Residential Zero
What We’ve Learned From the Market Leaders

1. Residential ZE by the Numbers
2. ZE Builder Insights
3. ZE Designer Tips
4. ZE Builder Tips
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1. Residential ZE by the Numbers

ZE Homes Are Going Exponential!

13,906 units

+70%

+33%

< 2015 2016 2017

Plus: 33,324 units planned in 44 projects, including:

- 21,500 units in Santa Clarita, CA (Newhall Ranch, FivePoint)
- 5,000 units in Waterset, FL (EcoVillage Waterset, Planet Greenenergy)
- 2,900 units in Prescott Valley, AZ (Jasper, Mandalay Homes)
- 1,900 units in London, ON (West 5 - Phase 2, Sifton Properties)

http://netzeroenergycoalition.com/zero-energy-inventory/
ZNE development intensity is highest where there are advanced energy policies and market leaders.
Big Projects Drive Top 10 ZE Cities

<table>
<thead>
<tr>
<th>Rank</th>
<th>City</th>
<th>Biggest Project</th>
<th>Developer/Builder</th>
<th>Units</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Sacramento, CA</td>
<td>Northwest Land Park</td>
<td>Ranch Capital LLC</td>
<td>800</td>
<td>SF</td>
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<tr>
<td>2</td>
<td>Vancouver, BC</td>
<td>Alberni Towers</td>
<td>Recollective</td>
<td>358</td>
<td>MF</td>
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<tr>
<td>3</td>
<td>Davis, CA</td>
<td>West Village Student Housing</td>
<td>UC Davis</td>
<td>662</td>
<td>MF</td>
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<tr>
<td>4</td>
<td>Portland, OR</td>
<td>Ramona Apartments</td>
<td>Walsh Construction Co.</td>
<td>138</td>
<td>MF</td>
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<tr>
<td>5</td>
<td>New York, NY</td>
<td>The House at Cornell Tech</td>
<td>Handel Architects</td>
<td>290</td>
<td>MF</td>
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<tr>
<td>6</td>
<td>Austin, TX</td>
<td>Whisper Valley</td>
<td>Taurus of Texas</td>
<td>237</td>
<td>SF</td>
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<tr>
<td>7</td>
<td>Honolulu, HI</td>
<td>Kalaeloa NZE Community</td>
<td>Tesha Malama</td>
<td>338</td>
<td>MF</td>
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<tr>
<td>8</td>
<td>Clarkdale, AZ</td>
<td>Mountain Gate</td>
<td>Mandalay Homes Inc.</td>
<td>323</td>
<td>SF</td>
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<tr>
<td>9</td>
<td>Washington, DC</td>
<td>Langston Terrace Dwellings</td>
<td>DC Housing Authority</td>
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<td>MF</td>
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<tr>
<td>10</td>
<td>National City, CA</td>
<td>Park Villas</td>
<td>San Diego Community Housing</td>
<td>268</td>
<td>MF</td>
</tr>
</tbody>
</table>

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ZE Builder Insights: Understanding Buyers

Gene Myers
Thrive Home Builders, CO

We have learned to adopt a less-is-more approach. The best example is how we sell health in the home — we show a girl in a high chair with her mom feeding her. The caption is, "The air she breathes is just as important as the food she eats.”

This resonates with buyers and their values.

ZE Builder Insights: Features & Value

Josh Salinger
Birdsmouth Construction, OR

What separates us from other builders in our market is that we’re offering these features – comfort, performance, and quality – at close to cost parity with conventional homes.
ZE Builder Insights: **Simplicity & Savings**

Anthony Aebi  
Greenhill Contracting, NY

Our homes are simpler. This keeps costs down. Our spectrum of buyers all realize that paying a bit more up front will save them in the long run.

ZE Builder Insights: **Building ZE to Save Money**

George Koertzen  
Habitat for Humanity, CA

Some features, like added insulation, do cost more, others cost less. Because we add insulation and reduce air leakage, we can use a ¾-ton heat pump for a 1,200 sf home, instead of the typical 2.5- or 3-ton unit.

We’re saving money by building this way.
ZE Builder Insights: All-electric ZE Homes

Brandon DeYoung
DeYoung Properties, CA

In our EnVision homes, the only gas will be for cooking; we have an induction option and some are upgrading to that. Some plans have a gas fireplace, but many buyers delete it. Gas is plumbed for the dryer, but most buyers choose electric. It’s just a matter of time and consumer education to get to all electric homes.

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**Designer Tip #1: Focus on 3 Key Issues**

A. Thermal Enclosure

B. Efficient Systems (HVAC & DHW)

C. Solar Roof

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**Designer Tip #2: Keep Track of Your Numbers**

- Know how much space you will need for HVAC & other equipment (for a ZE home, this may be more than you are used to).

- Run an energy model **early** and **often**.

- Know how much **PV space** you will need, based on the model; compare with your roof design every time you change the design.
Designer Tip #3: Give Your Construction Docs Teeth

- Develop details for air sealing & exterior insulation
- Draw an air sealing cross section
- Provide specifications for air sealing, insulation installation, & other critical construction quality tasks

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http://pge.com/zne
Builder Tip #1: Weigh Your Trade-offs

- **Super-efficient home, e.g.:**
  - Advanced framing
  - Super-insulated walls & roofs
  - European windows
  - Compact HVAC & DHW distribution
  - Full commissioning
  - less PV
  - more design flexibility

- **Less efficient home, e.g.:**
  - No advanced framing
  - Code-level insulation
  - Garden-variety windows
  - Garden-variety HVAC & DHW distribution
  - No commissioning
  - more PV
  - less design flexibility

Builder Tip #2: Avoid Common Pitfalls

- **Reluctance to update designs**
  - All changes are additive
  - Additive changes add cost

- **Gaps in construction documents**
  - Change orders add to cost
  - Enforcement is difficult

- **Defaulting to standard practices**
  - Performance suffers
  - Habit defeats specs
Builder Tip #3: Get Everyone on Board with ZE Early

Midstream changes will add to effort & cost

Thank you!