Designing a Zero Energy Home
Thomas Dietz, Afton VA

**Homeowner designed project**
- Built in 2016 in Afton VA, no external consultants
- Features heavy insulation, geothermal HVAC, energy efficient windows, lighting and appliances
- Wine cellar chiller run off geothermal loop
- 15 KW solar array on barn and quilting studio
- HERS score – 0, with magnificent mountain views

**Building has an estimated ten year pay back on energy efficient investments with ROI of 6-8%/yr.**
- Total investment ~$75,000 ($62,000 after tax)
- Sufficient electric production for home, studio and an electric car
- Electric consumption is 50% of a comparable sized conventionally designed home in VA

**Key Learnings**
- Insulation is the first and best investment
- HVAC efficiency key to lowering building electric demand – select high efficiency heat pumps
- Passive solar design and energy efficient windows essential for efficiency and livability
- Electric vehicles and appliances used to consume excess solar outputs
- Can be designed by homeowners with a little bit of research
- Zero Energy Homes are a great long term investment

Additional information at [https://nesea.org/project-case-study/afton-va-near-zero-energy-home/general](https://nesea.org/project-case-study/afton-va-near-zero-energy-home/general)

<table>
<thead>
<tr>
<th>Array</th>
<th>Size, KW</th>
<th>Production, KWhr (1st yr.)</th>
<th>Cost, $K</th>
<th>After Tax Refund, $K</th>
<th>Int. Rate of Return (IRR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barn</td>
<td>10.26</td>
<td>14,260</td>
<td>27.95</td>
<td>19.57</td>
<td>7.7%</td>
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<tr>
<td>Quilt Studio</td>
<td>5.12</td>
<td>7,200</td>
<td>14.34</td>
<td>10.04</td>
<td>7.4%</td>
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<tr>
<td>Total</td>
<td>15.38</td>
<td>-</td>
<td>42.29</td>
<td>29.06</td>
<td>7.6%</td>
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