

Performance-based regulation: Experience in Europe and the US

This note examines jurisdictions that implemented performance-based regulation (PBR) to incentivise their network companies/utilities¹ to meet the power sector decarbonisation challenge.

When regulating natural monopolies, the traditional focus is on costs. The role of regulation, however, is not limited to cost effectiveness, just as market competition (that regulation mimics for monopolies) is not only about cost competitiveness. An equally important political objective is meeting customer needs within the framework of decarbonisation.

Performance-based regulation (sometime also referred to as output-based regulation) is a fundamental shift of approach. Instead of regulating the inputs (i.e., CAPEX and OPEX), the allowed revenue is based on the performance/outputs of the regulated company. Outputs are defined ex-ante with financial rewards and penalties attached. It is important to note that this is not a binary choice: having or not having PBR. Rather, often the PBR is just an element driving a certain share of the revenue. Consequently, PBRs only drive the behaviour and choices of these companies if a considerable share of the revenue depends on the outputs.

PBRs in Europe integrate some output incentives into the classical revenue-cap schemes. The most common performance target is service quality, measured by SAIDI and/or SAIFI.² In the US, PBRs are still limited, both in terms of target scope and weight in steering the allowed revenue of regulated companies. As networks are key enablers of the transition, companies owning and operating them must align their decisions to facilitate the process. Defining outputs - that are deemed to be essential by the regulator for the transition - could provide more direct guidance.

The following jurisdictions have implemented PBRs:

United Kingdom

In 2013, Ofgem introduced the RII03 (Revenues=Incentives + Innovation + Outputs) network regulation model which required system operators to provide a business plan with

¹ Depending on the market structure: wire-only companies in Europe (DSOs and TSOs) and integrated utilities owning both wire and generation in many US states.

² Z. Pató, P. Baker, Dr. J. Rosenow, Performance-based regulation: Aligning incentives with clean energy outcomes, June 2019. <https://www.raonline.org/knowledge-center/performance-based-regulation-aligning-incentives-clean-energy-outcomes/>

³ Ofgem. Network price controls 2013-2023 (RIIO-1). [Webpage]. Accessed 27 November 2024. <https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2013-2023-riio-1>

measurable goals. Once approved by the regulator, these are the metrics against which the performance of the company is measured:

- Customer satisfaction
- Network safety
- Network reliability
- New connections
- Environmental impact
- Social obligations.⁴

In addition, OFGEM introduced a TOTEX approach to reduce the CAPEX bias of previous retail price index minus inflation (RPI-X) regulation. It is an important change to make the companies indifferent to the type of solutions they chose, to provide service to consumers. Traditionally, these companies earn a rate only on CAPEX; this incentivises investments into assets and not consideration of (usually OPEX-heavy) alternatives, such as grid enhancing technologies or flexibility/energy efficiency procurement.

The assessment of the first pricing period concluded that 1) the majority of revenues for system operators were still coming from CAPEX expenditures, 2) the defined outputs were hard to evaluate, 3) targets were set too low, leading to excessive gains for the companies, 4) the complexity of regulation resulted in information asymmetry, and 5) the 8-year period increased the risk of over- and under incentivizing.⁵

For the second price control period (2023-2028) some adjustments have been made such as reducing the price control period to 5 years due to uncertainties, cutting excessive profits, and introducing a new financial output delivery incentive (ODI-F), and new license requirements and obligations.⁶

Sweden^{7 8}

PBR was introduced in 2012. The Swedish regulator determines a revenue cap for the 4-year regulatory periods and defines performance targets for reliability of service (or service

⁴ Ibid.

⁵ Florence School of Regulation. (2023, June). Benefit-based incentive regulation to promote efficiency and innovation in addressing system needs. Robert Schuman Centre for Advanced Studies. https://www.acer.europa.eu/sites/default/files/documents/en/Electricity/Infrastructure_and_network%20development/Infrastructure/Documents/Benefit_based_regulation_2023.pdf

⁶ Ofgem. (2022, 30 November). RIIO-ED2 Final Determinations Core Methodology Document. <https://www.ofgem.gov.uk/sites/default/files/2022-11/RIIO-ED2%20Final%20Determinations%20Core%20Methodology.pdf>

⁷ G. Wigenborg et al., 2016, " Incentive Scheme for Efficient Utilization of Electricity Network in Sweden", *the 13th International Conference on the European Energy Market (EEM)* <https://ei.se/download/18.4ed2158a18722d7df785b6b/1680684552490/CIRED-2016-The-regulation-of-electricity-network-tariffs-in-Sweden-from-2016.pdf>

⁸ Wallnerström, Carl Johan & Grahn, Elin & Johansson, Tommy. (2017). Analyses of the Current Swedish Revenue Cap Regulation. CIRED – Open Access Proceedings Journal. 2017. 2606 – 2610. <https://doi.org/10.1049/oap-cired.2017.1021>

quality) and contribution of operations to the efficient utilisation of the power grid. Swedish regulation separates OPEX into controllable and non-controllable costs, allocates specific shares to OPEX and CAPEX, and allows these shares to vary across distribution system operators (DSOs) and over time, based on the DSO's operational and investment decisions within this framework.

Since 2016, for a more accurate calculations on service quality, customers are divided into 5 groups based on outage costs, and DSOs are compared by SAIDI and SAIFI indicators.

The incentive scheme to increase grid efficiency has two parts, reducing energy losses and increasing system utilization by improving the load factor and lowering grid costs. This incentive scheme was introduced where the DSO can get a share of such cost reduction. It is designed in such way that the DSO can only be rewarded and not penalised. In order to monetise the incentive, the load factor is combined with the reduction of the cost that DSOs pay to the feeding grid for withdrawal of electricity. The percentage that the grid company may keep corresponds to the load factor, which in the extreme case — where the average load and maximum load are the same — results in keeping the whole profit.⁹

Italy

The Italian regulator, ARERA, first introduced incentives for innovation by allowing bonus WACC on innovative solutions. ARERA adopted incentives that were calculated based on CAPEX savings realized by the transmission system operator (TSO) with respect to a CAPEX target value. Recently, ARERA launched a new regulatory program, called ROSS (*Regolazione per Obiettivi di Spesa e di Servizio*), to introduce major changes in its regulation for energy infrastructure, including a fixed OPEX-CAPEX share, also widely referred to as a TOTEX approach.¹⁰

USA

PBR is not a mainstream regulatory approach in the USA. The number of states implementing PBR has been increasing since 2015¹¹ and, as in Europe, the introduction of

⁹ Wallnerström, C.J., et al. (2016, August). *The Regulation of Electricity Network Tariffs in Sweden from 2016*. Energimarknadsinspektionen. <https://ei.se/download/18.4ed2158a18722d7df785b6b/1680684552490/CIRED-2016-The-regulation-of-electricity-network-tariffs-in-Sweden-from-2016.pdf>

¹⁰ Bovera, F., Schiavo, L.L. & Vailati, R. Combining Forward-Looking Expenditure Targets and Fixed OPEX-CAPEX Shares for a Future-Proof Infrastructure Regulation: the ROSS Approach in Italy. *Curr Sustainable Renewable Energy Rep* (2024). <https://doi.org/10.1007/s40518-024-00239-4>

¹¹ Wilson, G., Felder, C., & Gold, R. (2022, 31 March). *States Move Swiftly on Performance-Based Regulation to Achieve Policy Priorities*. RMI. <https://rmi.org/states-move-swiftly-on-performance-based-regulation-to-achieve-policy-priorities/>

PBR is not an either/or decision. The so-called performance incentive mechanism (PIM) is the component relevant for the EU discussions.

New York, Massachusetts, California and Hawaii have a fairly comprehensive PBR regime, while many other states have been or are in the process of introducing some or more PBR elements.

The most often used PIMs are:

- Customer service and billing performance measures
- Customer satisfaction metrics (e.g., customer complaints, service response times)
- Reliability metrics (e.g., SAIDI, SAIFI, CAIDI, power quality measures)
- Employee safety metrics (e.g., restricted work injury index)
- Distribution efficiency metrics (e.g., line losses)
- Generator performance metrics (for vertically integrated utilities)
- Load factor and peak load reduction targets
- Targets for expanding distributed generation and storage
- Targets for the expansion of electric vehicle storage facilities (utility owned and third party)
- Targets for moving customers to voluntary time-of-use and critical peak pricing rates
- Targets for expanding customer demand response capabilities
- Environmental metrics (e.g., greenhouse gas emissions)
- Targets for “smart grid” deployment
- Targets for “beneficial electrification” (e.g., heat pump adoption).

Hawaii

The Public Utilities Commission adopted three overarching regulatory goals and outcomes in 2020: customer experience enhancement, utility performance improvement and societal outcomes advancement. New PIMs have been adopted to reach those regulatory goals, alongside with existing PIMs like SAIDI/SAIFI and call centre performance.¹²

- **RPS-A:** Renewable portfolio standard, to incentivize achievement of renewable energy goals by promoting the outcomes of distributed energy resource (DER) asset effectiveness, customer engagement, interconnection experience, cost control, affordability, grid investment efficiency and GHG reduction.

¹² Summary of Phase 2 Decision & Order Establishing a PBR Framework, December 2020 https://puc.hawaii.gov/wp-content/uploads/2020/12/PBR-Phase-2-DO-5-Page-Summary.Final_12-22-2020.pdf

- **Grid services PIM:** Designed to promote DER asset effectiveness and grid investment efficiency by incentivizing acquisition and integration of grid services capabilities provided by DERs.
- **Interconnection approval PIM:** Promotes interconnection experience by incentivizing faster interconnection times for DER systems <100 kW, and also penalizes underperformance.
- **Low- and moderate-income customer (LMI) energy efficiency PIM:** Promotes customer engagement, customer equity and affordability by the collaboration between utilities and the Public Benefits Fee Administrator to deliver energy savings to LMI.
- **Advanced metring infrastructure (AMI) utilization PIM:** Promotes customer engagement, DER asset effectiveness and grid investment efficiency by incentivizing the acceleration of the number of customers with advanced meters.

A recent proposal on how to make PIMs a more effective tool suggested shifting their focus away from accounting measures, such as profits or achieved return on equity (ROE), and toward a utility's stock price and all the underlying factors that drive it.¹³

Conclusions

The introduction of PBR is not an either/or decision. It can be seen as a building block or overlay on traditional regulatory methods. PBRs are not mainstream in Europe nor the US, but are gaining traction.

The metrics used in operational PBRs are diverse. There are a few identifiable clusters, however: security of supply (SAIDI, SAIFI), customer satisfaction (smart meter deployment, utility data sharing, interconnection time) and RES integration (deployment and curtailment rates) and grid cost savings (grid utilization, peak load reduction).¹⁴ All of these can play an important role in the transitional process. Metrics should be defined based on the needs of change in the national power system, and further investigation and research are required to find the best set of metrics to incentivise network operators according to the objectives.

¹³ LeBel, M., Shipley, J., Kihm, S., Calice, M., & Cappers, P. (2023, 26 October). *Improving Utility Performance Incentives in the United States: A Policy, Legal and Financial Framework for Utility Business Model Reform*. RAP. <https://www.raonline.org/knowledge-center/improving-utility-performance-incentives-in-the-united-states-a-policy-legal-and-financial-framework-for-utility-business-model-reform/>

¹⁴ ICC and RMI, Performance and Tracking Metrics Workshop Summary, December 2021, page 19 https://icc.illinois.gov/api/web-management/documents/downloads/public/informal-processes/ICC_Metric_Report_12-01%20Final.pdf