

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
- Addition information at <https://nesea.org/project-case-study/afton-va-near-zero-energy-home/general>

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

