ESO Technology Advisory Council

TAC-7

10 June 2022

Pre-read pack

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TAC-7 agenda – 10 June 2022

Item	Start	Finish	Time	Item	Presenter	Notes
1	9:00	9:05	5	**Welcome & Apologies**	Vernon Everitt	
2	9:05	9:10	5	**Minutes of last meeting and matters arising**	Vernon Everitt	Philip Fitzmorris (ESO CIO) to introduce himself
4	9:10	9:15	5	**Feedback from the last meeting**	Vernon Everitt	Feedback from last meeting
5	9:15	10:45	90	**Balancing Programme**	Rob Rome Bernie Dolan Jim Needle Gabriel Diaz	Overview of the Balancing Capability Strategic Review Playback of what we heard Co-created and agreed industry roadmap Updated costs and benefits Future engagement
	10:45	11:00	15	BREAK		
6	11:00	11:40	40	**Network Control programme**	Ian Dytham Keith Eller Simon Watson	Overview of latest status
7	11:40	12:20	40	**RIIO-2 BP2**	Adelle Wainwright Amy Brooks Emily Leadbetter Dan Delgado	Overview of current Business Plan 2 position
8	12:20	12:25	5	**Subgroups update**	Vernon Everitt	
8	12:20	12:25	5	**Next meeting and calendar**	Vernon Everitt	Next meeting: Friday 2 September 2022
9	12:25	12:30	5	**AOB**	Vernon Everitt	

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Welcome and apologies

Item 1

Vernon Everitt

Minutes of last meeting and matters arising

Item 2

Vernon Everitt

Minutes of last meeting and matters arising

- Minutes of TAC-6 are out for comment via circulation and will be published once agreed.

- The feedback from the meeting will also be published.

- This section will be used to discuss any matters arising.

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Feedback from the last meeting

Item 3

David Bowman

Feedback from the last meeting

- The topics discussed at the last meeting were:
  - Balancing Programme
  - Network Control Programme
  - Product Model / Ways of Working initiative

- Feedback from the TAC was around:

  - Funding product models
  - Carbon intensity in decision making
  - Transitioning between current and new systems
  - Siloed working

  - Resilience and energy security
  - Asset health
  - DSO-TSO consideration
  - Market reform and design
  - Transparency

- The feedback on these topics have been noted by the respective programmes

- A number of the topics formed the basis of the Balancing Capability Strategic Review over April and May for further feedback and engagement.

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Balancing Programme

Item 4

Rob Rome, Gabriel Diaz, Bernie Dolan

Aim of this session

- In this section we will present:
    - An overview of our engagement journey over the last two months
    - The high-level industry agreed roadmap
    - Updated benefits
    - Updated costs, risks and assumptions
    - How we propose to engage going forward

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Our journey so far

5 May workshop objective:

We co-created and prioritised a Balancing Capabilities Roadmap, enabling us to:

- Identify further industry requirements
- Identify which technology changes would be required to achieve
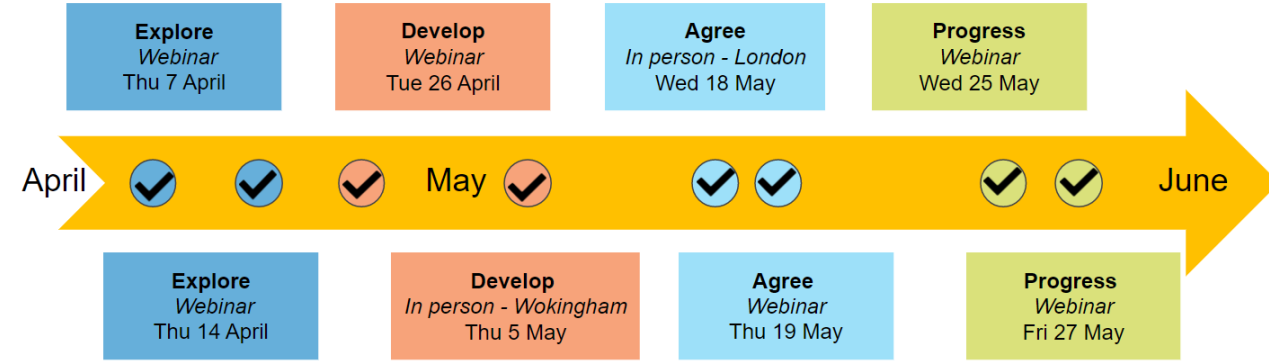
18 May workshop objective:

- Played back the outputs from the 5 May workshop
- Shared proposed co-created balancing capability roadmap, showing supporting benefits and costs
- Corroborated and sought agreement of an initial roadmap with associated risks and assumptions
- Captured the confidence level of industry of the joint proposed approach

25/27 May webinar objective:

- Recap of the journey so far
- Opportunities to ask further questions regarding the proposed roadmap, costs and delivery plan
- Understand how we continue to build confidence in our roadmap and approach
- Validating if we have successfully included your input and is there anything missing?
- Future engagement

Timeline (April → June):

Top row:
- **Explore** — Webinar — Thu 7 April
- **Develop** — Webinar — Tue 26 April
- **Agree** — In person - London — Wed 18 May
- **Progress** — Webinar — Wed 25 May

Bottom row:
- **Explore** — Webinar — Thu 14 April
- **Develop** — In person - Wokingham — Thu 5 May
- **Agree** — Webinar — Thu 19 May
- **Progress** — Webinar — Fri 27 May

Feedback – Roadmap

Some questions we have (Please enter comments into the MS chat box)

- How have you managed roadmaps in the past?
- Does this look like a good approach?
- What level of detail do you usually present?
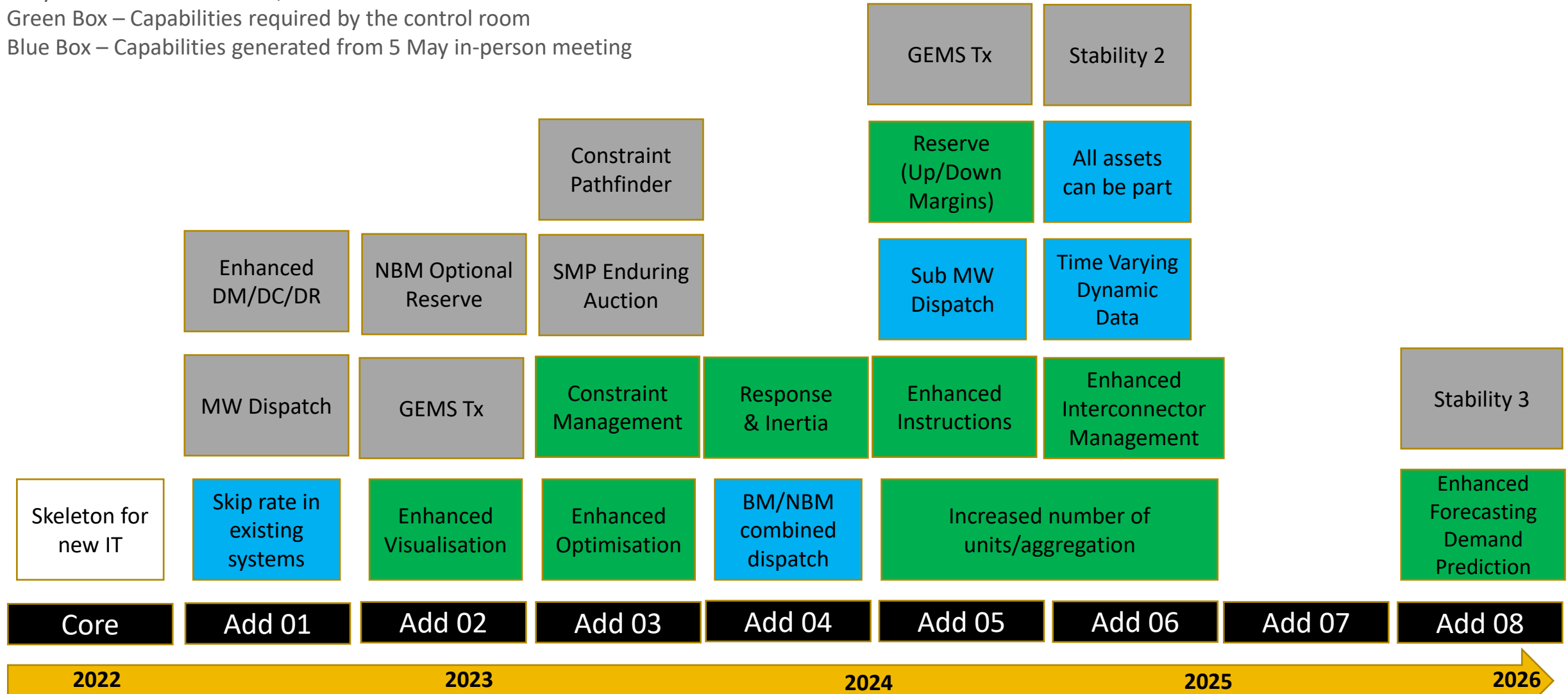- How does our roadmap look compared to others you have seen?

Proposed Roadmap

Suggestions from industry not on the roadmap

Carbon Intensity Decision Making

NG ESO licence does not allow this.
We said we would build in this capability but could not enable it without industry change

Allow decreasing BM prices

This would make the problem difficult for optimisers.
We said we would look at alternatives (such as including start-up prices)

Show BM Prices outside GC

This would need code changes and agreement with Elexon.
We said we would keep this on our backlog and investigate

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Feedback – Roadmap

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- How have you managed roadmaps in the past?
- Does this look like a good approach?
- What level of detail do you usually present?
- How does our roadmap look compared to others you have seen?

Feedback – Benefits

We have some questions (Please enter comments into the MS chat box)

- Have you experience of benefit tracking you can share?
- Do you always express in financial terms?
- How do you relate to releases or milestones?
- Are there any additional benefits you believe need including?
- Any clarifications around the scale of the benefits described?

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Benefits and the case for change

Direct benefits delivered by Balancing Transformation

Submission	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Dec 2019[1]	£9.4m	£12.1m	£30.7m	£44.5m	£55.7m	**£152m**
May 2022[2]	£7.2m	£3.6m	£18.6m	£85.4m	£119.2m	**£234m**

## Net present value (NPV) delivered by RIIO-2 plan (excluding Balancing and Network Control)

Submission	5 year NPV
December 2019	£1,754m
May 2022	£2,581m

Forecasting benefits

Capability	RIIO-2 benefits
Platform for Energy Forecasting	£1,048m

1 – half of the A1 CBA as submitted in the December 2019 RIIO-2 plan

2 – provisional figure for engagement only. Subject to change in final BP-2 submission
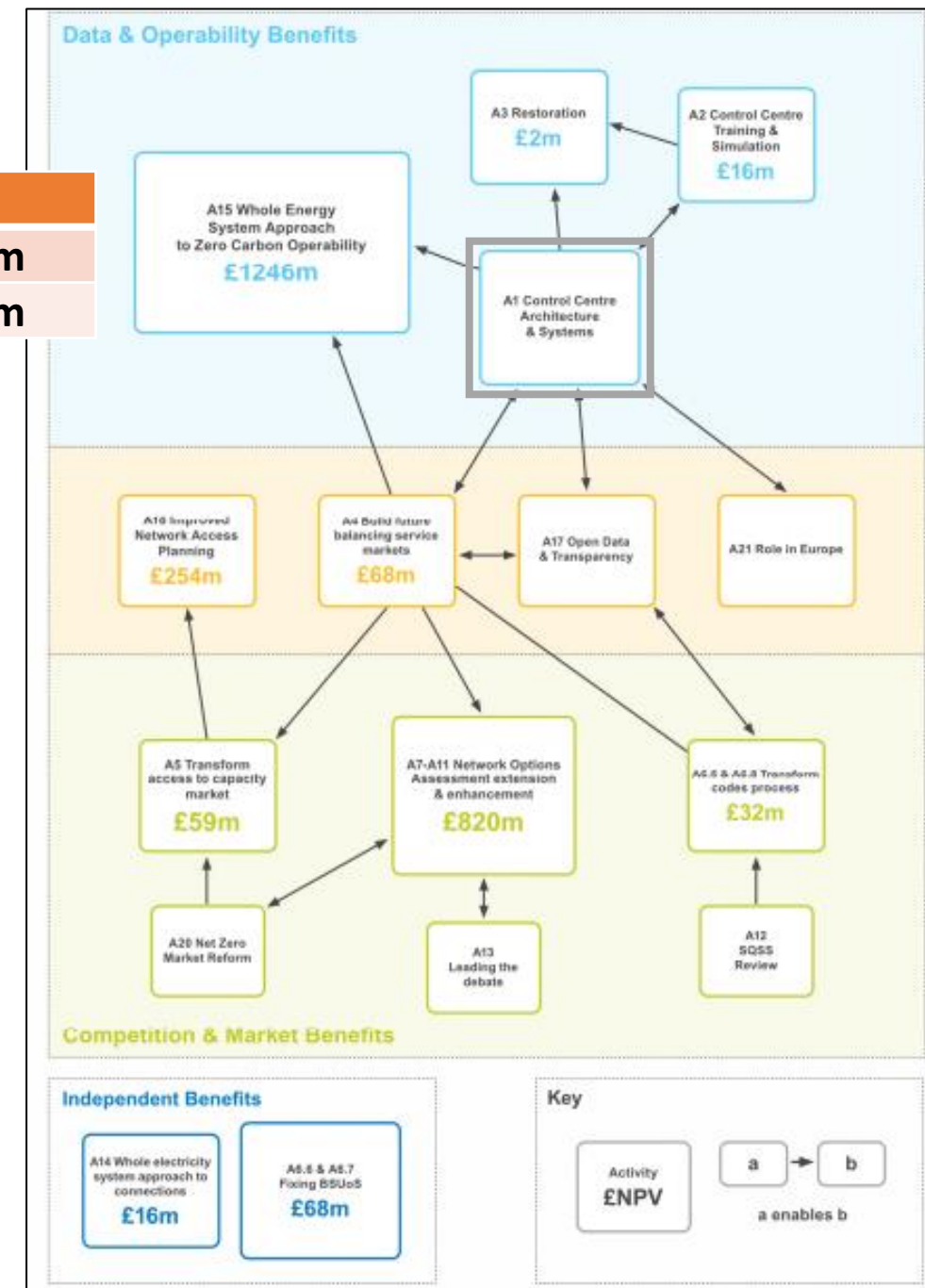
Additional benefits captured on 18 May

Knowledge share with less developed markets in EU & include participants

Flexible architecture: agility provides a speed benefit in future "unknowns"

FSO Whole system optimisation

Better constraint management solutions

Comparing £8m investment and £282m loss. The loss is much greater when looking at a higher level. Other industries (e.g dairy, agriculture etc) will suffer from a blackout. I think the loss would be in billions.

Smarter System + Smarter Choices + Better Frequency = Reduce wastage

More automated decisions leading to greater transparency cost/benefits

Feedback – Benefits

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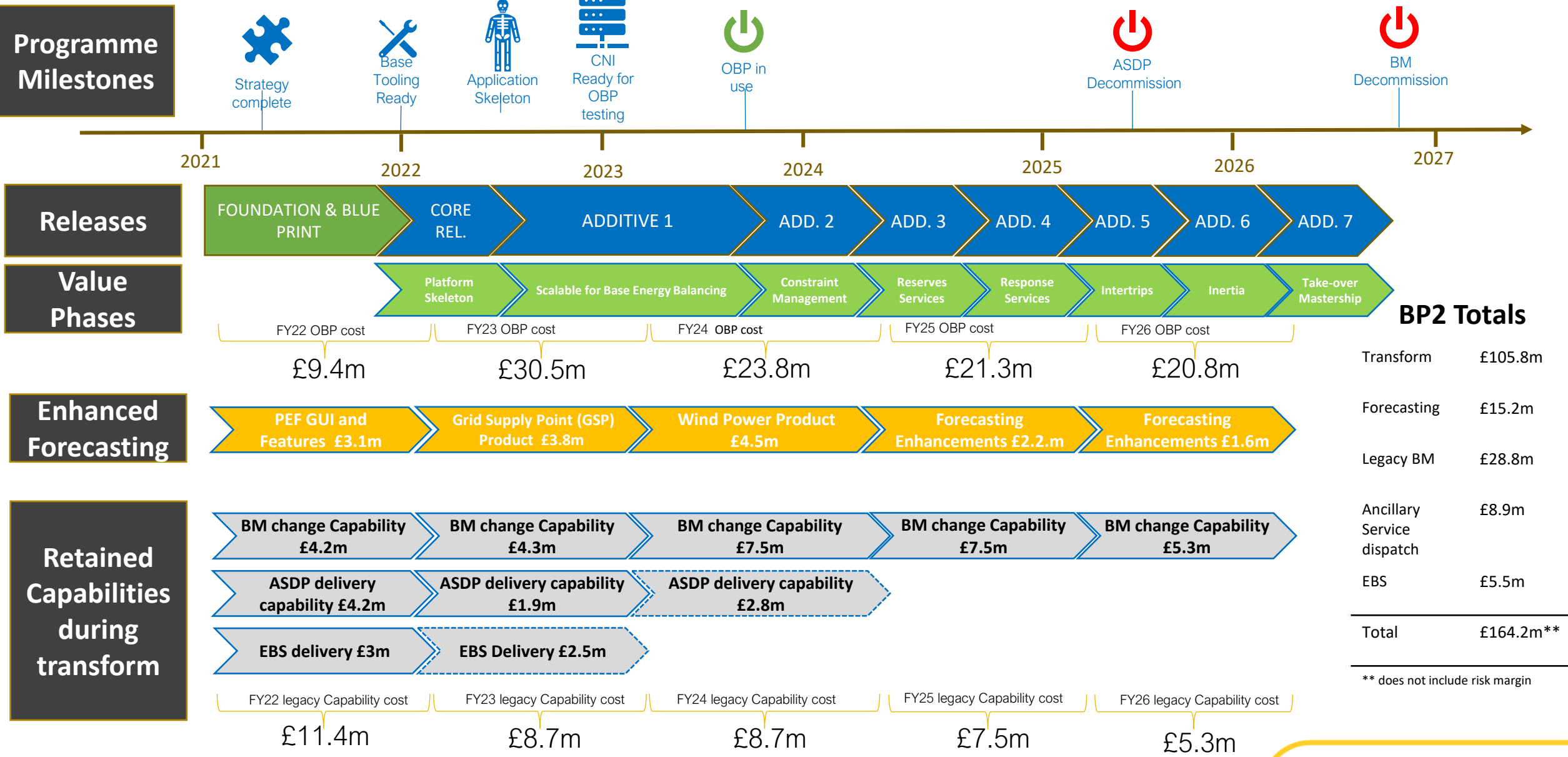
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- Are there any additional benefits you believe need including?
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Feedback – Costs, risks and assumptions

We have some questions (Please enter comments into the MS chat box)

- Given your experience do our costs look the "right order of magnitude"
- Can you share your experience of forecasting?
- How do you deal with forecast errors and tolerances?
- How do we deliver in an agile way within a framework that asks for forecasts several years in advance?
- What additional information do you need to understand our cost forecasts?
- Are there any further risks and issues?
- Given the unique nature of this project how do we get external assurance

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Transformation Roadmap Totex Overview

Programme Milestones

| Strategy complete | Base Tooling Ready | Application Skeleton | CNI Ready for OBP testing | OBP in use | | ASDP Decommission | | BM Decommission |

2021 2022 2023 2024 2025 2026 2027

Releases

| FOUNDATION & BLUE PRINT | CORE REL. | ADDITIVE 1 | ADD. 2 | ADD. 3 | ADD. 4 | ADD. 5 | ADD. 6 | ADD. 7 |

Value Phases

| Platform Skeleton | Scalable for Base Energy Balancing | Constraint Management | Reserves Services | Response Services | Intertrips | Inertia | Take-over Mastership |

FY22 OBP cost	FY23 OBP cost	FY24 OBP cost	FY25 OBP cost	FY26 OBP cost
£9.4m	£30.5m	£23.8m	£21.3m	£20.8m

BP2 Totals

Transform	£105.8m
Forecasting	£15.2m
Legacy BM	£28.8m
Ancillary Service dispatch	£8.9m
EBS	£5.5m
Total	£164.2m**

** does not include risk margin

Enhanced Forecasting

| PEF GUI and Features £3.1m | Grid Supply Point (GSP) Product £3.8m | Wind Power Product £4.5m | Forecasting Enhancements £2.2.m | Forecasting Enhancements £1.6m |

Retained Capabilities during transform

| BM change Capability £4.2m | BM change Capability £4.3m | BM change Capability £7.5m | BM change Capability £7.5m | BM change Capability £5.3m |

| ASDP delivery capability £4.2m | ASDP delivery capability £1.9m | ASDP delivery capability £2.8m |

| EBS delivery £3m | EBS Delivery £2.5m |

FY22 legacy Capability cost	FY23 legacy Capability cost	FY24 legacy Capability cost	FY25 legacy Capability cost	FY26 legacy Capability cost
£11.4m	£8.7m	£8.7m	£7.5m	£5.3m

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Major Assumptions

- Transformation is fully supported, funding agreed in good time
- CNI Data centres are ready to support additive 1
- Adequate internal resources and expertise to support Roadmap
- 2-3 years minimum until major market reform & OBP can adapt
- Market initiatives are as per current RIIO-2 plan
- Optimisers & Models can be developed in parallel, outside of CNI
- Existing BM support cannot be extended beyond 2030
- Financial assumptions related to resources/SW/HW remain within tolerances

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Risks and uncertainties

Risk / Uncertainty	Response
There is a risk that the ESO underestimate the complexity of the Transformation objective	The ESO has delivered the blueprint for the transformation and has built product teams which include Product Owners and SMEs with industry and operational expertise. We are also undertaking an external assurance audit on the programme as well as engaging with industry.
There is an uncertainty that the Balancing transformation costs and plan will meet industry and regulatory requirements	The programme is undertaking an external engagement initiative with industry and Ofgem with the objective of delivering a joint plan and seeking support for the increase in costs. High quality governance processes in place, including Quarterly Exec-level steering.
Energy system optimisation does not meet requirements	We have built a specialist Optimisation team with internal and external specialists, who are working on solving the complex Engineering and scientific problems. Optimisation/Modelling can be developed independently of Roadmap
There is a risk that critical changes will be required to existing balancing systems before Transformation is complete.	Existing systems development capability is expected to be retained to ensure critical changes can be made during transformation, particularly in BM.
There is a risk to the timeline if industry engagement changes the direction of the transformation	We will ensure that the Roadmap aligns to industry needs. Delays or changes may delay the zero-carbon objective and related benefits case. The service life of existing systems can be extended to maximum 2030.
There is a risk that the Open Balancing Platform will not satisfy the requirements of a changing energy market	The Open Balancing Platform has been built on highly resilient, highly flexible (RedHat OpenShift) technology that is easy to change and deploy. The system is designed to adapt to changing energy market and operational conditions.
There is a risk that, in the future, costs increase or that costs are not approved by Ofgem	Robust stakeholder engagement to get support for delivery roadmap and associated costs. Developing costs in bottom-up way to give greater confidence. Robust assurance, governance and benchmarking in place.
There are challenges in completing the ESO components of the Critical National Infrastructure Data Centre (CNI-DC)	We are working with the National Grid Infrastructure and Operations team to complete the CNI-DC base infrastructure.
There is a risk that the global shortage of semi-conductors could delay the deployment and go-live of the Open Balancing platform.	We are looking at technical choices (with Industry) possibly deploying the new Open Balancing Platform on hardware planned for the Modern Dispatch Analyser and Ancillary Service Dispatch Platform.

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Additional risks captured on 18 May

Slow DSO Development and regional disparities in balancing control

Losing "pioneers" - when ESO catches up, the Pioneers have already gone

ESO does not allow enough time to address optimisation challenge

Funding Regime/Incentive framework depends on FSO outcomes. How to ensure this is adequately & consistently funded through this change

IF LMP/Central Dispatch is approved this would be a huge organisational distraction from OBP

Confusing "Stakeholder Engagement" with "keeping everyone happy". You will have to make tough decisions

Slow ESO- DNO/DSO engagement block new distributed/Agg flexibility from entering the market

Higher Data in Metering Standard push MW out of BM

Lack of appropriate resource (not just OBP but wider ESO) Entire industry is fishing in the same pond

Additional comments captured on 18 May

Develop Market design with computation requirements in mind

ESO does all balancing...no self dispatch

Take a view on overall system operation requirement

Costs need to be measured on scale of industry + society, not ESO Turnover

Optimisation routines - what are absolute requirements by certain dates vs what can be developed more organically

Don't move at the speed of the slowest member of the group

Get Interim solutions working now

Outsourcing Platform reform to Innovate UK might save time and resources

Only a handful of optimisation + power network experts. Get them to work together

Feedback – Costs, risks and assumptions

We have some questions (Please enter comments into the MS chat box)

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- Can you share your experience of forecasting?
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- Given the unique nature of this project how do we get external assurance

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Feedback – Engagement

We have some questions (Please enter comments into the MS chat box)

- How have you kept engagement going through the length of a project?
- What is the best way to communicate change to the roadmap, costs, risks etc.
- How frequent?
- What formats?

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Proposed engagement

Based on the feedback we received last week, we propose **monthly progress updates** on website and **run quarterly webinars or in-person events**

This engagement could include:

- Transparency on changes to the roadmap, costs and benefits
- Review of the previous quarter and plans for the upcoming quarter
- Demos of key functionality
- Consideration of wider issues and agreeing how they should be incorporated into our roadmap
- Your chance to ask questions and provide feedback into our plans
- Highlighting dependencies and impacts on market participants
- Continual review of engagement

How would you like to receive updates on this topic going forward?

	Number of votes
Updates at the operational transparency forum	11
Webinars from the project team	19
Updates on the website	12
Newsletters from the ESO	14
Information included as a part of other ESO…	5
Face to face meetings with the project team	14
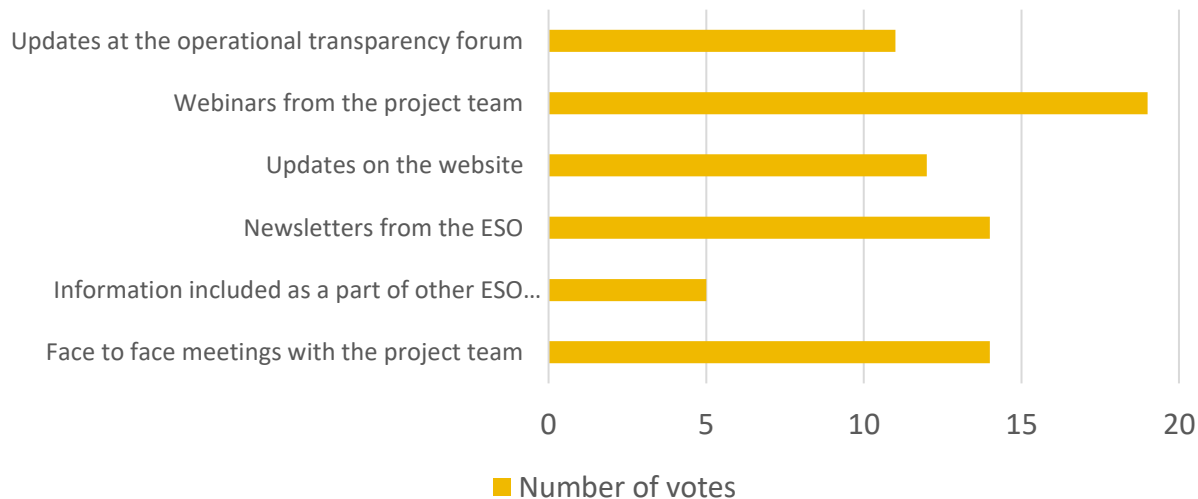
How often would you like to be engaged on this topic?
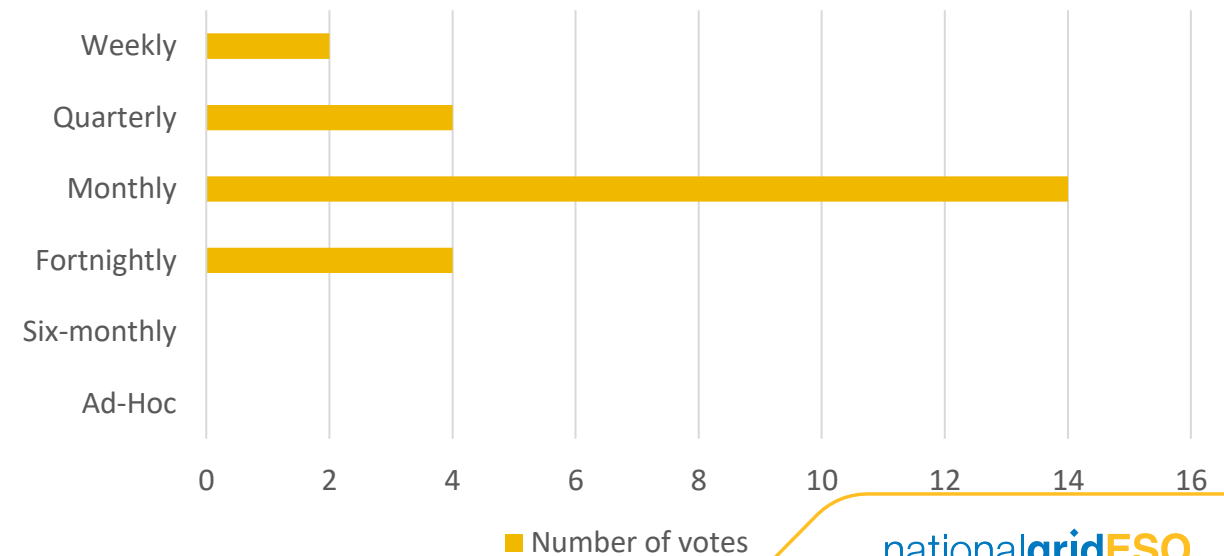
	Number of votes
Weekly	2
Quarterly	4
Monthly	14
Fortnightly	4
Six-monthly	0
Ad-Hoc	0

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Feedback – Engagement

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Network Control Programme

Item 5

Update on current progress

- Mobilised team in **August 2020**
- Developed our Vision, Strategy and initial User Stories
- Procurement commenced in **May 2021**
- Competitive Dialogue approach taken
- Received first proposals from vendors in **August 2021**
- On-site Sandbox demonstrations received from final vendors
- Received final proposals from vendors in **January 2022**
- Completed complex commercial negotiations with both final vendors
- Evaluation of proposals completed in **April 2022**
- Vendor selected in **May 2022**

- And the winner is…   **GE Digital**

What does that look like

Total To-Be Compliance US & Feats

- 5, 2%
- 108, 42%
- 144, 56%

Legend:
- Committed in Product Roadmap
- In Current Product
- Not Available or Commimtted in Product Roadmap
- (blank)
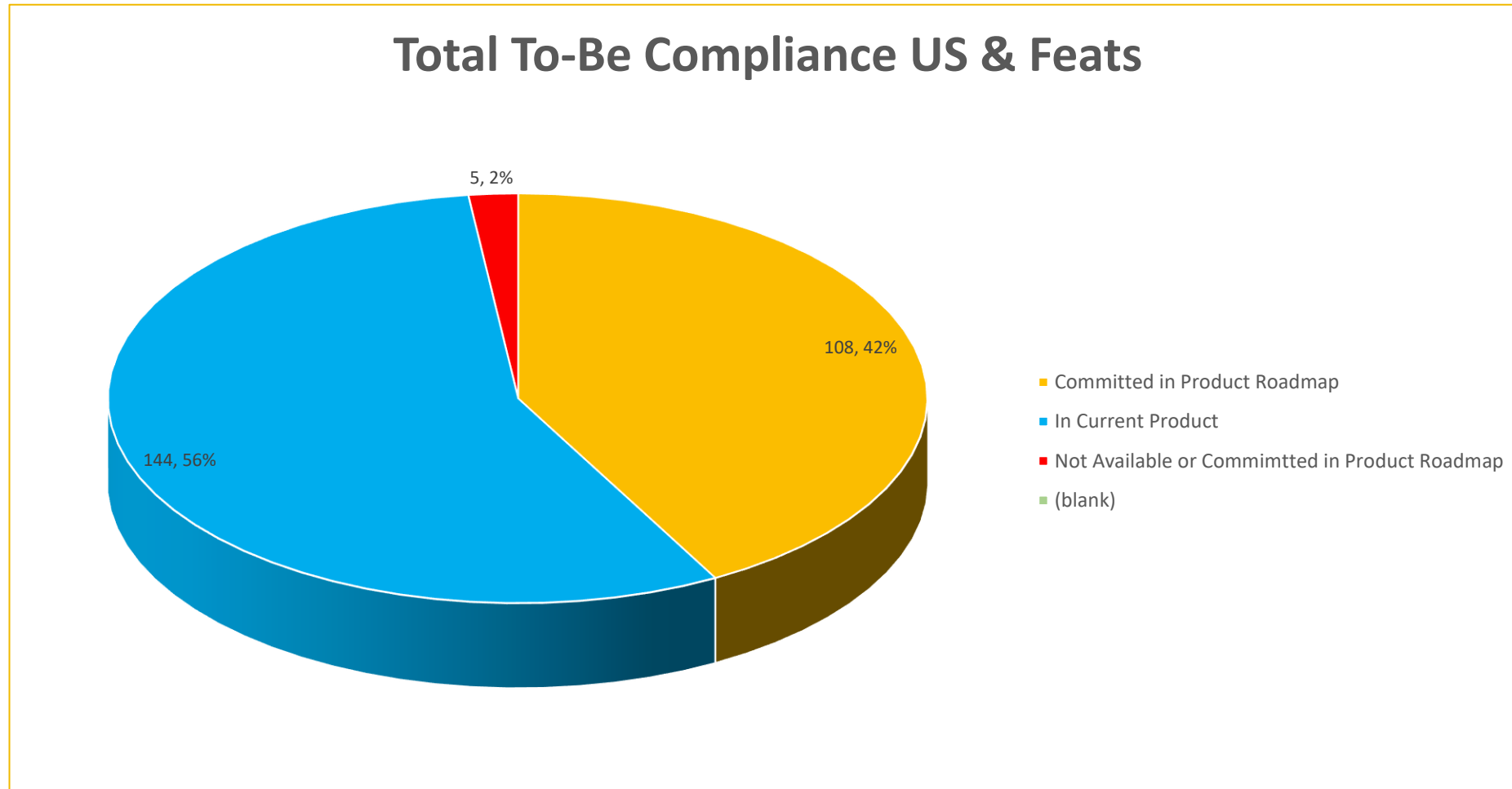
Network Control Management System
IEMS Strategic Replacement
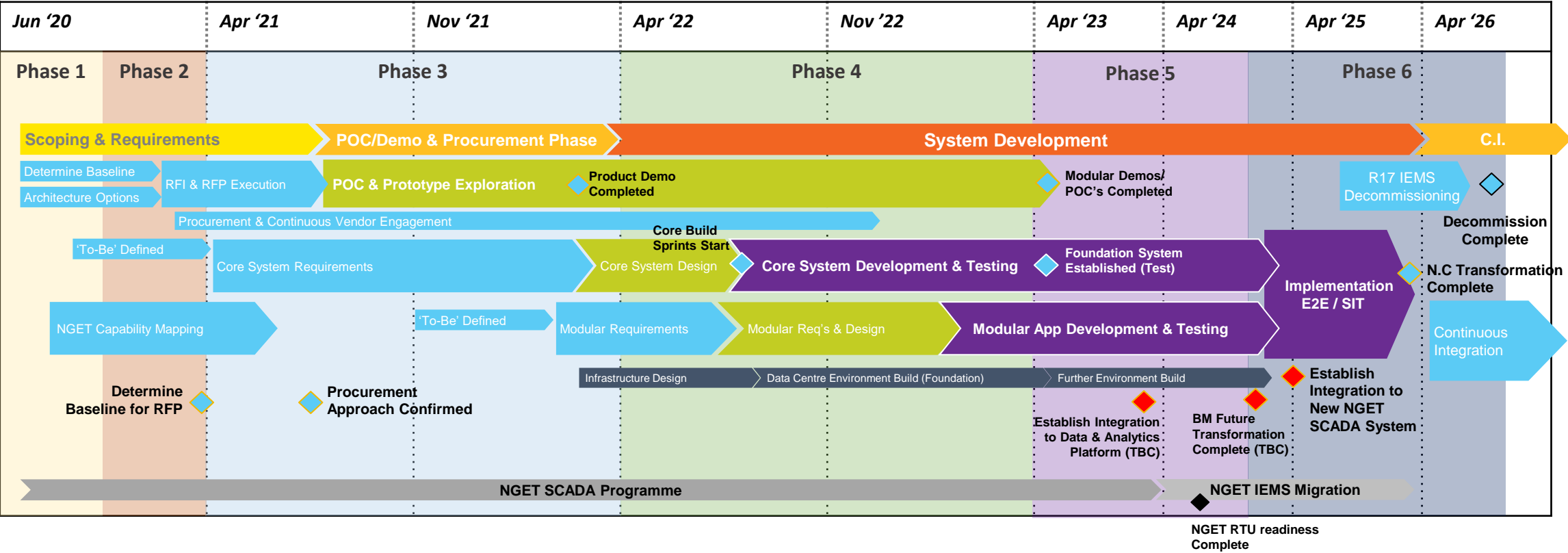
GE Advanced Energy Management System (AEMS)
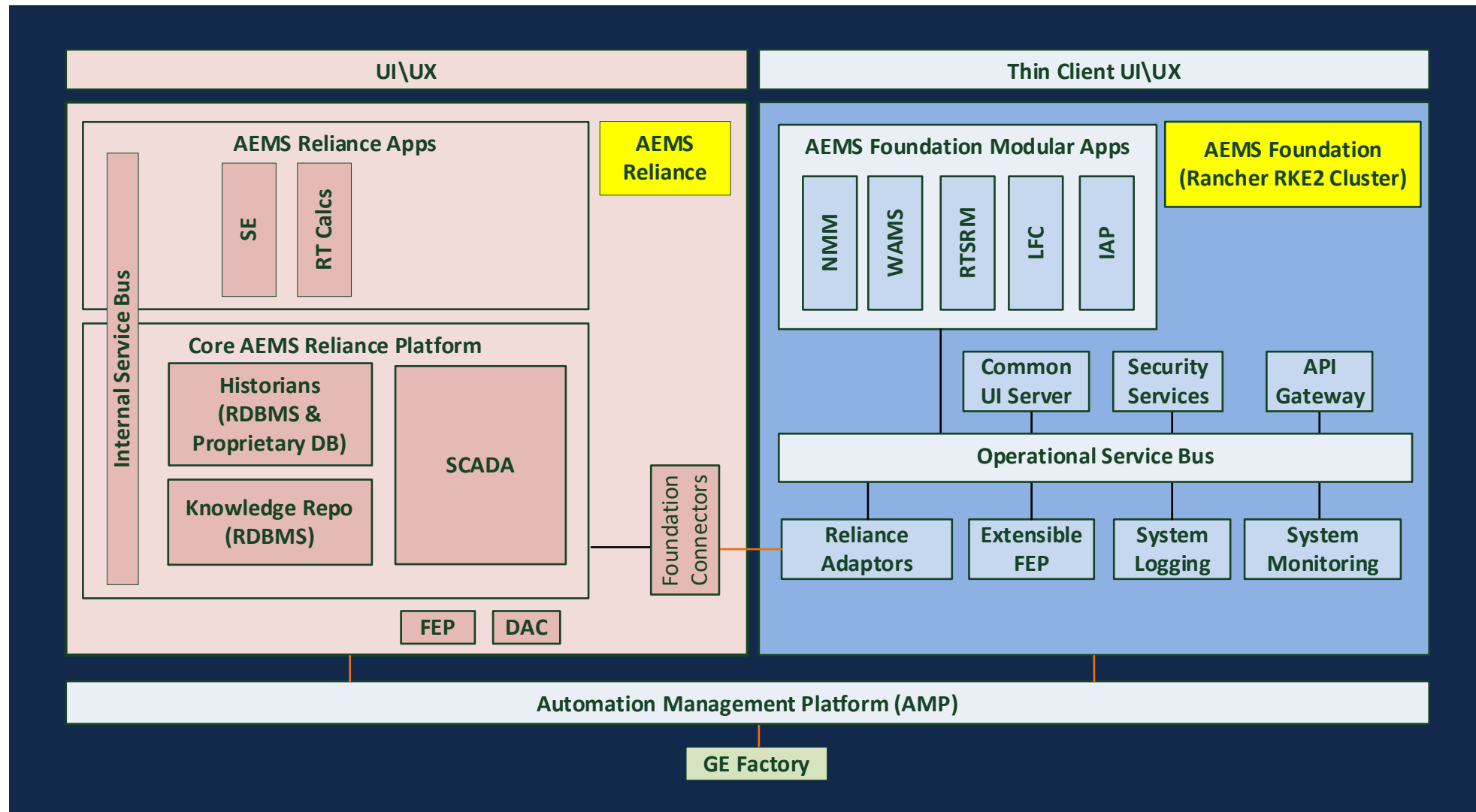
AEMS Reliance & AEMS Foundation
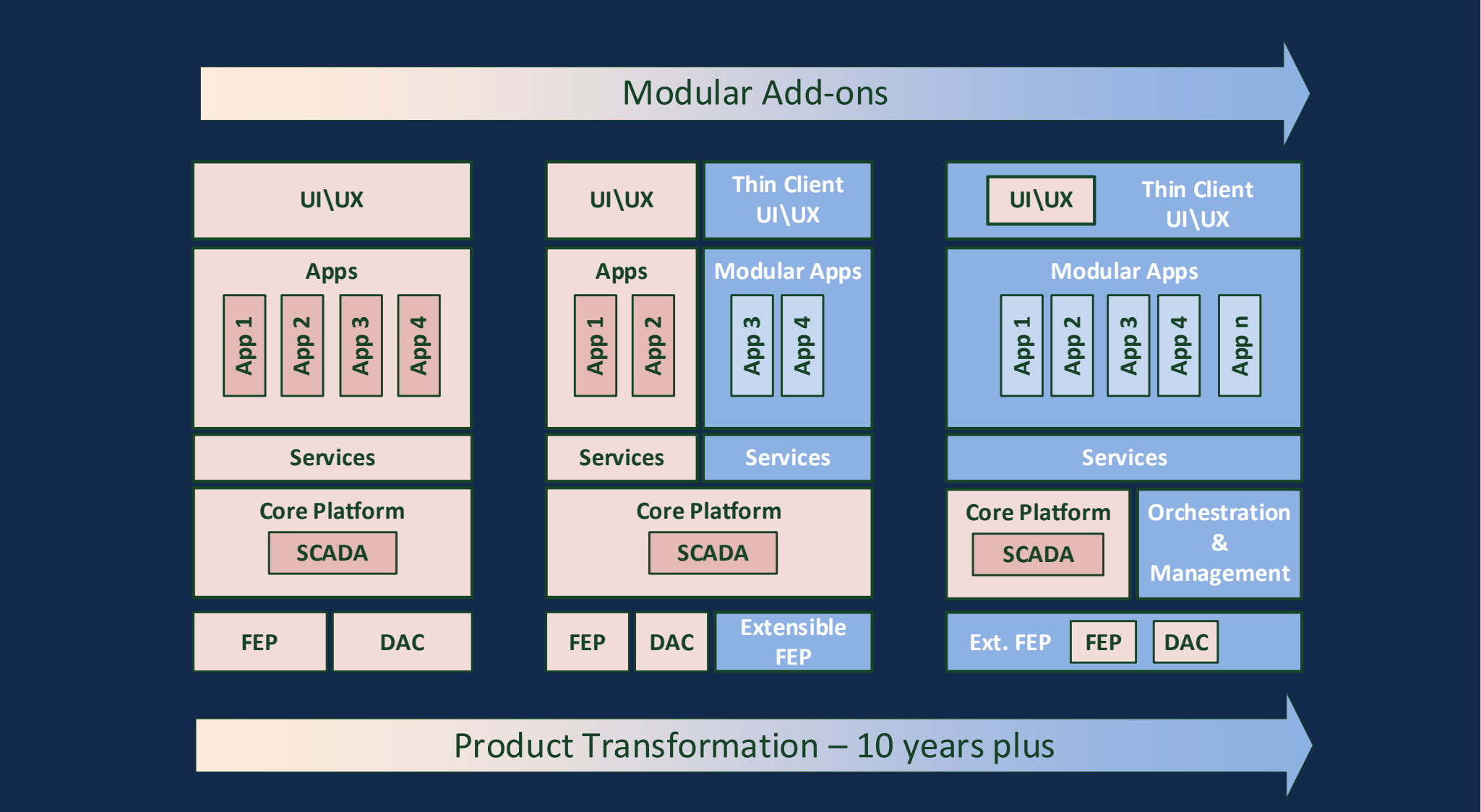
Tech Stack

LAYER	PURPOSE	ENABLING TECHNOLOGY
Container Orchestration & Management	**StartUp, Load Balancing, HA & SVC discovery**	RANCHER kubernetes
Container Runtime	**Host containers on Virtualised OS**	container**d**
Container & App Security	**SVC Level Authentication & Authorisation**	Istio
Cluster Ingress Control	**Authentication and Authorisation of inbound requests to the Cluster and Session Management.**	GE NGINX Lua
Application and Cluster Observability	**Logging, metrics gathering, Monitoring, Alerting & Tracing**	Grafana Prometheus fluentbit kibana JAEGER kiali

Tech Stack Continued

LAYER	PURPOSE	ENABLING TECHNOLOGY
Mediation & Routing	Supports various domain integration pattern	APACHE Camel
Messaging	Support for multiple messaging patterns e.g. streaming, pub-sub, request-response	APACHE kafka · APACHE ACTIVEMQ · Spring Cloud
Data Stores	Provide Persistance and HA for Service related data	Infinispan · PostgreSQL · elastic · Timescale
GE & 3rd Party Adaptors	Interfaces to existing GE products and typical enterprise systems e.g. AMI, LDAP, RSA etc.	GE
User Authentication, Authorisation and AORs	Enforce Role-based Access	GE · CLOUDFOUNDRY

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Question for TAC

What are your experiences of managing a change in ways of working with a long-term existing supplier? i.e. moving from traditional waterfall to an agile delivery method

RIIO-2 BP2 (April 2023 – March 2025)

Item 6

BP2 – draft business plan

Re-cap: the RIIO-2 price control timeline

The RIIO-2 price control timeline

RIIO-2 Price Control Period

Business Plan 1
April 2021 to March 2023

**Business Plan 2
April 2023 to March 2025**

Business plan 3 (TBC)

1 April 2021

31 March 2026

The BP2 planning timeline

September 2021
Ofgem publish Business Plan 2 guidance

ESO to publish Final Business plan
31 August 2022

Ofgem to publish draft determinations
November 2022

2nd Business Plan cycle begins
1 April 2023

BP2 consultation

December 2021
Ofgem publish IT specific Business Plan 2 guidance

ESO publish draft BP2 plan and consult with stakeholders
**29 April – 10 June 2022
(IT annex 16 May)**

Ofgem to publish Final determinations
March 2023

Continuous stakeholder engagement

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Our focus for the BP2 period

The new themes in our external environment and increased system complexity mean we've rethought our activity in the following ways:

1 Brand new activities to support the transition to net zero e.g. Early Competition and Offshore Coordination

2 Increased activity for our teams resulting from increased decentralisation of the energy sector

3 Activity from BP1 replanned or expanded to deal with growing system complexity

Focus for BP2

Establishing the pathway to a fully decarbonised electricity system by 2035

Improved engagement, transparency, and customer service

Building organisational capability and flexibility

Transforming to a digital and data business

Keeping the lights on

Minimising system costs

Delivering the capability for zero carbon operation by 2025

Whole system coordination

Reform of energy, flexibility and service markets

Strategic planning for delivery of networks and commercial services

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BP2 activity key takeaways

- Our three ESO roles are the same for BP2
- Significant number of new and changed activities for each role:

5 new activities:

- Market Monitoring
- Data and analytics operating model
- Net Zero Market Reform
- Role in Europe
- Offshore Coordination/Network Planning Review
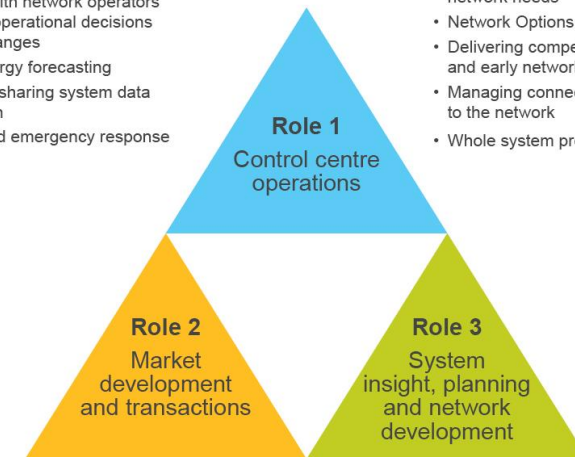
And 12 new sub-activities

Role 1 activities:

- Operating the system (monitoring and dispatch)
- Coordinating with network operators on short term operational decisions and outage changes
- Short term energy forecasting
- Managing and sharing system data and information
- Restoration and emergency response

Role 3 activities:

- Long term forecasting, energy scenarios and identification of network needs
- Network Options Assessment
- Delivering competitive system solutions and early network competition
- Managing connections and access to the network
- Whole system process development

Role 1
Control centre operations

Role 2
Market development and transactions

Role 3
System insight, planning and network development

Role 2 activities:

- Balancing and ancillary service market design
- Service procurement and settlement
- Revenue collection
- Policy advice and delivery of market framework changes
- Code administrator
- EMR delivery body

Work related to FSO sits separately to our draft plan in Annex 5

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BP2 key financial takeaways

**Five-year investment increase:
£74m opex, and £179m capex
NPV of around £2.6bn**

**Two-year investment increase (for BP2):
£42m opex, £88m capex and an increase
of 307 FTEs (in FY24).**

This investment increase is driven by:
- New activities e.g. Offshore Coordination
- Expanded activities
- Direct IT capex variance driven by Balancing Programme
- Increased opex related to IT
- Property spend
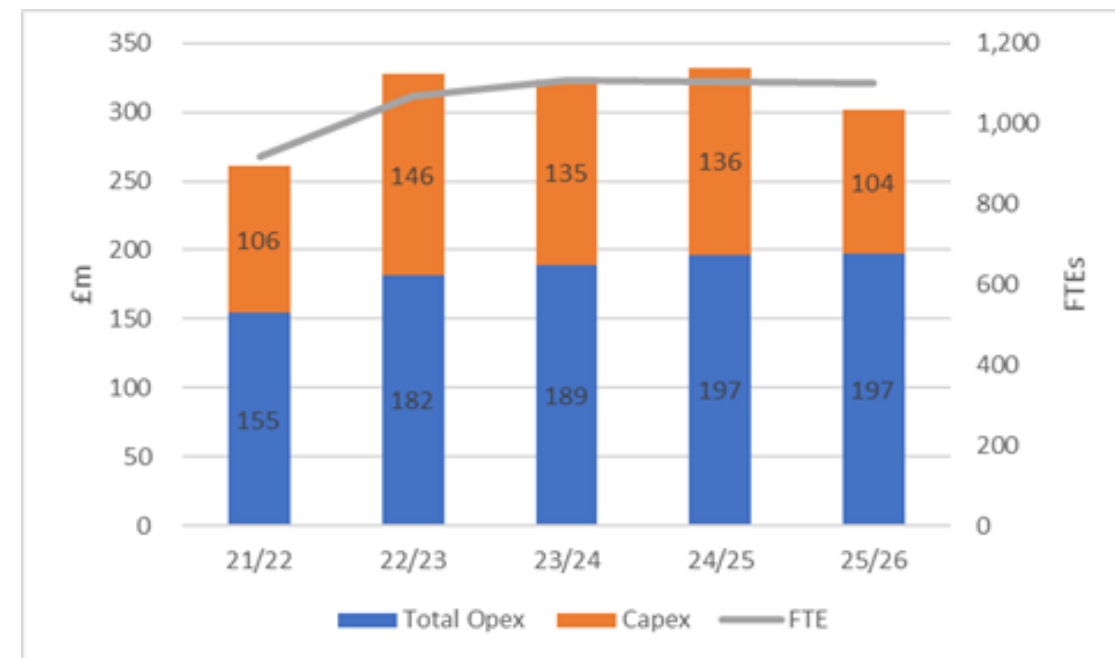
Our plans deliver savings for consumers of around **£5.50** a year.

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People, culture and capability

We want to be the net zero employer of choice.

People are at the heart of what we do and a skilled and engaged workforce is critical to our success. This becomes more important in the context of the pace of change within the energy industry and our role at the centre of enabling the energy transition.

Building our capabilities

Build on core capabilities identified in BP1:
- power system engineering
- data and analytics
- commerciality
- leading the debate
- ESO technology

Resourcing our workforce

- Growing our own talent pipeline
- 'Buying' in talent/skills by partnering with specialist training and recruitment firms
- Borrowing via a contractor partnership model
- Increasing collaboration with academia and external industry partners

Attracting and retaining talent

- Strengthening and leveraging Employee Value Proposition
- Developing our people through learning platforms and materials, career pathways, talent management, upskilling our leaders and an alumni network
- Delivering DEI commitments and strategy
- Prioritising health, wellbeing and employee engagement
- Evolving our culture to meet the needs of net zero

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Question for TAC

During BP2 we will need to upskill, attract and retain talent in the technology space in much greater numbers than we have previously.

We would be keen to understand any learnings you could share with us around growing technology expertise within your own organisations?

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What we heard vs. how this has shaped our plan

How TAC Feedback has shaped draft BP2 proposals

"Don't try to build a perfect end to end solution that does many things poorly. Build core functionality that does limited things well and build from there."

"Consider the people side in terms of roles and responsibilities in the design of the new tools for 2025, particularly what can be learnt from other companies who have undergone or are undergoing similar large-scale transformation"

Single Markets Platform (SMP)

The foundational release for the SMP was built on a core functionality to facilitate registration (provider and asset), accede to specific service terms and pre-qualify units.

This was for new and enduring Response and Reserve products initially, prior to integration with downstream capabilities (such as auction capabilities) in the future and extension to wider balancing services markets

June 2021

Digital Engagement Platform (DEP)

For BP2, have introduced the new continuous deliverable D17.8 Digital Engagement Platform (DEP) with a continued phased deployment.

We will deliver incremental build out of the physical platform via a use-case led approach. In this way, the deployment of new capabilities is always aligned with business priorities and value creation for stakeholders

June 2021

Balancing and network control programmes

The Balancing and Network Control programme are being managed with product lines with associated workshops being run with customer / user groups to capture and properly understand the user requirements.

A business change team has been setup to manage the transition to new processes and tools and how change is implemented. We have also visited other companies who have undergone similar transformations to feed into our BP2 plans.

Nov 2021

We are still working through other feedback as part of our August update.

We would also appreciate feedback on our IT Annex.

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Subgroups update

Item 7

David Bowman

Subgroups update

- The *Control Room of the Future* subgroup met on 27 April.

- Topics discussed:
  - Balancing Capability Strategic Review
  - Transmission – Distribution collaboration

Next meeting and calendar

Item 8

Vernon Everitt

Next meeting and calendar

Meetings are every quarter for a half-day on the first Friday morning of the month, 9am-12.30pm

- 2 September 2022

- 2 December 2022

- 3 March 2023

AOB

Item 9

Vernon Everitt