

Energy Management



1. Saving Energy
2. The time of use (Demand)
3. The time of use (Cost)

Commercial Load

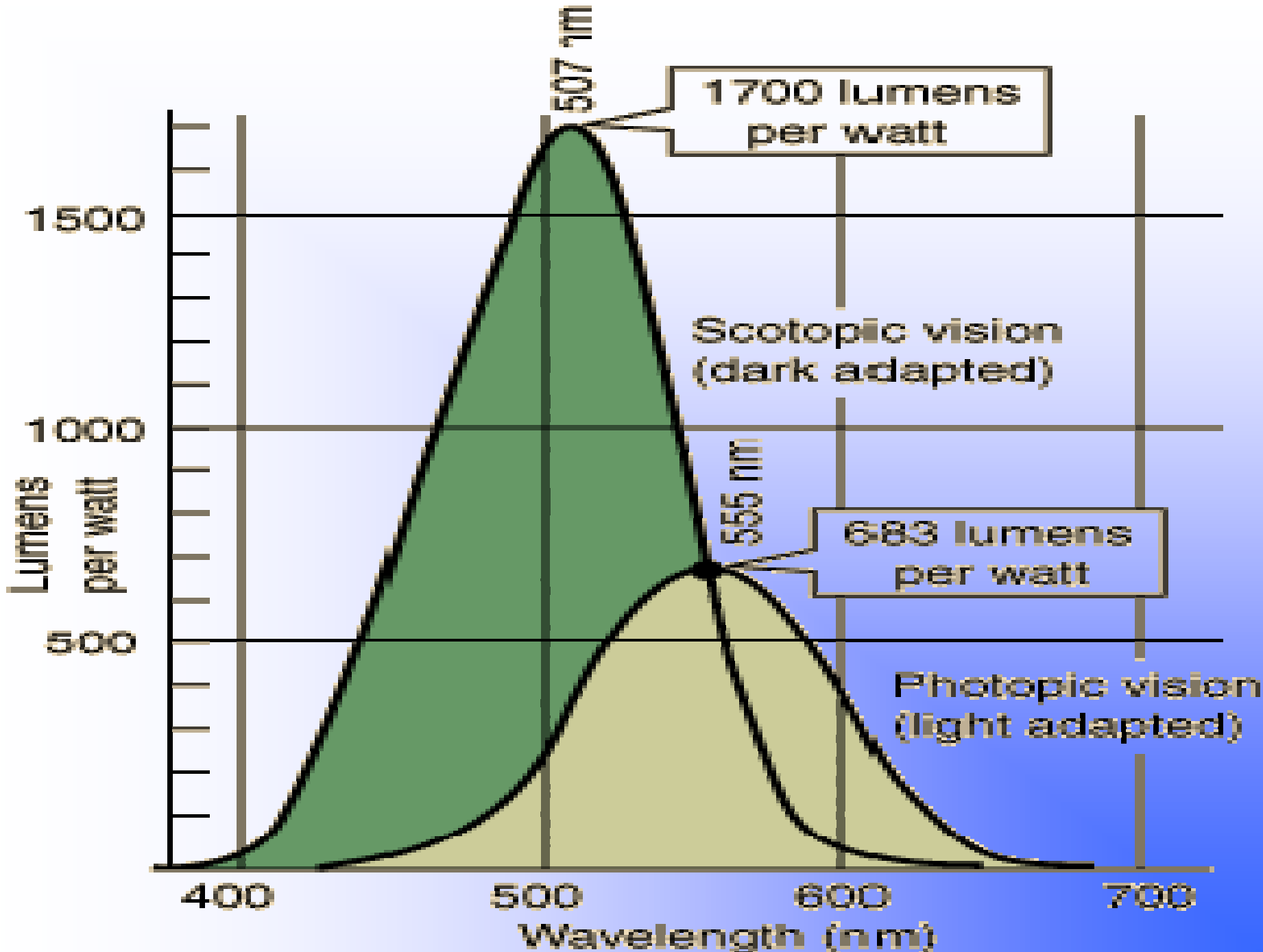


1. Lighting
2. Air conditioning
3. Refrigeration

Natural Lighting



- **Skylight**
- **Useful light without solar gain**
- **Spectral Visible & Infrared waves**



507 nm

1700 lumens per watt

Scotopic vision (dark adapted)

555 nm

683 lumens per watt

Photopic vision (light adapted)

1500

1000

Lumens per watt

500

400

500

600

700

Wavelength (nm)

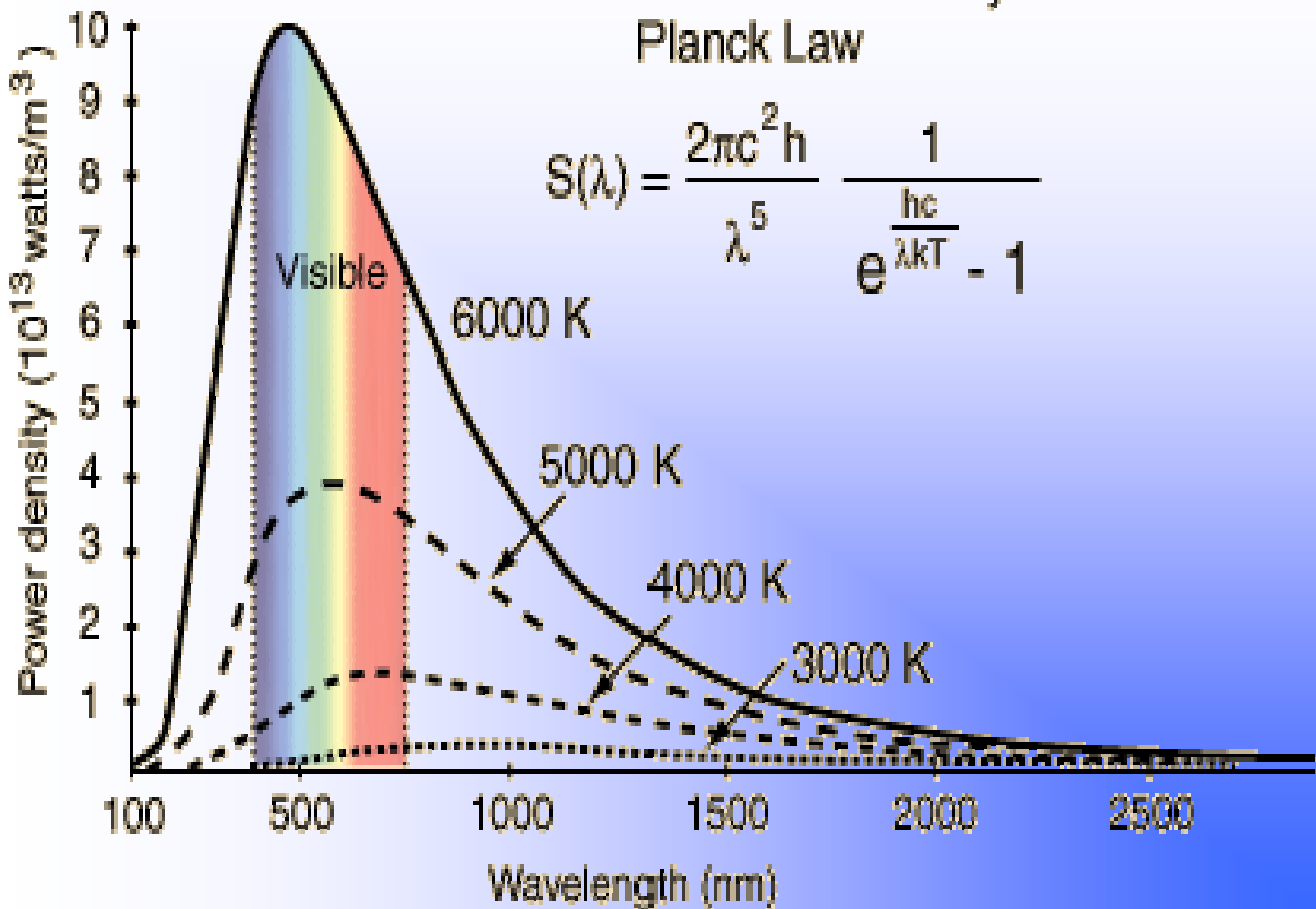


Artificial light match natural light

- Colors rather than lumens
- Lamp energy cone stimulation
- Skylight energy rod stimulation
- Dimming lights matching natural light & can reduce power for load shedding

Radiated Power Density Planck Law

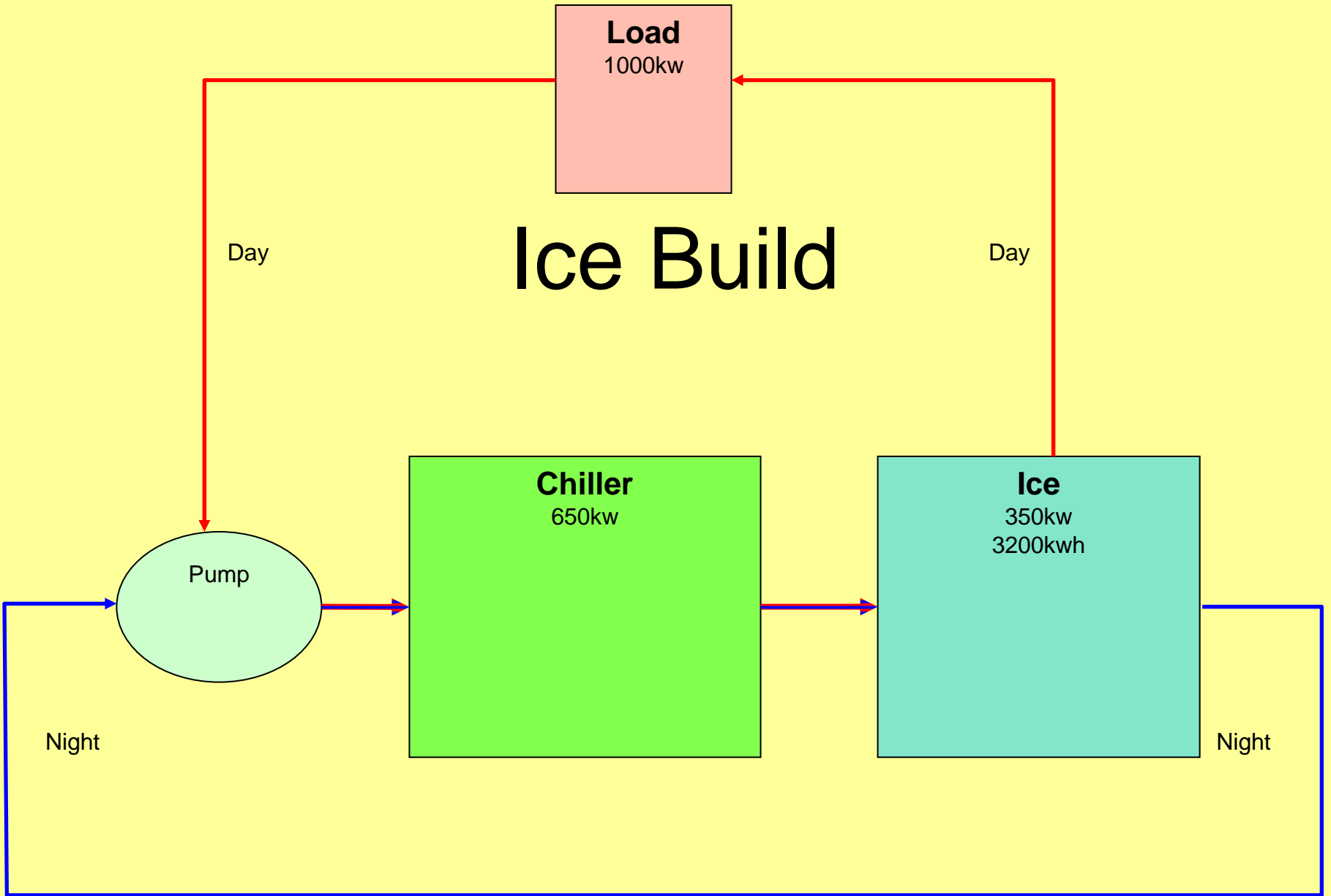
$$S(\lambda) = \frac{2\pi c^2 h}{\lambda^5} \frac{1}{e^{\frac{hc}{\lambda kT}} - 1}$$





Thermal Storage

- Air Conditioning & Refrigeration
- Ice and heat storage
- Discharge in electrical peak times



Load
1000kw

Ice Build

Pump

Chiller
650kw

Ice
350kw
3200kwh

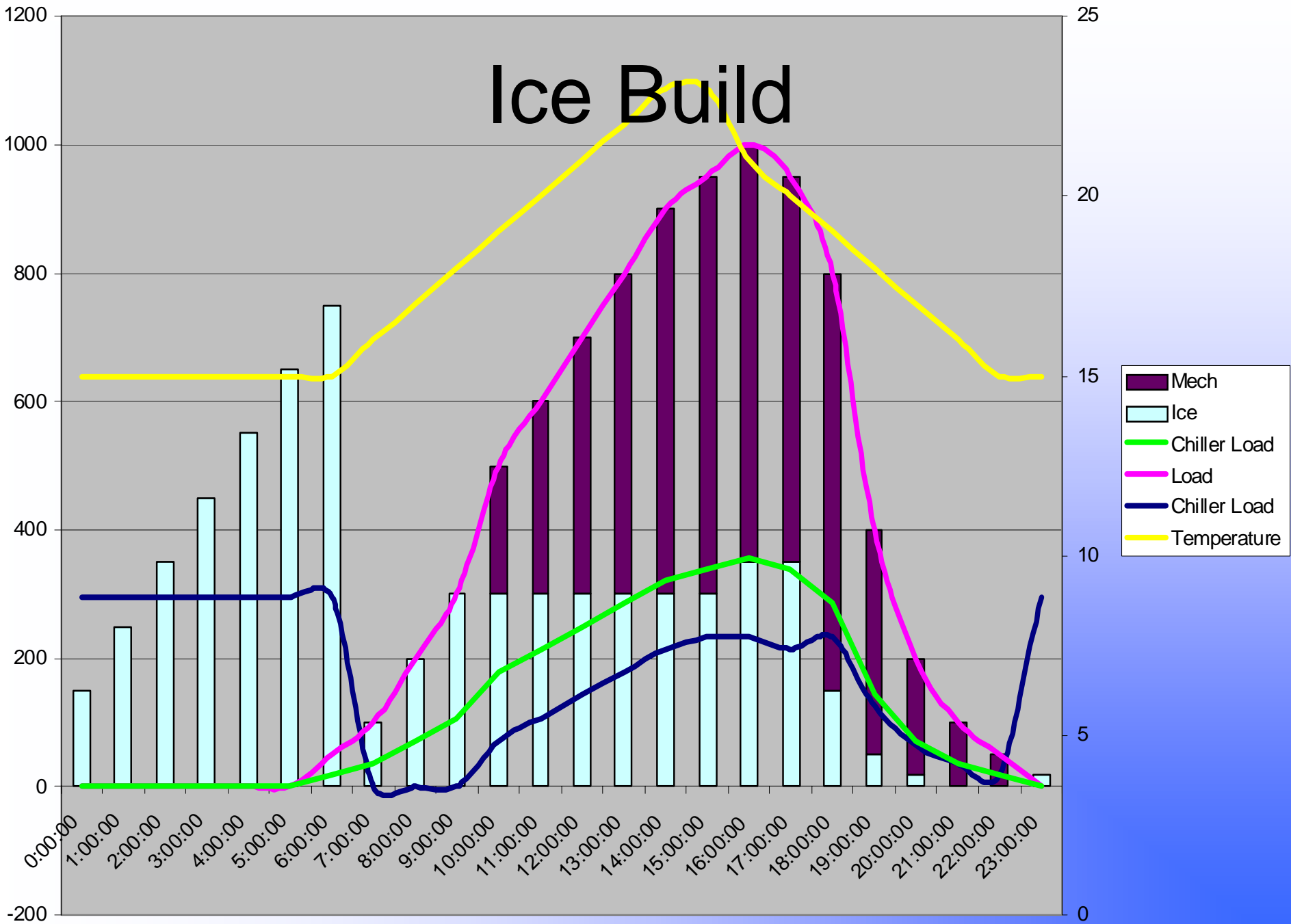
Day

Day

Night

Night

Ice Build

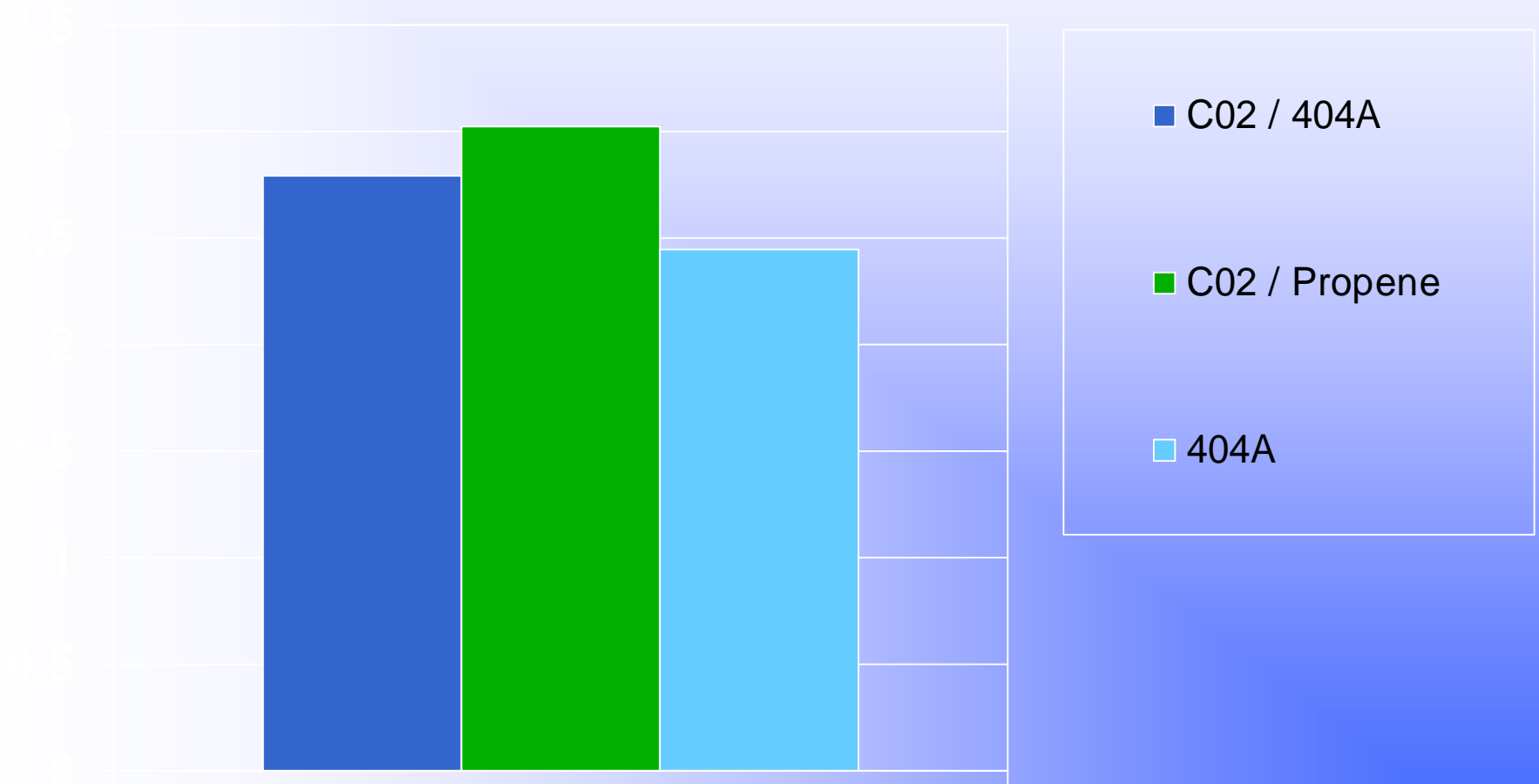




Refrigerant Global Warming Potential

- R404A has a 100 year GWP of 3850
- CO₂ has GWP of 1
- New Zealand has pledged to reduce its GWP levels to the same as 1990.

Refrigeration Rack Energy



Advantages

- Quick defrosts result as CO² boils rapidly out of coil leaving only the ice and coil material to heat.
- Even heat transfer through the coil compared to blend refrigerants which have gas and liquid pockets.
- Even frosting of coils
- Shorter temperature pull down times. Quick recovery after defrost.

What we require to make projects happen

- Some \$ contribution to projects
- Better \$ line & energy tariffs
- Legislation
- Taxes \$