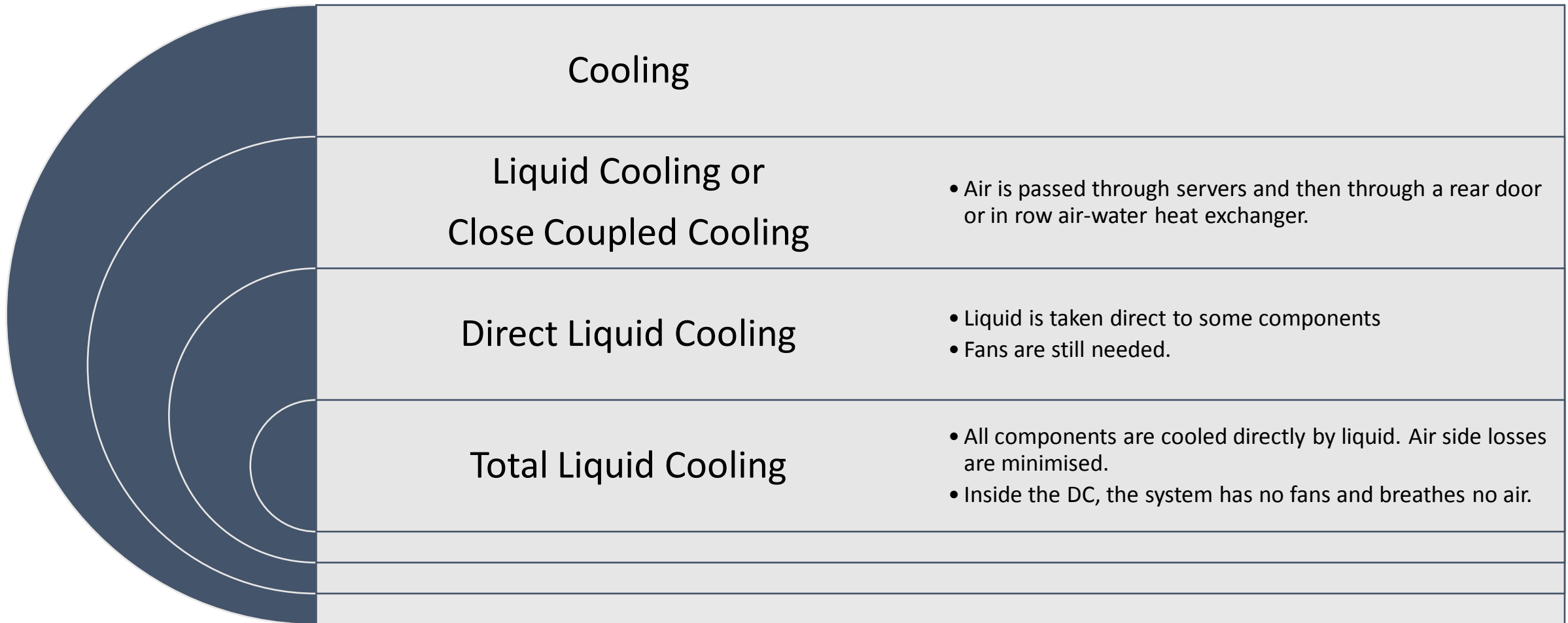


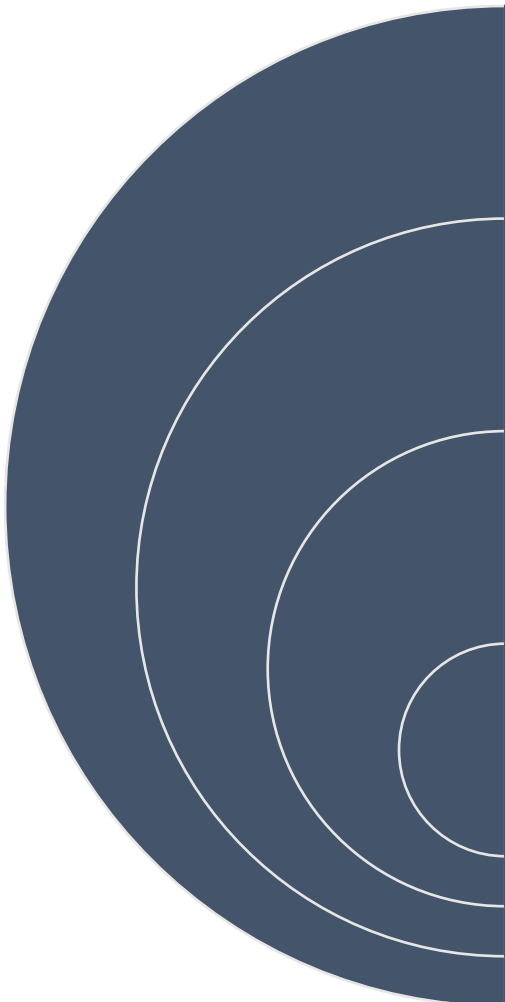
# Peter Hopton

Founder & Chief Visionary Officer, Iceotope

# From Air To Liquid



# The Benefits of Liquid Cooling Technologies



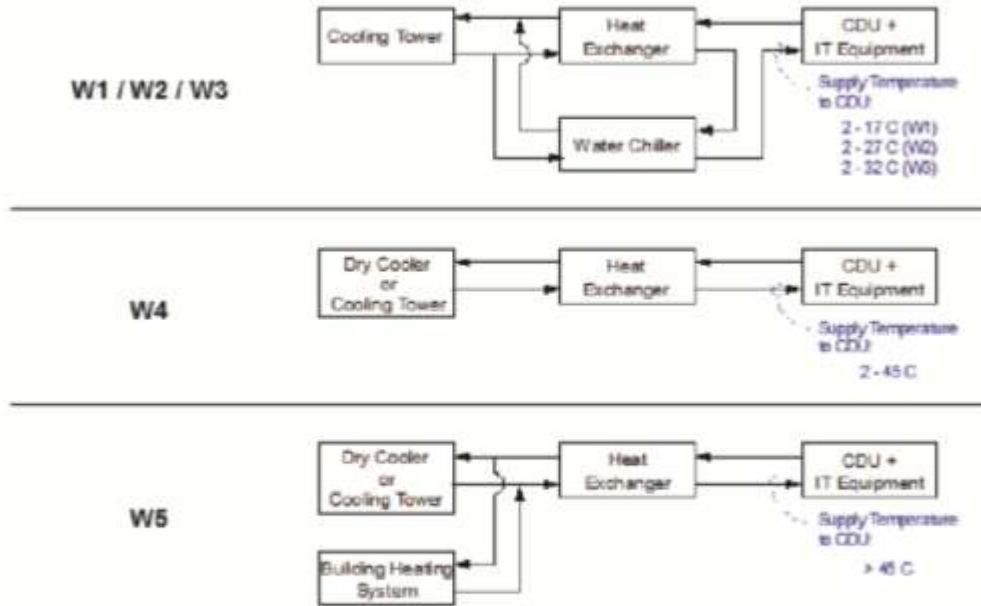
Cooling	Liquid Cooling or Close Coupled Cooling	• Offers Better Density • Offers Better Efficiency.
Direct Liquid Cooling	Total Liquid Cooling	• Offers better Density • Offers better Efficiency.
		• Eliminates/Massively Reduces air based infrastructure. (Fridge Argument) • Offers better efficiency still. • Density is high, especially overall.

# ASHRAE Water Cooling

**Table 5.1 ASHRAE Liquid Cooling Guidelines**

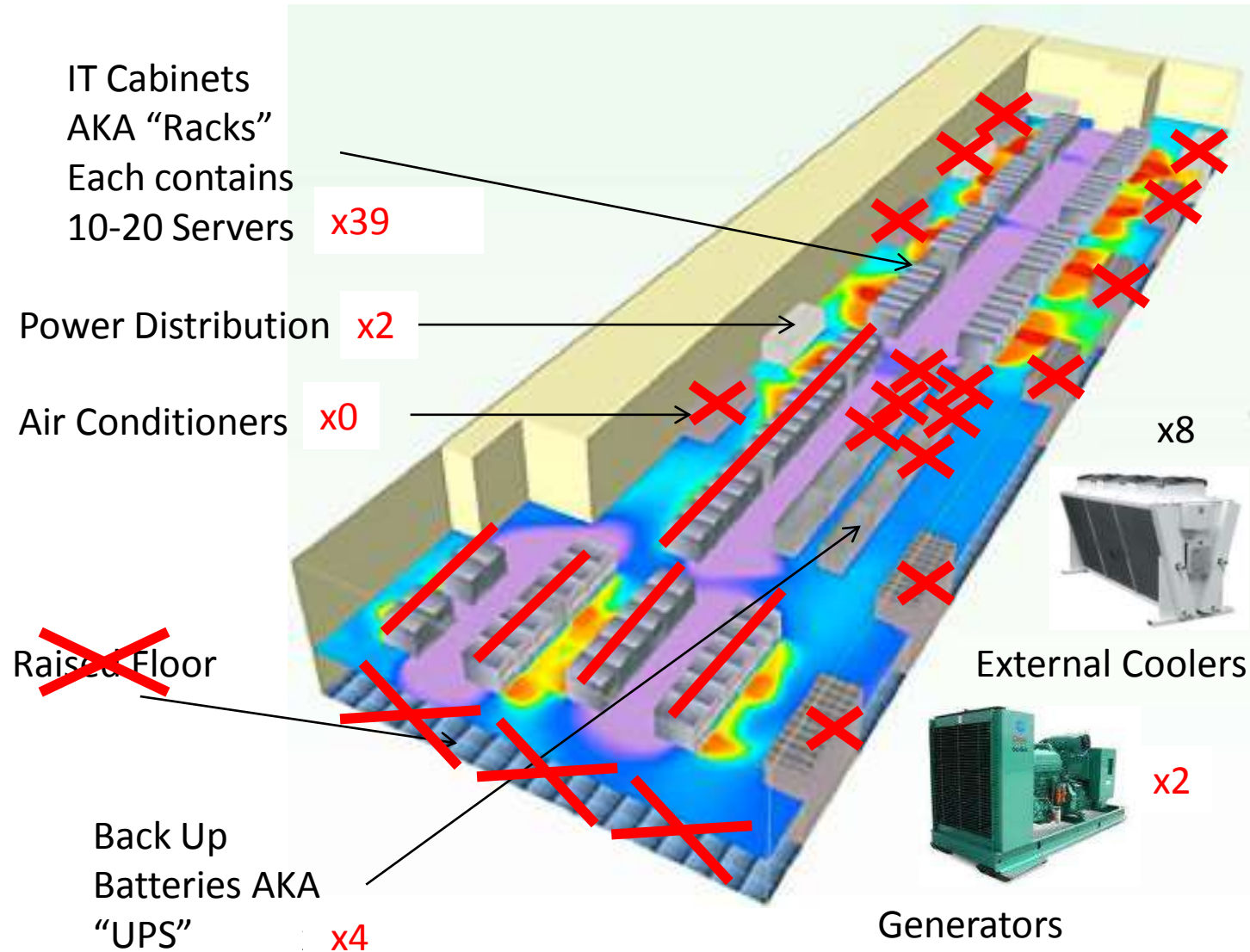
Liquid Cooling Class	Typical Infrastructure Design		Facility Water Supply Temperature
	Primary Facilities Cooling Equipment	Secondary/Supplemental Cooling Equipment	
W1	Chiller / Cooling Tower	Water Side Economizer (with Dry Cooler or Cooling Tower)	2°C – 17°C
W2			2°C – 27°C
W3	Cooling Tower	Chiller	2°C – 32°C
W4	Water Side Economizer (with Dry Cooler or Cooling Tower)	N/A	2°C– 45°C
W5	Building Heating System	Cooling Tower or Dry Cooler	> 45°C

## Liquid Cooling Class



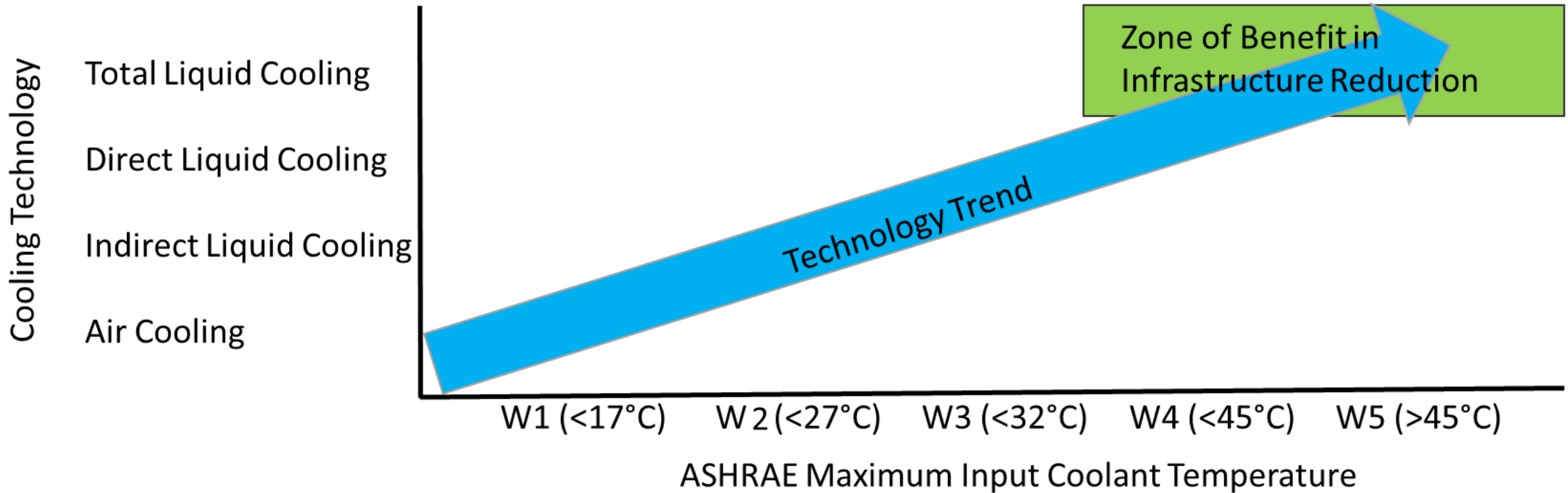
**Figure 5.3 ASHRAE liquid cooling classification, typical infrastructure design schematics.**

# TOTAL LIQUID COOLING



1. TLC needs no A/C
2. No Airflow, no raised floor
3. TLC servers have no fans – use less power
4. No A/C, average and peak power consumption reduced
5. At least 2x as many servers per Cabinet

# The Cost Reduction Oasis



# Questions?

Thanks For Listening

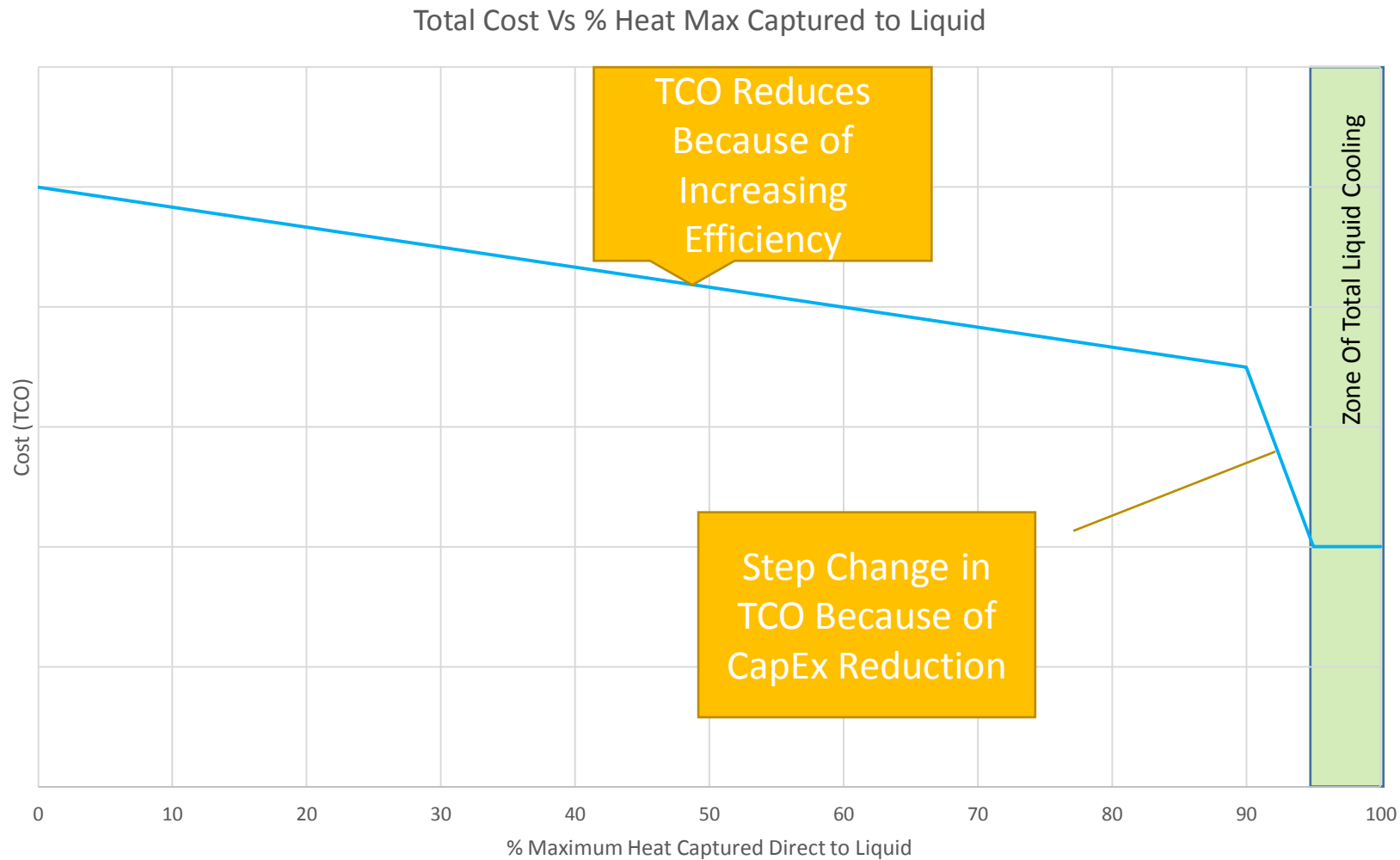
[Peter.Hopton@Iceotope.com](mailto:Peter.Hopton@Iceotope.com)

@petehopton

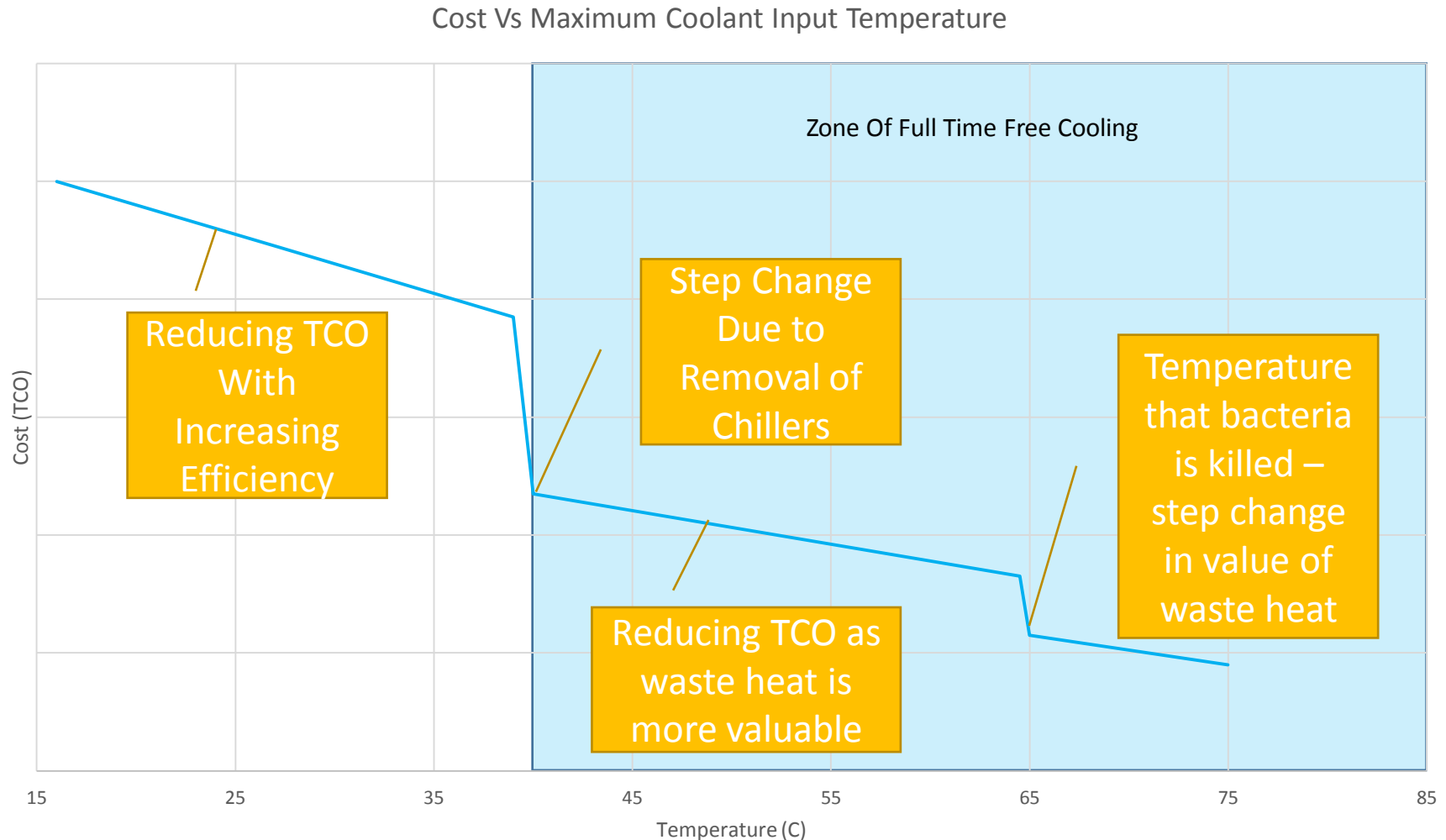
Reserve Slides



# Cooling With Liquids



# Hotter Coolants Reduce Cost



# Who Will Adopt Early?

