Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Bangkok, Thailand
10 April 2012, 9-15
Presented by:
Eva Born Rasmussen
Mila J. Jude
Stakeholder Workshop

09:00 – 9:15 Welcome, Purpose and Agenda
  Introduction to dialogue process

Presentation 1 → Workshop 1 → Break
Presentation 2 → Workshop 2 → Lunch
Presentation 3 → Workshop 3

14:40-14:50 Wrap-up
Topics

1. A New Thai MRV Framework Methodology
   • Workshop: What are the objectives for MRV?

2. GHG Inventories for energy sector
   • Workshop: Lessons learned?

3. ‘Good Practices’
   • Workshop: What are ‘good’ MRV practices?
Purpose

Stakeholder dialogue

• Initial stakeholder input in Kick-off (Feb. 2012)
• Now:
  – Second round of stakeholder input
  – Presentation of initial findings
  – Outline of new Thai MRV Methodology Framework

Please provide: Ideas, concerns, comments
Status of the MRV Framework Methodology

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Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Status

1. Kick-off
2. MRV Institutional Framework
3. Define data collection system
4. Create shared emission reporting format
5. Support capacity building on MRV
6. MRV Framework methodology
7. Quality control
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

1. Kick-off
   - Mandate
     - Stakeholder Dialogue
       - 2. Initiate MRV Institutional Framework

1. Survey of existing MRV For National GHG Inventory

2. Develop
   - International MRV Method and Tools
     - 6. MRV Framework Methodology

3. Define Data Collection System and
4. Create shared emission reporting format

5. Support capacity building on MRV

7. Quality Control
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Scope and objectives for MRV

- Regulations
- Data
- Method
- Institutional Framework
- Measure Report Verify
- Evaluation
- Quality Control
- Tools

Source: "Climate regulation' by Eva Born Rasmussen
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Scope and objectives

- Regulations
- Data
- Method

Institutional Framework

Why?
What?
How?
Who?
Decision!
Next?
Ok?
How to?

Measure Report Verify

Evaluation

Quality Control

Tools

Source: "Climate regulation’ by Eva Born Rasmussen
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Why?

The EU principles from 2004 have been the framework for all EU countries when developing their MRV methodologies.

Still no clear MRV guidelines for developing countries.

Enforcement still unclear.

Regulations

Annex 1 countries: Legally committed to reduce GHG emission and yearly report National Inventory;
For non-Annex 1 countries: Reduce and report

Measure Report Verify
UNFCCC – National GHG Inventory

Annex I

National GHG Inventory
- Annual submission
- National Inventory Report (NIR) - 1990-present

CRF tables (UN software)
Strictly review annually by ERT

UNFCCC database

Non-Annex I

Submission as part of National Communication
Submission when applicable INC 1994, SNC 2000

UNFCCC Non-Annex I software version 1.3.2
Common review with NC

Revised 1996 IPCC GL for Nat GHG In.

2000 IPCC GPG
2003 GPG-land-use

2006 IPCC GL for Nat GHG In.
New software development

Source: Prof. Dr. Sirintornthep Towprayoon
MRV for developing countries

• Regulations will most likely use principles based approach
• Each country, their way – but principles must be upheld
• Lesson learned from Annex 1 countries: Unique national strengths to be used, and ‘weak’ points to be compensated for
• General lesson learned: All principles can be debated!!!
Principles: Completeness

Monitoring and reporting for an installation shall **cover all process and combustion emissions from all sources** belonging to activities listed in Annex I to the Directive and of all greenhouse gases specified in relation to those activities.
Principles: Consistency

Monitored and reported emissions shall be comparable over time, using the same monitoring methodologies and data sets. Monitoring methodologies can be changed in accordance with the provisions of these guidelines if the accuracy of the reported data is improved. Changes in monitoring methodologies shall be subject to approval from the competent authority and shall be fully documented.
Principles: Accuracy

It shall be **ensured that the emission determination is systematically neither over nor under true emissions**, as far as can be judged, and that uncertainties are reduced as far as practicable and quantified where required under these guidelines. Due diligence shall be exercised to ensure that the calculation and measurement of emissions exhibit the highest achievable accuracy. The operator shall provide reasonable assurance of the integrity of reported emissions. **Emissions shall be determined using the appropriate monitoring methodologies set out in these guidelines.** All metering or other testing equipment used to report monitoring data shall be appropriately applied, maintained and calibrated, and checked. Spreadsheets and other tools used to store and manipulate monitoring data shall be free from error.
Principles: Transparency

Monitoring data, including assumptions, references, activity data, emission factors, oxidation factors and conversion factors shall be obtained, recorded, compiled, analysed and documented in a manner that enables the reproduction of the determination of emissions by the verifier and the competent authority.
Principles: Cost effective

In selecting a monitoring methodology, the improvements from greater accuracy shall be balanced against the additional costs. Hence, monitoring and reporting of emissions shall aim for **the highest achievable accuracy, unless this is technically not feasible or will lead to unreasonably high costs**. The monitoring methodology itself shall describe the instructions to the operator in a logical and simple manner, avoiding duplication of effort and taking into account the existing systems in place at the installation.
Principles: Materiality

An emission report and related disclosures shall be **free from material misstatement**, avoid bias in the selection and presentation of information, and provide a credible and balanced account of an installation's emissions.
Principles: Faithfulness

A verified emissions report shall be capable of being depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to represent.
Principles: Quality (QA/QC)

Improvement of performance in monitoring and reporting emissions. The process of verifying the emission reports shall be an effective and reliable tool in its support of quality assurance and quality control procedures, providing information upon which an operator can act to improve its performance in monitoring and reporting emission.”
MRV for non Annex-1 countries

- Regulations will most likely use principles based approach
- Most likely a mix of currently used standards and methodologies such as ISO 14064, UNFCCC guidelines, CDM regulations and various input from Intergovernmental Panel on Climate Change (IPCC)
- As well as inspiration from the way the developed countries have developed their MRV Framework methodologies.
Thailand
INC and SNC:

Reporting on three main GHGs: CO2, CH4 and N2O (both by source and sink)

Furthermore inventory reports on CO, NOx and NMVOCs as well as SOx.
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Source: Prof. Dr. Sirintornthep Towprayoon

Conceptual framework of GHG estimation

- Activity data
  - Consult responsible organization
  - Focus group meeting
  - International driver (default driver)
  - Check quality of data

- Emission factor
  - Literature review, using driver
  - Consult relevant institute
  - Default value

Managing time series of data → Database setting → Calculation → Reporting using UN ver. 1.3.2 → Uncertainty: key sources analysis → National Inventory Report → Second NC
Tier 1 and 2

- In the SNC activity data are obtained from statistical reports from relevant agencies, while emission factors are mostly default ones provided by the IPCC Guidelines.
- Tier 2 is applied to N2O emission from animal waste management and GHG emissions from rice, forest and waste management.
- Local emission factors derived using the Delphi technique are also applied in the waste management sector.
Main constraints reported - 1

- The absence of local emission factors for the key sectors such as agriculture, energy and forests. The INC pointed out that the local emission factors applied were based on **limited experiments and case studies**.
- The lack of sufficient data for inventory estimation
- The lack of qualified people to undertake inventory work on a regular basis, i.e. the need for capacity building within staff of relevant agencies,
Main constraints reported - 2

• The need to have access to researchers who can help determine local emissions factors, i.e. handle complex inventory methodology.

• The need for participating in international network for information and technological exchange on local emission factor development.
Data standards are essential

Methodologies on data standardization strong and many data standards from Annex-1 countries could be adopted in Thailand

Lessons learned:
- Interoperability requires standardisation
- But only standardize when relevant
- Long (hard) process for each data standards
- Sector data, multi-sector data and metadata
Data ‘journey’

Roadmap needed for the long ‘journey’ of data standardization

• Strong governance to ensure long-range planning, cross-cutting and effective process
• Sector ‘expert’ knowledge needed to drive semantic standardisation
• Cross-sector governance need to drive syntactic standardisation and overall process
• Closely linked with institutional framework
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Measure
Report
Verify

Guidelines for National GHG Inventory made by IPCC

1996 Revised
2000 Good practice
2003 LULUCF

2006 IPCC Guidelines for NGI (new GL) Inventory

Method

How?
Methodology – high level

**Annex I**
- National GHG Inventory
  - Annual submission
  - National Inventory Report (NIR)
  - 1990-present
- CRF tables (UN software)
- Strictly review annually by ERT

**Non-Annex I**
- Submission as part of National Communication
  - Submission when applicable
  - INC 1994, SNC 2000
- UNFCCC Non-Annex I software version 1.3.2
- Common review with NC

UNFCCC database

Revised 1996 IPCC GL for Nat GHG In.

2000 IPCC GPG

2003 GPG-land-use

2006 IPCC GL for Nat GHG In.

New software development
Methodologies

\[
\text{Emission} = \text{Activity Data (AD)} \times \text{Emission Factor (EF)}
\]

- Mass of fossil fuel = tonnes
- Energy used = kWh
- Area = hectare
- Volume = m³ wastewater

\(\text{CO}_2, \text{CH}_4, \text{N}_2\text{O}, \text{PFC}, \text{HFC}, \text{SF}_6\)

kg GHG / unit of activity

Tonnes CO₂ equivalent of the estimated year

CO₂ = 1
CH₄ = 21
N₂O = 310
HFC = 140-11700
PFC = 9200
SFC = 23900

Source: Prof. Dr. Sirintornthep Towprayoon
Methodologies ‘implicit’ (more)

- IPCC Guidelines for GHG Inventories are mix of good advice and ‘how-to’ methodologies
- Clean Development Mechanism (CDM) comes with methodologies for every technology that reduces GHGs
- The GHG Protocol is a step-by-step guide (methodology) for company accounting and reporting on GHG emissions, and project level quantification
Methodologies ‘implicit’ in standards

- ISO-14064 is guidance on (1) organization level for quantification and reporting, (2) project level monitoring, and (3) validation and verification of GHG assertions
- Tools for accounting, optimization, forecasting, simulation etc. have ‘implicit’ methodologies and data ‘standards’
Thai MRV Methodology Framework

• Focused at ‘most likely’ MRV regulations
• Taking into account the data ‘journey’ needed
• Structured to leverage selectively from ‘existing’ methodologies and standards
• Starting from current Thai strengths
• Aiming at capacity building
  – data collection system
  – create shared emission reporting format
  – quality control and quality assurance
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Input from meetings

Institutional Framework

Who?

Measure Report Verify
Structure of SNC in Thailand

National Committee of Climate Change chaired by Prime Minister

Office of Natural Resources and Environmental Policy and Planning Ministry of Natural Resources and Environment

Steering committee of SNC

Thailand GHG management organization

SNC compilation

Mitigation team

National GHG inventories team

Adaptations and vulnerability team

Working teams
Lead by JGSEE

Working teams
Lead by JGSEE

Working teams
Lead by CU

Source: Prof. Dr. Sirintornthep Towprayoon
Greenhouse Gas (GHG) Measurement, Reporting and Verification (MRV) Study

Scope and objectives

Decision!

Measure
Report
Verify
MRV Objectives

Thailand’s national and international MRV requirements for National GHG Inventory consistently fulfilled

Additional objectives:

• **Value**: Increased value from the National Inventory data and related MRV processes
• **Process**: Effective governance and stakeholder involvement
• **Data**: Increased availability and standardization of activity data and reporting format
• **Quality**: Increased transparency and QA/QC
Value

Value: Increased value from the National Inventory data and related MRV processes

• Increasingly more efficient and less resource-demanding to collect the data required by IPCC

• The data collected used for analysing options for mitigation and for forecasting modelling i.e. “the principle of no-regrets” to analysis of “least-cost options”

• The data could be made available for use by both public and private stakeholders for increased use in calculation of the carbon footprint for specific enterprises, public organizations, NGOs etc.

• The could be used during the daily processes of public authorities for environmental and regulatory purposes, and also for planning and national policy formulation.
Process

**Process**: Effective governance and stakeholder involvement

- Ensuring and orchestrating effective stakeholder involvement
- All aspects of the proposed MRV considered negotiable to ensure key stakeholders buy-in
- Strong governance of the process of establishing the agreements with the data owners on providing timely and high-quality data, and ensuring the correct preparation of the NI.
Data

Data: Increased availability and standardization of activity data and reporting format

• With a ‘narrow’ focus this is less important as a few key stakeholders determine the data transformations needed to comply with the required reporting formats.
• With a ‘broader’ focus, where many different stakeholders use the data in various ways, the standardisation becomes essential
• In both cases: need for a data standardization process to be rolled out across the key stakeholders to ensure increased availability of timely and high-quality data from the various stakeholders
• Governance is required for the very specific agreements on the data including semantic and syntactic standardisation
• Taking into account the cultural interpretations and language connotation of key concepts
Quality

**Quality**: Increased transparency and QA/QC

- Increased transparency a requirement to enable reproduction of the determination of emissions by the verifier and the competent authority
- Publicly available Excel format of GHG calculations
- Understand via stakeholder dialogue which area of the MRV, where transparency is most urgently needed
- Quality related to the issues of overlap and double-counting
- Consistency between MRV for National inventory process (annual/biennial), the Non-supported NAMAs and the Internationally supported NAMAs
Questionnaire – workshop 1

MRV Objectives (see list)
1. Choose the most important additional objective for the MRV and give 3 reasons why it is so important – 5 minutes
   (1 post-it note for each reason, place on white-board)
2. Present to table group – 25 minutes
3. If time: same for next MRV objective of importance

Table coordinator will present an overview of the table discussion to all (max. 3 minutes per table)
National Greenhouse Gas Inventories Report (NIR): Thailand, Denmark and Netherlands

Bangkok, Thailand
10 April 2012
Presented by:
Mila J. Jude
• This is a comparison of the GHG inventory for the **Energy** sector for Thailand, Denmark and the Netherlands

• There is a Separate UNFCCC Guides on National Communications for Annex 1 (Denmark and Netherlands) and for non-Annex 1 (Thailand)
<table>
<thead>
<tr>
<th></th>
<th>Thailand</th>
<th>Denmark</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of National Communication</strong></td>
<td>2nd, SNC</td>
<td>4th</td>
<td>4th</td>
</tr>
<tr>
<td><strong>Years covered</strong></td>
<td>2000 to 2004</td>
<td>1990 to 2009</td>
<td>1990 to 2009</td>
</tr>
<tr>
<td><strong>Year Submitted</strong></td>
<td>2011</td>
<td>2011</td>
<td>2011</td>
</tr>
<tr>
<td><strong>No. of pages</strong></td>
<td>102</td>
<td>1,205</td>
<td>280</td>
</tr>
</tbody>
</table>

(NIR for Denmark and Netherlands)
<table>
<thead>
<tr>
<th></th>
<th>Thailand</th>
<th>Denmark</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Reporting Format (CRF)</td>
<td>Not required</td>
<td>Submitted and available in UNFCCC web and at: <a href="http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories">http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories</a></td>
<td>Submitted and available in UNFCCC web</td>
</tr>
<tr>
<td>National System for GHG Emission</td>
<td>Thailand</td>
<td>Denmark</td>
<td>Netherlands</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
</tbody>
</table>

Methodology - transparency

No mention of specific activity data and emission factors per sector in the SNC. | Methodology and other details are available: Danish EPA home page | Methodology and other details are available at www.greenhousegases.nl |
<table>
<thead>
<tr>
<th>Tier</th>
<th>Thailand</th>
<th>Denmark</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mostly Tier 1. Tier 2 is applied to N$_2$O emission from waste and rice and forest.</td>
<td>Tier 2 and Tier 3</td>
<td>Tier 2 and Tier 3</td>
</tr>
<tr>
<td>Emission factors</td>
<td>Thailand</td>
<td>Denmark</td>
<td>Netherlands</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Level of Disaggregation</td>
<td>Thailand</td>
<td>Denmark</td>
<td>Netherlands</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Statistical reports from relevant agencies, not disaggregated in SNC</td>
<td>‘Statistics Denmark’ include disaggregation to industrial subsectors.</td>
<td>Disaggregated, p.176 of NIR. Corporate level for the European CO₂ emissions trade. The Netherlands List, p. 201 of NIR.</td>
</tr>
<tr>
<td>Deviation/difference between National Statistics and disaggregated data</td>
<td>Thailand</td>
<td>Denmark</td>
<td>Netherlands</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Not mentioned in SNC.</td>
<td>Small deviation</td>
<td>Maximum of 3.8% difference, Reference Approach (RA) is higher. RA is from: Statistics Netherlands (CBS). Page 209 of NIR.</td>
<td></td>
</tr>
</tbody>
</table>
### Quality Assurance and Quality Control

<table>
<thead>
<tr>
<th>Thailand</th>
<th>Denmark</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes. Mentioned in SNC, page 50. From JGSEE, there is QC and QA</td>
<td>Yes</td>
<td>Yes. Page 217 of NIR</td>
</tr>
</tbody>
</table>
Netherlands - EF Energy

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Amount of fuel used in 2009 (TJ NCV)</th>
<th>CO₂ (x 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>533089</td>
<td>56.74*</td>
</tr>
<tr>
<td>Coal</td>
<td>208348</td>
<td>93.82</td>
</tr>
<tr>
<td>Waste, biomass</td>
<td>32596</td>
<td>128.62</td>
</tr>
<tr>
<td>Waste Gas</td>
<td>91861</td>
<td>72.98</td>
</tr>
<tr>
<td>Waste, fossil</td>
<td>31012</td>
<td>81.60</td>
</tr>
<tr>
<td>Solid biomass</td>
<td>28228</td>
<td>109.6</td>
</tr>
<tr>
<td>Blast Furnace Gas</td>
<td>16136</td>
<td>246.55</td>
</tr>
<tr>
<td>Other</td>
<td>15953</td>
<td>NA</td>
</tr>
</tbody>
</table>

*: EF standard natural gas is 56.6. In 1.A.1.C unrefined gas is used (EF = 58.89)
### Table 3.4 Overview of emission factors used (in 2009) in the sector Manufacturing Industry

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Amount of fuel used in 2009 (TJ NCV)</th>
<th>CO₂ (x 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>222170</td>
<td>56.60</td>
</tr>
<tr>
<td>Waste Gas</td>
<td>102580</td>
<td>65.02</td>
</tr>
<tr>
<td>Gas / Diesel oil</td>
<td>20187</td>
<td>74.30</td>
</tr>
<tr>
<td>Coke Oven Gas</td>
<td>12406</td>
<td>43.07</td>
</tr>
<tr>
<td>Blast Furnace Gas</td>
<td>11920</td>
<td>246.55</td>
</tr>
<tr>
<td>Solid biomass</td>
<td>10543</td>
<td>109.60</td>
</tr>
<tr>
<td>Other</td>
<td>10133</td>
<td>NA</td>
</tr>
</tbody>
</table>
Netherlands – sample computations

Questionnaire – workshop 2

Lessons learned:

1. Which aspects of the presented national approaches would you like to hear more about? Give 3 reasons why – 5 minutes
   (1 post-it note for each reason, place on white-board)
2. Present to table group – 25 minutes
3. If time: same for next aspect of interest

Table coordinator will present an overview of the table discussion to all (max. 3 minutes per table)
Good Practice Guidance in National Greenhouse Gas Inventories

Bangkok, Thailand
10 April 2012
Presented by:
Mila J. Jude
IPCC Good Practice Guidance (GPG) in National Greenhouse Gas (GHG) Inventories

IPCC – Intergovernmental Panel on Climate Change

GPG covers emissions of the direct GHGs: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), HFCs, PFCs, and SF₆
GPG Provides Guidance on:

- Choice of estimation method
- Quality assurance and quality control procedures
- Data and information to be documented, archived and reported
- Quantification of uncertainties at the source category level and for the inventory as a whole
The GPG does not revise or replace the *IPCC Guidelines*, but provides a reference that complements and is consistent with these Guidelines.
2: ENERGY

**Tier 1 approaches:**
1. Reference Approach
2. Sectoral Approach

**Tier 2/Tier 3 approach:**
- a detailed technology-based method, also called ‘bottom up’ approach
Tier 1

1. **Reference approach** – the activity data (amount of fossil fuel) is estimated using the national ‘apparent consumption’

2. **Sectoral approach** – activity data is summed up across all sectors
Tier 2 and 3 – Detailed Technology-Based Approach

Total CO\textsubscript{2} is summed across all fuels and sectors, plus combustion technologies (stationary and mobile sources)

More disaggregated emission estimates, require more data.
<table>
<thead>
<tr>
<th>Tier 1 – Reference Approach</th>
<th>Tier 1- Sectoral Approach</th>
<th>Tiers 2 and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Consumption – Aggregate Fuel Type (Primary and Secondary)</td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Sectors</td>
<td>Sectors</td>
</tr>
<tr>
<td></td>
<td>Fuels</td>
<td>Fuels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combustion technologies (stationary and mobile)</td>
</tr>
</tbody>
</table>
Good Practice on choice of Methods

Consult with National Statistical authorities and seek their advice on which method is the most complete and accurate indication of total consumption for each fuel
Good Practice on choice of Methods - Denmark

Very small deviation/difference between National Statistics and disaggregated data
GPG on the choice of Emission Factors (EF) and Net Calorific Values (NCVs)

- For traded fuels, obtain carbon content and NCVs from fuel suppliers
- For non-traded fuels like municipal solid waste (MSW), use default values
GPG on the choice of Emission Factors (EF) and Net Calorific Values (NCVs) - Denmark

Plant-specific for 71 large power plants and other large industries like cement and oil refineries. Complete list of emission factors is in Annex 3A-4 of the NIR.
Activity Data

• Activity data for all tiers – are the amount and type of fuel combusted.
• Sources of data: national energy statistics agencies, enterprises that consume the fuels, individuals responsible for the combustion equipment, suppliers of fuels (include customers and amount)
• GPG: use fuel combustion statistics rather than delivery statistics.
Activity Data - Denmark

- the **amount** and **type** of fuel combusted.
- Sources of data: from enterprises that consume the fuels.
- ‘Statistics Denmark’ include disaggregation to industrial subsectors.
Activity Data

- Confidentiality – if this is an issue with a company, they can be assured that their data will be aggregated, so the amount will not be per company but per sector or per industry (i.e. cement, beverage, etc.)
Activity Data - Denmark

- Confidentiality – have maintained confidentiality
Activity Data

- **Stored carbon** – obtain stored carbon factors from petrochemical companies that uses the feedstock.
- If not available, use default factors from IPCC.
Activity Data - Denmark

- **Stored carbon** – default factors from IPCC
Activity Data

- Lubricants – are sometimes burned for energy, and can cause overestimation of stored carbon.
- GPG – contact those responsible for recovering used oils
Activity Data - Denmark

• Lubricants – data are from the Danish Energy Authority
Activity Data

- **Amount of Fuel combusted** and **Amount of Fuel Delivered**
- Using **Amount of Fuel delivered** can cause double counting, as some processes have by-products also used as fuels.
- GPG : coordinate estimates with relevant industries
Activity Data - Denmark

- **Amount of Fuel combusted** and **Amount of Fuel Delivered**

- From page 105 of the NIR: The majority 61% - of all fuels is **combusted** in the source category
Completeness

- Must include emissions from all fuels and all source categories
- A reliable and accurate bottom-up CO$_2$ emissions estimate is important
- Direct imports of companies – might not be included in national statistics
Completeness - Denmark

- Must include emissions from **all fuels** and **all source categories**
- A reliable and accurate **bottom-up** CO$_2$ emissions estimate
- Small Deviation/difference between National Statistics and disaggregated data
Developing a Consistent Time Series

• Estimates for missing data in the time series should be prepared using backward extrapolation using present data
• When changing to a higher Tier approach, clear relationship should be established between approaches
• For Denmark, NIR states that the time series is consistent
Uncertainty Assessment

- Activity Data

The main uncertainty arises from:
The adequacy of the statistical coverage of all source categories;
The adequacy of the coverage of all fuels (both traded and non-traded).
Uncertainty Assessment - Denmark

- Activity Data – page 72 of the NIR presented uncertainty summary
Uncertainty Assessment

• Emission Factors
The uncertainty associated with EFs and NCVs results from two main elements, viz. the **accuracy** with which the values are measured, and the **variability** in the source of supply of the fuel and quality of the sampling of available supplies.
Uncertainty Assessment - Denmark

- Emission Factors

Activity Data – page 72 of the NIR presented uncertainty summary
Reporting and Documentation

- GPG: document and archive all information
- The inventory should include summaries of methods used and references to source data such that the report are **transparent** and steps in their calculation may be retraced.
Reporting and Documentation - Denmark

- Page 43 of the NIR: The complete emission inventories for the three different submissions (EU, Kyoto Protocol and UNFCCC) by Denmark are compiled by NERI and along with the documentation report (NIR) sent for official approval. In recent years the responsibility for official approval has changed. Previously it was the Danish Environmental Protection Agency (Ministry of the Environment) now it is the Danish Energy Agency (Ministry of Climate and Energy).
Reporting and Documentation

- Documents that need to be reported and documented:
  1) Sources and completeness of data
  2) Sources and date of revision of NCV
  3) Sources of emission factors and oxidation factors, date of last revision, verification of accuracy.
Inventory quality assurance/quality control (QA/QC)

• Compare using Tier 1 and 2 Sectoral approach, with the Tier 1 Reference approach.
• National Energy Balances – in mass units
• National Energy Balances – in energy units
• Mass and Energy balances – fuel conversion industries
• Energy Statistics compared with international organizations
• Cross check data with data for pollution legislation
Questionnaire – workshop 3

Good Practices:
1. Which of the ‘good practices’ would you like more capacity building on? Give 3 reasons why – 5 minutes (1 post-it note for each reason, place on white-board)
2. Present to table group – 25 minutes
3. If time: same for next type of capacity building

Table coordinator will present an overview of the table discussion to all (max. 3 minutes per table)