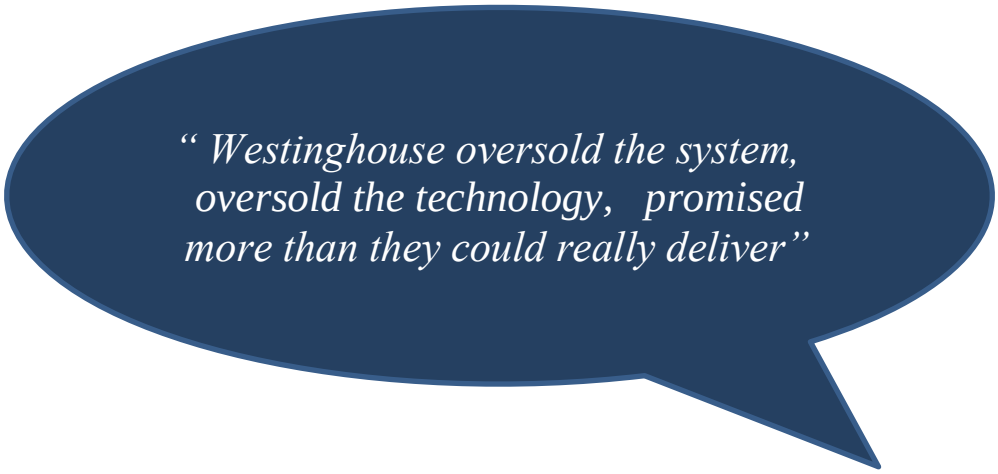


[China, 15th January 2015]

Moorside Build & Job Projections
- All Spin and No Substance –

An Assessment by CORE. February 2015

[Cumbrians Opposed to a Radioactive Environment]

Moorside Project Background

On 10th September 2008, following meetings with all those who had expressed an interest in the Authority's land assets, the Nuclear Decommissioning Authority (NDA) announced the start of its initial tranche of land sales around the nuclear sites of Wylfa, Oldbury and Bradwell.[1] The announcement confirmed that its land-holding adjacent to Sellafield would be subject to a separate statement. In April 2009 the winning bids for the Wylfa. Oldbury and Bradwell land auction were named by the NDA[2] - Germany's EoN and RWE for Wylfa and Oldbury, and France's EDF for Bradwell. Six weeks later, the start of the disposal process for land adjacent to the nuclear site at Sellafield in Cumbria was announced,[3] again with the invitation for expressions of interest.

The invitations for the land adjacent to Sellafield, some 200 hectares, drew expression of interest from six bidders[4], all of whom wanted to build new reactors on the proposed site. Of these bidders only EoN and EDF agreed to the public disclosure of their interest, though it is likely that RWE was also among the bidders given its similar interest in the neighbouring Kirksanton and Braystones sites. The winner of the Sellafield land auction was identified by the NDA[5] in October 2009 as the consortium consisting of Scottish & Southern Electricity (SSE), Iberdrola (Spain) and GDF Suez (France), now known as NuGeneration or NuGen.

That the Sellafield land auction had been delayed, and the winner announced six months after the other land auctions had been awarded - together with a waning interest in Sellafield by both EoN and EDF who had by then secured the southerly sites - had already caused consternation amongst the West Cumbrian nuclear lobby. It feared that if Sellafield missed the 'new-build boat' and failed to make the Government's final list, their plans to keep the site and West Cumbria at the cutting edge of all things nuclear in the UK would be dashed .Those concerns were voiced in a letter to the Office for Nuclear Development (DECC) from local MP Jamie Reed[6] who pleaded that ***'the present process does, in some respects, disadvantage Sellafield relative to other potential sites particularly in regard to its timing'*** and that ***'we hope therefore that you will maintain a degree of flexibility in the criteria and process which emerge from the current consultation so that Sellafield is not further disadvantaged'.***

There can be little doubt that, without such lobbying, the Sellafield site would not have made the Government list on merit alone. For the green-field site with questionable geology is also highly remote from where electricity was actually needed in the UK. These and many other drawbacks to the site will undoubtedly come under the closest scrutiny when NuGen finally divulges, through public consultation, the results of its current site investigations and how it intends to meet its new-build schedule.

As if attempting to make the best of the less than optimum site was not sufficiently challenging, NuGen also faces an uphill struggle against the unrealistically tight schedule projected by Toshiba/Westinghouse for the construction and operation of three AP1000 reactors – a Pressurised Water Reactor (PWR) with an output of 1,110 MWe – in just six years.

Whether the consortium's claim that Moorside ***'will be UK's biggest new nuclear output from a single site'*** is underpinned with robust evidence and astute forward planning - or yet another nuclear pretension that is 'all spin and no substance' is the subject of this CORE assessment. It examines a number of site-related hurdles that must be cleared before an investment decision can be made in 2018, the confusing employment projections and the major threats to the construction schedule due to start in 2020.

February 2015.

Milestones on the road to Moorside

Having been abandoned by two of its original members in 2011 and 2013 (Scottish & Southern Electricity and Iberdrola), the NuGen consortium is today comprised of Toshiba/ Westinghouse and GDF Suez. As a wholly-owned subsidiary of NuGen's current majority shareholder Toshiba, Westinghouse plans to quit the consortium *'within the first year of plant operations'* [7].

- **5th April 2009**. The green-field site adjacent to Sellafield selected by Government as one of eleven sites in the UK with potential to host new build reactors.
- **28th October 2009**. NDA sells 190 hectares (ha) of land adjoining Sellafield to a consortium comprised of Iberdrola, GDF Suez and SSE for £70M.
- **29th November 2010**. Establishment of NuGeneration (NuGen) as a joint venture with plans to develop up to 3.6GW of new nuclear power generation
- **4th February 2011**. Consortium plans to start building a new reactor in 2015 which would be commissioned in 2023.
- **8th August 2011.** NuGen initial meeting with Infrastructure Planning Commission (IPC) to discuss its project in West Cumbria.
- **23rd September 2011.** SSE pulls out of NuGen consortium
- **8th November 2011**. Copeland Council approves NuGen planning application for temporary site investigation and characterisation works – borehole drilling etc.
- **1st December 2011**. NuGen announces decision to name the site 'Moorside'.
- **20th March 2012**. Regulator OfGem grants Generation Licence to NuGen
- **26th September 2013**. Government rumoured to be considering re-auction of Moorside site due to frustration at lack of progress in project development.
- **16th December 2013**. Iberdrola to sell its stake in NuGen to Toshiba/ Westinghouse
- **16th January 2014**. Toshiba subsidiary Westinghouse announces that it is to supply AP1000 reactors to Moorside
- **1st May 2014**. An extension of the land option agreed between NDA and NuGen.
- **30th June 2014**. Toshiba becomes NuGen's majority shareholder after signing share deal with GDF Suez. Final investment decision put back (from 2015) to end of 2018.
- **16th September 2014**. Westinghouse announces that it will quit consortium NuGen within the first year of reactor operations.
- **2015.** NuGen's first public consultation on Moorside project to be run.

Summary – Moorside Realities

The target date of 'late 2018' for making its investment decision presents the first major milestone for NuGen in its new-build plans for Moorside. If reached, reactor construction would then start in 2020, but any slippage along the road to that investment date carries forward a similar delay to the construction schedule - optimistic by any standard and one riddled with uncertainties - that projects build completion and production of electricity from three 'first of a kind' AP1000 reactors within the six-year time frame 2020-2026.

To meet the currently proposed investment date, there are a number of site-related, regulatory and planning issues to be resolved before a decision can be made. These include the site's less than optimum geology, the upgrading of the National Grid transmission system and the satisfactory conclusion of the Generic Design Assessment of the AP1000 reactor. All have the potential to delay the process and put back the decision date by months if not years – a setback already being experienced by other new-build developers throughout the world, including EDF's Hinkley Point C project in Somerset.

For Moorside, the investment decision date has already been put back from 2015 to 2018 and there is nothing to suggest that the latter is guaranteed. Even if met, the construction stage of the project – from 2020 or later – faces the significantly greater and 'schedule-busting' threat to the construction phase posed by the fabrication of over 600 modules, many weighing hundreds of tons that will make up the three reactors. As much a novelty for the UK as for Westinghouse, the sheer scale of this requirement has never before been undertaken and is wholly dependent not only on the national availability of competent fabricators but also on overcoming the significant logistical problems of module delivery posed by West Cumbria's inadequate transport infrastructure.

Based on current evidence and Sellafield's recent experience of module fabrication and delivery (the Evaporator D project), it is inconceivable that this untried and untested element of NuGen's project can be delivered on time. That a delay of several years is inevitable is more than supported by the chronic progress of Westinghouse AP1000 projects overseas. For without exception, the build time for all overseas projects (twin reactor projects on two sites in both the US and China) now extends to between six and seven years - and still counting - largely as a result of module fabrication and delivery problems.

Whilst NuGen and its partners remain in collective denial of the problems overseas, it is reasonable to predict that Moorside's reactor construction stage will be compromised to a similar or greater degree. This would see completion of reactor construction pushed back towards 2030 at best and, should the investment decision not have been made by late 2018, even further into that decade.

The inference to be drawn from the catalogue of uncertainties and unsubstantiated claims in NuGen's project schedule, together with the AP1000 construction experience of Westinghouse overseas as exposed in this CORE assessment, is that the Moorside project is indeed based on spin – and has no substance. Adding incontrovertible support to this inference is the recent view of a nuclear expert in China that Westinghouse had "oversold the system, oversold the technology and promised more than they could really deliver" – a damning indictment that wholly undermines the viability of NuGen's current plans.

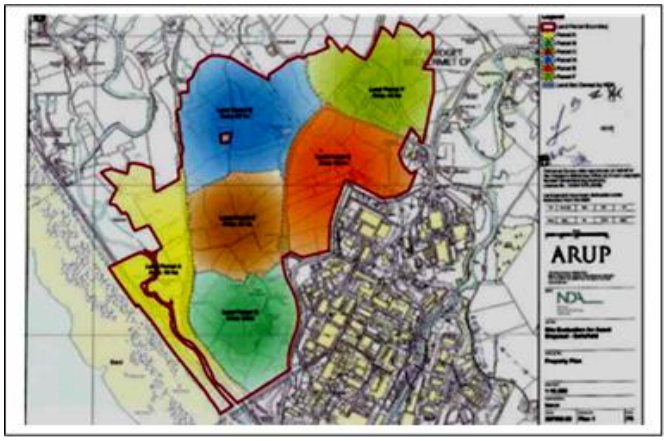
Should the project go ahead – to whatever timeline – a sizeable workforce will be required to build and operate the reactors. Many of the job projections published for Moorside in recent years are clearly overstated, and whilst Government, Industry and Developer collectively refuse to substantiate their own figures (14,000-21,000 jobs), a comparison with the current workforce employed on AP1000 projects overseas suggest an estimate of 5000 construction (at peak) and 900 operational jobs for three reactors. The final count is likely to include many workers transferring from Sellafield's closed-down reprocessing facilities, those provided directly by Westinghouse itself, and from West Cumbria's transient contractor workforce.

Moorside Assessment - Shovels in the ground

Figure 1

With the Sellafield complex lying along its south-east boundary, Figure 1 shows the 199 hectares (ha) under current investigation by NuGen broken down into its constituent land parcels.

The completion of satisfactory tests would allow NuGen to *'exercise its 'option to purchase the most appropriate land depending on the area that is found to be the most suitable'*. Construction of three AP 1000 reactors is projected to have a footprint of around 100ha.



NuGen plans to make its investment decision on Moorside in late 2018 – three years later than originally planned[8]. Once all permissions are secured, construction of the first of the three AP1000 reactors is scheduled to begin in 2020, with work on the second and third reactors starting in 2021 and 2022 respectively. All three reactors are projected to be producing electricity by 2026[9]. Meeting its 2018 investment decision date requires a number of hurdles being cleared on schedule – a rarity for new-build projects around the world. Whether these issues have been underestimated, or simply swept under the construction carpet by an over-confident developer remains to be seen.

In outline, these major issues include Moorside's geology, described as ***'difficult to construct a nuclear power station … the depth to reach bed rock is so great that construction is unreasonable - it is not the most favourable site and currently has significant commercial disadvantages'***[10]; securing all necessary permissions; the upgrading of the National Grid transmission system and the successful completion of the Regulators' Generic Design Assessment (GDA) of the AP1000 reactor. Whilst they may not be insurmountable, these hurdles all have the potential to frustrate and delay the project.

The National Grid plan – the North West Coast Connections (NWCC) project – which currently favours the use of large pylons inside and along the outer border of the Lake District National Park - faces significant opposition from organisations and individuals who want to see underground and sub-sea cabling. Subject to further consultation, the route and technology option must be finalised in sufficient time for National Grid to submit its plans to the Planning Inspectorate well in advance of NuGen's investment decision in late 2018. That Grid connection plans can be subject to delay is evidenced by the recent 2- 3year extension imposed by developer EDF's on the Grid connection timetable for its Hinkley Point C project in Somerset[11].

The GDA by the Regulators (ONR & EA) must be completed before any construction can begin. The assessment started in 2007 but, with no customer for its reactor, was put on hold by Westinghouse in 2011. At that time there remained 51 unresolved issues described by ONR as ***'technically challenging'*** and likely ***'to take a number of years'***[12]..

'Remobilised' in 2014, ONR's most recent GDA progress report[13] has concluded that more progress from Westinghouse was required before the 'technical assessment' of the reactor would be re-commenced. That progress included clarity on the reactor design, confirmed by Westinghouse as having undergone substantial changes since its assessment began. That three more months have now been added to the GDA process - by virtue of the failure to move back into the technical assessment phase by the end of December 2014 - shows how easily 'project creep' can delay the developer's best laid plans, and makes redundant the Westinghouse expectation of full GDA approval by mid-2016[14].

Moorside Module & Reactor Construction

Whilst not a 'show-stopper' in its own right, the installation of the seawater cooling system for Moorside's reactors offers the specific challenges of sinking the inlet/outlet systems through Sellafield's radioactively contaminated coastal waters and offshore plutonium banks, and the possibility of having to 'raise' the coolant water up to 20 metres above sea-level - depending on which land area is finally selected for the reactors. Whilst this presents its own engineering, radiological and environmental challenge, the far greater challenge to NuGen's timetable is presented by the complexities of the AP1000 reactor's modular design.

This major threat to the project schedule is posed by the novel experience for Westinghouse of building three reactors, at one-yearly intervals and on one site by 2026. The critical component of the challenge is the ability to fabricate to tight design specification, and assemble on or off-site, the 216 modules that make up the AP1000 [15].

With over 200 modules required for each AP1000 reactor, the claim that ***'factory-built modules can be installed at the site in a planned construction schedule of three years - from first concrete pour to fuel load as verified by experienced construction managers through 4D (3D models plus time) reviews of the computer-simulated construction sequence',*** is as completely undermined by the company's current overseas experience as the modelling ability of 'experienced construction managers' is clearly compromised.

In terms of 'where and how', Westinghouse has yet to divulge whether it will adopt its overseas practice of fabricating the modules in a facility remote from the new-build site. The main US facility, located at Lake Charles in Louisiana, is over 800 miles from either of its projects. Of the options for Moorside, the absence in the UK of a 'one-stop shop' capable of fabricating all the modules suggests that work will have to be farmed out to a number of fabricators around the UK, - and a custom-built assembly point located within Moorside's footprint.

Uncharted Waters for NuGen and West Cumbria

Figure 2 [16]

The enormity of the task of fabricating and delivering assembled modules stems from their size, weight and numbers. Divided into Mechanical and Structural (and sub-module) categories the AP1000 is made up of 160 Structural Modules and 56 Mechanical modules – many weighing several hundreds of tons or more when assembled.

With three reactors at Moorside, the module numbers will be tripled as must the potential risks of fabrication faults, delivery bottlenecks and on-site assembly issues. The assembled module pictured is for the Sanmen 1 project in China. It measures some 28x29x23 metres and weighs 1,030 tons

In the US particularly, the Westinghouse module experience does little to inspire confidence in the current schedule for Moorside. Suffering from regulatory and licensing delays; quality control issues; defective components; welding and design revisions and documentation problems, both US projects have succumbed to extensions to construction deadlines, spiraling costs and, in some cases, to time-consuming lawsuits[17].

This wayward record of AP1000 module fabrication in the US has resulted in the recent outsourcing of work on some major modules from the Lake Charles facility in Louisiana - described as being ***'not prepared for the rigor of nuclear construction'***[18] - to other fabricators. This raises serious doubts about the viability of the Moorside plan where the challenges of module fabrication and delivery are unlikely to be any less debilitating than those in the US.

For irrespective of where Moorside's modules are fabricated or assembled, the process will inevitably be exposed to the logistical nightmare, for developer and local communities alike, of transporting un-assembled or assembled modules through West Cumbia's poor and gridlock-prone road system, its under-developed and unreliable railway network and/or via a specially constructed but weather and tide-dependent Marine Offloading Facility (MOLF) on Sellafield's coastline.

The need for improvements to West Cumbria's roads has been voiced for decades - particularly an upgrading around Sellafield to provide viable escape routes in the event of a major nuclear accident. Such improvements, absent throughout the almost half century of Calder Hall's operation, were more recently promised in advance of the construction/operation of the THORP reprocessing plant in the early 1990's. They never materialized and, with Sellafield now in full decommissioning mode, the renewed call for upgrade by local MPs this month is likely to meet a similar fate.

As if the rather obvious potential for logistical chaos to module fabrication and delivery is not enough, Sellafield Ltd's recent experience of remote module fabrication should itself trigger alarm bells in the Westinghouse camp. For the remote fabrication and import of just 11 modules via a custom-built MOLF for its Evaporator D project suffered from 'design and quality issues' which resulted in significant cost increases and long delays[19] to the project. A formal investigation into the project by ONR found ***'systematic faults with quality management and oversight of the project'***[20]

AP1000 reactor construction overseas

The build time for one AP1000 reactor, originally put at just 36 months[21], now stands at 4 years. The timeline in the Westinghouse schematic above[22] - for building one 'nuclear island' comprised of the reactor itself, shield buildings, fuel handling facilities and auxiliary equipment has little relevance today as the fitting of some modules has taken years and not months. For example, the fitting of the 659 ton reactor containment vessel top head at two overseas sites was completed four years[23] after construction began – not the two years as shown above. This damaging knock-on effect has forced Westinghouse to repeatedly extend its AP1000 construction timetables for all its overseas AP1000 projects – ironically the very extentions that the reactor's modular form was supposed to eradicate.

As the only AP1000 construction projects currently under way anywhere in the world, progress at the twin- reactor projects of VC Summer and Vogtle in South Carolina and Georgia and Sanmen and Haiyang in China's Zhejiang and Shandong Provinces offers the clearest insight into what lies ahead for Moorside.

Overseas schedule slippage

For without exception, all the overseas AP1000 projects are now significantly behind target, having repeatedly fallen prey to module fabrication overruns and construction site delays. The current Westinghouse predictions for expected operation of these overseas projects as shown in **Figure 3** (column C) are but the latest in a long sequence of revisions, and may yet require further extensions.

Figure 3

	Westinghouse AP1000 Units	Build Start A	Original On-Line B	Expected On-Line C	Ongoing Years A to C
USA	Summer 2	Mar-13	2017	2018/2019	6
	Summer 3	Nov-13	2018	2019/2020	7
	Vogtle 3	Mar-13	2016	mid 2019	6 +
	Vogtle 4	Nov-13	2017	mid 2020	6 +
China	Sanmen 1	Mar-09	Nov-13	Feb-16	7
	Sanmen 2	Dec-09	Sep-14	2016	6
	Haiyang 1	Sep-09	May-14	2016	7
	Haiyang 2	Jun-10	Mar-15	Mar-16	6
UK	Moorside 1	2020		2024	4
	Moorside 2	2021		2025	4
	Moorside 3	2022		2026	4

The slippage to these overseas projects, from four to seven years, suggests that in reiterating its claim that ***'the AP1000 design saves money and time with an accelerated construction time from the pouring of first concrete to the loading of fuel',*** Westinghouse and its partners have fallen into the trap of believing their own propaganda and, refusing to acknowledge the realities on the ground.

Following the announcement of yet another delay and cost-hike to the VC Summer AP1000 project in South Carolina, a leading US environmentalist[24] advised that ***'We have warned from the start of this risky project that it would face significant delays and cost increases*** and ***that it has become clear that the soundest options for South Carolina energy planning remain conservation, efficiency and sustainable alternatives and not a nuclear project that is proving to be far too risky and costly'.*** The same sentiment is shared by many in West Cumbria where the major potential for sustainable alternative continues to be stifled by new-build.

Not to be upstaged by its Carolina sister-project, the build time for Vogtle 3 & 4 has most recently also been extended by some eighteen months[25]. That delays to AP1000 construction are not limited to the US however is highlighted by the announcement from China just last month, that further construction extensions have been forced on the Haiyang project that will take its operation date to 2016 at the earliest.

In a statement on the delay, a Chinese nuclear industry expert expressed the view that ***'the delays have illustrated shortcomings in China's nuclear sector, particularly when dealing with immature and first-of-a-kind technologies such as those found in the AP1000 reactor'*** and that ***'Chinese officials feel Westinghouse oversold the system, oversold the technology, promised more than they could really deliver'.***[26]

Despite these stark warnings – the legitimacy of Westinghouse claims and the overseas track record - the NuGen consortium continues to maintain that the three AP1000 reactors proposed for Moorside will be built and producing electricity in the space of just six years (2020-2026) [27]. That they continue to harbour the misconception that the debilitating glitches that have dogged the AP1000 build programme in the US and China won't find their way across the water – or that nuclear gremlins have suddenly become extinct in West Cumbria – highlight a further major weakness in an already compromised project schedule.

Moorside Jobs – Think of a Figure

Should it go ahead, the development of Moorside will involve a substantial workforce. Over the last five years however, the projected job numbers have been so wide-ranging as to arouse suspicions about their provenance. Given that a reasonably accurate count will only become known once the project is underway, this assessment simply highlights the discrepancies in the figures published so far, the sequence of increases over time and the official reluctance to substantiate its own figures.

Job numbers for Moorside need to be viewed against a number of local and national factors that will inevitably determine the final number. The current timing of the project coincides with the end of reprocessing at Sellafield when several thousand workers from the two plants and supporting facilities will be seeking or being diverted to a source of new nuclear employment. It also clashes with the construction period for EDF's Hinkley Point C in Somerset which, on current plans, will have started in advance of Moorside and thus have absorbed much of the skilled workforce that currently exists in the UK.

For West Cumbria, the creation of yet more nuclear jobs for locals will be viewed as paramount by the pro-nuclear lobby. Sharing that view, one local newspaper will have unnecessarily raised the hopes of locals with the claim that 6,000 construction and 1000 operational jobs would be created and that ***'to put those figures in context, there are currently 1,100 dole claimants in Copeland'***[28]**.** The reality is that irrespective of the size of the dole queue, the prospects for many unemployed locals are not that high, especially when account is taken of the combined effect of transfers from Sellafield, the use of outside skilled labour, and the shoe-horning into the project of the developer's own in-house workforce.

Whist forecasting worker numbers in advance of any major development cannot be an exact science, the disparity in published numbers for Moorside and the way the jobs have been variously referenced (construction jobs; site jobs; jobs under construction; jobs created by the project; operational jobs etc) is both confusing and misleading. Some numbers appear to have been plucked from mid-air and others simply fallen victim of copy-cat reporting or 'Chinese Whispers'.

Ranging from **6,300** in 2009[29] to **21,000** in 2014[30], the job projections are shown in **Figure 4** – plotted directly as per the headline 'as-published' figures where no distinction is made as to the job type. A top figure of 24,000, which made a print appearance only once[31], has been discounted.

The figures for 2009 and 2010 appeared in print during a period when new-build reactor numbers and types likely to be deployed in the UK remained unknown. Those from 2011 to 2013 are generally referenced as relating to jobs in construction and operation.

The upward trend from late 2013 appears now to have settled at ***'between 14,000 and 21,000'.*** Attributed to and shared by Government, Industry and Developer, all of whom have subsequently refused to provide further detail or breakdown of those numbers, the figure smacks of being contrived as an agreed 'official position' that stamps an air of authority on a project whose future is far from secure. Whether these figures are accurate is neither here nor there, their accuracy historically playing second fiddle to officialdom's fixation on forging ahead, often against the best evidence, with nuclear projects that invariably have an overrated economic case and little or no environmental merit.

Figure 4

Dodging the issue

The sequence of events leading to the officially agreed figures was triggered in May 2014 by DECC's announcement of ***'14,000 jobs over the construction period'***[32]**.** On the same day, the NDA published its own projection of ***21,000*** jobs for the same period[33]. When challenged on the sudden rise, the NDA responded by advising firstly that DECC was the source of the figures, then that NDA had been misquoted and, finally, by admitting that **'*DECC originally said 14,000 construction jobs – 6,000 on site at peak – and 1,000 jobs once operational. This has been erroneously added together to make 21,000 jobs, which counts the 6,000 peak figure twice. Assume the original DECC figure is the correct one'*[34]**

So NDA had got its sums wrong - and any notion that DECC's figure of 14,000 jobs over the construction period was indeed the 'correct one' was dispelled weeks later when NuGen also announced that the **'*project is forecast to create between 14,000 and 21,000 UK jobs'*[35]*.***

Not to be outdone in the numbers game, a subsequent press release from DECC[36] stated that **'*the planned Moorside reactors will… create '21,000 jobs … when fully operational'.*** This sudden increase on its earlier projection - and subtle change from jobs over the construction period to jobs when fully operational - prompted a further information request to DECC[37], with a similar request to NuGen[38] asking for clarification on its 14,000-21,000 forecast.

Making no reference to its 14,000-21,000 figure, NuGen replied that ***'our assumptions use basic industry multipliers that focus on direct, indirect and induced numbers that will benefit from the construction, operation and supply of the station going forward. Our staffing requirement going forward at the station would be between1000-1500, with of course many others benefiting via local and regional supply chain involvement … we estimate around 5,000 workers on site during peak construction'***[39]**.**

In its reply[40], DECC declined to cooperate further on the basis that such information was exempt from disclosure and was therefore being withheld. It nevertheless added ***'that the figures in question have been explained to you by John McNamara of NuGen in the following exchange on Monday 15th December 2014'.*** Though NuGen had not in fact explained the figures (as its response confirms), DECC's observation clearly suggests that FoI questions and responses do the official rounds in pass the parcel fashion, and that sharing them provides the opportunity to close ranks when an issue – in this case job numbers – is put under close public scrutiny.

Given that all the projected numbers cannot be correct, a comparison with the same jobs involved in the ongoing construction of the overseas AP1000 projects – when scaled up from two-reactor to three-reactor build - suggests that the top-end figures for Mooside are overstated. Taking further account of the overseas experience whereby job numbers fall away as construction progresses, a sensible estimate would suggest that, for Moorside, some 3,500-4000 on-site construction workers will be required, peaking at 5,000 for all three reactors (as stated by NuGen), and 900 to operate the reactors.

Based on this estimate of construction and operation jobs, the 'catch-all' figure of 14,000-21,000 must include an element of indirect and induced jobs that have been calculated by the use of the 'multiplier' referred to in NuGen's response. The use of a multiplier however has the distinct weakness of assuming that the additional jobs created are all new jobs - which is rarely the case, with workers from the site's other facilities and supply chain simply transferring to the new project. In essence, that assumption provides a useful tool for Government, Industry, Trades Unions and Developer to progressively enhance the figures, especially when the project's future comes under increasing threat – as happened in the early 1990's when employment numbers for Sellafield's THORP reprocessing plant rose dramatically in line with the increasing threat to its opening from legal challenges and international scrutiny of its economic case.

Reactor Refuelling

Contorting the employment figures is not however the sole preserve of officialdom, for the local media has also got into the act by pointing to **'an extra 1,000** (jobs) **every time a reactor needs refueling'.**[41] Whilst the source of this figure is not named by the local paper, the numbers are rebutted in a critique by Independent Nuclear Consultant John Large[42] who points to:

- ***the physical act of refuelling takes about two weeks (although the reactor shut down time is a little longer) and there simply is not enough room to have any more than perhaps up to a dozen or so workers in the immediate vicinity of the reactor pressure vessel and fuel pond,***

- ***the main refuelling tasks would be within the competence and training of the operational station staff and thus would not be brought into the site specifically for the refuel outage***

- ***some additional staff might be brought in during the refuelling outage, for example specialist health physics, engineers to carry out specialist non-destructive examination of the primary circuit, etc but again this would not account for the 1000 staff claimed but just a few, again about a dozen or so.***

The AP1000 reactor is loaded with 157 fuel assemblies, each consisting of 264 fuel rods containing low-enriched uranium pellets. Whilst the reactor is technically capable of 'burning' MOX fuel (uranium and plutonium), the Regulators' GDA assessment is confined to assessing the use of conventional uranium fuel only. There are no plans by UK new-build developers to use MOX.

Depending on the operating strategy and cycle length chosen, refuelling of the AP1000 will take place every 12-18 months. Over a 21-day refuelling outage, up to 68 fuel assemblies will be removed from the reactor (spent fuel) and replaced with new fuel. The spent fuel will be pond-stored in the reactor's spent fuel pool which has the capacity to hold 889 spent fuel assemblies.

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