Best Practices for Reporting and Verification

Stationary Combustion Emissions

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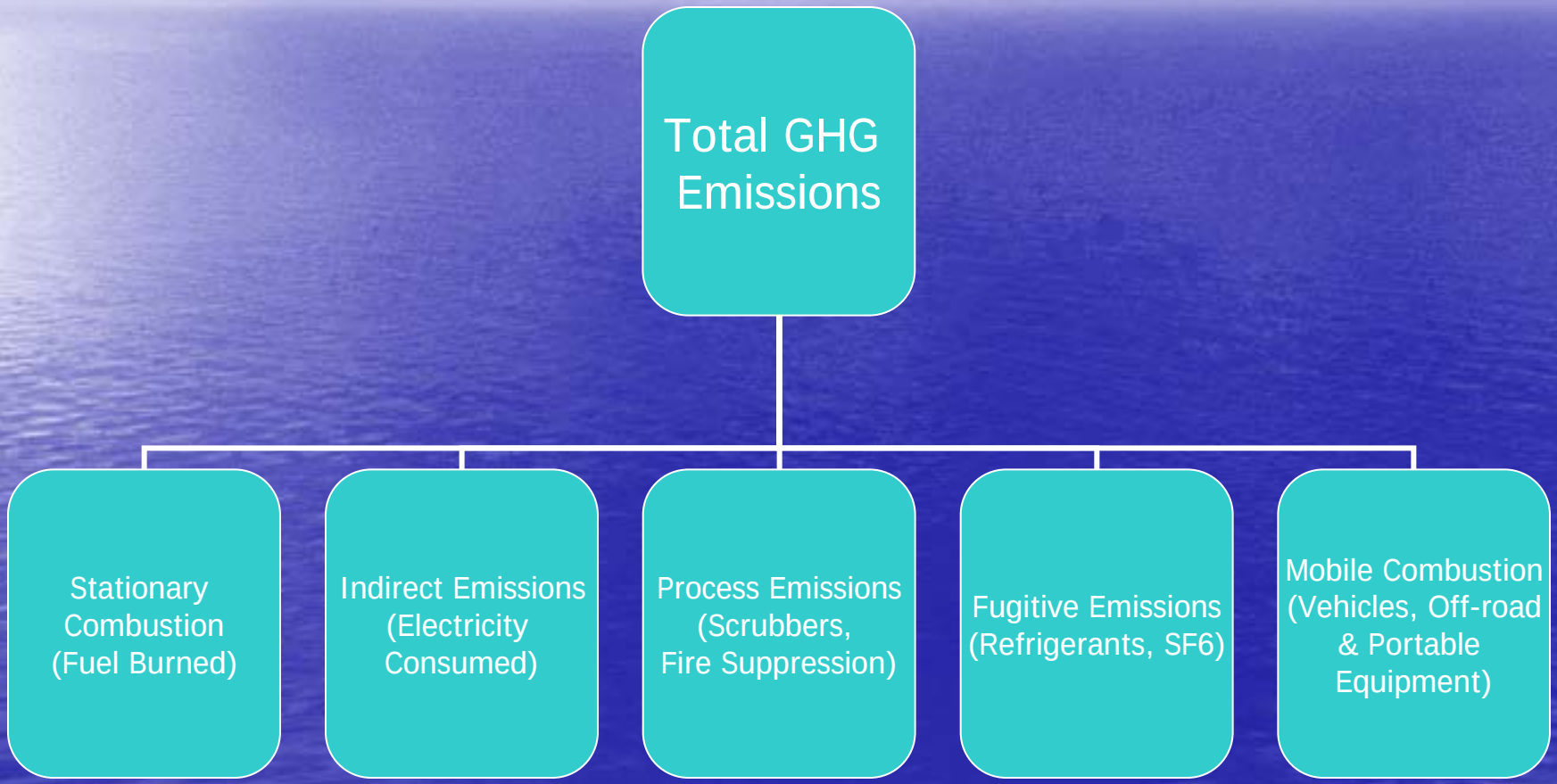
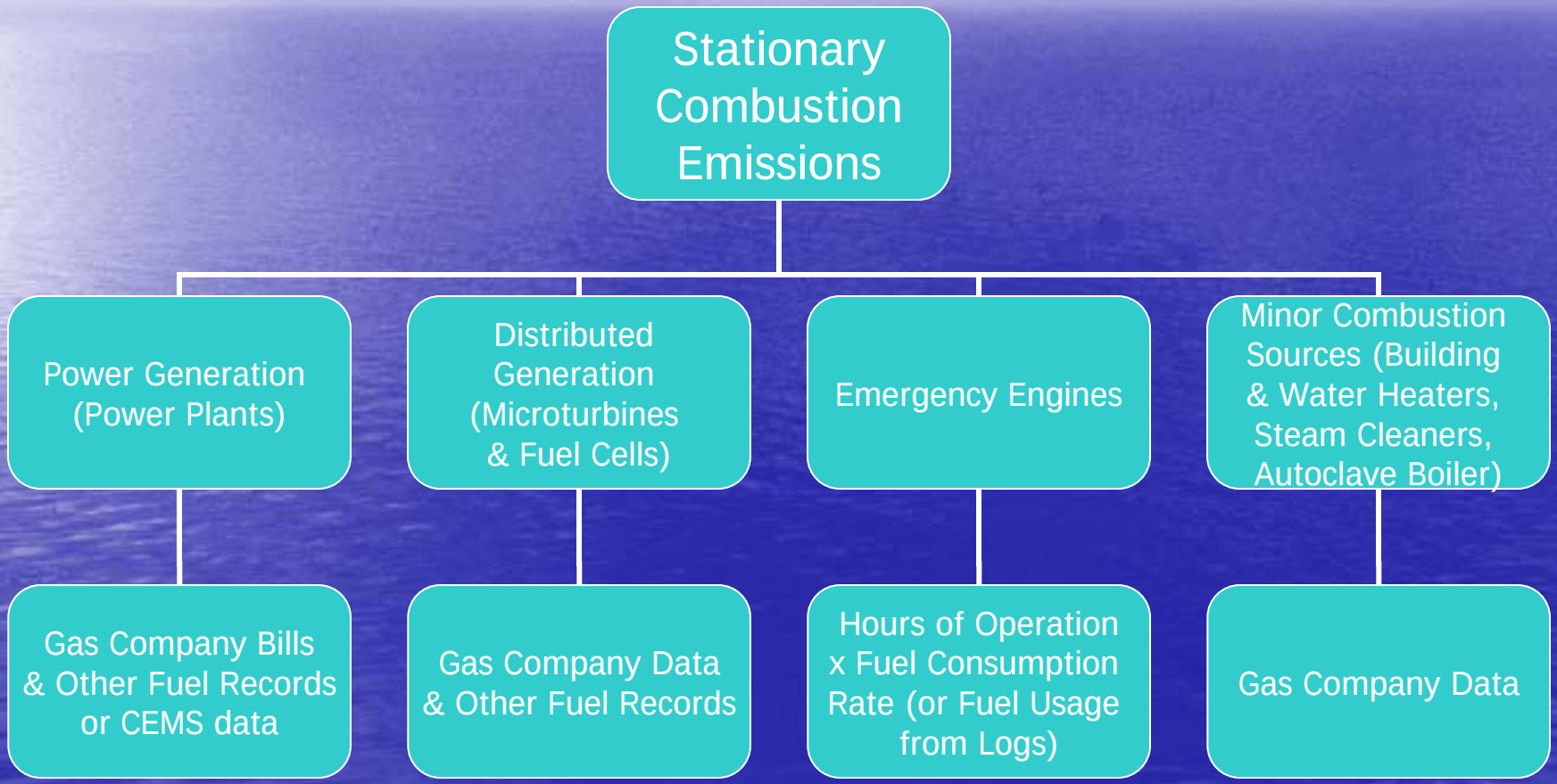
Los Angeles Department of Water & Power

- Largest Municipal Utility in U.S.
- Provides electric and water service to 3.9 million customers in the City of Los Angeles
- Charter Member of California Registry
- Reported & Certified 2000 – 2007 Annual Emission Inventories with the California Registry using the Power/Utility Protocol
- Reported 1990 – 2005 CO2 Emissions to U.S. Department of Energy EIA-1605b program

GHG Emissions Inventory Data Management System Organize Emission Sources by Category



Stationary Combustion Emissions Subcategories & Data Sources



Emissions Inventory Successes

- Created emission calculation spreadsheets for each category (stationary, indirect, process, fugitive, mobile)
  - Spreadsheets list individual emission sources, fuel data, emission factors, GHG emissions by source and total emissions.
  - Can compare magnitude of emissions between sources and sub-categories.
  - Makes it easy to review and verify emissions calculations (all data in one place).
- Data Notebook
  - Organize data and supporting documentation by category for verifier.
- Electricity and Natural Gas Consumption Data
  - Obtain list of all electric and natural gas utility account numbers from Accounts Payable.
  - Request account usage histories from the utilities rather than copying monthly bills (especially if have multiple accounts).

Emissions Inventory Issues & Challenges

- Calculating share of emissions from jointly owned generating stations
  - Power/Utility Protocol requires use of equity/contract % share.
  - Equity/contract % share differs slightly from each participant's % share based on electricity received / total generation.
  - If calculate share of emissions based on electricity received to be more accurate, verifier flags as inconsistent with reporting protocol.

- Wheeled Power T&D Losses
  - Balancing Authority may make up losses with its own generation, losses are part of overall system energy losses (not identified separately)
  - Transmission losses for jointly owned transmission lines are supposed to be reported based on equity share. If a utility with partial ownership (entitlement) in a transmission line does not use its full share of the transmission capacity and allows CAISO to use their excess transmission capacity, the utility may not be able to get data on the wheeled power transactions arranged by CAISO to report the losses.

Ongoing Emissions Inventory Issues and Improvements

- Refrigerants
  - Recordkeeping Issues
    - Lack of centralized recordkeeping for refrigerant usage
    - Servicing of equipment by outside contractors
  - New ARB Refrigerants Management Program regulation (pending)
    - Includes recordkeeping and reporting requirements
- SF6
  - Recordkeeping
    - Implementing new system to track weight of SF6 bottles at facilities, when receive from vendor, and when return to vendor for refill (not empty).
    - Centralize storage of SF6 bottles to improve control and recordkeeping.
  - Efforts to identify, seal or replace leaking SF6 equipment.

Lessons Learned

- Use fuel-based method for calculating GHG emissions from all sources for consistency
  - CEMS (Continuous Emissions Monitoring System) data usually only available for large emission sources.
  - CEMS calculates CO2 emissions but not CH4 and N2O emissions.
  - Fuel based method calculates CO2, CH4 & N2O emissions based on MMBtu, and can be applied to both large and small stationary combustion sources.
  - When co-fire fossil and biogenic fuels, need to use fuel-based method to separate biogenic from fossil emissions.
    - Note: CH4 and N2O emissions from biogenic fuels count towards total entity GHG emissions, but CO2 emissions from biogenic fuels do not.
  - Fuel-based emissions calculation method provides an apples-to-apples comparison between emissions from different sources.

Lessons Learned (continued)

- Fuel-based emissions calculations: best to use revenue meter fuel data or data from power plant records/reports
  - Revenue meters are considered the most accurate source of fuel consumption data
    - Revenue meters are calibrated frequently
    - Basis for $$ changing hands
  - Plant data will include corrections from audits and fuel inventories
  - Fuel data reported to EIA not as accurate
    - Have encountered errors in EIA data
    - EIA data may not reflect correction factors (e.g., “wet” tons of coal)

Lessons Learned (continued)

- Compare data from different sources to check for errors
  - Revenue meter fuel data should be comparable to sum of unit level fuel data
    - Our verifier compared fuel data from the Gas Company invoices with fuel data from the CEMS reports and found a 12% discrepancy for one power plant. We discovered the natural gas fuel flow meter scaling was incorrect in the CEMS software for the newer units.
  - Discrepancy between CEMS and fuel-based CO2 emissions
    - Comparing CEMS and fuel-based CO2 emissions for each of our power plants revealed CEMS CO2 emissions data was ~2% higher for natural gas fired plants and ~12% higher for coal-fired plants. We believe these discrepancies are due to errors in the CEMS calculations.

Lessons Learned (continued)

- Sources of error in CEMS emission calculations (coal-fired plants)
  - The CEMS software uses stack flow to calculate CO2 emissions
  - In-stack flow monitor measurements may be inaccurate due to:
    - Swirling flow (exhaust gas flow is at an angle instead of straight up)
    - Wall Effects (velocity of the exhaust gas flow is slower near the stack wall)
  - EPA promulgated alternative methods to address these issues:
    - Methods 2F and 2G compensate for swirling flow
    - Method 2H compensates for wall effects
  - If a stack has swirling flow or wall effects, failure to use the alternative methods can result in significant high bias in the flow values.
  - Not all facilities have implemented the revised methods to correct for stack flow variations. Therefore, a ton of CO2 emissions reported by one power plant may not be equivalent to a ton of CO2 emissions reported by another plant.

Lessons Learned (continued)

- Correcting error in CEMS emission calculations (coal-fired plants)
  - Intermountain Generating Station hired a consultant to optimize the stack flow monitor and minimize bias in the CEMS calculations.
  - Actions
    - Conducted stack flow testing.
    - "Curve-fit" the stack flow monitor to the reference method results (i.e., define a flow correction curve for the stack velocity values).
    - Implement the more accurate flow measurement methods (Method 2G or 2F and 2H).
    - Applied flow correction factors, resulting in an estimated 8% reduction in reported emissions.
  - Plan to compare 2008 CEMS and fuel-based CO2 emissions to determine actual reduction.
  - Cost of consult, testing and software modifications: ~ $200,000.
  - Cost savings: reduction in cost of SO2 allowances, and future cost of CO2 emission allowances.

Lessons Learned (continued)

- Sources of error in CEMS emission calculations (natural gas fired units)
  - The CEMS for natural gas fired generating units calculates CO2 emissions using heat input and F factors.
  - Part 75 states the natural gas heating value used in heat input calculations should be the value from the most recent monthly sample (monthly values range from 1021 to 1037 Btu/cf)
  - However, power plants within SCAQMD are required to use a fixed heating value of 1050 Btu/cf for RECLAIM emission calculations.
  - If the CEMS is not capable of performing 2 separate heat input calculations, the default factor of 1050 is also used to calculate CO2 emissions.
  - Correcting this requires re-programming the CEMS to perform separate calculations.

Conclusions

- Lessons learned from reporting GHG emissions to the California Registry will be valuable for mandatory GHG emissions reporting to ARB.
- It takes time to develop your own data management system, implement good recordkeeping and resolve emission calculation issues.
- You can learn a lot from the verification process.