DIABLO CANYON: COMPARISON OF TECHNOLOGIES

SOURCES	BECHTEL's Report on Diablo Canyon					GREEN COOLING TOWER SOLUTIONS
Comparison Parameters	Mechanical Forced Draft Dry/ Air Cooling	Passive Draft Dry/ Air Cooling	Wet Natural Draft Cooling	Wet Mechanical Forced Draft Cooling	Hybrid Wet-Dry Cooling	Green Cooling
	A	B	C	D	E	GCT
No. of Towers	4 towers	4 towers	4 towers	2 towers	2 towers	4 towers with a total of 176 Cells (including Standby cells)
Cooling Tower Footprint	110 acres	110 acres	110 acres	60 acres	60 acres	GCT can use 60 acres to site our 4 cooling towers, each with 44 cells
Excavation Needed	320,000,000 cubic-yard	320,000,000 cubic-yard	320,000,000 cubic-yard	190,000,000 cubic-yard	190,000,000 cubic-yard	190,000,000 cubic yard as considered in report, or less if the area is available to site 4 cooling towers in different areas near generating units.
Land Requirement Contiguous	Yes, in one lot	Yes, in one lot	Yes, in one lot	Yes, in one lot	Yes, in one lot	No, the cells can be flexibly dispersed in the plant, but preferably near each unit so as to minimize water piping and other infrastructure.
No. of Fan Motors & HP	4x60 fans; 250 hp motor			2x40 fans of 300 hp each	2x40 fans of 300hp & 2x40 fans of 200hp	No fan motors required; need 25 psi pressure at hot water inlet at a height of 13.5 ft to run the fan using hydro-turbine
Total MW Used for Fan Motors	45 MW			18 MW	30 MW	Zero; it uses water pressure to run the fan; no motor required
Total Generation Loss[1]	97.3 MW	73 MW	53.6 MW	75.2 MW	76.4 MW	It could the same as Wet Natural Draft Cooling, but with more flexibility in additional capacity
Energy Efficiency	Large penalty on condenser pressure, large penalty on fan motors	No fan motors, but large penalty on condenser pressure	Minimal penalty on condenser pressure	Moderate penalty on condenser pressure, Large penalty on fan motors	Moderate penalty on condenser pressure, Largest penalty on fan motors	Minimal penalty on condenser pressure, and no fan motors required
Sub-station Expansion	4x500 kV circuits expansion	4x500 kV circuits expansion	4x500 kV circuits expansion	4x500 kV circuits expansion	4x500 kV circuits expansion	GCT's pumping requirement is similar to Wet Natural Draft Cooling. GCT will not need energy for fan motors.
Civil Works[2]	$3.509 Billion	$3.628 Billion	$3.632 Billion	$2.426 Billion	$2.308 Billion	Since GCT tower height is only 40 ft, and cooling tower structure is primarily of FRP material, GCT's foundation will be much shallower than any other cooling tower or condenser. This would bring substantial savings in civil cost.
Cooling Tower Height	100 ft	590 ft	590 ft	180 ft	180 ft	40 ft
Architectural/ Visual Treatments	Yes	Yes	Yes	Yes	Yes	Less visibility as it will blend with the existing structures which may be taller than GCT. GCT will resemble the that of "A" (Mechanical (Forced) Draft Dry/Air-Cooling) (see Fig.4.3.12 on page 103 of Bechtel Report). But our height will be about 40 ft unlike 100 ft height of A.
Operation & Maintenance Costs	High (due to motors, switchgears, switchyard, etc.)	Low	Low	High (due to motors, switchgears, switchyard, etc.)	High (due to motors, switchgears, switchyard, etc.)	Low (due to lack of any electrical parts)
Supplementary Desalination Plant[3]	No	No	Yes	Yes	Yes	Similar to C, D & E as proposed, but direct sea water cooling is possible.
Relocation of the 230-kV Transmission Line[4]	Yes	Yes	Yes	Yes	Yes	Not required (as GCT needs no electricity input)

The Comparison Objective:	*to demonstrate certain key features of each of the technologies, based on the report of Bechtel[5] and show how such parameters in case of GCT will compare. In case of GCT, a field visit is required to provide an accurate and detailed estimate[6]*

NOTE:

1. Total Generation Loss calculation is taken from the Bechtel Report. However, there are some discrepancies between use of power for fan motors and total generation loss for Wet Mechanical Draft and Hybrid Wet-Dry cooling; nevertheless, it is clear that in case of GCT, the generation loss is the minimum.
2. We assumed that Civil Works include only the direct cost of erecting the Cooling Towers, and does not include any costs of pumps or of internal plant modifications or of water collection systems
3. We assume that desalination water is required for all the examined cooling towers.
4. We assume that the transmission line relocation is required only for Cooling Tower purpose
5. These are back-of-the envelop calculations from the Bechtel Report on Diablo Canyon Power Plant. Therefore, it may have some errors. It is intended to show a broad comparison along some key parameters in a very generic manner, and is not to be taken as a final comparison of any type of technologies, which may have better characteristics than these comparisons above.
6. The estimate for GCT can be given only after a study of the site, including a site visit.

Therefore, Green Cooling Tower **should be considered for evaluation** as the lowest cost, lowest risk, most energy efficient and most flexible (requiring little disturbance of the existing infrastructure) cooling tower technology as the Best Technology Available for replacing Once-Through Cooling.

Green Cooling Tower Solutions

A No-Electricity, Energy Efficient Industrial Cooling Tower

Table of Contents

Executive Summary

- Green Cooling Tower Solutions (GCTS) has **patented and commercialized (o**ver 2 years) an induced draft modular cooling tower (Green Cooling Tower – GCT) that uses **no electricity** to power the fan; instead it uses the existing pressurized water flow available within the circulation system to power the fans.
- GCT can be used as **both base load tower -** for replacement or new installations, **and supplemental -** designed to take partial load off existing towers). It can operate in any industrial setting where a cooling tower is needed; however, the largest markets are power plants, petroleum refineries, and chemical plants.
- GCTs can be installed (i) **in greenfield projects,** (ii**) as a replacement for the existing conventional towers** or (iii) as a **"retrofit" in the conventional tower** if the tower has a considerable life, and its structure is strong. GCTS can recommend the best option in discussion with the users in their best interest.
- GCT can be **installed as a capex program with depreciation benefits,** or (ii) **under a long term lease,** where the lease premium could remain below the cost savings in power and O&M expenses – **a net cash inflow for the user**.
- Conventional cooling towers are typically powered by 200-300 HP electric motors running 24hours/ 7 days a week; some plants use up to 100 of these units. At an average power tariff of $0.07/kWh, **a 300 HP motor will consume over $11,400 per month**; however, this number is much higher in places like California, New York, and Western Europe where power tariffs are much higher.
- Regulations under EPA's Clean Water Act (Sec 316B), passed in 2012, addresses the serious environmental problems with once-through cooling systems (a worldwide problem), and suggests cooling towers as the best technology available to address this problem. **GCT is the most optimal alternative in the cooling tower market today**.
- Industrial Energy Efficiency is a priority area for all governments. Electric Motor Driven Systems (EMDSs) is the single largest electrical end-use and, therefore, many states in the US and many countries are offering incentives to adopt energy efficient technologies in manufacturing.
- GCTS welcomes partnerships with utilities and refineries to implement this technology and save resources/money for the users.

Technology – How It Works

- **Green Cooling Tower** harnesses hydraulic energy to drive a specially designed hydro-turbine, which turns a fan shaft and fan blades on the unit. A sufficient amount of air flow is generated by this mechanism to cool the water flow (supplied to the turbine) to the optimal approach to the saturation (wet bulb) temperature of the air. This cooling is done by draining the return water out of the hydro-turbine into a spray nozzle assembly which distributes the water evenly across the section of the film fill. The airflow so generated flows upwards in a counter-flow fashion, exchanging heat with the water across the film fill. The cool water then is returned to the system. The amount of reduction in water temperature achieved is dependent on the baseline performance capability of the existing tower and the number of "Green" Cooling tower units used.

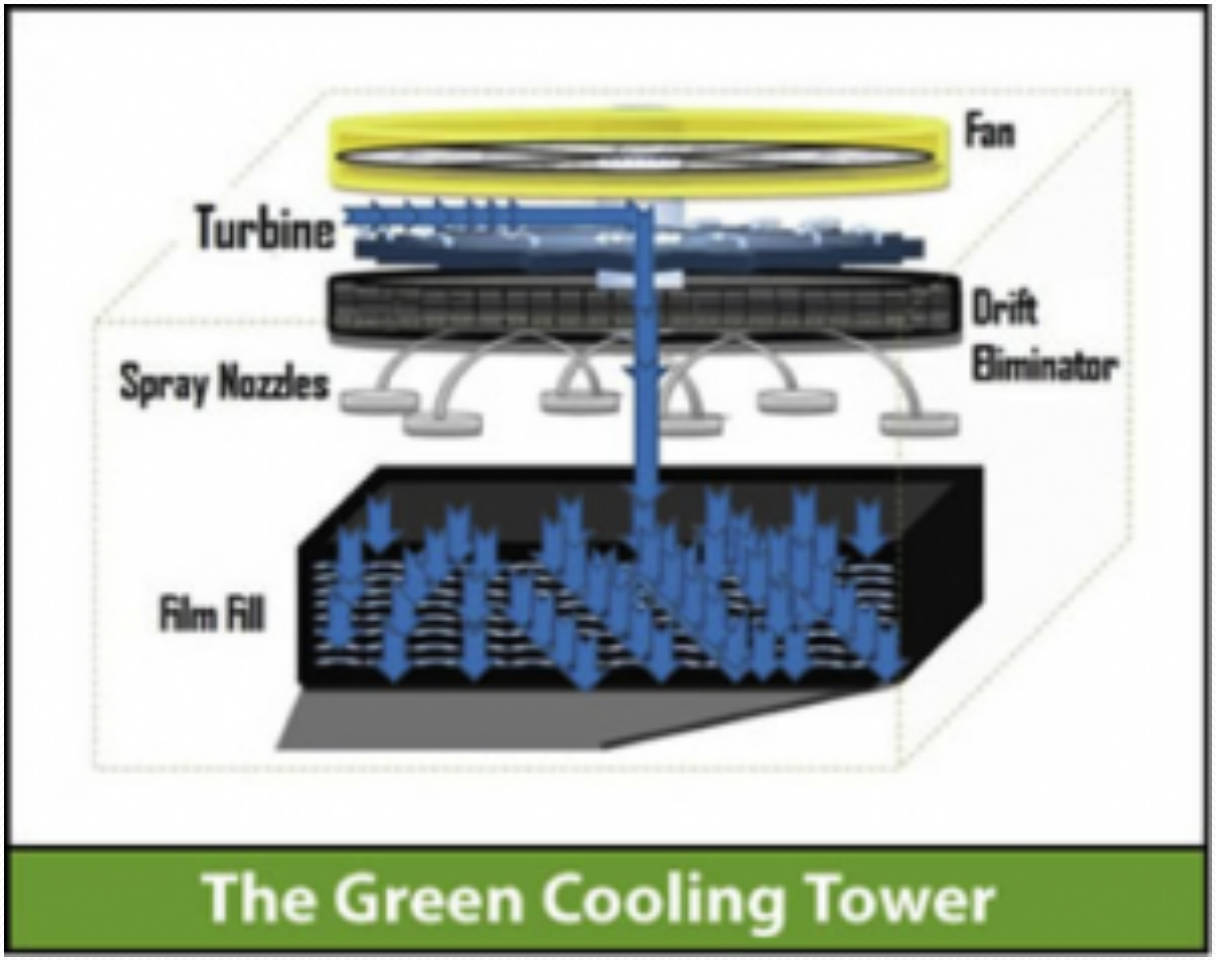
- It is **Energy Efficient**, because it uses the pressure already available within the recirculating cooling system to run the large industrial fan without any use of electricity or electric motor or any electric infrastructure. It uses that pressure which would otherwise go waste – in an existing tower, this pressure is used to raise the water to the top of the tower. In case of GCT, we use the same pressure to raise the water to a much lower height and use the remaining pressure to generate mechanical energy to drive the fan and also spray the hot water for cooling. Thus, GCT saves the electricity which is otherwise required (in conventional towers) for powering the motor to run the fans.

Technology – How It Works ...

- **Technology:** GCT's tower heights vary: deck height of 20-30 ft, and total height of 32-42 ft. Conventional cooling towers generally have a height of around 60 ft (deck height ~50 ft); and their inlets have a height of around 40 ft. In contrast, GCTs have inlet at a height of 13.5 ft. This difference in height (40 ft – 13.5 ft = 26.5 ft) creates a pressure head that is used by GCTs to drive the specially designed turbine (placed ~6 ft below the fan), and spray the hot water.

- **Higher Efficiency and Reliability**:
  - The power typically delivered to each fan of GCT is more than the power used on electrically driven motors to run fans in conventional cooling towers. This ensures better airflow, more cooling efficiency and higher reliability in GCT system.
  - GCT turbine efficiency is about 95%; the fans used by our cooling towers are among the most efficient ones in the industry and have total efficiencies up to 87%.
  - The fills in GCT have larger surface areas that aid more evaporation and therefore better cooling. The drift loss in GCT is about 0.002%, and the blow-down loss is variable and depends on the water quality. It can achieve a 3% loss level by strictly controlling the water quality.
  - GCT's cooling capacity is designed at 101% of the cooling specs; and without any electric infrastructure that is usually prone to breakdowns. Hence, highly reliable.
  - It can also use sea-water directly, with minimal filtration, but without requiring desalination – hence a cost-effective environmentally friendlier alternative to Once-Through Cooling systems.

Green Cooling Tower Model



Current Installation at CITGO

Current Installation-Fan View

GCT's Citgo Results: Comparison with BASELINE DATA

Green Cooling Towers

Comparison with Base Line Data at Citgo Refinery, Lake Charles, LA, USA

Parameters	CITGO Old Cooling Tower (electric motor operated)	Green Cooling Tower	Comments on Savings
No. & Type Of Cells	7 Crossflow	2 Counterflow	Less construction
Capacity (Total)	12,000 Gallon per Minute (GPM)	12,000 GPM	
Capacity (Cell)	2,000 GPM + 1 supplemental	One 8,000 GPM, and the other 4,000 GPM	
Tower Dimensions[1]	120 ft x 90 ft	42 ft x 42 ft (one cell) and 30 ft x 30 ft (other cell)	8,136 sq ft less land needed
Electrical Parts			
(i) Electric Motor (HP) & (kW)	**400 HP or 298 kW**	**No Motor Required**	No motor, gearbox, wiring, switchgear, etc. are needed in GCT. It resulted in a **permanent Load Reduction of 298 KW**
(ii) Gearbox	One/cell	None	
(iii) Wiring	Yes	None	
(iv) Switchgear	Yes	None	
Fan (diameter in ft)	18	28 ft and 24 ft	Higher efficiency fans
Fills	Splash type	CF 1900	
Shaft	From Motor to Gearbox	Direct Drive from Turbine to Fan	
Hot Water Intake Height	40 ft	13.5 ft	
Tower Height	52 ft	32 ft	Lower height; less civil work and maintenace
Electricity Consumption (Total) (kWh)- ANNUAL	2,610,480 kWh	Zero	2,610.5 MWh
Electricity Cost (USD) (Total)(.07/kWh)	$182,733.60	$0.00	$182,733.60
O&M Costs (Annual)	$28,660.00	$0.00 (over 2 years)2	$28,660.00
Chemical Costs	$32,672.00	$32,672.00	
Safety	Spark hazard from electric motor/circuitry, serviceable components elevated 40'	Explosion proof by design, Built in soft start, low maintenance components at 20' deck, otherwise, existing pump supplies power	Higher safety
Noise Pollution	High (noisy process)	Low - no electric motors, gearbox	Less noise pollution
Reliability of Cooling Tower	Low (aging cooling tower in need of major overhaul, high frequency of major replacement components)	High (circulation of water supplies power)	High
Client's Cooling Requirement Met	Partially	Yes. They get more cooling than they need in Winter Months.	More than required

Note:
1. Typically, GCT's land requirement is similar to those of conventional CTs. However, in this case, the cells were not sized appropriately in old tower, resulting in savings in land requirement.
2. Although Citgo reported zero maintenance cost, we expect the miantenance cost to be will be very small due to change of fills (as required) and maintenance of water turbine, etc. once in several years.

GCT's Citgo Facility Results

- New 2-cell Green Cooling Tower at Citgo's PFU unit has performed flawlessly since its installation over 2 years ago.
- Citgo has since taken its existing 7-cell tower offline and has slated them for demolition. GCT tower has taken 400 HP from existing 7-cell tower offline permanently.
- The key distinctions drawn from comparison with Baseline Data (of the 7–cell, conventional, old cooling tower) are:

  1. *No electricity use - annual savings of $182,734*
  2. *No maintenance cost - annual savings of $28,660*
  3. *Total Savings - $211,394 every year*
  4. *Total Load Taken off the Grid: 298 kW (400 hp)*
  5. *Other improvements: less noise pollution and higher reliability and sufficient cooling, exceeding their requirement.*

- CONCLUSION: By installing a 2-cell Green Cooling Tower, Citgo Refinery saves $211,394 every year – a potential saving of $2.11 million in 10 years.
- Typically refineries, chemical plants and power plants have over 20-30 cells, sometimes going as high as over 50. Although each case will be different as each use has specific parameters, nevertheless, this give a clear indication of the **enormous cost savings** that could be achieved for large users of cooling towers.

GCT'S SUPERIOR TECHNOLOGY

- **Reduced energy consumption**. If GCT is placed in a new installation, or replaces an existing tower, it will function with existing or designed pumping capacity - no additional pumping is required. If GCT is used as a supplement, it can remove 80% of the load off the existing cooling towers it supplements.
- **Production improvements**. GCTS can address inefficiency problems, which several plants currently face, with a truly affordable solution. Additional cold water in most plants usually takes an enormous capital expenditure; so most plants operate at a fraction of their capacity in warmer months. The increased revenue from the optimization of the plants will usually dwarf the energy savings, especially in petroleum refineries that produce different products depending on the temperature of their process water.
- **Energy independent**. It may seem illogical to stress the significance of losing power in a power plant, but as we saw in the disaster at Fukushima with the primary and backup generators down, it is a major undertaking to circulate and cool water. Our GCT technology can address primary or secondary cooling needs without costly additional and sometimes unreliable backup generators. We believe, GCT can be a key component in making nuclear plants safer.
- **Environmental compliance**. In today's environmentally conscious world, there is both social pressure and regulatory requirements and incentives for plants to retrofit from open (once-through cooling) to closed (cooling tower) cooling systems. This will essentially eliminate 95-97% of the current water demand industrial plants take from clean water sources, such as rivers, lakes and oceans. It is also a viable, cost-effective alternative to Once-through Cooling.

Superior Technology- Continued:

- **The GCTS Approach.** GCTS seeks to replace the following cooling towers:
  - **Conventional Wet Cooling Tower**: in all cases where the traditional wet cooling towers use electric motors to run the fans
  - **Once-Through Cooling**: all cases, where this system is considered environmentally damaging and/ or more expensive that the GCT.

    Once-Through-Cooling system: (a) takes huge volumes of clean water from sea/ lake/ river - rivers and lake water are scarce sources of clean water; and (b) dumps the hot water back in the same clean water source in large volumes, that is obviously very damaging to the ecosystems, in some cases eliminating up to 90% of aquatic life. US EPA's "**Clean Water Act's Section 316B**" (2012), addresses the entrainment and entrapment problems caused by "Once-Through Cooling" and recommends cooling towers as the Best Available Technology (BAT) because, among others, cooling towers will eliminate 95-98% of the current water demand of industrial plants from sources of clean water, and thereby drastically limit environmental damage.
  - **Air Cooling:** in some cases, where the cost of air cooling is rather prohibitive, and where GCT can compare well with its various advantages
  - **GCT's Advantages:**
    - GCT will eliminate electric motors, electrical infrastructure (e.g. switchgear, motor control centers, etc.), and electrical engineering involved with the equipment. This upfront expense could be in the order of several million dollars.
    - The plant also capitalizes on immediate energy savings from GCT, and can project these cost savings out as long as our cooling tower is in their plant. This could be in the hundreds of millions of dollars.

Power Plant layout current

GreenCoolingTower SOLUTIONS

24 CELL SUPPLEMENTAL PROPOSAL

GREEN COOLING TOWER SOLUTIONS

72 CELL SUPPLEMENTAL PROPOSAL

GREEN COOLING TOWER SOLUTIONS

Benefits for Power Plants

- **Additional Revenue:** A typical thermal power plant – either stand-alone or captive - uses about 0.5% to 2.0% of its gross energy generation in cooling. GCT can enable the plant to save this substantial amount of electricity and sell to the market. For example, in a 1,000 MW plant, the additional sales can range between 5 MW and 20 MW (0.5% to 2%). At a 90% PLF and at sales tariffs of $0.07 /kWh and $0.20 /kWh, respectively, the additional earnings can be significant even for a large utility:

Additional Revenue from Sales of Saved Energy (1,000 MW Plant)

Tariff ($/kWh)	5 MW Add'l Sales ($ Mn)	20 MW Add'l Sales ($ Mn)
0.07	$2.76 Mn	$11.04 Mn
0.20	$11.04 Mn	$44.15 Mn

This additional earnings goes directly to **Earnings Before Tax (EBT)** in the plant's income statement, as all other costs (e.g. fuel, insurance, O&M, interests & depreciation) remain unchanged as they would have already been accounted for in the sale of remaining 98%-99.5% power.

Benefits for Power Plants (contd.)

- **Energy Efficiency Revenue:** Many countries have created mechanisms to commercialize energy efficiency gains by users. Energy Savings Certificates are tradable, similar to renewable energy certificates, that typically represent 1 MWh of energy savings from energy efficiency projects. ESCs are also known by various names in various states, including: Portfolio Energy Credits in Nevada, Class III Renewable Energy Credits in Connecticut, Tier II Alternative Energy Credits in Pennsylvania, etc. ***Currently, 21 US states have energy efficiency targets, either mandatory or voluntary***. Outside the US, New South Wales (Australia), Italy, Great Britain and France have since established ESC trading programs. India's "***Perform, Achieve and Trade***" (PAT) is a market-based mechanism to monetize energy efficiency in 9 energy-intensive sectors (power sector has ~65% share). Targets are set under Section 14 of the Energy Conservation Act, 2001, and non-compliance will attract penalties. Thus, energy efficiency can count as another potential source of revenue for utilities.

- **Other Benefits:** Power plants will also benefit from:
  - lower O&M costs; hence financially more attractive;
  - higher safety and reliability;
  - better cooling efficiency leading to higher capacity utilization, and
  - more environmentally sustainable, lower noise, and smaller environmental footprints.

- **Warranty:** The performance of GCT will be backed by industry-standard warranties.

Retrofit & Other Options

- **Retrofit Option:**

  To target operating projects, GCTS is also offering a "retrofit" option - if the cooling tower is a few years old and its structure is still strong, then instead of demolishing the whole cell, we can use parts of the existing cell and install our turbine. This will minimize the cost for the client. The key modifications will include:

  - Use the existing cell structure - if it is a few years old and is still quite strong to survive well for next 20 years
  - Take out all electrical parts - motors, wirings, gearbox, etc.
  - Use the existing fan - only if its total efficiency is 80% or higher
  - Install the water turbine (with special support) and hot water inlets at a lower height
  - change of fills as necessary

  This retrofit option will minimize any additional land requirements for clients to install GCT, and will motivate them to go for retrofits even if their Cooling Tower is a new or a few years old.

- **Sea Water Use – Viable Alternative to Once-Through Cooling**

  GCT can use sea water directly in its cooling system, without requiring any desalination. With minimal changes for adaptation of this corrosive salt water, GCT can replace Once-Through Cooling systems without compromising its efficiency, reliability and cost-effectiveness. For those power and chemical plants and refineries sited near sea or lakes, GCT can assist them in transitioning to cooling tower technology to comply with EPA's regulations which have mandated users of Once-Through Cooling systems to transition to cooling towers within a defined time frame. So using direct sea water, GCT will be the most cost-effective and environmentally friendlier technology that is currently available in the market as an alternative for Once-Through Cooling systems.

Financial Viability & Savings

Cost Structure Comparison

GCT vs Conventional Electric Motor Driven CT

Parameters	Scattergood Generating Station, Santa Monica, CA (electric motor operated) [1]	CITGO Old Cooling Tower (electric motor operated)	Green Cooling Tower
No. & Type Of Cells	26 Counterflow	7 Crossflow	2 Counterflow
Capacity (Total) (GPM)	344,000	12,000	12,000
Capacity (Cell)	13,230.77	2,000 GPM + 1 supplemental	One 8,000 GPM, and the other 4,000 GPM
Tower Dimensions	288x54X58; 288,54x58; 374x54x60	120 ft x 90 ft	42 ft x 42 ft (one cell) and 30 ft x 30 ft (other cell)
Electrical Parts			
(i) Electric Motor (HP) & (kW)	211x26=5,486 hp or 4,087 kW; per cell 211 HP or 155.19 kW	**400 HP or 298 kW Total; 42.6 kW per cell**	**No Motor Required**
(ii) Gearbox	One per cell	One per cell	None
(iii) Wiring	Yes	Yes	None
(iv) Switchgear	Yes	Yes	None
Total Capital Cost	$1.735 mn per cell ($45.1 mn Total)	Not known as it is over 50 years old	$1.4 mn per cell
Capital Cost in terms of $ per GPM	**$131/ GPM**	**Not known as it is over 50 years old**	**$116.67 / GPM**
Electricity Consumption (Total) (kWh)- ANNUAL	1.378MWh per cell or 35.303 MWh total	2.61 MWh (total); 1.305 MWh per cell	Zero
Electricity Cost (USD) (Total)(.07/kWh) (ANNUAL)	**$95,163 per cell; $2.474 million Total**	**$182,733.6 Total; $91,366 per cell**	**Zero**
Electricity Cost (USD) per Gallon per annum (GPA)	**$7.20 per GPA**	**$15.23 per GPM**	**Zero**
O&M Costs (Annual)			
Average (20-year period) O&M Cost	**$63,731 per Cell**	**$30,666 per cell**	**$16,336 per cell**
Average (20-year period) O&M Cost: $/GPA	**$4.82**	**$5.11**	**$2.72**
Total Annual O&M Cost	**$52,981 per cell; Yr-12: $76,869**	**$61,332 Total; $30,666 per cell**	**$32,672 Total; $16,336 per cell**
Safety	Spark hazard from electric motor/circuitry, serviceable components elevated 40 Ft	Spark hazard from electric motor/circuitry, serviceable components elevated 40 Ft	Explosion proof by design, Built in soft start, low maintenance components at 20' deck, otherwise, existing pump supplies power
Noise Pollution	High (noisy process)	High (noisy process)	Low - no electric motors, gearbox
Reliability of Cooling Tower	Low (aging cooling tower in need of major ove	Low (aging cooling tower in need of major overhaul, high frequency of major replacement components)	High (circulation of water supplies power)
Client's Cooling Requirement Met	Met	Partially	Yes. They get more cooling than they need in Winter Months.

NOTE:

1. The cost estimates have been prepared by Tetra Tech, Inc. based on competitive quotes obtianed from cooling tower companies. Please see its report "**California's Coastal Power Plants: Alternative Cooling System Analysis**" prepared for California Ocean Protection Council (pg O-1 to O-39). Please bear in mind that this estimate is of 2006, which would have increased at least 2% every year since then (acumulative increase of 17.2%), whereas GCT's price is current.

2. Various costs in terms of $ per GPM provides the accurate comparison as it is irrespective of the cell capacity. Based on unit cost comparison, the conclusion is:
   A. In terms of Capital Cost per gallon per minute, GCT is 11% cheaper than Scattergood Station
   B. In terms of Electricity Cost per GPM, GCT has zero cost, compared with Scattergood's cost of $7.20/GPM
   C. In terms of average O&M Cost per GPM, GCT is 44% cheaper than Scattergood Station

Financial Viability & Savings:

Savings in (24- & 72-cell CT)

Green Cooling Towers vs. Traditional Motor-driven Cooling towers

(IN USD)

Cost Items	24-Cell Tower (12,000 GPM each)			72-Cell Towers		
	Motor-driven CT	GCT	Benefit from GCT	CT	(GCT)	Benefit from GCT
Capital Cost						
Electrical Infrastructure Cost	$6,200,000	$0	$6,200,000	$18,600,000	$0	$18,600,000
Electricity Cost						
Electricity Cost (@$7.2 Gallon p.a.)	*$7.20*	*$0*	*$7.20*	*$7.20*	*$0*	*$7.20*
Electricity Cost (p.a.)	$2,073,600	$0	$2,073,600	$6,220,800	$0	$6,220,800
Electricity Cost (20-yr)	**$41,472,000**	**$0**	**$41,472,000**	**$124,416,000**	**$0**	**$124,416,000**
O&M						
O&M Cost (@4.82 Gallon p.a.)	$4.82	$2.72	$2.10	$4.82	$2.72	$2.10
O&M (20-years)	$27,763,200	$15,667,200	$12,096,000	$83,289,600	$47,001,600	$36,288,000
TOTAL (20-year period)	$75,435,200	$15,667,200	**$59,768,000**	$226,305,600	$47,001,600	**$179,304,000**

NOTE:

1. All numbers are indicative; acutal calculations will vary with location, cost of generating power, power cost, and other associated costs. All cells have assumed capacity of 12,000GPM

2. For motor-driven CT, we have taken averages based on the cost estimates prepared by Tetra Tech, Inc. based on competitive quotes obtianed from cooling tower companies for Scattergood Generating Station. Please see its report "California's Coastal Power Plants: Alternative Cooling System Analysis" prepared for California Ocean Protection Council (pg O-1 to O-39). Please bear in mind that this estimate is of 2006, which would have increased at least 2% every year since then (acumulative increase of 17.2%), whereas GCT's price is current.

3. GCT's costs have been taken from the actual cost numbers obtained from Citgo Refinery

Lease Financing & Warranty

- **For US-based Customers: 15-year Lease Financing- Income from Day One**

  GCT has arranged lease financing options for certain categories of creditworthy, US based customers, whereby the cost of the GCTs could be fully paid for in terms of structured, long term lease payments directly from the plant's monthly O&M budget, which a plant manager can approve, and not as a new capex which may require the approval of the Board. The first installation at Citgo has been so financed.

  Wonders of Lease Financing:

  Assuming a power sales tariff of $0.07/kWh, a PLF of 100% and a lease term of 10+5 years, **the numbers are really very attractive for the Lessee who leases to buy 50 cells**:

  - **Total Annual Savings/ Revenue: $9.65 million (re**venue from sale of saved energy and from savings in O&M)
  - **Annual Lease Payment: $6.85 million**
  - **Annual Income to User:**
    - **Pre-Tax: $2.8 million**
    - **Post-Tax: $4.9 million**
  - **Total Income over Lease Term: $92.63 million**
  - **As an Operating Lease, treated as an off-balance sheet obligation.**
  - **A Profit Center from Day One:** With full tax and other benefits, the Lessee earns a net income every year, which is quite substantial. Never in the past has any user of Cooling Tower made any income from it as Cooling Tower has always been treated as a Cost Center. However, the lease financing makes it a Profit Center from Day One without investment of any capital.
  - **No Investment Required: only upfront guarantees depending on creditworthiness of the Lessee.**

- **Warranty For Customers:** GCT's performance and operation is backed by industry standard warranties. In certain cases, if required, an operational guarantee insurance can be negotiated with a global insurance company.

GCT- An Overview

- **An innovative, no-electricity, energy efficient, low maintenance Cooling Tower**
- **Additional Revenue and eligibility for energy savings certificates, where applicable**
- **Lower O&M costs:** it eliminates electricity use while producing better efficiency
- **Financing available**
- **Improves plant reliability -** once installed, customers will benefit from reliability of our cooling towers.
- **Safety**
  - no electricity and no electric infrastructure; hence no spark hazard,
  - Lock out/Tag out is accomplished by simply closing a water valve.
- **Low Maintenance:** GCT eliminates the most troublesome components of the cooling tower (motor, shaft, gearbox, wiring, and switches). It has sealed bearings enclosed in an oil bath, so there are no high maintenance grease points.
- **Lower noise levels** from elimination of electric motor.
- **The GCT is a patented technology** (Patent No: US 8,104,746 B2) that has been proven in a real industrial complex and has exceeded expectations.
- **Warranty:** Performance of GCT is backed by industry standard warranties.
- **Net Positive Benefits**: If structured properly, it can benefit the users as it brings in net income for them under leasing or a reasonable payback period of 3-5 years if done under a capex.

Spread the Green Technology

- Green Cooling Tower is financially attractive and environmentally friendly alternative to once-through cooling and electric motor operated induced draft cooling towers.
- GCT can be used in any manufacturing plant that uses a cooling tower where the volume of water to be cooled is 2,000 gallons per minute (126 liter/sec) or higher. It an be used in power plants (gas, coal, oil and nuclear), refineries, chemical/ fertilizer/ steel/ cement plants. It can also be used in universities, large hospitals, shopping malls, etc.
- After its successful and seamless operation of over 2 years at Citgo refinery in Lake Charles, LA, the GCT is now undertaking rapid expansion. Hence, GCTS would like to install them at some of the larges users of cooling towers in all regions of the country, as well as abroad. Its performance is backed by industry standard warranties.
- GCTS has partnered with a funding agency which provides lease financing for purchase of GCTs within the US. Thereby, the user will have to make monthly lease payments which will come out of the plant's monthly O&M budget.
- We welcome partnership with any large Power Group, Refineries, other users and Energy EPC/ Consulting firm, and welcome their experts to visit our Lake Charles GCT facility.
- We look forward to working with your group to save tens of millions of dollars worth energy and operating expenses, increase revenue, plant safety and reliability, and reduce environmental footprints through the use of this sustainable, energy efficient technology.

Thank You!

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GreenCoolingTower SOLUTIONS