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EECE401 Senior Design I

Howard University

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Innovative Energy Solutions for Buildings with Excessive Energy Consumption

Better Buildings Challenge: One Montgomery Plaza Towers

MGI:

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Background

- Better Buildings Challenge
 - 20% more energy efficient by 2020
- Provide case studies
 - Compete with teams from various universities
 - Find innovative ways of making buildings more energy efficient
- Sample case: Energy Efficient Buildings Hub Case
 - Energy-Regional Innovation Cluster
 - Created to improve energy efficiency, promote economic growth and create jobs
 - Building of choice: One Montgomery Plaza



Background: One Montgomery Plaza

- 1973
- County building
- Premature deterioration
 - Roof and window replacements
 - Changes to overall structure
- More effective spacing
- Our job to consider these changes but most importantly, energy efficiency!!



Problem Definition

Provide innovative solution to One Montgomery Plaza's excessive energy consumption and structural and operational deterioration while ensuring budget is minimal, project is completed in two years, all legal standards are upheld, and county representatives, tenants and EEB Hub are satisfied with results.



Problem Definition

Design Requirements & Performance Measures

- Building Energy Consumption decreased by 20%
- Project Completed in two years
- Uphold County Goals and Constraints
- Technical Analysis of building structure, envelope, integrated design process, energy performance contract

Required Compliance of Regulations

- ASHRAE
- OSHA
- Energy Service Performance Contract
- Montgomery County Procurement Policies for Contracting

Current Status of Art

- Statewide
 - California 2013 Building Energy Efficiency Standards
 - Residential and nonresidential buildings
 - New York initiates Energy Efficiency
 - Mayor's Carbon Challenge (MCC)
- Local
 - Dunkin Donuts - St. Petersburg, Florida
 - Lake Mills Middle School – Lake Mills, Wisconsin



Tasks and Deliverables

- Main Goal: Reduce energy consumption
- Determine the appropriate roles and responsibilities for the Hub:
 - Process for retrofits
 - Cover costs
 - Strengths and weaknesses
 - County's goals and initiatives



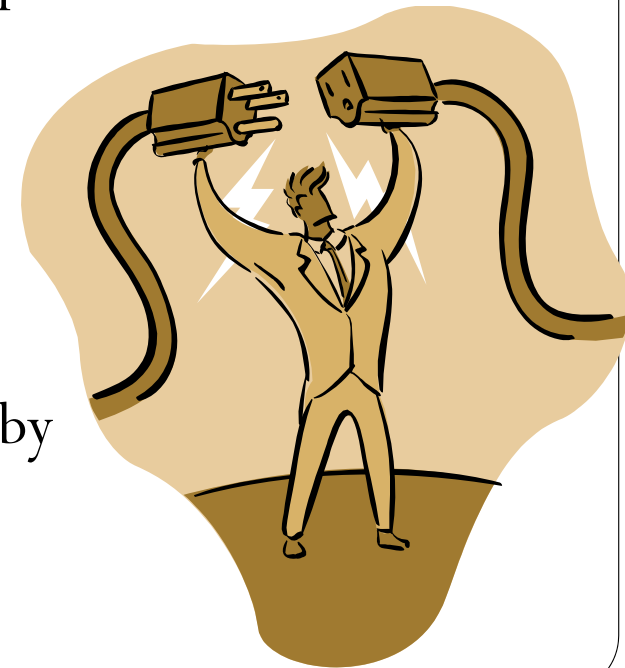
Engineering Approach Method

1. Receive and evaluate Critical Issues
2. Evaluate Current Status of Building
 - Conduct Energy Audit
 - Determine Operational and Structural Issues
3. Research State & Federal Regulations
4. Evaluate Solutions within scope and Limitations, through design matrix
5. Consultation on Research and Solutions
6. Rate Solutions: Regulations, Cost, Time, Maintenance
7. Design Solution best addresses all issues & align with scope and limitations



Engineering Approach: Energy Solutions

- BAS- Implement & replace controls on 370 of 400 VAVs
- Lighting- Redesign, reduce lighting by 25%, over all energy use by 4%
- HVAC- Do not replace as current system works efficiently
- Plug loads- Shut systems down at night, reduce use by 50%



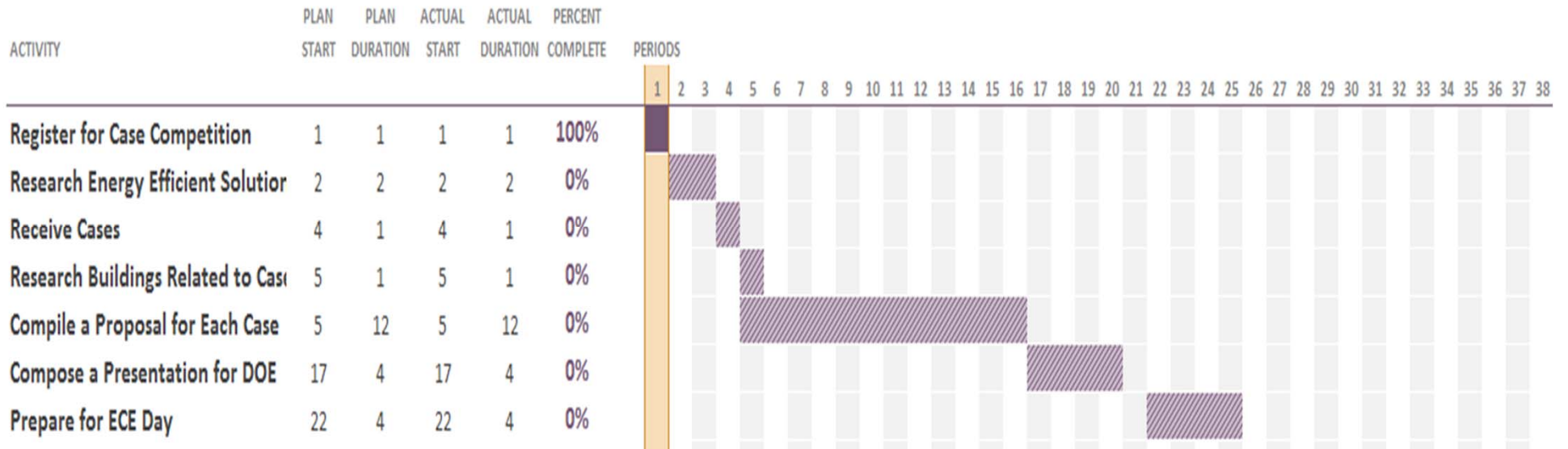
Engineering Approach: Interrelated Solutions

- Façade-Replace brick with GFRC Panels, saving 2-3% of energy usage
- Windows- new thermal break curtainwall, double
- Roof- Replaced using material with R20 value
- Floor Plan- Redesign using 80-20 layout
- Structural- Digitize and rid area of heavy files



Project Management

Project Planner



Project Management: Integrated Design Team

- Professor Outram Hussey: Assistant Professor, CEACS, Architecture
- Brian A, Stephenson: Adjunct Professor in CEACS, Engineering Project Management, Structural Engineering, Project Scheduling
- Patrice Simms: Assistant Professor, School of Law, Environmental Law
- Paul Blackman: Project Manager, Project and Development Services, Jones Lang LaSalle
- Chris Molivadas: Managing Director, Project and Development Services, Jones Lang LaSalle, Mid Atlantic Region

Conclusion

- Improving OMP will help in many ways
- OMP has become a great example for optimization with regard to energy efficiency
- This case study allows the community to be more exposed to the efforts being made and the benefits of them

References

- <http://www1.eere.energy.gov/buildings/betterbuildings/documents/2013/EEB-HUB-case-study.pdf>
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