

# DR13.05: Grid Integration of Zero Net Energy Communities

## OPPORTUNITY

What is the potential for ZNE Communities?

The State of California has set ambitious targets for greenhouse gas (GHG) reduction goals through landmark Assembly Bill (AB) 32. A key component to meet these targets is the Long-Term Energy Efficiency Strategic Plan, which set a goal that all new homes in California be Zero Net Energy (ZNE) by 2020.

## TECHNOLOGY

How does a ZNE Community work?

The typical ZNE home design is engineered to increase energy-efficiency of the envelope, space conditioning and water heating equipment, kitchen appliances, and lighting, and then add sufficient PV on the roof to attain zero TDV. The community will have many ZNE homes which have different grid distribution needs and load profiles than a normal community.

## M&V

Where did Measurement and Verification occur?

This project used data collected from connected devices. Today, common household devices such as thermostats and circuit panel metering log data on customer preference, indoor and outdoor environmental information, and system performance. This data can be readily available to both customers and third parties. This project incorporated a platform consisting of a combination of local and cloud-based data acquisition of multiple end-use devices.



## RESULTS

How did ZNE homes perform in M&V?

### Cost Effective

Up to \$22,000 in upfront costs can be offset with less than \$100 in monthly energy savings over a typical 30-year mortgage. This also emphasizes the importance of managing trade-offs in energy efficiency to manage the additional cost for ZNE.

### Electrification of Heating Loads

For optimal customer economics, it's preferable to keep PV annual production at 85-90% of total annual electric use. However, average PV production is larger than the typical electric load of a gas heated residence. This can be solved by electrifying the heating loads, increasing the total annual electricity usage.

### Customer Side Energy Storage Not Cost Effective

Energy storage systems total cost, excluding installation, was around \$20,000. While there is some value to customers in terms of backup power, it is not sufficient to offset the cost at scale. Most of the value for energy storage lies in grid scale storage – either at transformers, specific feeder locations, or at substations.

### Grid Integration and Distribution Planning

The impacts on the various elements of the distribution network such as secondary wires, transformers, laterals, switches (load blocks), feeders, and substations can differ. The backfeed from PV mainly impacts protection mechanisms at the switches and substations as well as secondary wire size, while the load variability, system peaks and EV penetration will impact all elements of the distribution system.

## DEPLOYMENT

What are the recommendations moving forward regarding ZNE homes and communities?

In California, the project team is leveraging these learnings in a new EPIC funded project to build community scale ZNE. This project will scale the first ZNE neighborhood into the first few communities, implementing ZNE communities in Orange County, Fresno, and the Bay Area with multiple builders. These initiatives will substantially help develop planning processes for ZNE communities and will help prepare for California's future of high PV penetration with ZNE communities.