
TISHMANSPEYER

Tishman Speyer: Gregg Fischer, PE

- Director of Energy Systems
- Sustainability + Utilities @ Tishman Speyer
- Oversee building and energy systems for the US portfolio (55,000,000 sqft)
- Based out of Rockefeller Center in NYC (global HQ)
- Focus:
  - Building Automation
  - Energy Monitoring/Management
  - Fire Alarm
  - Security/Card Access
  - Lighting Controls
  - Energy Supply Contracts
  - Tenant Billing Systems

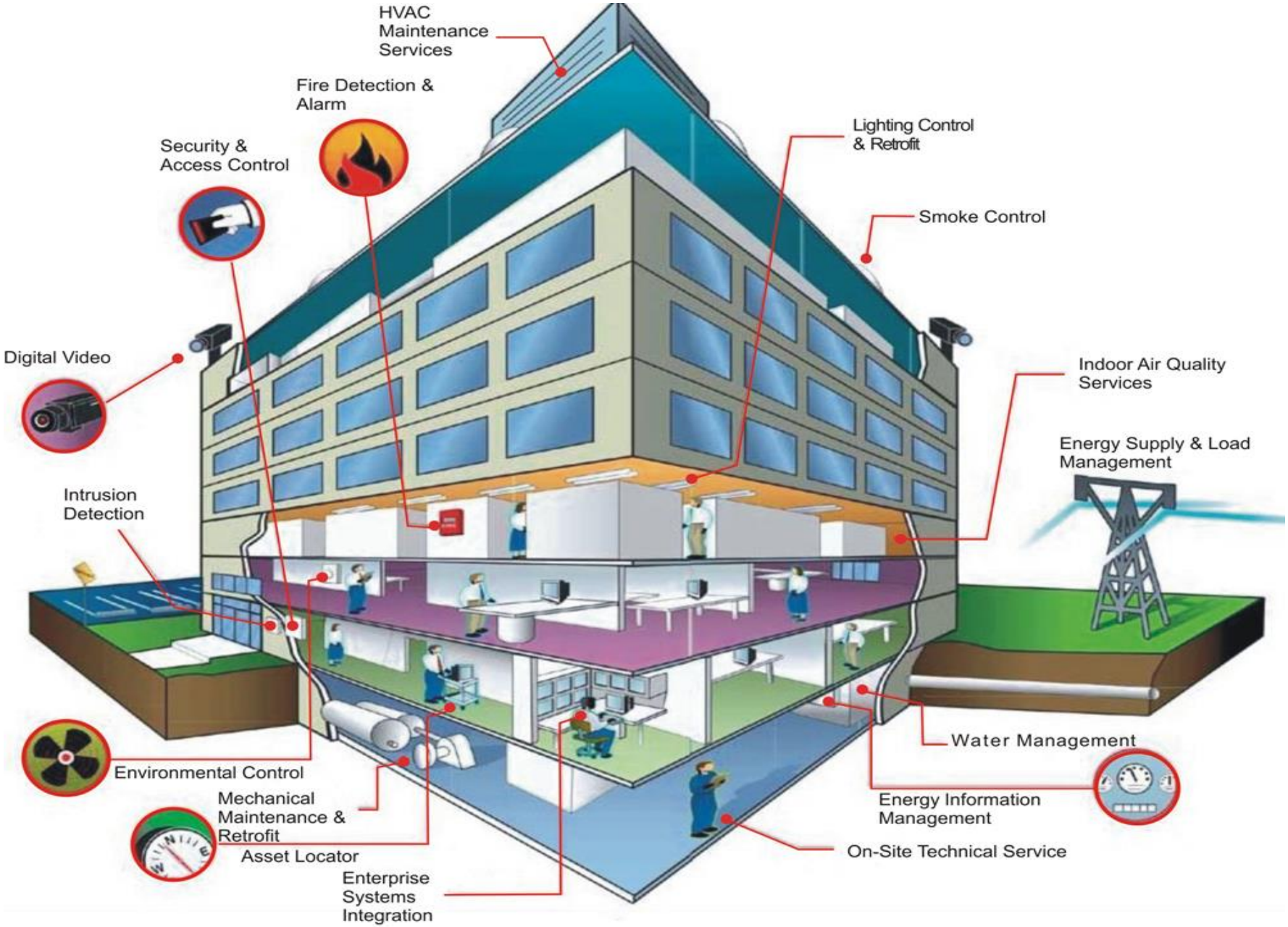
Tishman Speyer Company Profile

- Established 1978
- 100,000,000 sqft of class A commercial office space and luxury residential globally
- $90,000,000,000 in assets in 30 markets, 7 countries and 4 continents
  - Rockefeller Center
  - 200 Park/Metlife
  - Chrysler Center
  - Chicago Mercantile Exchange
- 2000+ tenants worldwide
- Divisions:
  - Sustainability and Utilities
  - Design & Construction
  - Investment Management
  - Property Management
  - Leasing
  - Acquisition and Development
- 1200+ real estate professionals

Tishman Speyer Focus

- Long term hold assets
- Renewed attention to building systems
- Landmark facilities
- Community/ Tenants

Tishman Speyer Focus: Systems

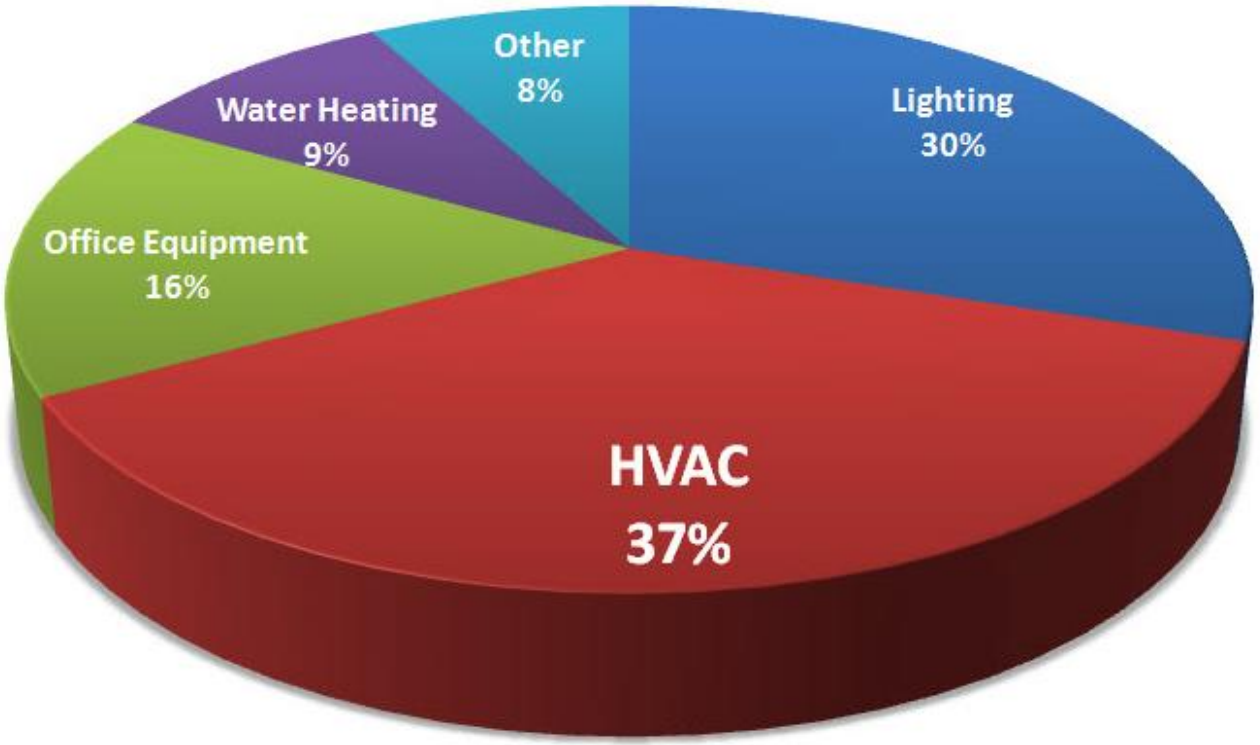


Project Highlight: Thermal Ice Storage

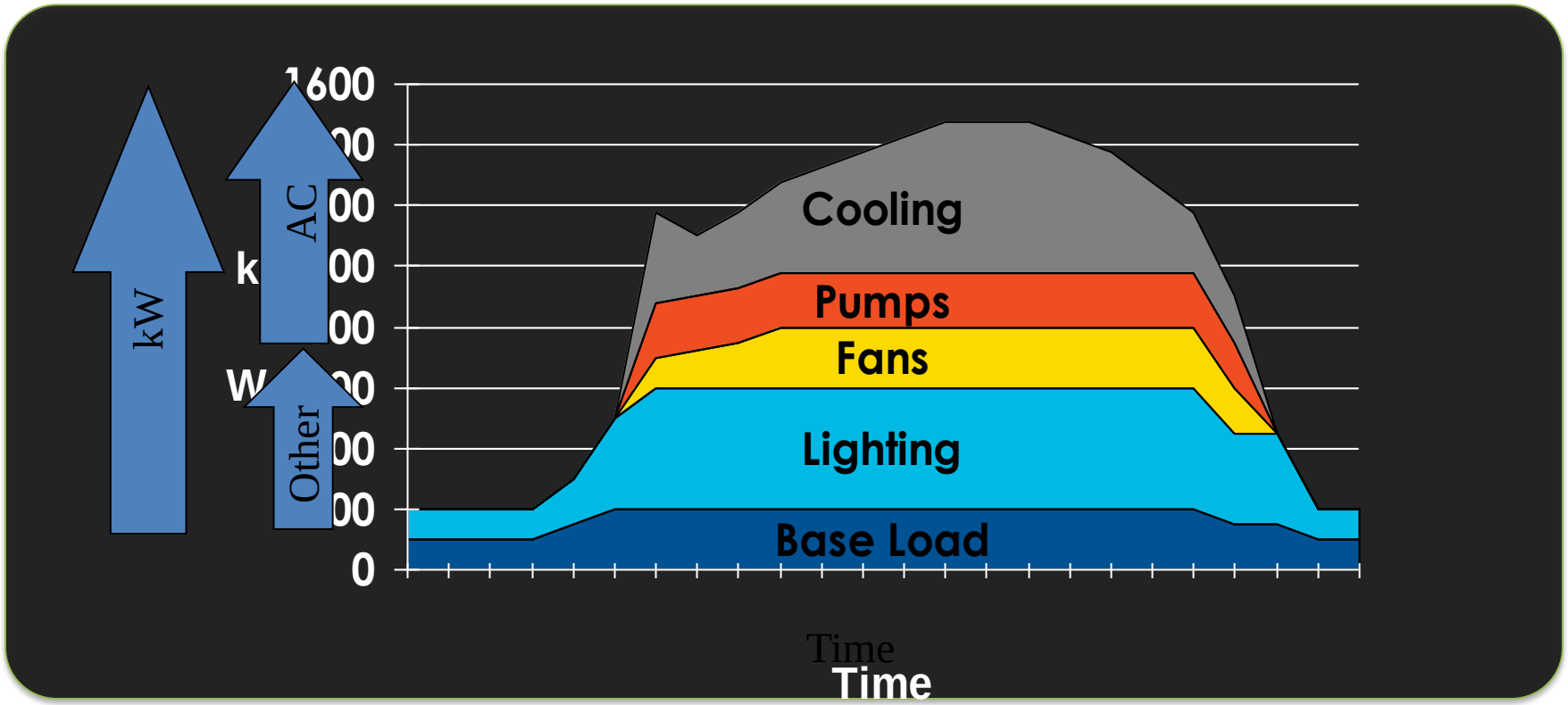
ASHRAE – (The American Society of Heating Refrigeration and Air-Conditioning Engineers) defines **"Thermal Storage"** as the **"Accumulation of Energy in a Body or System in the form of Sensible Heat (Temperature Rise) or Latent Heat (a change of phase).**

- One of the most common forms is a domestic water heater
  - Change in sensible heat and stored until needed

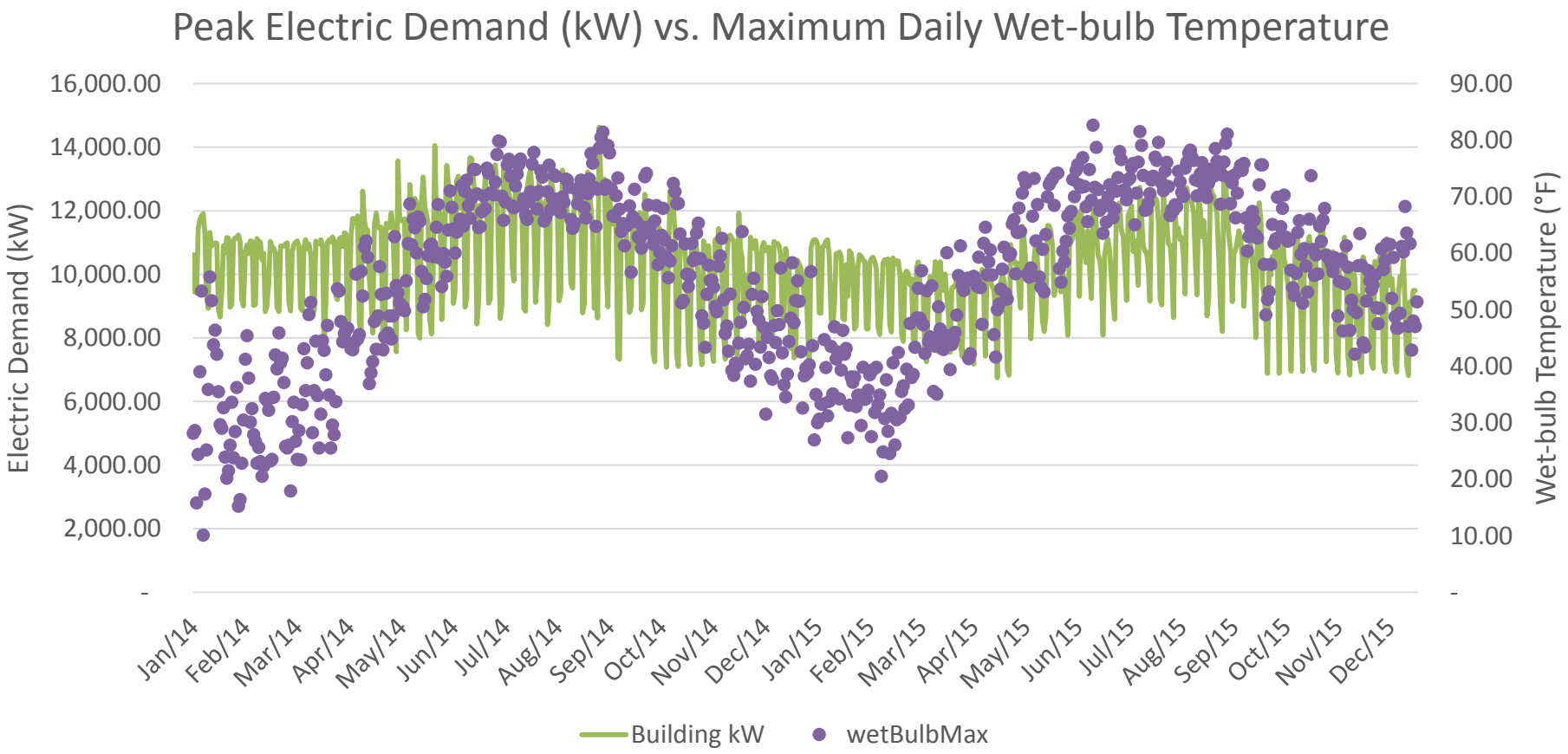
HVAC is typically the single largest contributor to a building's total summertime energy cost.



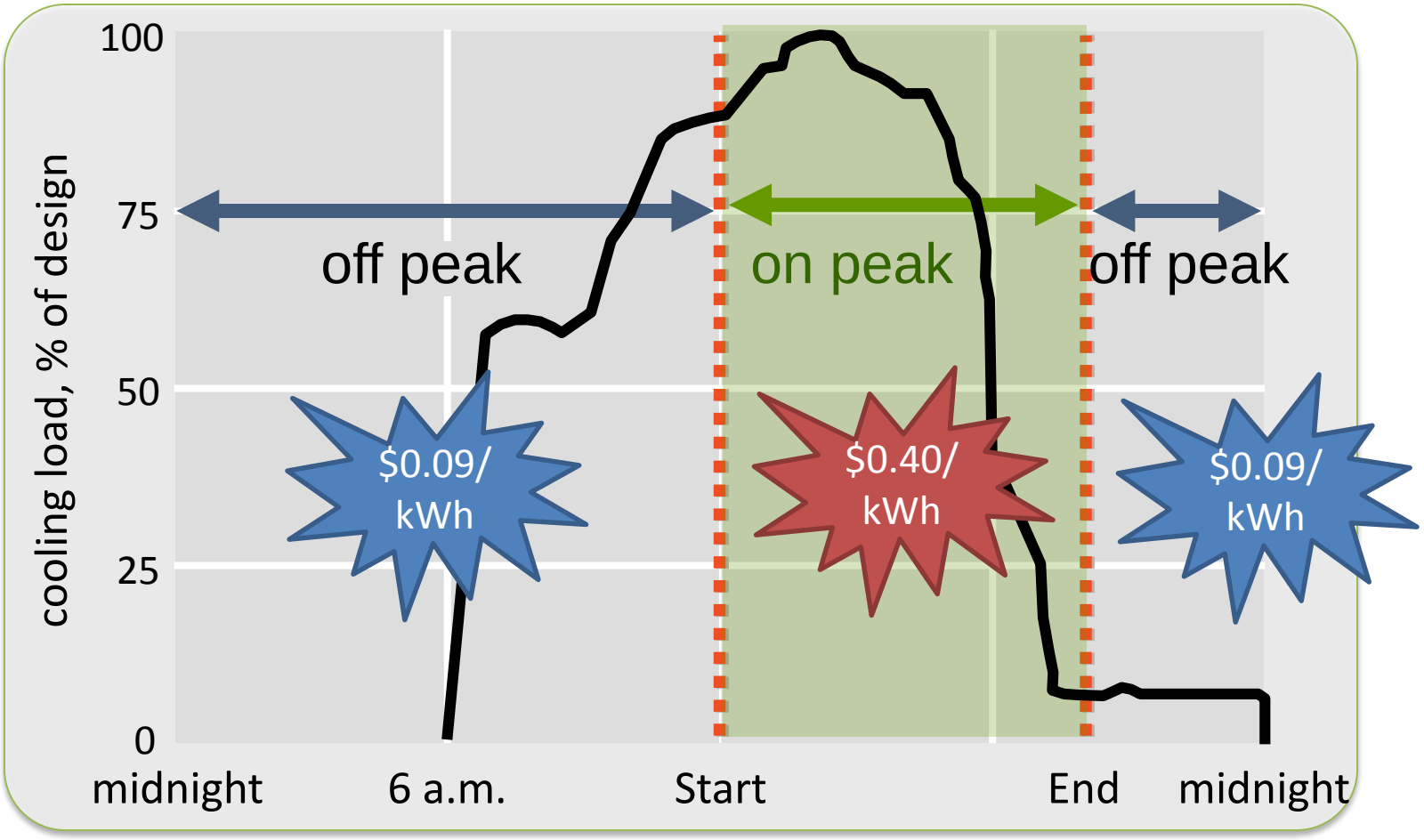
Conventional Electric Profile



Thermal Ice Storage: Why?



Time of Use (TOU)

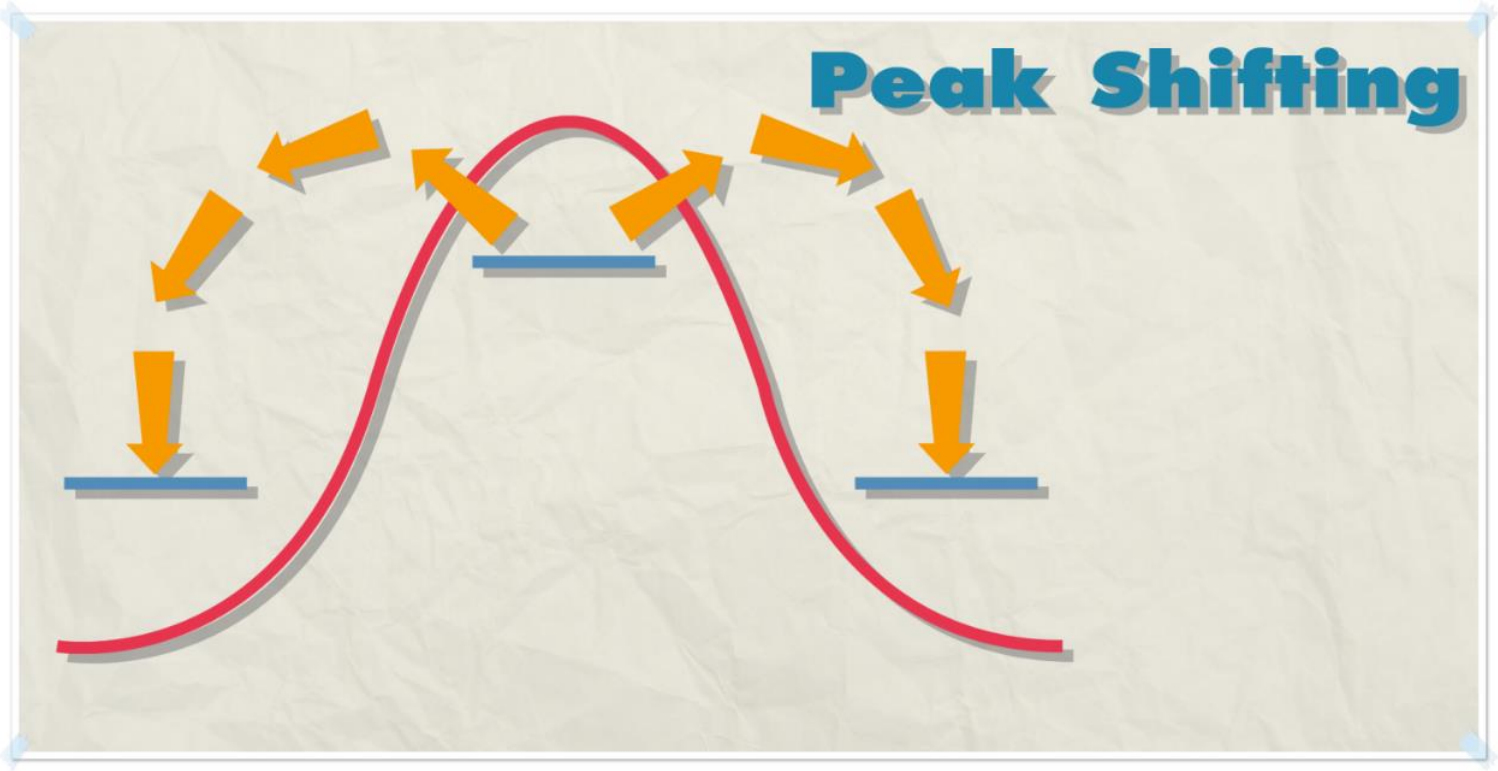


Utility Charges for Large Commercial

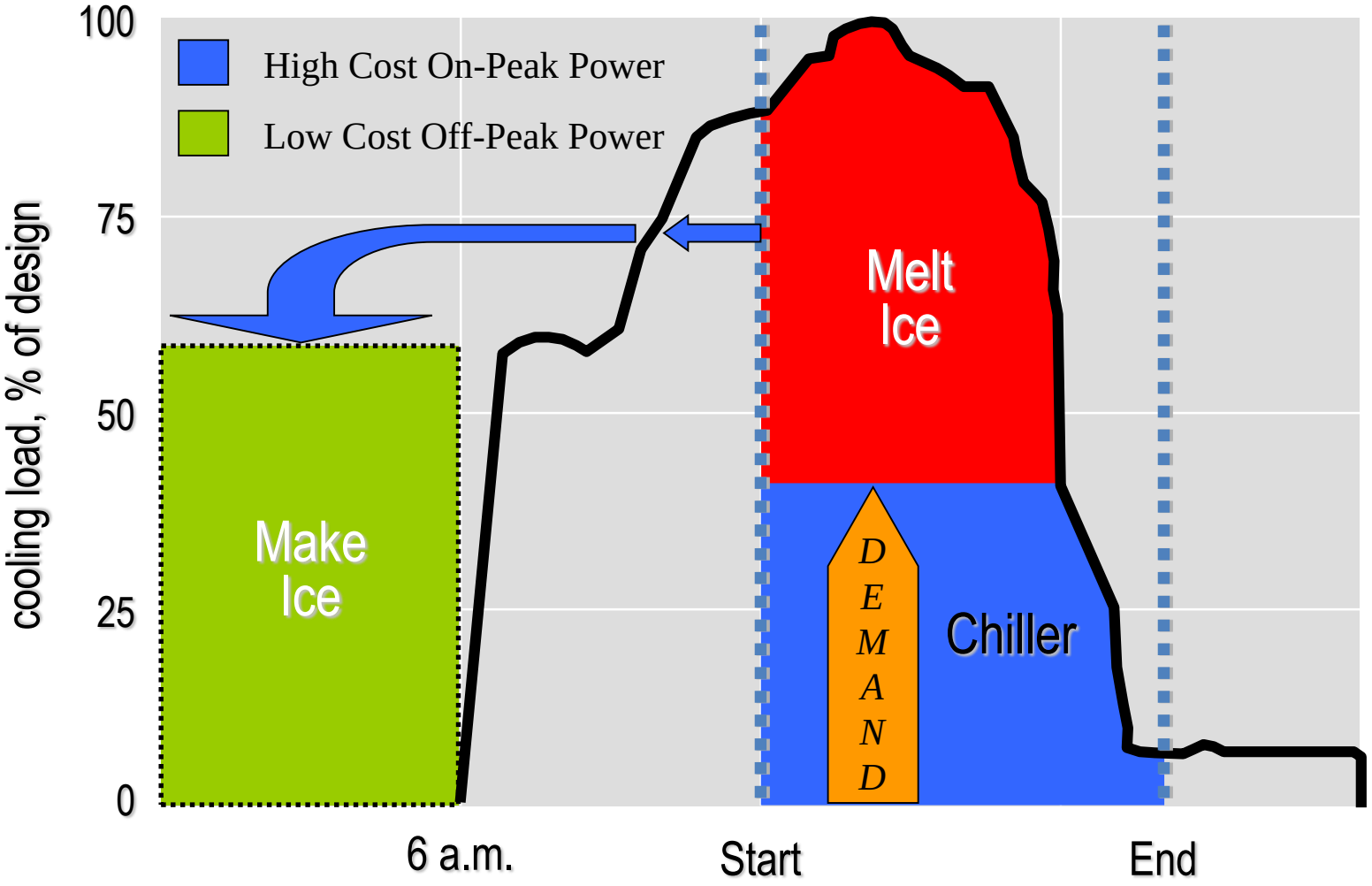
- Demand Charges (June thru September)
  - Total On-Peak (8am to 10pm, June thru Sept)= $56/kW
  - Total Off-Peak (10pm to 8am, June thru Sept) = $30/kW
- Consumption Charges
  - Total On-Peak = $0.115/kWh
  - Total Off-Peak = $0.09/kWh

Thermal Ice Storage: Why?

Thermal storage is designed to reduce COST by SHIFTING the energy that would be consumed by electrical cooling equipment during the day (on-peak) to the night time (off-peak)



Thermal Ice Storage: Why?



Thermal Ice Storage: Who cares?

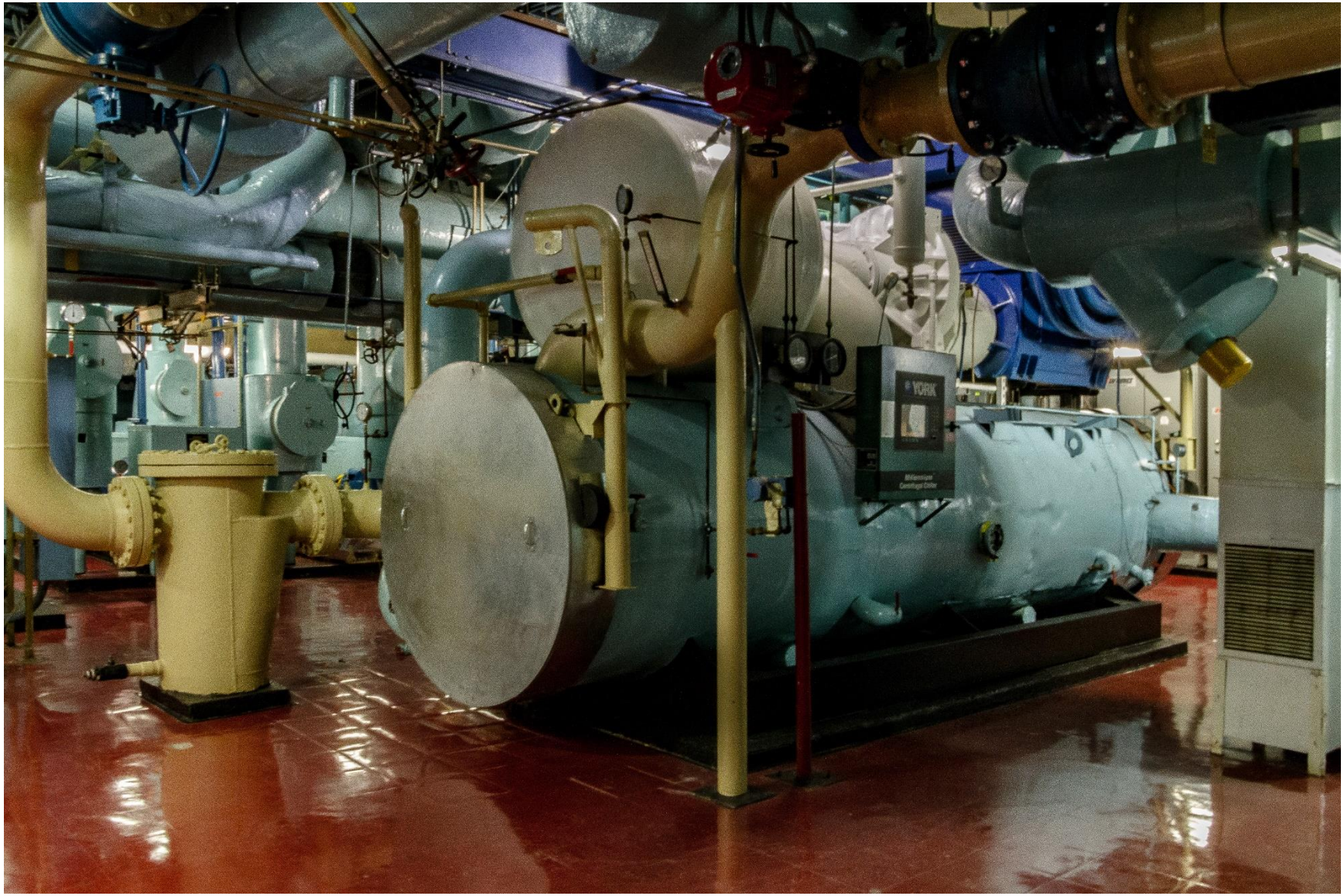
- Utility
  - Denuclearization of Zone J has created an incentive program called the “Demand Management Program” which incentivizes demand reduction during strategic hours of the summer weekday up to $1500/kW ($3MM cap, 50% cap)
- Community
  - Sustainable practice to reduce carbon emissions by running energy intensive mechanical equipment during peak hours of the day
- Asset Management
  - Increases asset value
- Operations Management
  - Gives operational flexibility
- Tenants
  - Corporate goals, interest in facilities

Thermal Ice Storage: When?

- Thermal storage is a smart decision when:
  - Central plant equipment is at the end of its useful life
  - **LARGE** buildings (1,000,000+ sqft bldg for indoor install)
  - **LARGE** time-of-use demand components to utility bill
  - Incentives are present
  - **LARGE** electric air conditioning loads in building
  - The building air distribution systems can benefit from lower discharge air temperatures

Project Highlight: Thermal Ice Storage

Thermal Ice Storage: How?



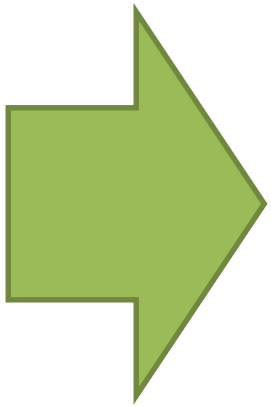
Thermal Ice Storage: How?

Building Statistics

- 2,000,000 sq ft of mixed use commercial space (45 and 50 Rock)
- 2,500 Ton peak chilled water load
- 6,700 kW peak electrical demand
- 5 Risers

Old Plant Statistics

- Four (4) chillers (total nominal capacity = 4200 tons)
- Chiller efficiency = 0.92 kW/Ton
- Chillers used R-11 and R-134a
- 8 degF deltaT
- Twenty-two (22) pumps (chilled and condenser water)
- Primary-Secondary pumping system
- Import capabilities only
- 208/480V Power

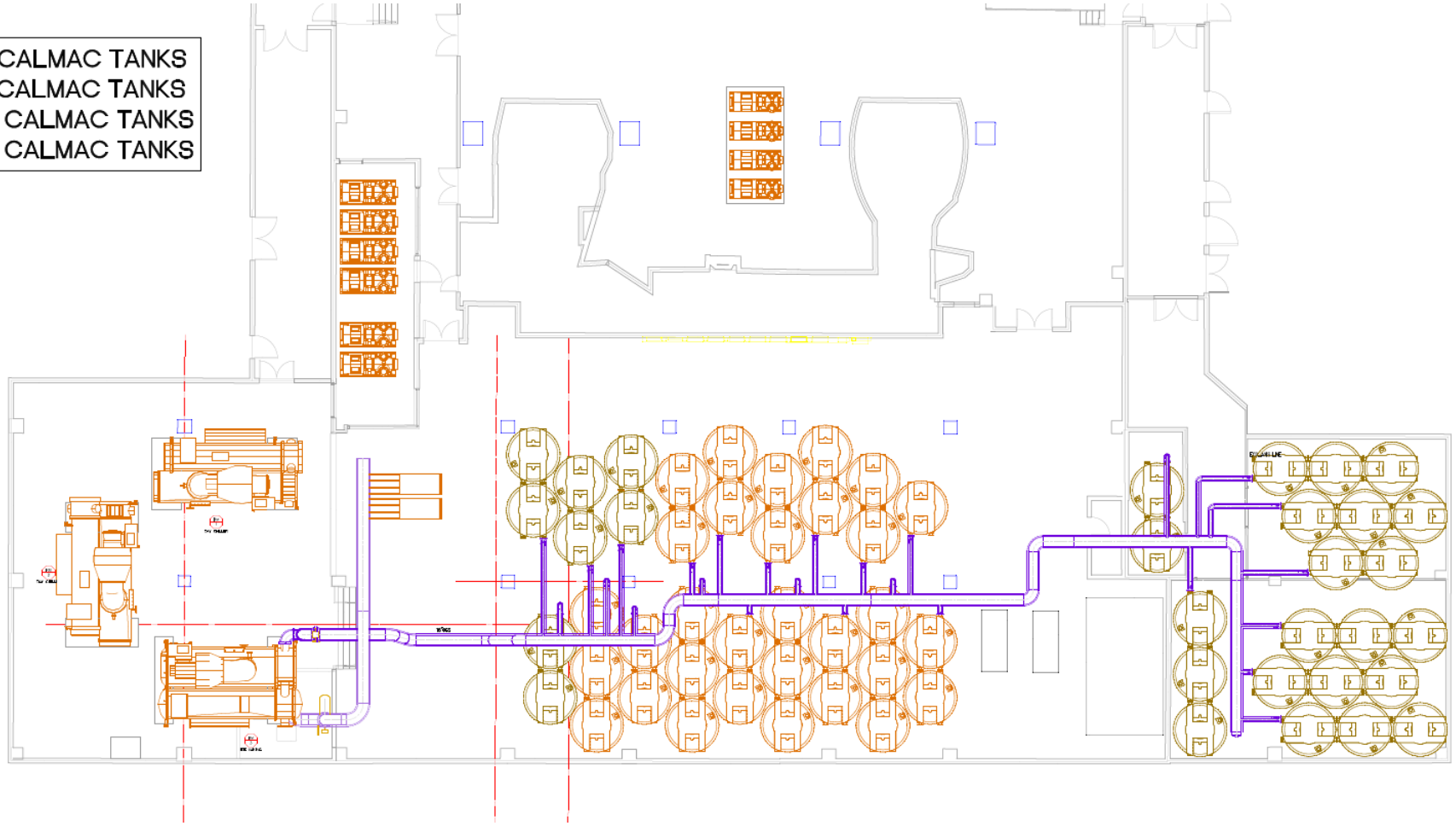


New Plant Design

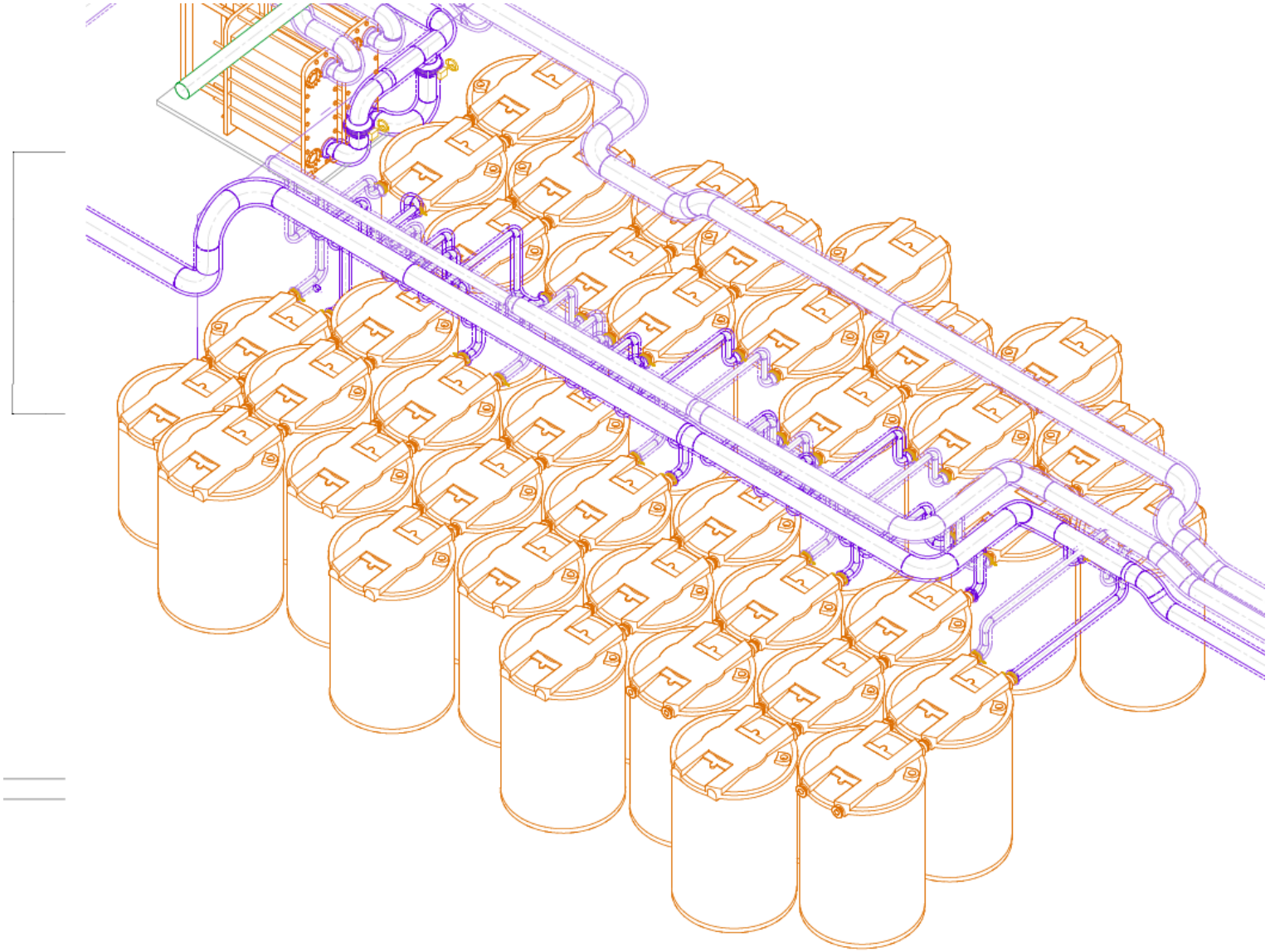
- Three (3) chillers (total nominal capacity = 4200 tons)
- Chiller efficiency = 0.55 kW/Ton (day), 0.68 kW/Ton (ice)
- Ice Capacity = 11,000 Ton-Hrs
- Chillers use R-514a and R-1233zd (next generation refrigerant)
- 15 degF deltaT
- Twelve (12) pumps (chilled, condenser and glycol water)
- Variable-primary pumping system
- Import AND Export capabilities
- 480/4160V Power

Thermal Ice Storage: How?

12 1190C2F CALMAC TANKS
18 1190C4F CALMAC TANKS
14 1220C2F CALMAC TANKS
17 1220C4F CALMAC TANKS



Thermal Ice Storage: How?



Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

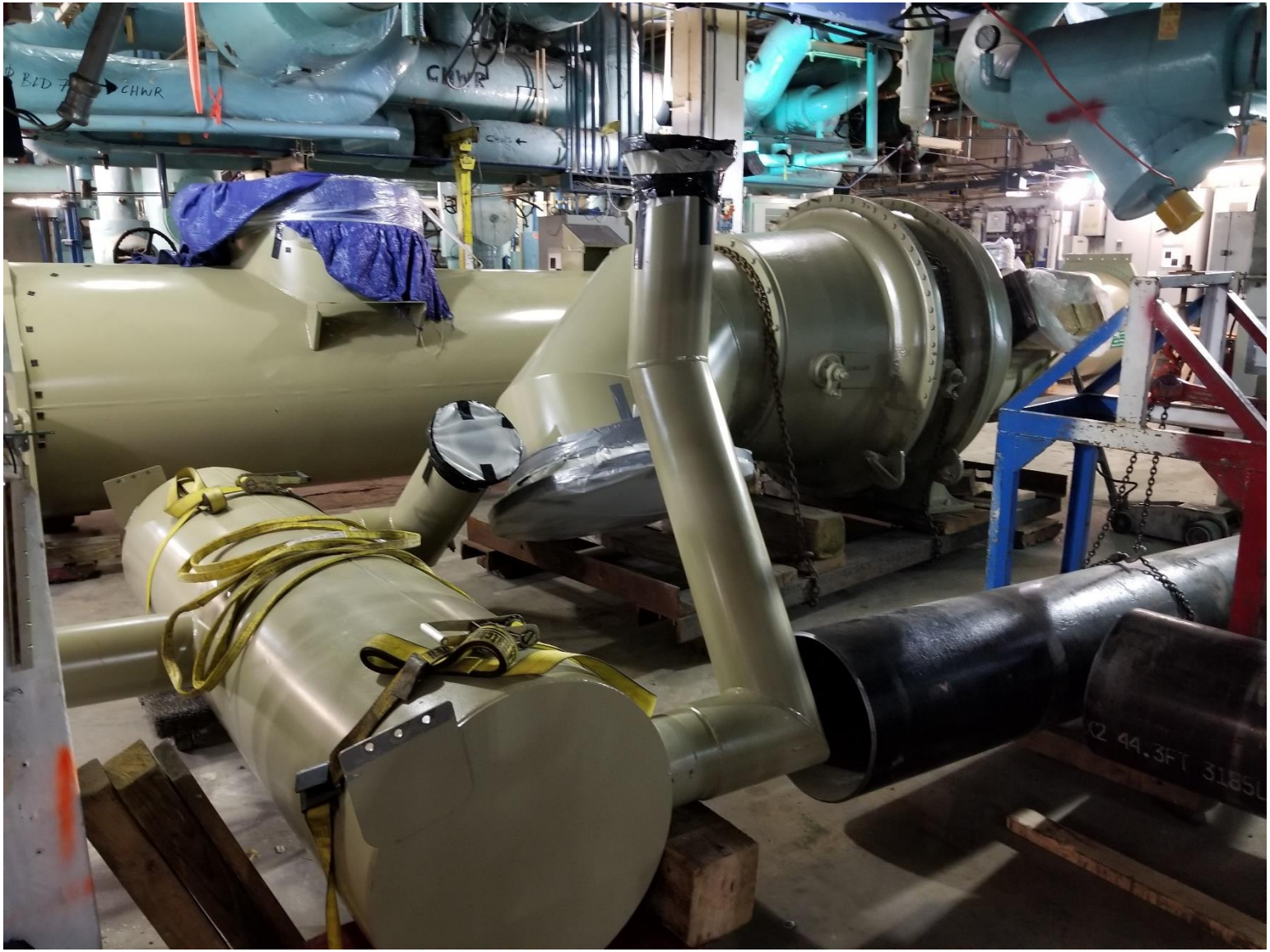
Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

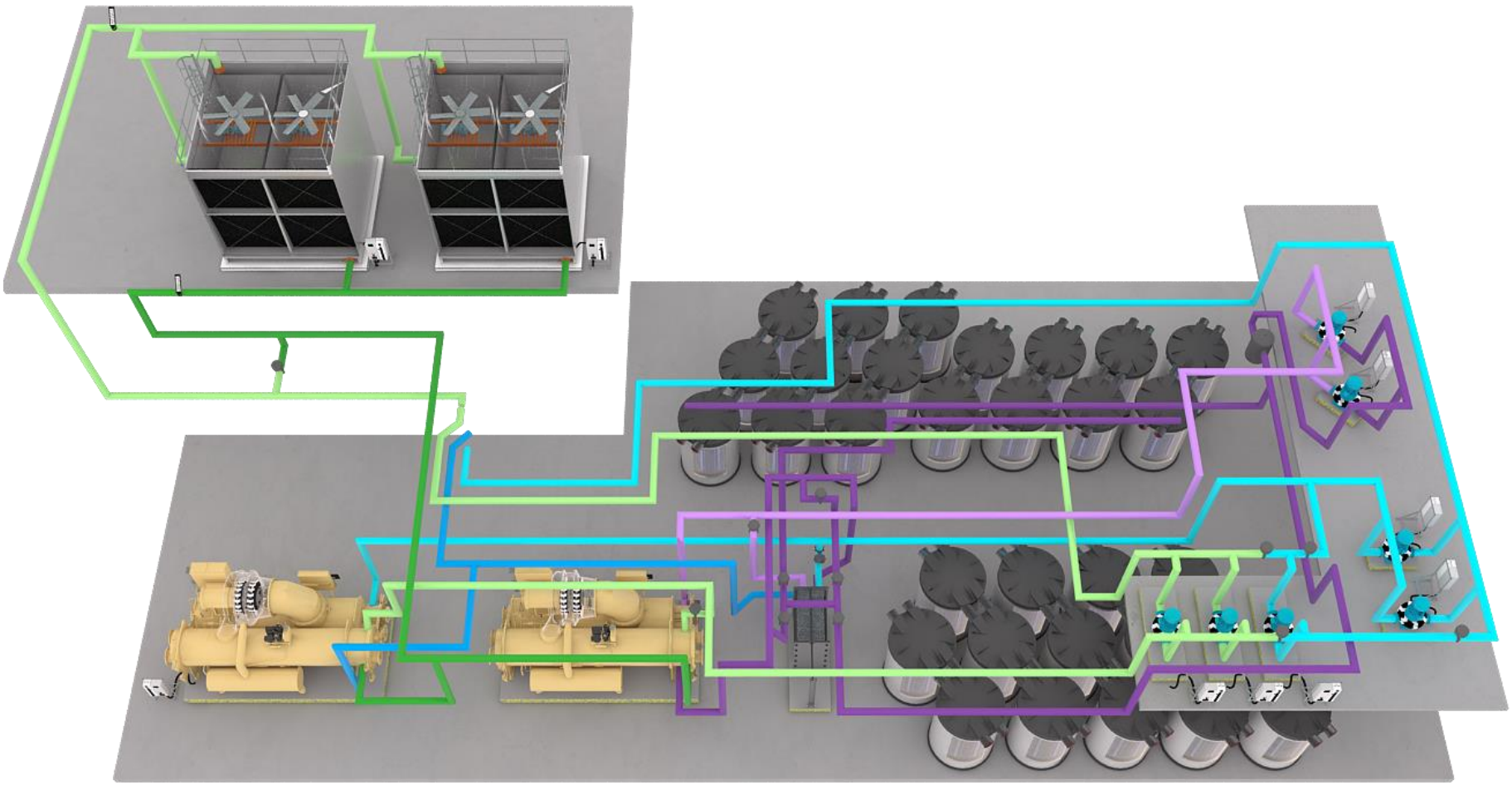


Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?

Thermal Ice Storage: How?



End Result

- Retired plant at end of useful life
- New high efficiency equipment (0.55 kW/Ton)
- New pumping systems for high efficiency pumping
- New control systems
- Operational flexibility with import/export, chillers and ice
- High GWP replaced with ultra low GWP (< 1.0) refrigerants
- Demand reduction 3,000 kW (45% DR) and 2,000 kW (30% traditional)
- Energy reduction 2,320,000 kWh (~3.8MM CO_2)
- Use 60% less power to produce same amount of cooling
- Millions of dollars of electrical demand and energy savings
- Millions of dollars of incentives (Con Edison DMP)
- Simple Payback = 7.0 years
- Incremental spend for like-in-kind replacement < 2 years

Thermal Storage Users (NYC)

Questions