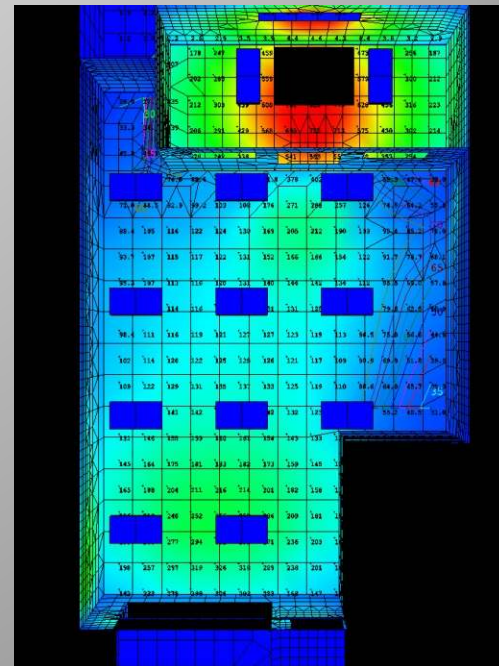
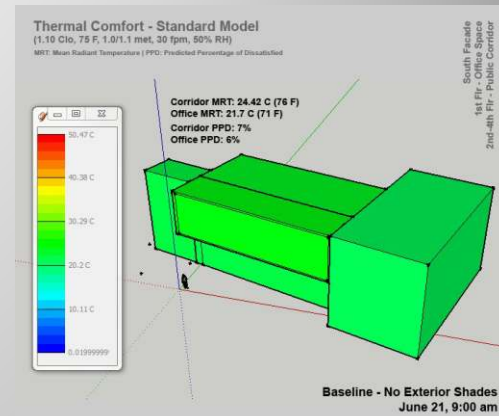


# Conceptual Energy Analysis & Performance Analysis

Introduction



# Agenda

- Introduction
- Conceptual vs Detailed
- Process
- Tools
- Conclusion

# Introduction

- Energy modeling.....

What comes to your mind first?

# Introduction

- Energy/Performance is
  - A design topic
  - Not a technology topic
  - Not a mechanical engineer's problem
  - About understanding physics, materials, enclosure and comfort

Architects, YOU are responsible!  
2030 Commitment – remember?

# Introduction

- Do you ask
  - How much energy your building design will consume?
  - How comfortable for the end users will the spaces be?
- We don't validate
  - Energy
  - Performance

# Introduction

- Validate what?
  - Aesthetics
  - Code compliance
  - Budget
  - Construction schedule

Why not energy and performance?

# Introduction

- Energy
  - Yearly utility consumption
  - Peak demand
- Performance
  - Visual comfort
  - Thermal comfort
  - Air quality comfort
  - Acoustic comfort

Do YOU validate any  
of this on your  
project?

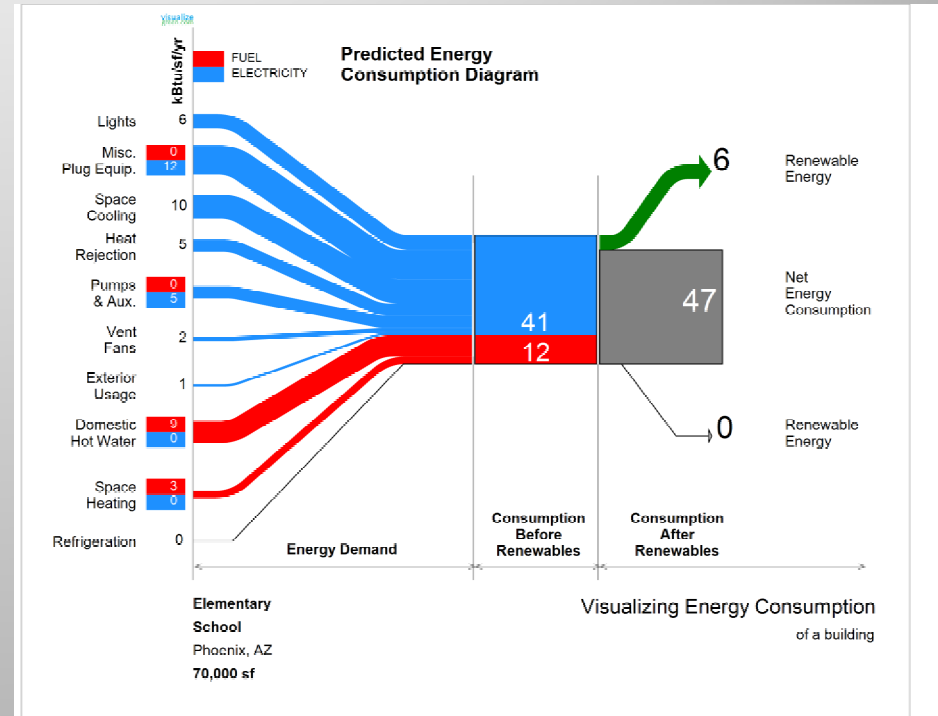
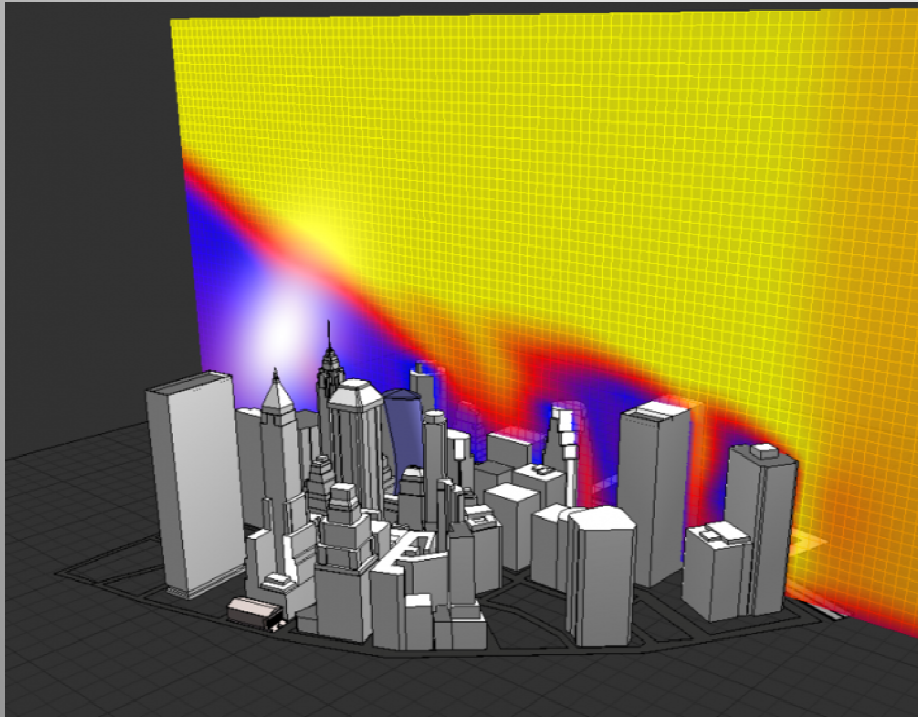
# Introduction

- Ultimate goal
  - Lowest energy consumption
  - Lowest peak demand
  - At most comfort
- Benefits
  - Not just a plaque on the wall
  - Less liability - Good design
  - Reduce redesign efforts

Not just being environmentally friendly – this is a business imperative – good business!



# Conceptual vs Detailed



# Conceptual vs Detailed

- Conceptual
  - To inform design
    - Form
    - WWR
    - Fenestration
    - Thermal R-values
- Detailed
  - For compliance
    - LEED
    - Title 24
    - CHPS
    - IECC
    - 2030 Challenge

# Conceptual vs Detailed

- Conceptual

- Who

- Architects

- Detailed

- Who

- Architects
    - Engineers
    - Energy Modelers

# Conceptual vs Detailed

- Conceptual
  - Time required
    - Can be rolled into design time
- Detailed
  - Time required
    - Requires additional service fee

# Conceptual vs Detailed

- Conceptual
  - What to model
    - Test individual components / spaces
    - Example - one classroom, one office bay, one cell
- Detailed
  - What to model
    - Whole building energy model
    - Include lighting, envelope, mechanical

# Conceptual vs Detailed

- Conceptual
  - Outcome
    - Performance metrics
    - Validate design
  - Caution
    - Do not guarantee performance
    - Lot of variables
- Detailed
  - Outcomes
    - Predicted energy consumption
    - Compliance achievement
  - Caution
    - Do not guarantee energy consumption
    - Lot of variables

# Process

Now, how do we do this?

# Process

- Take responsibility
- Ask energy/performance questions
- Set metrics
- Validate design
- Tell the story



# Process

- Approach
  - Take responsibility / Ask questions
    - Through out the process
  - Set metrics / Validate
    - Conceptual design stages
  - Tell the story
    - Construction documentation and post occupancy stages

# Process

- Energy
    - Yearly utility consumption
    - Peak demand
  - Performance
    - Visual comfort
    - Thermal comfort
    - Air quality comfort
    - Acoustic comfort
- Take responsibility
  - Ask questions
  - Set metrics
  - Validate design
  - Tell the story

# Process

- Energy
    - Yearly utility consumption
    - Peak demand
  - Performance
    - Visual comfort
    - Thermal comfort
    - Air quality comfort
    - Acoustic comfort
- Example – Kings County Courthouse
  - Energy
    - 30% reduction
    - ICE storage tanks
  - Performance
    - Reduced Glare
    - Less than 20% dissatisfied

# Process

Can we do all of this on every project?

— No

# Process

- Proposal
    - Do ONE thing exceptionally well on every project
      - Ask the right question
      - Set metrics
      - Validate design
      - Tell the story
- Energy
    - Yearly utility consumption
    - Peak demand
  - Performance
    - Visual comfort
    - Thermal comfort
    - Air quality comfort
    - Acoustic comfort

# Tools

What do we need to learn?

# Tools

- Past
  - Hand calcs
  - Few design iterations
  - Lots of factor of safety
  - No requirement to validate
- Today and Future
  - Simulation tools
  - Multiple iterations possible to optimize – “right size”
  - Codes and standards will mandate

# Tools

- Geometry / UI
  - Physical characteristics of the space
  - Properties of the components
  - User interface
- Simulation engine
  - Behind the scenes
  - Crunches all the numbers
  - Uses proven algorithms
  - Allows for multiple design iterations



# Tools

- Geometry / UI
  - Sketchup
  - Revit
  - Excel
  - AutoCAD
- Simulation engine
  - IES VE
  - DOE-2
  - Energyplus
  - Radiance
  - Trane Trace

# Tools

- Need
    - Learn multiple programs for different questions
  - Hope
    - One program easy enough to use that will do all
- Energy
    - Yearly utility consumption
    - Peak demand
  - Performance
    - Visual comfort
    - Thermal comfort
    - Air quality comfort
    - Acoustic comfort

# Tools

- Conceptual Performance Analysis

- Visual
  - SPOT
  - AGI 32
- Thermal
  - Open Studio
  - Opaque
- Air Quality
  - Vasari
- Acoustic
  - Ecotect

- Conceptual Energy Analysis

- eQuest
- IES VE

# Conclusion

Are you convinced yet?

# Business Imperative

- Energy Codes will mandate energy modeling
- Growing field of Energy Modelers
- Cannot be another lost opportunity
- Architects, take ownership!
- This journey is going to require
  - Technical understanding – no way around this!
  - Learning new terminologies