



Thermal Energy Storage

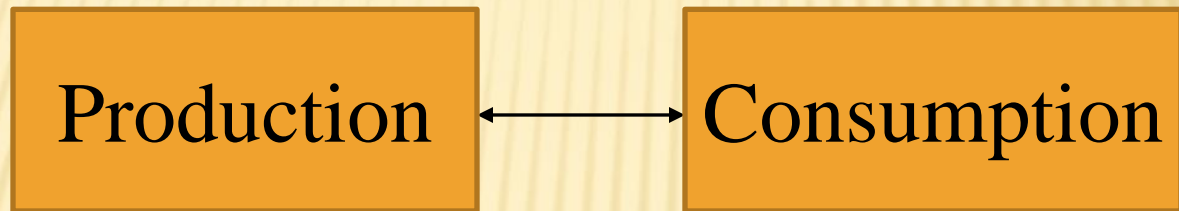
Tesla of Air conditioning



M. Adil

Sevcon India Pvt. Ltd

Why Storage?



Without Storage Production has to happen simultaneously in accordance with Consumption

Why Storage?



With Storage Production becomes independent of consumption

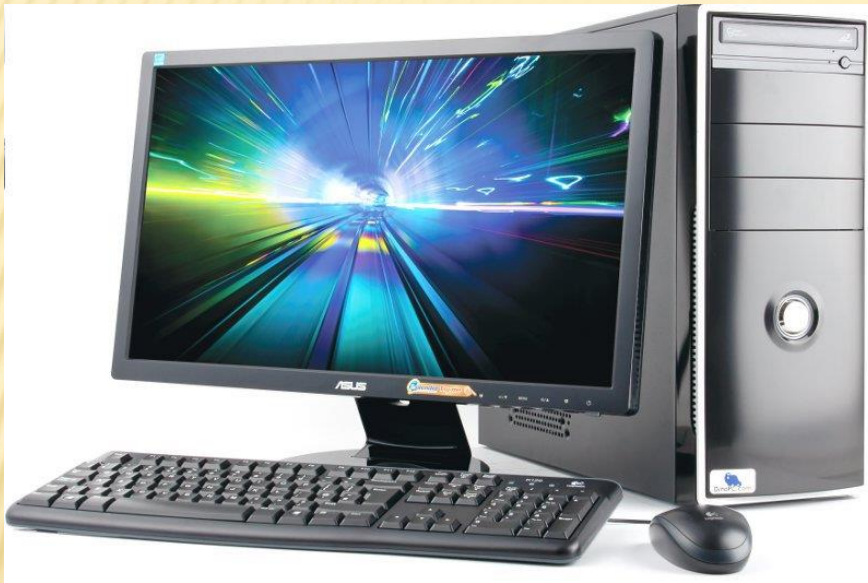
Common Examples of Storage



WATER STORAGE



Common Examples of Storage



DATA STORAGE IN PC

ENERGY STORAGE IN BATTERY



Common Examples of **Thermal** Storage



WATER HEATING IN GEYSER



**ICE & WATER COOLING
IN REFRIGERATOR**



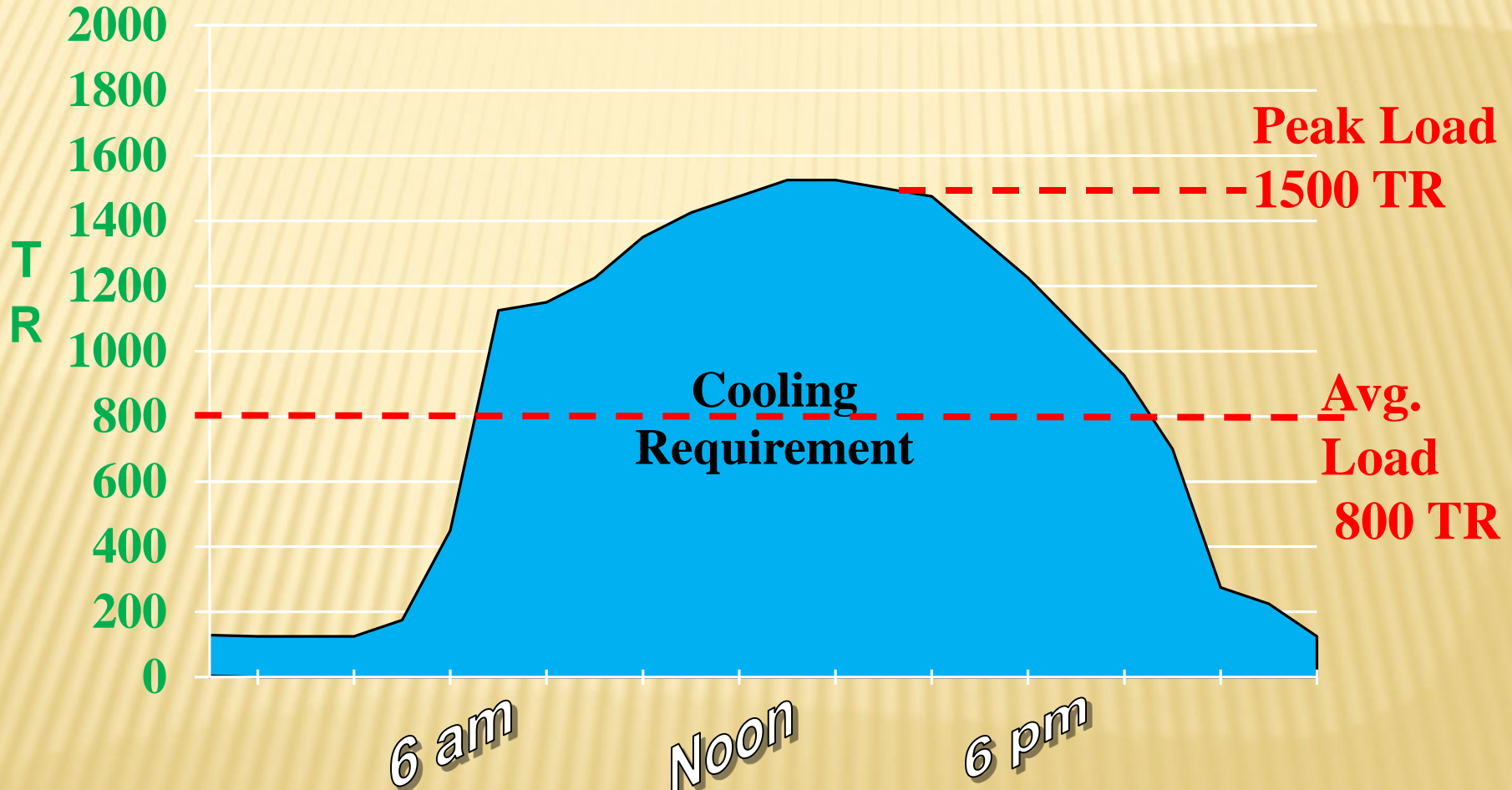
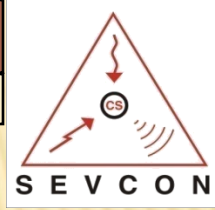
What is Thermal Energy Storage?

Thermal energy storage (TES) is a technology that store thermal energy by cooling a storage medium so that the stored energy can be used at a later time for cooling applications.



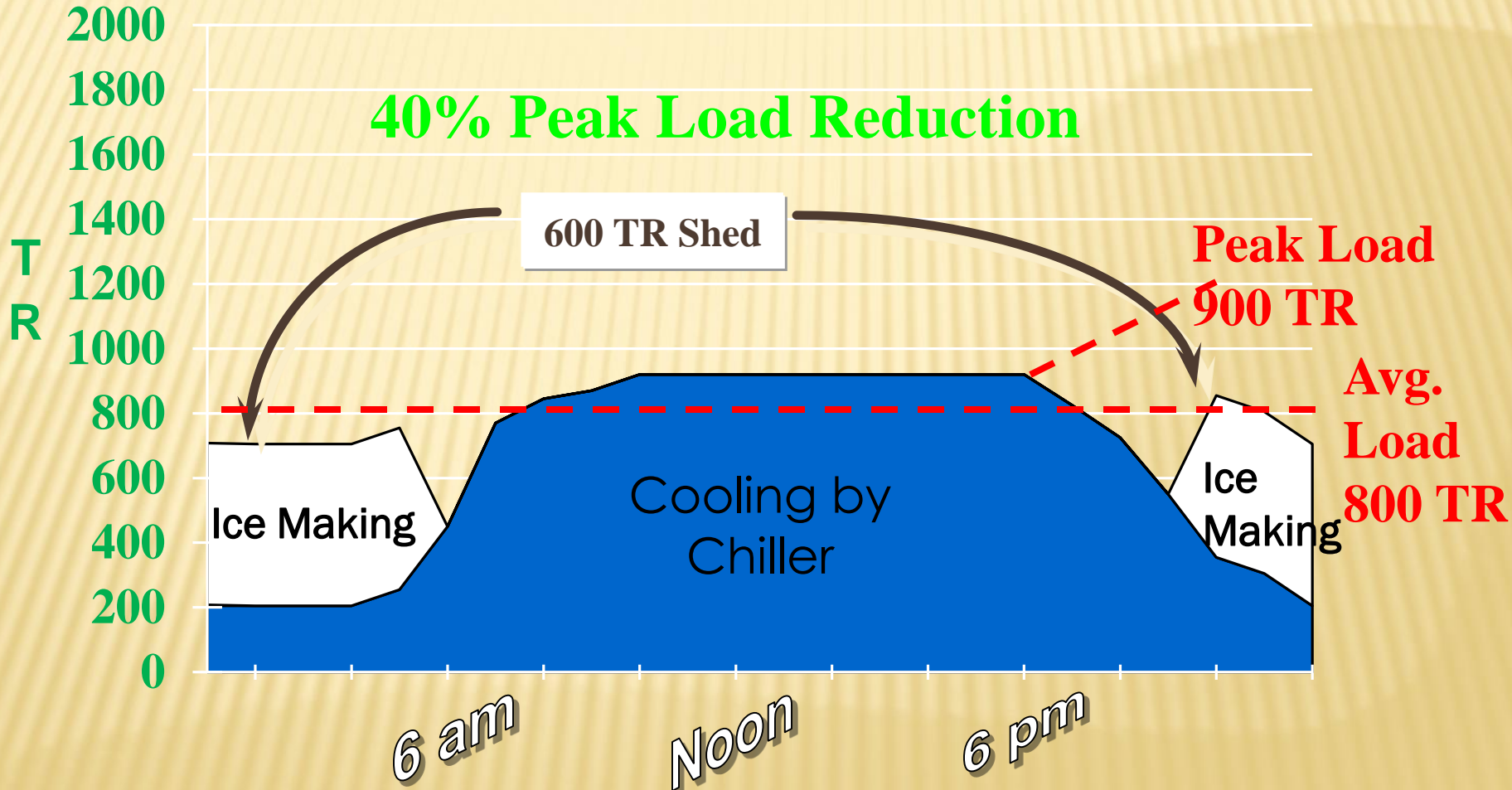
NEED FOR THERMAL ENERGY STORAGE

SEVCON – CALMAC



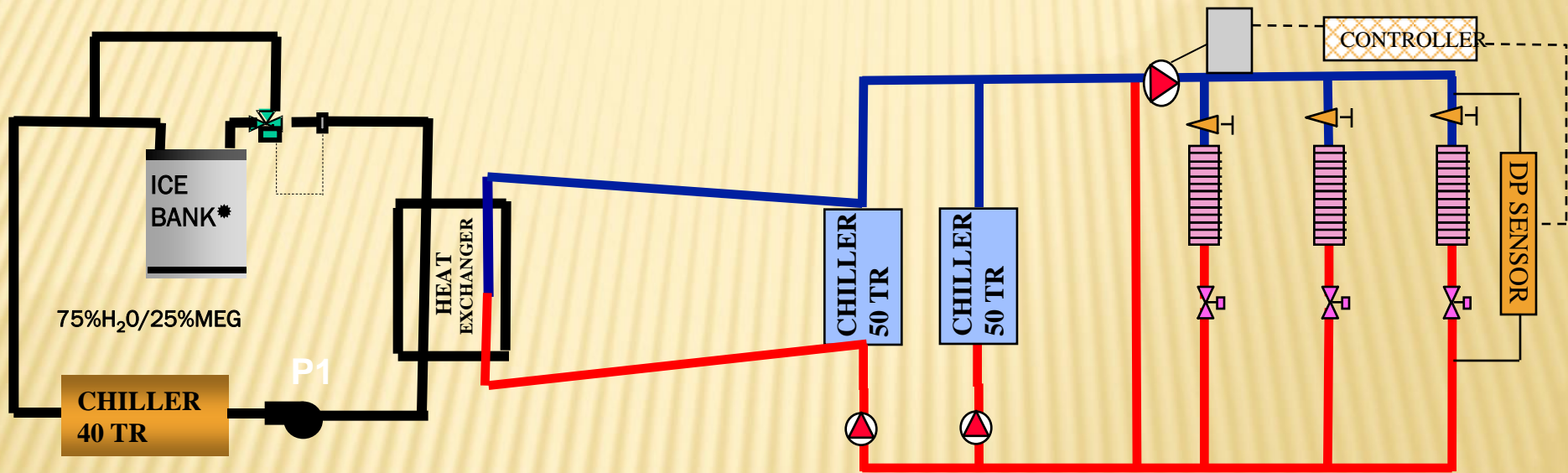
Total TRH = 19,200/day (Load Factor = 53%)

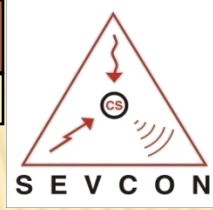
OFF PEAK COOLING PROFILE



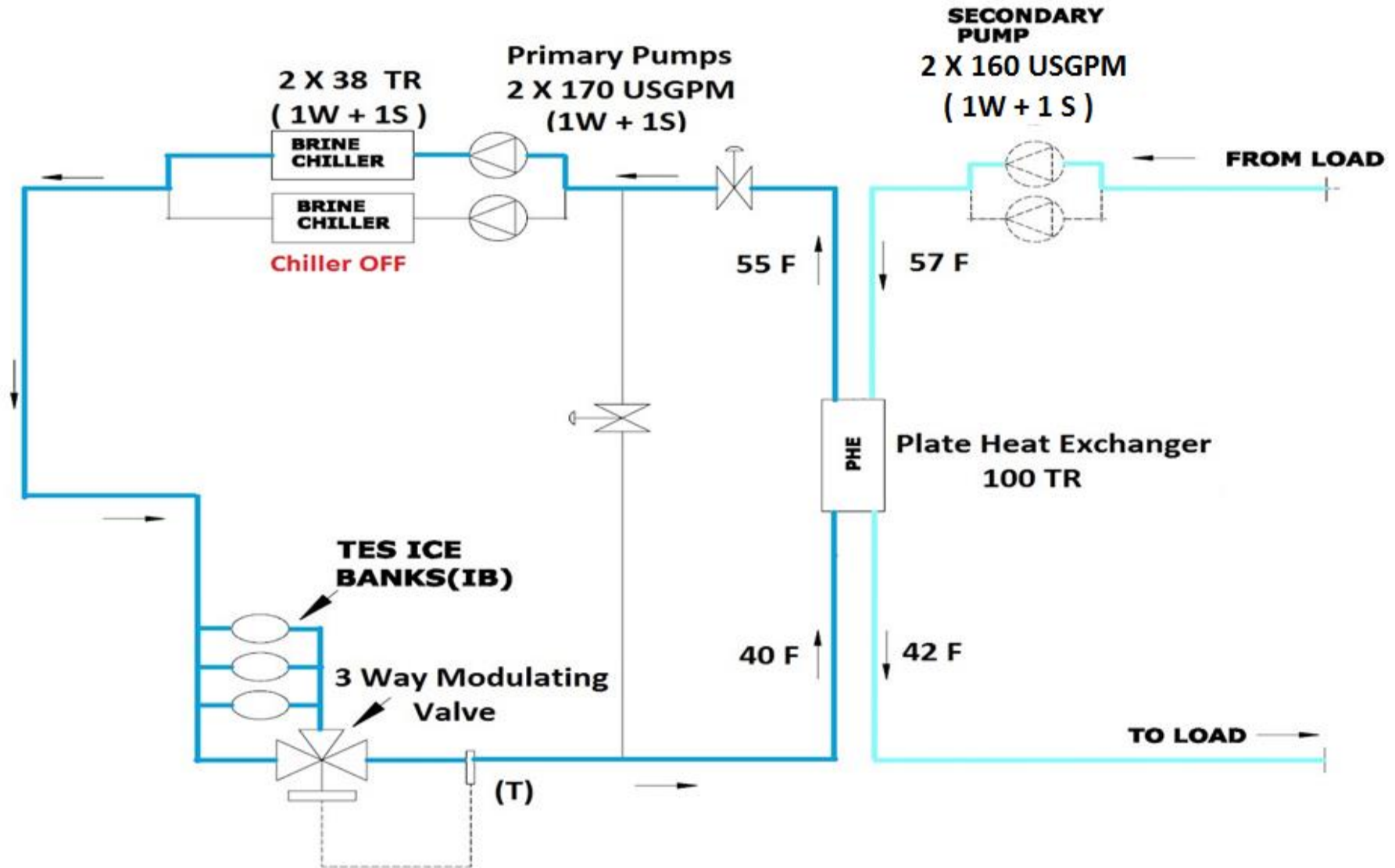
Total KWH = 19,200/day (Load Factor = 88%)

BASIC SCHEMATIC DIAGRAM





MODES : TES DISCHARGE

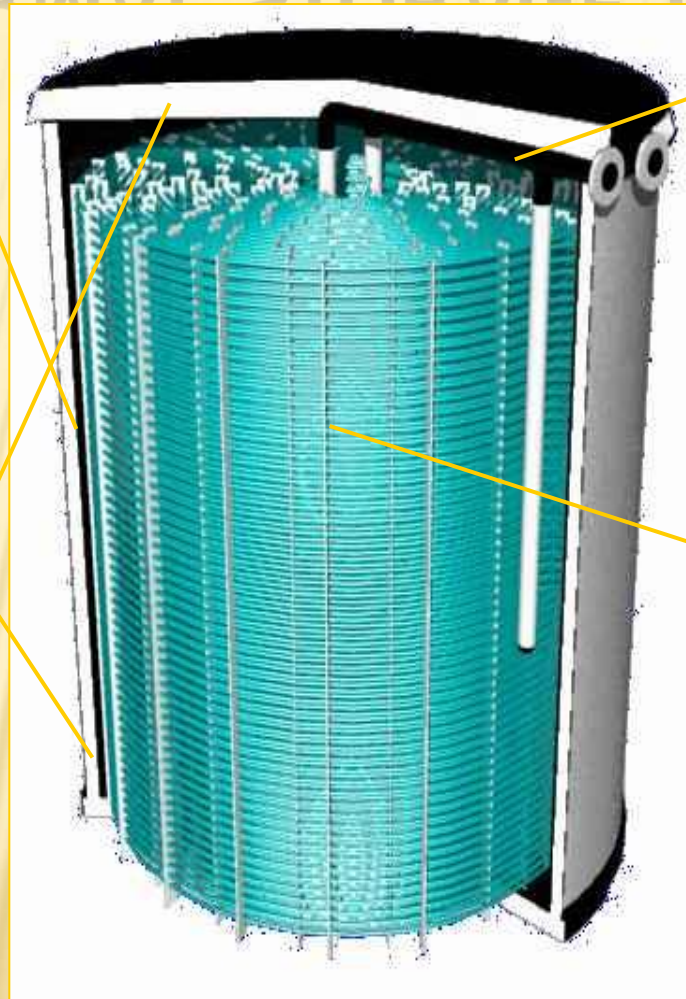




THERMAL STORAGE TANK

**Seamless
Polyethylene Tank**

Polystyrene Insulation

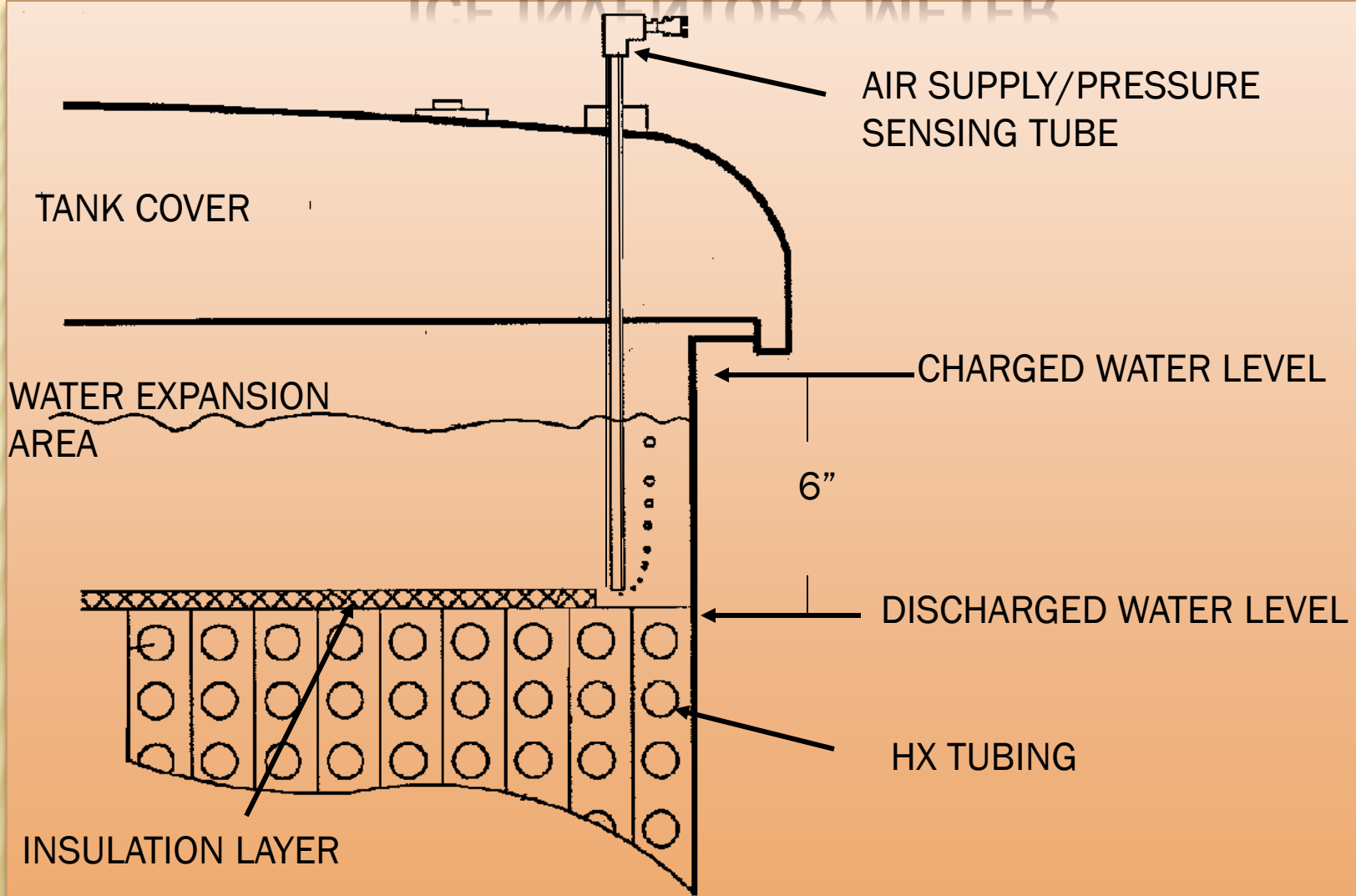


**Expansion
Chamber**

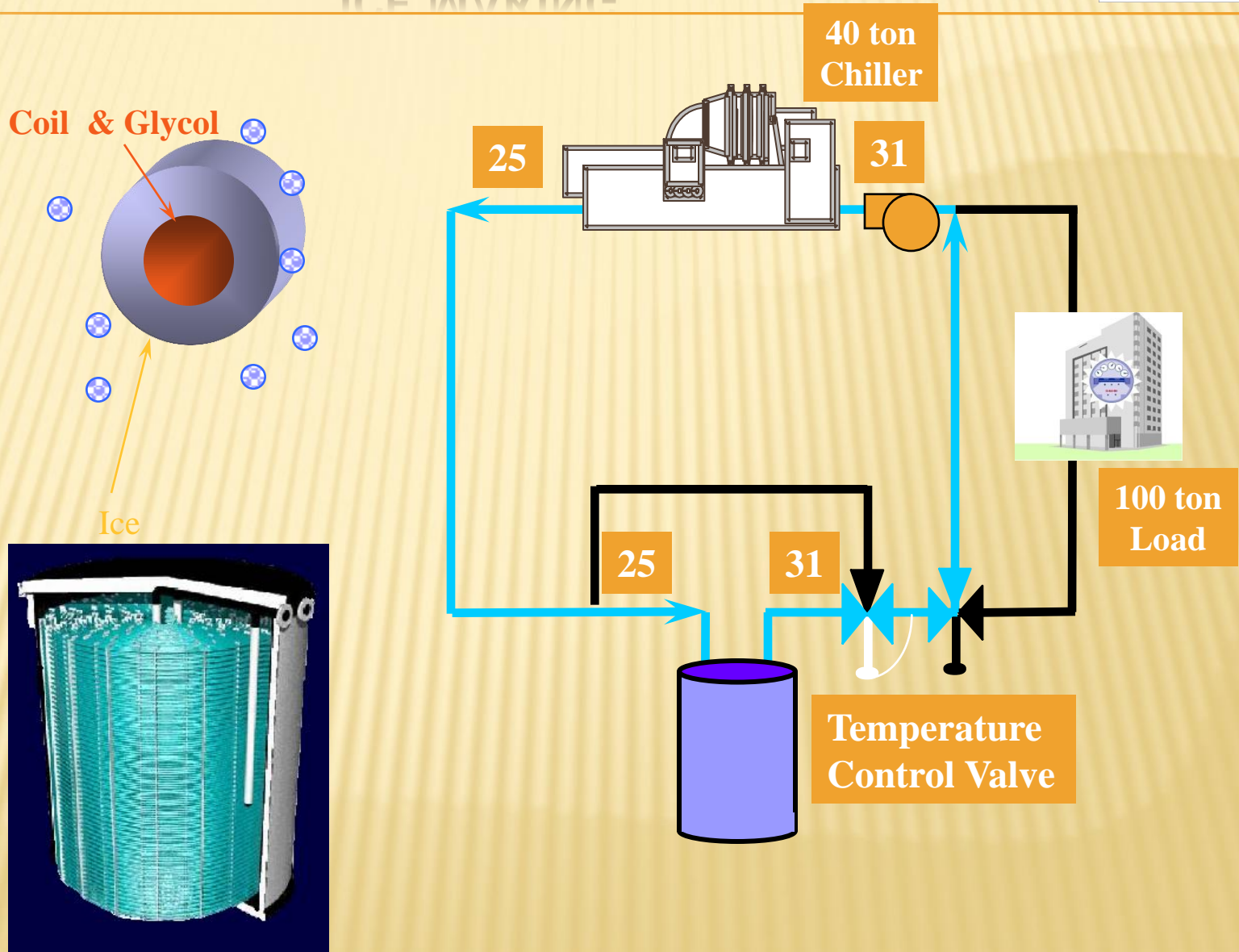
**All Welded
Polyethylene
Heat Exchanger**



ICE INVENTORY METER

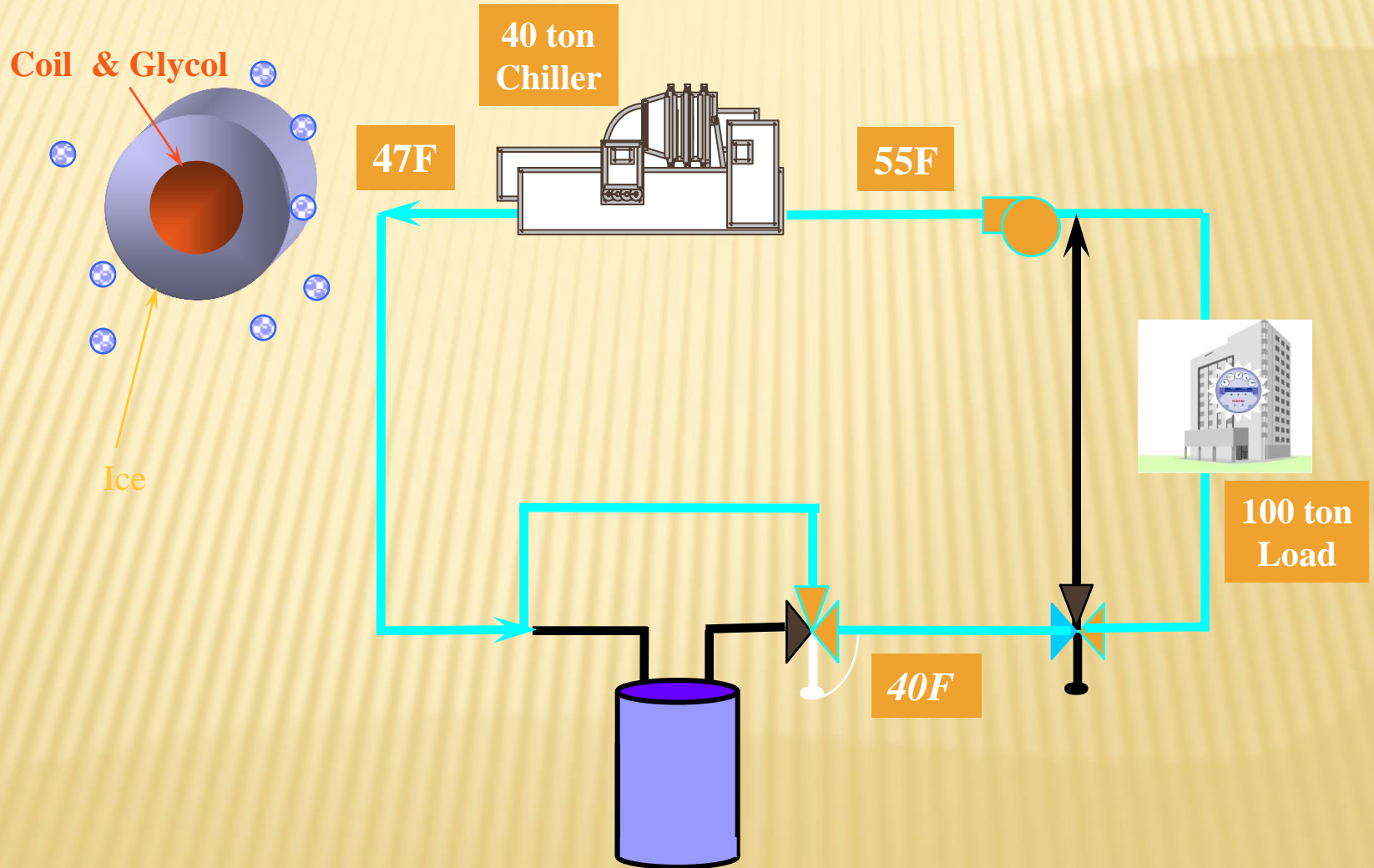


ICE MAKING

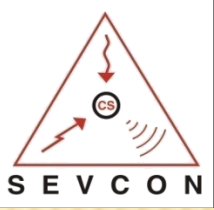




DISCHARGE





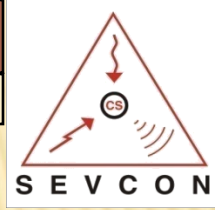


TYPES OF THERMAL ENERGY STORAGE

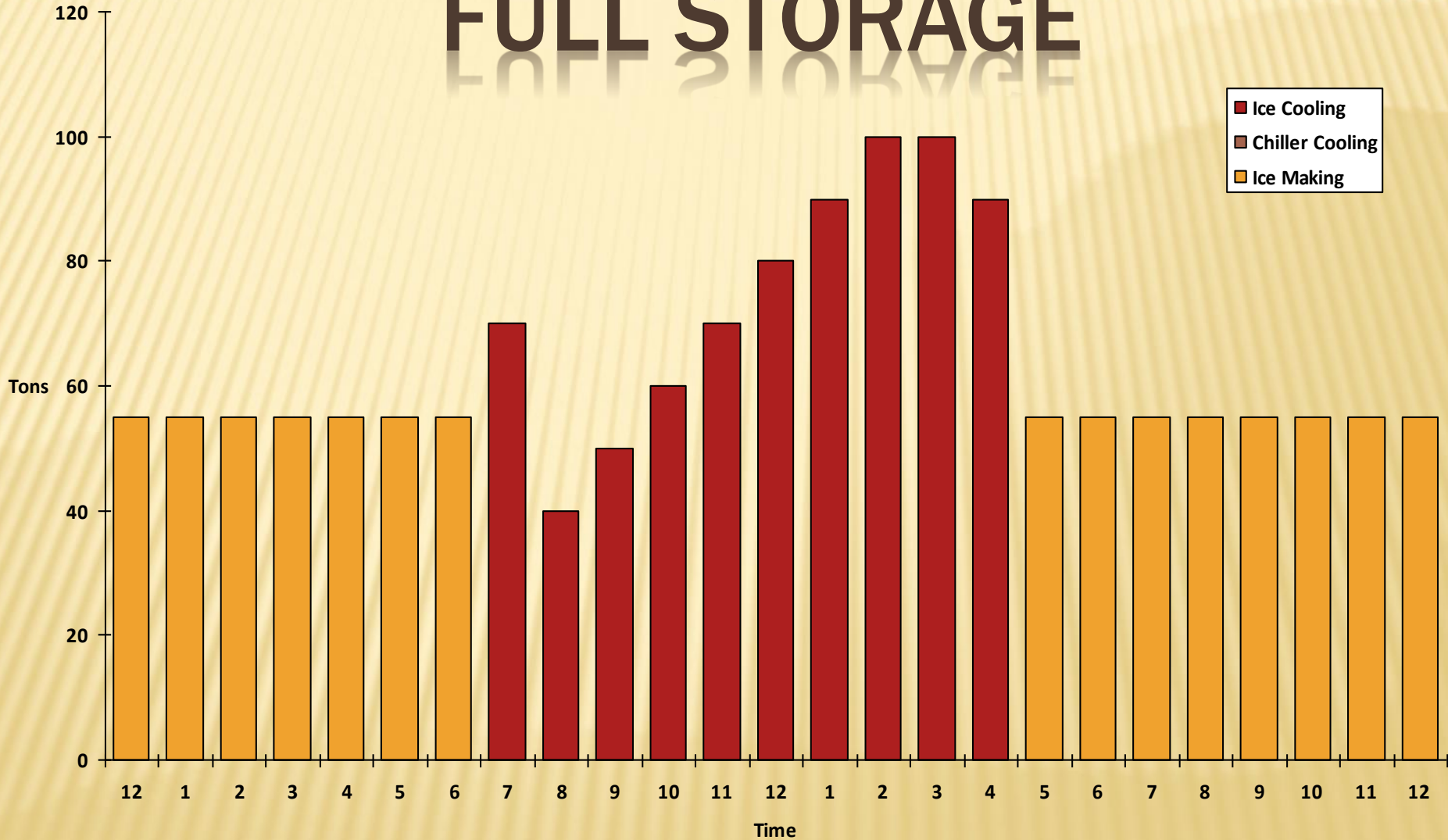
➤ Full Storage

➤ Partial Storage

➤ Window Storage

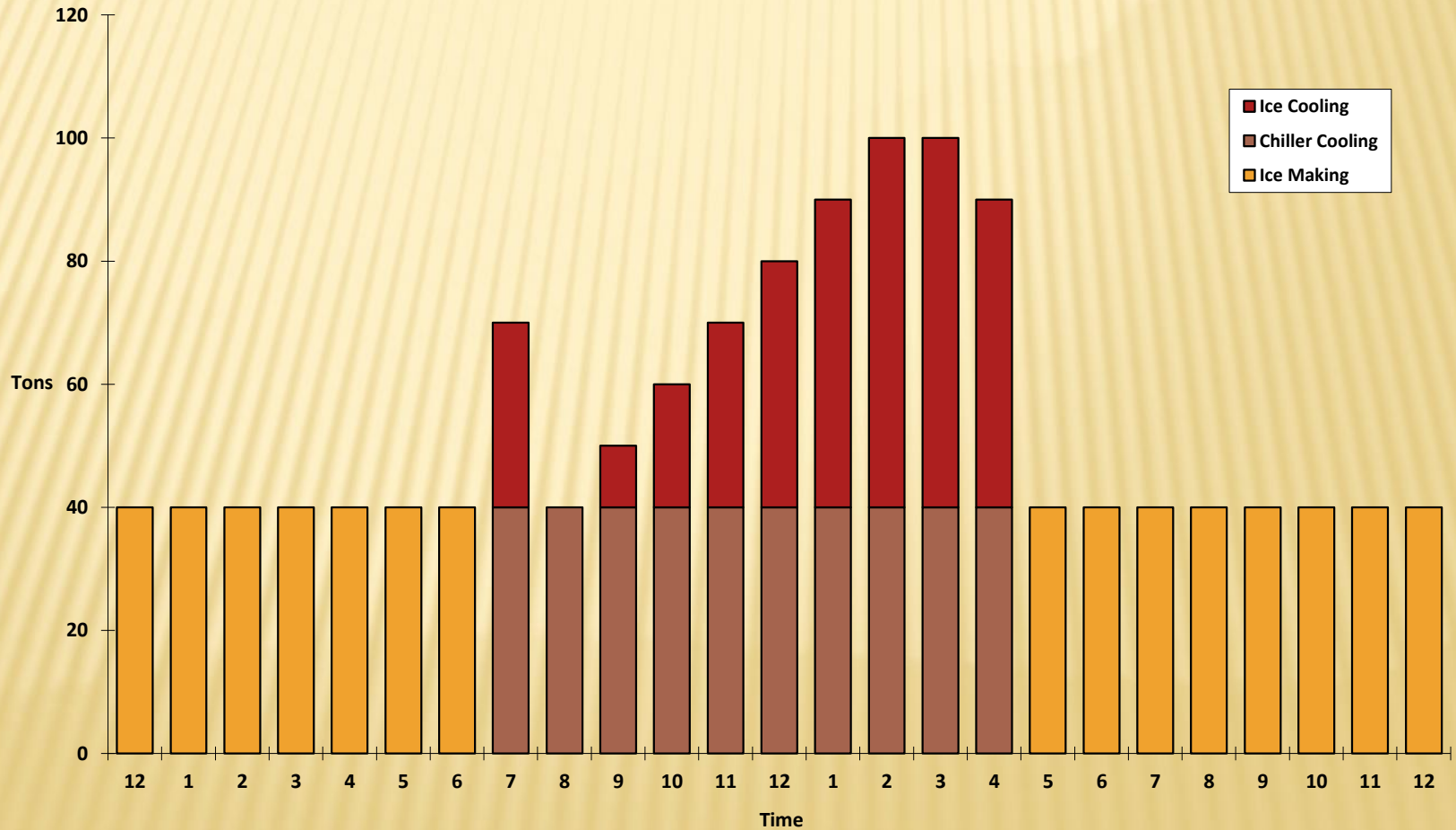


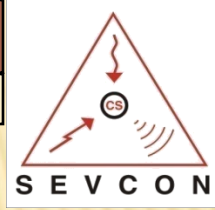
FULL STORAGE



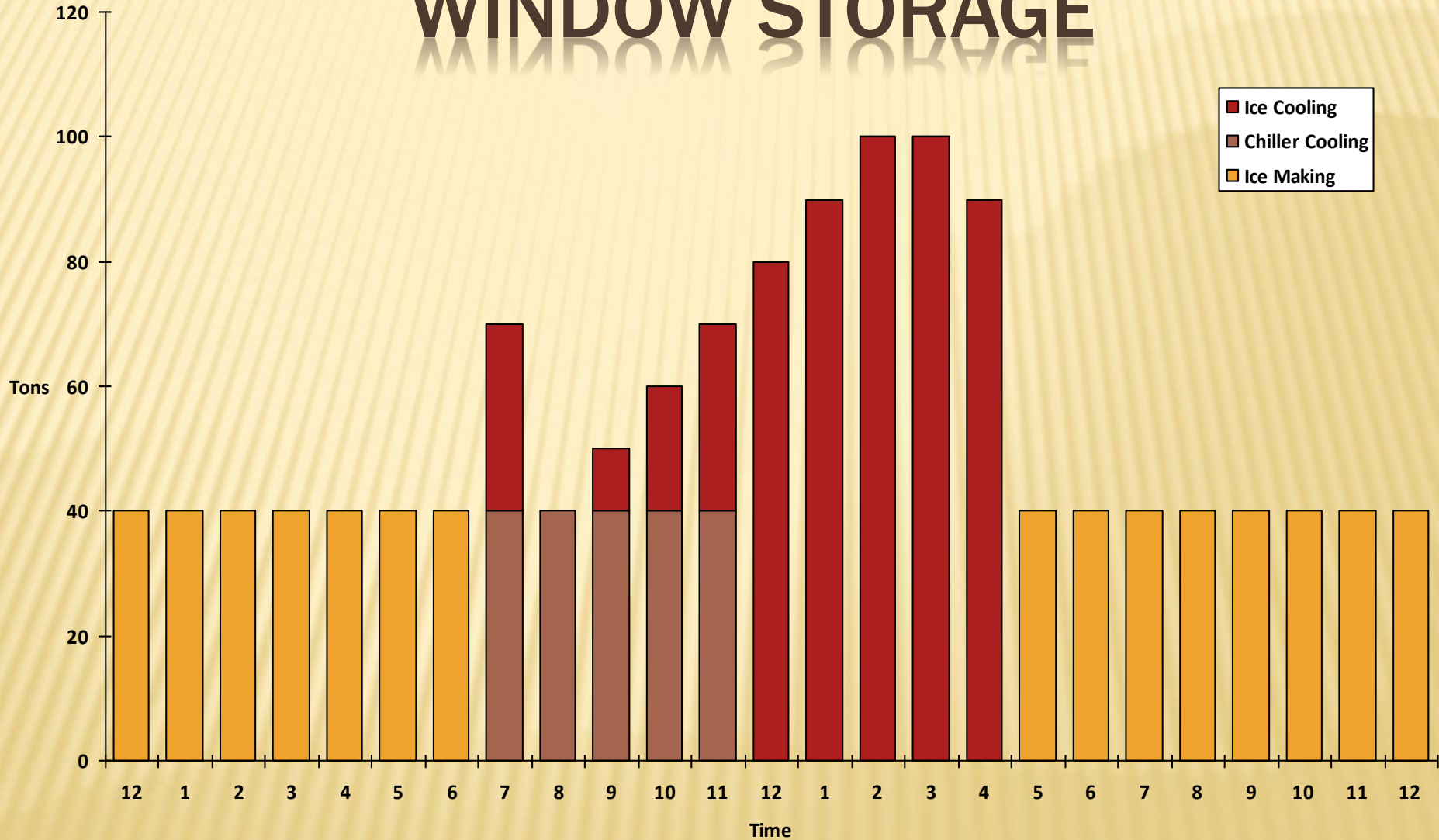


PARTIAL STORAGE



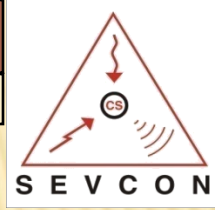


WINDOW STORAGE



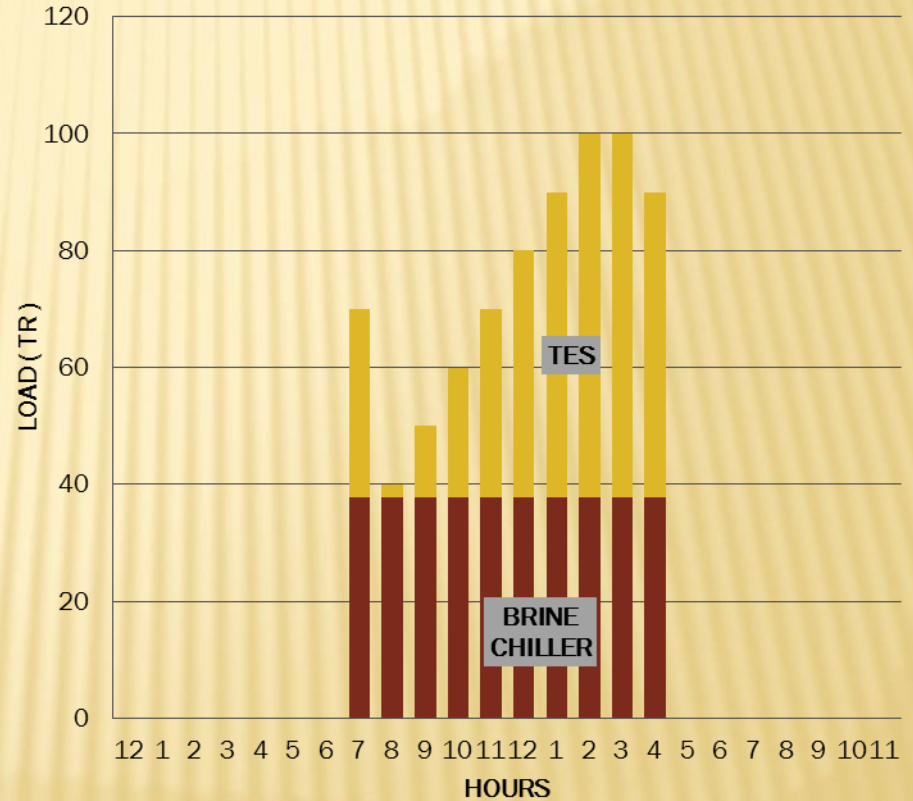


SEVCON – CALMAC



DESIGN DAY HOURLY LOAD PROFILE

Hours	Building Load	Brine Chiller	Load on TES (TR)	Charging Tonnage @ 70 %
		38 TR		(14 Hrs. Charging)
00:00-01:00	0	0	0	27
01:00-02:00	0	0	0	27
02:00-03:00	0	0	0	27
03:00-04:00	0	0	0	27
04:00-05:00	0	0	0	27
05:00-06:00	0	0	0	27
06:00-07:00	0	0	0	27
07:00-08:00	70	37.89	32	0
08:00-09:00	40	37.89	2	0
09:00-10:00	50	37.89	12	0
10:00-11:00	60	37.89	22	0
11:00-12:00	70	37.89	32	0
12:00-13:00	80	37.89	42	0
13:00-14:00	90	37.89	52	0
14:00-15:00	100	37.89	62	0
15:00-16:00	100	37.89	62	0
16:00-17:00	90	37.89	52	0
17:00-18:00	0	0	0	27
18:00-19:00	0	0	0	27
19:00-20:00	0	0	0	27
20:00-21:00	0	0	0	27
21:00-22:00	0	0	0	27
22:00-23:00	0	0	0	27
23:00-24:00	0	0	0	27
TOTAL(TRH)	750	379	371	371





LOCATION OF STORAGE TANKS

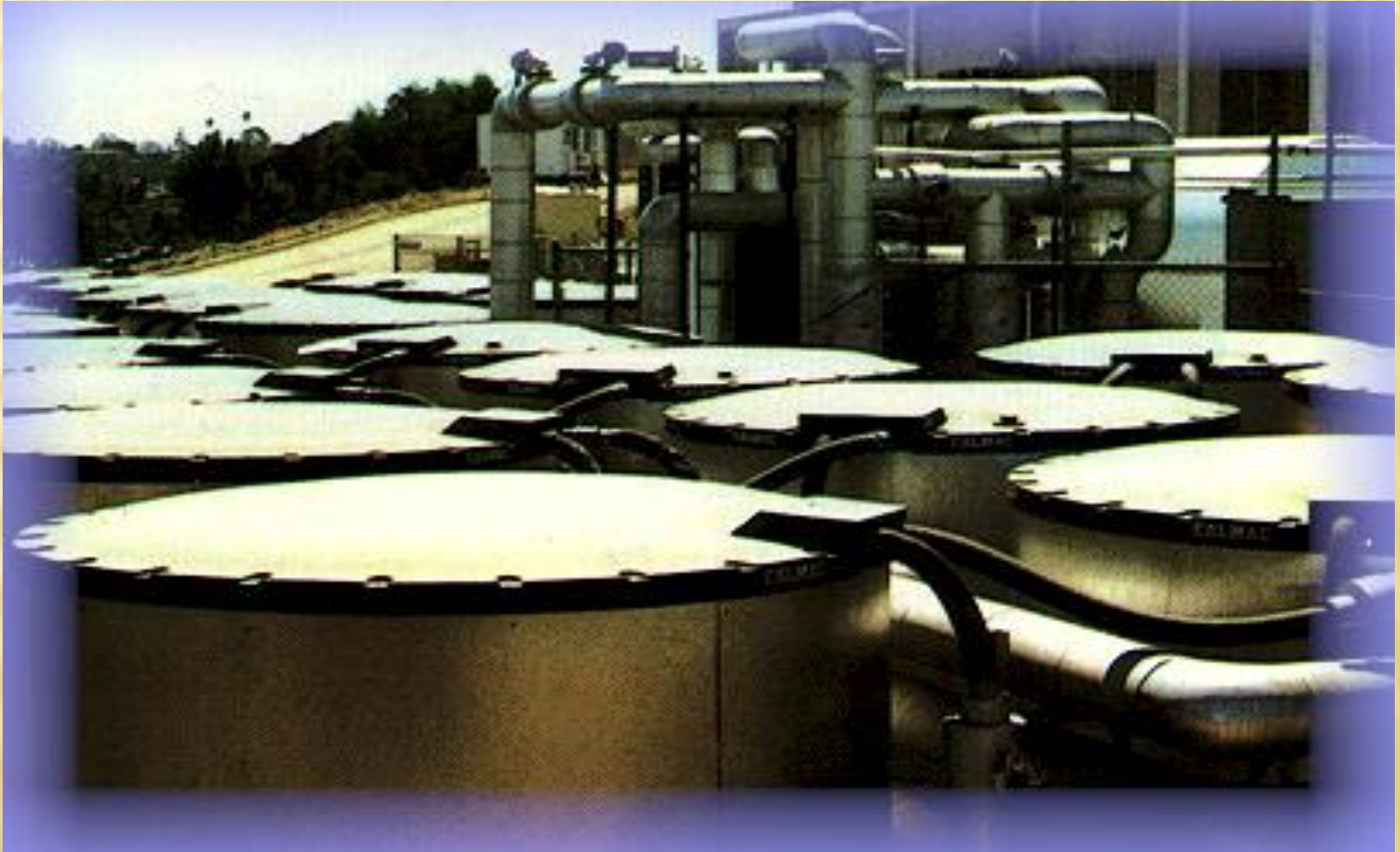


INDOOR





OUTDOOR





PARTIAL BURIAL





FULL BURIAL





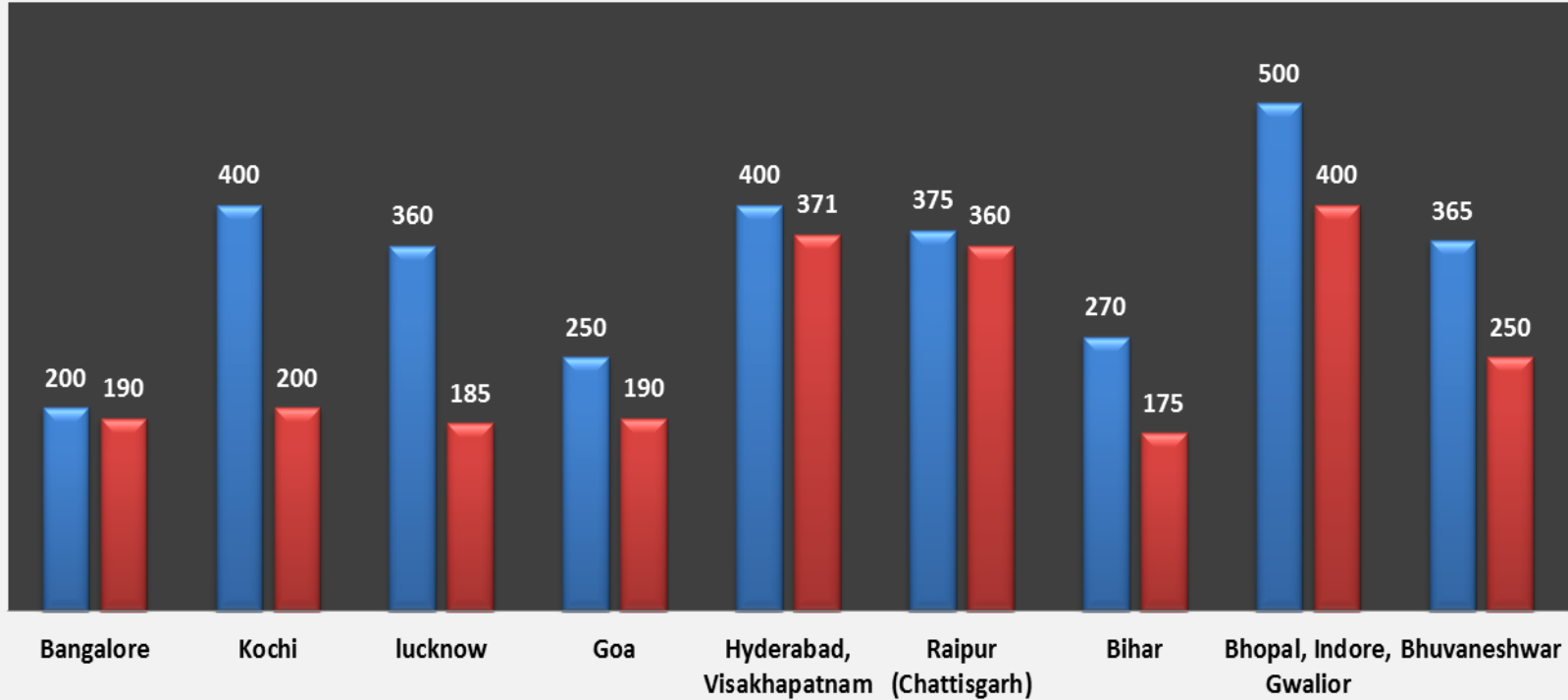
TRENDS...

THE UPCOMING SLIDES SHOWS A GENERAL TREND OF PAST YEARS FOR DEMAND CHARGES, ENERGY CHARGES, TOD % CHARGES AND DIESEL RATES.

WHY TES IS AN ESSENTIAL TOOL AND A FUTURISTIC CONCEPT, IS SELF EXPLANATORY FROM THIS SLIDES...

Increase In Demand Energy (Rs/KVA/Month)

■ Present ■ Past

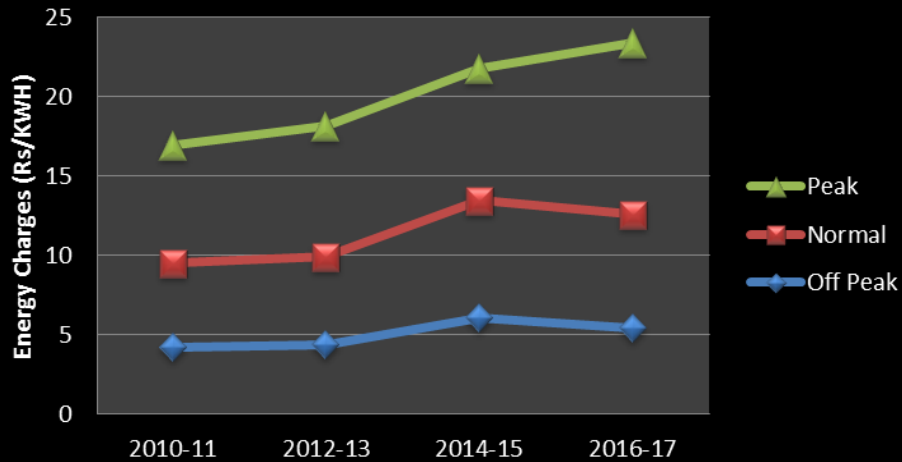


DEMAND CHARGES TREND GRAPH

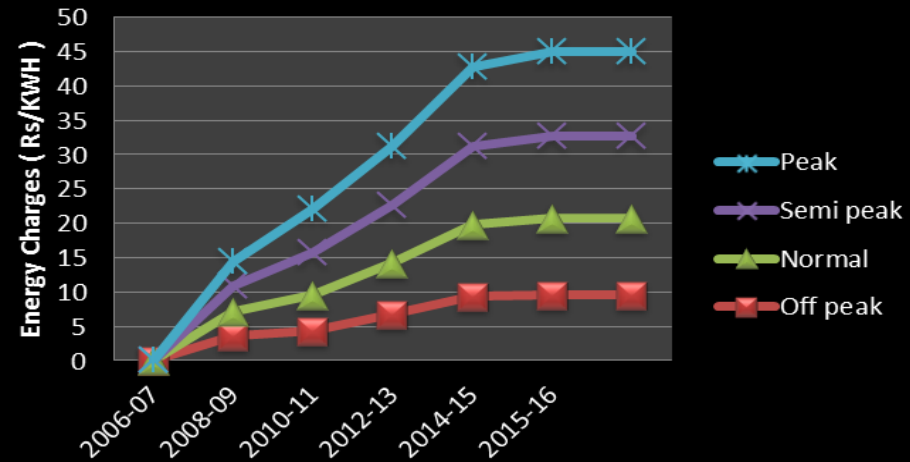
The Demand Charges (Rs/KVA/Month) have increased over a period of time, Thus demand management is a necessary tool of Operational savings, which can easily achieved by Shifting Load from peak to off-peak and downsizing the equipment

ENERGY CHARGES TREND GRAPH

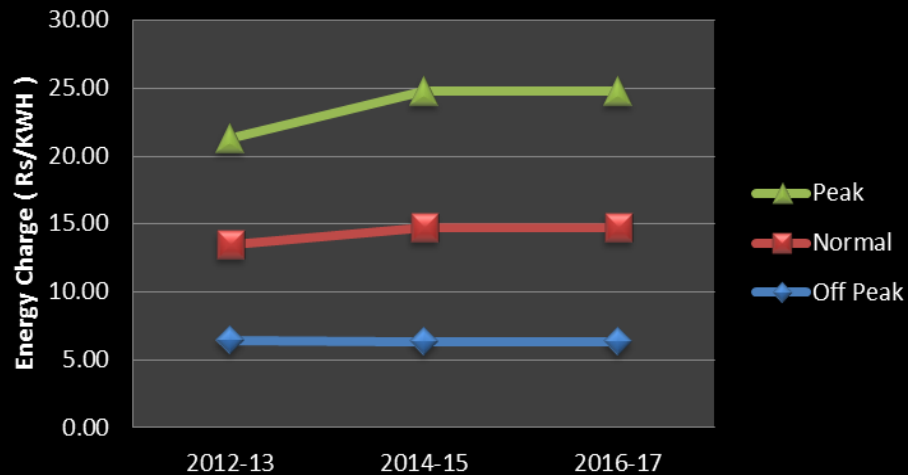
Kochi



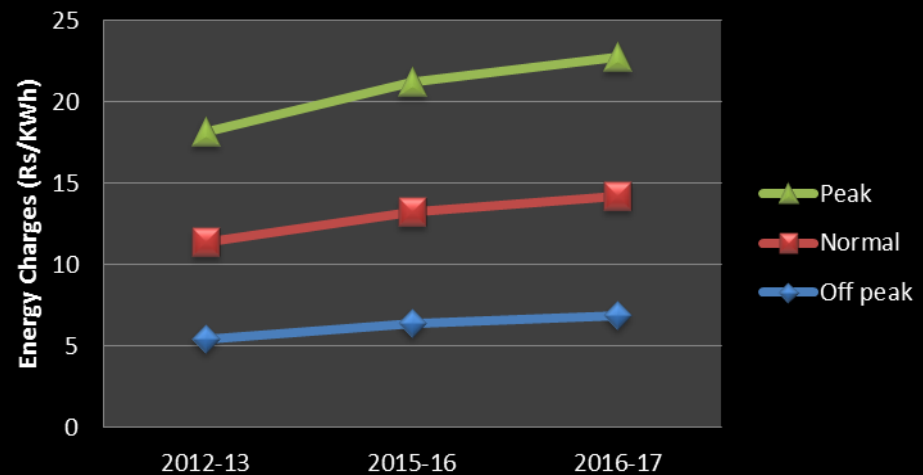
Mumbai



Delhi Energy Charges Trend

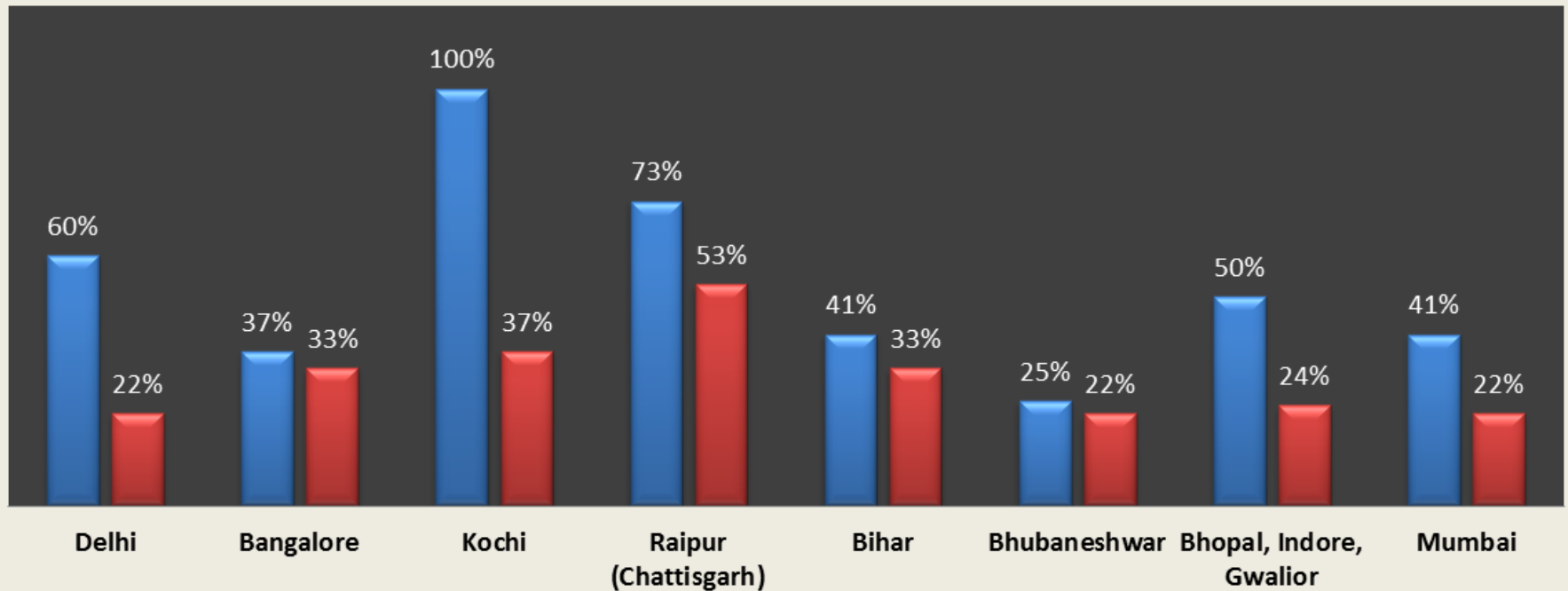


Agra, Lucknow, Allahabad



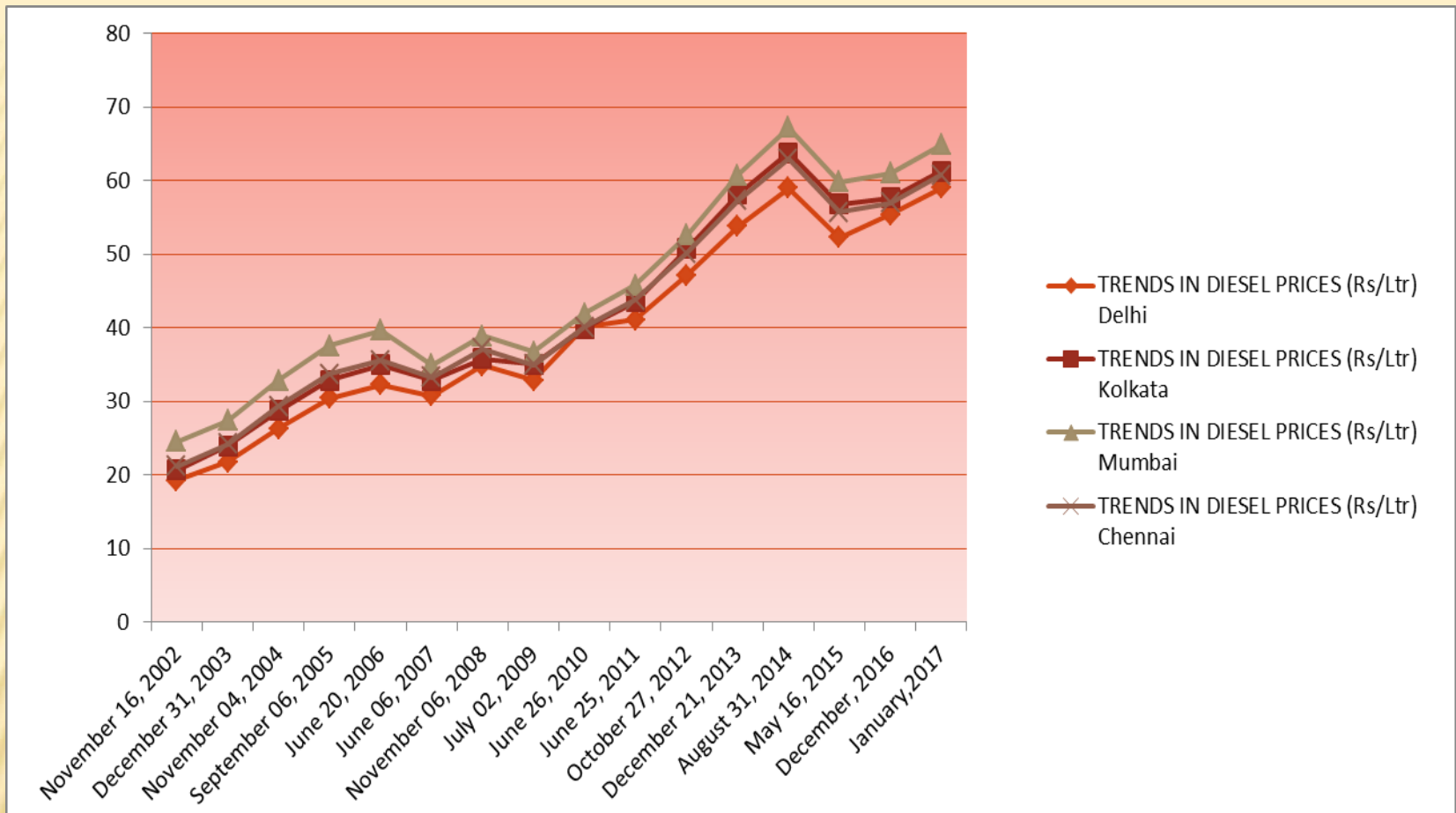
Increase in TOD (Peak - Off peak) %

■ Present ■ Past



TOD (PEAK - OFF-PEAK % DIFFERENCE) TREND GRAPH

The Time Of Day tariff has become more attractive over a time period, Thereby utilizing energy during Off peak time and utilizing the stored energy during peak TOD time is a huge tool for cost cutting in Operational expenses



DIESEL RATES TREND GRAPH

The Diesel prices have increased over a period of time, Thus dependency on DG operations are expensive and also contributes a lot of GHGs emissions.



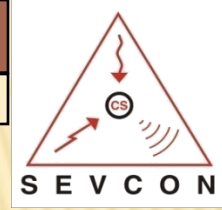
SEVCON IN THERMAL ENERGY STORAGE

- **Started First Job in the year 2004.**
- **We have over 750 tanks Installations all over India and we are adding on with customer satisfaction and contributing savings and providing solutions with TES.**
- **Our Clientele includes DRDO, Wipro Technologies, Tata consultancy services, Vatika, Elnet infrastructure, ISTA hotels, TIDEL park, TICEL park Hexaware, Hilton, Bhartiya City etc.**
- **From Critical defense emergency ‘7 Days Storage Back up’ to commercial – mall, offices, hotel applications and from huge storage capacity as big as 14550 TRH to Small as 750 TRH we have our installations.**
- **Detailed engineering with complete Load Analysis, whole TES System Design-with parameters of chillers, PHE, pumps and ICE PICK Software reports and support from the design to commissioning is delivered by SEVCON.**



BENEFITS OF TES

- It reduces operating costs by 20% to 25% because of reduction in demand charges.
- It reduces initial costs of chillers, cooling towers, cables, electrical panels and generators.
- It uses lower cost, off peak electricity (usually at night) to produce cool energy.
- It helps in Right-Sizing the HVAC System. As You can now meet your Safety factor and Redundancy needs with your stored ice.



OWNER BENEFITS FROM TES

- Energy Cost Reduction
- Can Be Installed For Little or No First Cost Penalty In New Construction
- Energy Saving
- Energy Management Transparent to Occupants
- More Powerful Negotiating Position With Power Providers

Sevcon-CALMAC TES REFERENCE LIST (INDIA)

Sl. No	Project Name	Location	TRH
1	TCS	Chennai	15000
2	ELNET	Chennai	4000
3	City Centre	Hyderabad	4000
4	Vikas Tech Park- Phase 1	Bangalore	2000
5	Vatika Tech Park	Gurgaon	8000
6	Vatika City Point	Gurgaon	2000
7	DRDO Seven Day's Storage	Delhi	6500
8	Bengal green Field	Kolkata	1600
9	Wipro CDC 5,Sholinganallur	Chennai	15000
10	Wipro, Kochi	Kochi	5500
11	ISTA Hotel (IHHR hospitality) is now Hyatt	Pune	1500
12	Triburg	Gurgaon	1600
13	Wipro, Mahindra city campus	Chennai	5500
14	SOFITEL Pune	Pune	2020
15	TIDEL Park	Coimbatore	8250
16	TRILIUM	Amritsar	8100
17	North Country Mall	Mohali	3000
18	IG3 Infra Ph 2	Gurgaon	9600
19	KBJ Grand Hotel	Varansai	2000
20	AIIMS Bhopal	Bhopal	3250
21	KT DRDO Rajasthan	Jodhpur	3088
22	Bharatiya City	Banglore	2350
23	RUG DRDO Delhi	Delhi	750
24	Hexaware	Chennai	3000
25	RV Hospital	Bangalore	1800
26	Hilton Hotel	Goa	1500



SOME OF OUR INDIAN PROJECTS



TCS Chennai



Tidel



Triburg



City Center,
Hyderabad





Thank You

*Mohammad Adil
Sevcon India Pvt Ltd*