

# *Nuclear Free Local Authorities* **briefing**



Date: 9<sup>th</sup> December 2014

No.127

Subject: **NFLA concerns over the reliability of aging nuclear reactors in the UK**

## **i. Introduction to Policy Briefing**

This NFLA Policy Briefing has been developed by NFLA Policy Advisor Pete Roche. The NFLA thanks both Pete for kindly agreeing for it to be presented as a NFLA Policy Briefing. It will also be replicated on the website <http://www.No2nuclearpower.org>, which the NFLA Secretary recommends all those interested in the nuclear policy debate to consult. The report focuses on recent concerns, which have also been made at a European level by Greenpeace International, over the unreliability of the aging fleet of civil nuclear reactors prior to a time when overall UK electricity capacity is at its lowest for many years.

## **Nuclear: an Unreliable Electricity Supplier**

### **1. Executive Summary of report**

A survey of press reports over the past three years reveals that, taken as a whole, the UK's nuclear reactor fleet is highly unreliable and that several reactors are unfit for purpose. It is generally known that UK reactors are getting old and going offline more often, but the new analysis indicates that this is, in fact, a serious problem.

This report finds that:

- in the three years 2012 - 2014, at least 62 unplanned shutdowns occurred
- poor performances are not evenly spread: the worst performers were Dungeness A & B, Heysham 1 & 2, Torness 1 & 2, and Sizewell. Some reactors had no reported unplanned outages – Heysham B2 and Hunterston B1.
- towards the end of November 2014, less than half (43%) of UK nuclear electricity capacity was available due to shutdowns
- UK's reactors have such poor operating records that EDF declines to report their performances to nuclear industry publications, unlike most other reactors world-wide
- unplanned shutdowns cause serious problems for electricity supply regulation and planning
- a major likely reason for poor performance is that most reactors are >30 years old and past their sell-by dates, some by considerable margins

### **2. Poor Operating Records**

An analysis of the three years 2012 - 14 clearly reveals a large number of unplanned shutdowns,

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outages and mechanical failures in UK civil nuclear reactors. The table is restricted to unplanned shutdowns, but several planned shutdowns are included because of their unexpectedly prolonged natures. See table 1.

**Table 1: Outages Reported at EDF Energy's UK Reactors 2012 -2014:**

Reactor	Major Outages: from	to	Comments
<b>Dungeness B21</b>	22 June 2012	24 June 2012	<b>unplanned outage:</b> fault on main boiler feed pump <a href="http://tinyurl.com/nog62kv">http://tinyurl.com/nog62kv</a> <a href="http://tinyurl.com/oo5b72h">http://tinyurl.com/oo5b72h</a>
	4 Aug 2012	7 Aug 2012	<b>unplanned outage:</b> <a href="http://tinyurl.com/mve9dyx">http://tinyurl.com/mve9dyx</a>
	23 Oct 2013	24 Dec 2012	<b>unplanned outage:</b> Pump control fault <a href="http://tinyurl.com/keu3ulg">http://tinyurl.com/keu3ulg</a>
	27 Feb 2013	?	<b>taken offline due to operational requirements</b> <a href="http://tinyurl.com/nx2rwe4">http://tinyurl.com/nx2rwe4</a>
	17 May 2013	?	<a href="http://tinyurl.com/p6wggcr">http://tinyurl.com/p6wggcr</a>
	28 Oct 2013	6 Nov 2013	<b>unplanned outage:</b> storms <a href="http://tinyurl.com/nnxscy2">http://tinyurl.com/nnxscy2</a>
	3 Dec 2013	7 Dec 2013	<b>unplanned outage:</b> turbine condenser problems <a href="http://tinyurl.com/nnxscy2">http://tinyurl.com/nnxscy2</a> <a href="http://tinyurl.com/olo8gva">http://tinyurl.com/olo8gva</a>
	12 Feb 2014	?	<b>unplanned outage:</b> fault on steam valve <a href="http://tinyurl.com/o5kngpv">http://tinyurl.com/o5kngpv</a>
	21 Mar 2014	June 2014	statutory outage <a href="http://tinyurl.com/nlezwa6">http://tinyurl.com/nlezwa6</a>
	10 Jul 2014	12 Aug 2014	<b>unplanned outage</b> Problem with transformer. <a href="http://tinyurl.com/n2qboce">http://tinyurl.com/n2qboce</a> <a href="http://tinyurl.com/ll3zq8f">http://tinyurl.com/ll3zq8f</a>
	25 Sept 2014	27 Sept 2014	<b>unplanned outage</b> <a href="http://tinyurl.com/ld8amc4">http://tinyurl.com/ld8amc4</a> <a href="http://tinyurl.com/njsk7do">http://tinyurl.com/njsk7do</a>
	?	24 Oct 2014	<a href="http://tinyurl.com/l9k9tyd">http://tinyurl.com/l9k9tyd</a>
	10 Nov 2014	21 Nov 2014	<b>unplanned outage</b> <a href="http://tinyurl.com/qxfth3w">http://tinyurl.com/qxfth3w</a>
<b>Dungeness B22</b>	5 Sept 2012	15 Sept 2012	<b>unplanned outage</b> gas circulator fault <a href="http://tinyurl.com/l3xwmjp">http://tinyurl.com/l3xwmjp</a> <a href="http://tinyurl.com/mb9a48g">http://tinyurl.com/mb9a48g</a>
	12 Jan 2013	16 Jan 2013	<b>taken offline due to operational requirements</b> <a href="http://tinyurl.com/lkj7apw">http://tinyurl.com/lkj7apw</a>
	20 <sup>th</sup> May 2013	15 <sup>th</sup> Oct 2013	<b>unplanned outage</b> work on flood protection <a href="http://tinyurl.com/nmotubh">http://tinyurl.com/nmotubh</a>
	28 Oct 2013	6 Nov 2013	<b>unplanned outage:</b> storms <a href="http://tinyurl.com/nnxscy2">http://tinyurl.com/nnxscy2</a>
		28 May 2014	<b>unplanned outage</b> <a href="http://tinyurl.com/lypi6yh">http://tinyurl.com/lypi6yh</a>
	22 Aug 2014	29Aug 2014	<b>unplanned outage:</b> <a href="http://tinyurl.com/pvp5cvp">http://tinyurl.com/pvp5cvp</a>

	19 Sept 2014	2 Oct 2014	unplanned outage: <a href="http://tinyurl.com/mrvbqdo">http://tinyurl.com/mrvbqdo</a>
	13 Oct 2014	17 Nov 2014	unplanned outage: fault on main boiler feed pump <a href="http://tinyurl.com/ksjkb8g">http://tinyurl.com/ksjkb8g</a> <a href="http://tinyurl.com/pwv6b2f">http://tinyurl.com/pwv6b2f</a>
<b>Hartlepool 1</b>	11 Aug 2014	expected 26 Nov 2014	boiler inspection <a href="http://tinyurl.com/ouupezi">http://tinyurl.com/ouupezi</a>
<b>Hartlepool 2</b>	20 Apr 2013	?	unplanned outage: small fire <a href="http://tinyurl.com/pg4uudq">http://tinyurl.com/pg4uudq</a>
	15 Mar 2014	?	unplanned outage: turbine fire <a href="http://tinyurl.com/k5no3hu">http://tinyurl.com/k5no3hu</a>
	11 Aug 2014	Expected 22 Nov 2014	boiler inspection <a href="http://tinyurl.com/ouupezi">http://tinyurl.com/ouupezi</a>
<b>Heysham A Unit 1</b>	12 Oct 2012	?	unplanned outage: <a href="http://tinyurl.com/qekv4l6">http://tinyurl.com/qekv4l6</a>
	22 Dec 2012	30 Dec 2012	unplanned outage: <a href="http://tinyurl.com/mjv9xzn">http://tinyurl.com/mjv9xzn</a>
	22 Aug 2013	?	unplanned outage: electrical fault, followed by planned maintenance <a href="http://tinyurl.com/pqjmnnq">http://tinyurl.com/pqjmnnq</a> <a href="http://tinyurl.com/oex67ng">http://tinyurl.com/oex67ng</a>
	4 Jan 2014	?	unplanned outage: faulty boiler pump <a href="http://tinyurl.com/o487gkb">http://tinyurl.com/o487gkb</a>
	4 Mar 2014	9 Mar 2014	operational requirement <a href="http://tinyurl.com/k795u3g">http://tinyurl.com/k795u3g</a>
	11 June 2014	Expected 31 Dec 2014	planned boiler inspection <a href="http://tinyurl.com/puf88aq">http://tinyurl.com/puf88aq</a>
<b>Heysham A Unit 2</b>	25 June 2012	30 June 2012	unplanned outage: electrical fault on a turbo generator <a href="http://tinyurl.com/lqcebsa">http://tinyurl.com/lqcebsa</a> <a href="http://tinyurl.com/puzya24">http://tinyurl.com/puzya24</a>
	6 July 2012	19 July 2012	unplanned outage: repairs to leak in pipe from main boiler feed <a href="http://tinyurl.com/kjz6fj">http://tinyurl.com/kjz6fj</a> <a href="http://tinyurl.com/l9789s8">http://tinyurl.com/l9789s8</a>
	4 Oct 2012	Failed to reconnect 1 <sup>st</sup> Nov?	unplanned outage: electrical fault <a href="http://tinyurl.com/ozecom8">http://tinyurl.com/ozecom8</a>
	4 Mar 2013	?	reason not given
	2 May 2013	?	unplanned outage: turbine fire <a href="http://tinyurl.com/okurl4s">http://tinyurl.com/okurl4s</a>
	22 Aug 2013	?	unplanned outage: electrical fault <a href="http://tinyurl.com/pqjmnnq">http://tinyurl.com/pqjmnnq</a>
	11 Aug 2014	Expected 22 Nov 2014	boiler inspection <a href="http://tinyurl.com/puf88aq">http://tinyurl.com/puf88aq</a>
<b>Heysham</b>	21 July 2012	25 July	unplanned outage:

<b>B Unit 1</b>		2012	repairs to turbine equipment <a href="http://tinyurl.com/oaxf7qz">http://tinyurl.com/oaxf7qz</a>
<b>Heysham B Unit 2</b>	-	-	-
<b>Hinkley Point B1</b>	22 Feb 2012	25 Feb 2012	<b>unplanned outage:</b> hydraulic fluid leak <a href="http://tinyurl.com/pwvnp2g">http://tinyurl.com/pwvnp2g</a> <a href="http://tinyurl.com/m5d8lps">http://tinyurl.com/m5d8lps</a>
	16 Dec 2012	21 <sup>st</sup> Dec 2012	<b>unplanned outage:</b> turbine problems <a href="http://tinyurl.com/p9hrr2r">http://tinyurl.com/p9hrr2r</a> <a href="http://tinyurl.com/kucflr9">http://tinyurl.com/kucflr9</a>
<b>Hinkley Point B2</b>	18 Mar 2012	23 Mar 2012	<b>unplanned outage:</b> <a href="http://tinyurl.com/mj8hbyc">http://tinyurl.com/mj8hbyc</a> <a href="http://tinyurl.com/okzurv4">http://tinyurl.com/okzurv4</a>
	27 Mar 2012	3 Apr 2012	<b>unplanned outage:</b> gas circulator earth fault <a href="http://tinyurl.com/pebxzyl">http://tinyurl.com/pebxzyl</a> <a href="http://tinyurl.com/oove6z5">http://tinyurl.com/oove6z5</a>
	27 Oct 2012	?	<b>unplanned outage:</b> <a href="http://tinyurl.com/k6dtwbb">http://tinyurl.com/k6dtwbb</a>
<b>Hunterston B-1</b>			allegations of scores of fire safety lapses The Herald 12 May 2012 <a href="http://tinyurl.com/qcbhzh1">http://tinyurl.com/qcbhzh1</a>
	31 Mar 2014	?	<b>unplanned outage:</b> <a href="http://tinyurl.com/m36j389">http://tinyurl.com/m36j389</a>
<b>Hunterston B-2</b>	1 Aug 2014	4 Oct 2014	statutory outage <a href="http://tinyurl.com/kdkdl3x">http://tinyurl.com/kdkdl3x</a> <a href="http://tinyurl.com/k3q9nzn">http://tinyurl.com/k3q9nzn</a> <b>unplanned outage:</b> new cracks found <a href="http://tinyurl.com/owgpgbu">http://tinyurl.com/owgpgbu</a>
	5 Oct 2014	3 Nov 2014	<b>unplanned outage:</b> turbine vibrations <a href="http://tinyurl.com/mdrcf9o">http://tinyurl.com/mdrcf9o</a> <a href="http://tinyurl.com/punvuno">http://tinyurl.com/punvuno</a>
<b>Torness - 1</b>	24 May 2013	29 May 2013	<b>unplanned outage:</b> high seaweed levels <a href="http://tinyurl.com/n3wswu6">http://tinyurl.com/n3wswu6</a> <a href="http://tinyurl.com/ns6hh9m">http://tinyurl.com/ns6hh9m</a>
	7 Feb 2014	19 Apr 2014	statutory outage <a href="http://tinyurl.com/pmcwkfs">http://tinyurl.com/pmcwkfs</a>
	1 July 2014		<b>unplanned outage:</b> electrical fault <a href="http://tinyurl.com/l3xtsy8">http://tinyurl.com/l3xtsy8</a> <a href="http://tinyurl.com/p9fr3zh">http://tinyurl.com/p9fr3zh</a>
	14 July 2014	17 July 2014	<b>unplanned outage</b> <a href="http://tinyurl.com/lud55rl">http://tinyurl.com/lud55rl</a> <a href="http://tinyurl.com/mss7y5v">http://tinyurl.com/mss7y5v</a>
<b>Torness - 2</b>	13 May 2012	?	<b>unplanned outage</b> – electrical fault <a href="http://tinyurl.com/osxnc3">http://tinyurl.com/osxnc3</a> <a href="http://tinyurl.com/nzrp8wl">http://tinyurl.com/nzrp8wl</a>
	31 Dec 2012	?	<a href="http://tinyurl.com/mjv9xzn">http://tinyurl.com/mjv9xzn</a>
	26 Mar 2013	?	<b>unplanned outage</b> <a href="http://tinyurl.com/oovtyev">http://tinyurl.com/oovtyev</a>
	23 May 2013	28 May	<b>unplanned outage</b>

		2013	high seaweed levels <a href="http://tinyurl.com/n3wswu6">http://tinyurl.com/n3wswu6</a> <a href="http://tinyurl.com/k9sbbwb">http://tinyurl.com/k9sbbwb</a>
	21 Nov 2013	?	unplanned outage: high seaweed levels <a href="http://tinyurl.com/kn54yy4">http://tinyurl.com/kn54yy4</a>
	2 July 2014	15 July 2014	planned maintenance to repair turbine governor valve.
<b>Sizewell B</b>	2 Mar 2012	11 Apr 2012	unplanned shutdown <a href="http://tinyurl.com/nsba459">http://tinyurl.com/nsba459</a> <a href="http://tinyurl.com/n5s2sr9">http://tinyurl.com/n5s2sr9</a> <a href="http://tinyurl.com/q27b435">http://tinyurl.com/q27b435</a>
	13 May 2012	?	unplanned outage: problem in lubrication system <a href="http://tinyurl.com/lejafya">http://tinyurl.com/lejafya</a>
	18 July 2012	21 July 2012	unplanned outage: <a href="http://tinyurl.com/ltpqp3">http://tinyurl.com/ltpqp3</a> <a href="http://tinyurl.com/p3wtfzx">http://tinyurl.com/p3wtfzx</a>
	26 Apr 2013	13 Jun 2013	planned re-fuelling outage for 5-6 weeks. <a href="http://tinyurl.com/nqy9hxe">http://tinyurl.com/nqy9hxe</a> <a href="http://tinyurl.com/lp3tqpp">http://tinyurl.com/lp3tqpp</a>
	13 Oct 2014	Expected 26 Nov and 8 Dec 2014	statutory outage <a href="http://tinyurl.com/puvxu6x">http://tinyurl.com/puvxu6x</a>

? = date not reported

**Table 1** shows 62 outages were reported over the past three years, over three-quarters of which were unplanned. These reported outages do not include routine closures every 18 months or so for refuelling. This table is not comprehensive as it relies on press reports: EDF Energy does not provide comprehensive data on reactor performance.

Of course, other types of old electricity generating stations can also be unreliable, such as the recent failures at Peterhead gas generating station (1- see references at end) and the large fire at the Didcot coal-fired station on October 20, 2014. But it seems that the mainstream UK media have a tendency to report infrequent non-nuclear failures but ignore the more frequent nuclear failures.

It is noteworthy that the Platts specialist nuclear publication, Nucleonics Week (<http://www.platts.com/products/nucleonics-week>) which provides monthly tables of reactor performance around the globe for the world's nuclear industry, does not include performance data for UK reactors - unlike most other countries, including China. This is apparently because EDF declines to provide load factors either monthly or for the year to date to Platts for its UK reactors - unlike the full data for its French reactors, for example. It would appear that UK reactor performance is so poor that EDF Energy refrains from sending their operating data - even to industry publications.

The table suggests that Dungeness B1 is the least reliable reactor in the UK, if not the world. For example, it can be estimated that its average lifetime capacity factor is 27%<sup>1</sup>, lower than the average load factor for offshore wind farms in the UK.

<sup>1</sup> Nucleonics Week records that up to the end of May 2014, this reactor had generated ~43 million MWh over its lifetime (lifetime data is given but not monthly or annual data). The reactor started commercial operation in April 1985, which means that by the end of May 2014 it had been operational commercially for 350 months or ~252,000 hours. If it had operated at 100% of the time over that period it would have produced 157 million MWh. This means an average lifetime load factor of around 27%. DECC's long-term average capacity factor for (onshore + offshore) wind is 27.82% - See more at: <http://www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/figures-explained.cfm#sthash.p2tgzULL.dpuf>

A similar calculation for Sizewell B, which might be expected to be EDF's most reliable reactor, gives a better 58% load factor, but this is still poor by international standards.

### 3. Situation on November 20<sup>th</sup> 2014

Bringing these issues up to the present day, on 20<sup>th</sup> November 2014, the status of EDF Energy's UK reactors was as follows:

**Table 2: Reactor operation on 20 November 2014:**

<b>Nuclear reactor</b>	<b>Nominal Capacity MW</b>	<b>Status</b>	<b>Comments</b>
Dungeness B1	625	Offline	Expected return Nov 2014
Dungeness B2	625	Operating at 30%	repairing boiler feed pump
Hartlepool 1	650	Offline	Expected return Nov 2014
Hartlepool 2	650	Offline	Expected return Nov 2014
Heysham A1	677	Offline	Expected return Dec 2014
Heysham A2	677	Offline	Expected return to be end of Nov 2014
Heysham B1	629	Operating	
Heysham B2	624	Operating	
Hinkley Point B1	493	Operating at ~80%	
Hinkley Point B2	491	Operating at ~80%	
Hunterston B1	495	Operating at ~80%	
Hunterston B2	484	Operating at ~80%	
Sizewell (Turbine 1)	625	Offline	Expected return Dec 2014
(Turbine 2)	625	Offline	Expected return Nov 2014
Torness (reactor 1)	587	Operating	
Torness (reactor 2)	596	Operating	
<b>TOTAL</b>	<b>9,553</b>		

Of the UK's 15 reactors, seven (47%) were offline, one was operating at ~30% load, and four at ~80% load. In other words, on November 20, the UK's reactors were delivering 4,120 MW instead of 9,550 MW, i.e. 43% of what they should have been delivering.

It may be claimed that the November 20 date was exceptional as several reactors went back on line later the same month, but it excludes unplanned outages at Torness later the same month.

### 4. Supply Problems for National Grid

The above two tables show that the UK's nuclear reactors are unreliable to a significant extent - so much so they must present major headaches to the supply operators and planners of the National Grid. Unlike wind turbines whose supply interruptions are in smaller amounts which can accurately be predicted and catered for, nuclear stoppages are large, and, as seen from table 1, have a documented history of going offline without notice within seconds. These

unforeseen shutdowns inevitably cause serious problems at the National Grid as electricity demand and supply have to be carefully matched.

Strangely, the National Grid states the opposite. Recent public concern over power stations closures and low spare capacity margins leading to the possibility of power cuts this winter has prompted the National Grid to declare (2) that the UK has enough electricity generating capacity to meet the maximum need over the course of a UK winter. But this calculation critically depends on the reliability of power stations and an accurate assessment of the generating capacity of each plant.

An independent analyst (3) examined the National Grid's assumptions on power station availability over the next few months. The analyst noticed that it had actually raised its assessment of nuclear availability and had done so by more than for other types of power station. The National Grid now predicts that 90% of the UK nuclear capacity will be working at the point of maximum demand, up from 84% last year.

However this assumption is contradicted by the evidence from last winter, when the UK's nuclear fleet achieved 90% output for only a few days between December 2013 and mid-February 2014. In the face of repeated unplanned shutdowns at EDF's plants this year as shown in table 1, there is little reason for the National Grid's optimism. For example, even Ofgem estimates only 81% availability for nuclear and this predated the recent unplanned closures at Hartlepool and Heysham nuclear stations (4).

## 5. Wind power in comparison

During October and November 2014, the high number of reactors offline led to a flurry of stories about wind providing a greater proportion of our electricity than nuclear at certain times. (5) On October 19 2014, wind provided 24% of the UK's electricity supply for the entire day. The previous record stood at 22% in August this year. Wind's consistently strong performance saw it outperform nuclear power from October 17 throughout the weekend and to October 20. In fact, some coal plants were taken offline as they were surplus to requirements. (6)

In Scotland, renewables have produced nearly one third more power than nuclear, coal or gas in the first six months of the year, generating a record 10.4 terawatt hours. (7)

Although wind is a variable energy resource in that it cannot be guaranteed to blow at a constant rate, it is predictable as a result of accurate weather forecasting technology. The fact that wind turbines are located all around Britain means that even when some areas are calm, others are very likely to be windy. (8)

## 6. Past their Sell-by Dates?

The AGRs were originally envisaged to have only 30 year lives and they are now mostly older than that. See table 3. An obvious explanation for the recent poor reactor performances is that they were not designed to be operated for longer, and since most (9 out of 15) are now doing so, they are showing obvious signs of wear and tear from their poor reliability records.

**Table 3: Stretched Decommission Dates**

Nuclear Reactor	Date commissioned	Original date expected to be Decommissioned	Latest estimated Decommission date	Added Life in Years
Dungeness B21	1983	~2013	2018	5
Dungeness B22	1985	~2015	2018	3
Hartlepool 1	1983	~2013	2019	6
Hartlepool 2	1984	~2014	2019	5

Heysham A Unit 1	1983	~2013	2019	6
Heysham A Unit 2	1984	~2014	2019	5
Heysham B Unit 1	1988	~2018	2023	5
Heysham B Unit 2	1988	~2018	2023	5
Hinkley Point B -1	1976	~2006	2023	17
Hinkley Point B -2	1976	~2006	2023	17
Hunterston B-1	1976	~2006	2023	17
Hunterston B-2	1977	~2007	2023	16
Torness -1	1988	~2018	2023	5
Torness -2	1989	~2019	2023	4
Sizewell B	1994	2035	2035	nil

It will be noted that very long life extensions have been granted to the Hinkley Point and Hunterston reactors: it is not known why this is the case, at present.

## 7. Conclusions

This analysis of the UK's aging civil nuclear reactor programme shows them to have been highly unreliable at producing electricity over the past three years. NFLA would argue that the National Grid is being overly optimistic in its assessment that nuclear power will provide the reliability over the winter period to cover the UK's electricity needs. The impressive record of wind energy in the past few months reiterates the growing importance of renewable energy in the UK's electricity generation. With purported new nuclear reactors still many years away from ever being built, the UK Government needs to prioritise a greater level of generation from wind and other forms of renewable energy to compensate for likely unplanned outages with unreliable and old nuclear power stations. Enhanced Local Authority-led energy efficiency programmes and community microgeneration schemes should also be further encouraged as essential short-term stop-gap measures.

It should also be noted that wind power generation has broken generation records, and in the autumn has exceeded nuclear power generation on occasions. Its generating capacity in Scotland is particularly impressive, where it provided 107% of Scottish household electricity demand throughout November 2014 – or 813 GWh to the National Grid. Indeed on one particularly windy day, November 11<sup>th</sup> 2014, wind turbines produced the equivalent of 221% of domestic Scottish demand. (9)

The increasingly decrepit state of UK nuclear power stations also presents a serious safety issue. UK nuclear regulatory agencies are very much aware of the continual reduction in safety margins resulting from graphite loss and crumbling in the moderators of AGR reactors. As recent events at the Heysham and Hartlepool reactors emphasise, the policy of allowing significant lifetime extensions to our aging civil nuclear reactors needs to be reviewed. This report has shown that almost all of the UK's nuclear power reactors have had many unplanned shutdowns in the past three years – on average over 20 a year. Their unreliability is a matter of major concern as regards the UK's overall energy security.

Therefore NFLA calls on the UK Government, National Grid and the nuclear regulators to urgently review safety issues and alternatives to nuclear power generation over the next 12 months to ensure the unreliability of nuclear power does not lead to the 'lights going off' around the country.



## 8. References

- (1) FT 24th Nov 2014, <http://www.ft.com/cms/s/0/74161a70-7404-11e4-82a6-00144feabdc0.html>
- (2) Carbon Commentary 30th Oct 2014 <http://www.carboncommentary.com/2014/10/30/national-grids-winter-outlook-relies-on-impossible-optimism-about-nuclear-power-over-the-next-few-months/>  
and Ecologist 31st Oct 2014  
[http://www.theecologist.org/News/news\\_analysis/2616920/uk\\_faces\\_serious\\_winter\\_blackout\\_risk\\_national\\_grids\\_rosy\\_nuclear\\_forecast\\_fails\\_reality\\_test.html](http://www.theecologist.org/News/news_analysis/2616920/uk_faces_serious_winter_blackout_risk_national_grids_rosy_nuclear_forecast_fails_reality_test.html)
- (3) ibid
- (4) ibid
- (5) Guardian 6th Oct 2014 <http://www.theguardian.com/environment/2014/oct/06/uk-wind-power-bests-nuclear-power-for-a-few-symbolic-minutes>
- (6) Renewable UK 20th Oct 2014 <http://www.renewableuk.com/en/news/press-releases.cfm/2014-10-20-wind-power-steps-up-when-nuclear-and-gas-go-offline>
- (7) Guardian 27<sup>th</sup> Nov 2014 <http://www.theguardian.com/environment/2014/nov/27/renewable-energy-overtakes-nuclear-as-scotlands-top-power-source>
- (8) Beyond the Bluster: Why wind power is an effective technology by Reg Platt, Paul Gardner and Oscar Fitch-Roy, IPPR 30<sup>th</sup> August 2012 <http://www.ippr.org/publications/beyond-the-bluster-why-wind-power-is-an-effective-technology>
- (9) Business Green 8<sup>th</sup> Dec 2014 <http://www.businessgreen.com/bg/news/2385476/wind-farms-powered-107-per-cent-of-scottish-homes-in-november>