ETCC Public Meeting:

Innovative Technologies and Practices in the Agricultural and Food Industry

October 10, 2013

Hosted by Southern California Edison

Housekeeping

- Safety Announcement
- WiFi
- Lunch!
- Slides will be posted to www.etcc-ca.com

EMERGING TECHNOLOGIES COORDINATING COUNCIL

Agenda – Part I

Welcome, Safety and Introductions – *Edwin Hornquist, Southern California Edison*

ETCC Overview and Updates – *Edwin Hornquist, Southern California Edison*

Bread Basket of the World: The state of agribusiness and role of agricultural technology in California – *David Zoldoske, CSU Center for Irrigation Technology*

From Field to Food Market – *moderated panel discussion*

- Henrik Skov Laursen, *Grundfos*
- Michael Sesko, *Woolf Farming & Processing*
- Ken Patterson, *Advanced Energy Innovations*
- Moderator: Marrs Gist, *Tulare Energy Education Center*

Agenda – Part II

California Energy Efficiency Industrial Strategic & Action Plans – *Rory Cox, California PUC*

Lunch

Opportunities for Industry-Utility Collaboration: ETCC Members' Vision for Ag and Emerging Technologies, and Industry Needs and Engagement

- *ETCC representatives* from California Energy Commission, Southern California Edison, Pacific Gas & Electric, San Diego Gas & Electric, Southern California Gas, and Sacramento Municipal Utility District
- *Morning speakers* from the Center for Irrigation Technology, Grundfos, Woolf Farming & Processing, Advanced Energy Innovations and California Public Utilities Commission

Emerging Technology Program Mission

To support increased energy efficiency market demand and technology supply by contributing to development, assessment and introduction of new and under-utilized energy efficiency (EE) measures (that is, technologies, practices, and tools), and by **facilitating their adoption as measures** supporting California's aggressive energy and demand savings goals.

What is an Emerging Technology?

A market-ready or near market-ready technology that needs validation, technical assistance, and/or increased visibility to succeed in the marketplace. ETs include hardware, software, design tools, strategies, and other services…

ET 2013-2014 Program Design – Three-Pronged Approach

Technology Development Support — Increase energy efficiency technology supply

Engage in targeted technology support efforts; increase developer outreach

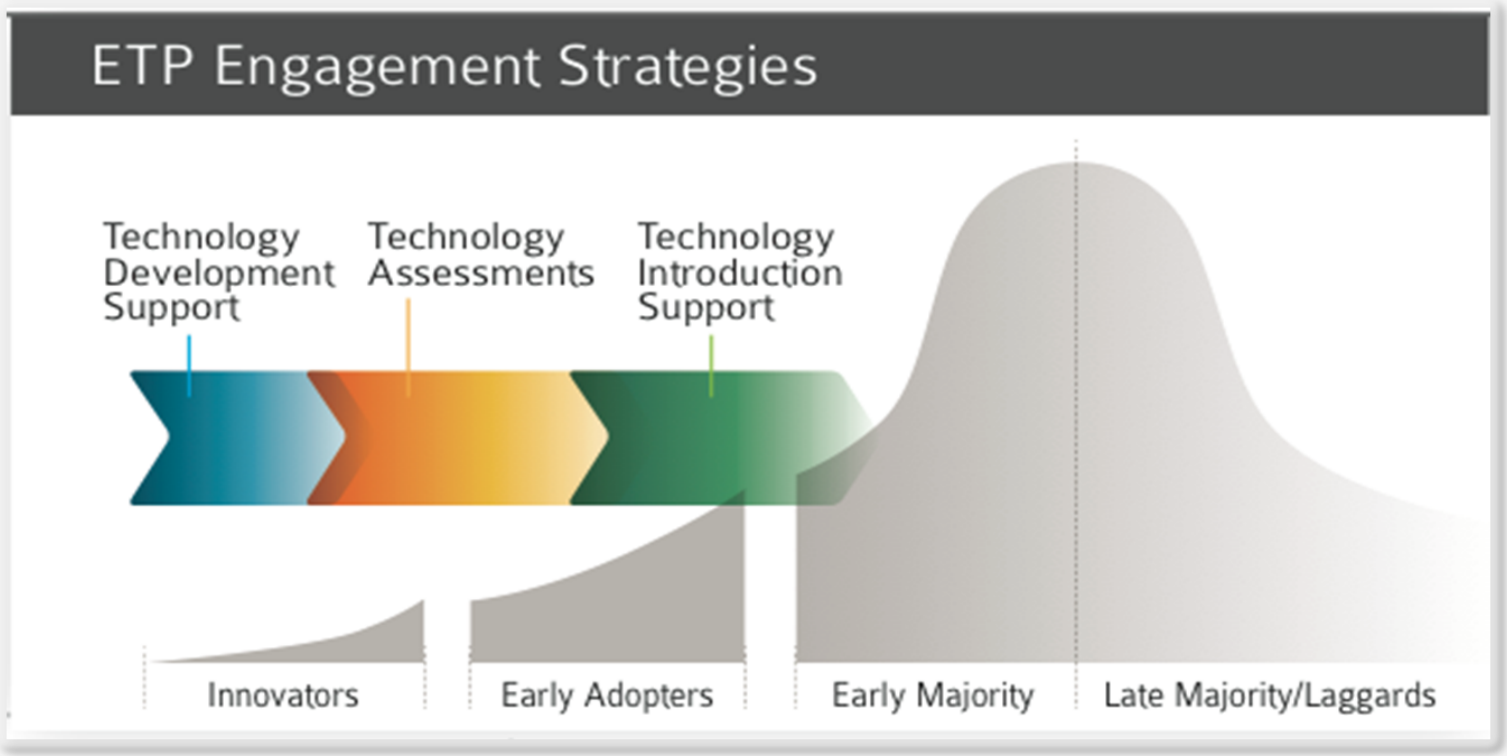
Technology Assessments — Increase the number of measures offered by programs

Assess energy efficient technologies; support technology transfer

Technology Introduction Support — "seed" market demand

Conduct demonstrations and targeted field placements; help increase market knowledge of new technologies

ET 2013-2014 Program Design – continued



Together, the three strategies work in concert to help technologies make the leap from idea to adoption. ETP provides support across the lifecycle of technologies from the Innovators stage to Early Adopters and Early Majority.

State's Ag & Industrial Market Segment

Industrial	Agriculture
"California industry will be vibrant, profitable and exceed national benchmarks for energy efficiency and resource management."	***"Energy efficiency will support the long-term economic and environmental success of California agriculture."***
Major driver in California's economy - uses 33% of the State's overall energy supply	7% - concentrated in irrigation, process heat applications and refrigeration
• Petroleum • Food • Paper • Chemicals • Stone/clay/glass industries	• Irrigated Agriculture • Dairies • Refrigerated Warehouses • Vineyards & Wineries • Greenhouses & Nurseries • Post-Harvest Processing • Confined Animal Feeding Operations

Challenges & Barriers

Industrial	Agriculture
• Complex & proprietary processes	• Air & water regulations and compliance
• Uniform "one size fits all " programs not align with business or facility needs	• Lack of end-use sector energy consumption data
• Competing objectives of multiple state and federal policies and rules	• Acceptance of high first costs vs. long term financial benefits
• Asset mobility & global competition	• Production risks & new technologies
• Risk aversion to new technologies that may impact industrial output or quality	
• Industrial optimization vs. energy efficiency	
• Business hurdle rates with EE project paybacks longer than 2 years	

Upcoming ETCC Events

Next ETCC Public Meeting: *Q1 2014, hosted by PG&E*

Date and theme TBD. Check the ETCC website or sign up for the ETCC listserv to be notified.

ET Summit: Q4 2014 TBD

http://www.etcc-ca.com/calendar

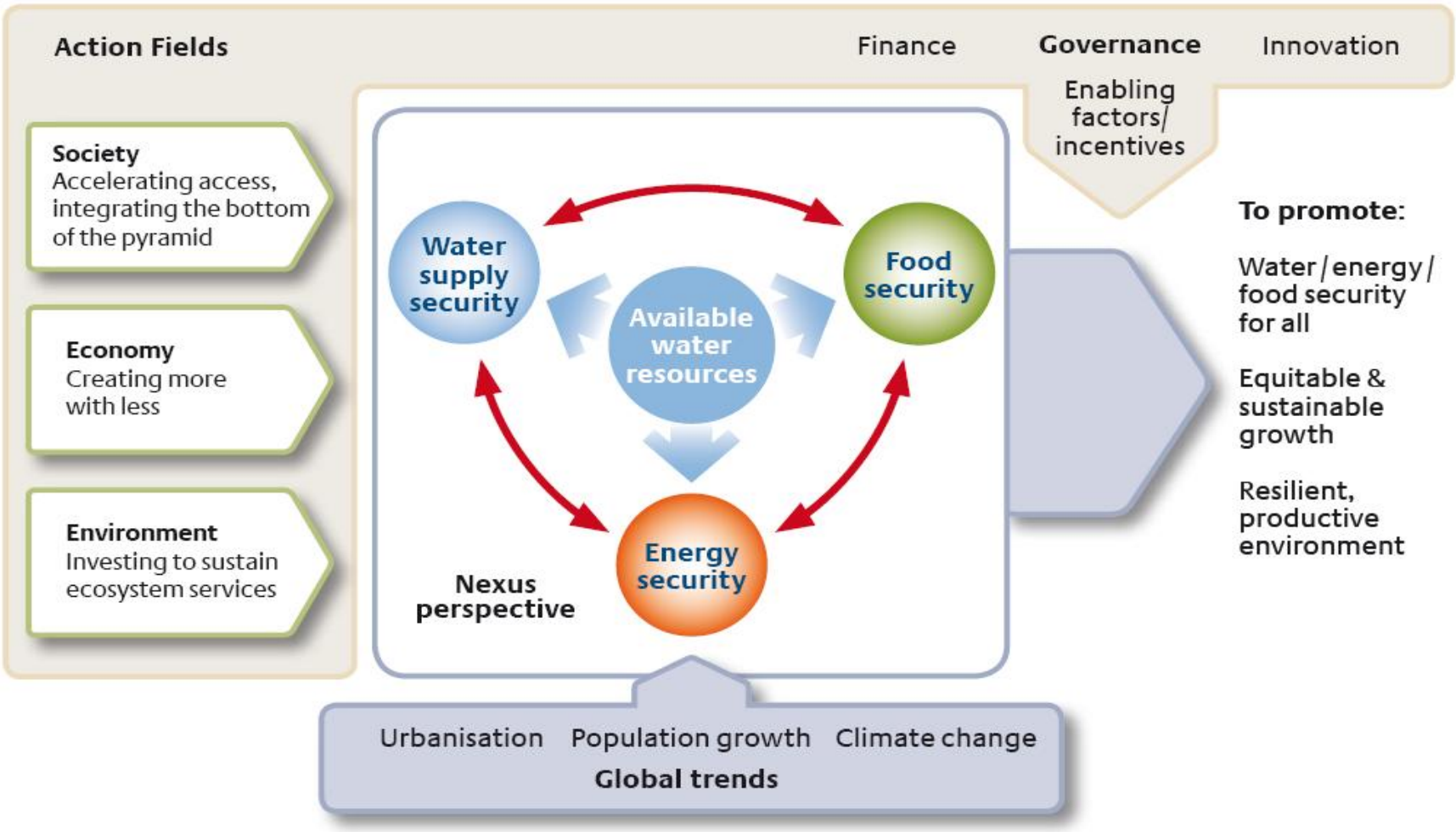
EMERGING TECHNOLOGIES COORDINATING COUNCIL

The State of Agribusiness and the Role of Agriculture Technology

Q4 Emerging Technology Coordinating Council

David F. Zoldoske, Director
Center for Irrigation Technology
California State University, Fresno

Food/Energy/Water (FEW)



Sustainability Assessment Matrix (SAM

5	Leading edge	Performance that represents genuine global leadership on an issue.
4	Best practice	Achieving what is currently considered to be global best practice in a particular field.
3	Developing leadership	Applying a comprehensive approach including innovative tools and widespread engagement.
2	Progressing	Ensuring consistent performance is achieved in a particular field.
1	Minimum standard	All operations must achieve level 1, or have a plan in place to do so, as it represents management of our key sustainable development risks.

Beer Facts:
Why beer is never bought, only rented

- Approximately 90% of beer is water
- Over 90% of the water used to make beer is in growing the raw ingredients (barley, hops, etc.)

Miller/Coors Company: Case Example

- Reduced industry average ratio of 6.0 barrels of water for each barrel of beer to 3.82 in August of 2013 (3.5 at one operation)
- In the brewing operations, the water savings was achieved by 20% investment in capital improvements and 80% from employee input
- Biggest water savings came from working with barley growers who reduced applied water by 20%

Miller/Coors Company: Case Example-continued

- One farm in Silver Creek Valley saved 270 million gallons of water over 2 years-equivalent of water required for 2-months a brewery.
- A showcase farm reduced energy costs from $50/ acre to $20-22/acre-total energy cost of $120,000 annually
- Food processors are working back through the supply chain to improve natural resource utilization

Ag Irrigation Background

- Less than half of all new irrigation systems have water meters as part of the purchase agreement
- Approximately 1 in 8 growers use soil moisture sensors
- It is said that "if you can't measure it, you cannot manage it"-many growers are flying blind
- Significant potential for water/energy savings exists with monitoring system performance and optimizing water delivery (timing and amount)

Establishing an Ag Water/Energy Center on the Fresno State campus…

- Vision: establish full scale irrigation/water technology demonstration sites on the campus 800 acre farm
- Objectives:
  a) Demonstrate new control, sensing and management technologies that optimize water/energy use
  b) Use demonstration sites to collect performance data and conduct educational workshops
  c) Cooperative projects between the university, industry, government and local utility

Ag Water/Energy Center offers…

- Technology demonstrations that include:
  a) Control and monitoring software
  b) Mechanized gates
  c) Flow measurement
  d) Local weather measurements
  e) Sensors; soil moisture, temperature, pH, nitrates, etc.
- Case study evaluation & Data collection
- Identify Potential for Emerging Technologies
- Education
  a) Class room instruction/theory
  b) Field demonstration/operations at field scale
  c) Discussion with industry representatives

Optimize Water/Energy Use…

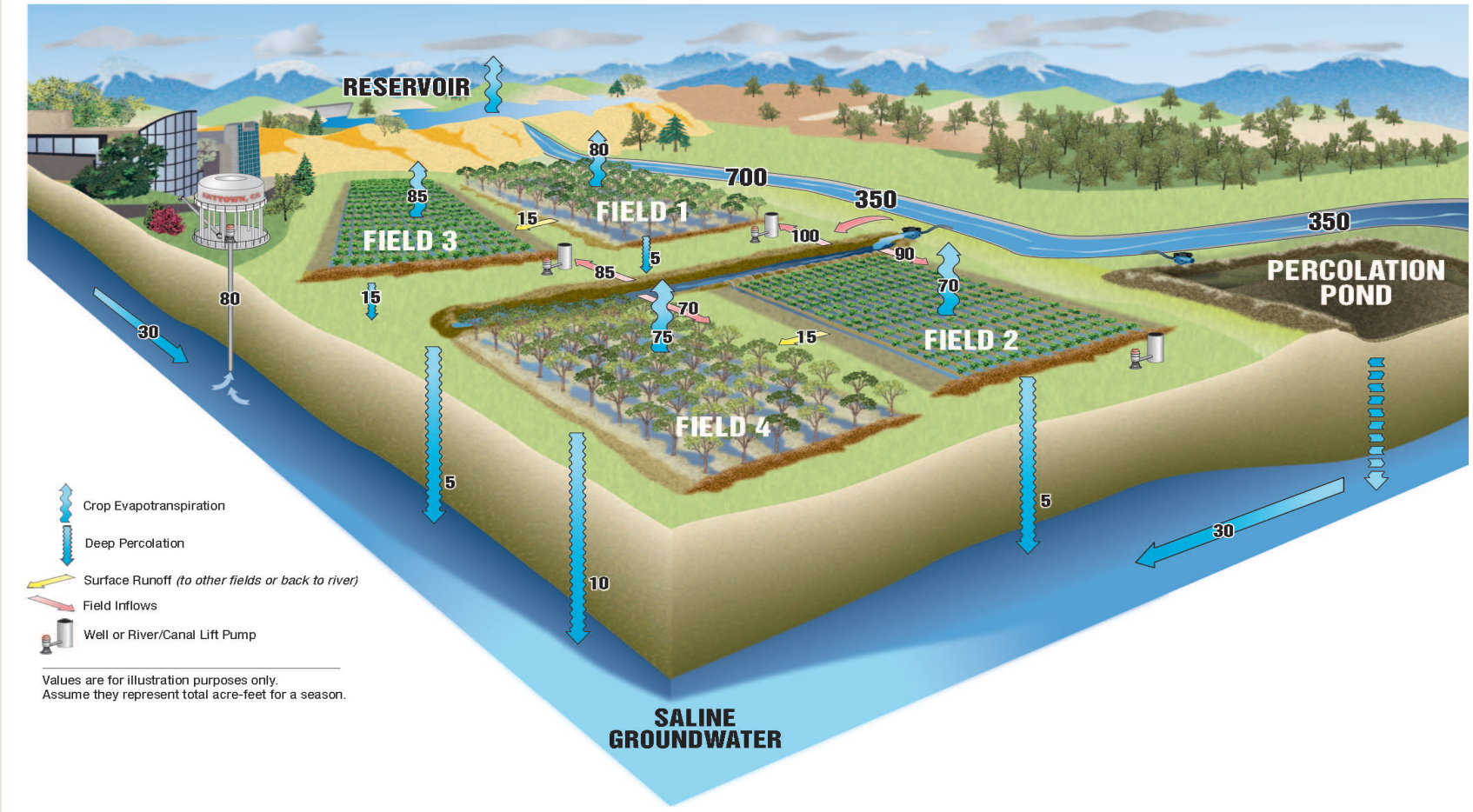
Irrigation

a) High distribution uniformity
b) Proper irrigation management
c) Optimize energy use
d) Flow measurement
e) Soil moisture sensing
f) Well and pump instrumentation
g) Data monitoring and reporting
h) Minimize cost of water per acre-foot

Conclusions

- New reality is food processors working back though supply chain to improve resource efficiency and publicizing improvements as a positive Public Relations campaign
- Water use is no longer only viewed at the source
- Utilities have an opportunity to engage multiple stakeholders in the process and can be seen as part of the solution (growers, food processors, NRCS, Nature Conservancy, other NGO's, etc.

Questions?- Thank You!



CA Energy Efficiency Strategic Plan

Industrial Action Plan & Strategic Plan Update

October 10, 2013
Emerging Technology Coordinating Council
Tulare, CA

The Strategic Plan

Expected Sources of GHG Reductions per AB32

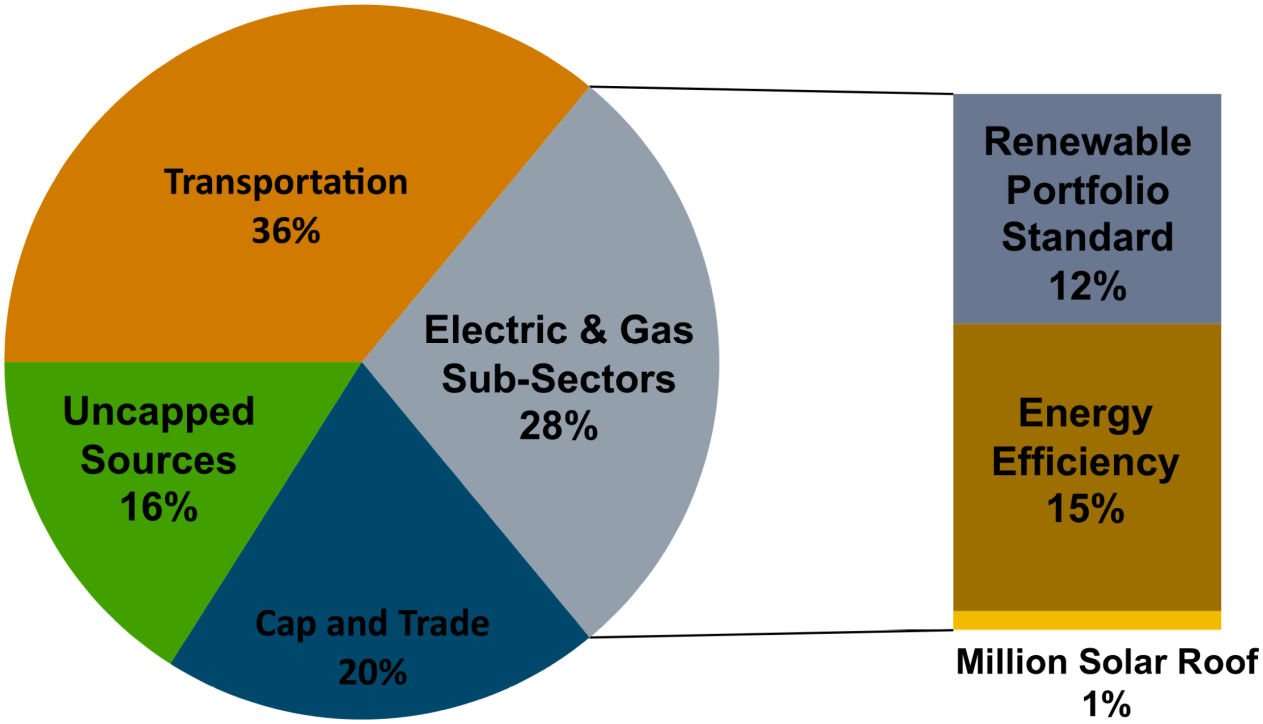
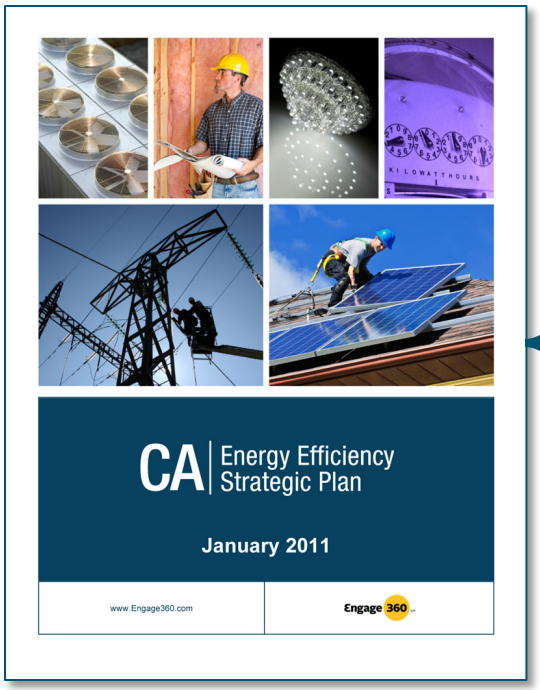


Figure 1: ***California Air Resources Board Scoping Plan, December 2008, Table 2 (p. 17)***

The Strategic Plan



IOU Portfolios

State Agencies

Action Plans

Champions Network

Grants & In-Kind

Big Bold Energy Efficiency Strategies

Strategic Plan: Big Bold Goals

CA Energy Efficiency Strategic Plan




- All new residential construction in California will be zero net energy by 2020
- All new commercial construction in California will be zero net energy by 2030
- Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate
- All eligible low-income customers will be given the opportunity to participate in the low income energy efficiency program by 2020.

Impact of the Strategic Plan

ZNE Center, San Leandro

Examples of Plan Success:

- Executive Order: New CA buildings 2025+ to be ZNE
- Title 24 requires new building commissioning plans
- Western HVAC Performance Alliance
- 2013-14 EE portfolio supports lighting market transformation
- IDSM and workforce training playing greater role in IOU EE portfolios.

2014 Strategic Plan Update

CA Energy Efficiency Strategic Plan

- Strategic Plan published in 2008. Since then…
  - Energy Upgrade California "Home Upgrade" program
  - The Great Recession
  - Building Codes and Standards more efficient
  - Smart Meters installed
  - Governor calls for 12 GW of Distributed Generation
  - Governor calls for 1.5 million EVs

2014 Strategic Plan Update

CA | Energy Efficiency Strategic Plan

- Energy Division staff working internally on update
- Chapters by building type
- Coordination with AB 758
- More Metrics-based approach
- IDSM approach – DR, DG, EVs
- Kick off webinar Q4 2013
- Projected completion Q2 2014

Energy Division Staff Draft Concept

Existing Residential	Existing Commercial / Institutional	New Residential	New Commercial /	Industrial / Agricultural	Local Government

Envisioned chapter structu
of CA Energy Efficiency
Strategic Plan 2.0

CEC
AB 758 Action Plan[1]
Residential ZNE A.P.
Commercial ZNE A.P. (2011)[2]
Industrial / Ag A.P.
Local Gov't A.P.

Codes & Standards Action Plan (2013)

Research & Technologies Action Plan (2013)

HVAC Action Plan (2012)

Lighting Action Plan (2011, 2013)

ARB
AB 32/Scoping Plan Update

California Long-Term EE Strategic Plan (2008, 2011)

Scope
1. Update Goals and Strategies
2. Consolidate / Avoid Duplication
3. Update / Develop New Metrics

Strategic Plan Update

"Strategic Plan 2.0"

IOU Ratepayer-funded Program Activity[3]

Other California Activity[4]

New or Revised Action Plans

CPUC Jurisdictional

Non-CPUC Jurisdictional

"Living Documents" maintained through non-regulatory process until Strategic Plan / AB 758 Plan updated again

Key:
- Launched
- Nearing Completion
- Early Stages
- Under consideration

CPUC EE Proceeding(s)

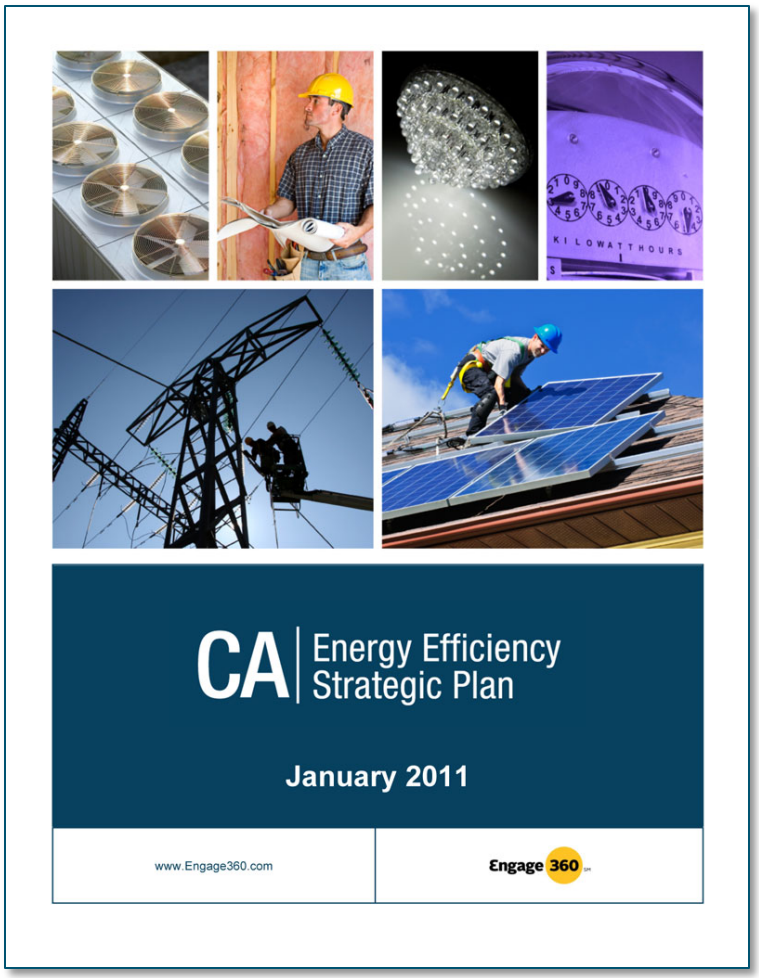
Post-2014 Program Guidance

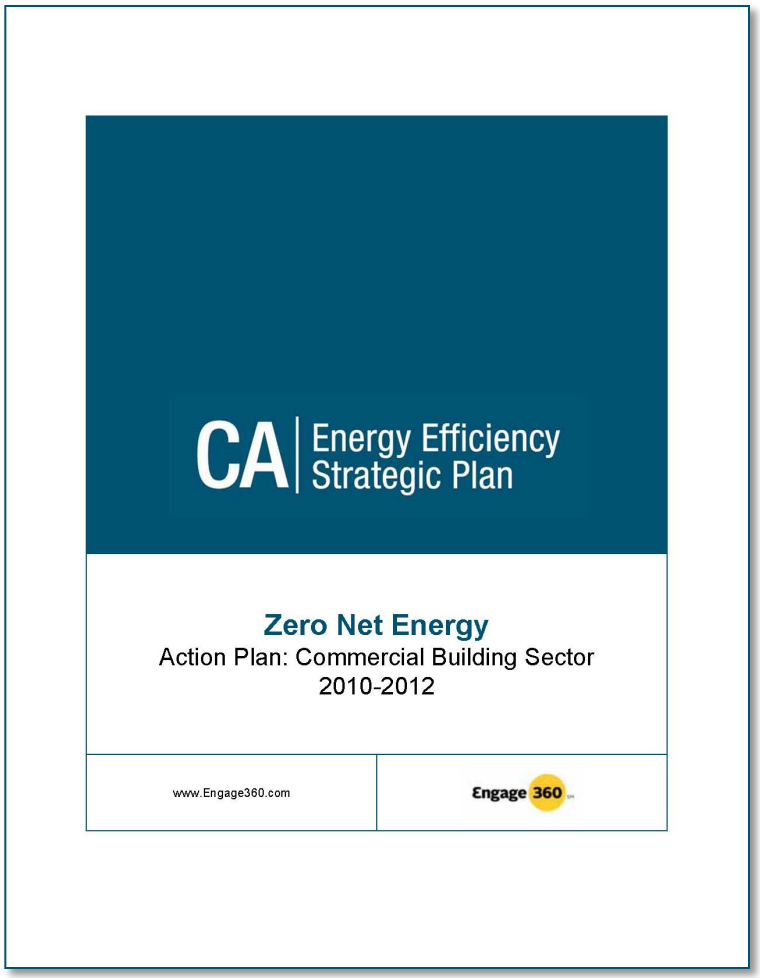
"Strategic Plan 2.0" Adoption

Subsequent Strategic Plan Updates

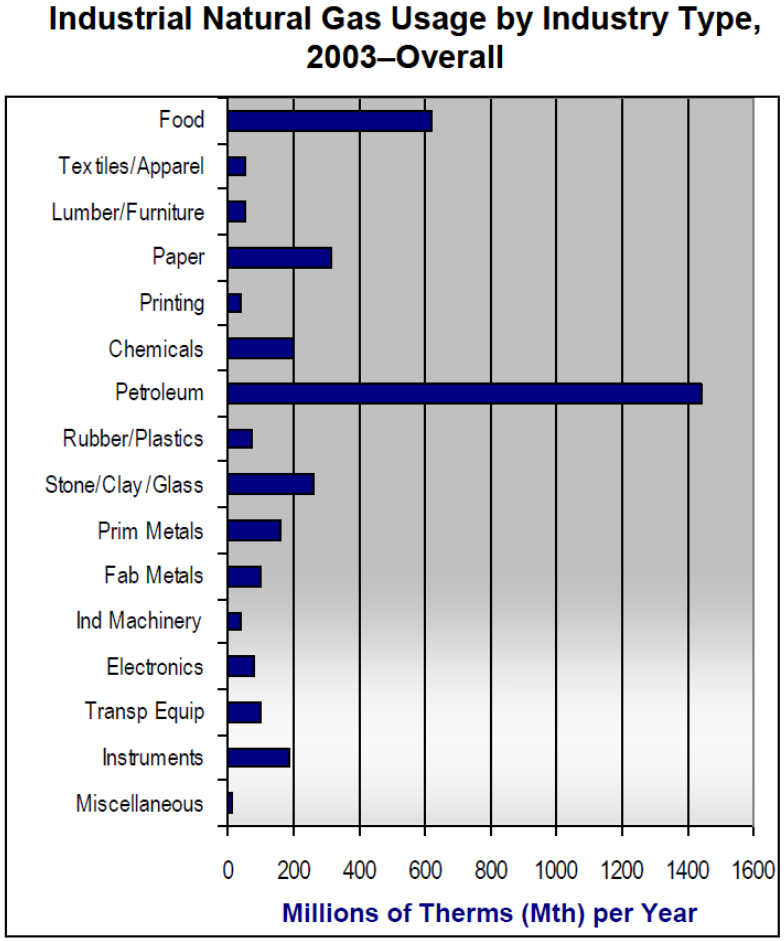
1. CEC plan to implement AB 758 (Skinner, 2009)
2. Addresses existing buildings as well
3. May support other state and local government activity, e.g. codes and standards, climate action
4. State / local government, POU, and other market actor

Action Plans





Industrial Sector Usage



Source: KEMA 2006, California Industrial Existing Construction Energy Efficiency Potential Study

2008 Industrial Chapter: Vision & Goals

CA Energy Efficiency Strategic Plan

Vision: CA Industry will be vibrant, profitable and exceed national benchmarks for EE & resource management

GOAL	GOAL RESULTS (by 2020)
Integrate EE savings w/achievement of GHG goals and other resource management objectives	• By 2012, goals, designs, funding of industrial resource management programs fully coordinated
Build market value of and demand for energy efficiency through branding and certification	• Certification and benchmarking is standard practice* by 2020 • By 2020, energy intensity will be reduced at least 25 percent • Trained workforce in energy management and systems EE
Provide centralized technical and public policy guidance for resource efficiency and workforce training	• Industrial consumers will use to inform actions and manage energy/ resource use with best practices

Industrial Strategic Planning

CA Energy Efficiency Strategic Plan

- Stakeholder process to update Industrial chapter of Plan & Action Plan
- Forming Project Coordination Group
- Industrial customer outreach
- Concepts under consideration:
  - Energy management
  - Integration of non-EE technologies
  - Streamlining and improving program delivery
  - Begun stakeholder process to update Industrial chapter of Plan

Barriers Identified

- Too many demand side programs, too little coordination
- Short term budget/portfolio cycle
- Complex and frequently changing program rules
- Excessive time to review and approve applications
- Lack of resources at industries
- Need to strictly quantify energy savings
- Disproportionate burden on small projects
- Continuous Energy Improvement effective, should grow

Questions?

Rory Cox

Regulatory Analyst, CPUC Energy Division

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From the Field to Food Market

Moderated panel discussion featuring

- Henrik Skov Laursen, *Grundfos*
- Michael Sesko, *Woolf Farming & Processing*
- Ken Patterson, *Advanced Energy Innovations*
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EMERGING TECHNOLOGIES COORDINATING COUNCIL

Lunch Time!

EMERGING TECHNOLOGIES COORDINATING COUNCIL

Opportunities for Industry-Utility Collaboration

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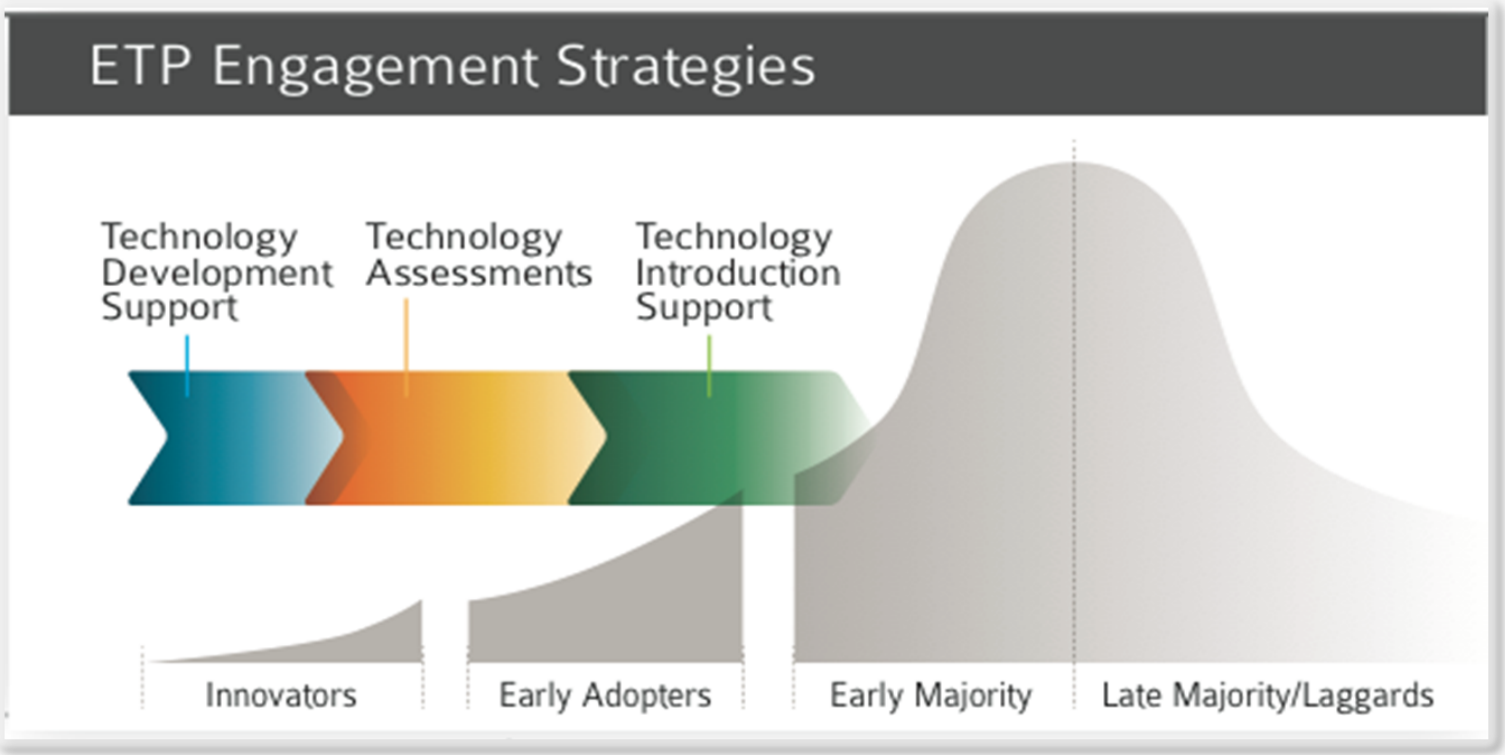
ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

Southern California Edison

ET 2013-2014 Program Design



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PRODUCT/SERVICE AREA:

Process Loads

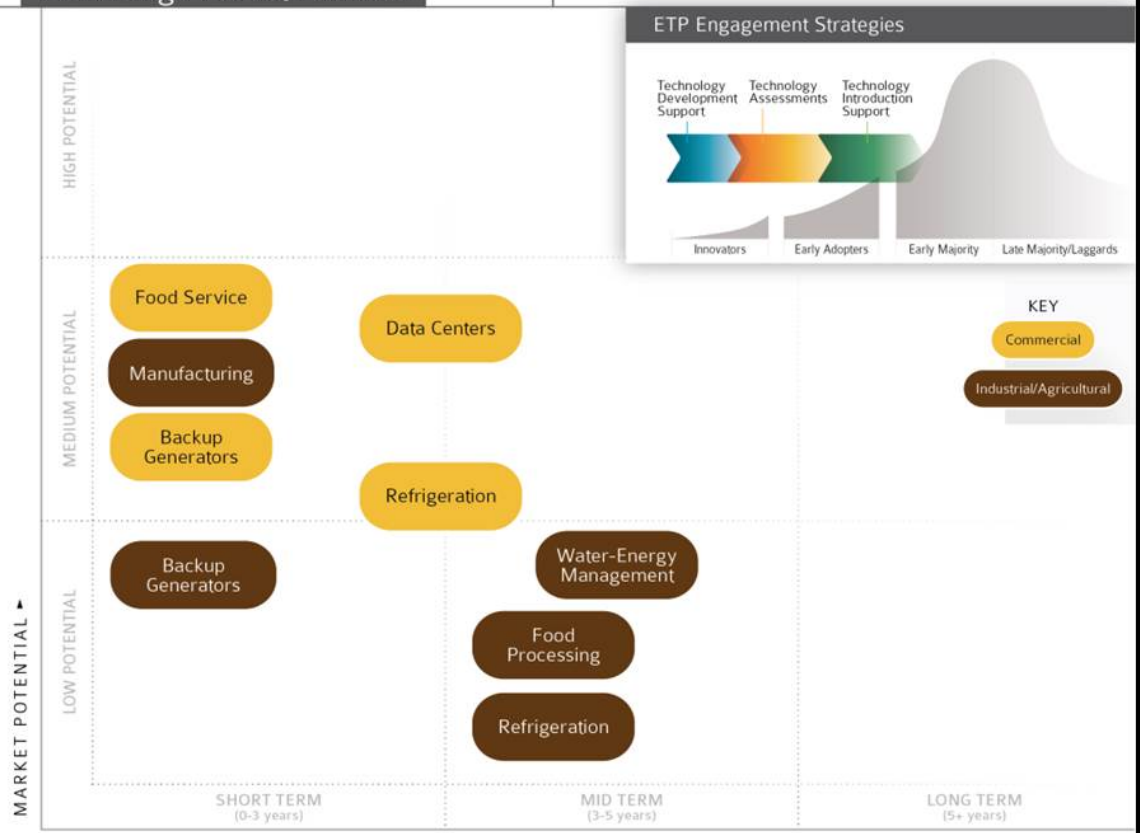
Drivers

- Customer and Shareholder Value
- Regulatory and Policy Drivers
- IDSM Potential
- Need for New Products and Measures
- Market Status and Realities

Gaps and Barriers

- Training and Education
- Performance Uncertainty
- Value Proposition
- Productivity Disruption
- Custom Application

Promising Product Families



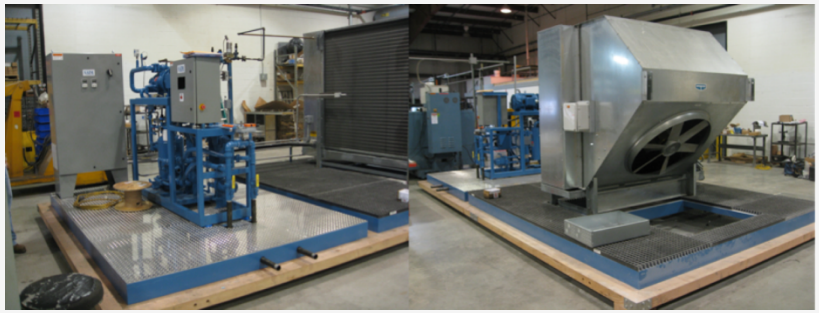
Process examples – *mid and long term – TA*

- Description - NxtCold (patented) replaces a traditional central plant based ammonia refrigeration system with an optimized distributed unit utilizing Electronic Refrigerant Injection Controlled technology. Improved energy efficiency, reduces the amount of ammonia on site by 98%. Replaces central plant with remote controlled and monitored units that are AutoDR capable.

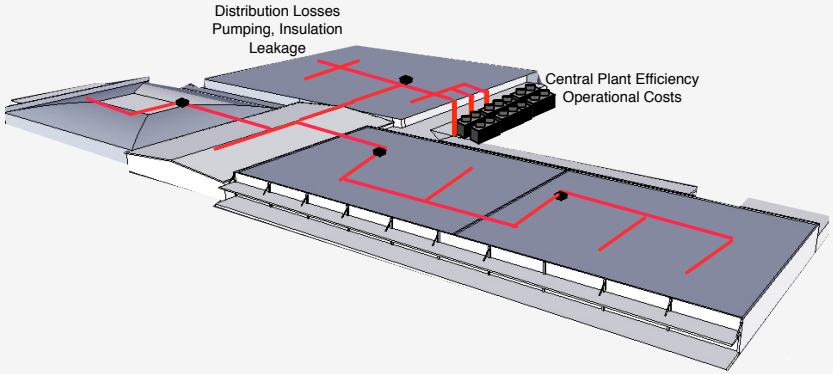
>= to 2000 pounds, monthly inspection schedule enclosed systems, every 3 months for non-enclosed – every 3 months for 200-1999 pounds and annually for less than 200 lb

- Market Potential – see next slide
- Product Families – Cross Cutting

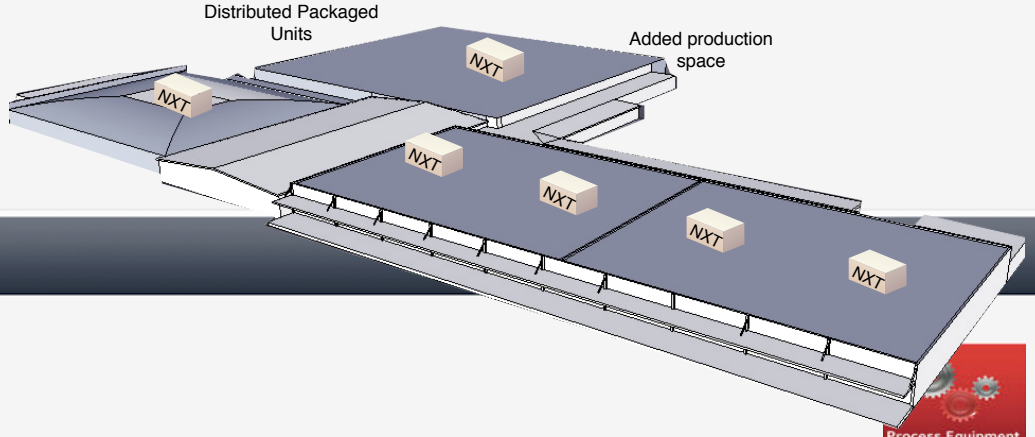
NXTCOLD Technology Description



Central Plant - baseline



Distributed - NxtCold



Market potential

- Refrigerated space has one of the highest electric usage intensities in the commercial building sector
  - In the 2008 PIER Project Report, *Benchmarking Study of the Refrigerated Warehousing Industry Sector in California*, electric usage (kWh/ft^2) ranged from a low of 10 kWh/ft^2 to high of 65 kWh/ft^2 depend on end use market

Refrigeration	Primary Electric Use %	Example: Refrigerated Warehouse (million Fft2)	Example: Refrigerated Warehouse (kWh/End-Use ft2)
PGE	15%	30	15
SCE	12%	61	12.5
SDGE	12%	2	22.7
SMUD	11%	2.7	10.3
State	**14%**	**95.7**	**13.44**

- California depends heavily on refrigerated space with temperatures ranging from +40°F to -80°F for preservation and storage of products
  - Restaurants, Food Stores, Agriculture, Processing, Refrigerated Warehouses

PRODUCT/SERVICE AREA:

Process Loads

NxtCold Technology Low and Medium Temperature Refrigeration

Drivers

- Customer and Shareholder Value
- Regulatory and Policy Drivers
- IDSM Potential
- Need for New Products and Measures
- Market Status and Realities

Gaps and Barriers

- Training and Education
- Performance Uncertainty
- Value Proposition
- Productivity Disruption
- Custom Application

Global warming potential and hazardous materials issues.

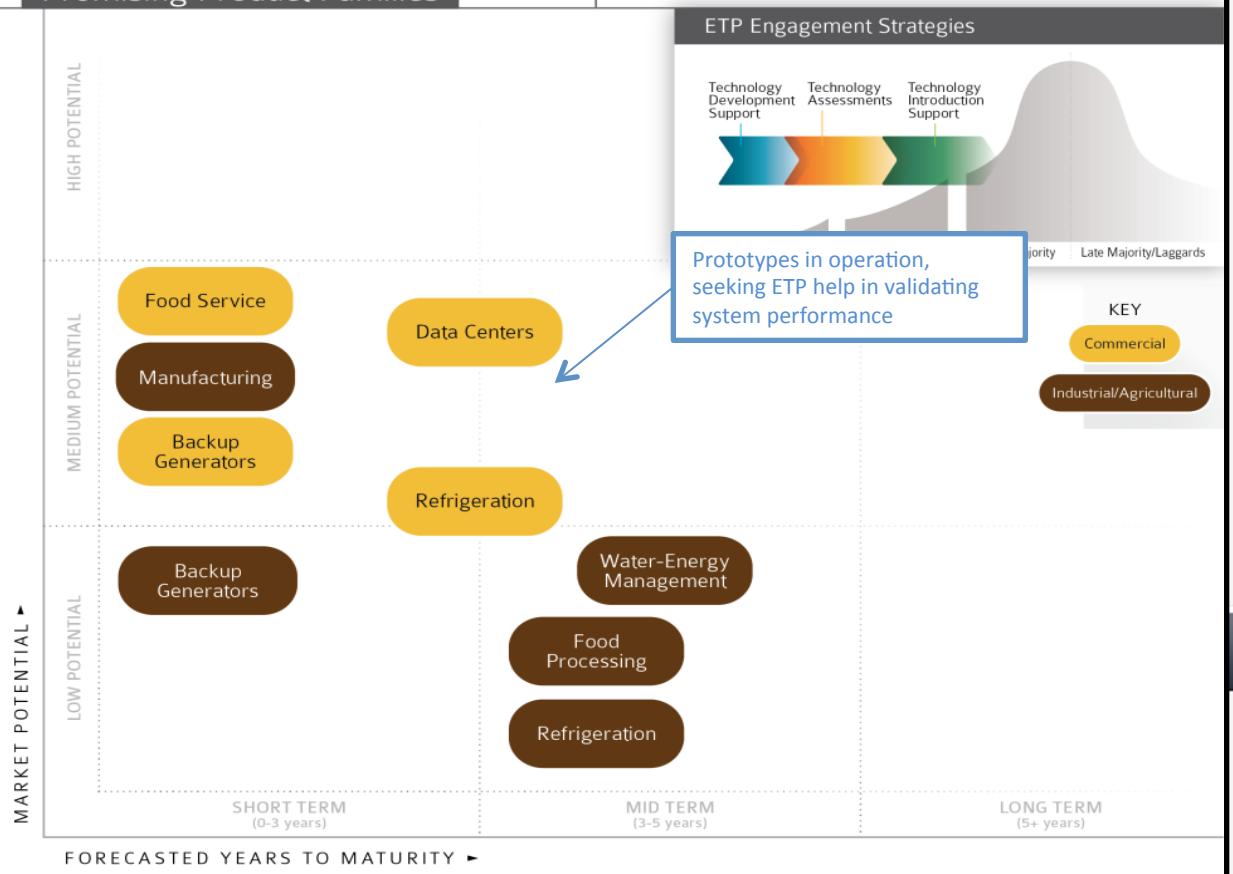
CFC and HCFC replacements for medium and low temperature cold storage.

Air Resources Board Refrigerant Management Program, Title 40 , Code of Federal Regulation, Part 82 drivers for medium sized facilities

Possible field tests with PG&E customer and new Wallmart refrigerated distribution facility

Vendors indicate secondary market that technology will expand to HVAC applications

Promising Product Families



Prototypes in operation, seeking ETP help in validating system performance

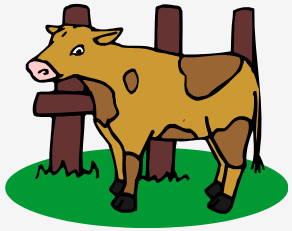
Process examples – *near term - TDS*

- Description – Cow Cooling thru conduction – Uses heat exchangers to remove excess heat from cows through conduction. Heat exchangers placed under the bedding material. Chilled water or low temperature ground water circulates through the heat exchangers. Reduces energy from fans and water usage from soaker lines
- Drivers, Gaps and Barriers – Happier Cows so more milk, requires changes to pen/bed/stall, expensive.
- Market Potential – see next slide
- Product Families – Agriculture

Through ***direct surface contact*** the relatively *'hairless'* and *'thin-skinned'* cow's udder (and belly) …

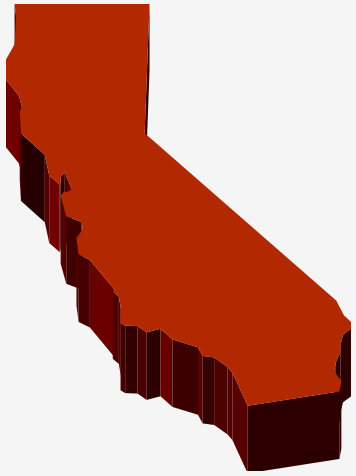
Conductive Cooling for Dairy Farms

Market potential



112 kWh/cow
.05 kW/cow

224 MWh
100 kW
2,000 cow dairy farm



100 GWh
45 kW
1.8 million cows in California

Process examples – *near term – DR*

Description - This project will help explore laboratory and field tests of commercially available agricultural pumps and controllers by evaluating and estimating the DR potential of curtailing pump usage during DR events. This project is to evaluate and test agricultural pump technologies with retrofit or bolt-on solutions that provide options for agricultural customers to purchase and install to adjust their agriculture pump load during a DR event (Open ADR).

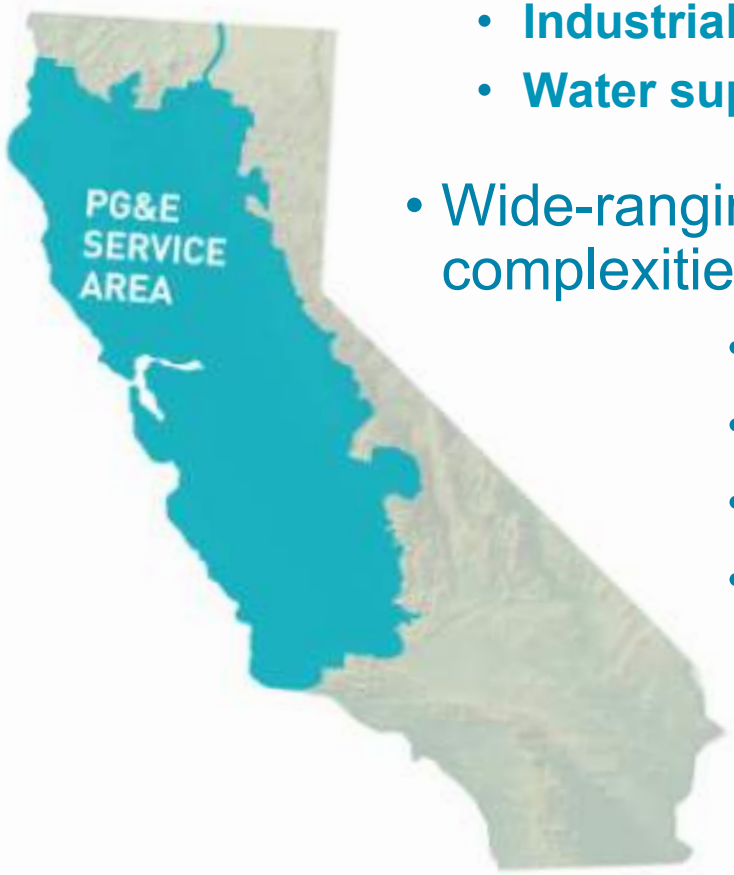
- Drivers, Gaps and Barriers – Communications
- Market Potential – 20,000 pumps, 50-125 hp
- Product Families – Agriculture

Process examples – *near term – demand response*

Pacific Gas & Electric

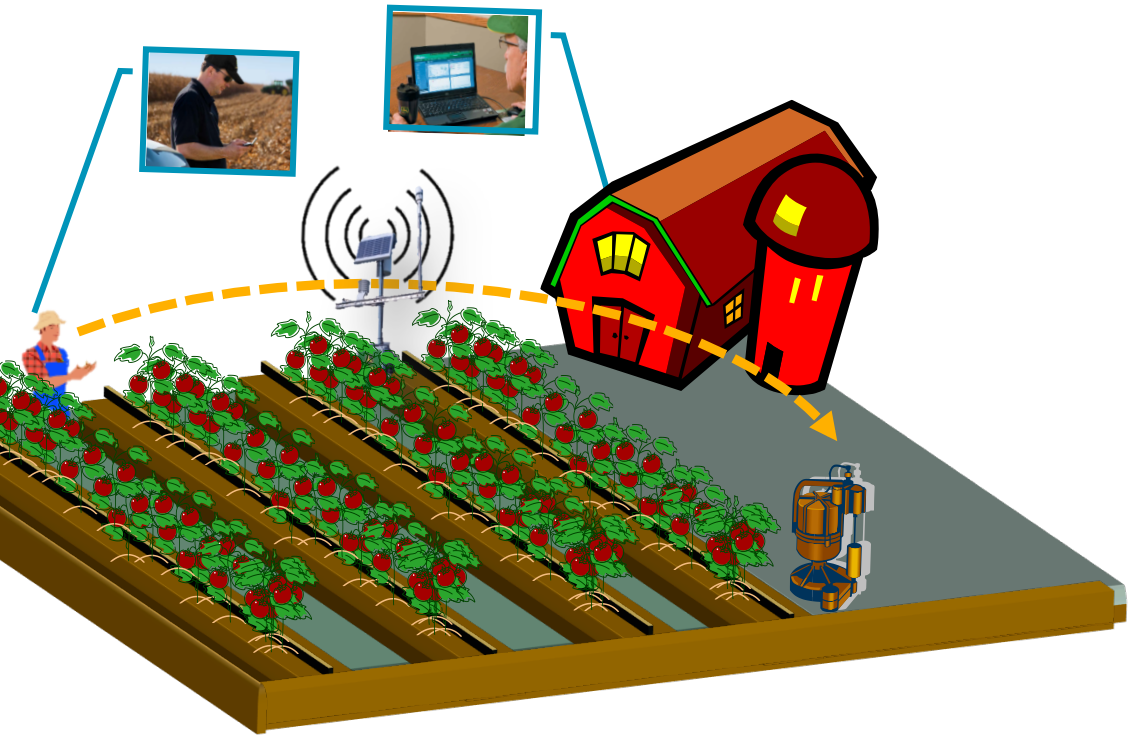
Energy Usage Characteristics

- High energy usage in industrial and agricultural segments
  - **Agricultural production**: 9% of non-res electricity
  - **Food processing**: 8% of non-res electricity
  - **Industrial**: 16% of non-res electricity, 71% of gas
  - **Water supply and treatment**: 4% of non-res elec



- Wide-ranging loads, end uses, and site-specific complexities and technologies
  - **Water supply**
  - **Heating and steam systems**
  - **Refrigeration**
  - **Water treatment**

Trends and Energy Efficiency Drivers



Key opportunities for new EE programs and products:

Water Management

- Restricted surface allocations
- Declining groundwater
- Water quality issues
- Water/Energy nexus

Precise Control

- Real-time information
- Precise delivery of inputs
- Tracking of metrics

>> Top priority: Production (yield, quality, safety)

Ag and Water/Energy ET Project Update

Low Pressure Irrigation Innovation

- **Combined Irrigation System Evaluations**: Combined approach to pump efficiency, pressure management and irrigation distribution uniformity (CSU-Fresno)
- **Low Pressure Irrigation Design**: Lab and field analysis testing of low pressure emitter, filter, and valve performance (CalPoly SLO)

Ag Water Management and Education

- **CSU Fresno Ag Water & Energy Center**: Creation of a center for education and demonstration activities related to agricultural water/energy issues
- **Field Deployment of New Products**

Irrigation Controls and Management

- **Additional projects being scoped**

San Diego Gas & Electric

SDG&E: Overview and Vision of Ag & Industrial Efforts

- SDG&E aims to increase targeted marketing to hard to reach Ag customers and assist with delivering any innovative technologies to the industrial sector.

	Industrial	Agriculture
DRIVER:	Large individual users	Large individual users, rate sensitive
GAPS:	Typically unique and specific processes ranging from shipbuilding to bio-tech, underserved technology or cross-over measures from commercial	Typically Citrus/ Avocado farmers, main opportunity is water pumping.
BARRIERS:	Very small number of customers with typically sensitive or unique processes (i.e. biotech or General Dynamics)	Mostly small farms with limited staff, hard to reach.

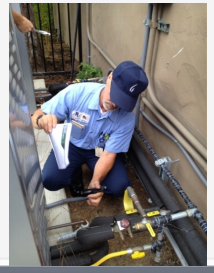
Southern California Gas

SoCalGas Rebates & Incentives

- **Agriculture rebates**
  - Greenhouse Heat Curtains
  - Infrared Film
  - Pipe Insulation
- **Financial incentives**
  - Energy Management Systems
  - Gas Engine Improvements
  - Solar Water Heating
- **Zero interest loans**
- **Custom rebates / incentives**

SoCalGas' Project Highlights & Collaboration

ETP Supported
Acrylic Panel for Greenhouses
Industrial tool kits (CEC, ESC)
RD&D Supported
Large CHP with CO2 Capture (Houweling)
Bio-methane CHP (Gills Onions)
Gas engine water pumping (SJV)
Roger's Garden Orchid House



EMERGING TECHNOLOGIES COORDINATING COUNCIL

Southern California Gas Company
A Sempra Energy utility

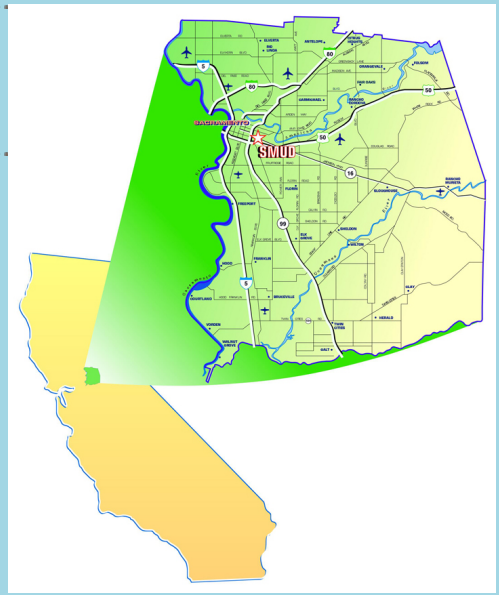
Industrial & Agriculture Initiatives

- **Industry & Agriculture EE gap analysis**
  - Determine technology and market intelligence gaps
  - Examine selected processes & benchmarking
  - Industrial project database
  - Industry Standard Practices
- **Industrial toolkit roll out**
  - 20 – 30 Excel based process models
  - CEC PIER & Energy Solutions Center collaboration
- **Participate and collaborate on Industrial Roadmap**

SMUD: Industry & Ag R&D & Customer Programs

Bruce Baccei

October 10, 2013



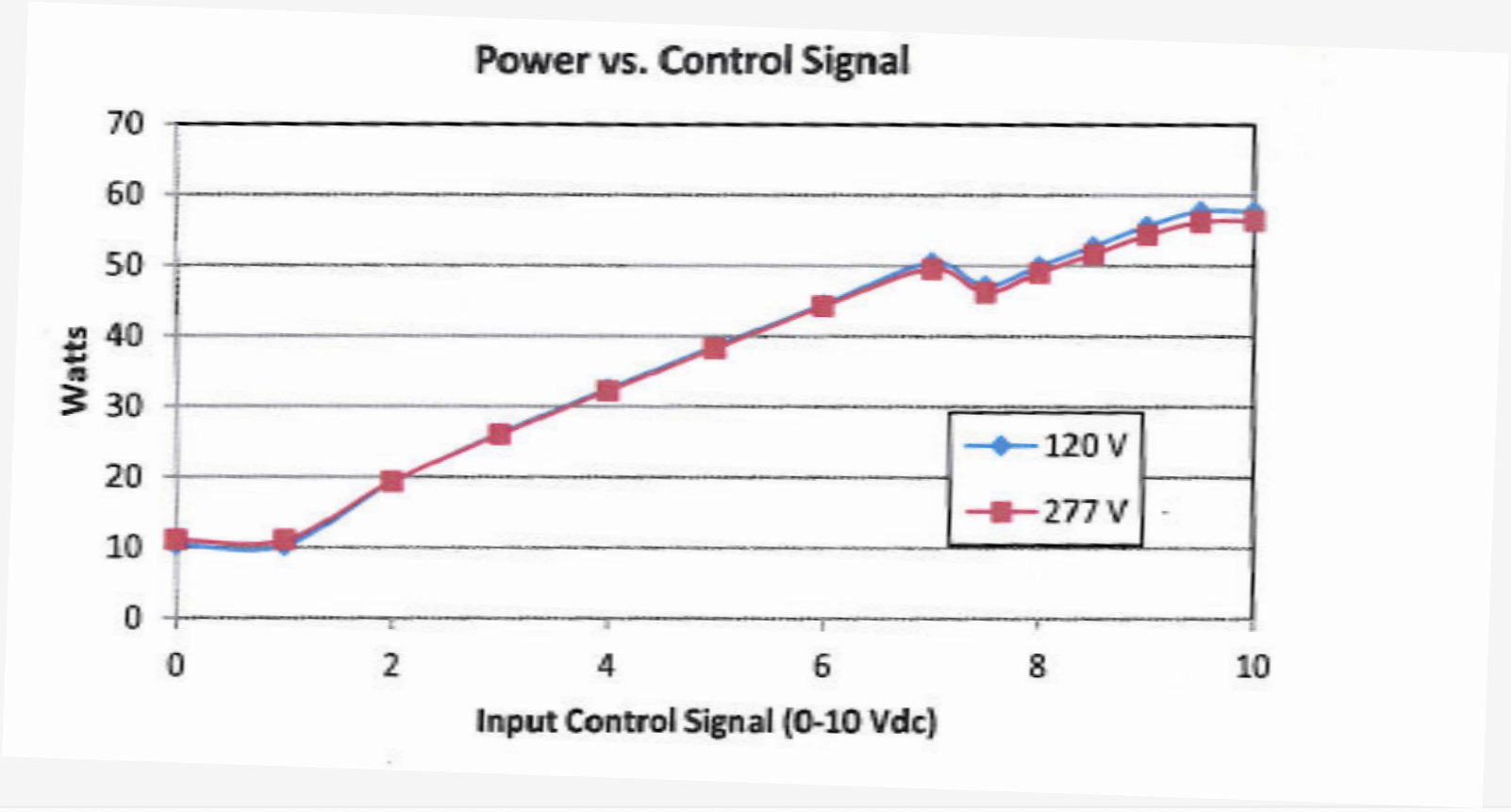
Powering forward. Together.

SMUD™

Industry & Ag

	R&D	Pilot	Rebate/Custom Programs
Data Centers			2
Industrial Processes	1		8
Lighting Interior	1	10	8
Lighting Exterior	2		1
HVAC Upgrade	1		2
Efficient Motor	2		
Anaerobi Digesters	3		

SMUD: Dimming Balasts



EMERGING TECHNOLOGIES COORDINATING COUNCIL

SMUD

SMUD:

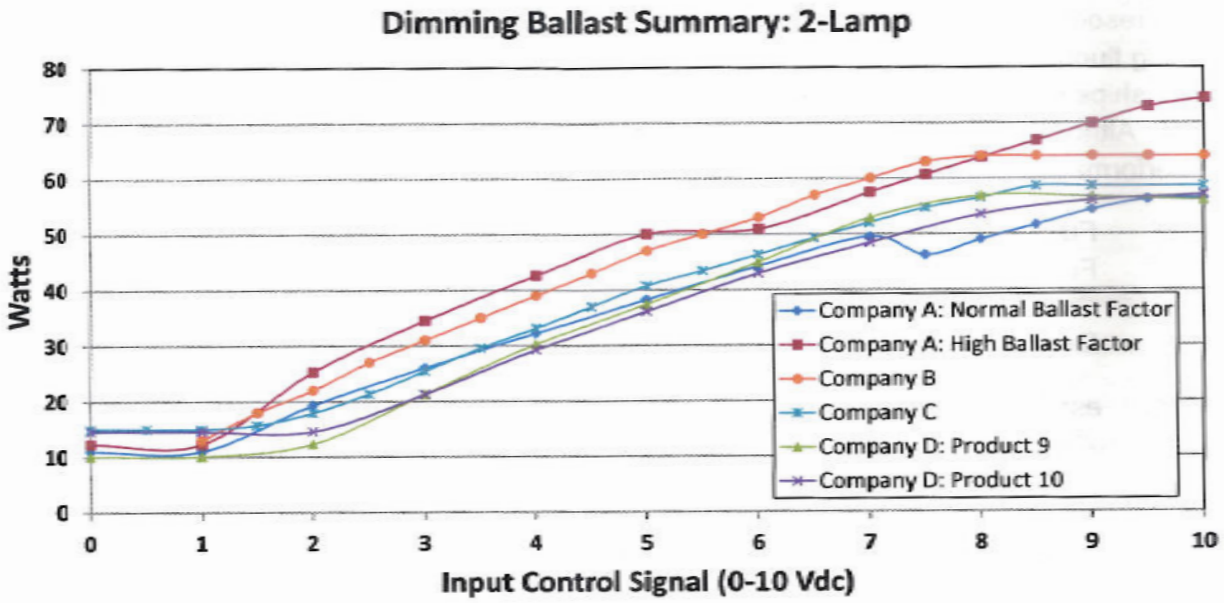


Figure 1: Summary for 2-Lamp, 277 V Dimming Ballasts

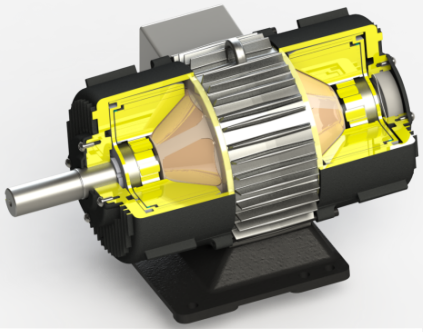
SMUD:

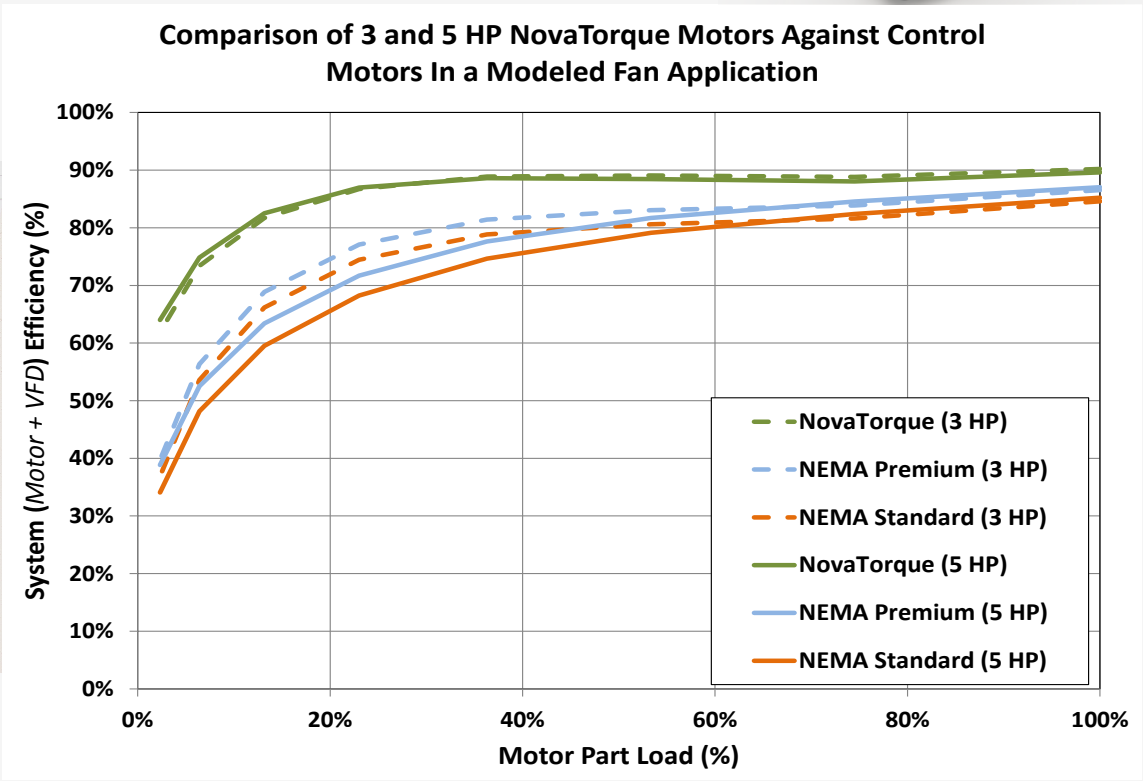
Climate Wizard

Air In: 124.4 ˚F Air Out: 57.4 ˚F

NovaTorque

4 to 25% More Efficient





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SMUD:

Anaerobic Digestion

California Energy Commission

California Energy Commission RD&D Overview and Vision of Ag & Industrial Efforts

- Goal: Conduct RD&D to help the industrial, agriculture and water sectors maximize energy efficiency, reduce operating costs, meet environmental challenges and increase productivity

- Policy drivers: Aligned with state policy goals- Integrated Energy Policy Report, Energy Efficiency Strategic Plan and AB 32

California Energy Commission: Project Highlights and Collaboration

- Food processing energy efficiency improvements:
  - Infrared peeling of fruits and vegetables; refrigeration; food drying; boiler enhancements
  - Thermosorber –thermally driven heat pump- co production of hot water and air conditioning
  - Winesecrets: Electrodialysis to remove tartrate salts from wine-saves energy and it's fast
- Wastewater Treatment Improvements:
  - Ozone Water Treatment – Duda Farms, Oxnard
  - Membrane Filtration – Gills Onions, Oxnard
  - Process improvements (aeration and secondary treatment
- Anaerobic Digestion: agricultural waste (dairy manure/food processing waste) and bacterial enhancements: Gills Onions, Fiscallini Farms, Valley Fig, Cascade
- Solar thermal demonstration– Frito Lay
- Refrigerated warehouses – demand response applications
- Tool development to identify energy efficiency opportunities

California Energy Commission: Collaboration

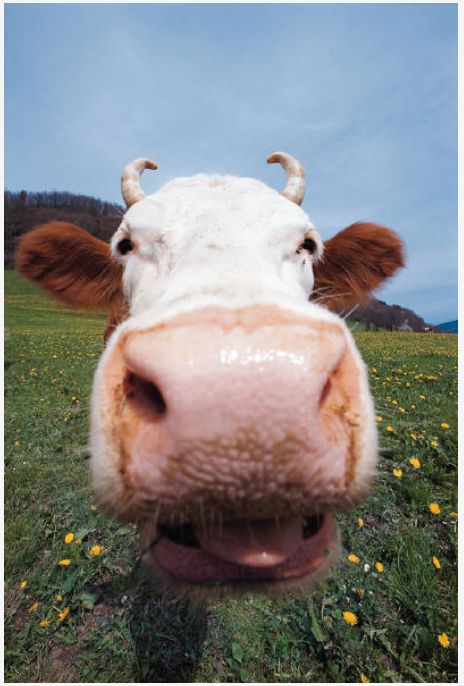
- **Collaboration Needs and Interest**
  - work with industry to identify energy research needs and opportunities
- **Upcoming solicitations**

http://www.energy.ca.gov/contracts/pier_upcoming.html

Closing Remarks

Please fill out evaluation survey!

Next ETCC Public Meeting Q1 2014; exact date and location TBD



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