Reclassifying Reservoir Water as a Produced Asset: Implications for the Hydroelectricity Industry

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Abstract

The hydroelectricity industry is a key component of Australia's renewable energy sector, contributing approximately 5–7% of the country's electricity supply. Major projects such as the Snowy Mountains Hydro-Electric Scheme, Wivenhoe Power Station, and Gordon Power Station demonstrate the critical role of water reservoirs in energy generation and storage. Pumped Hydro Energy Storage (PHES) systems, in particular, help stabilise the electricity grid by storing energy during low demand periods and releasing it during peak times.

Currently, under the System of National Accounts (SNA) and the System of Environmental-Economic Accounting (SEEA), water in artificial reservoirs is classified as a non-produced asset. This classification does not fully reflect the substantial human intervention involved in creating and managing these reservoirs. A reclassification of reservoir water as a produced asset—similar to the distinction made between plantation and natural forests—would more accurately represent these economic activities.

While the water supply industry is a key focus of this reclassification effort, this paper outlines the importance of the hydroelectricity industry, which should also be considered due to its heavy reliance on stored water. The Australian Bureau of Statistics (ABS) is currently exploring this issue, and this paper presents findings and recommendations related to this investigation.

Reclassifying reservoir water as a produced asset would expand the physical supply and use tables to include inventory changes and losses such as evaporation and distribution. This change will modify the representation of both the water supply and hydroelectricity industries in the water accounts.

1. Introduction

Australia’s hydroelectricity industry plays a vital role in the country’s renewable energy mix, contributing approximately 5–7% of national electricity supply. Beyond generation, hydroelectric systems—particularly Pumped Hydro Energy Storage (PHES)—are critical for grid stability, enabling energy to be stored during periods of low demand and released during peak times. Central to these systems are artificial reservoirs, which store vast volumes of water and are managed through significant human intervention.

To date, the discussion around reclassifying reservoir water as a produced asset has largely focused on the water supply industry, which manages the majority of Australia’s large reservoirs. This is understandable given the sector’s central role in urban and agricultural water delivery. However, it is equally important to consider the hydroelectricity industry, which also relies heavily on stored water as a key input to production.

Australia has over 500 major dams, many of which are integral to hydroelectric systems. In Tasmania, for example, 44% of dams were constructed specifically for hydroelectricity. The Snowy Mountains Hydro-Electric Scheme—one of the largest engineering projects in the country—includes major reservoirs such as Lake Eucumbene, which alone holds nearly 4.8 million megalitres of water.

The hydroelectricity industry itself is a significant economic contributor, generating $1.9 billion in revenue annually and operating 73 hydro power plants with a combined capacity of over 8,500 MW. These facilities

depend on the active management of water inventories, often involving complex pumping, storage, and release operations that mirror the production processes seen in other industries.

Given this scale and complexity, it is essential that the hydroelectricity sector be included in any reclassification of reservoir water. Doing so would ensure that environmental-economic accounts accurately reflect the full spectrum of human intervention in water management—not just for supply, but also for energy generation and grid stability.

2. Current Accounting Treatment of Reservoir Water

Under the SEEA Central Framework and the SNA, natural resources are classified as either produced or non-produced assets. Produced assets are those that result from human activity and investment—such as buildings, machinery, and cultivated biological resources—while non-produced assets occur naturally and are not significantly altered by human intervention.

Currently, water in artificial reservoirs is treated as a non-produced natural resource, even though the reservoirs themselves are often constructed and maintained through large-scale engineering projects. This treatment is based on the assumption that the water itself remains a natural input, regardless of the infrastructure used to store or manage it.

This classification creates a disconnect between the economic reality of water infrastructure and its statistical representation. It also limits the ability of environmental-economic accounts to fully capture the role of water in sectors like hydroelectricity, where stored water is a key input to production.

2.1 Water Storages in Australia and Hydroelectricity's Contribution

Australia has a vast network of large dams, with over 500 classified as 'large' under international guidelines. These dams serve multiple purposes including water supply, irrigation, flood control, and hydroelectricity. Collectively, they have a total surface water storage capacity exceeding 80,000 gigalitres (GL), making Australia one of the countries with the highest per capita surface water storage capacity globally.

Within this broader infrastructure, hydroelectric dams play a significant role. It is estimated that dams used for hydroelectricity store well over 30,000 GL of water. This includes major schemes such as the Snowy Mountains Hydro-Electric Scheme, which comprises 16 large dams including Lake Eucumbene, and Hydro Tasmania’s extensive network of reservoirs, including Lake Gordon—the largest hydro reservoir in Tasmania with a capacity of over 12,000 GL.

These storages are critical not only for electricity generation but also for energy storage and grid stability. In systems like Pumped Hydro Energy Storage (PHES), water is cycled between reservoirs to store and release energy based on demand. The scale and complexity of these operations underscore the importance of including hydroelectric reservoirs in environmental-economic accounting frameworks.

Recognising the contribution of hydroelectric storages to national water inventories supports more accurate assessments of resource use, infrastructure value, and environmental impact. It also strengthens the case for reclassifying stored water in artificial reservoirs as a produced asset, reflecting the significant human intervention involved in its management and use.

Table 1: Top 10 Hydroelectric Reservoirs in Australia by Volume

Reservoir	State	Dam Name	Capacity (GL)	Primary Uses
Lake Gordon	TAS	Gordon Dam	12,359	Hydroelectricity
Lake Argyle	WA	Ord River Dam	10,763	Irrigation, Hydroelectricity
Lake Eucumbene	NSW	Eucumbene Dam	4,798	Hydroelectricity
Lake Hume	NSW/VIC	Hume Dam	3,046	Irrigation, Hydroelectricity
Dartmouth Reservoir	VIC	Dartmouth Dam	3,056	Irrigation, Hydroelectricity
Lake Eildon	VIC	Eildon Dam	3,391	Irrigation, Hydroelectricity
Blowering Reservoir	NSW	Blowering Dam	1,628	Hydroelectricity, Irrigation
Burdekin Falls Dam	QLD	Burdekin Dam	1,860	Irrigation, Hydroelectricity
Copeton Dam	NSW	Copeton Dam	1,364	Irrigation, Hydroelectricity
Tumut 3 Reservoir	NSW	Tumut 3 Power Station	1,500	Hydroelectricity

3. The Case for Reclassification

There is a growing argument that water stored in artificial reservoirs—particularly those used for energy generation—should be reclassified as a produced asset. This would align with how other managed natural resources are treated. For example, plantation forests are considered produced assets because they are cultivated, harvested, and regenerated through human effort, even though they are composed of natural materials.

Similarly, artificial reservoirs involve significant capital investment in dam construction, pumping systems, and control infrastructure. They require ongoing management of water levels, inflows, and outflows, and operational decisions that directly affect the availability and use of water for economic purposes.

In this context, the water stored in these systems is not simply a passive natural resource—it is actively managed and used as part of a production process. Reclassifying it as a produced asset would better reflect the economic value created through human intervention.

While the water supply industry has been the primary focus of this reclassification effort, the hydroelectricity industry presents an equally compelling case. Hydroelectric operators manage some of the largest and most complex water storage systems in the country. These systems are not only essential for electricity generation but also for energy storage, peak load management, and grid reliability.

4. Implications for the Hydroelectricity Industry

The hydroelectricity industry is uniquely dependent on stored water. In traditional hydroelectric systems, water is released from reservoirs to drive turbines and generate electricity. In Pumped Hydro Energy Storage (PHES) systems, water is pumped to an upper reservoir during periods of low electricity demand and released back down during peak periods, effectively functioning as a battery.

In both cases, the availability and management of stored water are central to the industry's operations. Treating this water as a produced asset would recognise the economic role of water inventories in energy production, allow for the inclusion of inventory changes in environmental-economic accounts, and improve the representation of losses such as evaporation, seepage, and operational inefficiencies.

This would enhance the accuracy of both physical supply and use tables (PSUTs) and monetary accounts, providing a clearer picture of the hydroelectricity industry's resource use and environmental impact. Moreover, it would allow for better integration of water and energy statistics, supporting more informed decision-making in areas such as energy transition planning, climate resilience, infrastructure investment, and natural capital valuation.

5. Accounting and Statistical Impacts

Reclassifying reservoir water as a produced asset would have several implications for environmental-economic accounting. These changes would enhance the accuracy and relevance of water and energy statistics, particularly in the context of the hydroelectricity industry.

5.1 Physical Supply and Use Tables (PSUTs)

Reclassifying water stored in artificial reservoirs as a produced asset would require an expansion of the physical supply and use tables (PSUTs) to more accurately reflect the production, storage, and use of water. In the water supply industry, this has led to a proposed split between water storage and water distribution activities, with corresponding water products—stored water and distributed water (both CPC 1800)—recorded separately in the rows.

A similar structure can be applied to the hydroelectricity industry, which relies heavily on stored water as a production input. In this expanded PSUT framework:

- The hydroelectricity industry would appear as a **user of stored water**, drawing from reservoir inventories to generate electricity.
- In Pumped Hydro Energy Storage (PHES) systems, the industry may also act as a **producer of stored water**, when water is pumped back into upper reservoirs—mirroring the cyclical nature of energy storage.
- **Inventory changes** in hydro reservoirs would be recorded, capturing seasonal or operational fluctuations in water levels.
- **Losses**, such as evaporation or seepage, would be explicitly shown as outflows, improving transparency in water balances.
- Water entering the reservoir from the environment (e.g. rainfall, river inflows) would be recorded as **environmental supply**, while the volume stored becomes part of the **produced asset inventory**.

This treatment aligns with the proposed revisions to the SEEA Central Framework and the 2025 SNA, which recognise inventories as produced assets when they result from economic activity. Including hydroelectric systems in this structure ensures consistency across industries and better reflects the economic and environmental significance of managed water storage.

5.2 Treatment of Evaporation in Multi-Use Reservoirs

In the context of multi-use reservoirs—those serving hydroelectricity, irrigation, water supply, and flood control—accurately attributing water losses such as evaporation is a key challenge for environmental-economic accounting. These reservoirs often support multiple industries simultaneously, complicating the allocation of resource use and losses in physical supply and use tables (PSUTs).

To address this, we propose that evaporation from multi-use reservoirs be treated as a use by the industry or industries that actively utilise the stored water. This approach aligns with the principle that losses incurred during production or storage should be attributed to the responsible economic activity.

In practice, this means that if a reservoir is used 60% for hydroelectricity and 40% for irrigation (based on water withdrawals or operational control), then 60% of the evaporation loss would be recorded as a use by the hydroelectricity industry and 40% by the agriculture sector. This proportional allocation ensures that environmental losses are reflected in the resource efficiency and environmental impact indicators of each industry.

Where detailed usage data are unavailable, allocation may be based on reservoir design purpose, operational control, or expert judgment. In cases where hydroelectricity is the primary or sole user, the full evaporation loss would be attributed to that industry.

This treatment enhances the transparency and analytical value of PSUTs by linking environmental losses to economic activities. It also supports more accurate assessments of water use efficiency, particularly in the hydroelectricity sector where evaporation can represent a significant share of total water losses.

This structure allows for a more complete representation of the hydroelectricity industry's interaction with water resources. It supports improved analysis of resource efficiency, losses, and environmental impacts, and aligns with the broader goals of the SEEA to integrate environmental and economic information.

5.3 Monetary Accounts

The value of stored water could be capitalised, reflecting its role in production. Depreciation of water inventories due to losses or reduced availability could be included. Investment in water infrastructure could be more accurately linked to the value of the water it stores.

5.4 Industry-Level Accounts

The hydroelectricity industry's input-output structure would be more accurately represented. Productivity measures could reflect the role of water inventories in energy generation. Environmental indicators such as water use efficiency would be more meaningful.

6. Challenges and Considerations

While the conceptual case for reclassification is strong, several practical challenges must be addressed.

6.1 Data Availability

Detailed data on water volumes, flows, and losses are needed to support inventory accounting. Not all hydroelectric operators may have consistent or standardised reporting systems.

6.2 Boundary Issues

Clear criteria are needed to distinguish between produced and non-produced water. For example, should all water in artificial reservoirs be reclassified, or only that used in energy production?

6.3 International Consistency

Any changes must be aligned with international standards to ensure comparability. Coordination with the SEEA and SNA revision processes is essential.

6.4 Valuation Methods

Assigning a monetary value to stored water is complex, especially when it is not traded. Methods such as resource rent, replacement cost, or net present value may be needed.

7. ABS Work and Preliminary Findings

The Australian Bureau of Statistics (ABS) is currently exploring the implications of reclassifying reservoir water as a produced asset. This work includes reviewing the treatment of water in existing accounts, engaging with stakeholders in the water and energy sectors, and assessing data availability and methodological options.

Preliminary findings suggest that there is strong conceptual support for reclassification, particularly in the context of PHES. Data challenges are significant but not insurmountable. A phased or partial implementation (e.g. for specific industries or reservoir types) may be a practical first step.

The ABS is also contributing to international discussions through the London Group and other forums, helping to shape the future direction of environmental-economic accounting standards.

8. Recommendations and Next Steps

Based on the analysis presented, the following recommendations are proposed:

1. Reclassify water in artificial reservoirs used for hydroelectricity as a produced asset, recognising the human intervention involved in its management.
2. Develop clear criteria for distinguishing produced from non-produced water, based on use, infrastructure, and management intensity.
3. Enhance data collection on water inventories, flows, and losses in the hydroelectricity sector.
4. Engage with international bodies (e.g. SEEA, SNA, UNSD) to promote alignment and comparability.

5. Pilot the revised classification in selected case studies (e.g. Snowy Hydro, Wivenhoe) to test feasibility and refine methods.

These steps would support more accurate, policy-relevant environmental-economic accounts and better reflect the role of water in Australia's energy transition.

9. Conclusion

Reclassifying reservoir water as a produced asset represents a meaningful step toward aligning environmental-economic accounts with the realities of modern infrastructure and energy systems. For the hydroelectricity industry, this change would improve the representation of water as a managed, economically significant input to production.

While challenges remain—particularly around data and valuation—the potential benefits in terms of accuracy, transparency, and policy relevance are substantial. As countries seek to better understand the links between natural resources, infrastructure, and economic activity, updating the treatment of reservoir water is both timely and necessary.

The ABS's ongoing work in this area contributes to a broader international conversation about how environmental assets are defined, valued, and integrated into economic decision-making. The London Group is well placed to lead this discussion and guide the evolution of accounting standards to reflect the changing nature of resource use in the 21st century.

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