

Solar and Rain Power generation System

ENSC 305/440 Final Presentation

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Introduction

- ❖ GPI Team Members
- ❖ Background Information
- ❖ Motivation



Introduction

❖ GPI Team Members

Green Power Innovation (GPI)

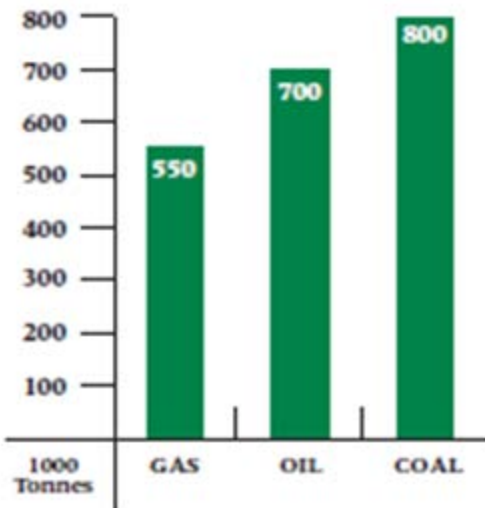
- Frank Feng – CEO
- Zhiyu Hu – CTO
- Max Liu – CMO
- Daniel Dong – CFO
- Jeff Bian - COO



Introduction

❖ Background Information

- non-renewable resources
- **Pollution**
 - Sulfur dioxide → acid rain
 - Nitrous oxides → urban smog
 - Carbon → global climate change



Tonnes of CO₂ produced per unit of electricity per TWh (terawatt hour = million megawatt hours)





Introduction

❖ Motivation



Solar



Wind



Rain

ALL COMBINING TOGETHER?



System Overview

1

System Block Diagram

2

**High level Functional
Demonstration**

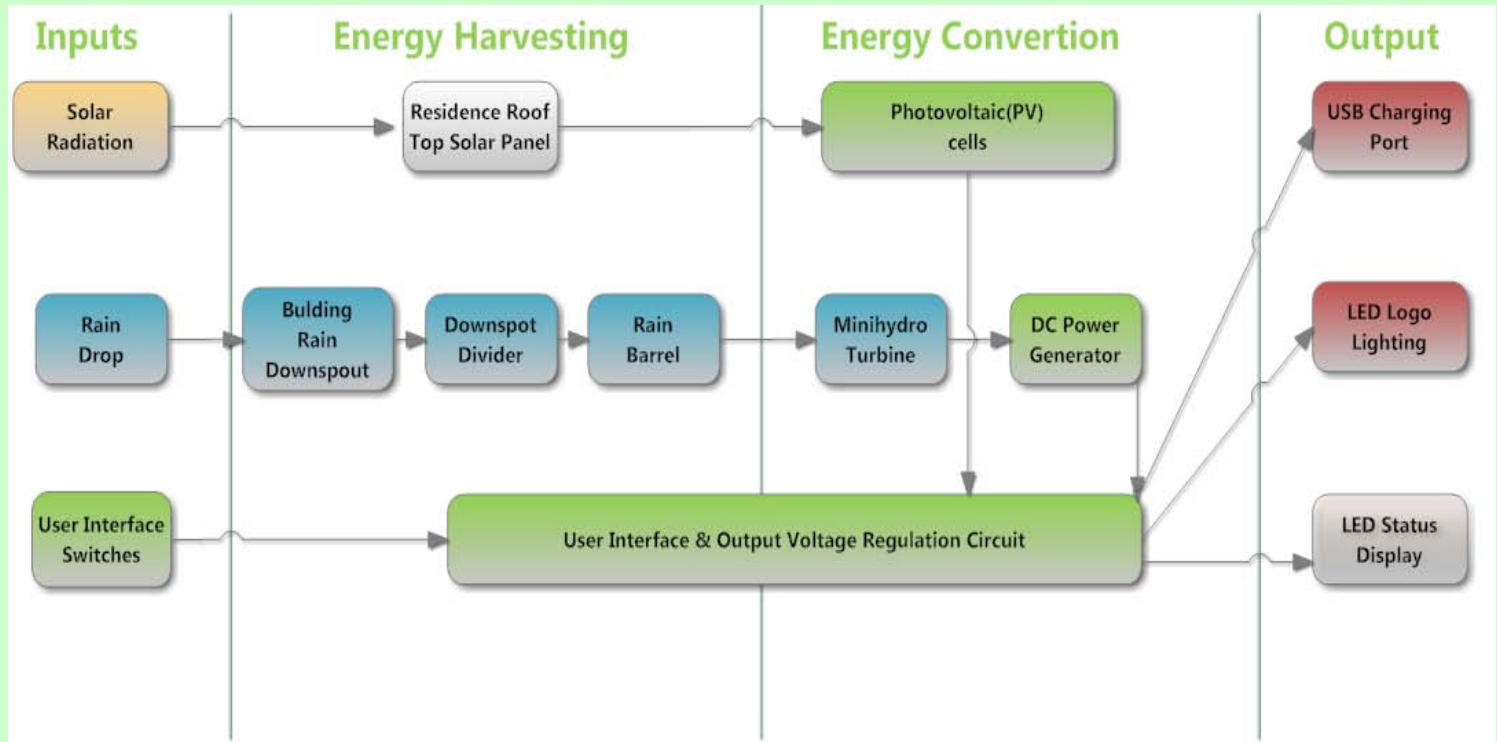
3

System Test Result



System Overview

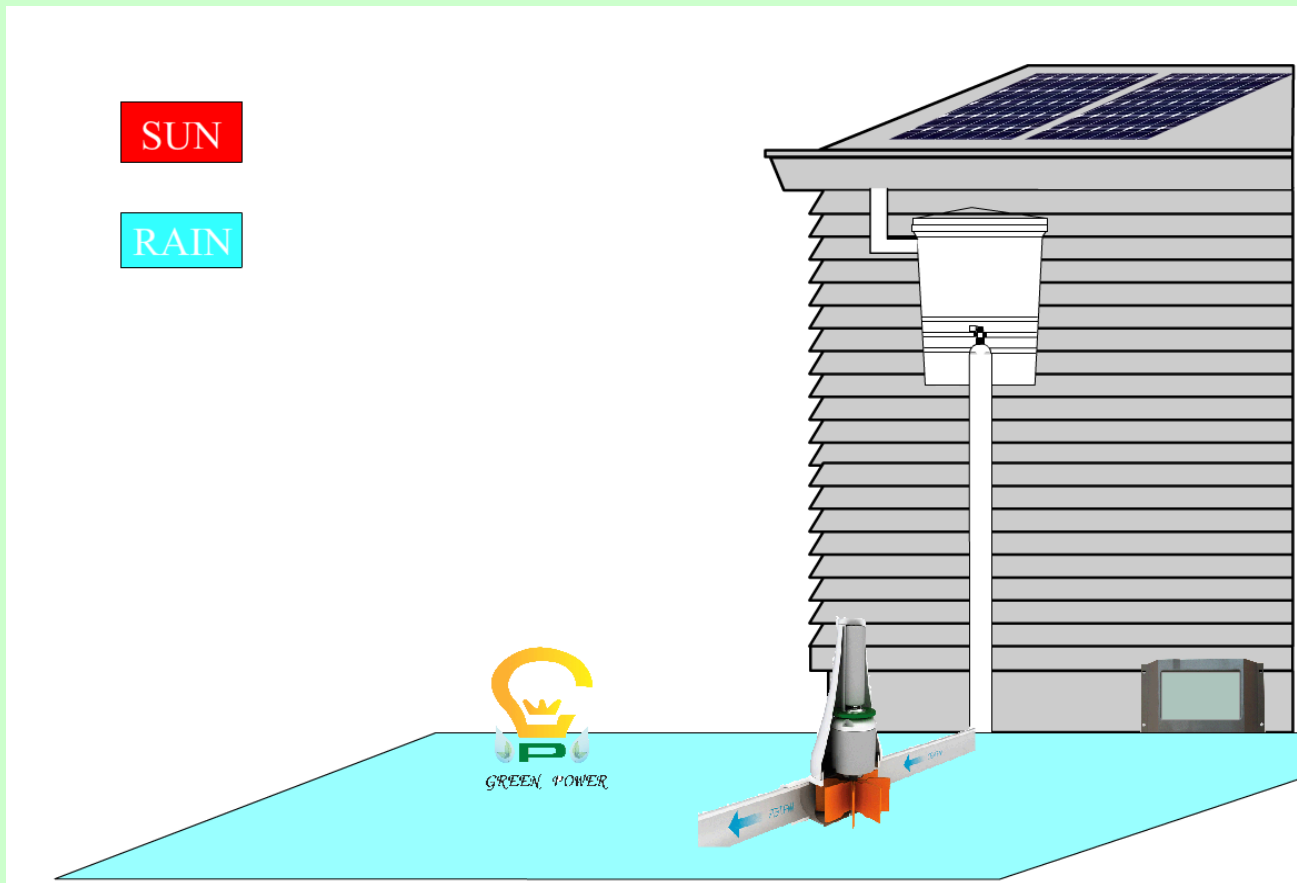
❖ System Block Diagram





System Overview

❖ High level Functional Demonstration

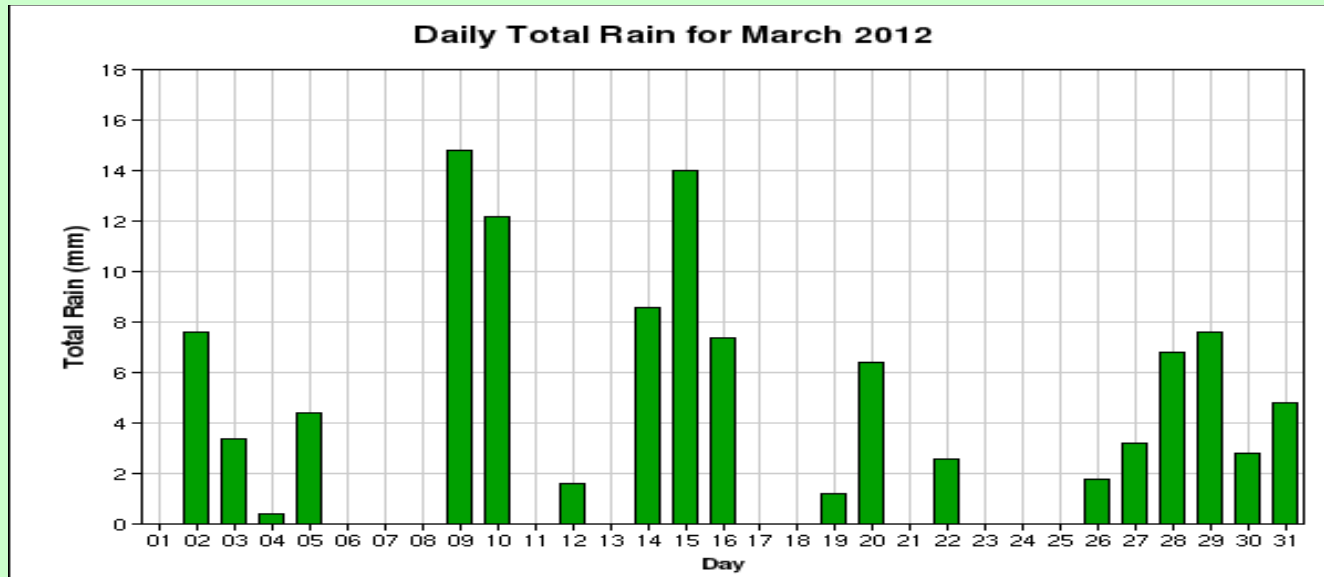




System Overview

❖ System Test Result

Rain Collection Testing



Day	Actual Water Collected (m ³)	Roof top area	Daily Rain (mm)	Expected Total Collected Water (m ³)	Theoretical Max Power Output Value (J)
9	0.25	100 m ²	15	1.5	25000
14	0.19	100 m ²	9	0.9	19000
16	0.12	100 m ²	8	0.8	15000
28	0.16	100 m ²	7	0.7	16000



System Overview

❖ System Test Result

Power Output Testing

Time	Height	RPM	Power	Electricity Production	Theoretical water potential	Efficiency
5min	5m	60	1.25 W	375 J	2500 J	0.15
10min	5m	50	0.99 W	600 J	2500 J	0.24
15min	5m	10	N/A	N/A	2500 J	0
5min	10m	150	3.5w	1050 J	5000 J	0.21
10min	10m	100	3w	1800 J	5000 J	0.36
15min	10m	70	1.5w	1350 J	5000 J	0.27



System Specifications

- ❖ **Rain Power Generation System**
- ❖ **Solar Power Generation System**
- ❖ **Electrical System**
- ❖ **User Interface**



System Specifications

❖ Minihydro Turbine Subsystem

- Turbine Selection

- Impulse turbines

The change in momentum (impulse)

- Reaction turbines

Changes pressure as it moves through the turbine





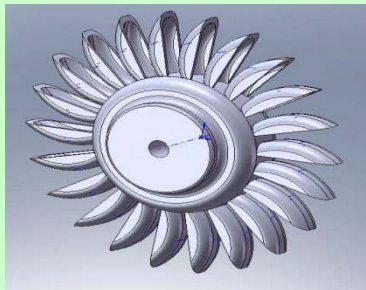
System Specifications

❖ Minihydro Turbine Subsystem

- Turbine Runner Prototype Expected



Our Design



Actual Model





System Specifications

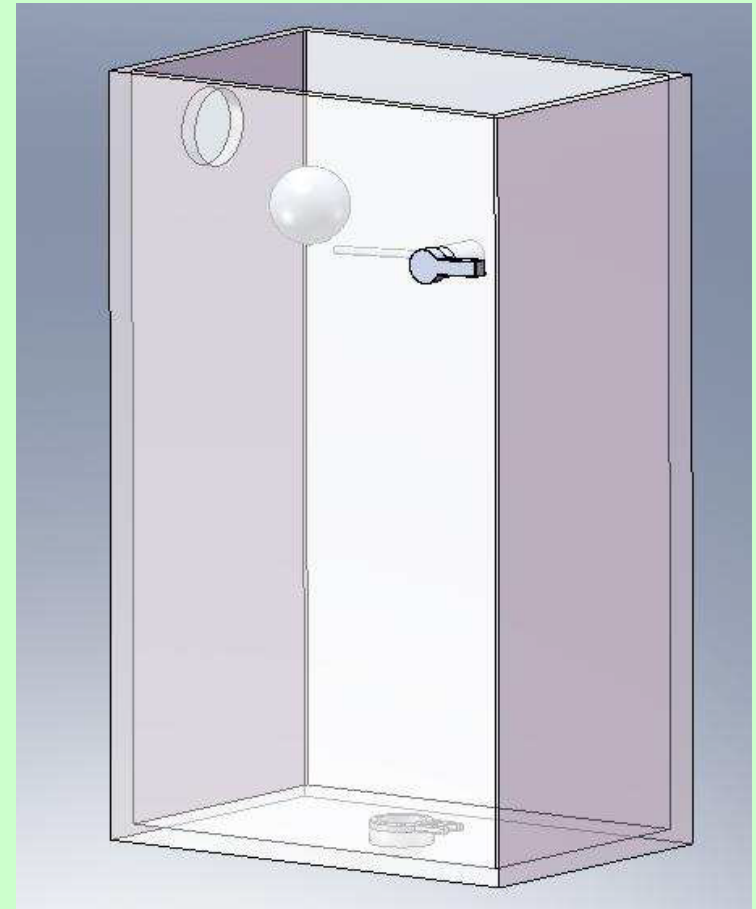
❖ Plumping System

Water Tank

Based on toilet flush tank
Releasing water automatically

Plumping Pipe

Valve control flow rate
PEX material



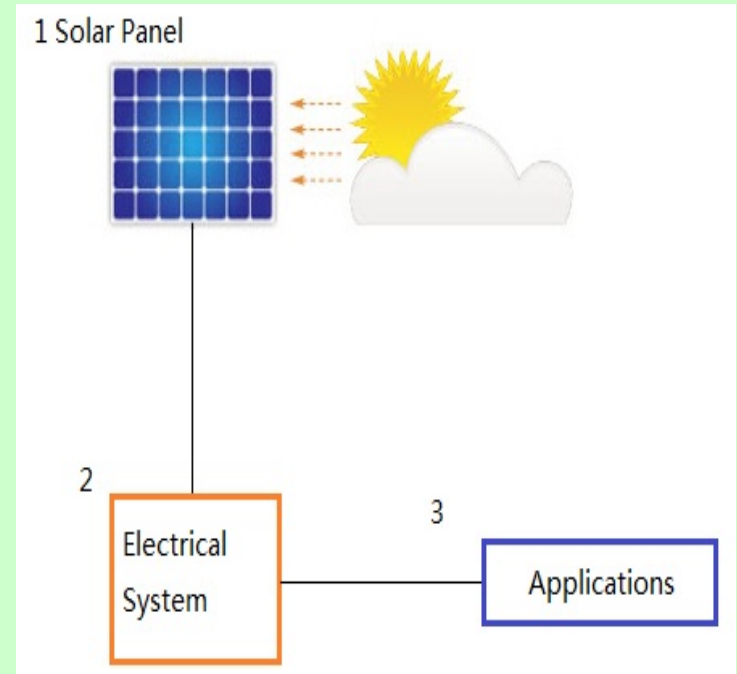


System Specifications

❖ Solar Power Generation System

10W 22V Solar Panel

Weather proof
25 years plus durability





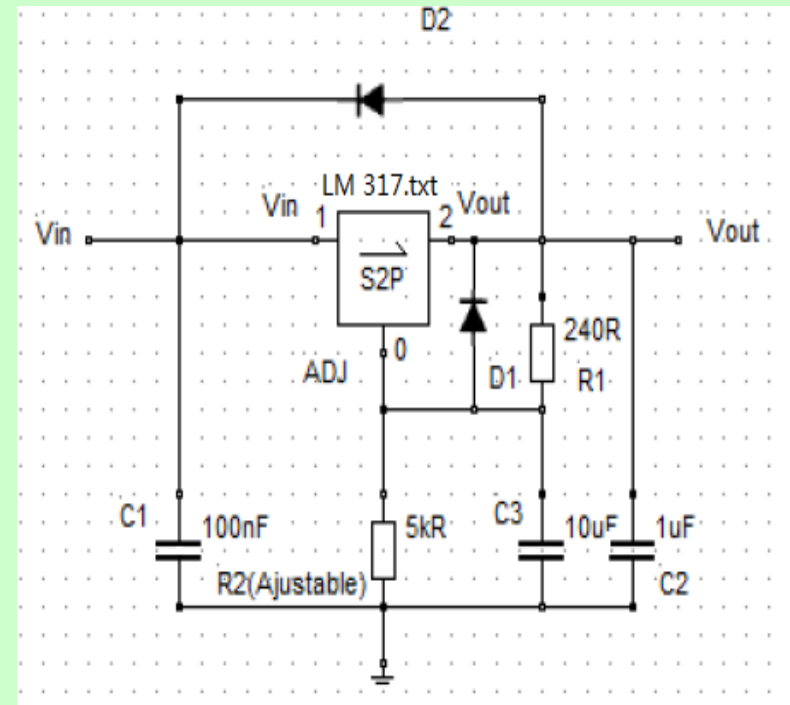
System Specifications

❖ Electrical System

LM317 Adjustable Voltage Regulator

Three bypass capacitors

Two protection diodes





System Specifications

❖ User Interface

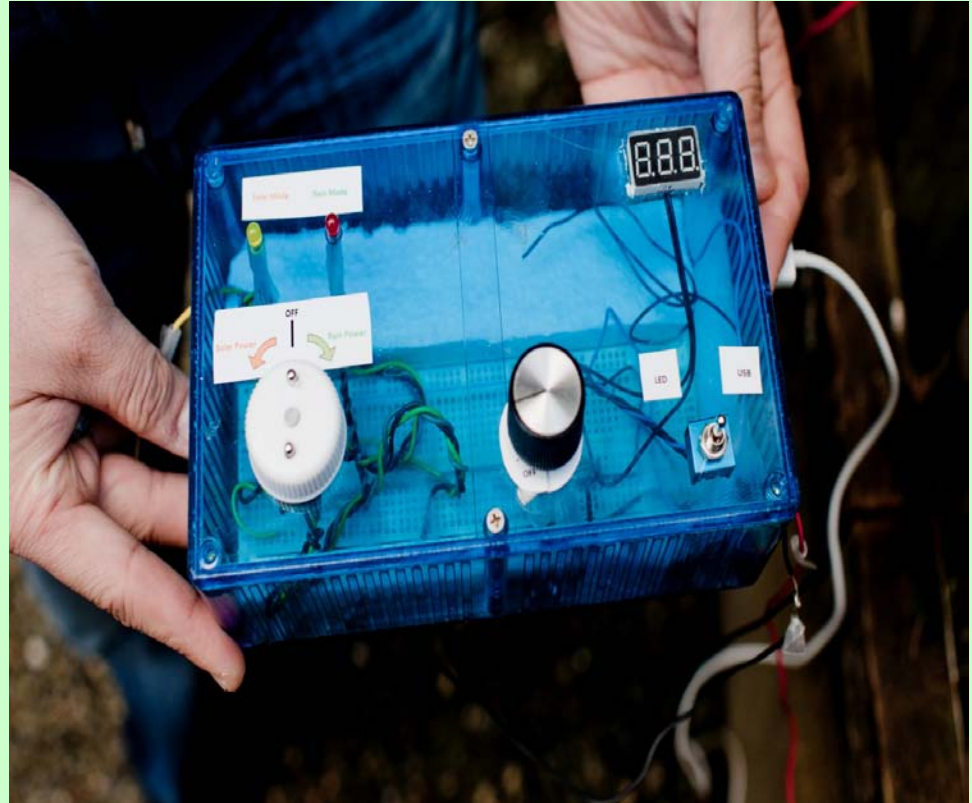
Source Selection

Mode Indication

Voltage Adjustment

Voltage Display

Load Selection





Business & Marketing

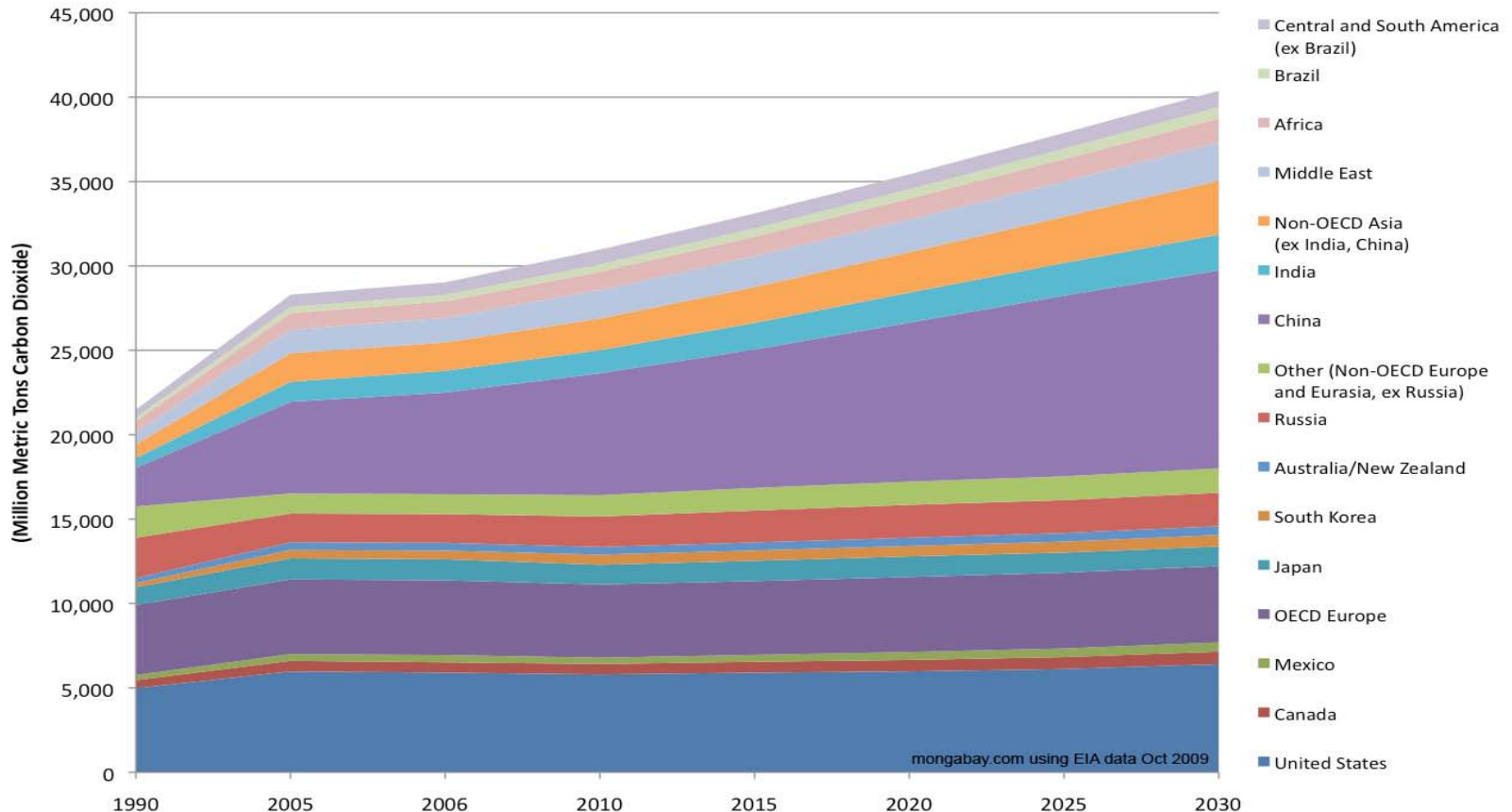
- ❖ Social Impact
- ❖ What we Need
- ❖ Our Solution
- ❖ Market Size
- ❖ Competitors



Business & Marketing

Social Impact

World Carbon Dioxide Emissions by Region, Reference Case, 1990-2030





Business & Marketing

What We Need

Sustainability

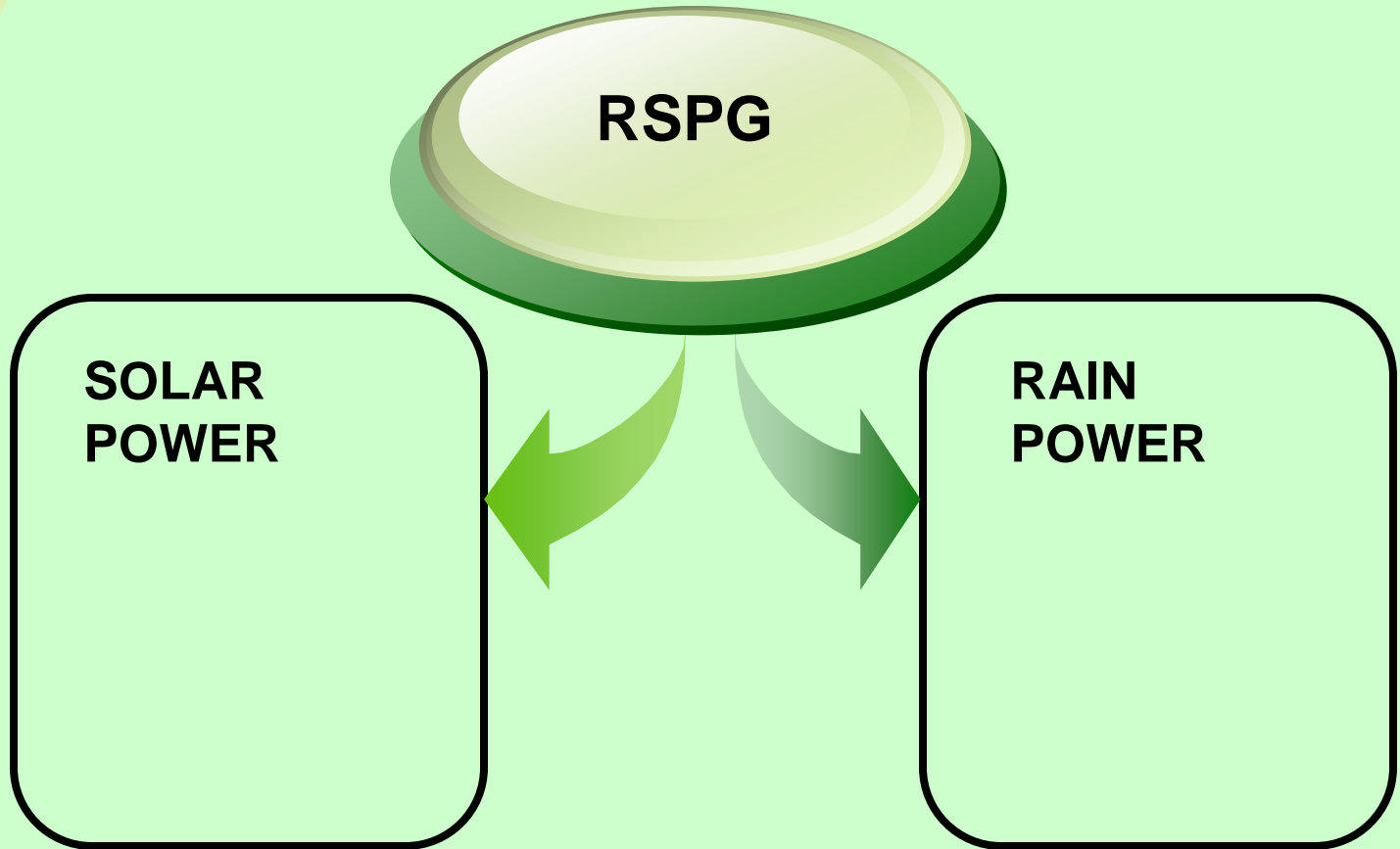
Reliability

Usability



Business & Marketing

Our Solution





Business & Marketing

Market Size

- ❖ Global power generation industry:\$1,141.8 billion.
- ❖ Renewable Energy:18.7% of the industry total.

Global power generation industry category segmentation :TWh, by volume, 2011(e)

Category	2011	%
Fossil Fuels (Conventional Thermal)		67.7%
Renewable Energy		18.7%
Nuclear Electric Power		13.5%
Total		99.9%

SOURCE: MARKETLINE

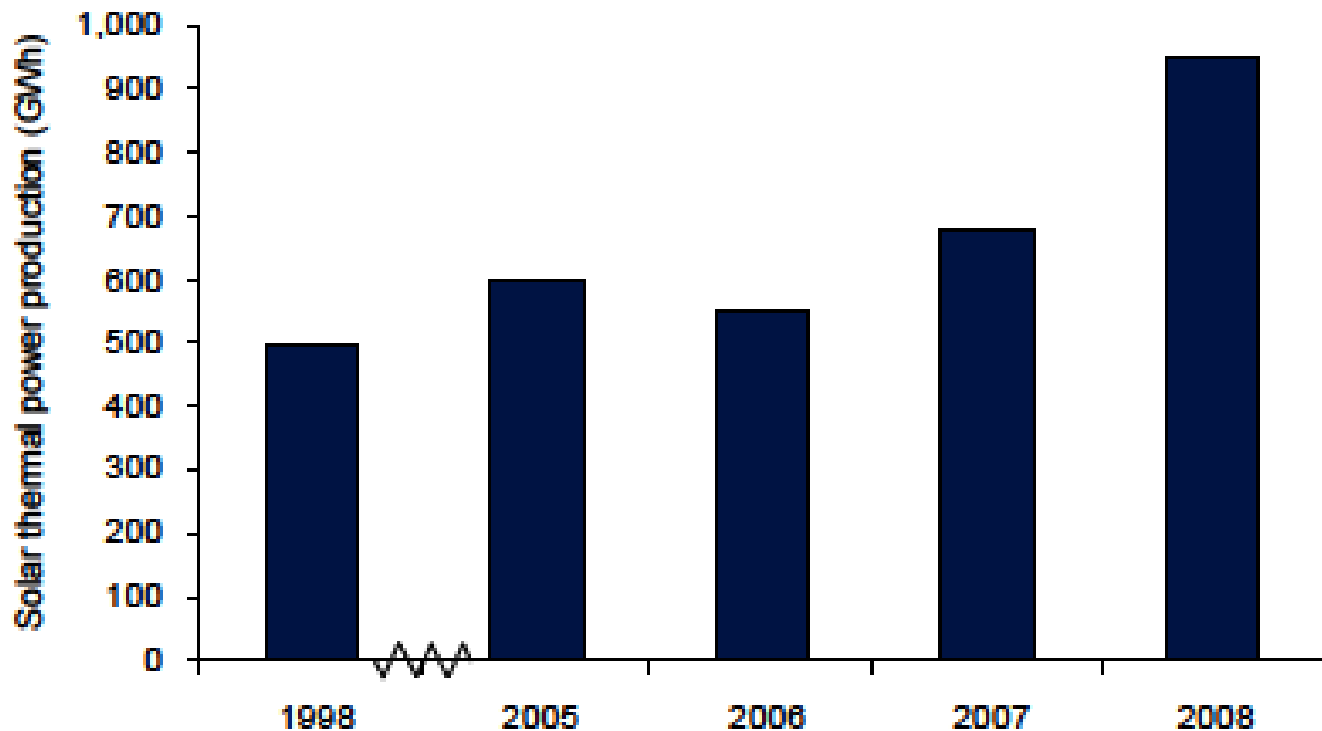
MARKETLINE



Business & Marketing

Global Trend

Global solar thermal electricity production (GWh), 2009



Source: Observ'ER

BUSINESS INSIGHTS



Business & Marketing

Competitors

1

Traditional Generators

2

Solar Power Generators

3

Raindrop Generators



Business & Marketing

Raindrop Generator

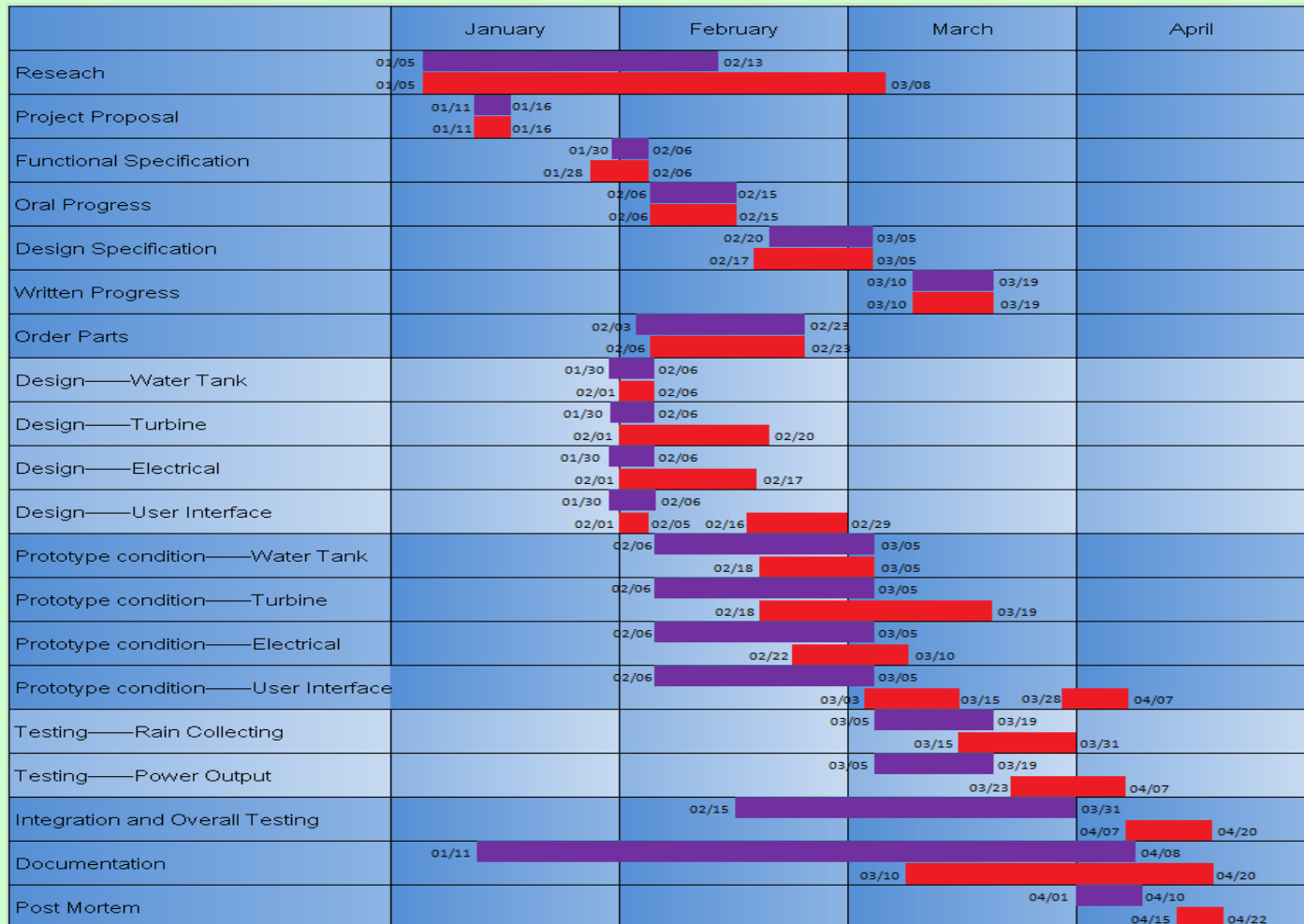
- ❖ High cost
 - [PVDF Price Calculator](#)
- ❖ Not portable





Timeline & Budget

Timeline





Timeline & Budget

Budget Initial Estimation

Equipment List (Include brand and model # if possible)	Quantity	Estimated Unit Cost
5W5 Watt 12V Flexible Solar Panel Charger(ICO-SPC-5W)	4X \$28.49	\$113.96
High Performance 2-Piezo Layer Bending Elements(T215-A4CL-103X)	5X \$44	\$220
Turbo Fans & Gears	-	\$30
High Power Low Speed DC Generator Motor	1	\$245
Rain Collector and other parts	-	\$50
Duracell AA Rechargeable NIMH Battery	4X 2.5	\$9.99
Cables and other electronic parts	-	\$40
Water Filter System	-	\$100
Total Cost		\$808.95



Timeline & Budget

Budget Final Cost

Equipment List	Quantity	Price
10 Watt Solar Panel 12V Battery Charger	1	\$53.98
High Power Low Speed DC Generator Motor	1	\$245
Turbine Fans & Gears		\$20
• Spoons	• 12	• \$20
• Metal Disc	• 2	• Borrowed
Electronics Parts		\$29.22
• Enclosure	• 1	• \$17.24
• Toggle switches	• 2	• \$5.89
• LEDs	• 1	• \$1.49
• LM317T	• 2	• \$3
• Diode-signal 10/PKG	• 1	• \$1.60
Rain Collector		\$59.34
• 79L TOTE	• 1	• \$11.99
• Valve	• 1	• \$9.99
• Tank Lever	• 1	• \$5.79
• FLX CP15X125	• 1	• \$7.99
• Float Ball	• 1	• \$5.79
• FLX CP 2X1.5	• 1	• \$7.99
• Reduc Adapt	• 1	• \$2.36
• 1 1/4 CPLING	• 1	• \$1.08
Turbine Fan Shelter and parts		\$86.95
• Plastic Sheets	• 4	• \$68.05
• Corner Brace	• 2	• \$6.58
• Hinge	• 1	• \$1.29
• Catch	• 1	• \$1.29
Miscellanies		\$60.85
• Cables and tubing		• \$29.49
• Shelf		• \$31.36
Total Cost		\$555.34



Future Work

- ❖ Plumbing System
 - Water level sensor
 - Upgrade the water tank size
- ❖ Turbo Fan
 - Increase the number of blades
- ❖ Water Filter
 - Point-of-user filters
- ❖ User Interface
 - Fully Automatic
- ❖ Combines with Wind Power



Conclusion

- ❖ Achieve the majority of functions
- ❖ Project finished on time
- ❖ Future works needed



Acknowledgement

- ❖ Dr. Andrew Rawicz
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Questions



THANK YOU A BILLION TIMES

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