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# Geothermal and Biomass Case Studies

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Session 3: Green Energy at Airports





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# Agenda

- Geothermal case study:
  - Portland International Jetport (US)
- Biomass Case studies:
  - London Heathrow (UK)
  - London Gatwick (UK)



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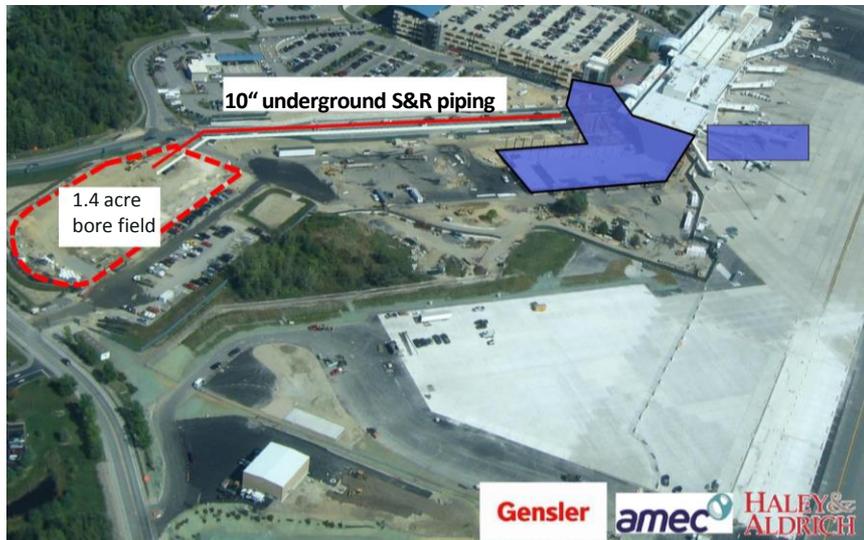
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# Portland International Jetport: Geothermal



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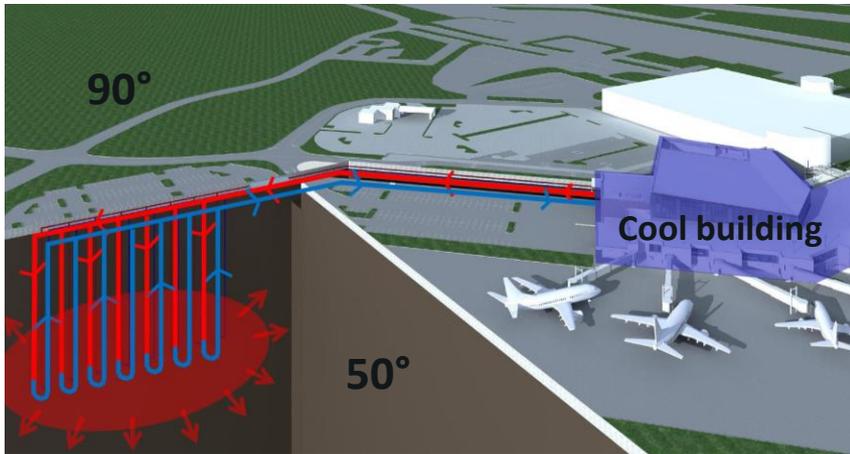
## Portland International Jetport: Geothermal



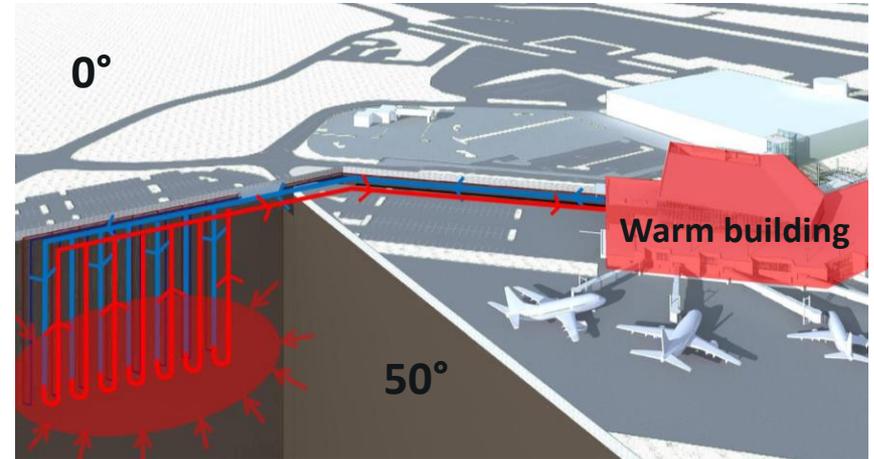
### Largest system in Maine:

- 23 miles of high-density polyethylene piping
- 120 ground wells that are up to 500' deep
- Moves up to 475 gallons of water per minute
- Under normal operations, takes 30 minutes to complete a round trip

# Portland International Jetport: Geothermal



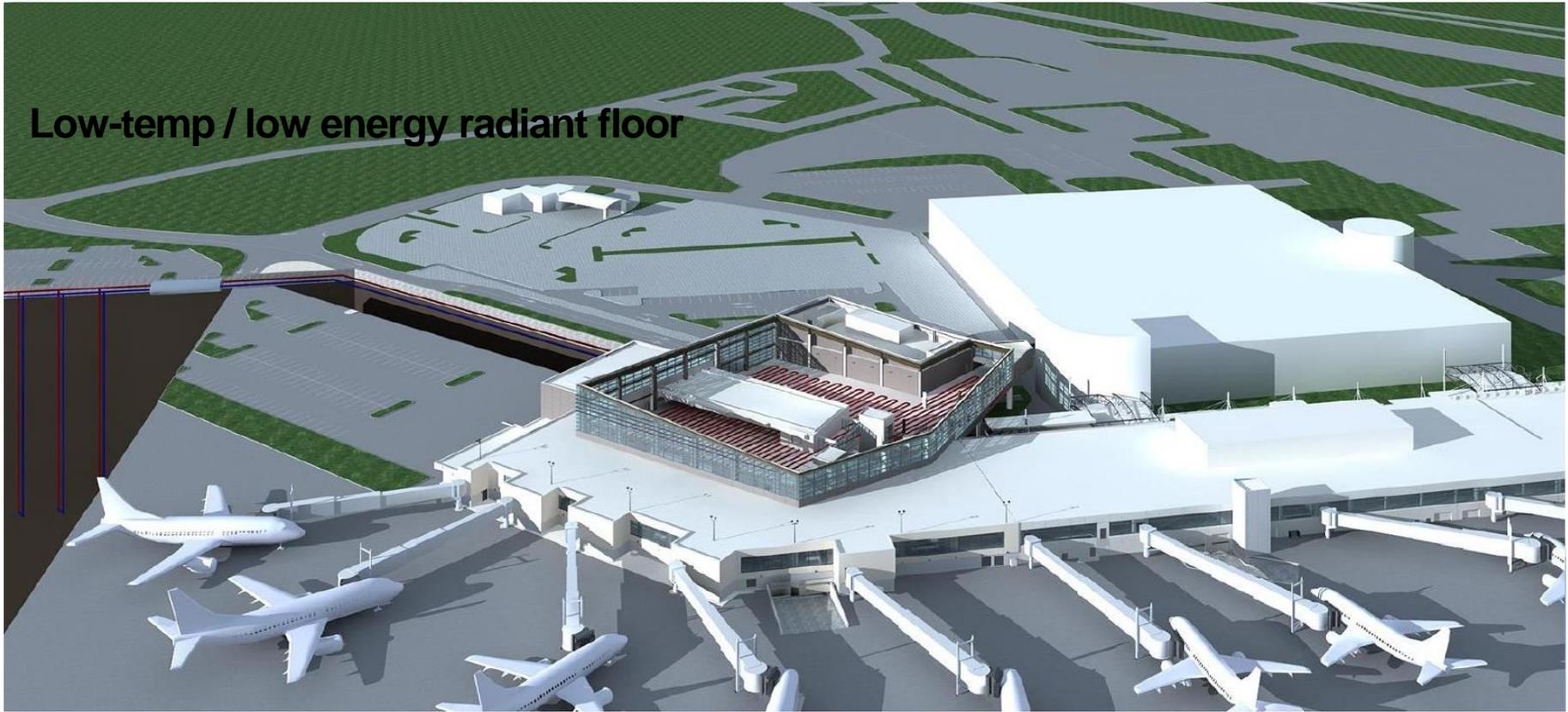
Summer Cooling Operation



Winter Heating Operation

# Portland International Jetport: Geothermal

Low-temp / low energy radiant floor



## Portland International Jetport: Geothermal



- System uses 8 stacked heat pumps (up to 7 for cooling and all 8 for heating) to provide 100% of the terminal's cooling requirements and 75% of the heating needs
- System provides a maximum heating capacity of 6.87 million BTUH (572.5 Tons) and a maximum cooling capacity of 462.1 Tons.

## Portland International Jetport: Geothermal



- VALE Grant funding (Voluntary Airport Low Emission Program)
  - Administered through the FAA Airport Improvement Program (AIP)
  - Portland Jetport received \$2.59M grant; Total cost \$3.1M



## Portland International Jetport: Geothermal

Estimated Annual Fuel Savings	
100,000 gallons oil x \$3.36US per gallon (2012 project price)*	\$336,000
(Minus net added electrical costs)	(\$91,000)
Net Savings	\$245,000

\*current evaluation would need to be against natural gas

Simple payback without VALE grant: 12.7 years

Simple payback with VALE grant: 2.1 years



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# London Heathrow T2 Energy Centre



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## London Heathrow T2 Energy Centre



\*Photo: VAS

- Combined Heating Power (CHP) base heating load 9 MW (thermal) and biomass CHP output 1.8 MW (electric)
- Uses 25,000 tones woodchips per year from sustainable woodlands
- Saves 13,000 tones CO<sub>2</sub> per year

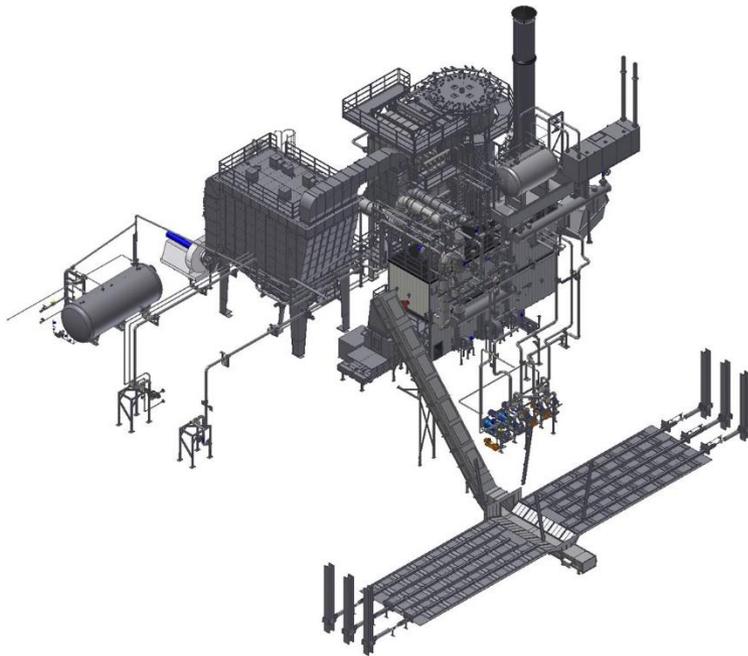


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## London Heathrow T2 Energy Centre



\*Photos: VAS

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## London Gatwick Biomass



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## London Gatwick Biomass



Photo: [letsrecycle.com](http://letsrecycle.com)

- Waste is prepared by shredding, screening, and drying.

## London Gatwick Biomass



Photo: [letsrecycle.com](http://letsrecycle.com)

- Dried, powdered material then passes through a rotary screen (to remove any remaining packaging material)
- Then treated with biomass boiler

## London Gatwick Biomass



Photo: [letsrecycle.com](http://letsrecycle.com)

- A small materials recovery facility is also located on the same site, where commingled waste from the terminal is handled.
- Any remaining organic material is passed to the biomass drying system.



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