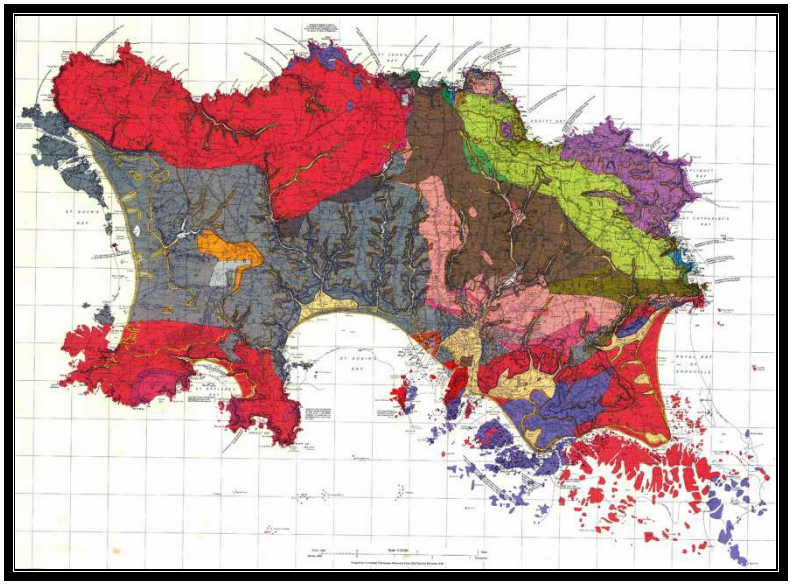
States of Jersey
States Assembly

États de Jersey
Assemblée des États

Environment Scrutiny Panel

Radon



Presented to the States on 8th September 2014

S.R.11/2014

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Chairman's Foreword

An article in the Independent newspaper in August 2010 reporting on the health risks headlined radon gas as 'the silent killer in the countryside'. Radon gas affects indoor air quality worldwide. It is radioactive, colourless, odourless, and tasteless, and occurs naturally at higher levels in areas of igneous and metamorphic geology such as granite.

In the open air, radon causes no problems. But it can also seep into buildings through cracks and holes in the foundations, where it can sometimes build up to levels that pose a health risk. What makes this more of a concern is that, being odourless and colourless, it is easy to ignore, especially in our homes.

The link between lung cancer and prolonged exposure to elevated levels of radon has been known since the 1980s. In studies carried out in Jersey at that time, the Island was identified as a high risk area. Following measures introduced in the UK, new building bye-laws were adopted locally to guard against this risk in new homes.

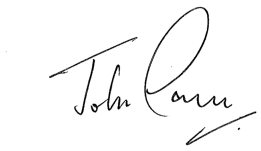
Following approaches from concerned citizens, the Environment Scrutiny Panel set out to discover how effectively our government had followed up these measures in the last three decades and whether we had adopted some of the excellent work done elsewhere to ensure the known risks from radon are mitigated. We were fortunate to recruit the expert services of Public Health England's Centre for Radiation, Chemical and Environmental Hazards (PHE – CRCE), who have enabled us to carry out the difficult and sensitive task of openly facing the reality of risk to health in our homes without causing unnecessary alarm.

We immediately recognised that this work involved Environmental Health, Environment and Building Control departments and crosses over two ministries, Health and Environment. The Panel has concluded that lack of joined-up government has seriously hampered progress and significantly contributed to complacency and a lack of effective action between departments. Throughout the Panel's work and public hearings the impression gained is that this is not a priority task, it has to take its course and detection and mitigation of radon gas is reliant on householders themselves. The Panel finds this a lamentable position.

It is of particular concern that our expert report identified that the risks reported in the UK of the effect on smokers in combination with elevated radon exposure have in the case of ex-smokers not been fully recognised locally. This may have been a contributory factor in the

lack of urgency shown by departments; it is undeniable that smokers face a far greater health risk than from radon exposure alone. However, the Panel sees a big distinction between the health risk incurred by people from smoking, which is entirely self-induced and one which is hidden, pervasive and unknown.

The Panel hopes that the Ministers who are appointed after the election will take up the recommendations in this report and ensure the next review is able to report a great improvement.



Deputy John Young
Chairman, Environment Scrutiny Panel

1. Background to the Review

A review of radon was first considered by the previous Environment Scrutiny Panel in 2010 and this was mentioned in its legacy report to the new Panel. Following media interest and correspondence with members of the public on the subject in 2011 the Panel agreed that it would carry out a review, but for various reasons was unable to include this in its work programme until late 2013. In the meantime, following a debate on the proposition 'Radon Gas Levels and Cancer Rates in Jersey' (P.144/2011) brought by then Deputy P. Le Claire, the Health and Social Services Department responded by participating in a new national radon survey run with the assistance of the Health Protection Agency (HPA), which subsequently became part of Public Health England in 2013. The local results of this were published in a report on 'Radon in Jersey' by the Health Protection department in 2012. Health Protection shared the results of the survey work with the Panel, and these together with historic records have formed the basis for much of the Panel's current investigation.

1.1 Panel Adviser

During its review the Panel has been grateful for the expert advice and guidance provided by Ms. Jane Bradley, from Public Health England's Centre for Radiation, Chemical and Environmental Hazards (PHE – CRCE). Her section is the leading authority on radon matters for the UK, responsible for analysing and mapping survey results, advising on radon risks, and providing guidance on mitigation measures. Ms. Bradley's report to the Panel therefore comprises the best and most up-to-date information available on this subject, taking account of the Island's geology and other specific local factors.

1.2 Reports

The Panel's report summarises key questions and lists the Panel's findings and recommendations. The adviser's report covers issues in more detail and is attached in full as an appendix. Areas prioritised for the review are indicated in the Panel's terms of reference (see Section 2).

2. Terms of Reference

Environment Scrutiny Panel

Radon

This review will examine the policies of the Ministers for Planning and Environment and Health and Social Services[1] in respect of measures for dealing with radon gas in Jersey, in particular the monitoring of radon levels in the Island, information provided to the public and applicable bye laws. The primary focus of the review will be on evidence regarding levels of radon found in buildings in the Island, available guidance and means of prevention, rather than detailed investigation of potential health implications, which falls outside the remit of this Panel.

Terms of reference

1. To consider the results of the latest radon survey of properties in the Island, announced in November 2011 by the Health Department

2. To compare these results with previous local surveys and information available from the UK and elsewhere, to establish whether any further work is considered necessary and if so, make appropriate recommendations

3. To review the support and advice provided to the public in respect of radon, together with any assistance available to Jersey homeowners to address higher levels of radon in their properties where these are found to exceed recommended guidelines, or are considered potentially to be of concern

4. To review the scope and effectiveness of present building bye laws requiring measures to protect against the build-up of radon gas in buildings and whether they need updating

The Panel will report its findings to the States.

[1] By agreement with the Health, Social Security and Housing Scrutiny Panel

3. Panel Membership

The Environment Panel is constituted as follows:

Deputy John Young of St. Brelade (Chairman)

Deputy Steve Luce of St. Martin (Vice Chairman)

Connétable Phil Rondel of St. John (Member)

Deputy John Le Bailly of St. Mary (Member)

4. Radon Facts

Radon is a natural radioactive gas, which has no taste, smell or colour. It is produced by the radioactive decay of uranium, which is present in all soils and rocks in small quantities. In some areas where granite is found, such as Jersey and parts of the south-west of England, notably Cornwall, higher levels are recorded, especially around the edges of granite intrusions. Jersey was defined as an area with higher radon potential (radon Affected Area) in the late 1980s.

Radon can travel through faults and voids in underlying rocks and soils until it escapes to air. It is therefore present in outdoor air, albeit in very low concentrations. However, it also has the potential to collect in buildings. Cellars and poorly-ventilated (particularly ground floor) rooms in radon affected areas can sometimes show elevated levels of radon. This raises some health concerns, as since the 1980s it has been accepted that exposure to high levels of radon over long periods can pose health risks. The International Agency for Research on Cancer (IARC) classified radon as a human carcinogen in 1988.

Research into the occurrence of lung cancer amongst miners highlighted risks from exposure to the high levels of radon sometimes found in underground workings. Radon concentrations found in such circumstances were sometimes extremely high, but the levels in some homes in affected areas can also be high enough to cause concern, especially if the occupants are exposed to them for many years. Radon in the home increases the risk of lung cancer, especially for those exposed to higher concentrations.

It is important to understand that the risks from radon are generally associated with exposure to high levels of the gas over very extended periods; the health implications are calculated on the basis of lifetime risks, rather than as any immediate threat. However, there is particular concern associated with the effects of exposure to high levels of radon on current or ex-smokers, who are at significantly increased risk from the combination of these two factors. A report produced for Jersey's Medical Officer of Health based on local cancer statistics[2] has highlighted that a smoker in Jersey exposed to radon at levels equivalent to the target guideline (see section 5 below) or higher is over 30 times more likely to contract lung cancer than a non-smoker.

[2] See Appendix 2

Estimates suggest that around 1,100 lung cancer deaths per year in the UK are linked to radon, the majority of them in current or ex-smokers. Overall radon is the second highest cause of lung cancer in the UK, and also poses the highest risk of lung cancer for non-smokers.

5. Protecting Against Radon

5.1 Target and action levels for dwellings

National and international organisations have developed guidelines for protecting against radon since the 1980s, which continue to evolve over time. Radon levels vary between regions depending on local geological factors, and guidelines can also differ, although most authorities have adopted broadly similar standards. Jersey has tended to follow UK guidance, which for some years has set 'Target' and 'Action' levels to inform local authorities and homeowners of the radon concentrations where remediation is recommended.

In the UK radon levels are generally measured in becquerels per cubic metre (Bq m^{-3}) of indoor air. The Target Level for dwellings is 100 Bq m^{-3}, with an Action Level of 200 Bq m^{-3}, calculated as annual average figures. Actual measurements recorded in homes can vary from less than 10, to over 10,000 Bq m^{-3} in some cases.

5.2 Affected areas

Areas where 1% or more homes are likely to exceed the Action Level are described as radon 'Affected Areas'. Results from the limited number of surveys carried out in Jersey since 1987 have been relatively consistent, with some 10% or more of properties tested being over the Action Level. The latest findings from 2011 showed that 17% of the properties surveyed had levels over the 200 Bq m^{-3} Action Level, the highest level recorded being 1,100 Bq m^{-3}. As above-guideline levels have been recorded in various different parts of the Island, the whole of Jersey is considered a radon Affected Area.

5.3 Building bye laws - dwellings

A positive government response to the results of the early surveys carried out in Jersey in 1987-88, and again in 1992 was the introduction by the Planning Department in 1997 of Building Bye Laws requiring that all new dwellings should incorporate radon protection measures in their construction. These measures were based on UK-developed standards for 'full protection'. Since that time all new homes in Jersey have been built with a protective membrane designed to provide a gas-tight seal between the accommodation and the ground below, and a radon 'sump', essentially a small void constructed beneath the dwelling with a pipe connecting this to the open air above ground.

The membrane is intended to prevent radon being drawn into the property; the sump is fitted as a back-up, in case later tests prove that the membrane is not fully effective in preventing the gas from entering the building. If so, a small electric fan can be attached to the outer end of the pipework and kept permanently in operation to depressurise the void, causing any

radon below the property to be drawn into the sump and expelled via the pipe to the outside air. The sump by itself will not reduce radon levels unless a fan is fitted and working.

These radon protection measures are relatively simple to apply during construction of new homes. In older properties found to be affected by radon it is not normally possible to apply an effective barrier membrane retrospectively, so remedial work would usually involve the addition of a radon sump underneath the property fitted with a fan. New extensions to local properties are required to be protected against radon.

5.4 Places of employment and radon

In Jersey there is no requirement for non-domestic buildings to be protected against radon ingress. However, places of employment are covered by health and safety provisions for the protection of employees. These require that organisations with five or more employees prepare a written health and safety policy, including a statement of risks identified by the employer, together with the measures that have been taken to minimise or mitigate them.

The local Health and Safety at Work legislation is designed to be self-regulating, requiring employers to take action if risks to the health and safety of their employees are identified, put in place suitable measures to control them, and notify the authorities. The Panel was informed that only a very limited number of notifications had been received from employers.

Jersey also follows UK guidelines for radon levels in workplaces, which are different from those for domestic properties. The radon concentration at which the Approved Code of Practice (ACoP) applies is 400 Bq m^{-3}, measured as a 'worst case' figure rather than an annual average; if this level is exceeded specific actions are required, including advising the States Health and Safety Inspectorate.

Non-domestic buildings in Jersey are not required to be protected against radon, unlike in England and Wales, where Building Regulations requiring radon protection measures now extend to all types of new building in areas with a 3% probability or above of buildings exceeding radon guideline levels. In Scotland and Northern Ireland the first level of protection is required from 1% probability; all parts of the UK require additional protection at levels of 10% or above. Without radon protection, there is more potential for workplaces to exceed the levels where radon exposure needs to be notified. This is possibly more of a concern in ground floor or basement areas of buildings where there may also be an element of residential use, such as in hospitals, care homes or the prison, or where working areas are below ground or the public have extended access. It is unclear how many commercial premises have been tested locally.

5.5 Radon in water

Radon is soluble in water, although it gases off readily from surface water sources exposed to the air, such as streams, ponds or reservoirs. However, sometimes higher levels of radon are found in groundwater, for example in wells or boreholes, and this may become another route for exposure when the water is released from taps or showers inside the occupied parts of a building. There is also potential for build-up of radon in enclosed spaces where high volumes of water flow, for example in waterworks buildings, where the concentration of radon is lower but de-gassing occurs from large volumes.

Levels of radon found in water are normally low compared with potential levels in air, and the primary concern therefore is not generally radon in the water itself, but the increased concentration of airborne radon that may result if it gases off inside enclosed spaces, for example poorly ventilated bathrooms, shower rooms or kitchens. This is not considered to be a major problem, and it can be addressed by ensuring that any water sourced from boreholes or wells found to be affected by higher levels of radon is aerated before use away from living areas.

5.6 Radon in building materials

Some natural construction materials such as granite can emit low levels of radon, although generally these are much lower than levels that may occur if radon rising from below ground can enter and collect in a building. Radon levels associated with internal features such as granite worktops and fireplaces, or even the structure of homes built largely of granite (or other natural stone materials that emit some radon) are not generally high enough to be of any significant concern.

5.7 How to find out if your home may be affected by radon

In the UK, following extensive survey work over many years the likelihood of a building in a specific location having a higher level of radon can be predicted by use of specialist mapping techniques based on the measurement data and underlying geology. However, radon levels in an individual dwelling can only be assessed accurately by testing. In Jersey, the number and coverage of radon surveys carried out is insufficient to allow meaningful predictions of likely levels by area, so individual testing is the only option.

The means of construction, any protection measures (as applied to all newly-built residential properties in Jersey since 1997) and also how individual dwellings are used can potentially have a significant effect. Because of these variations even similar neighbouring properties in a terrace can give quite different results, which is why testing is the only reliable way to determine the level in a particular property.

5.8 Variations in radon levels indoors

There are many factors that can influence radon levels indoors. They are generally higher in winter than in summer; amongst other things that can influence radon levels are:

- the use of heating, which causes an increased 'stack effect' resulting in reduced air pressure in the property and encourages radon to enter, if floors in contact with the ground are not sealed
- operation of some appliances, such as extractor fans, cooker hoods, log burners or open fires, which can also reduce the air pressure inside parts of the property and cause radon ingress
- prevailing winds, which can affect uplift of soil gases
- the structure of the property itself, for example the integrity of floors, and whether it is built on a solid base (although concrete floors will not necessarily stop radon gas from entering around the edges)
- if the property has a basement or cellar
- the way the property is ventilated
- whether there are air-bricks or voids affecting underfloor ventilation

Natural ventilation of living spaces, for example opening windows in hot weather can help radon levels to be diluted, although in certain circumstances, for example opening upstairs windows only could potentially cause more radon to be drawn into a property.

5.9 Testing for radon

Because of these variable factors, the recommended way to assess the annual average radon concentration in a building for comparison with guideline levels or regulations is by means of a long term test. Commonly this is done by placing 2 passive radon detectors in the most frequently used rooms (generally the living room and main bedroom in a dwelling, or occupied rooms in workplaces) for three months. The presence of radon is recorded through 'track etching' on a sensitive layer in the detector, which can be analysed by a specialist laboratory when the detector is returned at the end of the test period. Standard correction factors are then applied to account for the time of year that the measurement is done; radon levels are generally higher in the winter (heating season) than in summer. Domestic measurements are corrected to give the annual average to compare with the Action and Target Levels, workplace testing to the worst case winter result for compliance with the ACoP.

Other forms of testing can be used to obtain a ‘snapshot’ reading, particularly if high radon levels are already suspected, but passive detectors are considered more accurate and reliable for assessing the average, provided that instructions for placing them in the home are correctly followed and they are left undisturbed for the required period. They are also relatively inexpensive, at around £20 per detector ex-VAT (currently £41.50 for a domestic 2 detector pack).

6. Local Issues

6.1 A hidden problem?

The Panel has concerns about the relatively small number of tests carried out locally, and the low priority seemingly given to radon issues since it was first identified as a potential problem in the Island. Evidence from the first survey in 1987/8 showed that 3 out of 30 (10%) of the properties tested had radon levels above 200 Bq m^{-3}.[3] Subsequently additional tests were carried out over 10 months in 1989/90 in nearby properties and areas of similar geology, to determine whether this was a wider problem and if so, to ascertain its possible extent. These follow-up tests found levels over 200 Bq m^{-3} in 8 out of 22, or 36% of the dwellings tested.

Further tests were carried out in 1992, and again in 1998. The 1992 tests focused on houses and school buildings in St Helier, and found no properties above the recommended action levels. However, the very small sample of 14 properties tested in 1998 again showed 35% above 200 Bq m^{-3}.

The latest survey results taken in 2011 were presented in the 2012 report by Health Protection. 63 properties had been tested, of which:

- **64% were below the precautionary guideline (100Bq m^{-3})**
- **19% were above the Target level, but below the Action Level (i.e. between 100-200 Bq m^{-3})**
- **17% were above the Action Level of 200 Bq m^{-3}**

Given the evidence that 36% of the properties tested had radon concentrations in excess of recommended levels, and nearly half of these were above the Action Level, the Panel is surprised that significantly more effort has not been put into addressing the potential problems and raising public awareness of them. At the very least it would seem important to be sure that Islanders are well informed about the risks of radon and the likelihood of potentially problematic levels being found in their homes. The Panel considers that the fact that only some 130-140 tests have been carried out locally over a period of nearly 30 years demonstrates a serious lack of commitment on the part of the States to addressing the potential health risks posed by radon.

The Panel has been informed that the total cost to the Department of Health and Social Services of participating in the 2011/12 national survey was only £3,000, which also seems

[3] The Panel's adviser has pointed out that these were winter tests with no seasonal variation applied, so would have been somewhat lower if a correction factor had been calculated at the time

an insignificant sum compared with the importance of its findings. If the results were considered representative of the overall housing stock,[4] they would suggest that nearly 15,000 dwellings in the Island may be above the Target Level for radon, with some 7,000 of these over the Action Level. Even taking into account the number of apartments above the ground floor (thus at lower risk from radon) and the increasing number of post-1997 bye law properties with radon protection measures built in, it seems there may be a significant number of homes in Jersey whose occupiers could be exposed to higher than recommended levels of radon without necessarily being aware of the fact, or knowing how to remedy the situation.

During the Panel's public hearing with the Minister for Planning and Environment on 7th March 2014 the Minister and his officers appeared to view radon testing as something for householders rather than the States to deal with:

Director, Building Control:

I see it as a choice for the householder, really. They have got measures in.[5] If they are concerned, they can have that extra testing done and act accordingly, so it is about awareness and letting people make their own choices.

The Minister for Planning and Environment:

For my way of thinking, it is about the level at which State intervention and public monies are applied in order to maximise any benefits for the greater public, so you are going to be offsetting that against the individual risks, and the State generally does not kind of come in very heavy unless there is a potentially large wider public health problem. People are reluctant, by and large, to have the States Government imposing too many restrictions if indeed it is their choice and wish to do whatever may be disadvantageous to themselves. We see that with smoking.

Deputy J.H. Young:

Do you think that people are generally aware of radon gas?

The Minister for Planning and Environment:'

I think they are, and certainly the Turnbull report and Cameron report a while back certainly gave, I think, a better indication of the overall risks, in particular to the heightened risks for people who smoked, might have had professional occupations that took them into a greater

[4] 41,595 dwellings in 2011 (Jersey in Figures 2013)
[5] Post 1997 properties only

exposure of these gases than the ordinary members of the public. But at the end of the day, before we start applying legislation and regulation, there always has to be a determination as to cost and benefit and the analysis has got to be done in some instances. The State may only go as far as we have done with smoke alarms and suggest that you should have them in your own property, but if you choose not to maintain them and you are caught out and you die through burning or whatever through a fire, it is your choice, up to a point.

The Panel would agree with the view that awareness of radon issues is necessary to enable people to make informed choices. However, it has not seen any evidence to support the Minister's apparent assumption that householders generally are informed about radon and therefore understand the potential risks sufficiently to make appropriate decisions.

Questioned during a later public hearing on 7th March 2014 with the Minister for Health and Social Services, the Interim Head of Environmental Health stated that if he owned a property in Jersey with a ground floor or basement, he would want to have it sampled for radon, for his own peace of mind. He also made mention of the UK Housing Act, which includes radon as one of a range of hazards covered in the Housing, Health and Safety Rating System (HHSRS) to determine if a dwelling is fit for occupation. A similar system was proposed for Jersey in 2013 (the Public Health and Safety (Dwellings) Jersey Law 201-), but was withdrawn for reconsideration following consultation.

However, even after the publication by Environmental Health (in August 2012) of the report on the results of the latest survey, little if any meaningful action appears to have been taken on its recommendations.[6] To the Panel this seems to demonstrate an unacceptable degree of complacency.

6.2 Radon and smoking

The Health Minister and her officers naturally give smoking a much higher priority, this being by far the biggest cause of fatalities from lung cancer. The Panel was told at the hearing that only one lung cancer death in every three or four years in Jersey (out of a total of approximately 200) was probably directly attributable to radon.

However, closer investigation of evidence from a scoping report on 'Cancer in Jersey', produced for Jersey's Medical Officer of Health in July 2013 by the Public Health England Knowledge and Intelligence Team (South West) shows that in fact, while the effect of radon acting alone may only be responsible for one lung cancer death locally every 3-4 years, the

[6] See Appendix 1

'multiplier effect' of radon and smoking in combination probably causes a further death every year; and the effects of radon on ex-smokers are a probable factor in another. Overall radon could therefore be associated with 2 deaths from lung cancer every year in Jersey, or up to eight times the level initially suggested at the public hearing.

There also appeared to be a misunderstanding that people who have given up smoking significantly reduce their risks from exposure to radon, compared with continuing smokers. Research suggests that this is incorrect, and that ex-smokers remain at more risk from radon exposure than non-smokers.

A table illustrating the relationship between radon and lung cancer deaths produced by the Panel's adviser is reproduced below.

Causes attributable to lung cancer deaths

Factor	Annual Lung cancer deaths		
	Jersey	UK (AGIR 2009)	%(AGIR 2009)
Radon alone	**0.3**	**157**	**0.5**
Radon and smoking - current smokers	**0.9**	**532**	**1.6**
Radon and smoking - ex-smokers	**0.7**	**421**	**1.2**
Smoking alone	**49**	**28,376**	**83.1**
Other	**8**	**4,664**	**13.6**
Total	**59**(NCIN 2013)	**34,150**	**100**

The Panel accepts that reducing smoking should remain the top priority in efforts to prevent lung cancer, but anything that can be done to decrease cancer deaths from other causes must surely also be worthwhile. This evidence suggests that the relationship between smoking and radon exposure may deserve closer attention; it also seems highly likely to the Panel that many people are not aware of the additional risks arising from a combination of the 2 factors. If the risks were communicated effectively both current smokers and ex-smokers could make an informed choice on action (either reducing radon, or giving up smoking or both). Currently both groups are in ignorance of the facts that affect their individual risks.

The Panel finds that while the report's findings on radon[7] may have been interpreted by the department as further justification for focusing resources on the bigger target of smoking, the full impact of radon may have been underestimated. Although small by comparison it should not be ignored or discounted, as this could be putting lives at more risk unnecessarily.

6.3 Effectiveness of radon protection

There also seems to be room for a more pro-active approach on the part of the Environment Department's Building Control section. While the department deserves praise for the early introduction of full radon protection measures with new local building bye laws in 1997, the Panel was very surprised to find that no tests have been carried out, by either the Department of the Environment or Health and Social Services, to check the effectiveness of these measures. Every home built in the Island since that time has included (at extra cost) a protective membrane and radon sump in its construction, but the Panel was informed that there is no record of any being tested to check whether they are successful in keeping radon out. Building Control do visually check during construction that the protection measures are being properly installed, but beyond that there appears to be no coordinated or consistent approach to informing purchasers what radon protection measures are in place in new homes, how they work, or indeed of the need to test for radon levels at all. This seems to demonstrate a lack of joined-up thinking, possibly arising from the fact that no single department has responsibility for delivering a strategy to protect against radon.

Although they had not done any tests, the Director of Building Control was fairly confident that the measures being put in were effective, because tests done in the UK showed that if protection measures were installed in a competent way, the required standards would be achieved. However, the Panel is advised that there is a proportion of new homes that test high in the UK even where radon protection measures are installed. This may be due to poor fitting, damage to the membrane during construction or the original level of soil radon being excessively high. The full protection measures applied in the higher radon areas (such as Jersey) are designed to help in the latter case to give an easy fix if the testing shows high levels, by fitting a fan to activate the sump. This highlights the need for testing of all new homes even if the fitting is done correctly in full protection areas.

While visual inspections are not required in the UK at the time of installation, it would appear optimistic to assume that a visual check as practised in Jersey could give adequate assurance of a radon-proof seal in every new property without further testing. This could

[7] For full details see Appendix 2

raise questions not only about the effectiveness of protective measures, but also potentially about issues of liability, were a householder subsequently to find high levels of radon in a supposedly protected new property.

7. Summary

7.1 Lack of information for the public

Surprisingly to the Panel there appears to be a sense amongst the various States departments with responsibility in this area that radon in Jersey is not really a major issue. It has clearly been given a low priority for many years, despite being widespread across the Island and frequently found at levels that significantly exceed recommended guidelines.

Accepting that in the majority of cases the lifetime risks remain very low, the Panel still considers that more should be done to inform Island residents about the increased risk of lung cancer associated with continued exposure to elevated concentrations of radon. This seems particularly important because the gas is completely undetectable to householders, whereas testing with radon detectors is a cheap and easy precautionary measure. Remedial measures (if necessary) are also relatively simple and inexpensive to apply, particularly compared with the value of local property and the cost of other forms of maintenance.[8]

The Panel finds it remarkable that the Health and Social Security and Environment Departments appear content to leave it up to people to approach them about the issue; little or no thought appears to have been given to pro-actively providing homeowners with relevant information, so unless someone has prior knowledge of the subject, contacts a department directly or searches the States website specifically for this purpose they could easily remain oblivious to the presence of radon in Jersey. Reference was made during the hearing with the Minister for Health and Social Security to the higher public profile brought about by the most recent survey in 2011-12, but even then only just over 60 properties were actually tested; and while this nearly doubled the total number of tests carried out since 1987, the numbers of people who have asked for information each year since then have been insignificant, in ones and twos according to the Interim Head of Environmental Health.

The Panel believes that this should change. Local residents clearly have a right to be fully informed by relevant authorities about any known issues that could potentially affect their health. Although radon is predominantly a very long-term concern, the relative lack of movement in Jersey's housing market due to restricted availability and the Island's small size means that families may spend longer in one dwelling than could be the case

[8] For more detailed information on radon remedial measures see the following links to guidance produced by Public Health England and BRE. NB Indicative costs refer to the UK and may need adjustment for Jersey

http://www.ukradon.org/information/reducelevels

http://www.ukradon.org/cms/assets/gfx/content/resource_2722cs33267e5dc5.pdf

elsewhere, whether in rented or owner-occupied accommodation. As such, knowing that radon concentrations in a particular property were above recommended levels could be more significant in terms of long term health outcomes; while confirmation in the majority of cases that they were low would still be reassuring.

With so little information circulating in the public domain about radon, it also seems unlikely that the message about the significantly higher risks it poses for smokers is common knowledge; and from evidence given at the Panel's public hearings it appears that the continuing implications for ex-smokers are not necessarily fully recognised even amongst health professionals. By not informing all householders of the potential consequences of living with high levels of radon the Panel considers that departments are failing in their responsibilities. The first recommendation of the 2012 Environmental Health report 'Radon and Public Health in Jersey' was:

"*That the States of Jersey continues to recommend to householders and employers that they test their premises for the levels of radon exposure."*

The Panel believes that a much more positive effort is required to ensure that this message is communicated and acted upon.

It is understood that the Housing Department (now Andium Homes) is taking radon into account in plans to ensure that all of its properties meet 'Decent Homes' standards; this is considered to be a very welcome development. It may involve a substantial amount of testing but will help to improve data available on radon distribution in the Island, and may also raise awareness of this largely unacknowledged problem. However, this programme will not apply to private landlords, their tenants, or homeowners.

7.2 Need for more information

It could perhaps be argued that since each successive set of results (barring one series of tests in St Helier) seems to have reinforced the message that Jersey has high levels of radon, there is no real reason to pursue further surveys. However, the Panel has identified some issues with past results that suggest more work is needed.

Normal protocols for radon mapping surveys in the UK call for a random selection of properties to be tested based on a grid pattern of 1 kilometre squares. In the UK, once mapping has identified high radon areas, effective targeting can be carried out, which can involve free tests and further support being offered to all households in specific high radon areas. This approach has not been followed in Jersey, although initial tests to aid mapping

have been carried out. However, analysis of the results suggests that for whatever reason, the majority of homes tested for radon locally have been detached houses, generally owner-occupied, older properties of traditional construction.

While the results still provide useful information about the distribution of radon in the Island, the relevance of the findings to other types of property is therefore questionable. In particular, as explained previously the Panel is surprised that no effort has been made to test a representative sample of homes built since the 1997 bye laws, to see how effective radon protection measures have been, whether any more work is required in individual cases (such as connecting up fans to radon sumps where levels remain higher than recommended) or if there are any specific types of construction that perform better or worse than others. Results from the 2011-12 survey and a small number of additional tests since then are insufficient to prove whether the bye law measures are making a difference to average radon concentrations, although this would be expected.

Targeted testing on a range of newer properties of different types of construction where radon protection has been applied could be useful to ascertain if any of these are more or less likely to experience high levels of radon build-up. One particular area that the Panel believes could benefit from investigation is that of insulation standards to reduce energy consumption in homes and workplaces, as measures to enhance the ‘air-tightness’ of buildings could potentially have unintended consequences in terms of higher radon concentrations (if the gas is still able to enter the structure from below). Findings could then be used to inform planning decisions about how best to protect Jersey homes from radon in future. Currently there is no means of knowing for certain whether the bye law measures are always successful, or alternatively if they are always necessary. However, in the absence of such information the continued application of full protection measures to all new residential properties seems the safest and most sensible way forward, assuming as mentioned above that all householders are informed of the need to test, and if high results are found, to activate the standby sump by installing and operating a fan.

Further testing could also provide better information on the geographical distribution of radon. The limited results available to date show that the gas has been found in higher than recommended concentrations in many parts of the Island, unlike in Guernsey where it is understood that different geology makes it more of a localised problem. Additional survey work could possibly help to identify specific areas in Jersey which are more or less prone to high radon levels. It has been suggested (perhaps somewhat pessimistically) that this might generate concern among homeowners, and possibly even create distortions in the housing

market. However, the Panel considers that the very low cost of testing and relatively modest expenditure required to remediate any problems if discovered should allay such anxieties; greater clarity about radon distribution throughout the Island would be a positive outcome.

This leads to a recommendation which the Panel believes could be a useful step forward in building a database of knowledge about radon for the future. In the UK, all property transactions include questions about the Affected Area status of the property, and when it is in an Affected Area further questions follow about whether the property has been tested, what the results were, and if remediation has been applied. Where tests have not been undertaken, a retention can be negotiated to cover any remedial work determined by the results of a test carried out by the purchaser.

As explained above, different patterns of usage can affect radon levels in a property, and there is little or no point in testing unoccupied dwellings. A retention in the case of an untested property would therefore have to allow sufficient time for tests to be completed (3 months) and subsequently for the results to be analysed. An individual purchaser with concerns about radon levels could already request this, but the Panel considers that as the entire Island is currently deemed a radon Affected Area, it would be appropriate to encourage a common standard on such matters and include radon questions in the conveyancing process for all local house sales. The results could be centrally collated to provide a valuable source of public information on radon.

In respect of standards for radon-related remedial works it would also be useful to ensure that detailed information on how to deal with elevated levels of radon is made available to all householders who identify a problem. A list of builders qualified to undertake such work (or possibly an accreditation scheme) could also assist owners of affected properties needing help with radon problems. Experience from the UK suggests that even where financial support in the form of grants or loans is available, not knowing exactly what to do and getting someone to do the work can present barriers to successful remediation. It is understood that Public Health England offers free post-remedy testing to check the effectiveness of remedial works, which also enables sharing of data about results to improve future advice to stakeholders.

7.3 Radon in the workplace

There is very little information available at all about radon levels in workplaces in the Island even though the Health and Safety at Work (Jersey) Law and the associated ACoP for working with radiation apply. Given the range of results that have been found in surveys of

residential properties, realistically it seems likely that there are also workplaces in Jersey where workers could be exposed to higher levels of radon. In the case of workplace exposure the levels are not guidelines; if exceeded they require notification and action. There is therefore a need to enforce the requirement to test – the UK Health and Safety Executive requires a risk assessment (usually a test) in all workplaces in Affected Areas of 1% and greater probability.

In the absence of testing or reliable baseline information for radon in non-domestic buildings there would seem to be a strong argument for amending the Building Bye Laws applying to new workplaces in the same way as those for dwellings, to ensure that they are also protected against radon. As noted above this is standard practice in the England and Wales where it applies to all new buildings, extensions and conversions in areas of 3% or greater probability. The limited information available suggests that radon probability in Jersey is around 10%.

8. Key findings

1. Responsibility for radon in Jersey is shared between several departments, with none taking a lead on radon matters. Perhaps partly as a result, very little effort has been put into investigating radon levels, following up survey findings or making information on radon more widely available
2. Despite consistent results showing that many homes in Jersey are likely to exceed guideline Target and Action levels for radon this information has not been fully explained to the general public
3. There appears to be no consistent message to encourage all householders to have their properties tested for radon, despite this being amongst the recommendations of the 2012 report
4. Surveys carried out since 1987 have been limited in scope and number. Too few homes have been tested to enable conclusive results and the types of property tested have been limited
5. Measures for protecting new homes against radon since 1997 have not been followed up with testing to ensure that they are effective
6. New workplaces are not required to be protected against radon, which is inconsistent with bye laws for dwellings and would appear to be a worthwhile precaution
7. No action appears to have been taken to advise homeowners about the possible presence of radon in private water supplies, or to carry out any testing to ascertain whether or not this may be a problem in specific areas
8. Potentially increased risks of developing lung cancer associated with prolonged exposure to high levels of radon have not been communicated adequately to homeowners, particularly those who smoke and ex-smokers

9. Recommendations

The following recommendations largely reflect those of the Panel's adviser, which are fully supported by the Panel. It is noted that not all of them fall within the remit of one States department, and some break new ground. However, the Panel believes that all of the recommendations should be taken into account to raise the profile of radon as an environmental health issue potentially affecting many Island residents, which has been ignored or dismissed as unimportant for far too long.

1. **Information about radon measurements in Jersey should be brought together in a consistent format (ideally representing the annual average radon concentration) to enable analyses and comparisons to be made**
2. **Formal advice should be published recommending that all ground floor (or lower) dwellings on Jersey should be tested for radon and that premises with annual average indoor radon concentrations above the appropriate Action Level should be remediated**
3. **Discussions should be held with the Jersey Law Society regarding the possibility of including questions about radon in the conveyancing process associated with the sale and purchase of all buildings in Jersey**
4. **Consideration should be given to the benefits of applying in Jersey, relevant aspects of the radon related requirements contained in the 2014 EU Basic Safety Standards**
5. **The States should consider if workplaces with high public occupancy (2,000 or more hours per year) and schools should use the protection standards developed for homes**
6. **Consideration should be given to including radon protection to all new buildings and extensions, refurbishments and conversions**
7. **Consideration should be given to amending the Building Bye-Laws (Technical Document Part 4) to clarify the level of protection required**
8. **Consideration should be given (depending on the outcome of recommendation 6) to updating the reference in Technical Document Part 4 to the latest version of the Building Research Establishment's Report BR211 2007 Edition**
9. **The States should consider a pilot programme to determine if radon in water is a significant source of exposure in homes and workplaces**
10. **The States should publish a summary policy document on radon that would bring together all aspects of radon and the control of exposures to the population of Jersey in one document. The document should be made easily available for distribution to all stakeholders**

11. **Detailed radon remedy information should be made available to all households with test results above Target levels, or on request. A list of qualified builders and/or some form of accreditation scheme may also be advisable to guide those needing remedial work**

12. **The Minister for Health and Social Services should assume overall responsibility for radon protection measures in the Island, assisting householders with advice and support through the Environmental Health Department and coordinating any requirements for new or amended building bye laws with the Department of the Environment**

13. **The Minister for Health and Social Services should produce a plan to carry out a major new programme for the detection and remediation of radon in homes. Such plan to produce a significant increase in the number of homes tested, particularly dwellings which may be likely to have increased radon levels, support for householders where radon Action or Target Levels are exceeded and assistance to householders to undertake remediation measures. The plan to include an appropriate level of public funding to be determined in consultation with the Minister for Treasury and Resources, and a scheme of financial support for grants and loans to householders in appropriate circumstances**

10. Appendices

1. Recommendations from report 'Radon and Public Health in Jersey', Valerie Cameron, 7th August 2012

Recommendations

1. That the States of Jersey continues to recommend to householders and employers that they test their premises for the levels of radon exposure.

2. That consideration should be given to further work with the HPA to undertake grid square mapping and geology based mapping. This may require additional testing and further funding.

3. That the current contract with the HPA be continued to allow local residents to purchase test packs at a reduced rate through the department (£35 through the States cf £48 to individual householders).

4. That advice is given to householders with high levels of radon and levels that might affect smokers, on how to reduce levels of radon in their homes.

5. In households that have levels affecting smokers, advice and support to quit should also be given.

6. A new report from the EU - European Atomic Energy Community (Euratom) has advised that EU member States should introduce a new standard of 100Bq/l for water supplies and also member States should consider the development of a 'Radiological Action Plan' that includes radon in air and water supplies. HPS has already started to develop a plan for Jersey and has raised the risk of radon in drinking water with the Environment Department.

7. Environment Scrutiny Panel (ESP)
Radon was on the 'legacy list' for the current ESP. The Head of HPS was invited to give a short presentation to the ESP subgroup about radon. The outcome was that the ESP subgroup recommended that a joint meeting with the Minister for Environment and staff from Planning and Building Control should be organised with the Head of HPS to discuss the issue further to ensure a joined up approach to policy and implementation. This is particularly important as the current Energy Policy requires residents to conserve energy consumption by 'tight house' initiatives. This is in conflict with the health recommendation to improve ventilation to reduce radon exposure.

2. Section on radon (p.22) from report 'Cancer in Jersey', produced for Jersey's Medical Officer of Health in July 2013 by the Public Health England Knowledge and Intelligence Team (South West)

Radon Gas

Radon is a naturally occurring gas, produced by decay of minute amounts of uranium in certain rocks. Some parts of the UK, particularly the South West, are known to have higher amounts of radon due to large granite deposits. Much of a person's exposure is in their place of residence and strongly depends on the precise details of their home for example, ventilation, pipe work, and the underlying ground structure. There are examples of neighbouring houses with widely differing radon measurements.

The wide range of radon exposure in small geographical areas means that studies based on where people live (ecological studies) can be unreliable in drawing conclusions on how radon affects risk of cancers.

The type of radiation which radon produces does not penetrate deeply and is blocked by human skin. However, the membranes lining the lung are much thinner, and any radiation emitted by inhaled radon gas can damage the cells of the lung. This is why radon is a risk factor for lung cancer. Even in a high radon concentration there needs to be a sequence of events occurring to cause the lung cancer. The risk of a single exposure causing lung cancer can be discounted and the risk levels for exposure are all calculated on a lifetime exposure to radon.

Although radon is a risk factor for lung cancer, the magnitude of risk is very much lower than the risk induced by smoking. However, those exposed to higher radon levels who are also smokers have an added risk as the two factors multiply together. A report by the Health Protection Agency (HPA) in the UK (HPA, 2009) concluded that the lifetime risk of lung cancer for a non-smoker when exposed to long-term radon levels of 0, 100, 200 and 400 Bq m^{-3} (a measure of radon concentration) was 0.4, 0.5, 0.5 and 0.7%. In contrast the risk for a smoker at the same levels is 15, 17, 19 and 23%.

A recent study (ref HP 2011/12 report) in Jersey showed that radon occurs across the island. On a sample of premises 64% had radon level less than100 Bq m^{-3}, 19% levels between 100-200 Bq m^{-3} and 17% had levels over 200 Bq m^{-3}. There were no 'hot spots' identified and even neighbouring buildings were shown to have very different radon levels. The HPA data shows that at levels of 100 Bq m^{-3} a smoker in Jersey exposed to radon is over 30 times more likely to contract lung cancer than a non smoker and this is true at the higher radon levels.

The UK HPA report attributed only 0.5% of lung cancer deaths in 2006 to radon exposure alone, with a further 2.8% attributed to radon and smoking in combination; that is, if either radon exposure or smoking were avoided, the death would not occur. Based on this data, it suggests that in Jersey around two lung cancer deaths a year could be the result of radon exposure in tandem with smoking and an additional one lung cancer death every 3-4 years could be a consequence of radon alone. This is very small when compared with the total of around 60 lung cancer deaths a year due to other causes (predominantly smoking). This again shows that the risk of dying from lung cancer linked to radon exposure is greatly increased in smokers.

The current 'action levels' for radon exposure in the UK are 200 Bq m^{-3} in residential buildings and 400 Bq m^{-3} in workplaces. Jersey Health Protection recommendations are that advice is given to those living in houses with high levels of radon on how the levels affect a smoker's risk of lung cancer (including advice and support to quit) and on how to reduce levels of radon in their homes.

The HPA report also examined other studies of the relationship between radon and cancer. It concluded that if radon does have a relationship with cancers of other organs, it is so small as to be undetectable in practical terms.