

# Investing in Nuclear Power

## Current Concerns

A briefing for the government from

Tom Burke, Tony Juniper, Jonathon Porritt, Charles Secrett

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*‘Even before the Japanese earthquake and tsunami of March 11, prospects for nuclear construction were looking difficult in most of the developed world, mostly because of shaky economics.’<sup>1</sup>*

**The Financial Times, 28 Sept 2011**

*‘Nuclear new builds are both high value and high risk construction projects with a historical precedent for significant delay claims, cost growth, and - ultimately - investor disappointment.’<sup>2</sup>*

**KPMG International 2011**

# The Headlines

1. **Construction Risks** - even when construction goes according to schedule, the capital costs of building nuclear power stations are so huge that they risk bankrupting even the very largest companies in the world. And they almost never do go according to schedule. Pierre Noël of Cambridge University Electricity Policy Research Group says the record for building plants on time and within budget is 'between horrendous and terrible.'<sup>3</sup>

2. **Operational Risks** - nuclear power stations are complex pieces of equipment, making them subject to increased risk of breakdown. Such breakdowns are lengthy. Since they are very expensive to maintain, even when they are not generating power, the costs of outages lasting months can be hundreds of millions of pounds.

3. **Political risks** - all investment analysts and academic commentators agree that nuclear power can only be economically viable if it is offered subsidies. But investors need to be confident that these subsidies will be sustained for decades in order for nuclear to start making real returns on capital. Governments rarely maintain this level of consistency in public policy. Moreover, governments change, and the governments in both France and Germany are under increasing pressure from anti-nuclear voters.

4. **Liability** - of all the political risks to investors, a re-evaluation of liability for accident costs might be the most complex - and expensive. Governments have traditionally assumed the liability for disasters, but there is no guarantee that this will remain the case.

5. **Fukushima** - the short-term consequences of Fukushima are huge increases in safety costs and lengthy delays in planning and construction processes. The long-term consequences are unknowable, but, according to some investment analysts, could include the rejection of some plant designs, including the EPR scheduled for construction at Hinkley and Sizewell.<sup>4</sup>

<sup>1</sup> Nuclear: enthusiasm for reactor investment cools, Financial Times, 28 September 2011. Accessed on 23 March 2012 at: [on.ft.com/zrVwTa](http://on.ft.com/zrVwTa).

<sup>2</sup> Construction Risk in New Nuclear Power Projects - Eyes Wide Open. KPMG International 2011, Accessed 23 March 2012 at: <https://www.kpmg.com/global/en/issuesandinsights/articlespublications/pages/construction-risk-in-new-nuclear-power-projects.aspx>

<sup>3</sup> Nukes of hazard, The Economist, 15 October 2011. Accessed on 23 March 2012 at: [econ.st/yzZXRb](http://econ.st/yzZXRb).

<sup>4</sup> UBS Investment Research, Q-Series®: Global Nuclear Power, 4 April 2011, page 4.

# Introduction

High risks can be attractive to investors but they demand high returns - the Risk Premium. Nuclear is high risk, but the only premium it yields is through long-term government subsidy which adds another level of investor uncertainty to a range of other risks.

## Investment in nuclear power can 'damage beyond repair'

At E.ON's most recent results conference (March 2012), Board member Klaus-Dieter Maubach admitted 'Our appetite to boost nuclear with great energy has become smaller'.<sup>5</sup> This was dramatically confirmed on March 29th, when E.ON UK and RWE npower withdrew from their own joint venture, Horizon Nuclear Power. Whilst they are still looking for a new owner for Horizon, this effectively leaves EDF (and its Areva subsidiary) as the only interested party in new nuclear in the UK. Both E.ON UK and RWE npower cited the same reason for their withdrawal, as articulated by Tony Cocker, E.ON's Chief Executive:

*"E.ON has decided to focus its investment in the UK on other strategic projects that will allow us to deliver earlier benefit for customers and our company, rather than the very long-term and large investment new nuclear power calls for."*

Investment analysts wouldn't have been too surprised by this decision. For instance, Citigroup has become increasingly sceptical about the prospects for nuclear power. In 2009, it warned of 'risk areas so big and significant' that even the biggest utilities developing them risk financial 'damage beyond repair'.<sup>6</sup> UBS Investor Research concluded that 'investor-owned utilities are unlikely to consider nuclear a good risk-reward option. We believe it will mainly be an option only

for public or semi-public entities and in particular in systems with regulated cost pass-through regimes.'<sup>7</sup>

Citigroup calculates that new nuclear in the UK would need a price of €65/MWh in real terms, year in/year out, to break even. But they point out that, up to 2009, prices had only held at that level for just 20 out of the preceding 115 months. 'No nuclear power station has ever been built to our knowledge where the developer takes the power price risk.'<sup>8</sup>

When UBS Investor Research talks about a 'cost pass-through regime', they refer to the need to guarantee power prices over the long-term i.e. an ongoing subsidy. The Economist agrees, noting baldly: 'In liberalised energy markets, building nuclear power plants is no longer a commercially feasible option: they are simply too expensive... Nobody will now build one without some form of subsidy to finance it or a promise of a favourable deal for selling the electricity.'<sup>9</sup>

That's why governments that want nuclear power to be part of their future energy mix have no alternative but to subsidise it. In the case of the Power Price Risk raised by Citigroup, the UK government has proposed guaranteed power prices for low carbon energy via the Carbon Floor Price. Returns on investment will depend on the level finally chosen by the government.

<sup>5</sup> E.On says its commitment to Nuclear is fading. Reuters Africa 14 March 2012. Accessed on 15 March 2012 at: <http://af.reuters.com/article/energyOilNews/idAFL5E8EE2R520120314>

<sup>6</sup> New Nuclear - The Economics Say No. Citigroup Report (November 2009).

<sup>7</sup> UBS Investment Research, Q-Series@: Global Nuclear Power, 4 April 2011, page 5.

<sup>8</sup> New Nuclear - The Economics Say No. Citigroup Report (November 2009).

<sup>9</sup> The Dream That Failed; Special Report, Nuclear Energy, The Economist 10 March 2012, page 5.

# 1. Construction Risks

The scale of the construction work involved in building nuclear plants means that construction and capital costs of construction can take up to 75% of the cost of nuclear electricity.<sup>10</sup> Capital alone is very costly since it can easily take 10 years for a plant to start generating revenue, during which time billions of pounds will need to be spent. Interest payments alone could be more than the entire cost of building a gas-powered generating plant that would return revenues after just 4 years. The average time from start of construction to full grid connectivity for Areva's last four reactors was 17.5 years.

This is compounded by nuclear energy's terrible track record on construction times and budgets. There are two EPR reactors (the type proposed by EDF for the UK's nuclear programme) currently under construction, one at Olkiluoto in Finland, and one at Flamanville in France. Olkiluoto was licenced for construction in 2000 with a completion date of May 2009 and a budget of €3 billion. As of January this year (2012), its completion date is scheduled for 2014 and the budget has increased to €5.3 billion. And

with at least two more years to run it is widely believed that the final budget will increase considerably.

Flamanville was begun in 2007, with a completion date of 2012 and a budget of €3.3 billion. It is now scheduled for completion in 2016 with a budget of €6 billion. Again, this budget is subject to upward revision.

It comes as no surprise that at Olkiluoto the French construction company AREVA and the Finnish utility TVO are currently locked in a labyrinthine arbitration dispute attempting to apportion blame for the project. It seems inevitable that all parties will have to accept large losses. As a 2010 report from the University of Turku in Finland states, 'somebody will suffer; candidates include Areva, TVO and its shareholders, electricity consumers in Finland...[& Finnish] French and Swedish taxpayers'.<sup>11</sup>

<sup>10</sup> The Dream That Failed; Special Report, Nuclear Energy, The Economist 10 March 2012, page 13.

<sup>11</sup> Recent developments of nuclear power in Finland: Olkiluoto 3, University of Turku Finland Futures Research Centre, 10 September 2010.

## 2. Operational Risks

Because of their high fixed cost base, nuclear stations are also very vulnerable to shortfalls in output due to operational unreliability. A six-month breakdown can cost hundreds of millions of pounds in direct costs and lost output, particularly if the output has been pre-sold. Citigroup find this to be a risk that would be beyond the capacity of a single project; it would need to be shared across a portfolio of assets.

Ironically, one of the measures that DECC is consulting on to reduce Power Price Risk - namely, offering fixed long term contracts in the form of Contracts for Difference for low-carbon generators to support the power price if this is too low - may result in the operational risk for nuclear power increasing. This is because long-term contracts mean the de facto pre-selling of all nuclear output. Any 'outages' caused by breakdowns become correspondingly more expensive since operators will have to buy alternative supplies on the open market in order to meet their contracts. In circumstances like these, it is likely that operators will pass on at least some of these costs to households and businesses in the form of higher energy bills.

Although most nuclear plants are licensed, in the first instance, for 25 years, investors may once have made the working assumption that the lifetime of these reactors would in due course be extended - not least if the payback period was in excess of 25 years. That assumption is now open to much greater doubt if investors take into account the prospect of abundant, very cheap renewables being available in 25 years time, and if they see the recent decision by Angela Merkel (to bring forward the retirement date for Germany's reactors) as a sign of things to come.

# 3. Political Risks; the government giveth and the government taketh away

Governments can decide that nuclear is necessary and provide the subsidies required to draw in private investment capital, but they are subject to political and economic pressures that make these commitments unreliable - as analysts at the Manhattan Institute for Policy Research point out: *'the time horizons for financing payback [of nuclear power] still outlast most political and economic cycles.'*<sup>12</sup>

## 3.1: Government policies can change abruptly even when governments don't.

For examples of the perils of subsidy-led investment, investors are looking both at what's happened to the global solar PV market in the past 6 months and the North Sea oil industry in the past year.

Share prices in the former have collapsed since the surprise halving of the solar Feed In Tariff by the UK government in Autumn 2011. German market leaders SolarWorld and Q-Cells have seen share values fall by over 60%<sup>13</sup> following that announcement. Chinese PV panel makers have seen similar but less dramatic falls in value. For investment capital in businesses such as solar this is bad, but not disastrous - solar PV is a relatively nimble business, surplus panels can be sold elsewhere, eventually, and labour capacity is relatively easy to expand and contract.

Neither of these propositions is true for nuclear or power generators with much larger scale investments. When George Osborne slapped a controversial tax increase on North Sea oil companies in March 2011 to raise an extra £2 billion per year to help pay for a cut in fuel duty, he triggered a drop in oil production of 18%, and a collapse in exploration by 50% in the tax's first year.<sup>14</sup> Oil rigs and refineries cannot be liquidated and moved into more attractive markets, and neither can their labour force. Malcolm Webb, of

industry body Oil & Gas UK, was forced to plead publically for a 'very clear signal from the government'<sup>15</sup> regarding future tax arrangements. Possibly as a result of this kind of lobbying, the Chancellor gave the industry substantial tax breaks in his 2012 Budget. Help that Ernst & Young described as 'badly needed after last year's shock'.<sup>16</sup>

For nuclear power companies to retain profitability, investors need to be confident that favourable tax and subsidy regimes will be maintained for decades - and the risk of this not happening needs to be factored into investment decisions, adding yet another upfront cost. Indeed, there is risk it may not happen at all. A subsidized, regulated energy market runs directly counter to thirty years of UK and EU policy which have consistently demanded increased liberalisation. British government policy is currently the subject of a legal challenge on just these grounds.<sup>17</sup>

## 3.2: Governments change and on doing so rarely consider themselves bound by the decisions of their predecessors.

Even national policies which appear set in stone can crumble under electoral pressure. France, apparently the most impregnable bastion of state-run nuclear power, will vote for a new President on 6 May 2012, with all current polls pointing strongly to a victory for the newly anti-nuclear Parti Socialiste (PS). PS candidate Francois Hollande was forced to cut a deal with the French Green Party in November 2011 in order to ward off an electoral challenge to his support that had seen the Green vote surge to a peak of 16% in the 2009 European elections. When the deal (which agreed to reduce France's nuclear capacity by one third by 2025) was announced, EDF's share price fell by 4% in one day,<sup>18</sup> wiping millions of euros from investors' portfolios.

<sup>12</sup> Nuclear Power: The Investment Outlook, Manhattan Institute for Policy Research, Energy Policy & the Environment Report No. 1, June 2007.

<sup>13</sup> Solarworld figures 16 March 2012. Accessed 17 March 2012 at: <http://uk.finance.yahoo.com/q/bc?s=SWV.DE> and Q-cells figures accessed 17 March 2012 at: <http://uk.finance.yahoo.com/q/bc?s=QCE>.

<sup>14</sup> The Scotsman, 28 February 2012 [www.scotsman.com/news/politics/north\\_sea\\_oil\\_supply\\_slumps\\_as\\_tax\\_grab\\_bites\\_deep\\_1\\_2141789](http://www.scotsman.com/news/politics/north_sea_oil_supply_slumps_as_tax_grab_bites_deep_1_2141789)

<sup>15</sup> Ibid.

<sup>16</sup> Chancellor George Osborne announces offshore oil sector measures. BBC website, 21 March 2012. Accessed on 23 March 2012 at: <http://www.bbc.co.uk/news/uk-scotland-scotland-politics-17448277>

<sup>17</sup> Legal bid to halt nuclear construction: lawyers send complaint to European Commission about subsidies for nuclear power. Energy Fair press release (February 2012). Accessed 15 March 2012 at: [www.energyfair.org.uk/news-releases/legal-bid](http://www.energyfair.org.uk/news-releases/legal-bid).

<sup>18</sup> EDF Slumps to Seven-Week Low on Opposition Plan to Shut 24 Reactors Bloomberg, 16 November 2011. Accessed on 17 March 2012 at: [www.bloomberg.com/news/2011-11-16/french-socialists-greens-would-halt-24-edf-nuclear-reactors.html](http://www.bloomberg.com/news/2011-11-16/french-socialists-greens-would-halt-24-edf-nuclear-reactors.html)

However, despite neutralizing the Greens with this commitment, Hollande has recently been faced with a new threat from the political left. The poll ratings of Left Front candidate Jean-Luc Mélenchon have more than doubled from a relatively insignificant 5% to as high as 14% in recent polls. Mélenchon has promised a referendum on the future of nuclear power.

In Germany, home to the next largest nuclear programme in Europe, Chancellor Merkel was forced into an embarrassing U-turn by political pressures unleashed by the Fukushima disaster. The presence of the German Green Party in the 'Red-Green' coalition of 1998-2005 had led to the decision to phase out nuclear power in Germany by retiring plants as they reached the end of their life. Merkel announced that she was reversing that decision in Autumn 2010, but following Fukushima, she changed her mind again and ratified the original closure plan. The immediate pressure on Merkel was local - her party, the CDU lost a series of Regional elections as a result of a huge swing to the Greens - but this underlined the fact that, uniquely amongst power generation sources, nuclear's future is subject to random events anywhere in the world. As The Economist commented, 'Germany's plants are being shut down in response to an accident its industry had nothing to do with. Being hostage to distant events thus adds a hard-to-calculate systemic risk to nuclear development.'<sup>19</sup> Germany's abrupt change in nuclear policy put a dent of €1.3 billion in RWE's results for 2011<sup>20</sup>, and in just 3 weeks its share price fell by 50%. Reporting year-on-year net income down by 45%, RWE's Annual Report stated the year was 'marked by difficult economic and political framework conditions'.

With Federal Elections due in 2013, some have speculated that Merkel's decision was designed to leave open the possibility of an electoral coalition between her

CDU and the Green Party. By heeding public opinion opposed to nuclear power, Merkel signalled that she's 'wide open for a coalition with the Greens at the next parliamentary election in 2013' according to Bernhard Jeggler, a utility analyst with Landesbank Baden Württemberg in Stuttgart. 'It is a smart chess move.'<sup>21</sup> Polls currently indicate that whoever forms the next government will only be able to do so with the Green Party's support, making nuclear power politically toxic in Germany for at least the next decade.

Regardless of the actual political colour of individual governments, investment analysts have been explicit that lack of trust in politicians' reliability is a major stumbling block. As part of oral evidence to the Energy and Climate Change Select Committee, Citibank's Peter Atherton said:

*"On the sustainability of all these support mechanisms for renewables, with the push to get the utility companies to invest these vast amounts of money, the investment community has become very concerned about whether it is sustainable and whether, when the bills become due, the Governments of the day will stand behind the decisions that were made several years ago".<sup>22</sup>*

UK utilities investors with long memories will remember the 1997 Budget of Labour's Gordon Brown who punished the "excess profits" of the newly privatized UK utilities sector with a windfall tax amounting to several billion pounds, a decision seen by many commentators as a deliberate riposte to Conservative policies of the previous two decades.

<sup>19</sup> The Dream That Failed; Special Report, Nuclear Energy, The Economist 10 March 2012, page 6.

<sup>20</sup> Utility hit by upheaval in nuclear policy. World Nuclear News, 6 March 2012. Accessed 18 March 2012 at: [http://www.world-nuclear-news.org/C\\_Utility\\_hit\\_by\\_upheaval\\_in\\_nuclear\\_policy\\_0603121.html](http://www.world-nuclear-news.org/C_Utility_hit_by_upheaval_in_nuclear_policy_0603121.html)

<sup>21</sup> Merkel's Atomic Retreat Opens Lines to Greens for 2013 as FDP Ally Fades Bloomberg, 31 May 2011. Accessed 17 March 2012 at: [www.bloomberg.com/news/2011-05-31/merkel-s-atomic-retreat-opens-lines-to-greens-for-2013-as-fdp-ally-fades.html](http://www.bloomberg.com/news/2011-05-31/merkel-s-atomic-retreat-opens-lines-to-greens-for-2013-as-fdp-ally-fades.html)

<sup>22</sup> Peter Atherton, Citibank, Oral evidence taken before the Energy and Climate Change Committee 14 December 2011. Accessed 20 March 2012 at: [www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/648/10121403.htm](http://www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/648/10121403.htm).

## 4. Liability Re-evaluation?

(This would be the case not just for major disasters like Chernobyl and Fukushima, but for any “minor accident” which is ultimately contained, but still leads to the closure of the plant through high levels of radiation.)

Another vital issue is that of re-evaluation. UBS analysts argue there could be an entire re-evaluation of the risk of nuclear companies, both by governments and insurers. This could mean not just higher costs for operators, but a greater chance that if the worst

should happen, procedures will have been put in place to make sure there is no taxpayer bail-out. In other words, investors will need to adjust to the new reality of ‘nuclear operators being significantly more risky than other utilities’.

Shareholders in TEPCO, the utility that owned the Fukushima plants would agree: they lost 85% of their equity value almost overnight, and only kept the remainder as a result of major government intervention to save the company from bankruptcy.

## 5. Fukushima: A Problem That Could Take Years to Fully Impact on Balance Sheets

*‘From a shareholder point of view, nuclear is a risky business and [post Fukushima] the margins are now potentially lower’* says James Stettler at UniCredit.<sup>23</sup>

In a Parliamentary briefing in April 2011, Professor Steve Thomas pointed to the difficulties of accounting for design problems post-Fukushima in time for the UK’s planned new nuclear fleet. He noted that it took five years to discover the extent of the damage following the Three Mile Island accident.<sup>24</sup> It is likely to take at least that long to properly explore and understand the Fukushima disaster site, meaning that expensive new safety regulations resulting from it are possible for many years to come. We already know that safety upgrades ordered by the French nuclear regulator are going to cost EDF €10 billion over the next 6 years.<sup>25</sup> But this could be just the beginning.

It’s also worth remembering that even if individual governments wish to shield nuclear operators from expensive and problematic re-writes of the safety manual, some of these re-writes may come in the form of international treaty obligations that are beyond national control. The European Union has ordered a risk assessment to be carried out on all nuclear energy plants in every member state.<sup>26</sup> And while some disaster scenarios are out-of-the-blue, others may be visible already. Writing in the Guardian, Dr Paul Dorfman, University of Warwick senior researcher and member of The Nuclear Consulting Group, points out how vulnerable to the effects of global warming many nuclear plants are. He refers to a 2009 Institution of Mechanical Engineers report that suggests significant sea defence investment may be needed at sites like Sizewell in order to prevent the need for relocation or abandonment in the future.<sup>27</sup>

<sup>23</sup> Siemens saves face as Rosatom tie-up fades away. Financial Times, 19 September 2011.

<sup>24</sup> New thinking now needed on new nuclear. Nuclear Consulting Group, Prof Steve Thomas, Parliamentary Brief, 4 April 2011.

<sup>25</sup> EDF: Extra Nuclear Safety Measures Could Add €10 billion To Costs. Wall Street Journal, Jan 3 2012. Accessed online 18 March at <http://online.wsj.com/article/BT-CO-20120103-707473.html>

<sup>26</sup> Fukushima’s fate inspires nuclear safety rethink. New Scientist, 9 March 2012. Accessed online 12 March at: [www.newscientist.com/article/dn21556-fukushimas-fate-inspires-nuclear-safety-rethink.html?DCMP=OTC-rss&nsref=online-news](http://www.newscientist.com/article/dn21556-fukushimas-fate-inspires-nuclear-safety-rethink.html?DCMP=OTC-rss&nsref=online-news)

<sup>27</sup> Nuclear sites, sea level rise and tsunamis. Guardian 12 Mar 2012. Accessed on 14 March 2012 at: [www.guardian.co.uk/environment/2012/mar/11/nuclear-sites-sea-rise-tsunamis](http://www.guardian.co.uk/environment/2012/mar/11/nuclear-sites-sea-rise-tsunamis)

## Safety, Disasters and Flooding

‘Normal’ risks (e.g. construction and finance), however large, can undergo normal risk analysis; and political risks are a problem, but large utilities are familiar with them. However, nuclear also carries a unique set of risks related to ‘potential disaster’.

Extra safety requirements resulting from Fukushima-style disasters can add hugely to the costs and timescales of nuclear construction. The Office for Nuclear Regulation (ONR) reported in the last quarter of 2012 that it has had to re-jig its resources to cope with the delays resulting from post-Fukushima reassessment of the proposed new plants at Hinkley and Sizewell. It has coded two issues as red, meaning that ‘delays cannot be recovered and will impact on the target closure date’.<sup>28</sup>

Investment analysts have inevitably been drawn into the debate. UBS’s Investor Report warns that one consequence of Fukushima could be that only the newest designs such as the AP1000 with passive cooling systems will make the grade in future.<sup>29</sup> EDF’s plans for Hinkley and Sizewell are based on the EPR reactor which does not have a passive cooling system. UBS also warns that safety regulations will be tightened, adding that plant life extensions will likely be legally limited, with up to 30 plants that could be shut down (‘sacrificed’) in a bid to appease public fears.<sup>30</sup>

Tsunamis are rare in the UK, but flooding much less so. A Defra report, unearthed by The Guardian, identifies flooding and coastal erosion risks at 12 of the UK’s 19 civil nuclear sites. Commenting on the research, University College London flood specialist, David Crichton, pointed out that due to climate change some sites will be flooded within 100 years making ‘decommissioning expensive and difficult, not to mention the recovery and movement of nuclear waste to higher ground’.<sup>31</sup>

## Conclusion

The investment climate for new nuclear power is therefore not good. This was powerfully confirmed in a recent speech by Mark Muldowney, head of energy advisory at BNP Paribas at the Marketforce European Nuclear Forum in Brussels in March. Muldowney pointed out that there has been a sharp decline in investor interest in new nuclear power since Fukushima, and that ‘significant government support’ will be needed in most markets. “People are very aware of the financial hit on the German utilities from the Fukushima phase-out. It’s an unfortunate precedent from an investors’ point of view”. What’s more, Chinese experience in building the reactors, supposedly on time and on budget, will ‘not be weighted by financial investors at all’, when considering investments in new nuclear plants in Europe.

<sup>28</sup> Delay to safety approvals for new nuclear stations in UK. Blog of freelance journalist Rob Edwards. Accessed 18 March at: [www.robedwards.com/2012/02/delay-to-safety-approvals-for-new-nuclear-stations-in-uk.html](http://www.robedwards.com/2012/02/delay-to-safety-approvals-for-new-nuclear-stations-in-uk.html)

<sup>29</sup> UBS Investment Research, Q-Series@: Global Nuclear Power, 4 April 2011, page 4.

<sup>30</sup> Thousands join German anti-nuclear protests. Financial Times, March 26 2011.

<sup>31</sup> UK nuclear sites at risk of flooding, report shows. Guardian, 7 March 2012. Accessed 23 March 2012 at: <http://www.guardian.co.uk/environment/2012/mar/07/uk-nuclear-risk-flooding>

## For more information:

[www.jonathonporritt.com](http://www.jonathonporritt.com)

[www.tomburke.co.uk](http://www.tomburke.co.uk)

## Contact:

[JPOffice@forumforthefuture.org](mailto:JPOffice@forumforthefuture.org)