Training Disclaimer: *ISO New England (ISO) provides training to enhance participant and stakeholder understanding. Not all issues and requirements are addressed by the training. Consult the effective Transmission, Markets and Services Tariff and the relevant Market Manuals, Operating Procedures and Planning Procedures for detailed information. In case of a discrepancy between training provided by ISO and the Tariff or Procedures, the meaning of the Tariff and Procedures shall govern.*

November 2026

Day-Ahead Ancillary Services Bid-to-Bill Journey

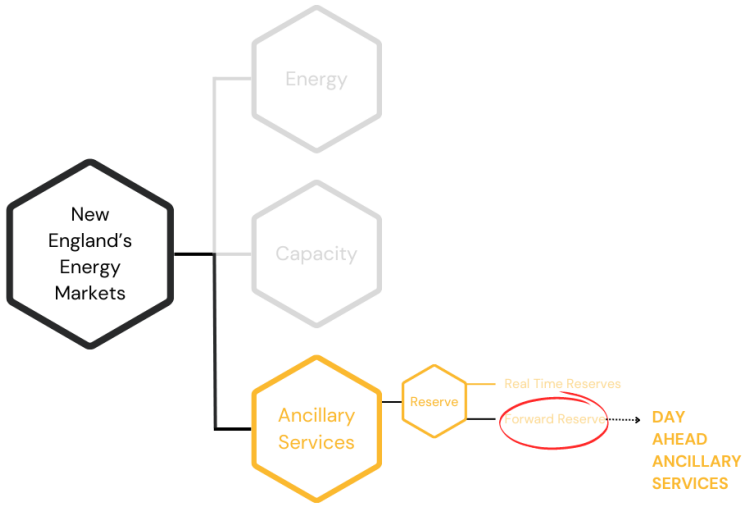
Note: This printable workbook serves as a supplemental reference for the Day-Ahead Ancillary Services (DA A/S) Bid-to-Bill self-paced training. We recommend completing the self-paced training first for the best learning experience.

ISO-NE PUBLIC

This module offers a high-level, step-by-step walkthrough of a participant's DA A/S bid-to-bill journey, defining key concepts in the context and sequence they'll appear.

Notes:

DASI Background



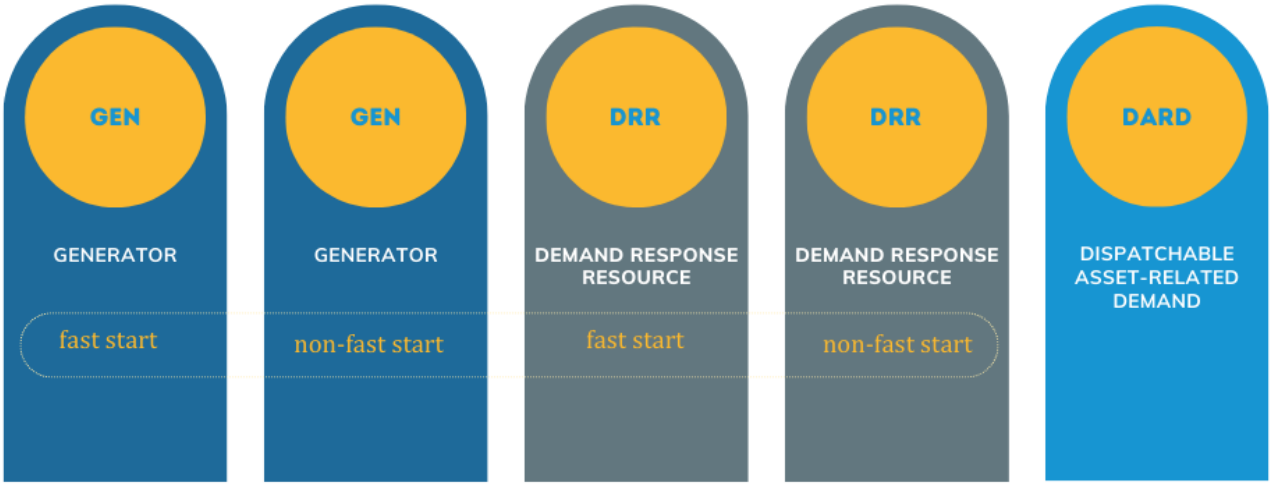
- ✓ Replaces forward reserve market
- ✓ Effective March 1, 2025
- ✓ Meet real-time energy demand
- ✓ Deliver a reliable next-day operating plan

- ✓ Awareness
- ✓ Preparedness
- ✓ Incentivized

The forward reserve market sunset on February 28, 2025. ISO began accepting day-ahead ancillary services offers and clearing day-ahead ancillary services awards on February 28, 2025, with such awards taking effect on the March 1, 2025 operating day. The goal is to procure and price ancillary service capabilities to meet real-time energy demand, deliver a reliable next-day operating plan, and send a clear market signal regarding the cost of satisfying these DA reliability requirements.

Notes:

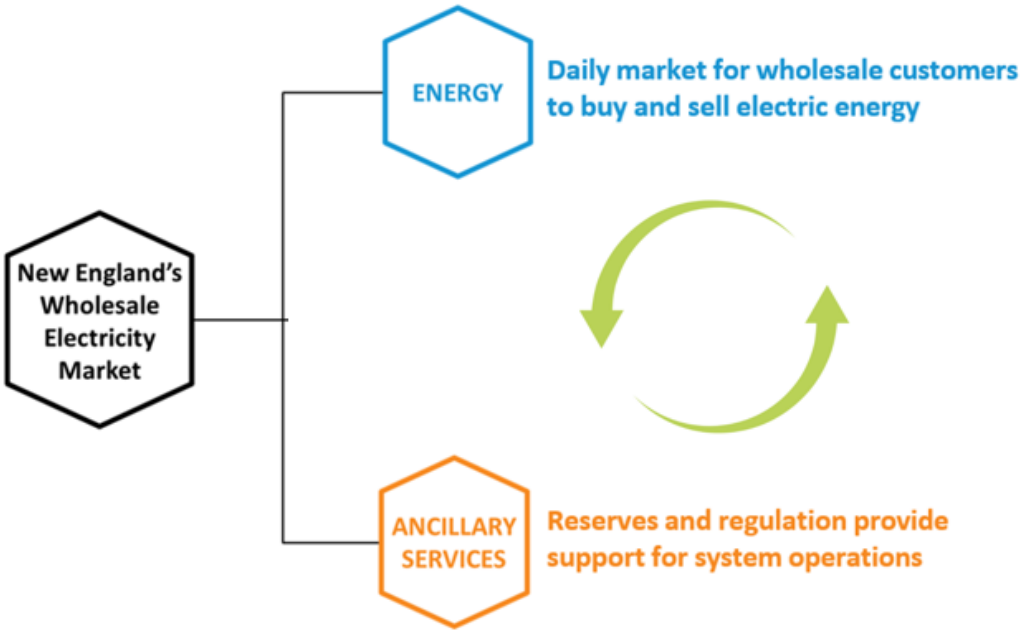
Asset Types



Participants who receive a day-ahead ancillary serviceaward will know that the ISO is relying on their capability in the next-day operating plan. They will be paid for providing this capability (to deliver energy the next day in addition totheir DA energy schedules) with stronger incentives to perform in real-time.
Because day-ahead reserves can be called upon and converted into energy in real-time, eligibility is limitedto physical resources only.

Notes:

Offers



If a lead market participant for an assetoffers day-ahead ancillary services, it must also offer day-ahead energy. When both DA energy and DA A/S are offered, the day-ahead market clearing engine will ensure each asset is scheduled for its optimal combination of energy and A/S.

Notes:

Key Concepts



The walk-through below defines each of these new key concepts in the context and sequence in which they appear for participants who offer day-ahead ancillary services.

Notes:

Inputs for DA A/S Offer Formation

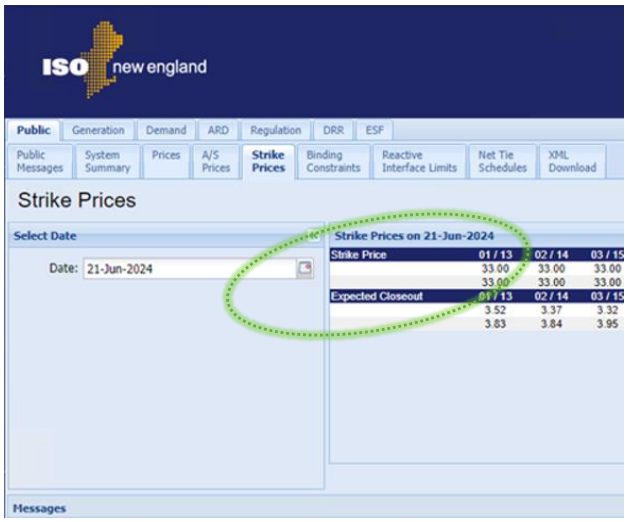
- Strike price
- Expected close-out component
- Benchmark levels
- Avoidable input costs



Inputs for day-ahead ancillary services offer formation. If the lead participant would like to offer day-ahead ancillary services, they need to consider a few inputs before forming an offer: the strike price, expected close-out, and their asset-specific benchmark levels, which take into account their avoidable input costs.

Notes:

Strike Price and Expected Closeout Component

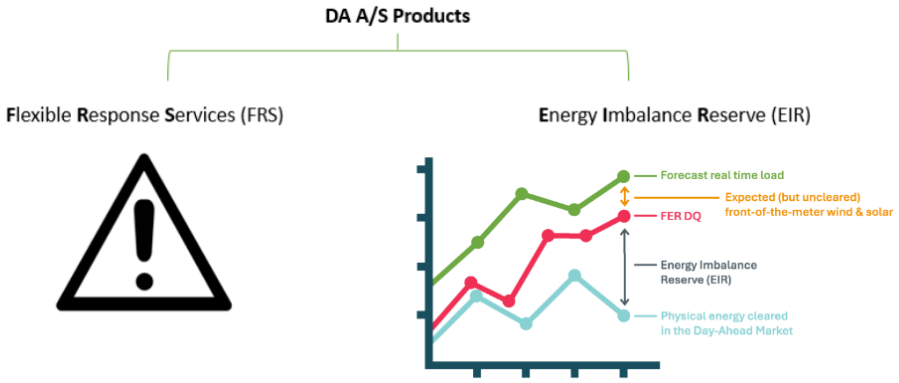




The first input needed to form a day-ahead ancillary service offer is the strike price. The strike price and expected closeout value are published in eMarket and ISO Express at 5:30 eastern every morning. But what are they?

Notes:

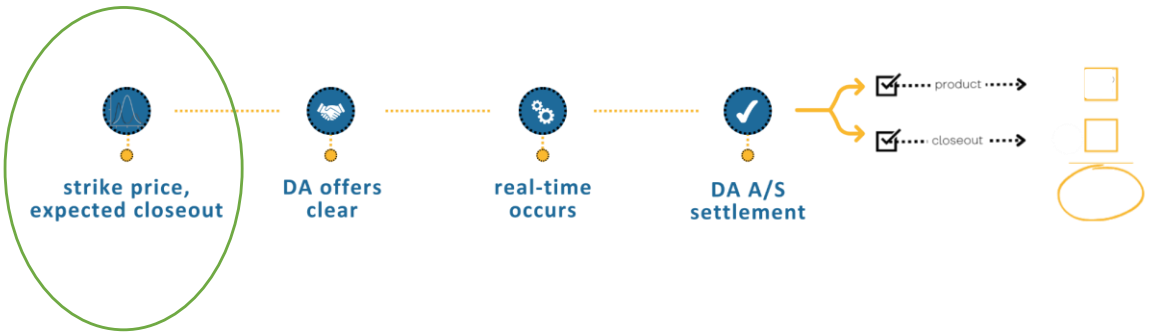
Strike Price and Expected Closeout Component



To answer that question, let's look at two new day-ahead ancillary service products: Flexible Response Services – FRS, and Energy Imbalance Reserve – EIR. FRS are used to cover a contingency. EIR is provided by resources that can increase output over 60 minutes in order to help close an energy gap.

Notes:

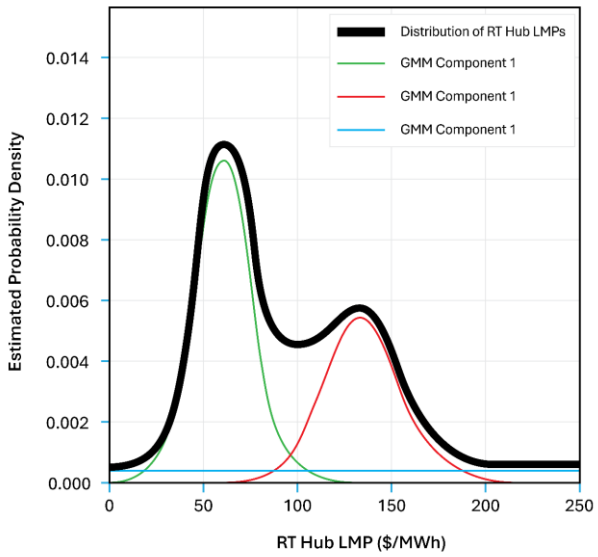
Strike Price and Expected Closeout Component



Both products will use a call option settlement mechanism where the ISO sets the energy strike price and anticipates the expected closeout component prior to market participants' offers. Offers clear, and the call option settlement is conducted after real-time, consisting of a product credit and a closeout charge. But how does the strike price get set? And how can we estimate what the closeout component will be?

Notes:

Strike Price Calculator

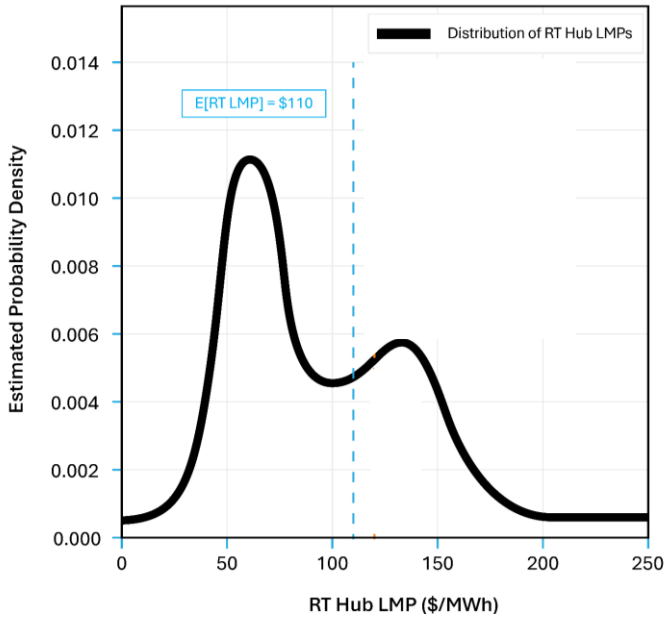


- ✓ Statistical model (Gaussian mixture model)
- ✓ Weather and system conditions to predict:
  - ✓ probability distribution of RT hub LMPs
  - ✓ strike prices
  - ✓ expected cost to close a DA A/S position

Market pricing can vary widely by hour, so the ISO uses a statistical modeling technique called a Gaussian mixture model, or GMM to derive the strike price. This model is called the strike price calculator. The strike price calculator leverages key variables related to weather and system conditions to predict a probability distribution of Real-Time Hub LMPs for every hour of the next operating day. The ISO will use these predicted price distributions to calculate hourly strike prices and to formulate the expected cost to close a day-ahead ancillary service position,

Notes:

Expected RT Hub LMP



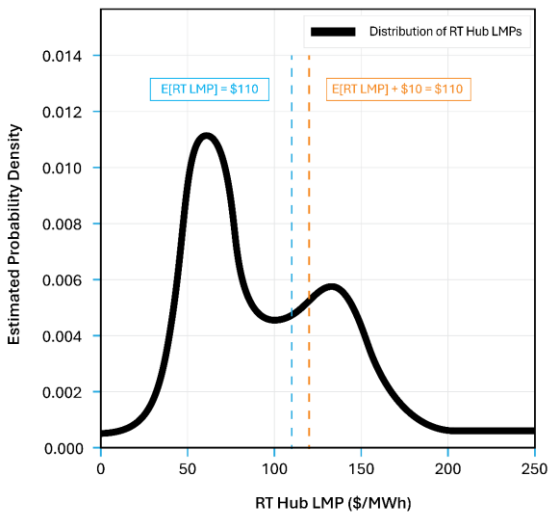
The strike price calculator uses 5 years of historical data inputs to capture different seasons and day patterns
It includes inputs like:

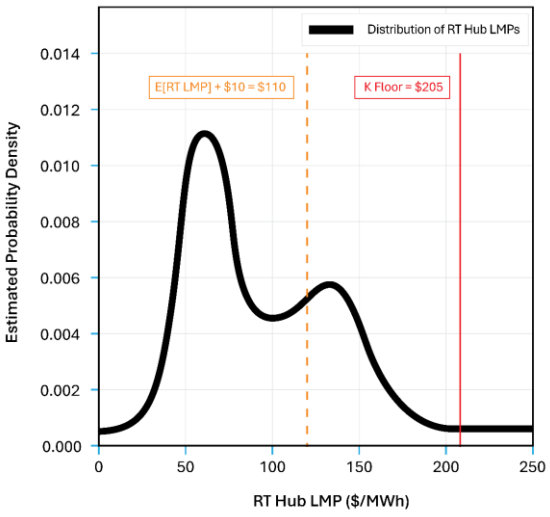
- load forecasts
- real-time hourly hub LMP from the prior day
- natural gas and oil prices
- a variety of weather variables and more.

to predict a distribution of RT Hub LMPs. With that distribution, we calculate the expected (or mean) RT Hub LMP shown here as $110.

Notes:

Strike Price

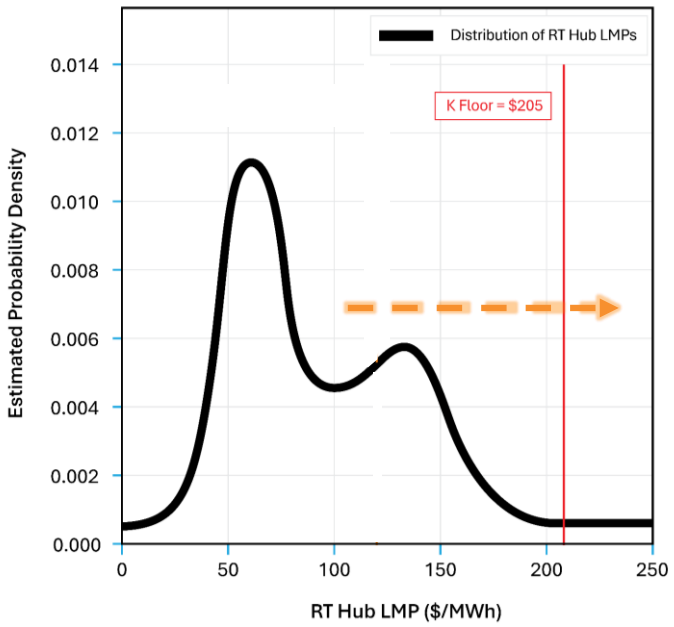




Under the original design, the strike price was determined using the expected real-time Hub Locational Marginal Price (LMP) plus a $10/MWh adder. Under the revised design, that value continues to be calculated, but it is now compared with a strike price floor. The strike price is then set at the higher of these two values. In this example, the strike price floor sets the strike price at $205. This is done for every hour of the next day. The strike price is populated on ISO New England's website and in eMarket at 5:30 every morning.

Notes:

Expected Closeout Component

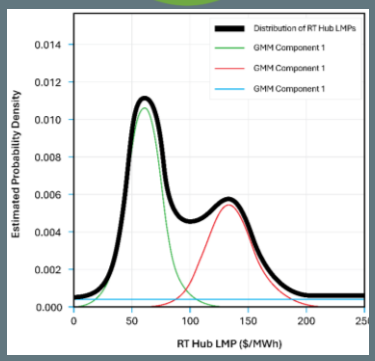


The expected closeout component is the expected charge for a resource if the actual RT Hub LMP exceeds the strike price. This value is used as an input to benchmark levels. The ACTUAL closeout value will be calculated during settlements, but since the expected closeout component calculated before real-time occurs, how do we know whether the RT Hub LMP will exceed the strike price, and if so by how much?

Notes:

Expected Closeout Component

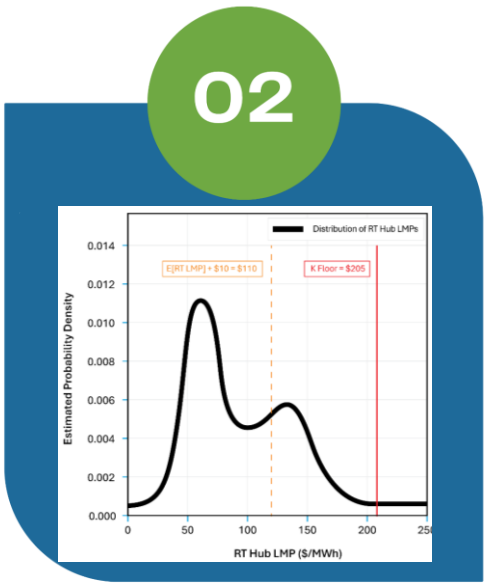
01



To estimate the expected closeout value, we first use the strike price calculator to predict a probability distribution of possible Real-Time Hub LMPs for every hour of the next operating day, as we said.

Notes:

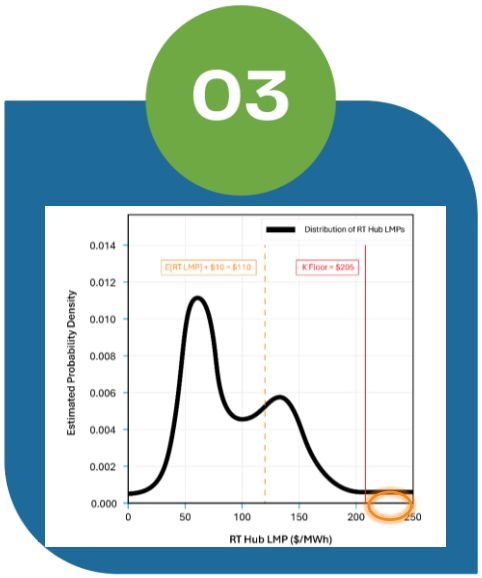
Expected Closeout Component



And as we've shown, from that distribution, we get the expected RT Hub LMP, and the higher of *that plus $10* –**or**- *the strike price floor* sets the strike price.

Notes:

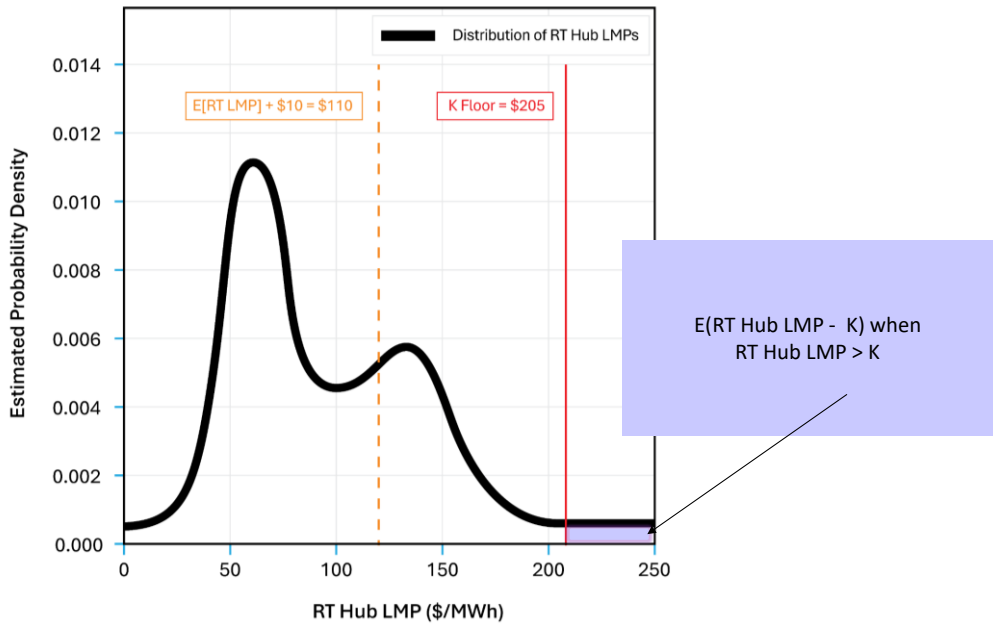
Expected Closeout Component



With that, we can then examine all the possible prices that could exceed the strike price, and their probability or likelihood.

Notes:

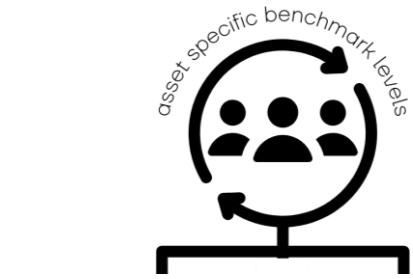
Expected Closeout Component



To calculate expected closeout charge, we sum over all possible RT Hub LMPs that are greater than the strike price, adjusted by the probability of that RT Hub LMP.
Then we can calculate the expected difference between the RT Hub LMP and the strike price, *if* the RT Hub LMP exceeds the strike price.
This is the expected closeout value. The ACTUAL closeout values will be calculated during settlements using real-time data.

Notes:

Asset-Specific Benchmark Levels

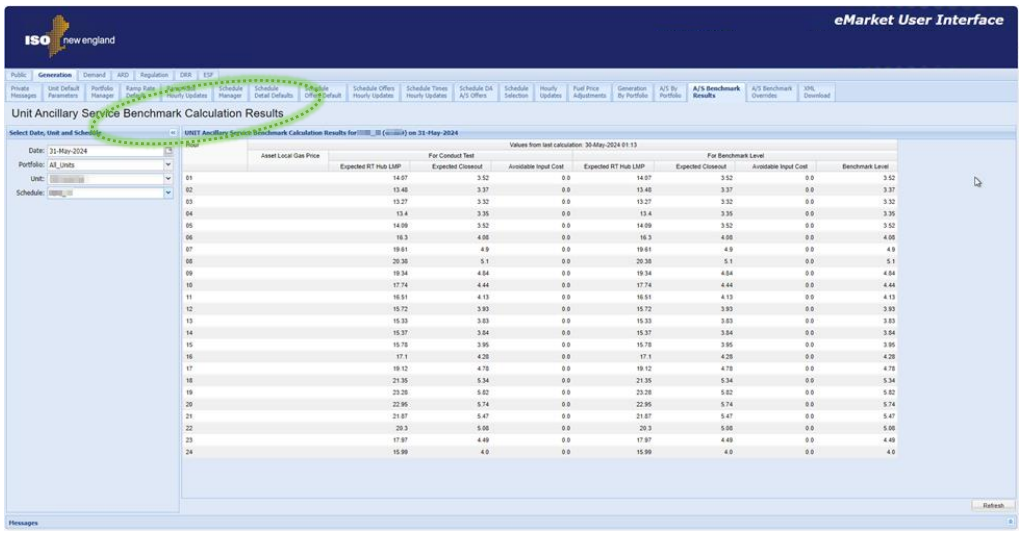


expected close-out avoidable input costs

The expected closeout component is one of the inputs that goes into establishing asset-specific benchmark levels. Like reference levels in the energy market, benchmark levels help protect participants from the exertion of market power.

Notes:

Asset-Specific Benchmark Levels



A participant's asset-specific benchmark levels can be found in eMarket on the A/S Benchmark Results tab.

Notes:

Asset-Specific Benchmark Levels



expected close-out

avoidable input costs

ISO calculates asset-specific levels to estimate what a competitive offer from that participant should be. The framework for this calculation considers two possible costs an asset may incur with a day-ahead ancillary service award: a closeout charge, and an avoidable input cost or AIC. Expected close-out charges are common across all asset types, but avoidable input costs apply only to certain types

Notes:

Asset-Specific Benchmark Levels

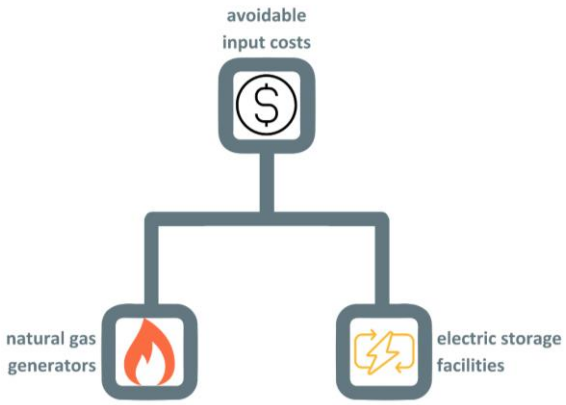


expected close-out + avoidable input costs = benchmark level

For suppliers with these costs, their benchmark level would be the expected closeout value + their avoidable input cost or AIC. But what are avoidable input costs, and who incurs them?

Notes:

Avoidable Input Cost

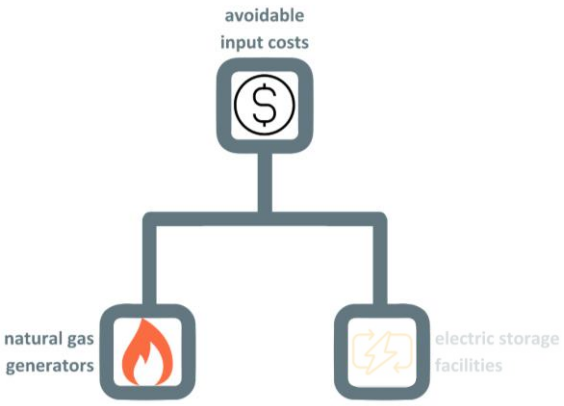


- binary storage facilities (BSF)
- continuous storage facilities (CSF)

Avoidable input costs are avoidable fuel-related cost(s) for assets who will incur costs because of their DA A/S position. Natural gas generators, binary storage facilities, and continuous storage facilities are the asset types that will have AICs. Depending upon the type of asset, the factors that establish an AIC differ.

Notes:

Avoidable Input Cost

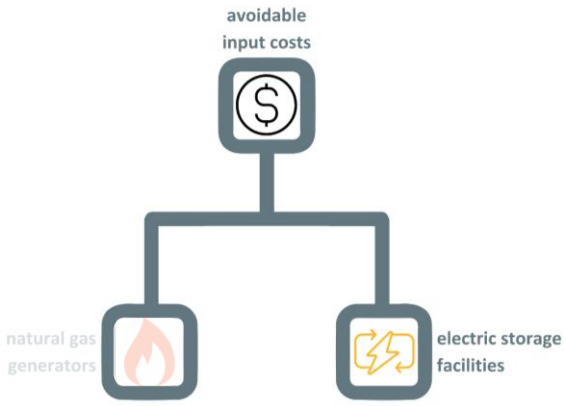


- average incremental heat rate
  - between ecomin & ecomax
- expected price of natural gas
  - adjusted for the expected hourly RT Hub LMP

For a supplier using natural gas as its fuel type in a given hour's supply offer, it includes an asset's average incremental heat rate between eco min and eco max, and the expected price of natural gas, adjusted for the expected hourly Real-Time Hub LMP.

Notes:

Avoidable Input Cost

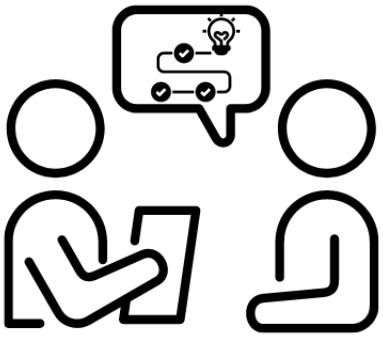


- expected cost of charging energy
  - adjusted for the RT revenue for that charged energy during the operating day

For electric storage facilities, it includes the expected cost of charging energy adjusted for the real time revenue for that charged energy during the operating day

Notes:

Consultation and Overrides



Because benchmark levels are the ISO's *estimate* of a competitive offer, they may not include all the costs perceived by individual units. Consultation is an important part of the benchmark-level development process. It is the means by which participants communicate and potentially override the IMM's benchmark-level values. Learn more about this process for day-ahead ancillary services in the mitigation module

Notes:

Inputs for Offer Formation

- Strike price
- Expected close-out component
- Benchmark levels
- Avoidable input costs



With an understanding of these new concepts, a participant is ready to form their day-ahead ancillary service offer.

Notes:

Offer Formation

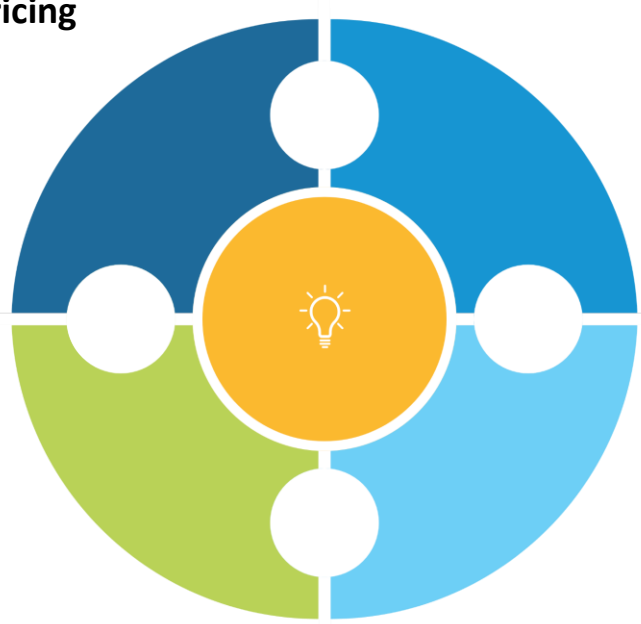
- Pricing and quantities
- DA A/S products
- Forecast energy requirement demand quantity (FER DQ)
- Asset limitations
- Co-optimization



When a lead participant is ready to offer day-ahead ancillary services, there are a few considerations including understanding how pricing and quantities work for day-ahead ancillary products, what the forecast energy requirement demand quantity means, how different assets can provide different products, and the market clearing engine co-optimization process.

Notes:

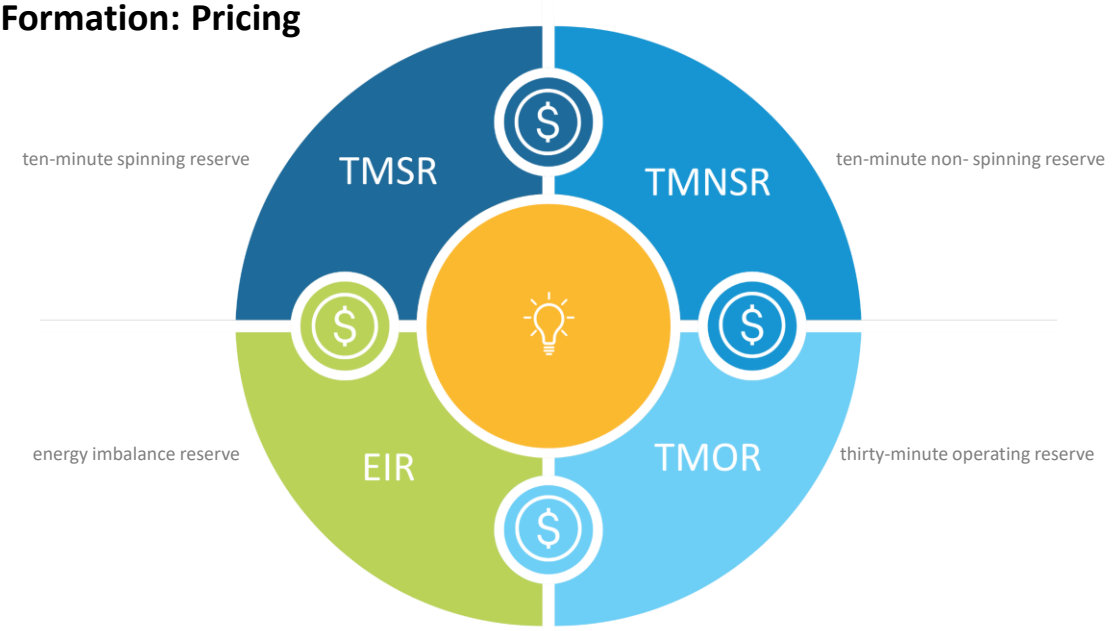
Offer Formation: Pricing



Energy or ancillary service offers should reflect an assets costs. A participant may submit a different price for each product to reflect different costs it may incur to provide it. Participants that submit hourly offers will enter 4 monetary values.

Notes:

Offer Formation: Pricing



For each of the 4 day-ahead ancillary products.

Notes:

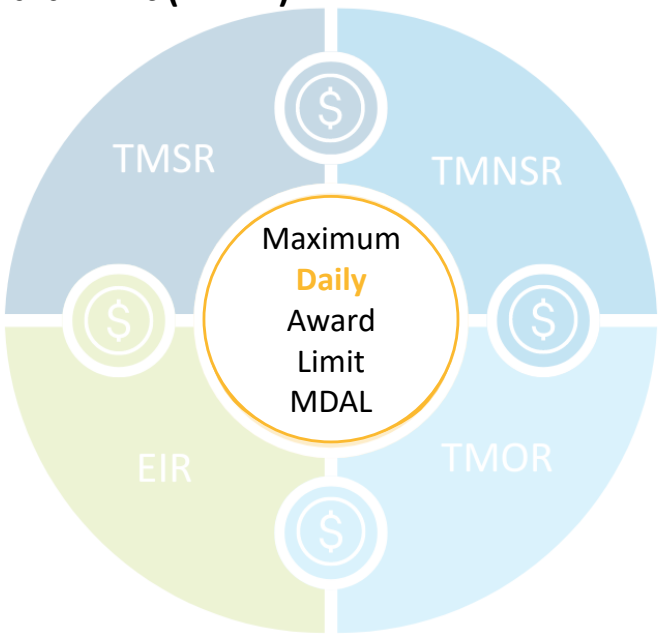
Offer Formation: Quantity



And one overall quantity of megawatts for each hour.

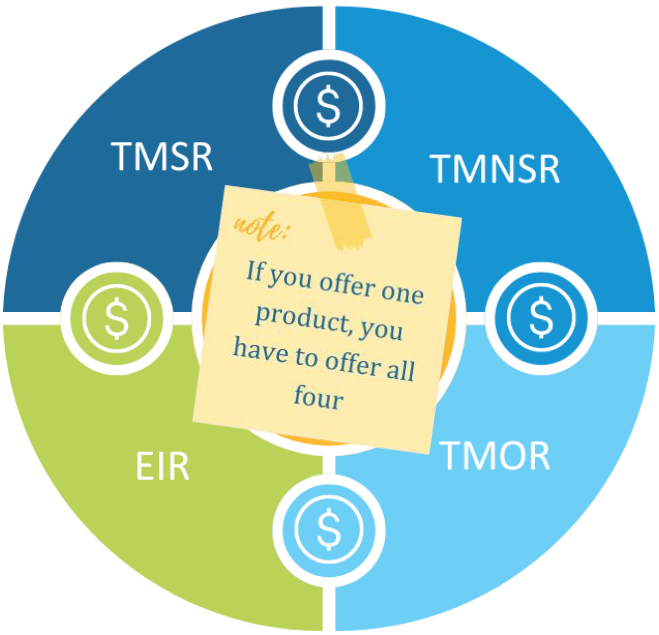
Notes:

Maximum Daily Award Limit (MDAL)



Offer quantities are hourly. A key concept with day ahead ancillary services is a maximum daily award limit, or MDAL. This features allows participants to specify the maximum amount of energy and reserves they want to be scheduled for throughout the operating *day*.

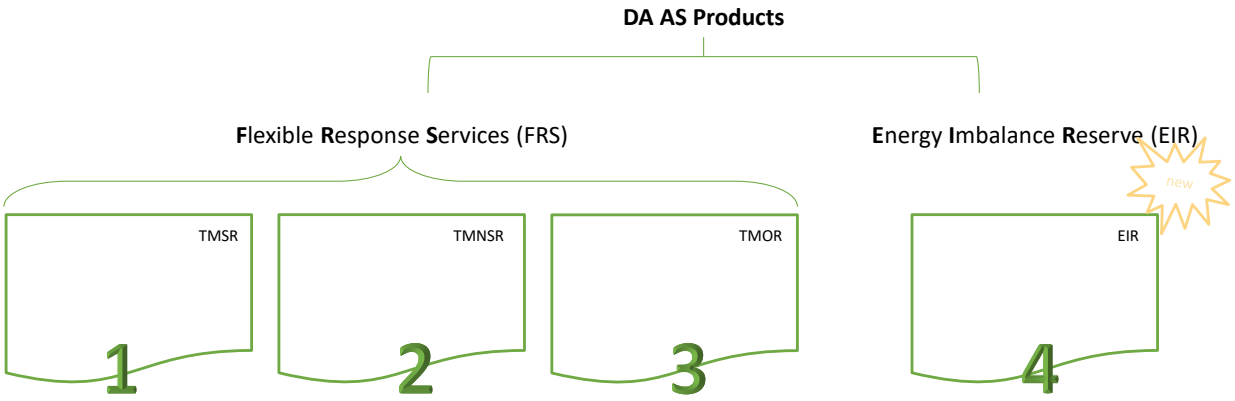
Notes:



If a participant offers day ahead ancillary services, they must submit for all products, even if they will not be supplying that product. The market clearing engine will account for the unit's capability when awarding these obligations. More on this in the market clearing section.

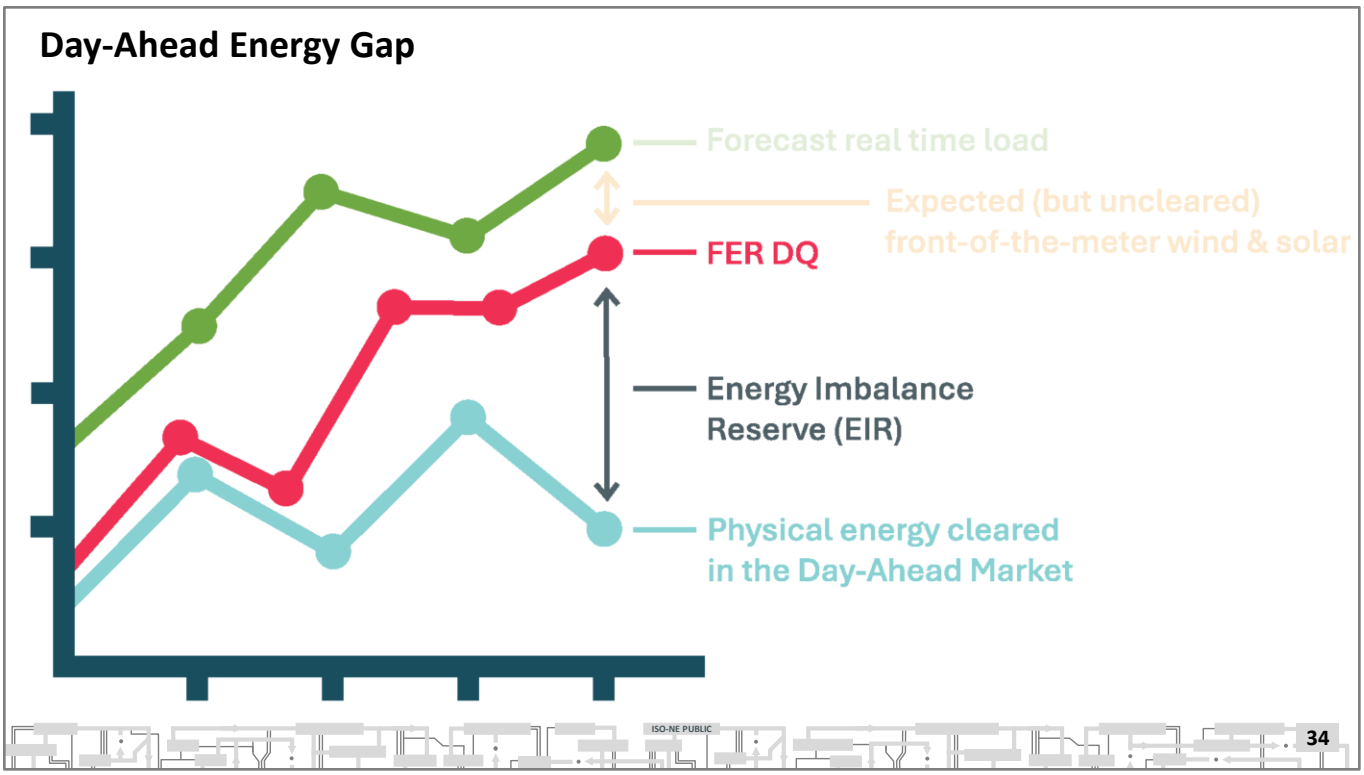
Notes:

Four DA A/S Products



Flexible Response Services include three reserve products: ten-minute spinning reserve, ten-minute non-spinning reserve, and thirty-minute operating reserve which all cover contingency needs. Energy imbalance reserve or EIR is used not in response to a contingency, but to close the DA energy gap when DA obligations from physical assets are less than the forecast energy requirement demand quantity or FER DQ. Let's explore the energy imbalance reserve a bit more:

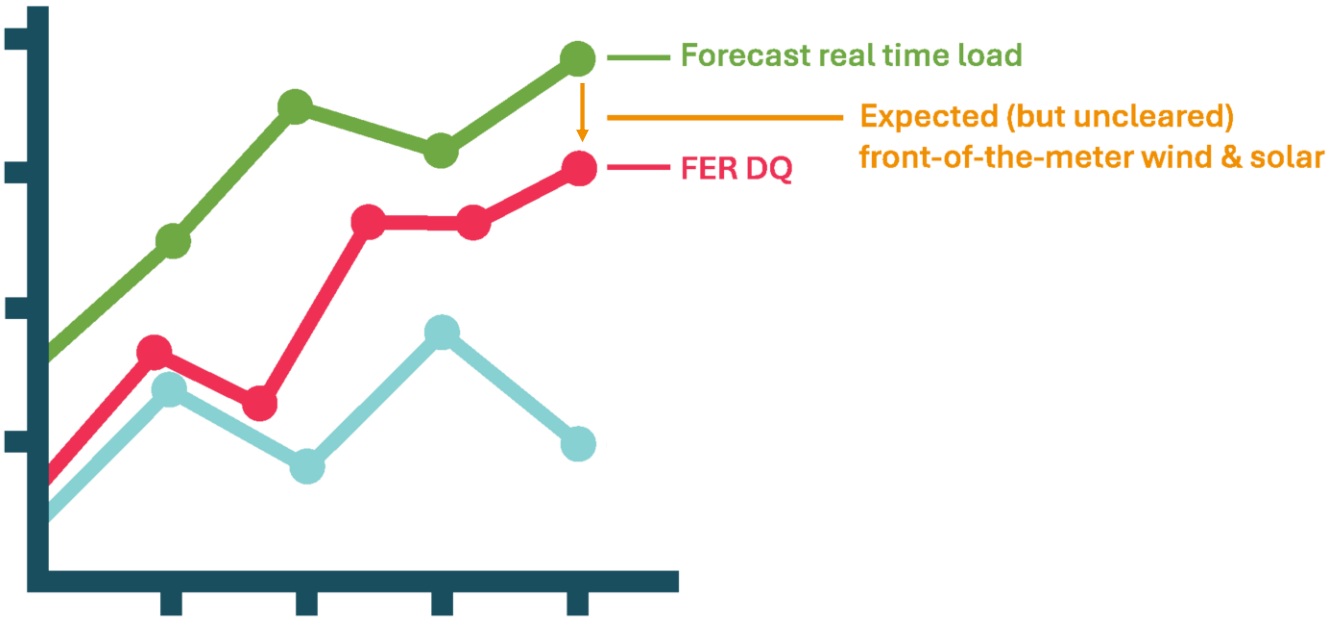
Notes:



EIR are megawatts used to close the DA energy gap. A day-ahead energy gap exists when there's a difference between the physical energy cleared in the day-ahead market and the forecast energy requirement demand quantity or FER DQ.

Notes:

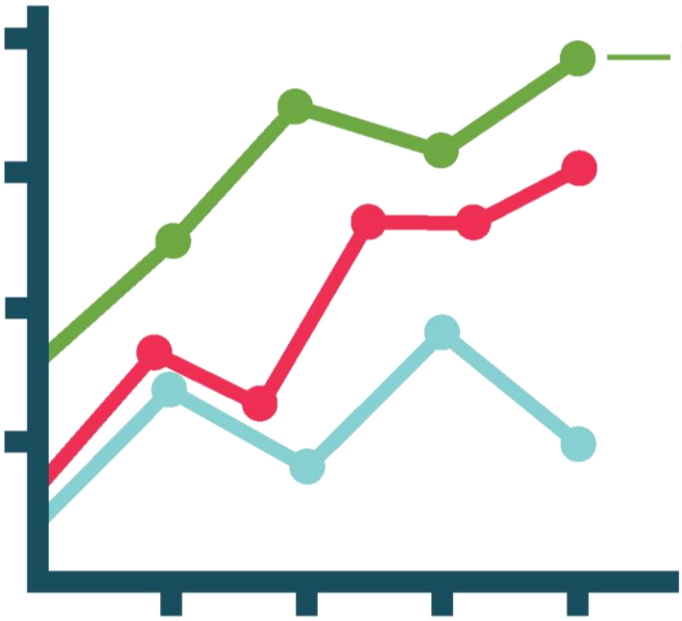
Forecast Energy Requirement Demand Quantity (FER DQ)



The forecast energy requirement demand requirement or FER DQ represents the forecasted real-time load minus the front of the meter wind and solar megawatts expected but not cleared.

Notes:

Load Forecast Reports

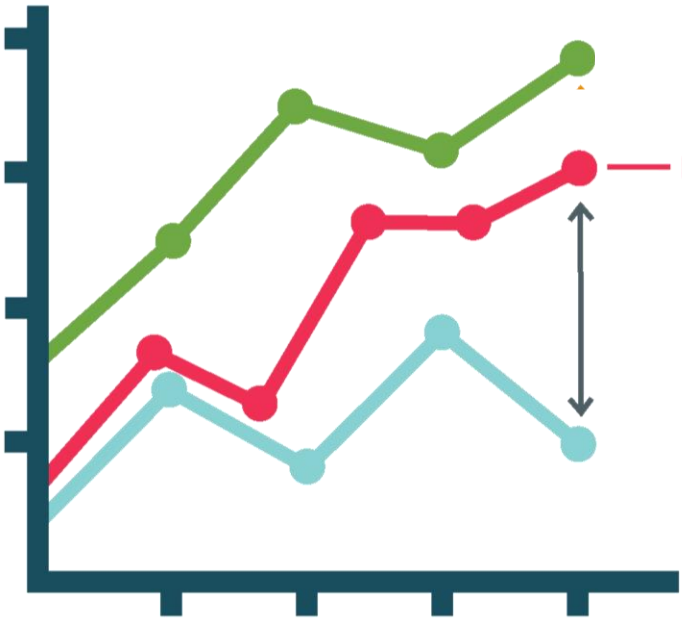


Standard load forecast reports are on ISO New England's website with the Energy, Load, and Demand Reports

. The standard load forecast reports are on ISO New England's website with the Energy, Load, and Demand Reports.

Notes:

Reserve Report for FER DQ Values

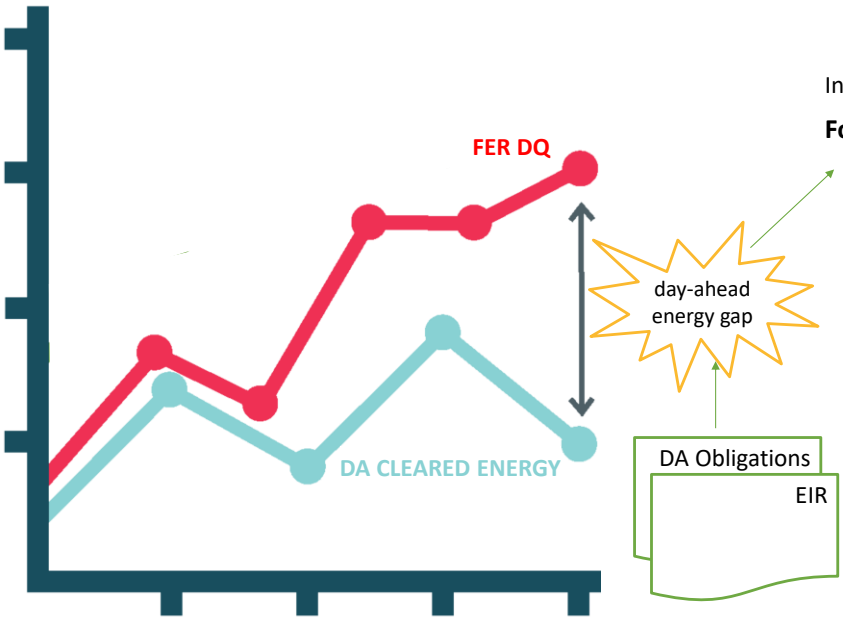


FER DQ reports are in the Day-Ahead Hourly Reserve Requirement Prices, Designations, and Forecast report under Pricing Reports.

FER DQ values are in the Day-Ahead Hourly Reserve Requirement Prices, Designations, and Forecast report under Pricing Reports on ISO Express.

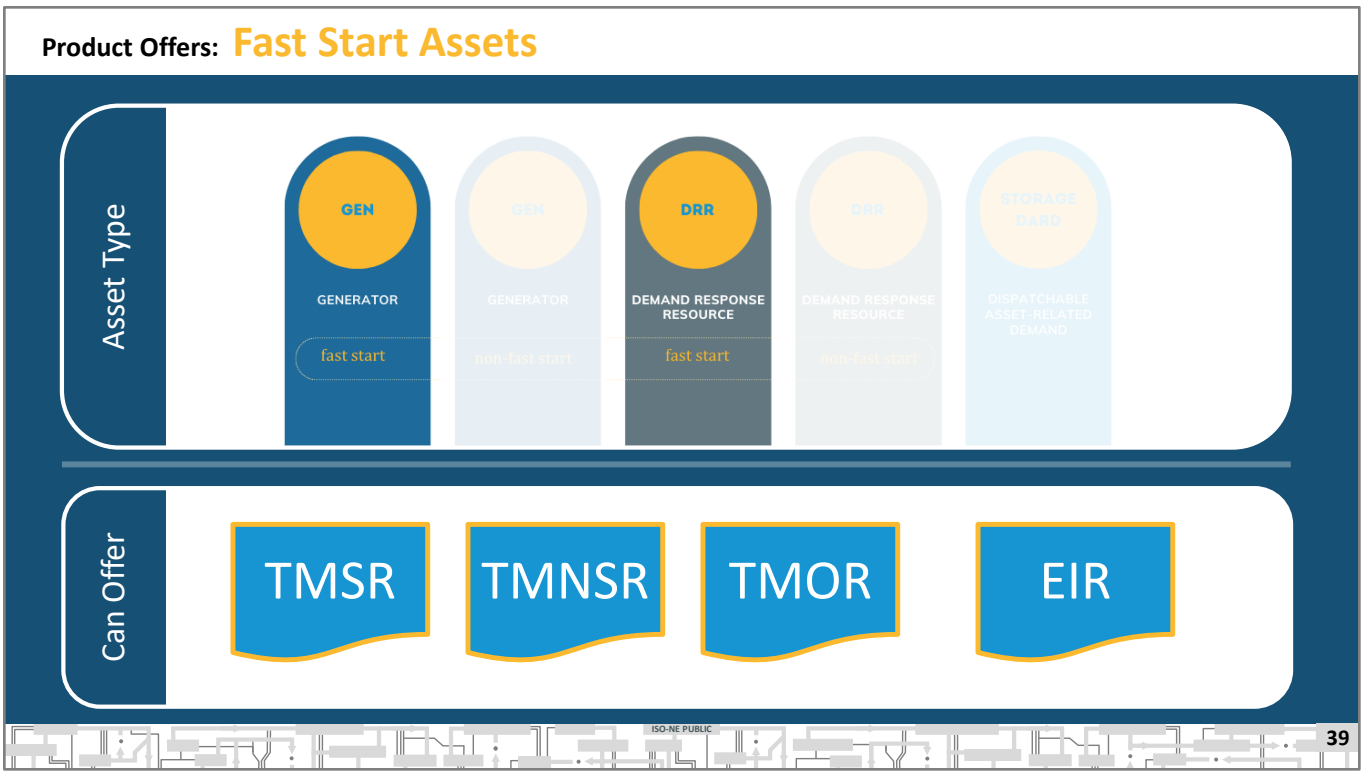
Notes:

Forecast Energy Requirement (FER) Price



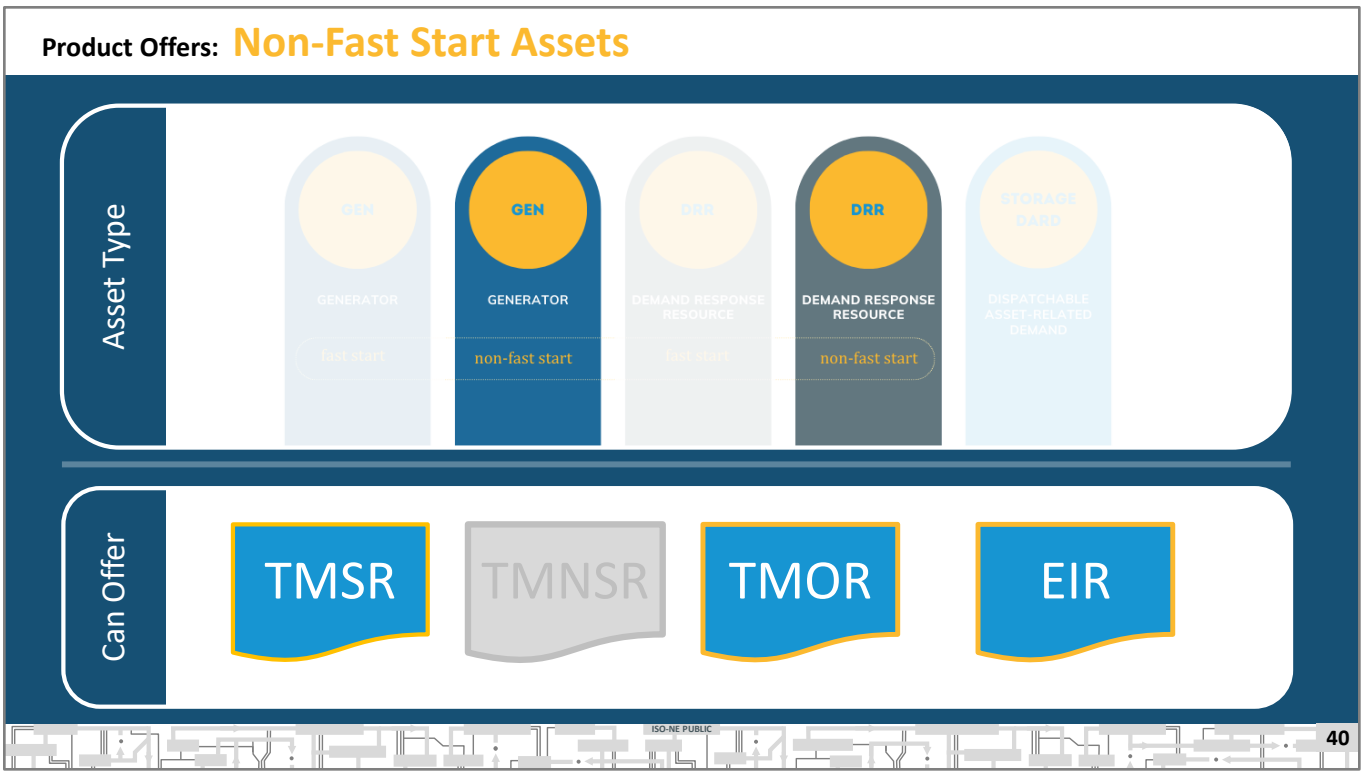
When a day-ahead energy gap exists, the DA clearing engine will use EIR megawatts and additional DA obligations to close the gap. There's an incremental cost for procuring these megawatts called the Forecast Energy Requirement (or FER) Price. During settlements, we'll explore how the FER Price is credited and charged.

Notes:



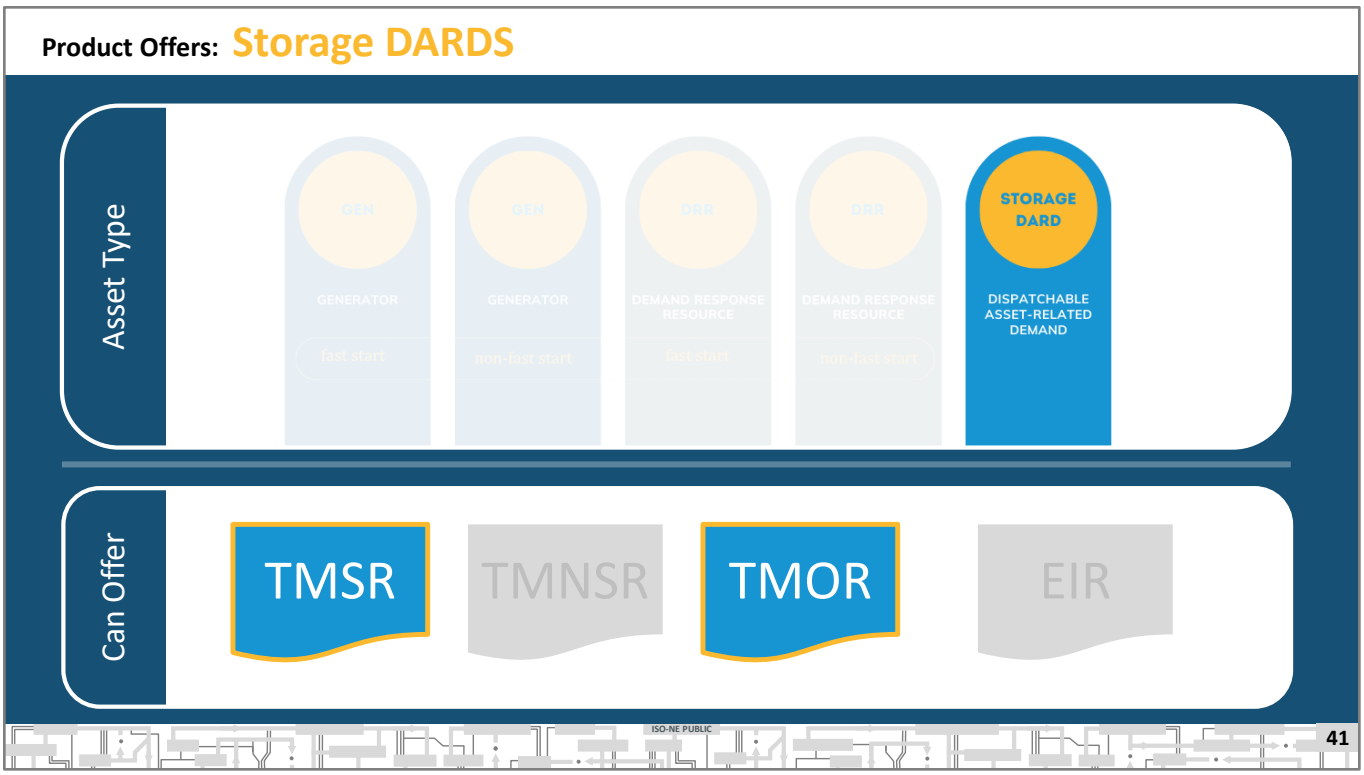
A fast start asset can clear all 4 products.

Notes:



A non-fast start can only clear TMSR, TMOR and EIR.

Notes:



A dispatchable asset related demand or Storage DARD can only provide TMSR and TMOR. It cannot provide TMNSR & EIR.

Notes:

Co-optimization

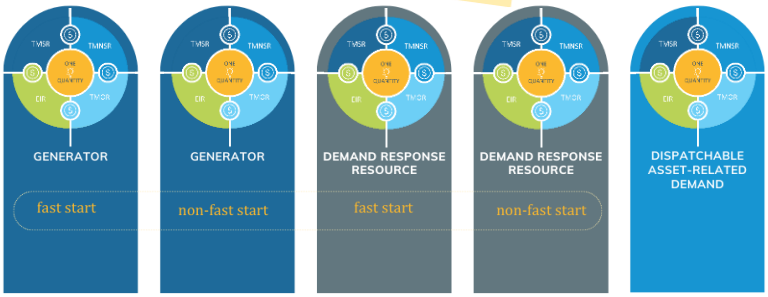


However, despite these constraints…regardless of asset type, if you offer one day-ahead ancillary service product, you have to offer all 4. Through co-optimization, the market clearing engine will schedule each asset for its optimal combination of energy and ancillary serves needed to satisfy requirements throughout the operating day at least cost to consumers. No resource will clear for a product it is not capable of providing.

Notes:

Co-optimization

note: If you offer one product, you have to offer all four



- Energy offers
- Demand bids
- DA A/S offers
- Transmission constraints
- Physical capabilities

The co-optimization process considers energy offers, demand bids, DA A/S Offers, transmission constraints, and each resource's physical capabilities. We'll explore this co-optimization a bit more when we get to market clearing. But first, continue the journey to a participant's next step: using eMarket or XML to place day-ahead ancillary service offers.

Notes:

Offer Formation

- Pricing and quantities
- DA A/S products
- Forecast energy requirement demand quantity (FER DQ)
- Asset limitations
- Co-optimization



With an understanding of how pricing and quantities work for day-ahead ancillary products, what the forecast energy requirement demand quantity is, how different assets can provide different products, and the market clearing engine co-optimization process, advance to the next step in the journey to learn about the emarket tabs and screens to gather information, take action, and find results for day-ahead ancillary services.

Notes:

Submitting DA A/S Offers in eMarket and by XML

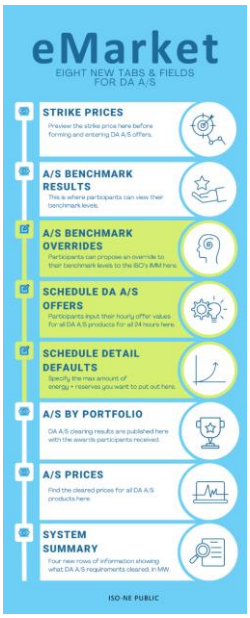
- Information
- Action
- Results
- Documentation



This primer prepares participants with the new eMarket screens associated with day-ahead ancillary services. The primer walks through tabs that supply information, that require action and that deliver results, and explains the documentation available including the eMarket user guide, and instructions for programmatic offers.

Notes:

eMarket Screens for DA A/S



information

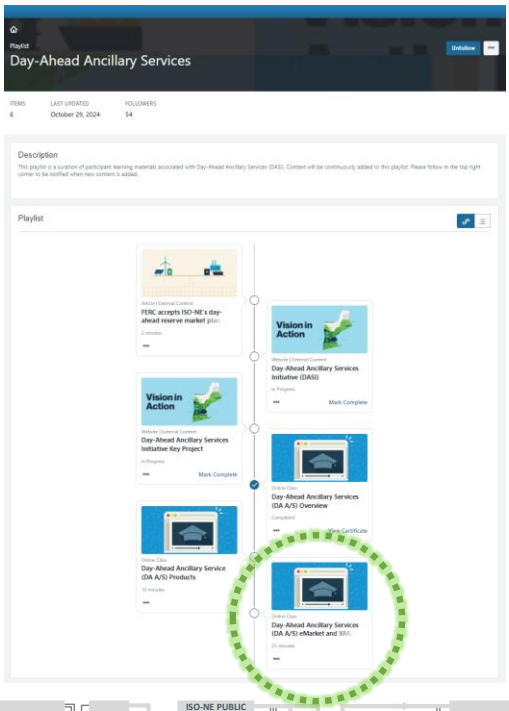
action

results

There are eight eMarket screens associated with DA A/S. Some are information only, some may require action.

Notes:

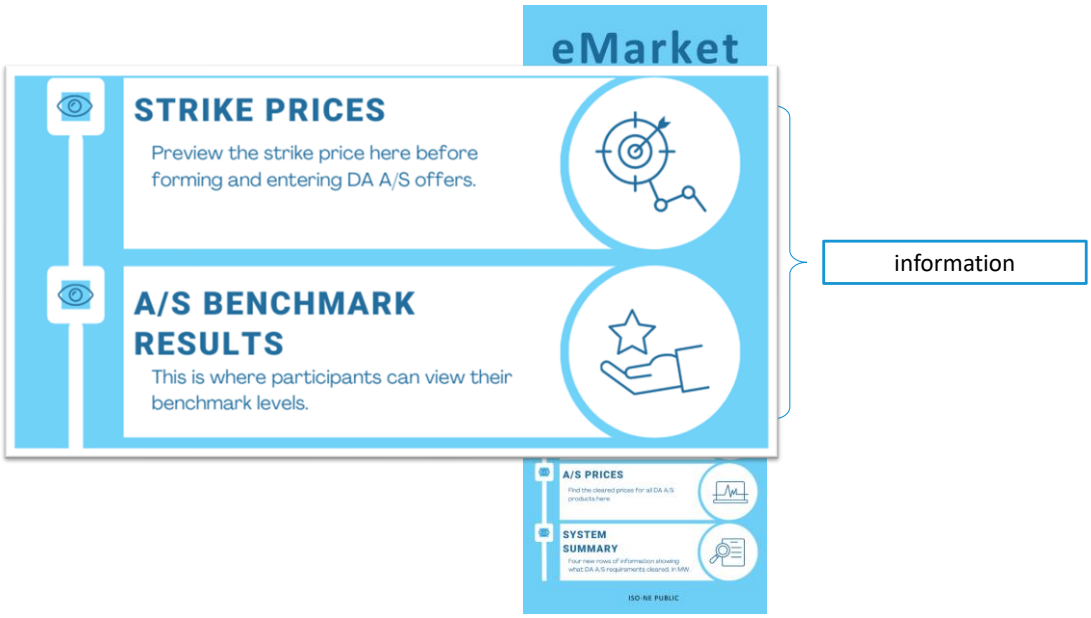
eMarket Playlist Module



For a more in-depth explanation of each screen, including screenshots please review the eMarket module on the day-ahead ancillary services playlist in ISO-TEN.

Notes:

eMarket Informational Screens



There is a strike price screen within the public tab of eMarket. On this screen, participants will find the strike price and expected closeout values published at 5:30 est each morning. The benchmark results tab is an asset-specific estimation of what a competitive offer from that participant might be, given the estimation of an expected closeout value and their unique avoidable input costs. These two screens help inform participants about offer parameters for day-ahead ancillary services and invite consultation with ISO New England's internal market monitor.

Notes:

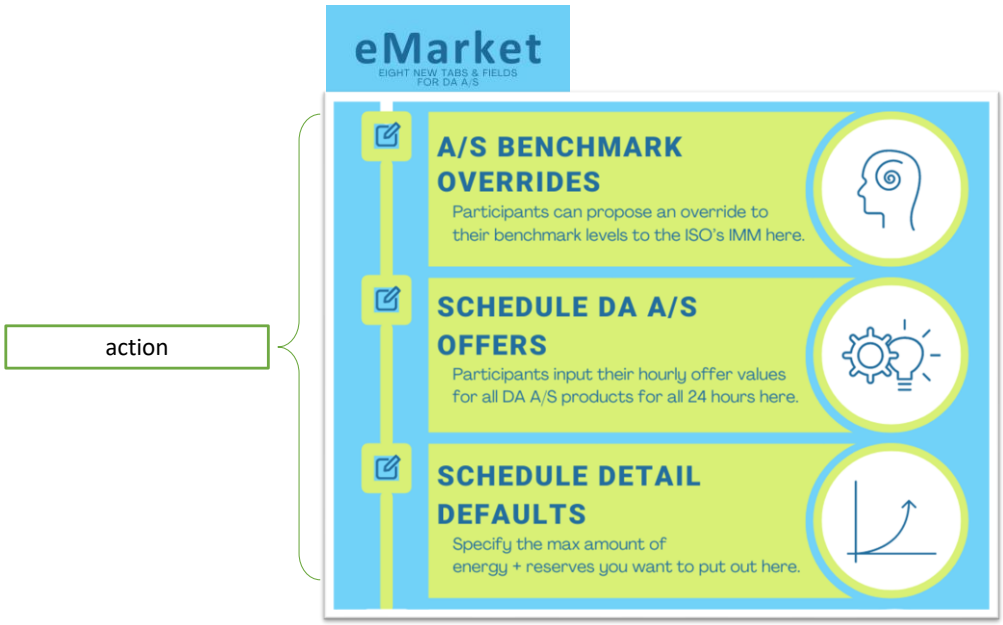
eMarket Informational Screens



For a refresher on what strike prices and benchmark levels are, watch the Inputs of Day-Ahead Ancillary Service Offer Formation video.

Notes:

eMarket Action Screens



Three action-oriented screens in eMarket are shown here. A/S Benchmark overrides invite participants to get into dialogue with the internal market monitor to align on costs and estimations. The schedule DA A/S offers screen is where participants who use eMarket will enter their hourly offers for all 24 hours.
And the schedule detail defaults screen has an important field requiring action…

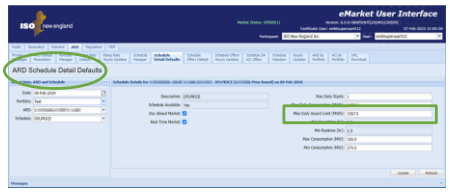
Notes:

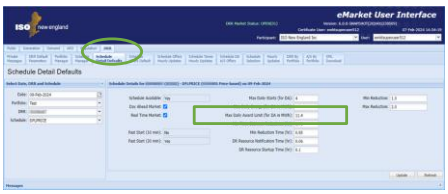
Max Daily Award Limit (MDAL)

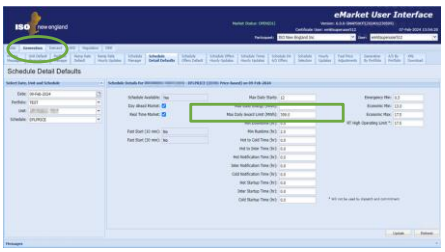


Schedule Detail Defaults Tab

- ✓ Specify MDAL: Maximum daily award limit



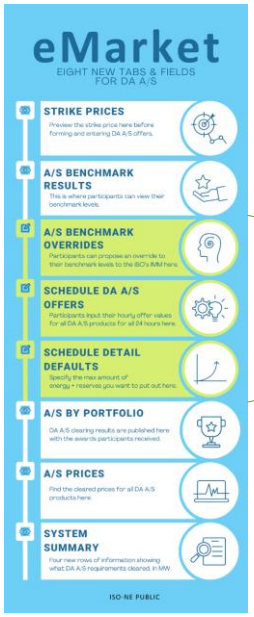




The schedule detail defaults tabs for generators, ARDs and DARDS each have this Max Daily Award Limit field on their respective schedule detail defaults screens to specify themaximum amount of energy and reserves they want to clear across all hours of the day.

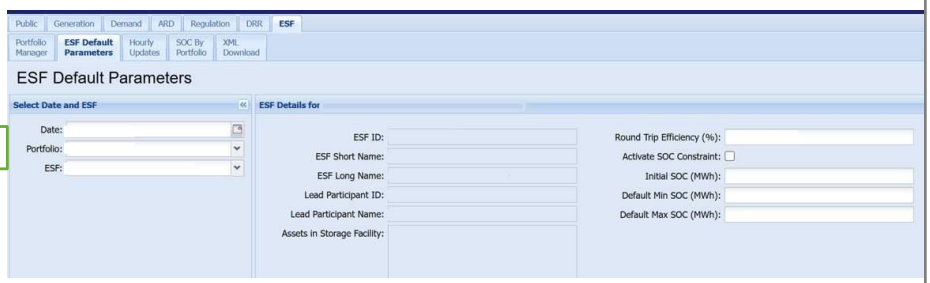
Notes:

ESF Daily Defaults



- ✓ round-trip efficiency (RTE) parameter
- ✓ ESF details

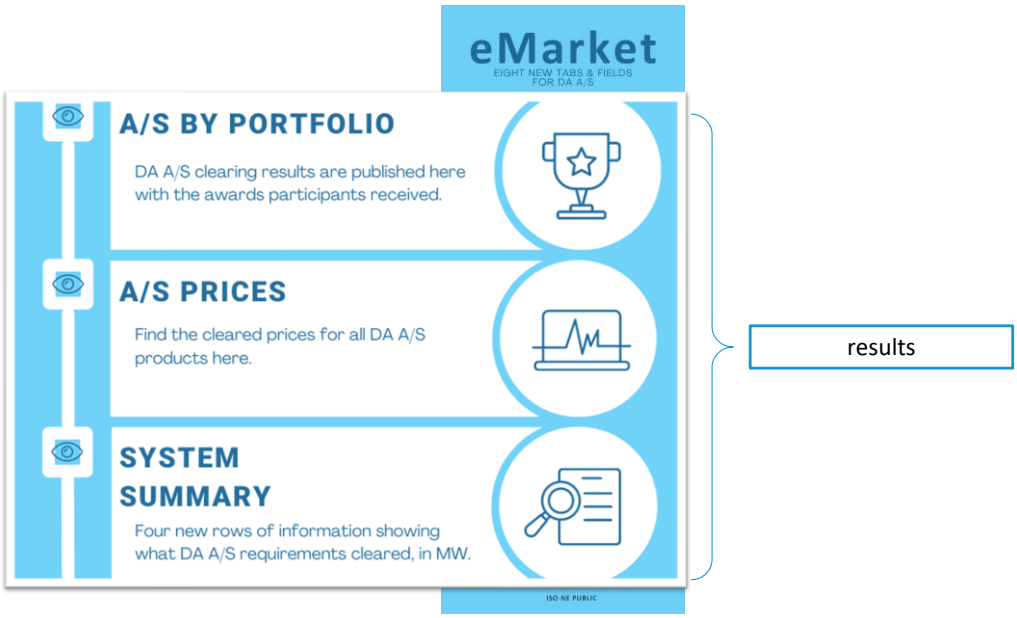
action



There is also an ESF Daily Defaults display that allows participants to enter and view the round-trip efficiency (RTE) parameter and ESF details for a selected market day and selected storage facility. The RTE parameters and ESF details a participant enters into eMarket factor into establishing an assets avoidable input costs. By being proactive inputting good information about ESF here, a participant's benchmark levels can better reflect their avoidable input costs.

Notes:

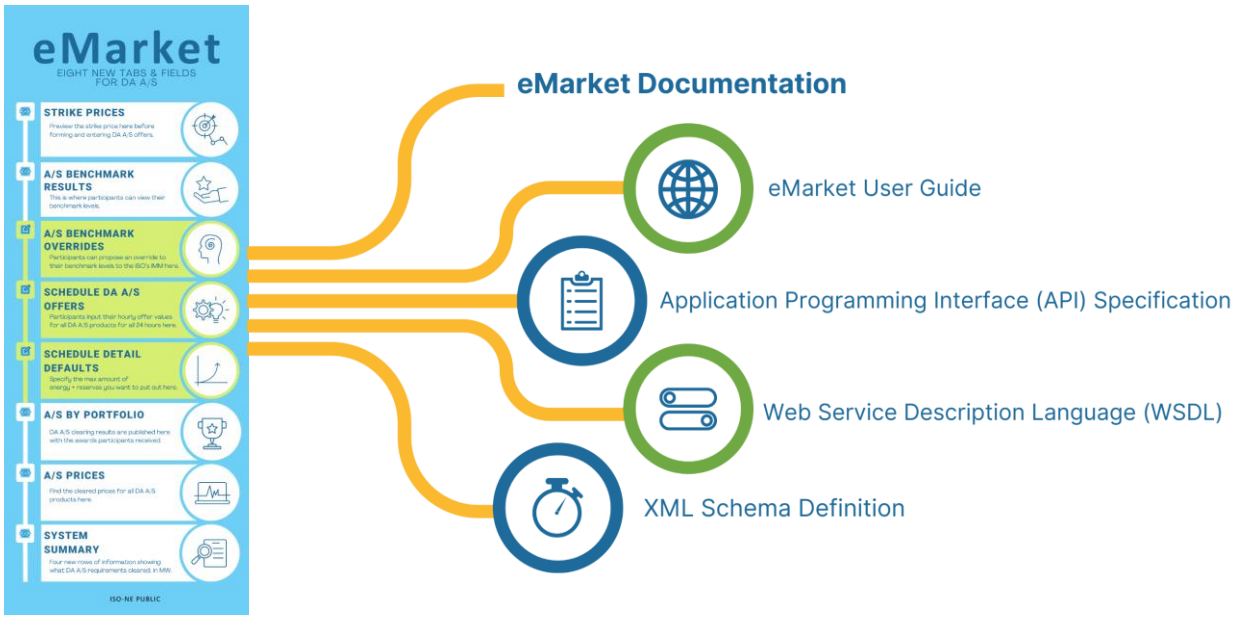
eMarket Results Screens



Once the offers are made and the market has cleared there are three screens in eMarket where participants can find results. The A/S by portfolio screen shows individual participant awards. A/S prices shows the hourly clearing prices for ancillary services. And the system summary shows the megawatt requirements for each product on a given operating day.

Notes:

eMarket



The guides referenced here support participants' ability to make offers for DA A/S and can be found on ISO-New England's website. For those who offer programmatically, all the eMarket graphical user interface (GUI) changes listed here have a corresponding XML download change.

Notes:

DA A/S eMarket

- Information
- Action
- Results
- Documentation



This primer exposes participants to the new eMarket screens associated with day-ahead ancillary services. The primer walks through tabs that supply information, require action and deliver results, and explains the documentation available including the eMarket user guide, and instructions for programmatic offers. For a more in-depth explanation of each screen, including screenshots please review the stand-alone eMarket module on the day-ahead ancillary services playlist in ISO-TEN.

Notes:

DA A/S Mitigation



Mitigation is the process by which the Internal Market Monitor evaluates and eliminates the potential for market power exertion. Participants who operate in the energy market should be familiar with the concept, yet the application of mitigation in day-ahead ancillary services has a few differences. DA A/S mitigation is separate and independent from energy mitigation and includes a few key concepts introduced here.

Notes:

Benchmark Levels

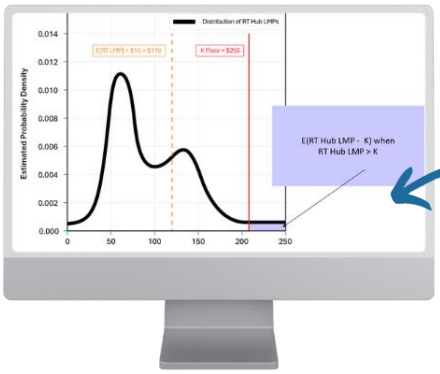


expected close-out charges + avoidable input costs = benchmark levels

Let's start with the concept of benchmark levels. Remember that ISO calculates asset-specific levels to estimate what a competitive ancillary service offer from that participant should be. The framework for this calculation considers two possible costs an asset may incur with a DA A/S award: the expected closeout charge, and an avoidable input cost or AIC. Expected close-out costs are common across all asset types, but AICs apply only to certain types. For suppliers with these costs, their benchmark level would be the expected closeout value + their avoidable input cost or AIC.

Notes:

Benchmark Levels



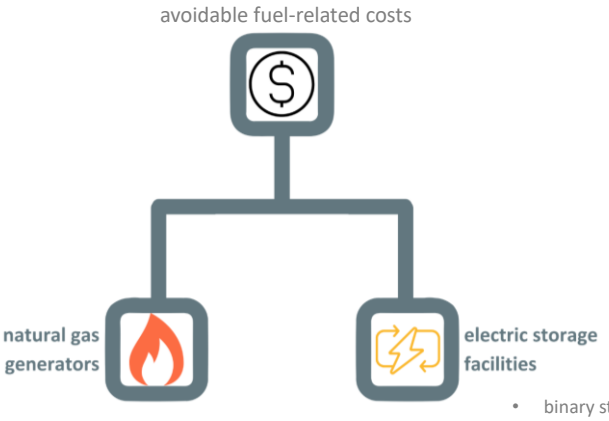


expected close-out charges + avoidable input costs = benchmark levels

To review the details of establishing the expected closeout component, refer to the *Inputs for Day-Ahead Ancillary Service Offer Formation* video.

Notes:

Avoidable Input Cost

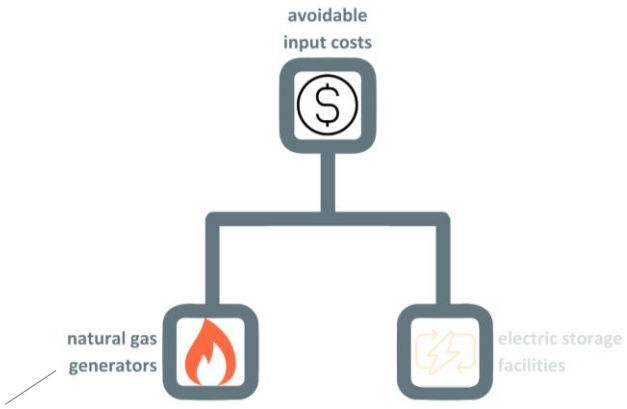


- binary storage facilities (BSF)
- continuous storage facilities (CSF)

Avoidable input costs are avoidable fuel-related cost(s) for assets who will incur costs because of their DA A/S position. Natural gas generators, binary storage facilities, and continuous storage facilities are the asset types that will have AICs. Depending upon the type of asset, the factors that establish an AIC differ.

Notes:

Avoidable Input Cost

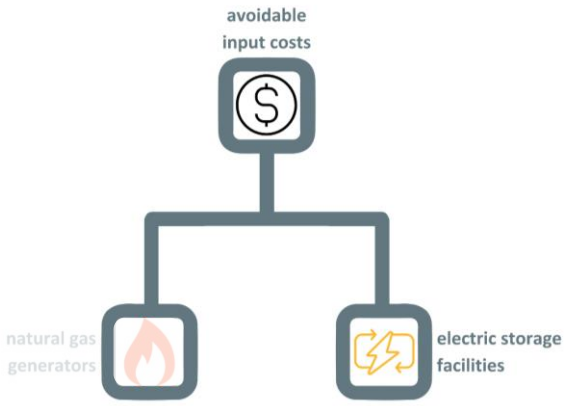


- average incremental heat rate
  - Between ecomin and ecomax
- expected price of natural gas
  - adjusted for the expected hourly RT Hub LMP

For a supplier using natural gas as its fuel type in a given hour's supply offer, it includes an asset's average incremental heat rate between eco min and eco max, and the expected price of natural gas, adjusted for the expected hourly Real-Time Hub LMP.

Notes:

Avoidable Input Cost

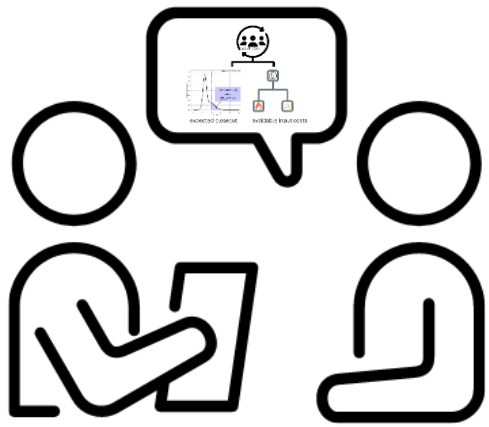


- expected cost of charging energy
  - adjusted for the RT revenue for that charged energy during the operating day

For electric storage facilities, it includes the expected cost of charging energy adjusted for the real time revenue for that charged energy during the operating day

Notes:

Consultation and Overrides

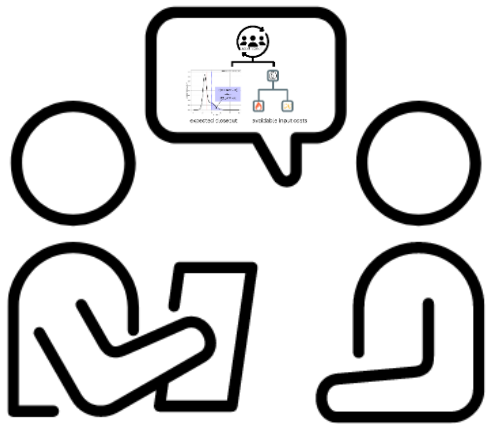


- Benchmark levels are estimates
- Expected costs may differ
- Risk of mitigation

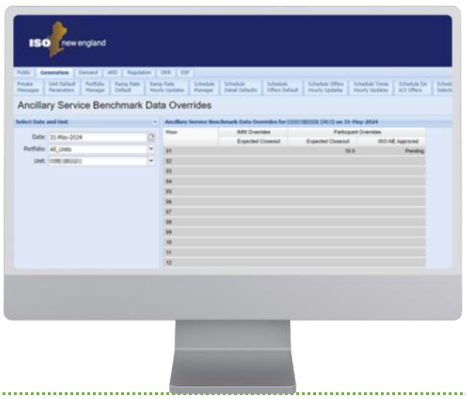
Because benchmark levels are the ISO's *estimate* of a competitive offer, it may not include all the costs perceived by individual units, making consultation an important part of the benchmark level development process. Participants may have different expectations for their benchmark level components. If a participant's expected costs differ significantly from the estimates, there's a risk of mitigation and under-recovery of competitive costs. Consultation with the IMM is important to limiting this risk and associated market and participant harm.

Notes:

Overrides



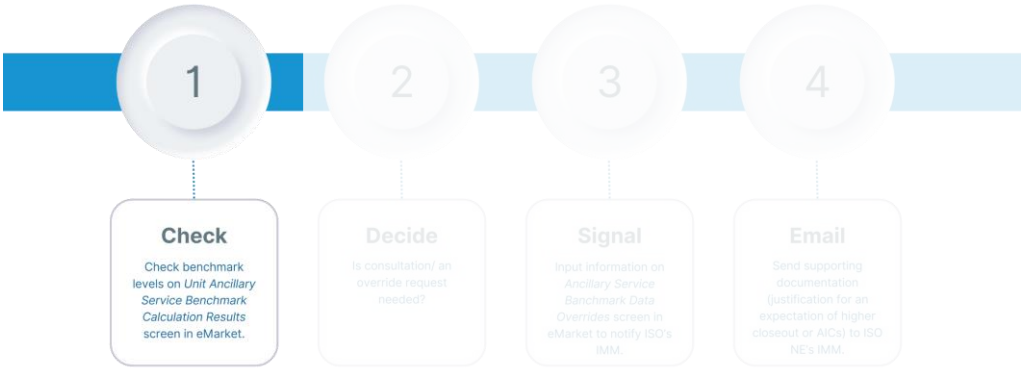
Participants initiate the override process in eMarket



It's the participant's responsibility to initiate this process through the overrides screen in eMarket. Taking this step is the means by which participants communicate and potentially override the IMM's benchmark level values.

Notes:

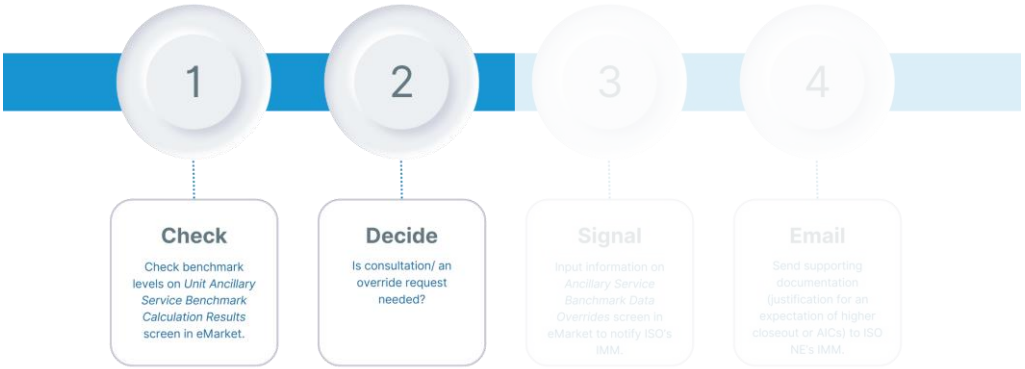
Consultation and Overrides



The process for day-ahead ancillary service offer consultation is different than what a participant might do for an energy offer. This process is initiated by the participant checking their benchmark levels,

Notes:

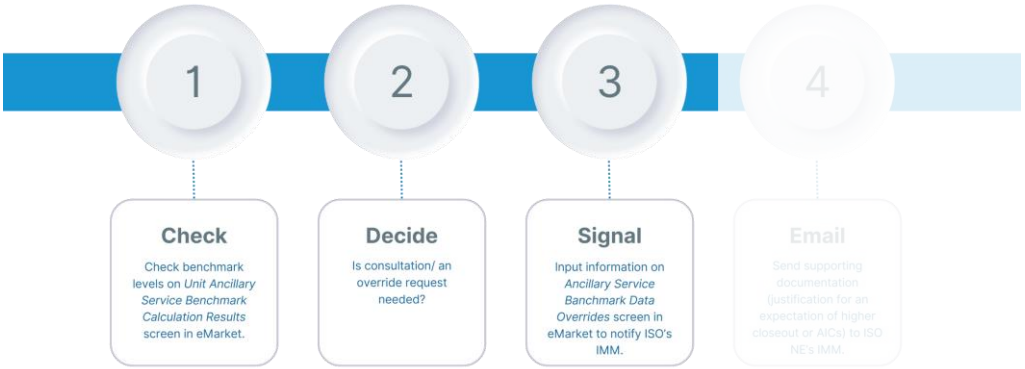
Consultation and Overrides



deciding whether an override request is necessary,

Notes:

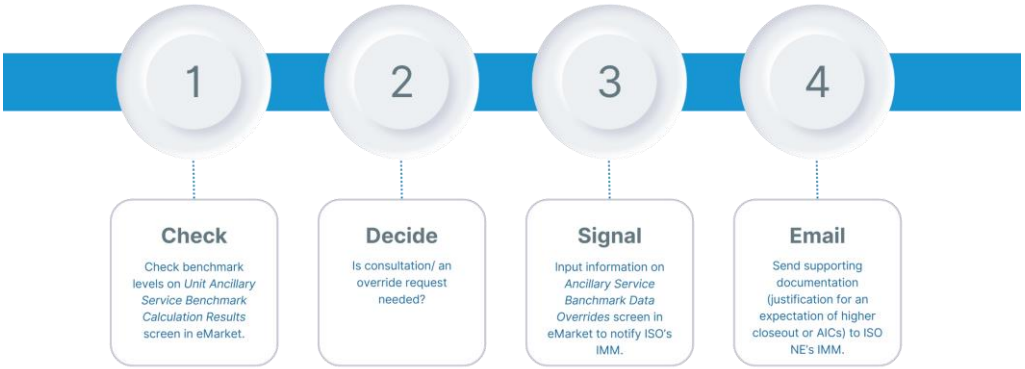
Consultation and Overrides



signaling the Internal Market Monitor through the *Benchmark Data Overrides* screen in eMarket,

Notes:

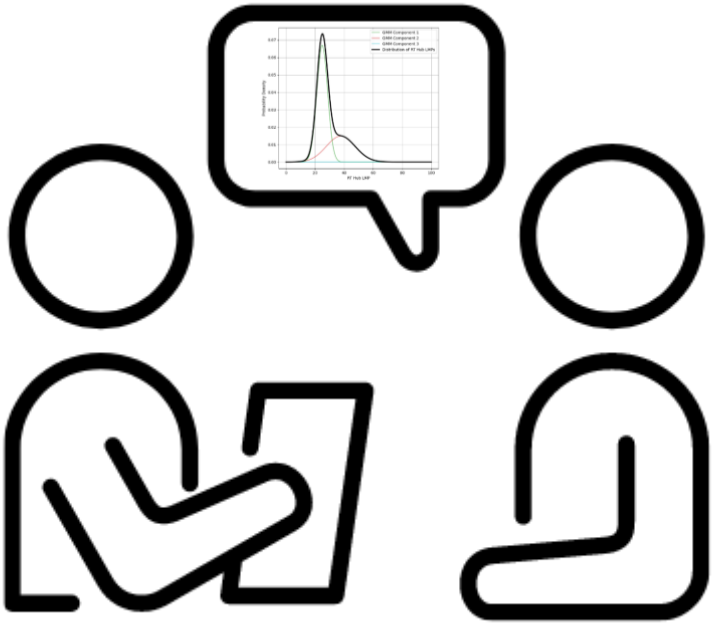
Consultation and Overrides



And emailing supporting documentation such as an approved model to the ISO's Internal Market Monitor justifying the expectation of a higher close-out or AIC. Getting IMM approval can take days to weeks depending upon complexity. There is no prompt for or follow-up to the participant from IMM if the override request or documentation is not submitted.

Notes:

Consultation and Overrides



Any participant who tends to routinely submit overrides is expected to build their own model to be better equipped to substantiate their claims.

Notes:

Bid-to-Bill Recap

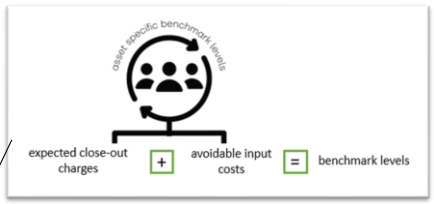


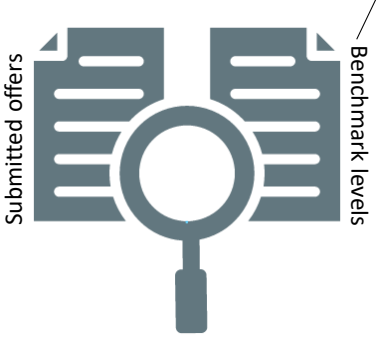
- ✓ Checked strike-price and expected closeout
- ✓ Checked benchmark levels
- ✓ Initiated an override if necessary
- ✓ Entered hourly offers into eMarket
- ○ IMM offer review

Before continuing let's recap where a participant is in their bid-to-bill journey so far. They have checked the strike-price and expected closeout value in eMarket, and cross-checked their asset-specific benchmark levels. They have considered their costs and if desired, they have initiated an override request and supplied the supporting documentation. They have decided upon the price values for each product, and a quantity for each of their hourly offers, and those offers have been entered into eMarket or submitted by XML. At this point, all submitted day-ahead ancillary service offers are reviewed by the Internal Market Monitor relative to their asset-specific benchmark levels. Let's look at what that review entails:

Notes:

Offer Review





Remember that ISO calculates asset-specific levels to estimate what a competitive ancillary service offer from that participant should be, given their costs. The framework for this calculation considers two possible costs an asset may incur with a DA/AS award: a closeout charge, and an avoidable input cost or AIC. For suppliers with these costs, their benchmark level would be the expected closeout value + their avoidable input cost or AIC. The first review is all submitted day-ahead ancillary service offers relative to their asset-specific benchmark levels.

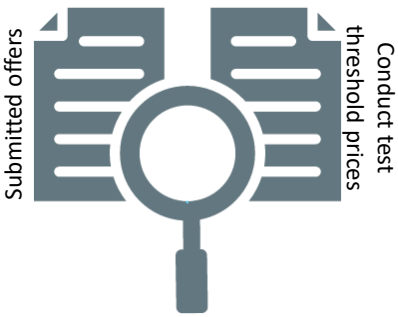
Notes:

Conduct Test

DA A/S offer review



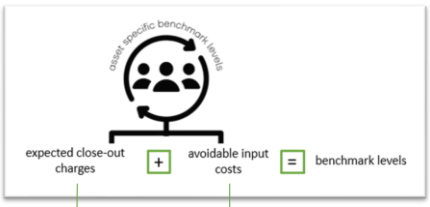
conduct test



The first step in the IMM's review compares day-ahead ancillary service offer prices to a conduct test threshold price.
If an offer price is higher than the corresponding threshold price, that offer violates the conduct test and is flagged for potential non-competitive conduct.

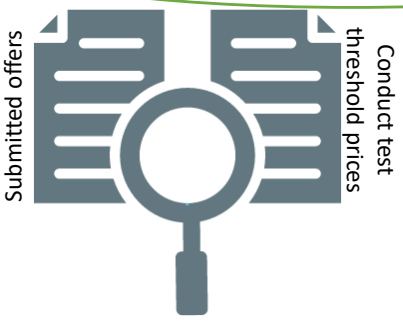
Notes:

Conduct Test Threshold



2x expected closeout + 150% avoidable input cost = conduct test threshold

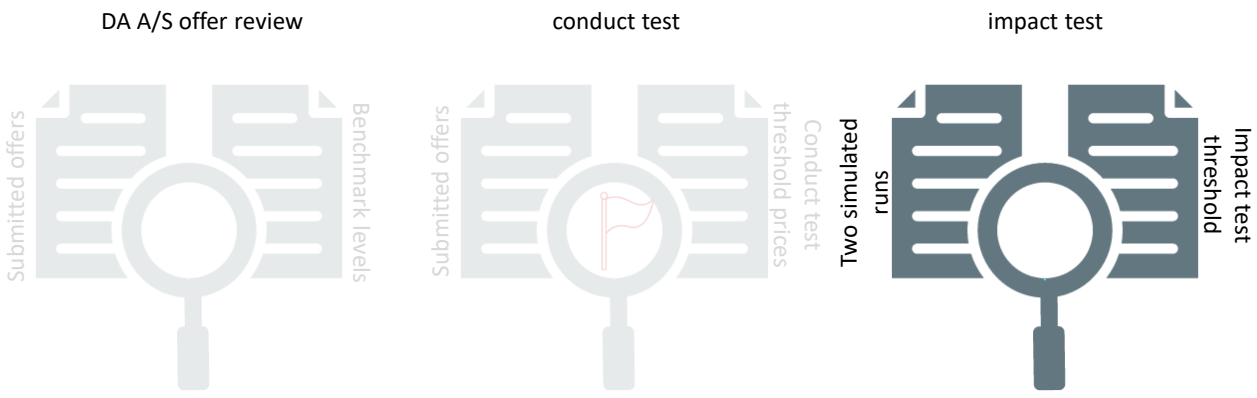




These hourly, product-specific conduct test threshold prices are calculated as 2 times an assets' expected closeout Plus 150% of their avoidable input cost (for those who have one). The minimum value of the conduct test threshold price is $2/MWh.

Notes:

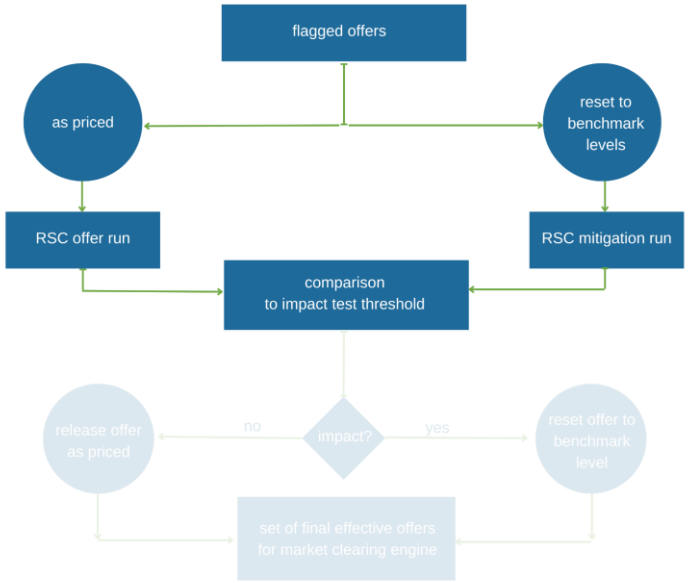
Impact Test



A third step for those offers flagged in the conduct test is the impact test. The impact test is where the ISO measures the price impact of those offers demonstrating potential noncompetitive conduct.

Notes:

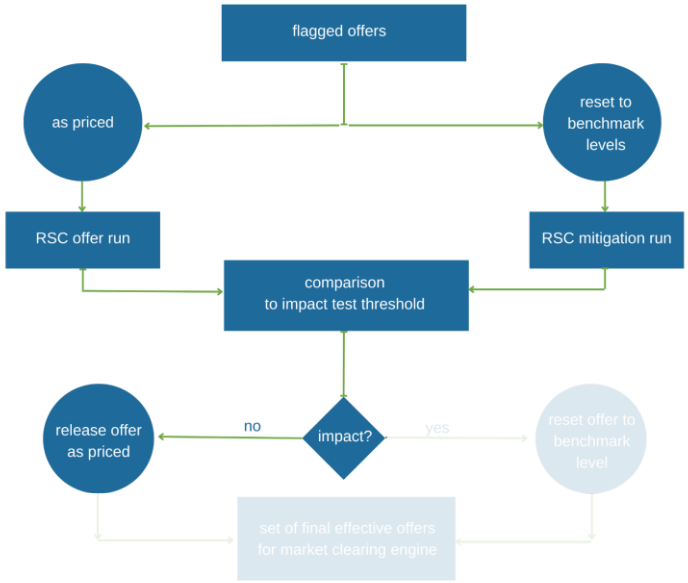
Impact Test Threshold



The purpose of this test is to determine whether non-competitive offers flagged in the Conduct Test have a material impact on market clearing prices. To make this determination a comparison of market outcomes is performed by looking at the results of two different runs to see if the differences in the energy or ancillary service prices is larger than an ISO-determined impact test threshold price, which is at minimum $3/MWh. Because of the co-optimization of markets, impacts are assessed against *all* day-ahead prices.

Notes:

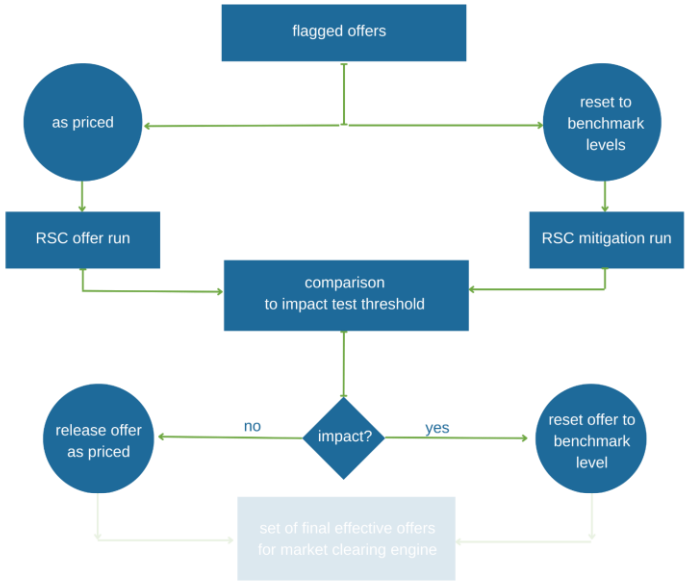
Impact Test Threshold



If we compare the cases and there is no price impact, then there is no mitigation (even if participants had failed the conduct test in certain hours).

Notes:

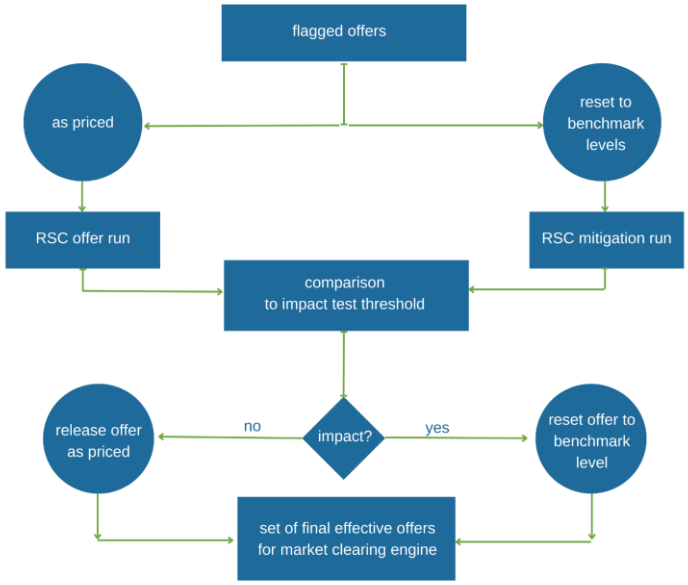
DA A/S Mitigation



If there IS an impact test failure in any hour, then all DA A/S offers that failed the conduct test are set to their benchmark level completing the mitigation process.
There is a $3/MWh floor on the impact test threshold to avoid mitigation actions being triggered by very small price impacts during low-priced and unstressed market conditions.

Notes:

Final Effective Offers



With all offers reviewed and those that required mitigation reset to their benchmark levels, there is a resulting set of final effective offers to go into the market clearing engine.

Notes:

DA A/S Mitigation



In this brief primer, we explored the process of day-ahead ancillary service offer review and mitigation where the Internal Market Monitor evaluates and eliminates the potential for market power exertion. This module explained the assessment of benchmark levels, the consultation process, and how the application of mitigation in day-ahead ancillary services is independent of and has a few differences from energy offer mitigation. Continue on to learn about how the set of final effective offers goes through the process of market clearing.

Notes:

DA A/S Market Clearing

- Requirements
- Co-optimization
- Results



With a set of final offers that the outcomes of the IMM's mitigation process, day-ahead ancillary service offers will go into the market clearing engine to yield a set of cleared awards. Let's look at the requirements and co-optimization that lead to the awards and results posted to eMarket

Notes:

Bid-to-Bill Recap

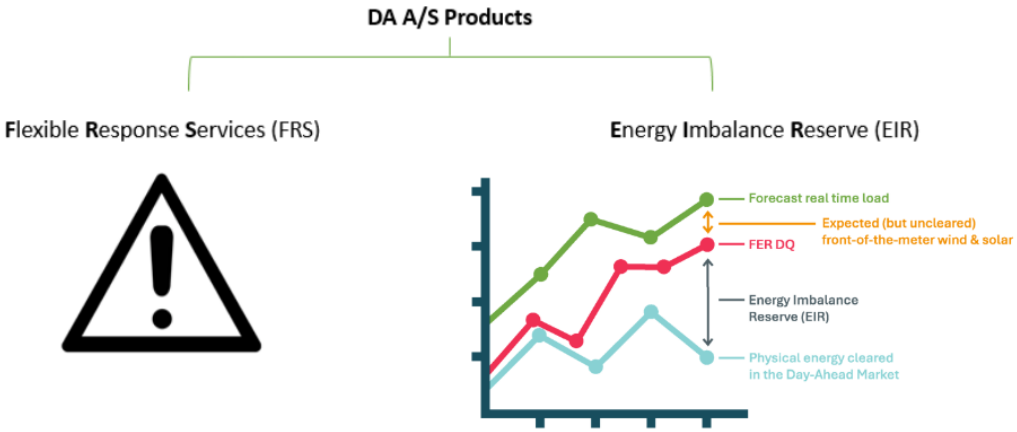


- ✓ Checked strike-price and expected closeout
- ✓ Checked benchmark levels
- ✓ Initiated an override request, if necessary
- ✓ Formed hourly offers
- ✓ Entered offers into eMarket (or via XML)
- ✓ IMM conducted offer review
- ✓ Final effective offers sent to market clearing engine

Before continuing let's recap where a participant is in their bid-to-bill journey so far. They have checked the strike-price and expected closeout value in eMarket, and cross-checked their asset-specific benchmark levels. They have considered their costs and if desired, they have initiated an override request and supplied the supporting documentation. They have decided upon the price values for each product, and a quantity for each of their hourly offers, and those offers have been entered into eMarket or submitted by XML. All submitted day-ahead ancillary service offers were reviewed by the Internal Market Monitor against their benchmark levels, the conduct test threshold and impact test threshold. A set of final effective offers is then delivered to the market clearing engine.

Notes:

Day-Ahead Ancillary Service Requirements

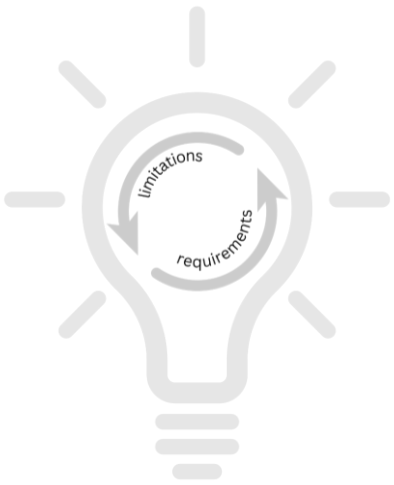


Day-ahead ancillary service products are procured to satisfy two requirements, reflective of the ISO's operational needs. You'll recall from learning about day-ahead ancillary products that the FRS or flexible response services are the system operating reserve requirements used to respond to a contingency. And EIR or energy imbalance reserve helps close any gap between physical supply that clears in the day-ahead market and the forecasted energy requirement demand quantity.

Notes:

Co-optimization





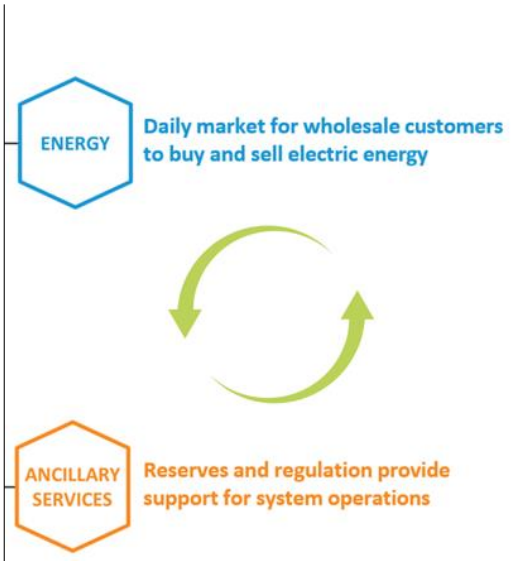
You'll recall that participants submit hourly offers by entering 4 monetary values for each of the 4 day-ahead ancillary service products and 1 overall quantity, and that the internal market monitor reviews the ancillary services offers against a series of test thresholds. A set of final effective offers is delivered to the market clearing engine. Through co-optimization, the market clearing engine will consider the system requirements as well as an asset's limitations. This ensures the optimal combination of energy and ancillary services needed to satisfy energy demand and system operating requirements throughout the operating day at least cost to consumers.

Notes:

Limitations Considered

Limitations

- ✓ Energy and A/S can't overlap
- ✓ Won’t clear more than physical limitation
  - eco max: max reduction, max consumption
  - claim capabilities
  - ramp limits
- ✓ Maximum Daily Award Limit
- ✓ Delivery due to transmission



Some of the limitations considered include that day-ahead energy and ancillary service capabilities can’t overlap. The clearing engine won’t clear more than an asset’s physical limitations, including their eco max, claim capabilities, and ramp limits, and for those who specify, the maximum daily award limit cannot be exceeded. Deliverability due to transmission is another possible limitation considered.

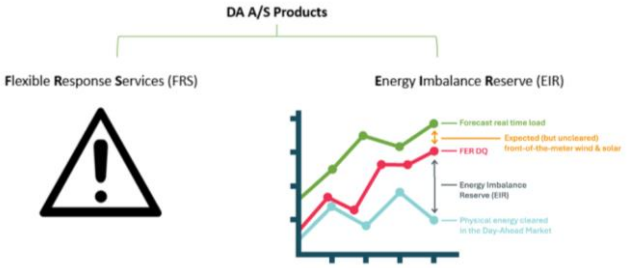
Notes:

Requirements to Meet

Limitations

- ✓ Energy and A/S can't overlap
- ✓ Won't clear more than physical limitation
  - eco max; max reduction, max consumption
  - claim capabilities
  - ramp limits
- ✓ Maximum Daily Award Limit
- ✓ Delivery due to transmission

Requirements



- ✓ Operating reserves to meet reserve requirements
- ✓ Physical supply capability to meet the FER DQ

And the requirements include the quantity of reserve capability needed to respond to a contingency with flexible response services, as well as the amount of physical supply capability needed to meet the forecast energy requirement demand quantity (Fer DQ)

Notes:

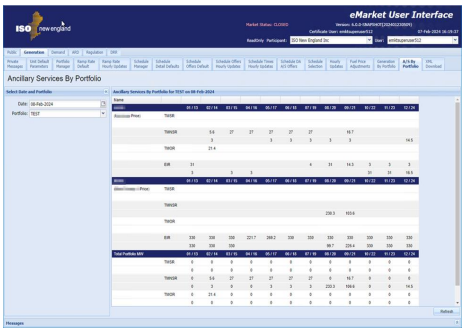
DA Clearing Outcomes

The DA Market Clearing engine satisfies the ISOs reliability requirements in the least-cost way, considering resource offer prices and physical characteristics.
The clearing outcomes include MW awards to resources for energy and the four DA ancillary services and clearing prices that reflect the marginal costs of providing energy and ancillary services.

The DA Market Clearing engine satisfies the ISOs reliability requirements in the least-cost way, considering resource offer prices and physical characteristics.
The clearing outcomes include MW awards to resources for energy and the four DA ancillary services and clearing prices that reflect the marginal costs of providing energy and ancillary services.

Notes:

Results Published in eMarket: Awards, Prices, Summary



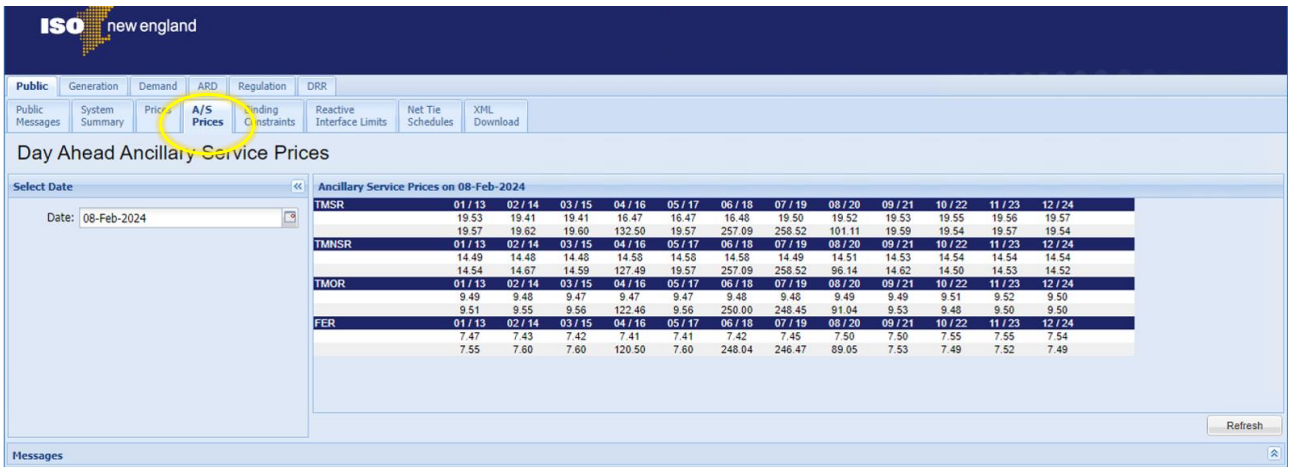




There is no reoffer period for day ahead ancillary services, so after the market clears, there are three sets of results published in eMarket.

Notes:

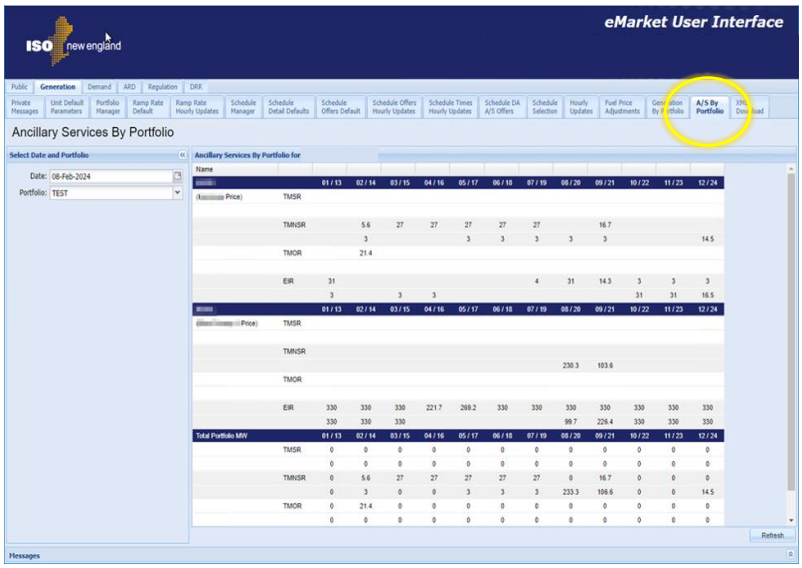
Hourly Grid-Wide Prices



The hourly system -wide prices are published for each product. They appear on the A/S Prices public tab.

Notes:

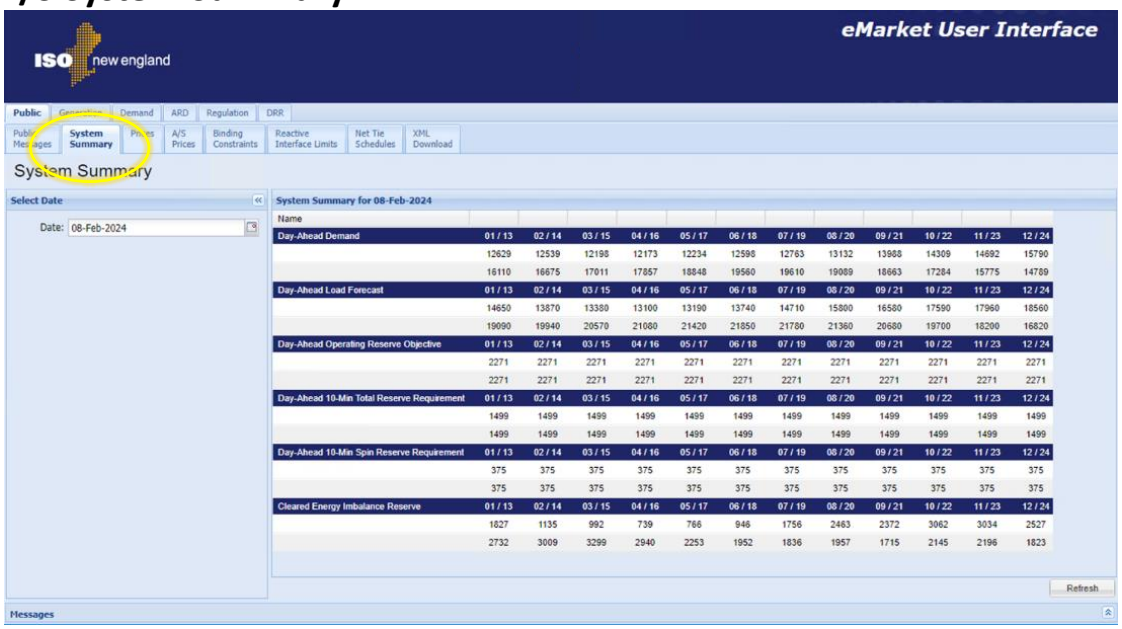
DA A/S Awards



Each participant who submitted an offer can see their awards on the A/S By Portfolio tab.

Notes:

DA A/S System Summary



And the system summary tab shows the hourly values of the net of all the demand bids cleared, as well as the system operating reserve requirements cleared in the Day-Ahead Market for any selected market day.

Notes:

DA A/S Market Clearing

- Requirements
- Co-optimization
- Results

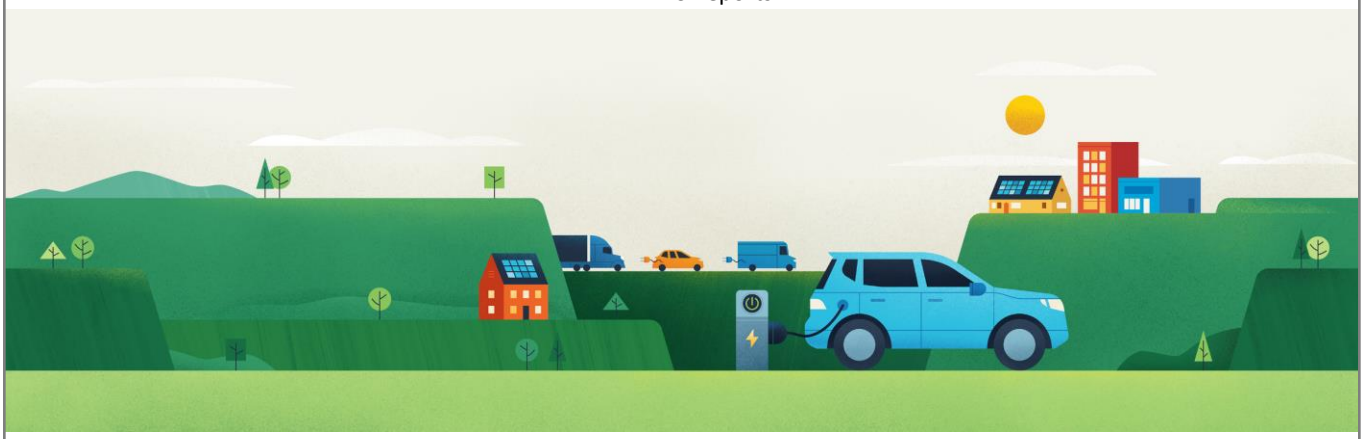


Here we introduced the day ahead ancillary service requirements, and how the market clearing engine works within the asset limitations and system operating requirements to co-optimize the offers to optimally produce day-ahead awards and clearing prices. We showed where to find the results that are published in eMarket including day-ahead ancillary awards by portfolio, system-wide prices, and a summary of hourly requirements for any given market day. Now that the market has cleared, continue learning to see how what happens in real-time affects settlements for day-ahead ancillary services.

Notes:

DA A/S Settlement

- RTLO Cost allocator
- Product credits and charges
- Closeout calculation
- Closeout credits and charges
- MIS Reports



Day-ahead ancillary services settlements. Day-ahead ancillary services uses a call option settlement mechanism and settles after real-time. This primer will introduce the cost allocator used in settling day-ahead ancillary services, the function of product credits and charges, how the closeout charge is calculated, and the new MIS reports associated with day-ahead ancillary services. Before we explore the settlements aspect of day-ahead ancillary services, let's recall how a participant has gotten here.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value

Up until this point in a participant's bid-to-bill journey, we learned that the ISO sets the strike price and calculates the expected closeout value and posts them in eMarket and ISO Express at 5:30am daily, prior to market participants' submitting their offers.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides

Participants reference these figures along with their benchmark levels which are the ISO's estimate of an assets' costs. Participants have an opportunity to signal an override request if their expected costs differ from the estimates.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML

Participants who chose to submit offers for day-ahead ancillary services will enter four monetary values for each of the four day-ahead ancillary service products and one overall quantity for each hour they wish to clear. They will enter their hourly offers into eMarket or by XML.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

We learned how all day-ahead ancillary offers are reviewed by the internal market monitor against certain thresholds to establish a set of final effective offers.

Notes:

Bid-to-Bill Recap



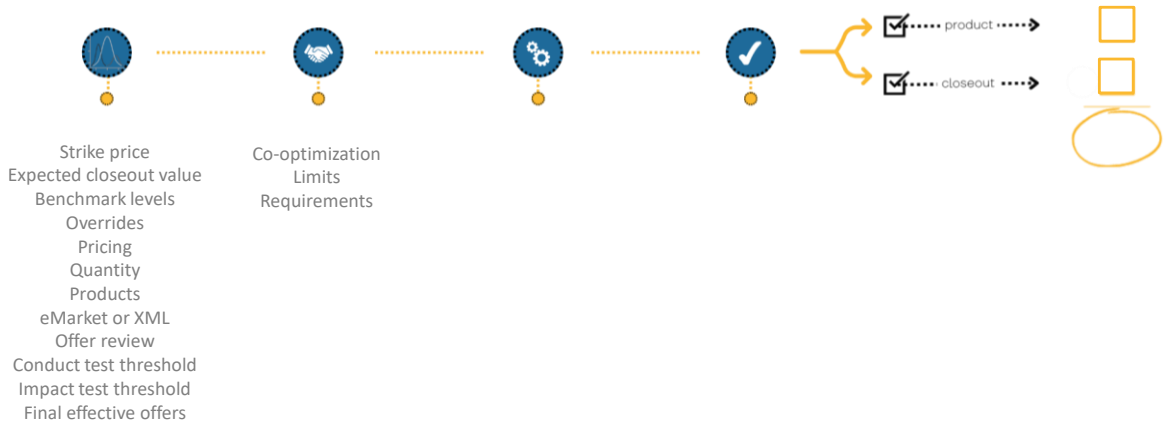
Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

Co-optimization

The final effective offers are co-optimized by the market clearing engine

Notes:

Bid-to-Bill Recap



considering assets' limitations and system operating requirements.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

Co-optimization
Limits
Requirements
Pricing
Results

Grid-wide pricing for day-ahead ancillary services is established and results are published in eMarket and ISO Express.

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

Co-optimization
Limits
Requirements
Pricing
Results

Real-Time

RTLO cost allocator
Product credits
Product charges

Day-ahead ancillary services uses a real time load obligation cost allocator, which means the ISO conducts the settlement after real time. Here let's examine the product and credit charges,

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

Co-optimization
Limits
Requirements
Pricing
Results

Real-Time

RTLO cost allocator
Product credits
Product charges
Closeout calculation

And now that we know what the RT Hub LMP was, we can calculate the actual closeout value,

Notes:

Bid-to-Bill Recap



Strike price
Expected closeout value
Benchmark levels
Overrides
Pricing
Quantity
Products
eMarket or XML
Offer review
Conduct test threshold
Impact test threshold
Final effective offers

Co-optimization
Limits
Requirements
Pricing
Results

Real-Time

RTLO cost allocator
Product credits
Product charges
Closeout calculation
Closeout credits
Closeout charges

See how the closeout credits and charges are assigned

Notes:

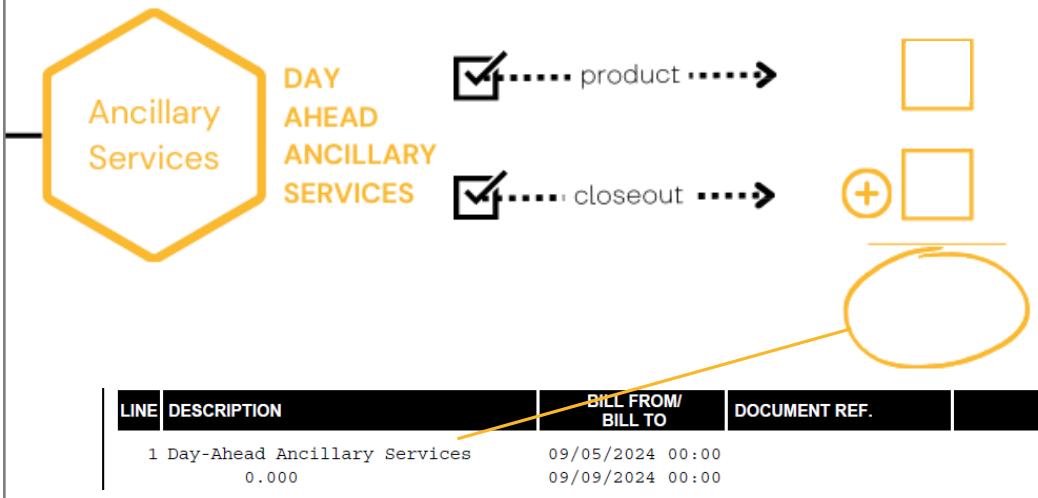
Bid-to-Bill Recap



See how the closeout credits and charges are assigned and show the new market information server reports associated with day-ahead ancillary services.

Notes:

DA A/S Settlement



LINE	DESCRIPTION	BILL FROM/ BILL TO	DOCUMENT REF.	NET AMOUNT
1	Day-Ahead Ancillary Services 0.000	09/05/2024 00:00 09/09/2024 00:00		

Which net out onto one line item on the bill.

Notes:

RTLO Cost Allocator

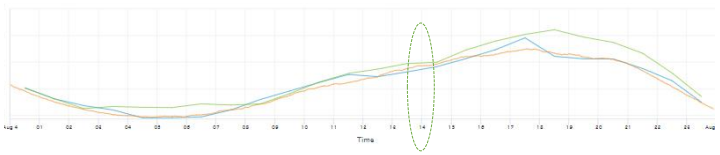


Day-ahead ancillary services uses a generally uses a real-time load obligation cost allocator, which means the ISO conducts the settlement after real time. There is one exception to the use of real-time load obligation, which we'll discuss momentarily. This approach sums all product credits at a pool level, meaning the sum of all possible credits.

Notes:

RTLO Cost Allocator

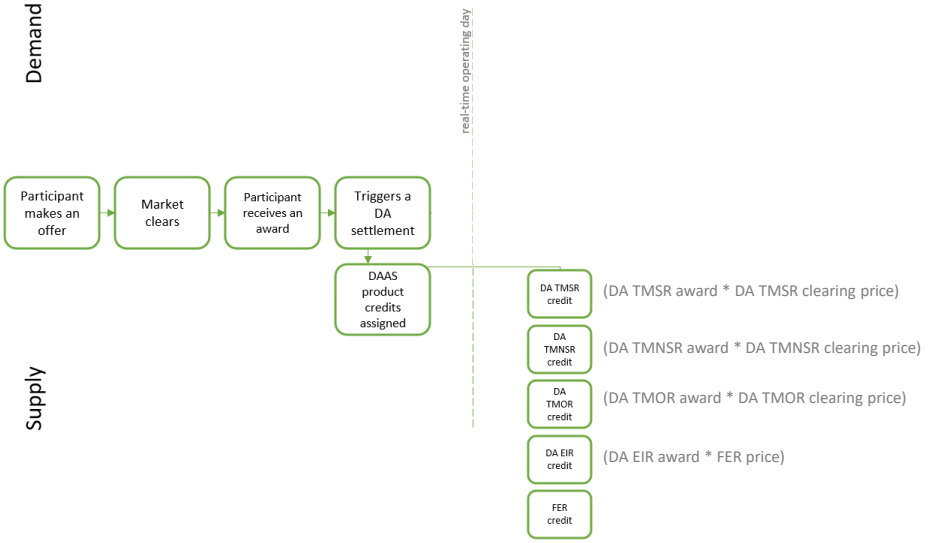




Then, referencing the real-time figures from each particular hour, charges are based upon the participants' pro-rata share of the real-time load obligation. This means the total amount of credits can be allocated as product charges to load according to their percent used.

Notes:

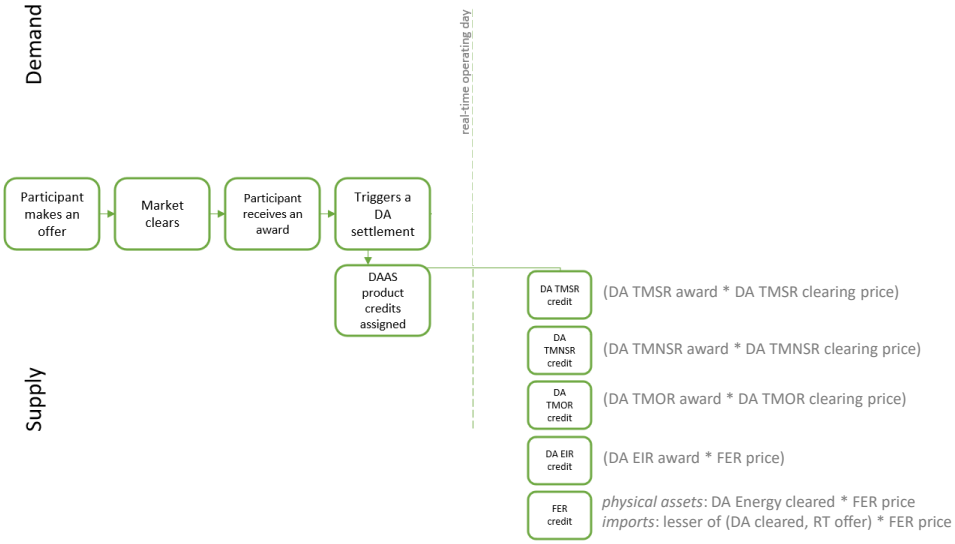
Product credits & charges



the product credits provide compensation to resources to be prepared to provide energy,

Notes:

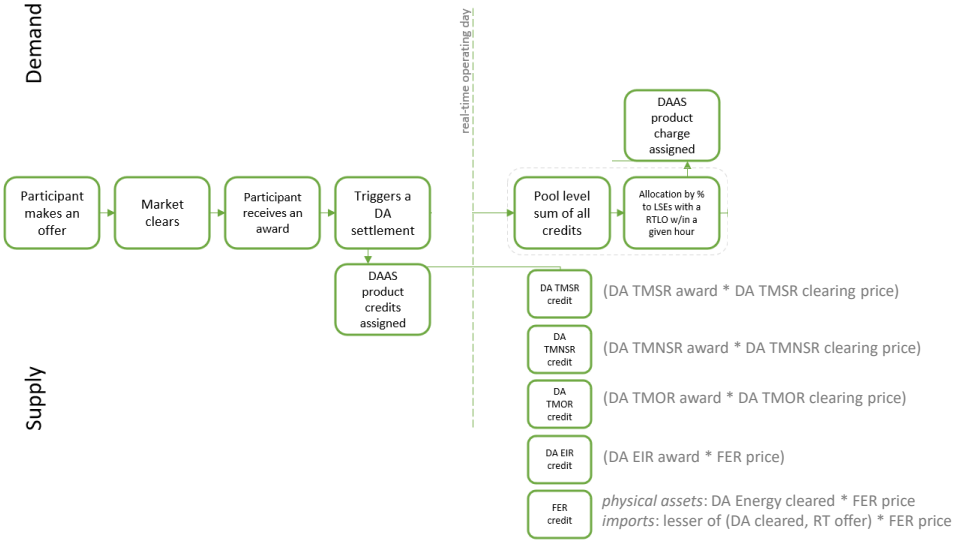
Product credits & charges



and FER credits go to those who were awarded EIR megawatts and DA cleared physical energy supply.

Notes:

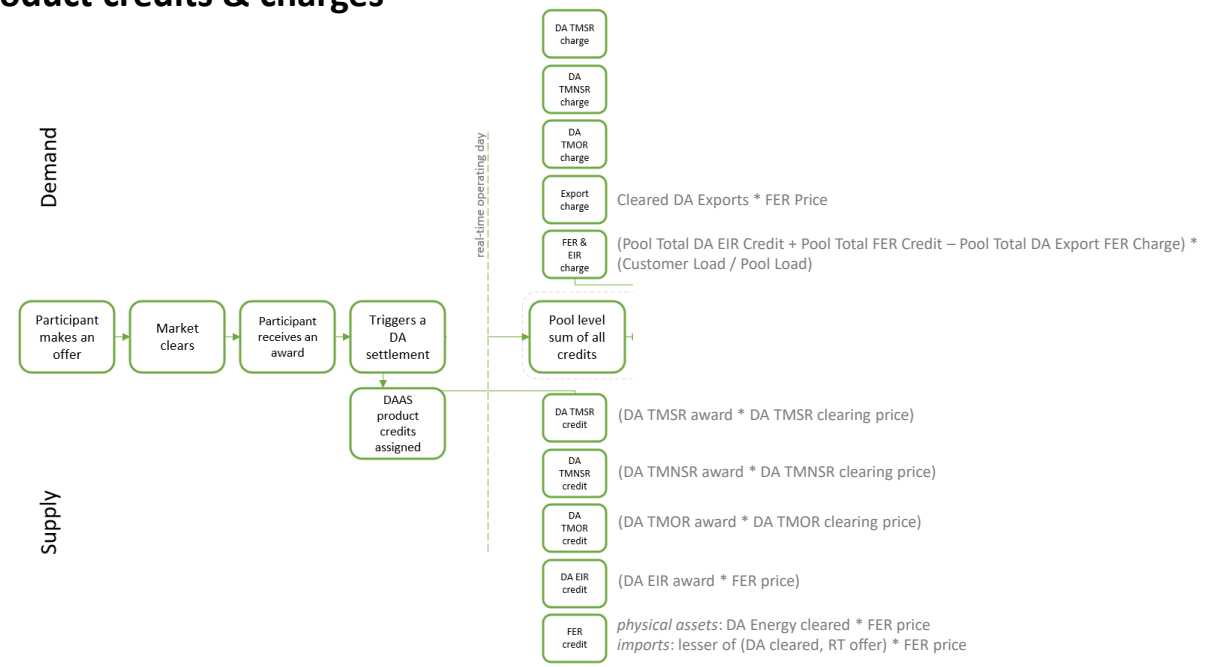
Product credits & charges



The real-time load obligation cost allocator is applied, and then charges are assigned accordingly.

Notes:

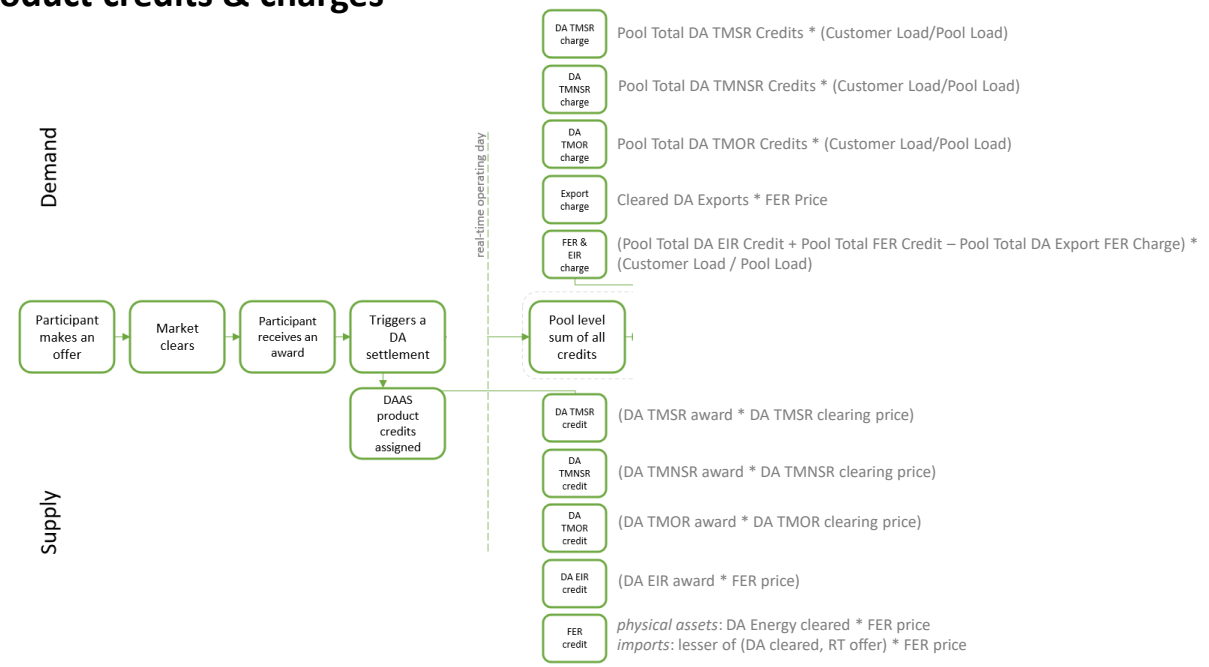
Product credits & charges



FER charges first to day-ahead exports, then to real-time load obligation. The FER export charge is assessed to anyone with a cleared Export in the DA energy market.

Notes:

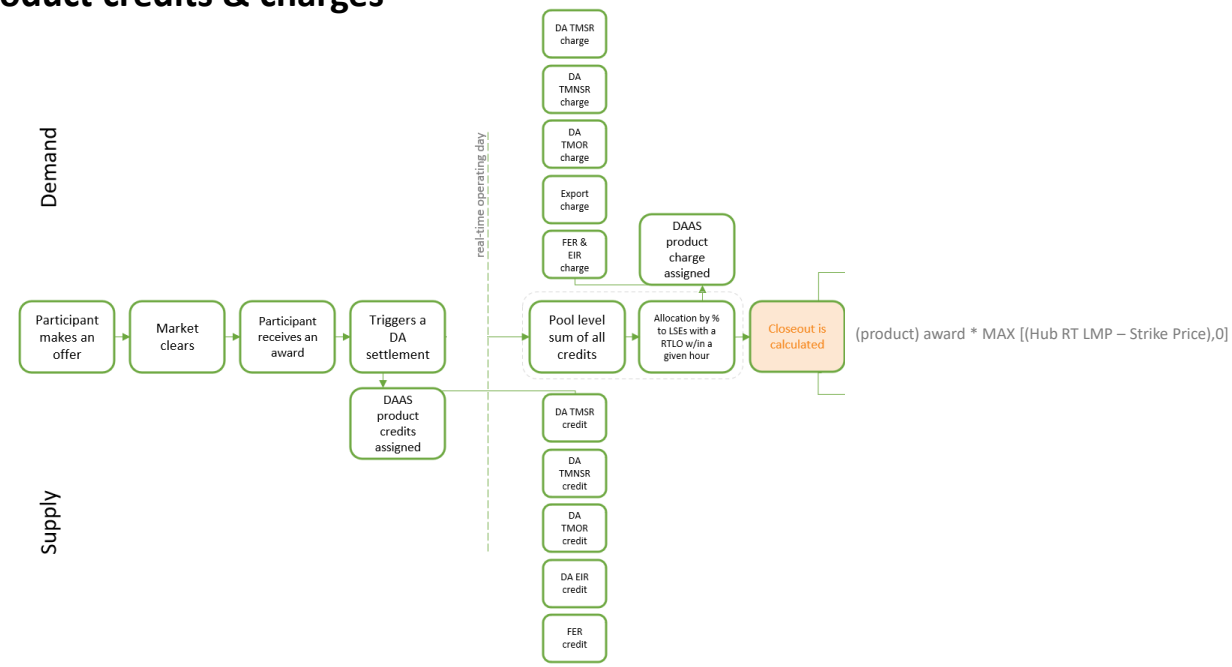
Product credits & charges



And the product charges are assigned.
Charges are paid by load to ensure capability to cover sudden shifts in demand or unexpected loss of supply.

Notes:

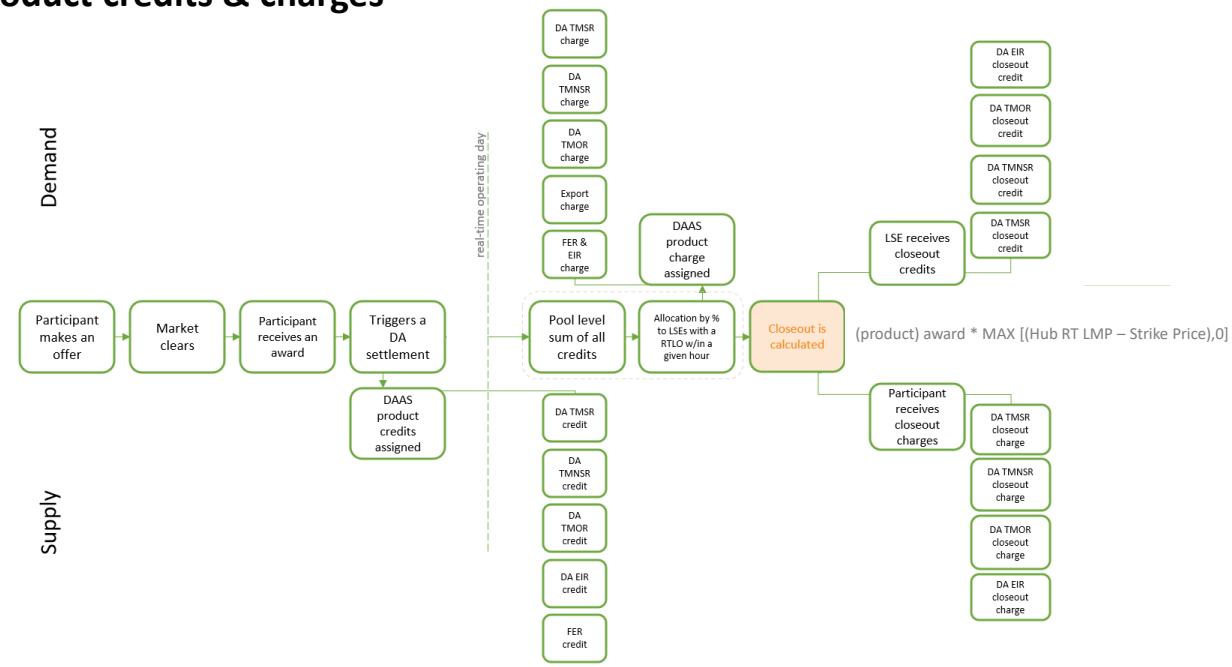
Product credits & charges



Participants who received a day-ahead ancillary service award will also receive a closeout charge, in addition to receiving a credit. A closeout charge is triggered when the RT Hub LMP is higher than the strike price. If the RT Hub LMP was lower than the strike price, the closeout charge will be zero.

Notes:

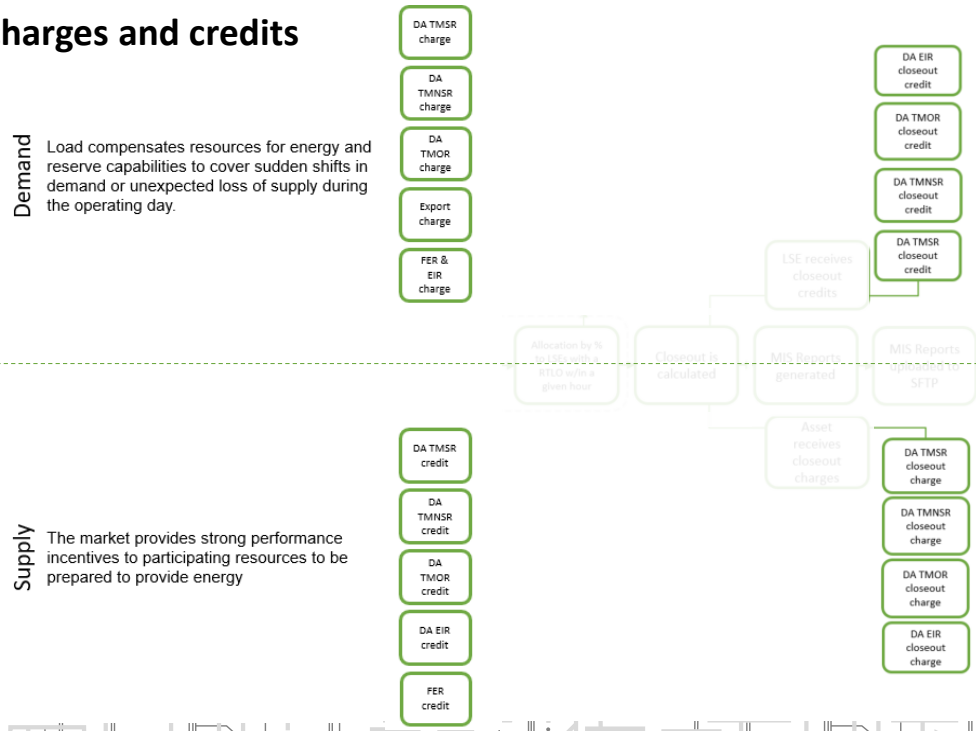
Product credits & charges



Closeout charges are calculated for each of the day-ahead ancillary service products. The same allocator is used to issue them back out as closeout credits to load who paid the product charges.

Notes:

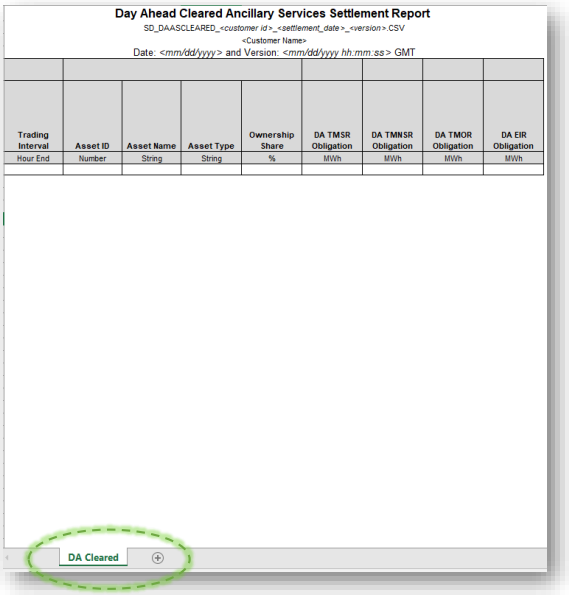
Closeout charges and credits



In summary, load pays the product charges and receives the closeout credits. Participants with day-ahead ancillary service awards receive the product credits and pay the closeout charges.

Notes:

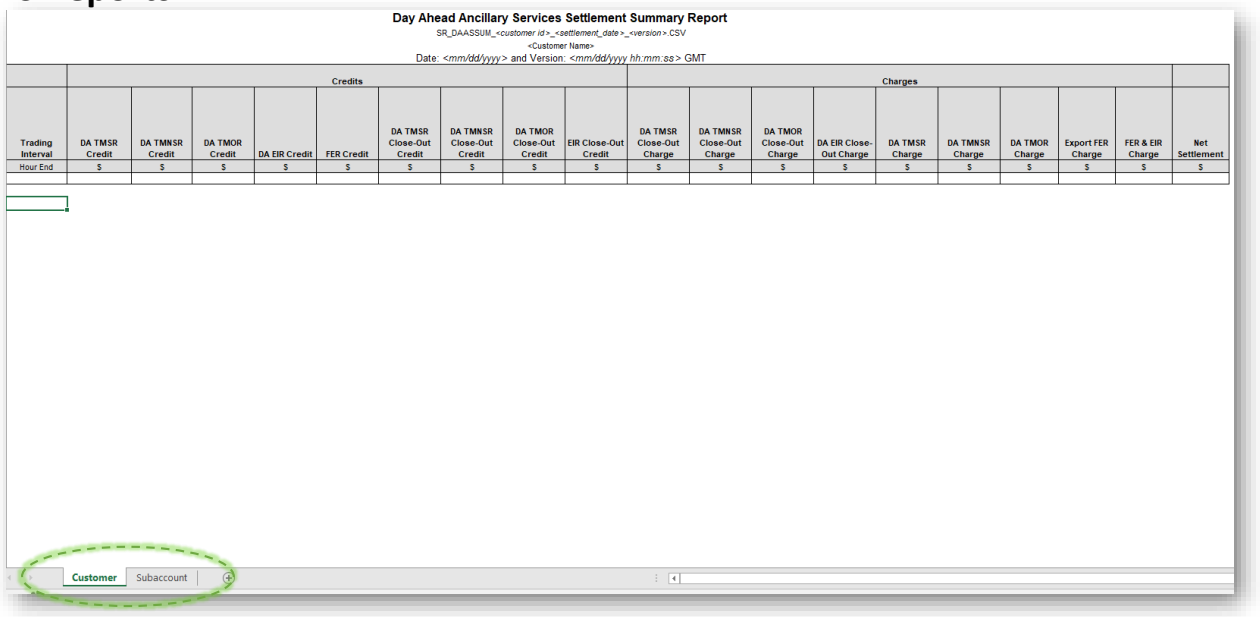
MIS Reports



After settlement is complete, MIS reports are issued with cleared data,

Notes:

MIS Reports



Day Ahead Ancillary Services Settlement Summary Report

SR_DAASSUM_<*customer id*>_<*settlement_date*>_<*version*>.CSV

<Customer Name>

Date: <*mm/dd/yyyy*> and Version: <*mm/dd/yyyy hh:mm:ss*> GMT

	Credits									Charges									
Trading Interval	DA TMSR Credit	DA TMNSR Credit	DA TMOR Credit	DA EIR Credit	FER Credit	DA TMSR Close-Out Credit	DA TMNSR Close-Out Credit	DA TMOR Close-Out Credit	EIR Close-Out Credit	DA TMSR Close-Out Charge	DA TMNSR Close-Out Charge	DA TMOR Close-Out Charge	DA EIR Close-Out Charge	DA TMSR Charge	DA TMNSR Charge	DA TMOR Charge	Export FER Charge	FER & EIR Charge	Net Settlement
Hour End	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$

Customer | Subaccount

summary data, by customer and subaccount

Notes:

MIS Reports

Day Ahead Ancillary Services Settlement Detail Report

SD_DAASDT_<*customer id*>_<*settlement_date*>_<*version*>.CSV

<Customer Name>

Date: <*mm/dd/yyyy*> and Version: <*mm/dd/yyyy hh:mm:ss*> GMT

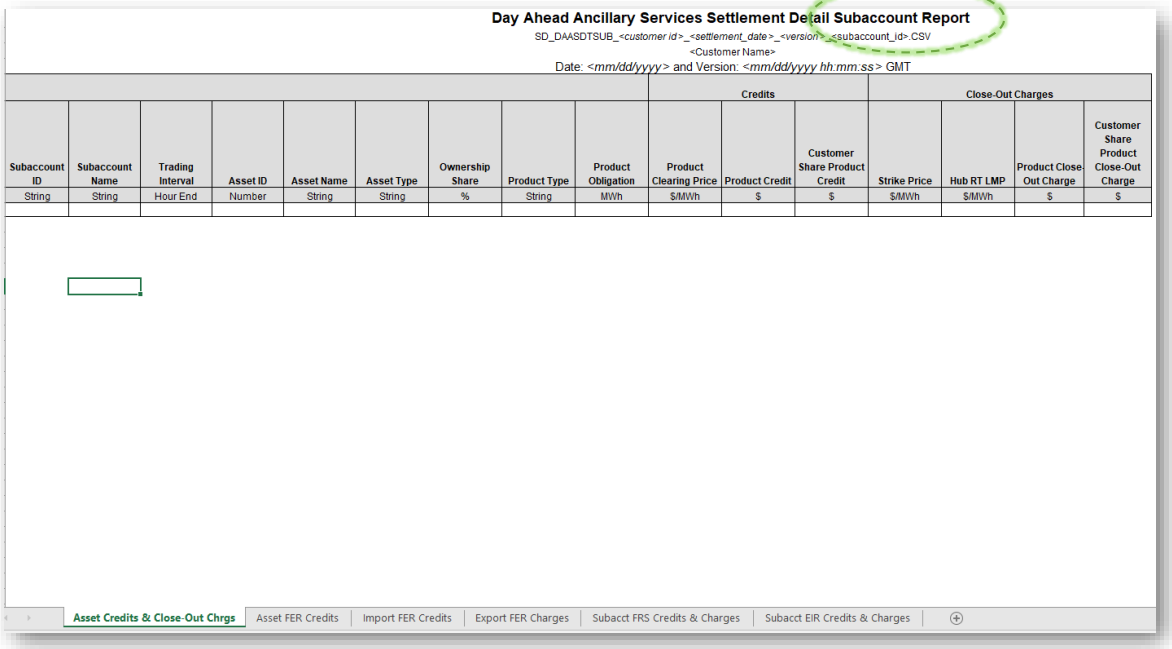
									Credits			Close-Out Charges			
Trading Interval	Asset ID	Asset Name	Subaccount ID	Subaccount Name	Asset Type	Ownership Share	Product Type	Product Obligation	Product Clearing Price	Product Credit	Customer Share Product Credit	Strike Price	Hub RT LMP	Product Close-Out Charge	Customer Share Product Close-Out Charge
Hour End	Number	String	String	String	String	%	String	MWh	$/MWh	$	$	$/MWh	$/MWh	$	$

Asset Credits & Close-Out Chrgs | Asset FER Credits | Import FER Credits | Export FER Charges | FRS Credits & Charges | EIR Credits & Charges | Subacct FRS Credits & Charges | Subacct EIR Credits & Charges

detail data for each of the day-ahead ancillary services credits and charges

Notes:

MIS Reports



Day Ahead Ancillary Services Settlement Detail Subaccount Report

SD_DAASDTSUB_<*customer id*>_<*settlement_date*>_<*version*>_<subaccount_id>.CSV

<Customer Name>

Date: <*mm/dd/yyyy*> and Version: <*mm/dd/yyyy hh:mm:ss*> GMT

									Credits			Close-Out Charges			
Subaccount ID	Subaccount Name	Trading Interval	Asset ID	Asset Name	Asset Type	Ownership Share	Product Type	Product Obligation	Product Clearing Price	Product Credit	Customer Share Product Credit	Strike Price	Hub RT LMP	Product Close-Out Charge	Customer Share Product Close-Out Charge
String	String	Hour End	Number	String	String	%	String	MWh	$/MWh	$	$	$/MWh	$/MWh	$	$

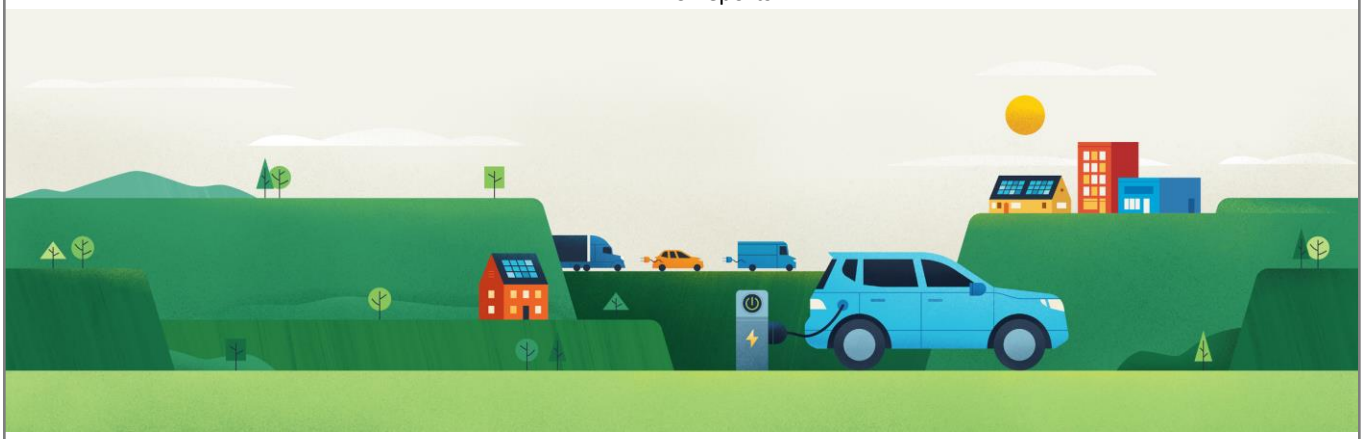
Asset Credits & Close-Out Chrgs | Asset FER Credits | Import FER Credits | Export FER Charges | Subacct FRS Credits & Charges | Subacct EIR Credits & Charges

And by subaccount for participants who have subaccounts set up.

Notes:

DA A/S Settlement

- RTLO Cost allocator
- Product credits and charges
- Closeout calculation
- Closeout credits and charges
- MIS Reports

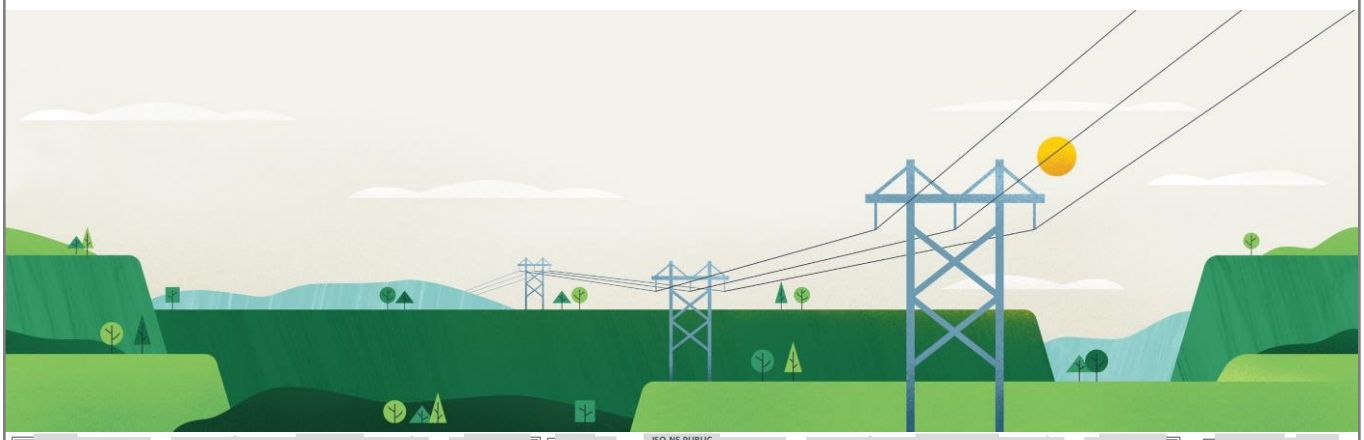


This settlements introduction to day-ahead ancillary services explained how this market uses a real-time load obligation cost allocator to assign product credits and charges. The actual closeout value calculation, and how closeout credits and charges are assigned. The market information server reports associated with day-ahead ancillary services break down the summary and detail data by customer and subaccount. Finish the bid-to-bill journey by learning about financial assurance and billing for day-ahead ancillary services.

Notes:

DA A/S Financial Assurance and Billing

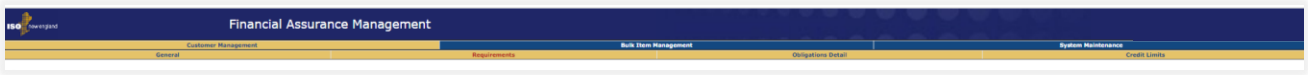
- FA obligations detail screen
- FA requirements screen
- Invoice line item



This short primer will expose participants to the two financial assurance screens impacted by day-ahead ancillary service awards, and what to expect as a line item on the bill.

Notes:

Financial Assurance

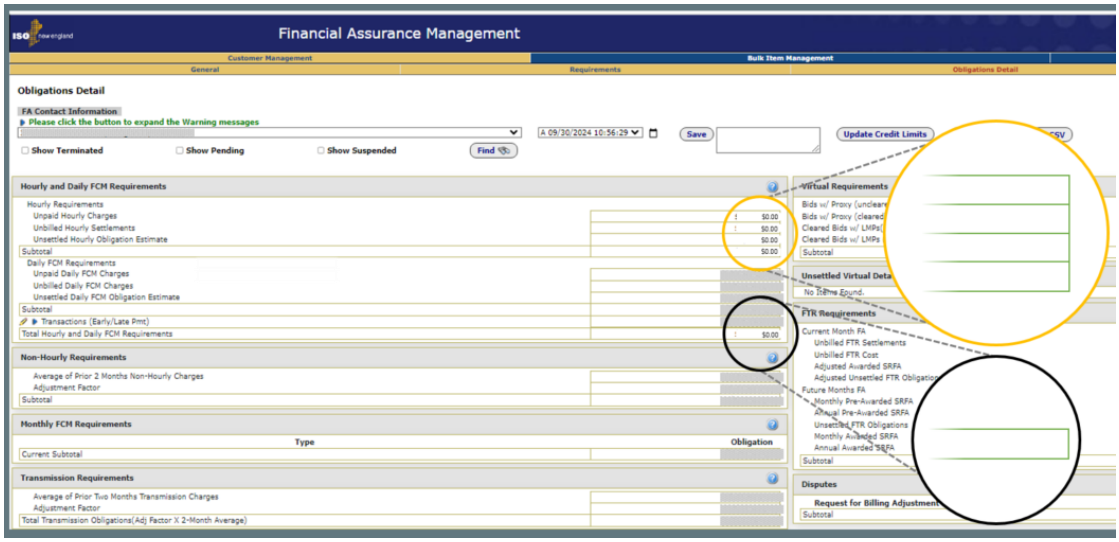


- No financial assurance policy revisions
- Settlement flows through the hourly obligations section of the financial assurance calculation
  - Identified in Exhibit IA of the ISO-NE Tariff
  - Described in financial assurance policy

The DA A/S products require no financial assurance policy revisions. The settlement of these call options will flow through the hourly obligations section of the financial assurance calculation identified in Exhibit IA of the ISO-NE Tariff and described in the Financial Assurance Policy.

Notes:

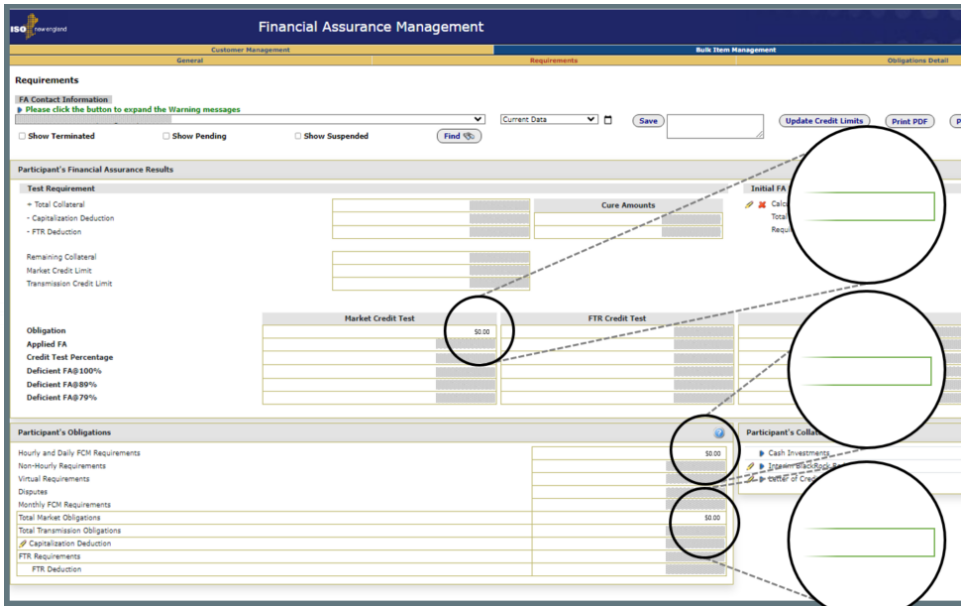
Financial Assurance, Obligations Detail Screen



Day-ahead ancillary service values will not be displayed independently on the financial assurance management screens. On this screenshot of the obligations detail tab, the fields encircled in yellow are where the day ahead ancillary services data will directly flow. As a result, the aggregations in the fields circled in black will change- both those on this obligations detail screen…

Notes:

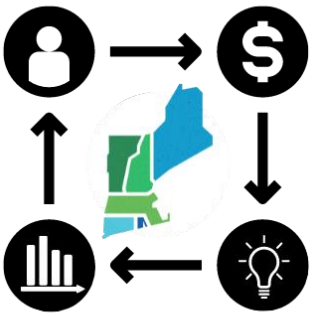
Financial Assurance, Requirements Screen



And as shown here on the requirements tab, which also contains aggregations that will be impacted by day-ahead ancillary service data.

Notes:

Billing



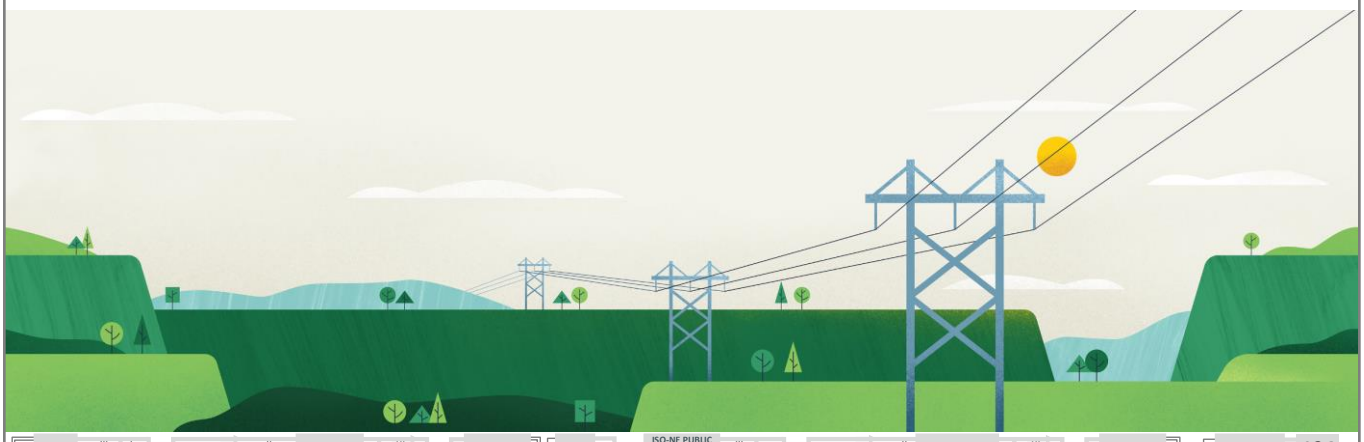
LINE	DESCRIPTION	BILL FROM/ BILL TO	DOCUMENT REF.	NET AMOUNT
1	Day-Ahead Ancillary Services	09/05/2024 00:00		
	0.000	09/09/2024 00:00		

The Day ahead ancillary services settlements will net out to one line item on the bill, as shown here.

Notes:

DA A/S Financial Assurance and Billing

- FA obligations detail screen
- FA requirements screen
- Bill line item



In short, there are no policy revisions to financial assurance. Day-ahead ancillary services impact two tabs and five fields on the financial assurance screens and will appear as a separate line item on the bill.

Notes: