System of Environmental and Economic Accounting for Energy

SEEA-E

Draft Chapter 3 Physical Asset Accounts

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Chapter 3 Physical asset accounts for energy

A. Introduction

3.1. The term physical asset account is generally used to describe accounts showing opening and closing stocks and change therein for the specific assets in focus.

3.2. Generally, in SEEA, an asset is defined as an entity that provides use and non-use benefits to humanity now or in the future. *Energy resources* are accordingly defined as known deposits of energy that provide use and non-use benefits to humanity now or in the future.

3.3. Assets are in SEEA-E defined in a broader way than it is in SNA 2008. In SNA 2008 natural resources as assets are limited to that part of the resources, which have an economic value. SEEA-E includes all known deposits, even parts of the resources, which have no present economic value, but which may obtain a value in the future, or which in other ways brings benefits in the form of non-market value to the owner.

3.4. Since all energy resources may in principle be able to bring benefits of some kind to humans in the future, all known deposits of energy resources such as coal, oil, natural gas and uranium ore are in principle included in the asset accounts.

3.5. The SEEA-E does not as assets include "infinite" renewable energy resources, such as wind, solar and hydro energy. This does not in any way imply that renewable energy resources are considered to be unimportant, but it is a consequence of the fact that measurement of the stocks of these energy resources is a complicated issue, which is still the subject of research and discussion. It should also be observed that the supply and use of renewable energy are included in the flow accounts presented in Chapter 5 and 6. In other words, the stocks of the "infinite" renewable energy resources like wind, solar and hydro energy are not recorded in SEEA-E, but the flows of the resources are.

3.6. Firewood in forests and other stocks of biomass in nature are not included as energy resources in the SEEA-E asset accounts because these assets are as an overall group not primarily energy resources, and it is first in the use phase that it becomes evident that they are being used for energy purposes. They are, however, in the general SEEA asset accounts recorded as biological resources, and as in the case of the "infinite" renewable energy resources, the supply and use of these cyclical renewable energy resources are presented in the flow accounts in Chapter 5 and 6.

3.7. Estimates of the quantities of energy resources in known deposits can be associated with some level of confidence and they are therefore included in the asset accounts. In contrast, estimates of quantities of so-called potential resources are based on indirect evidence and limited technical data, and as they are of a hypothetical nature they are not included in the SEEA-E asset accounts.

3.8. In SEEA-E the energy resources are characterised by type and according to an economic and social criteria, a project status and feasibility criteria and a geologic knowledge criteria.

3.9. In line with the System of National Accounts, SEEA-E includes as assets also energy products held in inventories. Energy products in inventories include primary energy products (crude oil, natural gas, coal, and uranium ore, etc.) which are being accumulated after extraction and before processing

take place as well as secondary energy products (gasoline, diesel, fuel oil, town gas, etc.) which are the result of a further processing.

3.10. In section B energy resources are first classified by type and characteristics. Secondly, quantification issues and accounting units are addressed. Thirdly, the structure and accounting items of the physical asset accounts for energy resources are presented.

3.11. In section C asset accounts for inventories of energy products are presented. The section presents the structure and accounting items for inventories of energy products.

B. Energy resources

1. Classifications of energy resources

Classification by type of energy resource

[The classification will be fully aligned with the overall SEEA classification when this is in place]

3.12. Energy resources are included in the general classification of natural resources in SEEA. The general SEEA classification includes the aggregate category EA.11 Mineral and Energy Resources as part of EA.1 Natural Resources.

3.13. For the purpose of clarity those natural resources, which are energy resources are classified separately in SEEA-E. Table 3.1 presents this classification and shows how they fit into the overall SEEA classification of natural resources. At the first level, a distinction between E.1 Oil and gas, E.1 Solid energy resources, and E.3 Other energy resources is made. Within E.1 a distinction between natural gas, crude oil, oil shale, and natural bitumen and extra heavy oil is made. Within the solid energy resources, coal and lignite on one hand and peat on the other are separated. Note that peat is included as part of the energy resources and not as part of the SEEA category EA.14 Biological resources. Uranium ores are presented as a sub-category of E.3 Other energy resources.

Table 3.1 SEEA-E classification of energy resources and correspondence to the general SEEA classification of natural resources

SEEA-Energy classification of energy resources	SEEA Classification of natural resources
E Energy resources	EA.1 Natural resources
E.1 Oil and gas	EA.11 Mineral and energy resources
E.11 Natural gas	EA.111 Oil and gas
E.12 Crude oil and natural gas liquids	EA.111.1 Natural gas
E.13 Oil Shale	EA.111.2 Crude oil and natural gas liquids
E.14 Natural bitumen and extra heavy oil[1)]	EA.111.3 Oil Shale
E.2 Solid fossil energy resources	EA 111.4 Natural bitumen and extra heavy oil[1)]
E.21 Coal and lignite	EA.112 Non-metallic minerals and solid fossil energy resources
E.22 Peat	EA.112.1 Non-metallic minerals except for coal and peat
E.3 Other Energy resources	EA.112.2 Coal and lignite
E.23 Uranium and thorium ores	EA.112.3 Peat
E.24 Others	EA.113 Metallic minerals
	EA.113.1 Uranium and thorium ores
	EA.113.2 Other metallic minerals
	EA.12 Soil resources
	EA.13 Water resources
	EA.14 Biological resources
1) Includes oil extracted from oil sands, etc.	

3.14. The SEEA-E does not include "infinite" renewable energy resources, such as wind, solar and hydro energy in the natural resource classification. Similarly, firewood in forests and other natural biomass stocks are not included as energy resources. However, both cultivated and non-cultivated timber resources, and other crop and plant resources are included as EA.14 Biological Resources in the classification of natural resources. Further, supply and use of firewood, as well as biofuels like biogasoline and biodiesel and heat and electricity produced from "infinite" and cyclical renewable energy resources are included as energy products in the flow accounts, cf. Chapter 5.

Classification by energy resource characteristics

3.15. In addition to the classification of energy resources by type, another dimension is introduced to further characterize the energy resources. This second dimension relates to a "quality and knowledge" component of the energy resources and expresses the economic, geological and project feasibility status in relation to the resources.

3.16. The SEEA-E standard classification by resource characteristics includes three broad classes which characterize the known deposits of energy resources, i.e. those energy resources, which are included as assets in SEEA-E:

A. Commercial Energy Resources

B. Potential Commercial Energy Resources

C. Non Commercial and Other Quantities in Place

3.17. Reference is made to the United Nations Framework Classification for Fossil Energy and Mineral Resources 2009 (UNFC-2009[1]) in order to more specifically determine the parts of the resources which fall into these three classes[2].

3.18. UNFC is a generic and flexible scheme for classifying and evaluating quantities of energy and mineral resources. It is designed to allow the incorporation of currently existing terms, definitions and classifications into the framework and thus make them comparable and compatible. The UNFC-2004 was endorsed in February 2004 by the UN Economic Commission for Europe (UNECE) and recommended by the United Nations Economic and Social Council (ECOSOC) for application worldwide in Resolution 2004/233. In November 2009 the UNECE Committee on Sustainable Energy approved UNFC-2009 as the successor to UNFC-2004.

3.19. The UNFC categorizes the energy resources by looking at whether, and to what extent, projects for the extraction or exploration of the energy resources have been confirmed, developed or planned. Based on the maturity of the projects the underlying energy resources are classified. The UNFC is based on a breakdown of the resources according to three criteria affecting their extraction:

- Economic and social viability (E)
- Field project status and feasibility (F)
- Geological knowledge (G)

[1] UNFC-2009: United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009, ECE ENERGY SERIES No.39. United Nations, New York and Geneva, 2010, ECE/ENERGY/85. www.unece.org/se/pdfs/UNFC/UNFC2009_ECE_EnergySeries39.pdf

[2] The text in the following sections is an extract of the text in UNFC-2009.

3.20. The first criterion (E) designates the degree of favourability of economic and social conditions in establishing the commercial viability of the project, including consideration of market prices and relevant legal, regulatory, environmental and contractual conditions. The second criterion (F) designates the maturity of studies and commitments necessary to implement mining plans or development projects. These extend from early exploration efforts before a deposit or accumulation has been confirmed to exist through to a project that is extracting and selling an energy product. The third criterion (G) designates the level of certainty in the geological knowledge and potential recoverability of the quantities.

3.21. Table 3.2 gives an overview of how the three classes of energy resources are defined based on the E, F and G criteria. Each criterion, E, F, and G, is sub-divided into categories characterizing the projects for exploring or extracting the resource. The categories for the economic and social criteria are called E1, E2, E3, and E4, the categories for the project status and feasibility criterion are called F1, F2, F3, F4 and the categories for the geologic knowledge criterion are called G1, G2, G3, and G4. In some cases a sub-categorisation can be applied to the categories. F1 is, for instance, broken down by the sub-categories F2.1, F2.2 and F2.3. Each project is then categorised by a combination of these categories or sub-categories, e.g. (E1, F1, G1). Further, each class is formed by combining projects with specific combinations of categories.

3.22. The *Class A Commercially Energy Resources* is formed by combining deposits for which projects falls in the categories E1 and F1. It corresponds to what is called reserves in many classification systems. However, the term "reserves" is not used by the UNFC since it is defined in different ways and has a different meaning in different other classifications.

3.23. The category E1 includes projects where extraction and sale is economic viable, i.e. assumed to be economic on the basis of current market conditions and realistic assumptions of future market conditions. It includes considerations of prices, costs legal/fiscal framework, environmental, social and all other non-technical factors that could directly impact the viability of a development project. The economic viability is not affected by short-term adverse market conditions provided that longer-term forecasts remain positive.

3.24. The category F1 includes projects where extraction is currently taking place (F1.1); or capital funds have been committed and implementation of the development project or mining operation is underway (F1.2); or sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined project or mining operation (F1.3).

3.25. The *Class B Potential Commercial Energy Resources* is formed by combining deposits for which project falls in the category E2 (or eventually E1) and at the same time in F2.1 or F2.2.

3.26. For projects falling into category E2, extraction and sale has not yet been confirmed to be economic but, on the basis of realistic assumptions of future market conditions, there are reasonable prospects for economic extraction and sale in the foreseeable future.

3.27. Both F2.1 and F.2.2 includes projects where the feasibility of extraction is subject to further evaluation. For F2.1 project activities are ongoing to justify development in the foreseeable future; and for F2.2 project activities are on hold and/or justification as commercial development may be subject to a significant delay.

3.28. The *Class C Non-Commercial and Other Known* Deposits includes energy resources for which projects falls in E3 and for which the feasibility is categorised as F2.2, F2.3 or F4.

3.29. For E3 extraction and sale is not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability.

Table 3.2 Overall energy resource classification based on UNFC-2009

	SEEA-E Classes	Corresponding UNFC-2009 project categories		
		E Economic and social viability	F Field Project Status and Feasibilty	G Geological knowledge
Known Deposits	**A. Commercial Energy Resources** [1]	E1. Extraction and sale has been confirmed to be economically viable.	F1. Feasibility of extraction by a defined development project or mining operation has been confirmed.	Quantities associated with a known deposit that can be estimated with a high (G1), moderate (G2) or low (G3) level of confidence.
	B. Potential Commercial Energy Resources [2]	E2. Extraction and sale is expected to become economically viable in the foreseeable future. [3]	F2.1 Project activities are ongoing to justify development in the foreseeable future. or F2.2 Project activities are on hold and/or where justification as a commercial development may be subject to significant delay.	
	C. Non-Commercial and additional quantities in place [4]	E3.Extraction and sale is not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability.	F2.2 Project activities are on hold and/or where justification as a commercial development may be subject to significant delay. or F2.3 There are no current plans to develop or to acquire additional data at the time due to limited potential. or F4. No development project or mining operation has been identified	
Potential deposits (not included in SEEA-E)	Exploration Projects and additional quantities in place	E3.Extraction and sale is not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability.	F3. Feasibility of extraction by a defined development project or mining operation cannot be evaluated due to limited technical data. or F4. No development project or mining operation has been identified	Estimated quantities associated with a potential deposit, based primarily on indirect evidence (G4).

[1] Includes on-production projects, projects approved for development and projects justified for development

[2] Includes economic and marginal development projects pending, and development projects on hold

[3] Potential Commercial Projects may also satisfy the requirements for E1.

[4] Includes unclarified development projects, non-viable development projects, and additional quantities in place

Source: UNFC-2009, Figure 2 and 3.

3.30. F2.3 indicates that there are no current plans to develop or to acquire additional data at the time due to limited potential. F4 indicates that no development project or mining operation has been identified.

3.31. In addition to these three classes which exhaust the known deposits of energy resources, the UNFC also includes so-called potential deposits of energy resources. These are resources estimated on the basis of very preliminary studies in the exploration phase and where currently no development projects or mining operations have been defined.

3.32. In SEEA-E only the known deposits, i.e. classes A, B and C are included as assets, while the potential deposits are not included due to the large degree of uncertainty and lack of knowledge related to these quantities.

3.33. Besides being included in the physical asset accounts, the energy resources belonging to *Class A Commercial Energy Resources* are also the subject on monetary valuation and inclusion in the monetary asset accounts as presented in Chapter 4. Since Class B and Class C are only potentially commercial or non-commercial, respectively, it is not recommended to carry out any monetary valuation of these energy resources in order to include them in the monetary asset accounts. Thus,

energy resources in Class B and in Class C are only the subject of the physical asset accounts, not the monetary asset accounts, cf. Chapter 4.

3.34. The quantification of the subsoil energy resources is always based on estimates and cannot be carried out with certainty. The geological (G) dimension of the UNFC is used to communicate the uncertainty in the geological knowledge and potential recoverability of the quantities.

3.35. Quantities associated with a high level of confidence is classified as G1, quantities associated with a moderate level of confidence is classified as G2 and quantities associated with a low level of confidence as G3. Alternatively, the uncertainty is communicated by making reference to *low (G1), moderate (G1+G2) and high* (G1+G2+G3) estimates of outcomes of future extractions. A moderate confidence estimate of future extractions (G1 + G2) is, for instance, equivalent to the combination of quantities associated with high confidence (G1) and quantities associated with moderate confidence (G2).

3.36. For the SEEA-E generally the moderate *estimate* (G1 + G2), sometimes also called the *best estimate*, of the energy resources should be used as standard, but the range of uncertainty can be presented as supplementary information by also presenting the low and high estimate.

3.37. Many countries have their own national systems based on the classification systems developed by e.g. the Committee for Mineral Reserves International Reporting Standards, CRIRSCO[3] and the Society of Petroleum Engineers, SPE[4] for solid energy resources and petroleum energy resources, respectively. Thus, setting up the SEEA-E accounts for energy resources may involve a conversion of the other classification systems into the overall UNFC-2009 used for SEEA-E. However, since the overall UNFC-2009 operates at a very high level of aggregation this conversion will normally be quite straightforward.

3.38. For instance, the CRIRSCO classes called *proved and probable reserves* goes directly into *Class A Commercial Energy Resources*. Proved reserves are categorized by G1 in the UNFC, while the probable reserves are categorized as G2. Similarly the CRIRSCO class called *Measured Mineral Resources* goes into *Class B Potential Commercial Energy Resources*. The uncertainty for these resources is in the CRIRSCO communicated by the terms indicated, inferred and discovered. In terms of the UNFC-2009 the corresponding categories are G1, G2 and G3.

3.39. The Petroleum Resources Management System (SPE-RPMS) maintained by the SPE includes three classes called Proved, Probable and Possible Reserves. They correspond to the G1, G2 and G3 estimates of the *Class A Commercial Energy Resources*. The SPE class called Contingent Resources covers resources, which fall partly into the *Class B Potential Resources* and partly into *Class C Non-Commercial and Other Known Deposits*.

3.40. It follows that, generally, the best estimate of *Class A Commercial Energy Resources* can be obtained from the CRIRSCO and SPE-RPMS classification by selecting the proved and probable reserves.

3.41. Information on how to make the conversion from e.g. the CRIRSCO and SPE-RPMS classifications to the UNFC-2009 classification can be obtained by consulting the mapping schemes

[3] International reporting template for the public reporting of exploration results, mineral resources and mineral reserves, Committee for mineral reserves international reporting standards. July 2006. http://www.crirsco.com/crirsco_template_v2.pdf

[4] SPE-2007: Petroleum Resources Management System. Sponsored by: Society of Petroleum Engineers (SPE), American Association of Petroleum Geologists (AAPG), World Petroleum Council (WPC), Society of Petroleum Evaluation Engineers (SPEE)
http://www.spe.org/industry/reserves/docs/Petroleum_Resources_Management_System_2007.pdf

worked out by the UN-ECE Ad Hoc Group of Experts on Harmonization of Fossil Energy and Mineral Resources Terminology, the custodian of the UNFC[5].

2. Quantification and units in the physical resource accounts

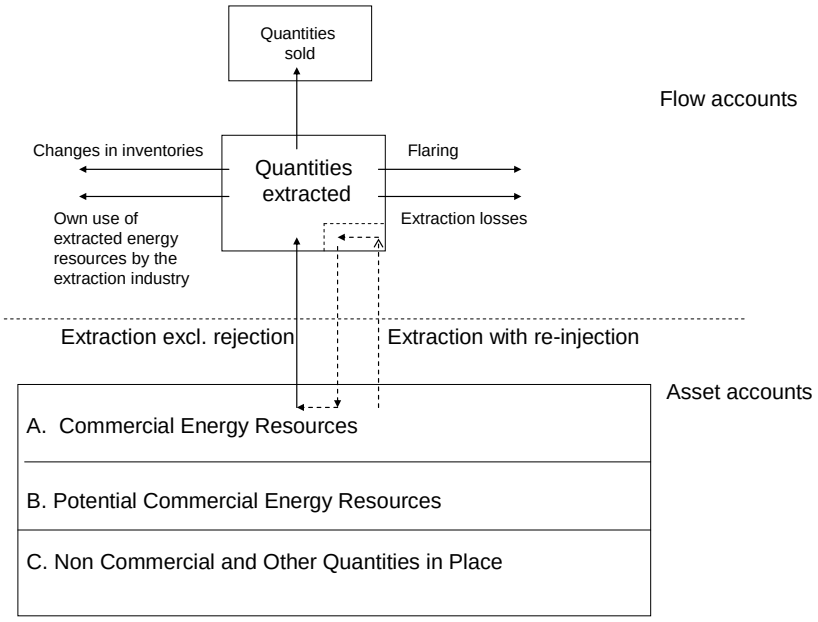
Quantification

3.42. For energy resources, the basic SEEA-E principle for quantification is that the quantities should be estimated as the sum of the potential future output of products (best estimate) even if the energy resources are classified as potential commercially or non-commercially.

3.43. This quantification principle for the potential future output refers to the physical appearance of the resources immediately after extraction. The potential output includes both quantities, which are expected to be sold and quantities, which are expected to be used for the extraction process or lost after extraction. Natural gas, which is expected to be flared, is also included.

3.44. When a quantification of natural gas assets based on potential future extraction is made, care should be taken not to count more than once quantities which are being extracted and then re-injected into the same or other geological deposits again. These quantities of gas should only be included in the potential future output when they are finally extracted with the purpose of being used in the economy. On the other hand, sometimes quantities of natural gas are being deposited in controlled storages ready for further distribution to users of the gas. In these cases the natural gas should be considered as products, and the stocks of gas in the controlled storages are considered as inventories, cf. Section C.

Figure 3.1 Quantification of energy resources included in the asset and flow accounts



[5] Mapping of the United Nations Framework Classification for Fossil Energy and Mineral Resources, ECE Energy Series, No.33 and ECE/ENERGY/71. United Nations, Economic Commission for Europe. http://www.unece.org/se/pdfs/UNFC/EnergySeriesNo33.pdf

3.45. This principle for quantifying the energy resources is coherent with how the flows are recorded in the flow accounts for energy, since these include flaring of natural gas, own consumption of energy and extraction losses.

3.46. In practice, the implementation of the asset accounts for energy resources will most often rely on the quantity estimates, which are published by companies, geological surveys, etc. and these estimates may be based on different principles. Thus, the Petroleum Resources Management System developed by the Society of Petroleum Engineers (SPE) states that in general the resource estimates should be based on sales quantities. Non-sale quantities include petroleum consumed as fuels, flared or lost in processing plus hydro-carbons that must be removed prior to sale. (SPE-2007, p. 15). In such cases it is necessary to adjust the quantity estimates based on additional information from the companies, geological surveys, etc. if such information on the use by extractors, flaring and losses is available.

Units

3.47. The physical energy resource accounts use different units such as tonnes, cubic metres, oil equivalents, petajoule (PJ), etc. depending on what is the most appropriate unit for the resource in focus. Of course, the same unit should be used throughout the account for a specific energy resource in order to ensure that the book keeping system of the account can be maintained (i.e. adding changes to the opening stock gives the closing stock). By applying conversion factors, it is possible to convert the accounts from one unit to another (e.g. from tonnes to PJ). However, care must be taken to use the right conversion factors as these might change over time and may be country dependent. Annex C of the International Recommendations for Energy Statistics, IRES, (IRES, 2010)[6] includes some general factors, which can be used for converting between units.

3.48. When all resource accounts for the various types of energy are converted to a common energy unit, e.g. PJ, the accounts can be added to one account (balance sheet) expressing opening and closing stocks status and changes within the period in total energy stocks.

3. Physical asset accounts for energy resources

3.49. The term physical asset account is generally used to describe accounts showing opening and closing stocks and changes therein for the specific assets in focus.

3.50. The purpose of physical asset accounts for energy is to describe the development in stocks and flows of energy in a consistent way. Thus, from the accounts, it is possible not only to observe the quantities of the resource in stocks but also to derive how the changes in stocks over time are a result of extraction, new findings, changes in the economic conditions, and other changes.

3.51. The asset accounts for energy resources present information for known deposits. Since known deposits also include resources which are not economic and social viable to extract given the prevailing knowledge and market conditions (Class B and C, cf. Section B.1), the physical asset accounts are broader in scope than the corresponding SNA 2008 accounts/monetary asset accounts for energy resources (cf. Chapter 4).

3.52. The structure of a physical resource account is presented in Table 3.3.

[6] IRES, 2010: Provisional draft of the International Recommendations for Energy Statistics prepared for the 2nd stage of the worldwide consultation, UNSD, July 2010.

3.53. The account starts with the opening stock of the resource at a given point of time, typically at the beginning of a given year. Then it shows the changes in the stock during the year, i.e. the acquisitions less disposals, increases (extractions and reappraisals), decreases (discoveries and reappraisals) and other changes in stocks. When the changes during the year are added to the opening stock, the closing stock at the end of the year is obtained.

Table 3.3 Physical asset account for an energy resource

	Total	Of which		
	Known deposits	A. Commercial energy resources	B. Potential commercial energy resources	C. Non-commercial and other known deposits
	Million m^3			
Opening stocks	**257**	**203**	**7**	**47**
Changes due to transactions				
Acquisitions less disposals				
Increases in stocks				
Discoveries	33			33
Reappraisals (upwards)	3		3	
Decreases in stocks				
Extractions	- 20	- 20		
Reappraisals (downwards)	- 11	- 8		- 3
Other changes in stocks				
Catastrophic losses and uncompensated seizures				
Changes in classifications and structure				
Closing stocks	**262**	**175**	**10**	**77**

3.54. The table illustrates an asset account for one year. It includes fictitious numbers. The measuring unit is in this example million cubic meters, but as mentioned in Section B2 other units can be used depending on the energy resource in focus. The various accounting items are explained below.

Opening stock is the quantity of the resources at the beginning of the year. It is equal to the closing stock of the previous year. It includes all quantities of energy resources in the deposits, also quantities which eventually will be lost, etc. during extraction, cf. Section B.2.

Changes due to transactions:

Acquisitions less disposals of energy resources relate to the purchase and sale, barter or transfers in kind of energy resources. This item will often be zero since energy resources are often owned by governments and as such seldom sold.

Increases in stocks:

Discoveries of new deposits refer to findings of energy resources previously unknown. They are included as additions to the stock of the energy resources.

Reappraisals (upwards): As more is learned about the characteristics of a particular oil well or mine, the estimate of the stock will be adjusted in the light of new knowledge. If the asset is bigger than expected, if it proves technically easier to extract it than was previously thought, or if the price of the resource

increases so that a greater quantity can be extracted economically, then there will be an upward reappraisal of the previously classified stock. This may lead to a revision of the estimate of the total level or simply to a shift from one category to another (e.g. from *Class B. Potential Commercial Energy Resources* to *Class A. Commercial Energy Resources*).

Decreases of stocks

Extractions is the item used to record the quantities of the resource, which are removed finally from the deposit. In the case of natural gas, some of the extractions are re-injected into the deposit. Provided that the re-injected gas can be extracted again at a later point in time, the recording should be net of the re-injected gas in order for the account to show what has been finally removed from the deposit. If re-injected natural gas becomes unavailable for any future extraction, the gas should be recorded as extracted (and subsequently recorded as lost in the physical supply and use tables, cf. Chapter 5). Quantities which are extracted and used by the extractor and thus are finally removed should be recorded as part of the extraction. The same is valid for e.g. natural gas, which is not used as such by the extractor, but is flared for precautionary reasons.

Reappraisals **(downwards)** is a counterpart to the upward reappraisals, cf. above.

If information is not available to separate upwards and downwards reappraisals may be combined in one item. Further, they can be combined with new discoveries, in one item *Discoveries and reappraisals*, if appropriate.

Other changes in stocks

Catastrophic losses cover the effects of earthquakes, volcanic eruptions, tidal waves, hurricanes, droughts, floods and other natural disasters as well as wars. Catastrophic losses are probably very seldom or never occurring in relation to energy resources. If a natural disaster changes the accessibility or conditions for extracting the natural resource this should be recorded as reappraisals and not as catastrophic losses. ***Uncompensated seizures*** rarely occur but may in theory take place.

Changes in classifications and structure involve no change in the volume of an asset but relate mainly to the reclassification of change of ownership from one institutional unit to another. Therefore this item is only relevant if separate asset accounts are set up for institutional units. Even then, non-zero entries for this item is not likely, but could in principle happen, for instance, if deposits are owned by units in the household sector, and these units change character and is reclassified into the non-financial corporations sector.

Closing stocks: The level of reserves at the end of the year. It is equal to the opening stock plus the changes in stocks, which have occurred during the period. Further, it is equal to the opening stock of the subsequent year.

C. Inventories of energy products

1. Classification of energy products

3.55. The Standard International Energy Classification, SIEC, provides the classification of energy products which are used for the general physical supply and use tables for energy products as presented in Chapter 5, Section D.2. The same classification should be used for the asset accounts for inventories of energy products in order to ensure the consistency between the physical supply and use tables and the physical asset accounts for inventories.

2. Physical asset accounts for inventories

3.56. The resource accounts described in the previous section refer only to accumulated quantities of energy resources, i.e. the naturally occurring resources before they are extracted from the ground and thus become products. However, the government and the industries in a country often hold accumulated quantities of coal, oil and others sorts of energy products either for reasons of national security, self-sufficiency policies or for purely commercial reasons.

3.57. Those accumulations of energy products correspond to what is often called stocks in relation energy statistics. Thus, the International Recommendations of Energy Statistics, IRES, defines stocks as quantities of fuels that can be held and used to: (a) maintain service under conditions where supply and demand are variable in their timing or amount due to normal market fluctuations, or (b) supplement supply in the case of a supply disruption. Further, according to IRES, stock changes are the increase (stock build) or decrease (stock draw) in the quantity of stock over the reporting period (IRES 2010, 5.16).

3.58. Using national accounts terminology, those physical accumulations of energy products are called *inventories* in SEEA-E, while the term *stocks* is used to designate any accumulation in the economy at a point of time, whether it is natural resources or energy products.

3.59. Energy products in inventories include primary energy products (coal, crude oil, and natural gas, etc.) which are being accumulated after extraction and before processing take place as well as secondary energy products (town gas, fuel oil, gasoline, diesel, etc.) which are the result of a further processing.

3.60. Besides having an analytical interest in their own right, the asset accounts for inventories can be instrumental in relation to the physical supply and use tables for energy products (Chapter 5) since full asset accounts for the inventories of energy products help keeping track of whether the recording of the inventories changes are biased over time and thus results in unrealistic small or large inventories.

3.61. Table 3.4 presents a physical asset account for inventories of energy products. In line with the physical asset accounts for energy resources (Table 3.3) it shows the opening and closing stocks and the changes in-between. However, the change items in the asset account for energy products are fewer in numbers compared to the asset accounts for energy resources since the recording of discoveries and extraction is not applicable for the inventories of energy products, only for the energy resources.

3.62. An asset account for inventories should be set up for each important energy product. The heading of Table 3.4 lists the various energy products. As mentioned in the previous section, it is important to use the same classification of the energy products as is used for the general supply and use tables.

3.63. Due to the non-material characteristics of electricity and heat it is not possible to put these energy products into inventories and thus asset accounts are not applicable for electricity and heat. Further, in practice, inventories of certain other energy products may also not exist, or it may be less obvious to account for them. For instance, it may not be relevant to set up accounts for inventories of waste.

Table 3.4 Physical asset accounts for inventories of energy products

	1. Coal, coke,gas work gas and peat		2. Oil	3. Natural Gas	4. Electricity	5. Heat	6. Renewable fuels and waste	
	a) Coal, coke and peat	b) Gas work gas					a) Solid biomass and wastes	b) Liquid biofuels and biogas
	1000 Tonnes	1000 m^3	1000 Tonnes	1000 m^3	TWh	Terajoules	1000 Tonnes	1000 m^3
Opening stocks (LS)	1 899	20	5 336	2 004			45	
Changes due to transactions								
Changes in inventories (P52)	- 796		- 59	53			18	
Other changes in the volume								
Catastrophic losses and uncompensated seizures (K3 and K4)								
Other changes in inventories n.e.c. (K5)	99		- 14					
Changes in classifications (K6)								
Closing stocks (LE)	1 202	20	5 263	2 057			63	

Note. Codes in parenthesis refer to the SNA 2008 classification and coding structure
The gray are indicates that inventories of electricity and heat is not applicable

3.64. It should also be observed that the heading of Table 3.4 only shows aggregated groups of energy products, and that in practice it is appropriate to implement the physical asset accounts for inventories at a much more detailed level, for instance, by distinguishing by various types of oil and oil products.

3.65. The units used in the inventories asset accounts can be specific to the various energy products, as in the example in Table 3.4, or it can be converted into a common physical unit, e.g. tonnes or into calorific values, petajoule.

3.66. The various accounting items are explained below. In most cases, it is only relevant to record the closing and opening stock and the changes in inventories.

Opening stocks (LS): The level of the inventories at the beginning of the year. It is equal to the closing stock of the previous year.

Changes in inventories (P52): This item records the difference between current entries into and withdrawals from inventories. Additions to inventories are recorded when energy products are purchased, produced or otherwise acquired. Deductions from inventories are recorded when products are sold, used up as intermediate consumption or otherwise relinquished. In addition recurrent losses are included in this net item. The recurrent losses include losses in inventories that normally take place and should be expected. Even very large losses, if they occur regularly, should be taken into account when calculating the change in inventories. *Changes in inventories* are also recorded in the physical supply and use tables, cf. Chapter 5, Table 5.2.

Catastrophic losses and uncompensated seizures **(K3 and K4)**: Catastrophic losses cover the effects of earthquakes, volcanic eruptions, tidal waves, hurricanes, droughts, floods and other natural disasters as well as wars. Blow-outs and conflagration of oil in

pipelines falls under this category. In addition to catastrophic losses, inventories owned by a specific institutional unit can be reduced by uncompensated seizures.

Changes in classifications **(K6)** involve no change in the volume of the inventories but relate mainly to the change of a unit from one institutional sector to another (e.g. the owner of the inventories moves from the household sector to the non-financial corporations sector). This is only relevant if the asset account is set up for individual institutional units, and not if the accounts are set up for the total economy. Also changes from work-in-progress to finished goods may be recorded here, if such a distinction between inventories of products is made in the accounts.

Other changes in inventories n.e.c. **(K5).** When the assumption underlying the calculation of the rate of current shrinkage of inventories is mistaken (cf. changes in inventories above) this should be corrected as *other changes in inventories* (cf. SNA 2008, 12.50).

Closing stocks (LE): The level of the inventories at the end of the year. It is equal to the opening stock of the subsequent year.