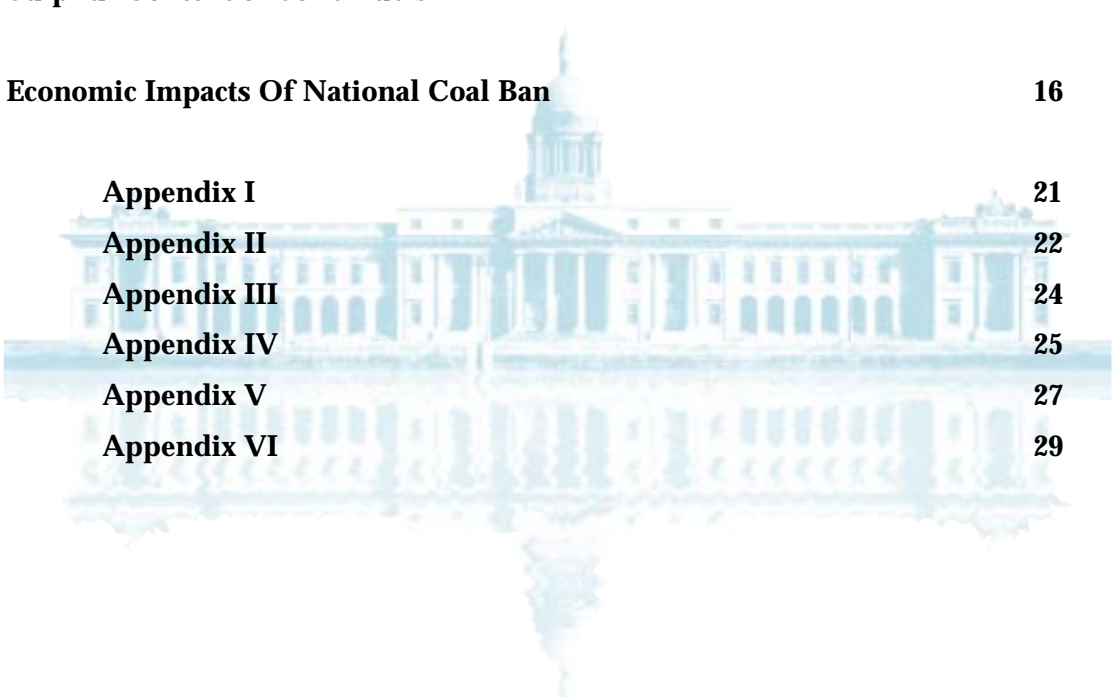


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## ***Introduction – Consultation Process***

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To improve air quality and reduce harmful emissions of smoke and sulphur dioxide (SO<sub>2</sub>) the Minister for the Environment and Local Government, Mr. Noel Dempsey, T.D., and the Minister of State at the Department of the Environment and Local Government, Mr. Dan Wallace, T.D., are considering banning the marketing, sale and distribution of bituminous (“smoky”) coal nationally. In addition, to avoid a switch from coal to alternative solid fuels with a high sulphur content and significant impacts on health and environment, the Ministers are also considering banning nationally the marketing, sale and distribution of petroleum coke (commonly know as “petcoke”).

This consultation paper identifies relevant considerations surrounding a national ban on these fuels. These include environmental, health and safety issues, and an assessment of potential impacts on the solid fuel trade and users of these fuels. EU and global environmental requirements to reduce the adverse impacts of harmful air pollutants, including those sourced from solid fuel combustion are addressed, and the current and proposed national legislative frameworks are set out.

**To provide a framework for consultations, this paper poses a number of questions. Any person or body wishing to comment on the possible banning of bituminous coal and petcoke nationally is invited to respond to these questions, or make written submissions on any aspect of the proposals.**

**All responses should be made by Friday 16th November 2001 to:**

**Mr Noel Sheahan  
Air/Climate Section  
Department of the Environment and Local Government  
Custom House  
Dublin 1  
Tel: 01-8882472  
Fax: 01-8882014  
E-mail: [noel\\_sheahan@environ.irlgov.ie](mailto:noel_sheahan@environ.irlgov.ie)**

**Copies of the consultation paper are available, free of charge, from the above address and any queries should also be addressed to the above. A copy of the consultation paper may also be downloaded from the Department’s website: - <http://www.environ.ie/press/coal.html>**

**All responses will be subject to release in accordance with the Freedom of Information Act, 1997.**

# Summary of Advantages and Disadvantages of A National Ban on Bituminous Coal and Petcoke

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Rather than continuing with further area-based ban extensions, a national ban would have a number of **potential advantages**:

- Reduced national smoke levels improving air quality and quality of life in all areas (including those areas currently unmonitored for air pollution but where pollution may exist).
- Improved air quality will benefit everyone but particularly vulnerable groups in society such as the young, the elderly, asthmatics and those with respiratory problems.
- Some current ban areas display slightly increased levels of ambient<sup>1</sup> SO<sub>2</sub> (most likely due to increased use of high sulphur petcoke). A ban on petcoke would lower ambient SO<sub>2</sub> levels and also help Ireland achieve our obligations under EU law and international agreements such as the Gothenburg Protocol. Assuming that following a national ban on bituminous coal and petcoke half of existing domestic users switch to gas oil and gas and the remainder to alternative solid fuels, this would lead to a reduction of 7kt (7,000 tonnes) in the national emissions of sulphur. Ireland's emissions were 157kt in 1999 and the national emission ceiling for sulphur is 42kt by 2010.
- The ban on petcoke will provide a safer environment for consumers by eliminating products with a tendency to “spit” from fireplaces, such as illegal high sulphur and unblended petcoke.
- Reduction of opportunities for illegal traders (e.g. currently outside ban areas selling bituminous coal within) will help create a “level playing pitch” and safeguard the legitimate industry from erosion through sales of illegal and dangerous products.
- The ban could be more centrally enforced at a restricted number of entry points.

## Potential disadvantages include:

- Sales of solid fuel have been falling steadily in recent years. A national coal ban may be seen as punitive on traders and consumers relative to the level of improvement in ambient air quality.
- The banning of bituminous coal could potentially worsen ambient SO<sub>2</sub> levels and SO<sub>2</sub> emissions unless there is a simultaneous ban on petcoke.
- Estimated additional Supplementary Fuel Allowance payments would be of the order of approximately £16m (€20.316m) per annum.
- Reduction in the choice of smokeless fuels, by banning petcoke from blends.
- Fuel supply difficulties unless adequate supplies of alternative fuels are sourced.
- Some alternative fuels are more expensive than bituminous coal. A switch to these fuels could potentially lead to a small rise in inflation.
- Potential job losses for bituminous coal suppliers and distributors.

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<sup>1</sup> “Ambient” means in the local environment, as opposed to across Ireland or wider afield.

## *Summary of Questions*

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1. Is it necessary/desirable to reduce further the health impacts of burning bituminous coal and petcoke?
2. Should a ban on bituminous coal and petcoke be used to reduce acidification?
3. Is it appropriate that the sulphur content of solid fuels is now reduced to help meet national, EU and global environmental requirements?
4. Are there sufficient existing alternative fuels to bituminous coal and petcoke to allow a complete ban on both products?
5. What is the appropriate date for the transition to a national ban?
6. Are the different requirements as to the composition of fuels North and South of the Border an issue?
7. Would the proposed national bans be equitable for traders?

# *Health and Environmental Effects of Burning Solid Fuel*

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## **Air Pollution**

Even at non-excessive levels, air pollution impinges negatively on the quality of life for everyone but especially for vulnerable sectors of the population such as the elderly, children, infants and people with respiratory ailments such as asthmatics.

There is increasing evidence that tiny dust particles have harmful effects on human health, causing premature deaths and reducing quality of life. Particulate matter (PM) differs fundamentally from other air pollutants in that it is a complex mixture rather than a single chemical compound, which is emitted into the air by a wide range of manmade sources (e.g. diesel engines, domestic fires, power plants and construction works) and natural sources (seaspray, dust, sand etc.). PM<sub>10</sub> refers to small particles less than 10 microns in diameter (10 millionths of a metre) and PM<sub>2.5</sub> to even smaller particles less than 2.5 microns in diameter. PM<sub>10</sub> particles are small enough to penetrate the upper airway and PM<sub>2.5</sub> can penetrate the lungs.

The particles produced by domestic coal burning lie wholly within the PM<sub>10</sub> range with most within the PM<sub>2.5</sub> fraction. Neither PM<sub>10</sub> nor PM<sub>2.5</sub> are new pollutants and the Dublin smogs of the 1980s are attributable to a mix of suspended particulates or “black smoke” and SO<sub>2</sub>. Thus, historic levels of both pollutants in many urban areas are likely to have been higher than today’s concentrations given the general decline in coal usage and the effects of bans on the burning of bituminous coal.

A significant constituent of PM is sulphur in the form of sulphate which results from the chemical transformation of sulphur dioxide (SO<sub>2</sub>) in the atmosphere. A study in the UK<sup>2</sup> found that 20% of the total mass of ambient particles sampled were sulphates and that 30% of the total mass in the fine size range (i.e. less than PM<sub>2.5</sub>) were sulphates.

SO<sub>2</sub> is also harmful to humans. Because of its acidic nature it is an irritant to the sensitive tissue of the mucous membranes of the mouth, nose and lungs, and its main impact is on respiratory function. High levels of SO<sub>2</sub> are harmful to human health especially for people susceptible to respiratory problems, such as asthma, bronchitis and emphysema. SO<sub>2</sub> can, through its impact on respiratory function, also aggravate cardiovascular conditions. In addition, there is increasing evidence that small acidic particles which are secondary products of emissions of sulphur and nitrogen oxides affect lung function.

More detailed information in relation to the health effects of air pollution is set out in Appendix I.

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<sup>2</sup> [QUARG (1996), Airborne particle matter in the UK. Third report prepared for the Department of the Environment (UK).]

**Question: Is it necessary/desirable to reduce further the health impacts of burning bituminous coal and petcoke?**

### Acidification

Acidification means the effects of the introduction of acidifying substances into the environment by means of atmospheric deposition. The primary air pollutants contributing to acidification are SO<sub>2</sub> (mainly from burning of coal and oil), nitrogen oxides (NO<sub>x</sub>; key sources are motor transport and power generation) and ammonia (NH<sub>3</sub>; almost exclusively from agriculture) which can be carried for hundreds and even thousands of kilometres before being deposited.

While still in the atmosphere, these pollutants can be transformed into acids to be washed out in rain (i.e. “acid rain”) onto vegetation, soil, and water. This acidification has extensive biological effects on both aquatic and terrestrial ecosystems which, especially where they have limited capacity safely to absorb excess added acids, can be greatly changed and impoverished by a reduction in the diversity of plant and animal species. Extensive areas of Europe, including some areas in Ireland, have been seriously damaged by acidification.

Acidification results in increased concentrations of aluminium and other toxic metals in the soils, ground water and surface waters. The biodiversity of lakes and rivers is drastically impoverished in areas affected by surface water acidification. Acidified ground water can cause problems, for instance by corroding pipe-work, but in addition by creating health risks through the increased mobility of harmful metals.

Acid deposition also accelerates the rate of deterioration of building materials as well as objects of artistic and cultural heritage, particularly in urban areas.

**Question: Should a ban on bituminous coal and petcoke be used to reduce acidification?**

# ***Bans on Bituminous Coal 1990 - 2000***

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## **Dublin Ban 1990**

Following increasing adverse public health and environmental effects of winter smog in Dublin in the 1980s, regulations were introduced banning the marketing, sale and distribution of bituminous coal and high sulphur fuels in 1990. Smokeless fuels became the only legally available solid fuels in the Dublin urban area. On occasions before the introduction of the ban, smoke levels were as high as 7 times the permitted EU limit. Such levels were reached during particularly cold and still weather.

The Dublin ban was very successful with ambient levels of smoke and SO<sub>2</sub> dropping rapidly. In the four years after 1990/91, the 98-percentile smoke value averaged 77 µg/m<sup>3</sup> (microgrammes per cubic metre) compared with 256 µg/m<sup>3</sup> in the four years prior to this (the statutory limit value allows only seven values exceeding 250 µg/m<sup>3</sup> in a full year; three consecutive values of this magnitude also constitutes a breach of the limits).

## **Extension to Cork City (1995)**

This successful approach was repeated in Cork City and parts of the adjacent county in 1995, when exceedances of air quality limit values were threatened. The ban ensured pollution levels dropped significantly.

## **1998 and 2000 Extensions**

To meet the Government commitment in “*An Action Programme for the Millennium*” to “extend the ban on bituminous coal to major urban areas”, five more urban areas (Arklow, Drogheda, Dundalk, Limerick and Wexford) were included in the ban from 1 October 1998. This was further extended from 1 October 2000 to Celbridge, Galway, Leixlip, Naas and Waterford. These bans were based on an analysis of air quality monitoring results over recent years. While mandatory national and EU air quality standards were not being breached, these areas had the highest smoke figures nationally and it was recognised that the quality of urban air should be brought to the same standard as obtained in the areas with the bans.

Air quality data and the need for further action is kept under ongoing annual review. However, as not all urban areas monitor for air pollution, it is possible that some towns with no monitoring may have higher pollution levels than monitored areas.

Bans now operate in all cities and many larger towns (covering c. 40% of national population). While smoke levels have significantly reduced, there is evidence of rises

in SO<sub>2</sub> levels in some areas (still within national and EU limits) as higher sulphur petcoke products replace coal to some extent.

Banning bituminous coal nationally would improve air quality in the remaining areas of the country, even though EU and national air quality standards continue to be met. This would be a continuation of the precautionary approach (to avoid deterioration of air quality and to improve it where possible) adopted by the Government in extending the ban on a phased basis so far.

An overview of air quality trends in selected urban areas between 1996 – 2000 is set out in Appendix II. Further details of the current air quality monitoring network together with the most recent air quality monitoring figures can be found in the EPA's Air Quality Monitoring Annual Report 1999; <http://www.epa.ie/techinfo/>

## How the Existing Coal Ban Regulations Work

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The ban regulations<sup>3</sup> specify the type of coal which can be marketed in a restricted area according to one of two sets of criteria:

- either in terms of the maximum *smoke emission rate* of the coal (10 grams per hour based on 3.6 kg burned in accordance with British Standard 3841:1994), or
- in terms of the gross calorific value (not greater than 24 MJ/kg on a moist ash free basis) *and* maximum volatile matter contents by weight on a dry ash-free basis (not greater than 14%).

The replacement market for smokeless coal is primarily met by blended coals, predominantly a blend of petcoke and brown coals. ‘Ovoids’, or nuggets manufactured as a blend and shaped for convenience, also make up part of the replacement market.

To address *peat* and *petcoke*, the ban regulations require that *all solid fuel* should not have a sulphur content of greater than 2% by weight. This limit was originally set at 1.5% in the 1990 regulations though revised in 1992 to 2% to allow the inclusion of petcoke in blends.

These criteria sought, in a market where the open fire was the primary means of heating, to balance three competing factors while ensuring an adequate environmental improvement:

- Convenience (‘ignitability’)
- Economic cost and
- Safety considerations

**Convenience:** Volatile matter allows the solid fuel to be easily lit and relatively high volatile content is particularly important in open fires where natural diffusion, chimney and other drafts will remove some of the volatiles thus reducing ‘ignitability’. For coals with high volatile matter content (e.g. lignite and sub-bituminous coal), their weaker burn means that the smoke emission rate is higher. Medium volatility bituminous coal would typically have a volatile matter content in the range of 22% to 31%<sup>4</sup> and a smoke emission rate of 30 to 35 grams per hour (Irish Energy Centre).

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<sup>3</sup> Air Pollution Act, 1987 (Marketing, Sale and Distribution of Fuels) Regulations, 1998 (S.I. No. 118 of 1998) and Air Pollution Act, 1987 (Marketing, Sale and Distribution of Fuels) (Amendment) Regulations, 2000 (S.I. No. 278 of 2000).

<sup>4</sup> Ranks of Coal as Classified by the American Society for Testing and Materials (ASTM)

Anthracite on the other hand typically has a volatile matter content of the order of 5% and a smoke emission rate of the order of 5 grams per hour. Fuel sold in ban areas must reconcile the requirements of the criteria specified in the regulations. Petcoke, when mixed with a lower ranked soft coal with high volatile matter content, for example a brown coal, can provide the characteristics to allow convenient ignition in a domestic open fire with sufficient duration of burn to provide adequate smoke free heat.

**Economic Costs:** Traditionally solid fuel tended to be burnt mainly by those who could not afford to have oil or gas central heating systems. It was necessary to ensure that solid fuels replacing bituminous coal offered equivalent levels of heat for a similar price. While smokeless fuels can be more expensive, weight for weight, than traditional fuels, less may be burned for the same heat output. However, in general the higher quality, higher energy fuels are more expensive, both in terms of the cost per unit volume and the cost per unit energy delivered. A comparison of energy costs for domestic solid fuels is set out in Appendix III.

The additional winter heating costs (October to April) to those most at risk from fuel poverty has been recognised by the payment of an additional £3.00 (€3.81) per week to qualifying social welfare recipients to assist lower income households with the increased cost of smokeless solid fuel.

**Safety:** Petcoke is prone to “spit” or eject hot embers from the fire, a serious hazard with an open fire. Also, very high-energy fuels can burn through domestic grates because of the intense heat unless there is enough ash to protect the grate. It is for this reason that the regulations specify a maximum calorific value for coal used in a restricted area.

To ensure fire safety and avoid grate damage, petcoke must be mixed with lower energy, ash-rich fuels. The limit is set at a maximum of 50% petcoke in the blend under regulations<sup>5</sup> made by the Minister for Enterprise, Trade and Employment.

### Enforcement

Local authorities ensure that only solid fuels in conformity with the regulations are marketed, sold or distributed in ban areas. Inspections of premises and vehicles are undertaken and all coal bags must be sealed and labelled as being in compliance. If a local authority suspects that the fuel is not in compliance with the regulations, a sample may be taken for further analysis. Prosecutions may be taken against individuals or firms who flout the regulations. Between October 1998 and April 2001 over 3,800 inspections of coal traders have been undertaken by local authorities; over 100 samples have been taken for analysis, 11 prosecutions have been recommended and 3 initiated.

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<sup>5</sup> Industrial Research and Standards (Section 44) (Petroleum Coke and other Solid Fuel) Order, 1991. S.I. No 257 of 1991.

## How the Existing Coal Ban Regulations Work

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The regulations governing petcoke apply nationally and are enforced by the Office of the Director of Consumer Affairs (ODCA). Inspections are undertaken and bags must be properly labelled.

Enforcement has been difficult in the past for local authorities and the ODCA, as successful prosecution can require laboratory sampling outside the State for ash, sulphur and volatile content, as appropriate (there are no appropriate facilities nationally at present). Enforcement in the context of a national ban would be significantly easier, as traders would not have any reason to have bituminous coal or petcoke on their premises, and these fuels can, for the purposes of selecting samples for testing, be readily identified by sight, dustiness etc. with appropriate training.

# *EU and Global Environmental Legislation*

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## **Domestic Legislation**

The primary legislation on air pollution is the Air Pollution Act, 1987. The Minister may by regulation specify the standard, specification, composition and contents of any type of fuel which is burnt in fireplaces or prohibit the sale, distribution, use or burning of such fuels. This power has been used since 1990 to ban the marketing, sale and distribution of bituminous fuels in urban areas, and would be the basis for any national ban on bituminous fuels and petcoke.

Since 1987 mandatory air quality standards in Ireland have been set out in regulations made by the Minister for the Environment and Local Government under the Air Pollution Act, 1987. The limit values are based on a series of EU Directives from the 1980s; in the case of smoke and suspended particulates (smoke, dust etc.), they are based on Directive 80/779/EC. The current and future standards are set out in Appendix IV.

The Act also requires local authorities to take such measures as they deem necessary to prevent or limit air pollution. A local authority may also make an air quality management plan to preserve or improve air quality in line with the standards. Local authorities are required to carry out such monitoring of air quality and emissions as they consider necessary for the performance of their functions under the Act.

The Environmental Protection Agency Act, 1992 gives the EPA significant advisory, monitoring and oversight functions, and the Agency now oversees the national air quality monitoring programme and reports annually on its own and local authority monitoring.

Emissions from industrial and other sources are controlled by the EPA under Integrated Pollution Control (IPC) licensing provisions of the EPA Act.

## **EU Air Quality Framework and Daughter Directives**

The 1996 “Framework” Directive 96/62/EC on ambient air quality assessment and management establishes objectives for air pollution and is designed to avoid, prevent and reduce harmful effects on human health and the environment. The national regulations<sup>6</sup> transposing the Directive into Irish law designate the EPA as the competent authority to implement the Directive in Ireland. The EPA recently published a preliminary assessment of Irish air quality.<sup>7</sup>

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<sup>6</sup> Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management Regulations, 1999 (S.I. No. 33 of 1999).

<sup>7</sup> “Preliminary Assessment Under Article 5 of Council Directive 96/62/EC – Ireland” (EPA, 2001). Available on request from the Publications Section, EPA, St. Martin’s House, Waterloo Road, Dublin 4 (tel. 01 6674474) (Price £5.00/€6.35).

A series of “Daughter Directives” under the “Framework Directive” set new EU limit values for a range of air pollutants to be achieved in either 2005 or 2010 dependant on the relevant pollutant. National action plans must be drawn up where there is a risk of the limit values or associated “short term” alert thresholds being exceeded.

The first daughter directive (1999/30/EC) setting limit values for SO<sub>2</sub>, oxides of nitrogen, lead and particulate matter was adopted in 1999. New monitoring methods and more sophisticated equipment are needed to replace or upgrade local authority networks in place since 1987 or before. The EPA has published a discussion paper on the new national air quality monitoring programme required.<sup>8</sup>

### **EU Acidification Strategy**

The Community strategy<sup>9</sup> to combat acidification comprises a wide range of interlinked measures, including

- a Directive setting national emission ceilings for sulphur dioxide, nitrogen oxides, volatile organic compounds to be achieved by 2010;
- Directive 93/12/EEC on the sulphur content of certain liquid fuels;
- revision of Directive 88/609/EEC on the limitation of pollutants from large combustion plants (i.e. power and heavy industrial plants).

### **EU Directive on National Emission Ceilings and Gothenburg Protocol**

Ireland is a signatory of the UNECE 1979 Convention on Long-Range Transboundary Air Pollution (CLRTAP) and has ratified, inter alia, the “Oslo” Protocol<sup>10</sup> in 1994 requiring compliance with an SO<sub>2</sub> ceiling of 155,000 tonnes (30% reduction below 1980 levels) by 2000. Ireland is on track to achieve this target; 1999 emissions were recorded at 157,000 tonnes and some 20,000 tonnes in additional reductions were expected in 2000 under an agreement entered into by the ESB.

In December 1999 Ireland signed the UNECE “Gothenburg” Protocol<sup>11</sup> to the CLRTAP to abate Acidification, Eutrophication and Ground-Level Ozone. This aims at limiting emissions of SO<sub>2</sub>, NO<sub>x</sub>, VOCs and NH<sub>3</sub> to improve environmental protection and human health, towards the long-term objective of no exceedance of critical levels and loads of acidifying and eutrophying pollutants. It sets national emission ceilings (NECs), not to be exceeded after 2010, aimed at the broad achievement of interim environmental objectives.

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<sup>8</sup> “National Air Quality Monitoring Programme - A Discussion Document” (EPA 2000). Available on request from the Publications Section, EPA, St. Martin’s House, Waterloo Road, Dublin 4 (tel. 01 6674474) (Price £5.00/€6.35).

<sup>9</sup> “Communication to the Council and the European Parliament on a Community Strategy to combat acidification” COM (97) 88 final (March 1997) (text available at <http://europa.eu.int/comm/environment/docum/9788sm.htm>).

<sup>10</sup> <http://www.unece.org/env/lrtap/>

<sup>11</sup> <http://www.unece.org/env/lrtap/>

Agreement has now been reached on an EU Directive covering the same pollutants.<sup>12</sup> This places a mandatory EU legislative requirement on Ireland to achieve the same ceilings as in the Gothenburg Protocol by 2010 and contains a review clause for the purpose of achieving further emission reductions by 2020.

Ireland's annual NECs (to be achieved by 2010) under Gothenburg Protocol and the EU Directive are:

	(kt, or '000 tonnes)
Sulphur Dioxide (SO <sub>2</sub> )	42kt
Nitrogen Oxides (NO <sub>x</sub> )	65kt
Volatile Organic Compounds (VOCs)	55kt
Ammonia (NH <sub>3</sub> )	123kt

A national emissions reduction strategy setting out how these ceilings can be achieved is in preparation by the Department.

The SO<sub>2</sub> ceiling represents a reduction of 76% compared to 1990 levels and will be onerous to achieve, requiring reductions across a range of sectors – power generation, industry, transport, residential etc. The ceiling will be achieved through, inter alia, fuel switching, more stringent emission limits from power plants and industry and reductions in the sulphur content of various fuels.

The Minister of State, Mr. Dan Wallace, T.D., made regulations<sup>13</sup> in 1999 and 2000 requiring a 70% reduction in the sulphur content of petrol and 30% in road diesel from 1 January 2000 with further reductions due from 1 January 2005. He also made regulations<sup>14</sup> in 2001 requiring a 50% - 66% reduction in the sulphur content of heavy fuel oil from 1 January 2003, – oil which was heretofore unregulated as to its sulphur content, and a 50% reduction in the sulphur content of gas oil (home heating, agricultural usage, aviation kerosene, marine diesel etc.) from 1 January 2008. These requirements are on foot of Directive 1999/32/EC on the reduction in the sulphur content of certain liquid fuels.

It is a necessary element of EU and national policy that all feasible reductions in the sulphur content of all fuels are addressed.

**Question: Is it appropriate that the sulphur content of solid fuels is now reduced to help meet national, EU and global environmental requirements?**

<sup>12</sup> Conciliation between European Council and Parliament in June 2001; final text not yet printed and will be available on the Europa website in due course.

<sup>13</sup> Air Pollution Act, 1987 (Environmental Specifications for Petrol and Diesel Fuels) Regulations, 1999 (S.I. No. 407 of 1999) and Air Pollution Act, 1987 (Environmental Specifications for Petrol and Diesel Fuels) Regulations, 2000 (S.I. No. 72 of 2000).

<sup>14</sup> Air Pollution Act, 1987 (Sulphur Content of Heavy Fuel Oil and Gas Oil) Regulations, 2001 (S.I. No. 13 of 2001).

## *Sulphur Content of Solid Fuels*

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**Bituminous coal** usually contains 0.5% to 3% sulphur (typically 0.7%). Peat and nuggets have a sulphur content of 0.35%; the sulphur content of anthracite, manufactured and imported ovoids is of the order of 1.2%, and wood has a sulphur content of 0.05%. Most of the sulphur in solid fuel will be emitted to the air as sulphur dioxide (SO<sub>2</sub>) on combustion.

**Petcoke** is not produced in Ireland, and the residues from the Whitegate oil refinery are sent abroad for further refining for higher value products before the final residue is converted to petcoke. The sulphur content can range from 2% to 8% with the typical value around 4% – 5%.

### **Increased SO<sub>2</sub> Emissions**

The solid fuel trade (Solid Fuel Industry Association (SFIA) which represents c. 70% of traders) maintains that significant amounts of high sulphur petcoke are sold in place of bituminous coal in ban areas with consequent increases in ambient SO<sub>2</sub> levels. Air quality data indicate that ambient SO<sub>2</sub> levels have increased somewhat (though still well within limits) in some areas after coal bans were implemented.

Thus, if bituminous coal is banned nationally to improve air quality and is, in turn, significantly replaced by the burning of petcoke blended products (with a prescribed limit of 2% in ban areas), this could potentially double, as a minimum, SO<sub>2</sub> emissions from the residential sector. Emissions of SO<sub>2</sub> would be even higher if blends of petcoke with more than 50% (or even pure 100% unblended petcoke) were used. Pure unblended petcoke can have up to 8% sulphur content.

Total sulphur emissions from the residential sector in 1999 amounted to 13.8kt of which the burning of coal and petcoke accounted for 8.2kt<sup>15</sup>. It is estimated that a national ban on bituminous coal and petcoke would not fully achieve this potential reduction, as some of the replacement fuels would contain some sulphur also although generally at lower levels. It is likely that a reduction of approximately 6.5kt could be achieved over time with a switch to cleaner solid, liquid or gaseous fuels. This would bring emissions from the sector down to c. 7kt. However, if a ban on bituminous coal only was introduced which resulted in direct switching to the burning of petcoke, it is estimated that sulphur emissions from the residential sector could rise as high as 22kt.

### **Proposed Banning of Petcoke for Domestic Use**

In considering a ban on bituminous coal nationally to reduce levels of air pollution from smoke, care must be taken to avoid a market switch to petcoke with higher SO<sub>2</sub> emissions and potentially worse SO<sub>2</sub> ambient levels, if real gains are to be made. This

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<sup>15</sup> Source: Environmental Protection Agency

would require a complete ban on the inclusion of petcoke in residential fuels, as managing and policing sulphur content of blends, at sufficiently low levels, at the level of the retailer or distributor, when petcoke varies in the range 4% - 8% would, in practice, be impossible.

### **Enforcement of a National Ban**

If a national ban on bituminous coal and petcoke for sale in residential sector is introduced, it may be possible to control their marketing, sale and distribution at the points of entry into the State rather than at the points of sale as has operated heretofore. The practicalities of enforcement options will be fully addressed with the Revenue Commissioners, local authorities and the fuel trade in the context of decision-making following this consultation.

### **Alternative Smokeless Products**

Within restricted areas, fuels include briquettes or lignites, coal nuggets or smokeless ovoids, or blends of these ovoids and nuggets, or blends of ovoids or nuggets mixed with petcoke and/or lignites, peat briquettes, and logwood. There is a wide range of different brand named products. Six companies supply the market with 5 to 6 products each so there are between 30 and 35 products on the market.

A sufficiently broad range of alternative safe, high energy fuels is considered to be available, once the solid fuel trade has sufficient notice of any ban on bituminous coal and petcoke to position itself to supply the market.

Contracts for fuel imports are normally entered into in the springtime for the following winter heating season. Notice by year end would be sufficiently early to ensure adequate supplies of alternative fuels, without commercial dislocation for fuel importers, for a ban to operate for the following heating season.

**Question: Are there sufficient existing alternative fuels to bituminous coal and petcoke to allow a complete ban on both products?**

**Question: What is the appropriate date for the transition to a national ban?**

### **Cross Border Issues**

In Northern Ireland a ban on the sale of bituminous coal only applies in a limited number of designated areas. There is no ban on using petcoke in blends. There is also a prohibition on the sale of any solid fuel with a sulphur content greater than 2%. These regulations do not, however, prohibit the export from Northern Ireland of fuels with a higher sulphur content. However, a national ban on the marketing, sale and distribution of bituminous coal and petcoke in the State would make it illegal to purchase such fuel from Northern Ireland for onward sale, marketing or distribution here.

**Question: Are the different requirements as to the composition of fuels North and South of the Border an issue?**

# ***Economic Impacts Of National Coal Ban***

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## **Social Welfare Costs**

The Department of Social, Community & Family Affairs (DSCFA) makes a Supplementary Fuel Allowance payment of £3 (€3.81) per week during the winter heating season (October to April, for 29 weeks) to assist lower income families with the increased cost of smokeless solid fuels. The full list of qualifying persons is listed in Appendix V. The current cost of the scheme is c. £10m (€12.697m) per annum and DSCFA estimates an extension of the payment nationally would cost an additional £16m (€20.316m) p.a. (not including persons on short-term unemployment assistance, some of whom may also qualify).

Payment would be extended to all qualifying persons if a national ban on bituminous coal and petcoke were applied.

The proposed bans are not seen as being sufficiently distorting to require any increase in the Supplementary Fuel Allowance.

## **Use of Bituminous Coal and Petcoke by Industry**

In 1999 industry consumed 278kt (38%) of the 732kt national total of all types of coal (bituminous, anthracites, lignite, ovoids and petcoke). The residential sector consumed 454kt (62%). 395kt of bituminous coal are consumed annually in Ireland. Of this total 99kt (25%) were consumed by industry and 296kt (75%) by the residential sector.<sup>16</sup>

These data are exclusive of about 2 million tonnes of bituminous coal burnt at the ESB Moneypoint power station.

Most coal and petcoke burned by industry and in power generation is or will be covered (by 2002) by the IPC licensing system operated by the EPA. It is, therefore, unnecessary to impose any separate limitations on industry through the proposed ban on the marketing, sale or distribution of bituminous coal and petcoke in the domestic sector.

## **CPI Impacts**

The requirement to supply only smokeless fuels may impact on the price of solid fuel, and have a small inflationary impact on the Consumer Price Index (CPI). Coal (smoky and smokeless) accounts for only approx. 0.83% of the CPI, and an increase of 12% in solid fuel prices nationally (considered unlikely) would be required to increase the rate of inflation by 0.1 percentage point.

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<sup>16</sup> Source: Department of Public Enterprise Energy Balances for 1999.

## Trade Impacts

Sales of solid fuel nationally have been steadily declining<sup>17</sup> since 1990. Nevertheless, there are currently some 3,000 persons employed in the solid fuel trade nationally.

The Ministers are of the view that eliminating any scope for use of illegal quantities of petcoke in blends will guarantee a fair competitive environment for the trade. The bans provide an opportunity for legitimate traders to enjoy better security for the trade and facilitate the safeguarding of jobs in these firms. The marketing, sale and distribution of legal fuels only would allow consumers to make straight heating choices based on environmental quality, price, convenience and efficiency without safety worries.

It is recognised that there is increasing competition to the solid fuel market from convenience fuels (e.g. oil and gas), and a ban would also provide marketing opportunities for these fuels.

**Question: Would the proposed national bans be equitable for traders?**

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<sup>17</sup> EPA estimates residential consumption will fall by 2/3rds by 2010 on a business as usual basis (i.e. in the absence of the potential bans in this paper).



# Appendices



## Appendix I Health Effects of Air Pollution

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### Smoke/Particulate Matter

International experience and independent Irish research has shown that excessive smoke pollution is associated with increased hospital admissions, increased morbidity and a peak in mortality. Acute effects may include immediate irritation to the eyes and throat. Chronic effects may include decreased pulmonary function, and there are specific high-risk groups such as the elderly, asthmatics and people with diseases of the lung.

Detailed research into the effects of air pollution on mortality rates was undertaken through St. James's Hospital over a 14-year period in Dublin. This included analysis of hospital admission rates and respiratory and cardiovascular deaths pre and post the introduction of the coal ban in Dublin. The effect of the coal ban on mortality was assessed using general additive models of total, cause specific and age specific daily mortality, allowing for meteorological factors and date. Amongst the principal findings of this research, it was established that as a result of the bituminous coal ban:-

- Total mortality decreased by 1.6% (95% CI, - 4.1% to 0.9%)
- Respiratory mortality decreased by 13.1% (95% CI, -19% to -6.8%)
- Cardiovascular mortality decreased by 3.9% (95% CI, -7.5% to -0.1%).

When age of death was considered, there was a decrease in mortality of 5.8% (95% CI, -9% to -2.4%) for the over 75 age group but no significant change for the 65-74 age group (1.3% reduction, 95% CI, -3.4% to 6.3%) or for the under 65 age group (3.2% reduction, 95% CI, -2.1% to 8.8%). The biggest effect was observed for respiratory deaths in the over 75 age group which showed a reduction of 15.7% (95% CI, 6.7% to 24.7%). The study concluded that the introduction of the ban on the sale of bituminous coal in Dublin has led to a reduction in particulate pollution levels, which in turn led to a reduction in total mortality, with a pronounced reduction in respiratory and cardiovascular deaths, particularly within the over 75 age group.

### Sulphur Dioxide

Sulphur dioxide is an irritant when inhaled and high concentrations may cause breathing difficulties in people exposed to it. People suffering from asthma and chronic lung disease may be especially susceptible to the adverse effects of sulphur dioxide and, within the range of concentrations that occur during the more extreme pollution episodes, it may provoke attacks of asthma.

A 1998 report from the British Government's Committee on the Medical Effects of Air Pollution (COMEAP) suggested that SO<sub>2</sub> emissions may be responsible for 3,500 deaths in the UK every year. The full text of the report ("The Quantification of the Effects of Air Pollution on Health in the United Kingdom") is accessible at <http://www.doh.gov.uk/comeap/state.htm>.

## Appendix II Overview Of Air Quality Trends In Selected Urban Areas 1996 – 2000

### Smoke ( $\mu\text{g}/\text{m}^3$ )

#### 98 Percentile

	Dublin <sup>18</sup>	Cork <sup>19</sup>	Drogheda <sup>20</sup>	Galway <sup>21</sup>	Naas <sup>22</sup>	Bray
1996/97	41	66	101	38	78	n/a
1997/98	42	80	94	47	67	27
1998/99	23	54	34	40	48	22
1999/00	41	52	22	27	53	31

#### Winter Median

	Dublin	Cork	Drogheda	Galway	Naas	Bray
1996/97	7	16	22	9	27	n/a
1997/98	10	23	24	9	21	8
1998/99	7	21	10	9	18	8
1999/00	6	19	6	9	13	9

### Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )

#### 98 Percentile

	Dublin	Cork	Drogheda	Galway	Naas	Bray
1996/97	78	72	33	24	32	n/a
1997/98	67	46	31	24	24	25
1998/99	33	36	26	17	37	25
1999/00	56	36	38	18	36	25

<sup>18</sup> Average of network in Dublin Corporation

<sup>19</sup> Average of network in Cork Corporation

<sup>20</sup> Coal ban since October 1998

<sup>21</sup> Average of network in Galway Corporation, coal ban since October 2000

<sup>22</sup> Coal ban since October 2000

**Winter Median**

	Dublin	Cork	Drogheda	Galway	Naas	Bray
1996/97	29	18	13	8	13	n/a
1997/98	24	17	13	9	6	13
1998/99	13	15	13	7	12	13
1999/00	6	13	13	8	12	13

Source: EPA "Air Quality Monitoring Reports" 1996 to 1999

## *Appendix III Comparison of Energy Costs for Domestic Solid fuels<sup>23</sup>*

<b>Fuel</b>	<b>Average price per Tonne</b>	<b>Gross calorific Value (kWh/unit)</b>	<b>Delivered Cost pence/kWh</b>
Machine Turf	47.25	4002.6	1.18
Briquettes, loose	86.63	5362.5	1.62
Standard coal	145.16	7900.0	1.84
Premium coal	164.60	8767.2	1.99
Standard anthracite	182.16	8735.2	2.09
Ovoids	190.62	8850.0	2.15
Grade A Anthracite	214.00	8960.0	2.39
Briquettes, baled	1.635*	67.0	2.44
Brown Coal Nuggets	149.60	5763.5	2.60

\* Price per bale

<sup>23</sup> (1 November 2000) Source:- Irish Energy Centre

## Appendix IV Air Quality Standards

### Existing Limit Values for SO<sub>2</sub> and Smoke

The limit values for SO<sub>2</sub> are structured to provide for more stringent limits where the associated smoke levels are above a specified level; where the associated smoke levels are below that level, higher SO<sub>2</sub> limit values apply.

	Limit Value for SO <sub>2</sub> (µg/m <sup>3</sup> )	Associated Smoke µg/m <sup>3</sup>	Limit Values for Smoke
Annual Median of Daily Mean Values	80	> 40	80
	120	≤ 40	
Winter Median of Daily Mean Values	130	> 60	130
	180	≤ 60	
98 – percentile of Daily Mean Values	250	> 150	250
	350	≤ 150	
Not more than three consecutive days	250	> 150	250
	350	≤ 150	

### New Limit Values for Sulphur Dioxide

The date for transposition of EU Directive 1999/30/EC is 19 July 2001, and these are the new limit values at EU level from that date.

Limit Value Objective	Averaging Period µg/m <sup>3</sup>	Limit Value	Basis of Application Date	Limit Value Attainment µg/m <sup>3</sup>	Margin of Tolerance* µg/m <sup>3</sup>	Alert Threshold
Protection of human health	1-hour	350	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005	150	500 (over three consecutive hours)
Protection of human health	24-hours	125	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005	none	
Protection of ecosystems	calendar year 1 October to 31 March	20	Annual Mean	24 months after entry into force of the Directive	none	

Directives 96/62/EC and 1999/30/EC

\* On entry into force of the Directive and reducing to zero by equal annual percentages from 1 January 2001 to 1 January 2005.

## New Limit Values for PM<sub>10</sub> (PM<sub>10</sub> Standards replace the Limit Values for Smoke)

### Stage 1

Limit Value Objective	Averaging Period	Limit Value $\mu\text{g}/\text{m}^3$	Basis of Application	Limit Value Attainment Date	Margin of Tolerance* % of limit value
Protection of human health	24-hours	50	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005	50%
Protection of human health	Calendar Year	40	Annual Mean	1 Jan 2005	20%

Directives 96/62/EC and 1999/30/EC

\* On entry into force of the Directive and reducing to zero by equal annual percentages from 1 January 2001 to 1 January 2005.

### Stage 2 Indicative limit values to be reviewed in the light of further information on health and environmental effects

Limit Value Objective	Averaging Period	Limit Value $\mu\text{g}/\text{m}^3$	Basis of Application	Limit Value Attainment Date	Margin of Tolerance** % of limit value
Protection of human health	24-hours	50	Not to be exceeded more than 7 times in a calendar year	1 Jan 2010	50%
Protection of human health	Calendar Year	20	Annual Mean	1 Jan 2010	50%

Directives 96/62/EC and 1999/30/EC

\*\* From 1 January 2005 and reducing to zero by equal annual percentages by 1 January 2010.

## **Appendix V Those Qualifying Payments for Fuel Allowances from the Department of Social, Community & Family Affairs**

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Old age (Contributory/Non-contributory) Pension  
Retirement Pension  
Blind Pension  
Widow/Widowers/Contributory Pension  
Orphan's (Contributory/Non-contributory) Pension  
Deserted Wife's Benefit and Allowance  
One Parent Family Payment  
Prisoners Wife's Allowance  
Blind Pension  
Disability Allowance (previously DPMA)  
Invalidity Pension  
Unemployability Supplement  
Long-term Unemployment Assistance (including smallholders)  
Farm Assist  
Pre-Retirement Allowance (PRETA)

Participants on approved employment schemes (listed below) may retain entitlement subject to certain conditions.

Jobs Initiative (JI)	Community Employment (CE)
Back to Work Allowance (BTW)	Workplace
BTW Enterprise (BTWE)	Jobstart (for 52 weeks)
Revenue Job Assist	

### **Social Security Pension/Benefit from other countries;**

EU Social Security Pension  
Austrian Social Security Pension  
Quebec Social Security Pension  
Australian Social Security Pension  
Canadian Social Security Pension  
American Social Security Pension  
New Zealand Social Security Pension  
Swiss Social Security Pension

### **Payments from a Health Board;**

Disabled Persons Rehabilitation Allowance  
Infectious Diseases Maintenance Allowance

All of the above categories receive £5 (€6.35) per week for a 29 week period from mid October to end of April.

## Qualifying Payments for Smokeless Fuel Allowance

All of the categories eligible for the fuel allowance living within the coal ban areas receive an additional £3 per (€3.81) week from mid-October to end of April. In addition, recipients of the following allowances living within the ban areas also receive the smokeless fuel allowance: -

Family Income Supplement

or

Disability Benefit ]

Unemployment Benefit ] must be in receipt for at least 3 months

Unemployment Assistance ]

## Appendix VI A Brief Background to Coal and Other Solid Fuels

### Bituminous Coal

Over long periods of time, organic matter trapped underground is converted into coal. Softer, younger coals contain higher percentages of volatile matter, oxygen and hydrogen and these are driven off over time (millions of years) as the depth of the overlying rock increases and the organic matter is transformed from peat to soft and then to hard coal. Coals are classified by rank according to their progressive alteration in the natural change from lignite (the softest and youngest coal) to anthracite (the oldest and hardest coal). Coal rank depends on the content of volatile matter, carbon (the combustible matter left when the volatile matter has been burnt off), moisture, and oxygen, although no single parameter defines a rank. Typically, coal rank increases with age as the amount of carbon increases and the amount of volatile matter and moisture decreases. Ash is the residue left after combustion. Generally the higher the ash content of the fuel the lower the heat potential. Calorific value is the potential heat output of a given quantity of coal.

Coal ranking<sup>24</sup> is indicated in the table below. The figures quoted in the table are indicative and can vary markedly depending, inter alia, on geological origin.

Fuel	Wood	Peat	Lignite	Sub-bituminous	Bituminous	Anthracite
Age	Youngest					Oldest
Colour	Brown Coal				Black Coal	
Hardness	Soft Coal				Hard Coal	
Gross Heating Capacity	Lower Calorific Value					Higher Calorific Value
(MJ/kg)	16	16	21	24	29	30
*Carbon content	Lower % values					Higher % values
%	50%	58%	70%	81%	87%	95%
Volatile Matter	Higher % values					Lower % values
%	80%	68%	53%	40%	35%	5%

\* Dry Ash Free Basis

Coals below 14% volatile matter consisting mainly of gases and tar are ranked as “smokeless”.

<sup>24</sup> Rose, J. W. & J. R. Cooper (Eds.) (1977) Technical Data on Fuel, World Energy Conference, London. Figures quoted are indicative based on typical commercial fuel.

Peat (turf, loose and baled briquettes) is the next step on from vegetable matter and wood. It is defined as a “smokeless” fuel (having a smoke emission rate of less than 10 grams of smoke per hour based on 3.6kg burned in accordance with British Standard 3814:1994).

Lignite (or brown coal) is used in the making of briquettes and has a high volatile matter content. Both lignite and sub-bituminous coal tend to burn more easily but will generally have a lower calorific value and so will not burn for as long or as strongly as coals with a high calorific value e.g. anthracite. The weaker burn means that the smoke emission rate is higher for a given amount of heat. Brown coal nuggets or “union” coal nuggets can be burnt unblended as a smokeless coal product.

Bituminous coal (between 20% - 40% volatile matter) varies considerably but due to the high volatility lights reasonably easily but giving off a large amount of smoke.

Anthracite is a natural smokeless fuel (smoke emission rate of the order of 5 grams per hour) due to its low volatile content (typically of the order of 5%); it is high in heat energy, high in carbon and generally low in ash. Anthracite is not normally suitable for use on open fires but rather in domestic closed appliances, commercial heating boilers and for briquetting mixed with other fuels.

Ovoids are manufactured from high-energy low ash fuels. Nearly all smokeless ovoids have a basis of anthracite or “duff”. This duff is in some cases mixed with binder or quantities of high energy processed coals may be added. Heated mixtures are passed through ovens to harden them and/or subjected to high temperatures to drive off sufficient volatile matter to make them suitable for smokeless uses.

Petroleum coke (“Petcoke”) is the final “end of barrel” by-product of the refining of crude oil after all other higher value, higher volatility products have been refined from the crude. To produce low-sulphur higher quality and value liquid fuels (petrol, diesel etc.), the residual sulphur levels in petcoke can be high. When mixed with a lower ranked soft coal with high volatile matter content, for example a brown coal, it can provide the characteristics to allow convenient ignition in a domestic open fire with sufficient duration of burn to provide adequate smoke free heat. Petcoke is a high calorific solid fuel; at around 35 MJ/kg its heating capacity is in excess of that of the hardest coal, anthracite, at 30 MJ/kg. It should not be burned in its pure form in an open fire due to the damage the high heat intensity will cause to the grate. It must be blended with another smokeless fuel for open fires. Similarly, it should not be burned on its own in a closed appliance.