Program will start at 10:00 am

ETCC QUARTERLY MEETING: *INDUSTRIAL ENERGY EFFICIENCY – ADVANCED SOLUTIONS*

August 25, 2015
SoCalGas, Downey, CA
HOSTED BY: SoCalGas

Welcome, Safety and ETCC Updates

Abdullah Ahmed

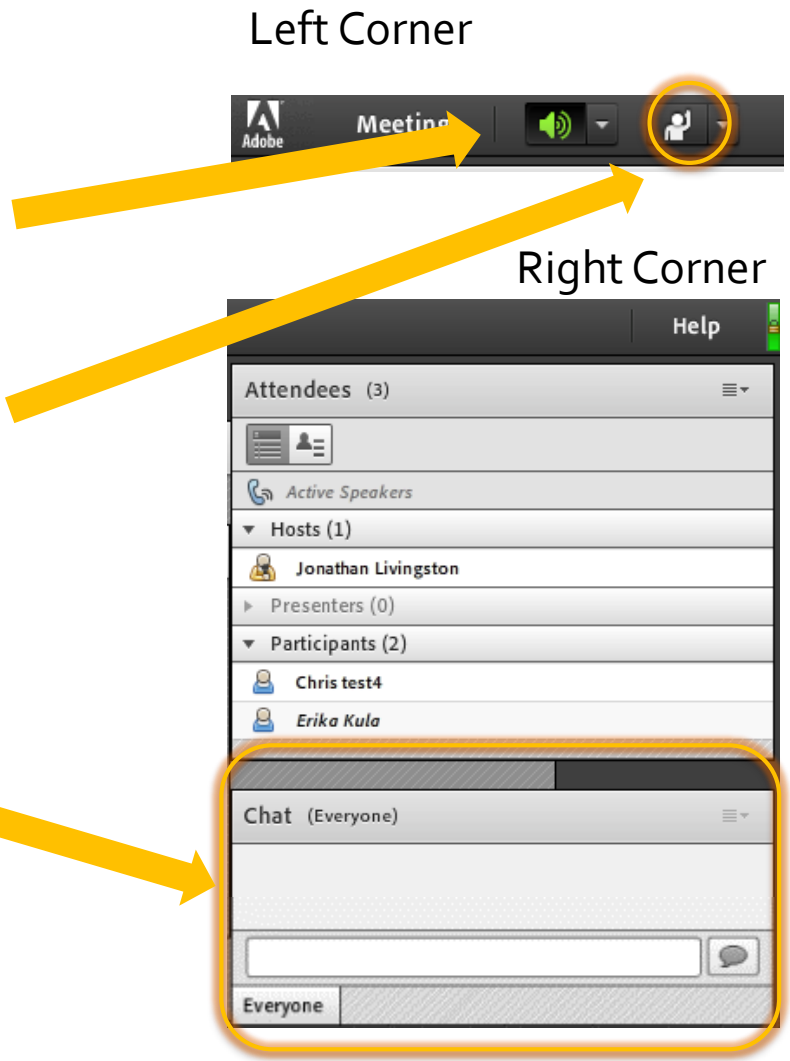
Program Manager, Emerging Technologies | Southern California Gas Company

WELCOME!

Before we get started….
housekeeping and safety

FOR OUR ONLINE MEETING PARTICIPANTS

- Quick logistics
  - Phone lines are muted, so if no sound is coming from your speakers, click here
  - Speaker check: select "raise" hand in the control panel to confirm you are able to hear
  - Please use question field to ask questions during Q&A or if any technical issues



HOUSEKEEPING FOR ALL PARTICIPANTS

- Please **turn off** or **silence** your phone, and **step outside** for any non-program conversations
- Slides will be posted to www.etcc-ca.com
- Don't forget to fill out evaluations!

SAFETY MESSAGE

- In the event of an emergency:
  - Earthquake
  - Fire
  - Other evacuation
- Meeting point
- 911
- CPR

TODAY'S AGENDA

10:00 AM	Welcome, Safety & ETCC Updates
10:25 AM	**Doubling Down with Water-Energy Solutions**
11:40 AM	LUNCH (*provided*)
12:40 PM	**Doing More with Less - Process Heat Recovery**
1:40 PM	BREAK
1:50 PM	**Finding Hidden Energy Savings in Industrial Applications**
3:00 PM	Wrap Up

EMERGING TECHNOLOGIES COORDINATING COUNCIL (ETCC)

The ETCC supports the advancement of energy efficiency and demand response initiatives through its leadership, impact and influence in the emerging technology domain. It pursues this objective through strategic stakeholder engagement and effective and efficient coordination among ETCC members.

Members include:

EMERGING TECHNOLOGIES PROGRAM MISSION

"…to increase energy efficiency market demand and technology supply through evaluation of *emerging* and *underutilized* advanced technologies to increase customer savings…"

Emerging Technologies → **Programs** → **Codes and Standards**

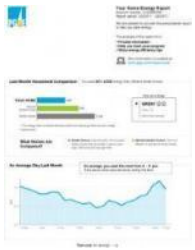
Zero Net Energy

LED Lighting

HVAC

EE Rebates

Home Energy Report

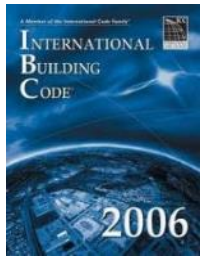


Retail and Manufacturer Strategy

Contractor Training and outreach

Appliance Standards

Building Codes



ET PROGRAM DESIGN

Technology Development Support

- Provide resources to transform early-stage technologies / concepts into saleable products
- Develop forward-looking product specifications
- Provide outreach to early-stage entrepreneurs, investors, and analysts (TRIO)

Technology Assessment

- Evaluate performance claims
- Generate energy savings and cost data required for regulatory approval of a new EE measures

Technology Introduction Support

- Conduct scaled field placements to foster market traction
- Build demonstration showcases to create visibility / market awareness
- Conduct third-party solicitations using competitive bidding (TRIP solicitation)

UPCOMING ETCC EVENTS

Date	Event	Location & Host
November 4th	Q4 Meeting: Residential	Sacramento (SMUD, LADWP, CEC)
November 5th	Open Forum	Sacramento (SMUD)
February 2016	Q1 Meeting: Commercial	San Diego (SDG&E)
Fall 2016	Emerging Technologies Summit	Los Angeles area (SoCal Gas)

To sign up for the ETCC Insight newsletter, check the box on the sign-in / registration sheet or sign up online at: www.etcc-ca.com/subscribe

Check the ETCC website for updates: http://www.etcc-ca.com/calendar

Welcome

Lisa Alexander

Director | Southern California Gas Company

DOUBLING DOWN WITH WATER-ENERGY SOLUTIONS

Frank Loge, Executive Director | UC. Davis Center for Water-Energy Efficiency – *moderator*

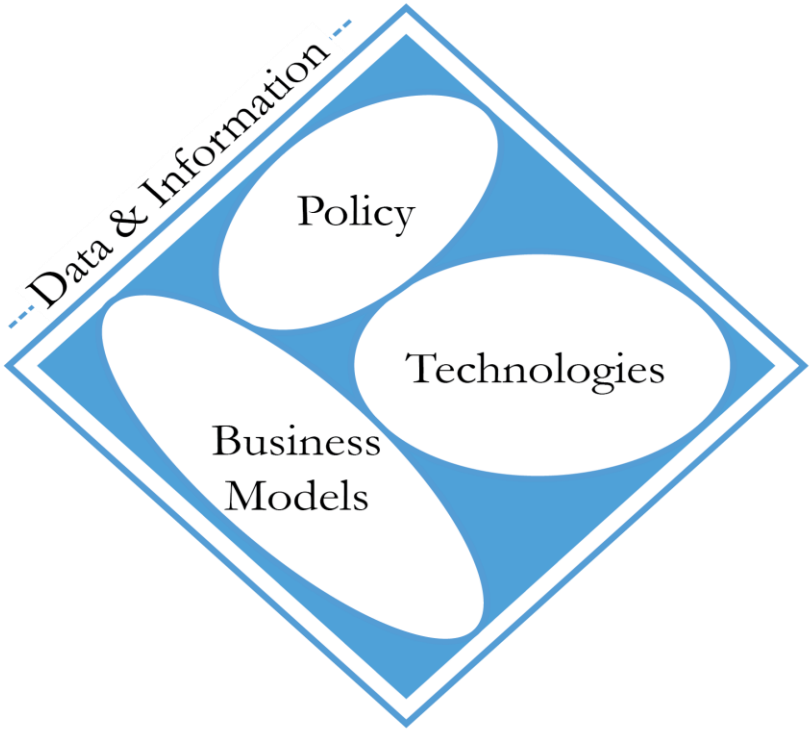
Baji Gobburi, VP, Sales | Cambrian Innovations

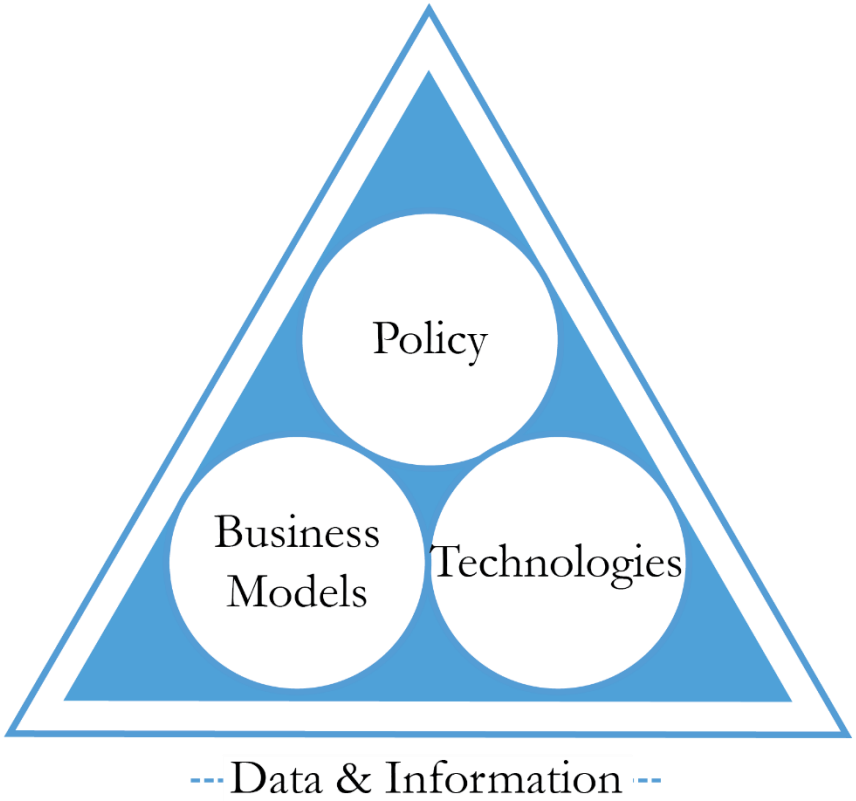
Sophie Walewijk, Senior Chemical Engineer | Trevi Systems Inc.

Richard Svindland, VP, Operations | American Water

Frank Loge, Executive Director
UC. Davis Center for Water-Energy Efficiency

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL



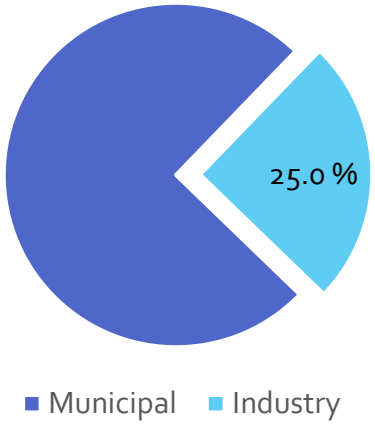


THE INFORMATION BOTTLENECK

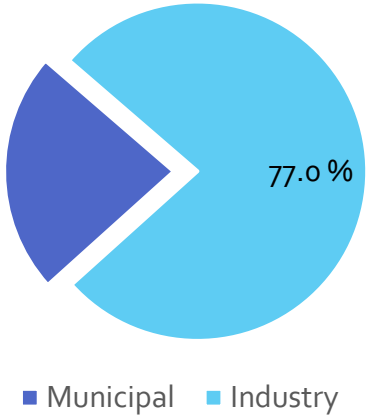
Baji Gobburi
VP, Sales | Cambrian Innovations

THE OPPORTUNITY

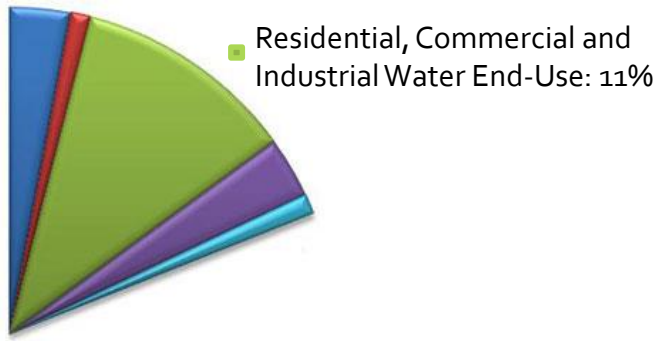
Urban Water *Usage*
56,800 MGD



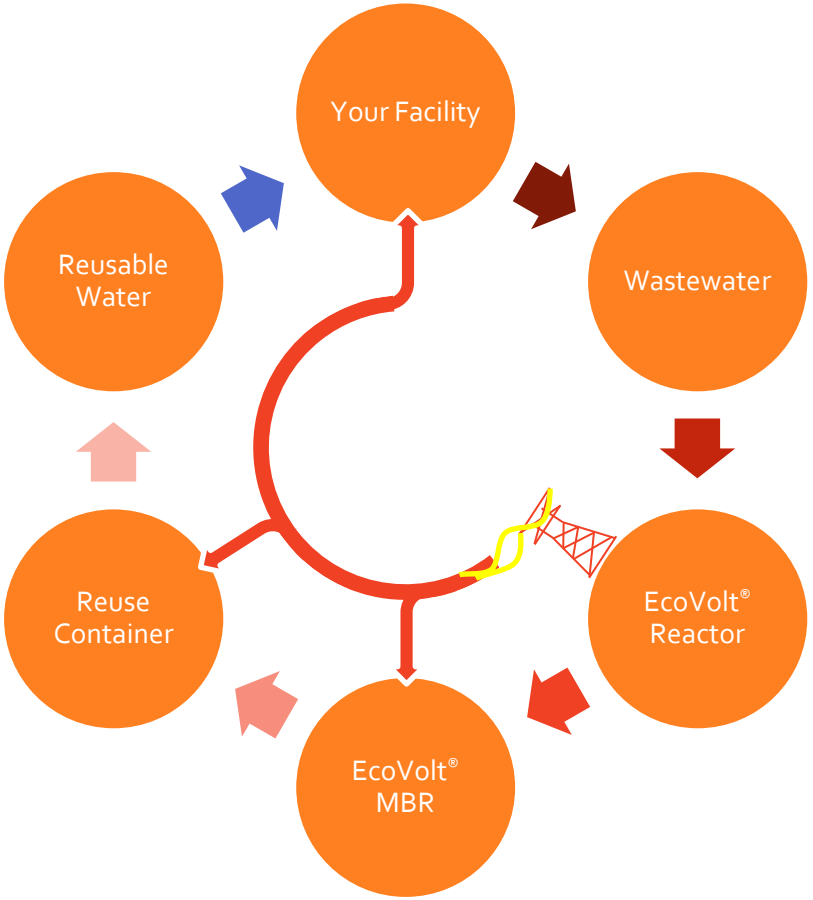
Urban Wastewater *Loading*
420,000 tons BOD/day



Water-Related Electricity
~ 20% of California's Total



CLOSED-LOOP SOLUTION



- In California alone…
- Water for > 1,565,000 people
- > 1,000 MW of power
- 6,000,000 metric tons CO_2 eliminated
  - 1,270,000 vehicles off the road!
  - A forest larger than New Jersey!

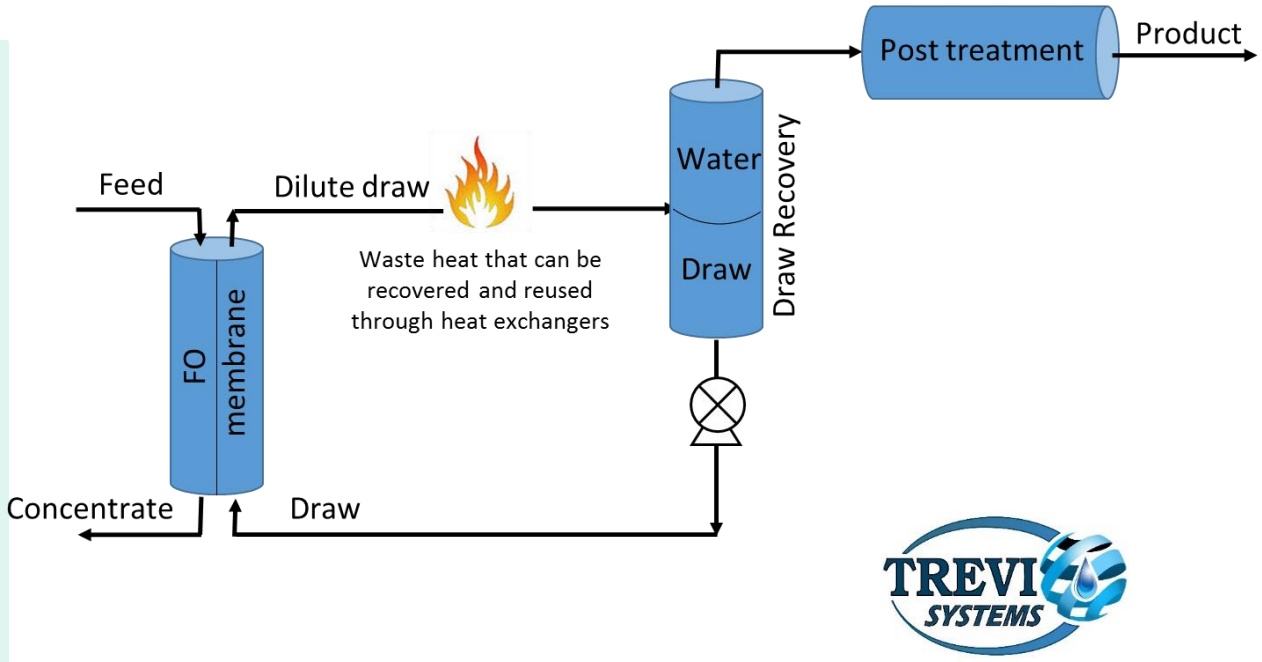
Sophie Walewijk
Senior Chemical Engineer | Trevi Systems Inc.

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

TREVI'S FORWARD OSMOSIS (FO) TECHNOLOGY

- Reverse osmosis uses hydraulic pressure to force water across a membrane (= lots of electricity)
- In contrast in FO feed water is pulled across the membrane using a draw solution of higher osmotic pressure than the feed
- Trevi's unique draw solution can be separated from product water using waste heat
- Heat exchangers are used to recover and reuse the heat

Trevi's Draw Solution



TREVI SYSTEMS

CURRENT PILOTS

Trevisystems.com
Dr. Sophie Walewijk
Senior Chemical Engineer
swalewijk@trevisystems.com

- United States/OCWD: 100 m3/day, RO concentrate (California Energy Commission Grant PIR-13-009)
- United Arab Emirates/Masdar: 50 m3/day, seawater

Richard Svindland
VP, Operations | American Water

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

California Drought

Water & Energy

APPENDIX SLIDES

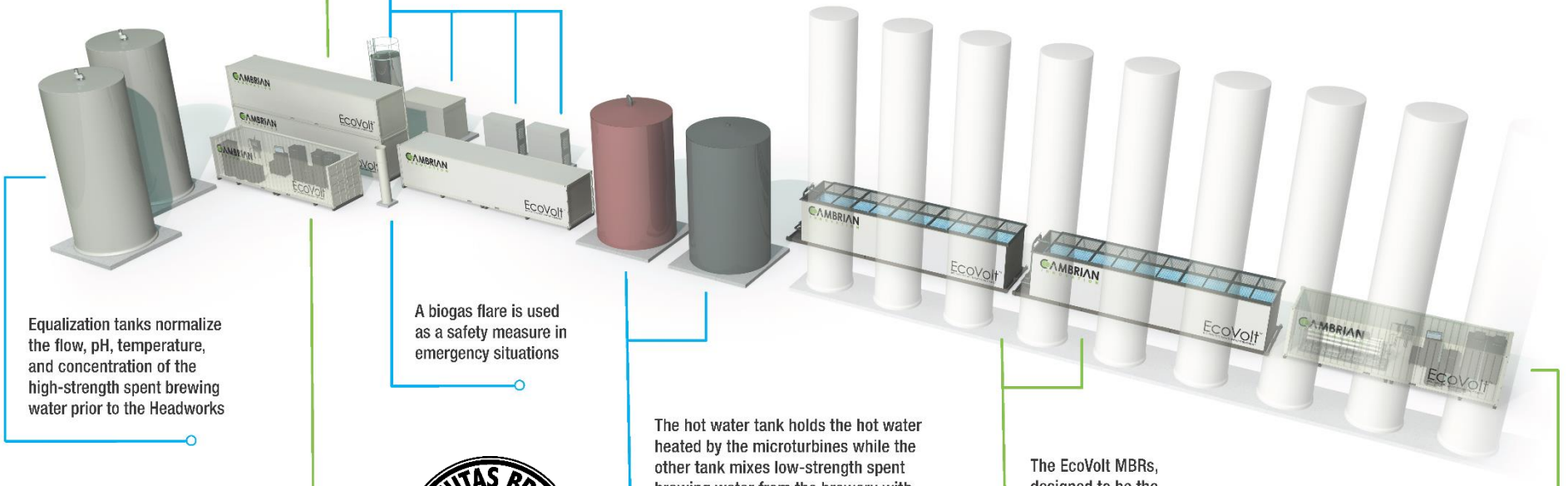
LAGUNITAS BREWING COMPANY

THE ECOVOLT SOLUTION...

- » Removes >99.9% of Contaminants in the Spent Brewing Water
- » Cuts the Facility's Total Water Demand by >40%
- » Reduces the Facility's Total Water Discharge Volume by >70%
- » Supplies Energy to Run Itself and Sends Excess to the Brewery
  - » EcoVolt Reactors Generate 15% of the Brewery's Electrical Demand
  - » EcoVolt Reactors Generate 7% of the Brewery's Heat Demand
- » Eliminates Over 1,600 Metric Tons of CO_2 per Year

Stackable EcoVolt Reactors use a bioelectrically enhanced treatment system to clean over 20,000 GPD of high-strength spent brewing water each while generating high-quality, renewable biogas

High-quality, renewable biogas is scrubbed of contaminants and burned in microturbines to produce clean electricity and clean heat



Equalization tanks normalize the flow, pH, temperature, and concentration of the high-strength spent brewing water prior to the Headworks

A biogas flare is used as a safety measure in emergency situations

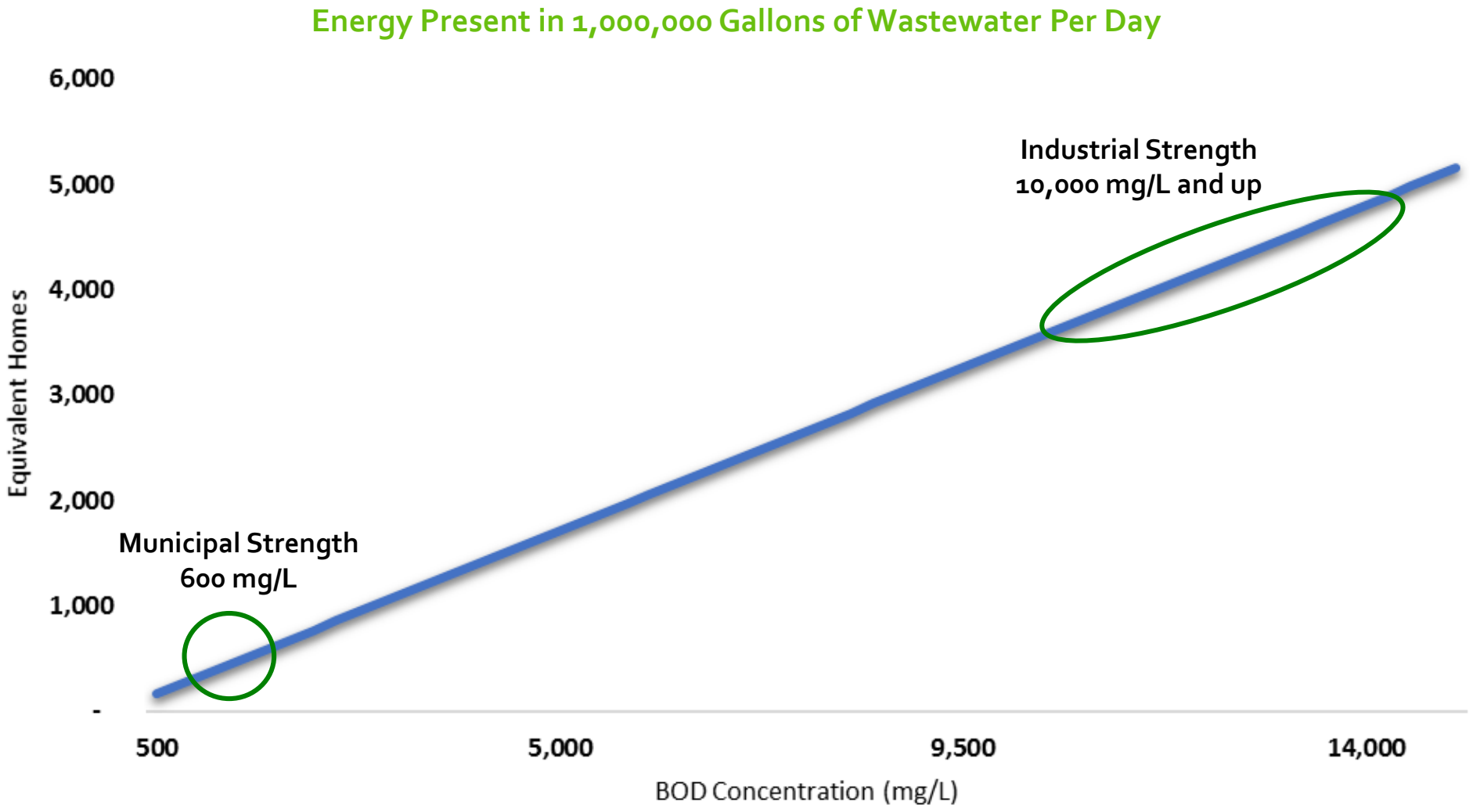
The hot water tank holds the hot water heated by the microturbines while the other tank mixes low-strength spent brewing water from the brewery with EcoVolt Reactor effluent and normalizes flow before the Reuse System

The EcoVolt Headworks houses integrated controls for the whole system, conditions the spent brewing water, handles process automation, and enables remote operation

The EcoVolt MBRs, designed to be the most energy efficient membrane bioreactors on the market, process over 70,000 GPD each, further polishing the water

The EcoVolt Reuse Container houses a high-efficiency reverse osmosis (RO) skid, power distribution for the Reuse System, and integrated controls for the whole system

Wastewater Contains Energy



Today's Treatment Technologies are Costly & Unsustainable

Aerobic Treatment

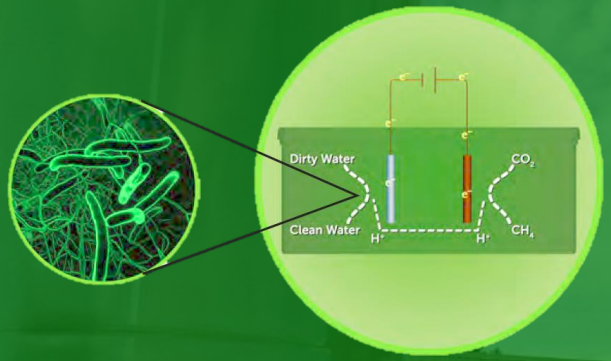
3% of US Electricity Demand
Large Footprint
Costly OpEx + Byproduct Disposal

Today's Anaerobic Treatment

Limited Applicability
Large CapEx
Complex + Prone to Failure

ECOVOLT® REACTOR

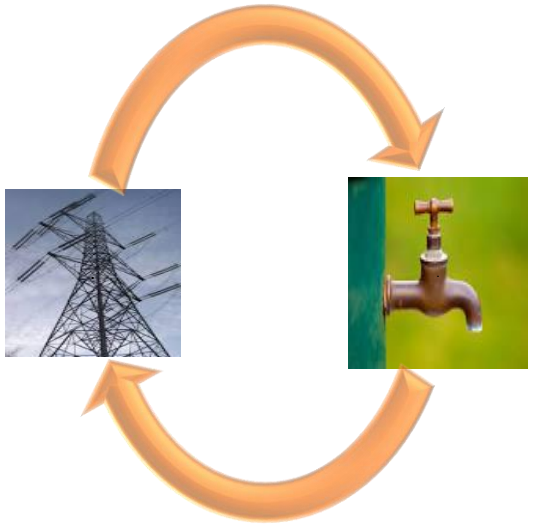
World's First Bioelectrically Enhanced Wastewater Treatment System



- Electrically active organisms treat wastewater & convert CO_2 into renewable biogas
- Net reaction generates information that is used to automate and stabilize the process

Energy Efficiency

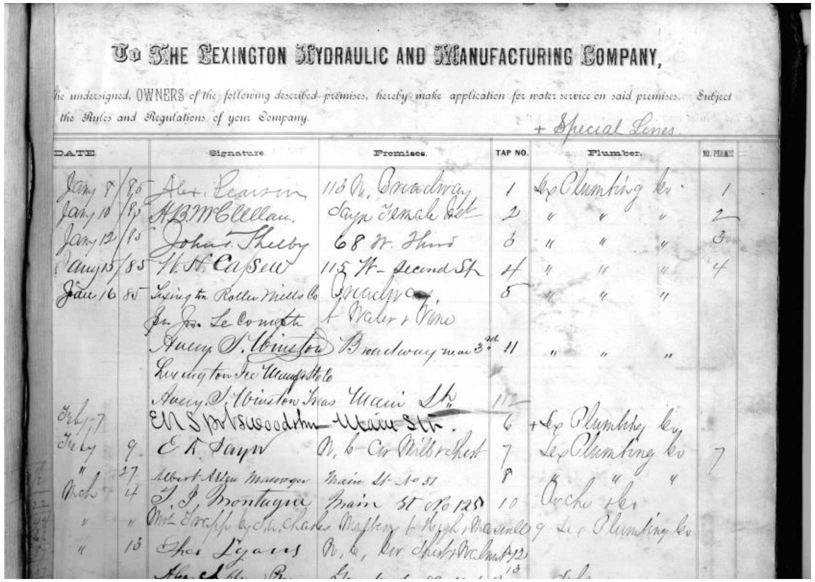
- 85% x 30%



- 50% x 50%

- 2% - 30%

Water & Telecom: Meter Reading

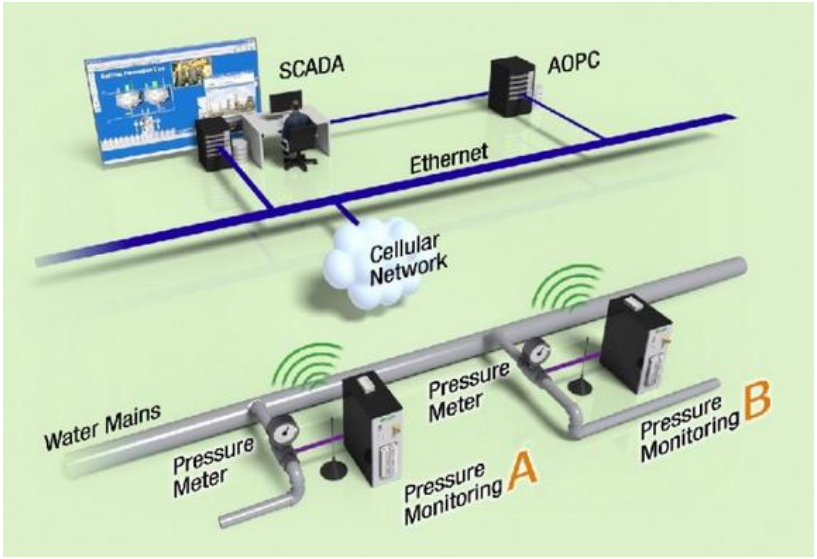


To The Lexington Hydraulic and Manufacturing Company,

The undersigned, OWNERS of the following described premises, hereby make application for water service on said premises. Subject the Rules and Regulations of your Company.

DATE.	Signature.	Premises.	TAP NO.	Plumber.	NO. PERMIT

Water & Telecom: Intelligent Systems



Supply Solution: Water Efficiency

How Companies Can Help…

Advanced Customer Communications

Outdoor Use Reduction Programs

Rate Designs

Fix Leaking Pipes

How Regulators Can Support…

Revenue Stabilization Policies that Support Fixed Cost Recovery

Infrastructure Surcharge Programs & Multi-Year Rate Plans

DISCUSSION / Q&A

LUNCH

Program will resume at 12:40 pm

PLEASE FILL OUT EVALUATIONS!

DOING MORE WITH LESS - PROCESS HEAT RECOVERY

Ryan Kerr, Emerging Technologies Manager | Gas Technology Institute – *moderator*

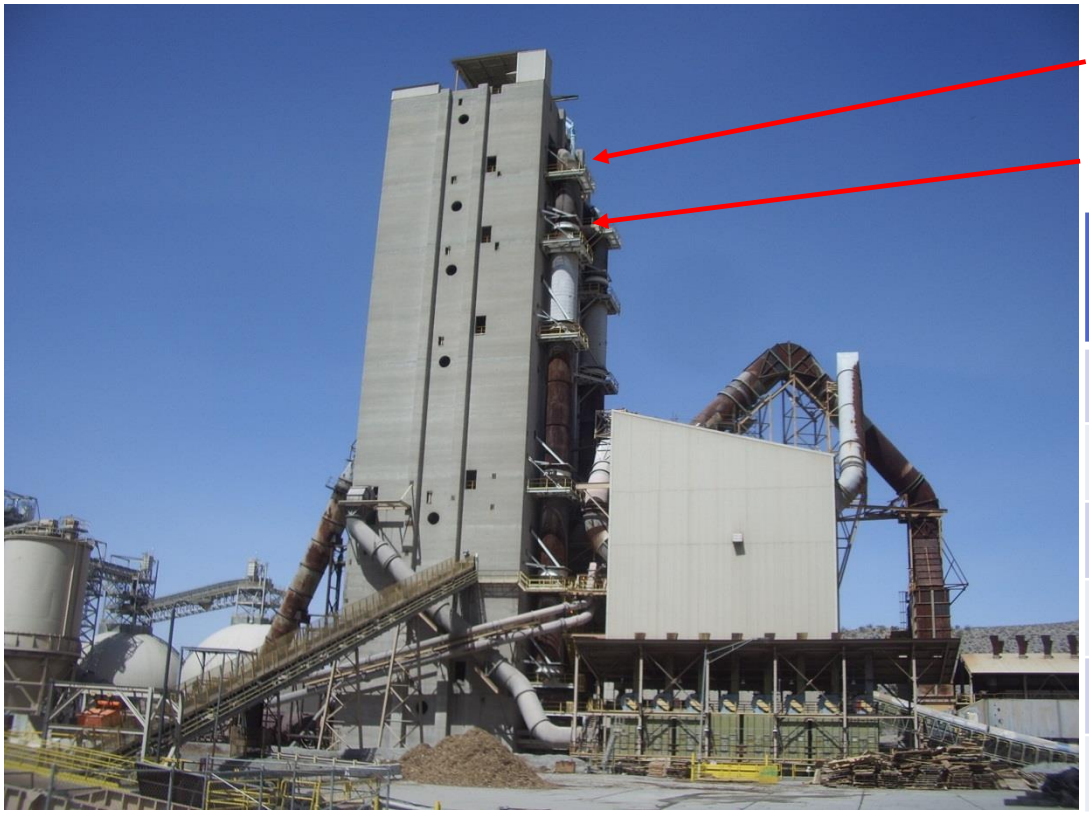
Bill Hunter, Owner | AirClean Technologies

Wes King, IDSM Program Manager | Southern California Edison

Vince Sands, Founder & Vice President | Boilerroom Equipment

Bill Hunter
Owner | AirClean Technologies

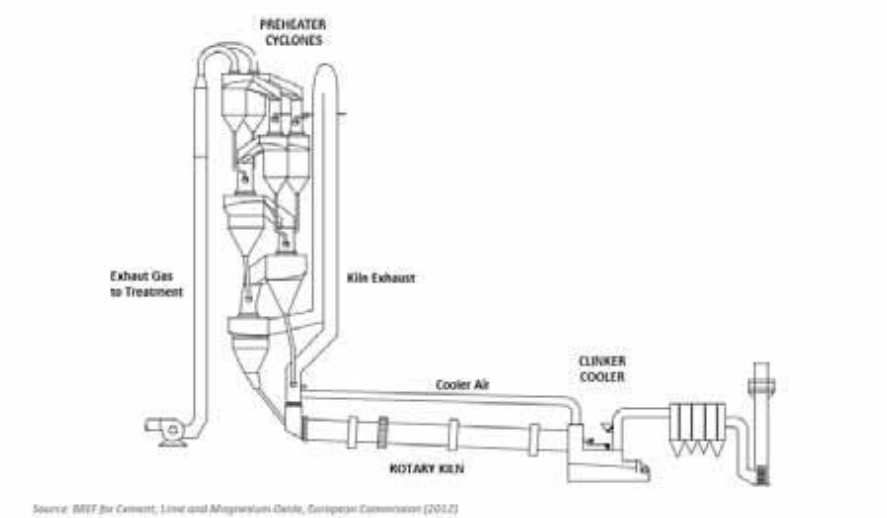
ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL



CEMENT PLANT PREHEATER TOUR EXHAUST.

Water Spray for evaporative cooling.

Country	2012 Cement Production (MT)
China	2,210
India	270
United States	75
Iran	70
Brazil	69
Turkey	64
All Others	1,042
Total:	3,800



Source: BREF for Cement, Lime and Magnesium Oxide, European Commission (2012)

Top Five Countries with Installed Waste Heat Recovery Installations	
China	739
India	26
Japan	24
Thailand	12
Pakistan	9

A SOLUTION THAT WORKS WITHIN EXISTING UTILITY INCENTIVE PROGRAMS:

- Recover the waste heat using a waste heat boiler. The waste heat boiler produces steam, that steam drives a turbine which drives the Induced Draft Fan on the system, saving 1-2 MW per fan.

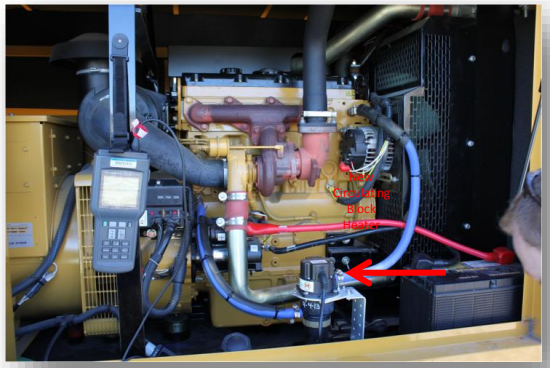
<u>Savings Estimates at a Typical US Cement Plant:</u>

24,000,000 kWh/yr
3.5 MW Demand Reduction
38,000,000 gallons/year

Wes King, IDSM Program Manager
Southern California Edison

Presented by: Wes King, Southern California Edison, Donald.Wesley.King@sce.com

CIRCULATING BLOCK HEATER – WHAT, WHERE,



Circulating Block Heater (CBH) PR-81943: $0.08/kWh $150/kW

Install a circulating block heater meeting manufacturer recommendations which heats with forced circulation the heated coolant to meet a 100-120 F temperature set point on existing generators located outdoors or in an unconditioned space.

Target Customers

(examples – not exhaustive) Have back-up Diesel Generators for emergency power.

- Colleges and Universities (CCCs, UC, CSUs)
- State of CA (State Prisons, Critical facilities)
- Counties (Jails, Sheriff's Dept., Critical facilities)
- Municipalities (Jails, Police Stations, EMS facilities, Fire Stations)
- Hospitals
- Military Bases
- Industrial Facilities with "critical" backup generation
- Any facility that has critical infrastructure that must maintain uninterrupted power in the event of an electrical outage.
- Any building 7 stories or taller is required to have standby generator set.

Simple Payback Calculation

Estimated Circulating Block Heater installed cost (Mtl. + Labor)	Diesel Generator Output kW	kWh Savings from CBH	kW Savings from CBH	Annual $$ Saved due to kWh Reduction	Estimated Simple Payback w/o Incentive	Estimated Simple Payback w/Incentive
$1,200	200	3,300	0.4	$495	2.4 yrs	2.0 yrs
$2,450	800	8,300	1.0	$1,245	2.0 yrs	1.4 yrs
$2,800	1,100	12,600	1.6	$1,890	1.5 yrs	0.9 yrs
$3,200	2,500	14,200	1.8	$2,130	1.5 yrs	0.9 yrs

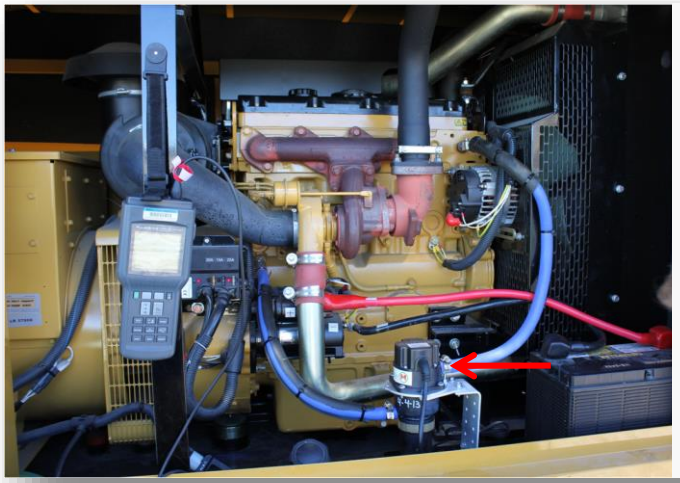
What to look for…

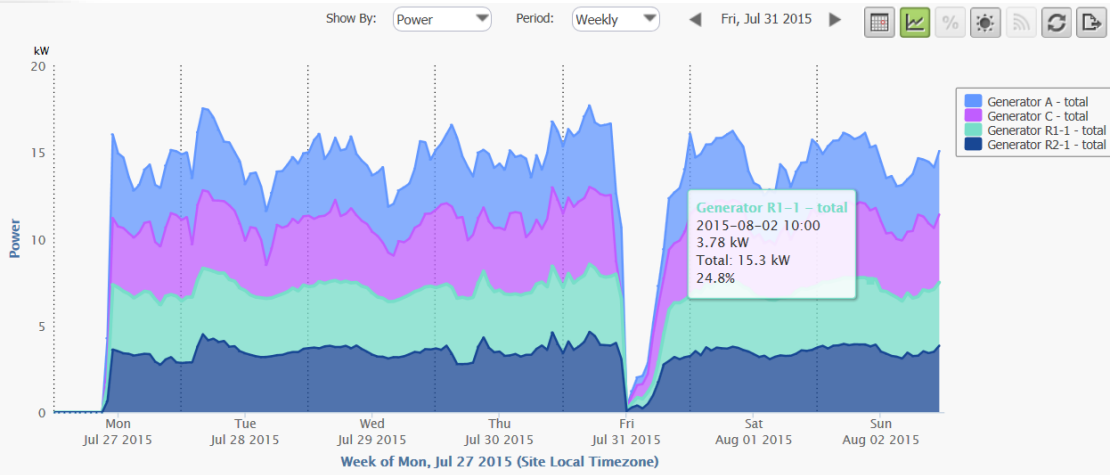
Resistance Block Heaters
(to be replaced)

Circulating Block Heaters
(to be installed)

Presented by: Wes King, Southern California Edison, Donald.Wesley.King@sce.com

CIRCULATING BLOCK HEATER – ENERGY EFFICIENCY IMPACT M&V





Average annual air temperature in Deg F	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
Generator Set Size (below)																
37-199 kW	920.28	958.87	997.45	1,036.03	1,074.62	1,113.20	1,151.78	1,190.36	1,228.95	1,267.53	1,306.11	1,344.70	1,383.28	1,421.86	1,460.44	1,499.03
200-799 kW	3,138.22	3,175.82	3,213.42	3,251.02	3,288.62	3,326.22	3,363.82	3,401.42	3,439.02	3,476.62	3,514.21	3,551.81	3,589.41	3,627.01	3,664.61	3,702.21
800-1099 kW	8,724.46	8,779.76	8,835.06	8,890.36	8,945.67	9,000.97	9,056.27	9,111.57	9,166.87	9,222.18	9,277.48	9,332.78	9,388.08	9,443.39	9,498.69	9,553.99
1100-2500 kW	2,849.02	4,480.14	6,111.26	7,742.39	9,373.51	11,004.63	12,635.75	14,266.88	15,898.00	17,529.12	19,160.24	20,791.37	22,422.49	24,053.61	25,684.73	27,315.86

Average annual air temperature in Deg F	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
Generator Set Size (below)																
37-199 kW	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.23
200-799 kW	0.39	0.40	0.40	0.41	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.45	0.45	0.46	0.46
800-1099 kW	1.09	1.10	1.10	1.11	1.12	1.12	1.13	1.14	1.14	1.15	1.16	1.16	1.17	1.18	1.18	1.19
1100-2500 kW	0.36	0.56	0.76	0.97	1.17	1.37	1.58	1.78	1.98	2.19	2.39	2.59	2.80	3.00	3.20	3.41

Vince Sands, Founder & Vice President Boilerroom Equipment

BEI

BOILERROOM EQUIPMENT INC.

When was the last time a product changed an entire industry?

- HeatSponge Sidekick: Condensing economizers for hot water boilers
- New or retrofit installations
- Eliminates the need to demolish existing conventional boilers and retrofit new condensing boilers to achieve same outcome
- A revolutionary change in the design of commercial hot water systems
- The most important commercial boiler product since the development of the condensing boiler

BEI

BOILERROOM EQUIPMENT INC.

Fundamentally Changes the Condensing Boiler Market

- There is nothing a condensing boiler can offer that a conventional boiler equipped with a Sidekick cannot do more efficiently and at a lower price.
- Sidekicks allow owners to use conventional boiler, burner, and control brands and service companies they are experienced with and prefer
- Sidekicks allow for dual-fuel boilers
- Condensing boilers offer no advantage over a Sidekick-equipped conventional boiler

DISCUSSION / Q&A

BREAK

Program will resume at 1:50 pm

PLEASE FILL OUT EVALUATIONS!

FINDING HIDDEN ENERGY SAVINGS IN INDUSTRIAL APPLICATIONS

Paden Cast, Review Engineer | Southern California Gas Company -- *moderator*

John Scherer, Manager of Engineer | Los Angeles Cold Storage

Don Musser, SVM I&E Superintendent | Searles Valley Minerals

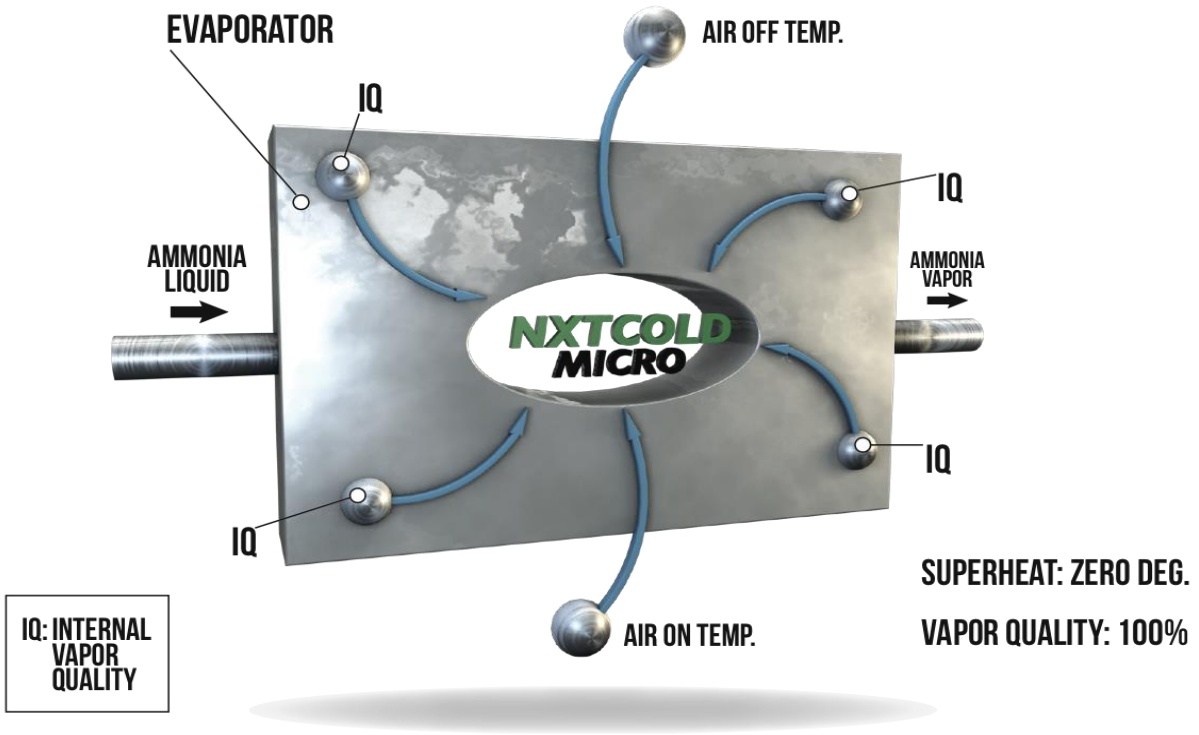
Daniel Farina, General Manager | American Apparel

John Scherer
Manager of Engineer | Los Angeles Cold Storage

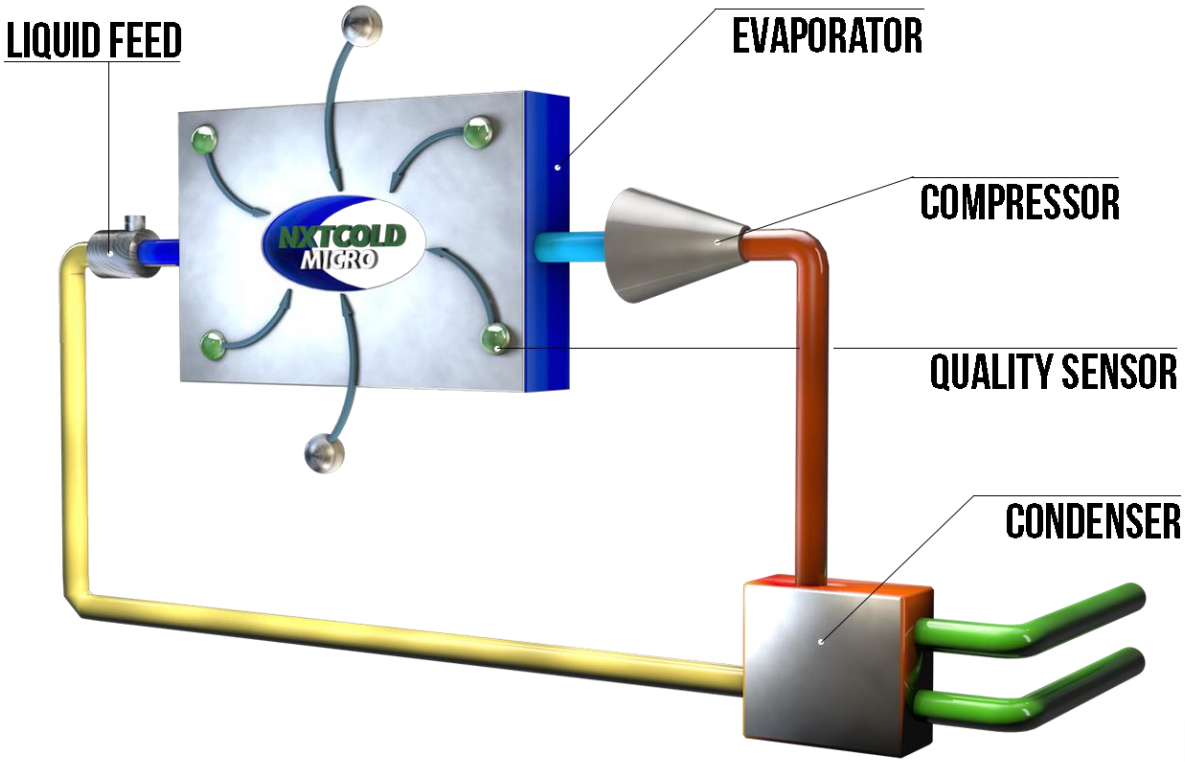
Southern California Edison NXTCOLD™ Test Unit

NXTCOLDTM Complete Self Contained
Ultra Low Ammonia Charge Refrigeration System
50 Tons Refrigeration : 25 Lbs. Ammoniac

NXTCOLD™ ELECTRONIC REFRIGERANT INJECTION CONTROL



NXTCOLD™ COMPONENT DIAGRAM



COLOR KEY

- LOW PRESSURE BOILING AMMONIA
- LOW PRESSURE AMMONIA VAPOR
- HIGH PRESSURE AMMONIA VAPOR
- HIGH PRESSURE AMMONIA LIQUID
- COOLING WATER

NXTCOLD™

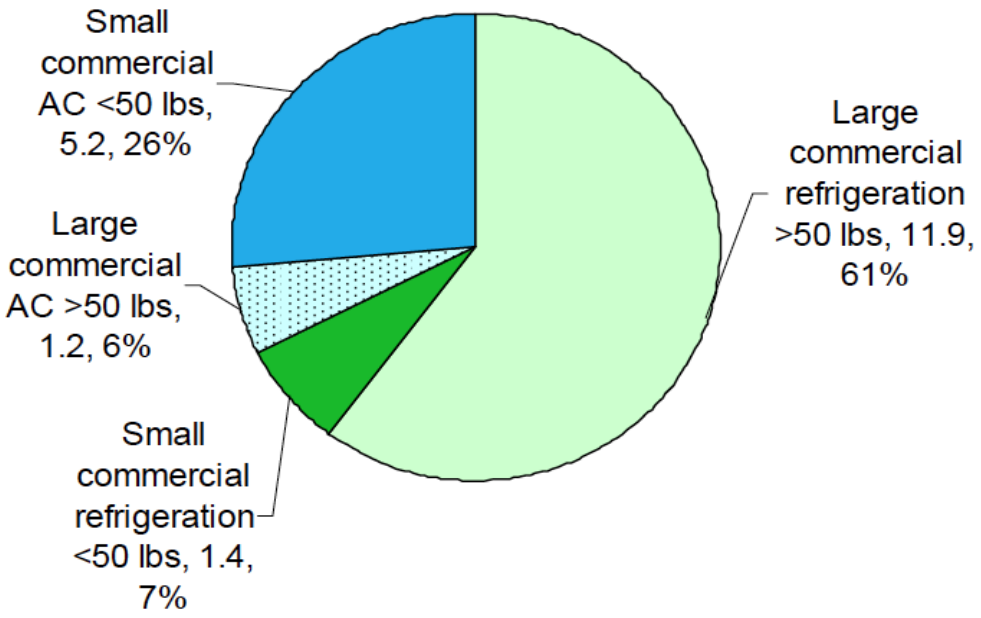
NXTCOLD™ PATENT PENDING

NXTCOLD™ EQUIPMENT COMPONENTS

SINGLE FACILITY CENTRAL ENGINE ROOM

ARB GREEN HOUSE GAS EMISSION ESTIMATES

(Sector, Emissions in MMTCO2E and % total shown)



Data source: U.S. EPA Vintaging Model Estimates refined by ARB using California-specific data and emission factors

NXTCOLD™ Effects

Industrial Market Potential

- **100's of NXTCOLD™ units installation planned and 1,000's of NXTCOLD™ units anticipated to be installed by 2020**

Commercial Market Potential

- **With advent of NXTCOLD™ "Ultra-Low" or "Tiny" ammonia charge technology available, many cooling applications traditionally addressed with HCFC or HFC refrigerants will move to ammonia. A true "divergence" is occurring with unprecedented positive results for industry as well as the public.**

Environmental, Community, and Business Potential

- **Eliminate need for refrigerants with ozone depleting and global warming potential**
- **Alleviate concerns locating nearby public services and within neighborhoods**
- **Improved electrical efficiency equal to or surpassing central engine rooms**
- **Better upfront costs with single day construction & commissioning**
- **Lower operation costs without need for full time engineering and technicians**
- **Reduce rigorous RMP, PSM, CAL ARP, and like regulation requirements**
- **Reduce expensive equipment and pollution insurance**

Don Musser
SVM I&E Superintendent | Searles Valley Minerals

SEARLES VALLEY MINERALS

- Mojave Desert – 100+ Years Old
- 3 Industrial Facilities
- Resource — Dry Playa Lake
  - Formed by Glacial Action
  - Area – 52 Sq. Miles
  - Brine Resource – Solution Mining
  - Brine Pumping – 15,000 GPM

ENERGY USE

- Electrical – 50+ MW
- Steam – 1,500,000 Lbs./Hour
- Natural Gas – 1,500,000 MMBTU/Year
- Compressed Air – 3 MW
- Water – Potable – 2000 GPM, Brackish – 5000 GPM

Process Facilities

- Soda Ash, Borax & Sodium Sulfate – 1,500,000 TPY
- Efficient – Processes, Hot & Cold
- Energy Efficiency – Energy Reduction, Cost Reduction

ENERGY EFFICIENCY PROJECTS

- Evaporative Condensers & Fan VFDs – 2 ½ 1500 Hp Motors
- Hot/Cold Brine Pump VFDs – 2, 250 Hp Motors
- Energy Efficient Water Pumps – 7
- Lighting – HPS2 Replace with LED
- Steam – Insulation, Steam Traps, Condensation
- Savings
  - Rebates – $1,358,299
  - Annual Dollars – $1,786,310
  - Annual Energy – 13,741 MWH
  - Demand – 1,378 kW
  - Annual CO_2 – Reduced 4,844 Tons

CPUC – INDUSTRY STANDARD PRACTICE

- 100 Year Old Facility – Reliable, Less Energy Efficient Equipment
- ETCC Meeting – San Francisco
- CPUC Meeting – Comments – Public & End Users
- Lighting – T 12, Tubes, Tombstones & Ballasts
- Motors – 5kV, Non-NEMA
  - Can't Wait 26 Weeks for New
  - Can Rewind – 4 Weeks
  - 25 Years Old, Rewound Many Times, Must Have Early Retirement Option

EMERGING TECHNOLOGY PROJECTS

- Lake Offices & Clinic Building (ZNE)
- Solar Thermal Pre-Heating of Dryers
- Solar Thermal Evaporation of Brine Liquor
- Most Efficient Diesel Systems
- More Efficient Chiller Systems
- Water Capture/Recovery Systems

Daniel Farina
General Manager | American Apparel

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

American Apparel®

Sustainable **Te**xtile **P**roduction

The Corporate Commitment to Made in USA produces very specific challenges:

- *California cost of Labor – Largest apparel manufacturing in USA*
- *Raw materials that meet international confidence guidelines (OekoTex, GOTS, Bluesign)*
- *Energy Usage (3M Therms/Yr, 12M Kwh/Yr)*
- *Water Usage (1.2 MGls/day)*

CEI is helping with ongoing long-term planning for plant improvements in energy and environmental performance.

- Future projects
  - Ultra low liquid ratio dyeing machines
    - Savings: 40% on water, 23% on natural gas, 13% on electricity, 14% on labor
  - Dye bath reuse
    - Savings: 12% on water, 30% on chemicals
  - Non-peroxide bleaching
    - Savings: 6% on water, 12% on natural gas, 18% on labor
  - CHP using ORC
    - Savings: 33% on electricity
    - NOx reduction associate to generation plant
  - High efficiency drying range
    - Savings: 30% on natural gas, 20% on electricity, 35% on labor, 80% on NOx

DISCUSSION / Q&A

SESSION WRAP-UP

PLEASE FILL OUT EVALUATIONS!

UPCOMING ETCC EVENTS

Date	Event	Location & Host
November 4th	Q4 Meeting: Residential	Sacramento (SMUD, LADWP, CEC)
November 5th	Open Forum	Sacramento (SMUD)
February 2016	Q1 Meeting: Commercial	San Diego (SDG&E)
Fall 2016	Emerging Technologies Summit	Los Angeles area (SoCal Gas)

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