GENERATOR HUB: THE CRITICAL BUILDING WE HOPE TO NEVER NEED
AGENDA

- PROJECT BACKGROUND
- EVOLUTION OF EMERGENCY POWER
- CHALLENGES
- DESIGN PROCESS
- LESSONS LEARNED
BACKGROUND: MODERNIZING THE HEALTH CARE CAMPUS

- New construction: 350 bed new patient tower
- Existing generators without available capacity
  - Individual units installed spread around campus
- Existing bed towers planned for complete renovation
BACKGROUND: GEN HUB SOLUTION

- No Space at the New Tower + Existing Tower Renovation = Centralized Generator Plant Option
  - Medium Voltage? Emergency Only?
BACKGROUND: EMERGENCY POWER PHILOSOPHY

Emergency Systems Only (Life Safety, Critical, Equipment) vs. Complete Campus Backup

Code Challenges (LV vs MV, Fuel Type/Quantity)

Operational Costs

2017 NEC Art. 517 Diagram

1996 NEC Art. 517 Diagram
GEN HUB CONCEPT

- Only Select Emergency and Optional Power
  - No Peak Shave, Curtailment, Storm Avoidance
- Centrally Located
  - Medium Voltage Generation and Distribution
- Robust, Resilient, Reliable
GEN HUB RESULTS

- Medium Voltage, N+1, Expandable
  » 8.25MW Installed, 12MW Future
- Centrally Located
  » Best for Distribution, Worst for Construction & Disturbing the Health Care Environment
- Team Effort Required
PROJECT CHALLENGES

- Immovable deadline
- Escalating costs: pressure to pre-purchase
- Highly visible site
GENERATOR PLANT CONCERNS

HERE LOOKS GOOD...
SITE CHALLENGES

- Patient Experience
- Recirc Concerns
- Existing Utilities
- OA Louvers

OUTSIDE AIR INTAKE LOUVERS
PATIENT TOWER
GENERATOR HUB
MEDICAL OFFICES
ACOUSTIC CONSTRAINTS

- Building Occupants
- FGI Guidelines
- Distance
- Line of Sight
- Inline Attenuators
- Acoustic Louvers
ACOUSTICS VS. AIRFLOW

- Free area = sound line of sight
- Attenuation = airflow resistance
- Extensive coordination between subs
AIRFLOW CFD ANALYSIS

- Radiator Backpressure
- Site Air Recirculation
- Inside Air Stagnation
- CO$_2$ Dispersion
- Guide Vane Design
FINAL DESIGN

ACOUSTIC LOUVERS

3 FT ATTENUATORS

7 FT ATTENUATORS

STANDARD LOUVERS

TRANSITION PLENUM
FINAL DESIGN

BASEMENT SUBSTATION FOR ADJACENT BUILDING
FINAL DESIGN

- THREE 2.75MW GENERATORS
- 110 FT VERTICAL STACKS
- CONTROL ROOM
LESSONS LEARNED

- FGI subject to interpretation on gen noise
- Airflow subconsultants are experts in CFD, not generators
- CFD reveals what hand calcs cannot
- Work with Authorities – Code Interpretations.
KEY TAKEAWAYS

- Keep Owner Involved
- Make Time for Iterative Design
- Compromise where you can; Emergency Power is the Goal.