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Permitting Internal Combustion Engines for Electrical Energy Generation in the State of Maryland

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Presentation Overview

- Summary of Federal Facilities.
- Potential sources of electrical power at facilities in Maryland
- Permit to Construct (PTC) and Permit to Operate (PTO) in Maryland
- Common Projects Permitted in Maryland
- Internal Combustion Engines Categories
  - Considerations when permitting Emergency Generators ICEs
  - Considerations when permitting Emergency Demand Response Generators ICEs
  - Non -Emergency Generators ICEs

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Presentation Overview

- Case Study:
  Permitting Demand Response ICEs

- Considerations when permitting Non -Emergency Combined Heat and Power (CHPs) Internal Combustion Engines

- Case Study:
  Permitting Combined Heat and Power systems

- Tips for successful permitting process

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Summary of Federal Facilities

Facility	Non-Emergency Generators	Emergency Generators	Boilers	Water Heaters	Turbines
National Institute of Health		37	6		1
GSA- Federal Research Center White Oak	1	3	4		7
Naval Support Activity - Annapolis		6	4	5	5
US Army Garrison – Fort Detrick		16	10		
US Army Garrison – Aberdeen Proving Ground	6	33	55		
US Army Garrison – Edgewood		43	59		
Naval Support Facilities - Bethesda		26	4	1	
National Security Agency		74	11		

Note: MD has approximately 20 federal facilities with registered equipment. However, there are sixteen (16) federal facilities with a Part 70 Operating Permit.

Summary of Federal Facilities Con't

Facility	Non-Emergency Generators	Emergency Generators	Boilers	Water Heaters	Turbines
NASA Goddard Space Flight Center		16	5	5	
US Coast Guard Yard	4		4		
Naval Air Station Patuxent River		15	78		
Social Security Administration		5	10		3
Naval Support Facilities -Indian Head		4	23		1
National Institute of Standards and Technology		2	6		
Andrews Air Force Base		9	27		
US Army Garrison Adelphi Laboratory Center	2	3	11		

Note: MD has approximately 20 federal facilities with registered equipment. However, there are sixteen (16) federal facilities with a Part 70 Operating Permit.

Illustration: NIH

- NIH in Bethesda, MD.
  - Emergency Generators
    - 37 units installed with engine power ratings (685 to 2937 bhp).
  - Boilers
    - 6 units installed with rating (1.3 to 245 mm Btu/hr)
    - Few use No. 2 fuel oil as a backup fuel.
    - Some equipped with flue gas recirculation and low NO_X burners.
  - Cogeneration unit
    - Gas combustion turbine ~ 23 MW of electricity

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Potential sources of electrical power at facilities in Maryland

- Electrical Grid
- Internal combustion engines (ICE)
  - Emergency Electrical Energy Power
  - Non -Emergency Electrical Energy Power Electrical Grid
- Solar Energy (Photovoltaics)
- Microturbines
- Onsite micro wind farm
- Battery banks, or others

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Permit to Construct and Permit to Operate in Maryland

- Permits to Construct (PTC)
  - One time permit
  - Issued before unit is installed
- Permits to Operate (PTO)
  - Issued to larger sources of air pollution
  - Includes all equipment at facility, not just engines
- PTO facilities must first get PTCs

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PTC Exemption

- Emergency engines less than 500 Hp
- Non fuel -burning equipment such as:
  - Photovoltaics
  - Wind farms
  - Battery banks

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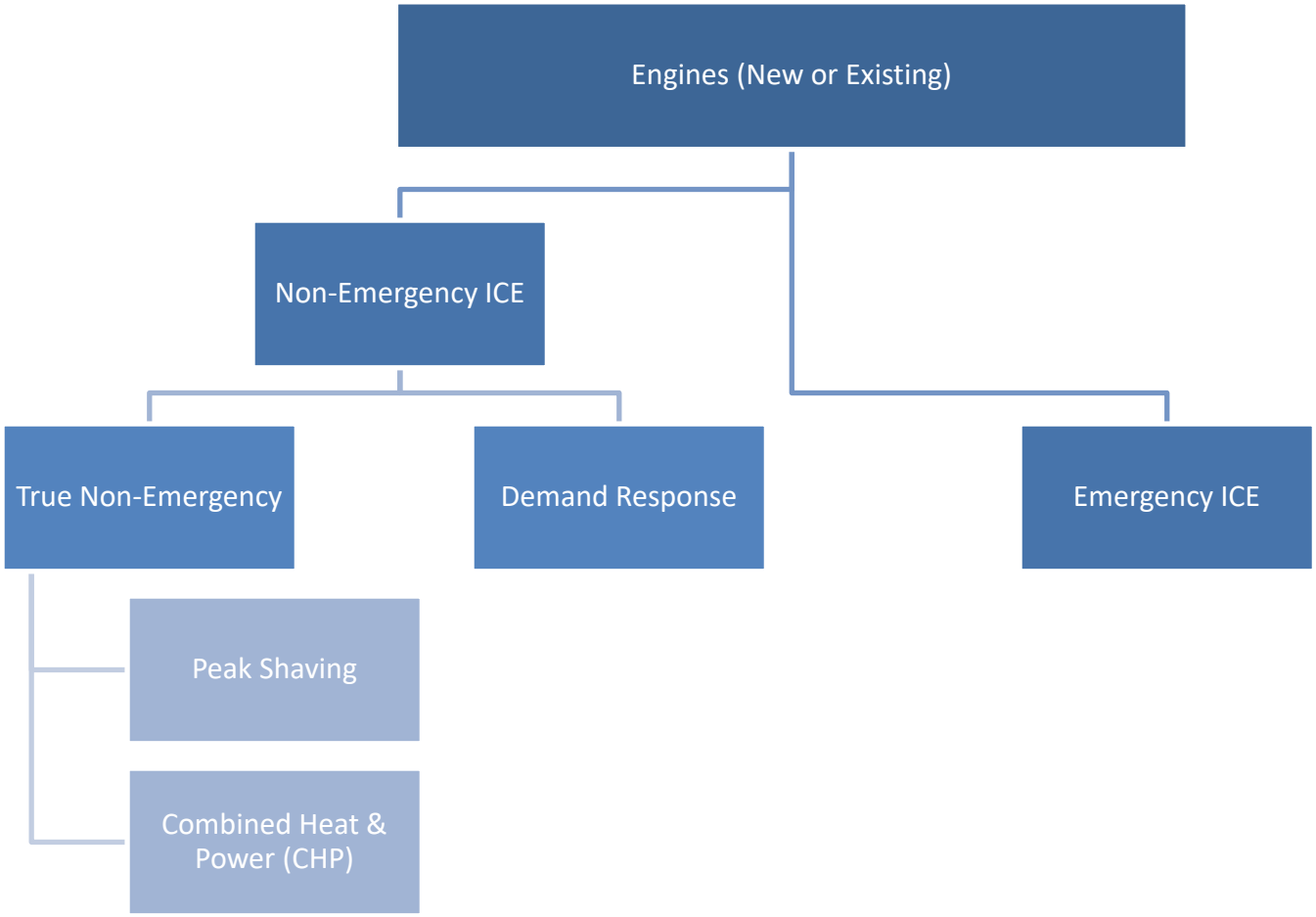
Internal Combustion Engines Categories



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Considerations when Permitting Emergency Generators ICEs

Emergency ICEs

- Who is subject to permitting?
  - Engines rated at 500hp or above
  - Engines burning any type of fuel: Diesel, Gasoline, Natural Gas
  - Both existing and new engines

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Emergency ICEs: Basic Requirements

- There are no limits on operation during emergency events.
- In non -emergency situations, emergency engines are only allowed to operate for 100 hours per year for testing, maintenance, and other specific uses.
- Emergency engines are forbidden from operating for Demand Response or Peak shaving, even if it is less than 100 hours per year.

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Emergency ICEs: Basic Requirements

	Existing Engines (pre 2007)	New Engines
Construction	Must install an hour-meter	Must install a certified Tier II engine
Operating	ULSD fuel, oil and air filter maintenance	ULSD fuel, Follow manufacturer's maintenance instructions
Monitoring	n/a	n/a
Testing	n/a	n/a
Recordkeeping	Keep records of fuel use	Keep record of fuel use
Reporting	n/a	n/a

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Permit Application Process for **Emergency ICEs**

- What is needed as part of the application process?
  - General permit new in Maryland as of this year
  - Simplified version of the application with a faster turnaround time
  - For diesel engines between 500 and 2,682 Hp
- For engines that do not meet the requirements for the general permit, an individual permit to construct is required.
  - Separate form (form 42) with more supplemental information required
  - Up to three months to process
- Installing an emergency engine does not typically require a PTO.

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Considerations when permitting Emergency Demand Response Generators ICEs

Updates in Demand Response Regulations

- In 2015, the US Court of Appeals ruled in Delaware v. EPA that emergency demand response was not considered to be an emergency.
- All engines operating for emergency demand response must now meet the federal non -emergency engine standards.
  - For new engines, they must be Tier IV certified
  - For some existing engines, control devices and testing may be required

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Maryland Demand Response Program

- Demand response as viewed by environmental regulation
  - It is not defined in any of the federal rules
  - Due to the federal court decision now any EG that will be used in demand response programs will be required to be operated as a true non -emergency engine
- Non -emergency engines can have different requirements than if the engines was used as an emergency engine.
- What is needed?
  - Form 44
  - Supporting Information (i.e., summary of project, emission calculation, equipment factsheet, letters, manufacturing dates, emissions data)
- Permitting could be as simple as a letter allowing DR operation or could take up to 3 months, if the engine has not been previously permitted

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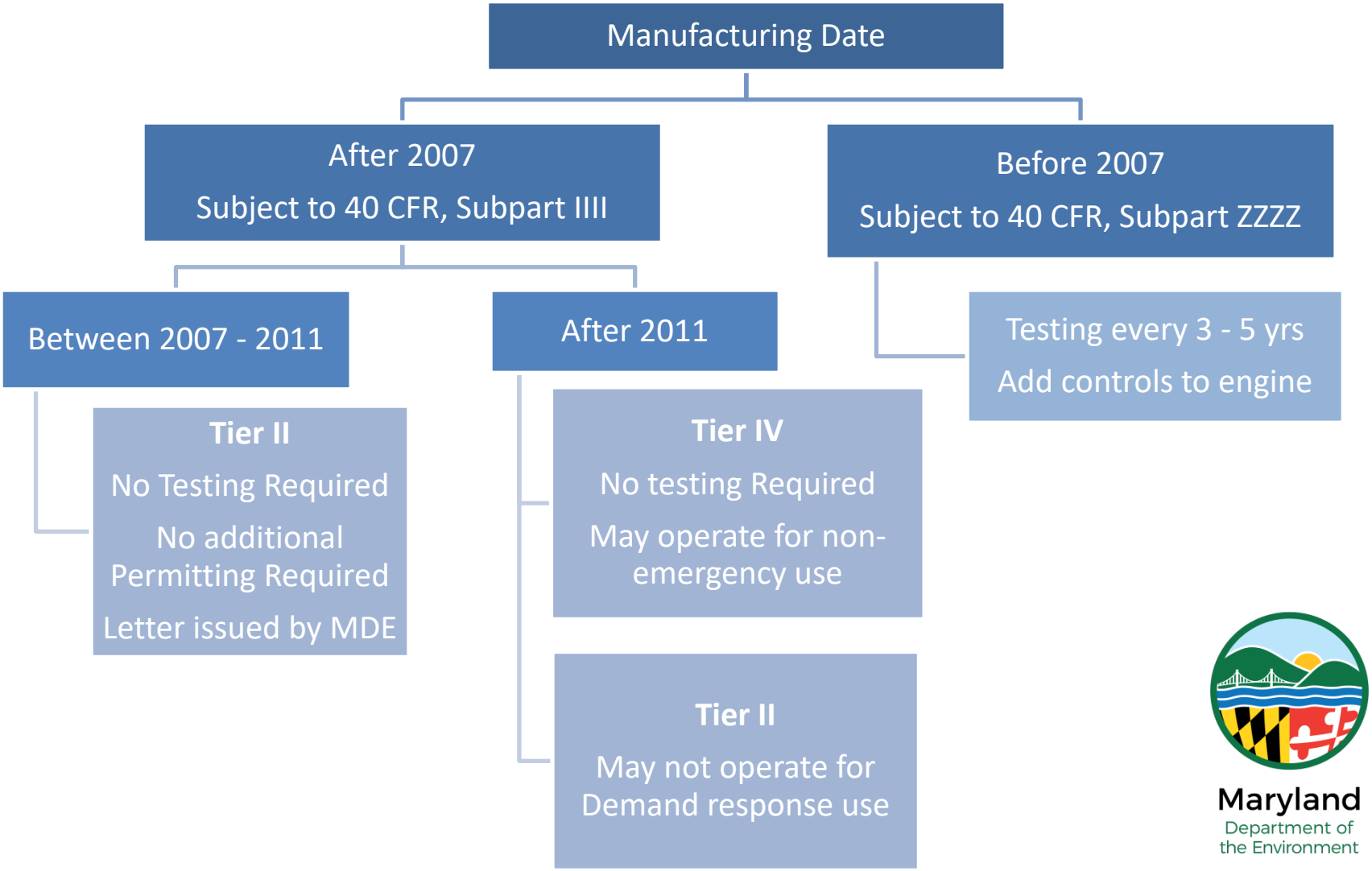
Permitting diesel engines participating Demand Response Programs



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Emergency Demand Response Program: Basic Requirements

	Existing (pre 2007) Engines	Existing (post 2007) & New engines
Construction	Must install Oxidation Catalyst control device and catalyst temperature monitor	2007-2011: Certified Tier II 2011-Present: Certified Tier IV
Operating	ULSD fuel	ULSD fuel, Follow manufacturer's maintenance instructions
Monitoring	Catalyst Temperature	n/a
Testing	Initial testing for CO must be performed, and then follow up testing every 3-5 years is required	n/a
Recordkeeping	fuel use, catalyst temperature	fuel use
Reporting	n/a	n/a

Case Study:
Permitting Demand Response ICEs

Case Study: UMD Institute for Bioscience and Biotechnology Research (IBBR)

- Research facility consisting of 2 main buildings with labs, medical equipment and greenhouses

Equipment Description	Date installed
Detroit Diesel generator rated at 2200 hp	2004, modified in 2019
Kohler Natural Gas fired generator rated at 530 hp	2016
Five (5) Aerco natural gas boilers each rated at 1 MMBtu/hr	three in 1997, two in 2008
Two (2) Cleaver Brooks natural gas boilers rated at 14.7 MMBtu/hr	2003

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Case Study: UMD Institute for Bioscience and Biotechnology Research (IBBR) (cont.)

- Equipment permitted as it was installed through 2018
- In 2018, additional equipment required the facility to obtain a PTO
- New PTC was written, PTO will be issued Jan 2020

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Case Study: UMD Institute for Bioscience and Biotechnology Research (IBBR) (cont.)

- Kohler Generator
  - Engine rated at 530 hp
  - 2012 model year, certified by manufacturer to meet EPA emission standards
- Detroit Diesel Generator
  - Engine rated at 2200 hp
  - 2004 model year, not certified
  - Must install controls and perform testing every 3 years per federal non -emergency requirements

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Non-Emergency Generators ICEs

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Non-Emergency ICEs

- Combined Heat and Power (CHP) systems
- Peak Shaving
  - Existing or New

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Considerations when permitting Non-Emergency Combined Heat and Power (CHPs) Internal Combustion Engines

Non-Emergency CHPs

- What installations are subject to permitting?
  - All ICEs
- Fuel Type: typically natural gas
- Installation Date
  - Existing
  - New
- Engine Manufacturing Date
- Certified vs non -Certified
  - NSPS –40 CFR 60, Subpart JJJJ

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Non-Emergency CHPs Con't

- NSPS –40 CFR 60, Subpart JJJJ
  - Applicability dates
  - Manufacturing date
  - Sizes
  - Testing requirements for non -certified engines
- NESHAP –40 CFR 63, Subpart ZZZZ
- Possible Benefits
  - Facility emission reductions
  - Heat/power savings $$
- Compliance Requirements

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Non-Emergency CHPs: Basic Requirements

	Non-Certified engines	Certified Engines
Construction	May require control devices (e.g. Oxidation Catalyst)	Must install a certified engine
Operating	n/a	Follow manufacturer's maintenance instructions
Monitoring	n/a	n/a
Testing	Initial testing; follow up testing every 8760 hours of operation or every 3 years	n/a
Recordkeeping	Fuel use, testing records	fuel use
Reporting	n/a	n/a

Non-Emergency CHPs

- Permit Application Package
  - AMA - Form 44
  - Supporting Information (i.e., summary of project, emission calculation, equipment factsheet, letters, manufacturing dates, emissions data)
- Projected Time frame for permitting
  - PTC only > 2 –4 months
  - PTC/PTO > 6 –9 months

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Case Study: Permitting Combined Heat and Power systems

Case Study: MGM Resort & Casino

- Scope of Permitting Project

Description	Operating schedule
Six (6) natural gas-fired boilers, each rated at 6.0 mm BTU/hr heat input.	8,760 hrs/yr
Three (3) Caterpillar diesel-powered emergency generators, each rated at 3,633 brake horse power (bhp).	As needed
One (1) Caterpillar natural gas-fired generator, rated at 1,106 bhp with a catalytic oxidizer.	8,760 hrs/yr
Twelve (12) natural gas fired hot water heaters, each rated at 1.35 mm BTU/hr.	As needed

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Case Study: MGM Resort & Casino Con't

- Permit Supporting Information
  - MDE PTC Application Forms 31, 42, and 44
  - Equipment size/ratings
  - Site diagram of the equipment location
  - Executive summary of project explaining objectives, and operational plans/schedule
  - Calculations supporting summary of potential emissions
  - Equipment factsheet
  - Engine manufacturing dates
  - Manufacturer's emissions data, if available
  - Certified Engine vs Non certified (stack testing)

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Case Study: MGM Resort & Casino Con't

- Scope of Permitting Project
  - A facility -wide PTC (boilers, EGs, and Non -EGs).
  - Permit review subject to public participation alternate NSPS -Only Public Participation Process due to non -EG.
- Two subsequent PTC modifications:
  - Add twelve (12) water heaters
  - Add a CO catalyst
- The facility was issued a state PTO.

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Case Study: MGM Resort & Casino

Overview of Potential Emissions

Pollutant	**Annual Potential Emission Rate (tpy)**	**Major Source Emissions Threshold Level (tpy)**
PM_{10}	2.3	100(1)
SO_2	0.12	100(1)
NO_x	**22.73**	**25(2)**
CO	35.26	100(1)
VOC	8.50	25(2)

Note:
1) COMAR 26.11.02.01 defines air pollutant major stationary source threshold levels.
2) COMAR 26.11.02.01(c)(i) defines air pollutant major stationary source threshold levels concerning nonattainment areas. Prince George's County is located within the Ozone Transport Region, emissions of VOC are considered to be major at 50 tons.

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Case Study: MGM Resort & Casino

Highlights of Permit Conditions for a Non-Certified Non-Emergency ICE

Description	Summary of Applicable Regs/Permit Conditions
Applicable Regulations	- 40 CFR 60 NSPS Subpart JJJJ –Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines. - 40 CFR 63 NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines
Construction Conditions	Construct in accordance with manufacturer's specs and provided with a catalytic oxidizer. Install a CO catalyst.
Operating Conditions	Operate in accordance with manufacturer's specs. Only burn natural gas. Not exceed Fed emission rates for NOx, CO, VOCs. Operate with the CO catalyst.
Testing and Monitoring	Initial testing (180 days startup) and subsequent (8,760 hrs or 3 years) for NOx, CO, VOCs. Monitor total electrical output and total hours of operation.
Recordkeeping	all maintenance performed, mass emission rates and calculations, electrical output, hours of operation, fuel usage, performance tests
Reporting	Emission certifications

Tips for successful permitting process

- Know your energy demand requirements
- Determine the appropriate equipment
- Know your time frame and schedules
- Use project management tools
- Know projected emissions
- Request a pre -application meeting, if guidance is needed
- Avoid the submission of incomplete applications
- Retain importance engine -related documents

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Questions??

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