Building Information Modeling
&
Data Management

Nuclear Strategy

Philip Isgar – BIM Task Group and Sunbeam Management Solutions Ltd
Andy Elsdon - National Nuclear Laboratory Ltd
Mark Bew – BIM Task Group

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V10

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>1 to 8</td>
<td>Various</td>
<td>Early drafts for discussion</td>
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<tr>
<td>9</td>
<td>Dec 2104</td>
<td>Included in the NIC Cost Reduction Working Group Report 4 Mar 2015</td>
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<td>10</td>
<td>Feb 2016</td>
<td>Updated to include progress since v9</td>
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Executive Summary

Centrally funded Government departments will be required to procure new built assets using BIM by 2016, departments have been given five years to mobilise capability in this area and Early Adopters have seen savings of up to 20% of CAPEX.

The nuclear industry is a significant holder of complex built assets and is keen to make use of these techniques to create efficiencies in the industry, by leveraging the core government departments. To do this they will have to create a sector capability and the purpose of this document is to outline the key drivers and tasks necessary.

A sector liaison resource, Philip Isgar (Sunbeam Management Solutions), has been made available from the BIM Task Group to assist with the coordination of this task. Work to date during the discovery phase identified several areas where progress in BIM strategy is already occurring in the nuclear sector and a strong presence within the NDA Estate is observed with a meaningful transition through implementation and BIM Level 2. Nuclear New Build show keen interest and the 3 utilities are at various stages in development. EDF’s existing fleet historically work on platforms with an inherent Common Data Environment, so all bodes well for the future.

Paul Howarth (NNL MD) has said;

‘The Nuclear Industrial Strategy identified BIM as an important collaborative approach in delivering a safe, secure and cost effective nuclear sector. The proposals outlined in this paper will further develop the BIM nuclear strategy and provide a solid foundation.’

Michael Fallon, Minister of State for Business & Energy stated at the 2014 ICE conference on Developing the UK’s Nuclear Industry;

‘We want to see a sector where strong project management, collaboration, effective planning, early engagement, knowledge and data capture and effective decision-making permeates throughout the whole of the supply chain to deliver projects to time and to budget.

This is why Government, through the Building Information Modeling for Nuclear Programme, will support the developers in this approach in helping to raise efficiency and quality in the supply chain. You will hear later today how this is progressing, and I look forward to consideration of the Strategy at the Nuclear Industry Council.’

Dame Sue Ion, Chair of the Nuclear Innovation Research Advisory Board (NIRAB) at a recent meeting with Nuclear Innovation Research Office (NIRO) said;

‘Capturing information and knowledge in a common data environment from all the parts of the asset lifecycle and ensuring that knowledge is successfully archived for both the present and future usage represents tremendous potential value to UK plc.’

David Hancock (Cabinet Office, Head of Construction) in an Interview for the upcoming ACE National Conference 2016 Building Teams: Boosting Productivity, 15 March 2016, London, responded to question about BIM (Ref 1) thus;

Q “Is the mandatory requirement for use of BIM 2 on government projects from 2016 forcing change on the industry to good effect?”
DH “Yes, I believe so. BIM 2 is a massive change and there is a lot of work to do to embed BIM level 2 throughout the industry which will take years. But whether we like it or not BIM is forcing a new way of working. Along with early contractor
involvement it is obliging collaboration; that leads you to standard products and offsite manufacture. Long term industry structural change has to follow."

Q “What is the key benefit of BIM for clients?”
DH “It’s understanding the supply chain right down to manufacturing, particularly what it costs to bespoke something. BIM will help us. It will really help educate clients so they understand every time they ask for something, they can quantify the on-costs and whether there is a better solution to fit the demands without having to go too bespoke.”

This strategy at v9 was included in the paper ‘Reducing the Future Cost of Nuclear Power’ (Ref 2) that was submitted by the Cost Reduction Work-stream to Nuclear Industry Council in November 2014 and March 2015.

Key Recommendation 1

"Developers should ensure a high level of design maturity before significant work commences, with a minimum of changes to design as the project progresses and standardized designs for subsequent plants. To ensure this is successfully achieved Developers and the supply chain must as early as possible jointly invest in a common digital engineering and management platform for each project that can be used throughout their specific supply chain for BIM based and general information management and infield verification

Version 10 of the BIM Nuclear strategy document updates on progress made to February 2016. To ensure that evolution of the overall sector strategy continues, a series of next steps have been identified.
Building Information Modeling & Data Management
Nuclear Strategy

Introduction

The Government Construction Strategy has mandated the full implementation of BIM to Level 2 by 2016, the initial policy decision in May 2011 being further reinforced by Francis Maude, Minister for the Cabinet Office in July 2012.

“The Government’s four year strategy for BIM implementation will change the dynamics and behaviours of the construction supply chain, unlocking new, more efficient and collaborative ways of working. This whole sector adoption of BIM will put us at the vanguard of a new digital construction era in the UK to become the world leaders in BIM”

BIM as a concept is relatively straightforward to understand. The BIM Task Group uses the following simple definition:

‘As the adoption of information rich Building Information Modelling (BIM) technologies, process and collaborative behaviours that will unlock new more efficient ways of working at all stages of the project life-cycle’

To aid the rapid delivery of BIM into the market, the Government and Industry have joined together to form the BIM Task Group, which is responsible for the delivery of BIM into the seven centrally funded departments by 2016. The Nuclear industry lies outside of this direct mandate, but this is both under review and a clear candidate to benefit from the capital and operational improvements available from the deployment of good data and BIM management processes.

However, it is clear that the implementation of BIM has its areas of complexity; people, process and technology. Evaluation of the benefits of BIM looks across the whole of the project lifecycle. Realising the full benefit involves integration and collaboration into the extensive Supply Chain supporting the Department. In 2012, BIS issued the ‘Industrial Strategy: government and industry in partnership’ Building Information Modeling. A quote of significant relevance to the introduction of this strategy and the nuclear industry is,

‘BIM will be the future IT solution in China; The Chinese Government is strongly supporting BIM’ Tsinghua University, Beijing’

In March 2013, HMG issued Industrial Strategy: The UK’s Nuclear Future. Together, and in alignment, the Strategy for BIM reinforces and underpins the Governments Industrial Strategy for Construction – Construction 2025 issued in July 2013 (updated
Oct 2015) (Ref 8). Six workstreams are being developed to deliver this strategy; People and Skills; Green and Sustainable; Supply Chain and Business Models; Smart and Innovation; Exports and Trade; Industry Communication. BIM features in these new strategies under the heading “Smart and Innovation”.

The three key activities of the Smart (BIM) strategy are to

1. Continue the Level 2 (Enabling) strategy to full adoption by 2016
2. Enable Growth through the development of Level 3 (In April 2015 HMG issued ‘Digital Built Britain which embraces Level 3).
3. Continue to lead

The purpose of this document is to explore how these three tasks can be applied to the Nuclear sector as we emerge into a growth market.

**What is BIM?**

Building Information Modelling (BIM) is a collaborative way of working, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets. BIM embeds key product and asset data and a 3 dimensional computer model that can be used for effective management of information throughout a project lifecycle – from earliest concept through to operation.

<table>
<thead>
<tr>
<th>Level 0 BIM</th>
<th>In its simplest form, level 0 effectively means no collaboration. 2D CAD drafting only is utilised, mainly for Production Information (RIBA Plan of Work 2013 stage 4). Output and distribution is via paper or electronic prints, or a mixture of both. The majority of the industry is already well ahead of this now (source: NBS National BIM Report 2014).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 BIM</td>
<td>This typically comprises a mixture of 3D CAD for concept work, and 2D for drafting of statutory approval documentation and Production Information. CAD standards are managed to BS 1192:2007, and electronic sharing of data is carried out from a common data environment (CDE), often managed by the contractor. This is the level at which many organisations are currently operating, although there is no collaboration between different disciplines – each publishes and maintains its own data</td>
</tr>
<tr>
<td>Level 2 BIM</td>
<td>This is distinguished by collaborative working – all parties use their own 3D CAD models, but not necessarily working on a single, shared model. The collaboration comes in the form of how the information is exchanged between different parties – and is the crucial aspect of this level. Design information is shared through a common file format, which enables any organisation to be able to combine that data with their own in order to make a federated BIM model, and to carry out interrogative checks on it. Hence any CAD software that each party used must be capable of exporting to one of the common file formats such as IFC (Industry Foundation Class) or COBie (Construction Operations Building Information Exchange). This is the method of working that has been set as a minimum target by the UK government for all work on public-sector work, by 2016.</td>
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</table>
Level 3 BIM

Currently seen as the holy grail, this represents full collaboration between all disciplines by means of using a single, shared project model which is held in a centralized repository. All parties can access and modify that same model, and the benefit is that it removes the final layer of risk for conflicting information. This is known as ‘Open BIM’, and the UK government’s target date for public-sector working is 2019. Current nervousness in the industry around issues such as copyright and liability are intended to be resolved – the former by means of robust appointment documents and software originator/read/write permissions, and the latter by shared-risk procurement routes such as partnering. The CIC BIM Protocol makes provision for these. Digital Built Britain – Level 3 Building Information Modelling – Strategic Plan has been issued.

To expect any market to migrate from an analogue, paper world to one managed through digital means was considered by the Government client and the market to be too big an ask in one step so a series of artificial “steps” have been devised to enable both the client base and the supply chain to “gear up” to become both market ready and productive. These steps are described in the figures below.

UK Government Digital Plan of Work (Ref 11)  BIM Stage Development

It is the ambition of the BIM Task Group to achieve compliance with Level 2 by 2016. Level 2 is defined by a number of documents which are either available (free of charge from http://www.bimtaskgroup.org/) or are in final production and will be available by the beginning of H2 2014. These are described in the table 1 below. It is expected that these documents once complete will be “packaged” and will form an accredited product set with associated certified training and support for the immediate legacy.

Table 1 Primary Standards and Guidance Notes

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>PAS 55-1:2008</td>
<td>Specification for the optimized management of physical assets</td>
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<td>PAS 55-2:2008</td>
<td>Guidelines for the application of PAS 55-1</td>
</tr>
<tr>
<td>BS ISO 55000:2014</td>
<td>Asset management. Overview, principles and terminology</td>
</tr>
<tr>
<td>Standard</td>
<td>Description</td>
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<tr>
<td>BS ISO 55001:2014</td>
<td>Asset management. Management systems. Requirements</td>
</tr>
<tr>
<td>BS ISO 55002:2014</td>
<td>Asset management. Management systems. Guidelines for the application of ISO 55001</td>
</tr>
<tr>
<td>BS110000:2010</td>
<td>BS 11000 is a two-part standard developed by BSI with industry and government and provides a framework to support collaborative working relationships. Part 1, BS 11000-1 contains the requirements and principles of effective collaboration - the key stages. Part 2, BS 11000-2 provides additional practical guidance to aid implementation of 11000-1.</td>
</tr>
<tr>
<td>BS 1192:2007</td>
<td>Collaborative production of architectural, engineering and construction information – Code of practice To make the most of the collaborative working process, a common methodology for managing the data produced by and between all parties must be used. This should include the naming of data as well as a process for exchanging data.</td>
</tr>
<tr>
<td>PAS 1192 Pt 2:2013</td>
<td>Specification for information management for the capital/delivery phase of construction projects using building information modelling. This document provides information on the management of data produced within a BIM project environment, and supplements the processes and procedures contained in BS 1192:2007.</td>
</tr>
<tr>
<td>PAS 1192 Pt 3:2014</td>
<td>Specification for information management for the operational phase of assets using building information modelling. This is a partner doc to PAS 1192-2 focusing on the operational phase of assets for both new and old buildings and like PAS 1192-2, it applies to both building and infrastructure assets.</td>
</tr>
<tr>
<td>BS1192 Pt4:2014</td>
<td>Fulfilling employers information exchange requirements using COBie</td>
</tr>
<tr>
<td>PAS1192 Pt5:2015</td>
<td>Specification for security-minded building information management, digital built environments and smart asset management. It outlines security threats to the use of information during asset conception, procurement, design, construction, operation, and disposal. It addresses the steps required to create and cultivate an appropriate security culture necessary to enable business to unlock new and more efficient processes and collaborative ways of working.</td>
</tr>
<tr>
<td>The BIM Protocol CIC 2013</td>
<td>The Protocol identifies the Building Information Models that are required to be produced by members of the Project Team and puts in place specific obligations, liabilities and associated limitations on the use of the models. The Protocol can also be used by clients who require the adoption of particular ways of working – such as the adoption of a common naming standard.</td>
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**Detailed Standards and Guidance Notes**

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<tr>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>BIP 2207</td>
<td>Building information management. A standard framework and guide to BS 1192</td>
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| BS 6953:1988 | (ISO 7078:1985) Glossary of terms for procedures for setting out,
<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS 7000-4:2013</td>
<td>Measurement and surveying in building construction (including guidance notes)</td>
</tr>
<tr>
<td>BS 8541-1:2012</td>
<td>Design management systems. Guide to managing design in construction</td>
</tr>
<tr>
<td>BS 8541-3:2012</td>
<td>Library objects for architecture, engineering and construction. Recommended 2D symbols of building elements for use in building information modelling</td>
</tr>
<tr>
<td>BS 8541-4:2012</td>
<td>Library objects for architecture, engineering and construction. Defines properties and multiple levels of information including properties required for specification and selection and environmental, cost and social impacts</td>
</tr>
<tr>
<td>BS 8541-5:2015</td>
<td>Library objects for architecture, engineering and construction. Covers assemblies - the sharing of sub-models representing combinations of components and spaces covering naming, classification and nesting. Code of practice</td>
</tr>
<tr>
<td>BS 8541-6:2015</td>
<td>Library objects for architecture, engineering and construction. Covers product declarations - the sharing of data expected from product declarations, labelling and environmental tables. Aims to offer IFC and IFCXML and COBie representations incl waste data in standardised printed forms</td>
</tr>
<tr>
<td>BS ISO 22263:2008</td>
<td>Organization of information about construction works. Framework for management of project information</td>
</tr>
</tbody>
</table>
A key requirement to implement PAS 1192 is the use of Employers Information Requirements (EIRs).

Essential components to develop the model diagram.

Engagement Process

The BIM Task Group are resourced to engage and assist government client departments to develop unique departmental delivery plans for BIM into each in scope department. This process is usually formed of four phases.

1. Processes Definition and Key Decisions
2. Technical Systems and Tools
3. Commercial Processes
4. Training, Awareness and Communications

The detailed activities for these stages are documented elsewhere and the conclusions brought together into an implementation document. Once the key activities and methods are agreed in this document a series of Early Adopter projects are identified to test both the team and the plan, to gather lessons learnt and refine the specifics of the processes unique to the sector. Once complete a set of template and knowledge is available to train and support the remainder of the client and supply chain team.

As discussed above the nuclear sector falls outside of the core focus of the BIM Task Group, but it is considered of such significance that Philip Isgar (Sunbeam Management Solutions) was appointed as Sector Liaison Manager to identify potential opportunities to derive benefits. To enable the activities we have described here a significant amount of the resources will have to come from "within the sector".

Benefits

For all projects to succeed there needs to be clear articulation of success and benefit. This has been a clear mantra of the BIM Task Group to date and the processes defined by the documents described above and the Early Adopter programme in other departments to date is showing a significant benefit. The areas where BIM benefits can be achieved are shown in the figure below over the typical lifecycle of a nuclear asset. Also shown is a mapping of UK Nuclear Site Licence conditions across the BIM asset lifecycle.

- Interpretation
- 2 Marking of the site boundary
- 3 Control of property transactions
- 4 Restrictions on nuclear matter on the site
- 5 Consignment of nuclear matter
- 6 Documents, records, authorities and certificates
- 7 Incidents on the site
- 8 Warning notices
- 9 Instructions to persons on the site
- 10 Training
- 11 Emergency arrangements
- 12 Duty authorised and other suitably qualified and experienced persons
- 13 Nuclear safety committee
- 14 Safety documentation
- 15 Periodic review
- 16 Site plans, designs and specifications
- 17 Management systems
- 18 Radiological protection

- 19 Construction or installation of new plant
- 20 Modification to design of plant under construction
- 21 Commissioning
- 22 Modification or experiment on existing plant
- 23 Operating rules
- 24 Operating instructions
- 25 Operational records
- 26 Control and supervision of operations
- 27 Safety mechanisms, devices and circuits
- 28 Examination, inspection, maintenance and testing
- 29 Duty to carry out tests, inspections and examinations
- 30 Periodic shutdown
- 31 Shutdown of specified operations
- 32 Accumulation of radioactive waste
- 33 Disposal of radioactive waste
- 34 Leakage and escape of radioactive material and radioactive waste
- 35 Decommissioning
- 36 Organisational capability

Published case studies (e.g. HM Prison at Cookham Wood (Ref 3)) are indicating around a 20% saving in capital cost and we expect this to continue as further projects reach completion. The location of these savings appear to be in two key areas.

Enterprise Life-cycle Management
1. Better understanding of the project scope, brief and emergent early design. To enable de-scoping and optimization
2. Better understanding of the design by the supply chain to enable the removal of contingency

We expect these to develop as project teams and client’s become more familiar with the information and toolsets develop. All future case studies will continue to be published at http://www.bimtaskgroup.org/ and the Cabinet Office website.

**Current Nuclear Position**

In April 2013 the BIM Task Group supported by the National Nuclear Laboratory (NNL) entered into a structured Discovery Phase with the nuclear industry to establish the level of industry knowledge and whether industry application of BIM was evident.

A number of sectors were identified, each one requiring its own Discovery Strategy. The key organizations in the development and implementation of BIM are the Site License Companies (including prospective SLC’s). These organisations have the vast majority of the expenditure and have every incentive to seek efficiencies in their operations. The supply chain is also heavily engaged in developing their own BIM strategies driven by competitive advantage in the marketplace.

**Table 2 Key Players in BIM Nuclear**

<table>
<thead>
<tr>
<th><strong>HMG Agencies etc</strong></th>
<th><strong>DECC/BIS</strong></th>
<th><strong>NDA</strong></th>
<th><strong>ONR/EA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NDA Non Operational Assets</strong></td>
<td><strong>NDA Nuclear Estate</strong></td>
<td><strong>Private Utilities</strong></td>
<td></td>
</tr>
<tr>
<td>Site Licence Companies (inc prospective SLC’s)</td>
<td>Sellafield Ltd</td>
<td>EDF Energy (existing Fleet and New Build)</td>
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<tr>
<td></td>
<td>RWM Ltd</td>
<td>NuGen</td>
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<td></td>
<td>Magnox Ltd</td>
<td>Horizon</td>
<td></td>
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<td></td>
<td>Dounreay Site Restoration Ltd</td>
<td>Urenco</td>
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<td></td>
<td>Research Sites Restoration Ltd</td>
<td>SFL</td>
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<tr>
<td>Supply Chain</td>
<td>Tier 1 Contractors</td>
<td>Emerging Technologies (e.g. Small Modular Reactors)</td>
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<td></td>
<td>SME’s</td>
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</tbody>
</table>

Each organisation has differing demands and liabilities regarding the need and use of data for delivery, operation and decommissioning. Each has a different commercial model and levels of technical and commercial risk. Further discovery work will need to be undertaken to identify how these key factors influence the final Nuclear Sector BIM Strategies.

**Current BIM Activities – NDA Estate**

The NDA Strategy (published Jan 2016 currently in a consultation phase) identifies Information Governance as a Critical Enabler with the objective;
“To optimise value from NDA knowledge and information assets in a compliant and secure manner, investing only in that which needs to be retained to deliver the NDA’s mission.”

This will provide the framework for Site License Companies to develop their own Information Governance working arrangements which will include BIM where applicable.

NDA Properties Ltd have already declared in the last Annual Report the completion of 1 Albion Square in Whitehaven, have an intention to progress the refurbishment of Hinton House in Warrington and will adopt BIM Level 2 on the NDA Nuclear Archive Caithness where ‘spade in the ground’ has now happened.

The GDF Project managed by NDA subsidiary RWM Ltd has already prepared an overarching generic BIM Strategy (Ref 7) that will establish BIM at the very highest level in the knowledge management chain. An independent review of the strategy has been undertaken and an approach developed to categorization of the Repository structure and contents.

Sellafield Ltd are developing their approach to Digital Engineering and BIM, a number of current engineering projects (e.g. SMF, BEPPS/Dif) have adopted BIM principles each developed to meet specific project/supply chain needs. This provides valuable experience with which to meet the Enterprise wide needs for information. An aspiration to use BIM principles will provide a solid basis for this.

The Sellafield Ltd Silo Maintenance Facility (Ref 4) project team comprises of Cavendish Nuclear & Balfour Beatty has been co-located with Sellafield Ltd (SL) since July 2011 as a "one delivery" team. The project is currently moving from detailed design phase towards construction with SL in the Intelligent Customer role. The project has an agreement to use BIM throughout, including construction, testing and commissioning stages with the opportunity to integrate the construction programme as it develops. At a BIM Roundtable organized by 'New Civil Engineer – (NCE)' Philip Isgar quoted that the work on this project was both exemplary and a 'game-changer' through its visualization and crane management strategy 30% had already been saved on the design programme.

Key successes in SMF has been the use of Employer’s Information Requirement (EIR’s) and the role of the Intelligent Customer. Through each of the contract phases EIR’s were defined and agreement of soft landings.

The project began BIM the process during concept phase and wrote a BIM “project specific strategy” and got buy in from company to develop new CAE procedures with agreed training of project staff (including contractor’s) to up-skill and use industry standard software taking the approach of SQEP disciplined designers to be responsible and accountable for their own native models...i.e. Architects only can edit Architects model etc.

A One team in One office approach although now has two teams separated by 250 miles but it is still fully integrated. A Co-ordinated Federated Model is used to develop the building with native (disciplined specific) models feeding into it. PAS 1192-2 has been used as the basis for our EIR’s which informed the Project execution plan (PXP) and the contractual Works Information and no COBie data drop was used because the client is responsible for Cradle to the grave asset.

The main benefits of the BIM approach have been;

- Safety reviews (HAZCON’s) used the model
- Increased confidence in the design and understanding
- Monitoring of material quantities
- Design Reviews (gated process)
- Stakeholder engagement (NDA, Internal Exe, NII & ONR)
- Pre-ops & commissioning.
- System Engineers

Greater Manchester-based steelwork and engineering contractor William Hare Group, whose recent projects include London’s Walkie Talkie tower and the conversion of the Olympic Stadium roof, has gained certification as PAS 1192-2 compliant and are already being used as steelwork supplier to SMF.

Magnox Ltd at Hunterston ‘A’ have a project which is at Care and Maintenance (C&M) Entry phase which will start to de-plant the reactor buildings in April 2015. The project team believe this as an opportunity to set out the process in alignment with BIM Level 2 (Ref 5, 9). The BIM benefits on the run up to C&M are

- Reduce the Cost of the Decommissioning Programme through better planning and better collaboration
- Improve Cost Certainty for the Programme through better scope definition and better estimates
- Facilitate Efficient Waste Logistics
- Facilitate Transfer of Information
- Facilitate Safe Delivery of Work
- Facilitate Stakeholder Engagement
- Facilitate Regulator Confidence

**Current BIM Activities – Non NDA Estate**

Nuclear Liabilities Fund have expressed interest in the BIM strategy and a presentation was made on 14th November 2014 to allow it to be shared to the Board. More recently during July 2015 a presentation was made to the Chief Engineer at Heysham 2 and a promising way ahead looks promising as the EDF Energy existing fleet approach extension of life activities ahead of decommissioning.

EDF Energy New Build, as SLC Reactor developer, is developing a BIM strategy using Waldeck Ltd, a specialist consultancy organization. Employer based guidance documents covering Level of Detail and Level of Information in relation to specific building design sequence and Asset codification requirements have been identified. Detailed 3D modelling standards and guidance have been developed, covering best practice, deliverables, interoperability requirements, governance of Model based Asset tagging and lifecycle management including Model Asset tagging, facilitating; schedule outputs, structured coordination exercises, timeline and sequence based scenario analysis, cost and procurement activities.

The approach was validated by successful completion of an extensive multi-disciplinary case study providing lessons learned and training direction. This is the first time that this has been done anywhere in the world and now positions EDF as a forward thinking client and a global leader in Big Data & Information Management.

NuGen have proactively invited the BIM Task Group Representative, National Nuclear Laboratory, Sunbeam Management Solutions and Waldeck Ltd (thus embracing the direct support from SME and industry experts) to complement their strategy as they develop the Initiation Plan for Moorside.

Horizon are in an organisational development phase and are aware of BIM potential and will be developing their own BIM strategy.
URENCO have now established a contract on its Capenhurst site where the ‘Legacy Cylinder Facility’ will develop a Reference Design, Base-line Programme and associated Cost Base working on BIM 3D, 4D and 5D principles.

The National Nuclear Laboratory Ltd and University of Liverpool have developed INDE® a conceptual framework for a digital environment (Ref 6) from the prototype design of nuclear plants through operations and decommissioning to storage and waste disposal. A series of interconnected multi-scale, multi-physics computational models linked to the real-world by data. Implementation of INDE® will be dependent on future advances in High Performance Computing. The data itself will be acquired through innovations in measurement, analysis and uncertainty and will be applied through projects lifecycle. Implementation of INDE® will lead to shorten development times, reduced costs and increased credibility, operability, reliability and safety.

An important aspect in the development of BIM strategies in the Nuclear Sector is to ensure that experiences and best practice (including benchmarking) both across the sector and with other industrial sectors are readily shared. A number of events have taken place (e.g. Ref 10) giving the opportunity for other sectors such as Rail, Highways and the Built Environment to present their positions.

**Next Steps**

1. Establish suitable BIM Governance arrangements to act as a guiding coalition to set the Sector Goals for BIM implementation. This could be part of the work of the Nuclear Industry Council and its sub groups and/or the work of the Nuclear Industry Association through the New Build Project Board and Construction Best Practice Group.

2. Develop the overall Sector Strategy for Level 2 BIM identifying all the issues identified above and setting departmental goals, applicable across the full project lifecycle, developed and signed off by all Key Stakeholders. The resource and funding for this will needs to be developed and agreed.

3. The overall Sector Strategy would establish a timeframe, outline programme and headline dates based on the work that is being carried out and sponsored by the key organisations shown in Table 2. In certain organisations early key dates may be achievable, for example:
   - Target BIM level 2 implementation and take up by Dec 2016
   - Optimum benefits by Dec 2016 with industry adoption by March 2017
   - Identify and promote Early Adopter Projects such as,
     - The Silo Maintenance Facility (SMF)’ a Sellafield Ltd project
     - The Geological Disposal Facility (GDF)’, an NDA – RWM Ltd project
     - Magnox Ltd Hunterston ‘A’ Reactor
     - NDA Properties Ltd ‘Property Portfolio’
     - URENCO ‘Legacy Cylinder Facility’

4. Success has been measurable as discovery as now moved to development and implementation. Each organisation will not move at the same pace and there will be the opportunity to learn from each other. Collaboration and knowledge sharing is seen as being key to achieving BIM Stage 2 by 2016 and mechanisms to facilitate this should be a key feature of the sector strategy.
References

Ref 1  http://www.ace-conference.co.uk/time-to-stop-debating-and-start-delivering-efficiencies-hancock-tells-industry

Ref 2 Nuclear Industry Council Cost reduction working group report Mar 2015


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