

Sunderland City Council and South Tyneside Council

International Advanced Manufacturing Park Area Action Plan

Utilities Technical Background Report

February 2017



South Tyneside Council

Sunderland
City Council



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1.0 Introduction

1.1 Overview

This is the **Utility Services Technical Background Report** for the International Advanced Manufacturing Park (IAMP) Area Action Plan (AAP). The aim of this report is to provide the technical evidence to inform the approach and policies in the IAMP AAP.

The Paper is one of a suite of Technical Background Reports which form part of the evidence base for the IAMP AAP. The full set of those reports can be accessed using the following links:

www.sunderland.gov.uk/iamp

www.southtyneside.gov.uk/localplan

1.2 Introduction to the IAMP

The IAMP represents a unique opportunity for the automotive sector in the UK. Located next to Nissan UK's Sunderland plant, the UK's largest and most productive car manufacturing plant, the IAMP will provide a bespoke, world class environment for the automotive supply chain and related advanced manufacturers to innovate and thrive, contributing significantly to the long-term economic success of the north-east of England and the national automotive sector.

The proposal is for 260,000 sq m Gross Internal Area (GIA) development aimed primarily at the automotive, advanced manufacturing and related distribution sectors. The IAMP will be located on land to the north of the existing Nissan car manufacturing plant, to the west of the A19 and to the south of the A184. This location benefits from its close proximity to Nissan and excellent transport links with opportunities for integrated connectivity provided by the surrounding Strategic Road Network, rail and port infrastructure.

1.3 Structure of this Paper

The Report is structured as follows:

- Section 2 sets out the evidence relevant to this Report.
- Section 3 draws on the evidence to set out issues that should be taken into account in developing the approach and policy of the AAP.
- Section 4 advises on the potential actions that should be considered in delivering the IAMP and includes a summary of the work being undertaken in parallel with the development of this Report, to investigate options for providing low carbon energy to the IAMP site.

2.0 Chapter 2 - Evidence Review

This section presents a summary of the key findings from the evidence review. The information and documents considered in that review are listed in section 2.1 below.

2.1 Overview

The key issues relating to utilities were established through of the following studies:

- IAMP Desktop Engineering Assessment (July 2014, Mott Macdonald) ([SD68](#))
- IAMP Utility Services Study - Statutory Services Report Issue No 3 (June 2016, Desco) ([SD69](#))

IAMP Desktop Engineering Assessment (July 2014, Mott Macdonald)

The Mott Macdonald report describes the findings of an engineering assessment carried out on the IAMP site, located adjacent to the intersection of the A19 and A184. The purpose of the assessment was to identify issues and constraints that will require consideration during the master planning of the site.

The most critical issue, in relation to the utilities, was identified as follows:

- Pylons and overhead electricity cables run across the site and as they are difficult and expensive to move it may be more cost effective for development to be incorporated around them.

A Constraints Map was produced to highlight the key constraints across the site, and can be found in Appendix A of the Mott MacDonald report.

IAMP Utility Services Study - Statutory Services Report Issue No 3 (June 2016, Desco)

This report identifies utility services infrastructure reinforcements, the extent of the new statutory services supplies and any diversions to existing statutory services required by the proposed IAMP development.

The indicative utility capacity requirements have been based on the Schedule of Floor Space and Employment document, Draft v1 dated 8th August 2014, provided to Desco by JMP. Benchmark energy figures have been used for each utility and the overall energy calculations have been based on the area of development. Further detail is given in the Statutory Services Report.

Details of existing plant and infrastructure in the vicinity of the proposed development have been provided by all utility providers, including Northern Gas Networks, Northumbria Water, BT, Virgin Media and Northern Power Grid. This information was provided to Desco as part of the Desktop Engineering Assessment undertaken by Mott MacDonald and summarised above.

It is recommended that a site radar survey is carried out by the scheme promoter of IAMP to confirm the accuracy of these records and inform their application for a development consent order.

Records for all of the other utility providers have been received, and these are detailed within this report.

3.0 Chapter 3 - Key Issues, Constraints and Opportunities

In response to the evidence base outlined above, this section provides an overview of the key issues and constraints, the opportunities and requirements that the IAMP is seeking to address. This is structured around the following headings:

1. Utility Capacities
2. Budget Costs
3. Utility Diversions

3.1 Utility Capacities

3.1.1. Water

Existing Provision

The existing water infrastructure records for the site have been received and these confirm that there are NWL services present across the IAMP site.

NWL's distribution pipe work is located across the site running from the south east corner diagonally to the north-west corner. In addition to this a number of private water mains are connected to this distribution system to supply various consumers across the site.

Treated and combined sewers are also present on the site. The treated sewers run in the north-west corner and also along the southern boundary. Combined sewers run across the south-west corner of the site.

The existing drainage records are referenced in this report for information only. Design and development of the drainage design to cater for the new development will be provided by the civil/structural engineering consultant.

IAMP Requirements

Desco submitted a pre-development enquiry to NWL to enable an assessment to be made of the impact of the proposed development on NWL's assets and to assess the capacity within the NWL network to accommodate and treat the anticipated flows arising from the proposed development.

NWL has confirmed that a new water supply can be made available for the proposed development from the existing network of water mains and has confirmed that there will be no abnormal infrastructure costs incurred.

To make the pre-development enquiry at this early stage Desco made a number of assumptions regarding the water demand for the site. The preliminary peak water demand for the site has been estimated as 236 litres/second.

3.1.2 Gas

Existing Provision

The existing gas infrastructure records for the site confirm that there are gas services present across the proposed site. These consist of intermediate pressure gas mains (2 – 7 bar) and medium pressure gas mains (75 milli bar – 2 bar).

The intermediate pressure gas mains run from both the north and south of the site into the centre and then run out to the eastern boundary.

The medium pressure main runs along the southern boundary of the site and also from the south eastern corner to the centre of the site.

IAMP Requirements

Desco submitted a pre-development enquiry to NGN to enable an assessment to be made of the impact of the proposed development on NGN's assets and to assess the capacity within the NGN network to accommodate the anticipated gas demand arising from the development.

NGN has confirmed that the mains operating in the vicinity of the site have the capacity to supply the anticipated loads without any requirement for network reinforcement.

To make the pre-development enquiry Desco made a number of assumptions regarding the gas demand for the site. The preliminary peak gas demand for the site has been estimated as 25,000 kW.

3.1.3 Electricity

Existing Provision

The existing electrical infrastructure drawings for the site have been received from both National Grid (NG) and Northern PowerGrid (NPG). These drawings confirm that there are both National Grid and Northern PowerGrid services present on the site.

The National Grid service comprises a 275kV overhead service running diagonally from the north eastern corner across to the south eastern corner of the site.

Northern PowerGrid services comprise overhead 66kV, 20kV and 11kV lines and underground HV and LV cables. The 66kV, 20kV and 11kV overhead cables run across the north of the site from east to west. The 66kV and 11kV overhead cables also run along the western side from north to south. In addition 66kV overhead lines run along the eastern boundary.

11kV overhead cables run diagonally across the site from the north east corner to the south west corner, with various branches running north and south from these overhead cables. In addition 11kV overhead lines are present near to the western boundary.

Underground HV and LV cabling is present across all areas of the site.

IAMP Requirements

Desco submitted a pre-development enquiry to Northern PowerGrid to enable an assessment to be made of the impact of the proposed development on NPG's assets, and to assess the capacity within the NPG network to accommodate the anticipated electrical demand from the development.

The reply has now been received from NPG and provides two options as requested by Desco:

Option A – Supply Capacity 4,500 kVA (62,500m² only)

This option would be initially to supply enough electrical capacity for a development area of 62,700m² only from the local HV infrastructure. The cost also includes for establishing 6No. Substations to supply this area of development.

NPG has estimated that this work would take 12 months to complete.

Option B – Supply Capacity 19,000 kVA (Full extent of IAMP (260,000m²))

This option is to provide the estimated electricity capacity for the full extent of IAMP and to establish a primary substation during the Phase 1 development.

NPG has estimated that this work would take 4 years to complete.

Alternative IDNO - Energetics

In addition to the distribution network operators who are licensed for a specific geographic area there are also independent distribution network operators (IDNO). IDNOs own and operate electricity distribution networks which will predominantly be network extensions connected to the existing distribution network, e.g. to serve new housing developments.

Energetics have been approached to provide an alternative quotation for the necessary power requirements for the IAMP development.

Energetics have estimated that it would typically take 2 years to establish a primary substation excluding any upstream EHV/GSP upgrades, 3 years if these are required.

The supply capacity can also be reserved as the current industry agreement allows a capacity ramp between the IDNO/DNO up of 5 years. Thereafter the end client can relinquish any unused capacity or pay the reservation charges to secure a level of capacity they require. In practical terms for this project, taking a 2 year construction period for the primary, the capacity can be secured for 7 years (2 + 5 years) under a ramping agreement (which would shield the end user from the high reservation charges for the full load). After this period they can agree and pay the full reservation charges to secure the full load or relinquish unused capacity.

3.1.4 Telecommunications

BT

Existing Provision

The existing BT infrastructure drawings for the site have been received and these drawings confirm that there are both overhead and underground services present on the site.

The overhead service is present in the centre of the site running from east to west and along part of the southern boundary.

Underground BT cabling runs through the site from north to south and also branches off to the east. Additional underground cable routes also follow the northern and southern site boundaries.

Virgin Media

Existing Provision

The existing VM infrastructure drawings for the site have been received and these drawings show that there are no VM assets present on the site.

However VM do have cables/assets in areas surrounding the site. It is likely that VM will want its infrastructure extending onto the site and advanced infrastructure works would be required to ensure adequate data capacity is available on site.

3.2 Budget Costs

Water

NWL will provide a budget quotation for the main pipework infrastructure only and it is not their company policy to issue a detailed scheme design until payment is received. As noted above the application for new supplies will be made when sufficient detail about the site layout is available. In the meantime Desco have estimated the costs of providing Water supplies to the development.

In addition to the main pipework costs, further costs are also associated with the required works, as identified below:

Item	Cost
Infrastructure/Off Site Reinforcement	No Cost
Mains laying Charge/ Water Infrastructure Charge	£ 600,000*
Total New Service Connection Charge	By Developer of each new building
Sewage Infrastructure Charge	Estimates provided by Civils/Infrastructure Consultant
Diversions / Removal of Services	TBC

Total estimated budget cost for water = £ 600,000* (excluding VAT and BWIC)

***Denotes costs estimated by Desco; these will be superseded by Northumbrian Water quotations when they are received.**

Gas

Northern Gas Networks will provide a budget quotation for the main pipeline works and the required new supplies to the development. This quotation can be progressed when an indicative site plan is available. *In the meantime Desco have estimated the costs of providing Gas supplies to the development.*

Item	Cost
Infrastructure/Off Site Reinforcement	No Cost
Northern Gas Networks Main Pipeline Works (Gas supply to terminate at 3No points within development)	£ 375,000*
Total New Service Connection Charge	By Developer
Diversions / Removal of Services	TBC
Meters and Meter Installation	Provided by Others

Total estimated budget cost for gas = £ 375,000* (excluding VAT and BWIC)

***Denotes costs estimated by Desco; these will be superseded by Northern Gas Networks quotations when they are received.**

NPG

Costs

Northern PowerGrid have provided budget quotations for the required infrastructure to the development including substations, however they have not included for connections from the substations to the buildings (please note Option B excludes any substations and the 11kV infrastructure). The quotation for the connections from the substations to the buildings can be progressed when an indicative site layout is available. In the meantime Desco have estimated the costs of providing electricity connections to the development as follows:

Item	Cost	
	Option A (62,700 m2 only) £1,350,000 (incl VAT)	Option B (Full extent of IAMP) £11,800,000 (incl VAT)
Infrastructure/Off Site Reinforcement		
NPG Network Substations (electrical services up to Network Substations only)	Incl above	£ 3,000,000*
Total New Service	By Developer	

Connection Charge	
Diversions / Removal of Services	TBC
Meters and Meter Installation	Provided by Others

Total estimated budget cost for electricity = £13,000,000* (excluding VAT and substation construction)

*Denotes costs estimated by Desco; these will be superseded by Northern PowerGrid quotations when they are received.

Telecommunications

BT

Costs

The costs associated with the provision of BT voice and data cable connections to the new development will be the subject of a directly negotiated contract with the end user client, however advanced infrastructure works will be required to ensure adequate data capacity is available on site, these cost cannot be provided by BT until an indicative site layout is made available. In the meantime Desco have estimated the costs of providing BT supplies to the development.

Item	Cost
Infrastructure/Off Site Reinforcement	TBC
Total New Service Connection Charge	By Developer
Diversions / Removal of Services	TBC

Total estimated budget cost for BT = £ 75,000* (excluding VAT)

*Denotes costs estimated by Desco; these will be superseded by BT quotations when they are received.

Virgin Media

Costs

The costs associated with the provision of VM voice and data cable connections to the new development will be the subject of a directly negotiated contract with the end user client, however advanced infrastructure works will be required to ensure adequate data capacity is available on site, these costs cannot be provided by Virgin Media until an indicative site layout is made available. In the meantime Desco have estimated the costs of providing VM supplies to the development.

Item	Cost
Infrastructure/Off Site Reinforcement	TBC
Total New Service Connection Charge	By Developer
Diversions / Removal of Services	No cost

Total estimated budget cost for VM = £ 75,000* (excluding VAT)

***Denotes costs estimated by Desco, these will be superseded by Virgin Media quotations when they are received.**

3.3 Diversions

Diversions to the existing NWL, NGN, NPG and BT apparatus and plant may be required, however the extent of these works are still be confirmed.

No diversion work is required to VM apparatus as they have no apparatus on the site.

3.4 Mitigation Measures

The key issues to resolve for standard utilities, as highlighted above, are as follows:

- Costs for new supplies to the IAMP buildings
- Diversion requirements to existing utility services
- Lead in time for the primary substation
- Reserved capacity of primary substation

A summary of the work investigating options for providing low carbon energy to the IAMP site is included in Section 4.

Costs for new supplies to the IAMP buildings

All of the utility companies will provide costs to provide services to the new development, however they all require an indicative site plan of the proposed before budget costs associated with the new supplies can be provided. In order for this information to be provided an indicative master plan will be required.

As the master plan is progressed it will be necessary for the scheme promoter to engage with utility companies to firm up costs associated with the new supplies required to each of the buildings as part of the development.

Diversion requirements to existing utility services

Diversions to existing utility apparatus and plant maybe required, however this cannot be assessed until a master plan detailing the building layouts is made available.

The master plan is required to allow for an assessment of utility diversion requirements. The masterplan would be assessed against the composite utility drawing in terms of any diversions required and, once assessed, applications would be made to the relevant utility companies.

Lead in time for the primary substation

NPG has identified that a Primary Sub Station would be required to supply the IAMP development with the required electricity demand.

To establish the Primary Substation NPG has identified a timeframe of 4 years from when the order is placed, to power being made available.

Reserved capacity of primary substation

NPG has confirmed that the capacity of the Primary Substation would only be reserved for the IAMP site for a three year period from the date when the Primary Sub Station is energised.

To mitigate the risk of power not being available to the site when required, despite the investment in a new Primary Substation an alternative electricity provider, Energetics, has been approached with an enquiry about its ability to establish a new Primary Substation and to reserve the required capacity for the IAMP development.

Energetics has confirmed that, as a licensed Independent District Network Operator (IDNO), it can establish the Primary Substation and would be able to reserve the capacity of the primary substation for exclusive use by the IAMP development. However there would be 'scalable capacity charges' levied against this over an agreed period and these charges would need to be negotiated and can be quite expensive).

3.5 Strengths / Opportunities

Strengths

The strengths of the site in terms of utilities, are that there are water, gas, electricity and telecoms infrastructure services present in the vicinity of the IAMP development.

NWL and NGN have both confirmed that the existing water and gas utility infrastructure is sufficient to satisfy the demand of the IAMP development.

The electricity infrastructure will require reinforcing as noted above, and a Primary Substation will be required to serve the site.

In terms of telecoms connections a new site wide duct network will be provided to connect to the existing BT/VM infrastructure in the vicinity of the site.

Opportunities

During the early project development stages potential opportunities were explored with Gateshead Council with regard to sharing the costs and benefits of any utility infrastructure enhancements associated with the development of the IAMP site and the Follingsby Industrial Estate.

However, due to the different programs and timescales for each development it was agreed that is unlikely that opportunities to share the utility infrastructure costs between the projects can be capitalised on.

Discussions were also held with Nissan as they would be interested in any surplus electrical capacity that might be present at IAMP. However, further to meetings with Nissan and NPG, it became apparent that due to the different electrical supply arrangements required to each site, there is no benefit to either party in sharing any supply enhancements associated with the IAMP development.

4.0 Chapter 4 - Interventions and Actions

This section summarises the main proposed interventions and actions identified so far, which will be progressed through the AAP for both standard utilities and low carbon energy options:

- Reserve electricity capacity in the HV Network
- Further discussions with NPG
- Further interventions may be identified by IAMP LLP once a master plan has been issued and further dialogue has taken place with NWL, NGN, BT and VM regarding new supplies to the buildings and any potential diversion works.

4.1 Interventions for Electricity

Further Discussions with NPG - NPG has confirmed that the capacity of the Primary Substation would only be reserved for a 3 year period. Further discussions will be held with NPG to explore what options are available with regard to the issue of reserving capacity and to understand if NPG can offer a similar arrangement to that proposed by IDNO's such as Energetics, i.e. payment of capacity charges over an agreed period.

Reserve Capacity at Primary Substation - The recommended intervention is to continue to explore and pursue the Independent Network District Operator option for providing the HV Connection / Primary Substation as a potential alternative to NPG as this could resolve the reserved capacity issue.

An alternative electricity provider, Energetics, has been approached already with regard to establishing a primary substation and reserving the required capacity for the IAMP development- see Section 3. Other IDNO's might offer similar opportunities as alternatives for reserving the capacity of the Primary Substation for exclusive use by the IAMP development.

4.2 Interventions for Other Utilities

Interventions related to reserving capacity may be required with the other utility providers such NWL, NGN, BT and VM, and this will become clear as the IAMP is progressed through the DCO process.

4.3 Interventions for Low Carbon Energy

In addition to the work developing the utilities strategy by Desco, the consultant Arup has been commissioned by the Councils to carry out a study into options for a considered, integrated, flexible and future proofed energy strategy incorporating low carbon and renewable energy technology to provide heat, cooling and power where appropriate to the IAMP site, to inform the AAP.

A number of options for low carbon alternatives to the traditional approach to providing thermal and electrical energy to the new buildings on the IAMP identified in this Utilities Report have been reviewed in the first stage of the study:

1. Building integrated photovoltaics – generating renewable electricity in each of the buildings.
2. Solar thermal – generating hot water in each of the buildings.
3. Large scale wind turbines – off site or near the site of the IAMP buildings.
4. Building integrated fuel cell Combined Heat and Power (CHP).
5. Anaerobic digestion – producing gas as fuel for a CHP engine and heat network.
6. Building integrated gas boilers – a traditional approach for heating.

7. Large scale ground source heat pump, providing heat into a heat network.
8. Biomass fuelled CHP and absorption cooling and heat network and cooling network.
9. Gas CHP and heat network.
10. Biomass boilers and heat network.
11. Biomass fuelled CHP and heat network.
12. Air source heat pumps – integrated in each building.
13. Gas boilers and heat network.

It is important to consider alternative approaches to grid electricity and gas supplies owing to the changes expected in carbon requirements driven by legislation and because the scheme promoter is considering a 'low carbon' site.

The overall aim of this low carbon energy study is not to identify the preferred energy supply solution immediately, but is to identify a range of possible options from the long list of alternatives, using the initial analysis summarised here. This short list of low carbon potential approaches, or combinations of technical options, will be taken forward into more detailed feasibility work after this initial study.

Estimates of the expected annual energy consumption of the IAMP have been calculated and the contribution to reducing carbon emissions beyond minimum compliance with the Building Regulations tested for the range of technologies listed above.

The low carbon technologies were assessed in terms of initial estimates of capital costs, carbon savings, simple payback and land area required for the technology (e.g. energy centre footprint) in order to shortlist the technologies for future techno-economic feasibility work and to test 'deliverability'.

Key messages at interim reporting stage are:

- It is early in the site development process and there is little firm data on building types, floor areas, location and uses to work from.
- It is a useful and important stage to start energy masterplanning, however, as the results from this study are important influencing factors for the masterplan in terms of the location, density and typology of buildings required to support alternative low carbon or renewable forms of energy generation.
- Energy demands for the IAMP are highly sensitive to building typologies, floor areas and the energy consuming processes in the buildings. For now, energy estimates are based on industry standard benchmark data.
- The traditional energy utilities strategy is likely to be the lowest capital expenditure option for energy supply, but it will not provide a low carbon site without wide scale low carbon energy generation technologies being installed within individual buildings and may not be the most cost effective option in the long term.
- In general terms, setting aside the heat generating technology, a heat network looks broadly viable, based on the initial analysis of heat demands and length of (and hence cost to install) a network. As noted above, however, the heat demands could be highly variable as a function of the area of buildings and the processes they contain.
- No work has been done yet on delivery models and the potential opportunities for the scheme promoter to receive grant funding or to generate revenues from energy generation such as selling electricity, selling heat, or receiving renewable energy incentive payments.

Following the preliminary analysis of capital costs and carbon saving potential for the options tested, together with the current uncertainty around building uses and hence energy consumption (especially

heat) for the IAMP), the recommendation is for a number of energy options to be taken forward separately and in combination to feasibility testing after this initial study. There were six options that were considered to perform best against the scheme promoter's primary drivers:

- Photovoltaics – ground mounted and building integrated
- Air source heat pumps – in buildings
- Biomass boilers & heat network
- Biomass CHP & heat network
- Alternative biofuels (such as biogas) & heat network
- Ground source heat pump & heat network

After the first stage of basic analysis, the second stage of the initial study will include more detailed techno-economic analysis of two energy strategy options, for early comparison with the traditional energy utilities case. From the six shortlisted options above, the bottom four incorporate a heat network and the recommendation is to test one 'generic' heat network option that would present good CO₂ reductions, together with an electricity based option that incorporates PV electricity generation with air source heating but no heat network.

Testing an electricity based option and a heat network based option in more detail will allow the comparison and testing of economic deliverability and contribution to the scheme promoter's required outcomes, together with some testing of the pros, cons, risks and opportunities to the scheme promoter of various delivery, ownership and O&M models.

From this analysis and comparison with the traditional grid electricity and gas option will come recommendations for how to progress to detailed feasibility testing, whilst ensuring the work on the masterplan and AAP (and DCO in due course) does not compromise or preclude the ultimate preferred energy strategy.