



## ***THESIS PRESENTATION OUTLINE***

### **1. INTRODUCTION (3 SLIDES)**

- a. Building Statistics (square footage, schedule, costs, firms involved) – (1 Screen -1 Slide)
- b. Identifying the Project Team – (2 Screens -1 Slide)
- c. Building Systems Summary and Construction Phases – (1 Screen -1 Slide)

### **2. ANALYSIS#1: Schedule Acceleration Through Multi-Trade Prefabrication (5 SLIDES)**

- a. Problem Identification – (1 Screen -1 Slide)
- b. What to Prefabricate? Why? And How? – (3 Screens -1 Slide)
- c. Impact on Schedule and General Conditions – (2 Screen-1 Slide)
- d. Where to Prefab? How Many Truck Loads Required? Site Logistics? – (2 Screens -1 Slide)
- e. Recommendations and Conclusions – (1 Screen -1 Slide)

### **3. ANALYSIS#2: Eliminating Inefficiency of Cost Estimating Through 3D Modeling (4 SLIDES)**

- a. Problem Identification – (1 Screen -1 Slide)
- b. Experimenting on Structural Steel Take-offs – (2 Screens -1 Slide)
- c. Analysis of Survey Questions – (3 Screens -1 Slide)
- d. Guidelines for Implementing 3D Estimation and Conclusion – (2 Screens -1 Slide)

### **4. ANALYSIS#3: Viability of Incorporating Solar Photovoltaic Systems (7 SLIDES)**

- a. Problem Identification – (1 Screen -1 Slide)
- b. How PV-System Works and Solar Analysis – (3 Screens -1 Slide)
- c. PV Panel Manufacturers and Energy Demand (ELECTRICAL BREADTH) – (3 Screens -1 Slide)
- d. Electrical Energy Production (ELECTRICAL BREADTH) – (2 Screens -1 Slide)
- e. Financial Analysis – (5 Screens -2 Slide)
- f. Recommendations and Conclusions – (1 Screen -1 Slide)

### **5. CONCLUSION (1 Screen - 1 SLIDES)**

### **6. ACKNOWLEDGEMENTS (3 Screens - 1 SLIDES)**

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#### **PRESENTATION OUTLINE SUMMARY**

- Total of 22 Slides
- All Analyses will be discussed in fair amount of details
- Only Electrical Breadth will be Discussed. The Structural Breadth will be Identified but not Discussed in the Presentation.
- Image screens were not counted in this outline

**FINAL THESIS PRESENTATION**  
PENN STATE AE SENIOR THESIS

**PENN STATE MILTON S. HERSHEY MEDICAL CENTER  
CHILDREN'S HOSPITAL  
HERSHEY, PA 17033**



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April 11<sup>th</sup>, 2011**



P A Y E T T E







# Project Background



**Presentation Outline:**

- I. Project Background
- II. Analysis #1: Multi-Trade Prefabrication
  - What to Prefabricate?
  - Schedule and GC Impact
  - Logistics
- III. Analysis #2: 3D Estimating
  - Methodology Used
  - Analysis of Survey
  - Guidelines For Implementation
- IV. Analysis#3: Solar PV-Panels
  - Solar Analysis
  - Manufacturers
  - Electrical Production Calculations
  - Financial Analysis
- V. Lessons Learned
- VI. Acknowledgements



**Building Name:**  
Children's Hospital

**Occupancy Type:**  
Medical Hospital

**Location:**  
500 University Drive, Hershey, PA 17033

**Gross Building Area:**  
262,587 SF

**Number of Stories:**  
5-Stories + Underground Level

**Delivery Method:**  
Design-Bid-Build w/ CM Agency @ Risk

**Construction Dates:**  
March 17<sup>th</sup>,2010 – August 20<sup>th</sup>,2012

**Contracted GMP Amount:**  
\$115 Million

**LEED Certification:**  
Certified



Penn State Hershey Medical Center





# 3D ESTIMATING



**Presentation Outline:**

- I. Project Background
- II. Analysis #1: Multi-Trade Prefabrication
  - What to Prefabricate?
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  - Logistics
- III. Analysis #2: 3D Estimating
  - **Methodology Used**
  - Analysis of Survey
  - Guidelines For Implementation
- IV. Analysis#3: Solar PV-Panels
  - Solar Analysis
  - Manufacturers
  - Electrical Production Calculations
  - Financial Analysis
- V. Lessons Learned
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**Methodology Used**

- Conduct Manual Quantity Takeoffs of Structural Steel System
- Conduct 3D Based QTO of Structural Steel System
- Determine Time Savings and Accuracy of Each Method

	RS MEANS COSTWORKS ESTIMATE		ACTUAL COSTS	
<u>SYSTEM</u>	<u>\$/SF</u>	<u>TOTAL</u>	<u>\$/SF</u>	<u>TOTAL</u>
Traditional QTO	\$20.49	\$5,380,000	\$21.31	\$5,597,000
3D QTO	\$19.81	\$5,200,900	\$21.31	\$5,597,000

**SUMMARY OF RESULTS**

	<u>Traditional QTO</u>	<u>Revit QTO</u>	<u>LFD Contract</u>
<b>Time Required</b>	25 hrs	2 hrs	-
<b>Percentage of Discrepancy</b>	15%	0%	-
<b>Cost of System</b>	\$5,380,000	\$5,200,900	\$5,597,000
<b>% Difference to Actual</b>	- 3.87%	- 7.1%	0%
<b>Level of Accuracy Achieved</b>	85%	100%	100%





# PHOTOVOLTAIC SYSTEM



## Presentation Outline:

- I. Project Background
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  - Methodology Used
  - Analysis of Survey
  - Guidelines For Implementation
- IV. Analysis#3: Solar PV-Panels
  - Solar Analysis
  - **Manufacturers**
  - Electrical Production Calculations
  - Financial Analysis
- V. Lessons Learned
- VI. Acknowledgements

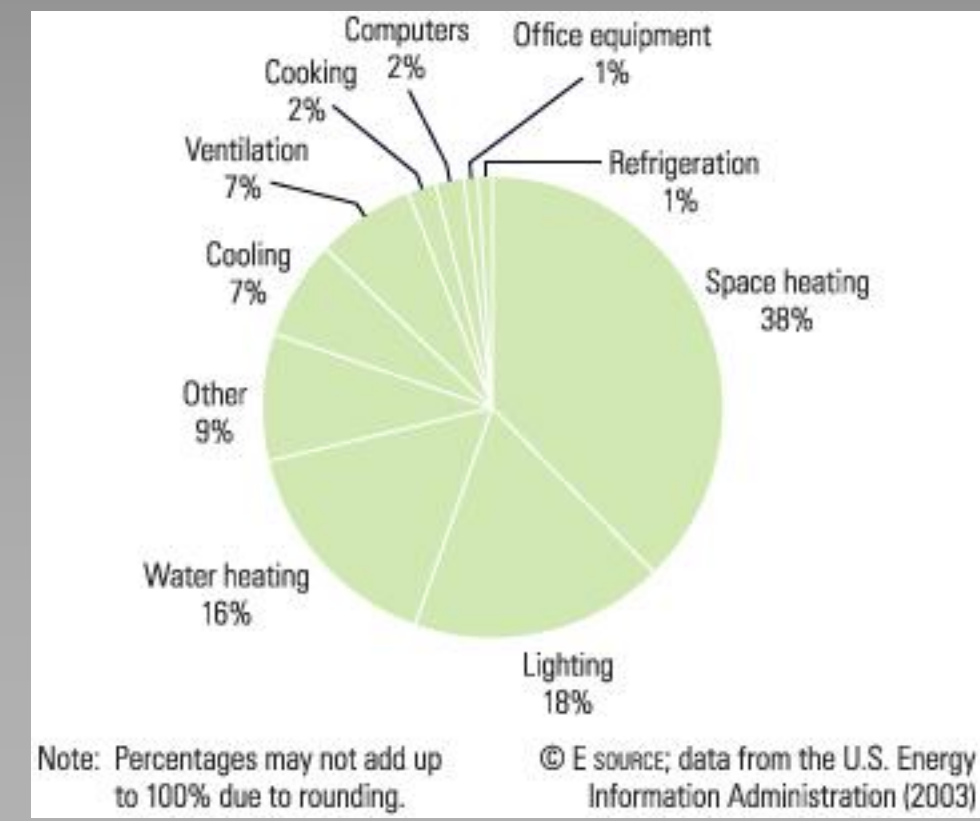
## Electric Demand

- **Annually** 7,221,143 kWh
- **Monthly** 601,762 kWh
- **Daily** 19,784 kWh

## Manufacturers and Panels Needed

- **Kyocera (KD235GX-LP)** 18961 Panels
- BP Solar (BP3230T) 19373 Panels
- Suntech (STP210-18) 21218 Panels

## More Realistic Approach (Electric Breadth)



## Panels Required Per End Use

DIVISION	End Use Percentage	Watt Hours Per Day	# of Panels Req'd	Is it Feasible?
<b>Office Equipment</b>	1%	197840	189.61	YES
<b>Refrigeration</b>	1%	197840	189.61	YES
<b>Space Heating</b>	38%	7517920	7205.18	NO
<b>Lighting</b>	18%	3561120	3412.98	NO
<b>Water Heating</b>	16%	3165440	3033.76	NO
<b>Cooling</b>	7%	1384880	1327.27	NO
<b>Ventilation</b>	7%	1384880	1327.27	NO
<b>Cooking</b>	2%	395680	379.22	YES
<b>Computers</b>	2%	395680	379.22	YES
<b>Others</b>	8%	1582720	1516.88	NO
<b>TOTAL</b>	<b>100%</b>	<b>19784000</b>	<b>18961</b>	

## System Size to be Designed

- 240 Panels @ 4180 SF Roof Space
- System Rated at 56.4 kW