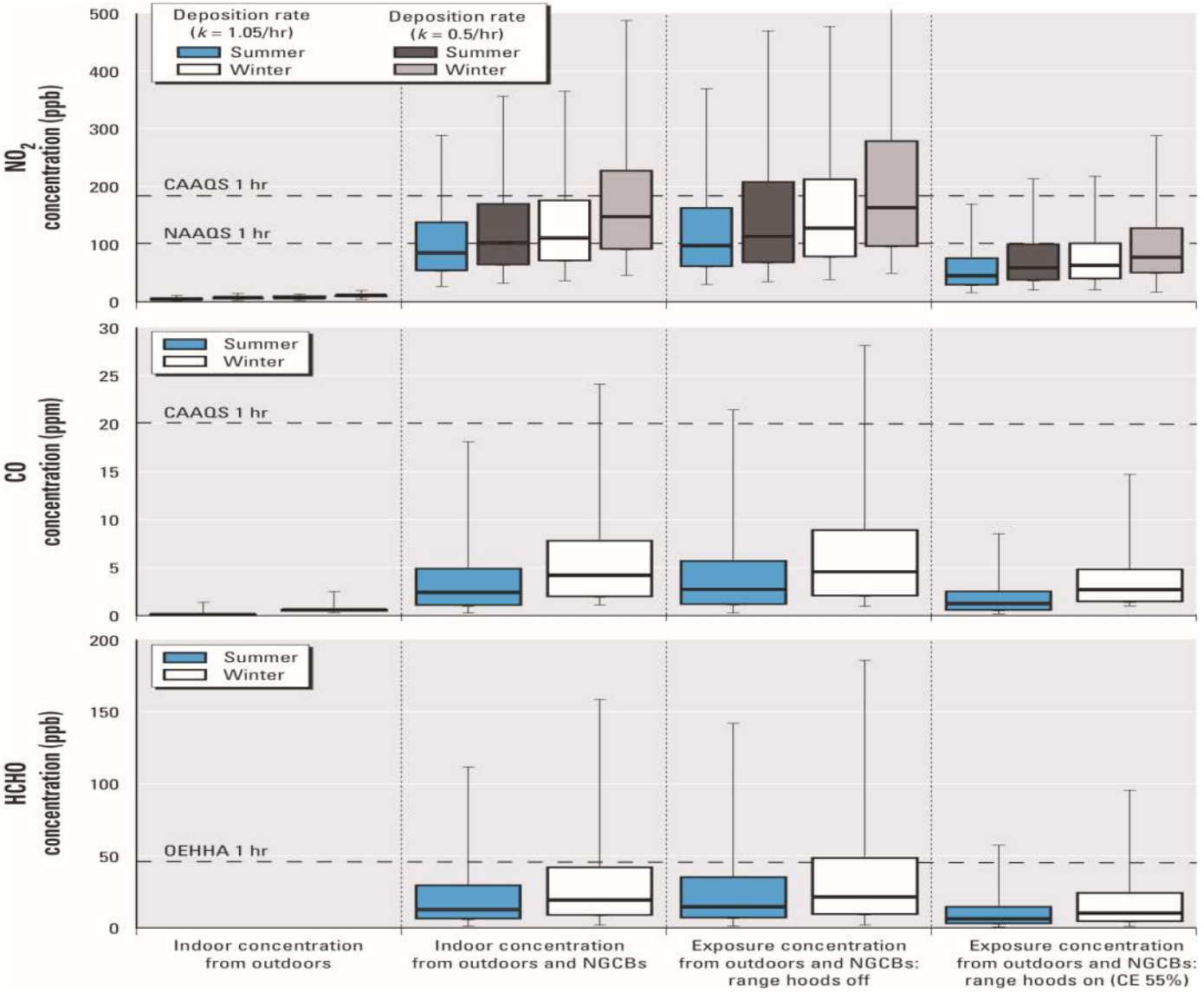
Indoor Environment Group, Energy Technologies Area, Lawrence Berkeley National Laboratory, Berkeley CA, United States

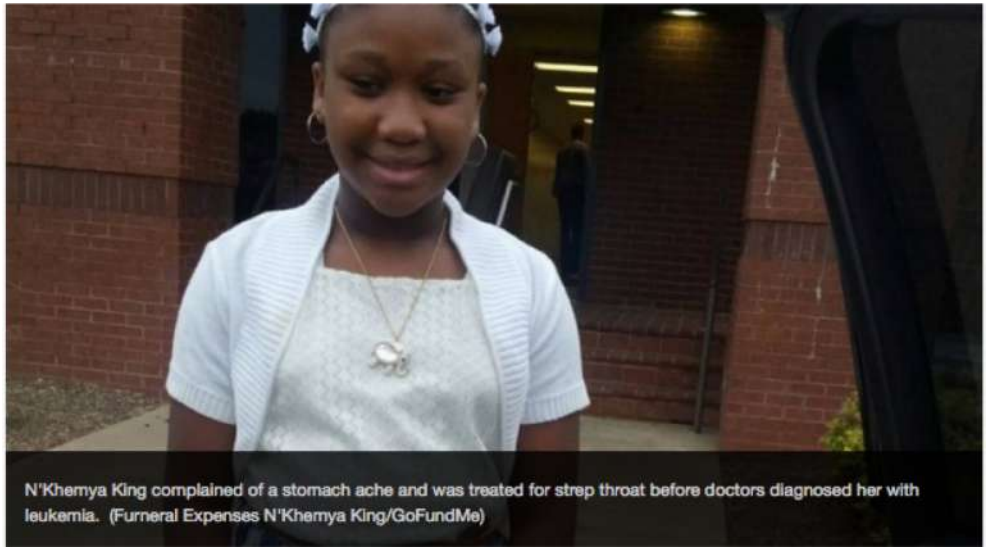
California Environmental Protection Agency

Air Resources Board

Residential Cooking Exposure Study Finds Unhealthful Levels

Exposure Levels During an Hour of Cooking Poison Children with Cancerous Formaldehyde and Nitrous Oxides (LBNL, 2011)





N'Khemya King complained of a stomach ache and was treated for strep throat before doctors diagnosed her with leukemia. (Furneral Expenses N'Khemya King/GoFundMe)

CANCER

Girl diagnosed with strep throat dies of leukemia one week later

Published March 22, 2017 · Fox News

Parents' heartbreak as four-year-old daughter diagnosed with leukaemia dies just 11 DAYS later

'HIS BODY COULDN'T TAKE IT' Teenager dies just ONE WEEK after being diagnosed with leukaemia having shown NO symptoms

James O'Mara, 13, from Worcester, spent eight days battling acute myeloid leukaemia before he passed away

Policy Triggers for California Decarbonization: Explosions

1994: Ruptured gas line after 1994 Northridge Earthquake destroys two homes on Balboa Boulevard, LA. *The Atlantic, Jan 14, 2014.*

2010: Ruptured gas line in San Bruno kills 8, destroys 38 homes, PG&E fined for hiding responsibility. *KPCC News, 2016*.

2015: Aliso Canyon leak sends hundreds of children home from school with mass nose bleeds and vomiting, 12,000 citizens evacuated. *EDF, 2015*.



Nancy C. Pec: A Santa Rosa Environmental Activist (1957 – 2017)
Killed by Climate Change

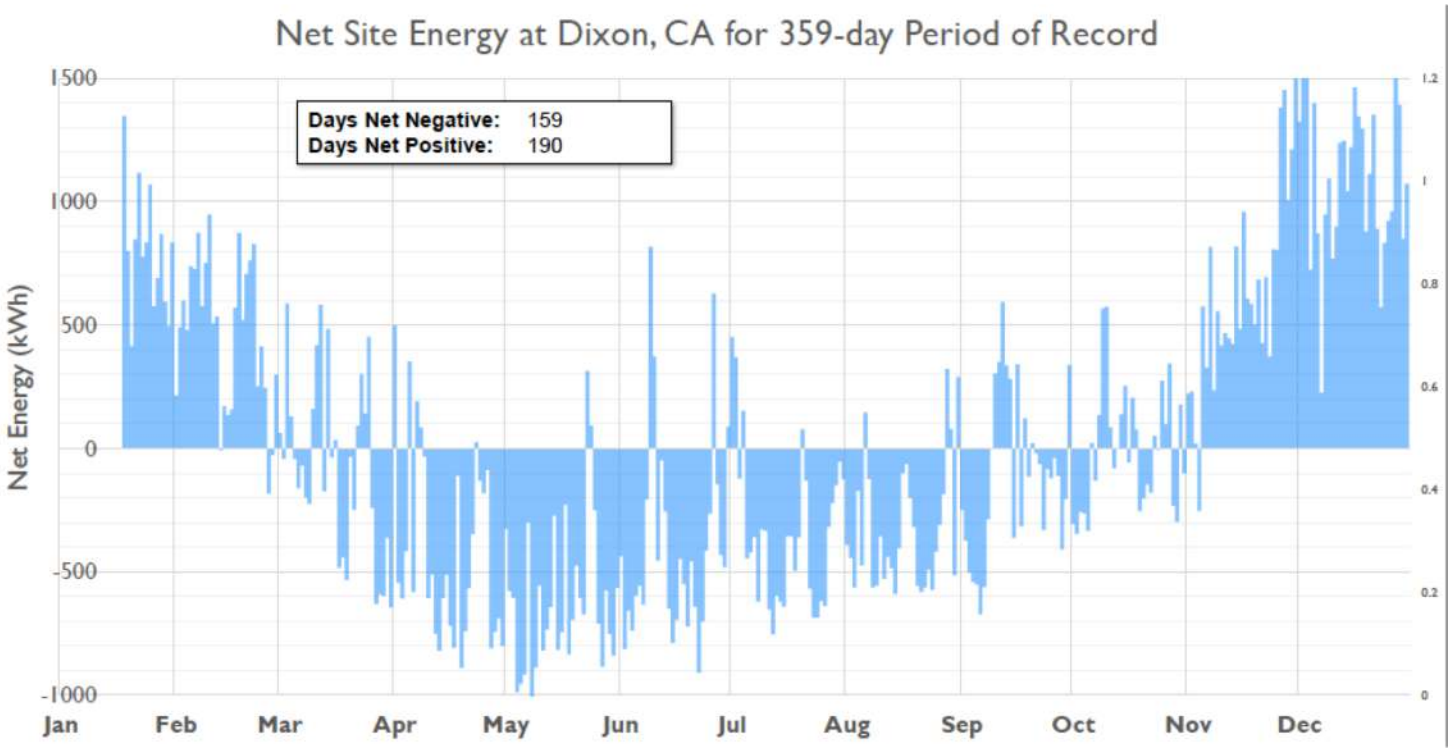
Berkeley Bans Gas Piping from Building Permits for Public Safety and Climate Change : August 6, 2019

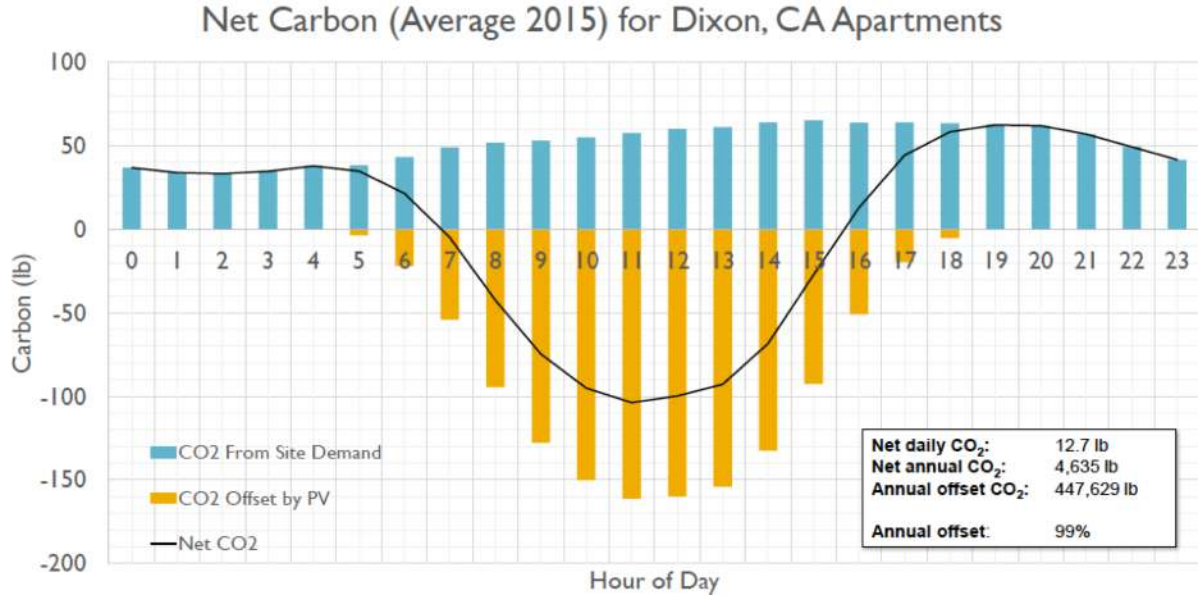
Rooftop Solar on 100% of New CA Homes in 2020!






ZNE Works for Low Income: Dixon's 59 Townhouses Perform at 94% Zero Net Energy, 99% Zero Carbon





The New York Times

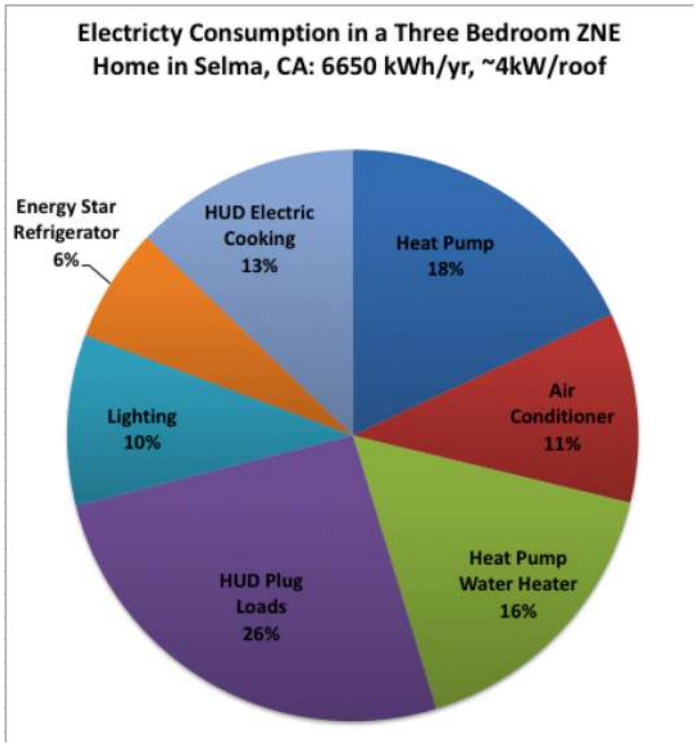
New York Rejects Keystone-Like Pipeline in Fierce Battle Over the State's Energy Future

All-Electric Saved Money for Tribe and Elders at Hoopa's Trinity River Elder Village

Two Bedroom Home Annual Utility Bills at Trinity River Elder Village, Hoopa, CA			
Fuel Mix	**Electricity Bill**	**Propane Bill**	**Total Bills**
Propane + Electricity AFUE/EF=.93	$28	$51	$79
All-Electric: Average COP=3.2	$59		$59
All-Electric + Zero Net Energy PV	$5		$5

The New Valley View Homes of Selma, CA

PSH1BG iQ Drive® | Maytag® M1200 up to 19 SEER, 10 HSPF Heat Pump



Smooth-Top *Radiant* vs. Smooth Top *Induction*

Amana AER6303MFS	**Whirlpool** WFE320M0ES	**Frigidaire** FFEF3052TS	**GE Appliances** JBS60DKBB
			
$450	$500	$500	$510

Kenmore Elite 95073	Frigidaire Gallery FGIF3036TF	Samsung NE58K9560WS	Frigidaire Gallery FGIF3036TF	Electrolux EI30IF40LS
				
$1260	**$ 1,075**	**$1400**	**$1200**	**$1800**

Fireplaces That Make Steam and Heat, No Smoke

Dimplex Opti-Myst Pro 1000
($2099)

Napoleon See-thru
($2,008)

Dynasty DY-BT79
($1,299)

Amantii Zero Clearance
($1,308)

Amantii BI-40-SLIM (In/Out)
($1,618)

Modern Flames CLX Series
($7,449)

Dimplex Opti-Myst Pro 500
(outdoor) ($1300)

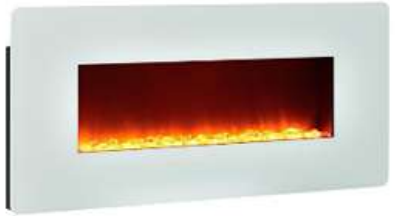
EnerG+ Patio Heater
(outdoor) ($186.99)

Touchstone Sideline
(outdoor) ($574)

Dimplex Opti-Myst Pro 400
($1749)

ClassicFlame Felicity
($349.77)

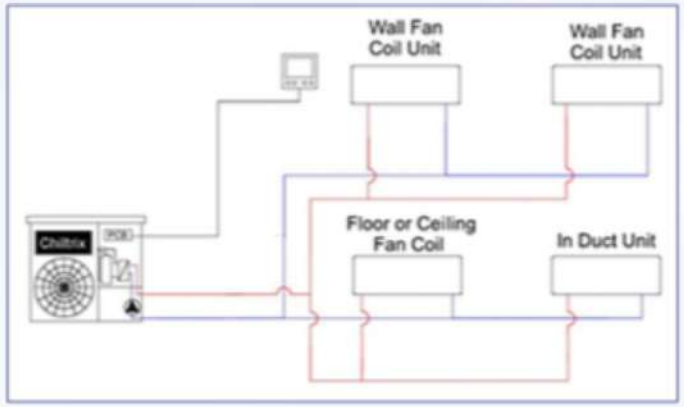
Altra Furniture
($160)

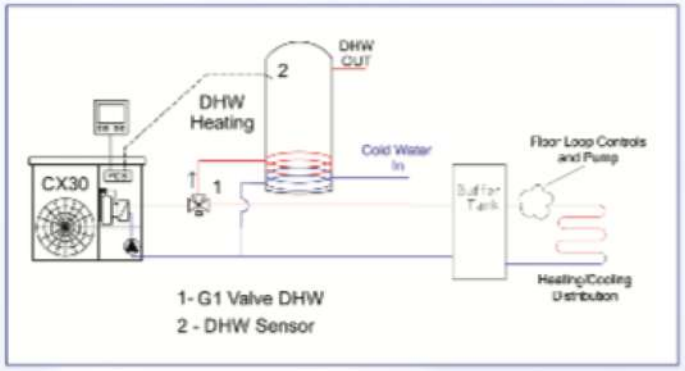


Heat Pumps for Radiant Floors

CX34 ODU (Outdoor Unit)
Self-contained 2 Tons Cooling /
2.7 Tons Heating
IPLV:
Cooling EER 23.02
Heating COP 3.92

Chilltrix





Up to 8 indoor units (IDUs) can be used. One Chiltrix ODU can connect to an amount of IDUs rated for up to 115% of the ODU capacity. ODU can also be used with ducted air handler, floor heating, or integrated with existing boiler or solar hydronic heating.

PHNIX

Residential Heat Pump Water Heaters

	Sanden CO2	**Rheem** Prestige Hybrid	**AO Smith** Voltex Hybrid	**Bradford White** AeroTherm	**Steilbel Eltron** Accelera
					
Description	Split heat pump water heater	Hybrid (WIFI option adds $150/tank)	Hybrid	Hybrid	Hybrid

U.S. Government

Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Water Heater – ELECTRIC

Tank Size (Storage Capacity): 59 gallons

Uniform Energy Factor: 3.7

Rheem Sales Company, Inc.

Model XE65T10HD50U1

B00150

Estimated Yearly Energy Cost

$161 ELECTRIC

$225 — $732

Cost Range of Similar Models

The estimated yearly energy Cost of this model was not available at the time the range was published.

First Hour Rating

(How much hot water you get in the first hour of use)

very small	low	medium	high 75 Gallons

Estimated Yearly Electricity Use

- Your cost will depend on your utility rates and use.
- Cost range based only on models fueled by electricity with a high first hour rating (75 gallons and over)
- Estimated energy cost is based on a national average electricity cost of 12.00 cents per kWh.
- Estimated yearly energy use: 1341 kWh

ENERGY STAR

www.ftc.gov/energy.

Part No AX4258

U.S. Government

Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Water Heater – Natural Gas

Tank Size (Storage Capacity): 46 gallons

Rheem Sales Company, Inc.

Modei ECORHE50

B00007

Estimated Yearly Energy Cost

$231 GAS

$225 — $297

Cost Range of Similar Models

First Hour Rating

(How much hot water you get in the first hour of use)

very small	low	medium	high 87 Gallons

Estimated Yearly Energy Use

- Your cost will depend on your utility rates and use.
- Cost range based only on models fueled by natural gas with a high first hour rating (75 gallons and over)
- Estimated energy cost is based on a national average natural gas cost of $1.09 per therm.
- Estimated yearly energy use: 212 therms

ENERGY STAR

www.ftc.gov/energy.

Part No. AX4258

Superior Pool Heating for $3000

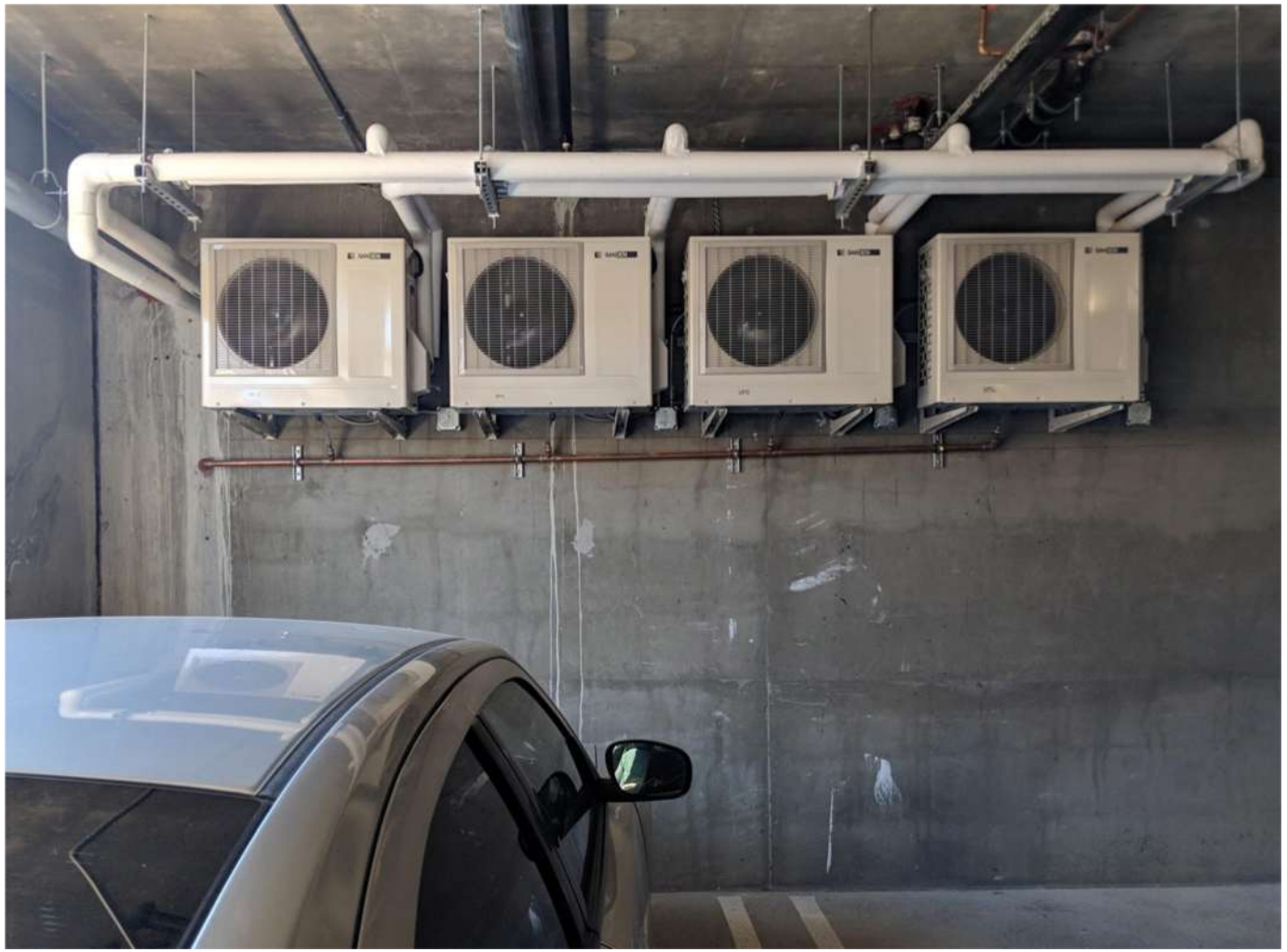
Pentair

Aquacal Heatwave

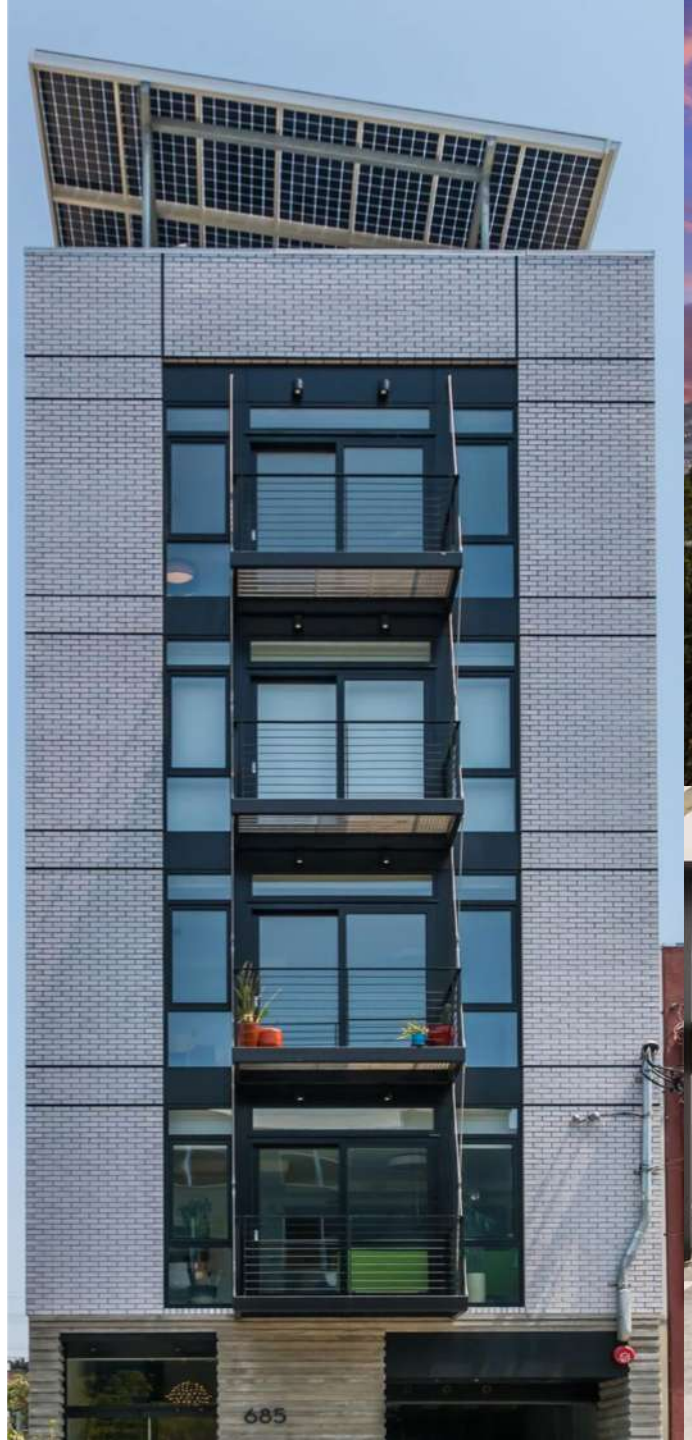
Hayward Heat Pro

PHNIX

Cold Climate Heat Pump Boilers: Sanden, Chiltrix, Colmac and Mitsubishi



Resiliency at Sol Alpha Lux in San Francisco: PowerWalls and Vehicle to Building Chargers

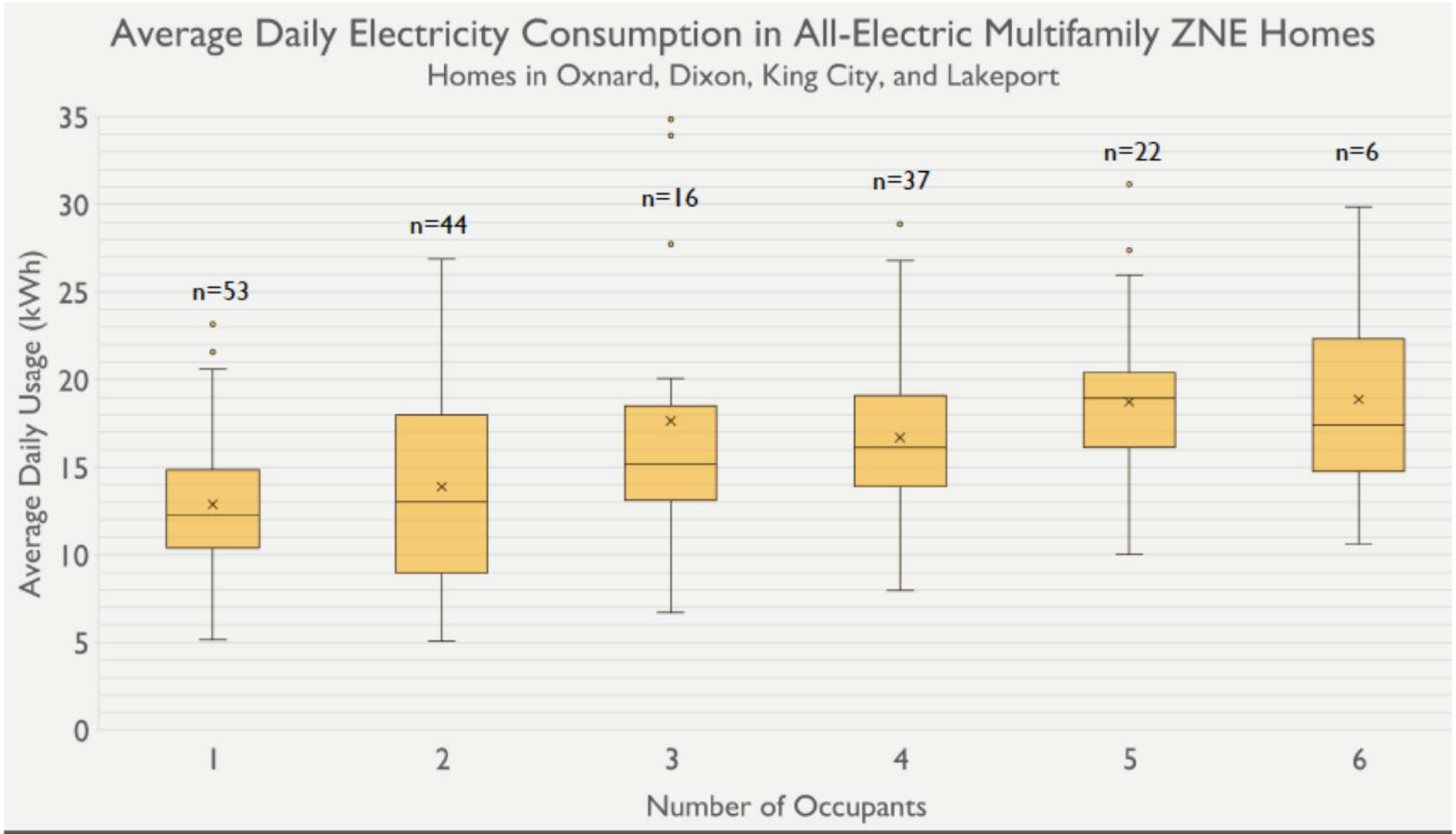


dcbel

Your Energy Without Compromise

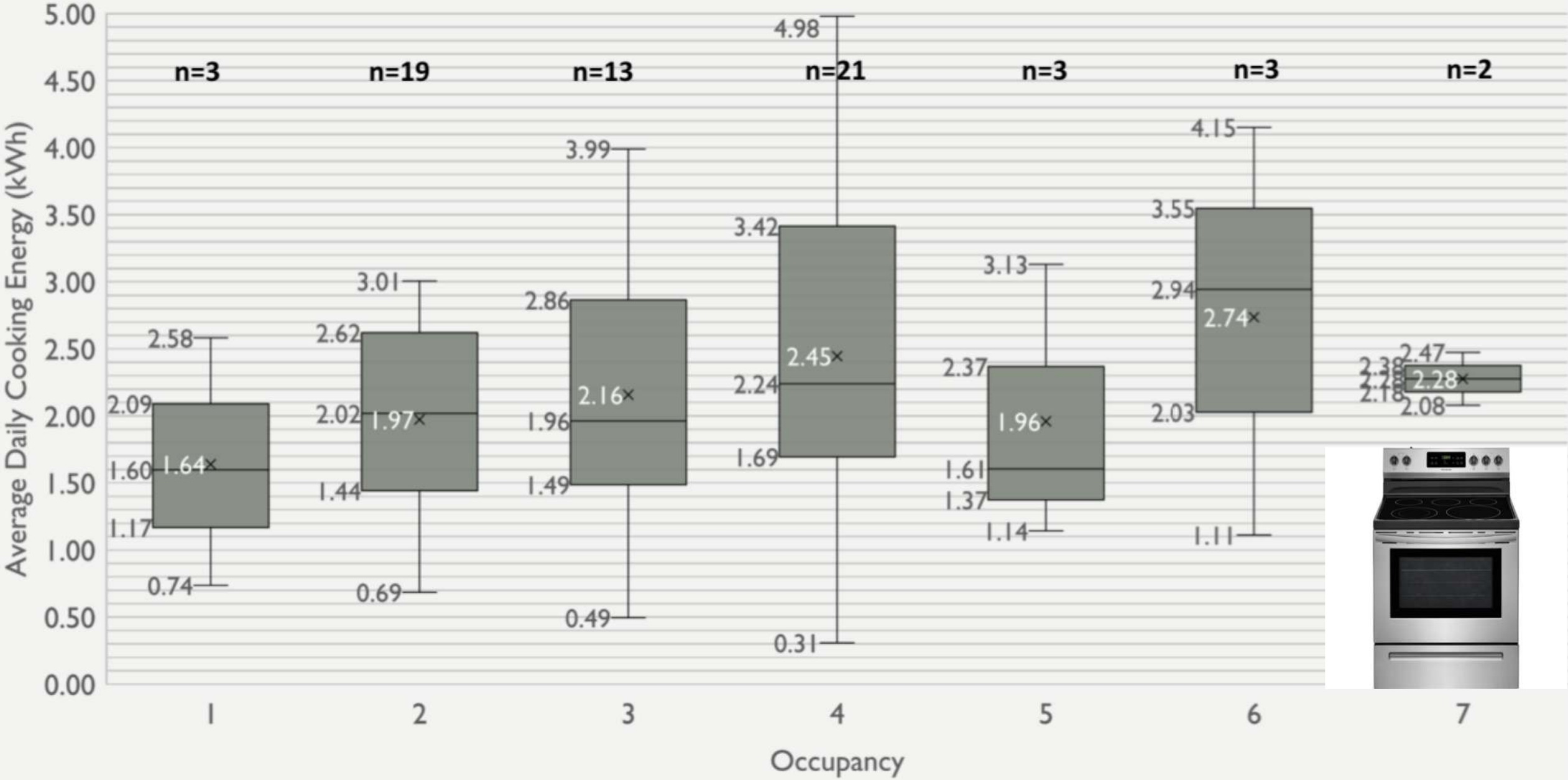
Intelligent home energy manager, solar inverter, and bi-directional EV charger, all rolled into one.

Cars Store 60-100 kWh
Apartments Use 13-19 kWh/day



Per Occupant Daily Cooking Loads

Dixon, Oxnard



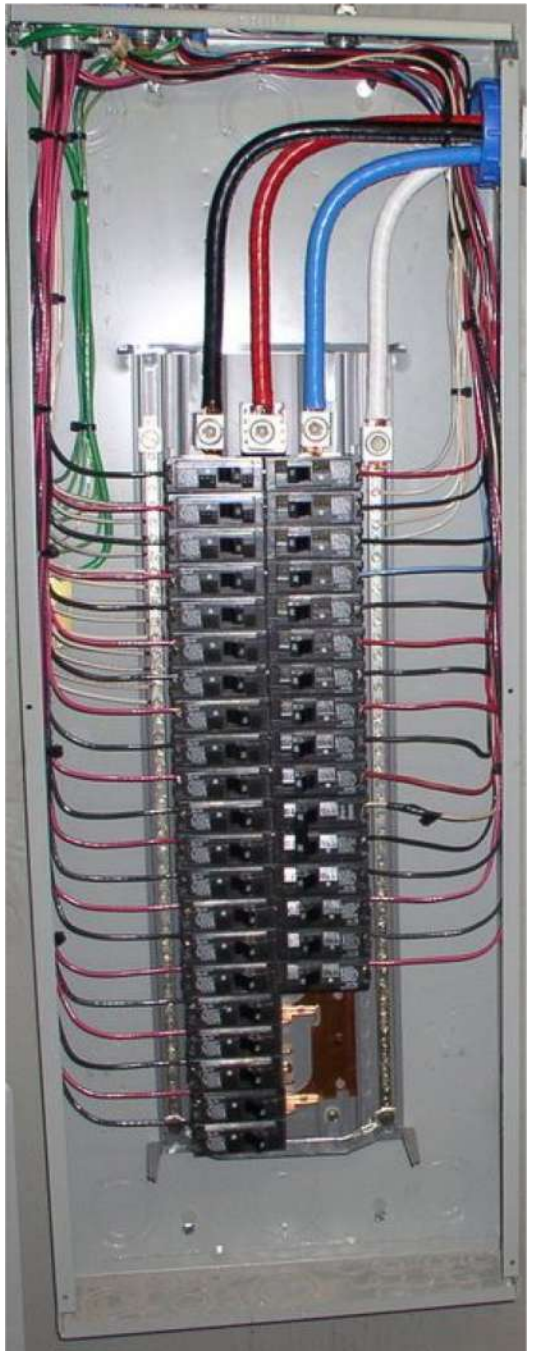
The Challenge of Power Availability in Electrification Retrofits

50 Amp
12,000 Watt Panel

100 Amp
24,000 Watt Panel

200 Amp
48,000 Watt Panel

400 Amp, 96,000 Watt Panel



”Smart” Subpanels That Can Maintain Existing Panel Amperage with Load Management

Load Sharing Between Dryers, Water Heaters and Cars with the Dryer Buddy and NeoCharge

Condensing Washer/Dryers 1400W at 120V

Make And Model	**Magic Chef** MCSCWD20W3	**Haier** HLC1700AXW	**Summit** SPWD2201SS	**Deco** DC4400CV	**LG** WM3488HW	**Whirlpool** WFC8090GX
						
Price	$720	$1,000	$1,000	$1,200	$1,300	$1,500
kWh/year	85 kWh/year	65kWh/year	65kWh/year	96kWh/year	120 kWh/year	180kWh/year
Drum Capacity (cu. ft.)	-	2.0	2.0	3.5	2.3	2.8
Volts/Amps	-	120V/10A	115V/12A	110V/15A	120V/15A	240V/30A

Retrofit-Ready Water Heaters: Ariston/HTP *Coming Soon.
1200W at 120V

NUOS EVO

80 - 110

Wall-hung heat pump water heater

HIGH EFFICIENCY

PROFESSIONAL TECH

R134A

ECOLOGIC GAS R134A

ANTI LEGIONELLA

- COP 3,4 WITH AIR TEMPERATURE AT 20°C (EN 255-3)
- COP 2,6 WITH AIR TEMPERATURE AT 7°C (EN 255-3)
- WORKING IN HEAT PUMP MODE WITH AIR TEMPERATURES FROM - 5 TO 42°C.
- ECOLOGIC GAS R134A ALLOWS TO REACH WATER TEMPERATURES UP TO 62°C IN HEAT PUMP MODE
- CONDENSER COILED AROUND THE BOILER (NOT IMMERSED IN THE WATER)
- LOW NOISE' (SILENT FUNCTION)
- BOILER IN TITANIUM ENAMELLED STEEL
- ADDITIONAL HEATING ELEMENT
- ACTIVE ANODE (PROTECH) + MAGNESIUM ANODE

LCD DISPLAY

- GREEN, BOOST, AUTO, ANTILEGIONELLA FUNCTIONS AND TIME SETTING OF THE WITHDRAWALS

Retrofit-Ready HVAC—1200W at 120V

MITSUBISHI ELECTRIC

COOLING & HEATING

JP SERIES 115 VOLT SYSTEMS

PRODUCT LAUNCH GUIDE

Product Overview

The new JP Series offers a 115 volt product perfect for replacement of window air conditioning units or existing 115 volt systems. This product comes standard with a remote controller and remote control holder.

All-Electric Fine Dining in New York City Multifamily Buildings

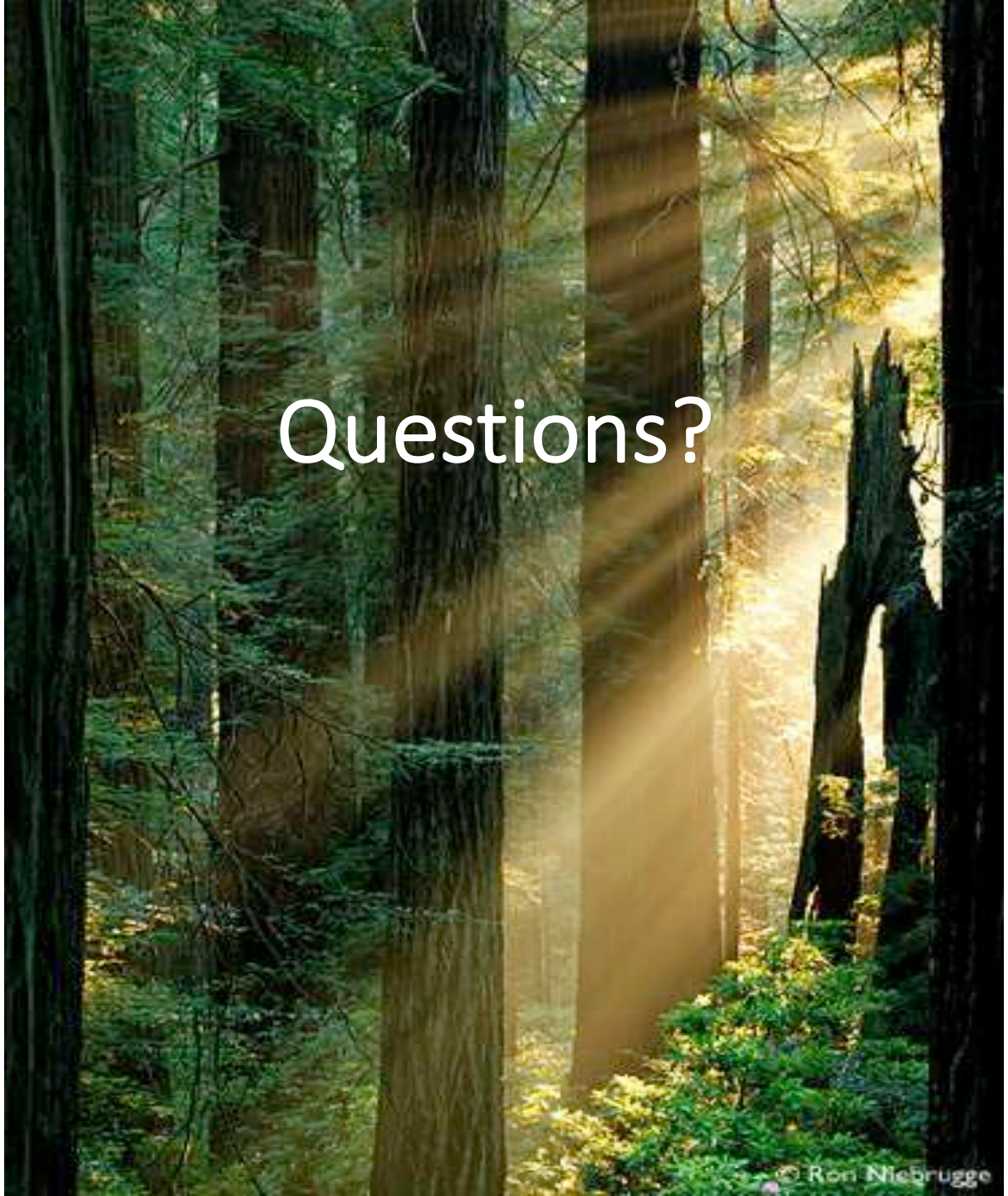
HYATT REGENCY

VAIKIKI BEACH RESORT AND SPA

Spa and Pool Heated with a Heat Pump

An All-Electric Resort

Hilton Hawaiian Village


Questions?
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