

Up to 80% Energy & Peak Savings!

Add-On & Stand Alones & More.....


Bruce Baccei **HVAC**, Motors & Daylighting R&D

May 16, 2014

Powering forward. Together.



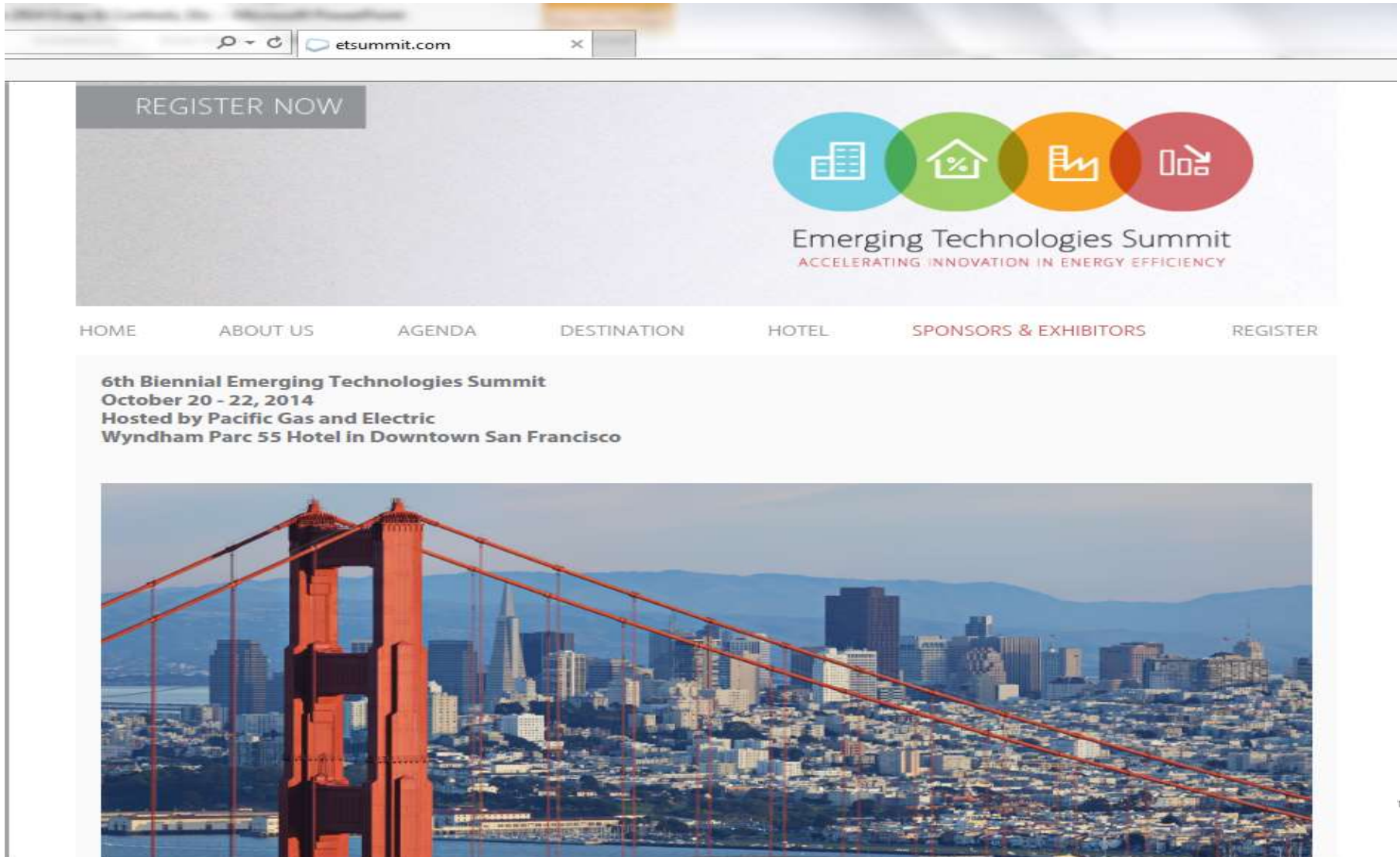
Existing & New RTU's & More.....

- **Maintenance Programs, “Arrows in the Quiver”**
 - Background/The Big Picture from AHRI
 - New Controls for Existing RTU's
 - Add-On-Evaporative Systems – Rebates this Summer
 - 1st Winner of DOE's RTU Challenge: EER18
 - Stand Alone Indirect Evaporative System: EER 45.2
- 
- NovaTorque
 - Side Daylighting – Light Louver & 3M film

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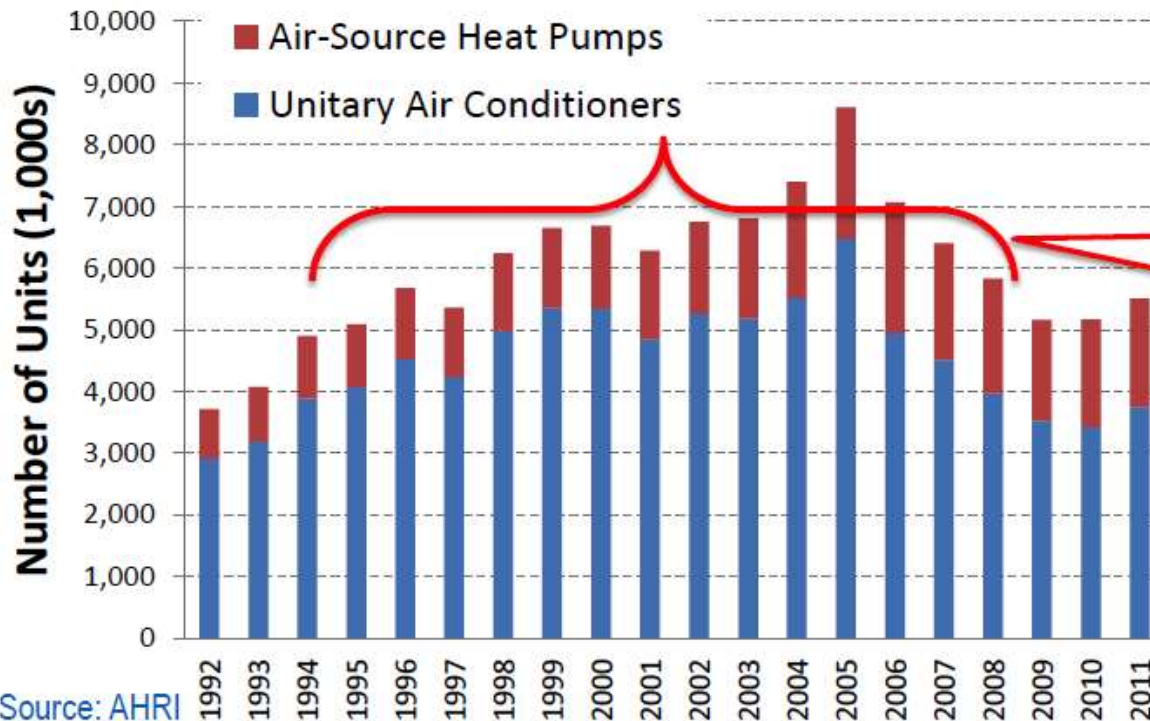
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Why RTU's?

- RTUs cool over 60% of U.S. commercial building floor area
- Lots of 10 to 20 year old RTUs installed
- Replacement is often only after failure



Large stock of 6-18 year old equipment

Source: AHRI

What are RTU Retrofit Controls?

- For units <10 years old and > 5-7 tons of cooling capacity
- Essential features:
 - Variable or multi-speed fan control
 - Integrated economizer control
 - Demand controlled ventilation
- Desirable features:
 - Variable capacity compressors
 - Fault detection and diagnostics
 - Remote monitoring
- Reduce RTU energy consumption by up to 40% with a 2-4 year payback



Retrofit Controls to Rooftop Units

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RTU's: Single Speed, Oversized, Non-Communicative! Run to Failure!
.....

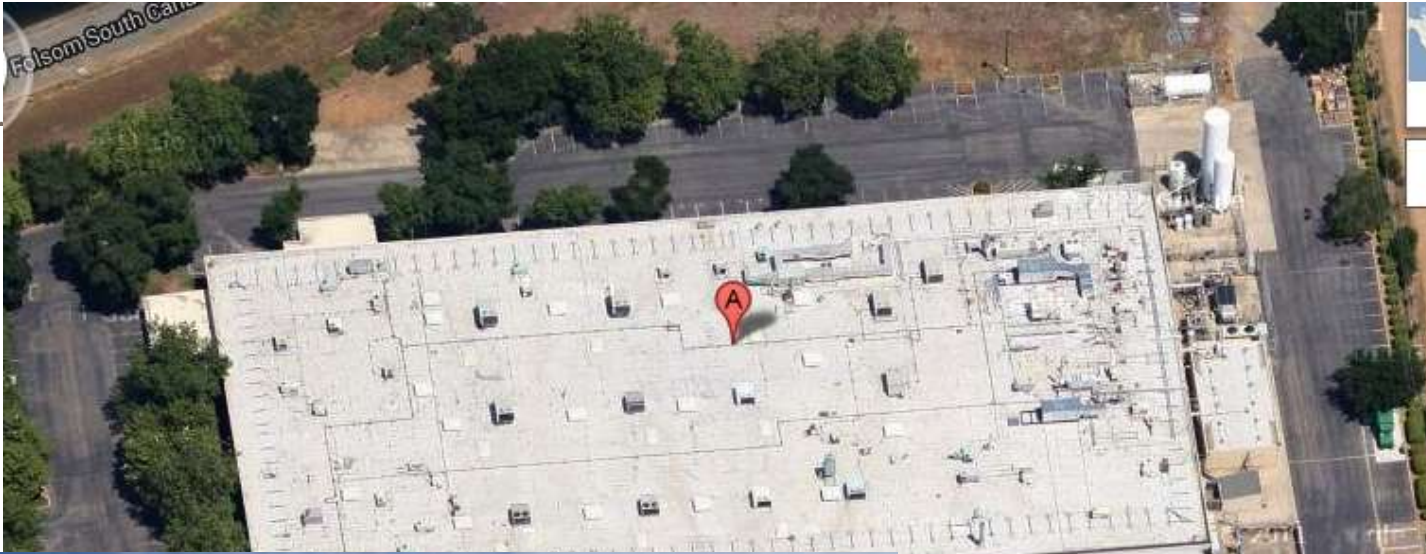
Replace or Repair? Customer Decision – Cash Flow

10 Tons & Above

-
- Catalyst, [DigiRTU](#), Enerfit: “Rigorously Tested”*
 - PNNL: - 66 RTU’s on 8 buildings in 4 climates, 2011-12
 - Annual E Savings 22%-90%, Ave 57%
 - Omaha PUD- 20-45% Savings
 - **Catalyst & DigiRTU:**
 - FDD/M&V system is robust, sophisticated and inexpensive

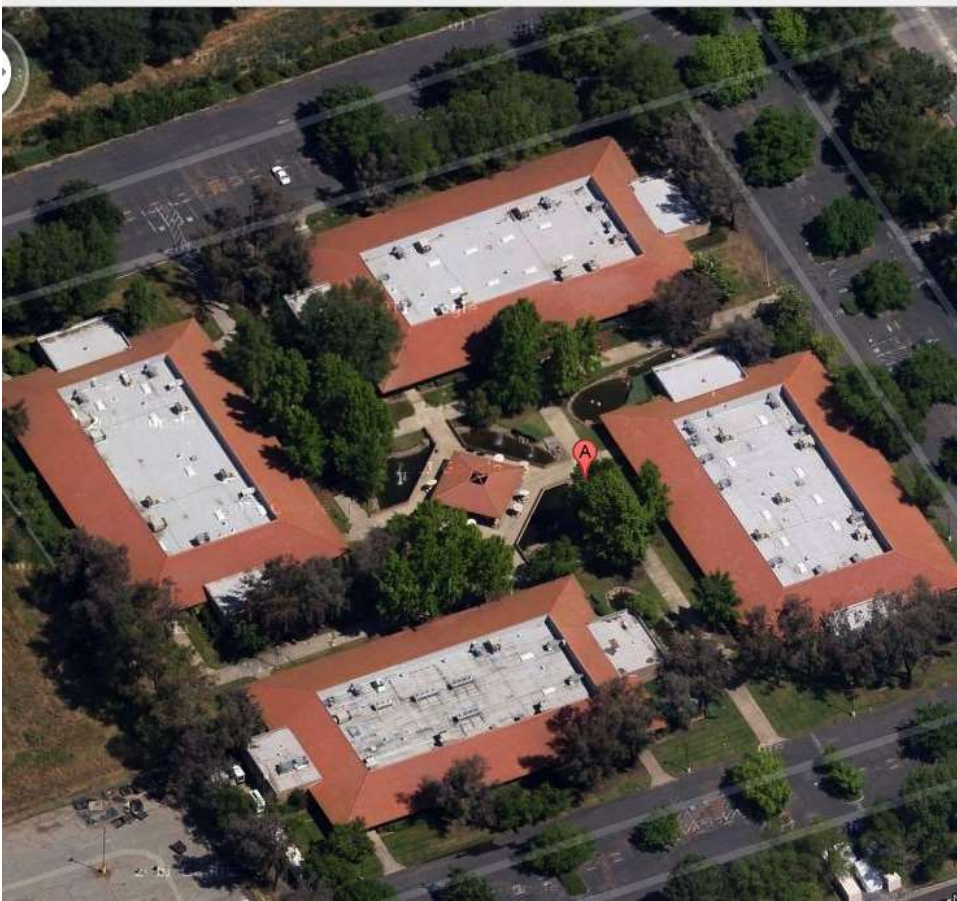
* **E-Source**

- Teledyne 80 RTU's - 4 With Catalyst



Below 10 Tons

- **Honeywell, Belimo, Innotech - CRDC**
 - DOE/NREL: 30-40% savings 2 year payback



Add-On Evaporative Systems



Rebates This Summer

- Fault Detection
- Warranty (Service x 2/yr-2)

- **Evaporcool.....Peak Efficiency**
- **FlashCool** “ “
- **Dual Cool..... same functionality + Economizer Control**
- Air2O
- HyderEvap

HVAC R&D

- Add-On Evap for RTU's moving to Commercial Program Rebates Summer 2014
 - Fault Detection
 - Warranty (Service 2 times per year)
 - Coordination with WCEC & IOU's in process



Daikin Rebel EER 18

Variable Speed Everything....Not Oversized

WCEC Monitoring





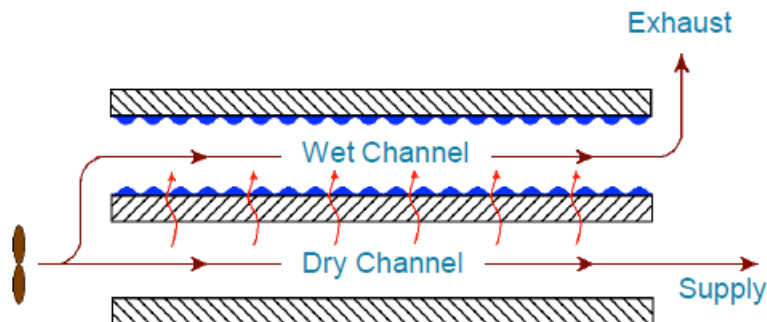


Indirect Evaporative Cooling

- Evaporatively cool one stream of air and use it to cool another without adding moisture to it.
- How to achieve better than 100% wet-bulb (WB) effectiveness:

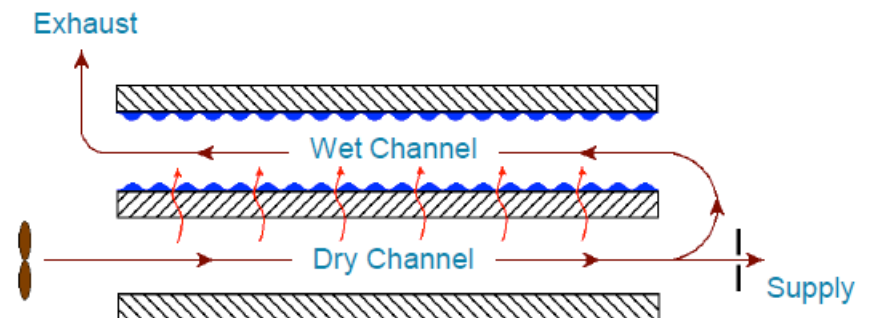
Parallel Flow

- Supply air temperature is limited to inlet **wet-bulb** temperature
- < 100% WB Effectiveness



Counter Flow

- Supply air temperature is limited to inlet **dew-point** temperature with multiple stages
- > 100% WB Effectiveness possible



Climate Wizard” – Synectics & Tri Tool

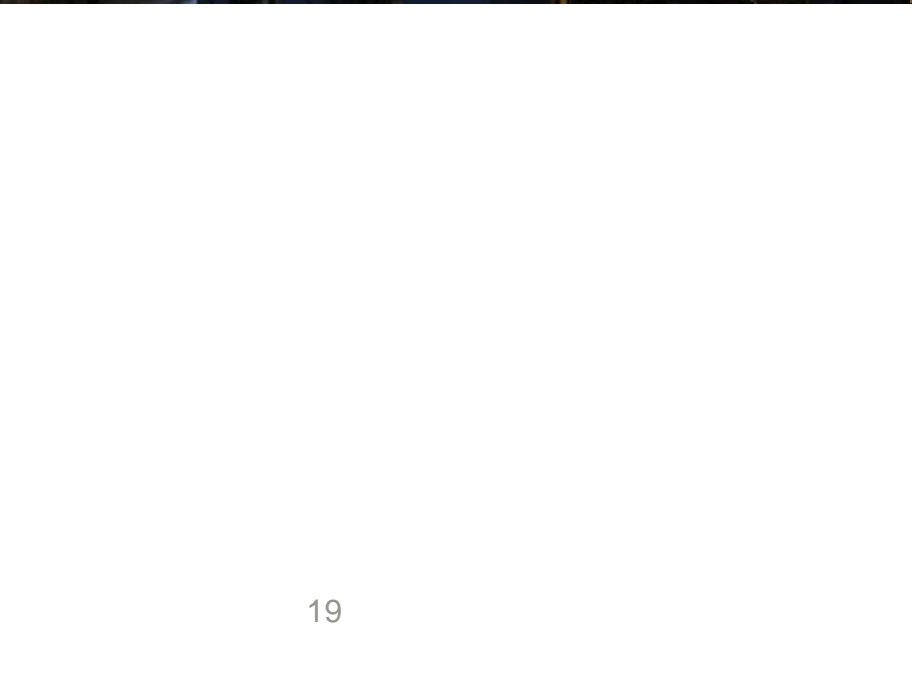
An Indirect Evaporative System

- EER 45.2
 - Tri Tool 60 Tons – 34 amps
 - Synectics 6 Tons – 2.6 amps x 5
- Clean Air Tri Tool!
- High Cost (R&D)
- 50% reduction

Synectics - Commissioned







Future Plans (CY 2015 and beyond)

- Manufacturing -Bring costs down 50%
- Plan Rebates for 2015 in stage 3 program, if cost trajectory warrants
- Coordinate Rebates with IOU's & Muni's

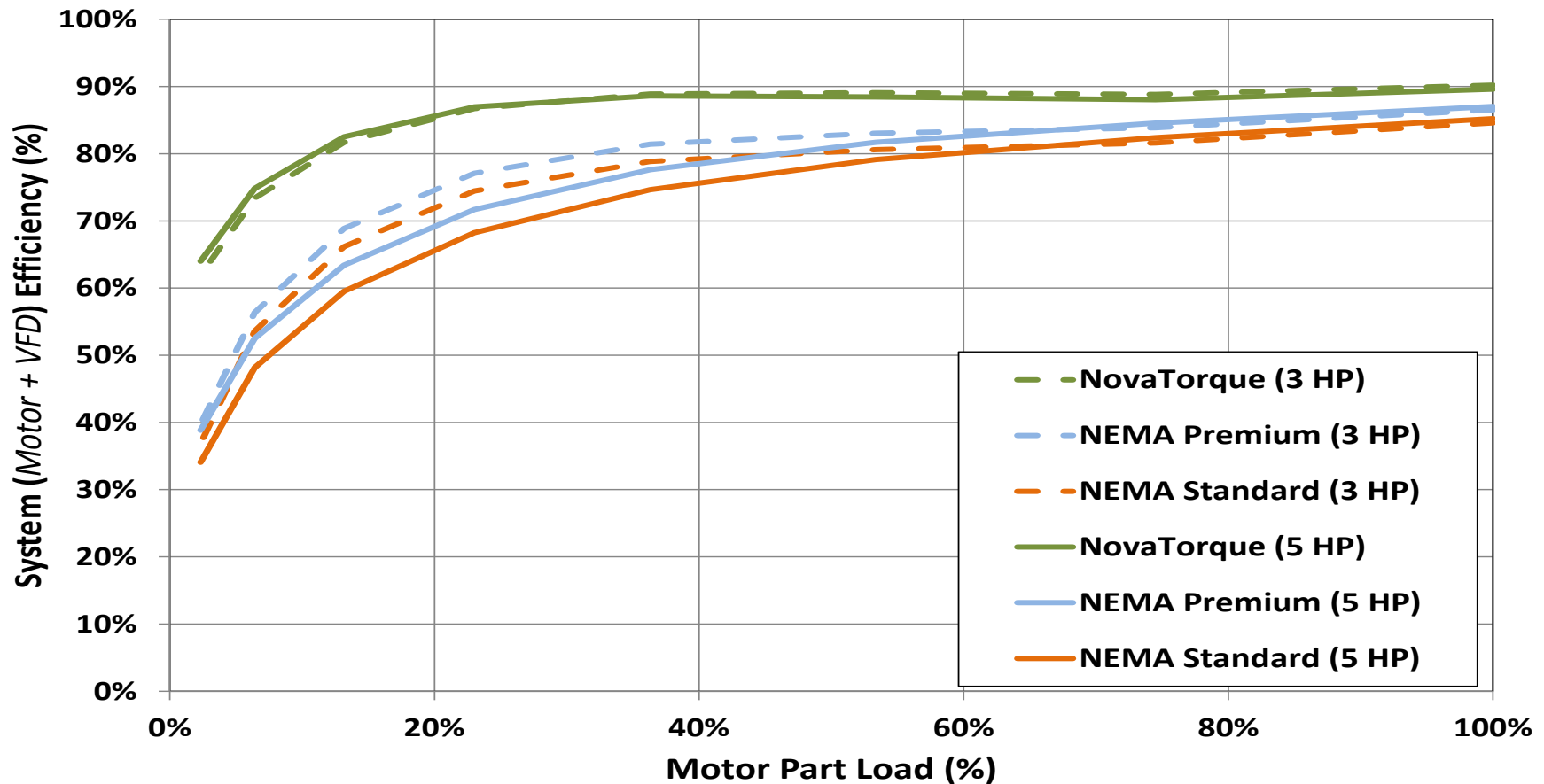
SMUD:

NovaTorque

4 to 25% More Efficient



Comparison of 3 and 5 HP NovaTorque Motors Against Control Motors In a Modeled Fan Application



Comparing to Existing Daylight Sails



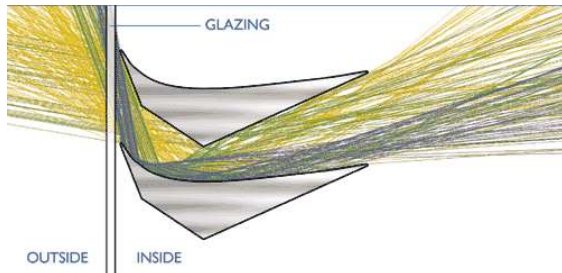
SMUD™

SMUD “Side Daylighting Study compares:

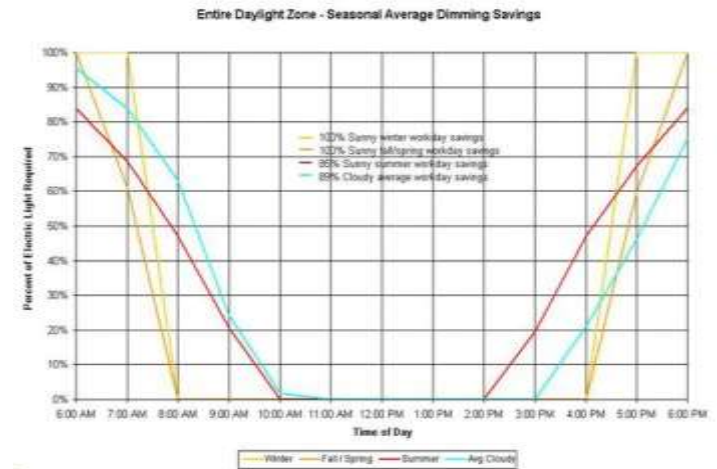
1. Existing Daylighting Sails,
2. LightLouver &
3. 3M Film

- LightLouver redirects Daylight from 5 to 85° deep into the building
- 3M: angle of incident = angle of reflection

LightLouver Patented Optical Slat Design



LightLouver & 3M Samples









Stay Alert &
Don't Get Hurt

ENTERPRISE SYSTEMS
SUPPORT

EXIT

PATRICK JO

3NEB

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