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June 18-19, 2014 - San Francisco

Walgreens Net Zero with Transcritical CO_2

Rob Olden –GI Energy

Jason Robbins - Walgreens

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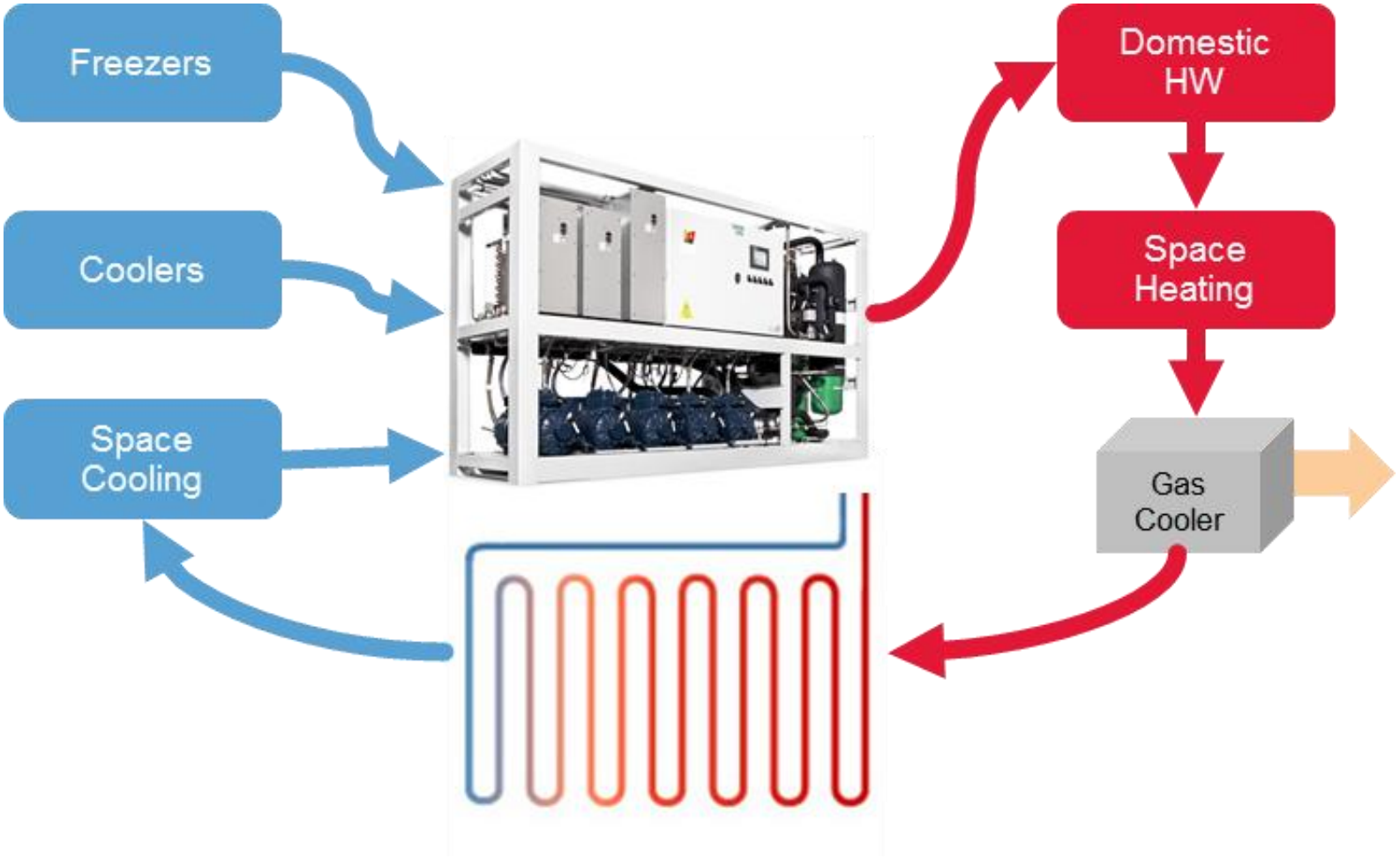
Net Zero Project Objectives

1. To evaluate “net zero” technologies.
2. Define the scalability of each independent



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Efficient $C0_2$

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Political Volatility of Chemical Refrigerants in the developed world

$2.9 Billion International Investment for Montreal Protocol ODP Projects

Phase-out of R-22 $50 Million Investment for Walgreens Portfolio

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R744 and Geothermal: MAY 8 High of 31C (88F)

- Geothermal loop provides steady condensing temperatures < 15C (60F)

Pink= OA Temp

Blue = Trans-Critical
Orange = PT1
Green=$GEOTemp_{in}$

Navy=$GEOTemp_{out}$
Red = GEO power

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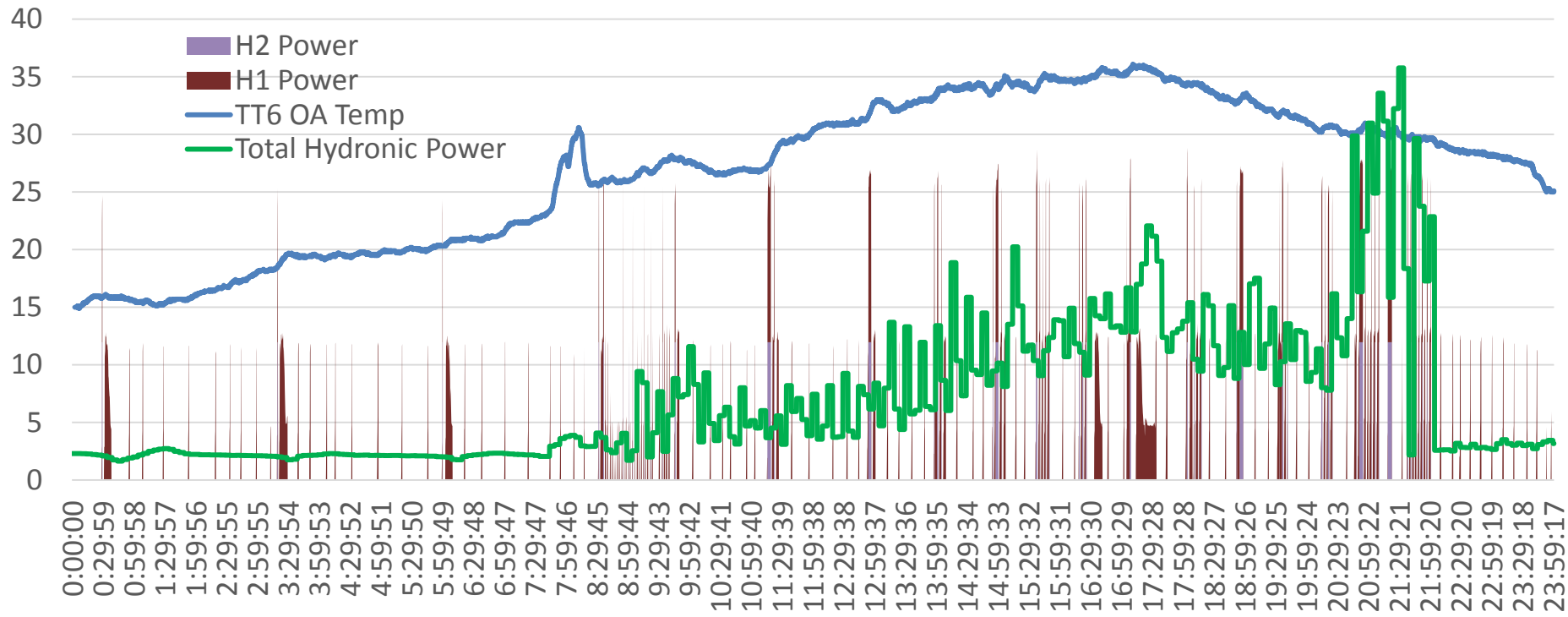
R744 and Geothermal: MAY 8

- Instantaneous HT COPs up to 10, range:4-6
- Aggregate hydronic COP = 3.4



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Summary and Lessons Learned

- Incorporating HVAC into refrigeration rack breaks down historic barrier to innovation
- Geothermal loop adds redundancy and increases operational flexibility
- Aluminum piping is a no-brainer
- US suppliers lack sufficient stock of 80 Bar rated components. UL Certification hurdles.
- Real time monitoring and transparency are vital

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Thank you very much!