



SUSTAINABLE DESIGN GROUP

Zero Energy  
Grid Independent Homes  
and  
Commercial Buildings  
By  
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[www.SustainableDesign.com](http://www.SustainableDesign.com)

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SUSTAINABLE DESIGN GROUP

We live in an Unsustainable World

- Totally dependant on others for survival
  - Food
  - Water
  - Electricity
  - Sanitation
  - Fuel for your car
- Those we rely on for these services
  - Pollute the air we breath, the water we drink and the soil we need to grow our food.
  - Rely on limited supply of fossil fuels
  - Cut us off if we don't pay



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What Happens when the power goes out?

- No heat
- No hot water
- No lights
- No communications
- No refrigeration
- If you have a well
  - No water
  - Cant flush the toilet

You Cant Live In Your House



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What If ?

- You never lost power
- You never had an electric bill
- The Utility Company was only there to serve you on your terms



## SUSTAINABLE DESIGN GROUP

Local Zero Energy/ Self Sufficient Homes by  
Sustainable Design Group



## SUSTAINABLE DESIGN GROUP

Before

After

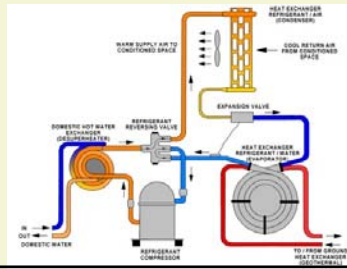
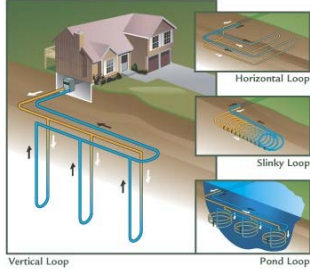


- Foam Insulation
- Air Seal
- Low E Windows
- LED Lights
- Energy Star Appliances
- Geothermal
- ERV
- Solar PV
- Batteries



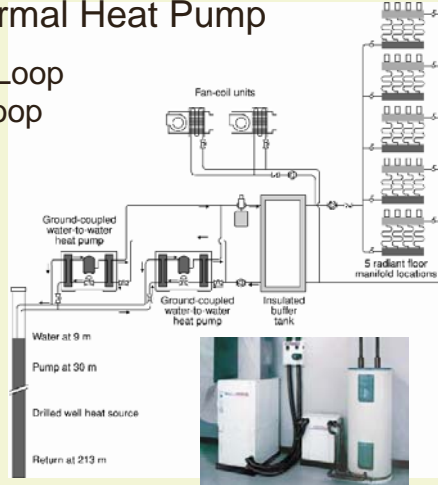
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## Geothermal Energy for the Home



## Geothermal Heat Pump

- Closed Loop
- Open Loop



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## LED Lighting



- Highest efficiency
- Lasts 60,000 hours
- Dimmable
- No mercury
- All colors





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Solar PV with Batteries



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**Zero Energy Retrofit  
in Poolsville, MD**

- 6.5 kW PV system
- Battery back up power
- Propane back up Generator



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**6kW PV SYSTEM  
UPPERVILLE, VA**

- POWER FOR A SMALL FARM



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**GARDEN ATRIUMS  
ZERO ENERGY  
SOLAR HOMES  
TIDEWATER, VA**

- 100% SOLAR PV POWER
- BATTERY BACK UP
- SOLAR HOT WATER
- GEOTHERMAL HEAT PUMP
- SMART HOUSE TECHNOLOGY
- LARGE CENTRAL ATRIUM





## SUSTAINABLE DESIGN GROUP



### **SUSTAINABLE ENERGY RESEARCH FACILITY FROSTBURG STATE UNIV.**

1. 100% OFF GRID NO UTILITY CONNECTIONS
2. SOLAR AND WIND POWER
3. SOLAR HEATING AND HOT WATER
4. SOLAR DAY LIGHTING
5. DIRECT GROUND WATER COOLING
6. DESSICCANT DEHUMIDIFICATION



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### **Mountainside Energy and Environmental Center Urbana, MD**

1. 100% Solar and Wind Powered
2. Solar Greenhouse for vegetables and fish
3. Composting toilets
4. Grey water recycling
5. Geothermal Heat Pump
6. Solar hot water
7. Green Roof
8. Rainwater Collection
9. Solar Day Lighting
10. Passive solar heating and natural cooling





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### EARTH HOME DC

- 1250 ft<sup>2</sup> addition w/ full basement
- 6" SIP walls, 10" SIP roof
- 4 kW Photovoltaic Power system
- Passive solar heating
- Natural cooling
- Retractable awnings
- LED Lighting



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### ERDHAUS FALLS CHURCH, VA

- 1250 sq ft w/full basement
- 3 bedrooms, 3 baths
- Passive solar heat
- Natural cooling
- Compressed earth brick walls made on site
- 2kW PV sun shade
- Rainwater collection
- Earth Craft Home



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## SUSTAINABLE DESIGN GROUP



### EARTH HOME WESTERN MD

- 850 sq ft 1 bedroom
- Passive solar heat
- Natural cooling
- Compressed earth brick walls made on site
- 2kW PV
- Solar water heating



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### Jefferson MD

- Passive solar heating
- Natural cooling
- AAC Block walls
- 4.4kW solar PV
- 3.2 kW wind turbine
- Battery back up
- Geothermal Heat pump
- Energy recovery ventilation
- LED Lighting
- High Efficiency appliances
- Rain water collection and use
- Rain gardens




  
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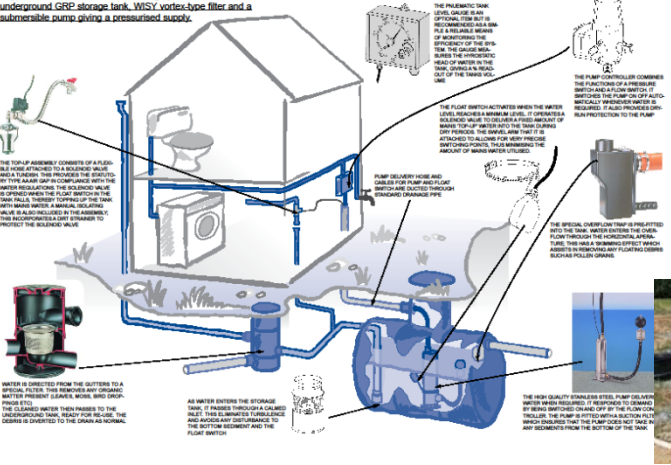
Wind and Solar Power





  
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**A typical domestic rainwater harvesting system based on an underground GFC storage tank, WVOY vortex-type filter and a submersible pump giving a pressurised supply.**



**THE TOP-UP ASSEMBLY** CONSISTS OF A PLUG, BLEED VALVE ATTACHED TO A BLEEDING VALVE AREA TAPPED. THIS PROVIDES THE INDICATOR OF WATER INSUFFICIENCY. THE BLEEDING VALVE IS OPERATED WHEN THE PLUG SWITCH ON THE GUY SHALL VISIBLY TURN UP IN THE OPEN POSITION. WATER WITH A MANUAL ISOLATED VALVE IS ALLOWED TO ENTER THE ASSEMBLY. THIS IS NECESSARY FOR REPAIRS TO PROTECT THE BLEEDING VALVE.

THE PNEUMATIC TANK LEVEL GAUGE IS AN OPTIONAL DEVICE AND IS PLACED IN A CONCEALED AREA OF THE TANK. THE GAUGE WILL SHOW THE HEAD OF WATER IN THE TANK. GAUGES ARE READ OUT OF THE TANK VOL.

THE PUMP CONTROLLER COMBINES THE FUNCTIONS OF A PRESSURE SWITCH AND A FLOW METER. IT SWITCHES THE PUMP ON OFF AUTO-REPAIRS TO THE PUMP.

THE PUMP DELIVERY HOSE AND GUY ARE CONNECTED TO THE PUMP AND FLOW SWITCH AND DUCTED THROUGH STAIRWELL DRAINING PIPE.


THE SPECIAL OVERFLOW TRAP IS PRELATED INTO THE TANK. WATER EXCESS THE TANK FLOW THROUGH THE HORIZONTAL AIRVALVE. THIS HAS A THERMAL EFFECT WHICH ABLE TO REMOVE THE POLLUTING DEBRIS SUCH AS POLLEN GRANULE.

WATER IS COLLECTED FROM THE GUTTERS TO A SPECIAL FILTER. THE REMOVED ANY ORGANIC MATTER IS PRESENT ELEMENTS, WHICH DRIP-FREE THE TANK.

AS WATER ENTERS THE STORAGE TANK, IT PASSES THROUGH A FILTER AND THIS ELEMENTS TURBULENCE AND AIRBUBBLE CONFORMANCE TO THE BOTTOM OF THE TANK AND THE PLUG SWITCH.

THE HIGH QUALITY STAINLESS STEEL PUMP DELIVER WATER WHEN REQUIRED. IT IS PROTECTED TO OVERHEAT THROUGH THE PUMP IS FITTED WITH A BURNOUT ALARM WHICH INDICATES THE PUMP OVERHEAT. THE ALARM AND SEGMENTS FROM THE BOTTOM OF THE TANK.

## Rain Water System





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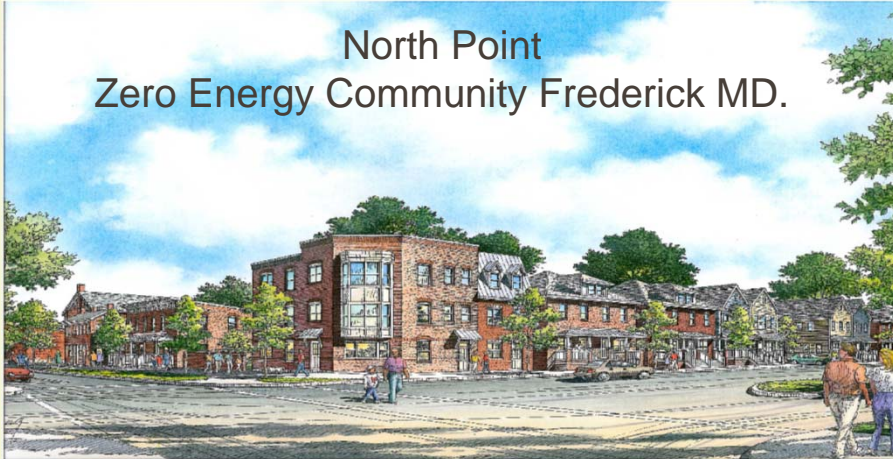
### **NEXUS ZERO ENERGY HOMES**

- NET ZERO ENERGY
- 4-6KW PV POWER
- GEOTHERMAL HEAT PUMP
- STRUCTURAL INSULATED PANEL CONSTRUCTION
- LED LIGHTING
- ENERGY STAR APPLIANCES
- WHOLE HOUSE ENERGY MANAGEMENT



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North Point  
Zero Energy Community Frederick MD.



Energy Architect- John Spears, LEED AP, CEM, Sustainable Design Group, Gaithersburg  
Builder- NEXUS Energy Homes



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North Point



**Envelope**

- SIPS Walls R 24
- Roof R40
- Windows Low E, Argon
- Airtight construction

**Appliances**

- Best Energy Star Appliances
- Gas cooking and Dryer
- LED Lighting
- Low Water use

**Materials**

- Non Toxic, low VOC
- Recycled content
- Locally Manufactured



## SUSTAINABLE DESIGN GROUP

### Mechanical

- Geothermal Heat Pump
- Geothermal DHW with Gas back up
- ERV
- HEPA Air Purification

### Solar

- 4 KW PV roof and carport mounted
- Micro Inverters per panel
- Solar Electric Car Charger

### Monitoring and Control

- NEXUS Vision Home energy management and automation



## SUSTAINABLE DESIGN GROUP

### Economics

### Zero Energy Homes Cost Less

#### Comparable Home

- \$270,000
- Monthly mortgage cost= \$1,450 per month (30 yr mortgage @5%)
- Monthly Energy Cost= \$229 (REM Design)
- Total Monthly Cost= \$1,679**

#### NEXUS Energy Home

- \$295,000
- Monthly mortgage cost= \$1,583 per month (30 yr mortgage @5%)
- Monthly Energy Cost= \$0 (REM Design)
- Total Monthly Cost= \$1,583**
- Monthly Savings= \$96**
- PLUS Rebates to the Buyer= \$16,500**





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THANK YOU!

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