

BEYOND ZERO: NET POSITIVE ENERGY

100% Renewable Energy Nanogrid Structures and
Community Microgrid Development
For the Transition to Highly Resilient
Renewable Energy Systems

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100% RENEWABLE, N+E NANOGRID STRUCTURE

- **GENERATES** > than all required Energy for the Structure with 100% site based renewable energy systems
- **STORES** site produced energy in on-site Energy Storage system(s) (ESS)
- **MANAGES** the energy within systems with site based and cloud based management / control systems
- **INTERCONNECTS** for NRG export/import with the local grid or microgrid, AND/OR operates in an “islanded” mode in grid disruption events
- **Export excess ENERGY** for revenue
- **Import/export excess grid energy** for Grid Balancing services
- **Excess generation Provides** for site EV Charging



BIPV SOLAR TRELLIS ENERGY AS “ART”

- SunPreme **Bifacial** 380w Panels produce up to 30% more energy (Up to **494 Watts** per panel !!)
- Highest Bifacial boost effect is achieved when raised high off roof
- 96 panels X 380 + 30% = Boost to 47.4 Kw Array
- Allows mix of direct and filtered light
- Roof deck garden / kitchen / lounge area under
- Designed for Integrated Rain Catchment
- Designed for Integrated LED lighting



SOL LUX ALPHA; USA'S FIRST MULTI UNIT
PASSIVE HOUSE CERTIFIED
"NANOGRID"- CARBON NEUTRAL LIVING + TRANSPORTATION SYSTEM

Net Positive Energy : How do we do this?

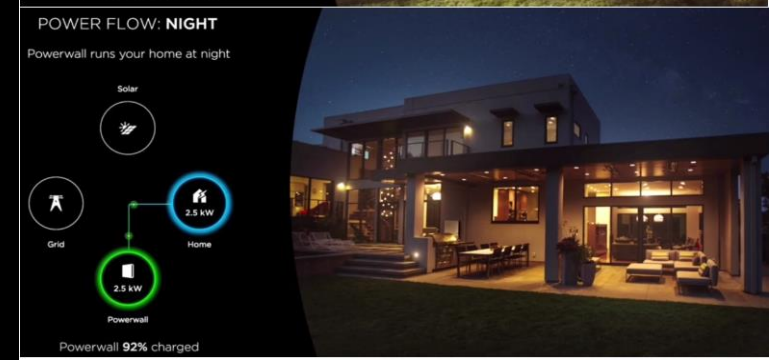
- COLLABORATIVE DESIGN – **PARAMOUNT!** Owners, Architects, Engineers, G.C., P.M., Subcontractors
- DEFINE PROJECTED, **AND AN OPTMIIZED** ENERGY BUDGET to work towards
- Identify Goals, Site R.E. Assets, Limitations, **Passive Solar** Design ideals for the site
- Systems for Integration, best products and practices (WITH subcontractors)
- Route Mech and Plumbing inside the thermal envelope, CONSULT SUBCONTRACTORS

SOL-LUX ALPHA

100% RENEWABLE
NET POSITIVE ENERGY NANOGRID

CARBON NEUTRAL
LIVING AND TRANSPORTATION SYSTEM

- Ultra High-Efficiency Multi-Unit Phius+ Source Zero Certified Building
- 47 Kw **FULL ROOF COVERAGE** SUNPREME Bi-Facial Raised Trellis BIPV (10 kW for ea unit , 7 kW for common areas & elevator)
- Fully integrated EV charging infrastructure and management. (Off peak charging as ancillary grid asset and saves \$\$)
- Future ready - **V2B / V2G** infrastructure
- **24 kWh** – 2 BLUE PLANET ENERGY / SONY Towers for common + elevator
- **40.5 kWh (x 4)** – 3 TESLA powerwalls per unit = **186 kWh Total for building**
- Energy Management Systems (EMS) **Monitor + Manage** the variable R.E.+Storage assets, to maximize self consumption & variable tariffs of Grid



UNIT TWO CURRENT DATA

Florida St - 2nd Floor
Discharging



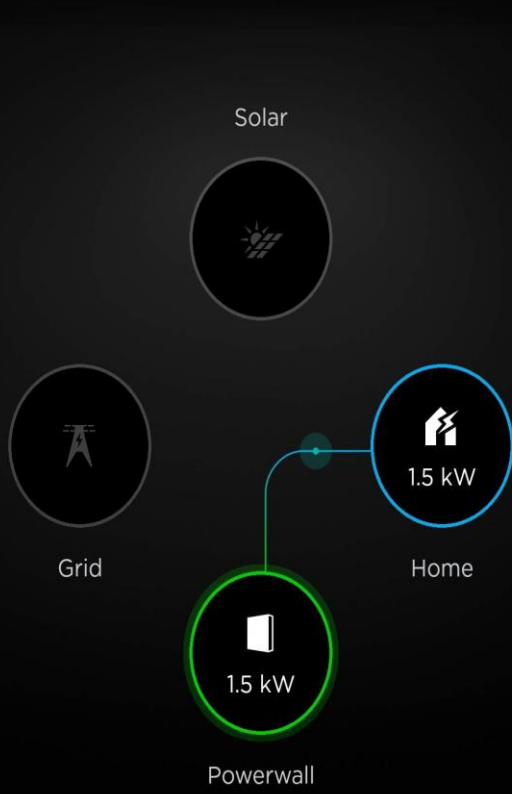
81%

- POWER FLOW
- PERFORMANCE
98% Self-powered today
- BACKUP HISTORY
- CUSTOMIZE

POWERWALL

3x Powerwalls
Version: 1.23.0

POWER FLOW



Solar 1.5 kW

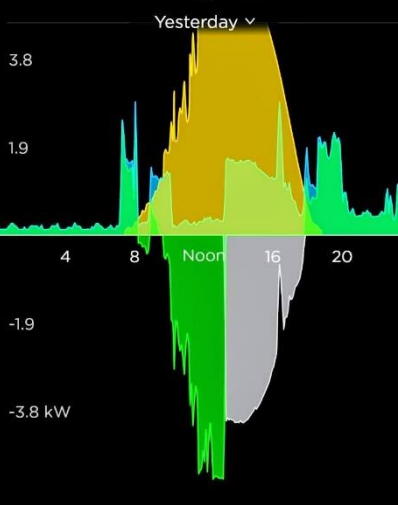
Grid

Home 1.5 kW

Powerwall 1.5 kW

ENERGY USAGE

Yesterday




3.8
1.9
-1.9
-3.8 kW

4 8 Noon 16 20

- 18.3 kWh HOME USAGE
- 34.5 kWh SOLAR ENERGY
- 9.1 kWh FROM POWERWALL
- 12.3 kWh TO POWERWALL
- 0.1 kWh FROM GRID

ENERGY USAGE

Sep 11th - Sep 17th



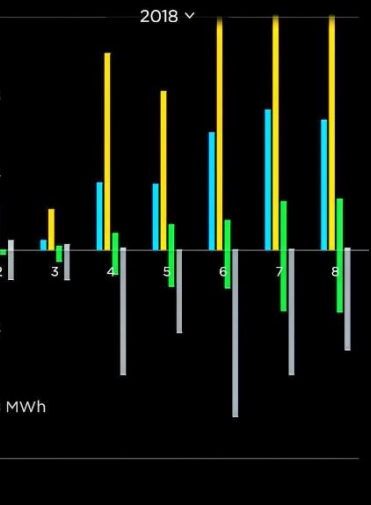
31.5
21
10.5
21 kWh

Tue Wed Thu Fri Sat Sun Yesterday

- 126 kWh HOME USAGE
- 265 kWh SOLAR ENERGY
- 43.7 kWh FROM POWERWALL
- 60.3 kWh TO POWERWALL
- 0.8 kWh FROM GRID

ENERGY USAGE

2018



0.8
0.4
0.8 MWh

2 3 4 5 6 7 8

- 2.6 MWh HOME USAGE
- 6 MWh SOLAR ENERGY
- 0.8 MWh FROM POWERWALL
- 1.1 MWh TO POWERWALL
- 0.1 MWh FROM GRID
- 3.2 MWh TO GRID

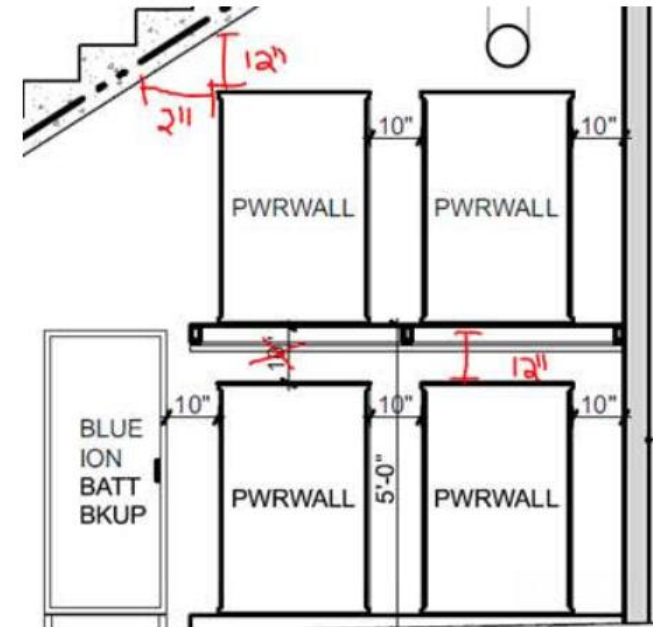
186 KWH LITHIUM ION ENERGY STORAGE

- 12 TESLA POWERWALLS / 2 SONY BLUE ION TOWERS
- TESLA for AC POWER / SONY for DC to 3 Phase AC
- LiFe Po4 Produces no heat or gases = No venting required for Lithium Batteries
- Small, scalable modules can be distributed within building or units
- Battery Chemistry = Indoor rated, U.L. Listed



• WHY ENERGY STORAGE?

- Uninterruptable, safe, secure Energy, ALWAYS
- Energy / Fuel source during GRID OUTAGES
- Revenue \$\$ Grid balancing asset
- Saving \$\$ Charge off-peak for use at Peak (Time of Use)



V2B / V2G READY VEHICLE TO BUILDING / GRID

- Bi-Directional Vehicles and Chargers
- Allows expanded energy storage capabilities (reduces need for stationary ESS)
- Potentially *quadruples* energy storage for a building
- Another tool for grid balancing during high renewable generation (Additional Revenue)
- Adds community resilience in emergencies (Mobile Energy Source)




V2B (Vehicle to Building)

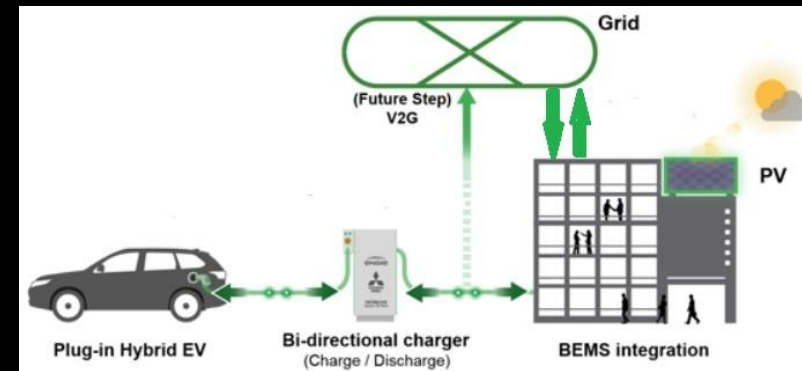
- **Reduces** need for site based ESS
- EXTENDS “**NANOGRID**” TO “**MICROGRID**”
- “**Mobile Energy Assets**” for community resilience AND
- “**Mobile Grid**” reduces WIRE infrastructure

Connected Vehicle Fleet

- 2014 • 40,000+ Model S Vehicles
• 4 GWh of Deployed Energy Storage
- 2019 • 1,000,000+ Tesla Vehicles x 10kW On-Board Charger
• 75 GWh of Energy Storage
• **10 GW Controllable Charging Load**



15
THINK

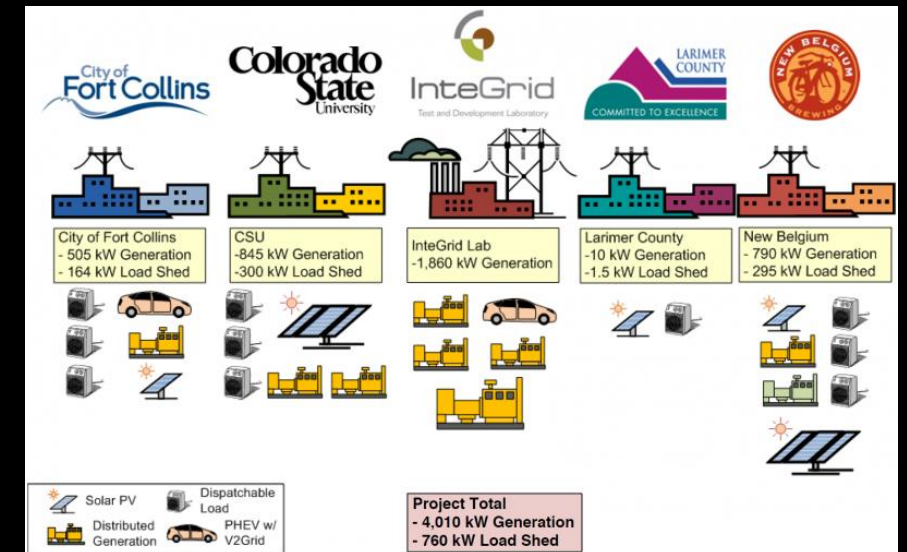
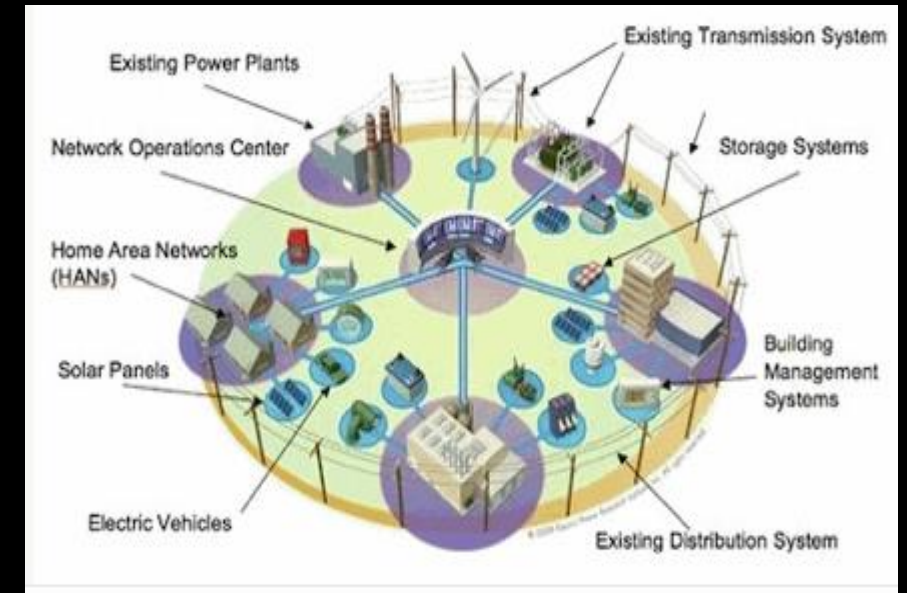


MICROGRID COMMUNITY DEVELOPMENT

- Multiple Renewable Energy Assets
 - Community Solar Farms
 - Community Wind and Hydro Generation
 - HYDROGEN Generators
 - Fuel Cells and Combined Heat and Power systems
 - **Net Positive Energy NANOGRID Buildings "SOL LUX ALPHA"**
- Site based **and** Grid Scale Energy Storage
- "Smart Grid" COMMUNITY based Energy Management Systems

BENEFITS;

- Scalable and expandable, **Organic** Growth. Start small and add as needed and as funds become available.
- Connect to, or "island" from the larger Grid (for RESILIENCE),
Creating an interconnected "Grid of Microgrids"
- Isolated communities (Islands) and those at the end of Grid feeder lines
- CEC Roadmap for Microgrids;
<http://www.energy.ca.gov/research/microgrid/documents/index.html>



BENEFITS AND DIVIDENDS\$

FINANCIAL IMPACT; @ BUILDING SCALE (Nanogrids)

- Lower Operational Costs (No energy bills)
- Revenue from excess energy export (HOA **dividends??**)
- FREE and RENEWABLE Transportation Energy (100% R.E. EV Charging)



= **Higher Appraised Property Values**

MICROGRID BENEFITS AND DIVIDENDS\$

- **SOCIAL / ENVIRONMENTAL IMPERATIVE to DECARBONIZE**
- **CO2 & GHG ELIMINATION IN BUILDINGS - LIVING & WORKING + TRANSPORTATION SECTORS = 70% OF GLOBAL GHG EMISSIONS**
- **CLIMATE CHANGE REVERSAL**
- **BUILDING and COMMUNITY ENERGY RESILIENCE for disaster preparedness**
(Harvey, Irma, Maria, Florence, Mangkhut)
- **NATIONAL and GLOBAL ENERGY RESILIENCE and SECURITY**
- **NO MORE REASON FOR ENERGY CONFLICTS (WARS OVER FOSSIL FUEL ENERGY)**
- **“PEACETIME” NATIONAL Budget Shift from “Military” to modernizing our “National Energy Infrastructure”**



NATIONAL & GLOBAL BENEFITS AND DIVIDENDS

FINANCIAL IMPACT; @ COMMUNITY / NATIONAL / GLOBAL SCALE

- No New Powerplant investment + Transmission lines & losses
- PERMANENT and LOCALIZED Employment gains in Energy
- ZERO CARBON EMISSION Projects for Regional Mass Transit
- Better Community / National Health (Reduced medical costs)
- Reduced costs of Climate Change Mitigation and “Damage Control” & Rebuilding from Extreme Weather Events

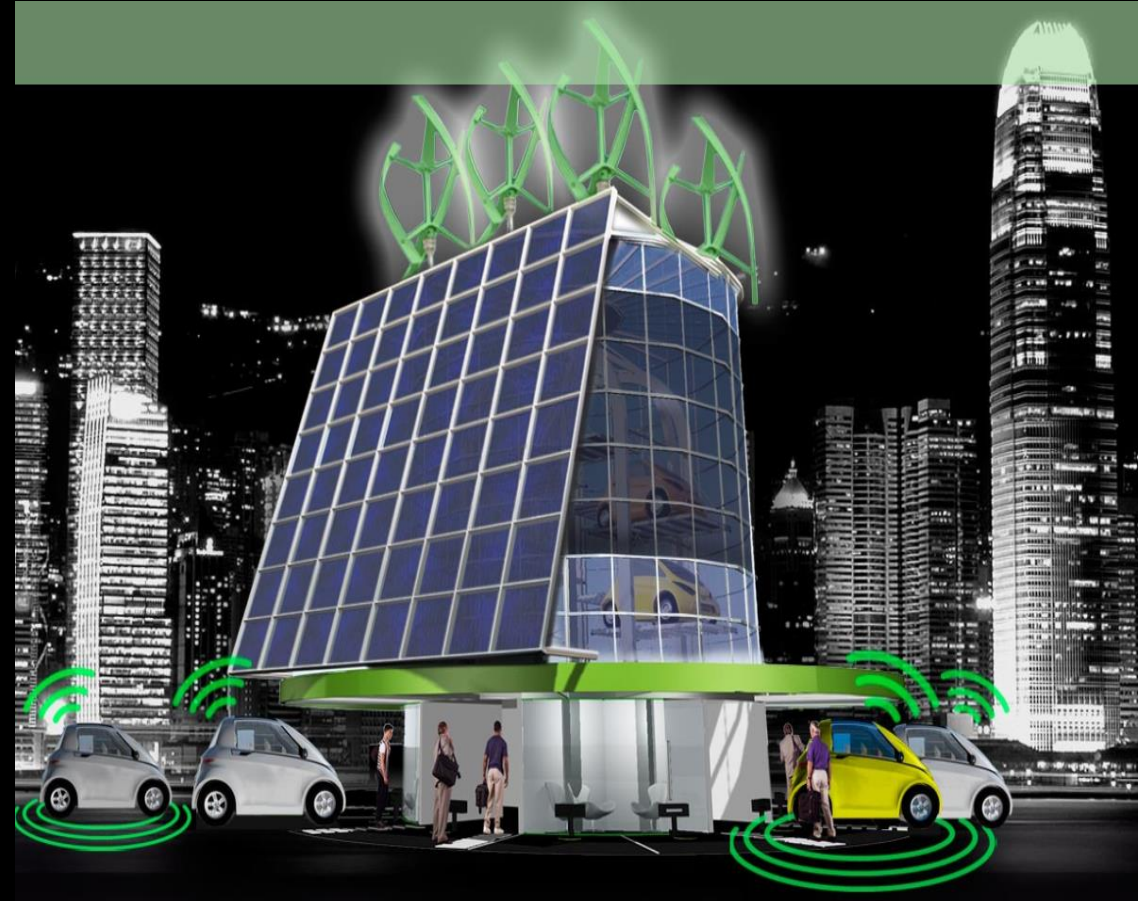
= **Higher GDP and GNH “Gross National Happiness”**





NEXT GENERATION PROJECTS

- FULL DC systems (reducing inverter losses)
- Energy recapture (from waste, water and?)
- Light Energy recapture
- V2B and V2G integration
- AEV + V2B integration
- “Energy Hub” developments for Communities and Campuses.
- AEV – V2B Car shares and Mass Transit



PROJECT CERTIFICATION PARTNERS

SOI-LUX ALPHA Achieved the first ever “Alternate Path of Compliance” to the *S.F. Green Building Code* by certification with;

- **Phius+ Source Zero** Certification
- **US DOE – ZERH** Zero Energy Ready Home Program Certified
- US EPA **WaterSense** Certified
- **2018 US DOE Housing Innovation Award WINNER – Multi Family Category**

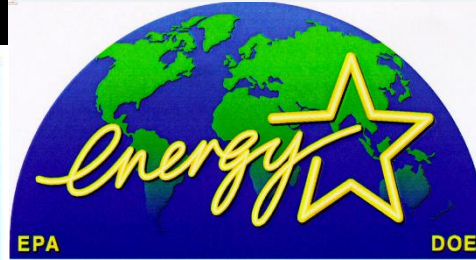
±C



PHIUS+ SOURCE ZERO

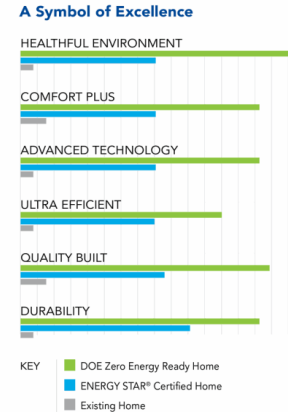


Passive House Institute US
Homes to the Power of **ZERO**



What is the DOE Zero Energy Ready Home™ Label?
It is a Symbol of Excellence for energy savings, comfort, health, quality, and durability met by a select group of leading builders meeting U.S. Department of Energy Guidelines.

What is a Zero Energy Ready Home?
It is a high-performance home so energy efficient, all or most annual energy consumption can be offset with renewable energy. In other words, it is the Home of the Future.



U.S. DEPARTMENT OF **ENERGY**

THANK YOU !

QUESTIONS?

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