CONCEPT: LAYERING

UT Zero-Energy House
“Layer House”
University of Tennessee, Knoxville
Arc 572 I Spring 2008

ARCHITECTURE I INTERIOR I TECHNOLOGY I SOCIETY
architecture
kit of parts
engineering
materials

materials
appliances
lighting

comfort zone
energy balance
hot water

market viability

FLOOR PLAN
UT Zero-Energy House
“Layer House”
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architecture
kit of parts
engineering
materials

materials
appliances
lighting

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energy balance
hot water

market viability

NORTHEAST ELEVATION
ARCHITECTURE | INTERIOR | TECHNOLOGY | SOCIETY
architecture  | materials  | comfort zone  | market viability
kit of parts  | appliances | energy balance |
engineering materials | lighting | hot water |
<table>
<thead>
<tr>
<th>ARCHITECTURE</th>
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<th>SOCIETY</th>
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</table>

**FUNCTIONAL VOLUME**

**FUNCTIONAL VOLUME SCHEDULE**
UT Zero-Energy House
“Layer House”
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Arc 572  I  Spring 2008

ARCHITECTURE  I  INTERIOR  I  TECHNOLOGY  I  SOCIETY
architecture  I  materials  I  comfort zone  I  market viability
kit of parts  I  appliances  I  energy balance  I
engineering  I  lighting  I  hot water

materials

STEEL I BEAM
STRUCTURALLY INSULATED PANEL
PRECAST CONCRETE SLABS

STEEL H COLUMN
GLASS
SIP WALLS
UT Zero-Energy House
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VERTICAL LOUVERS

HORIZONTAL LOUVERS

FUNCTIONAL VOLUME MODULES

FUNCTIONAL VOLUME

ARCHITECTURE I INTERIOR I TECHNOLOGY I SOCIETY
architecture kit of parts engineering materials
materials appliances lighting
comfort zone energy balance hot water
market viability
CORTEN STEEL

WOOD OPTIONS:

TEAK  LAMINATED BEECHWOOD

FUNCTIONAL VOLUME
WOOD OPTIONS:

- TEAK
- BEECHWOOD
- WENG EWOOD VENEER
- WALNUT VENEER
SHADING CONDITION: APRIL 25, 5 PM
UT Zero-Energy House
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PHOTOVOLTAICS: PV MEMBRANE
ARCHITECTURE I INTERIOR I TECHNOLOGY I SOCIETY
architecture materials comfort zone market viability
kit of parts appliances energy balance
engineering materials lighting hot water

SOLID VOLUMES

EVACUATED TUBES

PRIMARY CIRCULATION

THERMAL MASS

CROSS AND STACK VENTILATION

WATER COLLECTION
POSSIBLE CONFIGURATIONS OF BASIC MODULE

ROW HOUSE  COURTYARD HOUSE

ARCHITECTURE  INTERIOR  TECHNOLOGY  SOCIETY
architecture  kit of parts  materials  comfort zone
engineer  ing  appliances  energy balance
m ents  lighting  hot water
market viability
ENERGY REPORT: TYPICAL SUMMER CONDITIONS, DISPLAYING ALL ELEMENT GROUPS
Energy Report for 1/2:00 a.m. May 1, 2008

ENERGY SUMMARY GRAPH
By Element Group
Energy Report for Typical Summer Conditions

ENERGY SUMMARY GRAPH

Total Net Heat Flow

Energy Report: Typical Summer Conditions, Displaying Total Net Heat Flow
Energy Report: Extreme Summer Conditions, Displaying Total Net Heat Flow
ENERGY REPORT: TYPICAL WINTER CONDITIONS, DISPLAYING ALL ELEMENT GROUPS
Energy Report: Extreme Winter Conditions, Displaying All Element Groups
Energy Report for typical winter conditions, May 1, 2008, 7:23 a.m.
ENERGY REPORT: EXTREME WINTER CONDITIONS, DISPLAYING TOTAL NET HEAT FLOW
CISTERN SIZING CHART:

Water Supply and Usage Comparison

- Unused Storage Capacity
- Stored Water
- Catchment Yield
- Demand

[Graph showing water supply and usage comparison over months with different water levels and usage patterns.]
ARCHITECTURE I INTERIOR I TECHNOLOGY I SOCIETY

PHOTOVOLTAIC ESTIMATE

**PHOTOVOLTAIC ESTIMATE**

**Assumed Cost, per Watt**

<table>
<thead>
<tr>
<th>Item</th>
<th>System Size &lt; 1W</th>
<th>System Size &gt; 1W</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Array</td>
<td>$9.00</td>
<td>$6.00</td>
</tr>
<tr>
<td>Inverter</td>
<td>$1.30</td>
<td>$1.30</td>
</tr>
<tr>
<td>Balance of System &amp; Installation Costs</td>
<td>$2.80</td>
<td>$1.80</td>
</tr>
<tr>
<td>Total</td>
<td>$13.10 (per watt)</td>
<td>$9.10 (per watt)</td>
</tr>
</tbody>
</table>

**OTHER ASSUMPTIONS**

This summary is based on many assumptions and the limited data entered. An actual site assessment by a qualified systems installer or designer would be needed to determine the actual costs or size of an actual PV electric system.

- **Balance of Systems** - Includes materials and labor not included above (example: architectural integration, electrical upgrades, etc.)
- **Other costs** - Vehicle integration, building-integrated PV, etc.

**The Cost of Energy** - Photovoltaic PV Calculator

- **Initial Investment** - $10,000
- **Savings** - $1,000

**Market Viability**

- **Architecture**
  - Materials
  - Kit of parts
- **Interior**
  - Appliances
  - Lighting
- **Technology**
  - Energy balance
  - Hot water

**Sociology**

- **Comfort Zone**
- **Market Viability**

**UT Zero-Energy House**

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SHADING CRITERIA