



Physical asset accounts for energy

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SEEA Energy includes three main types of information on energy



1) The supply and use of energy (flows)

2) The stocks of energy and the changes in them

- Availability of energy resources and energy products at the beginning of a time period
- Disappearance and entering into the stocks
- Availability of energy resources and energy products at the end of the time period
- *Monetary valuation of the depletion of energy resources*

3) Other economic aspects related to energy



Content

1. What is an asset?
2. Definitions, concepts and classifications
3. The physical asset accounts
4. Uses/applications of the accounts
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Assets

Assets are items considered to be of value to society.

In **SEEA Energy** the assets in focus are first of all *energy resources like petroleum resources (oil, natural gas), coal and peat* that occurs in the environment.

Energy assets - Mineral and Energy resources

- Oil resources
- Natural gas resources
- Coal and peat resources
- Uranium and other nuclear fuels

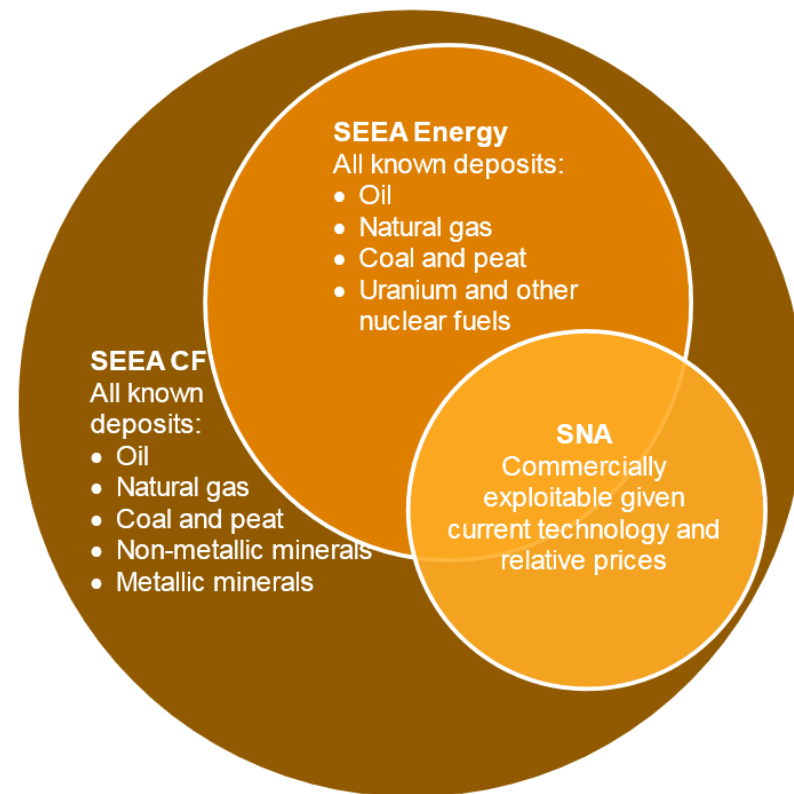
→ Also **uranium** ore that can be used for nuclear energy production falls within the scope of physical asset accounts for energy.

→ **Wood in forests** is also an asset that can be used for energy production. However, normally the primary purpose of these assets are not to be used as a source of energy. Thus, timber resources are normally not included in the energy asset accounts

Scope of the physical asset accounts

SEEA Energy includes **all stocks that may provide benefits to humanity**, although they may not have any present market value. In principle this means all known deposits of the energy resources.

For the physical asset accounts this means that the scope is broadened compared to the national accounts, SNA, which only includes the commercially exploitable resources, which can be associated with a market value.



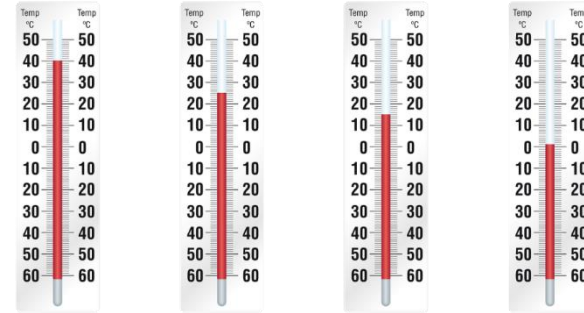
Measurement units for the physical stock

SEEA Energy recommends in general that a common unit for the calorific values of the energy, e.g. *joules* are used for the energy accounts.

By using a common unit different types of energy can be aggregated.

In practice, one will however, often start by using the natural units tonnes, cubic metres, which are the units used for the observable basic data.

By using conversion factors the stocks of energy resources measured by joules can then be estimated, and a link to the physical supply and use tables can be made.



Measurement units for the physical stock

Type of fossil energy	Value	Unit	Conversion factor	Giga Joule (GJ)
Coal	500	Tonnes	29,3 GJ / tonnes	14.654
Natural gas	3	Million m ³	37,7 GJ / thousand m ³	113.044
Oil	50.000	Barrels of oil	5,86 GJ / boe	293.076

By converting the different units into a common unit, in this case joules, different types of energy can be aggregated and can for instance be used in the physical supply and use table.



Classification of energy and mineral assets

	Classes of energy and mineral resources
Known deposits	A: Commercially recoverable resources
	B: Potentially commercially recoverable resources
	C: Non- Commercial and other known deposits
Potential deposits (not included in SEEA Energy)	Exploration projects and additional quantities in place

Existing deposits of oil, natural gas, and coal, etc. can be classified according to the **economic and social viability, the status of extraction projects and the geological knowledge**.

SEEA-Energy classifies the physical energy and mineral resources by three classes A, B, and C.

The classification is based on the **United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009**.



Classes A, B and C

Class A Commercially Recoverable Resources includes resources for which extraction is currently taking place or is underway or for which the feasibility of extraction has been demonstrated. Further, the extraction of the resources in this class is expected to be economically viable on the basis of current market conditions and realistic assumptions for future market conditions.

The second ***Class B Potential Commercial Resources*** may also be extracted in the future, but since the feasibility of extraction is subject to further evaluation and extraction and sale have not yet been confirmed to be economic, the uncertainty related to whether future extraction will take place is quite high.

The uncertainty related to future extraction of energy resources included in ***Class C Non Commercial and Other Quantities in Place*** is even higher than for energy resources included in *Class B*. Extraction and sale are not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability.



Other classifications and categorizations of energy

In practice you may find that the basic data on energy resources produced by, for instance, the Energy Agency in your country is categorised different from the SEEA and the UNFC 2009.

Sometimes they are categorised, for instance, as *proven*, *probable* and *possible* energy resources. You may also find references to "reserves" and "contingent resources", etc.

The UNFC 2009 gives advice on how to *map* different classifications against each other.

UNFC Mapping

PRMS Class		UNFC-2009 "minimum" Categories			UNFC-2009 Class
Discovered	Reserves	E1	F1	G1,G2,G3	Commercial Projects
	Contingent Resources	E2	F2	G1,G2,G3	Potentially Commercial Projects
		E3	F2	G1,G2,G3	Non-Commercial Projects
	Unrecoverable	E3	F4	G1,G2,G3	Additional in Place ^a
Undiscovered	Prospective Resources	E3	F3	G4	Exploration Projects
	Unrecoverable	E3	F4	G4	Additional in Place ^a

Source: <http://www.unece.org/index.php?id=34487>



A physical asset account for Class A Commercially Recoverable Resources

Class of energy resource				
Type of mineral and energy resource (Class A: Commercially recoverable resources)				
	Oil resources (*000 barrels)	Natural gas resources (m3)	Coal & peat resources (*000 tonnes)	Uranium and other nuclear fuels (tonnes)
Opening stock of mineral and energy resources	800	1 200	600	
Additions to stock				
Discoveries				
Upwards reappraisals		200		
Reclassifications				
<i>Total additions to stock</i>		200		
Reductions in stock				
Extractions	40	50	60	
Catastrophic losses				
Downwards reappraisals			60	
Reclassifications				
<i>Total reductions in stock</i>	40	50	120	
Closing stock of mineral and energy resources	760	1 350	480	

Opening and
closing stocks

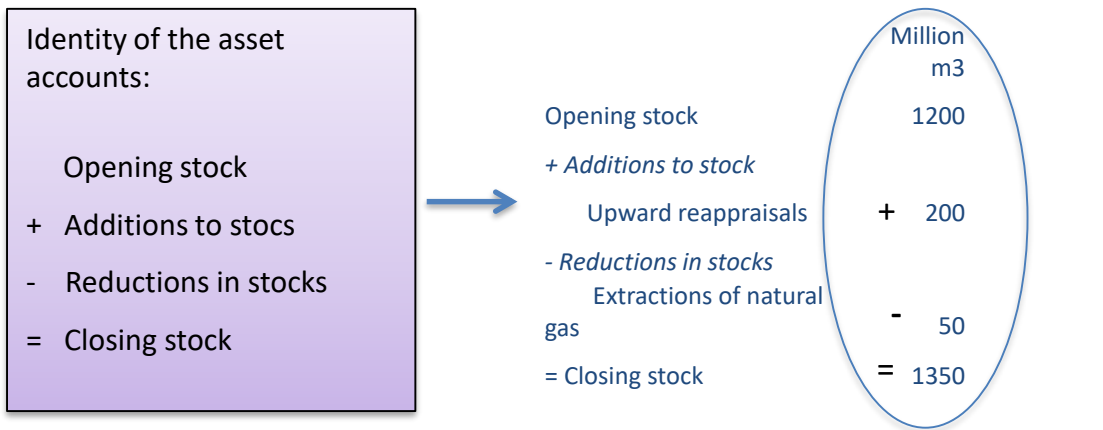
Various
changes
during
the
period

Different
types of
energy
resources
and
different
units



The important identity of the physical asset accounts

The asset account “explains” the development of the stock from the beginning to the end of the period. The “explanation” is given by the basic identity that the **closing stock is always equal to the opening stock plus changes during the period.**



Causes of change in stocks of energy resources

Opening stock

+ Additions to stock

Discoveries

Upwards reappraisals

Reclassifications

Three items for
additions/increases

- Reductions in stock

Extractions

Catastrophic losses

Downwards reappraisals

Reclassifications

Four items for
reductions/decreases

= Closing stock

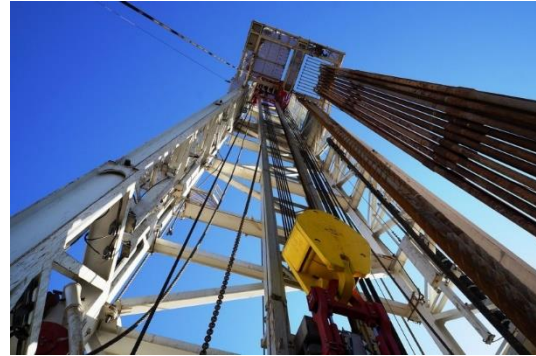


Discoveries

When new quantities of energy resources are **discovered through exploration** activities in an accounting period the new quantities should be recorded as **additions to the opening stock**.

Depending on the characteristics of the new discoveries and the development of the related projects for extraction the discoveries should be accounted for as either Class A, B or C.

When quantities of *potential deposits* becomes known to a higher degree of confidence and thereby become *known resources*, the increase is treated as discoveries.



Additions to stock

Discoveries

Upwards reappraisals

Reclassifications



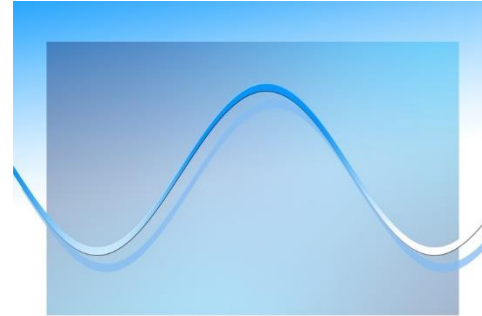
Reappraisals

Reappraisals pertain to the estimated available stock of a specific deposit. Reappraisals occur with **changes in the geological information, technology or prices**.

Reappraisals are typically associated with a move of resources between class A, B and C.

A common reason for **upward reappraisals** of the quantity of energy resources is **price increases**. When energy prices go up it becomes more profitable to extract resources and an upward reappraisal of the physical quantities may take place.

In contrast **downward reappraisals** of the quantities may take place when energy prices are going down.



Additions to stock

Discoveries

Upwards reappraisals

Reclassifications

Reductions in stock

Extractions

Catastrophic losses

Downwards reappraisals

Reclassifications

Reclassifications

Sector
accounts

Natural gas – physical quantities

Reclassifications are relevant when separate asset accounts are set up for **institutional sectors** (government sector, corporations, etc.) i.e. when the accounts are split according to the ownership or right to use the resources.

When a mine is sold or the rights to extraction are transferred, for instance, from the government to a private company, a reclassification between the government's asset account and the asset accounts of the corporations take place.

	Government	Corporations	Total
Opening stock	100	200	300
Additions to stock			
Discoveries			
Upwards reappraisals			
Reclassifications	-10		- 10
Reductions in stocks			
Extractions			
Catastrophic losses			
Downward reappraisals			
Reclassifications		+10	+10
Closing stock	90	210	300

Additions to stock

Discoveries

Upwards reappraisals

Reclassifications

Reductions in stock

Extractions

Catastrophic losses

Downwards reappraisals

Reclassifications



Catastrophic losses

Catastrophic losses are rare for most energy resources. While flooding and collapsing of mines do occur, the deposits continue to exist and can, in principle, be recovered.

Petroleum wells can be destroyed by fire or become unstable for other reasons leading to significant physical losses of oil resources.

Such losses of energy resources should be recorded as catastrophic losses.



Reductions in stock

Extractions

Catastrophic losses

Downwards reappraisals

Reclassifications



Extractions

The recording of extraction should reflect the quantity of the resource physically removed from the deposit.

The quantity removed should be estimated before any refinement or processing of the resource is undertaken. If relevant, estimates of extraction should include estimates of illegal extraction as these amounts reduce the availability of the resource.

The physical extraction of energy resources like coal, oil and natural gas are sometimes also called **depletion**, since these energy resources are non-renewable



Reductions in stock

Extractions

Catastrophic losses

Downwards reappraisals

Reclassifications

Applications and uses of physical asset accounts

Physical asset accounts are important tools for assessment of the economic situation

Physical asset accounts for energy resources show how many energy resources a country owns, and to which extent these are available for economic use via extraction.

They also show how the stocks have developed over time, and how the development has been affected by the economic activities, for instance, how much has been extracted and how much has been added to the available stocks by new discoveries.



Applications and uses of physical asset accounts

Analysis of national security, self-sufficiency and commercial conditions

The asset accounts for inventories of energy products shows how much energy is stored in the economy and how the inventories have developed over time.

The information from the asset accounts is useful for analysis of national security, self-sufficiency or the commercial conditions within the energy sector.

While the physical asset accounts themselves are important for analysis, they are at the same time a first necessary step towards the construction of monetary asset accounts



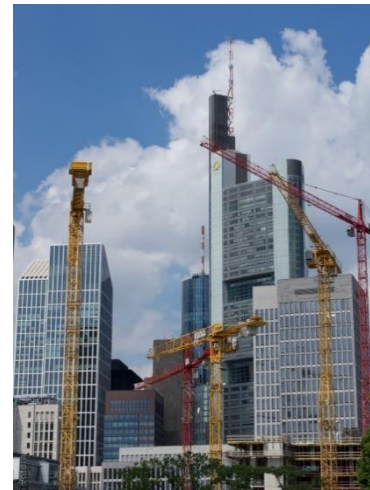
Flexible implementation

SEEA Energy is flexible: You can implement the asset accounts for those energy resources and energy products you find most useful to do it for.

Start with the most important resources and where data are available. Gradually, you can then continue with other energy resources.

The implementation will often require some cooperation between statistical offices and energy agencies, etc.

The accounting structures and identities of the accounts will often help you estimate missing items



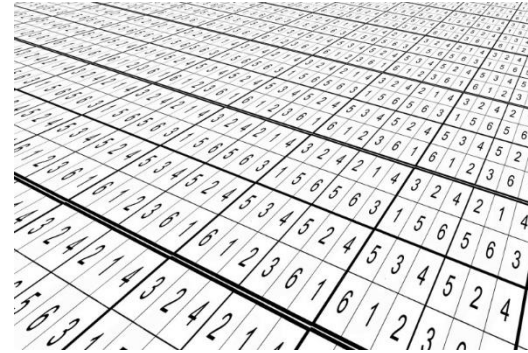
Ensure that there is a coherence between the change items in the physical asset accounts and any information on extraction and inventory changes, etc. in the physical supply and use tables

Data sources

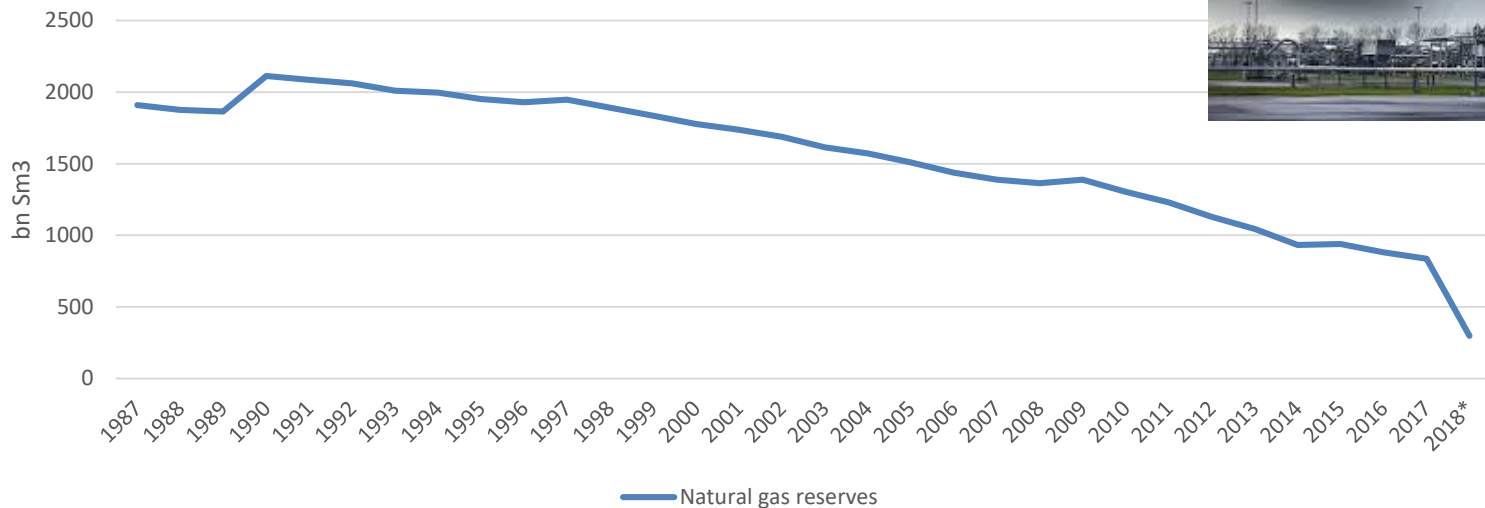
The physical data on stocks of energy resources, extraction and other changes in energy resource stocks is often available from **energy agencies or geological institutes**, etc.

If **physical supply and use tables** are already implemented, information on extraction of energy resources and inventory changes will be available.

Make sure that there is a **coherence** between the two sets of accounts



Gas reserves in the Netherlands



Where do you find more information?

Chapter 5 in SEEA Energy describes in more detail what has been presented in this module
https://seea.un.org/sites/seea.un.org/files/documents/seea-energy_final_web.pdf

Chapters 10, 12 and 13 in the System of National Accounts 2008 includes general information relevant for an understanding of the concepts of economic assets (as defined in SNA) and the general principles behind the assets accounts. These chapters is especially relevant for the construction of asset accounts for inventories. Observe that with regard to scope of the SEEA Energy physical asset accounts and the SNA 2008 accounts there are some important differences, since the SEEA Energy scope is broader
<http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf>

A dedicated UNECE website on the UNFC 2009 informs about resource classifications and mapping between different classification systems
<http://www.unece.org/energy/welcome/areas-of-work/unfc-and-resource-classification/about-unfc-and-resource-classification.html>



Thank you. Any questions?



Exercise

Use the following information to fill in the asset account (Class A Commercially recoverable resources) for coal resources.

- 1) The total amount of coal available for extraction at the beginning of the year was 20 million tonnes.
- 2) During the year a new coal deposit is discovered and made ready for extraction. It contains 3 million tonnes of coal
- 3) The geologic survey discovers that the their previous estimate of the coal deposit underestimates the stock by 1.4 million tonnes.
- 4) The extraction of coal by the mining company was 0.7 million tonnes
- 5) An earthquake totally destroys a mining site, which makes it uneconomically in the foreseen future to extract coal from this site. It was otherwise expected that 0.2 million tonnes of coal could have been extracted from this mining site.
- 6) Due to a new ambitious climate change policy the government decides that half of the available coal resources must stay in the ground, never to be extracted. This decision applies to the coal deposits as of the beginning of the year.



Physical asset account

Class A Commercially recoverable resources

Coal resources
1000 tonnes

Opening stock (1 January)

Additions to stocks

Discoveries

Upwards reappraisals

Deductions from stocks

Extractions

Catastrophic losses

Downwards reappraisals

Closing stock (31 December)



Solution

Class A Commercially recoverable resources

Coal resources 1000 tonnes	
Opening stock (1 January)	20.000
<i>Additions to stocks</i>	
Discoveries	3.000
Upwards reappraisals	1.400
<i>Deductions from stocks</i>	
Extractions	700
Catastrophic losses	200
Downwards reappraisals	10.000
Closing stock (31 December)	13.500 (=balance)

