Area C: Developing Global Databases

The UNCEEA Meeting, 6 -9 July 2020

Objectives and Principles

At previous meetings of the UNCEEA, a number of objectives and principles for developing global SEEA databases were agreed upon, including the establishment of five priority areas at the Eleventh Meeting of UNCEEA in 2016.

The core objective of Area C is to provide users with SEEA compliant data sets for integrated policy development and analysis, including the SDGs. This is done by providing users with direct access to SEEA databases, developed from national data, with global coverage (as much as feasible) and via a single-entry portal on the SEEA website (seea.un.org).

The global databases on the SEEA website will showcase the utility and relevance of SEEA-related data and encourage the implementation of the SEEA in more countries. The procedures for developing global SEEA databases are designed to support efficient compilation, processing and exchange of the relevant data by national and international organisations. Nine principles, based on data flows for SDGs, were put forward and agreed by the UNCEEA at its 14th meeting in 2019, as follows:

1. Official statistics reported in global SEEA databases should meet the Fundamental Principles of Official Statistics.
2. Official statistics are prioritised and estimation techniques are only used as a complement.
3. The principles of subsidiarity are being applied between international organisations when it comes to the collection of official SEEA data and metadata, in order to avoid duplication of requests, processing or validation.
4. Web queries and SDMX are the preferred options for the collection and exchange of data across organisations.
5. Estimation methodologies need to be precisely documented and their accuracy needs to be assessed.
6. Estimation methodologies need to be endorsed by the UNCEEA.
7. Countries need to be notified before estimates are released to the SEEA website.
8. Identified UNCEEA members are responsible for the further development of specific global SEEA accounts on the SEEA website.
9. A unique focal point is identified in each country for all questions related to SEEA databases.

Report of progress & ongoing tasks:

Organisation of responsibilities

One of the broad challenges for Area C is establishing institutional arrangements and organisation of responsibilities for the collection and compilation of SEEA accounts across international agencies, based, as much as possible, on official data compiled at the national level.

Progress has been made in the allocation of responsibilities for the five priority accounts under area C. Air emission accounts (AEAs) provides a good general example. Eurostat has an official mandate to collect and publish data on air emission accounts (as well as for energy and material flows) for members of the European Union. These accounts for the EU are shared with the OECD, which publishes them alongside air emissions accounts from official national sources for other countries, where available, outside of the EU.[1] OECD also developed a methodology, endorsed previously by the UNCEEA, for producing air emission accounts estimates[2] based primarily on reporting of greenhouse gas inventories to the UNFCCC and production statistics from official national accounts. Thus, the generic approach, in alignment with the Area C principles, is a decision tree-type model where existing international compilations of official statistics (such as from Eurostat) are used to avoid duplicating requests to countries, followed by official statistics published by other countries, and finally, as a last resort, filling gaps via UNCEEA-approved approaches to estimation. In all cases, the work needs to be done with clear and specific distribution of responsibilities between international organisations in terms of processes and coverage of countries.

Organisational responsibilities should be established explicitly among international organizations involved, with relevant details of the requirements (e.g. scope and coverage of databases) for each of the priority accounts. In several cases, including for air emissions accounts, details of responsibilities regarding coverage of countries in the databases could be more specifically clarified or confirmed and then communicated to countries. A summary matrix of current information and links to resources for the international SEEA-related databases was compiled (see **Annex E**).

Global SEEA Data Collection Templates

Currently, the UNCEEA lacks standard forms or questionnaire templates for collecting official data from countries for the SEEA website. The Area C group has begun investigating development of such standard templates for collecting official data. The standard global SEEA compilation templates would serve multiple purposes, including to (a) comprehensively describe the scope of data of relevance for international compilations from national sources and (b) illustrate key technical points underlying the accounts and facilitate discussions on harmonization and exchange of data, building on the SDMX data descriptions. The templates could be used for transmitting data from official sources to international agencies whenever SDMX transmissions are not possible or not in place.

It is proposed to adopt a tier-system regarding the potential use of templates for collecting data directly from countries. The tier-system would account for diversity in the level of detail of available data across countries. For example, the tier 1 template would cover relatively aggregated information and key variables from the core accounting tables[3], while a tier 2 template, containing optional

[1] https://stats.oecd.org/Index.aspx?DataSetCode=AEA

[2] https://stats.oecd.org/Index.aspx?DataSetCode=OECD-AEA

[3] SEEA Core Accounting Tables have been developed and endorsed by the SEEA Technical Committee and can be found in the SEEA Technical Notes.

content, would be more comprehensive and more detailed. A tiered approach could allow for flexibility in reporting from different countries without sacrificing comparability or creating unnecessary breaks in the time series. The templates used by Eurostat for EU countries can be used as a starting reference for developing the templates for countries outside of the EU, including for non-OECD countries. This work is currently underway, see **Annex D** for a brief summary of the proposed strategy.

Global Data Structure Definitions (DSDs) for exchange of data

The UNCEEA has agreed previously to use SDMX standards for exchange of data and metadata as the preferred approach for robust and efficient transfers of data and metadata. Global data structure definitions (DSDs) for each of the five priority accounts under Area C were developed by a technical group[4] under the UNCEEA and the SDMX Ownership Group for Macro-Economic Statistics, and are available at the SDMX Global Registry.[5]

Progress towards organizing all exchanges of SEEA-related data via SDMX is progressing gradually, starting with exchanges between international organizations, and a transition towards SDMX exchange with countries, where feasible. The DSDs for air emissions accounts were mapped to the global air emissions accounts database at Eurostat and the OECD and applied to test transfers to the UN Statistics Division (UNSD) earlier this year. UNSD also worked with Eurostat for transfer of Eurostat's energy physical supply and use tables (PSUTs). Thus, the AEAs and EU energy accounts provide a proof-of-concept basis for SDM-XML transfers from international organisations to the Secretariat at UNSD. The global DSDs can also be used for the collection of data via XML transfers from national statistical agencies responsible for the accounts, where feasible.

Priority accounts under development

Five priority accounts were identified previously, reflecting the policy relevance and data availability. The priority accounts are air emission accounts (AEA), material flow accounts (MFA), land cover/land use, energy accounts, and water accounts. In addition to work on the five priority accounts described below, related progress on other accounts or mechanisms include the publication of environmentally related tax revenue (ERTR) accounts (new edition forthcoming in third quarter of 2020) at the OECD and a pilot version of a new integrated environment-economy database available in 2021 on the OECD statistical portal. The integrated environment-economy database will complement the global SEEA databases with additional accounts (e.g. ERTR) and statistics alongside other related economic statistics.

Air emission accounts (AEAs)

Air emission accounts (AEAs) were developed at OECD and the procedures for exchange of data and metadata for publication on the SEEA website have been developed and tested. The AEAs are a combination of compilations of official statistics for the European Union by Eurostat, compilation for non-EU official accounts by the OECD, and OECD estimation for selected other countries using an UNCEEA-endorsed estimation methodology.

Several improvements or extensions to international compilation of air emissions accounts were identified through the process of developing the AEAs estimation methodologies. The latter includes, amongst others, the development of statistics on CO_2 emissions from air transport.[6] Air transport is

[4] https://seea.un.org/sites/seea.un.org/files/dsds_for_global_seea_data_flows.pdf
[5] https://registry.sdmx.org/data/datastructure.html
[6] https://stats.oecd.org/Index.aspx?DataSetCode=AIRTRANS_CO2

one of the major sources of growth in CO_2 emissions of recent decades, and it represents one of the key distinct emissions flows needed to adjust the air emissions statistics, which are compiled on a territory basis, for alignment with the residence principle of national accounting. While the Working Paper with a full description of the estimation methodology is pending final publication, it has already gone through extensive review by experts from several organisations. The methodology depends on air transport databases managed and shared by the UN International Civil Aviation Organisation (ICAO). The current temporal coverage for the database is 2013-2018 and OECD plans to maintain the database, in collaboration with ICAO, with annual updates (2019 update is currently be processed). For more information on air transport emissions and its relevance for global SEEA databases, see **Annex A.**

Building on the estimation of CO_2 emissions from air transport, the OECD is in the process of investigating similar approaches for maritime transport. Data sources, such as registration information on routes traffic, by type of vessel and its fuel usage are needed to produce the statistics and test the methodology for allocating emissions in alignment with transportation services as recorded in national accounts. Discussions are ongoing to develop a collaboration with the UN's International Maritime Organisation (IMO) and with the OECD's International Transport Forum (ITF), to gain access to necessary input data and develop solutions to incorporate emissions from maritime transport into the SEEA air emissions accounts infrastructure. **Annex B** contains a more complete description of the objectives and challenges for this topic.

Material flows accounts

The current distribution of work for material flows accounts follows a similar approach as the AEAs. Eurostat gathers official data for the accounts from the EU members, which is complemented by estimation of economy-wide material flow aggregates for other countries by UN Environment, OECD and others. UN Environment, in collaboration with Eurostat, the OECD and UNSD, prepared a global material flow accounting manual. Work is ongoing to apply the existing standards for exchange of relevant aggregates for material flow accounting between the international agencies. Meanwhile, in parallel, international organisations are working with countries to build capacities for collecting national data for material flow accounts compilation.

There is a need to improve national capacity on material flow accounts. UN Environment Programme is currently developing a system for collecting material flow accounts from countries (to replace the global estimations). This is particularly important as SDG 8.4.1, 8.4.2, 12.2.1 and 12.2.2 are all based on material flow accounts. There is also a need to improve the methodology for demand-based measures of material flow (i.e. material footprint). OECD is currently working on methodological harmonization for demand-based measures of material flow accounts. The UNCEEA could help provide support to develop and test the system for collecting official data. Additionally, the UNCEEA should engage in the process to reach agreement related to demand-based measures of material flow accounts.

Land accounts

There are a limited number of sources of input data (remote sensing data) for compilation of land cover accounts at the international scale, but the quality of data sources is progressively improving. There are judgements to be made, when processing these data and classifying them into land cover classes consistent with the SEEA Central Framework. Different approaches have various (dis)advantages, depending on how the statistics are used. Thus, it could be acceptable, or even important, to develop multiple products – i.e. multiple versions of land cover and land use accounts at the international scale. However, for assessing changes over time, the information in the database

also needs to be consistent over time. Changes between classes are only meaningful if the classification remains consistent and input data are sufficiently accurate to reflect permanent changes between classes rather than differences in interpretation. Progress is needed particularly on three fronts: (i) provide clearer guidance to the providers of the input data, (ii) encourage more extensive ground-truthing of the input data and (iii) test the suitability of the input data for developing land accounts consistently over time. Technical procedures for processing remote sensing data for production of SEEA land cover accounts is not yet standardized and there are multiple products that could be incorporated into the global SEEA website. Thus, a review was conducted to summarise and compare the methods and objectives of two current practices, at the OECD and at the FAO, as well as to develop a common position and set of requirements for communicating with the international earth observation community, see **Annex C**. There is also an initiative led by GEO Earth Observations for Ecosystem Accounting (EO4EA)[7] to define accounts-ready data with the geospatial community in for generating land cover and ecosystem accounts.

Land use is distinct in many ways from land cover but the development of global land use accounts is following a similar trajectory as the one for land cover. There are multiple applications of land use statistics and not yet a standardized recommendation for the compilation of land use accounts at the global scale.

Further exchanges among practitioners will be useful to further develop recommendations for creating land cover and land use accounts consistently over time, while also meeting various user demands. A web-platform where users could exchange experiences on the use of different land cover and land use sources would be useful. This idea, among others, was proposed previously at the 2019 SEEA Central Framework Technical Committee.[8] These ongoing technical discussions for land cover accounting should be linked with current activities under UNSD for ecosystem accounting using the ARIES platform.[9]

Energy accounts

UNSD is currently overseeing the development of a global database for SEEA Energy accounts, based on existing data sources, primarily energy balances from the International Energy Agency (IEA), which contains most of the data needed for compiling physical supply and use tables for energy. Collaboration with IEA is ongoing to refine an excel-based tool, which takes IEA energy balances as input to produces a first estimate of a physical supply-use table for energy, which then can be further improved by adding country-specific auxiliary information.

Assessing the accuracy of the tool has proved challenging. A full assessment would require countries that already have energy accounts to add in a variety of auxiliary data to the tool (ideally over multiple years), which could then be compared to their official accounts. In addition, to assess the suitability as a global estimation method, this group of countries should be regionally representative and have varying levels of data quality. UNSD has provided the tool to several countries and presented the tool at multiple workshops in 2019. At the same time, obtaining estimates from the relevant countries has been challenging, given the time demands it takes to fill out the tool.

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[7] https://www.eo4ea.org/

[8] https://seea.un.org/sites/seea.un.org/files/meeting_of_the_seea-cf_technical_committee_on_the_development_of_global_seea_database_on_land_accounts_-_17_june_2019.pdf

[9] http://aries.integratedmodelling.org/

Water accounts

The UNCEEA identified water accounts as a priority for the establishment of global SEEA related databases, recognising that the availability of coherent source statistics for populating SEEA water accounts is not yet guaranteed. Hence, it was agreed to adopt a pragmatic step-wise approach to advance the measurement agenda and progressively move towards the establishment of water accounts (see the cover note[10] prepared for 14th UNCEEA meeting).

The Eurostat/OECD questionnaire section on inland waters and the coordinated UNSD/UN Environment water statistics questionnaire are seen as useful vehicles for starting to populate global water accounts and measuring water-related SDG targets. Data collection through these questionnaires ensures a quasi-global country coverage, and the questionnaires are broadly aligned with the SEEA Core and related Water Accounts.

To respond to the demand for a global database on SEEA water accounts, commonalities and differences were reviewed again[11] with focus on terms and definitions. They were discussed among the four partner organisations - OECD, Eurostat, UNSD and FAO – as part of their regular co-ordination meetings, and by the OECD Working Party on Environmental Information (WPEI) at its meeting in November 2019. Some differences remain, in both definitions and reporting boundaries. This is partly due to the different purposes for which the data are collected, and partly to pragmatic choices that consider data availability in countries and the interpretation of the derived indicators. These differences will be addressed through amendments in the questionnaire. Some differences require further reflection and verification, and a few of the differences will remain and will be explained and highlighted.

The structure of the questionnaire tables and the variables needed to populate core water accounts as proposed in the SEEA Technical Note on Water Accounting have not yet been evaluated. This will be done in the coming months and will be discussed by the OECD WPEI in November 2020. The SEEA Central Framework Technical Committee could also be requested to support the evaluation or provide recommendations. The outcomes will be presented to the UNCEEA in 2021.

Discussions also continue between OECD/Eurostat/UNSD/UN Environment and the FAO on practical arrangements for future data collection, validation and exchange. While a consensus is being reached on the harmonisation of terms and definitions, the question of a *consolidated global questionnaire* on water that could be used by all IOs involved, with a layered global data collection remains open.

Dissemination

At the 14th Meeting of the UNCEEA, the Committee expressed support for a step-by-step process for disseminating SEEA global databases for the priority areas on the SEEA website. After successful SDMX transmission between international organizations over the past year, UNSD successfully disseminated physical energy flow data through data.un.org. However, now testing is underway using .Stat Suite (Data Explorer), with assistance from OECD. The .Stat data explorer presents a more user-friendly option, which is standard-based and open source. In particular, it is based on the General Statistical Business Process Model and SDMX standards, and will ensure that SEEA data exchange is robust, efficient and standardized. Moreover, using an already established dissemination platform will make the most out of the limited resources available for dissemination. Some preliminary views of the .Stat SEEA Data Explorer can be found below the questions at the end of this document. In addition to

[10] https://seea.un.org/sites/seea.un.org/files/unceea_global_seea_databases_water_accounts-oecdnote.pdf

[11] A first analysis of commonalities and differences was carried out in the mid-2000s when the SEEA Water was developed; it led to amendments in some of the definitions used in the questionnaires.

disseminating the accounts, it is important that aggregates and indicators derived from the global databases are also accessible from the platform. This could provide an entry point for new users of SEEA data and contribute greatly to the use of the SEEA for policy and analysis. Moreover, these aggregates and indicators would be key to developing data visualizations, which is planned for the future. To advance this endeavour, the Working Group could propose a list of aggregates and indicators, to be reviewed by the Technical Committee on the SEEA-Central Framework, and eventually the UNCEEA.

Questions & Recommendations for UNCEEA

1. The Committee is requested to comment on progress, and remaining challenges, for each of the five priority accounts under Area C. What can be done to accelerate progress on the data collection and compilation into global databases for these five accounts?

2. The Committee is invited to comment on procedures and responsibilities for compilation of priority accounts for the global databases. First preference is always to use official national sources; however, in line with the subsidiary principle, existing international compilations of official data (e.g. from Eurostat) are incorporated into the UN SEEA website, followed by direct exchange with official national sources for countries where the data are not already compiled, and finally filling remaining gaps by approved estimation mechanisms.

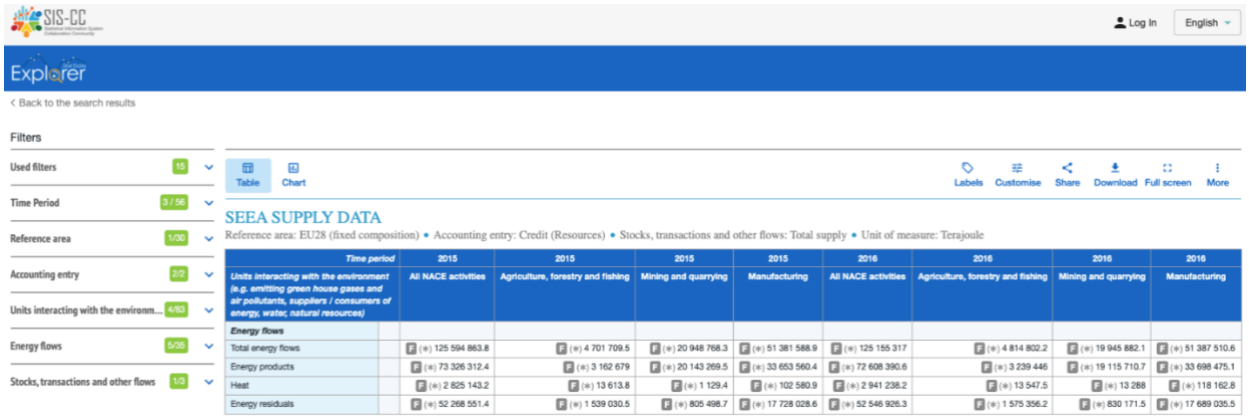
3. What is the opinion of the Committee regarding the development of templates (or sample questionnaires) for the priority accounts? Is the Committee in agreement with the proposed tiered approach, and general work plan?

4. The Committee is requested to comment on the suggestion to improve links and exchanges of information on requirements and technical challenges for land accounting with related experts from the earth observation domain. There is a need to coordinate with the Group on Earth Observation (GEO) and related experts, building on the GEO Earth Observations for Ecosystem Accounting (EO4EA) and GEO Land Degradation Neutrality (LDN) initiatives, to develop more specific guidance on use of remote sensing data for the compilation of land cover and land use accounts in global SEEA databases.

5. The Committee is invited to comment on the progress towards dissemination of global databases. Concerning the development of aggregates and indicators, what is the Committee's opinion on the process for advancing this endeavour?

Sample From SEEA Data Explorer

Figure 1: Example SEEA-Energy supply view (one reference area, multiple years)



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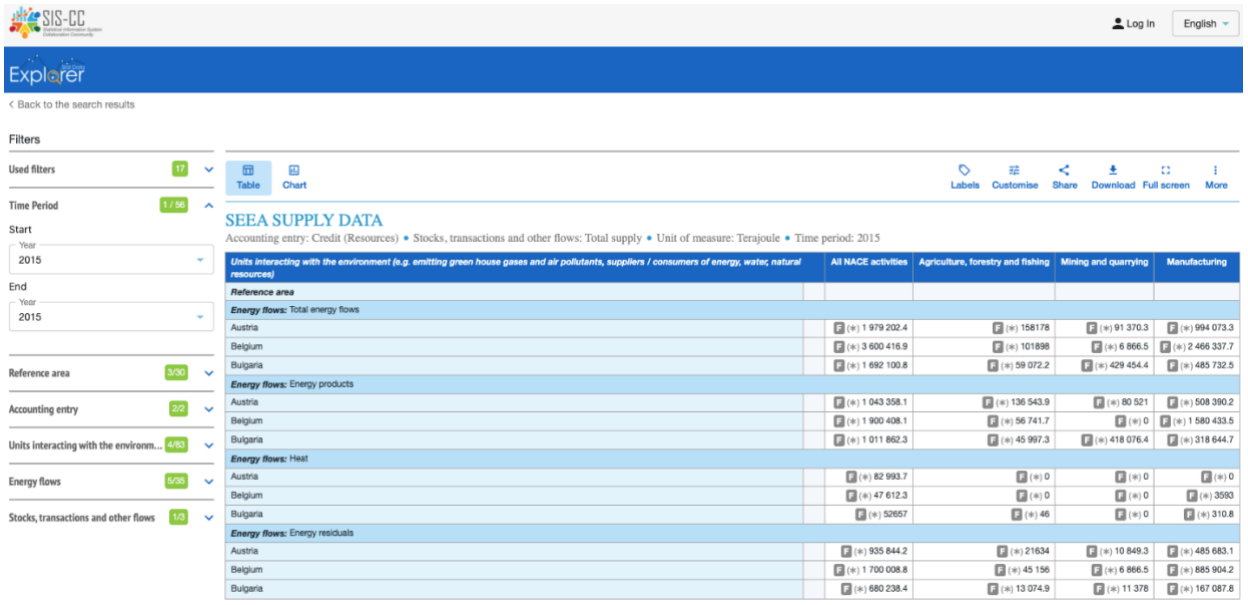
SEEA SUPPLY DATA

Reference area: EU28 (fixed composition) • Accounting entry: Credit (Resources) • Stocks, transactions and other flows: Total supply • Unit of measure: Terajoule

Time period	2015	2015	2015	2015	2016	2016	2016	2016
Units interacting with the environment (e.g. emitting green house gases and air pollutants, suppliers / consumers of energy, water, natural resources)	All NACE activities	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	All NACE activities	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing
Energy flows								
Total energy flows	F (e) 125 594 863.8	F (e) 4 701 709.5	F (e) 20 948 768.3	F (e) 51 381 588.9	F (e) 125 155 317	F (e) 4 814 802.2	F (e) 19 945 882.1	F (e) 51 387 510.6
Energy products	F (e) 73 326 312.4	F (e) 3 162 679	F (e) 20 143 269.5	F (e) 33 653 560.4	F (e) 72 608 390.6	F (e) 3 239 446	F (e) 19 115 710.7	F (e) 33 698 475.1
Heat	F (e) 2 825 143.2	F (e) 13 613.8	F (e) 1 129.4	F (e) 102 580.9	F (e) 2 941 238.2	F (e) 13 547.5	F (e) 13 288	F (e) 118 162.8
Energy residuals	F (e) 52 268 551.4	F (e) 1 539 030.5	F (e) 805 498.7	F (e) 17 728 028.6	F (e) 52 546 926.3	F (e) 1 575 356.2	F (e) 830 171.5	F (e) 17 689 035.5

Figure 2: Example SEEA-Energy supply view (multiple reference areas, one years)



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SEEA SUPPLY DATA

Accounting entry: Credit (Resources) • Stocks, transactions and other flows: Total supply • Unit of measure: Terajoule • Time period: 2015

Units interacting with the environment (e.g. emitting green house gases and air pollutants, suppliers / consumers of energy, water, natural resources)	All NACE activities	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing
Reference area				
Energy flows: Total energy flows				
Austria	F (e) 1 979 202.4	F (e) 158178	F (e) 91 370.3	F (e) 994 073.3
Belgium	F (e) 3 600 416.9	F (e) 101898	F (e) 6 866.5	F (e) 2 466 337.7
Bulgaria	F (e) 1 692 100.8	F (e) 59 072.2	F (e) 429 454.4	F (e) 485 732.5
Energy flows: Energy products				
Austria	F (e) 1 043 358.1	F (e) 136 543.9	F (e) 80 521	F (e) 508 390.2
Belgium	F (e) 1 900 408.1	F (e) 56 741.7	F (e) 0	F (e) 1 580 433.5
Bulgaria	F (e) 1 011 862.3	F (e) 45 997.3	F (e) 418 076.4	F (e) 318 644.7
Energy flows: Heat				
Austria	F (e) 82 993.7	F (e) 0	F (e) 0	F (e) 0
Belgium	F (e) 47 612.3	F (e) 0	F (e) 0	F (e) 3593
Bulgaria	F (e) 52657	F (e) 46	F (e) 0	F (e) 310.8
Energy flows: Energy residuals				
Austria	F (e) 935 844.2	F (e) 21634	F (e) 10 849.3	F (e) 485 683.1
Belgium	F (e) 1 700 008.8	F (e) 45 156	F (e) 6 866.5	F (e) 885 904.2
Bulgaria	F (e) 680 238.4	F (e) 13 074.9	F (e) 11 378	F (e) 167 087.8