Proposed Amended Rule 1135

Emissions of Oxides of Nitrogen from Electricity Generating Facilities

Working Group Meeting #2

August 4, 2022

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Webinar ID: 946 4851 5982

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Agenda

- Summary of Last Working Group Meeting
- Response to Comment Letter
- Background
- Logistics for Assessed Technologies
- Updated BARCT Assessment
- Next Steps

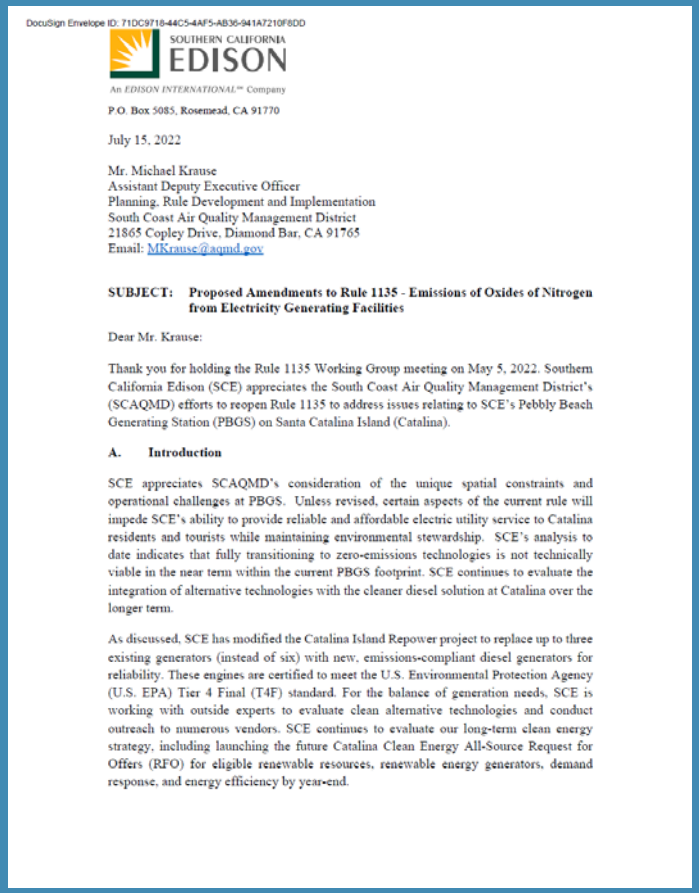
Summary of May 5, 2022 Working Group Meeting

- Rule 1135 background and applicability
- 2022 amendments to Santa Catalina Island requirements
  - Established 13-tons annual NOx emission limit by 2026 and retained three-year extension
  - Added interim NOx emission limits
  - Added prohibition on new diesel engines after January 1, 2024
- Discussed updated BARCT assessment
  - Southern California Edison (SCE) Pebbly Beach Generating Station (PBGS) repower parameters
  - Provided overview of technologies to be assessed
    - Fuel Cells
    - Linear Generators
    - Solar Photovoltaic (PV) Cells

Response to Comment Letter

Comment Letter

- Staff received a comment letter from SCE
- The comment letter expressed SCE's perspective that:
  - Tier 4 Final diesel engines are Best Available Retrofit Control Technology (BARCT), Best Available Control Technology (BACT), and Lowest Achievable Emissions Rate (LAER) on Catalina Island
  - Prohibition on new diesel engines after January 1, 2024, should be delayed
  - Mass emission limits and implementation deadlines should be adjusted
  - BARCT cost-effectiveness analysis must include all applicable costs and reflect appropriate equipment useful life
  - Fuel storage is a limiting factor
- Comment letter is available on the proposed rules webpage[1] and will be discussed in the following slides



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SOUTHERN CALIFORNIA EDISON

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July 15, 2022

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SUBJECT: Proposed Amendments to Rule 1135 - Emissions of Oxides of Nitrogen from Electricity Generating Facilities

Dear Mr. Krause:

Thank you for holding the Rule 1135 Working Group meeting on May 5, 2022. Southern California Edison (SCE) appreciates the South Coast Air Quality Management District's (SCAQMD) efforts to reopen Rule 1135 to address issues relating to SCE's Pebbly Beach Generating Station (PBGS) on Santa Catalina Island (Catalina).

A. Introduction

SCE appreciates SCAQMD's consideration of the unique spatial constraints and operational challenges at PBGS. Unless revised, certain aspects of the current rule will impede SCE's ability to provide reliable and affordable electric utility service to Catalina residents and tourists while maintaining environmental stewardship. SCE's analysis to date indicates that fully transitioning to zero-emissions technologies is not technically viable in the near term within the current PBGS footprint. SCE continues to evaluate the integration of alternative technologies with the cleaner diesel solution at Catalina over the longer term.

As discussed, SCE has modified the Catalina Island Repower project to replace up to three existing generators (instead of six) with new, emissions-compliant diesel generators for reliability. These engines are certified to meet the U.S. Environmental Protection Agency (U.S. EPA) Tier 4 Final (T4F) standard. For the balance of generation needs, SCE is working with outside experts to evaluate clean alternative technologies and conduct outreach to numerous vendors. SCE continues to evaluate our long-term clean energy strategy, including launching the future Catalina Clean Energy All-Source Request for Offers (RFO) for eligible renewable resources, renewable energy generators, demand response, and energy efficiency by year-end.

[1] http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1135/par-1135-sce-comment-20220715.pdf?sfvrsn=6

SCE Comment Letter – Tier IV Final Diesel Engines are BARCT, BACT, and LAER

Comment

- BACT and LAER are assessed in the context of reliably producing power within the current PBGS footprint
- BACT/LAER is met by Tier 4 Final diesel engines in several databases
  - California Air Pollution Control Officers Association (CAPCOA) BACT Clearinghouse
  - U.S. EPA Reasonable Available Control Technology (RACT)/BACT/LAER Clearinghouse
  - BACT guidelines for California and several air districts
  - BACT/LAER requirements in New Source Review permits issued by South Coast AQMD and other air quality agencies
- Until a new analysis concludes otherwise, Tier 4 Final diesel engines remain BARCT, BACT, and LAER

Response

- Rule development process determines BARCT, not BACT/LAER
  - BARCT assessment acknowledges the challenges and limitations of acquiring additional land but does not limit to PBGS footprint
- BACT/LAER is determined by class and category of equipment
  - Fuel availability on the island is a consideration
- Engineering will determine if Tier 4 Final diesel engines are BACT/LAER through the permit process

SCE Comment Letter – Delay Prohibition on New Diesel Engines

Comment

- After SCE replaces Units 8 and 10 with Tier 4 Final diesel engines, the remaining four engines will be needed until new equipment is operational
- SCE will have to rely on old engines with higher emissions when Units 8 and 10 are removed from service for maintenance and repairs
- Allowing SCE to replace the remaining aging units with new Tier 4 Final diesel engines would reduce the facility's NOx emissions
- SCE proposes either:
  - Extending the deadline for the installation of new diesel engines to July 1, 2025; or
  - Extending the deadline only for Unit 15 if the catalyst project fails to bring Unit 15 into compliance with Rule 1470

Response

- Rule 1135 includes emission limits for replacement engines (Units 8 and 10) and an overall facility mass emission limit
  - The facility mass emission limit will, in practice, limit the use of old engines
- Staff is including assessment of facility operating only Tier 4 Final diesel engines
- Staff is in the process of establishing a new BARCT standard for PBGS for equipment installed after 1/1/2024
  - The new BARCT standard will likely be lower than what a diesel engine can achieve
- Staff does not think extending the prohibition deadline for all new diesel engines or for the replacement of Unit 15 is necessary at this time

SCE Comment Letter – Adjust Mass Emissions Limits and Implementation Schedule

Comment

- Timeline to start construction and operate new Tier 4 Final diesel engines has since been altered due to:
  - Permitting complexity
  - Global supply chain issues
  - Facility construction constraints
- NOx emission limit of 13 tons/year is based on an unrealistic assumption that fossil fueled equipment can be completely replaced with zero-emission (ZE) or near-zero emission (NZE) technology
- SCE remains opposed to a facility mass emission limit because it effectively disallows future load growth

Response

- Staff will consider extending the deadline to replace Units 8 and 10
- NOx limit of 13 tons/year can be met with a combination of diesel engines and ZE/NZE technologies
- Based on the results of the BARCT assessment, staff may remove the 13 tons/year mass emissions limit and instead have concentration limits
- For example:

Equipment Installed Before 1/1/25	Equipment Installed On and After 1/1/25
45 ppm NOx	2.5 ppm NOx

SCE Comment Letter – BARCT Cost-Effectiveness Analysis

Comment

- SCE requests that South Coast AQMD consider all applicable capital and annual operating costs when evaluating viable technological options
- South Coast AQMD should include appropriate equipment life expectancy in the cost-effectiveness calculation
  - PBGS's unique location (coastal with marine corrosion) shortened the life expectancy of the microturbines

Response

- Staff agrees that all applicable capital and annual operating costs should be evaluated
- Staff is working with vendors to include applicable costs for ZE and NZE equipment
- Life expectancy is included in cost-effectiveness calculation and varies by equipment type
  - Staff will consider the impact of a marine environment on the life expectancy of equipment

SCE Comment Letter – Limited Fuel Storage

Comment

- The Roaring Canyon site is not a preferred option to expand power generation
- Any replacement technology considered under PAR 1135 must be technically feasible within PBGS's existing footprint
- Expanding the PBGS operational footprint would be a lengthy and complex process and may not be possible
  - 88% of Catalina Island is reserved for conservation purposes

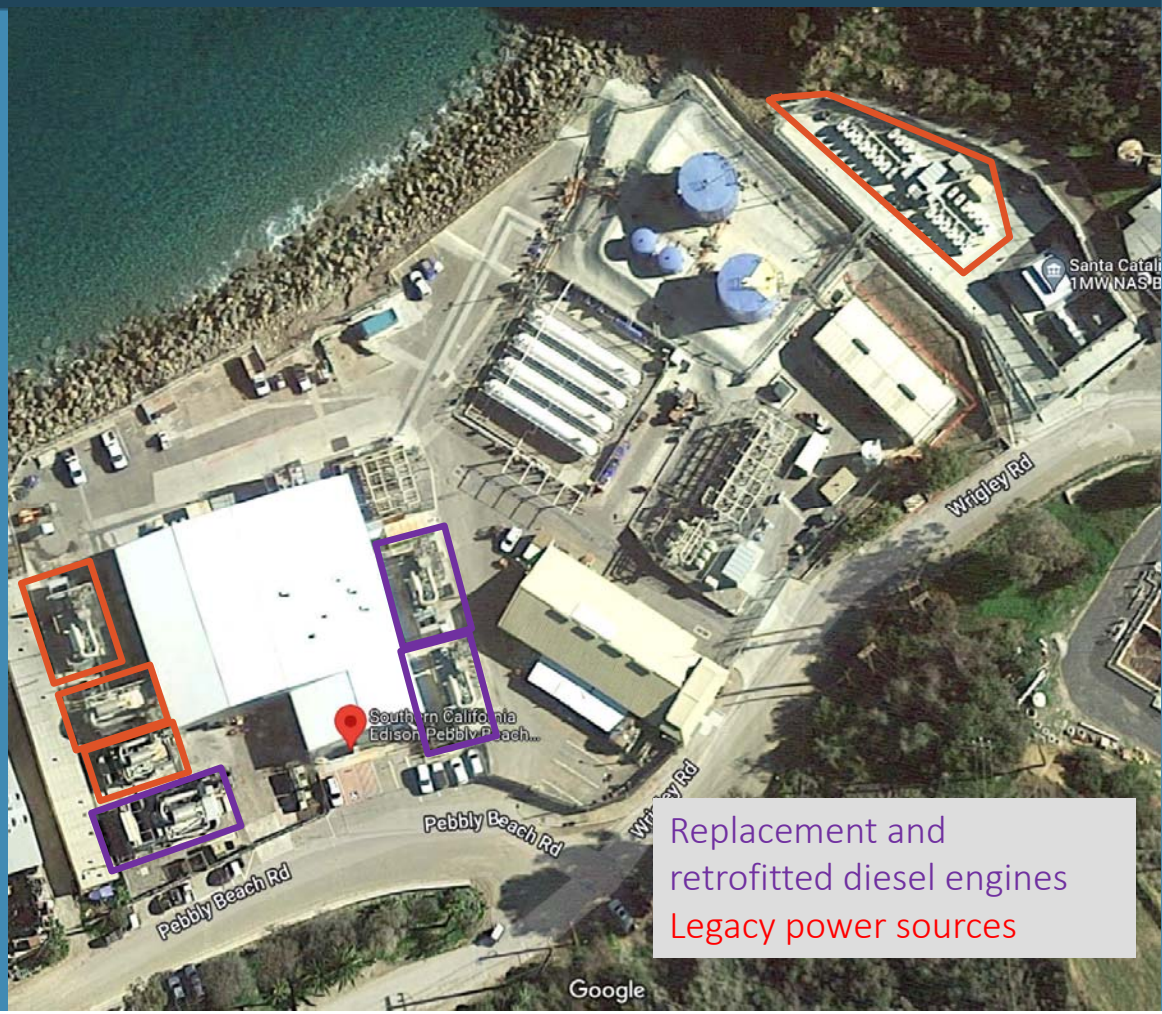
Response

- Staff recognizes the challenges and obstacles regarding expanding PBGS operational footprint
  - BARCT assessment is not strictly limited to existing footprint
- Staff will acknowledge the lengthy and complex process needed when a technology requires additional land (fuel storage or solar PV cells)
- Based on conversations with Catalina Island land-owners, some land is likely available for solar PV cells
  - Geography and conservation are significant limitations


Background

Current Status of PBGS Repower Projects

- SCE submitted permit applications for replacement of Units 8 and 10 (highest emitting engines) with Tier 4 Final diesel engines
- SCE submitted permit applications for a catalyst block for Unit 15 to comply with South Coast AQMD Rule 1470
  - Unit 15 relied on heavily due to being lowest emitting and largest engine
- SCE is considering refurbishing microturbines
  - South Coast AQMD had indicated preference to use space for ZE and/or NZE technologies



SCE's Emission Profile After Replacing Units 8 and 10 (Baseline Case)[1,2]

	Projected Share of Generation Output by 2024	Power Generation (MWh/year)	Estimated NOx Emissions in 2024 (lbs/year)	Estimated NOx Emissions in 2024 (tons/year)
Unit 7 (existing)	12%	3,425	17, 800	8.9
Unit 8 (replaced)	25%	7,340	8,310	4.16
Unit 10 (replaced)	25%	7,340	8,310	4.16
Unit 12 (existing)	12%	3,425	26,950	13.48
Unit 14 (existing)	12%	3,425	18,330	9.17
Unit 15 (retrofitted)	15%	4,404	5,080	2.54
Total	36% + 65% = 100%[3]	10,275 + 19,084 = 29,359	63,080 + 21,700 = 84,780	31.55 + 10.86 = 42.41

[1]Emission profile based on SCE provided data to the Public Advocates Office at the Public Utilities Commission
[2]South Coast AQMD numbers differ slightly from the Public Advocates Office at the Public Utilities Commission due to rounding differently
[3]South Coast AQMD staff rounded down

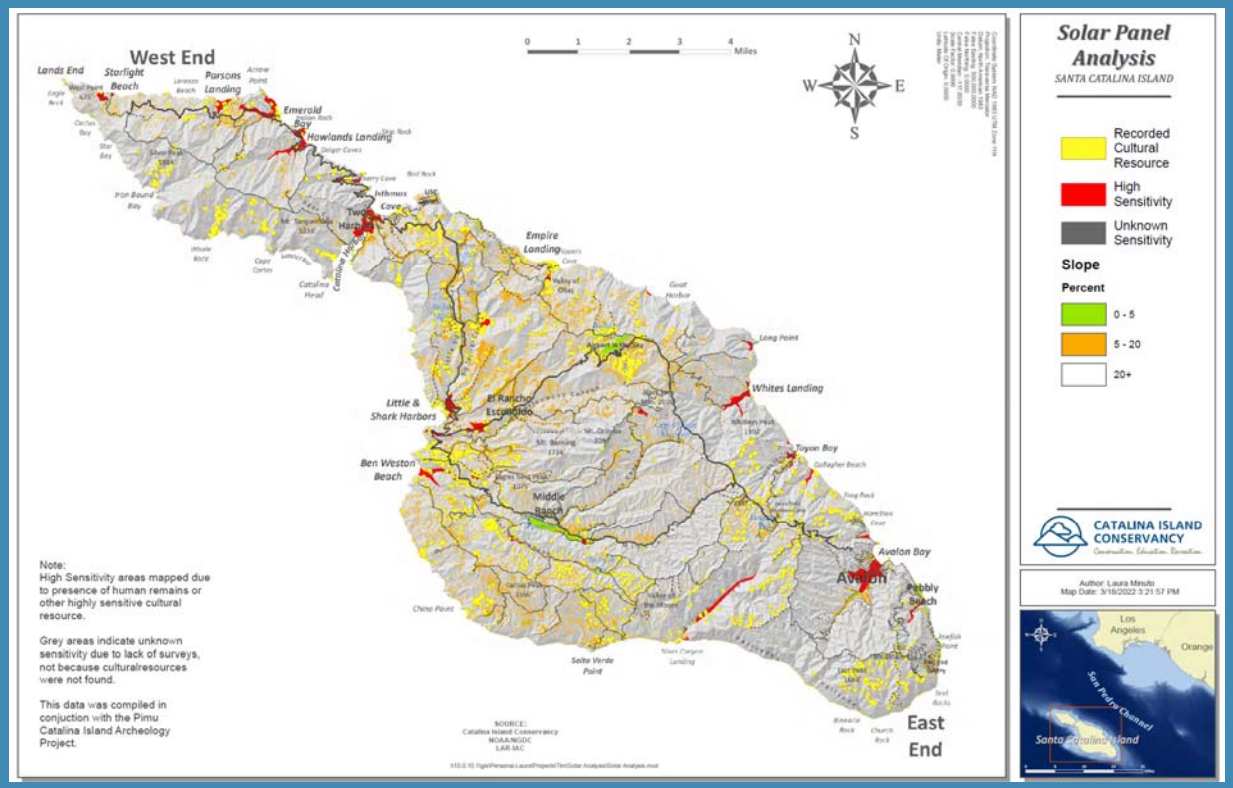
Rule 1135 Compliance Milestones

- It is expected that SCE PBGS can meet Rule 1135 interim NOx emission limits with the replacement of Units 8 and 10 with Tier 4 Final diesel engines
  - 50 tons/year NOx by January 1, 2024
  - 45 tons/year NOx by January 1, 2025
- Compliance with a 13 tons/year NOx emission limit would require replacement of older engines with ZE or NZE technologies

Logistics for Assessed Technologies

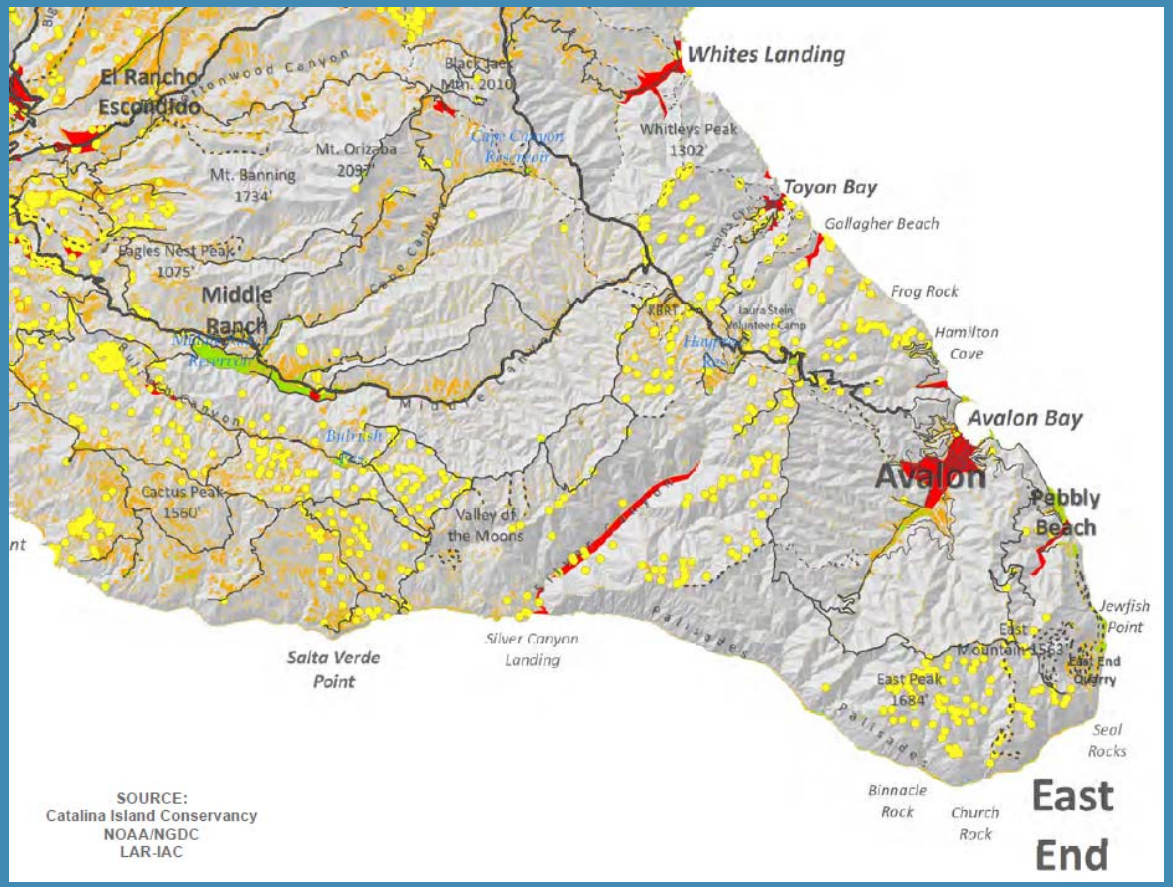
Update on Land Availability for Expanding PBGS

- Staff met with SCE and the Catalina Island Conservancy to discuss the possibility of SCE leasing land for ZE/NZE technologies
- The Catalina Island Conservancy is open to the possibility of leasing land to SCE
- There are challenges to installing ZE/NZE technologies on potential new sites:
  - Most available land is not flat or south facing (important considerations for solar PV cells)
  - Most available land in areas that are potentially culturally sensitive
  - Preserving the aesthetics of Catalina Island



Land Necessary for Solar PV Cells

- CalAdvocates estimates indicate 60% annual renewable energy target could be met with 18.6 MW/DC of PV (approx. 54.13 acres)
- The Catalina Island Conservancy identified Middle Ranch (approximately 15 acres) as one potential site to expand PBGS



Space Required for Linear Generators

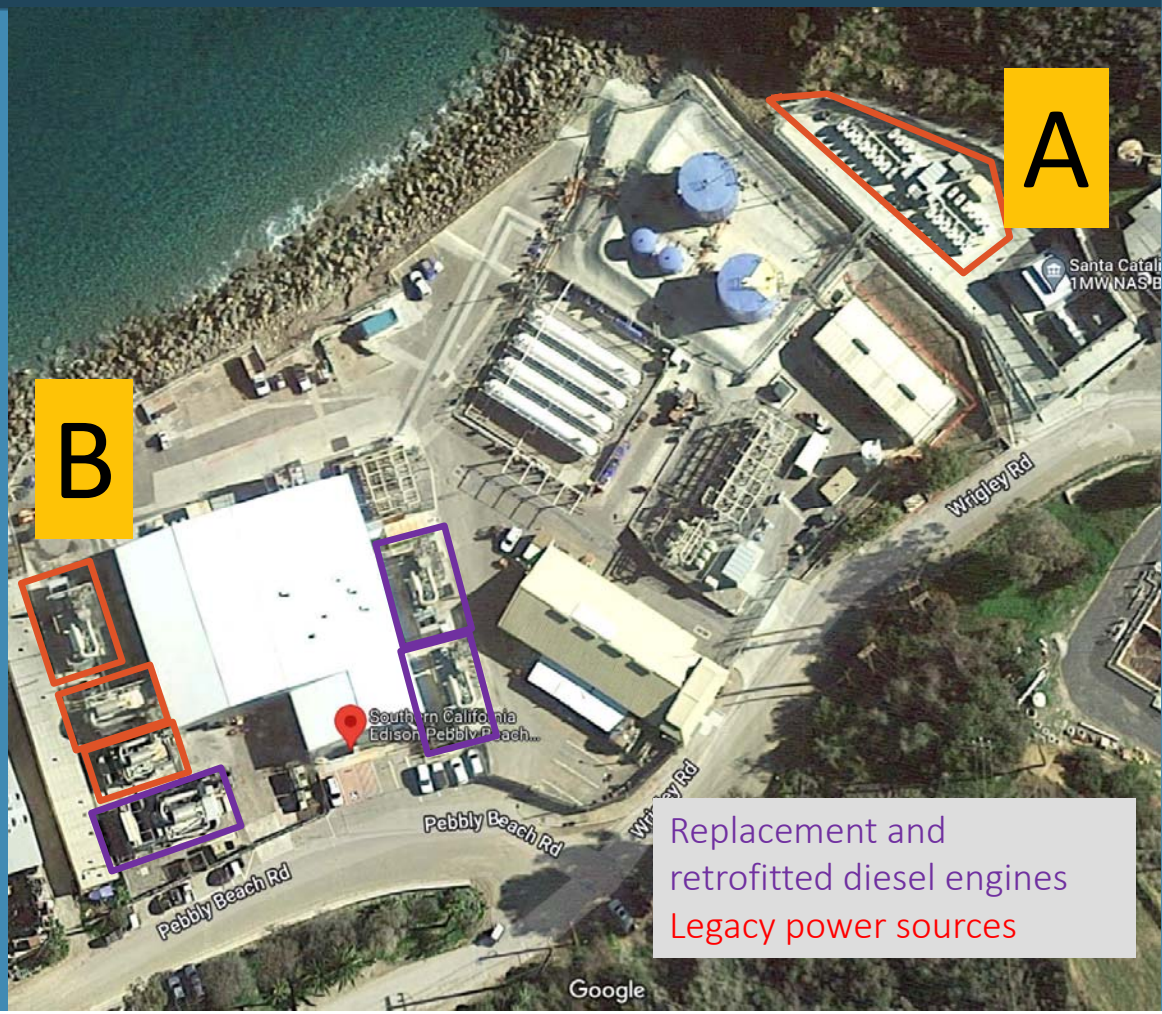
A Microturbine Platform ≈ 2,610 ft^2

B Diesel Engines (3) ≈ 2,077 ft^2

Linear generator specifications

- 230 kW
- 20.5’ x 8.5’; 330 sq ft with access

- Eight linear generators can fit at A
- Six linear generators can fit at B
- 14 linear generators would provide up to 3.2 MW



Space Required for Propane Fuel Cells

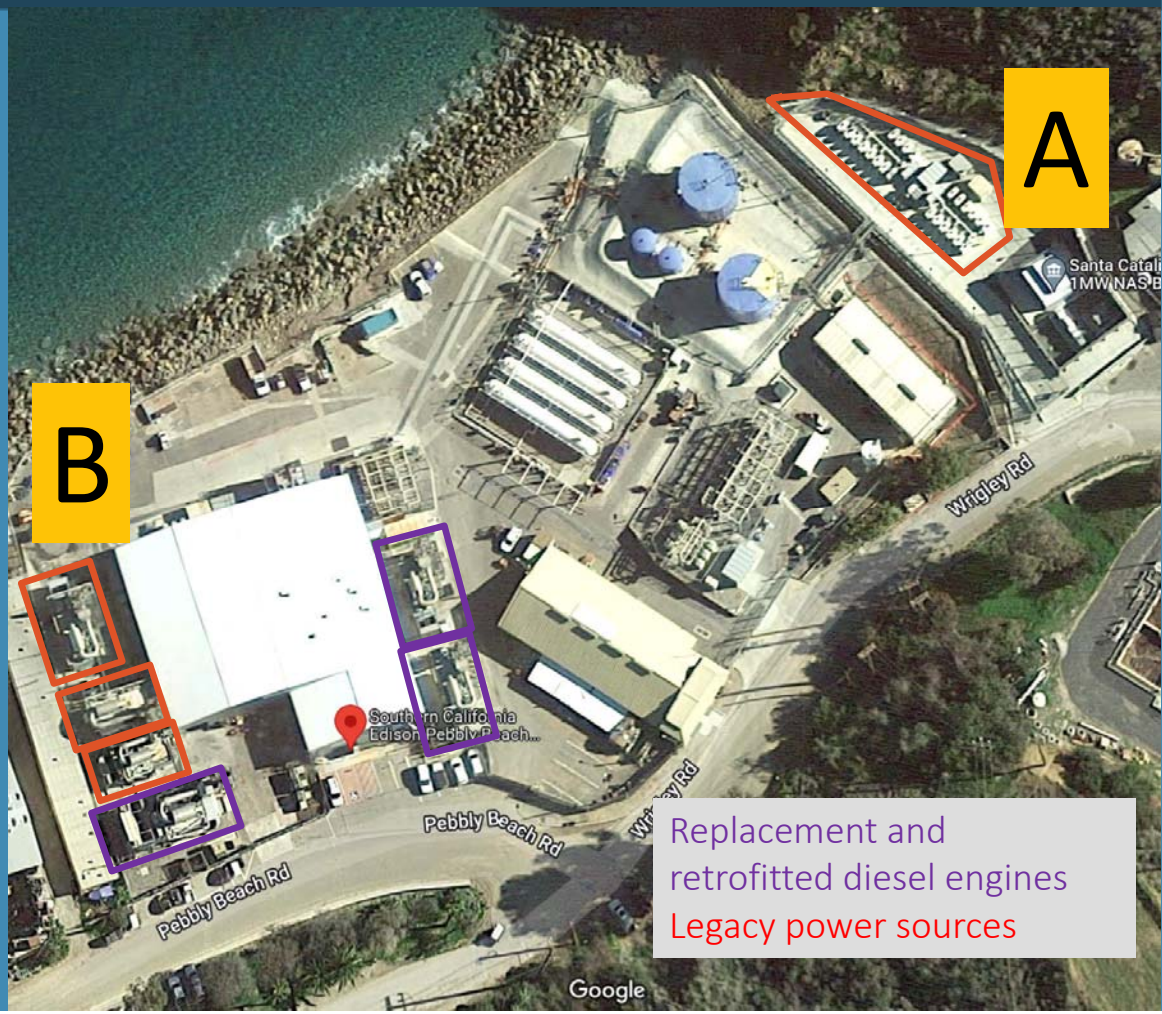
A Microturbine Platform ≈ 2,610 ft^2

B Diesel Engines (3) ≈ 2,077 ft^2

Propane fuel cell specifications

- 440 kW
- 29’ x 10’; 330 ft^2 with access

- Seven propane fuel cells can fit at A
- Six propane fuel cells can fit at B
- 13 propane fuel cells could provide up to 5.7 MW



Space Required for Hydrogen Fuel Cells

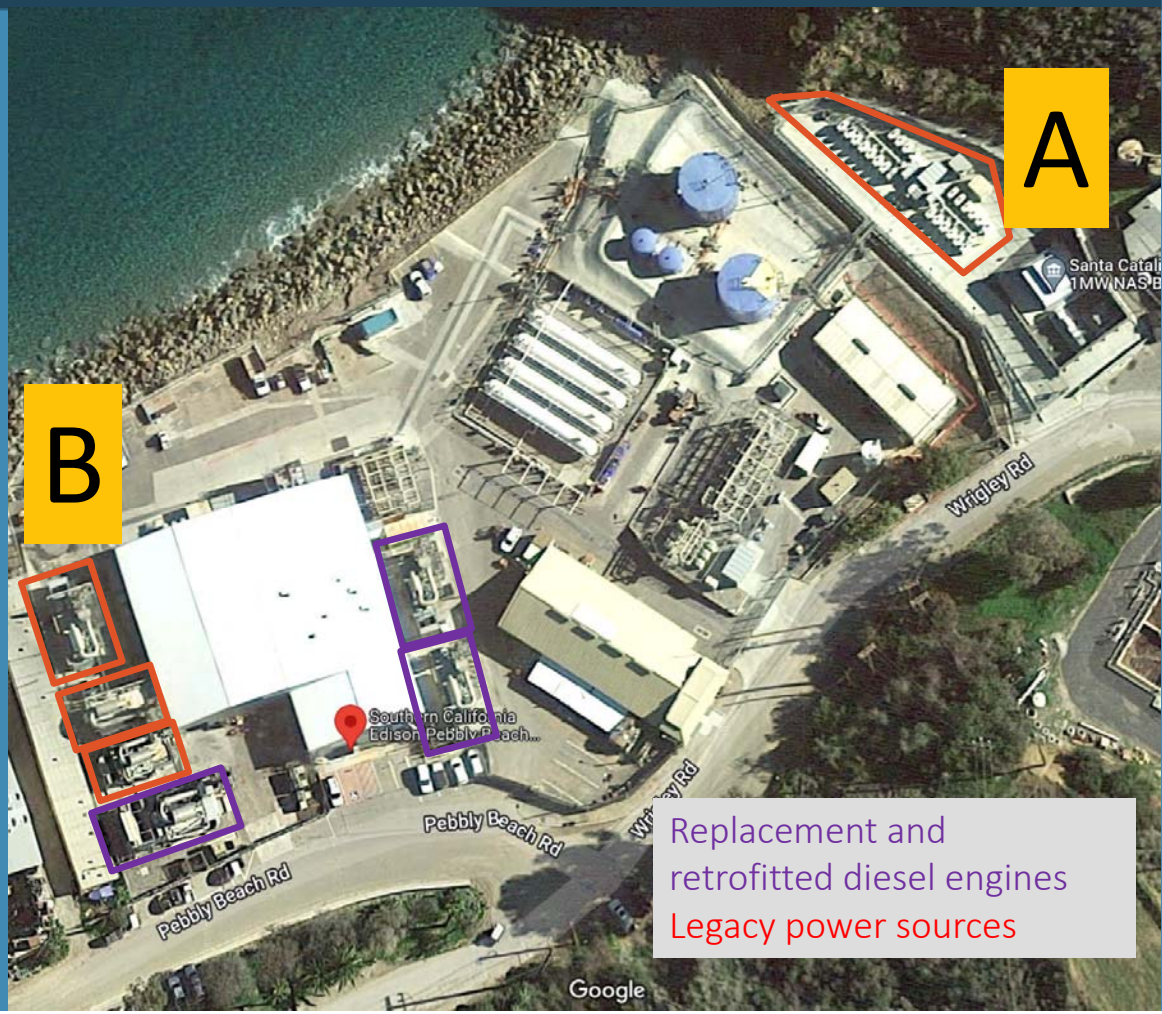
A Microturbine Platform ≈ 2,610 ft^2

B Diesel Engines (3) ≈ 2,077 ft^2

Hydrogen fuel cell specifications

- 1 MW
- 40’ x 20’; 1,400 ft^2 with access

- Two hydrogen fuel cells would likely fit at A
- Two hydrogen fuel cells would likely fit at B
- Four hydrogen fuel cells would provide up to 4 MW



Current SCE Fuel Reserve

- SCE historically maintains a 30-day fuel reserve to ensure continuity of operations if fuel deliveries are interrupted
  - Retention of the current diesel fuel storage will preserve 30-day continuity of operations
  - Site uses approximately 2.03 million gallons per year
  - Approximately 280 tankers annually (7,200 gal/tanker)
- PBGS currently stores 90,000 gallons of propane for utility service and fueling microturbines
  - Microturbines consume approximately 150,000 gallons per year
  - Utility service consumes approximately 650,000 gallons per year
  - Approximately 70 tankers annually (9,000 gal/tanker)
- Staff analyzed fuel deliveries from 2017 to 2021 to Catalina Island and found that:
  - The longest time lapse between fuel deliveries was five days
  - The barge did not run for a maximum of 14 days in a calendar year

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Projected Fuel Usage

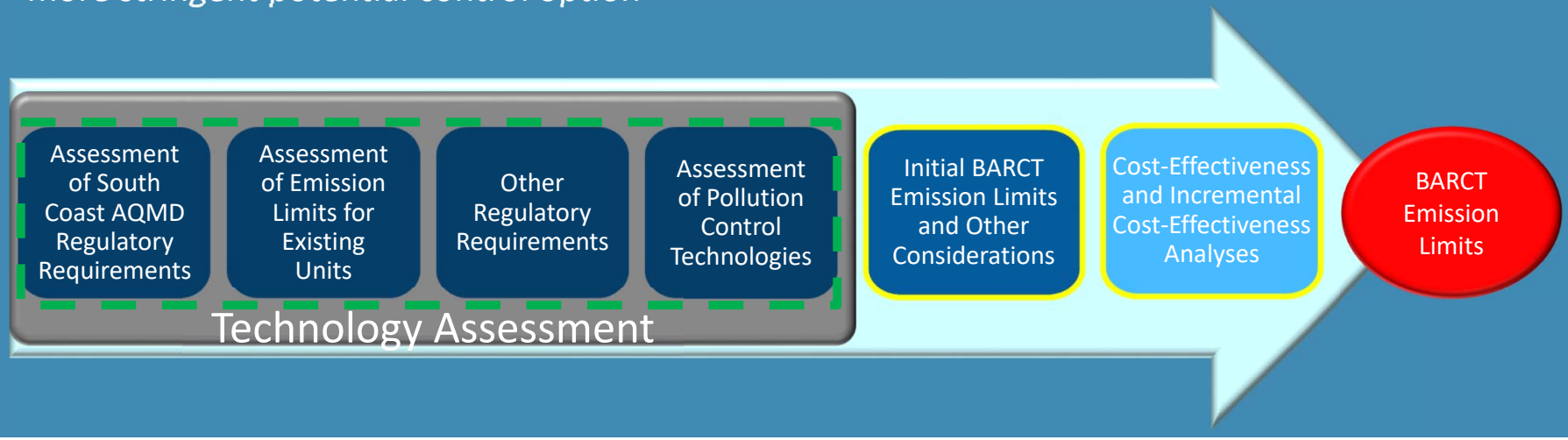
- Staff assumes that a five-day fuel reserve is necessary for ZE and NZE equipment at SCE while diesel engines are installed and operational
- Propane NZE technologies would likely not require additional fuel storage or fuel deliveries
- Hydrogen ZE technologies would require new fuel storage and more fuel deliveries

	Diesel Fuel Use (gal/year)	Propane Fuel Use (gal/year)	Hydrogen Fuel Use (kg/year)	5-day Propane Fuel Storage (gallons)	5-day Hydrogen Fuel Storage (kg)	Annual Barge Trips
Current	2,030,000	150,000	0	2,100	N/A	300
30% Propane	1,456,000	810,000	0	11,100	N/A	295
50% Propane	1,040,000	1,351,000	0	18,500	N/A	295
95% Propane	104,000	2,566,000	0	35,200	N/A	300
30% Hydrogen	1,456,000	0	660,000	N/A	9,000	348
50% Hydrogen	1,040,000	0	1,110,000	N/A	15,200	391
95% Hydrogen	104,000	0	2,108,000	N/A	28,900	483

Updated BARCT Assessment

BARCT Assessment

- Staff is conducting a BARCT assessment to determine if ZE and NZE technologies can replace all or some of the existing diesel engines on Santa Catalina Island
- Health and Safety Code Section 40406 defines BARCT as "…an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source."
- BARCT levels must adhere to Health and Safety Code Section 40920.6
  - Cost-effectiveness and incremental cost-effectiveness must be determined for each progressively more stringent potential control option



Assessment of South Coast AQMD Regulatory Requirements

- SCE PBGS is subject to both Regulation XX – Regional Clean Air Incentives Market (RECLAIM) and Rule 1135
- Staff is working to transition NOx RECLAIM facilities to a command-and-control regulatory structure

RECLAIM

- Comply with all applicable rules and permit conditions as specified in the Facility Permit
- Prohibition of emissions in excess of annual allocation

Rule 1135

- Electricity generating units located on Santa Catalina Island:
  - 50 tons/year NOx by January 1, 2024
  - 45 tons/year NOx by January 1, 2025
  - 13 tons/year NOx by January 1, 2026 (option for three-year extension)
- New diesel internal combustion engines located on Santa Catalina Island: 45 ppm NOx[1]

[1]Corrected to 15% oxygen on a dry basis and averaged over a three-hour rolling average using hourly averages computed in accordance with South Coast AQMD Rule 218.3

Assessment of Emission Limits for Existing Units

Diesel Non-Emergency Internal Combustion Engines at PBGS				
Unit	**Size (HP)**	**Output (MW)**	**Control***	**NOx Permit Limit**
Unit 10	1,575	1.125	SCR	6.5 lbs/net MWH annual facility limit
Unit 12	2,200	1.5	SCR	6.5 lbs/net MWH annual facility limit
Unit 7	1,500	1	SCR	6.5 lbs/net MWH annual facility limit
Unit 8	2,150	1.5	SCR	6.5 lbs/net MWH annual facility limit
Unit 15	3,900	2.8	SCR	2.13 lbs/net MWH annually and 51 ppmv
Unit 14	1,950	1.4	SCR	6.5 lbs/net MWH annual facility limit

*SCR – Selective Catalytic Reduction

Other Regulatory Requirements

Air District and Regulation	Engine Type	NOx Limit
Bay Area AQMD Regulation 9, Rule 8 (July 25, 2007)[1]	Compression-ignited and greater than 175 bhp	110 ppmv at 15% oxygen
Sacramento Metropolitan AQMD Rule 412 (June 1, 1995)[2]	Compression-ignited	80 ppmv at 15% oxygen
San Joaquin Valley APCD Rule 4702 (August 18, 2021)[3]	Non-Certified Compression-Ignited Engine Installed on or before January 1, 2015 (Greater than 750 bhp and less than 1000 annual operating hours)	EPA Tier 4
	EPA Certified Tier 1 or Tier 2 Compression-Ignited Engine	EPA Tier 4
	EPA Certified Tier 3 or Tier 4 Compression Ignition Engine	Meet Certified Compression-Ignited Engine Standard in effect at time of installation

[1] https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-8-nitrogen-oxides-and-carbon-monoxide-from-stationary-internal-combustion-engines/documents/rg0908.pdf?la=en&rev=29ec2b409134481a8d73a88f242e6f00
[2] http://www.airquality.org/ProgramCoordination/Documents/rule412.pdf
[3] https://www.valleyair.org/rules/currntrules/r4702.pdf

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Scenario 1 – All Tier 4 Final Diesel Engine Replacement

	Projected Share of Generation Output	Power Generation (MWh/year)	Estimated NOx Emissions (lbs/year)	Estimated NOx Emissions (tons/year)
Unit 7 (replaced)	**25%**	**7,340**	**8,310**	**4.16**
Unit 8 (replaced)	**25%**	**7,340**	**8,310**	**4.16**
Unit 10 (replaced)	**25%**	**7,340**	**8,310**	**4.16**
Unit 15 (retrofitted)	**25%**	**7,340**	**8,310**	**4.16**
Total	**100%**	**29,360**	**33,240**	**16.64**

- Emission reductions: 42.41 - 16.64 = 25.77 tons per year NOx reduced

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Scenario 2 – NZE Technology (Distributed Generation) for 50% of Power Generation

	Projected Share of Generation Output	Power Generation (MWh/year)	Estimated NOx Emissions (lbs/year)	Estimated NOx Emissions (tons/year)
NZE technology[1]	50%	14,680	1,030	0.51
Unit 8 (replaced)	17%	4,990	5,740	2.87
Unit 10 (replaced)	17%	4,990	5,740	2.87
Unit 15 (retrofitted)	16%	4,700	5,410	2.35
Total	100%	29,360	33,240	8.60

- Emission reductions: 42.41 - 8.60 = 33.81 tons per year NOx reduced

[11]Fuel cell, linear generator/engine

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Scenario 3 – ZE Technology for 50% of Power Generation

	Projected Share of Generation Output	Power Generation (MWh/year)	Estimated NOx Emissions (lbs/year)	Estimated NOx Emissions (tons/year)
ZE technology [1]	50%	14,680	0	0.00
Unit 8 (replaced)	17%	4,990	5,740	2.87
Unit 10 (replaced)	17%	4,990	5,740	2.87
Unit 15 (retrofitted)	16%	4,700	5,410	2.35
Total	100%	29,360	33,240	8.09

- Emission reductions: 42.41 - 8.09 = 34.34 tons per year NOx reduced

[11]Fuel cell, linear generator, solar PV cells

Revised Slide

Scenario 4 – NZE Technology (Distributed Generation) for 95% of Power Generation

	Projected Share of Generation Output	Power Generation (MWh/year)	Estimated NOx Emissions (lbs/year)	Estimated NOx Emissions (tons/year)
NZE technology [1]	95%	27,890	1,950	0.97
Unit 8 (replaced)	2%	590	680	0.34
Unit 10 (replaced)	2%	590	680	0.34
Unit 15 (retrofitted)	1%	290	330	0.17
Total	100%	29,360	3,640	1.82

- Emission reductions: 42.41 - 1.82 = 40.59 tons per year NOx reduced

[11]Fuel cell, linear generator/engine

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Scenario 5 – ZE Technology for 95% of Power Generation

	Projected Share of Generation Output	Power Generation (MWh/year)	Estimated NOx Emissions (lbs/year)	Estimated NOx Emissions (tons/year)
ZE technology [1]	95%	27,890	0	0.00
Unit 8 (replaced)	2%	590	680	0.34
Unit 10 (replaced)	2%	590	680	0.34
Unit 15 (retrofitted)	1%	290	330	0.17
Total	100%	29,360	1,690	0.85

- Emission reductions: 42.41 - 0.85 = 41.56 tons per year NOx reduced

[11]Fuel cell, linear generator, solar PV cells

Summary of BARCT Assessment

- Installation of NZE/ZE technology on Catalina Island is technologically feasible within the existing PBGS footprint
- Additional land is likely needed for NZE/ZE technologies to provide 100% of power needed to meet peak demand and provide redundancy
- Staff is working to establish initial BARCT limits considering necessary fuel storage and land for potential scenarios
- Staff will present initial BARCT limits, cost-effectiveness, incremental cost-effectiveness, and BARCT emission limits at the next Working Group Meeting


Next Steps

Next Steps

- Continue discussions with technology vendors and SCE
- Present results of technology assessment to the Stationary Source Committee in August 2022
- Hold Working Group Meeting #3 in September 2022 to discuss cost-effectiveness and preliminary rule language
- Public Hearing tentatively scheduled for 1st Quarter 2023

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PAR 1135 Proposed Rules Web Page

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