# Non-Operational IT Re-opener Application April 2021

**Project: AI capabilities [REDACTED]**

**File name: NG_ET_IT-RO-02_Submission_document_AI**

**8 April 2021**

Strictly Confidential

nationalgrid

# NATIONAL GRID
# ARTIFICIAL INTELLIGENCE
# APRIL 2021

## EXECUTIVE SUMMARY

Our investment in Artificial Intelligence (AI) systems supports National Grid's Electricity Transmission business. Our strategy is to invest in machine learning and AI technologies to ensure more effective and adaptive planning of our maintenance and capital plans, enabling more dynamic decisions and preparing the electricity system to run on purely zero-carbon electricity by 2025.

In RIIO-T2 we look to evolve the planning process through new and enhanced solutions to plan outages, work and resource, linked to and improving existing business processes with integrations to wider ET systems and greater collaboration with other business units. This will ensure the deliverability of work to meet commitments to our stakeholders.

This investment will deliver three capabilities through an initial program and two future tranches of enhancements at a total cost in 18/19 price base of £8,473,162.

The three capabilities are:

1. **Outage Sequencing**. National Grid have recently conducted a successful proof-of-concept that automatically generates the national year ahead outage plan whilst considering both system and resource constraints simultaneously. This investment will develop that proof-of-concept into a full digital product that can be used in the core of our annual outage planning process. By applying machine learning or more advanced and efficient modelling these constraints will be further refined to create higher quality reliable intervention plans which respect constraints, freeing up time to focus on value add and enhanced risk assessment and plan scenarios.

2. **Outage Cost Forecasting**. This bespoke Constraint Analysis Tool (CAT) will enable National Grid to work collaboratively with the ESO to maximise the potential benefits from the RIIO-T2 Constraint Incentive as visibility increases of potential system constraints and their costs. The CAT enables multiple case studies to be run per day [redacted] thus significantly increasing the potential to collaboratively formulate strategies with ESO to minimise constraint costs.

3. **Scenario Modelling**. This capability will ingest data relating to all work, the drivers, delivery decisions and historic outcomes. Building on our ET optimisation engine, delivered within T1, this investment will model deliverability confidence and suggest alternate work or sequencing.

The capability will learn from churn and actions to optimise future plans and automate planning activities.

The two future tranches will deliver enhancements to the above capabilities in-line with the assessed business needs at the time. It is expected the enhancements will deliver integration with Field Force Work Management applications and greater synchronisation with our Asset Performance Management solutions, to be delivered under separate T2 investment lines [redacted]

The breakdown of costs across the RIIO T2 period is as follows;

| Investment (£m) | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | T2 |
|---|---|---|---|---|---|---|
| Artificial Intelligence (AI) | £3.03 | £2.31 | £1.40 | £0.86 | £0.86 | £8.47 |

(18/19 prices)

Pre-assessment suggests enhancements relating to;

- Natural language interaction between device and field operator to improve safety, efficiency and overall experience.
- "Next best action" feature to be enabled for specific scenarios to support field operation with expert knowledge and avoid past errors.
- Pattern recognition of images, videos captured as asset condition information and delivery of image/videos to field for specific context to support field operation.
- Augmented virtual reality to overlay real-time asset performance, asset condition, maintenance history etc. on impacted asset/equipment.
- Use of learning in reasoning in modelling and advanced analytics space to create self-learning asset performance and risk assessment bot.

NG's initial submission was marked red for justification, definition and cost. This document provides a more detailed breakdown of each capability and the rationale for investment.

The initial submission was marked red against resource. Given the now mature nature of the capability requirements we have been able to accurately forecast the required resource. The required resource, WBS and subsequent cost are detailed within pages 12-14.

These capabilities are a vital early-regulatory period deliverable and will become a large component of the IT landscape releasing capability within ET. Delivery will ensure National Grid can mitigate the risk of plan instability and will help ET meet our collaborative commitments and obligations with the ESO to provide a stable confirmed view of maintenance and capital plans and avoid pushing the burden to our stakeholders.

If not delivered these capabilities will remain manual and not mature in-line with other system deliverables which incurs the risk of non-optimised planning and delivery which is detrimental to our stakeholders.

Digitizing large elements of the system operation and planning process is complemented by numerous IT investments planned for FY22, detailed below, which alongside addressing

recommendations from the Energy Data Taskforce will set-up ET to comprehensively deliver in RIIO-T2.

| | |
|---|---|
| [redacted] | [redacted] |
| [redacted] | [redacted] |
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| [redacted] | [redacted] |

[redacted]

Delivery of these capabilities will reduce time in planning and re-planning work by 30%. This is currently undertaken by Engineers across Network Optimisation and ET Operations [redacted] The released capacity will enable our Engineers to focus on delivering a more efficient and optimised outage plan, with less outages needed to deliver more work, resulting in reduced constraint costs and more system access available for other priority work, such as Net Zero.

80% of NGs Compensation Events (CE's) today link to changes in scope or are a result of plan change. These capabilities will reduce changes in scope through standardisation and codifying learning from experience. Plan change will be reduced through effective monitoring of deliverability, providing transparency on impact of change and holding delivery vehicles to account for outcomes, visibility of pipeline and allocations. This will reduce compensation events by 25%.

**There are documents contained in the Annex which are relevant to support this submission, the titles of which are detailed in the table below;**

| Document | File Name |
|---|---|
| IT Assurance Statement | NG_ET_IT-RO-03_Assurance_Statement |
| Irregular Submission Assurance report | NG_ET_IT-RO-04_Irregular Submission Assurance Report |
| Irregular Submission Risk Assessment | NG_ET_IT-RO-05_Irregular_Submission_Risk_Assessment |
| [redacted] | [redacted] |
| [redacted] | [redacted] |
| [redacted] | [redacted] |

# CONTENTS

# 1. PROJECT JUSTIFICATION

During RIIO T1, National Grid Electricity Transmission has invested in platforms and tools (from Oracle, IBM and SAP) to leverage value from data. These have been successfully deployed and form part of BAU operations, but the rate of change for data platforms is high and newer technologies offer capabilities which could accelerate data capabilities for data engineers/scientists and data citizens. NGET has identified many opportunities to leverage these new capabilities to achieve strategic objectives in both its RIIO T2 plans and Digitalisation plans. Ofgem also supports further data transformation and has highlighted this through the recommendations of the Energy Data Taskforce.

This project intends to develop three distinct use-case driven capabilities based on data within our platforms and tools. The need has matured using a collaborative approaching, utilising knowledge and experience from the Technology department (Enterprise Architecture, Global Solution Delivery & Data Governance) and the NGET Business (Data Engineering, Data Science & MI/BI Team).

Below is a view of ET's Data Strategy outlining our ambition to transform into a proactive data-driven business based on trusted analytics and reports. This investment in AI will develop complex models which learn and adapt, to predict and prescribe action reducing the need for manual intervention and enabling our teams to focus on more value-add activities.

Without investment National Grid's portfolio planning and delivery capabilities will be confined to mostly manual processes with core IT systems acting as data repositories rather than pro-actively and reactively suggesting cost-effective solutions to blockers and in turn ensuring efficient and reliable energy to our customers.

Throughout T2 IT intends to leverage AI and modelling as reflected in our T2 submission. Complementary investment in other IT solutions is planned through funding confirmed via final submission relating to;

- Advanced modelling and analysis (root cause analysis, predict future failures etc.) of risk and reliability of different asset types using operational, structured and unstructured data/content.
- Automation of network analysis & boundary condition development process and integration with planning process.
- Integrated data service on Insight (different data and content types: Conditional and Operational) with core asset register to support asset performance and risk analysis.

# NGET EA Data Strategy

Our vision is "to maximise the value that NGET derives from information, enabling us to outperform stakeholder expectations"

We are developing multiple focussed NGET strategies which will define how we achieve this vision:

- A foundational *Data Architecture* strategy
- Implemented through *Metadata Management*, *Storage* and *Integration* strategies
- Encompassed within *Governance & Quality* and *Master Data Management* frameworks jointly agreed with the Chief Data Officer
- Which enables the delivery of wider business value through *Analytics Visualisation*, *Advanced Analytics* and *AI & Machine Learning*

**Data Architecture**

- We know what we need to operate, measure and improve our business
- Our enterprise data models enable us to deliver changes faster and better

**Metadata Management**

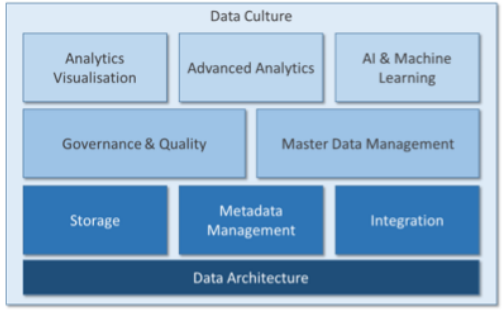
- We know what data exists, what it means, where it comes from and whether it's fit for purpose

**Storage**

- We know what data we use, how we classify it and how we store, process and dispose of it

**Integration**

- We provide a single consistent logical view of our data




**Data Culture**

- A data-driven culture determines how an organisation operates and gets things done with data, as an answer to internal and external challenges

**Governance & Quality**

- We implement policies and processes that govern the management of data to ensure quality, compliance and security

**Master Data Management**

- We provide a trusted, relevant and accurate view of our business-critical master data

**Analytics Visualisation**

- We deliver relevant, timely insights, in the appropriate context to enable quicker, better informed decisions

**Advanced Analytics**

- We transform into a proactive data-driven business based on trusted analytics and reports

**AI & Machine Learning**

- We build our capability to develop complex models which learn and adapt, to predict and prescribe action

We will progress through a series of **transition states** which will:

- Build a new data insights platform utilising the latest tools
- Rollout improved data ownership and governance processes
- Expand the data available in an updated data lake
- Experiment with emerging new data technologies to maximise business value

This will enable our **end state** goals which are to:

- Leverage information to provide business value
- Operate our enterprise information as an asset
- Have a single view of our information
- Have built a strategic insights platform
- Apply robust governance and maintenance of information

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4

# AI and Machine Learning Strategy

*We build our capability to develop complex models which learn and adapt, to predict and prescribe action*

**What have we done so far:**

- Established a Data Science capability within the Business Performance team
- Conducted proof of concepts with image recognition and optimisation
- Trialled the use of ML to extract insight from asset health data

**Our drivers are:**

- Regulatory: Seen as key innovation value lever
- Business: Increasing availability of data (structured and unstructured) and a desire to use that to transform processes and improve safety and efficiency
- Technology: Increasing availability and accessibility of powerful AI algorithms, cloud capability and compute power

**Our goals are:**

- Build an in-house capability to quickly trial and deploy Machine Learning algorithms
- Enable appropriate levels of trust in AI algorithms that are deployed
- Automate a significant proportion of the manual data processing that occurs today
- Enable proactive asset and customer interventions using AI and Machine Learning

**Delivered through:**

- A Data Science team delivering prioritised use cases
- Cloud-based compute resource to enable model training
- Deployment of AutoML solutions combined with 'MLOps' to enable rapid build, test and deployment of algorithms
- An effective framework for Model Risk Management
- Tools to support model interpretability for end users

**Our end state will look like:**

- Advanced tools and compute resource enable Data Scientists to quickly trial and deploy high quality Machine Learning algorithms
- MLOps tools and best practices enable models to be managed effectively throughout their lifecycle
- Leaders and end users are able to trust model outputs, and risks associated with AI & ML are understood and well managed
- Business processes have been transformed to leverage the ability of AI to automatically process large quantities of data, improving efficiency and increasing the effectiveness of our actions

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13

## Business Capability Detail

### 1.1 Outage Sequencer

To deliver outcomes required by our customers and stakeholders, NGET plans and delivers an extensive portfolio of interventions (maintenance, replacement, growth etc.). These interventions require planning which takes into consideration constraints in system access (outages) and personnel with specific skills and competencies (resources).

Currently the development of the annual year-ahead outage plan is a highly manual, labour intensive task where system and resource availability are considered individually, with plans iterating between those two constraints at a regional level until both are satisfied before the process is repeated at a national level. As a result, the process requires significant resource and interactions that present opportunities or risks to the plan are not always identified early in the process. This process restricts some of our visibility and risk management as a business.

The Data Science team have recently conducted a successful proof-of-concept that automatically generates the national year ahead outage plan whilst considering both system and resource constraints simultaneously. It only takes a few minutes to run and also identifies dependencies and alternative timings for each outage.

This investment will develop that proof-of-concept into a full digital product that can be used in the core of our annual outage planning process. By applying machine learning or more advanced and efficient modelling these constraints will be further refined to create higher quality reliable intervention plans which respect constraints, freeing up time to focus on value add and enhanced risk assessment and plan scenarios.

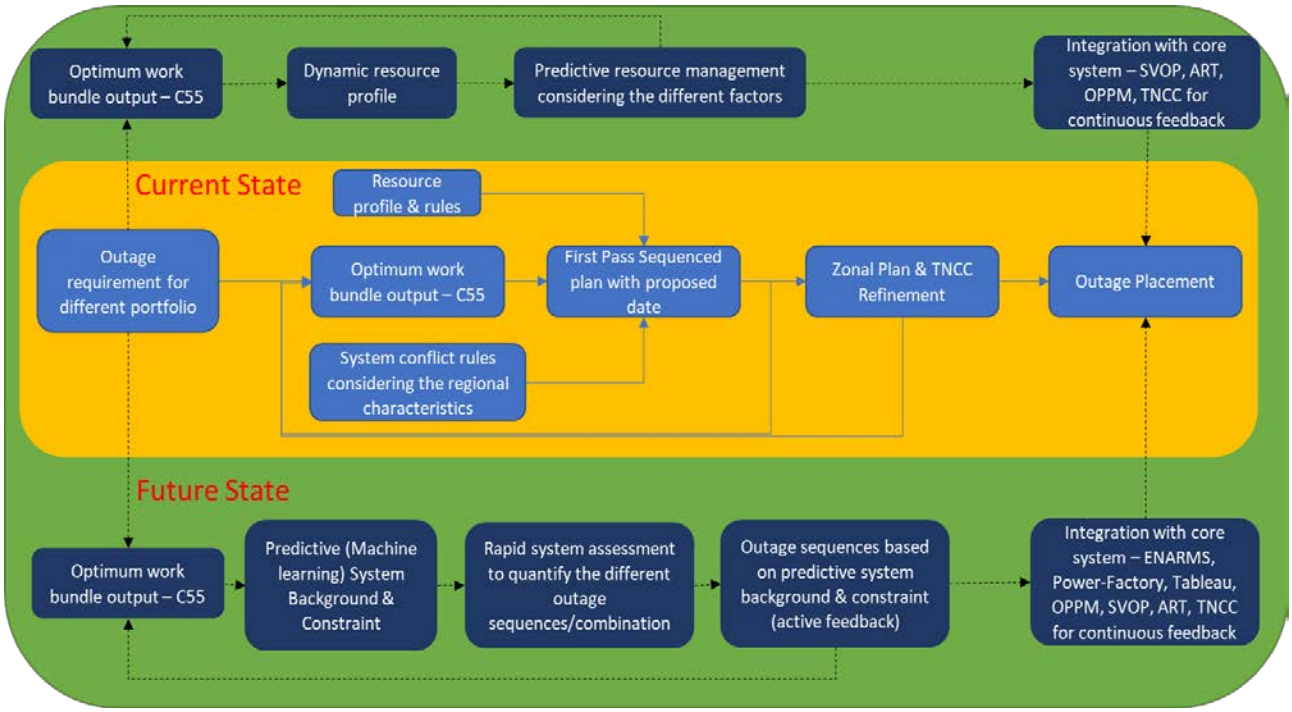
This will enable us to:

- Optimise the plan across the whole network not just regions, maximising efficiency of delivery
- Improve deliverability of initial plan by automatically avoiding undesirable interactions, reducing expensive changes that arise due to things that could have been foreseen
- Generate plans in very short timescales, which allows scenario testing and better assessments of plan resilience – which will enable a more transparent trade-off between plan efficiency and plan resilience with stakeholders. This will also allow ET to meet STC obligations.
- Generate optimal plans in very short timescales, which will support rapid replanning when major change is required (e.g. responding to Covid-19)
- Act as decision support tool for preliminary investment and connection assessments

Benefits:

- **Enablement & Empowerment:** Allows NG to create multiple planning scenarios to identify the risk and mitigating actions to enable plan stability and adaptability.

- **Customer Service:** Improve customer service by effectively managing the network risk & greater visibility of future requirement for scheme delivery & optimum connection year. This will potentially reflect in CSAT allowances.
- **Planning Efficiency:** This will result in time savings in the manual outage placement process [redacted] and empowers our people to focus on delivering a more optimised and efficient plan. There is a potential saving [redacted] in operational timescales, and a reduction in time by 60% when considering the rapid outage assessment. Increased the agility and speedy carry-out "what-if" analysis to manage the risk and identify the mitigation strategy. Additionally, this will provide the opportunity to deliver constraint cost reductions which are incentivised through the new SO:TO Output Delivery Incentive (ODI) by having a greater understanding of future system behaviour and network enhancement requirement.
- **Reduction in Total Cost:** Greater visibility of future system behaviour & resource management will enable us to plan more critical outage requirements. Effective optimising of the outages will reduce the outage requirement and allow the planning of more outages in parallel. [redacted]
- **Strategic Workforce Planning:** Greater visibility into long-term resource requirements and pinch-points across the network where there is a requirement to recruit and build resource capacity.



## 1.2 Outage Cost Forecasting

This bespoke Constraint Analysis Tool (CAT) will enable ET & ESO, during the separation of businesses and beyond, to work collaboratively to deliver constraint cost reductions (incentivised through the new SO:TO Optimisation ODI) as visibility increases of potential system constraints and their costs. The CAT enables multiple case studies to be run per day [redacted] thus significantly increasing the potential to collaboratively formulate strategies with ESO to minimise constraint costs.

Currently Power System Engineers (PSE) undertake transmission system analysis in compliance with the NETS SQSS. The analysis enables;

(i) ET to identify opportunities for Customers to connect to the system
(ii) ET to undertake asset renewals / maintenance / repairs / future network changes
(iii) ESO to economically & efficiently operate the network.

To date, ET & ESO share “frozen” outage plans annually following extensive analysis using historic network costs. Subsequently, the frozen plan is iterated as the network & operating conditions change to those initially planned for.

This business capability seeks to utilise machine learning and AI to streamline the outage plan and build a process cognisant of defined economic events. In the planning phase, outages (single or multiple) will be assessed against defined economic & system events producing a ranked output of outage costs. The CAT will also undertake automated PSE type actions to optimise the forecast economic costs by using codified actions e.g. Quadrature Booster Tapping, system running arrangement changes, generator output drops/raise etc.

The PSE will then propose which outage most economically & efficiently supports the delivery of the work. Noting that the forecast can be many years into the future and that there is still cost uncertainty, the evidenced based approach utilised ensures that clear interrogable justification can be provided for the selected outage sequence. The CAT script can be updated as the PSE learn more about the network. It is possible that future versions of the CAT will be able to assess costs in real time.

The recently published SO:TO Optimisation guidance (by Ofgem) highlights the need to have clear written justification for SO:TO optimisation, these AI proposals deliver a means to provide that evidence.

### Benefits:

### ET;

1. CAT will deliver an ability to investigate outage optimisation quicker and more efficiently, by releasing up to 748 hours of resource capability. In more detail this allows us to:
   a) Provide earlier visibility of “system hotspots” to avoid issues faster than using current techniques due to process automation and current dependency on ESO.
   b) Focus the planning engineer’s efforts on greater optioneering to minimise system hot spots and hence optimise network performance (and not iterating the base plan);

   c) Support collaborative working with ESO and outage scope reduction where possible introducing the opportunity to deliver value through reduced constraint costs;
   d) Extending the reach of studies beyond “year ahead” deriving greater value without current resourcing constraints or plan churn
   e) Obtaining a more qualitative view of the plan with reduced dependence on engineering judgement & historic comparators;
   f) Improved plan quality with detailed analysis on at least 10-20% of the plan rather than current 2-5% of the population of outages (c.2000). An issue that will be more prominent as an increased number of renewables generators connect or interconnectors operate etc.
2. Optimised approach to planning capital & operational outages. (Outage costs combined with other systems providing resource availability to support the works)
3. Reduces outage evaluation iteration with ESO; evidence-based approach supplementing engineer experience
4. Provide greater visibility & explanation to the Customers seeking an opportunity to connect to the transmission system and, when their connection works could be delivered
5. Open script solution which NG will own and can enhance (without support) to better address operational & system management needs

**ESO;**

6. Greater opportunity to better forecast the Network Access & Network Development costs and capability assessment using deterministic & probabilistic tools occurring current year, year ahead and further out (e.g. +5years), potentially increasing the accuracy of the NOA & ‘Year-Round’ process. Note: The tool potentially reduces the emergence of outage clashes with future works.
7. Greater evidenced based articulation of the cause of Balancing System Costs
8. Greater opportunity to manage and hence mitigate Balancing System Costs with the in-built continuous learning algorithm
9. [redacted]

**New Infrastructure;**

10. Better certainty on outage duration (e.g. weeks) & type (single/double/multiple) for works
11. Better informed contracting approach enabling greater delivery planning & contract optimisation and facilitating the coordination of the activities among main contractor and subcontractors across the supply chain
12. Greater opportunity to drive innovation (technology & process) to enable ESO to minimise Balancing System & Consumer costs for sustainable delivery
13. Better opportunity to contractually define the cost (Liquidated Damages") impact of missing an outage focussing the contractor & NG project teams to deliver. In addition, enabling the Performance Management KPI for early project delivery within contracted amounts to be rewarded.
    a) Note 1: Inability to forecast the impacts of losing outages (e.g. due to poor contractor performance, delayed release of outages to contractors, outages being withdrawn due to system faults, cancelled due to resource unavailability) has most likely meant that the cost impacts on NG re-planning the works have been underestimated when levying claims on contractors.
    b) Note 2: Reason codes can be captured & logged (by CD, ET & ESO) which can be used for Continuous Improvement e.g. identifying resource pinch points triggering hiring decisions of SAPs / Commissioning Engineers etc.

**Common benefits;**

14. Better commercial management from project initiation through ET's Business Investment Process for Capital projects as displayed in the below diagram;

**HIGH-LEVEL PROCESS**

The diagram below summarises Level 2 of the NDP map; it shows the six stages of the process and how the process control Gates A0 to E are arranged to control the movement of investments from stages 4.0 to 4.5.


*1 – Driver Approval ^ - Applies to complex works only

Information for stages 4.0 to 4.5 are contained in a single storyboard document that contains information throughout the lifetime of each investment. Each storyboard is divided into the following sections:

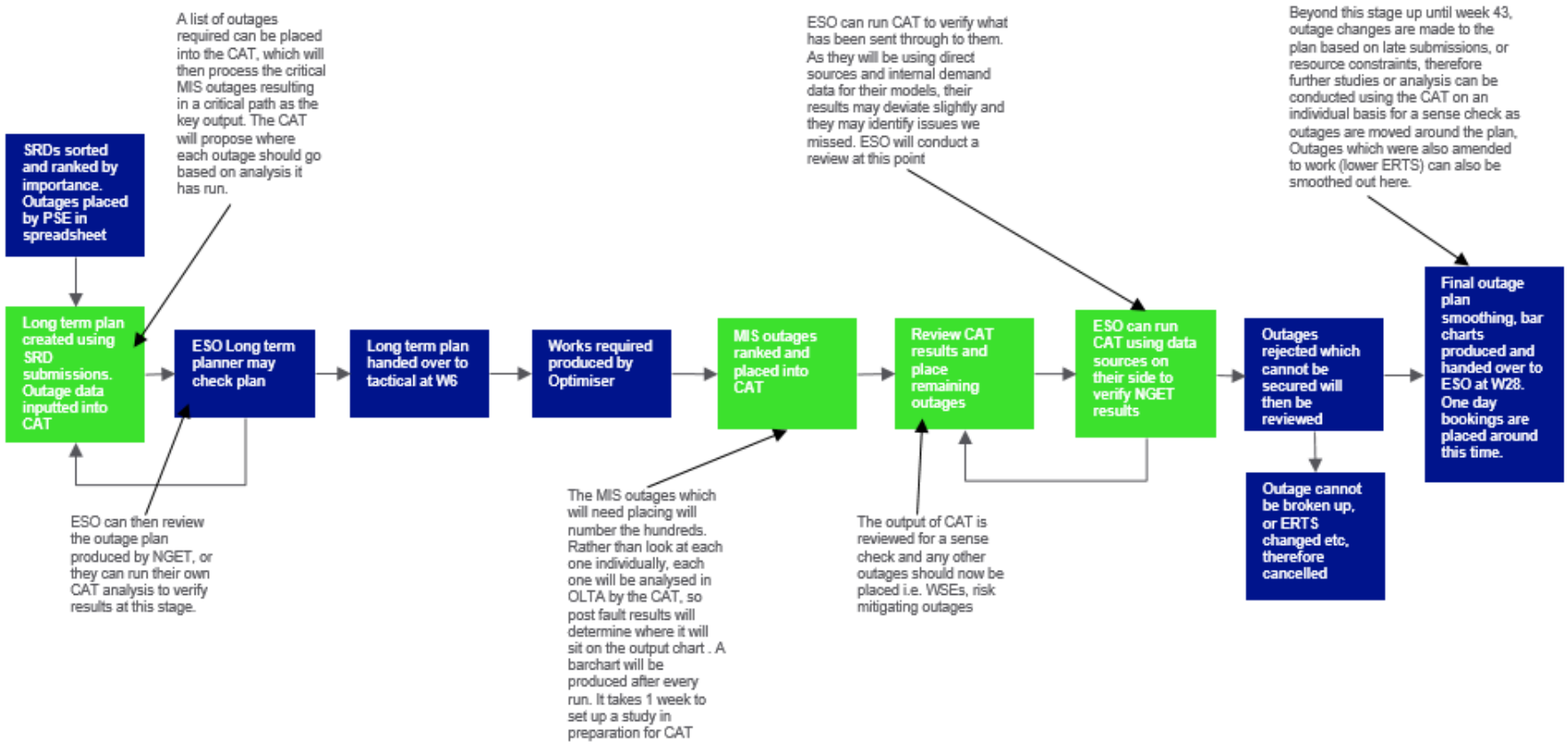
- Driver (4.0)
- Initial Business Plan Entry (4.1)
- Select Option (4.2)
- Project Execution Plan (4.3)
- Project Manager's Report (4.4)
- Project Review & Close (4.5)

This manifests at each stage;

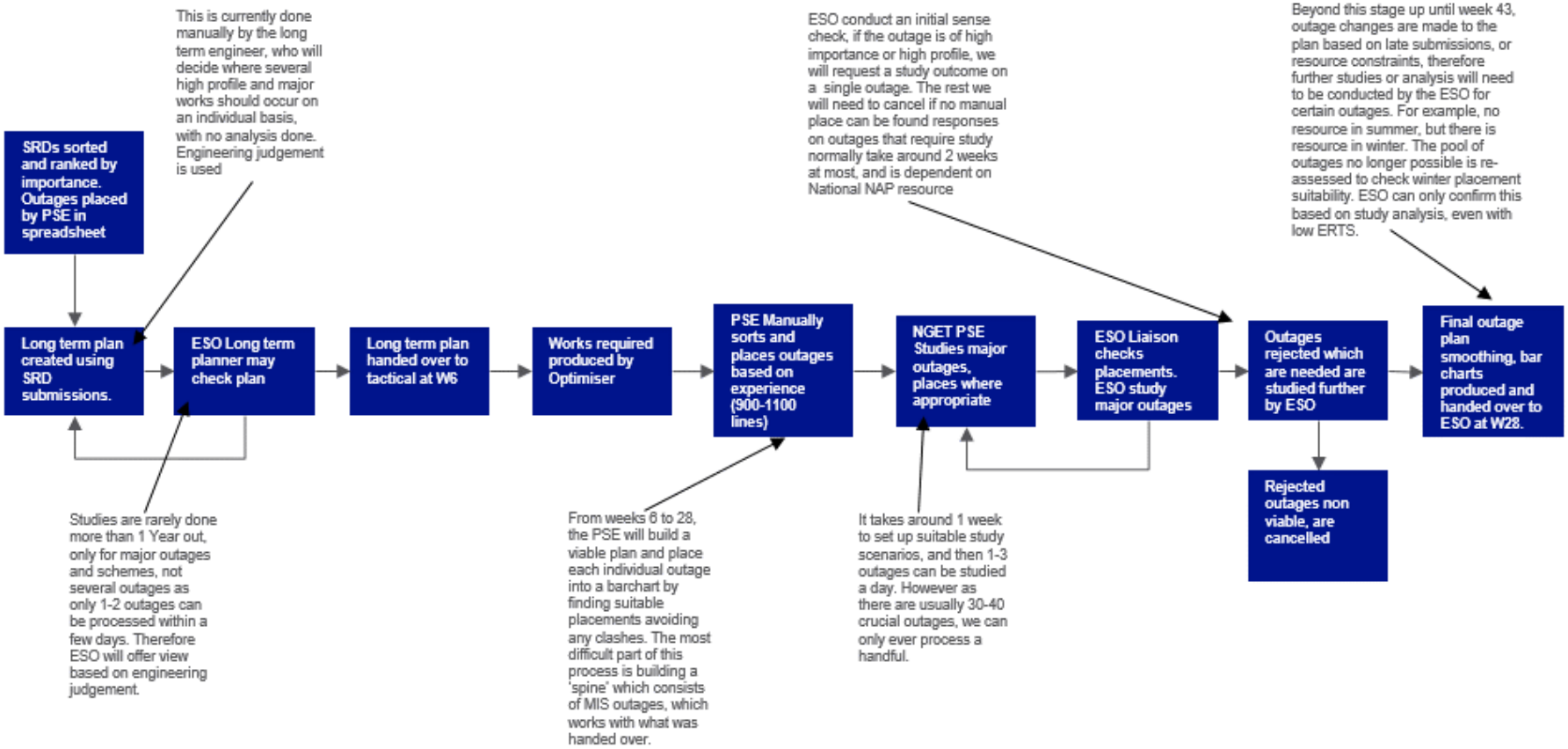
a) NDP4.0 - Responding to Customer Offers / Network Development (e.g. NOA)
b) NDP4.1 - More informed forecasting of delivery years for workbook entries for Load & Non-Load Related projects
c) NDP4.2 (D-3/4 years ahead) - More informed optioneering about potential investment solutions (e.g. do nothing or do works in outages (single circuit concurrent e.g. 2x16weeks, double circuit e.g. 1x10week). Considering the introduction of innovation and working with the contractor base to build & test concept where appropriate.
d) NDP4.3 (D-2, year ahead+) - More informed definition of outages (incl. proximity, ERTS) needed to deliver the Preferred Option. Enabling the contract to clearly capture the carrot ("Performance Bonus for early delivery") & stick ("Liquidated Damages for late delivery"). Outage de-risking by ensuring innovation is tested against key process & procedures to support type registration (if necessary) and ET Operations buy-in for the asset life
e) NDP4.4 (D-Current Year) - Ensuring that the project delivery team have current awareness of the economic cost of outages to ensure focussed delivery. Clear & detailed plans (e.g. daily/hour by hour) for what is needed in delivery to meet the outage. Better meet National Grid Data Management Standard by having the data captured in a system, adopting a process to manage the data and having a governance process in place.
f) Improved regulatory reporting governance and compliance as the data is captured and retrievable from a system.

g) Automated decision support tool which reduces the decision-making timescales enabling the user to make more informed decisions proactively, efficiently and consistently.

# Proposed Constraint Analysis Process – With CAT (constraint analysis tool)



# Current Constraint Analysis Process



## 3. Scenario Modelling

Scenario Modelling will ingest data relating to all work, the drivers, delivery decisions and historic outcomes. Building on our C55 optimisation engine, delivered within T1 [redacted] this investment will model deliverability confidence and suggest alternate work or sequencing. The business capability will learn from churn and actions to optimise future plans and automate planning activities.

Alerting to risks and constraints to delivery and implementing tracked changes throughout a deliverable's lifecycle the business capabilities smart analysis and optimisation will suggest where to swap out work when confidence levels are low, provide scheduling options for outages and resource mix.

Bringing together intelligence relating to Assets, Investments, Work, Equipment / Stores, Resources and Cost the business capability will provide the backend AI required to accompany ETs future project and planning tools to be delivered through our Digital Experience investments.

This business capability will require significant integration with ETs Data Lake.

### Benefits;

Automation of planning activities;

- Automate currently manual planning activities including plan download and manual entry of non-lead asset maintenances and outage inspections.
- Learning from manual plan changes to anticipate and optimise future work planning, codifying valuable site knowledge to build more suitable plans thus avoiding requirements for re-planning.
- Automate the scheduling of resource to work using the ability to connect to multiple data sources to provide accurate and adaptive resource scheduling.

Reduction in Compensation Events;

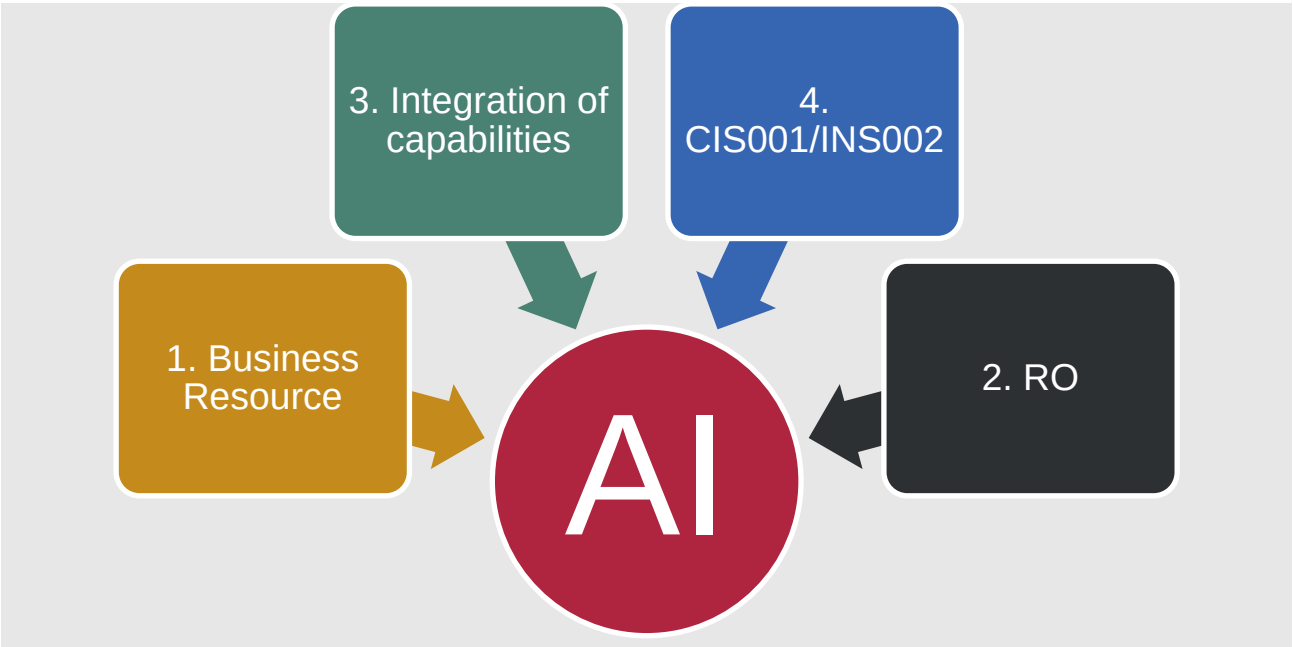
- 80% of our Compensation Events (CE's) today link to changes in scope or are a result of plan change. Scenario Modelling will reduce changes in scope through standardisation and codifying learning from experience.
- Plan change will be reduced through effective monitoring of deliverability, providing transparency on impact of change and holding delivery vehicles to account for outcomes, visibility of pipeline and allocations. This has been estimated to reduce compensation events by 25%.

# 2. PROJECT DEFINITION

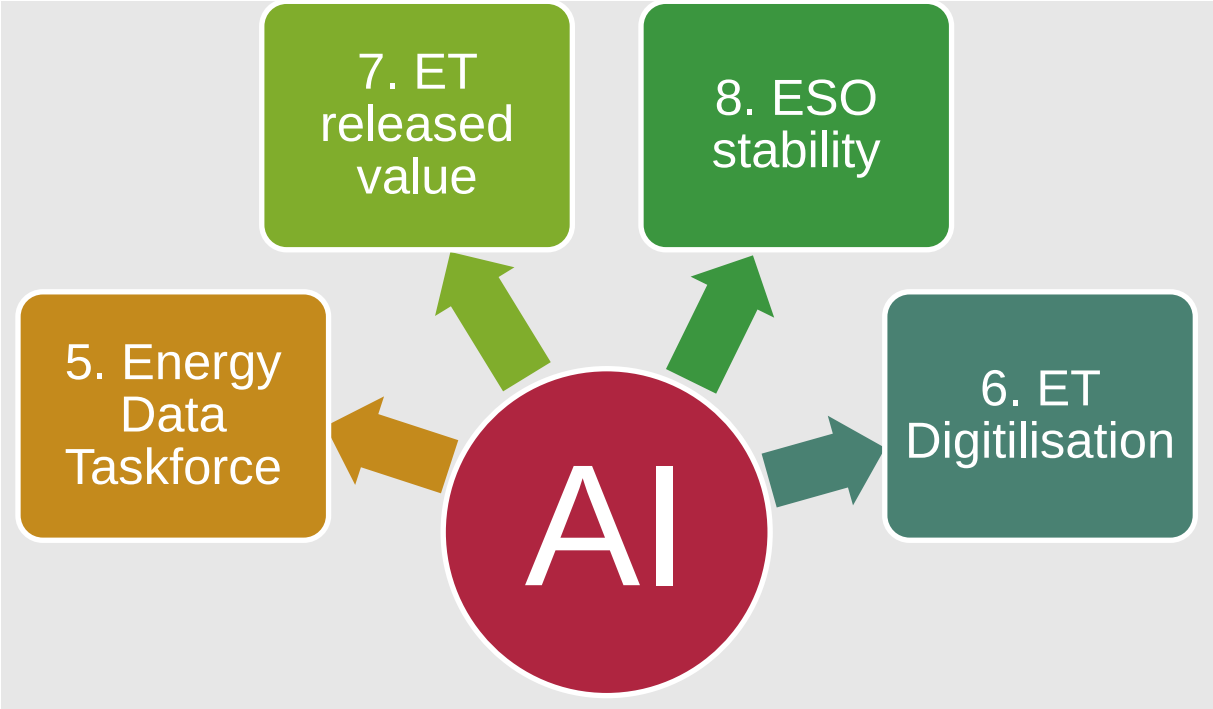
### DEPENDENCIES

The diagram below depicts the dependencies between the planned programme and other activities, projects and programmes. Both upstream and downstream IT architecture impacts are considered, and dependencies identified before releases are committed. Our release planning process ensures that dependencies are identified and then closely monitored thus ensuring environment and change conflicts are avoided.

The capabilities detailed within this document are dependent on the investments/outcomes numbered 1 to 4 in the diagram below. Completion and/or resolution of these pre-requisites are integral to successful delivery and will be mitigated as detailed in the accompanying table.



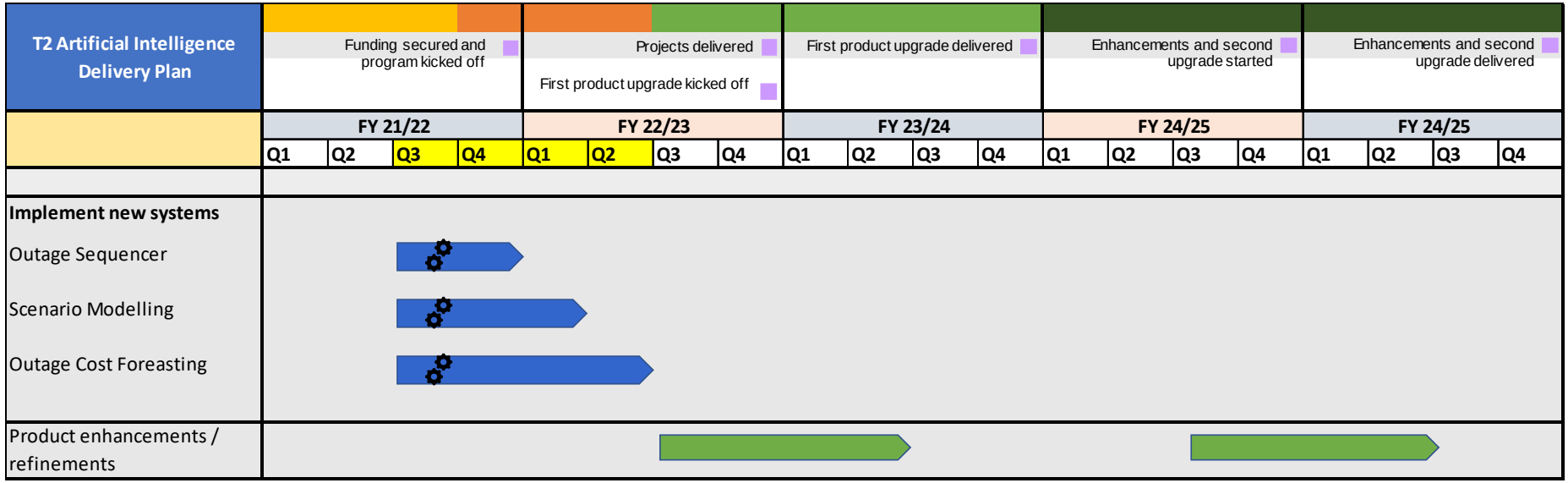

Consequently, there are a number of 'downstream' investments/outcomes dependent on the successful delivery of the capabilities detailed within this document, these are labelled 5 to 9 below. These are mitigated as detailed in the accompanying table.




| Dependency | Description | Mitigation |
|---|---|---|
| 1. **Business Resource** | The programme will be dependent on availability of relevant business resources to support definition of requirements and work in partnership with the development team | Use of established processes for engaging and requesting business resources for programmes. IT is already engaged with a significant base of business users and this engagement and focus will continue. |
| 2. **Resource Optimisation/ Availability data** | This product will rely on forecast resource availability data used in the Resource Optimisation tool within Single View of the Plan. Work enhancing this forecasting is also planned, which will need to consider the dependency of Outage Sequencer on the data | Manage delivery of these four products under a single programme to deliver to common timelines and standards. |
| **3. Integration of business capabilities** | All business capabilities within this investment will benefit from integration with each other and should where possible be developed in parallel. | |
| **4. CIS001 /INS002** | CIS001 - Deliver iPaaS (Integration Platform as a Service)<br><br>INS002 - Manage technology risk of Insight platform and transition to Cloud service<br><br>The AI investment will be dependent on availability of data from the current IT data warehouse IBM Data Lake and integration through the Fusions middleware. [redacted] | IT Delivery and Solution Engineering teams to align on program delivery. [redacted] |

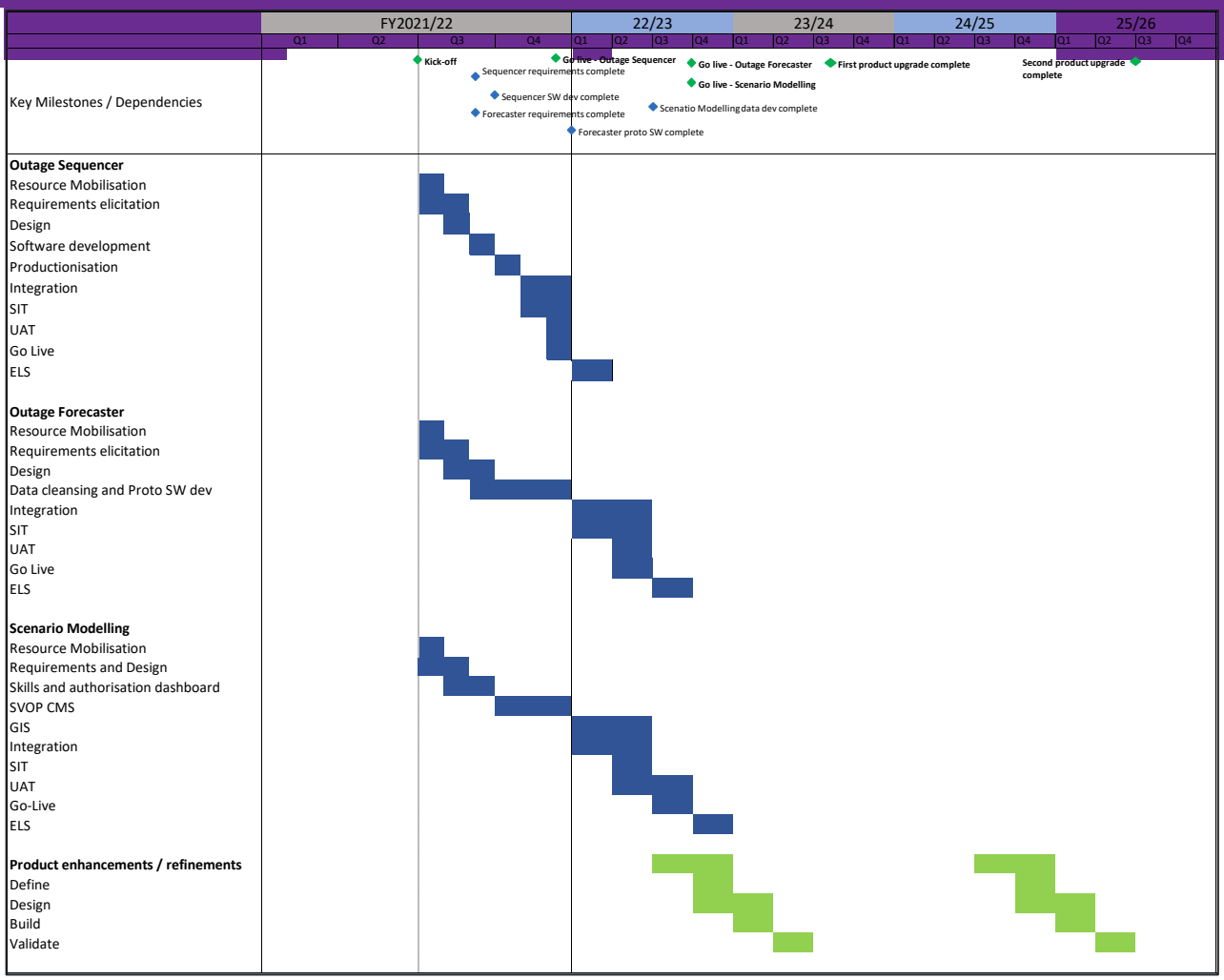
| | | |
|---|---|---|
| **5. Energy Data Taskforce** | The EDTF has developed a set of recommendations for how industry and the public sector can work together to facilitate greater competition, innovation and markets in the energy sector through improving data availability and transparency.<br><br>If the capabilities within this proposal are not delivered ET's capacity to meet the recommendations would be limited. | ET must work towards meeting the recommendations within the ETDF. These capabilities, alongside other IT deliverables, will ensure this is met. |
| **6. ET Digitalisation** | ET are currently defining a comprehensive digitisation strategy for process and IT systems to address the challenges of RIIO-T2 and futureproof the business. The capabilities within this proposal are crucial to complementing this digitalisation strategy, | IT are a key stakeholder and driver of the digitalisation strategy and will continue to work in parallel with ET to ensure the capabilities detailed within this proposal meet the defined outcomes, both from an IT architecture and evolved business process standpoint. |
| **7. ET Released Value** | If the capabilities within this proposal are not delivered defined resource efficiencies within ET will not be released. | IT to work closely with ET's Strategy and Performance team to ensure the resource efficiencies identified are realised. |
| **8. ESO Stability** | ET and ESO must align plans to ensure capital and maintenance plans are sufficiently resourced. | These capabilities will enable simulation of what the ESO would feedback to ET. In turn this will ensure the ESO is sufficiently resourced and reduce the risk of undelivered work and the subsequent negative impact to our stakeholders |

# 3. 5 YEAR ROADMAP AND RELEASE PLAN



# 4. PROJECT MILESTONES

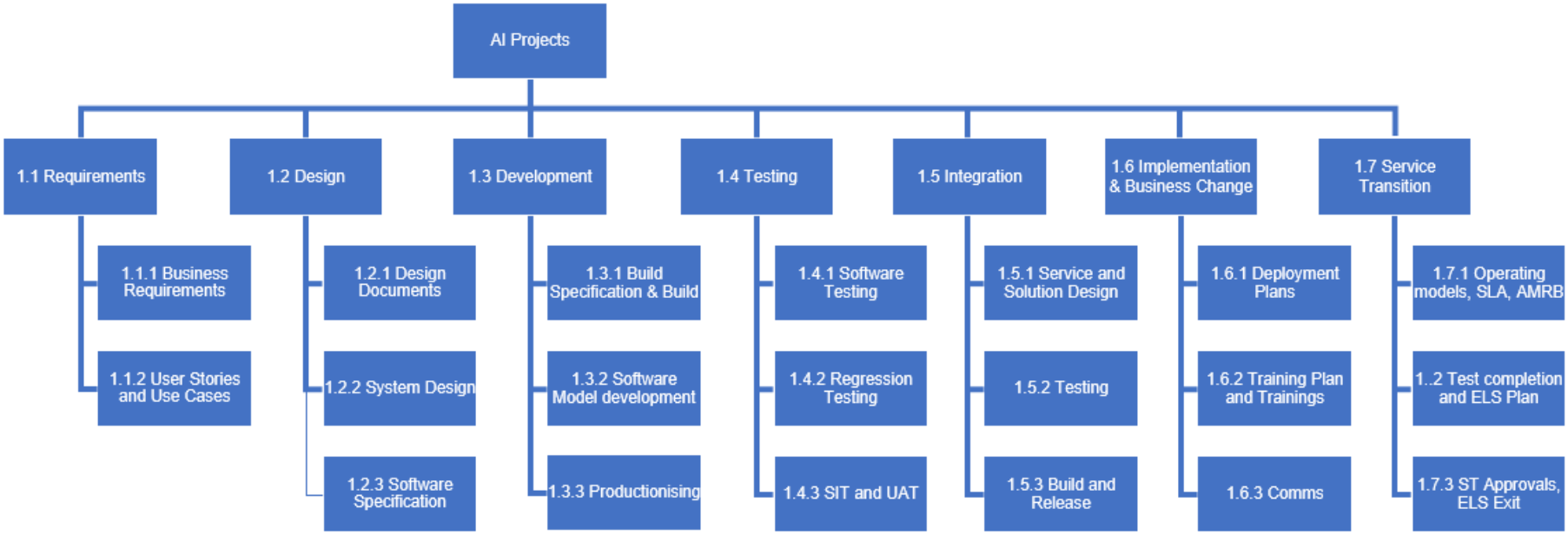
A waterfall delivery approach has been chosen however we still leverage agile methods where appropriate. An example of this being waterfall for the core refreshes and agile for enhancements.



## WORK BREAKDOWN STRUCTURE

The below defines the key activities and deliverables for this programme that is governed by our Solution Delivery Framework (SDF). This represents the WBS at programme level and the activities undertaken at each stage of delivery.

This is the mandated framework for delivery of all National Grid IT projects and programs. The framework consists of controls at various levels and stages of projects and programs which work together to minimize the risk of production into the live environment and ensures that IT projects are properly managed to the Business Management Standards (BMS). The framework consists of a set of mandated artefacts that all projects must produce, along with a set of non-mandated best practice materials. Adherence to SDF is governed via 3 stage gates, A, E and F, that all projects need to pass through.



## Resource Requirements by Task



The below table details tasks undertaken during the programme delivery against each WBS activity and the type of required resource. The estimated scale has been calculated in days and equates to the cost detailed in the COSTS section and the Cost & Resource Estimate workbook attached in Annex 'NG_ET_IT-RO-10_CostandResourceestimates_A1'.

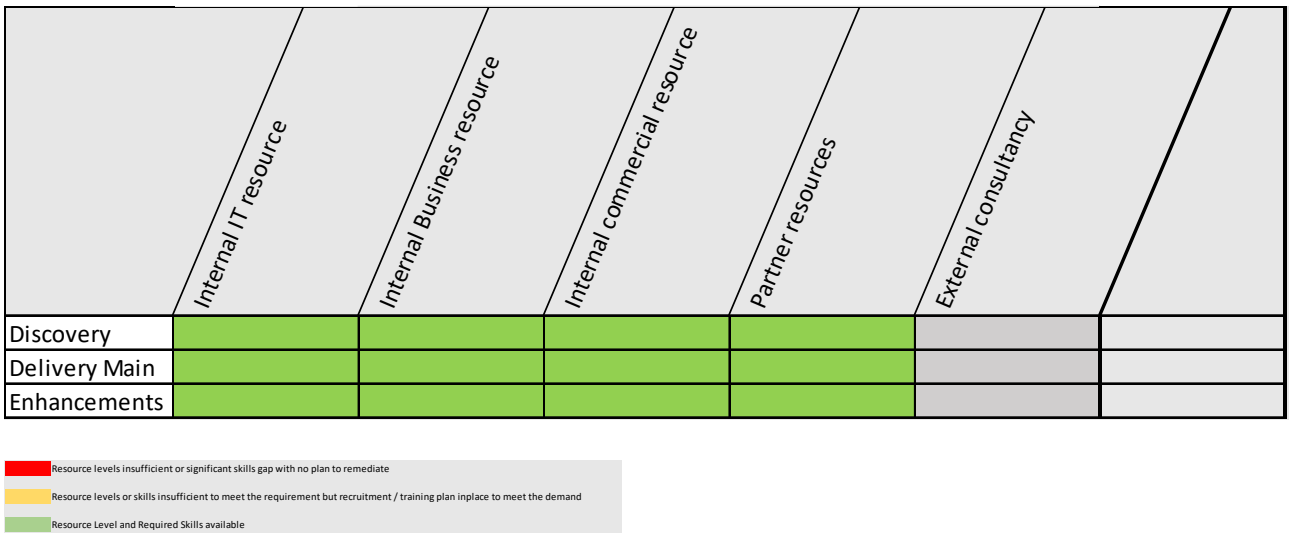
| WBS ACTIVITY REFERENCE | TASK | RESOURCE TYPE | ESTIMATED SCALE (DAYS) |
|---|---|---|---|
| 1.1 | REQUIREMENTS | INTERNAL, EXTERNAL AND PARTNER | [redacted] |
| 1.2 | DESIGN | INTERNAL, EXTERNAL AND PARTNER | [redacted] |
| 1.3 | SOFTWARE DEV | INTERNAL, EXTERNAL AND PARTNER | [redacted] |
| 1.4 | TESTING | INTERNAL, EXTERNAL AND PARTNER | [redacted] |
| 1.5 | INTEGRATION, PROCUCTIONISING | INTERNAL, EXTERNAL AND PARTNER | [redacted] |
| 1.6 | QES | INTERNAL AND PARTNER | [redacted] |
| 1.1-1.7 | PROGRAM MANAGEMENT AND ADMIN | INTERNAL AND PARTNER | [redacted] |

# 5. RESOURCING

The table below summarises the estimated resource requirements as a %

| SOURCING STRATEGY<br>Internal/ partner/ Consultancy etc. | ESTIMATED REQUIREMENTS<br>(Figures have been rounded) |
|---|---|
| PARTNER - OFFSHORE | [redacted] |
| PARTNER - UK | [redacted] |
| NATIONAL GRID | [redacted] |
| EXTERNAL | [redacted] |

Below details an assessment of resource availability to support delivery of the committed outcomes. The availability has been assessed against a project start of September 21. The bulk 77% of resource will be sourced from our ADAM partner framework and is readily available through our Solution Engineering Tower model.



# 6. RISK REGISTER

| ID | TITLE | DESCRIPTION | INITIAL RISK | | | MITIGATION OPTIONS | RESIDUAL RISK | | | RISK MARGIN |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood (1-5) | Impact (1-5) | RISK | | Likelihood (1-5) | Impact (1-5) | RISK | |
| 1 | SCOPE & COSTS | THE DEVELOPMANT TECHNOLOGY AND SPICIFIC ALGORITHMS ARE NOT CONFIRMED | 4 | 4 | 12 | THE REQUIREMENTS AND PROTOTYPE PHASES WILL IDENTIFY THE TECHNOLOGIES AND TOOLS TO BE USED | 3 | 2 | 6 | [redacted] |
| 2 | WIDER DELIVERY CONTEXT | THERE IS A RISK THAT THE OTHER INVESTMENTS WILL IMPACT AVAILABLE DATA | 4 | 3 | 12 | PROGRAMME MANAGEMENT TO ENGAGE CONSISTENTLY ACROSS INVESTMENTS | 1 | 3 | 3 | [redacted] |
| 3 | DELIVERY PROCESSES | BUSINESS PROCESS – THERE IS A RISK THAT BUSINESS PROCESS WILL NOT CHANGE IN LINE WITH SOLUTIONS | 2 | 4 | 8 | STRONG BUSINESS INVOVLEMENT IN DISCOVERY AND DELIVERY TO ENSURE CHANGE MANAGEMENT IS IN PLACE | 1 | 3 | 3 | [redacted] |
| 4 | DATASCIENCE UNCERTAINITY | THE DETAILED SPECIFICATIONS ARE NOT YET AVAILABLE | 2 | 3 | 6 | THE REQUIREMENTS AND PROTOTYPE PHASES WILL GENERATE SPECS AND IDENTIFY THE TECHNOLOGIES AND TOOLS TO BE USED | 1 | 3 | 3 | [redacted] |

# 7. COSTS

| Cost Item | Net Cost | Risk |
|---|---|---|
| PARTNER – offshore | [redacted] | [redacted] |
| PARTNER - UK | [redacted] | [redacted] |
| NATIONAL GRID | [redacted] | [redacted] |
| EXTERNAL | [redacted] | [redacted] |
| Assumed product refinements FY23-FY26 | [redacted] | [redacted] |
| Licenses and RTB | [redacted] | [redacted] |
| Total Cost (5 Years) | £7,725,814 | £747,348 |

- The selected options have been costed using a combination of data sources, with the % (rounded to nearest whole) of total capital investment shown in brackets:
  - Externally sourced costs from market tenders or request for prices from suppliers **8%** (EXTERNAL)
  - Benchmarked costs from comparable historic projects previously undertaken**; 80%** (PARTNER – offshore, PARTNER – UK, NATIONAL GRID)
  - ~~o~~ Subject matter expert opinion based on scope identified **11%** (Assumed product refinements)
- [redacted]

Cost Detail per Capability;

| Cost Item | Outage Forecaster | Outage Sequencer | Scenario Modelling | Risk | TOTAL |
|---|---|---|---|---|---|
| Partner - Offshore | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Partner - UK | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| National Grid | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| External | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Refinements | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Licenses and RTB | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Total** | **£1,107,236** | **£1,528,919** | **£5,089,659** | **£747,348** | **£8,473,162** |

# 8. CONCLUSION

Delivery of these capabilities and enhancements have been costed at £8,473,162.

A program will begin in FY22 to deliver the initial capabilities with two future tranches of enhancements planned later in RIIO-T2.

ET's ambition is to transform into a proactive data-driven business to ensure effective and adaptive planning of our maintenance and capital plans and complement planned IT investments in Asset Investment Planning, Work Management, Data Collection and visualisation we must invest in machine learning and AI technologies.

Delivery of these capabilities will offset FTE effort in planning and re-planning work by 30% and result in a 25% reduction in compensation events.

Without investment National Grid's portfolio planning and delivery capabilities will be confined to predominantly manual processes with core IT systems acting as data repositories rather than actively suggesting cost-effective solutions to blockers and in turn ensuring efficient and reliable energy to our customers.