**Agenda**

1. Background and software design  
   *Simon Eggleston*

2. Demonstration of Software  
   *Nalin Srivastava*

3. Spreadsheets available from 2006 Guidelines  
   - Landfill Emissions  
   - Harvested Wood Products  
   - Fluorinated Gases (Refrigeration, Foams, Fire Protection)

4. Other support for inventories – EFDB and primer  
   *Kiyoko Tanabe*
The mandate of the National Greenhouse Gas Inventory Programme (NGGIP) includes:

“to develop and refine an internationally-agreed methodology and software for the calculation and reporting of national GHG emissions and removals”

- Software for the 1996 Guidelines was developed
  - Development of this has been continued by the UNFCCC for non-Annex I parties

- Following completion of 2006 Guidelines we are developing similar companion software
Aims of Software Project

- To produce software that automates the Tier 1 (and most 2 methodologies) in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
  - A phased approach has been adopted
    - Demonstration version (Energy Sector) this year
    - Complete version next year
    - While future phases are anticipated they will require a decision by the IPCC plenary and so cannot be guaranteed

- The software will not impose any additional requirements onto users beyond those specified in the 2006 Guidelines to ensure a good practice inventory
  - QA/QC software items
  - Documentation items

Specific Software objectives

- Facilitate preparation of national GHG inventories according to 2006 Guidelines
  - either for complete inventories or for separate categories or groups of categories
  - assist in training and inventory review
  - harmonise reporting of greenhouse gas inventories
  - archive data and complete inventories (which may consist of estimates for a number of years)
Users of Inventory Software

- The primary target groups of users are:
  - Inventory compilers in all Parties to the UNFCCC with limited resources without their own inventory systems and who wish to apply default methods
  - Trainers and trainees on national GHG inventory compilation
- In additional a range of other potential users has been identified
  - Reviewers of national inventories
  - Academics/Researchers
  - UNFCCC Secretariat
  - Project developers
- Many of the primary target users may have both limited resources and limited internet access but have some knowledge of 2006 Guidelines and to be computer literate and be familiar with spreadsheets

Timeline

- Meeting in Doha, Qatar (January 2007)
  - Agreed on development of new software
  - Agreed on specification of software
- Agreement by Task Force Bureau (TFB) (January 2007)
  - Decided to develop in stages so as to minimise risk and ensure software meets our needs
- Software development tendered by TSU (April – July 2007)
- Contract awarded to SPIRIT a.s. (October 2007)
  - For demonstration version covering Energy sector
- Software development continues with “beta” versions available. (ongoing)
  - 2nd version distributed (April 2008)
- Work on 2nd phase contracting is now starting aiming for completion in 2009
General Specification

• Minimum hardware specification
  – reliable internet connections cannot be assumed
  – Hardware: Pentium CPU and 256 MB RAM
  – Operating System: Microsoft Windows 2000/XP/Vista

• Software - freely distributable
  – The system should be freely distributable and should avoid any
    financial burden on users
  – The system should be a standalone system. It should not depend
    on web access.

• Help
  – A help system should be available in each module that has
    information both on the operation of the software and technical
    help on the methodologies based on text of the 2006 Guidelines.

• Languages
  – system should be capable on running independently of the
    language version of the operating system.
  – While it would be desirable for the interface to work in the various
    UN Languages this is not mandatory at phase 1, however the
    system should be language-enabled for the future
  – User manuals will ultimately need to be in all UN languages
    though not as part of phase 1.

Inputs

• Numerical Data:
  – Activity Data and its uncertainties.
  – Emission Factors and other parameters as described in the printed worksheets in the
    2006 Guidelines and the uncertainty of each.

• Additional Information
  – Choice of Tier
  – Data Reference (source of data)
  – Comments

• Numerical input data can be:
  – A number
  – A notation key (limit input to those specified in the 2006GL
  – Uncertainties are expressed as +/- 95 percentiles. (Typically users write this as +/-x,
    +x and - y. Data may be expressed in absolute terms or as percentages and users
    should have flexibility on how to express inputs.)

• The system should have a data version control. This will record the user name
  of who made changes to the database and the date of the change.

• It is expected that, in phase 1, users will input data in standard units.
  – At a later stage this may be adapted to allow alternative units to be used with
    software unit conversions, proposals should allow for this in their design.

• Some input modules may have text references to external databases but no
  direct hyperlinks.
Outs

- The system should output data according to the reporting requirements & tables of the 2006 Guidelines.
  - To form these reporting tables data are aggregated from the individual calculation sheets.
  - The structure of the reporting table is hierarchical with each sector being the sum of all of its sub-sectors.
  - Time series of individual data items (activity data or Emission factors).
  - A facility to report using the Revised 1996 Guidelines Reporting Tables should be included.
- The outputs should be:
  - Printable
  - For import into MS Excel®
  - As XML files in the CRF Data XML Format.
- In later phases more output options and formats may be required. Future phases may also ask for graphs of outputs.

Greenhouse gases

<table>
<thead>
<tr>
<th>Gases in 1996 Guidelines</th>
<th>2006 Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon dioxide (CO2)</td>
<td>nitrogen trifluoride (NF₃)</td>
</tr>
<tr>
<td>methane (CH4)</td>
<td>trifluoromethyl sulphur pentafluoride (SF₃CF₃)</td>
</tr>
<tr>
<td>nitrous oxide (N₂O)</td>
<td>halogenated ethers (e.g., C₄F₉OC₂H₅, CHF₂OCF₂OC₂F₄OCHF₂, CHF₂OCF₂OCHF₂)</td>
</tr>
<tr>
<td>hydrofluorocarbons (HFCs)</td>
<td>CF₃I, CH₂Br₂, CHCl₃, CH₃Cl, CH₂Cl₂</td>
</tr>
<tr>
<td>perfluorocarbons (PFCs)</td>
<td>C₃F₇C(O)C₂F₅, C₇F₁₈, C₄F₆, C₅F₈ and c-C₄F₈O.</td>
</tr>
</tbody>
</table>
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
Task Force on Inventories

Modular Structure

Energy Worksheets
Phase 2
PPU Worksheets
AFOLU Worksheets
HWP Spreadsheets
Waste Worksheets
SWDS Spreadsheets
Precursor Gases

Data Import

KCA

Uncertainty

QA/QC Checks

Outputs

Shaded areas are Phase 2, Phase 1 is the unshaded area

<table>
<thead>
<tr>
<th>Module</th>
<th>Annual or Time Series</th>
<th>Number of Calculation pages</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Annual</td>
<td>11</td>
<td>Provide Annual Total Fuel Use from sum of fuel consumption data input by fuel type for QA/QC Calculation. Energy Balance Data can be entered into the Reference approach QA/QC sheet for comparison by users. “abandoned underground coal mines” should allow time series data entry. For CCS use Reporting Table 1.4b as there is no worksheet in the 2006 Guidelines.</td>
</tr>
<tr>
<td>Fluorinated Gases – Foams (2F2)</td>
<td>Time Series</td>
<td>1</td>
<td>Default data from global database to be provided</td>
</tr>
<tr>
<td>Fluorinated Gases – Refrigeration and Air Conditioning (2F1)</td>
<td>Time Series</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fluorinated Gases – Fire Protection (2F3)</td>
<td>Time Series</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>IPPU other than fluorinated gases above</td>
<td>Annual or Time Series</td>
<td>60</td>
<td>Note: spreadsheet to check Non-Energy Use of Fuels for QA/QC checks. For “2F5 Carbide Production” and “2F6 Soda Ash Production”, users should choose one from two calculation pages. Users should not use both of these two pages. For “2H Electrical Equipment” and “2H Other”, users should be able to duplicate the table to calculate emissions of different gases using the same calculation procedure as needed. There are no worksheets in the 2006 guidelines pages for the following sources/sink categories: 2A7, 2B10, 2C7, 2D3, 2D4, 2E5, 2F4, 2G2, 2G3, 2G4, 2H so the calculation page will be for data input only. (2 additional for Reference approach QA/QC)</td>
</tr>
<tr>
<td>HWP</td>
<td>Time Series</td>
<td>1</td>
<td>Time series default activity data from FAO entered by user.</td>
</tr>
<tr>
<td>AFOLU other than HWP</td>
<td>Annual and time series</td>
<td>66</td>
<td>Provide annual total land areas as sum of individual land types as a QA/QC check. Provide annual total numbers of livestock as QA/QC check. Time series is needed for lands converted.</td>
</tr>
<tr>
<td>SWDS</td>
<td>Time Series</td>
<td>1</td>
<td>Spreadsheet contains default data</td>
</tr>
<tr>
<td>Waste other than SWDS</td>
<td>Annual</td>
<td>18</td>
<td>Provide annual total waste and waste per capita (including SWDS) as QA/QC check.</td>
</tr>
<tr>
<td>Flue Precursor Gases</td>
<td>Time Series</td>
<td>This facility is to enter data from other inventory estimates for these gases for reporting, not to do any calculations. The gases are SO2, NOx, NH3, NMVOC and CO.</td>
<td></td>
</tr>
</tbody>
</table>
A Worksheet

Worksheet Modules

- For those modules based on the worksheets:
  - modules will open with a screen to select the sub-category (i.e. the calculation page)
  - the calculation page will open and users input the appropriate data. Help will refer to the appropriate chapter or section in the 2006 guidelines.
  - the calculation page should look like the worksheets in the 2006 Guidelines as much as possible.
  - users be able to enter data, a reference for the data and an optional comment
  - users will then save the data and can select another sub-category (calculation page)
  - each module will contain sectoral QA/QC checks on the data.
Spreadsheet Modules

- Some spreadsheets are included in the 2006 Guidelines
  - Solid Waste Disposal Sites (landfills)
  - Harvested Wood Products
  - Some Fluorinated Gases (e.g. refrigeration)
- These will be included in the same format with an interface to them from the software
- It will be also be possible to use them as stand-alone programmes

Initialising a new year’s inventory

- Year d copied to form basis of year e
- Existing years copied to form basis of new inventory
**QA/QC functions**

- At the data input level there should be some checks.
  - For numerical input these will flag numbers outside a "reasonable" value or a notation key.
  - For emission factors and other parameters, if the input data is outside the range defined by the default value and its uncertainty this should be flagged to the user. Such values should be allowed by the software.
  - Checks do not limit users – merely indicate possible issues
  - Reference Approach
  - Non-Energy Use of Fuels

**Flexibility**

- Within each sub-category the user should have the flexibility to both:
  - Duplicate the calculation page to stratify inputs
    - e.g. so the same calculations can be made for regions of the country with different parameters used in the estimate
  - Add additional sub-categories
    - In these cases the data management part of the software should ensure that these changes are applied consistently to all years in the same time series
Way forward

- A second phase will be contracted to produce:
  - Complete software for all sectors
  - Minimal quality control
  - Time series handling

- There may be further development to include additional items such as:
  - More quality control
  - Improved input/output
  - Improved help
  - Language options
The way forward

- Timing depends on contracts etc.
- Aim to have working complete software in 2009
- Decision on 3rd phase taken after review meeting

Summary

- Inventory Software is being written for the 2006 Guidelines
- It is aimed at
  - Users with limited resources
  - As a training tool
- The software will be free to users
- A modular structure will make the software more flexible – it can be used as a whole, in part or in a distributed fashion
- The software will display all the calculations – it is not a “black box”
If you would like to review the software please leave your name and email

Many thanks