ALF's House

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Jury Narratives
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Contents

Architectural Narrative

ALF. Affordable, Livable, Formidable.

The ALF House was designed for a small family, living in the Southern Tier of New York State. An open concept floor plan was chosen to enhance the openness of the house while keeping the building footprint under 1000 square feet. The central gathering space in the house is made up of the Living, Kitchen, and Dining Room.

This middle class residence could also be used for educational laboratory purposes that would offer Alfred State College and Alfred University students real world examples to practice in their studies. The main design concept consists of a modular construction that breaks up the house for easy transportation.

The Grid

The proposed design is made up of an 8’ x 6’ grid. To simplify shipping and construction, the grid displays 3 equal sections. These sections are broken up into two public segments and one private. The public segments consist of the Living, Kitchen, Bathroom, and Dining spaces, while the private segment contains two Bedrooms. These three pieces are joined to form an open floor plan concept. With few interior walls, the ALF House allows for a free-flowing circulation path throughout the home.

Interior

Some of the key features found in this house include: clerestory windows, a NanaWall system, tall ceilings with open-truss members, and moveable furniture.

The clerestory windows are placed at the break of the roof assembly. As the flat roof meets the sloping pitched roof, the clerestory windows allow southern, natural light to pour in to illuminate the central gathering space. A NanaWall system is positioned on the North Elevation of the building to increase lighting and to provide a means of egress to the porch which faces optimal views. Maximum natural light is achieved in the space by the indirect, northern light that the NanaWall provides. On warm temperature days, the curtain wall system can be opened to connect the porch with the interior of the house.

To make the space seem airy, tall ceilings and open-members were chosen for the design. These design features allow residents and guests to feel welcomed as they enter the house. The trusses are used to support the SIP panels, as well as to aesthetically warm the space.

Moveable furniture from our sponsor, Resource Furniture, allows furniture allows for extra floor space when not in use. . The Dining Room table and chairs, for example,

can easily be expanded into the central space from the eastern wall when meals are prepared, and effortlessly folds away when finished.

The Alf house is designed to bring people together in a large, inviting, multi-purpose space with scenic views.

Exterior

The house was positioned on the lot with the intent of gaining the most optimal solar gain. The sloping roof facing the south placed at the appropriate angle, allows the house to collect the sunlight through PV panels. Roof overhangs on the structure provide shade for the necessary spaces and approaching pedestrians. A green wall has been designed for the east side of the house to absorb sunlight, to collect rain water, and provide an inviting entrance to the home. Vegetation around the porch offers more greenery for guests in addition to the green wall. Ramps leading up to the structure provide accessibility for all guests. The ramps lead individuals to the most distinct feature of the house. A wrap-around porch invites residents or guests to experience an indoor / outdoor environment. The grass surrounding the home and on the green wall is the Patented, all natural, Pearl's Premium Ultra Low Maintenance Lawn Seed. The grass has deep roots and grows so slowly, you mow it only once every 4 to 6 weeks, rather than every week using only a fourth of the water and mow time of other grass.

Engineering Narrative

Energy analysis

Lighting analysis

Lighting is a critical factor in designing a house. An appropriate level of lighting can result in an improved décor, as well as increased sense of comfort and security. In designing the lighting levels of each area inside the house, a number of factors are to be taken into consideration:

Activities that occur in each area (For instance, eating, reading, sleeping …).

The mood or ambiance that we want to create for each area.

The elements in the house that we wish to emphasize.

Spaces with dark color and finishing which might require supplementary lighting.

A good lighting plan considers all these factors in lighting an area. After careful consideration of these factors and various types of lighting, we decided the use the following LED lighting:

6” Dimmable LED Retrofit Downlight 2700K Warm White, 1200 lumens

This lighting structure is dimmable. Thus it provides the functionality required for various purposes. It provides 1200 lumens and is suitable for dry, damp and wet locations. The lighting analysis for the solar Decathlon project was performed in the Design Builder software. Figure 1.1 demonstrates the daylighting analysis for Alfred solar house. This figure, illustrates how natural light is employed in order to provide the general lighting of the house. All the following analyses are performed according to the time and location of the competition.

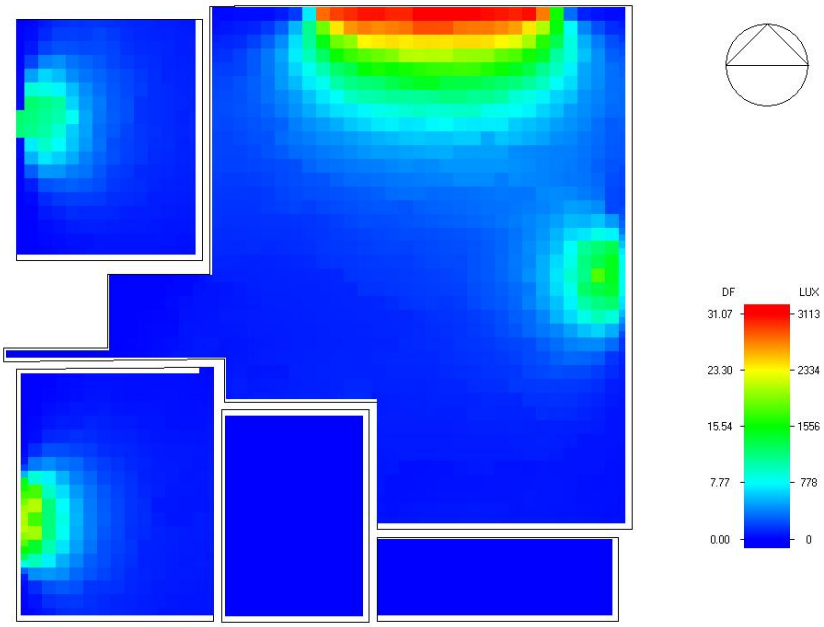


Figure 1.1 Daylighting analysis

The accepted authority for appropriate illuminance values is the illuminating engineering Society of North America (IESNA). The IESNA publishes a comprehensive handbook which provides appropriate illuminance data for various environments. The appropriate level of lighting for different areas inside the house is included in appendix A. The electrical lighting analysis for Alfred's solar house is performed by Ecotect software. Figure 1.2 shows the amount of electrical lighting in Alfred's solar house. It provides us with an accurate guide to set the lighting levels according to IESNA's standards.

Solar and shadow simulation is also performed using the Revit software. Figure 1.3 illustrates sun path and the building's exposure to the sunlight on a sunny day in October. In this model, the shadows are visualized based on the sun's position at a certain time during the competition week.

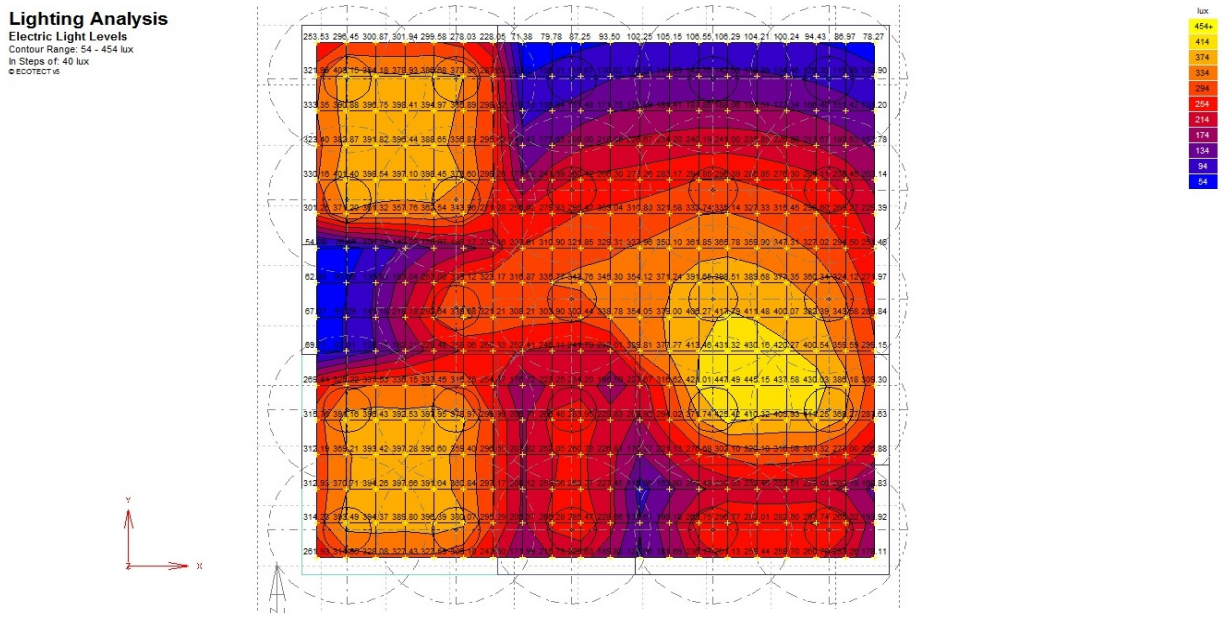


Figure 1.2 Electrical lighting analyses

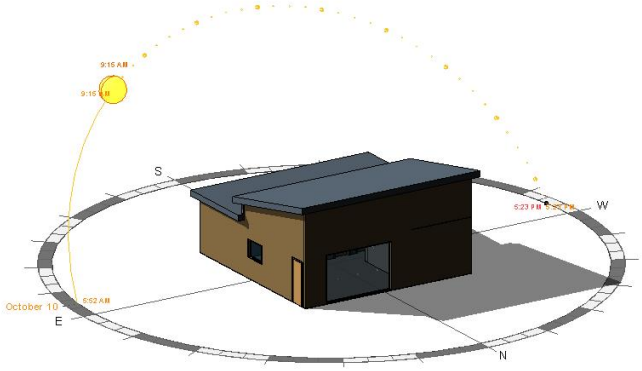


Figure 1.3 Solar and shadow simulation

1.2 HVAC Analysis

The energy analysis is also performed in Design Builder software. The simulation is performed to acquire monthly heating/cooling loads based on the location of the house. In this narrative, we limit our results according to the location and dates of the competition. After performing the architectural design, relevant material was applied to every construction unit. Therefore, the values for R and U factors were extracted from the software's database. In the first step, site data including outside dry-bulb/dew-point temperature, wind speed and direction, pressure, solar altitude and azimuth and Direct Normal Irradiance (DNI) and Diffuse Horizontal Irradiance (DHI) were required to perform a trustworthy simulation. This information is provided in a database and is obtained from observations at a specific location by the National weather service or methodological office. Figure 1.4 shows the site data in detail for the competition week.

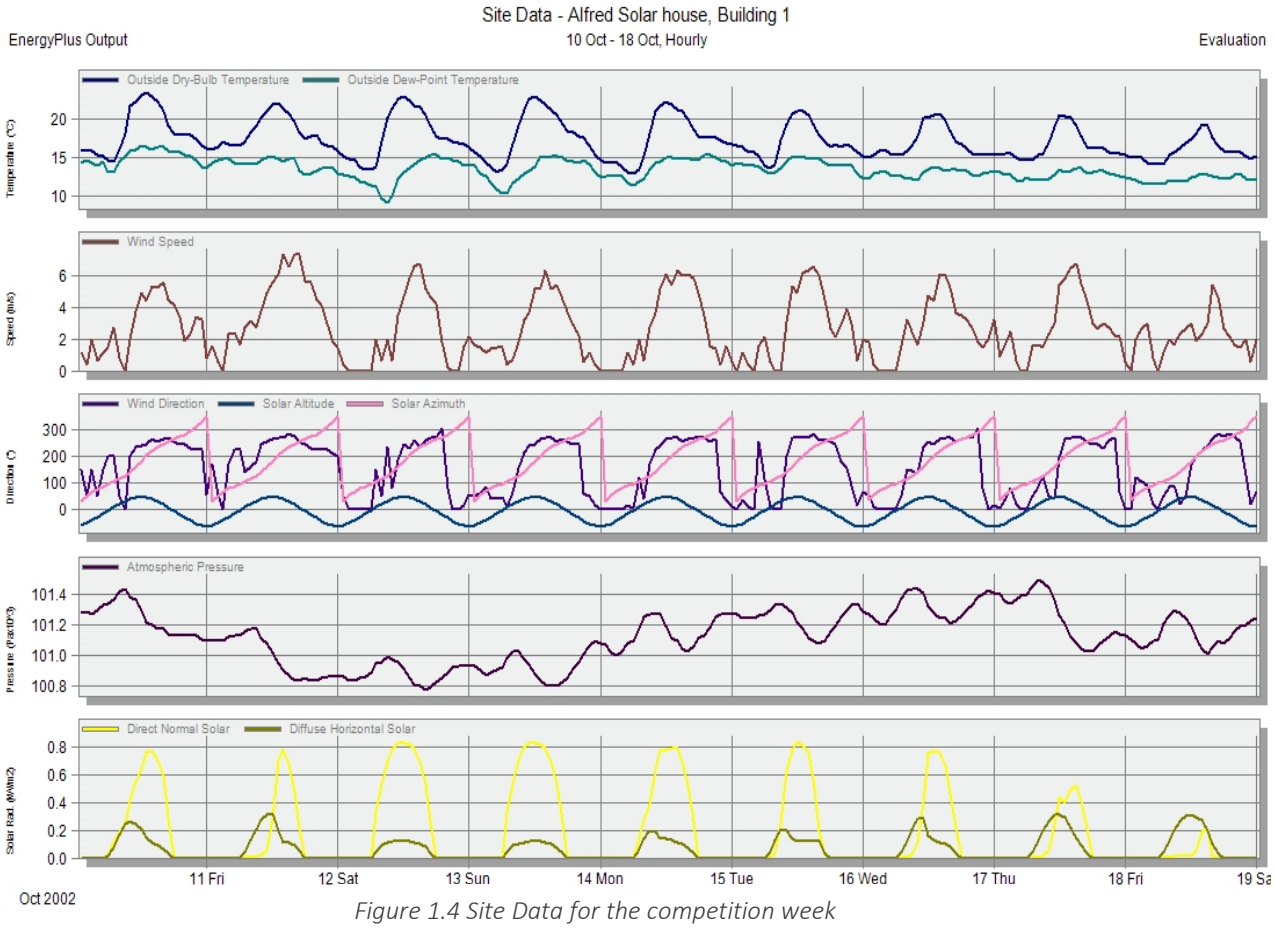


Figure 1.4 Site Data for the competition week

Figure 1.5 illustrates the comfort temperature and humidity for Alfred's solar house. The operative temperature which is the mean of the air temperature (Convection) and radiant temperature (radiation) provides the comfort temperature. In other words, operative temperature is what humans experience thermally in the space. Most real-world thermostats don't actually sense more than about %20 of radiant heat transfer. Thus, operative control can be useful for calculating realistic heating/cooling load in each space. While thermal comfort depends on many environmental factors such as air temperature, air velocity and relative humidity, many other personal factors including clothing, metabolic heat, acclimatization, state of health etc. need to be taken into consideration. Design Builder enables users to define a coefficient for many of these factors including occupancy, which is considered to be 0.04 people/m^2 and clothing which is 0.5 in summer and 1 in winter. One is considered to be the casual winter clothing at home.

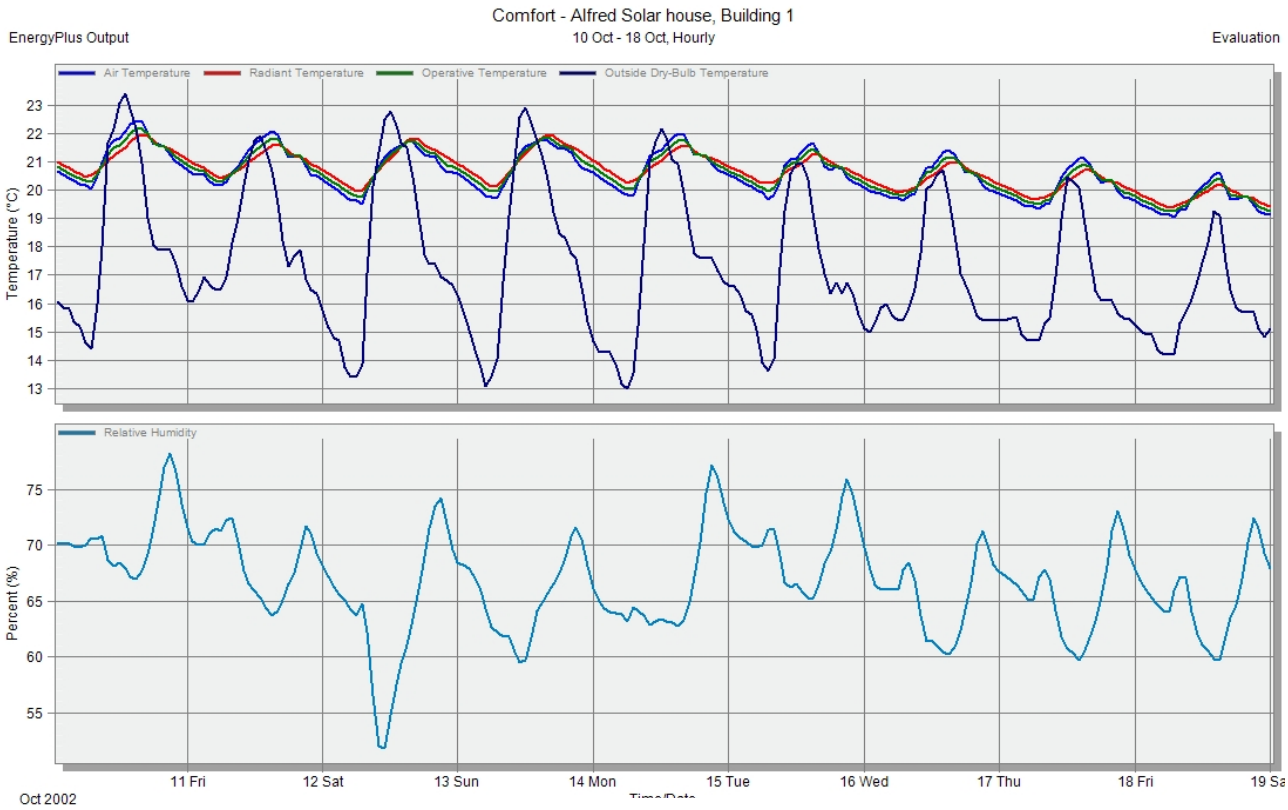


Figure 1.5 Comfort temperature and humidity for the competition week

Figure 1.6 represents Fabric and Ventilation data. External infiltration is the rate of entry of unintentional air from outside through cracks, holes and through the porosity of the fabric. Airflow through Exterior Windows, Vents and Doors is considered to be included in the Natural ventilation. During all the simulations, the occupancy coefficent is considered as a constant, 0.04 people/m^2. Alfred's solar house is desinged to be as energy efficient as possible. Therefore, the fewer number of joints and oriented strand board sheating on both sides of the SIP walls allow for a much tighter building assembly. Thus, the airtightness slider, which indicates the crack template, was set to 'good', which is a pre-diefined standards within the software. As a result, the external infilteration has reasonable variations. The lower graph shows the sum of the fresh air which is delivered through the HVAC system, infiltration and natural ventilation in air changes per hour (ac/hr).

Internal gains due to lighting, occupancy, solar gains exterior windows and zone sensible heating are presented in Figure 1.7. Solar gains through exterior windows are calculated through the transmission of short-wave solar radiation through all exterior windows. However, solar gains through external windows for 13th and 14th of October don't seem to be consistent with weather and temperature patterns. Zone sensible cooling is the sensible cooling effect on the zone of any air introduced into the zone through the HVAC system. It includes any 'free cooling' due to introduction of relatively cool outside air.

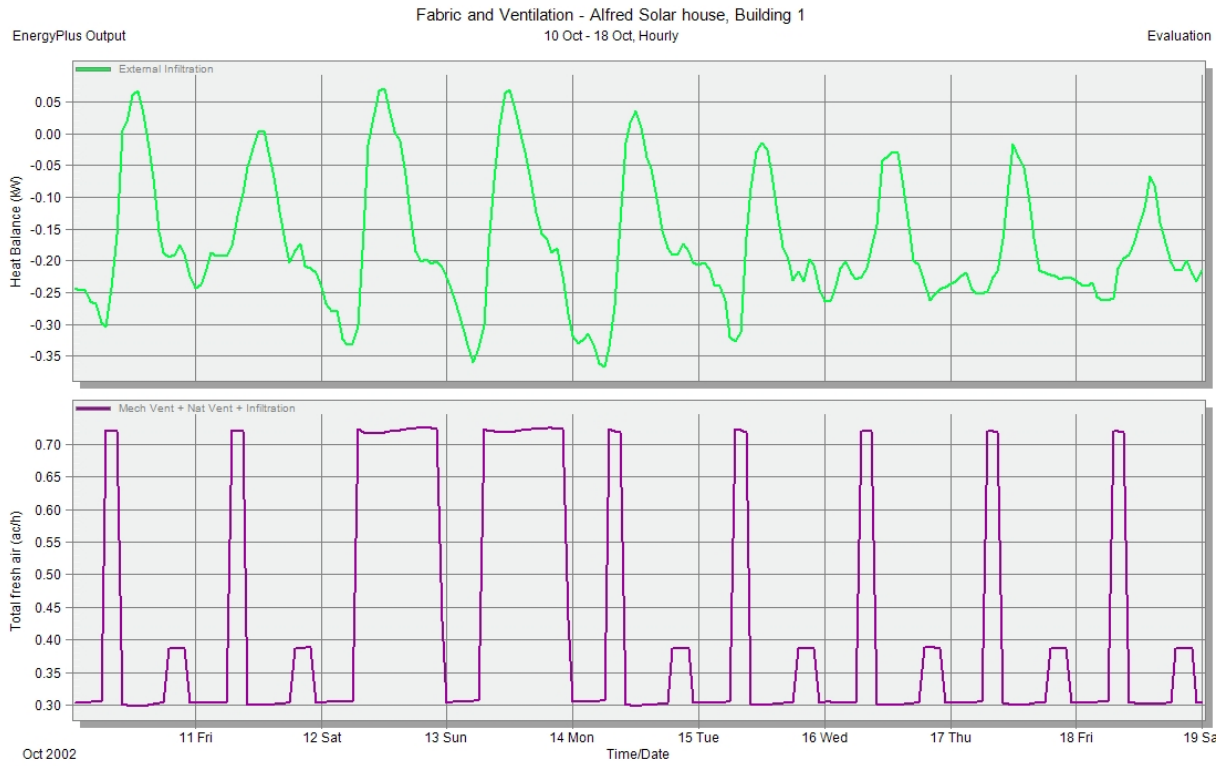


Figure 1.6 Fabric and ventilation for the Competition week

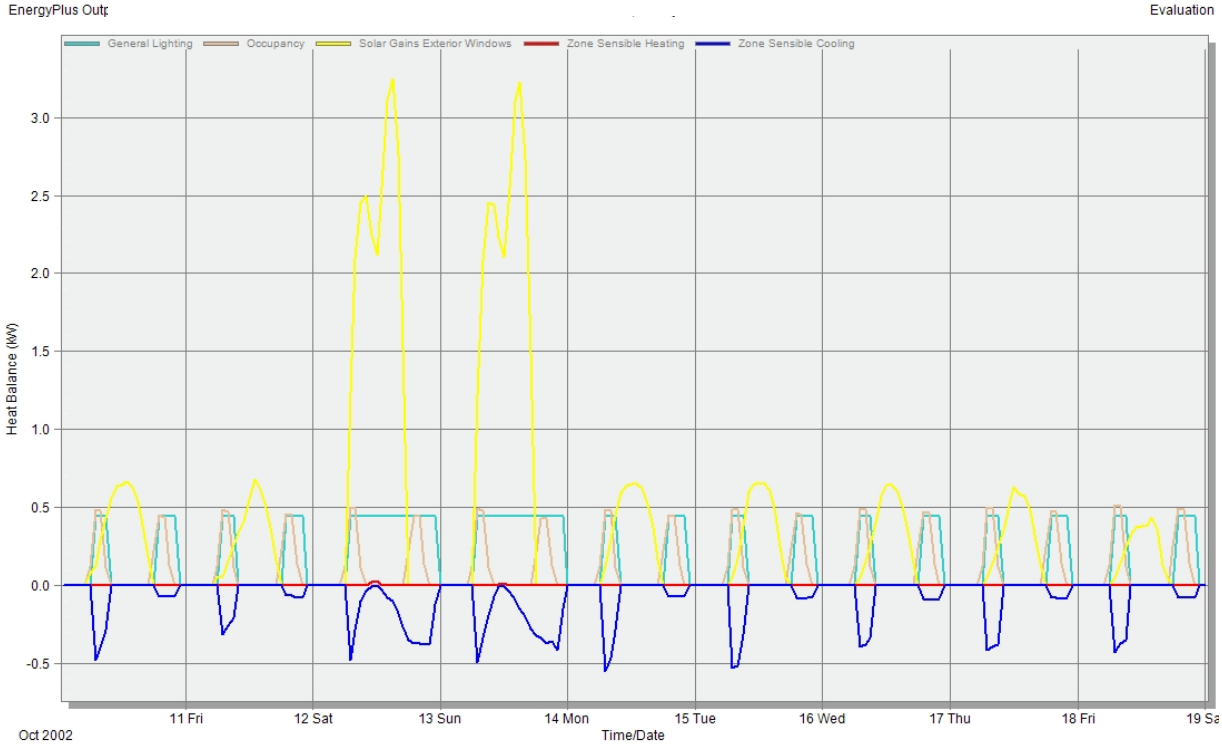


Figure 1.7 Internal gains for the Competition week

Finally, heating and cooling loads are calculated for a monthly time period. The result show that for October, estimated cooling load is negligible. The simulation shows

that the maximum heating load occurs in January and is less than 3 KW. The maximum cooling load happens in July and is less than 1 KW. The result is presented in figure 1.8.

Also, an external CFD analysis is performed in the aforementioned software. For the CFD simulation, the wind direction was assumed to be from West to East. This assumption is supported by the data by weather stations. This analysis provides the distribution of air velocity and pressure around building structures due to the wind effect and this information can be used to assess pedestrian comfort, determine local pressure for positioning HVAC intakes/exhausts, etc. Velocity and pressure of the air is presented in figure 1.9.

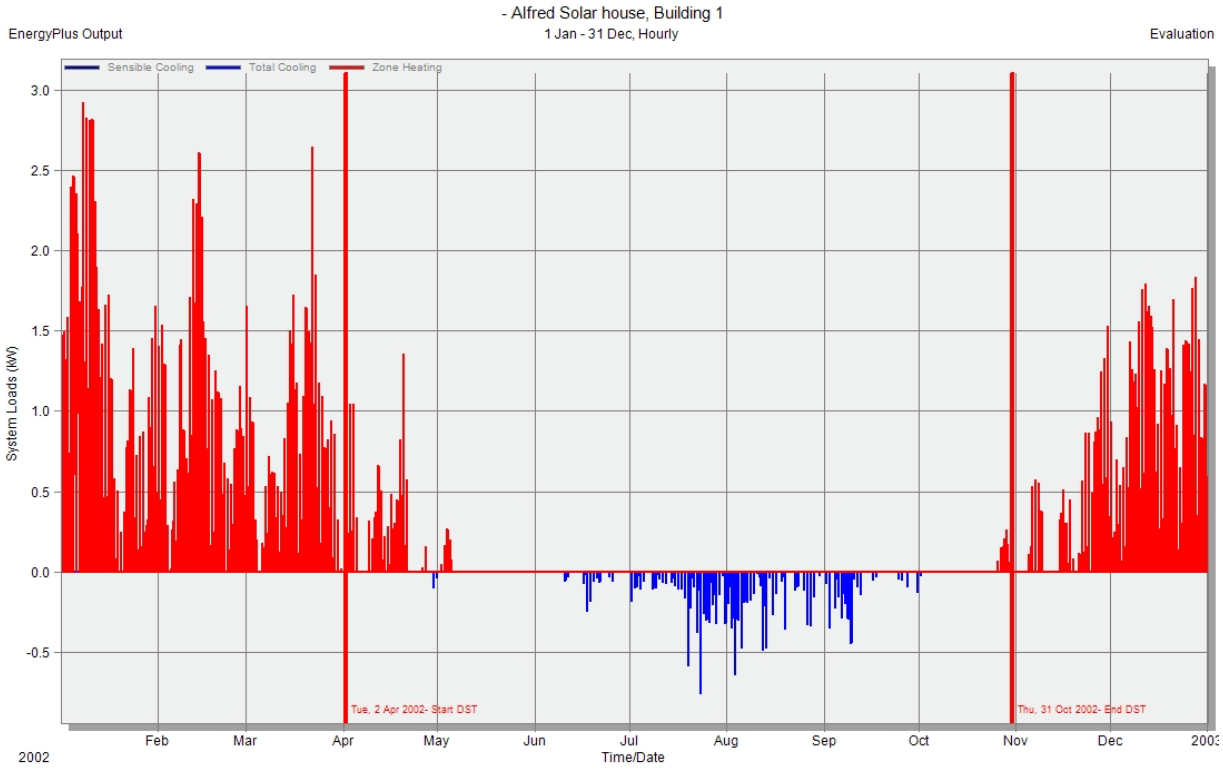


Figure 1.8 Monthly heating/cooling loads

Heating and cooling loads provided a guideline for Alfred's team to select the best possible HVAC systems for Alfred's solar house. After careful considerations, an air handler Carrier ER VXXLHB 1200 and a Carrier fan coil were selected for an optimal usage. To secure the heating loads at Allegany County's cold winters, floor heating was also included in the final design.

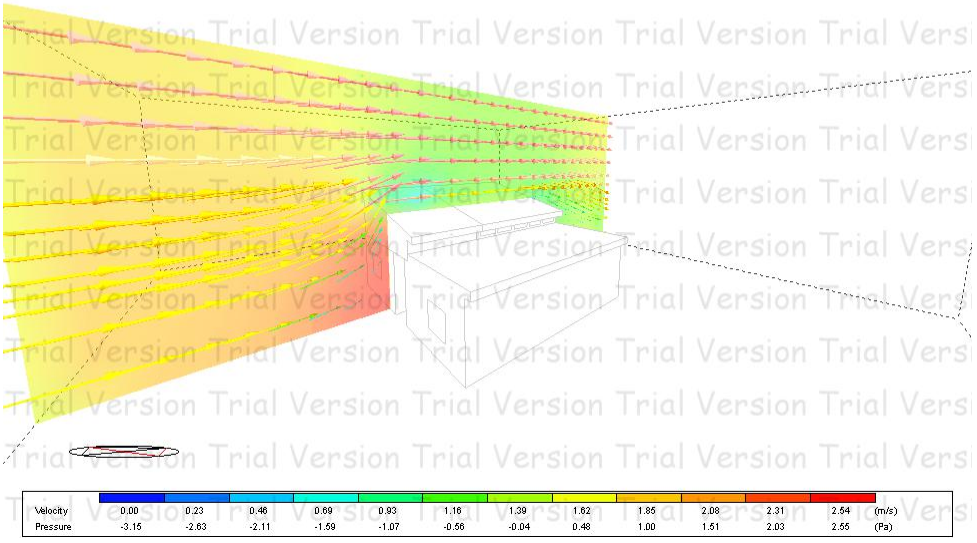


Figure 1.9 External CFD analyses

1.3 Energy Balance Estimation:

The estimated power consumption by Alfred's solar house is attached in appendix B. In the first step, the equipment in the house is identified and the total active hours during the day, or competition week is calculated with respect to different contests. This analysis provides a reasonable estimation for the power consumption during the competition week.

1.4 Domestic Hot Water

The Solar Hot Water system in Alfred's house employs an innovative approach to provide 80 gallons of hot water in less than an hour during the day. Using Apricus Solar Hot Water evacuated tube collectors, we are able to produce 13500 btuh of power in less than an hour. The system is not the same as a commercial solar thermal panel. Each tube is built with a glass tube, thermal conductive film and a copper bulb rod. The collector uses a 'dry' heat transfer method. The sun is absorbed into the evacuated tube, then heating the heat transfer liquid inside the copper bulbs which evaporates at 30 degrees centigrade, then the steam rises up to the bulb transferring the heat to the copper manifold containing a glycol mixture circulating in a closed loop system. The approximate hot water consumption in different contests and tasks for Alfred's solar house is presented in appendix c.

1.5 Commuting Contest

For the commuting contest, Alfred's team analyzed the available options in the market and finally concluded that Fiat 500e and Nissan Leaf are both are appropriate to serve the purpose in Alfred's house. The detailed data for these electrical vehicles is

provided in Appendix D. As a final conclusion for the EV charger, a 6.6 Kw charger was selected as an ideal option which will be able to charge the car in roughly 80 minutes.

1.6 Solar Dryer

An innovative approach was employed to investigate the effectiveness of the solar-thermal clothes dryer for Alfred's solar house. This design is based on drying clothes using medium-temperature solar collectors. This system includes an air-to-air heat exchanger used to preheat intake air with the humid exhaust stream and a water to air heat exchanger to utilize a 180° F storage system which is associated with a residential sized rooftop thermal-solar system. Appendix E presents the mechanical design, control systems, cost analysis, energy balance as well as a CFD analysis.

1.7 Home Automation

A comprehensive comparison study was performed by Alfred's team to decide on the most economically and technologically efficient home automation systems in the market. The selected system must not only be technologically reliable, but also flexible enough to fulfil the needs of the target client in Allegany County. Therefore, an Iris Energy Monitoring System and a smart hub was selected as a part of home automation system. No need to mention that these systems have several add-ons and can be upgraded according to the will of the customer. However, in order to keep the costs of the solar house minimum and affordable by the target client in Allegany County, the team decided to limit the home automation system to energy monitoring device. Appendix F discusses the comparison study on various home automation systems.

1.8 Thermostat:

Controlling the temperature of the room in Alfred's house is enabled through using the Arduino software platform. The Arduino was programmed to measure the reading of a temperature sensor and compare them to that of the potentiometer. The LEDs were programmed to turn on and off based on what the temperature reading of the heat sensor was. The programming code for the thermostat is included in Appendix G. When the temperature would reach above the temperature set by the dial (Potentiometer), a green light would turn on, saying the temperature was at or above the set location and therefore, disengaging the heater.

2. Earthquake Analysis

For solar house applications, there is no single code/regulation/standard dealing with earthquake damages. California State does have a recommendation. However, some houses with small roof slopes are having solar panels resting on the roofs, using frictional forces to restrain the solar harvesting equipment. The purpose of this study is to evaluate the possibilities due to earthquake damages.

According to the earthquake analysis, earthquake might cause two events in sequence: 1. Exposing the bare metal wires; and 2. Shorting two leads. With flammable materials nearby, fire might be started due to such short circuits.

2.1 Seismic loading

Generally, earthquake can be decomposed to three different directions-vertical, Horizontal North-South and Horizontal East-West. The following graph shows a 30-

seconds duration earthquake on the Horizontal North-South component. This results in sudden changes in the North-South acceleration.

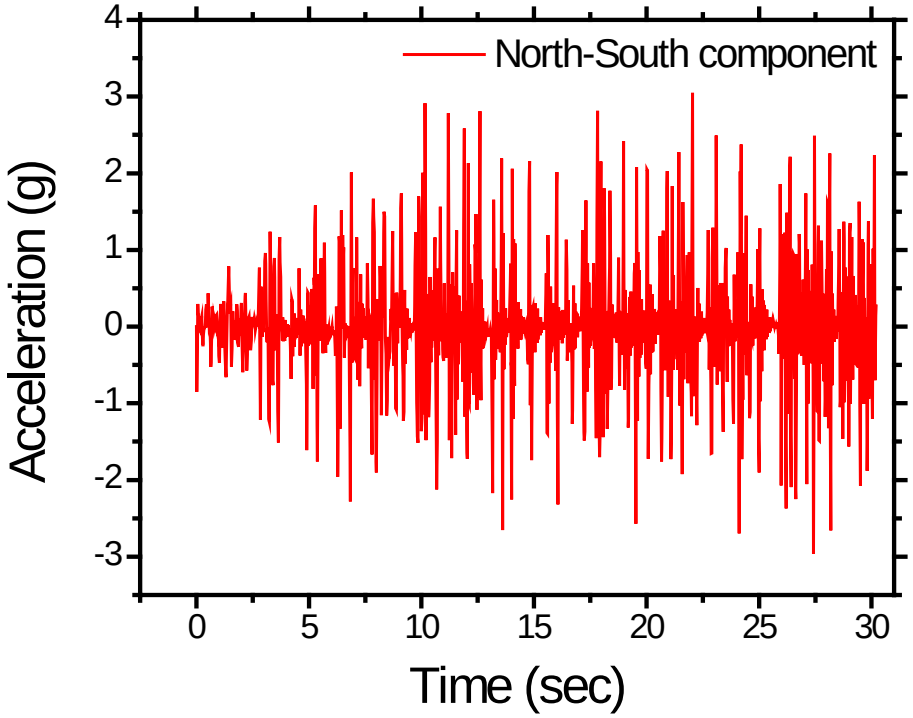
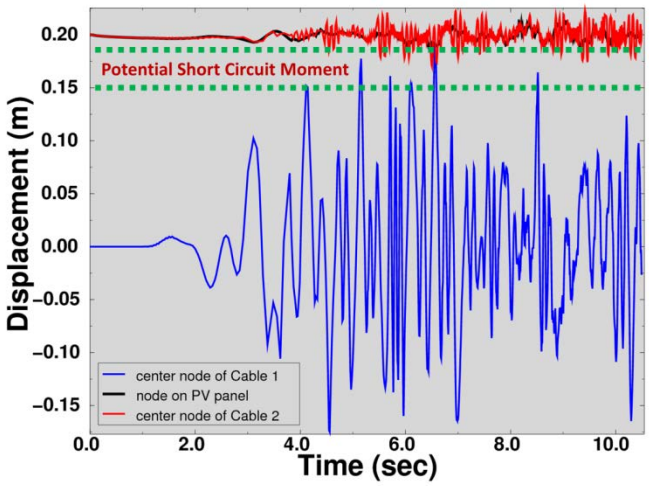


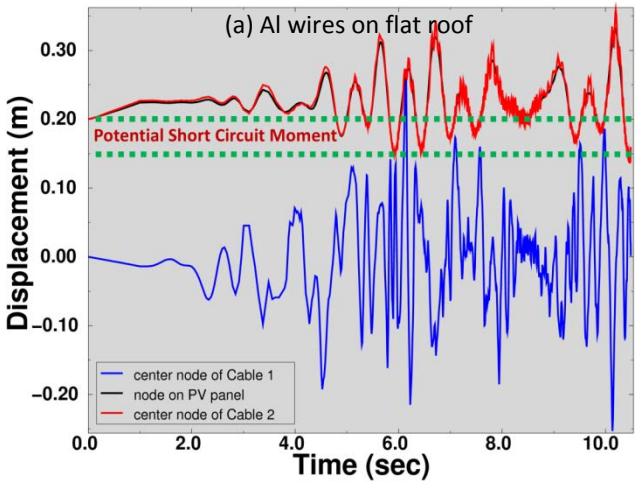
Fig. 2.1 Seismic wave (WenChuan earthquake, China, 2008)

Simulation Results of Wires Crossing Over

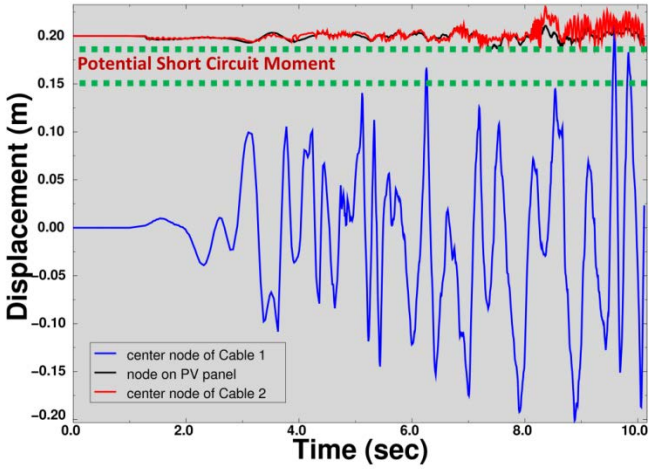
Displacement responding to the North-South shock wave is illustrated on a few concerned nodes (center point on cable one and center point of cable two). The theoretical study examines possible short-circuit on breakage of insulation layer and crossing wires. The figures below illustrate the potential crossing wire moments on flat/slope roof.

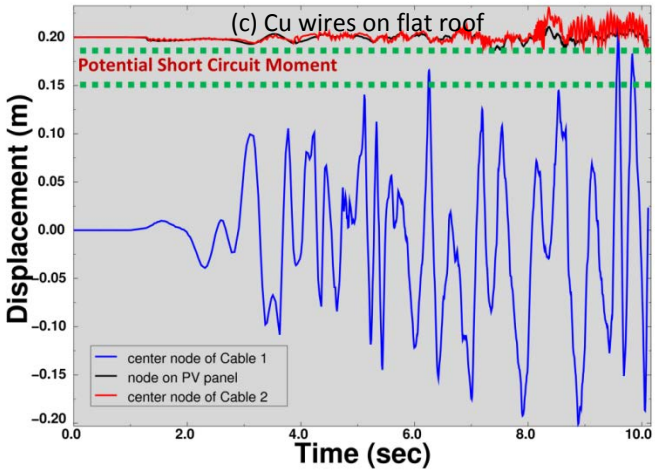


(a) Al wires on flat roof



(b) Al wires on slop roof





(d) Cu wires on slop roof

Figure 2.2 Node displacement response

Appendix A

Homes	Lux
Kitchen	150
Bath room	100

Bedroom (General)	50
Leaving room	50
Casual Reading	150

IES Lux Level

Appendix B

Estimated power consumption by Alfred's solar house

Equipment	Average power (W)	Peak Power (W)	Runs/ day (H)	Runs/ week (H)	Energy /Day (kWh)	Energy /week (kWh)	Energy/year (kWh)
Combo Fre/Ref	80	540	24	168	1.91780	13.4615	700
Clothes Washer	1071.42	<per load	1	7	0.76712	5.38461	280
Clothes Dryer	3000		1	7	3	21	1092
Dishwasher	1300		1	7	1.3	9.1	474.5
Standard Oven	2400		1	7	2.4	16.8	876
Microwave	1200		0.25	7	0.3	2.1	109.5
Lighting	500		5	35	2.5	17.5	912.5
Hot water	3200		3	21	9.6	67.2	3504
Aquarium	~50		8	56	0.41	2.88	150
Clock radio	80	400	3	21	0.24	1.68	87.6
Coffee maker	800		0.25	1.75	0.2	1.4	73
Dehumidifier	250		2	14	0.5	3.5	182.5
Electric blanket	100		3	21	0.3	2.1	109.5
Hair dryer	1000		0.75	5.25	0.75	5.25	273.75
Air conditioner	600	1200	12	168	7.2	50.4	2628
clothes iron	1200		1	7	1.2	8.4	438
Televisions(27")	113		5	35	0.565	3.955	206.225

Total fans	200	3	21	0.6	4.2	219
electric vehicle	1400	8	56	11.2	78.4	4088
			Total:	44.95089041	314.6562329	16407.075

Appendix c

Approximate level of hot water consumption in different contests and tasks for Alfred's solar house

Function	Water use (Gallons)	Calculations		Notes
		Gal	Events	
Hot Water Draws	240	15	16	Event requiring 16 draws of 15 gallons per draw
Kitchen Faucet	22.4	11.2	2	2 dinner parties
Bathroom Faucet	22	2.2	10	10 people per dinner party
Shower	255	25.5	10	Theoretically a 10 minutes shower every day
Thermal Storage				
Tanks	80			80 Gallon storage tank
Safety Factor	61.94			
Water required	681.34			

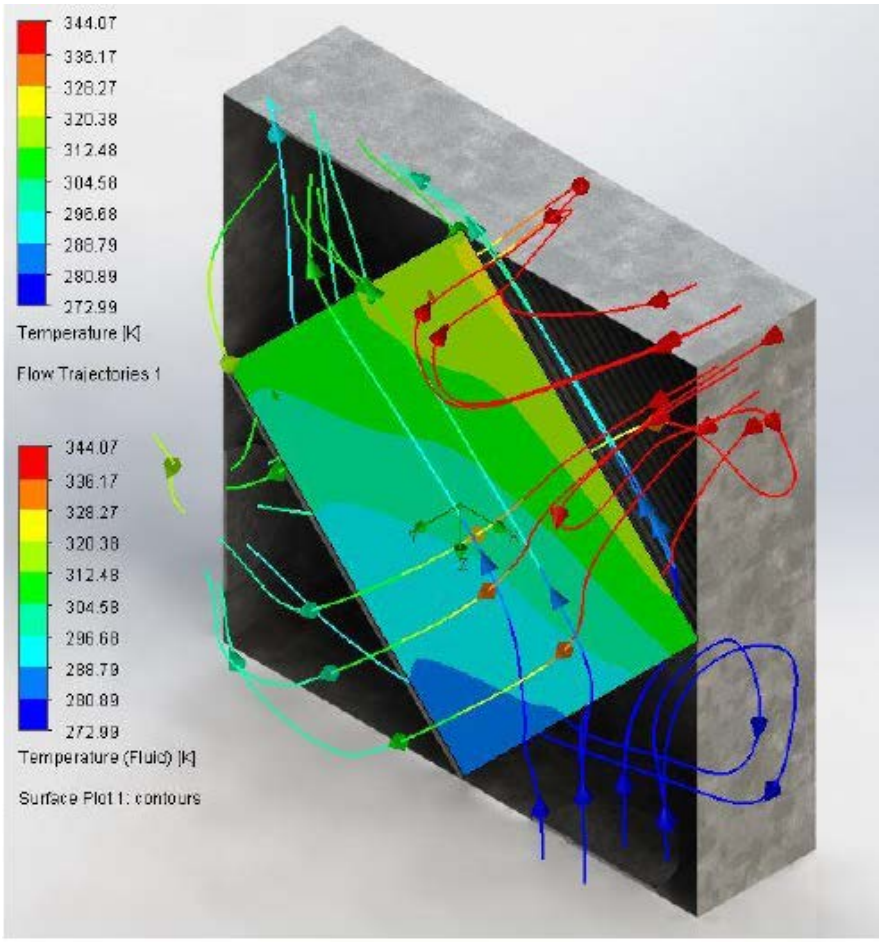
Appendix D

Electrical vehicle Comparison

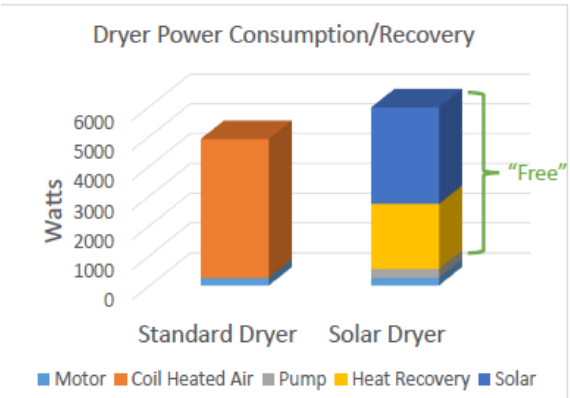
Model	MPG/city	Battery Size	Charging Input	Time/charge	Price
Fiat 500e	122	24	240v/30A	3.5 Hrs	$ 31,800.00
Nissan Leaf	126	24	240v/16A 240v/30A	3.6 Hrs	$ 28,980.00

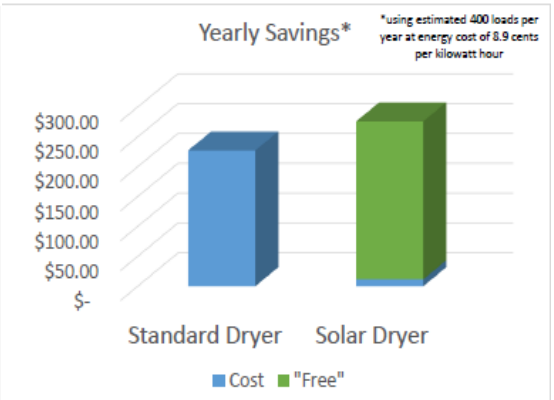
Appendix E

Trajectory surface plot (Temperature)

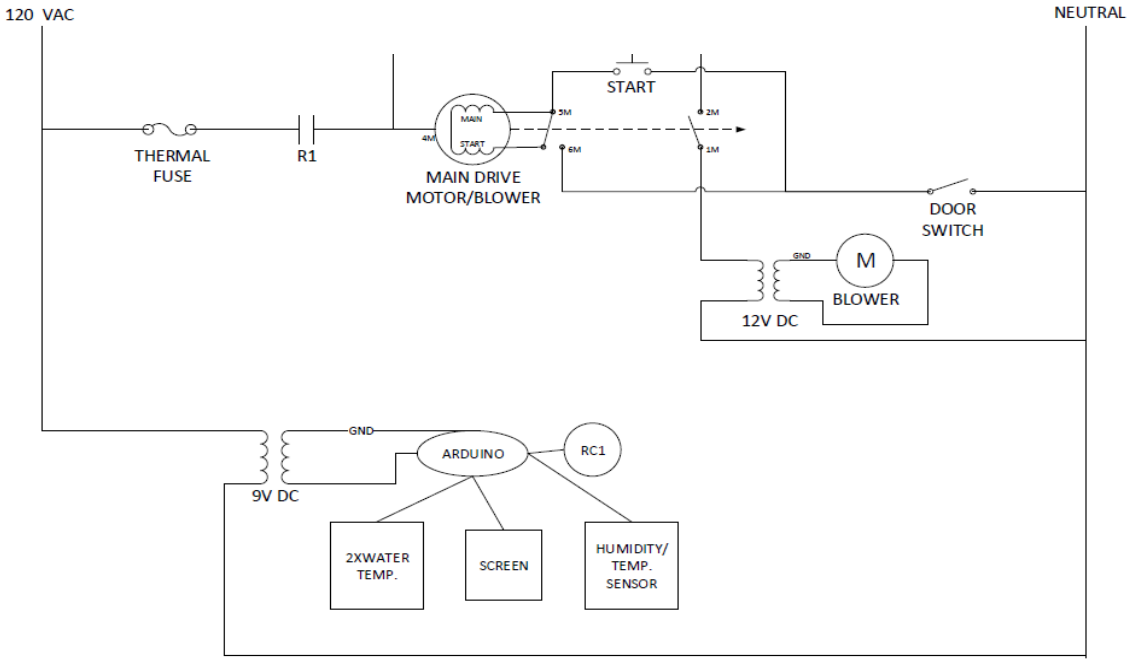


Power Consumption / Yearly savings

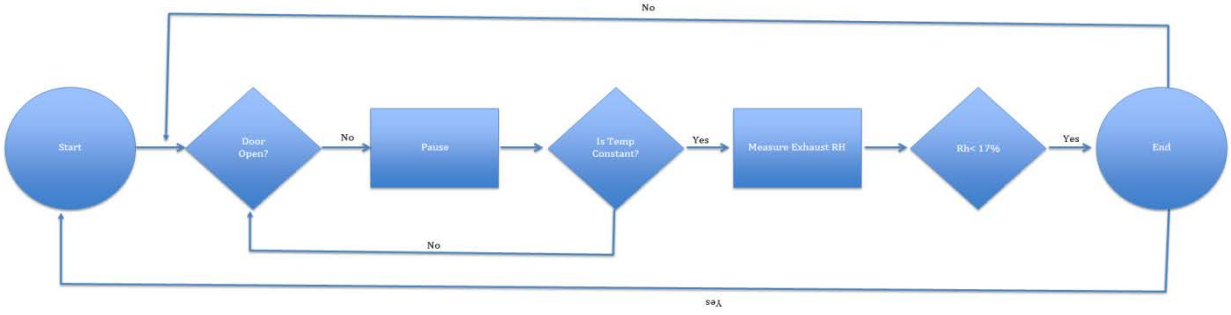




Schematic/Flow Logic



Dryer Schematic



Below is a chart showing the advantages and disadvantages of each system. Green is good, red is bad, and yellow is in the middle.

Criteria:	Synco Living	Andover Continuum	Iris
Simplicity of system	Med	Low	High
System ease of use	High	Low	High
Power usage	Low, 28W	High, 100W	N/A
# of add-ons	High	High	Low
price	Med, $3000	High, $10,000+	Low, $1000

Appendix G

```
int tempPin = A1;
int dialPin = A0;
int redPin = 12;
int greenPin = 13;

void setup() {
  Serial.begin(9600);
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
}

 void loop(){
  float temperature = getVoltage(tempPin);
  Serial.print("Actual=");
  Serial.println(analogRead(tempPin));
  delay(500);
  Serial.print("Desired=");
  Serial.println(analogRead(dialPin));
  delay(500);

  if (analogRead(tempPin) > analogRead(dialPin))
  {
    digitalWrite(redPin, LOW);
    digitalWrite(greenPin, HIGH);
  }
  if (analogRead(tempPin) < analogRead(dialPin))
  {
    digitalWrite(redPin, HIGH);
    digitalWrite(greenPin, LOW);
  }

 }
```

Communication Narrative

ALF is designed to entice people into the beauty of nature. It has a rustic feel with modern living, ideal for drawing people into the freshness of the environment and inspire people to preserve it. ALF has been designed with the concept of Allegany County in mind, a county made of farms and lower income families. The home is built on the concept of educating and bettering the community around it. It is a role model that's influence stretches beyond the 900 square feet home. An important part of this guidance will be effective communication in multiple mediums to varying audiences.

GOALS:

The goals in relation to communication had three main desires. First, to reach people via the media whether it be social or a more standard form, such as a newspaper. Second, to use ALF as an educational tool, to set the example for others to follow as well as provide a website with all the details of the home. Third, at the competition itself, a handout so all who come through the home can learn about the engineering they could realistically dwell in.

STRATEGIES:

Media Connection

Multiple accounts have been made in many modes of social media including Twitter, Facebook, and Instagram. These accounts are able to reach the general audience, the audience that may not be as well versed in the details of engineering, but still curious about green energy. In addition, articles have been provided to the Buffalo Chronicle, Rochester Democrat, and Rochester Engineering Society to reach a wider audience in more populated areas to draw on our target client. Our target client is an empty nesting couple, possibly from the city looking to replenish the spirit in an innovative home on the cutting edge of efficiency and livability. These accounts are maintained by team members who post photographs of the progress ALF is making. It gives insight into the efforts of building a home and the team itself that is working around the clock to get the job done. This form of communication has been effective in achieving over 100 followers from inside and outside Alleghany County and expanding the US Department of Energy Solar Decathlon name beyond the small town of Alfred.

Education Through The Website

The internet is reaching a wider and wide audience of millions of people every day. The desire is to reach these people with a stylish, informative, easy to use website.

The website covers every aspect of the home including the engineering, architecture, furnishings, etc. It is not the most mobile form of communication Team Alfred is using, but it is easy access tool for anyone who is interested in learning about the Solar Decathlon in a couple clicks. The website is maintained by a hand full of people to keep up to date as possible. The website has been an effective form of communication because it reaches the largest range in audience from those who understand the technical aspects, to the general public and just about any age range where social media is generally limited to a younger audience.

Competition Handout

One of the main transitions made on the handout is the renderings to the final result. The handout features renderings created at the designing stages of the home and would be received by those touring the home able to see the final finished product. This is the most hands on communication that Team Alfred has to offer because people would be able to see up close the technological innovations deployed in the home. They would also be able to ask for clarification on any details that interest them. The handout list detailed sections of the engineering, architecture, market appeal, and technology as well as a team photo and a list of sponsors. The competition boasted 69,000 people in 2013 making this the most guaranteed form of communication. This audience will also be one of the most educated in the topic of solar energy due to the other competitors. If they are not the most educated, then they would be the most curious since they would be making an effort to attend the competition. The handout will also provide face to face communication which has not been available in the other two forms of communication Team Alfred has been employing.

CONCLUSION:

Alf is a home built by the hard work of Alfred State College and Alfred University and multiple types of communication have been used to market the home to a large range of audiences. The media has been effective way to reach the younger audiences through social media while paper publications have been useful in reaching an old generation through out New York State. The website has spread the bounds even more, educated and drawing from people located anywhere internet is available. It offers more details and more interactivity then the media. The handout is the most interactive communication available reaching to an audience mostly uneducated about western New York, but the most curious. The communication tactics employed were designed to touch upon numerous available audiences to raise awareness of the capabilities of solar energy. Each one has been effective in the manner in which it was designed, with the final outcome to be determined with the conclusion of the competition in October.

Marketing Narrative

No house is ever built without the intention of it being the dream home for the perfect family. Alf is no different in this regard. It is designed with a target client in mind while nestled in the hills of Alleghany County. Three main categories must be considered when determining the market appeal. The livability of the home is a natural concern. The home must be comfortable and functional for a family to maneuver otherwise the appeal is lost. The next is the marketability. What makes Alf unique and well suited for a family in Upstate New York is a key factor inside and outside the home. The final category is the buildability of the home. Alf must be easy to assemble to ensure efficiency and desirability. A farmer would not desire a complicated home to build especially because that is time consuming, thus hindering the normal tasks of a standard day. This would drastically decrease the market appeal if buildability was not considered.

Livability:

Lighting, entertainment and other control

In the interest of using energy wisely, LED lighting technology is employed in Alfred's solar house. LED technology provides excellent lighting with a considerable decrease in the energy consumption compared to other available options in the market. Moreover, the lighting design enables the residence to change the intensity of the lights in the living room according to the desired mood or outside lighting. Dimmable lights in the living room, not only contributes to energy saving, but to the comfort level of the home. An appropriate amount of light during the day is secured through positioning clerestory windows at the south and a Nanawall on the North side of the house.

Safe, functional, convenient, comfortable and enjoyable place

Alf is designed for a single family, living in the Southern Tier of New York State. The central gathering space allows a convivial atmosphere for the occupants to interact. The movable furniture allows for the efficient use the space, which increases the functionality of the 900sq foot home. The multi-purpose space provided with scenic views through the Nanawall, serves as a large inviting area for an enjoyable interaction. New York is known for its scenery as it changes through the seasons and Alf is designed in full appreciation of this natural beauty. Alf's design does not solely limit it to the Southern tier however, its design is versatile for any area of upstate New York.

Unique needs and desires of the target client

Alfred house is designed to withstand the harsh winters of upstate New York. The HVAC system of the house employs floor heating and a fan – coil system to secure the heating load during winters. The house is built with green structural insulated panels for the walls and roofs, which in addition to reducing the material costs, provides incentive for customers with sustainable concerns. Also, Energy Recovery Ventilation system guarantees a huge reduction in energy consumption by recovering the energy of

the air inside the house. Iris smart hub coupled with Powercost monitor Bridge and sensors allow real time energy monitoring and can lead to a considerable reduction in electricity consumption. Moreover, according to the survey which was conducted in Allegany County in 2014, solar energy was the most popular option among renewable technologies and therefore, Alf is perfectly suitable for the target client in Allegany County.

Marketability:

Exterior and interior appeal for the target client

Alfred's home is a perfect fit for a small family due to the limited space while also exercising optimal creativity to maximize the living area for the family. The family will be able to take full advantage of nature with the large windows along the northern side and the wrap-around porch. Alf is a modular home that encompasses functionality and the fluidity of a resourceful home that not only is innovative on the inside, but environmentally friendly throughout. It is designed to decouple from the hectic modern lifestyle and therefore, the architectural design of the house is perfectly aligned with the rolling hills and picturesque streams of Allegany County. The inviting entrance of the home inspires any visitor to step inside or at least slow down to admire the architectural feat. The wide leaving room area employs the services of color, texture, light and indoor plants to add a fresh natural dimension to the house. In addition, tall ceilings and open-truss members are chosen to make the space more airy. The wrap-around porch enables the residents of the house to take full advantage of beautiful sceneries in Allegany County in every direction.

Material, equipment and detailing choices to the desires of the target client

By using green structural insulated panels for the walls and roofs, an energy monitoring system and an energy recovery ventilation system, a more sustainable design for Alf results. The sustainability factor has a considerable impact on obtaining a customers' trust. Materialistically within the home, movable furniture enhance the functionality of space providing more purpose in a small space. A large number of consumers desire space, but cannot afford it. Alf repurposes space to meet the needs of the client. While windows placements allows appropriate levels of daylighting inside the house, dimmable LED lights enables the residents to set the lighting to the desired level to further increase the comfort level and innovation of Alf.

Sustainability features and strategies to make a positive contribution to the marketability:

Alf is designed on the principle of being a zero energy home, thus being self-sustaining. Essentially what a client would be spending on energy in a given year is eliminated. Multiplied out to match the number of year residing in the home, eventually in due time the home would pay for itself. Alf would be an investment in sustainability and green technologies that with the proper care is virtually free.

To what extent does the house offer a good value to the target client?

Considering the fact that Allegany County has the lowest per capita income in NY State with high unemployment rate, we had to consider the capital price of the house in the designing and cost estimation step. Therefore, the team managed to provide a reasonable value of $165000 for the house. Being affordable by the majority of inhabitants in upstate NY, Alfred's house has a great chance of attracting its target clients' attention.

Buildability

How effectively do the drawings and specifications enable, through sufficient quality and detail, a contractor to generate an accurate detailed construction cost estimate?

The cost for Alfred house is estimated to be $165000. This price can be easily calculated through the drawings and specifications that are provided by the engineers and architects in Alfred's team. The costs are categorized and estimated for each sector separately and will be included in the final report. For instance, the estimated cost of the HVAC system, construction, labor etc. will be provided in the final version.

How effectively do the drawings and specifications enable, through sufficient quality and detail, a contractor to construct the home as the design team intended it to be built?

Alfred house is designed to maintain simplicity of construction, which plays a prominent role in attracting customers. Since the house is designed for a target client in Allegany County, which consists of numerous hills and valleys, the team took into consideration ease of assembly for the house. Therefore, provided with the architectural drawings and specifications, even the farmers which constitute a huge portion of our target client, can easily assemble the house. Sip walls provide a simple approach towards assembling the house. Moreover, the house can be assembled with the need for a crane. Also, any target client can take the initiative and request a specific system for the house, according to his/her needs.