Howard University

Management of Renewable Energy System under different Load Conditions

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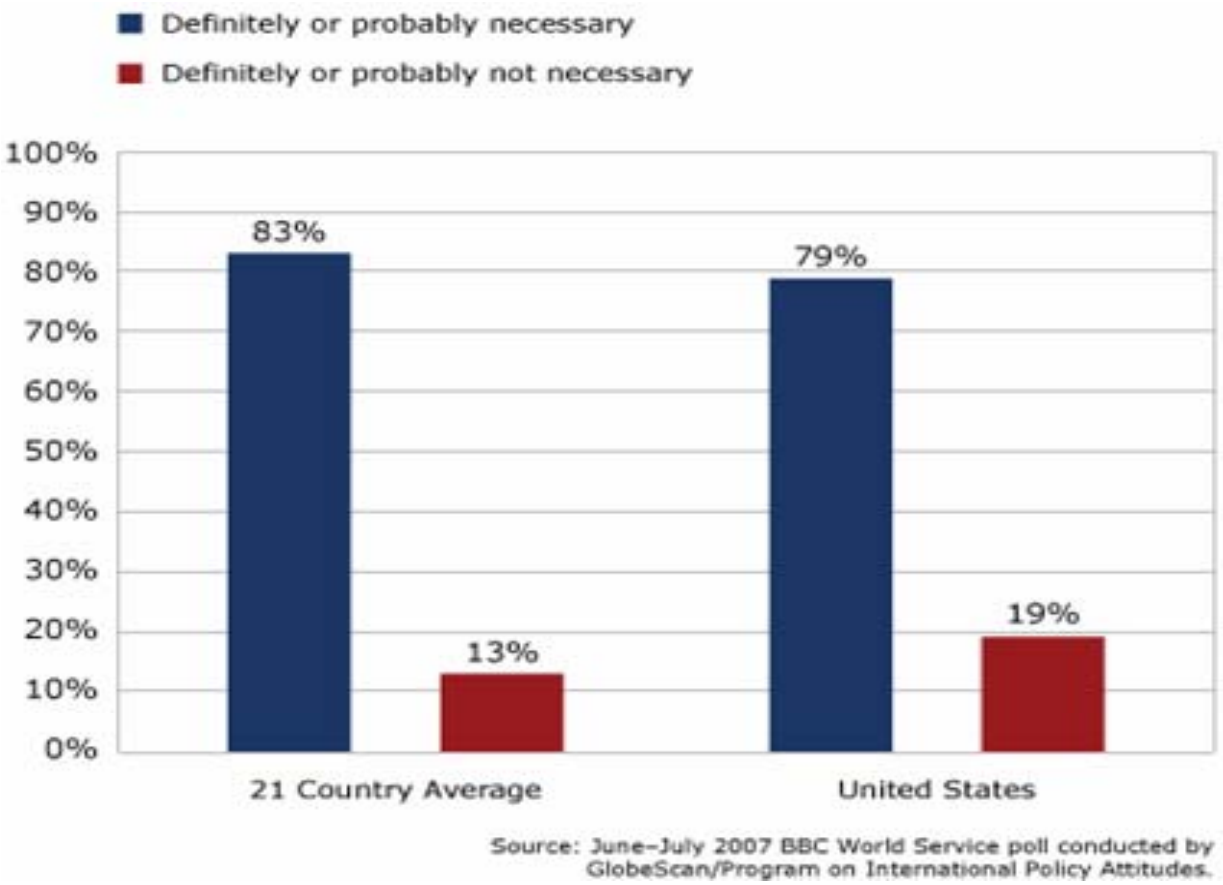
04-17-08

Background

Evolving Energy Systems and Deregulation	
Problems	**Constant Increase of Energy Demand**
	High Reliance of Conventional Energy Sources
	Increase in levels of climate changing gases

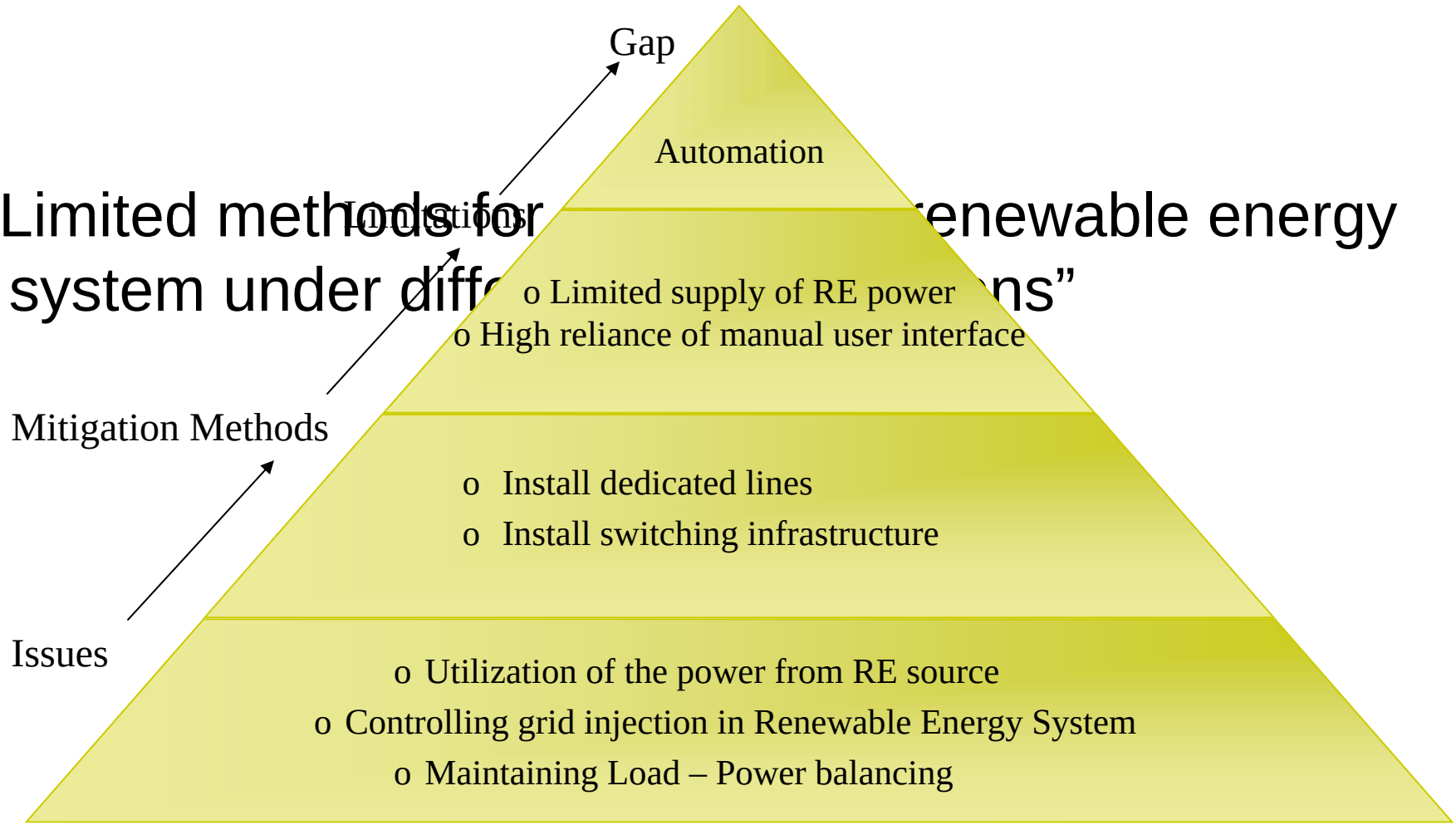
Background

Please tell me how necessary it is for individuals in [country] to make changes in their life style and behavior in order to reduce the amount of climate changing gases they produce.



Problem Statement

“Limited methods for renewable energy system under diff ns”



Design Requirements

- **Re-configurable**
- **Stay within project's budget**
- **Comply to:**
  - **IEEE 929, 1547**
  - **NEC: 480.9(A) (C), Section 690.74 and Article 110.26**
  - **UL 1741 product testing standards**

Solution Options

Option 1
GMB HR Module Controller

- Language
  - Pascal, BASIC, C++
- Cost = $450.00

Option 2
PIC 16F877A Controller

- Language
  - Assembly
- Cost = $80.00

Typical Renewable Energy System

PV Power Source

Utility Power (from bulk power grid)

Charge Controller

DC Bus

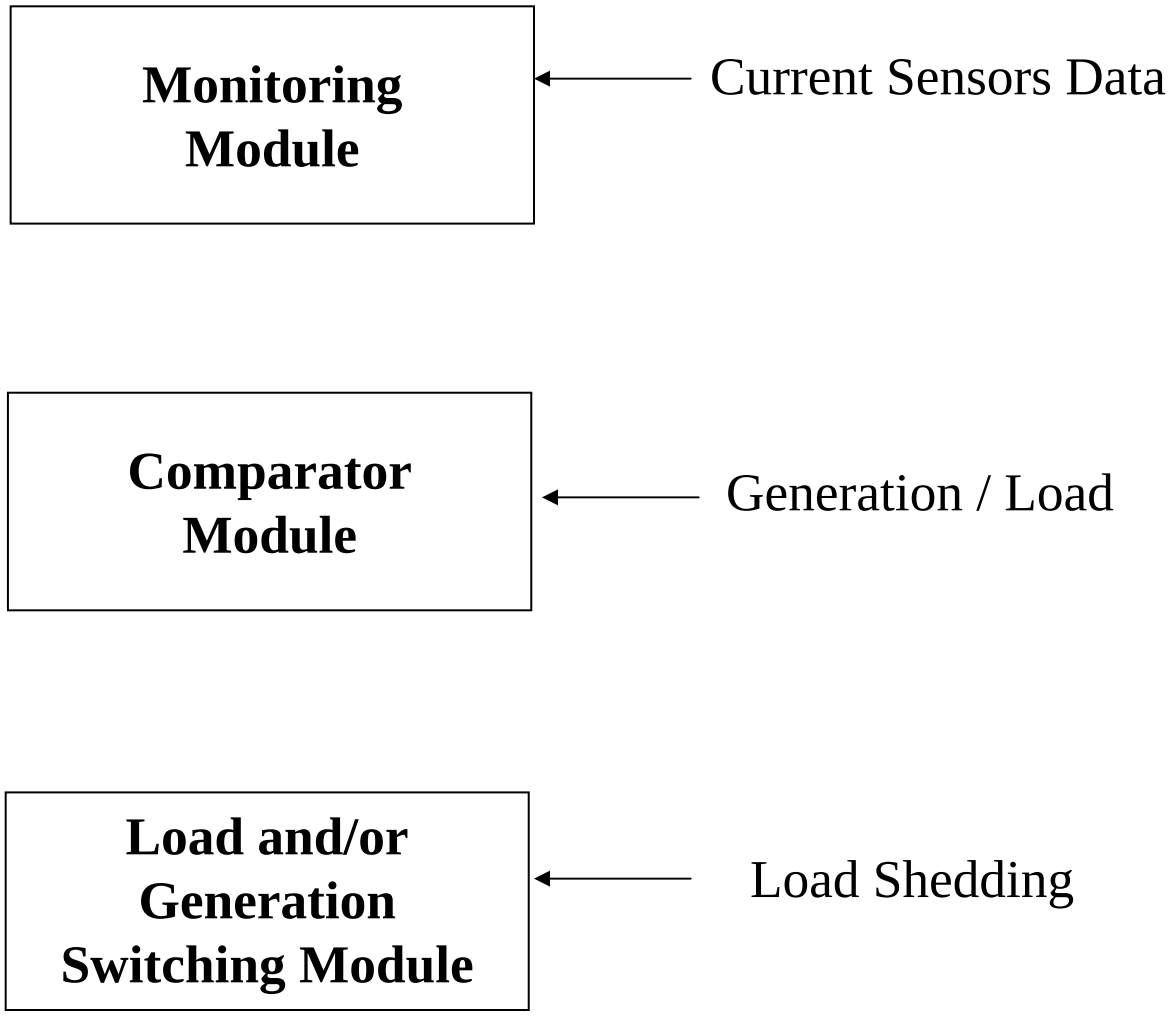
AC Bus

Inverter

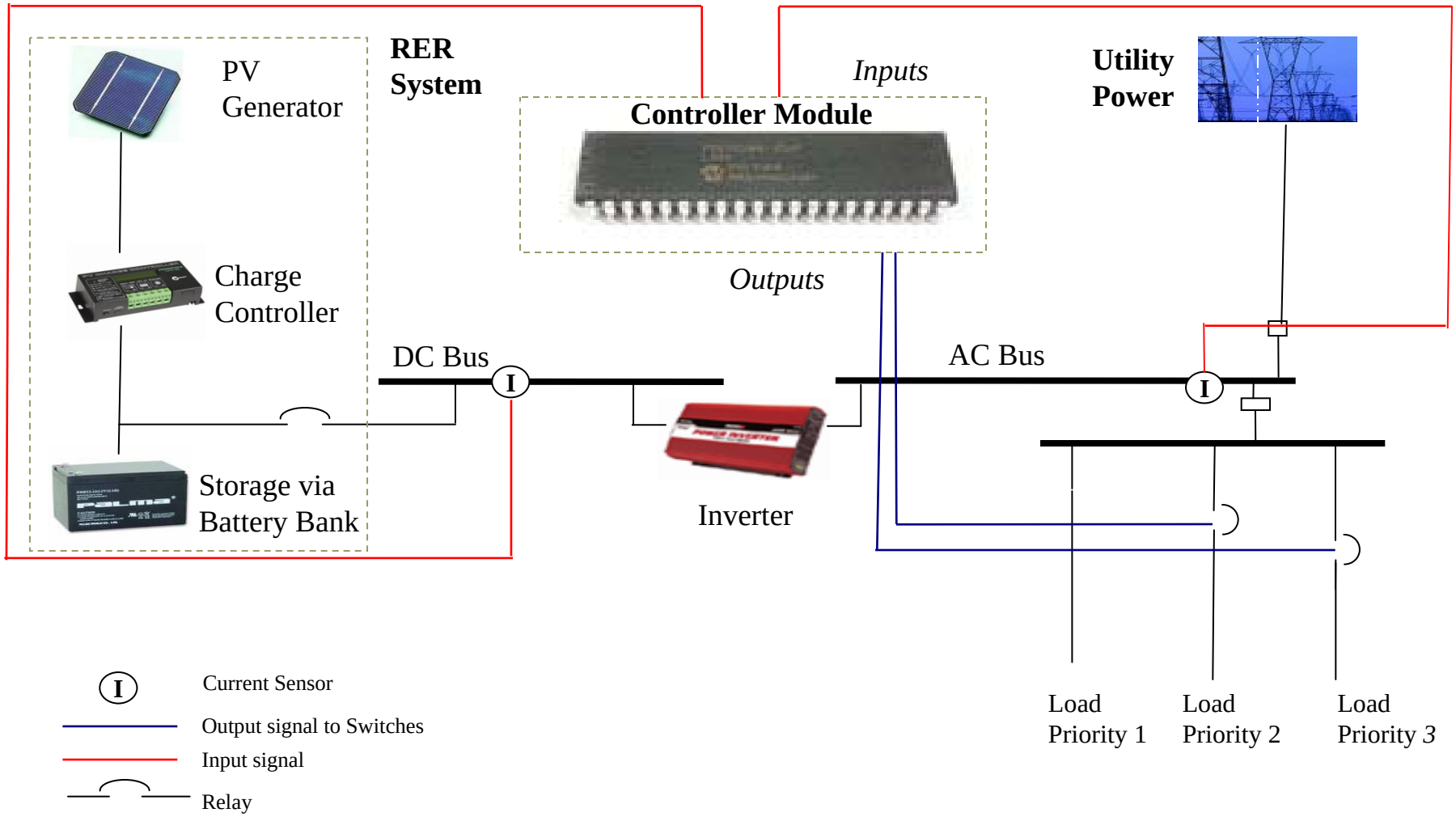
Storage Via Battery

Load 1 **Load 2** **Load 3**

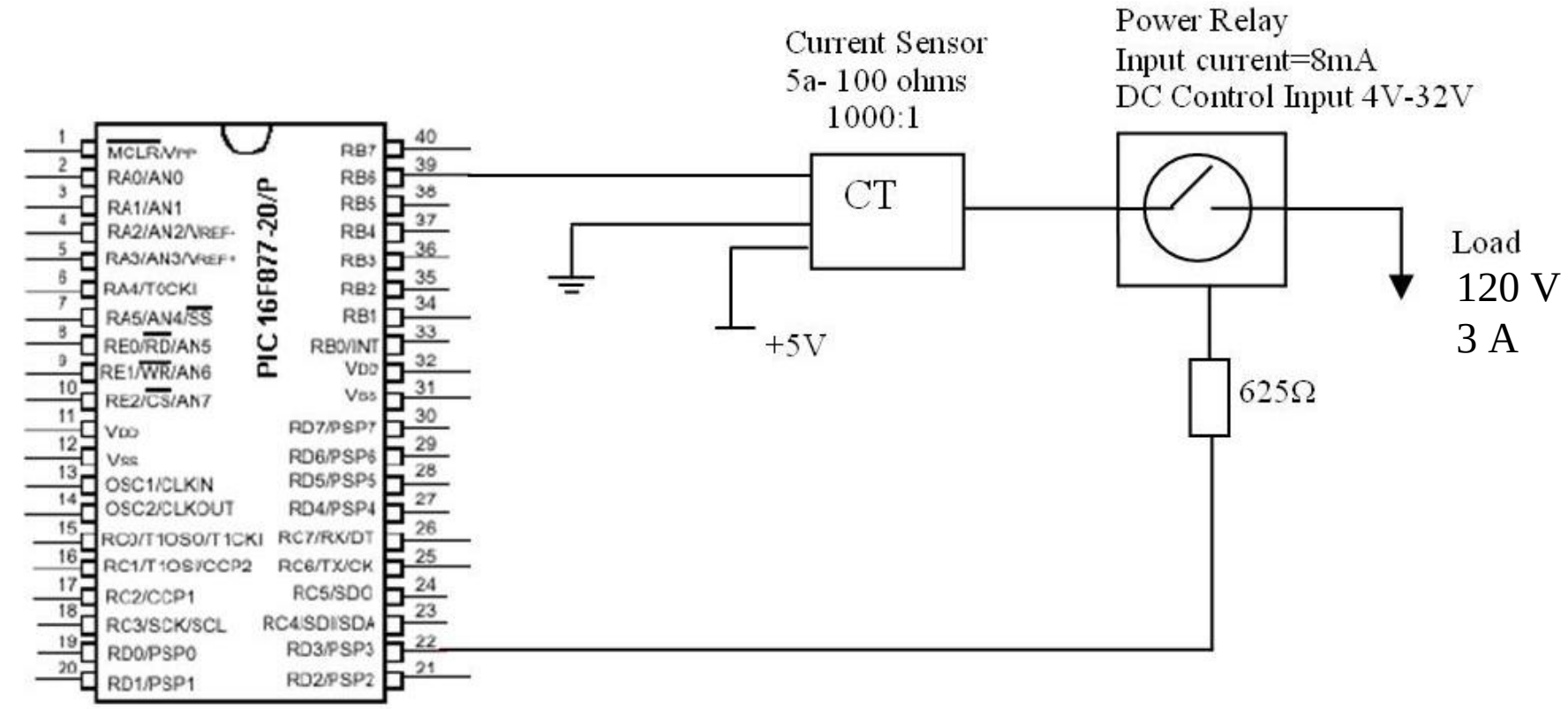
Modular Design



Final Design



Final Design Controller



PIC controller

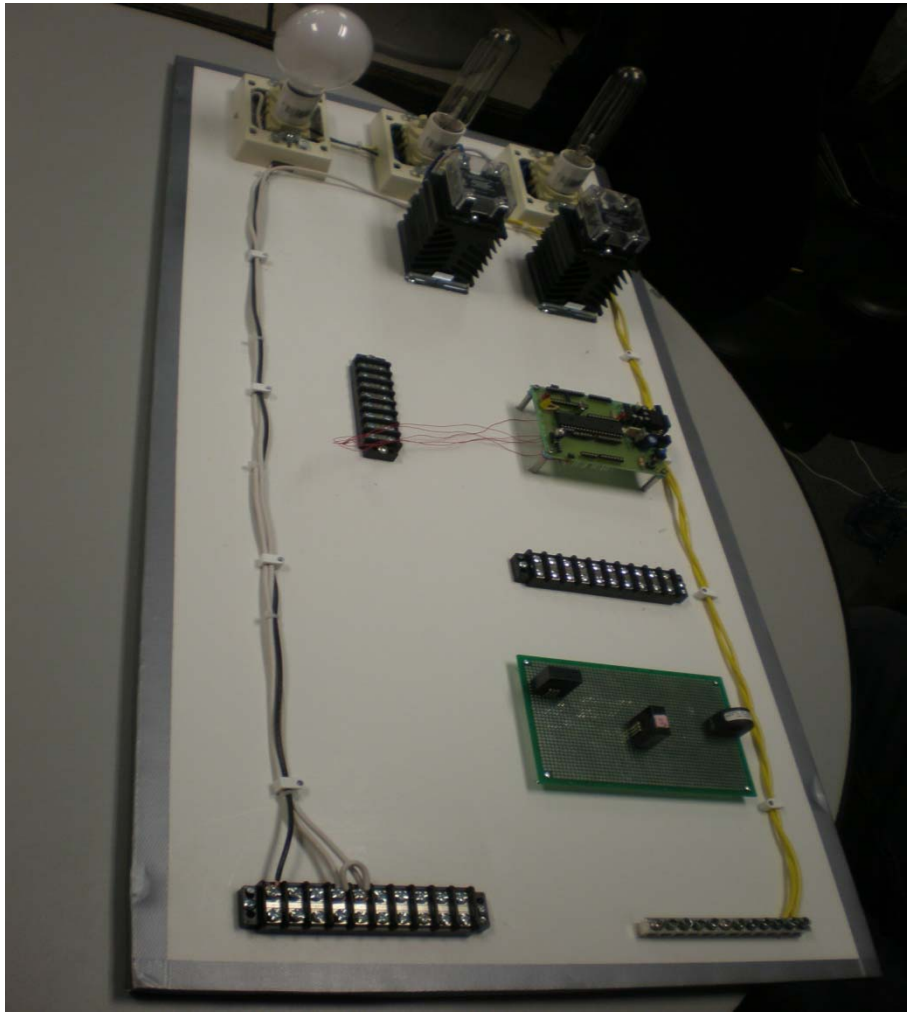
Max current sunk by all ports = 200mA

Output voltage = +5V

Implementation Methods

- Deriving alternative solutions
- Selection of best approach
- Hardware sizing
  - Renewable Energy system parts
- Selection and Purchase of Hardware and software
- Design Implementation
- Troubleshooting unforeseen hurdles

Implementation Design



Basic Layout of Parts

- **Relay**
- **Sensors**
- **Microcontroller**
- **Load Unit Connection**

Implementation Plan Timeline

Date	Abdoulaye Sy	Kalifa Llewellyn	Emmanuel Ekatah	Opeyemi Liadi
7th Jan – 11th Jan	Planning of activities for design project			
14th Jan – 20th Jan	Derive alternative solutions		System sizing	
21st Jan – 5st Mar	Analyze data sheets			
4th Feb – 15th Feb	Project review – alternative solutions			
18th Feb – 25th Feb	Parts selection		Analyze data sheets	
25th Feb – 14th Mar	Order parts			
15th Mar -19th Mar	Research PIC controller		Write code for switching logic	Test PIC microprocessor
20th Mar – 23rd Mar	Integrate PIC with power system		Test of Prototype	
24th Mar – 28th Mar	Troubleshoot		Monitor Prototype	
31st March	Completed Design prototype			
17th April	Final presentation on ECE day			

Conclusion

- Room for increase functionality
- We look forward to the demonstration

Lessons Learned

- Team Work
- Time Management
- Problem Solving Skills

Acknowledgement

- Department of Electrical & Computer Engineering
- Senior Design Coordinator
- CESaC – Dr. Momoh, Dr. Chuku and Garfield Boswell and staff