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PUBLISHED BY 7X24 EXCHANGE INTERNATIONAL

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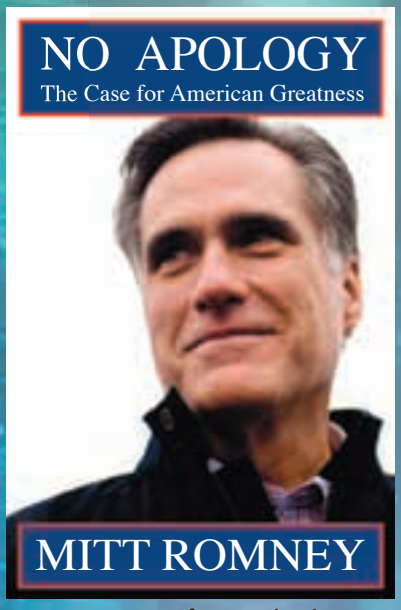
2010 SPRING CONFERENCE KEYNOTE

JUNE 6 – 9, 2010



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The End of the Low Hanging Fruit

by **Christopher M. Johnston, P.E.**

In these demanding times we always try to first pick the low-hanging fruit in our projects: the gains that are easily won with minimal cost and risk. The low-hanging fruit typically has a high return on investment (ROI) and is more likely to receive corporate funding. It also doesn't require much thought or imagination of us, and we are oftentimes lazy.

We typically pick low-hanging fruit in existing data centers that reduce operating costs with little or no capital expenditure. Projects that reduce cooling inefficiency, eliminate raised access floor air leakage at the wrong spots, and keep most of the lights normally turned off are prime examples. These opportunities will exist until we've fixed the older data centers or until they've been shut down. At the same time, we firmly resolve that we won't repeat these problems in the new data centers we design today.

Most of us today design more reliable, more energy-efficient data centers than we did a few years ago. The energy efficiency bar has been raised. RFPs in the northern United States and Canada often require an annual PUE of 1.25 or lower, requiring today's best technology and practices. Here we glimpse the end of the low-hanging fruit. When I design a data center with an annual PUE of 1.25, all of my efforts are restricted to the portion of the PUE greater than 1. At a 1.25 annual PUE, I can only affect 1/5 of the energy consumption while the 4/5 I cannot affect is the IT load. If I can reduce the non-IT energy consumption

by 10%, I will reduce the annual PUE by only 2%. The energy efficiency of the IT load becomes much more important than the energy efficiency of the non-IT load. The PUE ceases to be an appropriate metric for data center energy efficiency since it doesn't consider the IT load efficiency.

We must also consider the upcoming changes in computer technology. The ASHRAE TC9.9 committee last year widened the acceptable computer equipment operating conditions to 80.6° F. entering dry bulb temperature. In many locations in the US and Canada we can satisfy these conditions using airside economizer for 8000 or more hours per year, leaving only 760 or fewer hours per year of refrigeration. Once the acceptable entering dry bulb temperature reaches 90° F., the need for refrigeration will disappear and evaporative cooling will suffice. Some owners are already operating at 90° F. and not correcting for humidity at all. Assuming 6% energy loss for air handling and 2%-6% for UPS losses, we can see a potential annual PUE reduction to 1.08-1.16. There won't be any substantial improvement past this point.

SO, WHERE DO WE GO FROM HERE?

1. **We must recognize that today's low hanging fruit is mostly picked and won't be there tomorrow.**
2. **We must become more versed in IT so we think in terms of IT, power and cooling at the same time.**
3. **We must develop an easily applied metric to replace PUE and measure overall efficiency.**
4. **We must plan for tomorrow's technologies today.**
5. **We must take this opportunity to simplify our designs and make them more reliable to meet our client's needs.**

Christopher M. Johnston, P.E. is a Senior Vice President at Syska Hennessy Group. He can reached at cjohnston@syska.com.