



California Statewide Gas Emerging Technologies

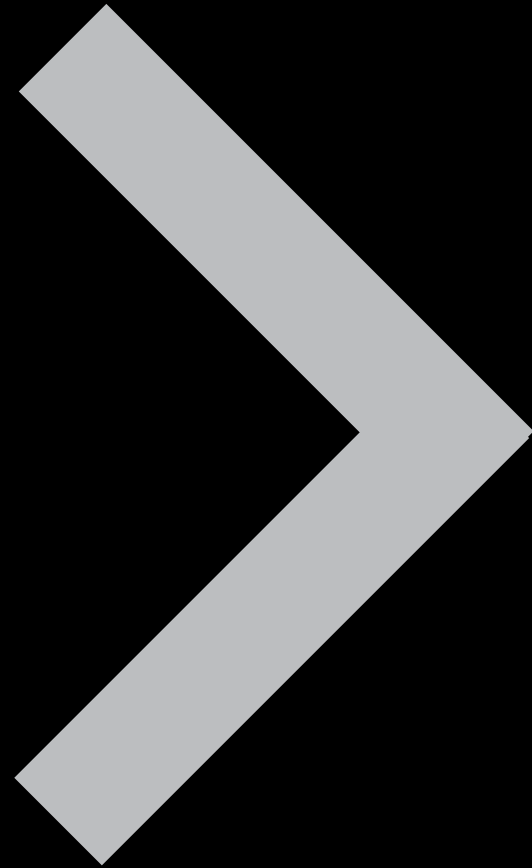
Final Presentation- ET23SWG0016



High-Efficiency Crematorium

Confidential

April 2024



Agenda

Project Objectives

Literature Review

Survey Tool and Crematorium Screening

Site Visits and OEM Interviews

Barriers

Recommendations

Conclusion



Project Objectives

Project Objectives

1. Literature Review:

- Explore the historical evolution of crematoriums, emphasizing flame-based cremation with natural gas.
- Investigate various cremation methodologies, regulatory frameworks, and innovative solutions contributing to energy-efficient cremation.

2. Technology Landscape Analysis:

- Examine the current state of crematorium technologies, focusing on primary and secondary chambers, control panels, loading doors, cooling trays, and auxiliary spaces.
- Analyze technological adaptations to the historical surge in cremation practices, emphasizing efficiency and environmental considerations.

3. Barrier Identification:

- Identify potential barriers to the adoption of energy-efficient cremation technologies.
- Explore factors such as cost considerations, lack of awareness, resistance to change, and the need for technical expertise.

Project Objectives

4. Interaction with Experts:

- Engage directly with industry experts, including OEMs and crematorium operators.
- Conduct on-site visits to capture valuable data on industry commonalities, barriers faced by each facility, and feedback from crematorium operators.
- Leverage input from OEMs to highlight specific design features contributing to energy efficiency.

5. Actionable Recommendations:

- Derive actionable recommendations based on survey results to guide the evolution of crematorium technologies in California.



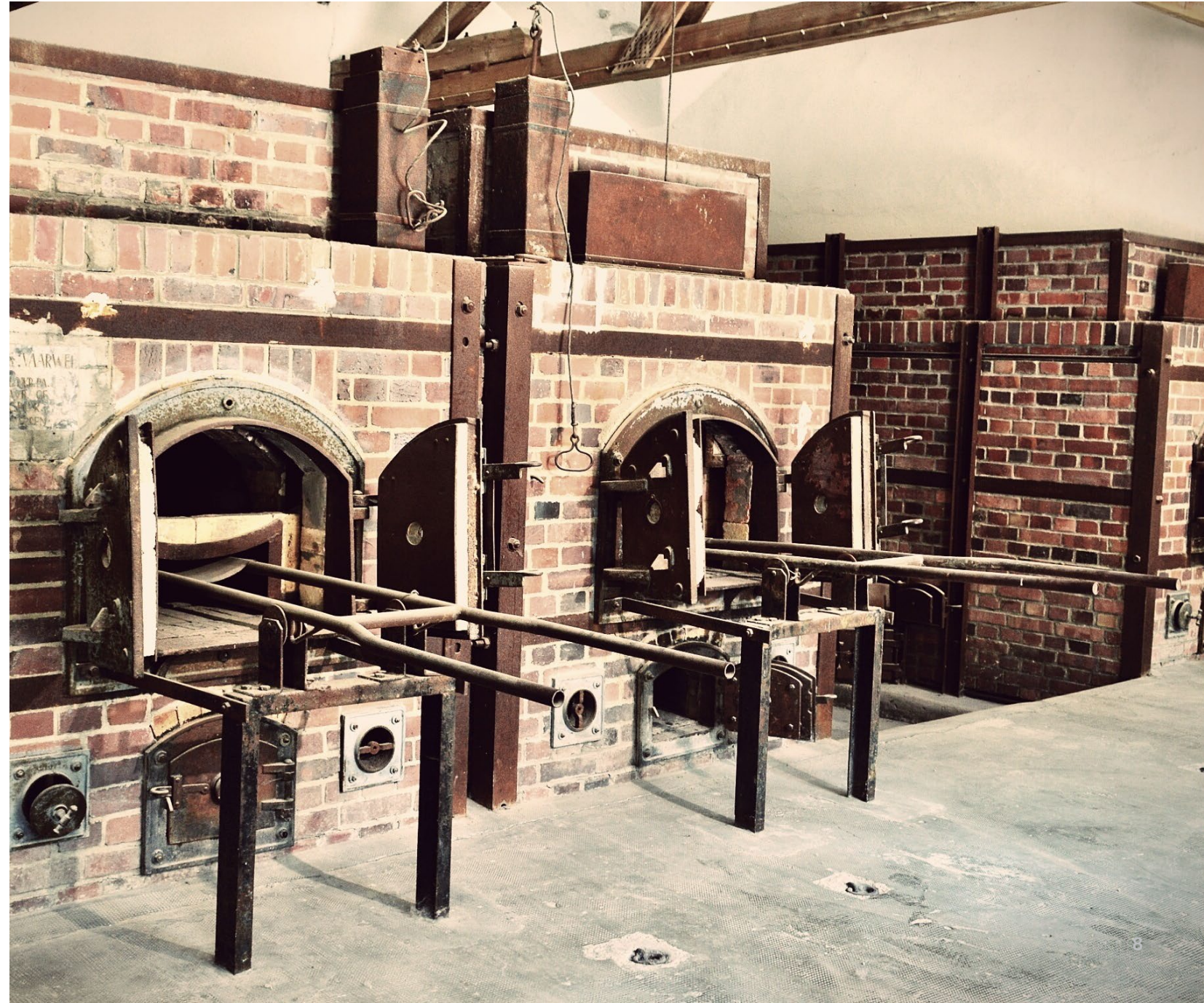
Literature Review

Literature Review

- Crematory
- Crematorium Design
- Technology Advancement
- Crematorium Adoption Barriers Identified in Literature Review

Crematory

- A facility for controlled cremation of human and animal remains.
- Emerged in the 19th century; rich historical significance.



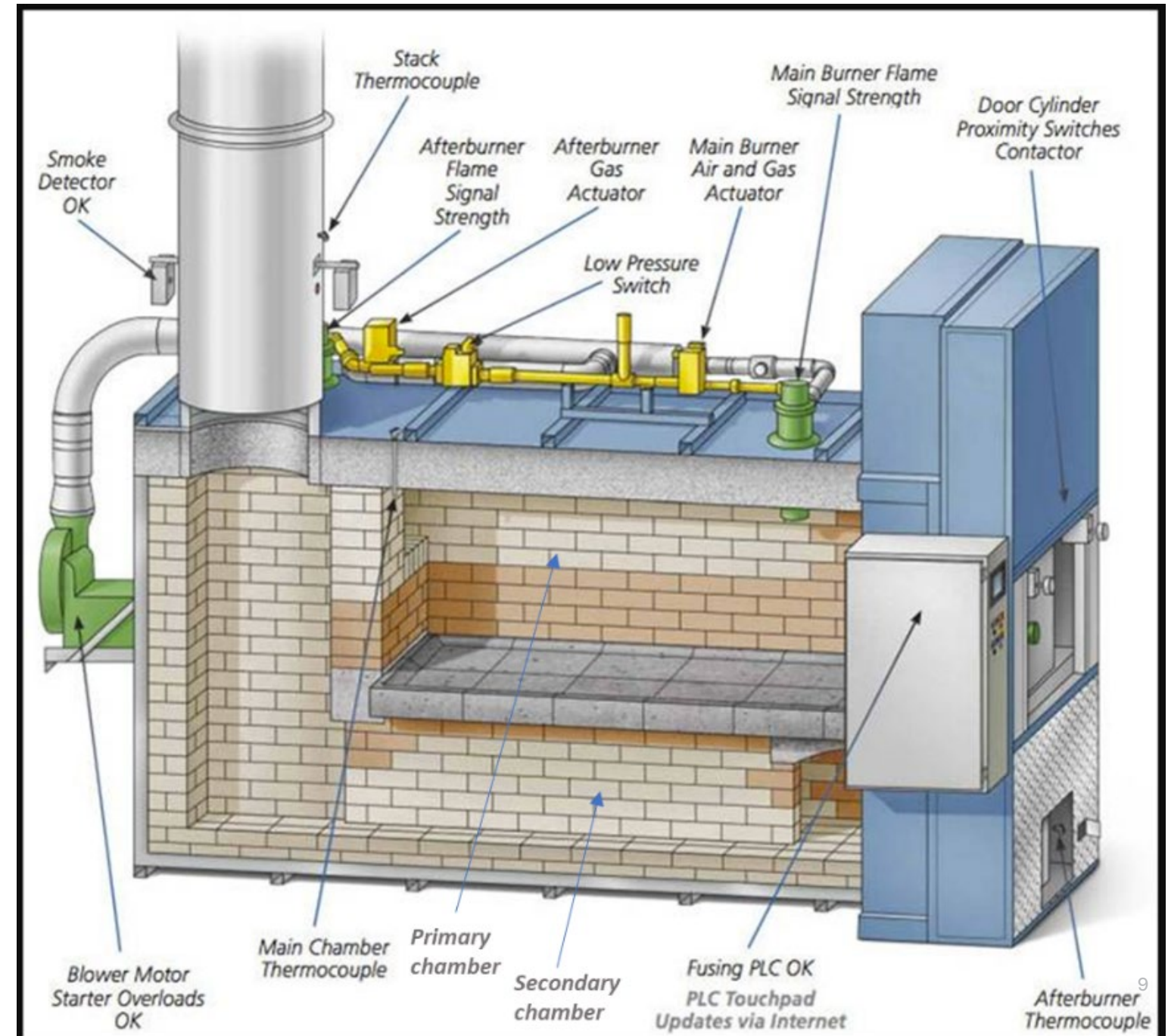
Crematorium Design

Crematorium Facility:

- Focus on flame-based cremation with natural gas.
- Facilities accommodate both human and animal remains.

Equipment:

- Primary and Secondary Chambers, Control Panel, Loading Door, Cooling Tray.



Building Support Spaces in Crematoriums

- Memorial Areas for services and ceremonies.
- Funeral Services for viewing and religious ceremonies.

Regulations Governing Crematoriums

- Governed by the California Health and Safety Code (HSC § 7117).
- Key provisions: individual cremation, no casket requirement, post-cremation handling.
- CARB requirements for emission reporting.



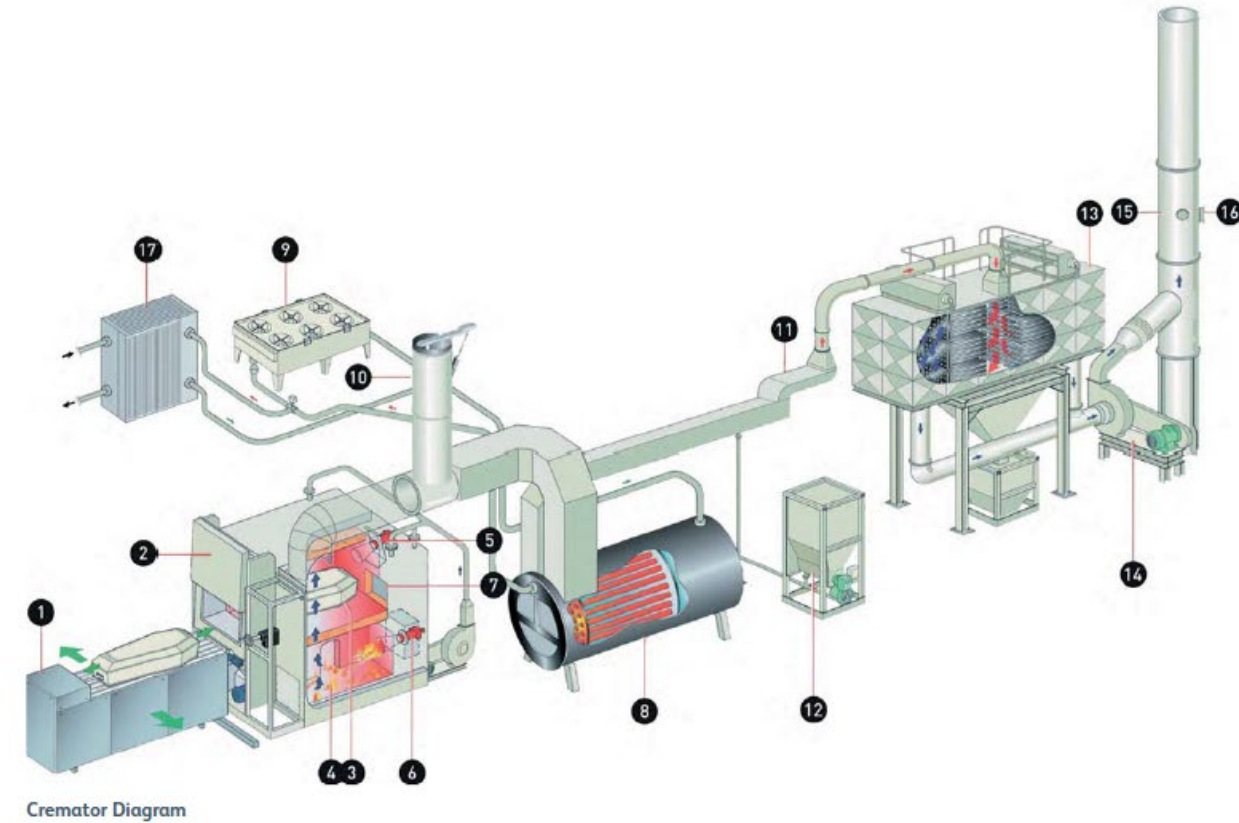
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Technological Advancements in Cremation

- Rise of cremation in the late 19th century.
- Fuel-powered cremation furnace introduction.
- Focus on energy-efficient and sustainable crematorium technologies.

Key

1. Coffin Charger with an electronic ram
2. Charging Door
3. Cremation Door
4. Post Combustion Chamber
5. Cremation Burner
6. Post Combustion Burner
7. Ash Removal Door
8. Energy Recovery
9. Aerocooler
10. By-pass
11. Reactor
12. Reagent Tank
13. Mercury Abatement Unit
14. Gas Extractor Fan
15. Chimney
16. Sampling Hole
17. Heating Recovery



Modern Cremation Design

Measures for Efficiency

- Thermal Energy Recovery
- Advanced Combustion Systems
- High-Efficiency Burners
- Energy Management Systems
- Insulated Chambers



Thermal Energy Recovery Unit

Crematorium Adoption Barriers Identified in Literature Review



Barriers include:

- Cost
- Lack of awareness
- Resistance to change
- Lack of Technical expertise



Survey Tool and Crematorium Screening

Survey Tool and Crematorium Screening



1. Development of a Comprehensive Survey Questionnaire
 - In-depth questions designed to gather detailed insights.
 - Tailored for site visits and interviews with crematorium professionals.
2. Challenges in Participant Identification
 - Limited success with initial cold calls to crematoriums.
 - LinkedIn outreach yielded inadequate responses.
3. Shift to Hands-On Approach
 - Personal visits to crematoriums for direct engagement.
 - Explanation of the program to secure survey participation.
4. Corporate Approvals and Hesitancy
 - Many crematoriums required corporate approvals to participate.
 - Initial hesitancy overcome through persistent efforts.

Survey Tool and Crematorium Screening

5. Breakthrough with Direct Engagement

- Personal visits emerged as the most effective method.
- Establishing connections with crematorium professionals.

6. Importance of Personalized Outreach

- Overcoming barriers for successful site visits.
- Building relationships crucial for data collection success.



Site Visits and OEM Interviews

Site Visit Data

1. Overview of Participants:

- Insights gathered from manufacturers and operators in the crematorium industry.
- Diverse organizations represented, with a focus on cremation technologies.
- Data primarily sourced from targeted crematoriums in Northern California.

2. Participants Summary:

- Only one OEM participated in the study out of the targeted five.
- Seven out of 61 contacted crematoriums responded, showing an 11% response rate.
- Aggregated data from four gas equipment manufacturers to supplement OEM insights.

3. Site Visit Challenges:

- Initial goal: Five OEM interviews and two site visits.
- One OEM and seven crematoriums responded, posing challenges in gaining deeper insights.
- Reluctance of other OEMs remains unclear, potentially due to confidentiality, competition, or resource constraints.

Site Visit Data: Response Rate

SMEs	SMEs Contacted	Response Obtained	Response Rate (%)
OEMs	13	1*	8%
Crematories	61	7	11%

Note: * The single OEM that provided a response does not manufacture natural gas-compatible systems. The data was not included in the summary.

Site Visit Insights

Category	Most Common Response
Interested in EE Solutions	Yes (100% of the respondents)
Cremation Equipment Vendor	Matthews Cremation Technology (3 locations)
Gas Usage (Therms per Year)	177,000 (Average across all locations)
Cremations per Year	5,057 (Average across all locations)
Therms per cremation per year	30.5
Energy-Efficient Initiatives	No (85% of respondents)
Waste Heat Handling	Released to atmosphere (28% of the respondents)
Considerations for Equipment Selection	Cost, consumption, compliance (85% of respondents)
Financial Incentives used for Energy Efficiency	No (100% of the respondents)
Collaboration with trade Experts	Yes (71% of the respondents)
Barriers to EE Technology	Cost: 5 (57% of the respondents)
Options Driving Adoption	Lower cost: 5 (100% of the respondents)

Market Adoption Drivers

Location	Lower Costs	Utility Incentives	Marketing	Education for End Users	Ease of Install	Ease of Maintenance	Testing and Rating Standards	Government Subsidies / Tax Credits
Location Six	5	4	3	4	4	4	3	5
Location Five	5	5	5	4	5	5	5	5
Location Four	5	5	5	5	5	5	4	5
Location Three	5	5	5	5	5	5	5	5
Location Two	5	5	5	5	5	5	5	5
Location One	5	4	3	4	5	5	3	5
Location Seven	5	4	3	4	5	5	3	5

Barriers to Adoption

Location	Cost	Technical Expertise	Technical Performance	System Incompatibility	Integration Complexity	Resistance From Employees
Location Six	4	2	4	2	3	3
Location Five	5	3	4	2	5	1
Location Four	5	3	2	3	4	2
Location Three	4	3	4	5	5	1
Location Two	5	5	4	4	5	2
Location One	3	2	2	3	3	2
Location Seven	5	3	3	2	3	2
Average	4.4	3.0	3.3	3.0	4.0	1.9
SD	0.8	1.0	1.0	1.2	1.0	0.7
CV	17.8	33.3	28.9	38.5	25.0	37.2

Environmental Commitment

- Operators' dedication to environmental responsibility and waste management.
- Collaboration with regulatory bodies and industry associations for adherence to environmental standards.
- “We are dedicated to environmental responsibility. Partnering with Air Quality Management District ensures emission control measures, reflecting our commitment to sustainable and conscientious crematorium operations.”



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Product Efficiency Features

Operators' dedication to environmental responsibility and waste management.

Collaboration with regulatory bodies and industry associations for adherence to environmental standards.





Recommendations

Recommendations

- Educational Incentives
- Financial Incentives and Rebate Programs
- Technical Support and Training
- Certification and Quality Assurance
- Market Adoption Strategies
- Customized Solutions



Conclusion

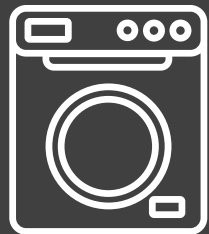
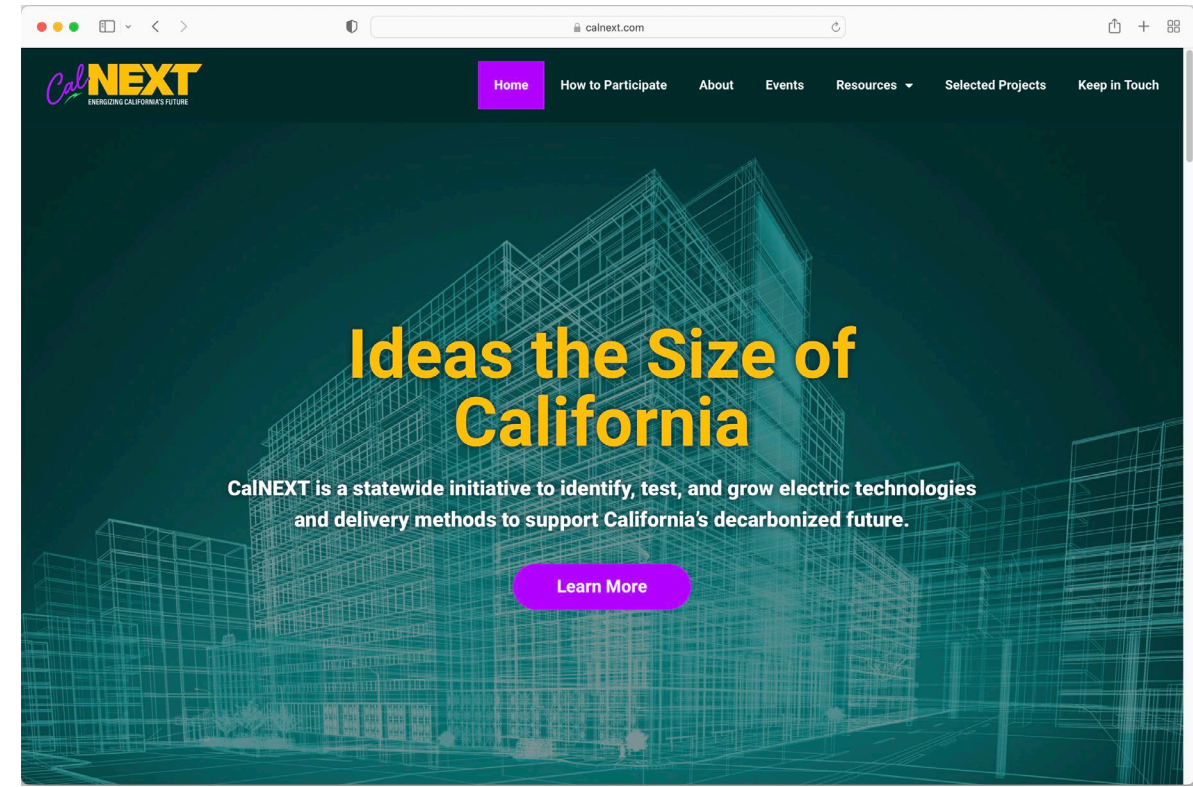
Conclusion

- This study sheds light on California's cremation industry, exploring its history, technology, and environmental aspects.
- Identified barriers to adopting energy-efficient technologies in natural gas cremation processes.
- Insights from site visits inform comprehensive recommendations spanning education, incentives, technical support, certification, market strategies, and tailored solutions.
- Aiming to empower operators, staff, and stakeholders, these recommendations guide the industry towards efficient and sustainable practices for a unified future.

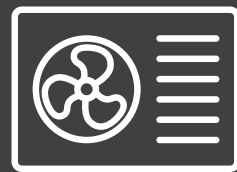
CalNEXT

CalNEXT's vision is to identify emerging electric technologies across six priority areas and bring them to the IOU energy efficiency programs portfolio.

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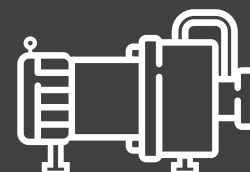
Appliances
& Plug
Loads



HVAC



Lighting



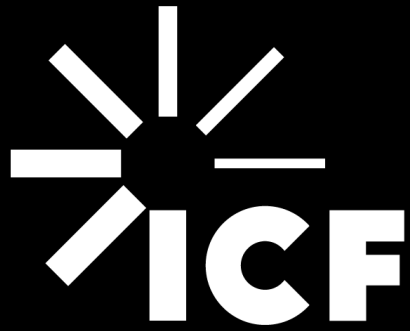
Process
Loads



Water
Heating



Whole
Buildings



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