Principles of Environmentally Sustainable Design

Fall Course - Class 5

Energy Evaluation

Marching Towards a Carbon Neutral Direction

Why is an Evaluation of Energy Important?

- Cash Flow should mirror Energy consumption
- Supply / Demand should never be out of balance in Energy Economics
- Establishing up front the minimums and maximums for Power will determine the conditioning needs for Energy

Pre-Construction Auditing

- What will System be used for?
- Where are peak usage areas?
- Where are peak demands?
- Identify potential for leaks
- Identify potential for spikes
- Identify potential for system being compromised

Challenges

- What do you want your building to be known for?
- What are the energy sources you intend to accept / deny?
- How will the energy be delivered?
- Are there future conditions that affect your energy?

Identification

- Determine why your system needs to fit in a certain area for a certain purpose
- Determine how your system will answer all the needs of the building with careful consideration to balance and delivery
- Explain the advantages of your system by the benefits to the life cycle, maintenance and sustainable results produced for the community

Delivering Service

ENERGY SYSTEMS

Grid Tie Systems

- Rely upon Power Company
- No Control over Power Failures
- Taxes and Surcharges
- Operates against your interest

Outside Delivery Systems

- Supplier Contracts
- Market Price fluctuation
- Reliability
- Available Backup Suppliers

Off Grid

- On-Site Generation
- Reliant upon consistent Resources
- Heavy Demand for Storage System
- Necessity for Power conditioning
- No outside experts to save the day

Passive Systems

- Operate by simple principles of physics
- Work without input from outside source
- Generally Free and Abundant
- Limit to operational function
- Limit to operational results

Active Systems

- Powered by outside source
- Delivers verifiable results
- Consistent delivery
- Ease of operation
- Immediate results

Centralized Systems

- One Unit
- Large Scale to meet demand
- Greater Potential for Leaks, Maintenance
- Lower Efficiency possible
- Big Problems if it breaks

De-Centralized Systems

- Multiple Units
- Small Scale, low demand
- Low Maintenance, Small leaks
- High efficiency – Point of Use
- Small headaches
- More handyman hours!

ENERGY SOLUTIONS

Electrical Power Company

- Regulated
- Constant
- Low Risk of Interruption
- Available Trained Workers

Oil / Gas

- Low Cost
- Can be efficient
- Reliant upon Delivery
- Risk related to Supply
- Not Environmentally friendly

Solar

- Passive – Thermal Energy provides up to 100% of needed energy for use
- Photovoltaic – Needs significant space to produce demand

Wind

- High potential to deliver 100% on-site power generation
- No guarantee in less windy conditions
- “When the Wind Blows”
- Must have backup or significant storage

Geo-thermal

- Proven passive technology as old as time
- Limited control
- Active Geo-Thermal is costly and often long payback
- Valuable in the right situation

Water

- Hydro-Power works well and can produce significantly
- H2O Electrolysis is great Energy Storage opportunity with Hydrogen Gas

Bio-Diesel

- Best kept secret in on-site power / energy
- Low cost, high efficiency
- Fast payback
- Limited by production
- High Risk without guaranteed supply

Bio-Mass

- Wood, Wood Pellet, Corn, Grass all available
- Tricky Environmental Conversation
- Efficient / But not long lasting
- Cheap, but not always effective
- Great Talking Piece and Country Feel
- Air Quality can be an issue