

Two Design Approaches for Neighborhood Resilience

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architects

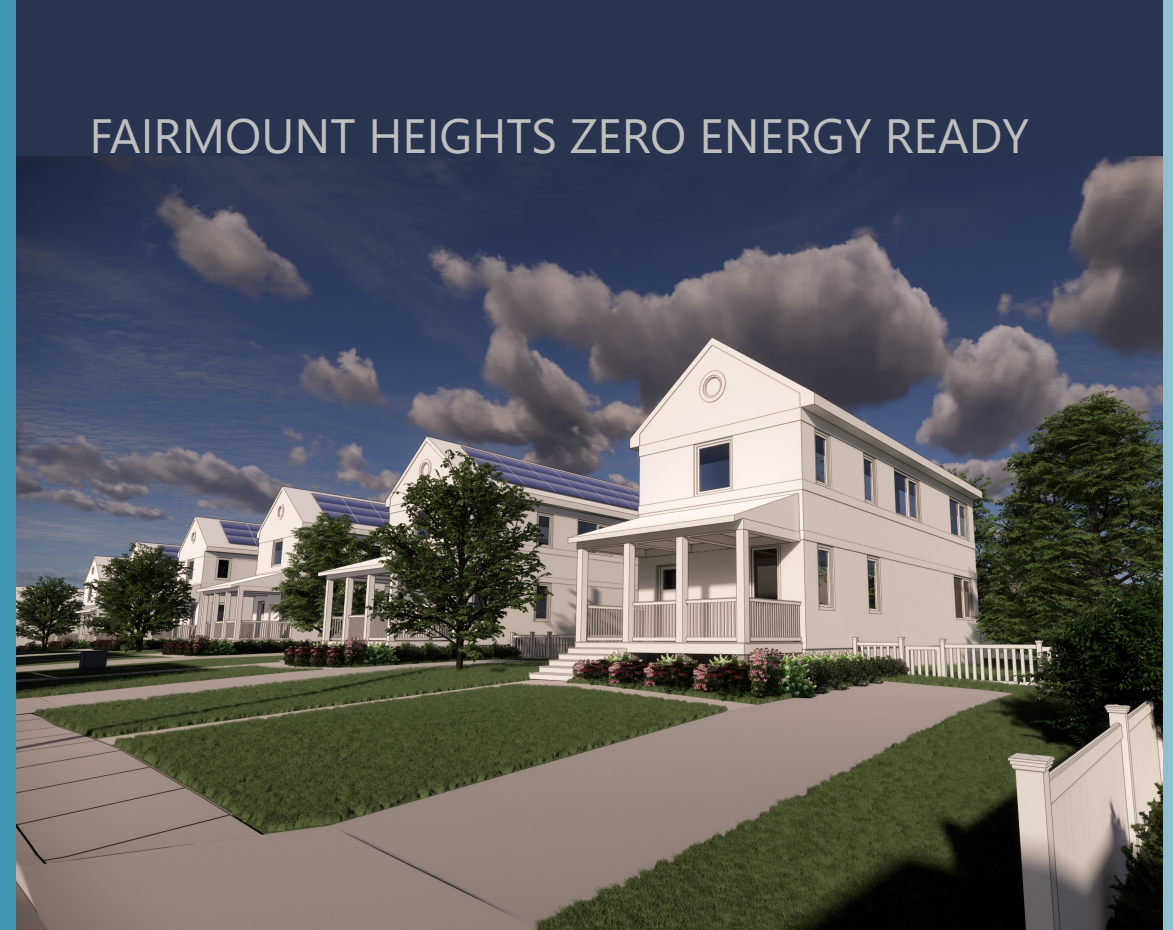
 **INTERFACE**
ENGINEERING

A tale of two microgrids...

ARLINGTON NET ZERO



FAIRMOUNT HEIGHTS ZERO ENERGY READY

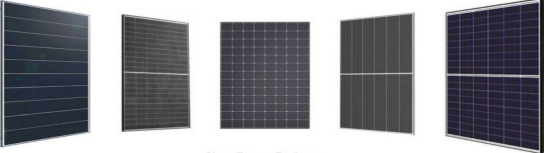


...but first,...

COMPONENTS OF A MICROGRID

Generation / Storage / Control / Distribution

Generation



Clean Energy Reviews

Storage



Control



Distribution/Loads



Image Courtesy: cleanenergyreviews.info

DC-Coupled = Fewer Conversions + Higher Efficiency = More Energy

DC-Coupled Solution = 1 Conversion

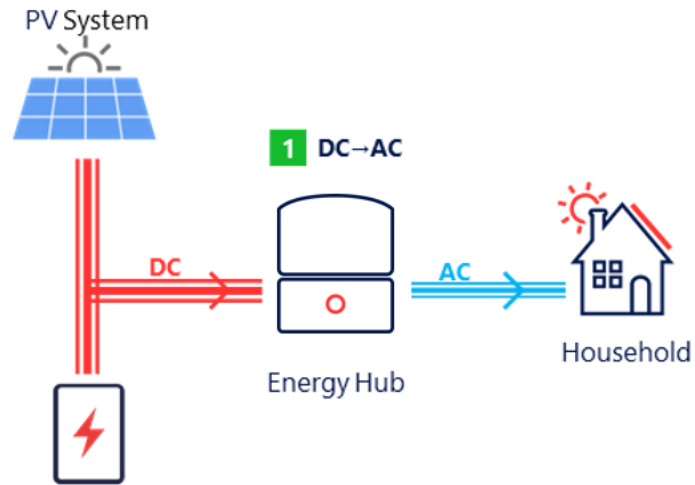
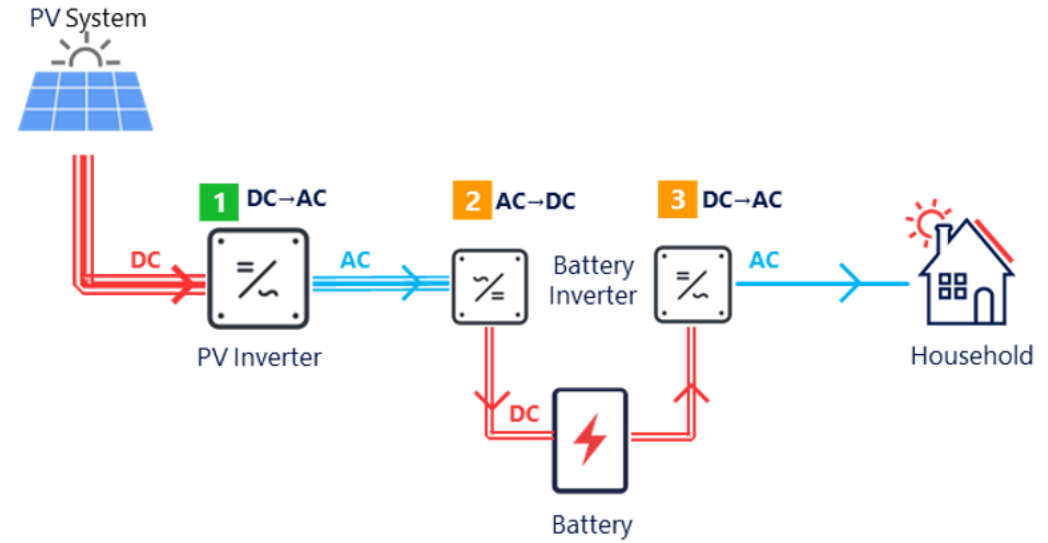


Image Courtesy: solaredge.com

AC-Coupled Storage Solution = 3 Conversions



VS.

SINGLE-FAMILY CUSTOM PASSIVE HOUSE

ARLINGTON NET ZERO

SINGLE-FAMILY CUSTOM PASSIVE HOUSE

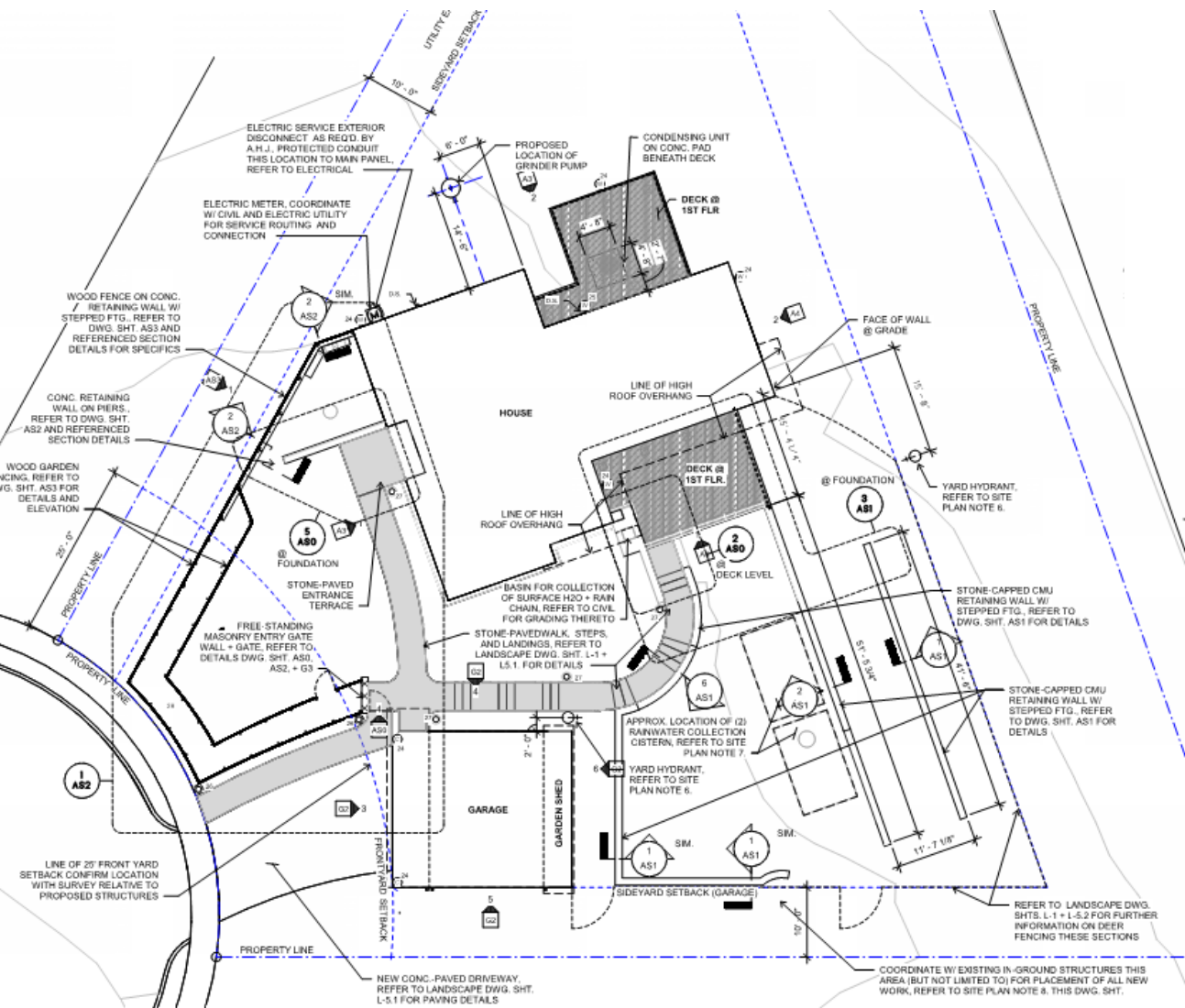


ARLINGTON NET ZERO

SINGLE-FAMILY CUSTOM PASSIVE HOUSE

SIZE:	3,900 SF ~3 Bedrooms; 3-½ Baths
FOOTINGS:	4" high density EPS below (R-20) 4" EPS at sides (R-20)
SLAB:	4" concrete with 4" EPS below (R-20)
FOUNDATION:	10" concrete with 4" EPS outside, 2" EPS+ 3-1/2" batts inside (R-44)
WALLS:	Double studs with 9-1/4" blown fiberglass + 4" EIFS outboard (R-48)
ROOF:	14" sloped wood trusses w/ loose-filled fiberglass and 3" ISO (R-69)
WINDOWS:	Zola triple-glazed Thermo Wood (R-6)
AIRTIGHT LAYER:	Outside face of sheathing, liquid-applied
MECHANICAL:	Central ducted HP system (17.8 SEER) Zehnder Q450 ERV
HOT WATER:	Rheem hybrid heat pump water heater
SOLAR:	10.4 kW of Solaria panels SolarEdge HD-Wave inverter LG Chem RESU 10H 9.8 kWh battery
AIRTIGHTNESS:	0.77 ACH @ 50 Pascals





Solar System

- Rooftop Solar on House
- Future provisions for Garage

Battery Storage System

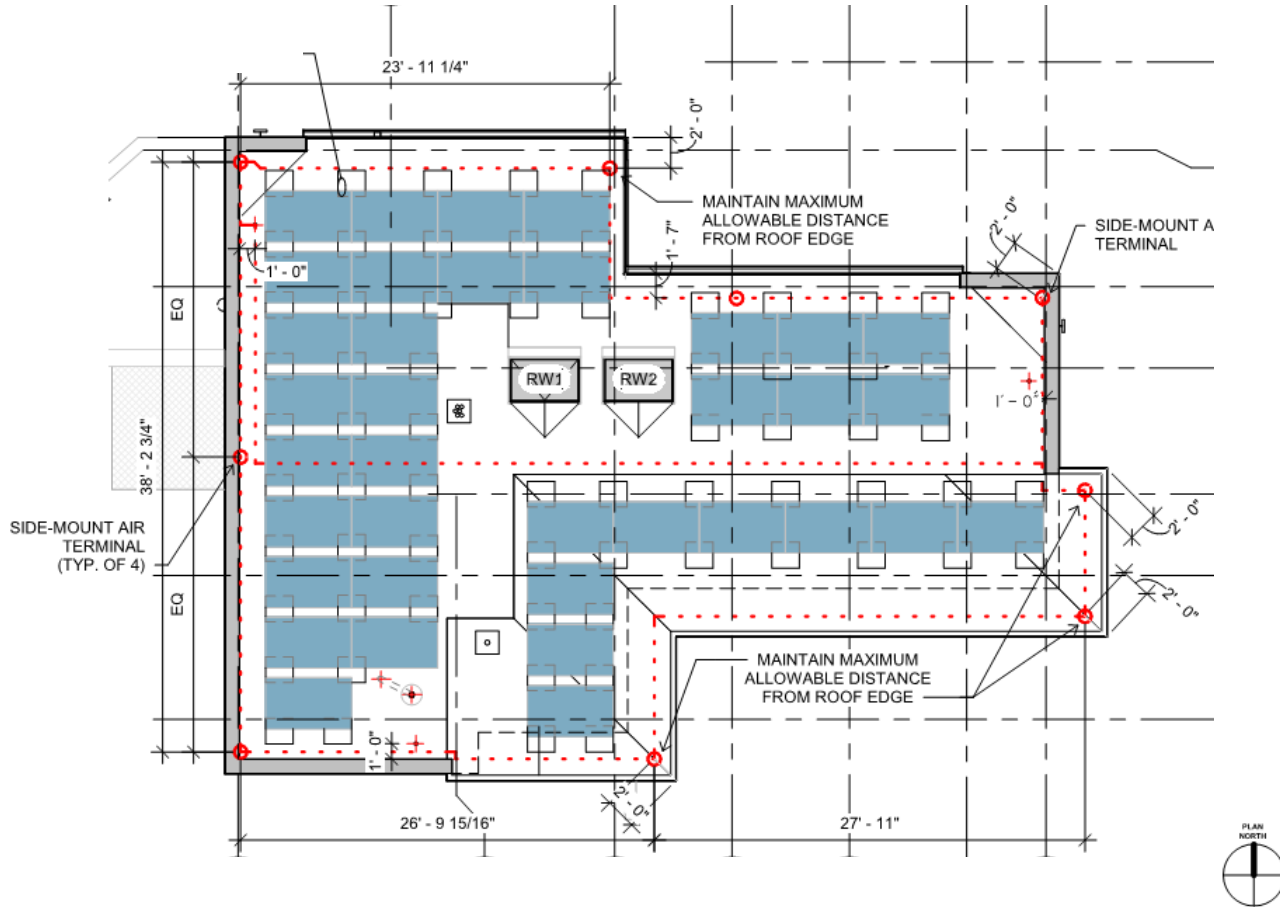
- Located in House
- Future provisions for garage

Control

- Allows for multiple control algorithms improving grid autonomy and islanding

Distribution/Loads

- Assessed DC loads for inclusion including;
 - Lighting
 - Receptacles
 - Appliances
 - HVAC



Solar System

- Sized for net zero energy annual basis (13.5kW DC)

Battery Storage System

- Sized to minimize clipping, maximize storage from self production
- 14kW / 2 x 16kWh Li-ion batteries

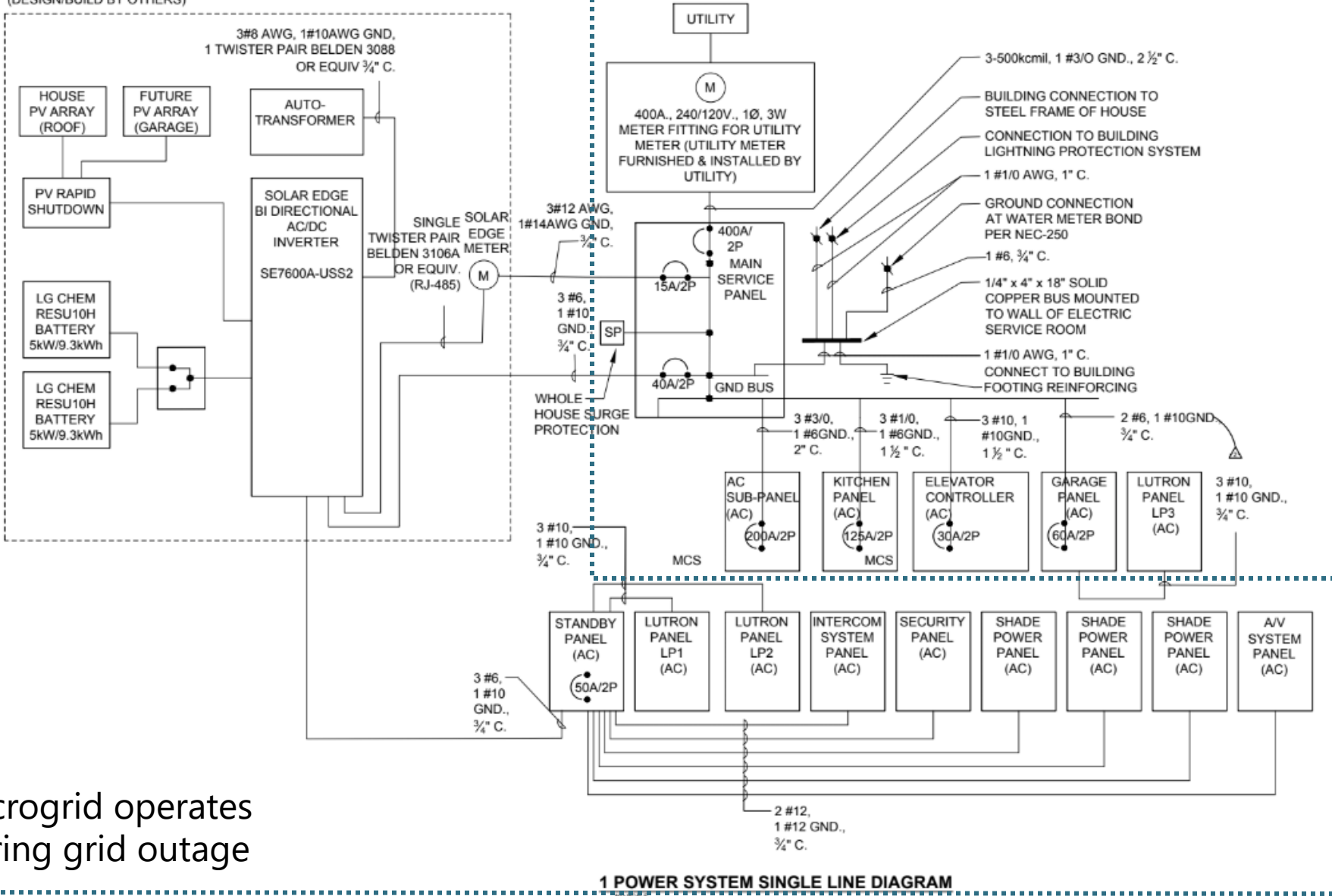
Control

- 2 x 6kW Bi-Directional Inverters
- Automatic Transfer Switch

Distribution/Loads

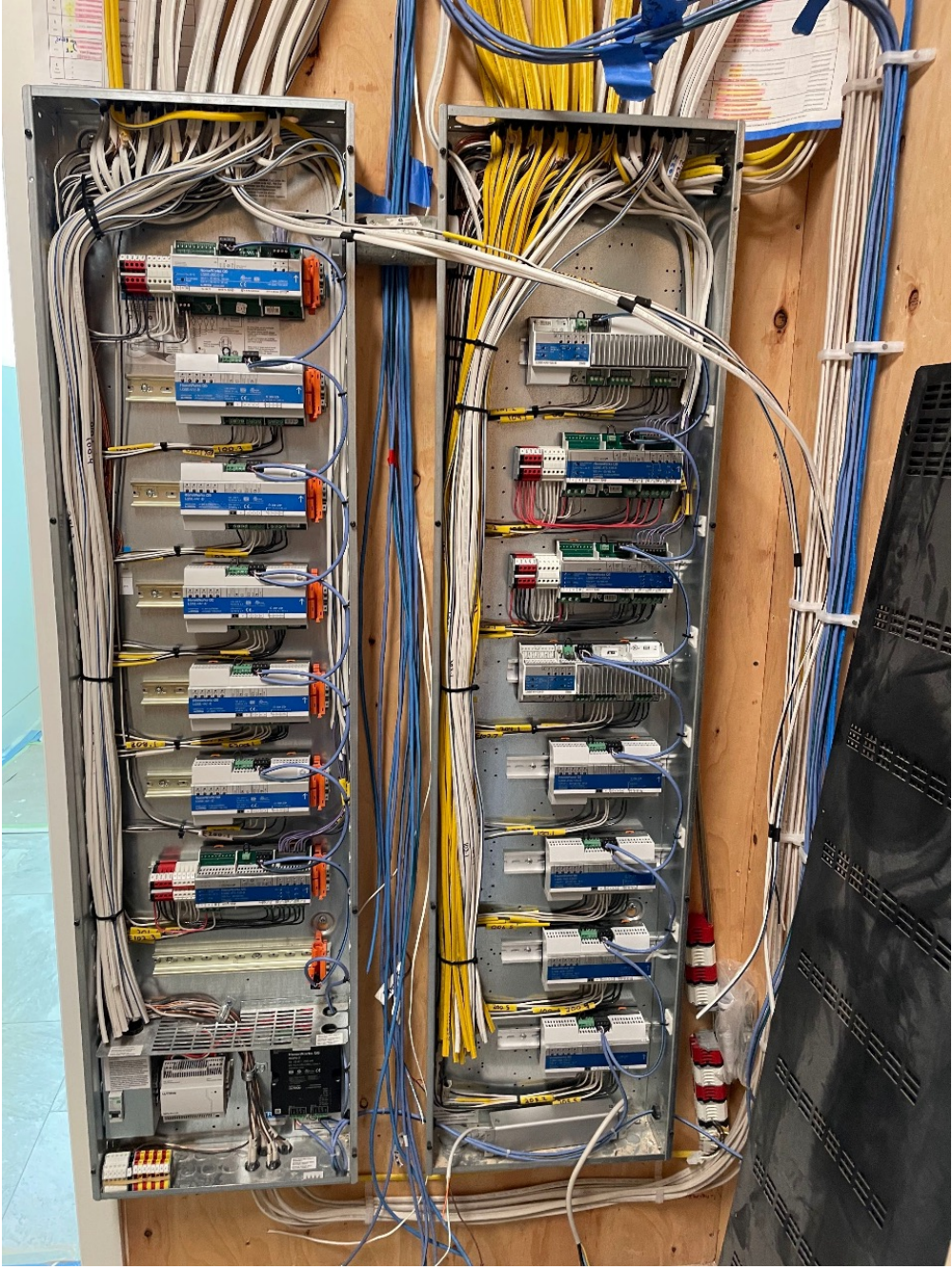
- Standby Panel
- Sized for owner defined critical loads
- Sun shades to control heat gains
- Some kitchen appliances to warm / keep food fresh

PRE-ENGINEERED SYSTEM PROVIDED
BY STANDARD ENERGY SOLUTIONS
(DESIGN/BUILD BY OTHERS)



1 POWER SYSTEM SINGLE LINE DIAGRAM

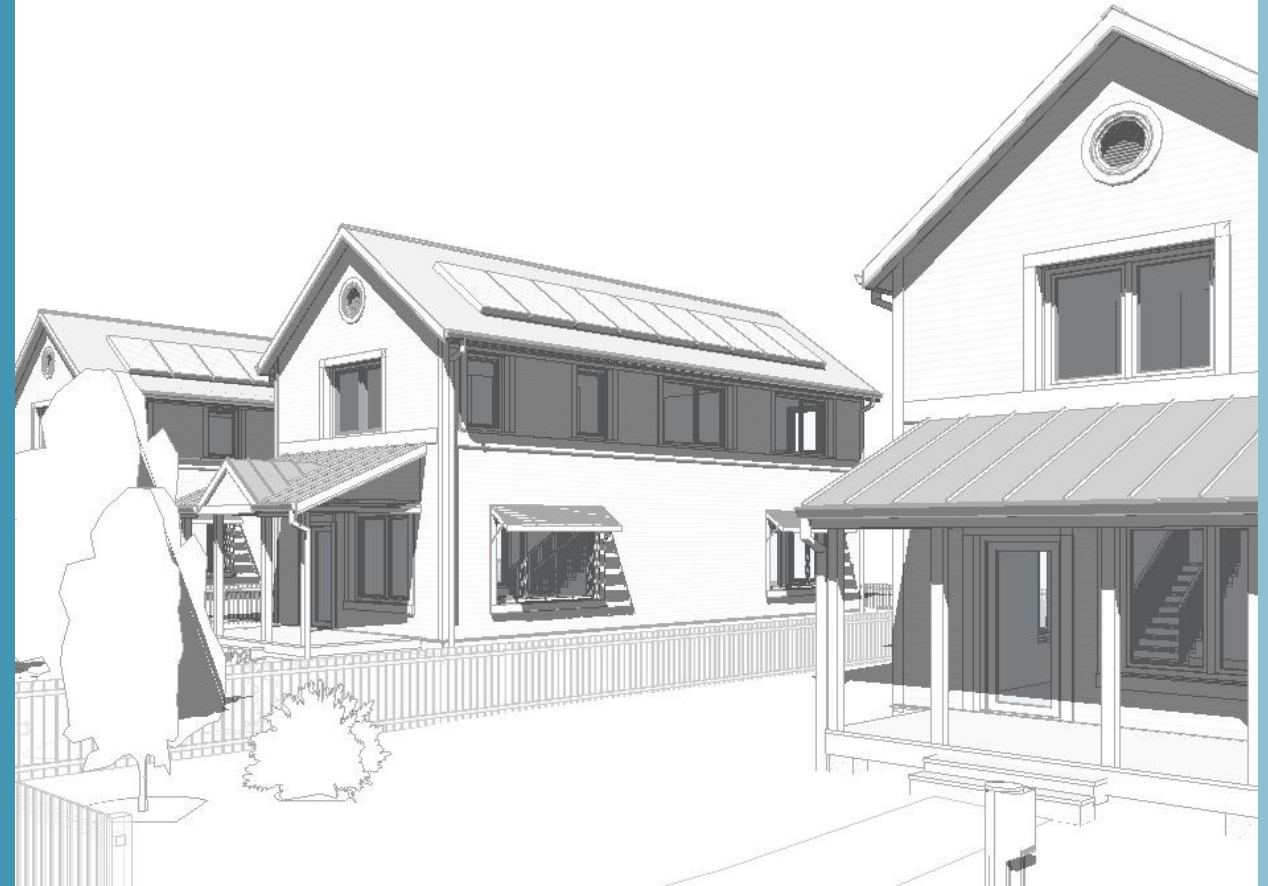
Microgrid operates during grid outage



COMMUNITY-INTEGRATED ZERO ENERGY READY
MICROGRID DEVELOPMENT

FAIRMOUNT HEIGHTS ZERO ENERGY READY COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID

SIZE:	1,800 SF ~3 Bedrooms; 2-½ Baths
CRAWLSPACE W/ SLAB:	4" concrete with 4" EPS below (R-20)
FOUND./STEM WALL	10" concrete with 4" EPS outside, 3" EPS+ 3-1/2" batts inside (R-44)
WALLS:	2x6 woodstud walls w/ blown fiberglass + 1" ISO outboard
ROOF:	11-1/4" ceiling cavity w/ dense- pack fiberglass and 3" ISO
WINDOWS:	Intus triple glazed uPVC
AIRTIGHT LAYER:	Outside face of sheathing, Huber Zip System
MECHANICAL:	Central ducted HP system (17.8 SEER) Zehnder Q450 ERV
HOT WATER:	Rheem hybrid heat pump water heater
SOLAR:	10.4 kW of Solaria panels
AIRTIGHTNESS:	TBD (target: 0.59 ACH @ 50 Pascals)



FAIRMOUNT HEIGHTS ZERO ENERGY READY COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID

Goals

Six, DOE Zero Energy Ready
PHIUS Design Approach (Not certified)
DC Microgrid Community
Maximize use of DC

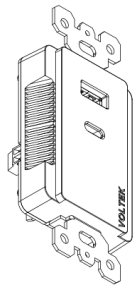
Challenges

Affordable Homes
Grant Funded
Regulations around DC metering
Sensitive budget



Single Line Diagram for in house AC and DC Microgrid

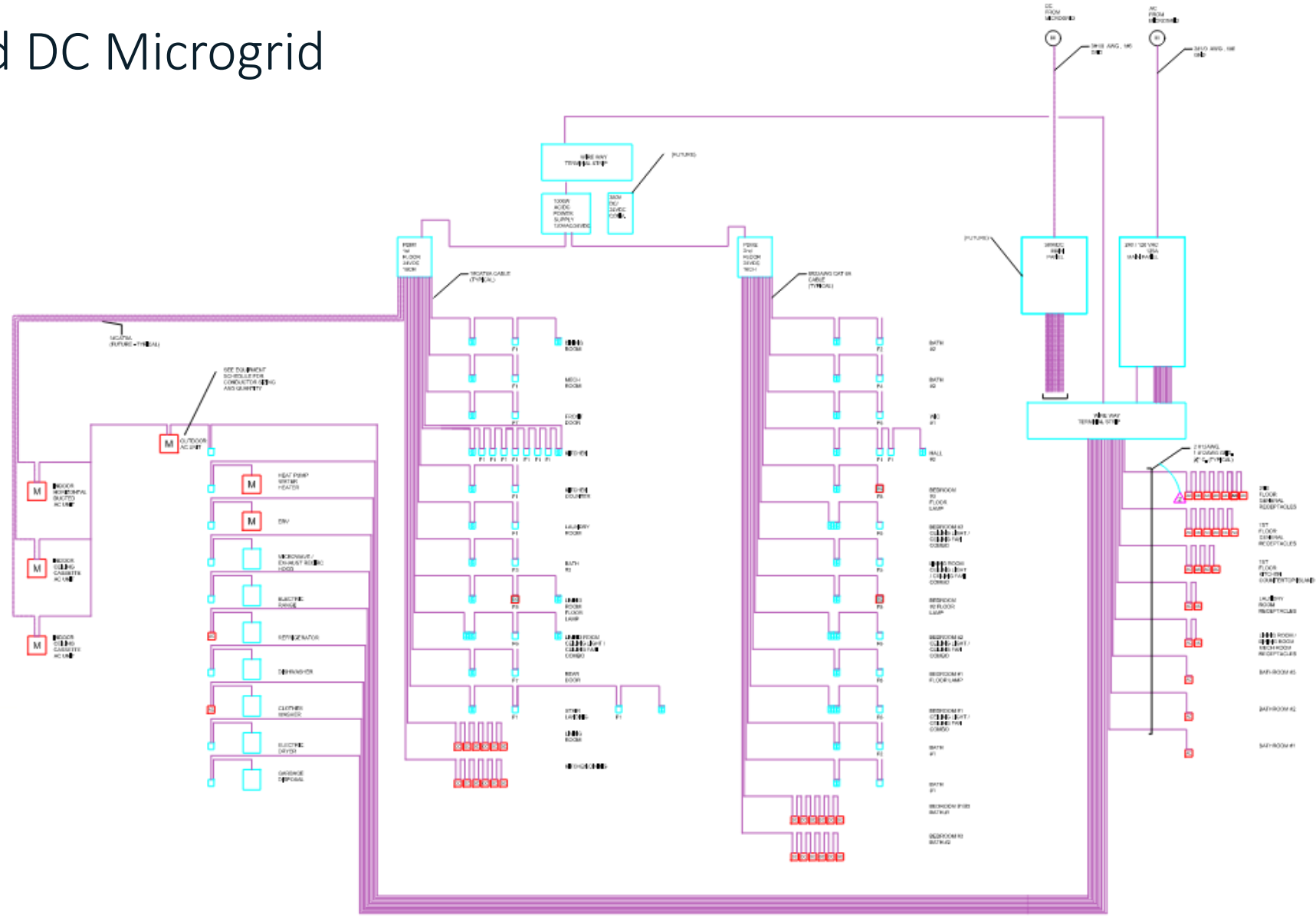
GENERAL SHEET NOTES



zehnder
always the best climate



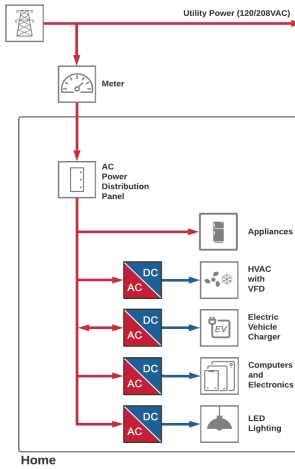
60 inches (1.52 m)
14 lbs. (6.35 kg)
17 lbs. (7.7 kg)
0.5 @ 12VDC
0.78 @ 24VDC



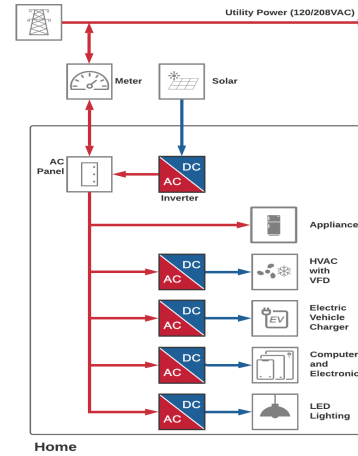
1 POWER SYSTEM SINGLE LINE DIAGRAM (TYPICAL)
NO SCALE

Single Line Diagrams for site AC and DC microgrid

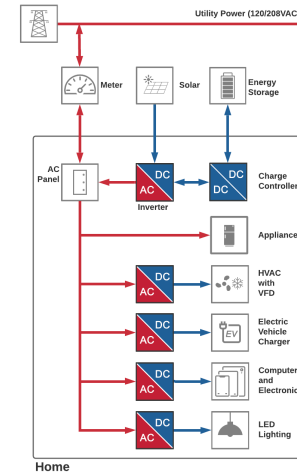
Option 1



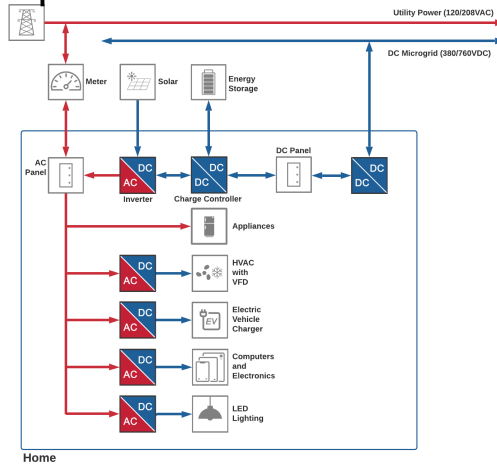
Option 2



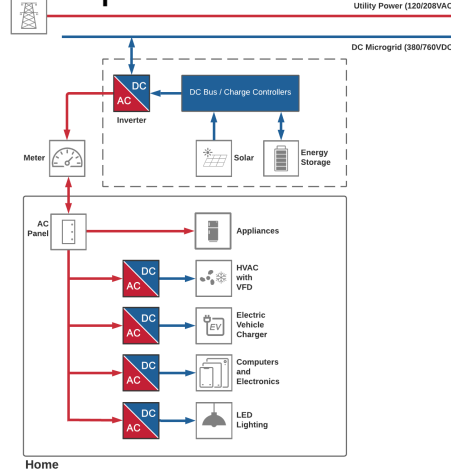
Option 3



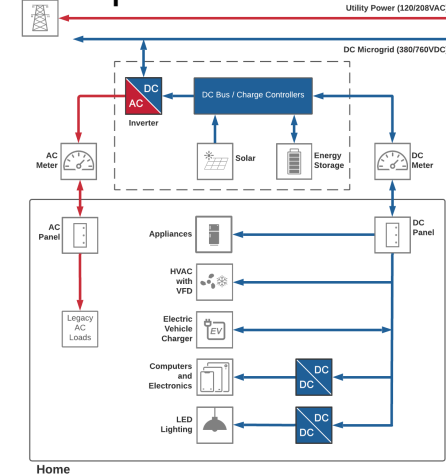
Option 4



Option 5

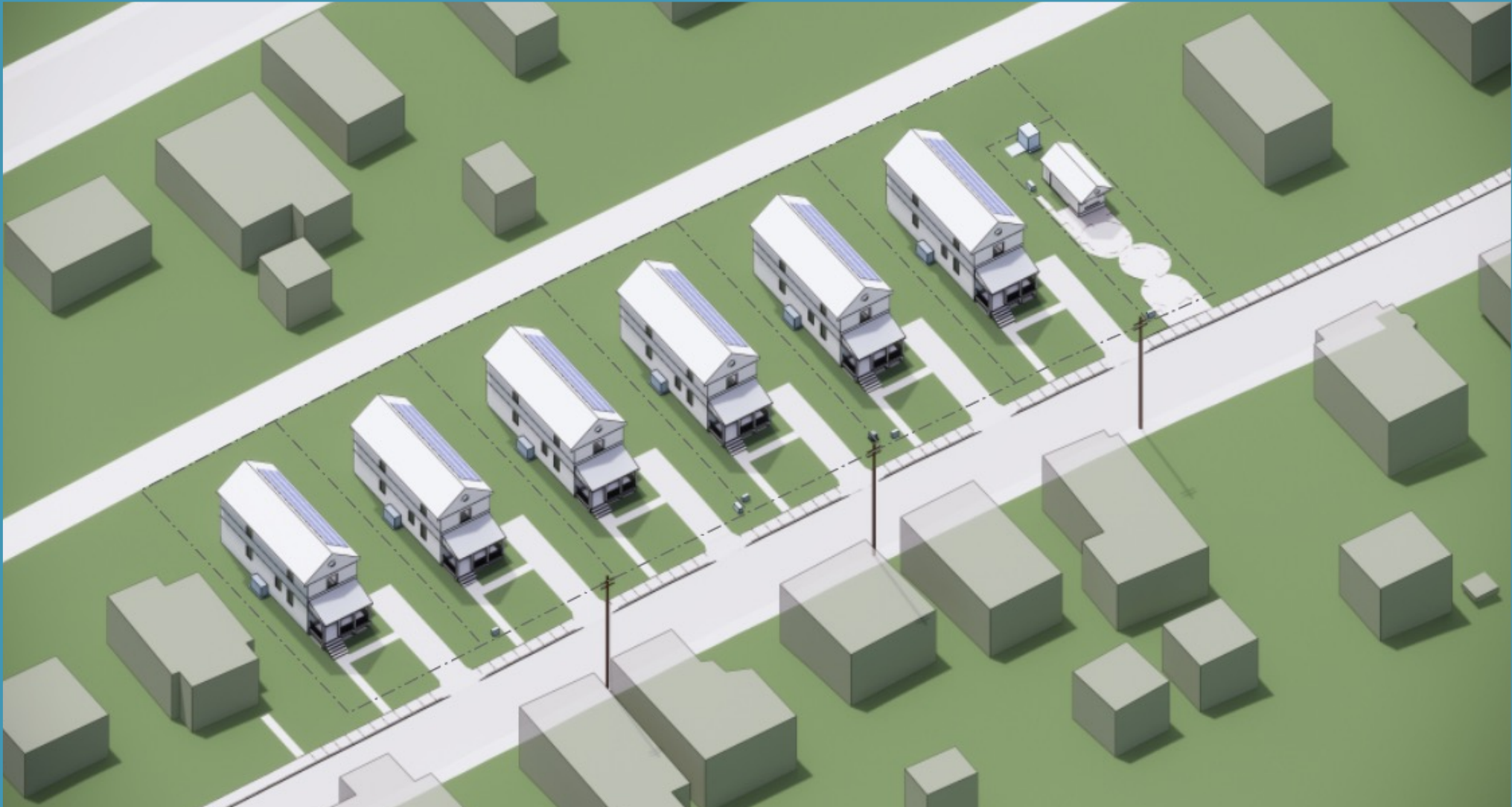


Option 6



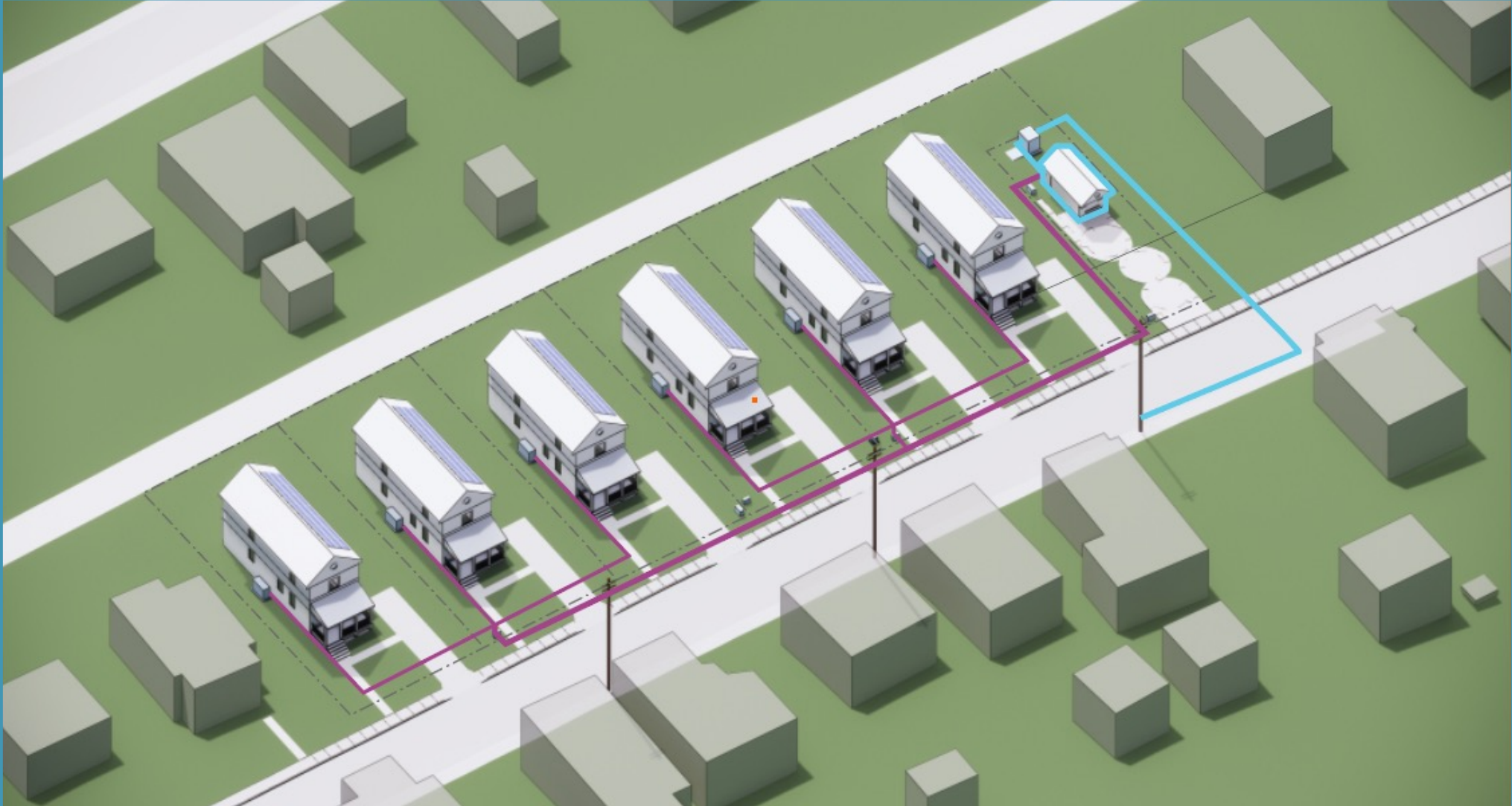
FAIRMOUNT HEIGHTS ZERO ENERGY READY

COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID



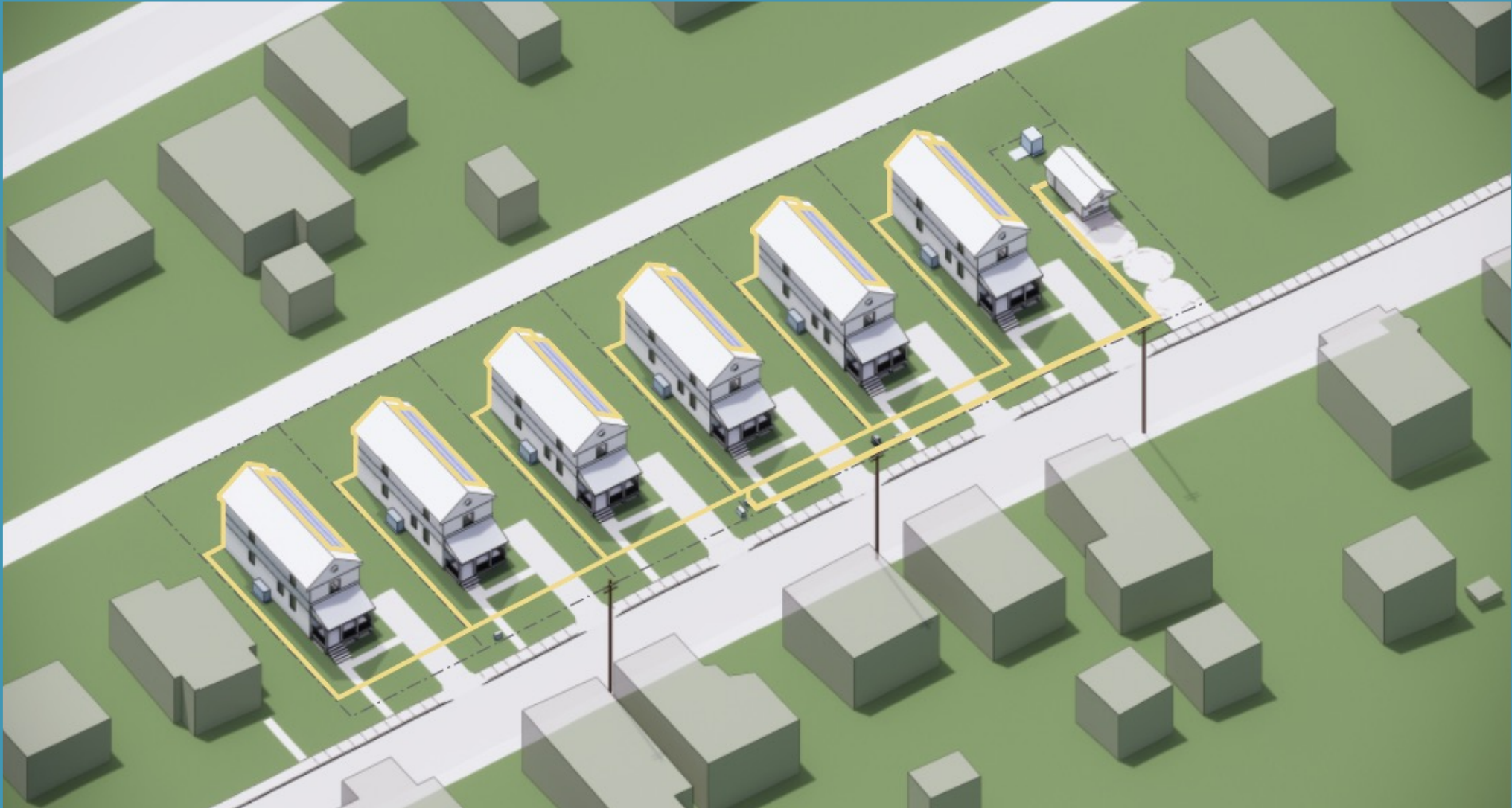
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COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID

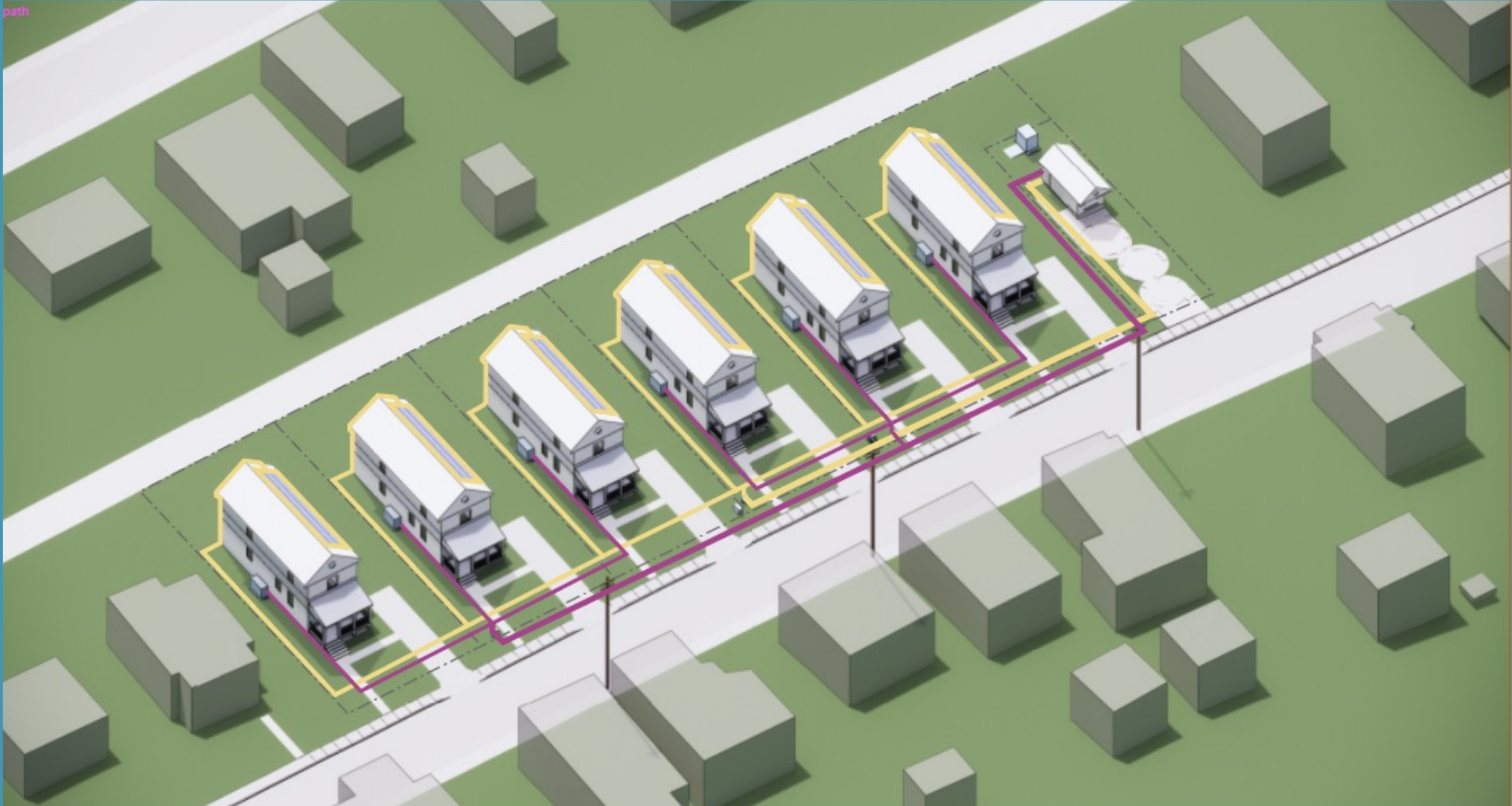


FAIRMOUNT HEIGHTS ZERO ENERGY READY

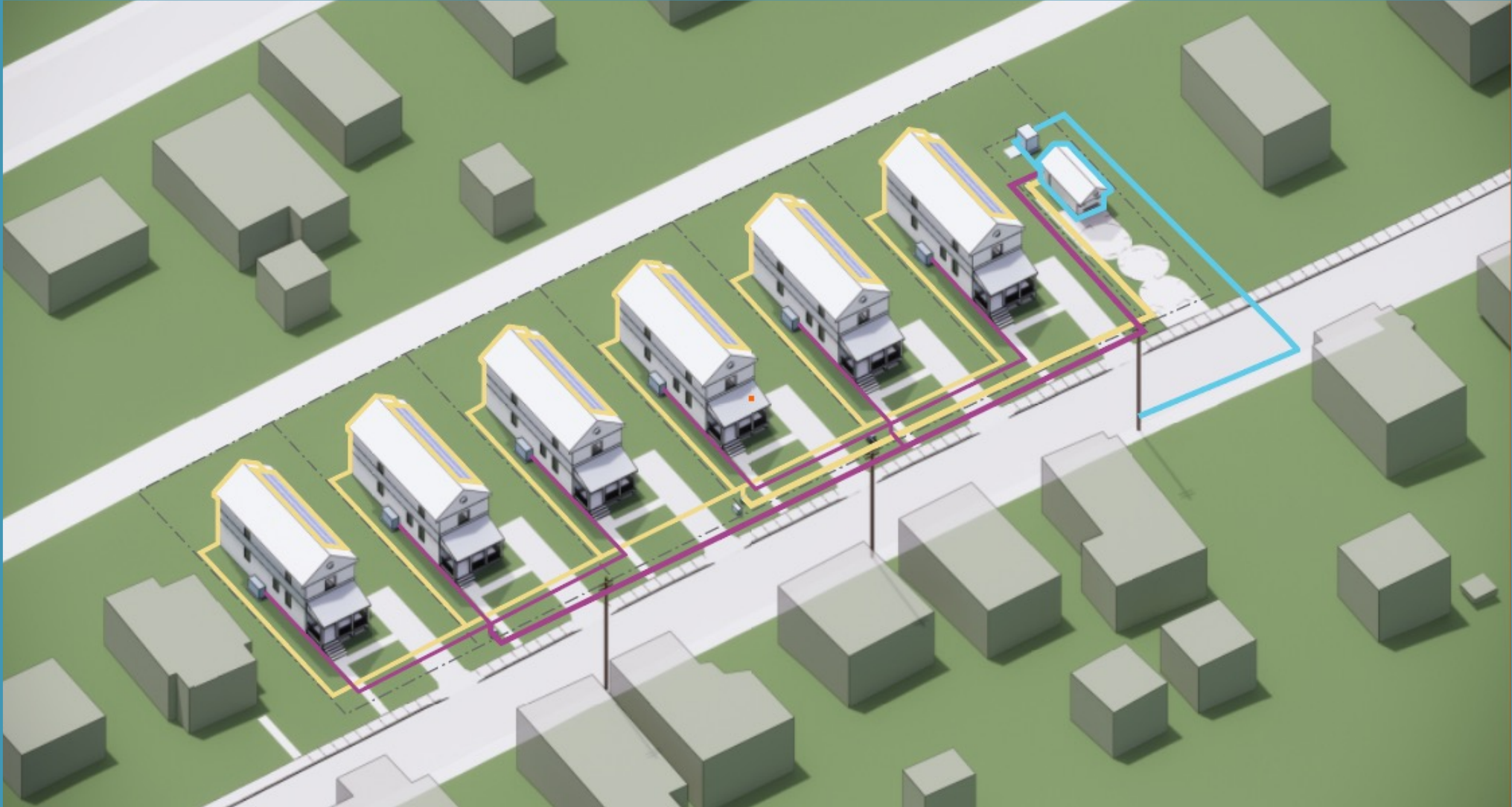
COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID



FAIRMOUNT HEIGHTS ZERO ENERGY READY COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID

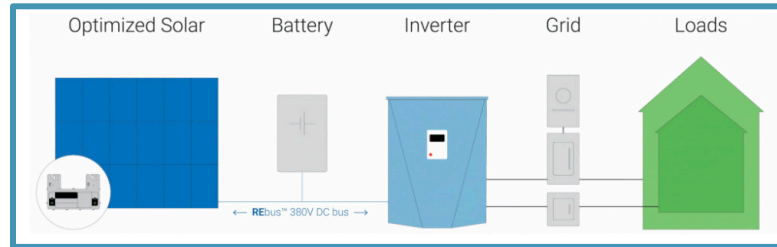


FAIRMOUNT HEIGHTS ZERO ENERGY READY COMMUNITY-INTEGRATED ZERO ENERGY READY MICROGRID

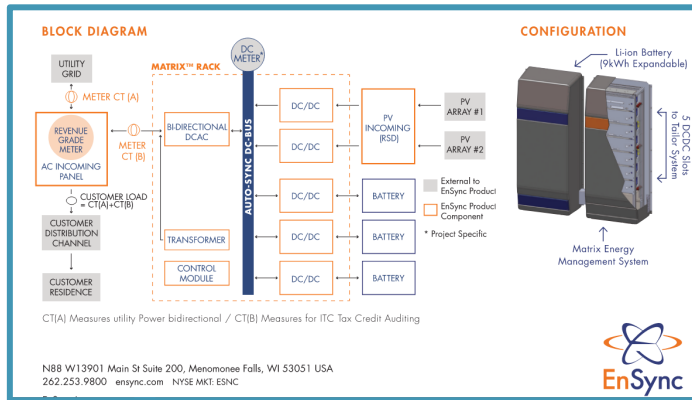


LESSONS LEARNED/TAKE AWAYS

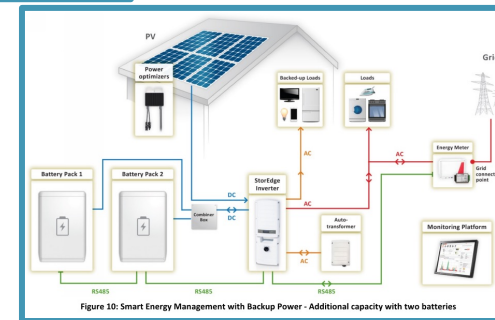
Arlington Net Zero



PIKA Harbor REBus by Panasonic Bought and sold...



EnSync Matrix Energy Bankrupt...



Solar Edge DC Coupled - Limited DC

ARLINGTON NET ZERO

Fairmount Heights Community Microgrid

DC Appliances and MEP Infrastructure market is not yet mature for Residential

Limited access to products may limit service, maintenance and replacement

Potential to limit equity until more widespread adoption and options

Emerge Alliance working on this, Manufacturers moving towards it;

Class 4 power
Dual input ratings for appliances (one appliance, accepts both AC and DC, only one SKU for retailer to stock)

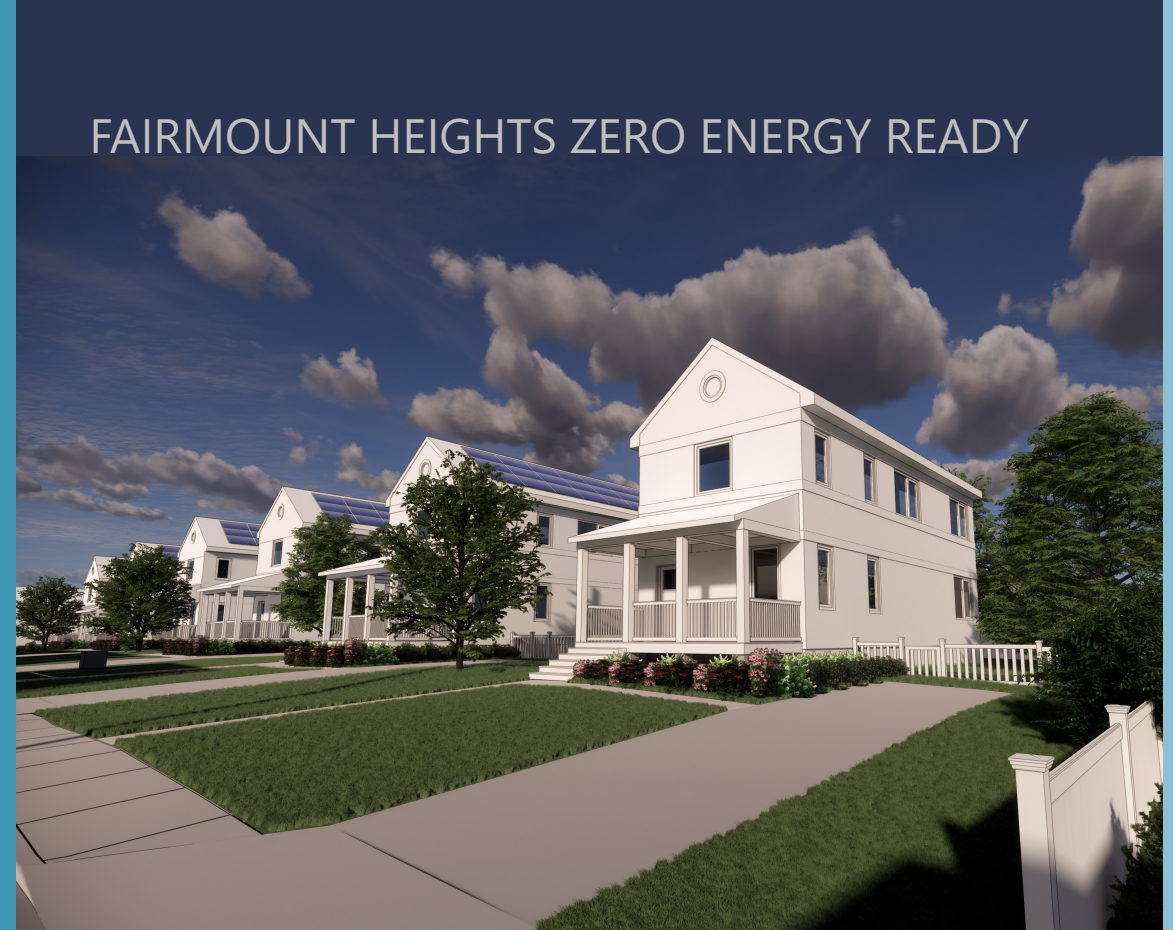


CLIENT RESPONSES TO FUTURE READINESS

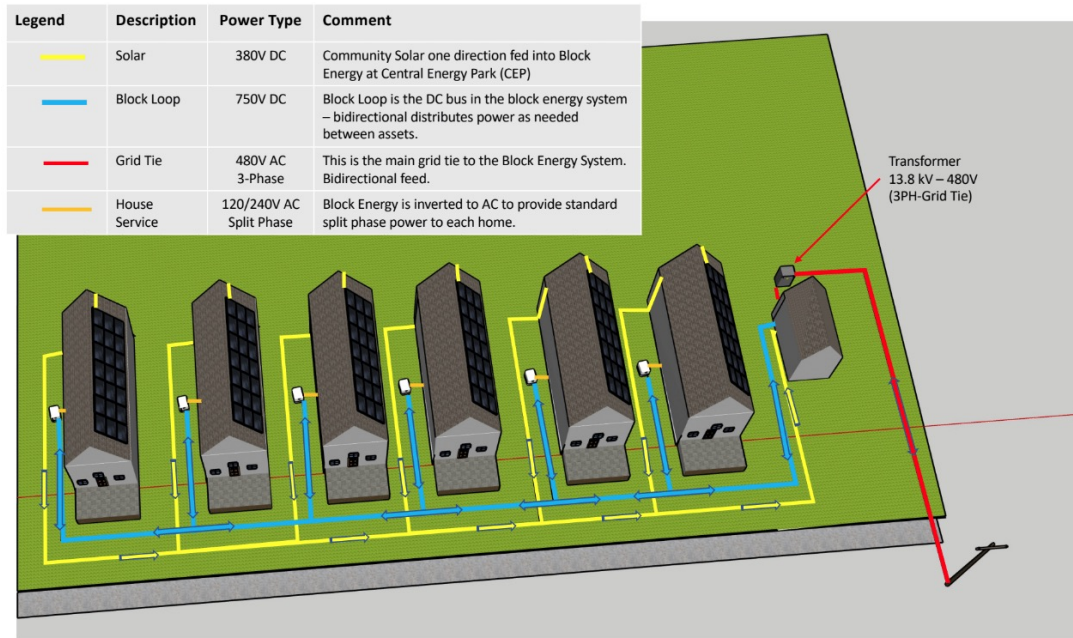
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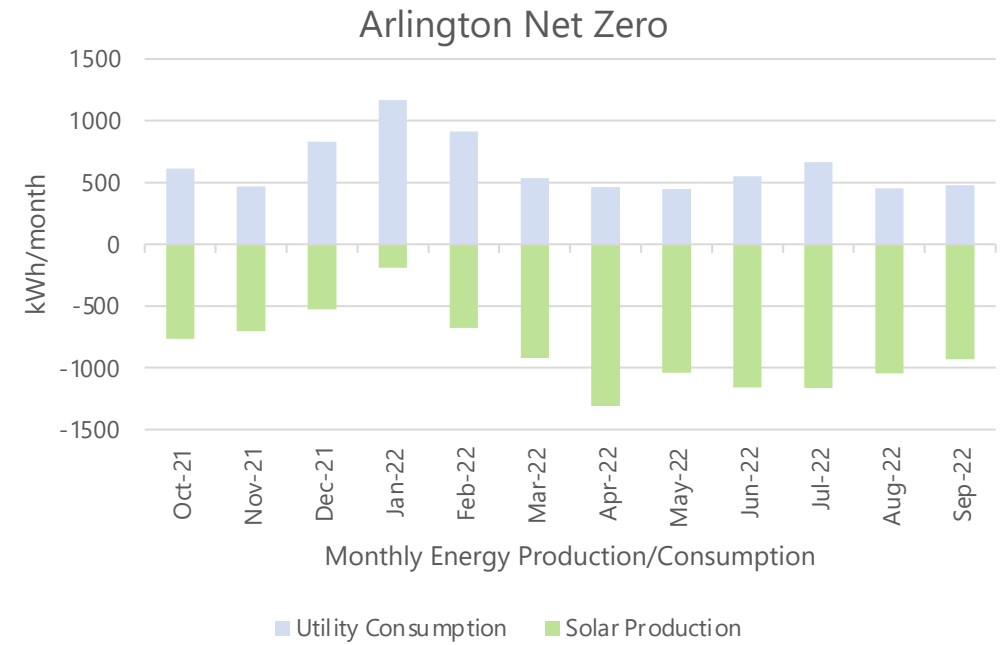
FAIRMOUNT HEIGHTS ZERO ENERGY READY



WHAT WERE THE MISSIONS OF EACH CLIENT?



Fairmount Heights Community Microgrid



Arlington Net Zero, Single-family Residence

THANK YOU.

