



Annex

A17.04 Gemini Engineering Justification Paper December 2019

As a part of the NGGT Business Plan Submission

nationalgrid

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Name of Project	<i>Gemini</i>		
Scheme Reference	<i>N/A- Xoserve delivered</i>		
Primary Investment Driver	<i>Asset Health and customer driven change</i>		
Project Initiation Year	<i>FY21</i>		
Project Close Out Year	<i>FY25</i>		
Total Installed Cost Estimate (£)	<i>£24m</i>		
Cost Estimate Accuracy (%)	<i>Indication of accuracy of cost estimate</i>		
Project Spend to date (£)	<i>None- there is some RIIO-1 costs incurred</i>		
Current Project Stage Gate	<i>Not yet in investment process</i>		
Reporting Table Ref	<i>Where in BPDT volumes/costs/outputs are recorded</i>		
Outputs included in RIIO-T1 Business Plan	<i>Yes – where yes, to be fully declared in document</i>		
Spend apportionment	RIIO-1	RIIO-2	RIIO-3
	£15.6m ¹	£24m	-

Project Status and Request Summary

The Gemini system is at the core of how the gas market operates. It is the main interface between shippers and National Grid Gas System Operator. It is used by shippers to balance their portfolios and to book capacity on the network. National Grid own the current Gemini system but Xoserve (the Central Data Services Provider (CDSP)) manage it on our behalf. The lifespan of our systems are dependent upon vendors' support policies. The average lifespan is five to seven years, at which point we need to plan to refresh or replace the system. The current Gemini system will become unsupported in 2025. Coupled with this is the need to have a system which is agile to industry change whilst also responding to feedback received from stakeholders throughout this RIIO-2 business planning process. Overall, the solution needs to provide value for money for end consumers.

To maintain supportability and deliver on stakeholder's requirements this paper considers five options for investment in RIIO-2. These options build in terms of the level of intervention and therefore costs. The options considered are;

0. Do nothing
1. Sustain
2. Hosting Modernity
3. Enhanced Solution
4. Re-write application using Commercial off-the-Shelf (COTs) products
5. Re-write with bespoke application.

¹ Note this is just the costs associated with the re-platforming activities for RIIO-1, six year actual and final 2 year forecast.

Recognising that option selection is not solely about costs, to assess the quantitative and qualitative benefits of each option, a hierarchy of metrics have been developed as further described in the “Business Case Outline and Drivers – Key Business Case Drivers Description” section. These metrics are;

- Implementation Costs
- Service & Performance Risk
- Change Delivery Ease / Cost
- User Experience / Interface
- Customer Impact
- Subsequent Operating Costs.

An assessment of each potential option was undertaken against these metrics. Following this methodology, the preferred option was identified as the “Enhanced Solution” option which has £24m of expenditure over the RIIO-2 period and a completion date of 2025. Although this is not the least cost option, it is believed this solution will give the greatest benefits to consumers as it will improve quality of service by delivering the enhancements industry have previously identified² (see ‘Future Capacity and Balancing Services’ engagement log), making shippers businesses more efficient which will ultimately lower consumer bills. Additionally, it will improve the reliability of the service and benefit society by maintaining vendor support and system security which will ensure the continued sound functioning of a system which underpins the UK gas industry.

Problem/Opportunity Statement

In 2025 the current Gemini system will become unsupported when the extension of vendor supported life achieved through the re-platform carried out in RIIO-1 will come to an end. A newer version of the Oracle software which underpins the Gemini system will be required. This would result in the potential increase in support costs. It may also result in an increase in infrastructure issues and potential ability to fix due to constraints within versions that cannot be “patched” or resolved without upgrading.

Throughout the RIIO-2 period there is expected to be a high degree of change as the industry adapts to a changing energy landscape. Part of that change is expected to have an impact on systems and services required. Therefore, to enable this change it is a fundamental requirement is to have a capacity and balancing system that is easily adaptable for future industry regulatory change. That will allow Users’ to take advantage of commercial opportunities which will ultimately drive consumer benefit.

Alongside this, it is expected that Users’ businesses will develop and adapt with evolving requirements to increase the efficiency of their businesses and adapt to their consumer’s needs. The future Gemini system needs to be able to accommodate these new functional and non-functional requirements to improve the quality of service for our customer’s which will lead to efficiencies and ultimately lower consumer bills.

² Enhancements previously identified through engagement with Users of the Gemini system

Wrapped around all these issues, is how to provide a future Gemini system which delivers value for money, addresses security and supportability concerns in a cost-efficient manner and find proportional solutions for delivering change.

Project Definition

Project Scope Summary

The below represent the issues with Gemini and therefore what a solution must deliver in RIIO-2. Throughout the RIIO-2 period the Gemini system must:

- Be Robust – the Gemini system needs to be supportable into the future. The current Gemini system will become unsupported in 2025 when the extension of vendor supported life achieved through the re-platform carried out in RIIO-1, will come to an end. At that time, the current system will be 20 years old.
- Enables Change – be adaptable to future industry change. Our ability to update our IT systems and services to adapt to the changing energy landscape and deliver industry driven regulatory change is critical in delivering what stakeholders require.
- Responsive – agile to respond to stakeholder requirements and action their feedback for functional and non-functional enhancements.
- Value for money – delivers a robust system which enables change and is responsive to stakeholder requirements in an economic manner which is efficient for end consumers.

How we deliver this system in RIIO-2 is particularly important to our stakeholders as any changes can impact their connected systems and processes. Due to the integral nature of the Gemini system and the expiry of support of the system expected in 2025, doing nothing is not an option. Therefore, this paper considers five options, ranging from minimal intervention and impact to maximum intervention and impact. These options can broadly be categorised as “maintain” options or “replacement” options. Each option will be assessed through a methodology designed to draw out the quantifiable and non-quantifiable benefits against a set of key criteria.

Options Considered

Options Summary

To ensure the Gemini system remains fit for purpose, continually supported and able to meet Users’ requirements six options have been assessed.

#	Option	Degree of Change
0	Do Nothing	None
1	Sustain	Sustain / re-platform with an element of re-architecture
2	Hosting Modernity	Sustain / re-platform with an element of re-architecture
3	Enhanced Solution	Sustain / re-platform with an element of re-architecture

4	Re-write application using Commercial off-the-Shelf products	Partial Re-write
5	Re-write with bespoke application	Full re-write

Option 0 – Do Nothing

Due to the integral nature of the Gemini system to the functioning of the UK gas market and the expiry of support expected in 2025, doing nothing is not a credible option. If continued support is not maintained and the system becomes unusable as a result, then the gas market would fail to function. Therefore, a doing nothing option has not been assessed any further.

Option 1 – Sustain

The health of the Gemini system would be continuously evaluated and response made accordingly, keeping a level of support in line with our risk profile. This would most likely result in re-platforming at a similar frequency (every 5-6 years). The application layer of the system would remain largely unchanged.

This option would ensure that all of the Gemini components remain in support and based on the understanding of the current architecture End of Life / End of Support signals. This, along with the ongoing performance of the platform will validate the required sustaining activities that need to be delivered.

Option 2: Hosting modernity

This option would leverage the advantages and capabilities of cloud based hosting, namely unlimited growth potential, modernised technology and flexibility around the cost of maintenance. Additionally, it would (most likely) remove the scale of regular sustaining activity we have previously undertaken as the hosting provider would maintain a supported platform. This would be reflected in service charging through reduced operating costs.

As with option 1, the functional components of the system would remain largely unchanged.

Option 3: Enhanced Solution

Building on option 1 and 2 with regards to providing an ongoing sustained infrastructure platform, this option also delivers a set of Gemini system enhancements in order to rectify the external user requirements to improve performance and stability of the application.

The enhancements meet the requirements of a better user experience, system optimisation and making the application easier to change.

Given the nature of the mitigation to the current challenges, it allows us to consider a phased more agile delivery approach to develop and implement the changes. This would extend the existing Application Programming Interface (API) for external users to have faster and more flexible access to data as well as removing the existing processes which are hampered by performance issues.

By introducing process and test automation, this option would enable easier and faster delivery of change to the application and reduce the run the business costs associated with the system.

Case Study

The delivery of the enhancements identified by Users' will enable benefits to be passed onto end consumers. For example, Users' of the Gemini system rely on API's to automate the transfer of information between their own systems and Gemini. Several of the enhancements relate to increasing the performance and scope of APIs. Users' have told us that greater automation will reduce the manual processes they use thereby reducing risk of errors and creating efficiencies, provides better, real time, accurate data for Users' to make better informed commercial decisions on. This will ultimately drive benefits which Users' can pass onto end consumers.

- Improve the user interface by implementing HTML 5
- Provide better and more flexible access to the underlying data via a modern Representational State Transfer (REST) based API is better suited to web services as REST APIs are faster and use less bandwidth.
- Improve performance via;
 - o Using code profiling tools to identify resource intensive and problematic code, which will then be optimised and re-written
 - o Reviewing database queries, optimising and adding more indexes
 - o Archiving historic data to decrease memory table sizes and increase overall database performance.
- Introducing process automation to reduce setup times for auctions and other processes.
- Introduce test automation to minimise testing resources and reduce testing timescales
- Faster provisioning of new servers and environments via Virtualisation.

In addition to technical improvements, there can also be improvements to change delivery which can be implemented in two ways;

1. A traditional waterfall for industry wide B2B 'hub and spoke' changes that may require many parties to align plans, testing and implementation
2. Lighter-weight changes (e.g. user interface) in a far more agile fashion.

Option 4: Re-write application using Commercial of-the-Shelf (COTS) with like-for-like / simplified business rules

This option would, where possible, replace like for like components with the delivery of a COTS product and integrate it within the Gemini application. An example of this would be replace the existing Capacity functionality with a separate capacity platform such as that operated by Prisma and to utilise the existing SAP-ISU Invoicing functionality deployed into UK Link.

This would minimise the complexity of the overall Gemini application and leverage the functionality of other platforms by providing a fully integrated solution. Therefore, the Energy Balancing component would be the only one to be created as a bespoke product.

Option 5: Re-write with bespoke application

By utilising our understanding of the existing Gemini application and the latest Industry Regime, this option will rewrite the entire application. Given the unique nature of the functionality and business rules, it is assumed that this would be a replacement bespoke application, which would fundamentally deliver the existing application logic.

By hosting the solution in the public cloud, this would allow us to leverage the capabilities of the cloud provision to simplify the development but would require considerable amount of build and testing effort.

Business Case Outline and Discussion

Key Business Case Drivers Description

A methodology has been used to assess each option against a hierarchy of metrics. The image below illustrates the relative strength of each option considered in the format of a heat map. This methodology has assessed options comparatively to each other meaning that language such as “highest/lowest” has been used rather than “high/low”. As previously highlighted, doing nothing is not an option due to system support expiring in 2025, therefore all options considered maintain vendor support as a minimum. Below is a brief description of each metric contained in the heat map.

Implementation costs: The upfront costs of delivering the solution.

Service and performance risk: this metric illustrates the anticipated degree of residual ongoing service and performance risks following implementation of the option

User experience/interface: The degree to which the user experience will be impacted and improved once the solution has been implemented. This metric particularly assesses the extent to which identified enhancements will be implemented

Change delivery ease/cost: The complexity and the associated costs of implementing future change, be that regulatory change or future functional requirements to deliver industry change

Customer impact: The level of impact on customers of implementing the option

Subsequent operating costs: The primary driver to sustaining or replacing the Gemini system is for continuity of service rather than for cost savings. This does not mean that there will not be cost savings but these have not been assessed in detail, therefore this is the lowest metric in the hierarchy as it has not driven option analysis. However, at the time of sustaining or replacing we would look for any opportunities within NG and Xoserve for any efficiencies to service costs.

Business Case Summary

Figure 1: Options Heat map

Options	Preferred Option				
	Sustain	Hosting Modernity	Enhanced Solution	Re-write with COTS	Bespoke Application
Implementation Costs	£13.6m	£19.6m	£24m	£25m	£37m
Service & Performance Risk	Highest	Highest	Lowest	Medium	Lowest
Change Delivery Ease/Cost	Highest	Highest	Lowest	Medium	Medium
User Experience / interface	Least	Least	Medium	Medium	Best
Customer Impact	Lowest	Lowest	Highest	Highest	Highest
Subsequent Operating Cost	Highest	Medium	Lowest	Medium	Highest

Option 1: Sustain

A sustain activity will ensure that continuity of support is provided to the Gemini system and that it is compatible with the latest version of the Oracle software (moving from version 12c to 18c). This is option involves the minimum intervention possible and is also the least cost solution.

In Appendix 1 a diagram is provided which illustrates the four principle layers of the Gemini system. This option would not impact the “Applications” layer. To mitigate service and performance risks, changes would be required to be made at the “Applications” layer. Therefore, as this option is not fundamentally changing the set-up of the system, the service and performance risks are identified as “highest” comparatively to other options as these risks would not be mitigated.

This option would be one of the most difficult and costly to implement subsequent change. As the fundamental set-up of the system would not change, the system would continue to be very meshed and interwoven, meaning that when a change is implemented a vast section of the system must be opened to test the implications of that change. This creates additional costs and time to deliver change.

Due to this option being a like-for-like solution, it would provide minimal opportunity for change. Although this means minimal risk and impact on Users’ systems and processes it would not deliver the enhancements they have previously identified and therefore not deliver the benefits to consumers of those enhancements. As highlighted above, previous stakeholder engagement has identified numerous functional enhancements that Users’ require to be made to the Gemini system. This option would not deliver on those requirements and would not be meeting the needs of our customers thereby meaning they will continue to experience the issues they do today.

Option 2: Hosting Modernity

The “hosting modernity” option is the second cheapest option investigated. This option would sustain the current system but would also include moving to a Cloud based solution.

As with the Sustain option, this option would not impact the applications layer. Therefore, any underlying service and performance issues will not be addressed.

A Cloud based solution offers flexibility which would allow “unlimited” growth potential (e.g. the ability to increase and decrease test environments when required to meet the differing demands). This would be vital given the expansion of the Gemini system that has been experienced since its implementation and expected to continue through RIIO-2. However, even with the increased growth potential this option does not in itself make any changes to the underlying applications layer. This means that change delivery would be complex, far-reaching and therefore costly and therefore has been highlighted as “highest” relative to the other options.

Similarly to Option 1, this option would essentially be a like-for-like solution but hosted on a different platform. It would provide minimal opportunity for change therefore not deliver enhancements previously identified by Users, falling short of meeting their needs. Therefore, although there would be low customer impact of the option there would be least improvements to the User experience.

An initial view of subsequent operating costs suggests that increased use of Cloud based solutions may enable commercial strength to be leveraged which may result in a reduction in subsequent running costs. However, at this stage this potential saving cannot be fully quantified as it is dependent on market prices for Cloud based solutions at the time of implementation. This may also be offset by possible increase in security costs required because of moving Cloud based solutions.

Option 3: Enhanced Solution

This option is an amalgamation of options 1 and 2 (with the option of moving to a Cloud based solution as one of the enhancements delivered) but additionally delivers the functional and non-functional requirements Users have previously identified. This is at a cost of £24m.

As part of the enhancements identified, changes will be made at the “Applications” layer under this option. The consequence of this is that service and performance risks can be mitigated.

In terms of change delivery ease and costs, due to changes made at the “Applications” layer as part of the enhancements work, (e.g. introduction of test automation to allow faster change, greater automation, optimising screens). This will result in change being easier and cheaper to implement and service and performance risks minimised, therefore meaning these areas are identified as “lowest” in comparison to other options.

This option would deliver on the enhancements previously identified by Users’. Furthermore, a program of continued delivery of enhancements allows for Users’ requirements to be regularly reviewed and delivered rather than delivering all at a particular point in time. This would result in a solution which is more responsive to industry needs. However, this option has been identified as “medium” in terms of User experience and interface as changes will still be restricted to what is achievable on the current platform. Customer impact is rated as “highest” as these enhancements will be required to be tested by industry.

The same ongoing benefits of moving to a Cloud based solution highlighted under Option 2 are also relevant for this option. Additionally, the proposed changes under this option include the removal of the Siteminder application for which additional licensing costs are currently being incurred. As with all options, if an opportunity exists to reduce running costs then we will seek to identify and assess these during design phases to understand whether any cost savings can be passed onto customers.

Option 4: Re-write application using Commercial of-the-Shelf (COTS) with like-for-like / simplified business rules

This option would enable efficiencies to be gained from using existing technologies and industry best practices at an upfront cost of £25m to implement.

This option would remove an element of risk in that this option would utilise industry proven solutions. It would reuse and integrate with industry systems rather than duplicating functions. The re-write would also include the “Applications” layer meaning that service and performance risks can be mitigated. However, the continued complexity of the energy balancing functions means that COTS solution would not be suitable. There is also the additional complexity of integrating a COTS solution with the multiple products that the current Gemini system interacts with. However, on balance, the service and performance risk is identified as “lowest” in comparison to other options.

This option would not give the same benefit as option 3 for change delivery ease and costs, as it will not deliver for example, workflow automation and user authentication changes – these being two of the key drivers to reducing change delivery ease and costs. Therefore, this option has been identified as “medium” for change delivery ease and costs.

This option would deliver the enhancements identified by Users’. However, this option is identified as “medium” for User experience and interface as changes will be constrained by the set-up of either the current system for energy balancing or the COTs solution for the capacity. Furthermore, these enhancements are more likely to be delivered at one point in time when the system solution is delivered rather than over the period resulting in them being less agile to changing requirements than in Option 3.

As this option would involve the implementation of a new system the impact on customer’s would be high. However, this option would deliver on those enhancements to an extent possible through using COTS solution. However, Users’ enhancements required would be taken a point in time to be delivered on the replacement system and therefore shown as “medium” on the heatmap above.

This is the only option where an element of Oracle costs can be removed entirely and therefore subsequent operating costs would be reduced. However, there may be subscription costs for replacement systems. Compatibility of a COTS solution to business requirements may be challenging. There is a risk that potential regulatory costs that could be introduced to enable more off-the-shelf functionality to be used in any third-party packages. If this results in amended UNC rules or other changes then there could also be consequential costs on customer systems that would increase the overall cost to the industry. Therefore, on balance, this option has been identified as “medium” for ongoing operating costs.

Option 5: Bespoke Application

The option of building a new, customised, bespoke application would offer the most tailored solution to fulfil the requirements for a balancing and capacity system at an implementation cost of £37m and therefore the highest cost of all options considered.

Service and performance risk is “lowest” compared to other options as this option would be a complete re-build of the system and so these risks can be mitigated.

Change delivery ease and costs is identified as “medium” because although change will be able to be implemented at the time of delivery of the replacement system, ongoing change delivery ease and cost will be more difficult than options 3 and 4 due to the bespoke nature of the system.

This option would deliver Users’ requirements as they can be built into the system design at feasibility stage. It would enable design rationalisation, removing now obsolete screens and functionality. This option is identified as “best” for User experience as it would address Users’ requirements in a more targeted manner.

As with option 4, this option would involve the implementation of a new system and therefore the impact on customers would be high. It would require the greatest interaction and input from industry to test the various elements.

Subsequent operating costs would be “highest” in comparison to other options as this would be a bespoke system which would require ongoing specific support and maintenance.

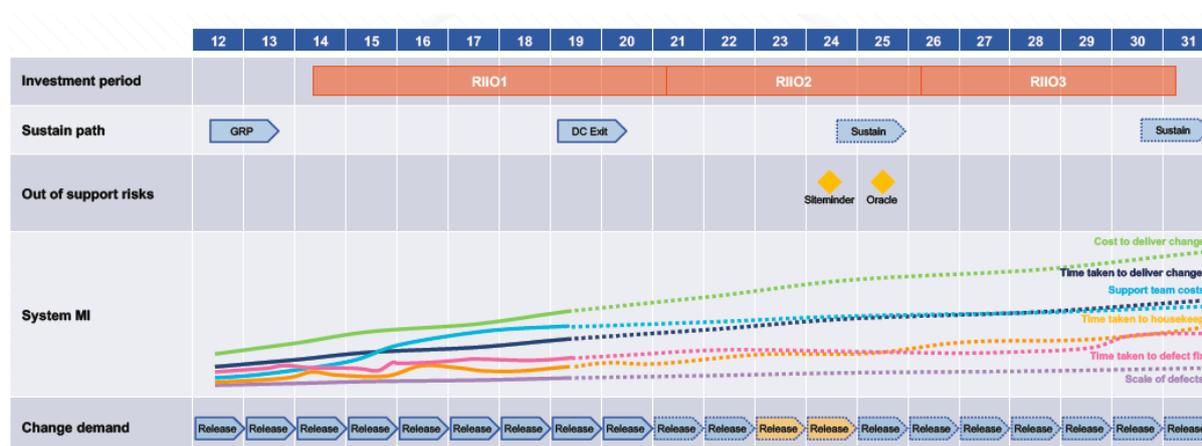
Triggers for replacement

There is no single trigger for a replacement. For a replacement option (options 4 and 5) to be necessary, an accumulation of issues needs to materialise and the following would need to be believed;

- Upgrades required to ensure continued third party support for major components of the system are more deep-rooted than initial analysis suggests. Analysis carried out to date believes moving to Oracle 18c wouldn’t require replacement. However, for a replacement to be required a belief that moving to the latest version of Oracle available at the time require more invasive changes to be made to the Gemini system.
- The ability to support the system activities reduces. For example, the number, scale and time taken to resolve system defects experienced is expected to increase. Data gathered to date, does not show an upward month-on-month trend of current defects. See Appendix 1 for more detail.
- The ability, including time and cost, to deliver industry change is increased from anticipated levels. Evaluation of the potential transformational change projects on the horizon suggests that none of these transformational projects would require a significant element of existing code to be re-written to implement meaning a system replacement to deliver this change.
- New requirements are identified which the application cannot meet. A list of stakeholder requirements has been evaluated and all can be delivered upon through a Maintain option.

There is no single trigger for a replacement. An accumulation of various factors which may trigger a need to replace the system – costs to deliver change, time taken to deliver change, support team costs, time taken to housekeep, time taken to defect fix and scale of defects. The chart below shows the actual information measure against these triggers from 2012 to 2019. It then contains a prediction of how these trends will develop over the RIIO-2 and RIIO3 periods.

Figure 2: Replacement triggers



It is believed that the risk of any of the points set out above materialising is not significant enough to warrant system replacement. Throughout the RIIO-2 period, the above measures will continue to be monitored and the materialisation of any potential triggers for replacement assessed. This will be particularly pertinent given that the Gemini system will have been live for 21 years by the end of RIIO-2. RIIO-1 has helped us understand where the threshold of the triggers for replacement lie and so can help to inform our decision on when replacement is required. Monitoring of the materialisation of potential triggers for replacement and lessons learnt from our approach in RIIO-1 and RIIO-2 will inform our RIIO3 strategy.

The Gemini system will require a Sustain activity every 5 years to ensure vendor support is maintained. Therefore, we know that by 2030, in the RIIO3 period, Gemini will require sustaining. However, leading up to that time, we will continue to measure the metrics outlined above (scale and impact of forecast industry change, time taken to deliver regulatory change, scale and impact of defects experienced, User enhancements required and ongoing support costs). An assessment will then be made at the appropriate time as to the Gemini strategy in RIIO3 which maybe solely a Sustain activity or may be a system replacement activity.

Preferred Option Scope and Project Plan

Preferred Option for this Request

The preferred option is “Enhanced Solution” (Option 3)³. Out of the options considered it is believed the Enhanced Solution option provides the most optimal solution as there is no foreseen triggers to require a replacement. Although it is not the cheapest option, the benefits highlighted above justifies the additional expenditure in comparison to the cheapest

³ This preference is shared by Xoserve, the current Central Data Services Provider (CDSP)

option. This option delivers on the key requirements of the Gemini system in the RIIO-2 period as outlined in the Project Scope Summary section above:

- **Be Robust** – all options considered will secure the continued support of the Gemini system for the RIIO-2 period as a minimum. Additionally, the “Enhanced Solution” option reduces the service and performance risks to the lowest compared to other options. Reliability of service and system security is fundamental for a system which underpins the gas industry.
- **Enables Change** – The Enhanced Solution option will mean that change can be delivered easily and more cost efficiently compared to other options, particularly compared to the other Maintain options (Sustain and Hosting Modernity). A Gemini system which enables the delivery of change provides benefits to society as it facilitates opportunities and developments in the industry to be leveraged.
- **Responsive** – the Enhanced Solution will be able to respond to stakeholder feedback and deliver the enhancements required by industry. Although for this option, responsiveness will be limited to the capability of the existing system it is believed that doesn’t prevent the delivery of any enhancements identified. Although the Enhanced Solution option is one of the three options which will have the highest impact on customers, this is inevitable to deliver the enhancements they have requested and we will work closely with Users’ to minimise the impact on them as much as possible. Delivery of these enhancements will improve the quality of service which will enable shipper’s businesses to be more efficient, ultimately leading to lower consumer bills.
- **Value for money** – as explained below, there are currently no foreseen triggers to warrant a re-write of the system. Therefore, the Enhanced Solution option represents value for money as it is delivering on the above requirements in the most economic and efficient way.

Our RIIO-2 Gemini Strategy was shared with Stakeholders at the National Grid Gas Operational Forum in September 2019. Following an overview of the options considered and their impact, the Forum’s participants were asked to indicate, on handouts, their preferred option. Out of 20 attendees, 10 attendees completed the handout. Out of this, 6 attendees stated that their preferred option was the ‘Enhanced Solution’ option (option 3). Two attendees stated their preferred option was ‘Re-write with Commercial Off-the-shelf products’. Following up on this, one of those attendees said his reason for this preference was because that attendee is from a software supplier company and so could provide the software. The other attendee that highlighted Option 4 as their preference said this was because they have experience of using the Prisma platform for capacity bookings which they feel is a “very well developed” and easier to use. Two other attendees highlighted option 5 ‘Re-write with bespoke application’ as their preference. This was due to them experiencing issues with connectivity, access, reliability, automation, consistency of units of measurement used by the system, and issues with specific rules. These issues are all captured in the “pain points” previously identified by Users and will be improved by the delivery of the enhancements as part of option 3, ‘Enhanced Solution’.

Project Spend Profile

Year	FY22	FY23	FY24	FY25	FY26	Total
Gemini Enhanced Solution (£m)	2.5	2.5	10.5	8.5	-	24

Efficient Cost

In their role as the sole Central Data Services Provider (CDSP), Xoserve currently manage the Gemini system on our behalf. Xoserve's costs already face a high degree of scrutiny through their annual business planning process, the Data Services Committee (DSC) and ultimately, by the Xoserve Board (made up of 4 shipper nominated Directors and four Gas Transporter nominated Directors, including one IGT nominated Director). There is a range of representatives on the Xoserve Board (4 shipper nominated Directors and four Gas Transporter nominated Directors, including one IGT nominated Director). However, as we approach the more detailed scoping of works⁴ we will try to ensure they are the most efficient company to deliver our requirements.

The forecast costs for each option have been derived by using historical project costs, this has included re-platforming costs incurred within RIIO-1, application change costs (e.g. GB Charging Reforms) and previous enhancements delivered. These costs have then been scaled up or down depending on the level of intervention required for the delivery of each option and efficiencies applied where appropriate. Market estimates have also been used to forecast costs of the Oracle upgrade and cloud migration. These costs have been validated with WIPRO, a leading global Information Technology, Consulting and Outsourcing company.

Project Plan

- Delivery of the sustain activity is required in 2025 when the expected life of the current support comes to an end. Therefore, there is a peak in the profile of investment in FY24 and FY25.
- Enhancements will be carried out throughout the period meaning that they are adaptable to changing requirements.

Key Business Risks and Opportunities

- There is a risk that the assumptions made around what technology is available in years to come when the current Gemini system requires work (i.e. leading up to 2025) is incorrect. A view has been taken on what is known today about technology available in the future. This view will be adapted with the emergence of any new technology solutions.
- Analysis of the options has focussed on the impact of changes required to be compatible with the latest version of Oracle, version 18c. There is a risk that at the time of implementation a later version will be available which requires more invasive and fundamental changes than previous versions and that the upgrade

⁴ Note. This has not been done before the December business plan submission.

is not viable without a high level of application changes. This may result in increased costs and time to implement. However, analysis can only be undertaken on what is known today, which is the version currently available. To mitigate this risk, we are liaising with the software provider to ensure we have early visibility of new products.

- The volume and magnitude of industry change is greater than envisaged. The industry change anticipated when developing the options is based on the Gas Markets Plan. The Gas Markets Plan is developed with industry and so provides a robust basis for planning our investment.
- There is a risk that the assumption that stakeholder's future functional requirements are of a similar magnitude/impact and scale as current requirements identified proves incorrect. At this stage, uncertainty over what other functional requirements might be means it is not possible to assume any other outcome. If magnitude/impact and scale of requirements does increase then this will lead to a prioritisation method being required.
- A further assumption is that the industry is available to support changes proposed in the RIIO-2 timescales (i.e. testing of API's; access changes). Throughout implementation, we will work with industry to ensure the impact on industry is kept minimal and timings are appropriate.
- Options have assumed that UNC Code obligations remain static, there is a risk that they don't. The future Gemini strategy will assess any amendments to UNC Code obligations to understand impacts and adapt our plans if required keeping our stakeholders informed.
- There is a risk that something happens which creates a trigger requiring replacement, for example;
 - The scale of defect and time taken to fix rises exponentially
 - Time taken and costs to deliver changes becomes prohibitive

Metrics will be monitored to ensure visibility of a change in trend is seen as early as possible.

Outputs included in RIIO-T1/GD1 Plans

In our RIIO-1 Business Plan we said we'd re-platform Gemini at the beginning of the period, replace in the middle and refresh at the end. This was in line with our agreed strategy with Xoserve that an application/system would go out of support over time, and investment would be required to deliver an in-support system. In tandem with this approach, it was recognised that over time, the application would get so large and complex that it becomes too difficult, time consuming and expensive to maintain and/or modify to Users' requirements, leading to the need to re-write this system. It was envisaged in addition to the requirement to sustain the system, that there would also be a level of commercial change which would require a new system. The table below shows the costs forecast for each of these activities:

Figure 3: Table of the RIIO-1 forecasts

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Gemini Re-platforming	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Gemini Operational Functionality Enhancements	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	4.0
Gemini Application Replacement	0.0	0.5	5.3	10.4	10.4	5.3	0.0	0.0	31.9
Gemini Interface Enhancements	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.0	1.0
Gemini Platform Refresh	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	4.0

During RIIO-1 we have carried out the re-platform forecast at the beginning of RIIO-1 and are currently carrying out a more substantial replatform at the end of RIIO-1 instead of replacing the system.

The decision to re-platform the system in RIIO-1 was taken for the following reasons;

- the volume and magnitude of regulatory change, which we thought would drive the requirement to replace the system, did not materialise to the extent foreseen. In RIIO-1 our strategy was to manage the change process to ensure implementation was at minimum cost (and therefore required minimum system change). The lack of requirement to replace the system demonstrates that we were effective at executing this strategy.
- Furthermore, a re-platform to the Gemini system was sufficient to maintain support of the system and there were no further technical reasons to replace.
- In the circumstances, the decision to re-platform rather than replace at the time, was endorsed by stakeholders at the Gas Operational Forum⁵.
- Re-platform rather than re-placement has the additional benefit that options for re-placement are kept open for longer, ensuring the solution is as future-proof as possible. Had we opted to replace in RIIO-1 and then subsequently seen the need for significant functional changes, we could be faced with the risk of needing a second replacement before the end of RIIO-2.

Furthermore, RIIO was structured to incentivise efficient spend for the benefit of the end consumer and NG and decisions throughout RIIO-1 were taken in line with this principle.

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<https://www.nationalgridgas.com/sites/gas/files/documents/Gas%20Ops%20Forum%20full%20pack%20-%20February%20202018.pdf>

The table below provides the actual six year annualised RIIO-1 spend and RIIO-1 Years 7-8 forecast spend for the Gemini re-platform activities outlined above.

Figure 4: Table of actual six year annualised RIIO-1 spend and RIIO-1 Years 7-8 forecast spend

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Gemini Re-platforming	2.0	3.1	0.0	0.0	0.0	1.5	6.7	2.2	15.6

APPENDICES

APPENDIX 1: Background

National Grid transports gas on behalf of gas shippers. Shippers are required to book space (known as 'capacity') on the National Transmission System (NTS) to flow gas. They are also required to tell us when and where they are going to flow the gas, which enables us to balance the network safely. To do this, shippers use a IT system called 'Gemini'. Gemini is at the core of how the gas market operates as it acts as our main interface with market participants, allowing them to balance their portfolio on a daily basis and manage their capacity bookings up to seventeen years ahead. It is also the main system the NGG uses to communicate commercial information to/from shippers (energy allocations, transportation invoicing, capacity auctions, confirmation of gas flow nominations). Delivering this system in an efficient and effective way provides value to consumers as it allows participants to make informed commercial decisions as well as enabling the efficient physical operation of the network. The Gemini system owned by NGG but managed and operated on our behalf by Xoserve.

As with any IT system Gemini requires periodical updating to maintain its health and functionality. When considering the options for these updates, there are range of terms which describe differing degrees of change to the system. The below definitions attempt to provide an explanation and the connotations of these terms:

- Sustain / re-platform: the maintenance / upgrade of components and products to ensure the conform with an agreed risk profile, and essentially stay in support
- Re-architecting: when a product is being upgraded as part of a sustain activity, it is possible that the activity will have a deeper impact on the system and require additional changes (e.g. application and database tight-coupling is expected to be impacted)
- Partial re-write: Re-write of certain aspects of the system to provide a substantially altered and/or improved solution.
- Full re-write: undertake a complete re-development of the system 'from the ground up', establishing requirements, selecting the architecture, solutions and suppliers, and then delivery of the solution and associated change management. Such a re-write should have been identified well in advance of the need by assessing triggers.

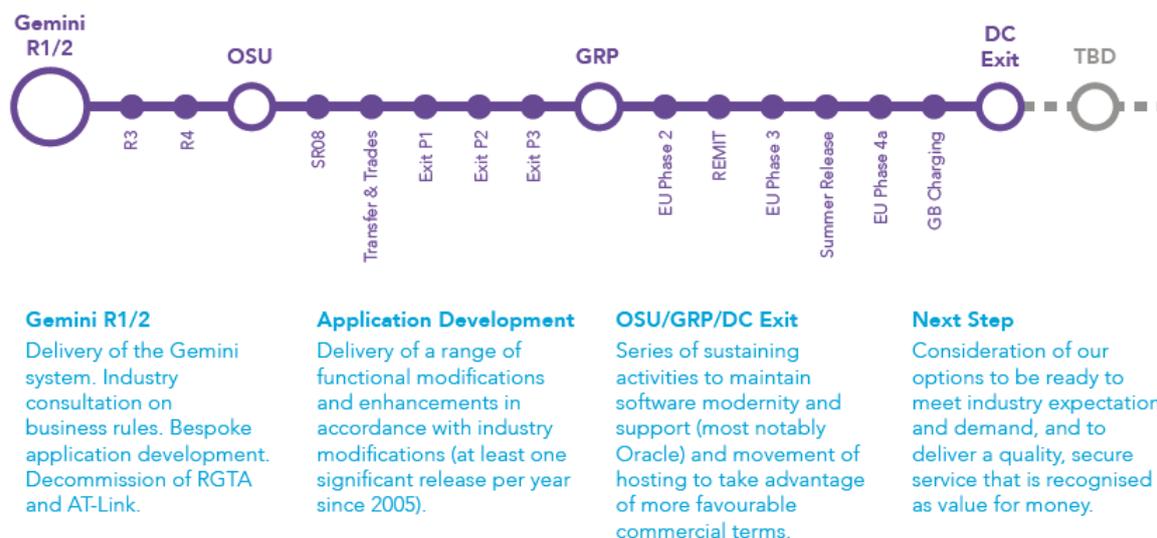
Since the implementation of Gemini in 2005, a sustain strategy has been followed which has focussed on keeping the Gemini components (third party products) in support⁶. Therefore, investment projects to move from 'out of support' to a more current version of the software to gain 'in support' benefits. Version upgrades generally come with advances in technology⁷ but they are largely about maintaining support and system health. As can be seen from the

⁶ For example, when a vendor (e.g. Oracle) stops supporting a product, our ability to maintain service is diminished – the vendor stops providing 'patches' to fix known faults, engineers are less/not available to fix new faults and support is more expensive.

⁷ For example, to make the system more performant or more secure.

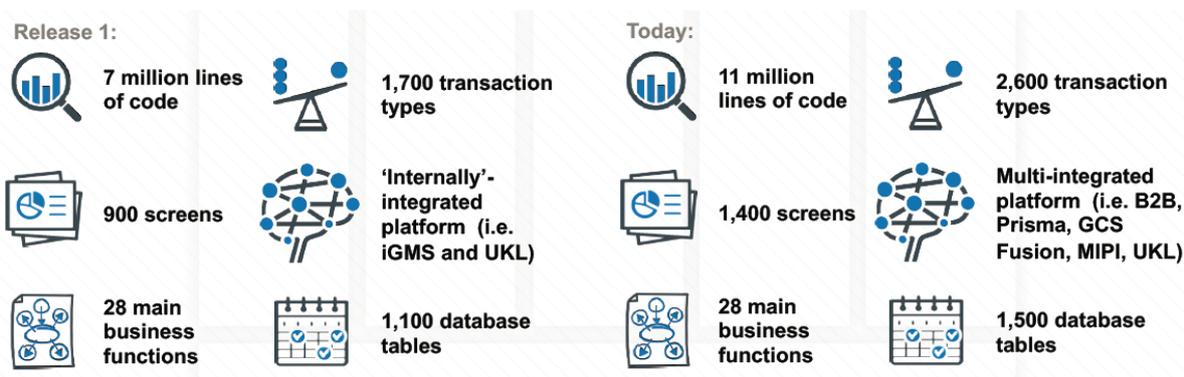
diagram below, two such major upgrades have occurred (OSU in 2007 and GRP is 2013) and the latest programme (DC Exit) is being commenced which will be completed in 2020. This approach has enabled Gemini service to continue to deliver to service standards and requirements whilst being efficient, proportional and economical for end consumers. However, following this strategy going forwards will mean the Gemini system will have been live for 16 years at the start of RIIO-2 and 26 years at the end of RIIO3. The below diagram illustrates this sustaining strategy activities since Gemini was implemented.

Figure A1.1: Gemini's roadmap to date



In addition to the sustaining strategy, a series of functional changes have also been delivered. This has been on average, one major release per year, most of which have been large additions to Gemini's processes and services. This continual functional modification is making the application larger and therefore more complex. The image below illustrates how the Gemini system has expanded since Release 1 in 2005:

Figure A1.2: How Gemini has changed



Below illustrates the four principle layers to Gemini and the expected state of each layer following the works completed in RIIO-1. This includes DC Exit – which will be completed in 2020 to sustain the Gemini system and extend vendor support until 2025.

Figure A1.3: Four principle layers of Gemini

Layer	State at end of T1 period
Web / Presentation	Interface is functional but looks dated. API's are based on aging technology. User requirements identified at this layer
Application	Application is reliable and the process to alter or add new functionality is well proven. User requirements identified at this layer
Database	DC Exit will move the Database layer to a mainstream support version of Oracle
Infrastructure	DC Exit will deliver new hardware and ensure that the underlying servers are supported by vendors for 5 years.

In preparation for NGG RIIO-2 business plan, a series of stakeholder engagement was carried out to understand Gemini Users' requirements for the future system. From this engagement, 66 "pain points" were identified with the current Gemini system. These have been distilled to form part of a series of enhancements required as detailed below;

1. BR1 - User Id Deletion
2. BR2 - User Id Password Reset
3. BR3 - Performance Optimisation
4. BR10 - New APIs
5. BR11 - API Standardisation
6. BR12 - API Documentation
7. BR13 - API Enhancements
8. BR22 - User Id Password Expiry
9. BR32 - NG IS Interfaces
10. BR41 - Locational Trades at IPs
11. BR42 - NTS Entry and Exit Meters Report
12. BR43 - Capacity Amendment Report.

APPENDIX 2: Removed template sections

The following highlighted sections have been removed or modified in our submission due to:

- The section not being relevant to the investment stated in this paper

Project Status and Request Summary

Problem/Opportunity Statement

Related Projects

Project Boundaries

Project Definition

Supply and Demand Scenario Discussion and Selection

Project Scope Summary (modified)

Options Considered

First Option Summary

Options Cost Estimate Details

Options Summary

Business Case Outline and Discussion

Key Business Case Drivers Description (modified)

Supply and Demand Scenario Sensitivities

Business Case Summary

Preferred Option Scope and Project Plan

Preferred Option for this Request

Project Spend Profile

Efficient Cost

Project Plan

Key Business Risks and Opportunities

Outputs included in RIIO-1/GD1 Plans.