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REGODISS

"Technical assistance to develop methodologies compliant with disclosure obligations on RES gases"

Annex VI: Hourly residual mix: considerations.

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1 Intro: Impact of hourly certificate issuance on residual mix

While the REGADISS work focusses mainly on gas, in its scope was to make some considerations on the application of the residual concept while the granularity of production periods for which guarantees of origin are issued, is increasing. Interest in issuing GOs for (sub)hourly production periods is going up, as is the amount of market parties and stakeholder that engages in hourly certificate market facilitation and hourly matching claims.

Where claims are made via certificates, the untracked consumption is to be covered by the residual mix. This annex makes some considerations on the hourly residual mix. As the interest is mainly in the electricity sector, and hourly GOs are an evolution mainly driven by demand for hourly electricity origin matching, the reasoning is here built up from electricity sector background.

2 A residual mix for every hour: why?

Where tracking the origin of energy with guarantees of origin (GOs), it needs a mechanism that states the origin of non-tracked energy, being the residual mix. Then moving into hourly tracking of energy, it needs figures for an hourly residual mix.

3 Core principle: ensure compatibility between hourly and annual residual mix.

A main design criterion is that this hourly residual mix methodology shall not undermine the currently used annual residual mix methodology as maintained by AIB. The main reason for that is that the transition towards (sub)hourly Guarantees of Origin / Granular Certificates is not taking place overnight, and to maintain reliable claims, no method should undermine the credibility of the existing practices embedded in the EU legislative framework. Like the existing annual residual mix method, the new method shall ensure that renewable attributes are only accounted for once and thus avoid double counting.

The technical challenge is to establish the hourly residual mix while ensuring compatibility with the existing annual residual mix. This is important as the annual residual mix is supervised by governmentally mandated Disclosure Authorities, often National Regulatory Authorities, based on monthly GOs and their cross-border flows. This is essential to prevent double claims of the same renewable energy.

4 A first report initiating a methodology.

In September 2023, a report was published that aims to support a residual mix per hour. This report is established in the voluntary market, authored by Ciril Wakounig & Eloi Fàbrega Ferrer (resp. from ElectricityMaps and Flexidao), and considers the annual residual mix of the AIB. It aims to work in consistency with the AIB residual mix, with a view to prevent double counting.

This firmly differentiates them from other initiatives that make claims on grid mixes without considering the annual residual mix used based on legislative context, and as such risk to stimulate that attributes are double counted.

The authors considered the need to align the hourly residual mix to the annual one. Although this comes with clear challenges, they built on existing strengths and created a model to fill in gaps, in a way that still values the annual residual mix work. They do so through a modelling approach as currently, hourly certificates are not yet broadly implemented. They are available however in pilots in NL, DK, EE, NO and in other areas of the world.

5 Handicap in the available Statistics as an input: cancellation per country of origin.

For a modelled hourly residual mix to be consistent with the annual one, it results in a quantity of electricity of the annual residual mix that cannot be mapped into an hourly residual mix because info is lacking.

The main missing info is that the annual statistics would include cancellation statistics per country of origin. The excerpts in the Annex to this paper show the reason for it.

The paper identifies the above-mentioned gap in the statistics (missing cancellation and expiry statistics per country of origin) as a problem. It establishes a workaround by estimating all the cancelled certificates, where they have been produced.

A more accurate result could be achieved by providing this data in the statistics for cancellation and expiry.

This method is derived from a report by Electricity Maps.

6 Methodology: Modelling of the Annual Residual Mix into an Hourly Residual Mix

The modelling methodology for the hourly Residual Mix is based on these assumptions:

1. Hourly certificates actions, such as “modelled” issuance and cancellations need to match with measured data related to the electricity grid (production and consumption).
2. The certificate balances much hold for each hour. The certificates that have been issued will be cancelled or they will expire. Thus, there can never be more cancellation than issuances, which means that it is impossible to claim the consumption of green energy if it has not been produced. This balance is enforced for each hour.
3. Certificate issuance and cancellation demand are aggregated at the European level.

After determining the modelled hourly artificial “issuances,” “cancellations,” and “expirations” for each technology and domain, we can compute the hourly residual generation for each domain. This step is similar to the approach and RM calculation formula used by AIB. Initially, the hourly domestic residual generation is calculated for each country and technology. This enables us to establish the domestic residual mix for each hour.

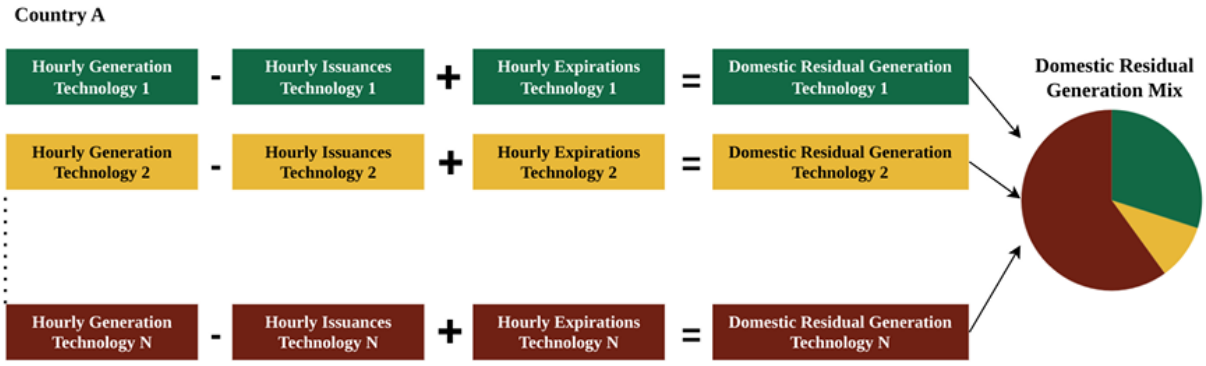

Figure 1: Calculating the Domestic Residual Generation and the corresponding Mix (source: ElectricityMaps and Flexidao)

The next step involves assessing whether the residual generation can meet the untracked consumption in each country for every time interval. Similar to the current methodology, it's crucial to differentiate between two scenarios: A domain is termed a 'Surplus Domain' if its residual generation exceeds local untracked consumption. Conversely, a domain is termed a 'Deficit Domain' if its residual generation is less than local untracked consumption. Surplus domains contribute their excess residual generation to the European Residual Generation Pool, making it accessible for deficit countries.

For countries with surplus hours, the untracked consumption takes on the technology mix of domestic residual generation. While countries with deficit hours, residual generation is taken from European Residual Generation Pool.

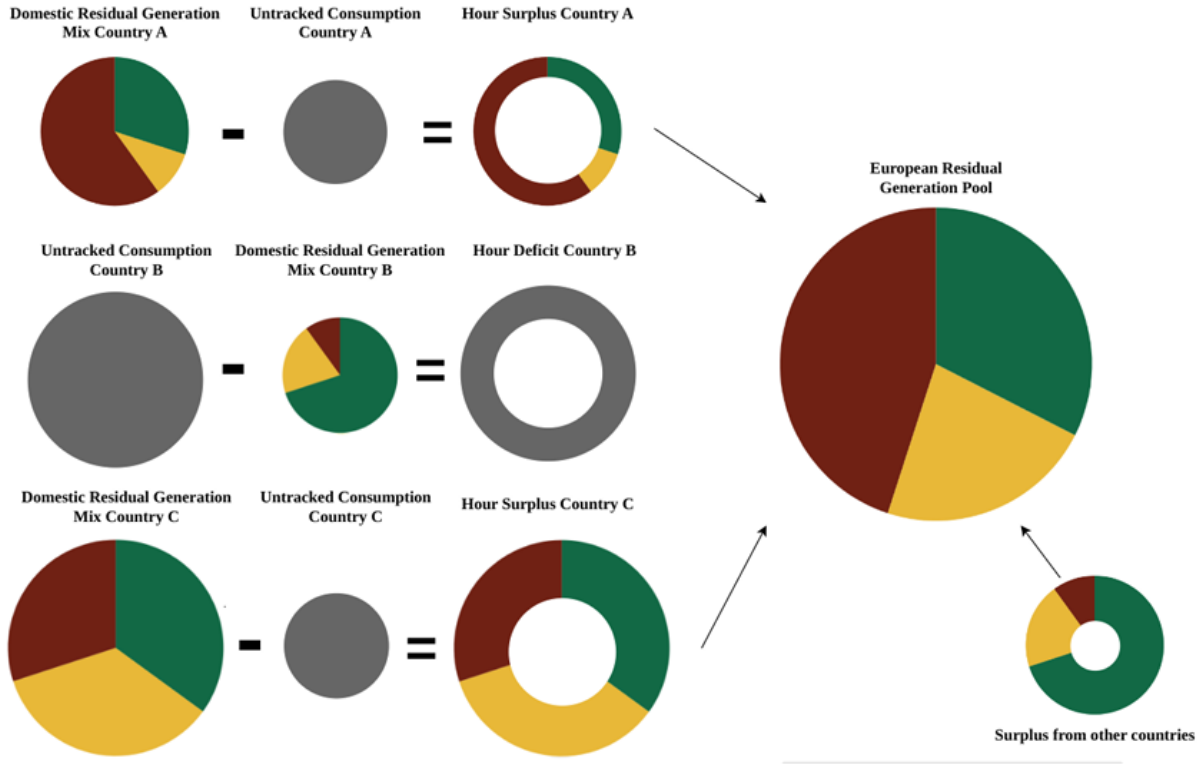

Figure 2: Surplus Countries supply their surplus residual generation to the European Residual Generation Pool (source: ElectricityMaps and Flexidao)

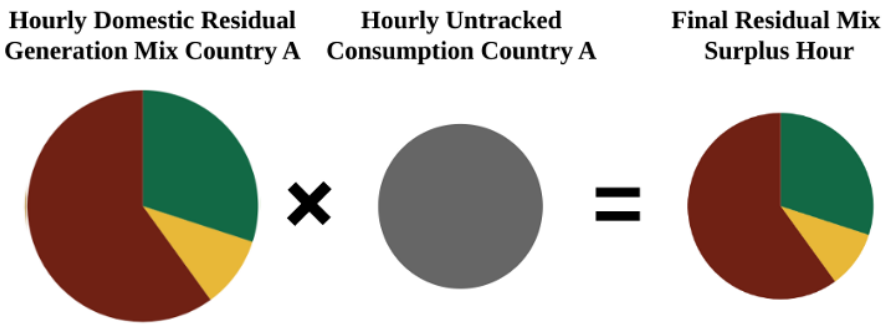

Figure 3: Determining the Final Residual Mix in Surplus Hours (source: ElectricityMaps and Flexidao)

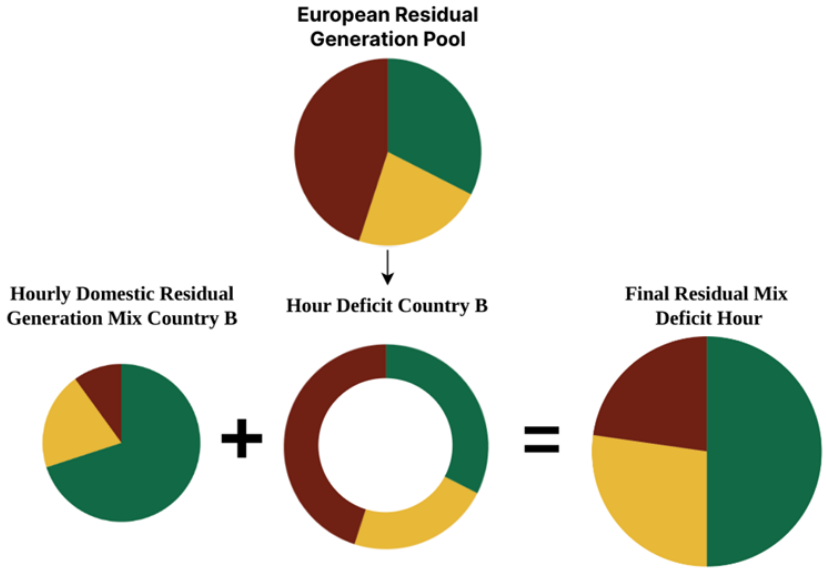

Figure 4: Determining the Final Residual Mix in Deficit Hours (source: ElectricityMaps and Flexidao)

The above steps are repeated for each domain in each hour. Note that domains can transition from being a surplus domain to a deficit domain from one hour to the next. This change depends on the local generation and consumption profiles for each hourly interval.

In case modelled certificate issuances are in surplus of cancellation demand, issuances are artificially "expired." In case cancellation demand exceeds the available certificate issuances, surplus demand is curtailed. Once this verification step has been conducted at a European level, it is possible to reallocate actual or fulfilled cancellations and expiries to the respective domains.

The advantage of this approach is that it allows an efficient allocation of certificates across the AIB region and thereby ensures that the certificate balance holds. The approach taken is based on a non-discriminatory approach, whereby cancellations and expirations are based on the level of contribution from a domain towards the European Pool.

A core caveat of this approach is the fact that using a European Certificate Pool ignores any aspect of physical deliverability of electricity. While this matches the approach done today, it does not improve

on the currently existing system in terms of tracing deliverability. As a result of this, this methodology improves on the current methodology purely on the temporal level. If information on certificate flows were publicly available, it would have been possible to include physical deliverability constraints using the flow-tracing methodology currently employed by ElectricityMaps.

7 Recommendations

1. **Making the modelled hourly residual mix fit into "deliverability" concepts: cancellation statistics per country of origin.**

   It is recommended that AIB should include an additional layer of detail in its collection of statistics and include information about the country of origin in the statistics that are reported to AIB by the different members.

2. **Developing an hourly residual mix**

   As long as not all European countries issue hourly GOs, the modelling will remain needed, if establishing an hourly residual mix. To move out of the modelled residual mix, hourly measurement data of production and all consumption would have to be available in the full calculation area. Also, hourly certificates would need to be broadly implemented.