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Open Compute Project

Lessons Learned and Next Steps

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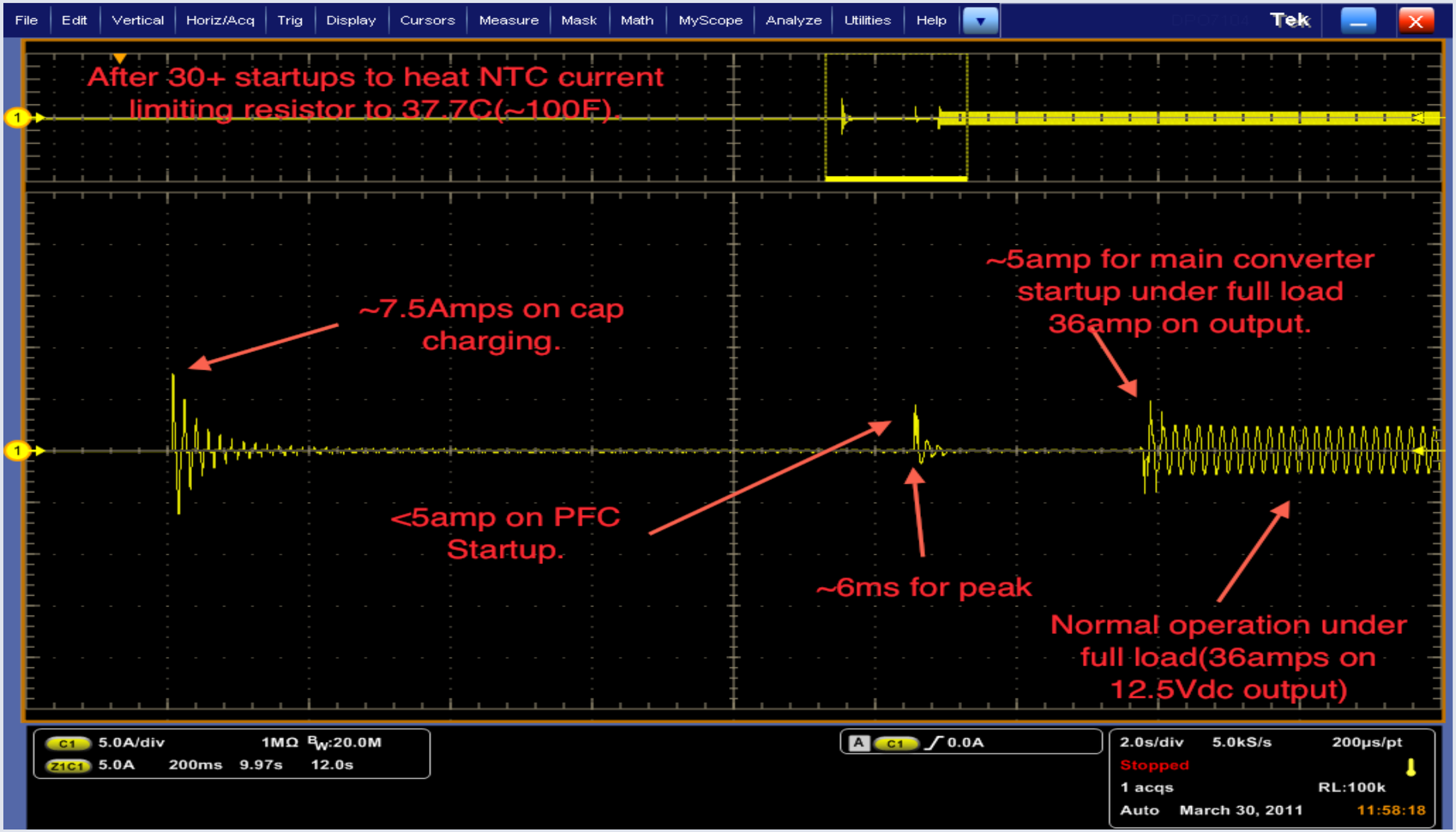
Lessons Learned - Electrical

In-rush Current with PSU

- Higher in-rush current experienced under repeated power outage
- CB see the high in-rush and trip on GF
- Cause due to NTC resistor characteristics
- Adjusted setting accordingly to resolve issue

In-rush Current with PSU



Use of Cable Bus

- What we expected
  - Ease of installation
  - Continuity of cable run
  - Cost savings
- What we experienced
  - Much more challenging to install
  - Not much cost savings due to increased labor

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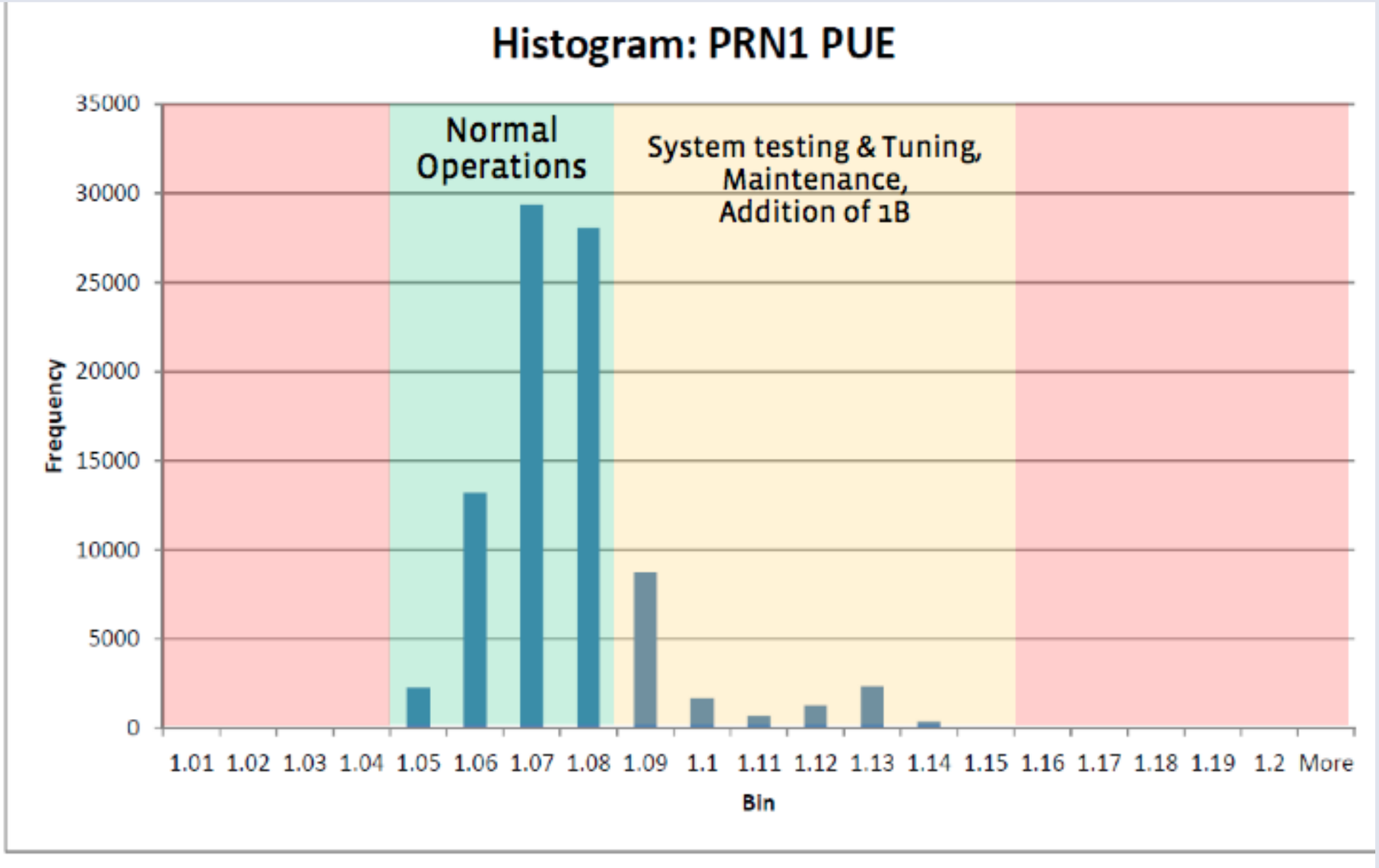
Lessons Learned - Mechanical

PUE Update for Prineville

PUE Data: Trended each minute; for period 14 Apr, 2011- 15 Jun, 2011

Bin	Frequency
1.01	41
1.02	6
1.03	12
1.04	31
1.05	2260
1.06	13199
1.07	29354
1.08	28086
1.09	8721
1.1	1656
1.11	653
1.12	1259
1.13	2335
1.14	348
1.15	40
1.16	15
1.17	4
1.18	1
1.19	1
1.2	3
More	4
	88029



Lessons Learned

- Controls issues with a 100% OA economization with direct evaporative cooling
  - We found an error in the controls sequence during high humidity levels within the datacenter that turned a single pass system into a recirculating system by closing the outside air dampers 100%
  - Control loop tuning (14) independently controlled AHU line ups has posed challenging issues to controlling temperature and humidity during large swings between day and night during the summer season

Lessons Learned

- WUE has not been reported as we are verifying readings. The original system wasn’t designed to calculate WUE as the design were complete in late 2009, WUE was created in March of 2011 by The Green Grid.
- A perforated target plate is for improved air distribution within the datacenter is in review

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Next Steps - Mechanical

Datacenter Basis of Design Comparison

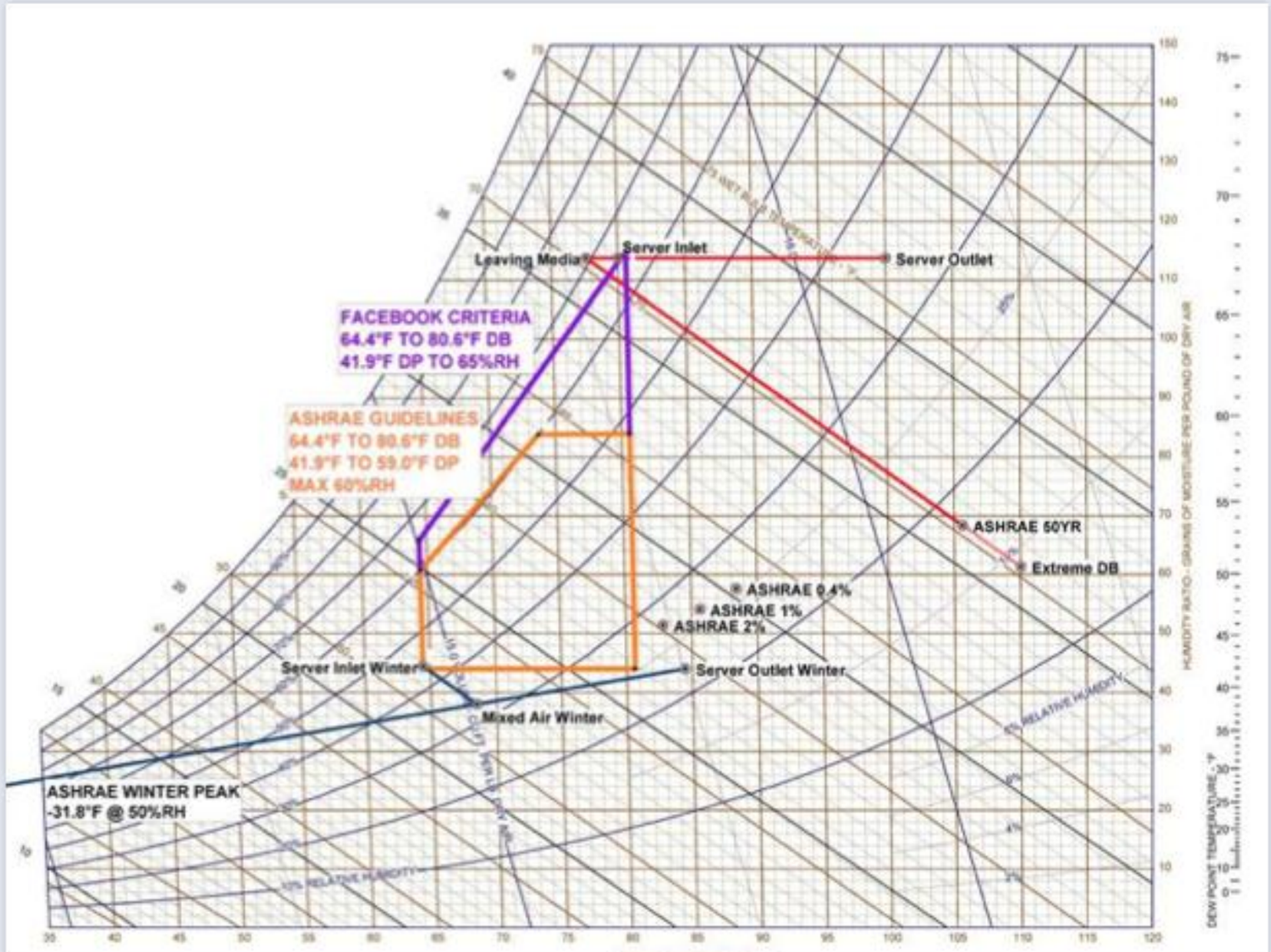
80ºF inlet	85ºF inlet	85ºF inlet
65% humidity	80% humidity	90% humidity
20ºF ΔT	35ºF ΔT	35ºF ΔT
PRN1A1B	PRN1C1D	FRC1A1B

From Prineville to Forest City

-45% air handling hardware

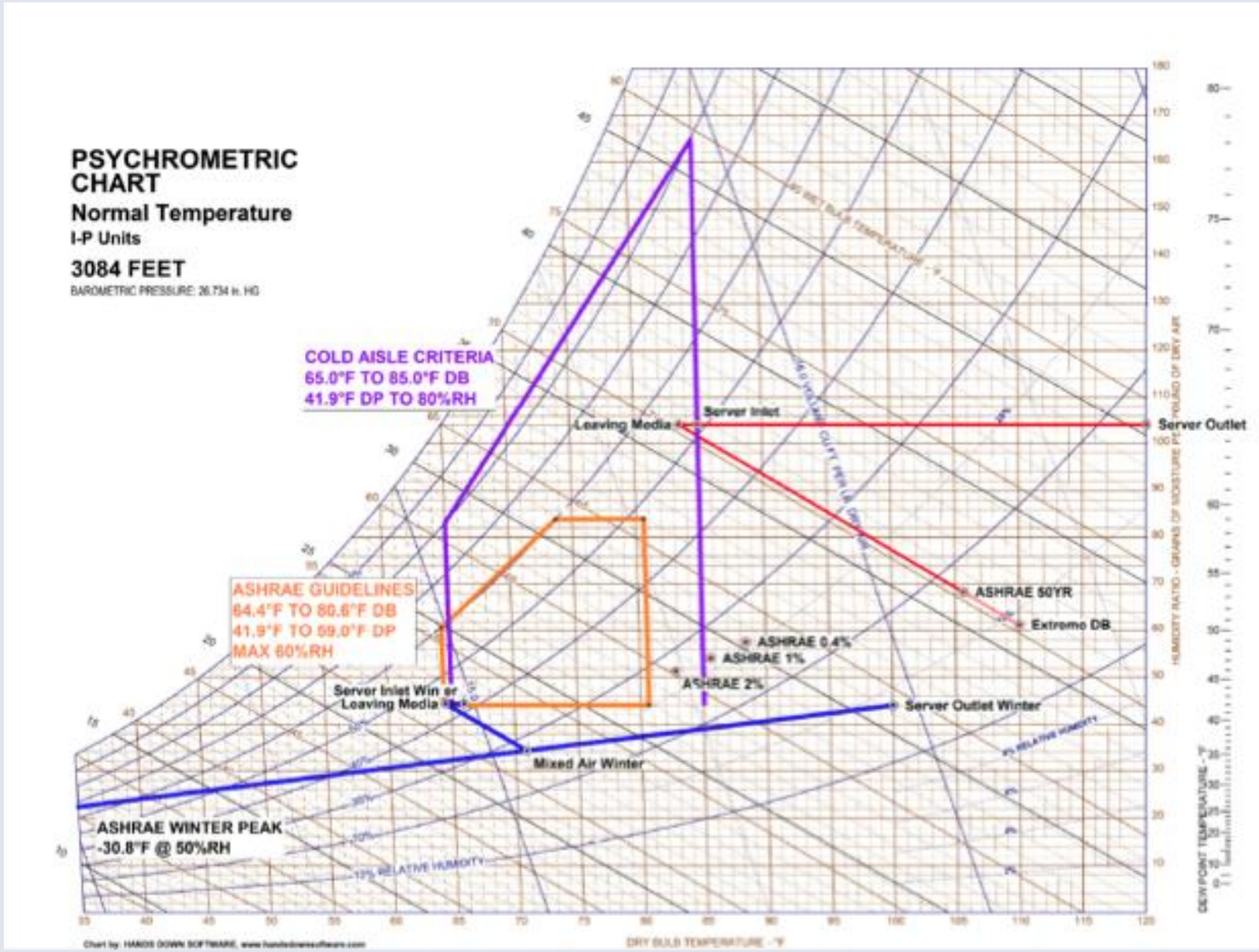
Psychrometric Chart – PRN1A1B

- 65F – 80F cold aisle temperature
- 65% relative humidity max
- 41.9F min dew point temp
- 105F Dry Bulb / 70.3F Wet Bulb
- Summer: 110ºFDB, 70.3ºFWB



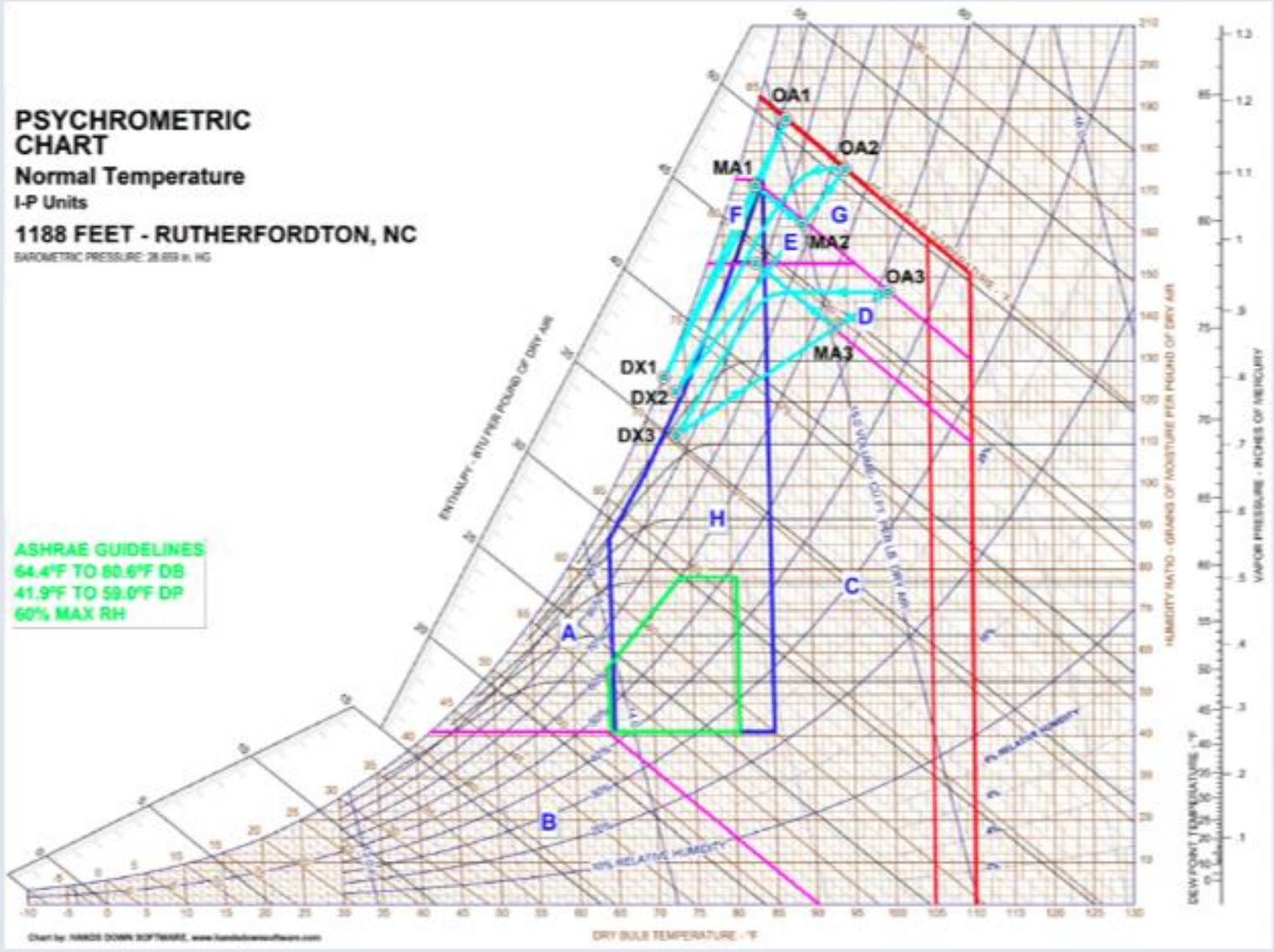
Psychrometric Chart – PRN1C1D

- 65F – 85F cold aisle temperature
- 80% relative humidity max
- 41.9F min dew point temp
- 35F delta T across servers allowed to minimize fan arrays from (14) to (8)
- We reduced the evap pump skid redundancy from 2N to N
- 105F Dry Bulb / 70.3F Wet Bulb



Psychrometric Chart – FRC

- 65F - 85F cold aisle temperature
- 90% relative humidity max
- 41.9F min dew point temp
- DX added for extreme weather criteria in to condition the air within acceptable server conditions
- 35F delta T across servers allowed to minimize fan arrays from (14) to (8)
- Also reduced the evap pump skid redundancy



Questions?