Database of U.S. CHP Installations Incorporating
Thermal Energy Storage (TES) and/or Turbine Inlet Cooling (TIC)
Updated: 9/4/03

Prepared for: **UT-Battelle, Oak Ridge National Laboratory**
U.S. Department of Energy
Prepared by: **The Cool Solutions Company - Lisle, Illinois**
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CHP Case No.	CHP Facility Name and Location: Name of Facility, Owner, or Operator	City	State	Year CHP In Service	Complementary Technologies: TES	TIC	Type(s) of Building Applications Served by System: Edu	Med	Airport	Govt	Comm	Indust	Other	District	Power Generation from CHP Prime Mover(s) Only: Technology Type and Details	MW(e)	Total On-site System Capacity: Power MW(e)	Heating MMB/h	Cooling tons
1	California State Polytechnic University	Pomona	CA	1989	yes		yes							yes	1 x 0.35 MW Caterpillar gas-fired recip engine	0.4	0.4	60	4,950
2	California State University - Long Beach	Long Beach	CA	1987	yes		yes							yes	1 x 0.2 MW Caterpillar gas-fired recip engine	0.2	0.2	50	5,000
3	California State University - Northridge	Northridge	CA	2001	yes		yes							yes	1 x 180 kW Capstone Microturbine	0.2	0.2	50	3,750
4	California State University - San Diego	San Diego	CA	2003	yes		yes							yes	1 x 3 (+2 future x 5) MW NG-fired CTs	13.0	17.4	116	4,000
5	El Paso - Badger Creek	Bakersfield	CA	1990		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		800
6	El Paso - Bear Mountain	Bakersfield	CA	1992		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		800
7	El Paso - Chalk Cliff	Maricopa	CA	1988		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		800
8	El Paso - Corona Cogen	Corona	CA	2002		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	37.0	37.0	0	2,000
9	El Paso - Live Oak	Bakersfield	CA	1991		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		800
10	El Paso - McKittrick	McKittrick	CA	1991		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		800
11	El Paso - San Joaquin	Lathrop	CA	1987		yes						yes			1 x 33.8 MW GE LM5000 NG-fired CT	35.0	48.0		1,400
12	Hanford Joint Union School District	Hanford	CA	1988	yes	yes	yes								1 NG-fired cogen	0.1	0.1		85
13	Norwalk Metropolitan State Hospital	Norwalk	CA	1988	yes	yes		yes							1 x 22 MW GE LM2500 NG-fired CT	28.0	28.0	35	1,500
14	Occidental College	Los Angeles	CA		yes		yes							yes			0.3	10	1,000
15	Stanford University	Palo Alto	CA	1987	yes		yes							yes	1 x 39.2 MW GE NG-fired CT	39.2	49.9	720	20,000
16	Texaco Cogeneration Co.	San Ramon	CA		yes('95)	yes('95)						yes			1 NG-fired CT	38.0	38.0		378
17	Tractebel Power - Ripon Cogen	Ripon	CA	1988		yes ('97)						yes			1 x 52 MW GE/IHI STIG LM5000 NG-fired CT	35.0	52.0		2,000
18	University of California - Los Angeles	Los Angeles	CA	1994	yes		yes							yes	2 x 14.5 NG-fired CTs	29.0	48.0	105	21,600
19	University of California - San Diego	San Diego	CA		yes		yes							yes	2 x CTs	25.6			
20	Fort Lupton Cogeneration Corp.	Fort Lupton	CO			yes						yes			5 x 40 MW NG-fired CTs	200.0			2,200
21	The Energy Network	Hartford	CT	1989	yes					yes	yes			yes	1 x 3.9 MW Solar Centaur 50 NG-fired CT	3.9	3.9		
22	Yale University	New Haven	CT	1997	yes		yes							yes	3 x 6 MW Nova Pinone GT + 3 x 1.5 MW diesel e	22.5	22.5	640	33,200
23	CSW - Mulberry Cogen	Bartow	FL	1992		yes						yes			1 x 85 MW GE Frame 7EA NG-fired CT	85.0			4,000
24	Reedy Creek (Disney World)	Lake Buena Vista	FL	1988	yes	yes					yes			yes	1 x 32 MW GE LM5000 NG-fired CT	32.0	40.0	90	14,425
25	U.S. Air Force		FL	planned		planned				yes					4 x 30 kW NG-fired microturbine	0.1	0.1		450
26	Kalaeloa Partners L.P.	Kapolei	HI			yes('98)						yes			2 x 74.6 MW ABB type 11N fuel-oil-fired CTs	149.2	200.7		
27	Trigen-Peoples District Energy	Chicago	IL	1997	yes	yes				yes	yes			yes	3 x 1.1 MW Turbomeca Makila TI, NG-fired CTs	3.3	3.3	370	16,800
28	University of Evansville	Evansville	IN	1997	yes		yes							yes	1 x 1.1 MW Cooper gas engine	1.1	1.1	100	1,900
29	University of Iowa	Iowa City	IA	early1900s	yes		yes							yes	none	0.0	21.5	500	
30	University of Maryland	College Park	MD	2002		planned	yes								1 x 60 kW Capstone NG-fired microturbine	0.1	0.1		108
31	Trigen-Cinergy (General Motors)	Lansing	MI	2001	yes							yes		yes	none	0.0	3.6	280	14,000
32	University of Michigan	Ann Arbor	MI	1897	yes		yes							yes	2 x 3.5 MW Solar NG-fired CTs	7.0	48.5	1,195	
33	District Energy St. Paul	St. Paul	MN	2003	yes					yes	yes			yes	none	0.0	25.0	764	13,892
34	Trigen - Kansas City Energy Corporation	Kansas City	MO	1991	planned					yes	yes	yes		yes	none	0.0	86.0	1,250	12,000
35	Black Hills Power - Las Vegas Cogen	Las Vegas	NV	2002		yes						yes			4 x 45 MW GE LM6000 NG-fired CTs	180.0	180.0		4,000
36	Princeton University	Princeton	NJ		2005		yes							yes	1 x 14.6 MW GE NG-fired CT	14.6	14.6	332	15,500
37	Trigen Energy	Trenton	NJ	1983	yes					yes	yes			yes	2 x 6.0 MW diesel recip engines	12.0	12.0	320	11,270
38	Union County Vo-Tech	Scotch Plains	NJ	2001	yes		yes								microturbines	0.2	0.2		240
39	Cornell University	Ithaca	NY		yes		yes							yes	none	0.0	8.0	600	28,000
40	Honeoye Falls High School	Honeoye Falls	NY	2000	yes		yes								reciprocating engine generators	0.6	0.6		170
41	KIAC Partners (JFK Int'l Airport)	Jamaica	NY	1994		yes			yes					yes	2 x 42.5 MW GE LM6000, NG(or Jet A)-fired CTs	85.0	110.0	450	28,000
42	TBG Cogen	Hicksville	NY			yes('00)						yes			2 x 21.9 MW GE LM2500 NG-fired CT	43.8			
43	Trigen Energy	Garden City	NY	1991		yes	yes	yes		yes	yes			yes	1 x 42 MW GE MS6001B NG-fired CT	42.0	57.0	830	16,400
44	University of North Carolina	Chapel Hill	NC	1992	2004		yes							yes	none	0.0	28.0	650	24,400
45	Trigen Energy	Oklahoma City	OK	1989 / 92		yes				yes	yes			yes	1 x 350kW diesel ('89) + 1 x 520kW CT-gen ('92)	0.9	1.2	296	17,600
46	Trigen Energy	Tulsa	OK	1989 / 92		yes				yes	yes			yes	1 x 350kW diesel ('89) + 1 x 520kW CT-gen ('92)	0.9	1.3	291	24,150
47	Trigen Energy	Philadelphia	PA	1998		yes	yes	yes		yes	yes	yes	yes	yes	1 x 120 MW Westinghouse dual-fuel (NG or oil) C	120.0	174.4	1,900	6,000
48	Baylor University	Waco	TX			yes	yes							yes	1 CT	3.0	3.0	125	7,200
49	Calpine - Clear Lake Cogen	Pasadena	TX	1982	yes('99)	yes('99)						yes			3 x 105.6 MW Westinghouse 501 D5 NG-fired CT	316.8	412.0		9,500
50	D/FW International Airport	Dallas / Ft. Worth	TX	2007	yes				yes					yes	CT	110.0		515	41,000
51	Hunt Oil Company	Dallas	TX			yes('99)						yes			2 x 28 MW GE Frame 5 CTs	56.0			
52	Huntsman Petrohemicals Corp.	Port Neches	TX			yes('95)						yes			2 x 39.6 MW GE Frame 6B NG-fired CTs	79.2	96.0		2,800
53	Washington State University	Pullman	WA	1982	yes		yes							yes	none	0.0	2.0	538	6,186
54	Norteshopping Mall	Rio de Janeiro, RJ	Brazil	1996	yes('96)	yes('98)					yes				1 x 1.2 MW Turbomeca Makila NG-fired CT	1.2	1.2	13	2,000
55	Trigen Energia	Altamira, Tamaulipas	Mexico	2000	yes							yes				17.0	17.0	160	5,500
56	Climaespaco	Lisbon	Portugal	1998	yes	yes				yes	yes			yes	1 x 5.2 MW Solar Taurus 60 CT	5.2	5.2	93	6,198

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CHP	Thermally-Activated System Outputs (Associated with the CHP System)											Timing of CHP Project			Local Electric Utility Rate (approximate)			
Case	Power			Heating			Cooling			Dehumidification		new	retro	pure	on-peak	on-peak	off-peak	demand
No.	Technology	MW(e)	% of Tot	Technology	MMB/h	% of Tot	Technology	tons	% of Tot	Technology	cfm	constr	expans	retro	hrs/day	$/kWh	$/kWh	$/kW-mo
1	none	0.0	0%				none	0	0%						8	$0.125	$0.075	$6.60
2	none	0.0	0%				none	0	0%						6	$0.195	$0.088	$24.55
3	none	0.0	0%												6	$0.195	$0.088	$24.55
4	steam turbine	4.4	25%	2 x HRSGs for stm htg			1x1000T + 2x400T stm-ab	1,800	45%						7	$0.016	$0.012	$11.26
5	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	800	100%			yes			6	$0.195	$0.088	$24.55
6	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	800	100%			yes			6	$0.195	$0.088	$24.55
7	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	800	100%			yes			6	$0.195	$0.088	$24.55
8	none	0.0	0%	HRSG			none	0	0%					yes	6	$0.195	$0.088	$24.55
9	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	800	100%			yes			6	$0.195	$0.088	$24.55
10	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	800	100%			yes			6	$0.195	$0.088	$24.55
11	steam turbine	13.0	27%	HRSG			1 x 1-stage stm LiBr abs	1,400	100%			yes			6	$0.188	$0.095	$13.35
12	none	0.0	0%	hot water heat recovery			peak-shave for elec recip	85							6	$0.195	$0.088	$24.55
13	steam turbine	7.0	25%	HRSG for steam	35.0	100%	none	0	0%			yes			6	$0.195	$0.088	$24.55
14							none	0	0%						4	$0.028	$0.016	$10.17
15	steam turbine	10.7	21%	HRSG			none	0	0%						6	$0.188	$0.095	$13.35
16	none	0.0	0%	HRSG			none	0	0%						6	$0.188	$0.095	$13.35
17	steam turbine	17.0	33%	HRSG			none	0	0%						6	$0.188	$0.095	$13.35
18	steam turbine	19.0	40%	HRSG	47	45%	stm turb-drvn & stm-abs								4	$0.028	$0.016	$10.17
19				HRSG											7	$0.016	$0.012	$11.26
20	steam turbine(s)						none	0	0%									
21	none	0.0	0%	HRSG	32										16	$0.056	$0.039	$9.13
22	none	0.0	0%				4 x York stm LiBr abs	16,100	48%						16	$0.056	$0.039	$9.13
23				HRSG			none	0	0%						9	$0.022	$0.010	$7.44
24	steam turbine	8.5	21%	HRSG	90	100%	steam-absorption						yes		9	$0.022	$0.010	$7.44
25	none	0.0	0%	hot water heat recovery			none	0	0%	desiccant				yes	9	$0.023	$0.006	$5.81
26	steam turbine	51.5	26%	2 HRSGs	515		none	0										
27	none	0.0	0%	HRSG (exh from 3 CTs)	20	5%	2 x 1-stage stm LiBr abs	1,300	8%	none	0		yes		13	$0.050	$0.021	$16.41
28	none	0.0	0%				1 x 400 T stm-abs	400	21%									
29	3 steam turbines	21.5	100%												15	$0.032	$0.023	$9.85
30	none	0.0	0%	none	0	0%	Broad absorption chiller	17	16%	ATS solid desiccant	3,000			yes	8	$0.040	$0.017	$13.95
31	2 x 1.8 MW stm turbine	3.6	100%	4 x HW HXs	280	100%	none	0	0%			yes			8	$0.035	$0.031	$9.45
32	3x12.5 + 1x4 MW stm tu	41.5	86%												8	$0.155	$0.075	$0.00
33	steam turbine	25.0	100%				2 x LP stm-abs	1,000	7%				yes		12	$0.035	$0.026	$9.26
34	2x40 + 1x6 MW stm turb	86.0	100%	coal (& NG/oil) boilers	1,250	100%	3 x stm turb-driven	6,000	50%	none	0			yes	8	$0.055	$0.029	$6.20
35	none	0.0	0%	HRSG			none	0	0%					yes	6	$0.056	$0.014	$8.22
36	none	0.0	0%	HRSG	182	55%							yes		14	$0.082	$0.056	$8.76
37	none	0.0	0%	2 x waste heat HW HXs	160	50%	3 x 1-stage HW LiBr abs	1,700	15%						14	$0.082	$0.056	$8.76
38	none	0.0	0%	HRSG			none	0	0%					yes				$10.00
39	steam turbines	8.0	100%				none	0	0%						15	$0.095	$0.080	$9.15
40	none	0.0	0%				none	0	0%				yes					$5.00
41	steam turbine	25.0	23%	2 x HRSGs	225	50%	steam-absorption	7,000	25%				yes		14	$0.116	$0.070	$23.42
42																		
43	steam turbine	15.0	26%	1 x HRSG	260	31%	stm turb-drvn & stm-abs	16,400	100%				yes					
44	steam turbine	28.0	100%				5 x 1500T Trane stm-abs	7,500	31%						8	$0.043	$0.022	$12.92
45	steam turbine	0.3	27%	1 x HRSG ('92)	6	2%	3 stm-turbine driven	12,500	71%				yes		6	$0.026	$0.026	$7.99
46	476kW stm turb ('97)	0.5	35%	1 x HRSG ('92)	6	2%	4 stm-turb, 1 diesel driven	16,980	70%				yes		6	$0.026	$0.026	$7.99
47	stm turb + 3 cust. BPT's	54.4	31%	1 x HRSG	700	37%	customers' stm-turb & abs	6,000	100%					yes				
48	none	0.0	0%	HRSG	27	21%	steam-absorption	2,250	31%									
49	steam turbine			HRSG and HW			5 x 1-stage HW LiBr abs	8,300	87%					yes	10			
50				HRSG			steam turbine-driven	22,500	55%				yes					
51																		
52	2 x steam turbine	16.8	18%	HRSG			2 x 1-stage HW LiBr abs	2,800	100%									
53	steam turbine	2.0	100%				2 abs (Carrier & Trane)	1,316	21%						24	$0.034	$0.034	$2.25
54	none	0.0	0%	HRSG	13	100%	dbl-effect, LiBr, stm-abs	800	40%	desiccant wheel		yes				$0.096		
55													yes					
56	none	0.0	0%	1 x HRSG	41	44%	dbl-effect, LiBr, stm-abs	2,900	47%			yes						

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CHP	Thermal Energy Storage (TES)						Turbine Inlet Cooling (TIC)				
Case		secondary	S/R temp	design	capacity	DSM		Cooling	Enhancement		
No.	Technology Type and Details	fluid	deg F	shift	ton-hrs	MW(e)	Technology	tons	MW(e)	%	Reasons Cited for Installing the System(s)
1	stratified chilled water, above-ground welded steel CB&I tank	water	42 / 58		25,000	3.9	not applicable	n.a.	n.a.	n.a.	
2	ice storage				40,000		not applicable	n.a.	n.a.	n.a.	
3	stratified chilled water, above-ground welded steel Matrix tank	water	40 / 60		29,000						
4	stratified chilled water, above-ground welded steel SLT tanks (2)	water	40 / 60		22,000						
5	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	800	11.0	46%	economics
6	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	800	11.0	46%	economics
7	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	800	11.0	46%	economics
8	no TES	water		n.a.	0	0.0	water coils	2,000	12.0	48%	economics
9	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	800	11.0	46%	economics
10	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	800	11.0	46%	economics
11	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	1,400	11.0	46%	economics
12	ice-on-coil										
13	500,000 gal chilled water, above-ground welded steel tank	water	45 / 55	partial	3,467	0.6	water coils for 50.0 F inlet air	515	3.3	17%	
14	ice storage				1,500						
15	ice-on-coil(BAC), retro in orig 3 million gal below-ground concrete water tk				93,200						
16	ice harvester (Paul Mueller) 333,000 gal ice tank, weekly design cycle	water		full	14,800	1.3	water coils for 42.0 F inlet air	1,345	7.0	23%	economics
17	no TES	none	n.a.	n.a.	0	0.0	direct NH3 evap coils, 45 F air	2,000	8.0	19%	economics
18	stratified chiled water, below-ground concrete tank	water			30,000						
19	stratified chilled water, above-ground welded steel CB&I tank	water	39 / 55		35,900						
20	no TES	water		n.a.	0	0.0	water coils	2,200			economics
21	stratified chilled water, above-ground welded steel CB&I tank	water	40 / 55		20,000	1.9					
22	3 million gal stratified chiled water, below-ground concrete tank	water									
23	no TES	water		n.a.	0	0.0	water coils	4,000			economics
24	stratified chilled water, above-ground welded steel CB&I tank	water	40 / 58.3	partial	57,000	6.6	water coils for 50.0 F inlet air	2,000	8.0	31%	reliability, flexibility, and economics
25	no TES	water		n.a.	0	0.0	57 F inlet air from bldg's AHUs		6.0	25%	reliable back-up power; plus AC, htg, dom HW, clothes drying
26	no TES			n.a.	0	0.0	evaporative cooling	n.a.	5.0	4%	economics
27	stratified low temp fluid (SoCool), above-ground welded steel CB&I tank	E-G / water	30 / 54	full	123,000	20.0	direct NH3 evap coils, 50 F air	30	0.9	35%	District Energy (CHP-TES) was economic (cap and oper svgs)
28	50,000 gal chilled water storage tank	water					not applicable	n.a.	n.a.	n.a.	
29	stratified chiled water, below-ground concrete tank	water			7,000		not applicable	n.a.	n.a.	n.a.	
30	no TES	water	45 / 55	n.a.	0	0.0	water coils				research & development, demonstration, and field testing
31	stratified water/LT fluid (SoCool), above-ground welded steel CB&I tank	water(LTF)	42 / 62	partial	36,500	5.6	not applicable	n.a.	n.a.	n.a.	efficiency and economics
32	stratified chiled water, below-ground concrete tank (retro of baffle tank)	water	44 / 56		17,000						
33	stratified chilled water, above-ground welded steel CB&I tanks (2)	water	40 / 54-57	partial	65,400	8.6	not applicable	n.a.	n.a.	n.a.	reliability, fuel flexibility, efficiency, and economics
34	stratified low temp fluid (SoCool), above-ground welded steel CB&I tank	SoCool LTF	33 / 53	partial	48,000	6.0	not applicable	n.a.	n.a.	n.a.	economics and more efficient conversion of fuel to useful energy
35	no TES	water		n.a.	0	0.0	water coils	4,000			economics
36	stratified low temp fluid (SoCool), above-ground welded steel tank	SoCool LTF	32 / 64	partial	50,000						reliable steam and electricity, and "a good long-term investment"
37	stratified chilled water, partially-buried concrete tank	water		partial	20,000		not applicable	n.a.	n.a.	n.a.	efficiency and economics
38	ice-on-pipe (Calmac), internal melt	E-G / water		full	1,800	0.2					demand reduction
39	stratified chilled water, above-ground welded steel CB&I tank	water	40 / 55	partial	38,000		not applicable	n.a.	n.a.	n.a.	
40	ice-on-pipe (Calmac), internal melt	E-G / water		partial	450	0.1	not applicable	n.a.	n.a.	n.a.	
41	no TES	water	45 / 55	n.a.	0	0.0	water coils for 50.0 F inlet air				privatized central energy plant - capital for upgrade & expansion
42	no TES	n.a.	n.a.	n.a.	0	0.0	fogging (saturation)	n.a.			
43	no TES	water	43 / 60	n.a.	0	0.0	water coils for 46.5 F inlet air	1,880	8.0	24%	efficiency and economics
44	stratified water/LT fluid (SoCool), above-ground welded steel tank	water(LTF)	41 / 54		40,000		not applicable	n.a.	n.a.	n.a.	
45	no TES	water		n.a.	0	0.0	direct NH3 evap coils, 50 F air				efficiency and economics
46	no TES	water		n.a.	0	0.0	direct NH3 evap coils, 50 F air				efficiency and economics
47	no TES (no central cooling; cooling is thermally-driven at steam user sites	n.a.	n.a.	n.a.	0	0.0	evap ('98), fog wet compr ('01)	n.a.	15.0	15%	economics and environmental (emissions) benefits
48	no TES	water		n.a.	0	0.0	water coils for 60.2 F inlet air	178			
49	stratified chilled water, above-ground welded steel CB&I tank	water	38 / 64	full	107,000	8.0	water coils for 50.0 F inlet air	18,700	49.0	21%	TIC/TES added power at only $367/kW, improved heat rate by 4
50	stratified low temp fluid (SoCool), above-ground welded steel CB&I tank	SoCool LTF	36 / 60	partial	90,000						economics and reliability
51	no TES			n.a.	0	0.0	evaporative cooling				
52	no TES	water		n.a.	0	0.0	water coils for 50.0 F inlet air	2,800	11.8	18%	economics
53	stratified chilled water, above-ground welded steel CB&I tank	water	41 / 56	partial	17,750	2.1	not applicable	n.a.	n.a.	n.a.	
54	stratified chilled water storage tank	water					desscnt, CW/CHW coil, 68 F ai	n.a.	0.1	16%	economics
55	stratified chilled water, above-ground welded steel tank	water			4,700						economics
56	stratified chilled water, above-ground concrete tank	water	39.2 / 53.6	partial	39,807	4.0	water coils	50	0.8	17%	economics

Database of U.S. CHP Installations Incorporating
Thermal Energy Storage (TES) and/or Turbine Inlet Cooling (TIC)
Updated: 9/4/03

Prepared for: **UT-Battelle, Oak Ridge National Laboratory**
U.S. Department of Energy
Prepared by: **The Cool Solutions Company - Lisle, Illinois**
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CHP Case No.	CHP System Capital Cost	System Benefits: Economic	System Benefits: Environmental	Comments	Primary Information Source	Applicable Website Address
1				university campus system	IDEA and J. Andrepont-Cool Solutions	
2				university campus system	IDEA	
3				university campus system		
4	over $22 million (tax-expt fincg)			university campus system	District Energy, Vol. 88, No. 1, p. 34	
5	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
6	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
7	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
8	not available			independent power / industrial cogen	TICA and M. Solms-The Stellar Group	
9	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
10	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
11	not available			independent power / industrial cogen (enhanced oil recovery)	TICA and GTI-00/0140 5M MI 5/01	
12				Hanford High School	Energy Solutions, Vol. 1, No. 3	
13		Increases Cogen Plant On-Peak Capacity		cogen plant and hospital	R. Pasteris-Strategic Energy Services	
14				college campus system	IDEA	
15				university campus system	IDEA and J. Andrepont-Cool Solutions	
16				industrial cogen	Paul Mueller Co., TE-2034, 2000	
17				industrial cogen (paper mill)	Gas Turbine World, V28N2 Mar-Apr '98	www.tractebelusa.com
18				university campus system; IDEA's 1997 System of the Year Award	Carter-Burgess	
19			9 ppm NOx at CT, 2.5 at HRSG	university campus system	Carter-Burgess	
20	not available			industrial cogeneration	D. Punwani-Avalon Consulting	
21				urban District Heating & Cooling system	Solar Turbines (930245/294)	www.theenergynetwork.com
22				university campus system	IDEA and J. Andrepont-Cool Solutions	
23	not available			industrial cogeneration	TICA and M. Solms-The Stellar Group	
24				entertainment/resort campus District Heating & Cooling system	IDEA Proceedings, 6/98	
25	$575K projected	under 10-yr simple payback		military barracks complex	ASHRAE Seminar 42, 7/2/03	
26				industrial cogeneration (electricity to elec utilty and steam to oil refinery)	Munters corporate website, 7/03	www.munters.com
27	not broken-out for CHP system	DE users saved $27MM cap + >$1MM/yr	reduced fuel use by 22%, CO2 by 41%	TES was key in balancing loads for economical use of CHP (trigeneration)	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
28				university campus system	IDEA	
29				university campus system	IDEA and J. Andrepont-Cool Solutions	
30				demonstration of CHP technology and component equipment	ASHRAE Seminar 42, 7/2/03	
31				automotive assembly plant	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
32				university campus system	IDEA and J. Andrepont-Cool Solutions	
33	$52 million		reduces coal use by 80%, soot by 50%	burns 280,000 tons/yr of renewable fuel (wood waste), reduces GHG 280,000 tons/yr	District Energy St. Paul	www.districtenergy.com
34	not available	Added elec gen w/ zero add'l fuel use	Added elec gen w/ zero add'l emissions	Steam turbine generators replaced PRVs; therefore, get elec gen w/o any add'l fuel us	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
35	not available			independent power / industiral cogeneration	TICA and M. Solms-The Stellar Group	
36	$34 million (incl. other projects)	Saves $3 to 5 million per year	NOx controlled by water injection	university campus system	J. Andrepont-Cool Solutions	
37			cut CO2 35.6% (48,572T/yr)	urban District Heating & Cooling system	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
38				vocational-technology school	Calmac Manufacturing Corporation	
39				university campus system	IDEA and J. Andrepont-Cool Solutions	
40				high school	Calmac Manufacturing Corporation	
41	$175 million special proj bonds		9 ppm NOx and 1 ppm CO for Cogen Plt	Reported reliability: 98% electrical and 100% thermal. Sized for future load growth.	IDEA Proceedings, 6/97	
42				industrial cogeneration	AMCO-Fern Inlet Fogging List, 3/03	
43			cut NOx, SO2, CO, PM 93%, CO2 54%	District Heating & Cooling system	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
44				university campus system	J. Andrepont-Cool Solutions	
45				urban District Heating & Cooling system	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
46			trigenerator cut fuel & emissions 47%	urban District Heating & Cooling system	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
47	$167 million	Revenue from electric sales; energy effic.	Added 100 MW, while slashing emissions	70% CHP fuel conversion efficiency (>double U.S. avg). EPA awardee for CHP.	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
48				university campus system	IDEA Proceedings, 6/99	
49	$18 million for TIC/TES system	TIC/TES added power at only $367/kW	TIC/TES improved heat rate by 4%	independent power / industiral cogeneration	ASHRAE AT-01-15-1, 2001 V107 Pt1	
50				Serves 4.2 million sf of conditioned terminal. Sized for current & future expansion.	District Energy, v88n1/Carter-Burgess	
51				industrial cogeneration (oil refinery)	Munters corporate website, 7/03	www.munters.com
52				industrial cogeneration (chemical manufacturing)	TICA and GTI-00/0140 5M MI 5/01	
53				university campus system	IDEA and J. Andrepont-Cool Solutions	
54	TIC: $93,220	TIC: 8% more power gen/yr, 3-yr payback	TIC improved heat rate by 2%	retail shopping mall	ASHRAE AT-01-15-2, 2001 V107 Pt1	
55				Serves Grupo Primex plastics mfg facility	Trigen "Capacity Update", 10/1/01	www.tractebelusa.com
56	$5.6 (40) million equip (tot proj)		Saved 45% energy, 54% CO2(20,000T/yr	Built to serve Parque Expo '98 (World Fair) area, with plans to expand in future.	ASHRAE MN-00-16-2, 2000 V106 Pt2	

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Prepared for: **UT-Battelle, Oak Ridge National Laboratory**
U.S. Department of Energy
Prepared by: **The Cool Solutions Company - Lisle, Illinois**
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