

Overview of Energy Flow Accounts



System of
Environmental
Economic
Accounting

<http://www.unescap.org/our-work/statistics>

Outline

- **Level 1:** What are energy flow accounts? (30min)
 - Links to other SEEA accounts
 - Links to SDGs
- Group exercise (30min)
- **Intermezzo:** Linking energy balances and energy accounts (15min)
- **Level 2:** Issues, data sources, country examples (20min)
- Questions and discussion (10min)



Learning objectives

- **Know** what Energy Flow Accounts are and why they are important
- **Understand** the basic concepts and how they are treated in the SEEA
- **Learn** to compile Energy Flow Accounts
- **Understand** how Energy Flow Accounts are linked with Energy Balances and be aware of main differences
- **Be aware** of data sources, country examples and measurement challenges

Environment accounts and statistics

SEEA-CF (Central Framework)	<ul style="list-style-type: none"> • Assets • Physical flows • Monetary flows 	<ul style="list-style-type: none"> • Minerals & Energy, Land, Timber, Soil, Water, Aquatic, Other Biological • Materials, Energy, Water, Emissions, Effluents, Wastes • Protection expenditures, taxes & subsidies
SEEA Water; SEEA Energy; SEEA Agriculture, Forestry and Fisheries	Add sector detail	As above for <ul style="list-style-type: none"> • Water • Energy • Agricultural, Forestry and Fisheries
SEEA-EEA (Experimental Ecosystem Accounting)	Adds spatial detail and ecosystem perspective	Extent, Condition, Ecosystem Services, Carbon, Water, Biodiversity
FDES (Framework for the Development of Environment Statistics)	Basic statistics for above plus...	<ul style="list-style-type: none"> • Extreme events and disasters • Human settlements and health • Protection, management & engagement

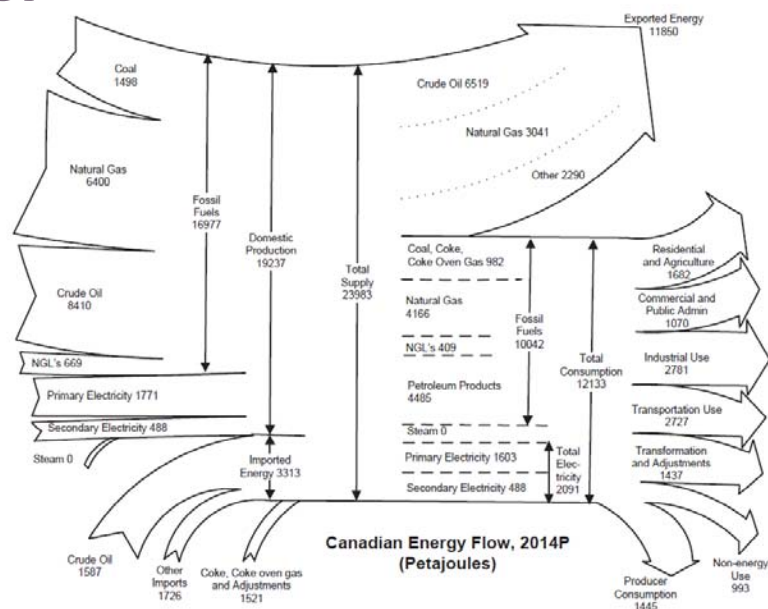


Scope of energy flow accounts

- SEEA-CF 3.140...record flows of energy, in physical units,
 - from the initial extraction or capture of energy resources from the environment into the economy;
 - the flows of energy **within the economy** in the form of the supply and use of energy by industries and households; and, finally,
 - the flows of energy **back to the environment**.



Energy flows



Statistics Canada. (2016). Report on Energy Supply and Demand in Canada 2014 Preliminary. Catalogue no. 57-003-X.



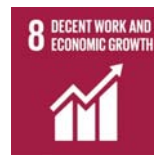
Which are energy flows?

- Carbon emissions from fossil fuel combustion
- Cutting trees for fuel wood
- Heating/cooling a home
- Installing solar panels
- Driving a car
- Buying mercury-free batteries
- Generating electricity from wind turbine
- Oil and gas reserves
- Fuel tax



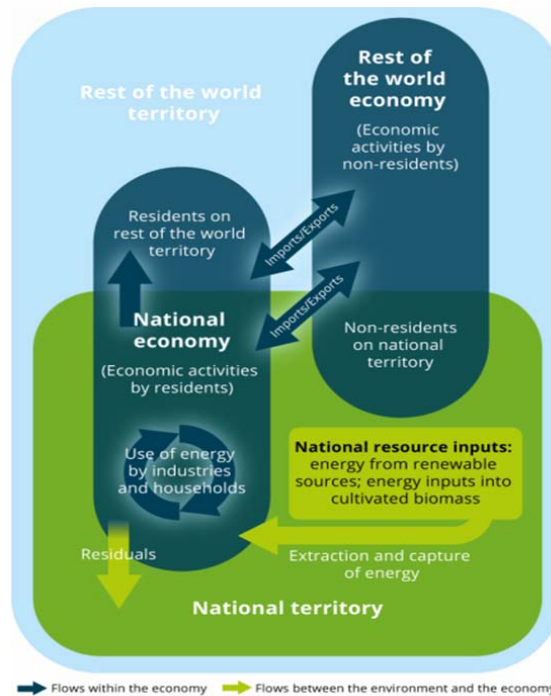
Uses

- Implied in a number of SDGs
 - Accessible? Clean?
 - Sustainable?
 - Efficient?
- Trade-offs between goals?
- Integrated view of energy policy
- A critical look at “traditional” energy statistics



Some principles

- Physical units (Joules)
- Residence principle (to align with SNA)
 - Residents of country regardless of location (e.g., energy products sold to residents)
- Energy balances:
 - Territorial principle
 - Different concept of “intermediary” and “final” consumption



The supply-use chain

Supply Table						
	Industries	Households	Accumulation	Rest of the world	Environment	Totals
Energy from natural inputs					Energy inputs from the environment	Supply of energy from natural inputs
Energy products	Output			Imports		Supply of energy products
Energy residuals	Generated by industry	Generated by households	From Accumulation	Received from rest of the world	Recovered from the environment	Supply of energy residuals
Use Table						
	Industries	Households	Accumulation	Rest of the world	Environment	Totals
Energy from natural inputs	Extraction, harvesting, capture					Use of energy from natural inputs
Energy products	Intermediate consumption	Household consumption	Change in inventories	Exports		Use of energy products
Energy residuals	Collection and treatment		Accumulation of energy residuals	Exports of energy residuals	Releases to the environment	Use of energy residuals



Some definitions

Energy inputs from the environment

Energy from natural inputs	
Mineral and energy resources	
Oil	
Natural gas	
Coal and peat	
Uranium and other nuclear fuels	
Natural timber resources	
Inputs of energy from renewable sources	
Solar	
Hydro	
Wind	
Wave and tidal	
Geothermal	
Other heat and electrical	
Other natural inputs	
Energy inputs to cultivated biomass	

Conventional solid and liquid resources **extracted and harvested**

Renewable resources **captured**

Embedded in cultivated biomass **harvested**

Supply Table	Industries	Households	Accumulation	Rest of the world	Environment	Totals
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Some definitions

Energy products

- Standard International Energy Product Classification (SIEC)
 - Countries may use others (CPC, HS)
- Useful to distinguish
 - Primary/secondary
 - Energy/non-energy uses

Standard International Energy Product Classification (SIEC)

Classes of energy products	
0 Coal	
1 Peat and peat products	
2 Oil shale / oil sands	
3 Natural gas	
4 Oil	
5 Biofuels	
6 Waste	
7 Electricity	
8 Heat	
9 Nuclear fuels and other fuels n.e.c	

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Energy residuals	Collection and treatment		Accumulation of energy residuals	Exports of energy residuals	Releases to the environment	Use of energy residuals

Section/ Division/ Group	Class	Title	CPC link	HS Link
0		Coal		
01		Hard coal		
011	0110	Anthracite	11010*	2701.11
012		Bituminous coal		
	0121	Coking coal	11010*	2701.19
	0129	Other bituminous coal	11010*	2701.12
02		Brown coal		
021	0210	Sub-bituminous coal	11030*	2702.10*
022	0220	Lignite	11030*	2702.10*
03		Coal products		
031		Coal coke		
	0311	Coke oven coke	33100*	2704*
	0312	Gas coke	33100*	2704*
	0313	Coke breeze	33100*	2704*



Some definitions

Energy Residuals

- Losses during
 - Extraction
 - Distribution
 - Storage
 - Transformation
- Other energy residuals
 - Releases to the environment (lost heat) from energy consumption
- Note: Some non-energy residuals (emissions to air, CO₂, solid waste) can be calculated from energy accounts.

Supply Table						
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Table 3.4

Typical components for groups of residuals

Group	Typical components
Solid waste (includes recovered materials) ^a	Chemical and health-care waste, radioactive waste, metallic waste, other recyclables, discarded equipment and vehicles, animal and vegetal wastes, mixed residential and commercial waste, mineral wastes and soil, combustion wastes, other wastes
Wastewater ^a	Water for treatment and disposal, return flows, reused water
Emissions to air	Carbon dioxide, methane, dinitrogen oxide, nitrous oxides, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, carbon monoxide, non-methane volatile organic compounds, sulphur dioxide, ammonia, heavy metals, persistent organic pollutants, particulates (e.g., PM10 dust)
Emissions to water	Nitrogen compounds, phosphorus compounds, heavy metals, other substances and (organic) compounds
Emissions to soil	Leaks from pipelines, chemical spills
Residuals from dissipative use of products	Unabsorbed nutrients from fertilizers, salt spread on roads
Dissipative losses	Abrasion (tyres/brakes), erosion/corrosion of infrastructure (roads, etc.)
Natural resource residuals	Mining overburden, felling residues, discarded catch

^a This list of typical components for groups of residuals can also be applied to certain flows defined as products.



Classifications

Industries

SEEA based on International Standard Industrial Classification (ISIC)

- Countries may use others

Significant energy industries

- Section A: Agriculture, **forestry** and fishing
- Section B: **Mining** and quarrying
- Section C: Manufacturing
- Section D: **Electricity**, gas, steam and air conditioning supply
- Section H: **Transportation** and storage
- Other industries
- Households

Supply Table						
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Group exercise

- **Situation:**
 - Have information on energy supply and use
 - Compile basic supply and use tables
- **Groups of 3-5 (not alone!)**
 - Put data into correct cells in handouts
 - Check totals
- **Report on**
 - Total supply of energy from natural inputs
 - Total energy supply
 - Total use of energy residuals
 - Total energy use

Physical supply table for energy						
	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows from the environment	Total
Energy from natural inputs						
Coal						
Solar						
Energy products						
Coal						
Electricity						
Heat						
Energy residuals						
Extraction						
Transformation						
Other						
Total						
Physical use table for energy						
	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows to the environment	Total
Energy from natural inputs						
Coal						
Solar						
Energy products						
Coal (Transformation)						
Electricity (End use)						
Heat (End use)						
Energy residuals						
Extraction						
Transformation						
Other						
Total						



Group Exercise

A simplified physical supply and use table for energy:

1. The mining industry extracts **150 PJ** of coal.
2. **60 PJ** of electricity are generated from solar panels by electricity industry.
3. All the coal is sent for processing to the coal power plant.
 - However, due to losses during extraction, the coal power plant received **140PJ** of coal.
4. The remaining supply of coal is converted to electricity and heat.
 - The coal power plant produces **75 PJ** of electricity and **35 PJ** of heat.
 - Losses during transformation account for the rest of the coal supply.
5. The resulting electricity from solar and coal is used as follows:
 - Mining **15 PJ**, manufacturing **20PJ**, Electricity **32 PJ** and with households consuming the rest of the electricity.
6. Households use **26PJ** of heat, electricity sector uses **2 PJ** and the rest is used by mining.



Group exercise – the answers

- Total supply of energy from natural inputs (210 PJ)
- Total energy supply (730 PJ)
- Total use of energy residuals (210 PJ)
- Total energy use (730 PJ)

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	172	20	234	94	210	730

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	172	20	234	94	210	730



Group exercise – the answers

1. The mining industry extracts 150 PJ of coal.
2. In total, 60 PJ of electricity are generated from solar panels,

Household solar generation is in electricity industry

3. All the coal is sent for processing to the coal power plant.
 - However, due to losses during extraction, the coal power plant received 140PJ of coal.

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	172	20	234	94	210	730

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	172	20	234	94	210	730



Group exercise – the answers

4. The remaining supply of coal is converted to electricity and heat.

- The coal power plant produces 75 PJ of electricity and 35 PJ of heat.
- Losses during transformation account for the rest of the coal supply. $(140 - 35 - 75 = 30)$

Total electricity supply (135 PJ)
= 75 PJ from coal + 60 PJ from solar

5. The resulting electricity from solar and coal is used as follows:

- Mining 15 PJ
- Manufacturing 20PJ
- Electricity 32 PJ and with
- Households consuming the rest of the electricity. (68 PJ)

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140		75+			140
Electricity			68			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
Other	22	20	34	94		170
Total	172	20	234	94	210	730

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows to the environment	Total
Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
Total	172	20	234	94	210	730



Group exercise – the answers

6. Households use 26PJ of heat, electricity sector uses 2 PJ and the rest (7PJ) is used by mining.

7. "Other" residual is total end use

Check:

- Total supply of natural inputs = total use of natural inputs
- Total supply of energy products = total use of energy products
- Total supply of energy residuals = total use of energy residuals

Bonus question: What energy product is double-counted and why?

	Mining (ISIC B)	Manufacturing (ISIC C)	Electricity (ICIC D)	Households	Flows from the environment	Total
Energy from natural inputs						
Coal					150	150
Solar					60	60
Energy products						
Coal	140					140
Electricity			135			135
Heat			35			35
Energy residuals						
Extraction	10					10
Transformation			30			30
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Energy from natural inputs						
Coal	150					150
Solar			60			60
Energy products						
Coal (Transformation)			140			140
Electricity (End use)	15	20	32	68		135
Heat (End use)	7		2	26		35
Energy residuals						
Extraction					10	10
Transformation					30	30
Other					170	170
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Intermezzo

- Linking energy balances and energy accounts

An overview

Energy Statistics

Based on primary statistics (production, foreign trade, business survey)

Specific energy surveys

No specific format

Territory principle

Physical

Energy Balances

Based on energy statistics

Supply and use balances

Various formats (IEA, Eurostat, UN)

Sectors and industries (ISIC)

Rearrangement of industries' energy use according to purpose (transport, auto-producers and heat for sale)

Detailed description of energy sector including technologies

All transport in one separate sector

Territory principle

Statistical differences

Physical

Energy Accounts

Based on energy statistics and balances

Supply and use balances

Uses national accounts SUT format

Industries classified by ISIC

No re-arrangement of industries' energy use

Energy "sector" described by ISIC
No description of technologies

Own account transportation included in industries' activities

Resident principle

No statistical differences

Physical and monetary

Creating balances and accounts

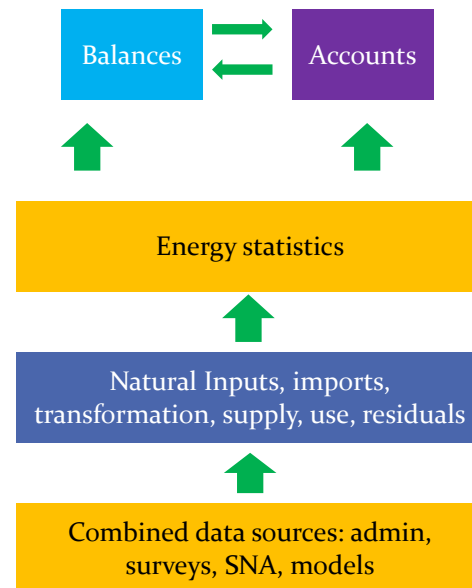
Use the same data

- Many flows are identical in balances and accounts

Important differences

- Terminology
- Territory vs residence principle
- Treatment of transport

Note: Purpose of accounts is comprehensiveness and consistency with SNA



23

Terminology: Energy supply

- Supply in the energy balance:

Total energy supply =

- + Primary energy production
- + Import of primary and secondary energy
- Export of primary and secondary energy
- International (aviation and marine) bunkers
- Stock changes

- Supply in the energy account:

Supply = output + imports



Terminology: Energy use and storage

Final consumption:

- Energy balance: Refers to the use of fuels, electricity and heat delivered to final consumers being it industries or households.
- Energy accounts: Refers to household use of energy only

Use in the energy account:

- Intermediate consumption, households final consumption, exports, international bunkers and stock changes are considered uses of energy

Storage

Stocks and changes in stocks (energy balance)

EQUALS

Inventories and changes in inventories (energy accounts)



Territory vs residence principle

	Residents	Non-residents	
National territory	Sold on territory to resident units	Sold on territory to non-residents (foreign, tourists, transport companies, embassies)	Energy statistics and balances
Rest of the World	Sold to residents operating abroad (tourists, transport companies, etc.)		
	SEEA-Energy		

Actual difference – territory vs. residence principle

	1000 tonnes
Total emissions originating from the Danish territory (IPCC-emission inventory)	54 568
+ Emissions caused by Danish operated vehicles abroad	1 905
+ Emissions caused by Danish operated planes abroad	1 105
+ Emissions caused by Danish operated ships abroad	35 084
+ Other differences in emissions from transport and cross border trade	612
= Total Emissions from Danish economic activities (Environmental Accounts)	93 274

- An extreme case, but still

Tools to ease the conversion

- Working group led by UNSD (with IEA, Eurostat, OECD + experts)
- Will provide assessment of existing sources; and roadmap
- Applies to countries not currently filling the detailed IEA energy statistics questionnaires

• Welcome to Level 2!

(It's not that easy)

Energy supply in the SEEA

Physical supply table for energy

	Production (including household production on own account; generation of residuals)								Flows from the rest of the world		
	Agriculture, forestry and fishing ISIC A	Mining and quarrying ISIC B	Manufacturing ISIC C	Electricity, gas, steam and air conditioning supply ISIC D	Transportation and storage ISIC H	Other industries ISIC I	Households	Accommodation	Imports	Flows from the environment	Total supply
Energy from natural inputs											
Natural resource inputs											
Mineral and energy resources										1 161.0	1 161.0
Timber resources										5.0	5.0
Inputs of energy from renewable sources											
Solar										20.0	20.0
Hydro										100.0	100.0
Wind										4.0	4.0
Wave and tidal											
Geothermal											
Other heat and electrical											
Other natural inputs										2.0	2.0
Energy inputs to cultivated biomass											
Total energy from natural inputs										1 292.0	1 292.0
Energy products											
Production of energy products by SIC class											
Coal										225.0	225.0
Peat and peat products											
Oil shale and sands											
Natural gas (extracted)		395.0									395.0
Natural gas (distributed)										369.1	369.1
Oil (e.g. conventional crude oil)			721.0								721.0
Oil (oil products)				347.0						930.0	1 277.0
Biofuels	5.3			0.2	1.5						7.0
Waste	39.0			14.3						36.9	100.4
Electricity										213.0	213.0
Heat										75.5	75.5
Nuclear fuels and other fuels n.e.c.											
Total energy products	48.3	1 336.0	802.7	663.1						1 393.9	3 482.0
Energy residuals											
Losses during extraction		45.0									45.0
Losses during distribution				13.0							13.0
Losses during storage			6.0								6.0
Losses during transformation			7.6	204.4							211.4
Other energy residuals	50.3	3.2	418.7	95.6	632.0	96.0	240.0				1 536.8
Total energy residuals	50.3	48.2	431.7	307.0	632.0	96.0	240.0				1 805.2
Other residual flows											
Residuals from and use for non-energy purposes			51.0								51.0
Energy from solid waste										95.5	95.5
Total supply	94.6	1 364.2	884.4	968.1	632.0	96.0	240.0	95.5	1 193.9	1 292.0	6 658.7

Energy from natural inputs

Energy products

Residuals & other flows

Energy use in the SEEA

Physical use table for energy

	Intermediate consumption, use of energy resources, receipt of energy losses					Final consumption	Flows to the rest of the world		Total use		
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage		Other industries	Households		Exports	Flows to the environment
Energy from natural inputs											
Natural resource inputs	5.0	1 161.0							1 166.0		
Inputs of energy from renewable sources				134.0					134.0		
Other natural inputs	0.3		0.2	1.5					2.0		
Total energy from natural inputs	5.3	1 161.0	0.2	225.5					1 292.0		
Energy products											
Transformation of energy products by SIC class											
Coal				223.0					223.0		
Peat and peat products											
Oil shale/till sands											
Natural gas (extracted)				395.0					395.0		
Natural gas (distributed)				87.0					87.0		
Oil (incl. conventional crude oil)		360.0		16.0					376.0		
Oil (oil products)				16.0					16.0		
Biofuels											
Waste				31.0					31.0		
Electricity											
Heat											
Nuclear fuels and other fuels n.e.c.											
Total transformation of energy products		360.0		752.0					1 112.0		
End use of energy products by SIC class											
Coal	2.0	0.1	17.0				3.0	-21.0	1.8		
Peat and peat products											
Oil shale/till sands											
Natural gas (extracted)											
Natural gas (distributed)	2.0		39.0	0.1		13.0	26.0	2.0	201.0		
Oil (incl. conventional crude oil)									361.0		
Oil (oil products)	34.0	2.0	336.0		421.0	49.0	103.0	-3.0	860.0		
Biofuels	0.3		0.2	1.5			5.0		7.0		
Waste	3.0	0.1	4.0	37.0		1.0	33.0	0.3	79.4		
Electricity	1.0	1.0	22.0	10.0		19.0	29.0		100.0		
Heat	2.0		15.5	2.0	1.0	19.0	44.0		78.5		
Nuclear fuels and other fuels n.e.c.									0.0		
Total end use of energy products	50.3	3.2	418.7	95.6	637.0	96.0	240.0	-21.7	744.9		
End use of energy products for non-energy purposes											
			51.0						51.0		
Energy residuals											
Losses during extraction									45.0		
Losses during distribution									12.0		
Losses during storage									6.0		
Losses during transformation									211.4		
Other energy residuals									1 530.8		
Total energy residuals									1 805.2		
Other residual flows											
Residuals from end use for non-energy purposes									51.0		
Energy from solid waste	35.0		54.5						89.5		
Grand total	94.9	1 164.2	56.4	908.1	637.0	96.0	240.0	-21.7	1 805.2		

Energy from natural inputs

Energy products Transformation & End-Use

Residuals & other flows

Compilation challenges & data

Getting data in detail (energy balances help)

- ISIC and SIEC

Bridge tables to convert from balance to account

- Balance may be by “purpose” (e.g., transport)

Getting data from importers/distributors

- May be easier for NSOs than Energy/Environment (if for statistical purposes!)

Allocating to natural inputs, products, residuals

- “Mixed” producers (e.g. co-production of electricity and district heating; coal mines own power generation)

Compilation challenges & data

Energy from natural inputs

- Supply & Use: May need to estimate losses from “factor”
- Data:
 - Energy balances
 - Ministries of energy, mining, natural resources, forestry (timber)
 - Commodity reports, annual reports, industry associations
 - Sample surveys
 - Royalty payments on extraction, harvesting
 - Administrative data (e.g., reporting to government)

Compilation challenges & data

Energy products:

- Supply & use: Industry & product detail
 - Conversion to energy units (different “kinds” of oil...)
- Data:
 - Energy balances, energy statistics, imports
 - Ministries of Energy, utility companies, industry associations
 - Commodity reports, annual reports
 - National Accounts, I-O Tables (expenditures, transactions between producers/users)
 - Administrative (energy taxes, distribution to users)
 - Surveys (energy use by business and households)

Compilation challenges & data

Transformation of energy products

- Supply & use: Duplicate energy flows (multiple inputs)
- Data:
 - Same as above (balances, statistics, surveys, admin)
 - Estimate from transformation efficiency “factors”
 - 100 PJ black coal → 33 PJ electricity
 - Estimate unknowns from balance between supply and use
 - 1000 PJ crude oil supply
 - 400 PJ exported
 - 250 PJ transformed to secondary oil products
 - 300 PJ stored [increased stock]
 - Remainder (50 PJ) allocate to losses

Compilation challenges & data

Transformation of energy products

- Cogeneration: Australia steel industry generates 80% of own electricity, 96% from cogeneration (i.e., heat)
- Own account production: Requires survey
- More detail is better:
 - Same energy product for different purposes
 - Easier to monetize

Compilation challenges & data

Energy end-use:

- Most interesting to policy; most time-consuming
- Data:
 - Balances, surveys, SNA/I-O
 - Admin (exports, emissions trading, electricity and gas bills)
 - Models:
 - Motor vehicle use: Allocate activity (km) to industry (joules);
Remember: non-transport use (e.g., diesel generators)
 - Domestically collected fuelwood
 - Bunkers = storage for ships and airplanes (ownership?)

Compilation challenges & data

Energy residuals:

- Supply & use:
 - Estimating losses from extraction, distribution & storage, transformation, end use (heat)
 - Losses in renewable?
 - Policy: efficiency, pollution (losses), relate to GHGs
- Data:
 - Supply and end use of energy products, transformation
 - Admin (annual reports, emission reports, GHG inventories)
 - Academic (life cycle analysis, storage losses, efficiencies of facilities)

Simplifications & Extensions

- **Simplifications**
 - Supply & use of electricity, renewables or fossil fuels
- **Extensions**
 - Monetary supply and use for energy (currency units)
 - Calculating air emissions from fossil fuel consumption
 - Apply “factors” to consumption → CO₂, SO_x, solids, ...
 - Allocation to “types” of households (volunteers?)
 - Energy for all? Could disaggregate with survey.

SDG indicators

Universal access

- 7.1.1 ...population with access to electricity
 - Sample survey to allocate household consumption
 - How much is enough?
- 7.1.2 ...population with...reliance on clean fuels & technology ... for cooking
 - Define “clean”

Share of renewable

- 7.2.1 Renewable energy share ...
 - From energy account

Energy efficiency

- 7.3.1 Energy intensity...in terms of primary energy and ...GDP...
 - Compare use from energy account with value added from SNA



Country examples: Netherlands

- High policy demand
→ inform SNA (\$)
- Energy accounts
1/3 person/year
- Bridge table (2006)
linking energy balances



	<i>PJ</i>
Final use (energy balances)	2 750
Conversion losses (energy balances)	482
Total energy use in the Netherlands (energy balances)	3 232
Use residents abroad (+)	166
Use non residents (-)	12
Bunkering Dutch companies in the Netherlands (+)	142
Total net energy use Dutch economy (net energy accounts)	3 527

Sjoerd Schenau, Statistics Netherlands

Discussion

- Which aspects are most relevant to begin with in your country (electricity, fossil fuels, efficiency, access)?
- What are the main institutional challenges (data sharing, data access, expertise...)?

References

- International Recommendations on Energy Statistics (2016)
<http://unstats.un.org/unsd/energy/ires/>
- SEEA-Central Framework (2014)
http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf
- SEEA-Energy (Draft)
http://unstats.un.org/unsd/envaccounting/seeaE/GC_Draft.pdf
- Energy Statistics Compilers Manual
<http://unstats.un.org/unsd/energy/ESCM.htm>
- IEA/Eurostat: Energy Statistics Manual
<http://www.iea.org/publications/freepublications/publication/energy-statistics-manual.html>
- Eurostat: Physical Energy Flow Accounts
<http://ec.europa.eu/eurostat/web/environment/methodology>
- Standard International Energy Product Classification (SIEC) (2011)
<http://unstats.un.org/unsd/class/intercop/expertgroup/2011/AC234-14.PDF>

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Thank you!