

ANM Vs STOR Cost-Benefit Analysis Summary

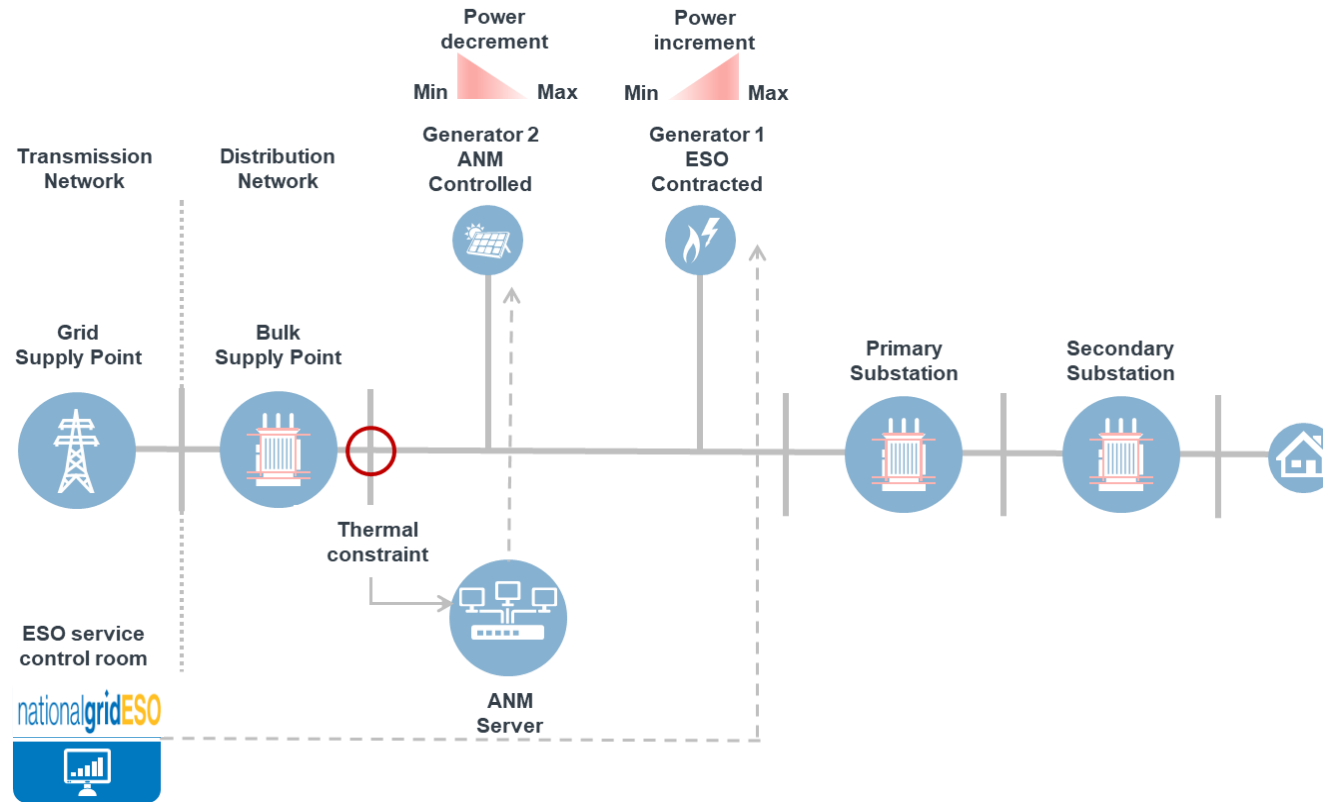
Open Networks
WS1A P5 Primacy Rules
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Context

- The Product group approached Ofgem and BEIS earlier in the year to note some of the initial findings/challenges associated with one of our initial Use Cases.
- It was apparent that the application of Primacy Rules in the case of STOR vs. ANM service conflicts would lead to high impacts on the affected ('losing') party.
- The Product team therefore sought to conduct more detailed analysis to highlight the costs and benefits associated with the deployment of each Rule.
- This work was commissioned via the FUSION Innovation project.
- These slides present a brief summary of the work. The full report accompanies it and provides the full details
- They also highlight the proposed next steps for the product.

STOR & ANM

STOR services (Generation Turn Up, Demand Turn Down, reserve services) and generation led DNO ANM on different assets



Primacy Rules

A number of Primacy rules were tested

DNO primacy ¹	ESO primacy ¹	Joint primacy
RULE 1 <ul style="list-style-type: none"> • STOR providers excluded (by the ESO) from provision of the service if this coincides with forecast ANM curtailment activity in a given geographical area 	RULE 2 DNO holds headroom value in ANM Systems to allow STOR to be provided	RULE 6 The ESO would pay the DNO (and therefore ANM customers or Flex providers) to hold headroom on their ANM systems
RULE 3 <ul style="list-style-type: none"> • Similar to the principles in rule 1, however, in this case, information would be provided to the market for STOR providers to exclude themselves from participation when ANM activity is forecast in the area 		RULE 7 The STOR provider would pay the DNO (and therefore ANM customers or Flex providers) to hold headroom on the ANM systems
RULE 4 <ul style="list-style-type: none"> • ESO over-procures to help counteract any non-delivery as a result of ANM pullback. 		

Types of forecast for DNO has primacy rules	Types of headroom for ESO primacy and joint primacy rules ²
i) Static forecast – if the DNO curtailment shows any potential for ANM activity, the rule would apply.	i) Static headroom – headroom always held in areas where ANM and STOR providers exist. This allows for simple systems, but means holding more headroom.
ii) Dynamic forecast – A threshold of curtailment would be agreed (as an example), above which the rule would apply.	ii) Dynamic headroom – headroom only held which equates to volume of STOR successful in Day Ahead (DA) auction. Requires more complex integration of systems

Scenarios considered

- We looked at 4 scenarios with varying levels of ANM coverage in the UK and different likelihoods of curtailment.
- All costs were modelled against a reference case. This allows modelling to focus on the differences from this reference, rather than modelling all costs/benefits.
- To keep system reliability constant across the rules, the reference case assumes “no conflict”. This is not the counterfactual which would be “conflict with no rules”.

	% of distributed STOR covered by ANM	ANM, Likelihood of curtailment
Scenario 1	Current coverage – 16% coverage	Curtailment 11% of settlement periods
Scenario 2	50% coverage	Curtailment 11% of settlement periods
Scenario 3	Current coverage – 16% coverage	Curtailment 5% of settlement periods
Scenario 4	50% coverage	Curtailment 5% of settlement periods

Table 3.1 – Overview of the scenarios

Cost Modelling

- Each Rule is modelled, with the associated costs for different parties determined. Examples are shown below.

RULES – DNO has primacy		STOR provider	ANM generator	ESO	DNO	End consumer
Rule 1	a. Binary	- Δ STOR provider margin		- Δ STOR procurement & utilisation cost - CAPEX - OPEX	- CAPEX - OPEX	Indirect impact = ESO + DNO net impact)
	b. Risk- based	- Δ STOR provider margin		- Δ STOR procurement & utilisation cost - CAPEX - OPEX	- CAPEX - OPEX	Indirect impact = ESO + DNO net impact)

RULES - ESO HAS PRIMACY		STOR provider	ANM generator (and their BRP)	ESO	DNO	End consumer
Rule 2	a. Static headroom		- CAPEX - OPEX - Cost for holding headroom	- CAPEX - OPEX	- CAPEX - OPEX	- Direct impact = Δ carbon emissions - Indirect impact = ESO + DNO net impact + ANM generator impact
	b. Dynamic headroom		- CAPEX - OPEX - Cost for holding headroom	- CAPEX - OPEX	- CAPEX - OPEX	- Direct impact = Δ carbon emissions - Indirect impact = ESO + DNO net impact+ ANM generator impact

CBA Results

- We have results across all 4 scenarios
- These look at the cost of mitigating the conflict. They do not include the benefits associated (improved system reliability). As such all results are negative.
- **Rule 2b** comes out as the lowest cost across the scenarios.
- As highlighted on the next slide, there are limitations to this analysis which impact the interpretation of the results.

Scenario 3						
RULES - DNO HAS PRIMACY (£m)		STOR provider	ANM generator + BRP	ESO	DNO	End consumer
Rule 1	a	252.30		-270.17	-0.34	-270.51
	b	35.99		-37.49	-0.72	-38.21
Rule 3	a	185.26		-189.72	-0.34	-190.06
	b	13.87		-18.54	-0.72	-19.26
Rule 4	a					
	b	37.54	-0.24	-38.89	-0.72	-39.85
Rule 2	a		-13.18	-0.73	-0.70	-14.60
	b		-2.35	-1.11	-1.08	-4.55
Rule 6	a			-14.15	-0.93	-15.08
	b	35.99		-38.06	-1.29	-39.35
Rule 7	a	-13.18		-0.98	-0.93	-15.08
	b	13.87		-19.08	-1.29	-20.37

ANM vs STOR CBA Interpretation

There are a few key elements that need to be highlighted when interpreting the results.

- These look at the cost of mitigating the conflict. They do not include the benefits associated (improved system reliability). As such all results are negative.
- They are focussed on a single year (June 21- May 22)
- They only consider a single service STOR, therefore they do not consider interactions with other services like Frequency response
- ANM systems are modelled simplistically, as a single entity, with curtailment aligned
- They apportion the capital costs associated over 7 years
- They are highly dependent on the Specific STOR market rules. These include:
 - A pay as clear auction (increases in the marginal cost, impact costs for the whole volume)
 - Availability carried out on a daily basis (for example in scenario 3, curtailment for 5% of HHs translates to a 29.3% of days)

Next Steps

- We feel that further analysis is needed to refine elements of the analysis. These include:

Option	Reason
Look at 2hr STOR windows	This is a large sensitivity in the initial analysis. The new Reserve products are considering such a change to availability setting.
Quantify the Counterfactual	This would allow us to be clear on the value of implementing any rules, and ensure that the costs do not outweigh the benefits.
DNV review of rules and recommendations for improvements	Independent review of rules will allow us to ensure that no options have been omitted
Formal Sensitivity Analysis on report	This will help us confirm the key sensitivities, and ensure there are no nearby knife edges.
More Granular modelling of ANM	This will allow us to model ANM in more detail, and create diversity across schemes. This reduces the risks of overstating the conflict.
Make CBA independently accessible	This will improve transparency of the results.