

Offshore Energy Accounts

Compiles accounts for offshore energy resources within the ocean accounting framework.

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OUTCOME

After completing this Circular, readers will be able to compile accounts for offshore energy resources within the ocean accounting framework, covering both non-renewable mineral and energy resources (offshore oil and gas, seabed minerals) and the newly recognised renewable energy resources (offshore wind, tidal, and wave energy) following the 2025 SNA adoption of renewable energy resources as a distinct asset category (AN322).

Offshore energy accounts serve several decision use cases for governments managing marine resources and energy transitions. They support energy transition planning by tracking offshore fossil fuel extraction alongside renewable marine energy generation, so that policymakers can quantify progress toward decarbonisation targets and assess the changing composition of ocean-based energy portfolios. They record the depletion of non-renewable seabed resources, recognising extraction of offshore oil, gas, and minerals as consumption of natural capital rather than income, which supports depletion-adjusted national income measures. They quantify the offshore wind, tidal, and wave energy resources available for development, informing spatial planning decisions and infrastructure investment priorities. These functions connect to [TG-1.1 OA and National Budget Processes](#) and [TG-2.5 Structure and Function of the Ocean Economy](#), where offshore energy data inform fiscal planning and economic performance monitoring.

The guidance draws on the general asset accounting methodology in [TG-3.1 Asset Accounts](#) and the economic activity classifications in [TG-3.3 Economic Activity Relevant to the Ocean](#), and connects to greenhouse gas accounting in [TG-3.4 Flows from Economy to Environment](#).

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ABOUT THIS CIRCULAR

RECOMMENDED CITATION

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1. Outcome

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¶3 The guidance draws on the general asset accounting methodology in **TG-3.1 Asset Accounts** and the economic activity classifications in **TG-3.3 Economic Activity Relevant to the Ocean**, and connects to greenhouse gas accounting in **TG-3.4 Flows from Economy to Environment**.

2. Requirements

¶1 Essential prerequisites:

- ¶2 **TG-0.1 General Introduction to Ocean Accounts**: conceptual framework and scope of Ocean Accounts
- ¶3 **TG-3.1 Asset Accounts**: general asset accounting methodology including standard account structure and valuation

¶4 Helpful background:

- ¶5 **TG-0.2 Overview of Relevant Statistical Standards**: statistical foundations in SNA 2025, SEEA CF, and SEEA EA
- ¶6 **TG-3.3 Economic Activity Relevant to the Ocean**: industry classifications for offshore energy sectors
- ¶7 **TG-3.4 Flows from Economy to Environment**: greenhouse gas accounting related to energy production
- ¶8 **TG-2.4 Environmental (including Ecosystem) Goods and Services** Section 3.10: valuation method preference order; **TG-3.1 Asset Accounts** Section 3.3: net present value and resource rent estimation
- ¶9 **TG-6.9 Offshore Energy Thematic Methods**: the sector-operational layer built on this Circular's account structures

¶10 ① Scope

¶11 TG-3.10 sits within Section 3 (Accounts Compilation). It owns the asset account for offshore energy resources: the SNA and SEEA CF classification of mineral, energy and renewable resources, the commercial-viability classes, the resource-rent and NPV valuation, the allocation between government and extractor, and the account rows in physical and monetary terms. The sector-operational layer – energy-type-specific measurement, spatial footprint and exclusion zones, underwater noise and electromagnetic fields, rigs-to-reefs, stranded-asset and transition accounting – is **TG-6.9 Offshore Energy Thematic Methods**, in the same relationship that TG-3.9 has to TG-6.8.

¶12 ① Framework Position

¶13 This Circular addresses offshore energy accounting, covering both non-renewable extraction (oil, gas, minerals) and renewable energy resources (wind, tidal, wave). Offshore energy accounts record the transformation of environmental stocks into economic flows, together with the environmental residuals generated by extraction. In the Ocean Accounts Framework (TG-0.1 Figure 0.1.2):

Edge	Direction	Description
E1	FG1 → SG3	Emissions and pollution from offshore energy production to the marine environment
E3	FG1 ↔ SG1	Energy asset transactions and production as monetary flows between economic sectors and SNA assets
E9	SG3 → FG1	Natural resource extraction as flow from environmental stocks to the economy

3. Guidance Material

¶1 The ocean domain contains energy resources central to national energy portfolios and sustainable development strategies. Offshore energy encompasses both extractive activities targeting non-renewable resources beneath the seabed (oil, natural gas, minerals) and the capture of renewable energy from marine environments (wind, tidal, wave). These activities have distinct accounting treatments, whilst sharing common challenges related to spatial delineation, valuation in the absence of market transactions, and management of environmental impacts including decommissioning obligations.

¶2 The 2025 SNA advances energy accounting by formally recognising renewable energy resources (AN322) as a distinct asset category within natural resources². This recognition reflects the growing economic importance of renewable energy and provides a statistical framework for tracking these assets alongside traditional mineral and energy resources. For ocean accounting, the new asset category matters given the rapid expansion of offshore wind and emerging interest in tidal and wave energy technologies. Compilers should note that the SEEA Energy (2019), which predates the 2025 SNA, does not include renewable energy as physical assets (para. 5.8)³. The 2025 SNA's recognition of AN322 effectively supersedes this position for national accounts purposes, though compilers working with SEEA-based physical energy accounts should document how they reconcile the two frameworks. A future revision of SEEA Energy is expected to align with the 2025 SNA treatment.

¶3 This section is organised to provide both conceptual guidance and practical compilation procedures. Section 3.1 establishes the asset classification framework. Section 3.2 provides a step-by-step compilation procedure for offshore energy accounts. Sections 3.3-3.5 address specific energy types (offshore wind, tidal and wave, oil and gas). Section 3.6 covers decommissioning considerations. Section 3.7 presents a worked example with synthetic data demonstrating the full compilation workflow. Cross-references to related circulars are provided throughout.

¶4 *Table 1: Offshore energy asset-flow linkages*

Energy Type	Asset Account	Flow Account	Depletion Treatment
Oil & gas	Non-renewable mineral and energy resources (AN.321)	Extraction flows	Depletion = extraction
Wind	Renewable energy resources (AN.3221)	Energy capture flows	No physical depletion
Tidal	Water energy resources (AN.3223)	Energy capture flows	No physical depletion

Energy Type	Asset Account	Flow Account	Depletion Treatment
Wave	Water energy resources (AN.3223)	Energy capture flows	No physical depletion

¶5 *Note: Produced assets (platforms, turbines) are separate from the energy resources and are recorded in the produced asset accounts (AN.11).*

3.1 Asset Classification

¶1 Classifying an offshore energy asset turns on two sequential questions: whether it was produced or constructed and, if not, whether the underlying resource depletes with use. These questions route each asset into a produced asset account (AN11), a non-renewable natural resource account (AN321), or the renewable energy potential account (AN322), the values of which must not be summed because they are recorded in incompatible units (Figure 3.10.1).

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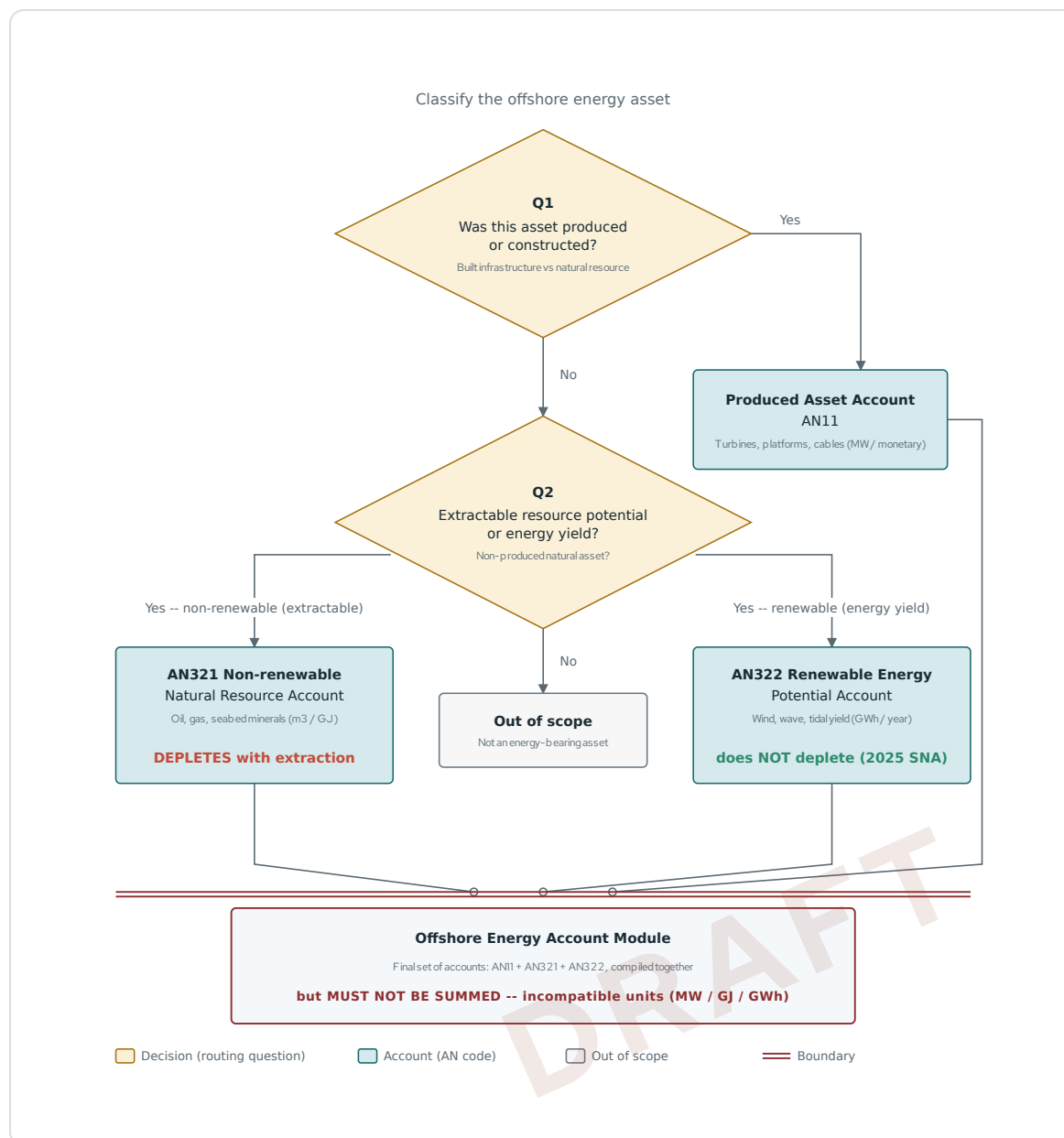


Figure 3.10.1 Two sequential questions route offshore energy assets into produced (AN11) or non-produced natural-resource accounts (AN321 or AN322). Circle docks signal incompatible units -- component values must not be summed into one total.

Source: TG-3.10 draft, §3.1 asset classification logic; SNA 2025 §13.81-13.95 (produced vs non-produced assets); SNA 2025 §13.122-13.139 (AN322 renewable energy potential, 2025 innovation); SEEA CF §5.41-5.62 (mineral and energy resources).

Adapted from: SNA 2025 asset-classification hierarchy (AN11 / AN321 / AN322), restructured as a routing decision tree with a GOAP must-not-be-summed account-boundary annotation per the Figure Style Guide §5.3.

3.1.1 The 2025 SNA classification of mineral and energy resources

¶1 The 2025 SNA establishes a classification of natural resources that provides the foundation for offshore energy accounting⁴. Under this classification, mineral and energy resources (AN32) comprise two primary categories:

1. ¶2

Non-renewable mineral and energy resources (AN321) – consisting of known deposits of oil, natural gas, coal, peat, non-metallic minerals, and metallic minerals that are economically exploitable given current technology and relative prices⁵

2. ¶3

Renewable energy resources (AN322) – comprising the cumulative quantities of kinetic, radiative, and thermal energy recoverable from moving water (hydro and ocean energy), moving air (wind energy), hot underground and surface rock and water (geothermal resources), and incident solar radiation (solar resources)⁶

¶4 For renewable energy resources, the 2025 SNA recommends the following breakdown⁷:

- ¶5 AN3221: Wind energy resources
- ¶6 AN3222: Solar energy resources
- ¶7 AN3223: Water energy resources (including ocean energy)
- ¶8 AN3224: Geothermal energy resources
- ¶9 AN3229: Other renewable energy resources

¶10 This classification enables separate tracking of offshore wind (AN3221) and marine-based water energy including tidal and wave (AN3223) within a coherent statistical framework.

3.1.2 Relationship between renewable energy resources and land

¶1 A central conceptual issue for offshore energy accounting concerns the relationship between renewable energy resources and land (or seabed). The 2025 SNA notes that “although these resources as such are generally not scarce, the exploitation of these resources may be restricted to certain economic agents, for example by needing permissions to put wind turbines on land, or having ownership of particular pieces of land which are highly favourable for exploiting renewable resources”⁸.

¶2 The SEEA CF addresses this issue directly for offshore renewable energy: “It is recognized that some investments in the capture of energy from renewable sources take place offshore (e.g., wind farms in the sea). By convention, the value of income streams from these sources are attributed to the value of land”⁹. Under this convention the value of offshore renewable energy resources is conceptually linked to the value of the seabed or marine areas over which exploitation rights are exercised.

¶3 For practical accounting purposes, this guidance implies that:

1. ¶4 The physical potential for renewable energy generation should be recorded in physical asset accounts
2. ¶5 The monetary value of these resources, where quantified, may be attributed to land/seabed values
3. ¶6 Permits and licences for offshore energy exploitation may themselves constitute separate assets (AN212 – Permits to undertake specific activities)¹⁰

¶7 The treatment of offshore marine areas as “land” for accounting purposes is a convention adopted in the SEEA CF to enable valuation of renewable energy resources in locations where traditional land ownership does not apply. For ocean accounting, this convention should be understood within the broader spatial framework for marine areas established in **TG-0.2 Overview of Relevant Statistical Standards**. In practice, the economic value attributed to seabed areas reflects the present value of expected income streams from energy exploitation, including the effect of any regulatory restrictions on access. Compilers should record the spatial location of these assets using the Basic Spatial Unit (BSU) approach and document the convention applied.

3.1.3 Distinguishing produced assets from natural resources

¶1 Offshore energy accounting requires careful distinction between natural resource assets and the produced assets (fixed capital) used to exploit them. For offshore energy:

- ¶2 **Natural resource assets** include the oil and gas deposits themselves, seabed mineral resources, and the renewable energy potential of offshore locations

- ¶3 **Produced assets** include drilling platforms, pipelines, wind turbines, tidal turbines, substations, and associated infrastructure

¶4 The 2025 SNA emphasises that “the costs of ownership transfer, which are part of fixed capital formation, must be shown separately in the capital account and not as part of the value of the transaction in the non-produced asset”¹¹. This separation ensures that investments in extraction/generation infrastructure are properly distinguished from the underlying natural resources.

¶5 For aquatic resources, a parallel distinction applies between cultivated and natural resources¹². However, for mineral and energy resources, all such resources are classified as non-produced natural resources regardless of the intensity of extraction activity.

3.2 Compilation Procedure

¶1 This section provides a step-by-step procedure for compiling offshore energy accounts, applicable to both renewable and non-renewable energy resources. The procedure follows the general asset account compilation methodology from **TG-3.1 Asset Accounts**, adapted for energy-specific considerations.

Step 1: Define scope and spatial boundaries

¶1 Determine the spatial coverage of offshore energy accounts:

- ¶2 **Marine area definition** – identify the portions of the Exclusive Economic Zone (EEZ), territorial sea, or extended continental shelf where energy resources are located or exploited
- ¶3 **BSU alignment** – ensure offshore energy data can be spatially linked to the Basic Spatial Unit framework used for ocean accounts
- ¶4 **Coordination with terrestrial accounts** – establish boundaries between offshore and onshore energy accounts to avoid double-counting (particularly relevant for nearshore installations)

¶5 Document the spatial conventions applied and any deviations from standard maritime boundaries.

Step 2: Identify data sources

¶1 Compile relevant data sources for physical stocks and flows:

¶2 **For offshore oil and gas:**

- ¶3 Geological surveys and resource assessments from national petroleum agencies
- ¶4 Production data from extractive industries (volumes, locations, field-level details)
- ¶5 Reserve estimates classified according to UNFC-2009 or equivalent frameworks
- ¶6 Seismic survey data and well completion reports

¶7 **For offshore wind:**

- ¶8 Wind resource assessments (wind speed, frequency distributions by location)
- ¶9 Installed capacity registers (turbine count, nameplate capacity, commissioning dates)
- ¶10 Generation data from transmission system operators
- ¶11 Lease area boundaries and development consents

¶12 **For tidal and wave energy:**

- ¶13 Oceanographic data (tidal range, current velocities, wave climate)
- ¶14 Pilot project registrations and demonstration installations
- ¶15 Feasibility studies identifying technically exploitable sites

¶16 **For monetary valuation:**

- ¶17 Energy prices (oil benchmarks, gas prices, electricity wholesale prices)
- ¶18 Operating cost data from industry or regulatory sources
- ¶19 Discount rates from national treasury or central bank guidance
- ¶20 Decommissioning cost estimates and bonding requirements

Step 3: Classify resources by asset category

¶1 Apply the 2025 SNA classification framework:

- ¶2 **Non-renewable resources (AN321)** – offshore oil, natural gas, seabed minerals
- ¶3 **Renewable resources (AN322)** – offshore wind (AN3221), tidal and wave (AN3223)

¶4 For non-renewable resources, further classify by resource class using UNFC-2009:

- ¶5 Class A: Commercially recoverable resources
- ¶6 Class B: Potentially commercially recoverable resources
- ¶7 Class C: Non-commercial and other known deposits

¶8 For renewable resources, classify by technology maturity:

- ¶9 Operational installations (existing generating capacity)
- ¶10 Consented projects (approved for development but not yet built)
- ¶11 Resource potential (technical potential not yet subject to development consent)

Step 4: Compile physical opening stocks

¶1 Record the physical quantity of each asset category at the beginning of the accounting period:

- ¶2 **Oil and gas** – volumes in place (barrels of oil equivalent, cubic metres) by field and resource class
- ¶3 **Offshore wind** – installed capacity (MW) by location, technology type (fixed-bottom, floating), and water depth
- ¶4 **Tidal and wave** – installed capacity (MW) where operational, and theoretical potential (TWh/year) for undeveloped resources

¶5 Ensure consistency with closing stocks from the previous accounting period. Where this is the first compilation, document the method used to establish initial stocks and any assumptions required.

Step 5: Record additions to stock

¶1 Identify and quantify all increases in resource stocks during the accounting period:

¶2 **For non-renewable resources:**

- ¶3 **Discoveries** – new fields identified through exploration
- ¶4 **Upward reappraisals** – revisions increasing estimated reserves based on improved geological knowledge
- ¶5 **Reclassifications** – transfers from Class B to Class A as economic conditions or project status changes

¶6 **For renewable resources:**

- ¶7 **New installations** – capacity additions from newly commissioned projects
- ¶8 **Resource assessments** – improved estimates of technical potential based on enhanced oceanographic data
- ¶9 **Technology advances** – increases in exploitable potential due to technological improvements (e.g., deeper water turbine foundations)

Step 6: Record reductions in stock

¶1 Identify and quantify all decreases in resource stocks during the accounting period:

¶2 **For non-renewable resources:**

- ¶3 **Extraction** – volumes of oil and gas produced and removed from deposits
- ¶4 **Downward reappraisals** – revisions reducing estimated reserves
- ¶5 **Reclassifications** – transfers from Class A to Class B or C due to changing economic conditions
- ¶6 **Catastrophic losses** – rare for subsurface deposits but may include uncontrolled well events

¶7 **For renewable resources:**

- ¶8 **Decommissioning** – removal of installed capacity at end of operational life
- ¶9 **Catastrophic losses** – destruction of turbines due to extreme weather or marine accidents
- ¶10 **Downward reassessments** – reductions in estimated technical potential due to spatial conflicts (e.g., designation of marine protected areas precluding energy development)

¶11 Note that for renewable resources, there is no equivalent to “extraction” as a stock reduction, since the energy source itself is not depleted by use¹³.

Step 7: Calculate physical closing stocks

¶1 Apply the asset account identity:

¶2 **Closing stock = Opening stock + Total additions – Total reductions**

¶3 Verify that the calculated closing stock is consistent with independent assessments where available. Investigate and reconcile any material discrepancies.

Step 8: Estimate monetary values

¶1 Apply valuation methods appropriate to each asset type, following **TG-2.4 Environmental (including Ecosystem) Goods and Services** Section 3.10 and **TG-3.1 Asset Accounts** Section 3.3:

¶2 **For commercially recoverable oil and gas (Class A):**

¶3 Use the net present value (NPV) approach based on expected resource rents:

¶4 $NPV = \sum (\text{Resource rent in year } t) / (1 + \text{discount rate})^t$

¶5 Where resource rent = Revenue – Operating costs – User costs of produced capital – Return to produced capital

¶6 Key parameters:

- ¶7 Expected extraction profile over remaining field life
- ¶8 Oil and gas price assumptions (consider long-term price paths, not spot prices)
- ¶9 Operating costs per unit extracted
- ¶10 Capital costs and depreciation of platforms, pipelines, processing facilities
- ¶11 Discount rate (typically national treasury bond rate plus risk premium)

¶12 **For offshore wind:**

¶13 Estimate NPV based on expected electricity generation and power prices:

¶14 $NPV = \sum [(\text{Generation} \times \text{Electricity price}) - \text{Operating costs} - \text{User costs of turbines}] / (1 + \text{discount rate})^t$

¶15 Key parameters:

- ¶16 Expected generation profile (capacity factor typically 35–50% for offshore wind)
- ¶17 Electricity price path (may reflect long-term power purchase agreements)
- ¶18 Operating and maintenance costs
- ¶19 Asset life (typically 25–30 years for offshore wind)

¶20 Where market transactions in offshore wind lease rights exist, these may provide direct indicators of resource value.

¶21 **For tidal and wave:**

¶22 Given limited commercial deployment, monetary valuation may not be feasible. Record physical potential and flag for future valuation as technologies mature.

Step 9: Allocate assets between government and extractors

¶1 For non-renewable resources subject to government ownership and licensing arrangements, allocate asset values between:

- ¶2 **Government** – reflecting ownership of in situ resources and receipt of resource rents through royalties, production shares, or resource taxes
- ¶3 **Extractors** – reflecting their share of resource rents after government take

¶4 Follow the methodology in SEEA CF paragraphs 5.216–5.224 and document the fiscal regime applied (concession, production sharing, service contract, or hybrid)¹⁴.

¶5 For renewable resources on the seabed, allocation follows the same principles where lease payments or revenue shares apply.

Step 10: Compile monetary asset accounts

¶1 Construct monetary asset accounts parallel to physical accounts, recording:

- ¶2 Opening stock (monetary value)
- ¶3 Revaluations (due to price changes)
- ¶4 Other changes in volume (discoveries, extractions, reappraisals, reclassifications valued at current prices)
- ¶5 Closing stock (monetary value)

¶6 Ensure that monetary depletion (extraction valued at resource price in situ) is recorded and reported as a reduction in net domestic product following 2025 SNA treatment¹⁵.

Step 11: Integrate with economic and emissions accounts

¶1 Link offshore energy accounts to related accounts:

¶2 **Upward linkages:**

- ¶3 Feed offshore energy production data into ocean economy GDP calculations (**TG-2.5 Structure and Function of the Ocean Economy**)
- ¶4 Provide asset values for natural capital balance sheets in ocean budgets (**TG-1.1 OA and National Budget Processes**)
- ¶5 Support energy transition indicators (**TG-2.1 Aggregate Biophysical Indicators of Environmental State**)

¶6 **Downward linkages:**

- ¶7 Source underlying data from administrative registers (**TG-4.3 Administrative Data Sources**)
- ¶8 Quality-assure estimates using the national statistical agency's own validation rules, documented as set out in **TG-0.7 Quality Assurance Principles**

¶9 **Lateral linkages:**

- ¶10 Allocate greenhouse gas emissions from oil and gas extraction to marine spatial units (**TG-3.4 Flows from Economy to Environment**)
- ¶11 Reconcile with broader economic activity accounts (**TG-3.3 Economic Activity Relevant to the Ocean**)

3.3 Offshore Wind

3.3.1 Scope and measurement boundary

¶1 Offshore wind energy has expanded in recent decades, with installed capacity growing in major maritime economies. For ocean accounting purposes, the measurement scope encompasses:

- ¶2 **Physical resource potential** – the theoretical and technical potential for wind energy generation at offshore locations, measured in terms of wind speed, consistency, and site characteristics
- ¶3 **Installed capacity** – the maximum power output of installed wind generation equipment (measured in megawatts, MW)
- ¶4 **Actual generation** – electricity produced from offshore wind (measured in megawatt-hours, MWh, or equivalent energy units such as terajoules, TJ)
- ¶5 **Infrastructure assets** – turbines, foundations, substations, cables, and other produced assets

¶6 The SEEA Energy framework provides that “renewable sources of energy such as wind, solar and hydropower are not considered physical assets” in the sense that “there is no physical stock of these types of renewable sources of energy that can be used up or sold”¹⁶. The 2025 SNA’s recognition of renewable energy resources (AN322) establishes a revised basis for recording these resources as assets where economic ownership can be established. In practical terms, the asset recognised under AN322 is best understood as the right to exploit the renewable energy potential at a given location, rather than the wind resource itself. Under this interpretation the SEEA Energy position holds that the wind as a physical phenomenon is inexhaustible and cannot be “used up”, whilst the 2025 SNA recognises that economic rights over favourable locations have measurable value. Compilers should record the physical resource potential (energy generation capacity) in physical accounts whilst attributing the monetary value to the combination of locational advantage and exploitation rights.

3.3.2 Physical accounts for offshore wind

¶1 Physical accounts for offshore wind should record:

¶2 **Stock measures (at a point in time):**

- ¶3 Installed capacity by location, technology type, and water depth category
- ¶4 Number of turbines and average capacity
- ¶5 Geographic distribution within exclusive economic zone

¶6 **Flow measures (during accounting period):**

- ¶7 Capacity additions (new installations)
- ¶8 Capacity reductions (decommissioned units)
- ¶9 Electricity generation
- ¶10 Capacity utilisation rates

¶11 Table 2 provides an example structure for a physical account of offshore wind capacity. The structure follows the general asset account format established in **TG-3.1 Asset Accounts**, adapted for renewable energy infrastructure. Compilers may disaggregate further by water depth category (shallow, transitional, deep), distance from shore, or marine planning area as appropriate for national circumstances.

¶12 *Table 2: Physical account for offshore wind capacity (MW)*

Item	Fixed-bottom	Floating	Total
Opening stock of installed capacity	5,000	200	5,200

Item	Fixed-bottom	Floating	Total
Additions during period			
- New installations	800	100	900
Reductions during period			
- Decommissioning	50	0	50
- Catastrophic losses	0	0	0
Closing stock of installed capacity	5,750	300	6,050

3.3.3 Monetary valuation of offshore wind resources

¶1 The monetary value of offshore wind resources can be estimated using the net present value (NPV) approach¹⁷. The resource rent attributable to offshore wind comprises the income remaining after deducting all costs including:

- ¶2 Operating and maintenance costs
- ¶3 User costs of produced assets (depreciation of turbines, foundations, cables)
- ¶4 Return to produced capital
- ¶5 Any payments to government for exploitation rights

¶6 The SEEA CF notes that “opportunities to earn resource rent based on sources like wind, solar and geothermal should be expected to be reflected in the price of land”¹⁸. For offshore wind, this implies that the value of seabed lease rights or development permits may provide market-based indicators of resource value.

¶7 Key considerations for NPV calculations include:

1. ¶8 **Expected generation profile** – accounting for capacity factors that vary by location and technology
2. ¶9 **Electricity price assumptions** – including long-term power purchase agreements where applicable
3. ¶10 **Operating life** – typically 25–30 years for offshore wind installations
4. ¶11 **Discount rate** – consistent with rates applied to other natural resources in national accounts

¶12 For worked examples applying the NPV approach to offshore energy resources, see Section 3.7 below and **TG-6.9 Offshore Energy Thematic Methods**.

3.3.4 Spatial considerations

¶1 Offshore wind development occurs within designated lease areas typically located within the exclusive economic zone (EEZ). The spatial framework for ocean accounts should enable linking of offshore wind data to specific marine areas using the Basic Spatial Unit (BSU) approach¹⁹.

¶2 Spatial data requirements include:

- ¶3 Lease area boundaries and their relationship to statistical marine areas
- ¶4 Water depth and seabed characteristics
- ¶5 Proximity to grid connection points
- ¶6 Overlap or interaction with other marine uses (shipping lanes, fishing grounds, marine protected areas)

¶7 Spatial data support analysis of interactions between offshore wind and marine ecosystems, informing integrated ocean management decisions. Cross-reference to **TG-3.3 Economic Activity Relevant to the Ocean** for the classification of offshore wind as an ocean economy activity, and **TG-3.4 Flows from Economy to Environment** for recording any environmental pressures associated with wind farm construction and operation.

3.4 Tidal and Wave Energy

3.4.1 Classification and measurement scope

¶1 Tidal and wave energy represent emerging renewable energy technologies that capture energy from ocean water movement. Under the 2025 SNA classification, these resources fall within water energy resources (AN3223)²⁰.

¶2 The SEEA Central Framework and FDES define renewable energy from marine sources to include²¹:

- ¶3 **Tidal energy** – energy captured from tidal flows and tidal range (barrage systems)
- ¶4 **Wave energy** – energy captured from surface waves
- ¶5 **Ocean thermal energy conversion (OTEC)** – energy derived from temperature differences between surface and deep ocean waters
- ¶6 **Salinity gradient energy** – energy from salinity differences between freshwater and seawater

¶7 These technologies are at varying stages of commercial development, with tidal stream and tidal barrage representing the most mature approaches. Wave energy technologies remain largely at demonstration stage in most jurisdictions. Accordingly, guidance for tidal and wave energy follows the same accounting principles as offshore wind, whilst recognising that data availability will be more limited and that compilation methods may need to accommodate fast-changing technologies. As marine renewable energy technologies mature and deployment scales increase, this section may be expanded in future revisions of this Circular to provide more detailed guidance on measurement methods and accounting treatments specific to each technology type.

3.4.2 Physical accounts for tidal and wave energy

¶1 Physical accounts for tidal and wave energy should follow the same structure as offshore wind, recording:

¶2 **Stock measures:**

- ¶3 Installed capacity by technology type (tidal stream, tidal range, wave)
- ¶4 Location and characteristics of installations

¶5 **Flow measures:**

- ¶6 Energy generation during accounting period
- ¶7 Capacity additions and reductions

¶8 Given the early stage of deployment, many countries will have zero or minimal entries for tidal and wave energy capacity. Establishing the accounting framework now nonetheless allows tracking as these technologies mature.

3.4.3 Resource assessment and potential

¶1 Unlike wind resources which can be assessed through established meteorological methods, tidal and wave energy potential requires oceanographic measurement of:

- ¶2 Tidal range and current velocities at potential sites
- ¶3 Wave height, period, and direction statistics
- ¶4 Seasonal and inter-annual variability

¶5 These assessments provide the physical basis for understanding exploitable resources, analogous to resource classification for mineral deposits. The three-class framework used for mineral resources in SEEA Energy (commercially recoverable, potentially commercially recoverable, non-commercial)²² could be adapted for emerging marine renewable resources to distinguish sites by development readiness.

3.5 Offshore Oil and Gas

3.5.1 Asset classification framework

¶1 Offshore oil and natural gas deposits are classified as non-renewable mineral and energy resources (AN321) within the 2025 SNA framework²³. The SEEA Central Framework and SEEA Energy provide detailed guidance on asset accounts for these resources, based on the United Nations Framework Classification for Resources (UNFC-2009)²⁴.

¶2 The UNFC categorises mineral and energy resources according to three criteria:

- ¶3 **Economic and social viability (E)** – the degree of favourability of conditions for commercial viability
- ¶4 **Field project status and feasibility (F)** – the maturity of development plans
- ¶5 **Geologic knowledge (G)** – the level of certainty regarding quantities

¶6 These criteria define three classes of known deposits²⁵:

- ¶7 **Class A: Commercially recoverable resources** – deposits where extraction has been confirmed economically viable (E1, F1)
- ¶8 **Class B: Potentially commercially recoverable resources** – deposits expected to become economically viable (E2 or E1, F2.1 or F2.2)
- ¶9 **Class C: Non-commercial and other known deposits** – deposits not expected to become viable in the foreseeable future (E3)

¶10 For monetary valuation and balance sheet purposes, only Class A resources are typically valued, as the timing and magnitude of income from Class B and C resources cannot be determined with confidence²⁶.

¶11 Compilers should note that the UNFC has been updated since 2009, with the UNFC-2019 incorporating specifications for renewable energy resources and injection projects alongside the original fossil energy and mineral resource categories. The three-class framework (A, B, C) used in the SEEA Energy remains applicable for non-renewable resources. For renewable energy resources, the UNFC-2019 bridging document provides mapping between UNFC categories and the 2025 SNA asset classification, though practical application to offshore renewables is still developing.

3.5.2 Physical asset accounts

¶1 Physical asset accounts for offshore oil and gas should record opening and closing stocks and all changes during the accounting period²⁷. The standard categories of change include:

¶2 Additions to stock:

- ¶3 Discoveries – new deposits confirmed during the period
- ¶4 Upward reappraisals – revisions based on improved information
- ¶5 Reclassifications – transfers between resource classes

¶6 Reductions in stock:

- ¶7 Extraction – quantities removed from deposits
- ¶8 Catastrophic losses – rare for subsurface resources but may include uncontrolled well events
- ¶9 Downward reappraisals – revisions reducing estimated quantities
- ¶10 Reclassifications – transfers between resource classes

¶11 Table 3 provides an example structure. The format follows the general asset account structure established in **TG-3.1 Asset Accounts**. Compilers should disaggregate by field, marine area, or resource class as appropriate, using the BSU spatial framework to enable integration with other ocean accounts.

¶12 *Table 3: Physical asset account for offshore oil resources (Class A, million barrels)*

Item	Amount
Opening stock of commercially recoverable resources	800
Additions to stock	
– Discoveries	50
– Upward reappraisals	30
– Reclassifications from Class B	20
Total additions	100
Reductions in stock	
– Extraction	40
– Catastrophic losses	0
– Downward reappraisals	10
Total reductions	50
Closing stock of commercially recoverable resources	850

3.5.3 Monetary valuation

¶1 The monetary value of offshore oil and gas resources is estimated using the NPV approach, based on expected future resource rents²⁸. Resource rent represents the surplus income after deducting:

- ¶2 Operating costs of extraction
- ¶3 User costs of produced capital (depreciation plus return)
- ¶4 Costs of mineral exploration and evaluation

¶5 Key considerations include:

¶6 **Price volatility:** Oil and gas prices fluctuate, creating volatility in resource rent estimates. The SEEA Energy recommends using smoothed price series or proxies (e.g., moving averages) to derive unit resource rents for projection²⁹.

¶7 **Resource life:** The resource life (stock divided by extraction rate) determines the period over which resource rents are discounted. At current extraction rates, this may range from under 10 years to several decades depending on field characteristics³⁰.

¶8 **Depletion:** For non-renewable resources, physical depletion equals extraction. In the Ocean Accounts Framework (TG-0.1), this corresponds to Edge E9 (SG3 → FG1), where extraction of environmental stocks feeds economic production flows. Monetary depletion is calculated by multiplying physical extraction by the resource price in situ³¹. The 2025 SNA treats depletion as a cost of production alongside depreciation, supporting depletion-adjusted measures of income³².

3.5.4 Allocation of income and assets

¶1 Offshore oil and gas resources are typically subject to government ownership, with extraction conducted by licensees who pay various forms of rent (royalties, production sharing, resource taxes). The SEEA CF provides guidance on allocating assets and depletion between government and extractors based on their respective shares of resource rent³³.

¶2 The recommended treatment records:

- ¶3 Total depletion in the production account of the extractor
- ¶4 Rent payments from extractor to government in the allocation of primary income account
- ¶5 A balancing entry “depletion borne by government” reflecting the government’s share of depletion

¶6 This ensures that depletion-adjusted measures correctly attribute the cost of resource use to both extractors and resource owners. The allocation of assets and depletion between government

and extractors varies by jurisdiction depending on the fiscal regime applied to offshore resources (royalties, production sharing agreements, resource rent taxes, or hybrid systems). For detailed treatment of asset allocation methodology, see **TG-3.1 Asset Accounts**. Compilers should document the national fiscal arrangements and allocation methodology applied in their compilations.

3.5.5 Greenhouse gas implications

¶1 Offshore oil and gas extraction generates greenhouse gas emissions through:

- ¶2 Combustion of fuels for extraction operations
- ¶3 Flaring and venting of associated gas
- ¶4 Fugitive emissions from equipment and processes
- ¶5 Downstream emissions from the use of extracted products

¶6 These emissions should be recorded in emissions accounts following the guidance in **TG-3.4 Flows from Economy to Environment**. In the Ocean Accounts Framework (TG-0.1), these residual flows correspond to Edge E1 (FG1→SG3), recording pollution and emissions from economic production to the marine and atmospheric environment. The spatial attribution of emissions to marine areas enables analysis of ocean-based contributions to national greenhouse gas inventories.

¶7 As the energy transition proceeds, offshore oil and gas accounts need to be read alongside renewable energy accounts. Tracking both within a consistent framework supports analysis of energy system transformation and its implications for ocean economies.

3.6 Decommissioning Considerations

3.6.1 Framework for decommissioning costs

¶1 Offshore energy installations require decommissioning at end of operating life, with potential environmental remediation obligations. The SEEA CF provides detailed guidance on accounting for these costs, distinguishing between³⁴:

- ¶2 **Terminal costs** – costs anticipated during production that can be provided for over the asset's life
- ¶3 **Remedial costs** – costs incurred after operations cease, often by parties other than the original operator

¶4 Terminal costs should be anticipated and written off over the operating life of the associated fixed asset through consumption of fixed capital (depreciation)³⁵. This treatment ensures that net income measures properly reflect the full costs of resource extraction, including future restoration obligations.

¶5 The 2025 SNA defines terminal costs as "Costs incurred on the disposal of an asset or at the end of its service life. These cover, for example, de-installation and decommissioning costs (in case of oil rigs or nuclear power stations) or rehabilitation costs of land sites"³⁶.

3.6.2 Application to offshore oil and gas

¶1 For offshore oil and gas platforms, decommissioning typically involves:

- ¶2 Plugging and abandonment of wells
- ¶3 Removal of platforms and surface facilities
- ¶4 Removal or stabilisation of pipelines
- ¶5 Environmental remediation of the site

¶6 The SEEA CF notes that for oil rigs, the original owner may no longer be an active business when decommissioning is required, creating challenges for cost recovery³⁷. The accounting treatment provides for several scenarios:

1. ¶7 **Terminal costs exceed accumulated provision** – the shortfall is written off as depreciation when incurred
2. ¶8 **No provision made** – terminal costs are treated as gross fixed capital formation and immediately depreciated
3. ¶9 **Terminal costs not incurred by operator** – subsequent costs by other parties are treated as remedial costs

¶10 In practice, offshore energy decommissioning often involves complex ownership structures, including joint ventures and transfers of ownership during the asset's life. While the accounting principles above apply regardless of ownership structure, compilers should document the ownership arrangements at the time of decommissioning and allocate costs to the responsible economic units accordingly. Where decommissioning obligations transfer with asset ownership, the present value of future decommissioning costs effectively reduces the transfer price of the asset.

3.6.3 Decommissioning of renewable energy infrastructure

¶1 Offshore wind and other renewable energy infrastructure also requires end-of-life management, though the obligations may differ from oil and gas:

- ¶2 Removal of turbines, foundations, and cables
- ¶3 Restoration of seabed conditions where required
- ¶4 Potential for repowering (replacement with new equipment) rather than full decommissioning

¶5 The same framework applies: anticipated terminal costs should be provided for through depreciation of the associated fixed assets over their operating lives. This ensures consistency between conventional and renewable offshore energy accounting.

3.6.4 Environmental and ecosystem considerations

¶1 Decommissioning decisions have implications for marine ecosystems that may colonise offshore structures during their operating lives. Platform structures and turbine foundations can function as artificial reefs, supporting marine biodiversity³⁸. Accounting for these ecosystem effects requires integration with ecosystem accounting approaches covered in **TG-3.1 Asset Accounts** and the broader ecosystem extent and condition accounts described in SEEA Ecosystem Accounting.

¶2 “Rigs-to-reefs” programmes that convert decommissioned platforms to permanent artificial reefs represent a transfer of assets rather than full removal. The accounting treatment should reflect:

- ¶3 Reduction in produced asset value (platform as industrial asset)
- ¶4 Potential creation or enhancement of ecosystem asset value (artificial reef)
- ¶5 Any ongoing monitoring or management obligations

¶6 Whether a rigs-to-reefs structure qualifies as an ecosystem asset depends on whether it meets the SEEA EA criteria for ecosystem extent and condition: the structure must support a self-sustaining biological community over a defined spatial area and provide measurable ecosystem services³⁹. Where these criteria are met, the transition from produced asset to ecosystem asset represents a reclassification that should be recorded in the other changes in volume of assets account. Compilers should coordinate with ecosystem accounting teams (see SEEA EA Chapter 4 on ecosystem extent accounts) and document the criteria applied.

3.7 Worked Example: Coastal State Offshore Energy Accounts

¶1 This section presents a worked example demonstrating the compilation of offshore energy accounts for a hypothetical Coastal State. The example uses synthetic data to illustrate the full workflow from data collection through to integrated energy transition indicators. The example covers a five-year period (2020–2024) during which Coastal State transitions from offshore oil and gas dominance to renewable energy deployment.

3.7.1 Context and policy questions

¶1 Coastal State context:

- ¶2 EEZ area: 150,000 km²
- ¶3 Mature offshore oil and gas sector with declining reserves
- ¶4 Offshore wind expansion target: 10 GW by 2030
- ¶5 Emerging tidal energy pilot projects in high-current straits
- ¶6 Policy goal: Net zero carbon by 2050 with offshore renewables providing 40% of electricity

¶7 Key policy questions informing account design:

1. ¶8 What is the rate of depletion of offshore oil and gas reserves, and when will reserves be exhausted at current extraction rates?
2. ¶9 What is the change in natural capital value as the offshore energy mix shifts from non-renewable to renewable resources?
3. ¶10 What is the contribution of offshore energy to national GDP when adjusted for resource depletion?
4. ¶11 How much has offshore renewable energy capacity expanded, and is the pace sufficient to meet 2030 targets?

3.7.2 Physical accounts: Offshore oil (Class A)

¶1 Table 4: Physical asset account for offshore oil (Class A), 2024 (million barrels)

Item	Amount
Opening stock (1 Jan 2024)	920
Additions to stock	
- Discoveries	15
- Upward reappraisals	25
- Reclassifications from Class B	10
Total additions	50
Reductions in stock	
- Extraction	65
- Downward reappraisals	5
- Reclassifications to Class C	0
Total reductions	70
Closing stock (31 Dec 2024)	900
Memo: Resource life at current extraction rate	13.8 years

¶2 **Interpretation:** Offshore oil reserves declined by 20 million barrels net during 2024. At the current extraction rate of 65 million barrels per year, remaining reserves will be exhausted in approximately 14 years ($900 \div 65 = 13.8$). This signals the need for economic diversification as oil reserves decline.

3.7.3 Physical accounts: Offshore wind

¶1 Table 5: Physical asset account for offshore wind capacity, 2024 (MW)

Item	Fixed-bottom	Floating	Total
Opening stock (1 Jan 2024)	4,200	150	4,350
Additions to stock			
- New installations	950	250	1,200

Item	Fixed-bottom	Floating	Total
- Upward reassessments	0	0	0
Total additions	950	250	1,200
Reductions in stock			
- Decommissioning	80	0	80
- Catastrophic losses	0	0	0
Total reductions	80	0	80
Closing stock (31 Dec 2024)	5,070	400	5,470
Memo: Annual generation (GWh)	18,250	1,440	19,690
Capacity factor	41%	41%	41%

¶2 **Interpretation:** Offshore wind capacity increased by 1,120 MW net during 2024, representing 25% growth. Total installed capacity of 5,470 MW is 55% of the 2030 target (10,000 MW), requiring continued expansion at approximately 750 MW per year to reach the target. Capacity factor of 41% is consistent with international benchmarks for offshore wind.

3.7.4 Monetary valuation: Offshore oil

¶1 Table 6: Monetary asset account for offshore oil (Class A), 2024 (million USD)

Item	Amount
Opening stock (1 Jan 2024)	27,600
Additions to stock	
- Discoveries	450
- Upward reappraisals	750
- Reclassifications from Class B	300
Total additions	1,500
Reductions in stock	
- Extraction (depletion)	1,950
- Downward reappraisals	150
Total reductions	2,100
Revaluations	200
Closing stock (31 Dec 2024)	27,200

¶2 Valuation assumptions:

- ¶3 Oil price in situ: USD 30 per barrel (world oil price USD 75/barrel minus extraction costs USD 30/barrel, user costs USD 15/barrel)
- ¶4 Discount rate: 7% real
- ¶5 Average resource life: 14 years
- ¶6 Resource rent calculation follows SEEA CF para. 5.194-5.213

¶7 **Interpretation:** The monetary value of offshore oil reserves declined by USD 400 million during 2024. Depletion of USD 1,950 million represents consumption of natural capital that should be deducted from GDP to calculate depletion-adjusted net domestic product (NDP). Price revaluations added USD 200 million due to strengthening of long-term oil price expectations.

3.7.5 Monetary valuation: Offshore wind

¶1 Table 7: Monetary asset account for offshore wind resources, 2024 (million USD)

Item	Amount
Opening stock (1 Jan 2024)	8,200
Additions to stock	
– New installations	2,640
– Reassessments	0
Total additions	2,640
Reductions in stock	
– Decommissioning	80
Total reductions	80
Revaluations	420
Closing stock (31 Dec 2024)	11,180

¶2 Valuation assumptions:

- ¶3 Average resource rent per MW of capacity: USD 2.2 million (based on NPV of expected generation over 25-year asset life)
- ¶4 Electricity price: USD 65/MWh (long-term power purchase agreement price)
- ¶5 Operating costs: USD 25/MWh
- ¶6 Capacity factor: 41%
- ¶7 Discount rate: 7% real
- ¶8 Resource rent calculation reflects post-2025 SNA recognition of renewable energy resources as assets (AN3221)

¶9 **Interpretation:** The value of offshore wind resources increased by USD 2,980 million during 2024, driven by capacity additions (1,200 MW × USD 2.2 million/MW = USD 2,640 million) and revaluations due to improved long-term electricity price outlook (USD 420 million). Unlike oil reserves, there is no depletion of renewable energy resources since the wind itself is not consumed.

3.7.6 Integrated energy transition indicators

¶1 Table 8: Coastal State offshore energy transition dashboard, 2020-2024

Indicator	2020	2021	2022	2023	2024
Physical stocks					
Offshore oil reserves (million barrels)	1,050	1,020	980	920	900
Offshore wind capacity (MW)	2,100	2,800	3,600	4,350	5,470
Monetary values					
Oil asset value (million USD)	31,500	30,600	29,400	27,600	27,200
Wind asset value (million USD)	3,800	5,040	6,480	8,200	11,180
Total offshore energy asset value	35,300	35,640	35,880	35,800	38,380
Energy production					
Oil production (million barrels)	60	60	62	64	65
Wind generation (GWh)	7,560	10,080	12,960	15,660	19,690
Economic indicators					
Oil depletion (million USD)	1,800	1,800	1,860	1,920	1,950
Offshore energy contribution to GDP (million USD)	4,200	4,350	4,530	4,740	5,010
Depletion-adjusted offshore GDP (million USD)	2,400	2,550	2,670	2,820	3,060
Transition metrics					
Renewable share of offshore energy assets (%)	11%	14%	18%	23%	29%

Indicator	2020	2021	2022	2023	2024
Renewable share of offshore energy production (%)	8%	11%	14%	16%	20%

¶12 Key insights from integrated accounts:

1. ¶13

Asset composition shift: The renewable share of offshore energy assets increased from 11% in 2020 to 29% in 2024. Oil nonetheless still accounts for 71% of asset value.

2. ¶14

Depletion impact on NDP: Oil depletion averaged USD 1,900 million per year over 2020–2024. Deduction of depletion reduces offshore energy's contribution to GDP by 41% on average over 2020–2024 (from USD 5,010 million to USD 3,060 million in 2024, a 39% reduction in 2024 specifically). This adjustment reveals that conventional GDP overstates sustainable income from offshore energy by not accounting for resource depletion.

3. ¶15

Pace toward 2030 targets: Offshore wind capacity grew from 2,100 MW in 2020 to 5,470 MW in 2024 (average addition of 842 MW/year). To reach the 10,000 MW target by 2030 requires adding 4,530 MW over six years, or 755 MW/year. The current pace is slightly above target, suggesting the 2030 goal is achievable.

4. ¶16

Total offshore energy wealth: Despite oil depletion, total offshore energy asset value increased from USD 35,300 million (2020) to USD 38,380 million (2024), driven by renewable energy expansion. The figures indicate that the energy transition can maintain or increase natural capital value even as fossil resources are depleted.

3.7.7 Cross-stack integration

¶1 The offshore energy accounts developed in this example feed into broader ocean accounting and policy frameworks:

¶12 Upward to policy (Section 1 circulars):

- ¶13 **TG-1.1 National Ocean Budgets** – Total offshore energy asset value (USD 38.4 billion in 2024) appears on the ocean natural capital balance sheet, informing budget allocation decisions
- ¶14 **TG-2.5 Structure and Function of the Ocean Economy** – Offshore energy contribution to ocean GDP (USD 5.0 billion gross, USD 3.1 billion depletion-adjusted) contributes to measuring ocean economy size
- ¶15 **TG-2.1 Aggregate Biophysical Indicators of Environmental State** – Energy transition metrics (renewable share of assets, renewable share of production) track progress toward net zero targets

¶16 Downward to data (Section 4 circulars):

- ¶17 **TG-4.3 Administrative Data Sources** – Oil production data sourced from petroleum licensing authority, and offshore wind capacity from transmission system operator registers
- ¶18 **TG-4.1 Remote Sensing and Geospatial Data** – Lease area boundaries and BSU assignments enable spatial disaggregation of energy accounts

¶19 Lateral to other accounts (Section 3 circulars):

- ¶10 **TG-3.3 Economic Activity Relevant to the Ocean** – Offshore oil extraction (ISIC 0610) and offshore wind generation (ISIC 3510) classified within ocean economy
- ¶11 **TG-3.4 Flows from Economy to Environment** – Oil and gas extraction generated 4.2 million tonnes CO₂-equivalent emissions in 2024, attributed to marine spatial units where platforms operate

Implementation Considerations

¶1 For minimum institutional capacity, data infrastructure, and human skills requirements for compiling these accounts, see [TG-0.8 Implementation Readiness Assessment](#). For guidance on adapting these methods to sub-national scales, see [TG-3.11 Sub-National Ocean Accounts](#).

4. Acknowledgements

¶1 **Authors:** [To be confirmed]

¶2 **Reviewers:** [To be confirmed]

5. References

1. ¶1 United Nations. (2025). *System of National Accounts 2025*, para. 11.200. Renewable energy resources (AN322) are formally recognised as assets “consisting of energy resources which comprise the cumulative quantities of kinetic, radiative and thermal energy recoverable from moving water (hydro and ocean energy), moving air (wind energy), hot underground and surface rock and water (geothermal resources) and incident solar radiation (solar resources).”
2. ¶2 2025 SNA, para. 1.25: “Natural resources are identified as a separate category within the asset classification, and renewable energy resources are explicitly recognised.”
3. ¶3 United Nations. (2019). *System of Environmental-Economic Accounting for Energy (SEEA Energy)*, para. 5.8: “In SEEA-Energy, renewable sources of energy such as wind, solar and hydropower are not considered physical assets. ... [T]here is no physical stock of these types of renewable sources of energy that can be used up or sold.”
4. ¶4 2025 SNA, para. 11.182: “In the integrated framework of national accounts, natural resources are broken down into five asset categories: (i) land; (ii) mineral and energy resources; (iii) biological resources; (iv) water resources; and (v) other natural resources.”
5. ¶5 2025 SNA, para. 11.199: “The first group of mineral and energy resources consists of non-renewable mineral and energy reserves (AN321) which consist of known deposits of non-renewable oil resources, natural gas resources, coal and peat resources, non-metallic minerals and metallic minerals located on or below the Earth’s surface that are economically exploitable, given current technology and relative prices.”
6. ¶6 2025 SNA, para. 11.200; see also Glossary entry for “Renewable energy resources” (AN322).
7. ¶7 2025 SNA, para. 11.202.
8. ¶8 2025 SNA, para. 11.200.
9. ¶9 United Nations. (2014). *System of Environmental-Economic Accounting 2012–Central Framework*, para. 5.231.
0. ¶10 2025 SNA, para. 11.165–11.168; see also Chapter 27 on Contracts, leases, licenses and permits.
1. ¶11 2025 SNA, para. 11.192.
2. ¶12 SEEA Central Framework (2012), paras. 5.407–5.410; see also TG-3.1 for the distinction between cultivated and natural aquatic resources.
3. ¶13 SEEA Energy (2019), para. 5.8; SEEA CF (2012), para. 2.50: “Energy from renewable sources represents a special case, inasmuch as renewable sources used in the generation of energy are different from non-renewable natural inputs, such as oil, as regards the manner in which they are exhausted.”
4. ¶14 SEEA Central Framework (2012), paras. 5.216–5.224.
5. ¶15 2025 SNA, Annex 4, para. A4.59.
6. ¶16 SEEA Energy (2019), para. 5.8.
7. ¶17 SEEA Central Framework (2012), Section 5.4; SEEA Energy (2019), Chapter VI.
8. ¶18 SEEA Central Framework (2012), para. 5.228.
9. ¶19 See TG-0.1 for the Basic Spatial Unit framework for Ocean Accounts.
0. ¶20 2025 SNA classification AN3223 (Water energy resources).
1. ¶21 United Nations. (2017). *Framework for the Development of Environment Statistics (FDES 2013)*, para. 3.95: “Renewable energy includes solar (photovoltaic and thermal), hydroelectric, geothermal, tidal action, wave action, marine (non-tidal currents, temperature differences and salinity gradients), wind and biomass energy.”
2. ¶22 SEEA Energy (2019), Table 5.1, based on UNFC-2009 categories.
3. ¶23 2025 SNA, para. 11.199.
4. ¶24 SEEA Energy (2019), paras. 5.11–5.12; UNECE (2010), *United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009*.
5. ¶25 SEEA Energy (2019), paras. 5.14–5.15; Table 5.1.
6. ¶26 SEEA Central Framework (2012), para. 5.193: “It is therefore recommended that valuation be undertaken only for deposits in class A: Commercially recoverable resources.”
7. ¶27 SEEA Energy (2019), Table 5.3.
8. ¶28 SEEA Central Framework (2012), para. 5.194: “Because there are few transactions in mineral and energy resources in situ, the valuation of these assets requires the use of NPV approaches.”

9. ¶29 SEEA Central Framework (2012), para. 5.199.
0. ¶30 SEEA Central Framework (2012), paras. 5.212–5.213.
1. ¶31 SEEA Energy (2019), para. 5.29: “In physical terms, the depletion of mineral and energy resources is equal to the quantity of the resource that is extracted.”
2. ¶32 2025 SNA, Annex 4, para. A4.59.
3. ¶33 SEEA Central Framework (2012), paras. 5.216–5.224.
4. ¶34 SEEA Central Framework (2012), paras. 4.194–4.197.
5. ¶35 SEEA Central Framework (2012), paras. 4.200–4.201.
6. ¶36 2025 SNA, Glossary entry for “Terminal costs”.
7. ¶37 SEEA Central Framework (2012), para. 4.202.
8. ¶38 Bull, A.S. and Love, M.S. (2020). ‘Worldwide oil and gas platform decommissioning: A review of practices and reefing options’. *Ocean and Coastal Management* 168: 274–306.
9. ¶39 United Nations. (2021). *System of Environmental-Economic Accounting–Ecosystem Accounting (SEEA EA)*, Chapter 3, paras. 3.13–3.18, on criteria for delineating ecosystem assets.

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