Information Paper: Economic regulation of hydrogen

Please note that the following text is an unofficial translation by Energinet of the paper "Økonomisk Regulering af brint" by the Danish Utility Regulator. The document is published as an appendix to Energinets Information Package 2 on 16 September 2024.

In the political partial agreement II on the financial framework conditions for hydrogen infrastructure from April 2024, it was decided that the hydrogen infrastructure companies must be regulated with a revenue framework based on the current methane gas regulation but adapted to special conditions for the start-up market for hydrogen. The economic regulation must thus make it possible for the hydrogen infrastructure companies Energinet and Evida to budget with lower revenues than costs in a start-up phase in order to be able to collect the deferred revenues at a later date when the infrastructure is expected to transport larger quantities of hydrogen when the market is well established with greater demand.

This memo describes the Danish Utility Regulator's considerations regarding general, immediate and preliminary principles for the economic regulation of hydrogen infrastructure in a start-up market. As the revenue framework regulation of the hydrogen infrastructure companies has not yet been adopted by law and the detailed regulation of this has not yet been implemented with detailed rules in any revenue framework orders, there is not yet a secure legal basis on which to base the content of this memo. The description in the memo is therefore only indicative and preliminary.

Section 1 below describes that the basic principle in the economic regulation of energy infrastructure is a revenue cap regulation. Section 2 describes the Danish Utility Regulator's preliminary approach to economic regulation, including the newly developed so-called start-up revenue caps for hydrogen transport, which allow infrastructure companies to spread the recovery of costs over time in relation to expected booked volumes. Finally, section 3 mentions the overall principle for charging the infrastructure companies' financing costs.

1. Starting point in current methane regulation

The economic regulation of a hydrogen infrastructure is framed in the Gas Supply Act, the EU Gas and Hydrogen Regulation and Directive, the political sub-agreements I and II and, at a later stage, also revenue framework orders.

In determining the economic regulation, reference will be made to the relatively newly developed principles that apply to the revenue framework regulation of gas transport (Gas-SO, Gas-TO and Gas-DSO). The starting point is thus regulated access based on revenue frameworks (further mentioned as IR), cf. 'Economic framework conditions for hydrogen infrastructure. 2nd partial agreement on pipeline hydrogen infrastructure'.

IR regulation, as it applies to methane gas transport, means that the Danish Utility Regulator annually sets an upper limit for how much the infrastructure companies may charge system users; this limit is called the revenue cap (IR). The IR for a new regulatory period is calculated as the average of the previous regulatory period's costs, i.e. both operating costs and return on assets. In practice, a regulatory period is 1-5 years depending on the regulatory area. From this, an annual efficiency requirement is deducted and approved supplementary applications are added. For new investments and other activity expansions, companies can increase their revenue caps with the approval of the Danish Utility Regulator.

If the companies can achieve lower costs than IR through efficiency improvements, they can keep the year's profit. This encourages efficiency improvements and is referred to as extraordinary efficiency gains.

However, since the revenue caps in a regulation period are based on the average of the previous period's costs, the efficiency gains in the next regulation period are automatically 'shared' with the system users. On the other hand, if the company had higher costs in the previous regulation period than their revenue cap indicates, the revenue cap for the following period will not necessarily be calculated as the average of the previous period's costs. In that case, the Danish Utility Regulator must assess whether they are 'persistently inefficient' and should therefore have a lower revenue cap than the average from the previous period.

Infrastructure companies are allowed to charge IR via tariffs for system users' access to the infrastructure. The infrastructure companies therefore submit a so-called 'method notification' to the Danish Utility Regulator. The method notification describes how the companies intend to structure their tariffs. A number of requirements must be met for the Danish Utility Regulator to approve the method notification. Among other things, the tariffs must be 'cost-reflective', i.e. reflect the actual costs for the year, insofar as such costs correspond to the costs of an efficient and structurally comparable network operator, and they must not discriminate across customer groups.

2. Revenue cap regulation for hydrogen infrastructure

This section describes the Danish Utility Regulator's expectations for the implementation of IR regulation for a future hydrogen infrastructure.

Section 2.1 describes how IR is expected to be started up in practice from a starting point where there has been no regulation or market for hydrogen transport. Section 2.2 describes that the infrastructure companies have the option to choose classic IR or the so-called start-up revenue framework (OIR), which spreads the recovery of costs over time. Section 2.3 describes OIR. Section 2.4 discusses the transition from OIR to classic IR. Finally, section 2.5 explains that OIR needs to be recalculated periodically.

2.1 The start of the revenue cap regulation

The Political Partial Agreement II addresses various elements for the start-up of a hydrogen infrastructure, including: 1) that the first IR is application-based; 2) the period length for the first IR; and 3) that certain IR elements will be exempt during the first regulation periods.

re 1) IR for the first regulatory period is application-based: The Danish Utility Regulator expects to establish a practice whereby infrastructure companies submit a budget ex ante, after which the Danish Utility Regulator approves cost categories and establishes a preliminary revenue cap. At the end of the first regulatory year, the infrastructure companies submit an application to the Danish Utility Regulator to cover their realised costs either through OIR (defined below) or classic IR. This application is reviewed by the Danish Utility Regulator to determine whether the costs reflect necessary costs for efficient operation. The Danish Utility Regulator then makes a decision on the final revenue cap for the first regulation year.

re 2) Length of regulation periods in the initial phase: The initial phase consists of two regulation periods of two years each. Thereafter, the length of the adjustment periods may be reassessed.

re 3) Certain temporary exemptions in the initial phase: The following IR elements are exempted in the initial phase:

a) Efficiency requirements
b) Assessment of persistent inefficiencies
c) Infrastructure companies' possibility to keep extraordinary efficiency gains

The political agreement also mentions that the Danish Utility Regulator is authorised to develop economic revenue cap regulations for hydrogen. The development and implementation of the revenue framework regulation for hydrogen infrastructure will take place in a working group between the Danish Utility Regulator and the Danish Energy Agency, where there will also be dialogue with the industry.

A division of labour between the hydrogen infrastructure companies and the Danish Utility Regulator, as known from the other revenue cap regulated supply areas, will be maintained. This means that the Danish Utility Regulator will announce the annual revenue frameworks, and the infrastructure companies will report tariff methods to the Danish Utility Regulator, who will then decide on the method. The infrastructure companies calculate tariffs based on approved methods. Below, it is described that the infrastructure companies can choose between classic revenue caps and the so-called start-up revenue caps. The described division of labour between the Danish Utility Regulator and the infrastructure companies will apply regardless of which type of revenue cap is chosen.

Summary:

1) IR regulation: A future hydrogen infrastructure will be IR regulated
2) Application-based revenue cap: The first revenue cap at market start-up will be an application-based revenue cap
3) Initial phase with two regulatory periods of two years each
4) Temporary exemptions in the initial phase: There will be no efficiency requirements, no possibility to earn extraordinary efficiency gains and no assessment of persistent inefficiency in the first two regulatory periods
5) Division of labour from the other utility areas is maintained: The Utility Authority announces revenue limits. The infrastructure companies report tariff methods to the Utility Regulator, which decides on the methods. The infrastructure companies announce tariffs on the basis of approved methods.

2.2 Initial Revenue Frameworks (IRFs) provide the opportunity to spread the recovery of costs over time

It is currently expected that relatively small amounts of hydrogen will be transported in the first years until the market matures, according to the Danish Energy Agency's Analysis assumptions 2023.

In classic IR (as known from the methane gas sector), the starting point for tariff revenue in a given year is the company's costs in that year, cf. above, including operating costs and costs for financing the company's assets. In a start-up market such as hydrogen, the level of bookings of the infrastructure may be low in the beginning. This means that the company's costs in a given

year will be spread over a low level of bookings, which will then result in very high tariffs. Higher start-up tariffs are considered to pose a significant risk that the hydrogen transport market will not get started.

To help the market get started, it has therefore been decided in the political sub-agreement II to give infrastructure companies the opportunity to spread the recovery of costs over time to achieve lower tariffs in the start-up of the market than what is possible with class IR.

It follows from the regulation that the infrastructure company may be given the opportunity to finance the infrastructure by spreading the recovery of costs over time. The mechanism for spreading the recovery of costs over time is determined by the Utility Regulator. The Danish Utility Regulator must also authorise an infrastructure company to spread cost recovery over time, cf. Article 5(3) of the EU Regulation, which states:

"Member States may allow hydrogen network operators to stretch the recovery of hydrogen network costs through network access tariffs over time to ensure that future users contribute adequately to the initial costs of developing the hydrogen network. Such inter-temporal cost allocation and its methodology shall be subject to approval by the relevant regulatory authority. Member States may take measures, such as a state guarantee, to cover the financial risk of hydrogen network operators related to initial insufficient cost recovery resulting from the application of inter-temporal cost allocation, provided that such measures comply with Article 107 TEUF."

The so-called start-up revenue caps (henceforth OIR) are the Danish Utility Regulator's expectations for how the possibility of spreading cost recovery over time should be implemented in the Danish regulation. These are described in section 2.3 below. A hydrogen infrastructure company must choose OIR if it plans to collect less revenue than costs in a start-up phase and then collect the difference at a later point in time.

Summary:

1) Free choice between classic IR and OIR: A hydrogen infrastructure company can choose to finance the infrastructure with classic IR or with OIR. However, once the choice is made, it cannot be changed until there is an automatic transition from OIR to classic IR, as described in section 2.4.
2) Spreading cost recovery over time must be done with OIR: An infrastructure company must apply for OIR if it plans to collect less revenue than expenses in a longer start-up phase and then collect the difference at a later date.

2.3 Description of the start-up revenue framework (OIR)

The central principle of OIR is based on the average payment per expected booked hydrogen unit. The purpose of OIR is to ensure that system users pay the same average payment per booked unit over time as far as possible. This means that initially, when fewer annual volumes are booked, the companies will have deficits, which are then settled later when the booked volumes are expected to increase. The annual deficits are accumulated in an account, which is a regulatory receivable from the system users. The regulatory receivable must be settled within a predetermined period.

OIR is calculated as follows:

a) Revenues are weighted according to expected booked volumes for a predetermined period, with OIR setting annual caps on revenues. The expected average payment per booked unit is determined so that it is constant at all times during the fixed period, starting when the regulatory receivable is built up and ending when the receivable is settled.
b) Expected revenue accumulated over the fixed period must balance expected costs

The average payment per expected booked hydrogen unit is calculated as the total costs accumulated over the stipulated period divided by the total expected booked usage accumulated over the stipulated period. The average payment per expected booked hydrogen unit is calculated so that it is constant over the specified period.

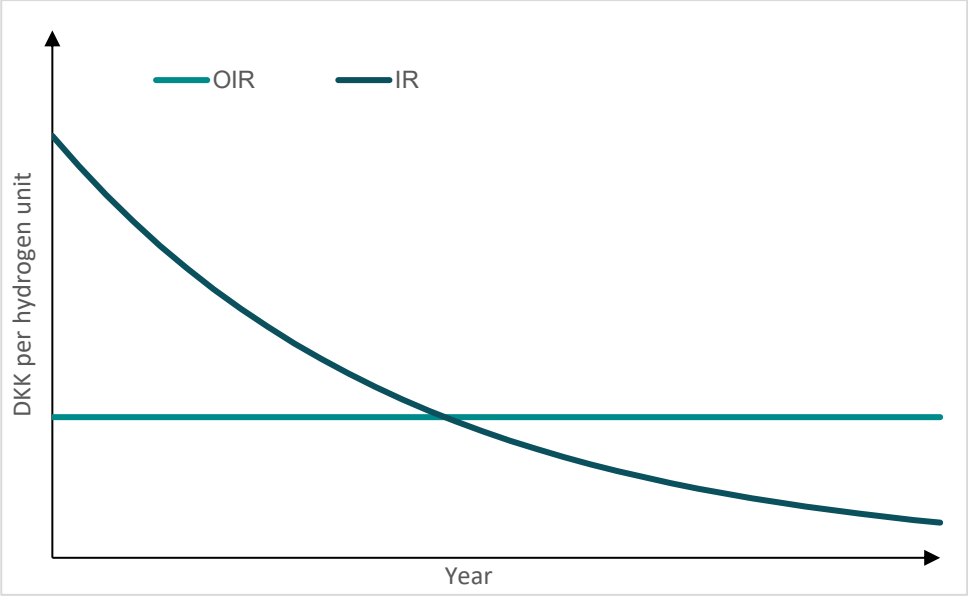
OIR for a given year is calculated as:

- *Average payment per expected booked hydrogen unit * expected booked volume for the year*

It should be noted that the average payment per expected booked unit included in the calculation of OIR is neither a tariff nor a payment announced to the system users. It is only used to control the spread of cost recovery over time in determining the OIR. As described above, infrastructure companies set tariffs based on the OIR and the tariff methodology approved by the Utility Regulator. The companies often offer several products that have different tariffs. For example, there may be differences in the length of contract periods, which can lead to variations in tariffs. However, the average payment per expected booked unit provides information about how tariffs develop over time.

The average payment per expected booked hydrogen unit calculated according to the OIR principle is lower in the start-up phase than if classic IR is used, see figure 1. The average payment per expected booked hydrogen unit is calculated so that it is constant over time with OIR, while it decreases over time with classic IR.

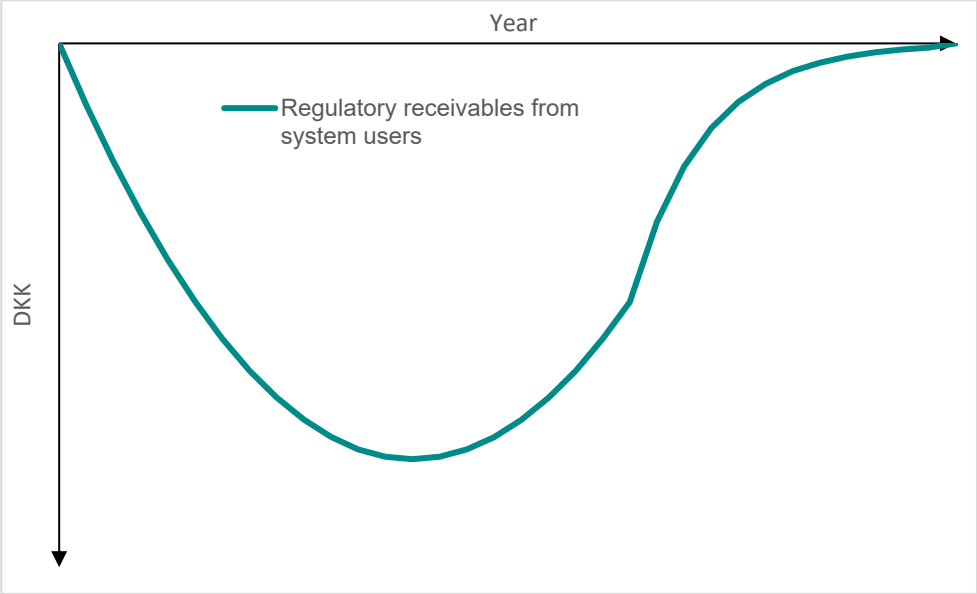
Figure 1. Average payment per expected booked hydrogen unit for OIR and classic IR in a start-up market.



The fact that the average payment per expected booked hydrogen unit in OIR is lower in the start-up phase than in classic IR and subsequently higher than in classic IR means that the infrastructure company has an annual under-recovery in the start-up phase and subsequently has annual over-recoveries. The annual under-recoveries and later over-recoveries are collected and accumulated in an account that constitutes the infrastructure company's regulatory receivables from system users, see figure 2.

The regulatory receivable from future system users increases as long as the annual revenues are lower than the annual costs. At some point, the utilisation of the infrastructure will become so high that the annual revenue exceeds the costs and a settlement of the receivable will begin. The calculation of OIR is set up so that the regulatory receivable is fully settled at a predetermined time.

Figure 2: Regulatory receivables from system users



In addition to capital to finance the regulatory receivables from system users, the infrastructure companies' total capital requirement also consists of capital to finance their investments in the infrastructure. The costs incurred by the infrastructure companies to finance this capital requirement are included in the OIR and will be charged to the system users.

OIR involves the same practice as classic IR

In principle, OIR sets the framework for the infrastructure companies' earnings in the same way as with classic IR, except that the annual revenue framework is smaller in the start-up phase and larger when the market is well established. The fact that OIR is a revenue cap makes it possible to maintain the division of labour between the infrastructure companies and the utility network as it is known from the other revenue cap-regulated supply areas, as described above.

Summary:

1) OIR calculation: an expected average payment is calculated such that the average payment per booked hydrogen unit is constant at all times over a predefined period. Revenue measured over this period must balance costs. The OIR for a given year is then calculated as average payment per expected booked hydrogen unit * expected booked volume for the year.

2.4 Transition to classic IR

In the OIR model described above, the regulatory receivable from the system suppliers is settled over a pre-determined period. There will be an automatic transition to classic IR at the end of the period. The length of the period for the build-up and settlement of the regulatory receivable must be decided as part of the regulation and depends, among other things, on the state's willingness to assume risk in connection with the financing of the infrastructure. This decision has not yet been made.

A shorter settlement time for the regulatory receivable from system users will, in isolation, result in higher start-up tariffs and a smaller capital requirement for the infrastructure company (compared to a longer settlement time). The timing of the transition to classic IR is thus of financial importance to system users and infrastructure companies and depends on the government's desire to assume risk.

Summary:

1) Transition to classic IR: A decision needs to be made on the length of the period for equalisation and settlement of a regulatory receivable from system users and thus the point in time when the regulation transitions from OIR to classic IR. This decision has not yet been made. An early transition will result in higher start-up tariffs and a smaller capital requirement.

2.5 Recalculation of OIR

Calculations of OIR are based on data on expectations for future bookings and future costs. The starting point is that these should be predicted to the best of your ability based on principles set out in the regulation. Based on this data, OIR can be calculated for all future years until the transition to classic IR.

OIR must be recalculated on an ongoing basis to include updated expectations of future revenues and costs in the calculation. The authorities will have to decide on the frequency of recalculation when determining the regulation. Decisions will also have to be made on how updated expectations will affect OIR on an ongoing basis and, in light of the government's choice of risk-taking, how and when to switch to classic revenue frameworks.

Summary:

1) *Recalculation of OIR: OIR must be recalculated on an ongoing basis to incorporate updated forecasts of future revenues and costs into the calculation.*
2) *When determining the regulation, the authorities must decide how recalculation affects OIR on an ongoing basis and possibly how recalculation affects the transition to classic revenue frameworks. This depends on the government's choice of risk-taking.*

3. Overall considerations on return on investment

The infrastructure companies will have to incur costs to finance their investments. These financing costs will correspond to a risk-adjusted reasonable rate of return, which is also the rate of return principle in the IR regulation of methane gas supply.

As mentioned, there are also financing costs associated with financing any regulatory receivables from system users. The Danish Utility Regulator assumes that the infrastructure companies must be compensated for these costs. The terms for how the infrastructure companies will

finance this receivable have not yet been decided. Therefore, it is too early to establish principles for charging the financing costs associated with this account. The terms of the regulatory receivable need to be clarified.

Summary:

1) Risk-based return on investments: The Danish Utility Regulator assumes that the infrastructure companies will be able to charge a risk-adjusted reasonable return, which must correspond to their financing costs for investments.
2) Return on regulatory receivables from system users: The Danish Utility Regulator assumes that the infrastructure companies must be compensated for the costs of financing a regulatory receivable from system users.

Annex: References to legislation regarding hydrogen infrastructure

1) Danish Gas Supply Act: 'Bekendtgørelse af lov om gasforsyning, LBK nr 1100 af 16/08/2023'
2) EU Hydrogen and Gas Regulation: 'Regulation (EU) 2024/...of the European Parliament and of the Council of ... on the internal markets in renewable gas, natural gas and hydrogen, amending Regulations (EU) No 1227/2011, (EU) 2017/1938, (EU) 2019/942 and (EU) 2022/869 and Decision (EU) 2017/684 and repealing Regulation (EC) No 715/2009 (recast)'.
3) EU Hydrogen and Gas Directive: 'DIRECTIVE (EU) .../...OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of ...on common rules for the internal markets in renewable gas, natural gas and hydrogen, amending Directive 2023/1791 and repealing Directive 2009/73/EC (recast)'.
4) The political sub-agreement I: 'Possibility of establishing hydrogen infrastructure 1st sub-agreement: Ownership and operation of future Danish piped hydrogen infrastructure' (22 May 2023). Agreement in principle between the Government (Social Democrats, Liberals and Conservatives), Socialist People's Party, Liberal Alliance, Conservative People's Party, Unity Party, Social Liberal Party, Danish People's Party and Alternative
5) The political sub-agreement II: 'Economic framework conditions for hydrogen infrastructure 2nd sub-agreement on piped hydrogen infrastructure' (4 April 2024). Voting agreement between the Government (Socialdemokratiet, Venstre and Moderaterne), Socialistisk Folkeparti, Liberal Alliance, Det Konservative Folkeparti, Enhedslisten, Radikale Venstre, Dansk Folkeparti and Alternativet