上海发电行业碳排放MRV方法学的设计理念与实践经验

The design thinking and practical experiences of MRV Methodology for GHG emission of electricity generation industry-- from Shanghai ETS

Low-carbon Economy &Climate Change Center
Shanghai Information Center
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政策文件
Policies

- 《上海市碳排放管理试行办法》
  Shanghai municipal Regulations of GHG emissions (trail)

- 《上海市温室气体排放核算与报告指南（试行）》
  Guidelines of GHG emissions Accounting and Reporting (trail)

- 《上海市电力、热力生产业温室气体排放核算与报告方法（试行）》
  Methodology of GHG emissions Accounting and Reporting for electricity and heat generation industry (trail)

- 《上海市碳排放核查工作规则（试行）》
  Working Rules of GHG emissions Verification (trail)

边界
Boundary

- 监测与报告主体为独立的发电企业，与本市能源统计报表制度的规定相一致 Monitoring and reporting entity is designated as an independent power plant, which is in consistent with Municipal Energy Statics System

  - 本市发电企业的设施边界等同于企业地理边界 Facility boundary is equal to the geographical region of power plants located in Shanghai

  - 有利于明确责任主体 in order to clear the emissions responsibility entity

  - 有利于开展碳排放交易和管理工作 in favor to lunch ETS polite and city emission regulation

边界
Boundary

- 仅核算发电生产系统内的燃料燃烧直接温室气体排放 only monitoring and reporting stationary combustion emissions in electricity generation system

  - 与发电行业技术经济指标计算方法一致 in consistent with the calculating method of economical and technical index for power plant

  - 不核算企业地理边界内的生活设施排放 living facility emissions do not to be reported

  - 与后续基准线法配额分配方案相衔接 linking benchmark allowance allocation method

  - 与环保政策相衔接，不核算脱硫设施排放 emission of desulfurization is not to be reported in order to encourage power plants to carrier environment protection

  - 降低整体MRV工作的难度 to simplify the hole process of MRV

边界
Boundary

- 仅核算CO_2排放 calculate CO_2 emission only

  - CO_2排放量占发电企业温室气体量95%以上 over 95% percent GHGs emission of power plant in Shanghai is CO2 emission

  - CH_4, N_2O, SF_6等气体排放量较小，核算难度较大大 it is hard to monitor and calculate CH4, N2O and SF6 emissions

  - 与全市碳交易管理工作口径一致 in consistent with Shanghai ETS framework

核算方法
Calculation Method

▸ 排放因子计算法 Emission factor based calculation method

- 排放量=活动水平*排放因子
  Emissions= activity * emission factor

- 燃料燃烧排放量=实物消耗量*低位热值*单位热值含碳量*氧化率*44/12
  Fuel Combustion Emission = Mass consumption * Net Calorific Value * Carbon Content per NCV * Oxidation factor * 44/12

▸ 直接测量法 Continuous Emissions Monitoring System CEMS

监测要求
Monitoring requirements

▸ 指导原则 guiding principle

- 对排放量占比高的排放源相关数据项的监测要求相对较高，如燃煤电厂的煤炭消耗排放 the requirements of relevant parameters of main emission sources are stricter, e.g. coal combustion emission form power plant boiler

- 对排放占比低、不确定性低的排放源，相关数据项的监测要求相对较低如燃气电厂的天然气消耗排放、燃油消耗排放 the requirements of relevant parameters of miner emission sources are easier, e.g. Natural gas and oil combustion emission form power plant internal-combustion engine

活动水平数据监测要求
Monitoring requirements for Activity Data

- 煤炭 Coal

  - 实物消耗量 Mass consumption
    - 每日监测加仓量 monitor the mass of coal that added in bunker everyday
    - 全年365天汇总 add daily data up to annual data

  - 低位热值 Net Calorific Value (NCV)
    - 采用企业级实测值 analysis value determined by power plant is required
    - 每日监测加仓量机械样低位热值 analyze the NCV of mechanical sample of coal consumed everyday
    - 对每日低位热值按日消耗量加权平均获取年均低位热值 annual NCV is the weighted average of daily data

排放因子数据监测要求
Monitoring requirements for Emission factor

- 煤炭Coal
  - 单位热值含碳量 carbon content per NCV
    - ✓ 可采用缺省值 default value is recommended
    - ✓ 也可采用企业级实测值，须从采购运输环节监测。从每购入批次（船次）获取机械样进行送交CMA认证的专业机构检测，取所有批次实测值的加权平均值为全年均值 analyzed value is also applicable which should be monitored in purchasing and logistic process. the entity should commission independent third-party organization with CMA certification to analyze the mechanical sample of each batch (esp. a ship) of coal purchased, and the annual value is the weighted average of all analyzed values.

  - 氧化率 oxidation factor
    - ✓ 一般采用方法学规定的分设施类型的缺省值 default values determined by facility type are recommended
    - ✓ 也可采用企业级实测值，根据碳元素物料平衡原理计算 analyzed value is also applicable which should be evaluated by the mass balance calculation formula stipulate in MRV methodology

活动水平数据监测要求
Monitoring requirements for Activity Data

- 天然气 Natural Gas
  - 实物消耗量 Mass consumption
    - ✓ 每日监测消耗量 monitor mass consumption everyday
    - ✓ 全年365天汇总 add daily data up to annual data
  - 低位热值 net calorific value
    - ✓ 采用企业级实测值 analysis value determined by power plant is required
    - ✓ 每月至少取样一次获取低位热值 at least sample once a month to analyze NCV
    - ✓ 月平均低位热值按月消耗量加权平均获取年均低位热值 annual NCV is is weighted average of monthly data

排放因子数据监测要求
Monitoring requirements for Emission factor

- ➤ 天然气 Natural Gas
  - ● 单位热值含碳量 carbon content per NCV
    - ✓ 须采用缺省值 default value is required

  - ● 氧化率 Oxidation Factor
    - ✓ 须采用缺省值 default value is required

活动水平数据监测要求
Monitoring requirements for Activity Data

- 燃油 fuel oil
  - 实物消耗量 Mass consumption
    - 监测每批次消耗量 monitor every batch of fuel oil consumption
    - 全年所有批次汇总 add every batch data to annul data

  - 低位热值 net calorific value
    - 一般采用方法学规定的缺省值default is recommended

排放因子数据监测要求
Monitoring requirements for Emission factor

- 燃油 fuel iol

  - 单位热值含碳量 carbon content per NCV
    - ✓ 须采用缺省值 default value is required

  - 氧化率 oxidation ratio
    - ✓ 须采用缺省值 default value is required

报告工作主要要求
Reporting requirements

- 上海市碳排放直报系统Shanghai Municipal GHGs emissions reporting system

  - ✓ 电子报送系统，标准化操作 online reporting system has been come into use for standardized reporting

  - ✓ 减轻企业工作量 reduced workload of enterprises

  - ✓ 有利于主管部门开展相关管理工作 in favor of government fulfill emission management

核查工作主要要求
Verification requirements

- 《上海市碳排放核查工作规则（试行）》 Working Rules of GHG emissions Verification (trail)

  - 关注组织边界、设施设备是否有变化 pay attention to the change of organizational boundary, facilities and devices

  - 至少抽查2个月每日实物消耗量原始称量记录和样本低位热值化验记录，如有误差情况，提高抽查比例 at least checking 2 month daily original records of fossil fuel consumption and analysis of NCV on random , if deviation was found, increase checking percentage

  - 核查全部第三方机构出具的单位热值含碳量相关原始报告 checking all original analysis reports about emission factor presented by third-part organization

核查工作主要要求
Verification requirements

- 《上海市碳排放核查工作规则（试行）》Working Rules of GHG emissions Verification (trail)

- 核查称量设备和化验设备的检定记录 checking the legal inspection records of measuring instrument and analysis equipment

- 对燃料到厂采购数据和入炉耗用数据进行交叉比对 cross checking the fuel purchasing data with boiler real consumption data

- 对单位发电量碳排放量年度数据进行比对分析 compare the emission performance data of annual time series

实践经验借鉴
Practical experience for reference

- 发电企业能耗管理制度完善，碳排放管理意识较强power plants have complete energy consumption management system and strong willingness to implement GHG emission management.

- 注意发电企业现有能耗统计方法与碳排放核算要求之间的差异，如煤炭每日消耗量，以保证不同企业之间方法一致、数据可比 there may be some minor bias between the existing energy static method used by power plant and GHG emission MRV requirements, such as daily mass consumption of coal, authority should ensure that different enterprises use the same method and submit comparable data.

实践经验借鉴
Practical experience for reference

- 单位热值含碳量数据交叉验证难度大，建议要求企业送交具备CMA资质的第三方机构进行检验，从而保证数据的可靠性 it is hard to cross check carbon content per NCV data, in order to guarantee the reliability of the data , it is suggested to be obtained from CMA certified third-party organization who carried on the analysis of fuel sample with full representativeness

- 注意企业是否使用多种类别的煤炭，如烟煤、褐煤等，防止企业将不同类别的煤炭混淆误报 pay special attention on the classification of coal，some enterprises may use kinds of coal，such as bituminous coal， lignite coal and so on，misreporting from them should be avoided.

谢谢
Thanks

021-62129099-2267 liuja@shic.gov.cn

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