



## A Step Change in Restoring Underground Steam Line Efficiency and Resiliency

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- Large sections of steam based campus energy systems risk underperforming due to aging infrastructure and deteriorated thermal protections. Increasingly unpredictable severe weather events add to the challenge of maintaining network efficiency and resiliency. Distributing reliable steam energy in an efficient, safe and cost effective manner is the goal of all system operators, but one that is becoming more difficult to sustain.

A growing list of campuses have utilized high temperature aerogel blanket insulation to remediate compromised underground networks prone to repeated flooding & Corrosion under Insulation. Aerogel blanket insulation limits water ingress, even in boiling submersion, protecting assets and steam quality. After flooding events dry-out times are drastically reduced and distribution lines can be restarted sooner limiting disruption to customers.

As ASHRAE standards have become more stringent, insulating for compliance becomes near difficult to impossible in space challenged vaults and steam tunnels. High temperature Aerogel blanket has thermal conductivity values superior to those of traditional solutions at typical steam operating temperatures. Network operators can now comply with state energy codes utilizing a thinner insulation profile while imparting an increased level of resiliency to their operations.

## System Efficiency



+ Running Costs

Pumping Boiling Water

+ GHG Emissions

+ Maintenance

Noncompliance with Code

Abandonment

+ Corrosion

Public Safety

Supply Constraints

Excess Condensate

Oversizing Capacity

Complete Re-insulation

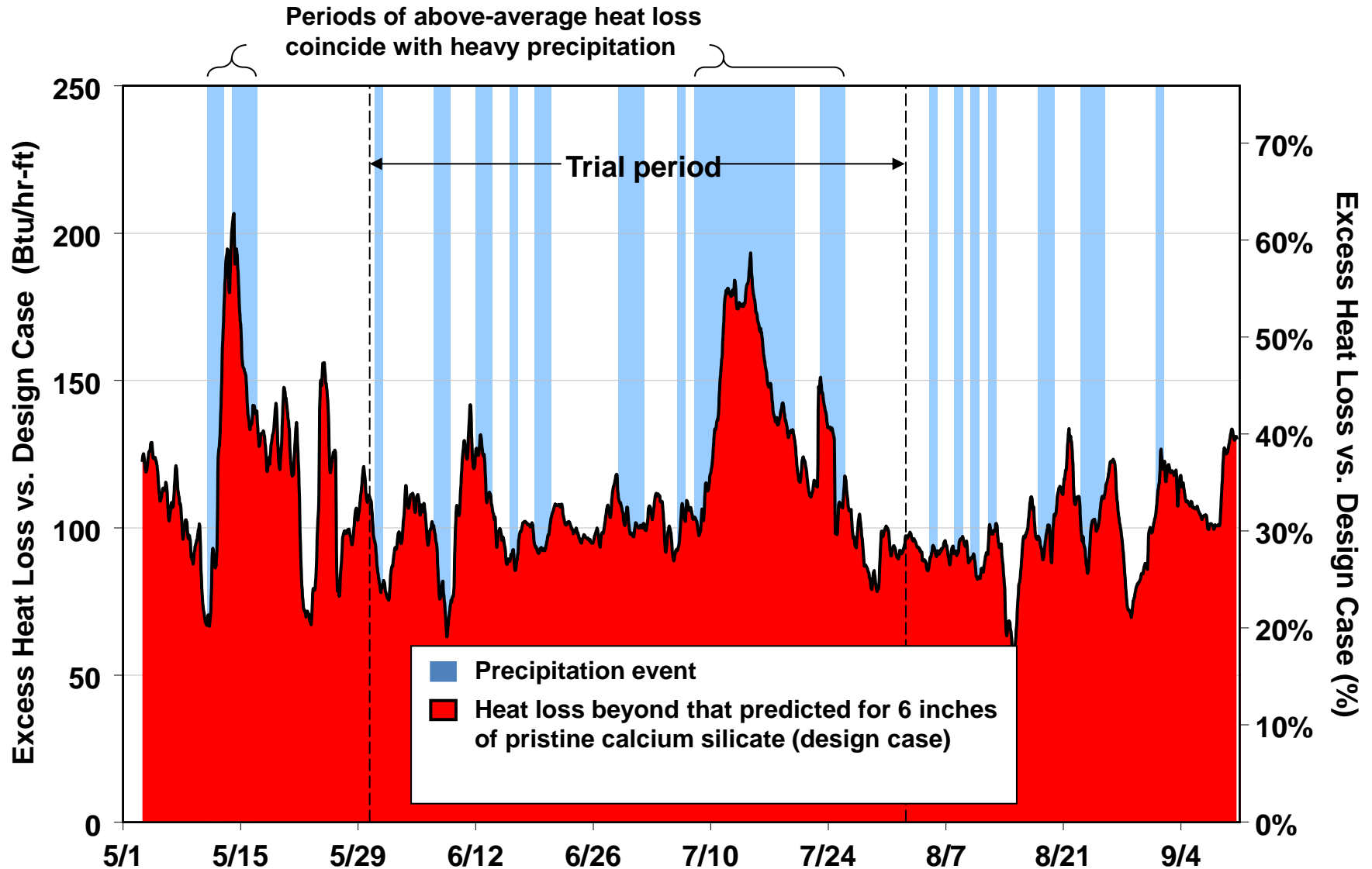
Operator Safety

Poor Steam Quality

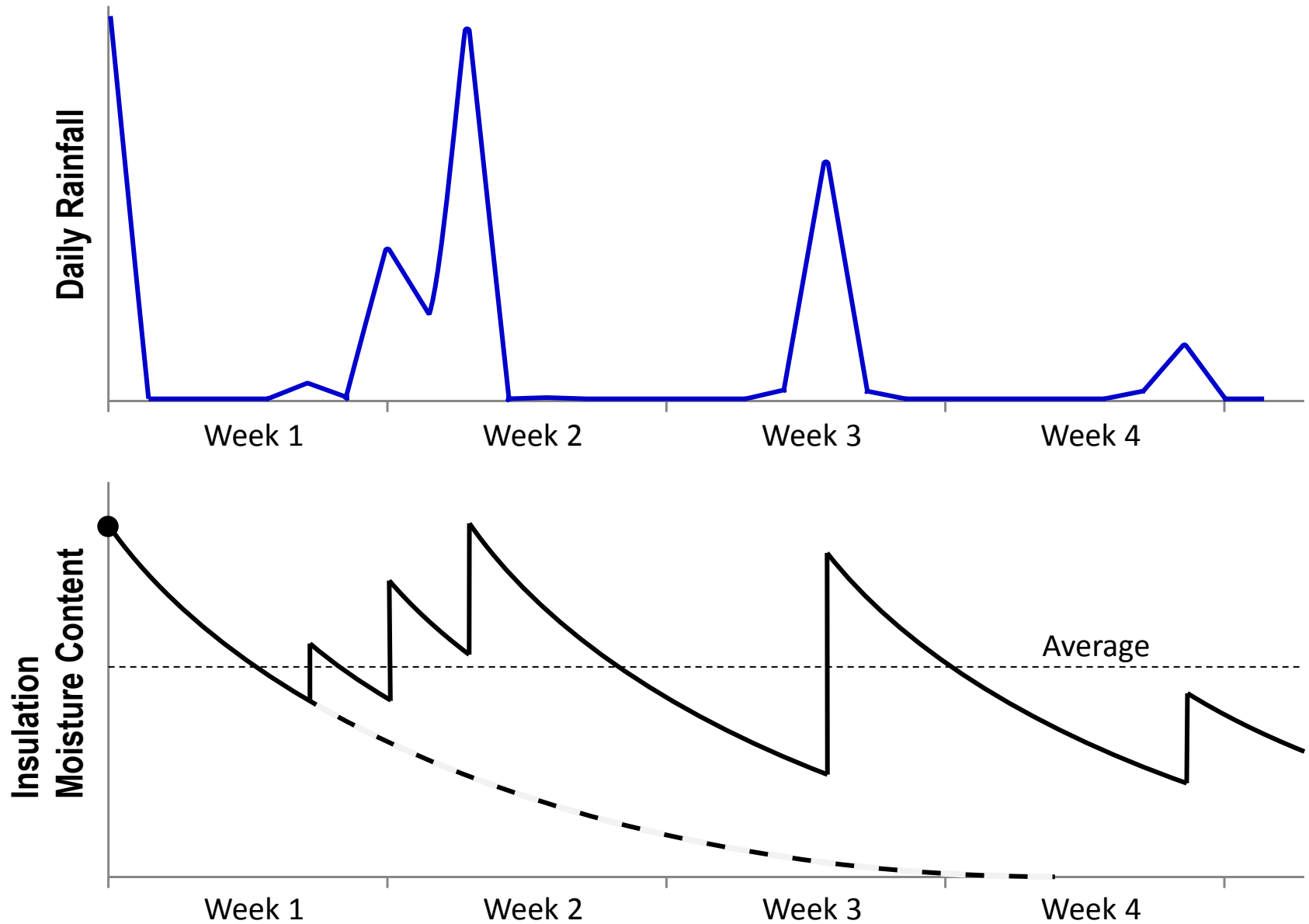
Service Interruptions

Decreased Resiliency

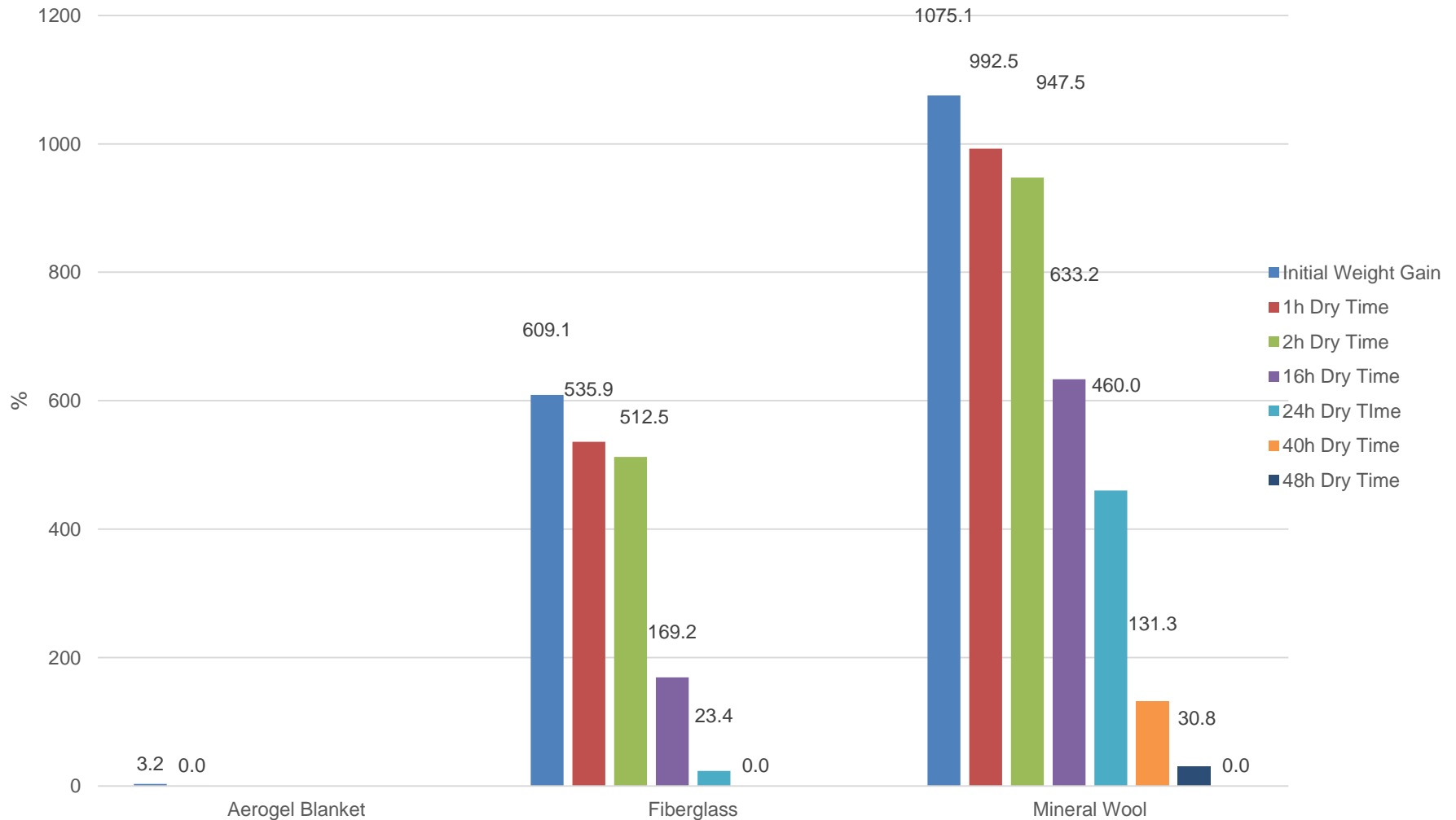
# Enemy #1 - Water



# Downward Spiral of Performance

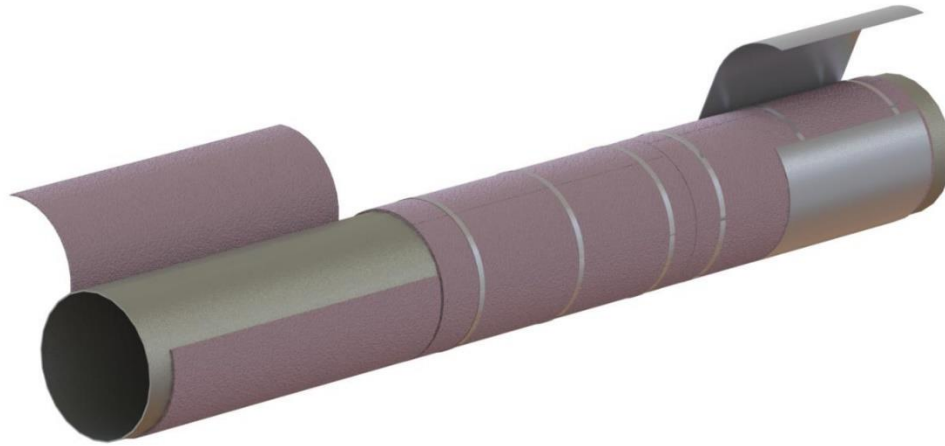


# Dry Out Dynamics of Three Thermal Insulations

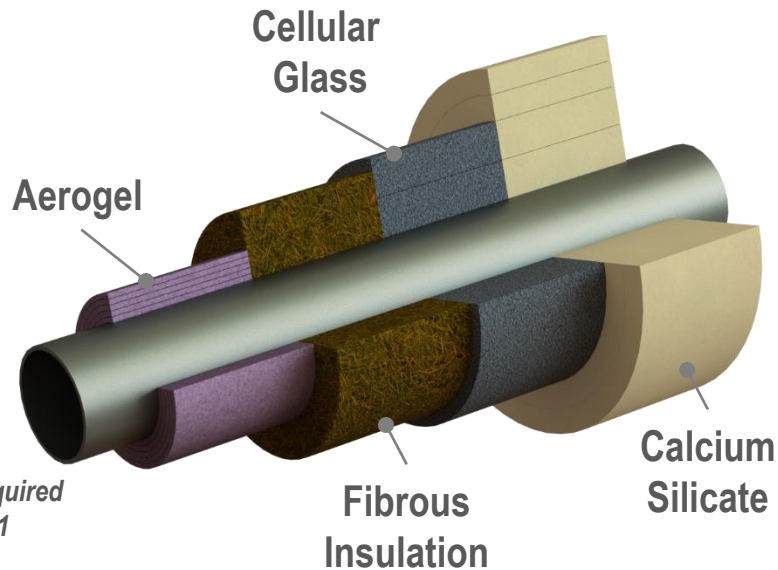


Recovery times post immersion for 15mins in Boiling Water

# High Temperature Aerogel Blanket Insulation



Traditional Insulation



*Thicknesses required  
for ASHRAE 90.1*



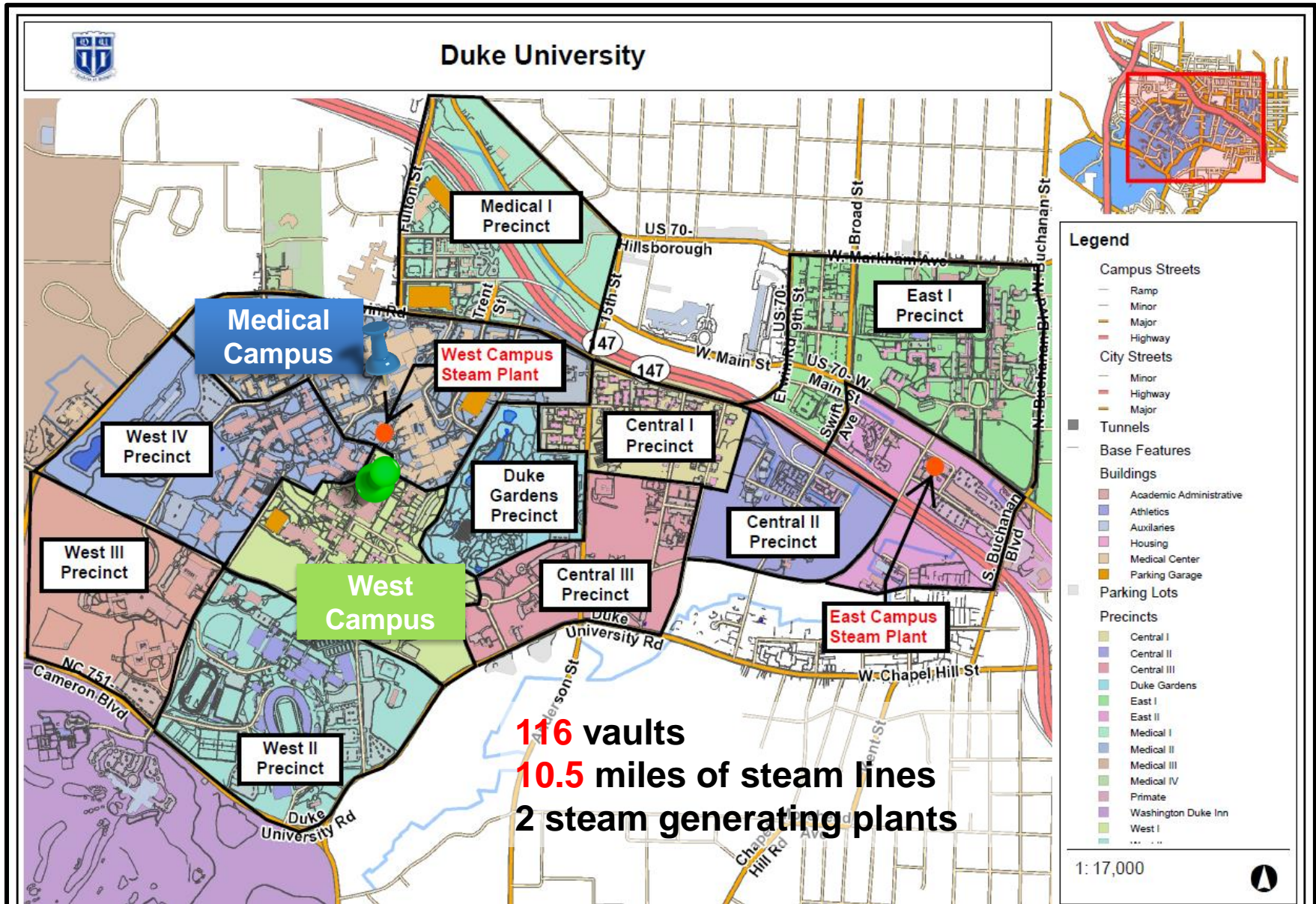
Hydrophobic



Durable



# Duke University Campus



+ Running Costs

Pumping Boiling Water

+ GHG Emissions

+ Maintenance

Noncompliance with Code

Abandonment

+ Corrosion

Public Safety

Supply Constraints

Excess Condensate

Oversizing Capacity

Complete Re-insulation

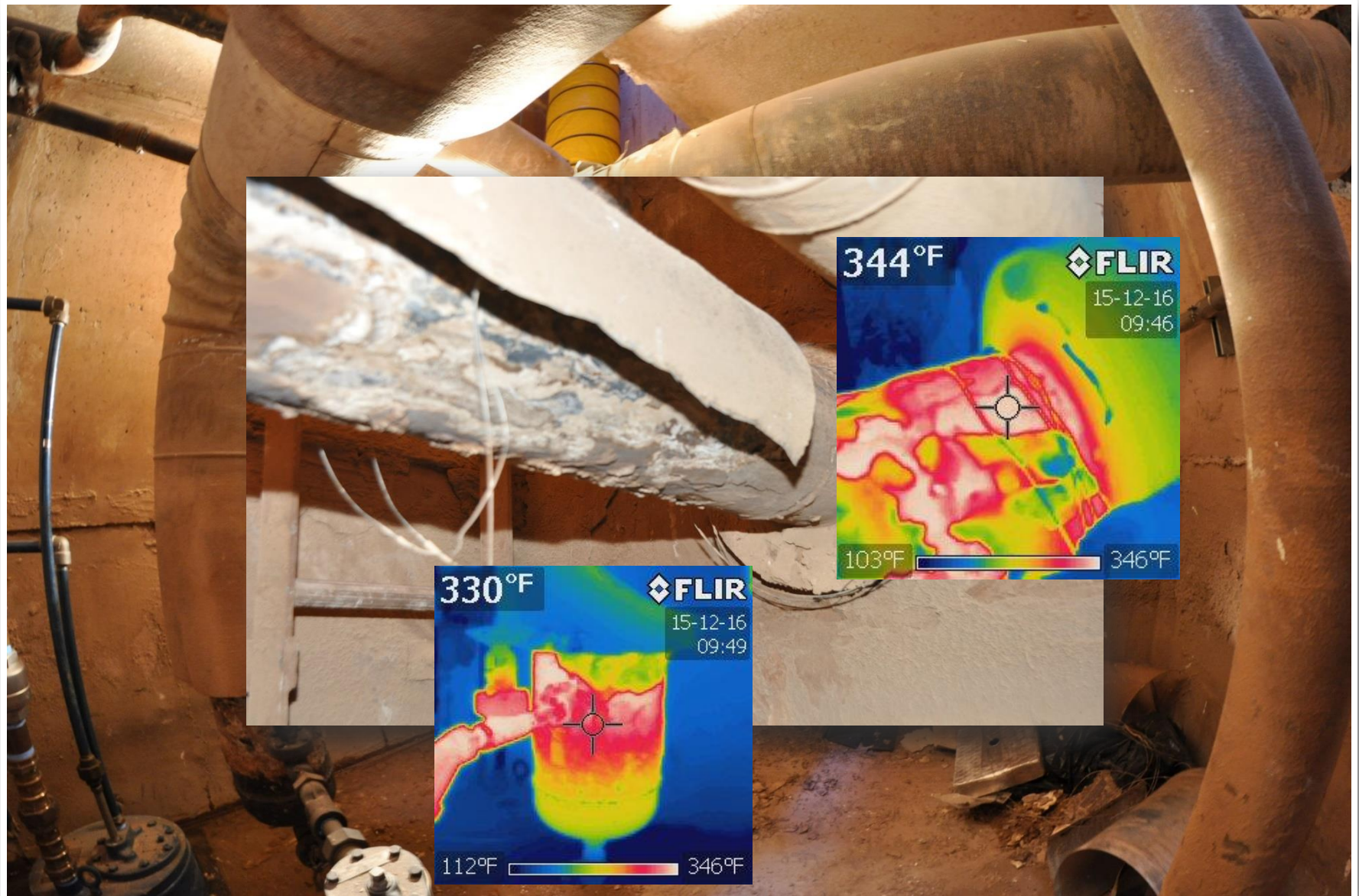
Operator Safety

Poor Steam Quality

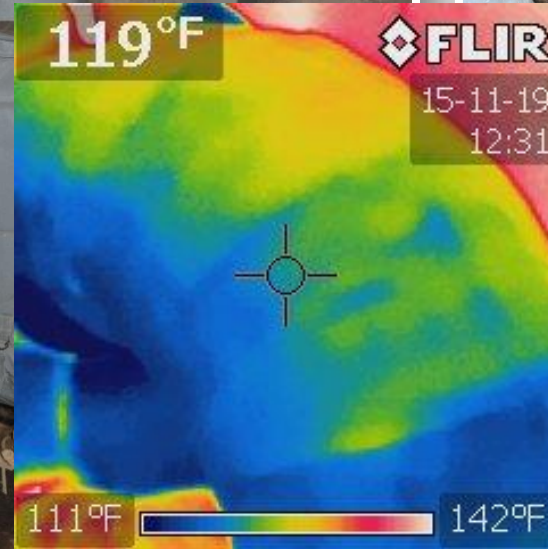
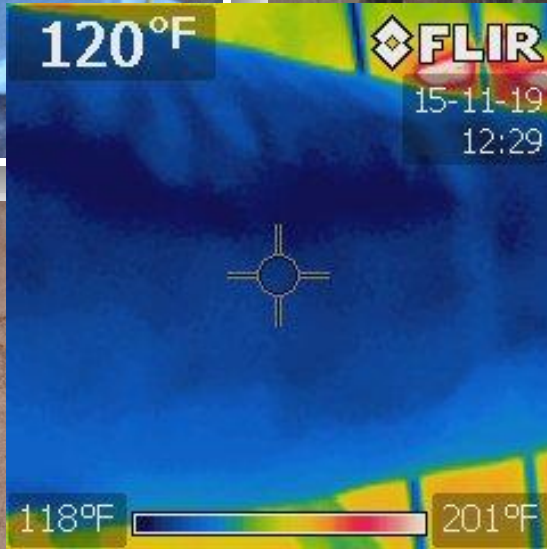
Service Interruptions

Decreased Resiliency









**Aerogel blanket performance not degraded by flooding**

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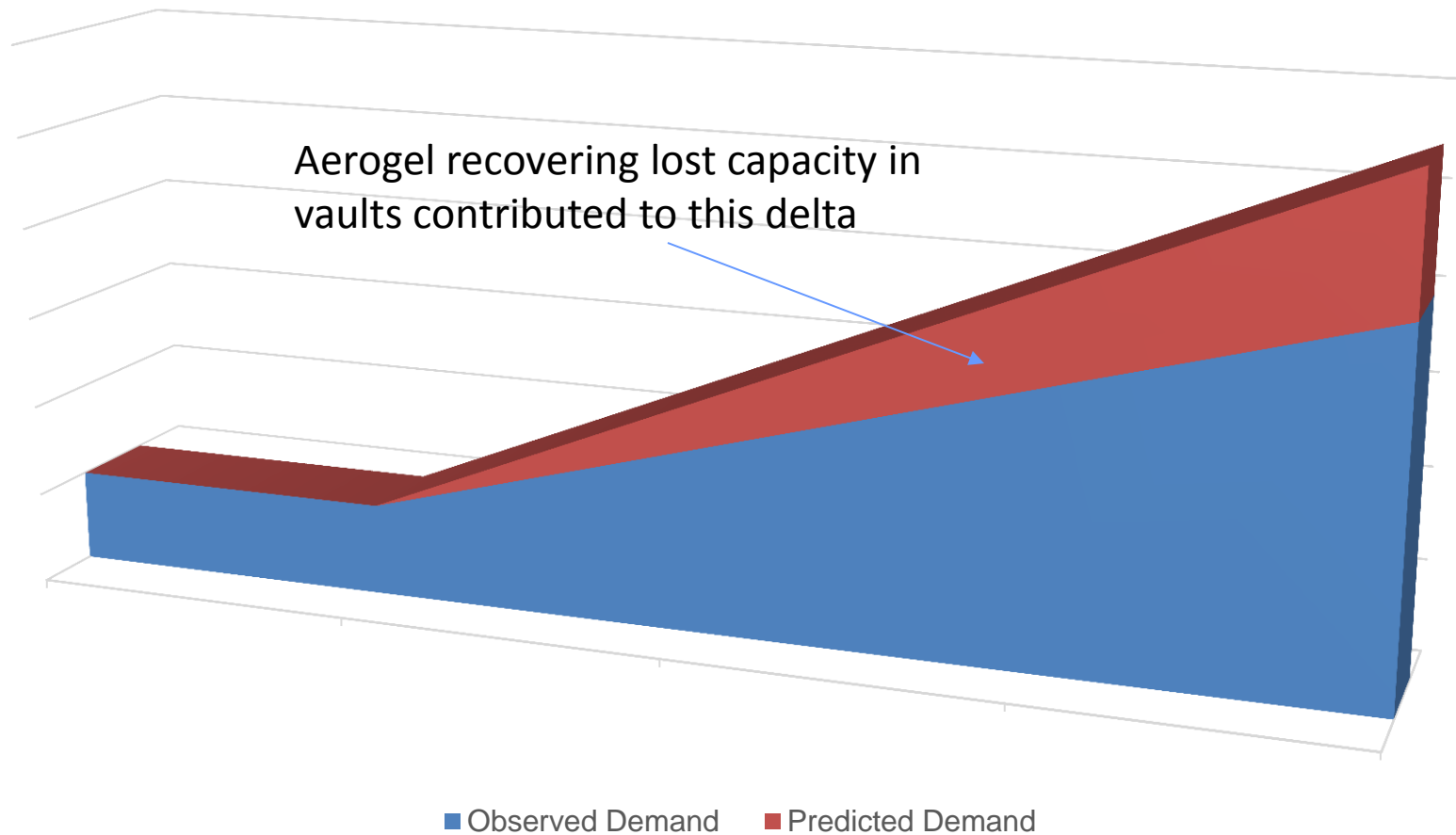


# Duke Medical Center – Steam Extension



# The Value of Recovered Capacity

## Capacity Recovery Plan









- It is evident that when a steam vault is subject to moisture ingress or periodic flooding then the choice of insulation has a key role to play in maintaining quality and service to consumers.
- Aerogel blanket has demonstrated superior performance in extremely challenging conditions throughout the US.
- Aerogel blanket has contributed to an increase in resiliency and efficiency of Duke University's steam distribution system.



# Thank You



**Visit us at Booth #68**

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