

Introduction

My ES Cornwall Scholarship period is currently agreed to be from March 2009 to September 2010. My proposed work program is aimed at gaining experience in alternate project management and delivery methodologies.

My initial period of employment is a 12 month period with Balfour Beatty Utility Solutions (BBUSL), commencing on the 16th February 2009.

This report is the first of six, focussing on my initial period of employment from 16 February to 16 May 2009.

Focus – Alliances

The traditional approaches for engaging contractors involved scoping of works, developing a tender document, and issuing them to contractors in order to receive differing tender responses in return. This approach is time consuming. The majority of work associated with administering traditional contracts is not associated so much with administering construction or engineering issues, but rather administering contractual issues. This method of controlling a scope of works is a proven method, driven by cost and supply/demand.

In the electricity industry, as with many others, the contracting environment has changed somewhat due to increased volumes of work, and reductions in skilled labour pools. Due to variability in project workload, the competition for skilled labour has increased sporadically, and as such, contractor companies have been unable to sufficiently build their capacity in order to meet all the required works. This results in what is commonly referred to as “cherry picking” the contracts: the implied policy whereby the contractor picks what is foreseen by them as the most profitable, and only commits to delivering those which deliver the most financial benefit. The practice of “cherry picking” is not beneficial to critical infrastructure, whereby all works must be carried in order to meet national demands.

National Grid initially trialled the alliance concept by forming an Alliance in their gas transmission business. The success of this Alliance led to National Grid applying a similar structure to its electricity investments. The Alliance(s) *allows National Grid and its construction partners to plan investment and construction programmes over several years at a time.*¹

¹ National Grid: What is the Electricity Alliance (2009), Available from: <http://www.nationalgrid.com/uk/Electricity/projects/ea-details.htm>, [Accessed Feb 27, 2009]

Background

Balfour Beatty Group

Balfour Beatty was originally electric tramway operators that sold excess generating capacity to the public. 2009 marks the 100year anniversary of Balfour Beatty's inception. The group has developed into a worldwide company with multiple specialist groups ranging from construction, engineering, services and investments.

Balfour Beatty Utility Solutions

Balfour Beatty Utility Solutions (BBUSL) capabilities extend into water, gas, power and maintenance services. The head office is located in Sheffield and their Power Networks Engineering division is located in Derby. As a result of the works being carried out, BBUSL also maintain multiple site offices across England and Scotland.

National Grid

National Grid originated when the gas transmission network and Central Electricity and Generating Board (CEGB) Electricity Transmission Network amalgamated in 1989 (then owned by the Distribution Network Operators) and eventually floated on the stock market 1995 (renamed to National Grid plc). National Grid owns and operates the transmission systems for gas and electricity in the UK and a number of states within the United States.

National Grid Transmission Electricity Alliances

National Grid Transmission (NGT) has developed 6 alliances for their UK electricity investment program; 4 substation alliances and 2 overhead and cable transmission alliances. NGT has partnered itself with multiple vendors and design companies in order to create these Alliances.

The 4 Substation Alliances are:

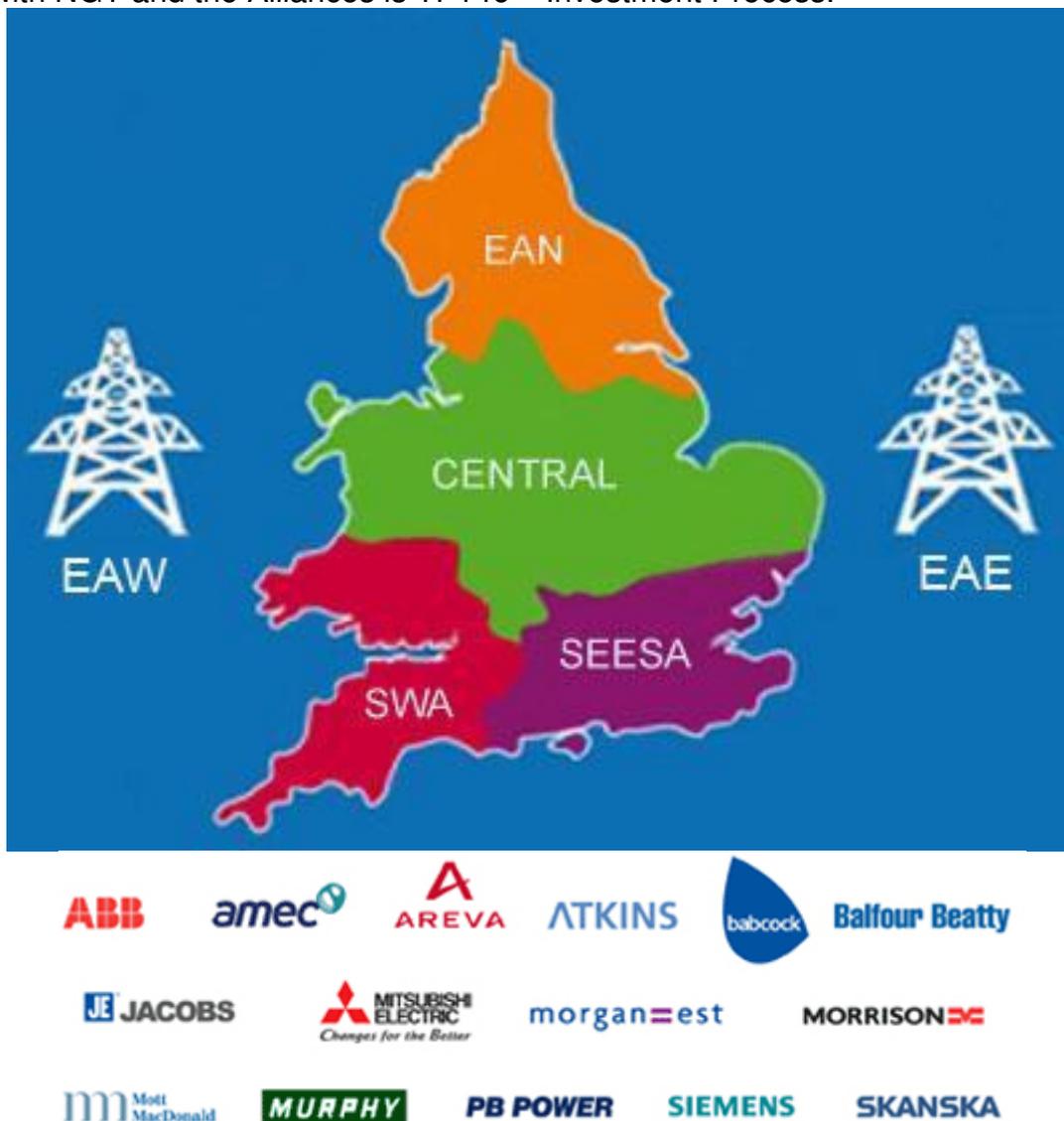
1. North Alliance – Siemens, J Murphy & PB Power
2. Central Alliance – ABB, Morgan Est & Atkins
3. South East Alliance – Areva, Skanska & Mott MacDonald
4. South West Alliance – Mitsubishi, Morrisons Utility & Jacobs

The 2 Overhead Line and Cable Alliances:

1. East Alliance – Balfour Beatty Group
2. West Alliance – AMEC, Babcock (Eve) & Mott MacDonald

Each Alliance consists of a mixture of employees from all respective Alliance partners, and National Grid.

Each scheme (or project) is subject to NGT Transmission Processes (TP). The major process that dictates the operation and interactions of the Alliances with NGT and the Alliances is TP146 – Investment Process.



TP146 – Investment Process

TP146 consists of 4 distinct Investment Procedure (IP) stages:

IP1 – Investment Definition

IP2 – Development

IP3 – Project Design and Detailed Design & Delivery

IP4 – Closure

As National Grid is both an energy transmission company, TP146 relates to both Electricity and Gas investments. The structure of TP146 shows the 4 stages to be sequential (see attached diagram).

At the conclusion of each IP Stage, a sanctioning committee (comprising of members of the respective scheme Alliance partners – including National Grid) approves or rejects the schemes progression to the next stage.

NGT are responsible for documenting the drivers, prioritisation and timing of the respective schemes. Typically, an IP1 is issued from 3-5yrs prior to the conclusion of the IP3 stage. Note that the conclusion of IP3 is typically when the system is energised.

IP1

An IP1 is supposed to be very limited in its form. It is intended to highlight a need case for the proposed investment, and give rough guidance as to the options it wishes to be investigated and developed. The documentation is developed and provided by NGT to the respective Alliance. An IP1 should contain enough information for the relevant Alliance(s) to develop the subsequent 2 stages of the Investment Proposal.

IP2

An IP2 is the option development (referred to as 'optioneering'). The respective Alliance is responsible for the development of the options (with a cost estimate +/- 10%), and for presenting the developed options to the respective scheme sponsor for option selection.

IP3

An IP3 develops the selected option to confirm feasibility. Documentation is developed to further define the scope of the scheme, and a cost estimate +/- 5% is calculated. At the conclusion of this, the scheme is sanctioned to proceed to Detailed Design & Delivery (DDD).

DDD

Detailed Design occurs outside of the Alliance in the respective Alliance's project delivery partner. Delivery of the project is done in conjunction with the Alliance and the delivery partners.

IP4

At the IP4 stage of the scheme, the scheme is reviewed. All required documentation is integrated into NGT's information management systems, and any future possible scheme improvements are analysed and where deemed necessary, integrated into future schemes.

Scheme Timing

The approximate timing for a typical/average scheme is as follows:

1. IP1 – expected to take up to 26 weeks to develop (from time of identification).
2. IP2 – expected to take up to 26 weeks to develop.
3. IP3 – documentation of the design is expected to take an additional 26 weeks however, the Detailed Design is expected to take a further 26-52 weeks, with Delivery (construction) to occur over a period of 1-2 years.
4. IP4 – expected to take 52 weeks.

Of course, timing for this is variable depending on the complexity of the works involved.

Connection Applications

In addition to the traditional network augmentations and refurbishments, NGT are also responsible for responding to Connection Applications from prospective generators. The timeframe for producing a connection offer is 90 days (note: NOT business days). As these options are presented to the connection applicant as purely offers for connection, IP stages 3 & 4 are not part of these schemes unless the applicant accepts the connection offer.

Connection Application Timings

1. IP1 – expected to take up to 6 weeks
2. IP2 – expected to take up to 4 weeks
3. Offer Sanction – 2 weeks

Sanctioning of the offer is done by the relevant Alliance in conjunction with NGT in order to ensure the relevant legal rigour that is necessary for 3rd party connections is applied.

As can be plainly seen, the timings mentioned previously do not allow for the same depth in preliminary design to be applied to a connection application; so typically, it is often referred to as an IP1.5 (for the purposes of TP146, it is still an IP2). More risk is built into these connections offers as there is more potential for unexpected costs.

National Grid/Balfour Beatty Electricity Alliance East

Works Planning

Outage Schedule

Due to outdoor works being exceptionally weather dependant in the UK, plant outages are planned for the months from April to October (this period is commonly referred to as the “outage season”). Outage seasons are scheduled up to 10 years in advance, and are confirmed at the beginning of the IP3 stage of works. Initial outage planning is scoped and provisional outages are booked during IP2 works. The upcoming outage season schedule is frozen at the end of the previous year.

Workbook

In order to plan for the upcoming works (a main reason for the development of alliances), yearly workbooks are maintained for each respective alliance. Each workbook outlines the upcoming works and is “locked down” at the beginning of each year. As the financial years end/begins on the 5/6 of April, the workbook lockdown date is the end of March.

Workbooks contain the list of schemes that each alliance is responsible for (including relevant KPI’s). This also allows for, if necessary, the transferral of work from one alliance to another. Workbooks contain all Investment works, with the focus being primarily on IP3 works.

Work Experience

Design & Development

Currently, I am working as a Development Engineer with the Electricity Alliance East (EAE). My initial placement in the Alliance was within the Design and Development group. This group is responsible for the initial Design and Option Development of schemes within the Alliance (IP2 Submissions).

Each scheme entered into the respective Alliance workbook is allocated a Development Engineer. The respective Development Engineer is responsible for the development of National Grids original scheme package (IP1) into a more detailed package (IP2) containing: preliminary scheme options, asset condition assessment, design documentation, staging, outage plans, resource plans, cost estimate, Safety Health Environment assessment, project risk assessment (& costing), scheme selection process, sanctioning presentation and various other documents as required by the specific scheme.

A Development Engineer is responsible for forming the design team (consisting of all necessary design personnel) in order to develop the scheme options and respective preliminary designs and outage plans. The Development Engineer acts as the interface between the Alliance and the respective NG departments. The development of scheme options leads to the

staging, Safety Health & Environment assessments, project risk assessments and eventual respective scheme option costing.

Salthome

The scheme I am responsible for is Salthome. This scheme entails 2 distinct parts:

1. The reconductoring of an existing transmission corridor
2. River Tees Crossing

Conductor uprating along the route is driven by multiple nearby power station connection offers and N-3 contingencies. The majority of the power stations are not confirmed; however IP1.5 offers have been made.

The most significant of these projects is a generating station located directly adjacent to the transmission corridor. This IP1.5 offer is the most likely to proceed and involves works associated with the establishment of a substation and cutting into the existing 275kV transmission line, and increasing the line capacity by increasing the operating voltage to 400kV. However due to the changes in the current economic climate, timing may be delayed by a number of years.

The Salthome scheme is considered as a purely investment scheme (as opposed to a connection scheme). The transmission corridor is a T arrangement, consisting of 3 circuits (two 275kV circuits and one 400kV circuit) on double circuit towers. The difficulties associated with the scheme are;

- transmission corridor runs through a petrochemical plant (with continuously operational petrochemical pipelines running UNDER and around transmission towers),
- transmission corridor runs through a steel refinery plant
- deep water crossings,
- nearby Natural England registered bird habitats
- protected wetlands (RAMSAR) crossings and
- numerous railway, road and pipeline crossings
- potential nearby power station development.

The River Tees is located in the north east of England, in the city of Middlesbrough. The existing transmission corridor bisects a petrochemical plant on the northern bank, and a steelworks on the southern bank, and at its extremities, runs approximately 2 kilometres from the coast. As a result, the crossing is difficult to maintain due to the general environment the transmission line exists in is an aggressive environment (Very High Pollution, and salt water), the traffic on the river, workplace health and safety (COMAH area), and the consents required to enter 3rd party properties. The condition assessments of the towers have been carried out multiple times in the past 10 years. The towers are approaching 50 years of age and the condition of them

reflects this and the environment (significant amounts of rust/oxidisation on the towers and assemblies).

Refurbishment of the line has been delayed due to the difficulty of justifying the River Tees crossing section of the work, changing project delivery (initially Salthome was planned to be CONSTRUCTED in 2002 – 4 years before the formation of the Electricity Alliances), absolutely minimal nearby available land, degraded land quality, and resourcing constraints.

The existing crossing towers are subject to the salt water environment and have developed extensive corrosion. In addition to this, the north shore tower is currently situated in a depression where water accumulates. This water is considered hazardous due to the mixture of chemicals that surround the petrochemical pipes.

The reliability of the transmission line is appearing to degrade. In the past 2 years, faults have occurred on it as a result of conductors separating at the joints.

There are currently four options under consideration:

1. Reusing the existing transmission towers
2. Reusing the existing transmission towers, and relocating the north shore tower
3. Cabling under the River, thereby removing the north and south shore towers
4. Rerouting the river crossing

Reuse of the towers requires the replacing of corroded steelwork and reinforcing of the towers requires the towers footing foundations to be strengthened. The proximity of the petrochemical pipes near the north shore towers mean that reinforcing of the foundations requires the movement of the pipes in order to allow work to occur in safety.

Relocating the tower to remove the need to relocating the north shore tower requires additional reinforcing. Additionally, the location of the new tower is restricted to being in-line with the existing crossing, thereby requiring a double circuit outage in order to build the tower.

The third option requires removing the crossing towers and replacing the crossing with cabling. Laid cable is improbable primarily due to two reasons: laid cable is not suitable in a tidal river, and the option of tunnelling is approximately 5 times the cost of a potential relocation of the crossing section.

Relocation of the crossing requires, on the northern side of the river, the towers to be relocated from the eastern side to the western side of the petrochemical works. Movement any further west is considered not feasible due to the extra works required, planned developments, sterilisation of commercial lands and Natural England wildlife sites.

In addition to this, on the southern side, the steelworks is experiencing difficulties and is predicted to mothball their plant. However, ownership of the land where the crossing is proposed to land will remain with the owners of the steelworks. The steelworks company is exceptionally reluctant to sell their land, as the proposed landing zone forms part of a mothballed deep water dock (one of three deep water docks in the UK).

As such, comprehensive option development needs to be done in order to assure the general community and relevant government agencies that the best option is being further developed, and any compulsory land acquisitions are necessary. The process whereby the community is engaged in the development is referred to as a Section 37 Consent.

Other Work

Carbon Budget

National Grid have committed to documenting its carbon footprint. This commitment is due to the commitment given by the UK government to reduce greenhouse gas emissions, and the resultant expectations placed on public utilities by OFGEM.

Alliances have been asked to jointly develop a methodology for developing carbon footprint budgets associated with investment works.

I am responsible for representing the Electricity Alliance East (the overhead lines portion of works). Workshops on this are ongoing, and are expected to take considerable time due primarily to the fact that it is believed that National Grid is the first company to consider conducting carbon footprint analysis' on construction works, INCLUDING the lifecycle of the components themselves.

It is expected that carbon budgets will be carried out within each schemes investment option development. The possibility that this may be included in the Alliance KPIs is also being developed.

Changes to National Planning Consent Process

This workshop was conducted to review the (about to be) newly developed Planning Consent process. This process supersedes and existing process by centralising the planning commission and significantly reducing the amount of recourse legal recourse available when development approvals are progressed through community consultation. These changes effectively make the development approval process a "one-shot" process whereby there is no recourse after a judgement is made. The changes also aid in the development of critical infrastructure due to the development of National Policy Statements (aimed at giving guidance for determining if a development is deemed critical or not). The changes have already received Royal Assent and are in the process of being brought into effect.

Other Experiences

Safety Stand Down Day 5 (SSDD5)

A Safety Stand Down Day (SSDD) is an annual day where all field staff are invited to attend a day that focuses on safety in the workplace, and is designed to inform the staff how other areas in the alliance are improving safety in the field. This day was developed by National Grid in response to field based staff identifying the need to understand what is done in the office, and how that affects what is done in the field.

SSDD5 was focused on safety in design, and how it relates to “Zero-Harm” (a Balfour Beatty workplace safety initiative). This initiative is part of the eastern alliances push for a zero incidence workplace. Balfour Beatty Chief Executive Ian Tyler has stated his desire to developing a workplace where there is *no realistic likelihood of a serious accident associated with our activities on site*² with a goal to achieve a 0 (zero) Accident Frequency Rate (AFR).

National Grid’s approach to safety in the workplace is termed “Road to Zero”.

Both “Zero Harm” and “Road to Zero” have aims of eliminating risks (wherever possible) and adequately managing unavoidable risks in the workplace.

Change Request Management

Change requests form part of the scheme management system employed by National Grid and the Alliances. The purpose of change requests is to modify the scope or KPIs associated with schemes as issues arise. Change requests can occur anywhere within the IP2 & IP3 stage of works, and is usually submitted by the scheme sponsor, or project engineer. The monitoring of these change requests is documented and communicated between the organisations by way of respective internal meetings within the Alliance, and within National Grid, and documented impact assessments submitted from each recipient to the respective requestor. Effectively, National Grid have the option of accepting or rejecting the change request/impact assessment as they see fit. If any conflicts arise, the issue is raised to management within each organisation and solutions are sought on that level.

² 31st October, 2008 - Ian Tyler (Balfour Beatty Chief Executive)

Future Planned Experience

In the upcoming 3 months, I plan on continuing my involvement with the Salthome scheme, as well as spending time within the programme management and commercial teams.

Programme Management

The programme management team is effectively a 'cradle to grave' team, responsible for the helping in the smooth delivery of schemes at all stages in the scheme's lifecycle.

Commercial

The commercial team is responsible for the costing and workbook development with the Electricity Alliance East. Here, I hope to gain a greater understanding of the development process of the workbooks, as well as the interactions between National Grid and the Alliance's costing teams.