



Needs Identification, Product Specification and Project Plan

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Presentation Outline

- Introduction
- Needs
- Project goals
- Operating environment
- Objectives
- Constraints

Introduction to Client

- Dr. Acker
- Professor of Mechanical Engineering at NAU
- Research
 - Renewable Energy Systems
 - Statistical Thermodynamics
 - Energy Systems and Integration
- Director of NAU Sustainable Energy Solutions Group



Dr. Tom Acker

Background

- What is the current solar panel system?
 - General information
(No. of PV panel; Size; Location)
- Why is a solar tracking system necessary?
- How does the solar tracking system work?
 - Increase the efficiency due to the increasing incident radiation rate.

Needs

- Tracking system for 4 solar panels up at the shack
- Current solar tracking systems are
 - Expensive
 - Unreliable
 - Hard to maintain

Project Goals

- To design and construct a more reliable solar tracking device.
- This device will capture solar energy and convert it to useable energy.
- The system will be measured for efficiency after completion.

Operating Environment

- Target location: “The Shack,” Flagstaff, AZ
- Target location is sunny during the day but shady in the morning and evenings.
- System is to be used year round, so it must withstand snow, rain, wind, etc.
- Design can be implemented in various locations (i.e. nationwide).



Solar Panels located up at the
“Shack”

Objectives

- It should to be inexpensive.
- The system should increase the energy efficiency.
- The solar panel tracking system should require low maintenance.
- The tracking system should be easy to manufacture.
- The system should have a high build quality.

Secondary Objectives

- The structure should handle the different weights of solar panels.
- There should be a way to remove snow.

Objectives

Objective	Measurement Basis	Units
Inexpensive	Unit cost of production	Dollars
Efficiency	Amount of useable amps per midday sun	Amp/hour
Low Maintenance	Time until first replacement parts	Days
Manufacturability	Number of moving parts	Parts
Build Quality	Stress times strain	N/m ²
Snow Removal	Area with out snow	m ²
Handle different weights	The weights of the solar panels	N

Solar Tracker QFD Matrix

		Weighted Importance	Specifications									
			Volume	Material Strength (YS)	Material Density	Weight	Young's Module	Maximum Deflection	Material Type	Degree of Freedom	Cost	Response Time
Obejctives	1. Light Weight	7	x		x	x			x			
	2. Time to Manufacture	8							x	x		
	3. Structural Simplicity	8	x							x		
	4. Low Maintenance	10		x			x	x		x		
	5. Build Quality	10		x				x		x		
	6. Efficiency	9								x		x
	7. Does Not Rust	8							x			
	8. Snow Removal	5		x						x		
	9. Survive Strong Wind	8		x		x		x				
	10. Inexpensive	10									x	
	* = unitless by method	Unit of Measure	m^3	N/m2	kg/m^3	kg	N/m2	m	ul*	ul*	\$	min
		Technical Target										



Conclusion

- Problem Definition
- Recognizing the Need
- Objectives and Constraints
- Clients

References

- <http://nau.edu/Sustainability-360/Sustainability-Experts/Thomas-Acker/>



Questions?