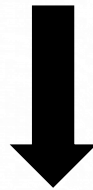
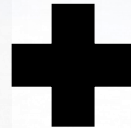




OPTIMIZING TURBINE INLET CHILLING WITH THERMAL ENERGY STORAGE



Synergistic Technologies

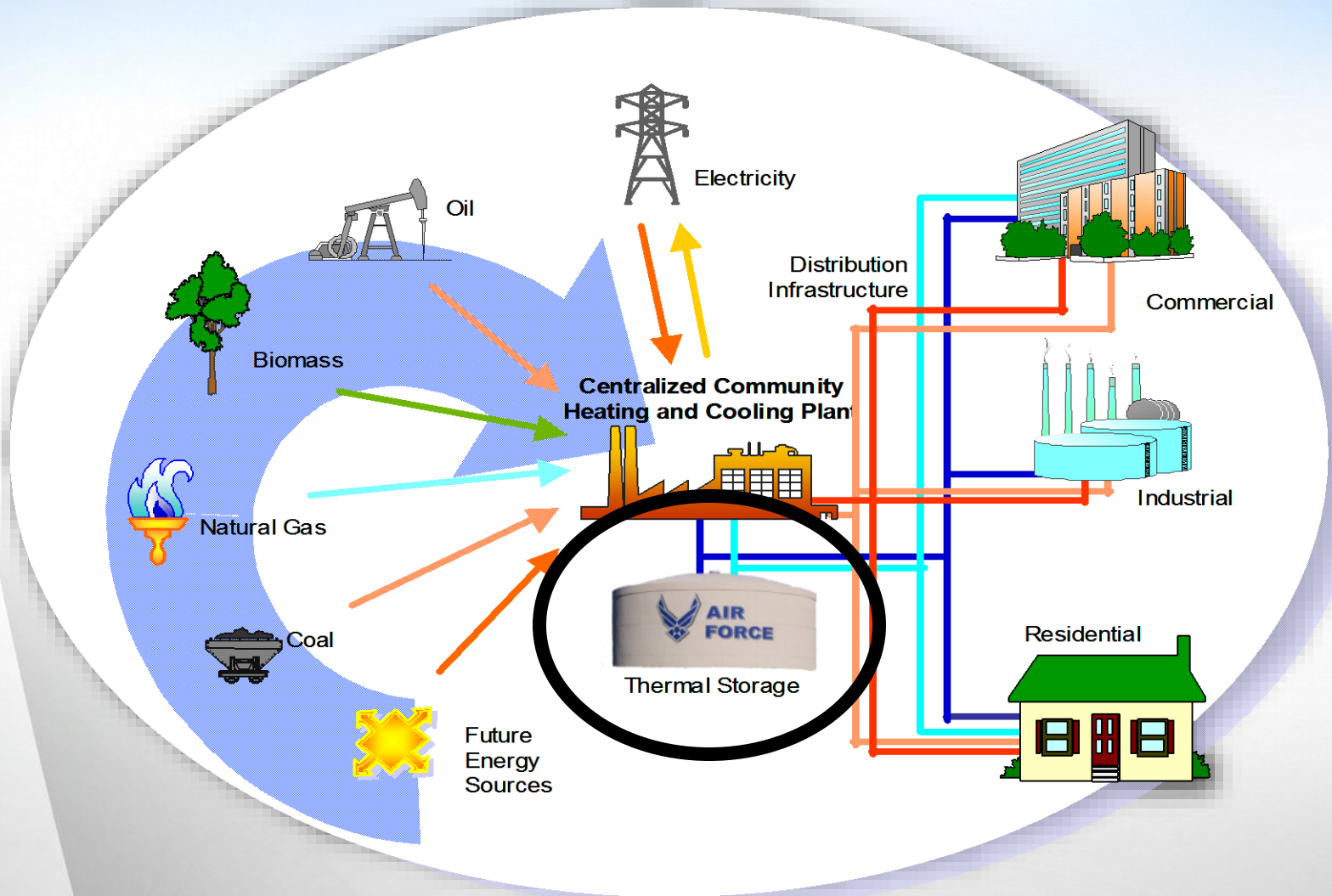


TECHNOLOGY “A”



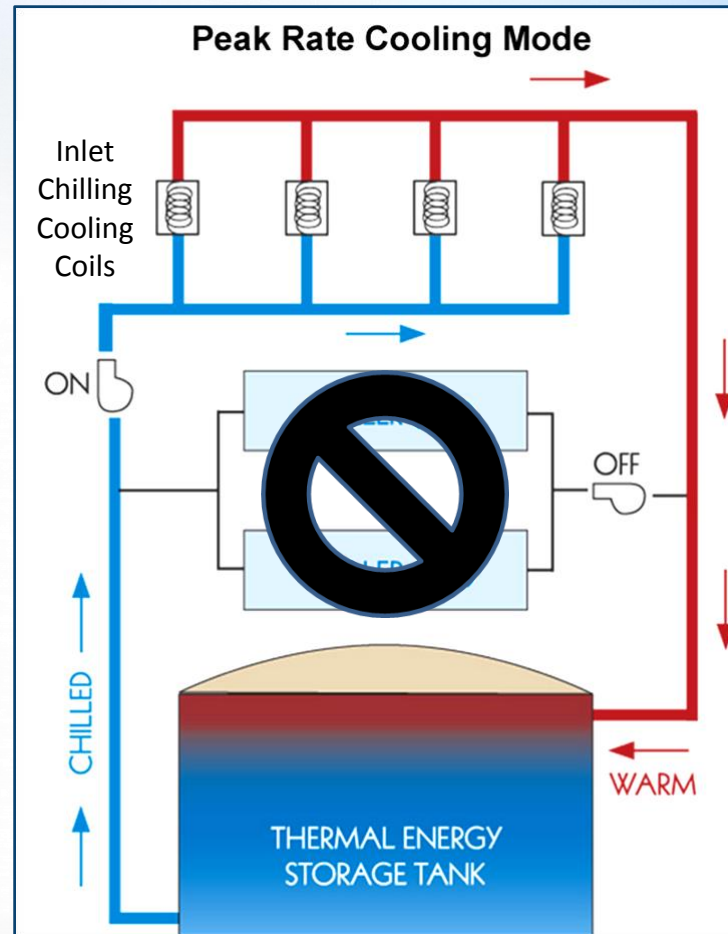
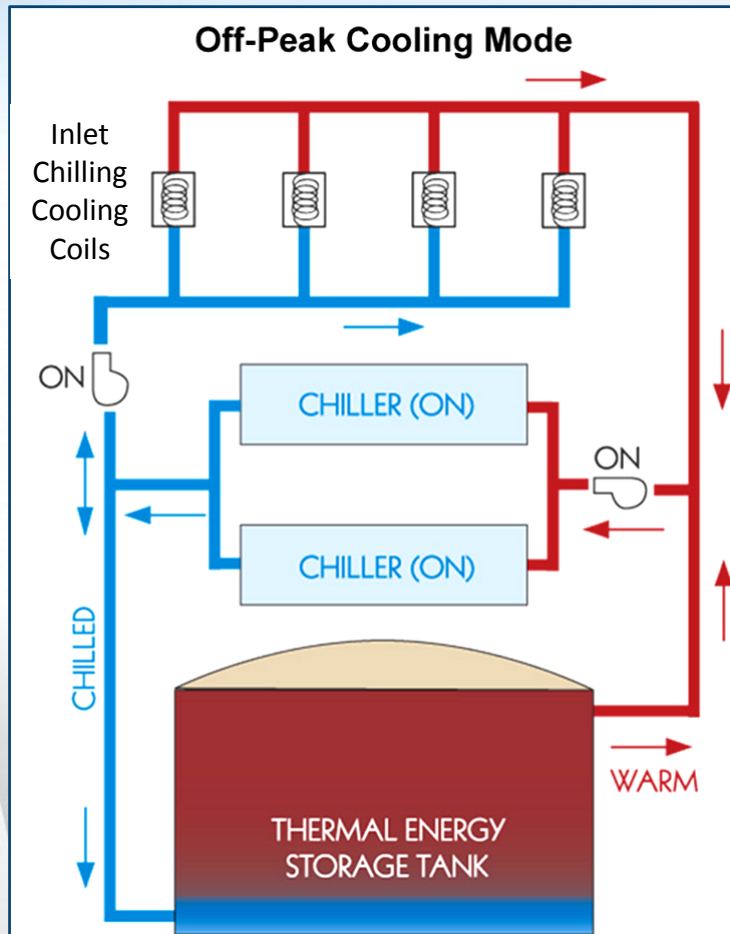
THERMAL ENERGY STORAGE

District Cooling and Thermal Energy Storage

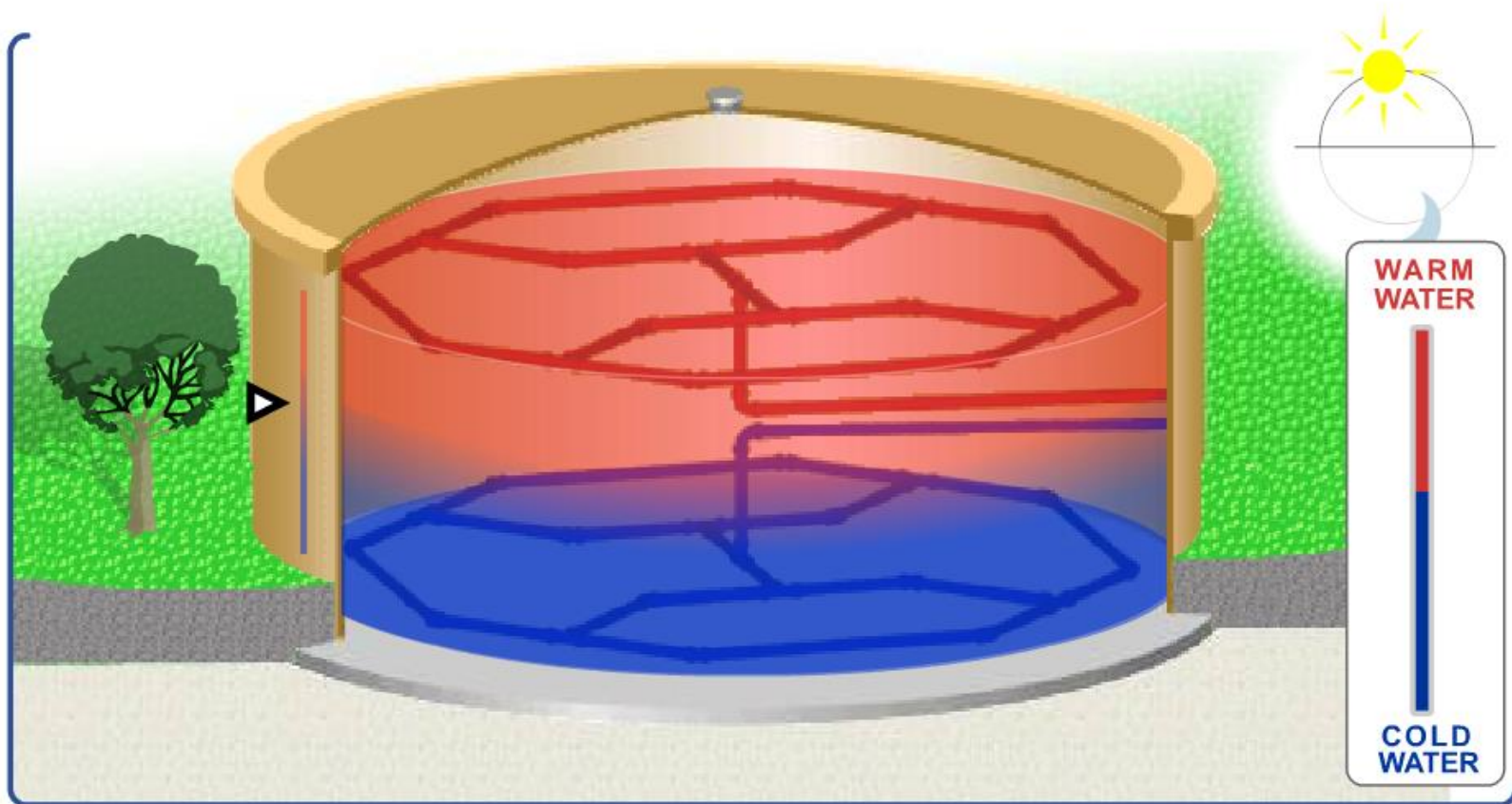


TES tank is like a big battery

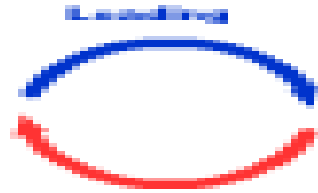
Chilled Water TES Concept



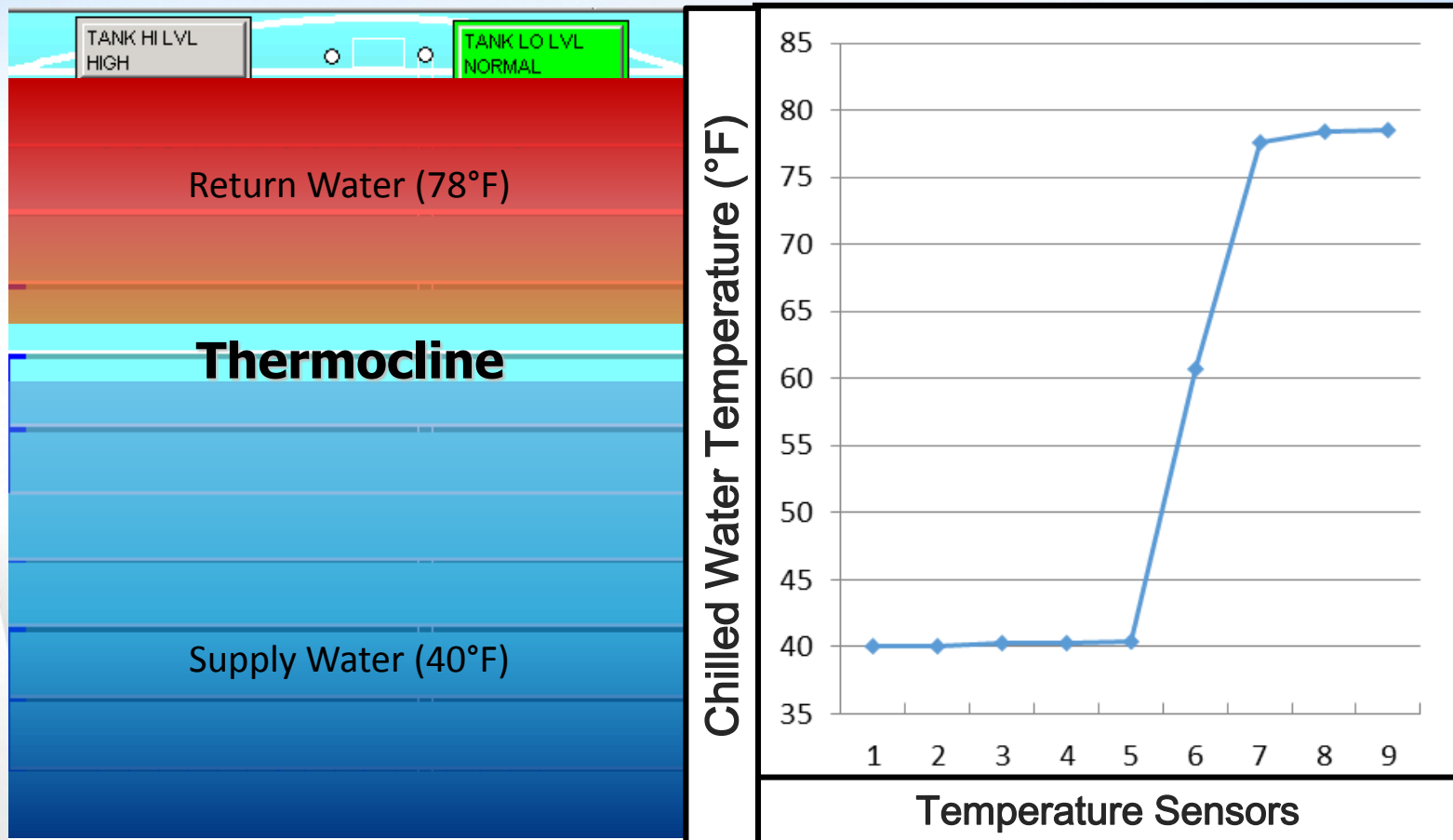
Chilled Water TES Concept



Daily Operation of a TES Tank



Stratified Chilled Water in a TES Tank



Actual Data – TES Tank at Power Plant in
Baytown, TX – 08-22-15

TES Tank Applications



Los Angeles, CA - USC



Riverside, CA - UC



Orlando, FL - UCF

College Campuses



Lackland AFB, TX



San Antonio, TX - Airport



Raleigh, NC

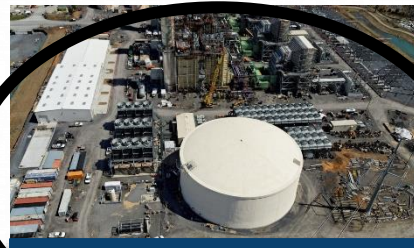
Government and Municipalities



Brooks, CA – CCC Resort



Santa Clara, CA – DFP



Front Royal, VA – Dominion

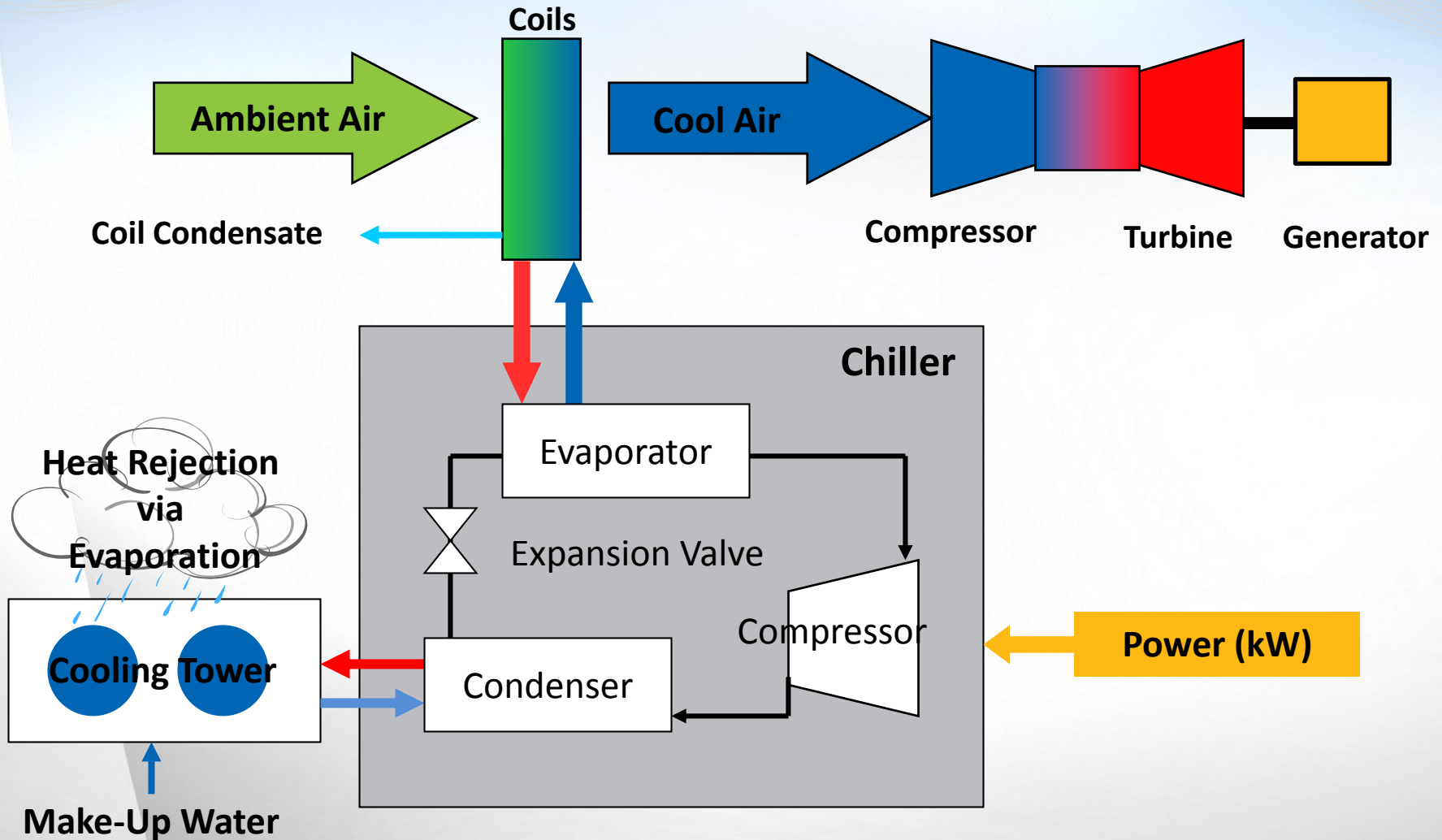
Private Industry, Power Plants, and Data Centers

TECHNOLOGY “B”

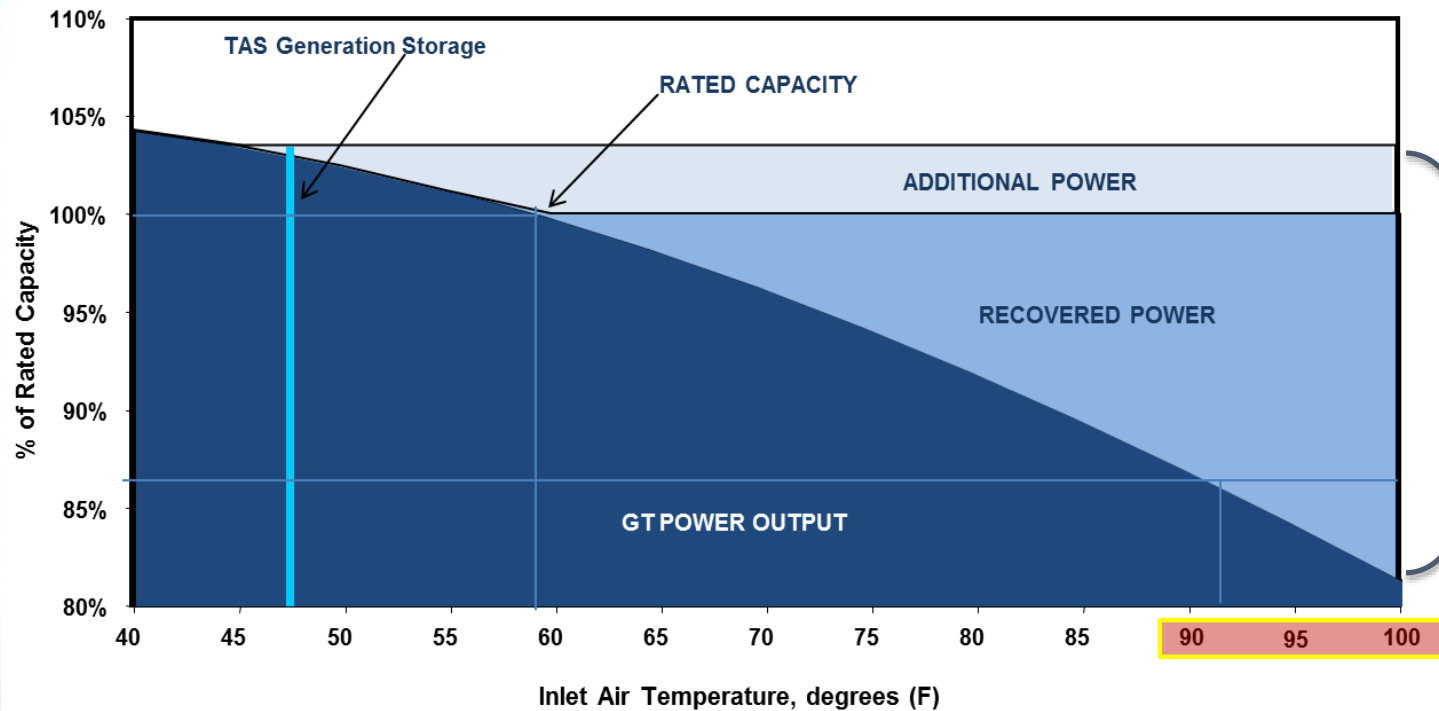


TURBINE INLET CHILLING

Turbine Inlet Chilling



Natural Gas Power Plant Performance



Performance goes down as outside air temp goes up



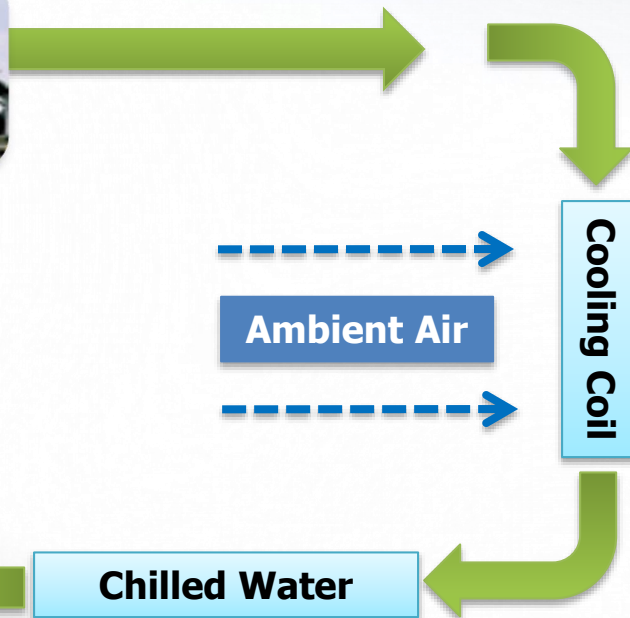
Turbine Inlet Chilling System



Turbine Inlet Chilling Improves NG Power Plant Performance



Chiller Plant

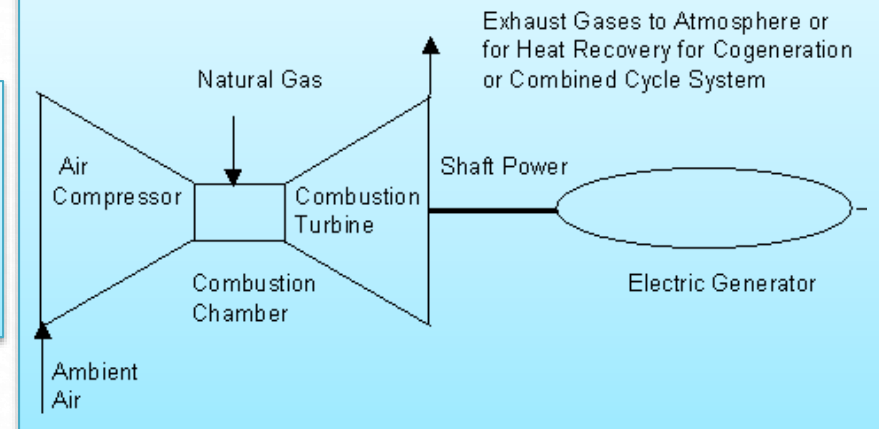


Cooling Coil

Ambient Air

Chilled Water

Combustion Turbine



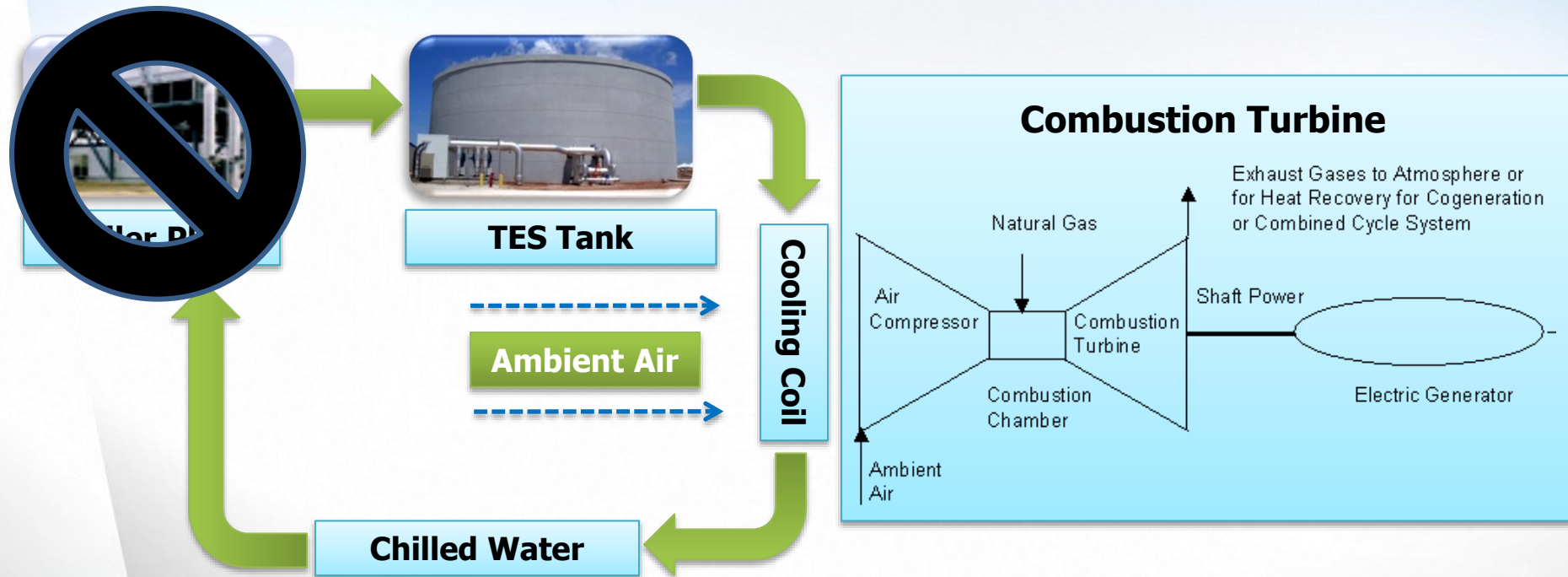


SYNERGY



TURBINE INLET CHILLING & TES

Turbine Inlet Cooling Improves Gas Turbine Plant Performance



During peak periods, the chillers can be de-energized and the TES tank can provide the cooling

Theoretical Performance Data without TIC & TES

CTG Output

95°F

Simple Cycle	MW
GE LM6000PG	39.3
Siemens SGT-800	41.4
Siemens Trent 60	48.9
GE 7FA.03	143.6

Plant Output

95°F

Combined Cycle - 2x1	MW
GE 7FA	429.3
Siemens SGT6-5000F	598.6
MHPSA 501GAC	700.3
MHPSA 501J	844.0
GE 7H.02	855.0

Theoretical Performance Data with TIC

CTG Output

	95°F	50°F	Incremental Output - TIC	
Simple Cycle	MW	MW	MW	%
GE LM6000PG	39.3	53.2	13.9	35%
Siemens SGT-800	41.4	49.2	7.8	19%
Siemens Trent 60	48.9	61.1	12.2	25%
GE 7FA.03	143.6	165.9	22.3	16%

Plant Output

	95°F	50°F	Incremental Output - TIC	
Combined Cycle - 2x1	MW	MW	MW	%
GE 7FA	429.3	483.4	54.1	13%
Siemens SGT6-5000F	598.6	660.1	61.5	10%
MHPSA 501GAC	700.3	801.4	101.1	14%
MHPSA 501J	844.0	939.1	95.1	11%
GE 7H.02	855.0	970.7	115.7	14%

Theoretical Performance Data with TIC & TES

CTG Output

	95°F	50°F	Incremental Output - TIC		50°F	Incremental Output - TIC + TES	
	MW	MW	MW	%	MW	MW	%
Simple Cycle							
GE LM6000PG	39.3	53.2	13.9	35%	54.5	15.2	39%
Siemens SGT-800	41.4	49.2	7.8	19%	50.3	8.9	21%
Siemens Trent 60	48.9	61.1	12.2	25%	62.6	13.7	28%
GE 7FA.03	143.6	165.9	22.3	16%	169.5	25.9	18%

Plant Output

	95°F	50°F	Incremental Output - TIC		50°F	Incremental Output - TIC + TES	
	MW	MW	MW	%	MW	MW	%
Combined Cycle - 2x1							
GE 7FA	429.3	483.4	54.1	13%	490.8	61.5	14%
Siemens SGT6-5000F	598.6	660.1	61.5	10%	670.8	72.2	12%
MHPSA 501GAC	700.3	801.4	101.1	14%	812.0	111.7	16%
MHPSA 501J	844.0	939.1	95.1	11%	949.2	105.2	12%
GE 7H.02	855.0	970.7	115.7	14%	983.8	128.8	15%

Warren County Generating Station, VA Case Study



3 x MHPSA 501GAC
3 x 7900 ton TAS Chiller Skids
8.9M gal TES tank

Warren County, VA – 23,700 tons Chilling



Warren County, VA – 8.9 MG TES Tank



Warren County, VA Award Winning Project

**POWER
Engineering**

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POWER-GEN

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POWER ENGINEERING

2015 Projects of the Year Winners Revealed!

01/28/2016

By Sharryn Dotson, Associate
Jennifer Runyon, Chief Editor,

Each year, power projects from
Renewable Energy World mag
Dec. 7 at the KMA Event Center



“The plant uses a thermal energy storage system and chillers from DN Tanks and Turbine Air Systems to reduce water use, store energy and reduce its parasitic power load during peak demand. **The system helps to increase power output by approximately 130 MW on a 92-degree day.**”

<http://www.power-eng.com/articles/print/volume-120/issue-1/features/2015-projects-of-the-year-winners-revealed.html>



Questions?



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