

Wind Effects on ACC's



J. S. Maulbetsch
(maulbets@sbcglobal.net)

M. N. DiFilippo
(mndconst@aol.com)

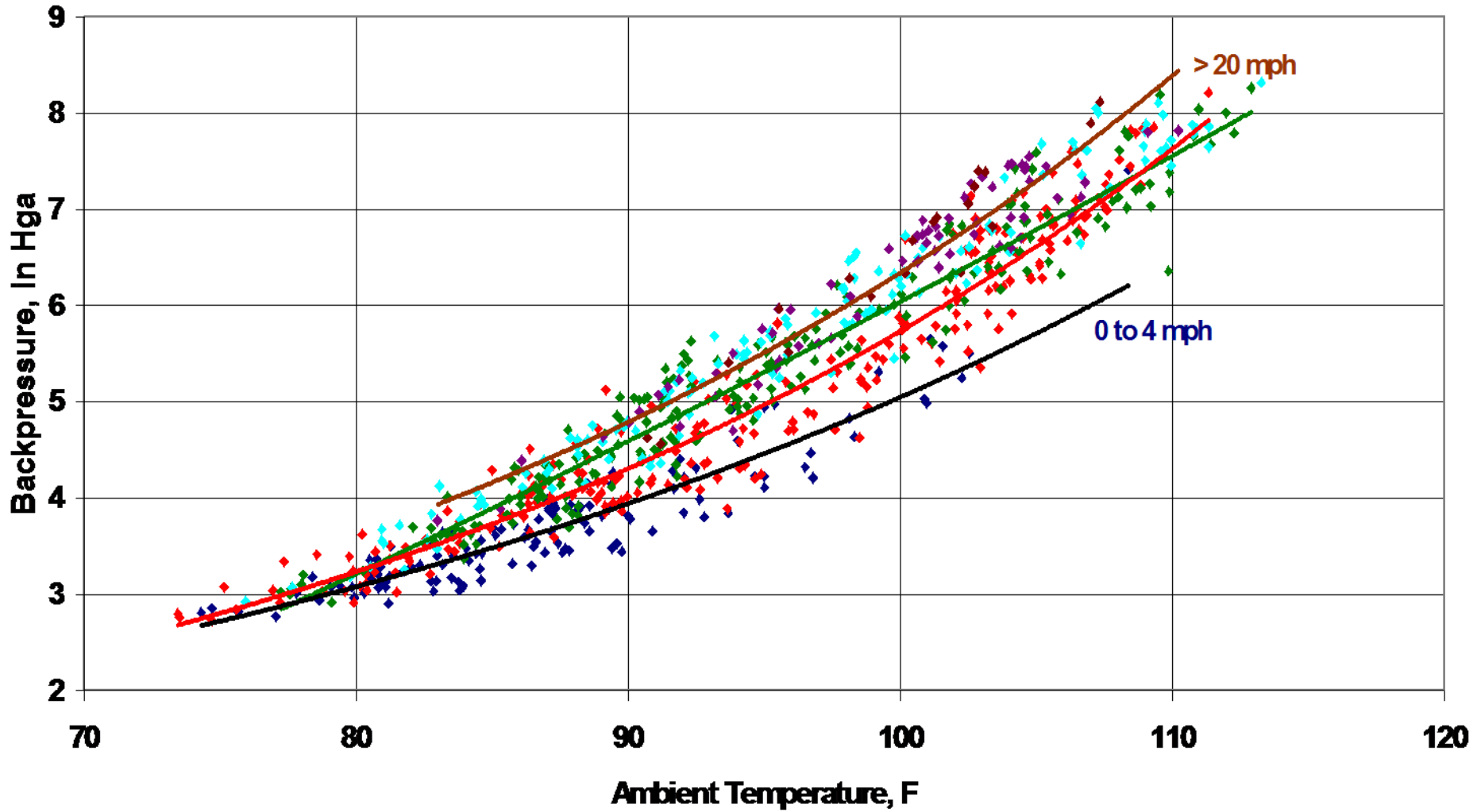
ACC Users Group
Pueblo, CO
September 28-29, 2010

Things to talk about today

- **How big is the problem?**
- **What have we measured?**
 - Measuring ambient temperature
- **Recirculation vs. wind speed**
- **Recirculation compared to effect on fans**
- **Modeling**
 - CFD models
 - Wind tunnel models
- **How to fix...maybe**

Wind Effect

◆ 0 to 4mph ◆ 4 to 8mph ◆ 8 to 12mph ◆ 12 to 16mph ◆ 16 to 20mph ◆ > 20mph



What we measured

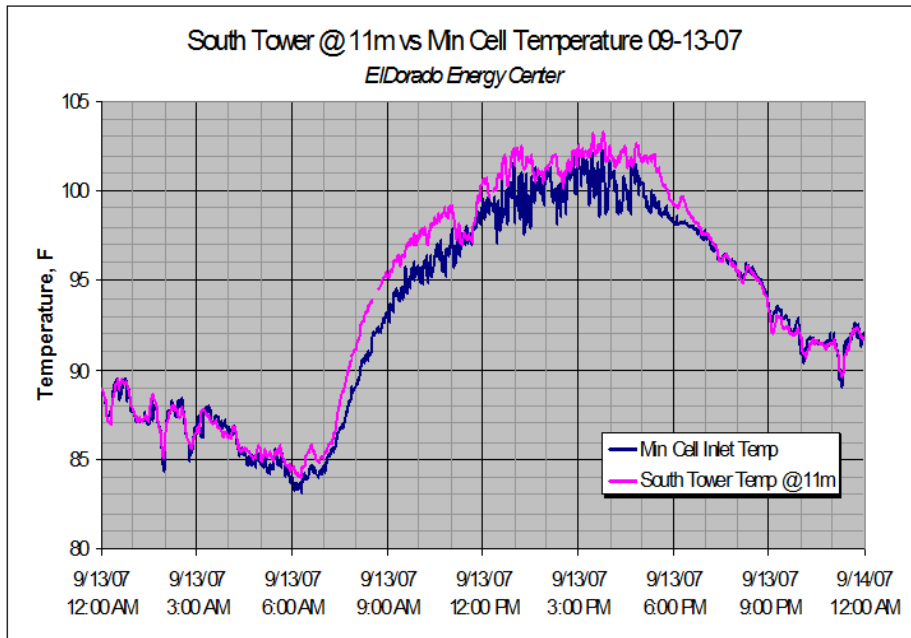


At 5 plants

**Higgins, El Dorado,
Apex, Front Range,
Wygen**

- Temperatures
 - Ambient
 - Inlet (every cell)
- Air velocities
 - Ambient
 - Inlet (some cells)
 - Other places
- Plant data

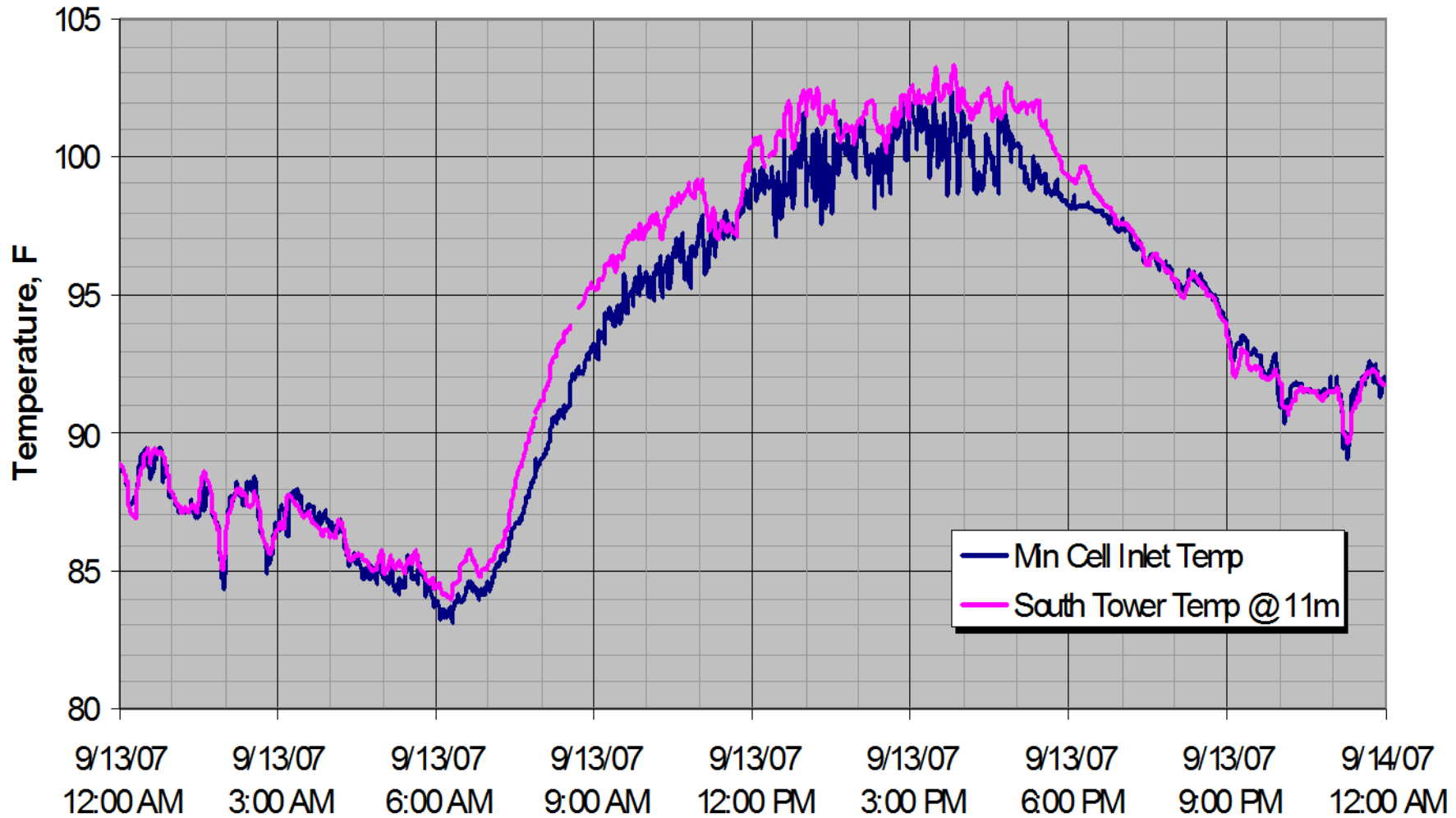
Ambient temperature



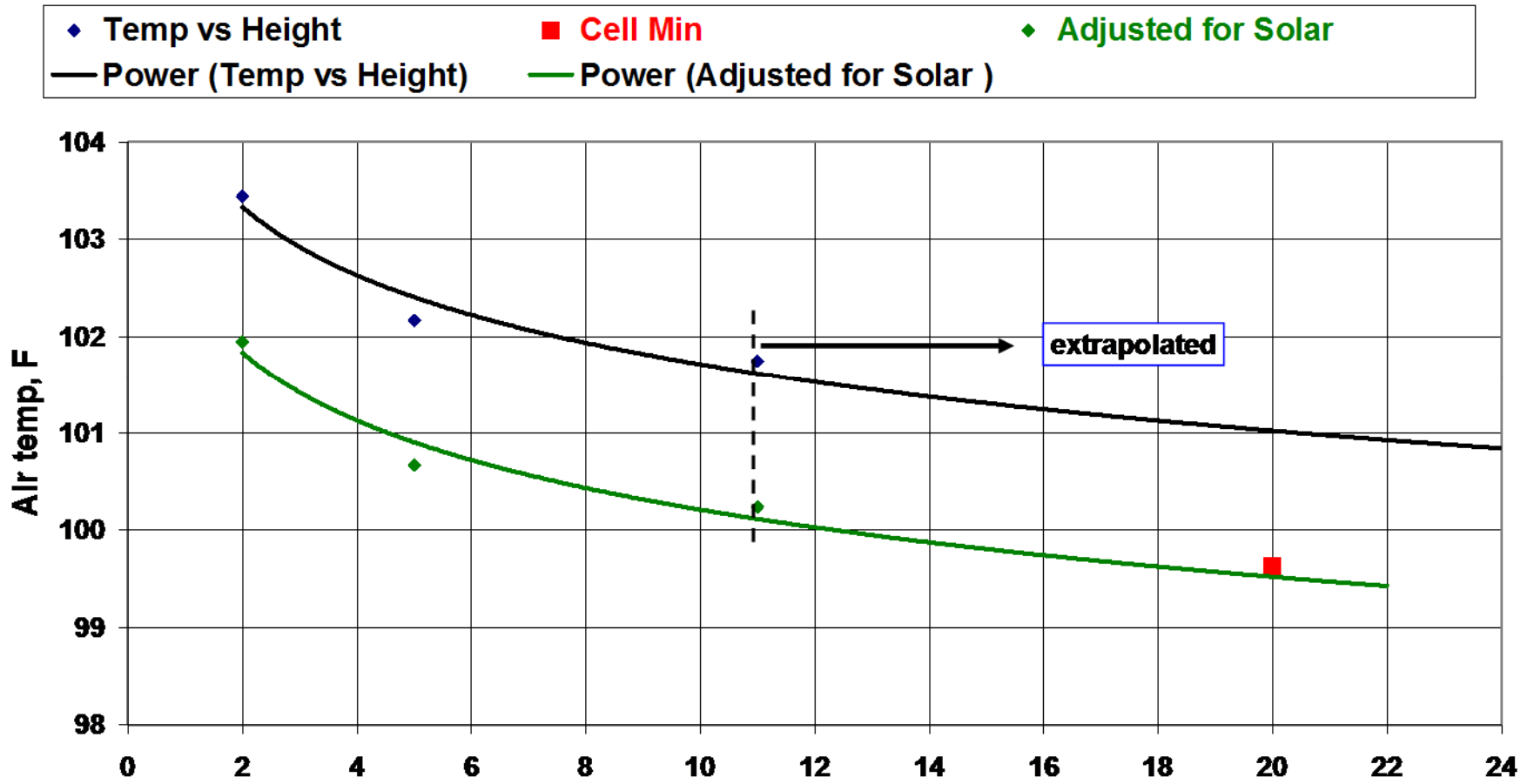
- Not so easy to do
 - Ground effect
 - Radiation effect
- Can get inlet temperatures less than measured ambient
- Used lowest cell inlet as ambient

South Tower @ 11m vs Min Cell Temperature 09-13-07

EIDorado Energy Center



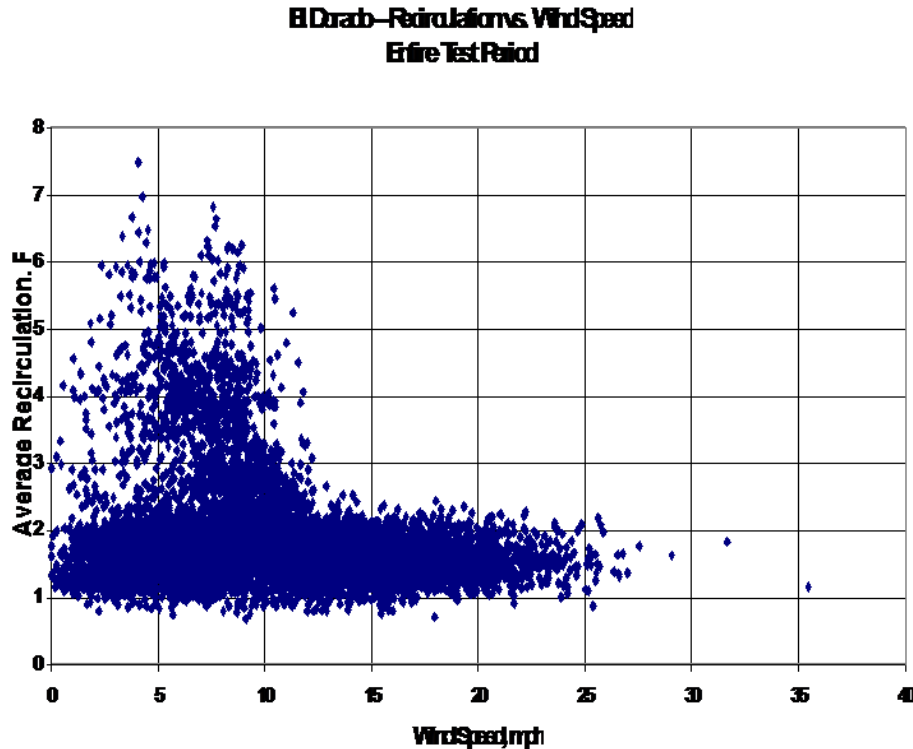
Variation in Air Temperature with Height (Average temps from 1 to 4 pm on Sept. 13)



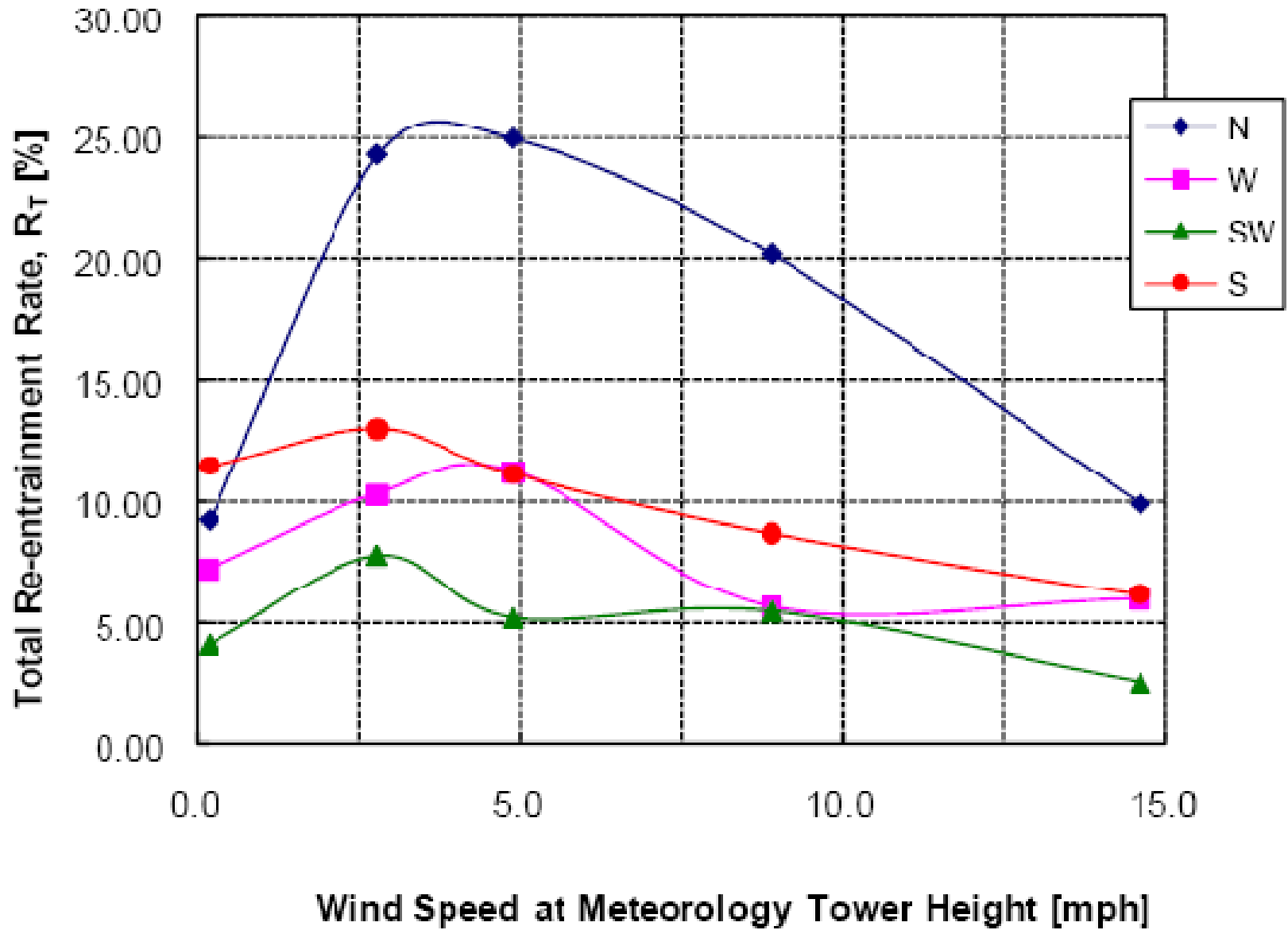
Height above grade

Figure 11

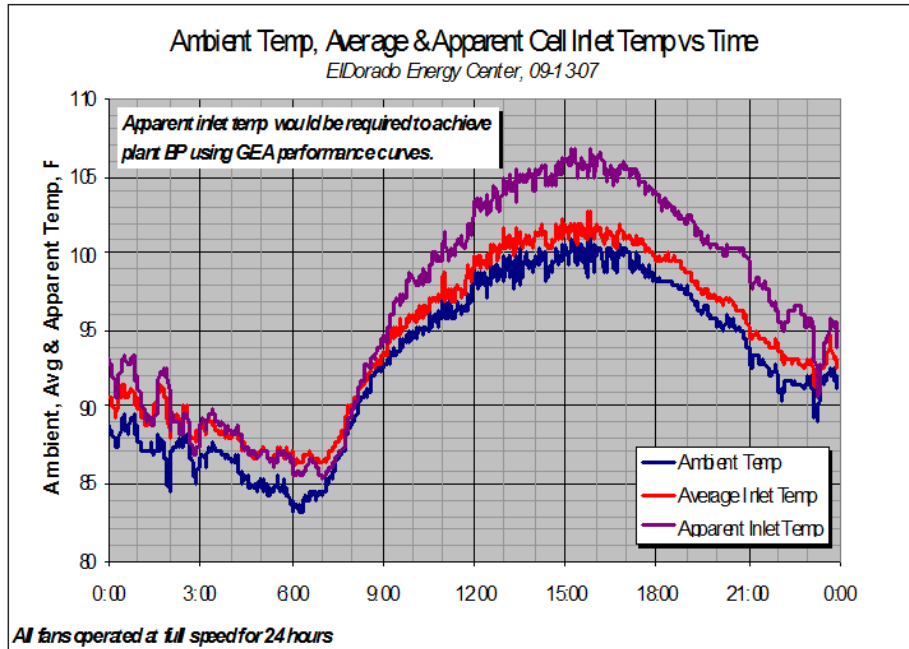
Recirculation vs. wind speed



- Increases and then decreases with wind speed
- Possible confounding effect of wind direction—not likely
- Effect seen at all 5 sites



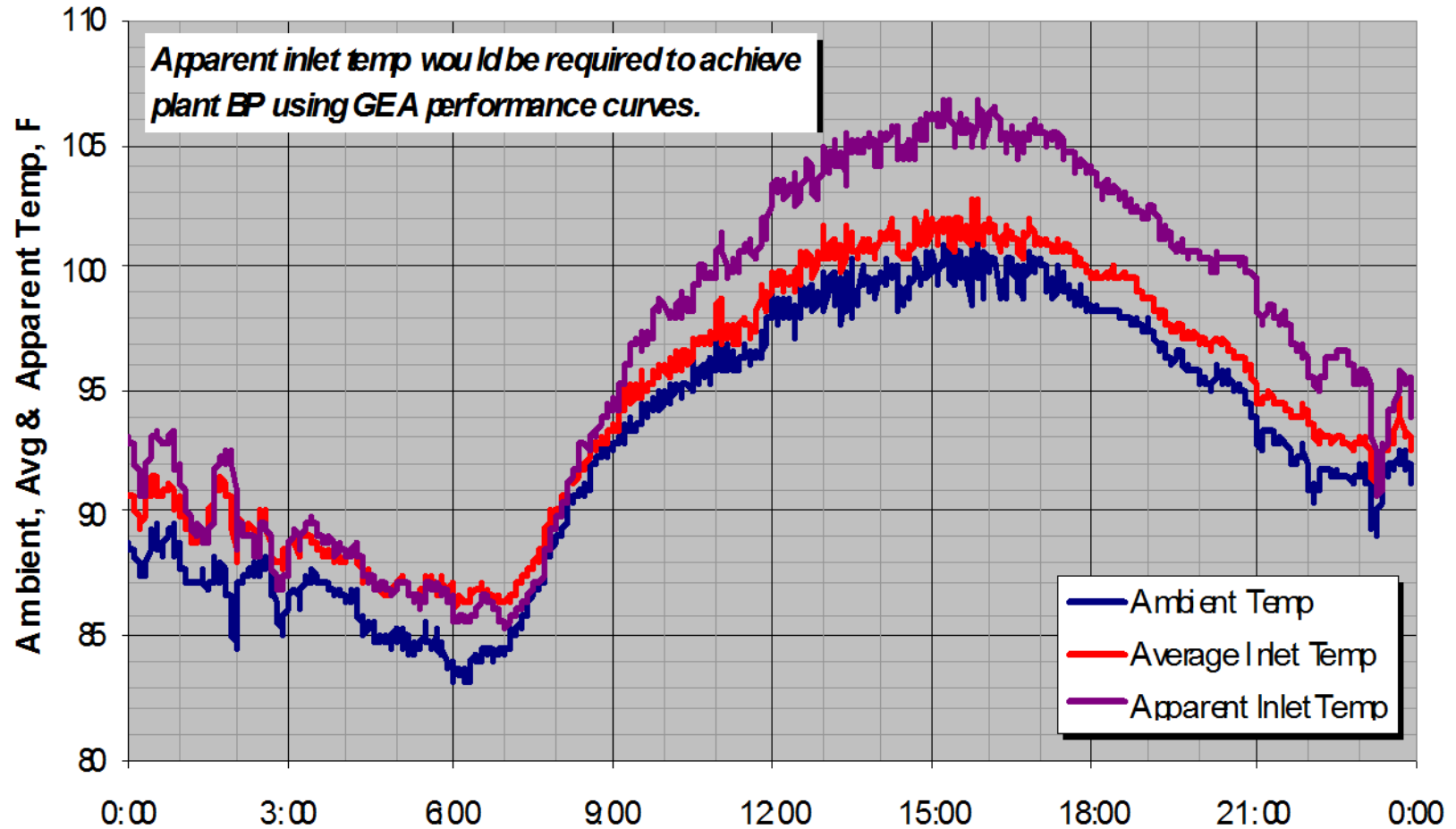
How to separate effects



- Plot
 - Backpressure vs. T_{amb} from design curves
 - Backpressure at T_{ave} inlet from design curves
 - Measured backpressure

Ambient Temp, Average & Apparent Cell Inlet Temp vs Time

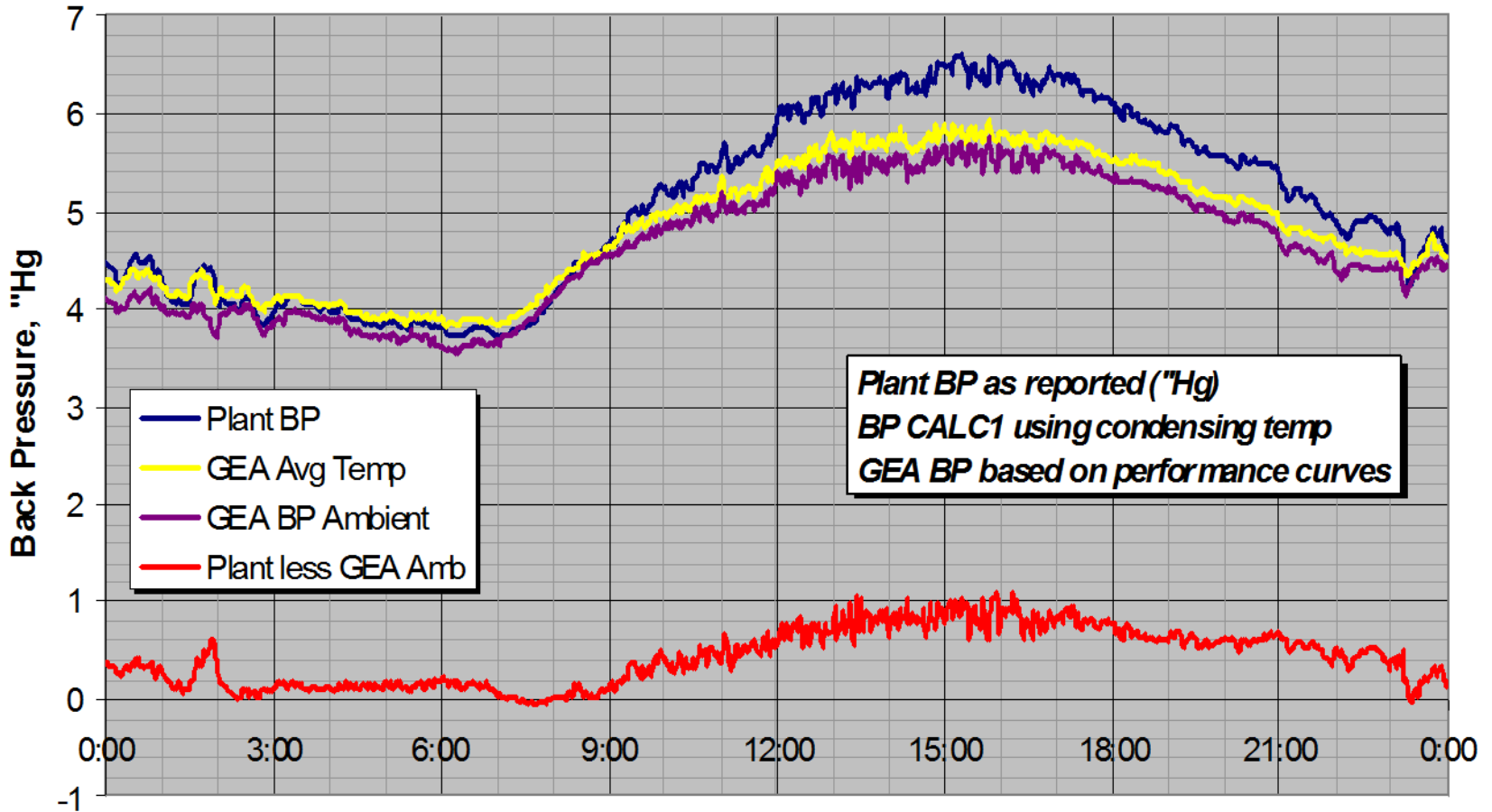
EIDorado Energy Center, 09-13-07



All fans operated at full speed for 24 hours

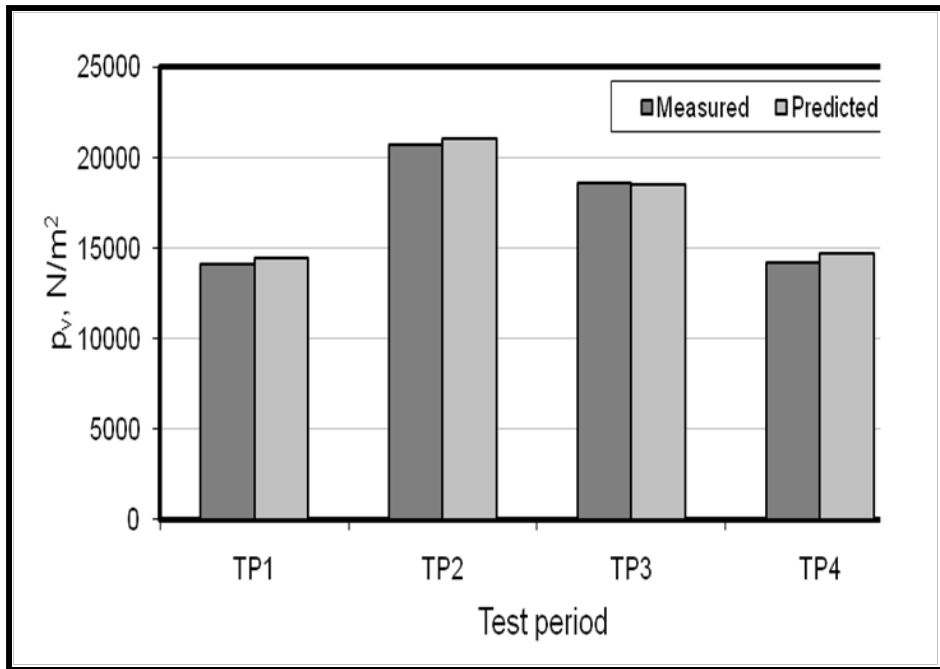
Back Pressure & ITD vs Time 09-13-07

ElDorado Energy Center



All fans operated at full speed for 24 hours

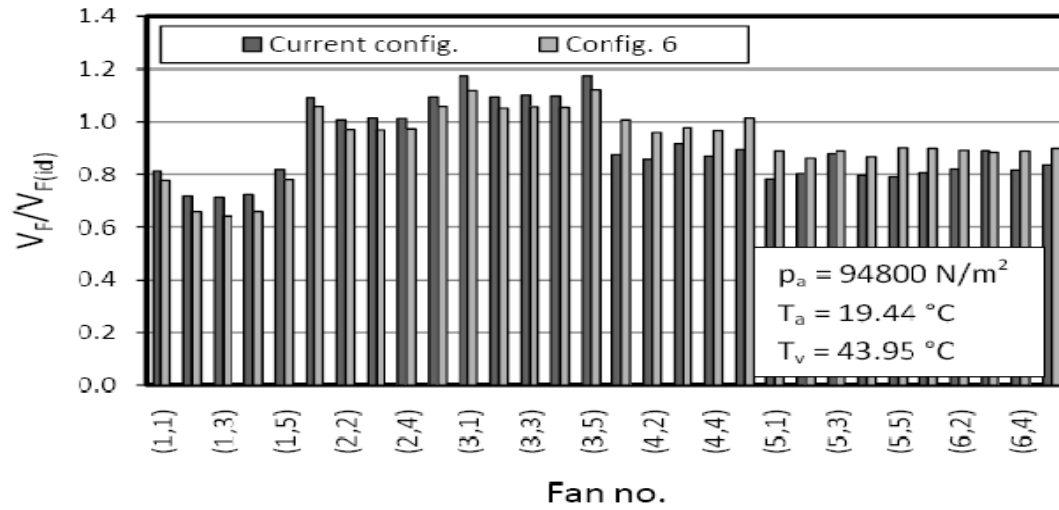
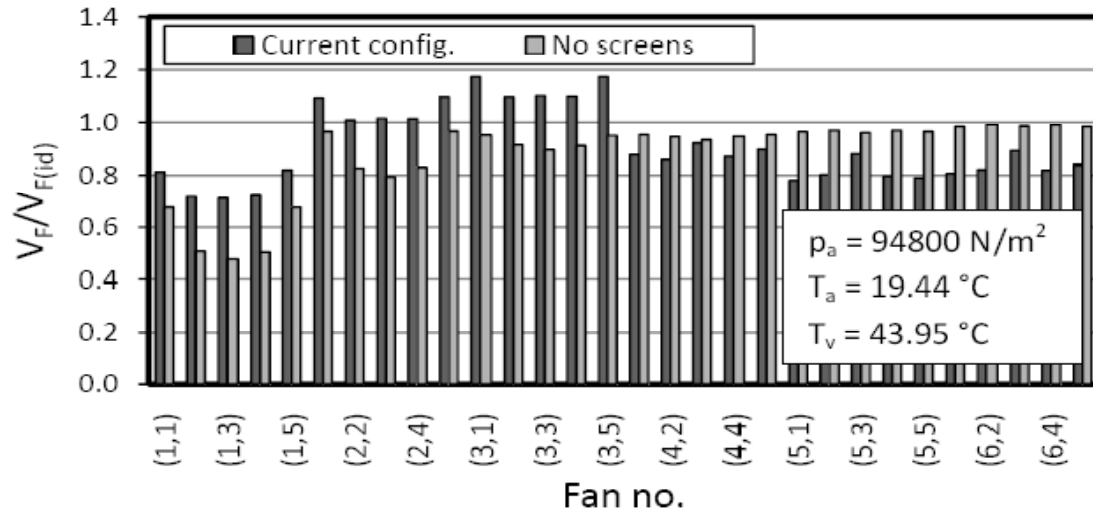
CFD Modeling



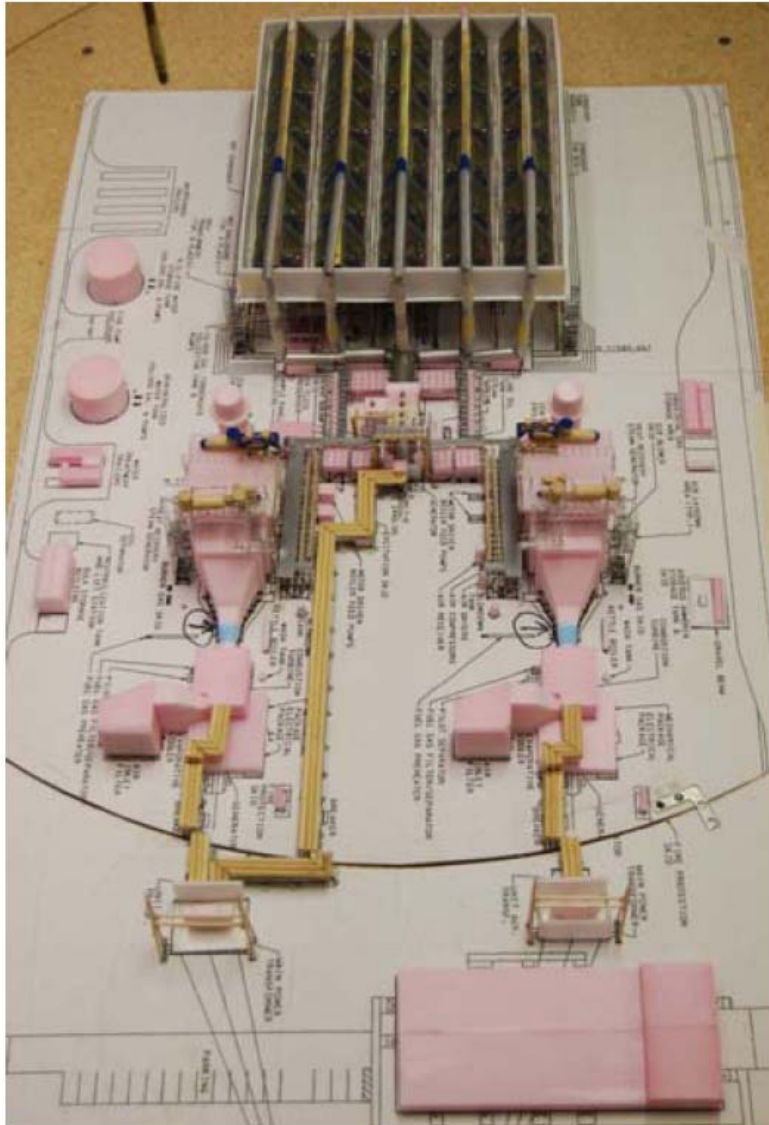
- Overall performance agreement was quite good
- Details of recirculation patterns generally (but not always) good
- Gave interesting suggestions for screen setups---not confirmed



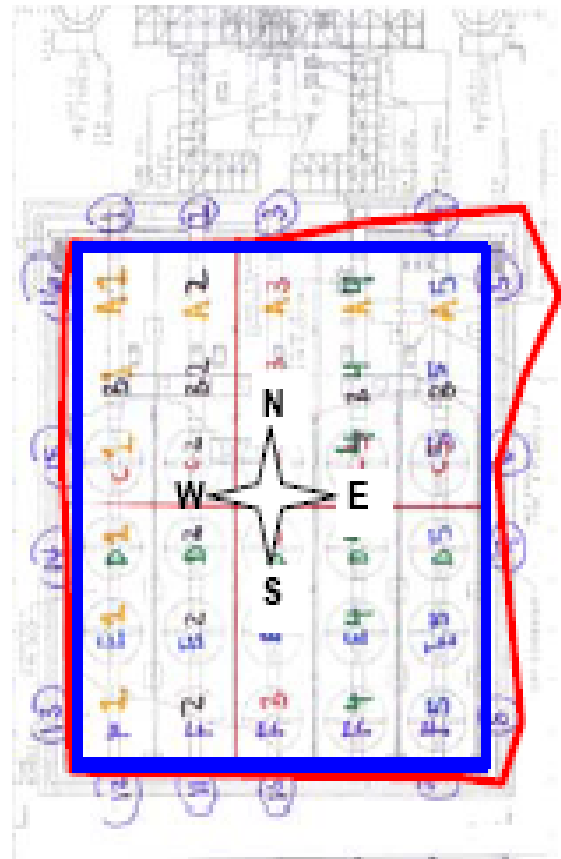
CAUTION
Work in Progress



Wind tunnel modeling

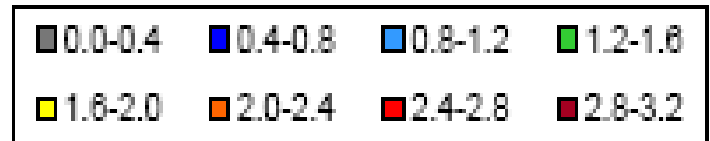
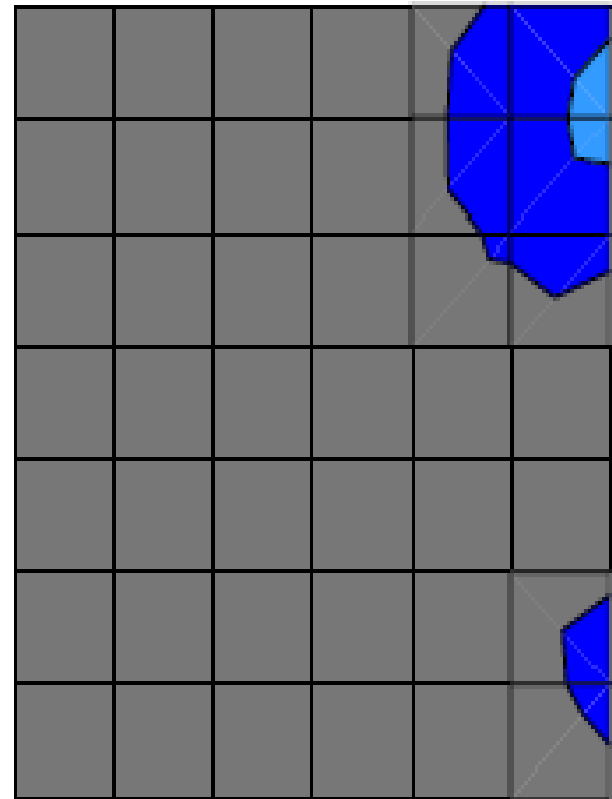


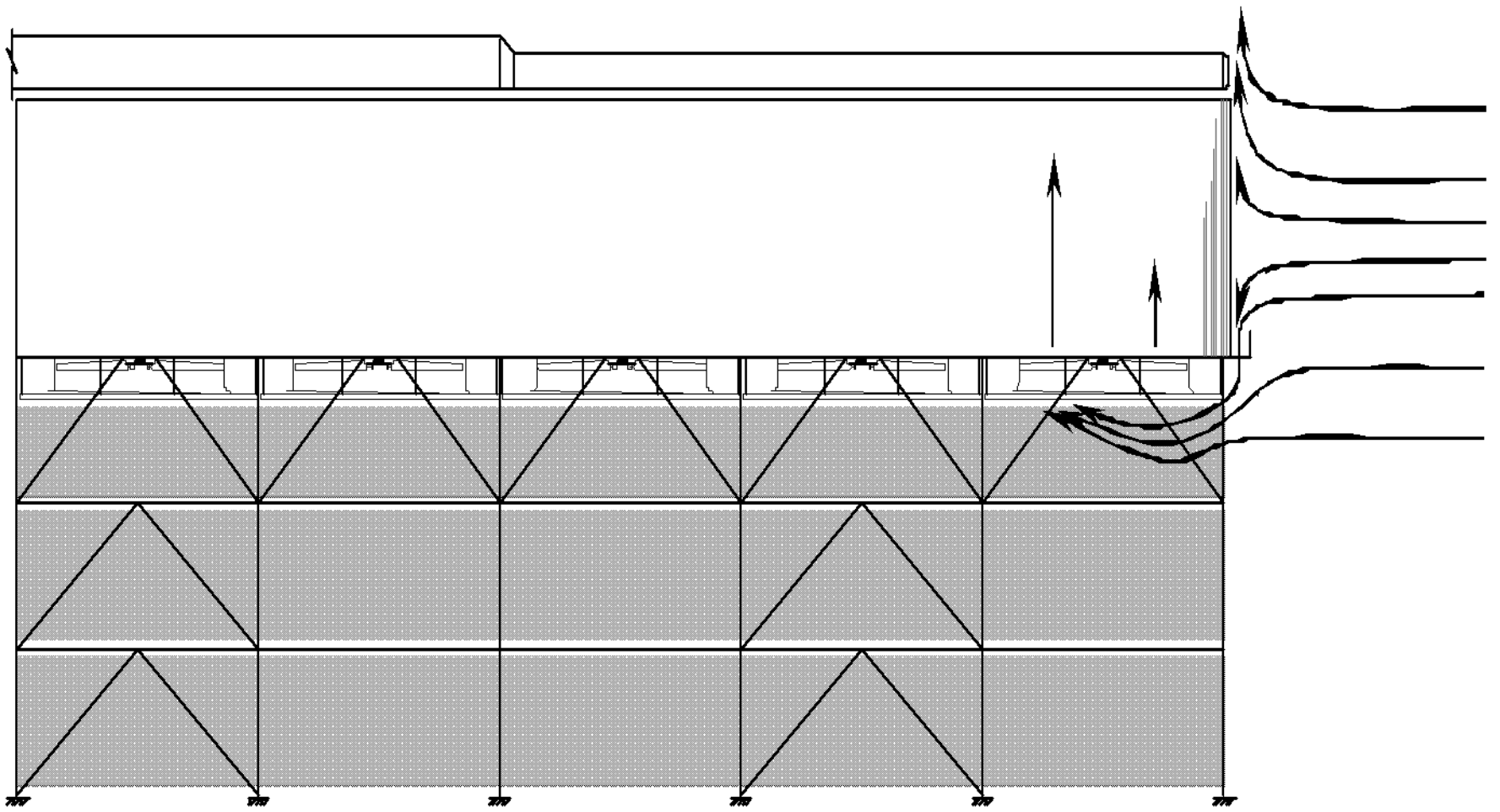
- Model of El Dorado ACC and site at UC Davis
- Get effects of surroundings
- Agreement with field test recirculation patterns was good
- No fan effects measured

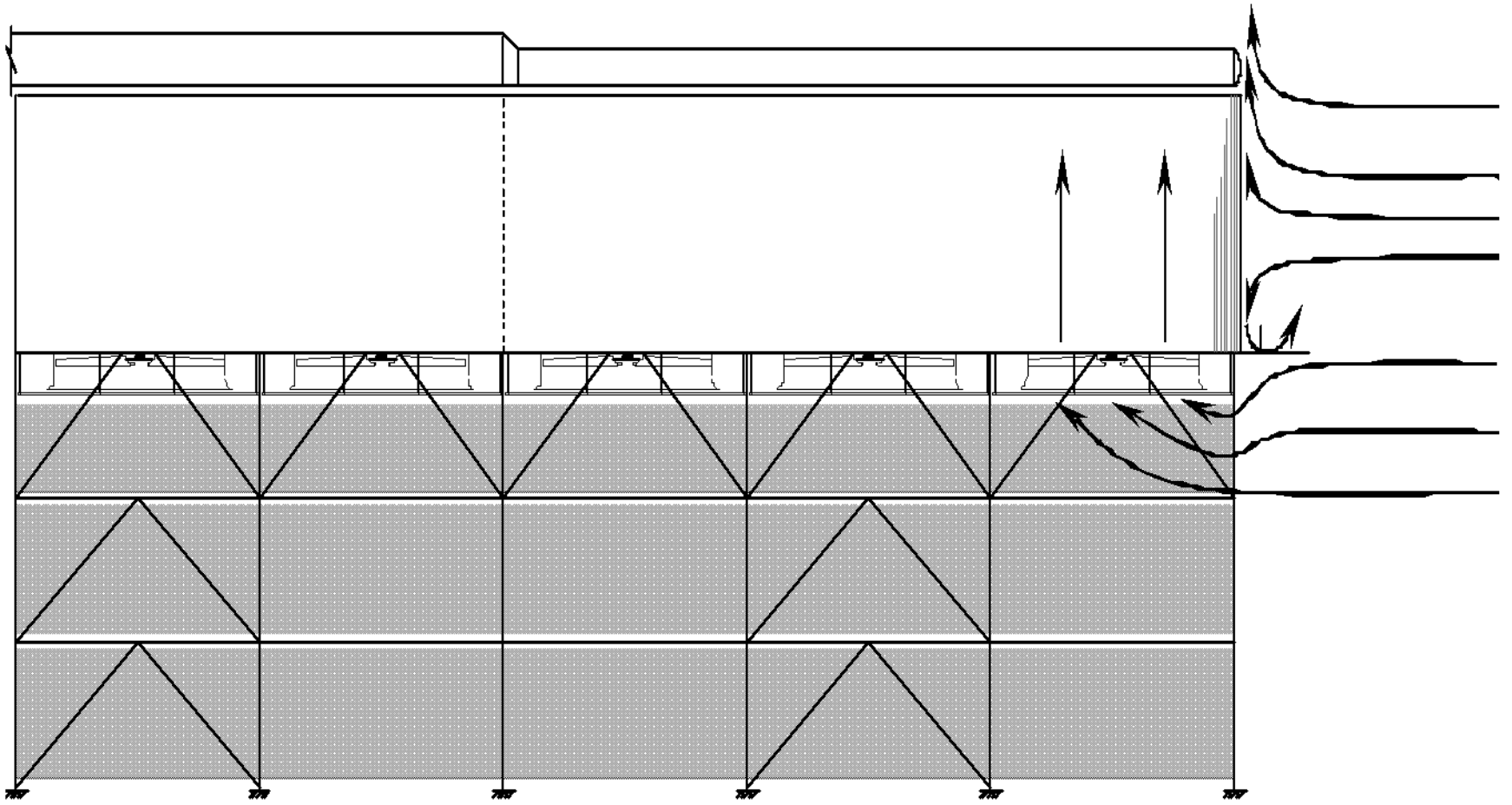


Re-entrainment Level along ACC Boundary

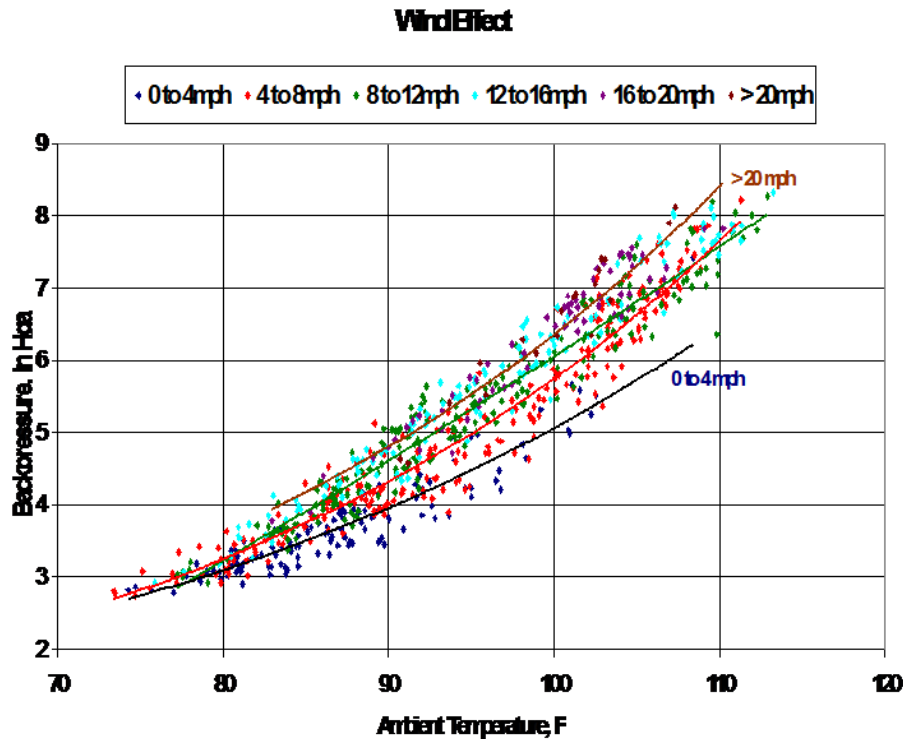
Estimated Contour of R







Summary



- We're getting there
- Broad data set of
 - Ambient temperature
 - Steam flow
 - Backpressure
 - Wind speed
 - Wind direction
 - Fan statuswould be helpful