Future Minerals Scenarios for the UK

Report from the scenario workshop

6 November 2013

Report prepared for

The UK Minerals Forum

November 2013

Contents

1 Introduction

1.1 The UK Minerals Forum

The UK Minerals Forum (UKMF) brings together representatives of the UK's onshore extractive industries, NGOs with a particular interest in the environmental impacts of mineral extraction, the sector's research organisation, local government planners and observers from central government, the territorial administrations and the main statutory regulators. The Forum is funded by the CBI Minerals Group and provides an opportunity for members to discuss matters of common interest in a neutral space, away from the pressures of traditional lobbying, campaigning, and formal dialogue about regulatory policy, legislation, minerals supply and environmental protection.

The Forum sponsors Working Groups to look in detail at matters of particular interest or concern and to report their findings to UKMF and to the wider public through suitable websites and the biennial CBI *Living with Minerals* Conferences. Specific issues emerging from Working Groups are followed up with government as appropriate.

1.2 The Working Group

The Working Group on future mineral scenarios for the UK is examining the possible impacts of alternative futures on UK minerals supply. It is particularly interested in exploring

- how demand, sourcing and supply of minerals might vary in different scenarios;
- how different scenarios might impact on current and future perspectives of the sector held by industry, policy makers, regulators and NGOs; and
- what the potential drivers of future minerals demand and supply might be.

The Working Group is meeting these objectives through a mix of desk research, interviews and a scenario workshop – the subject of this report - designed to engage interested stakeholders in the process and to gather their views on the key issues. The workshop took place at the Institute of Materials, Minerals and Mining on 5 November 2013 and was attended by around 40 people drawn from the Forum, wider industry, Government and the public sector, academia and industry consultants. The attendee list is attached at Annex 2.

1.3 This report

This report documents the outputs from the workshop.

- **Section 2** outlines the UKMF scenarios;
- **Section 3** describes the structure of the scenario workshop;
- **Sections 4 – 6** record the outputs from the workshop discussions;
- **Section 7** records the group vote on the plausibility and favourability of the scenarios; and
- **Section 8** provides our conclusions and recommendations.

The Annexes to the report provide additional information on

- Members of the Working Group;
- Workshop participants;
- The drivers for future UK mineral supply;
- Participants' perspectives on the future;
- A comparison of key issues across the three scenarios; and
- Possible variance in production and consumption across the scenarios.

There are two supplementary documents to this report: the Executive Summary and the UKMF Working Group scenarios.

2 The UKMF scenarios

2.1 Introduction

Rather than develop new scenarios, the Working Group chose to use an existing set - the World Economic Forum's Mining and Metals Scenarios to 2030 - to stimulate discussion.

The scenarios did, however, require some customising to meet the specific needs of this project. We therefore collaborated with the Working Group to extend the scenarios out to 2050 and to develop a more detailed picture of the UK and the UK minerals sector in each future.

The World Economic Forum (WEF) scenarios describe three futures: *Green Trade Alliance*, *Rebased Globalism* and *Resource Security*. The UKMF scenarios were developed by

- reviewing the drivers of change that might impact on future UK minerals supply (set out in Annex 3);
- exploring how drivers might play out in the different futures described in Mining and Metals Scenarios to 2030; and
- using the drivers to define what the UK's political, social and business environment is like in each scenario.

The full scenarios are set out in the Power Point presentation accompanying this report; this section provides an overview.

2.2 Predetermined elements

The scenarios take account of five *predetermined elements* (conditions that will not change between now and 2050):

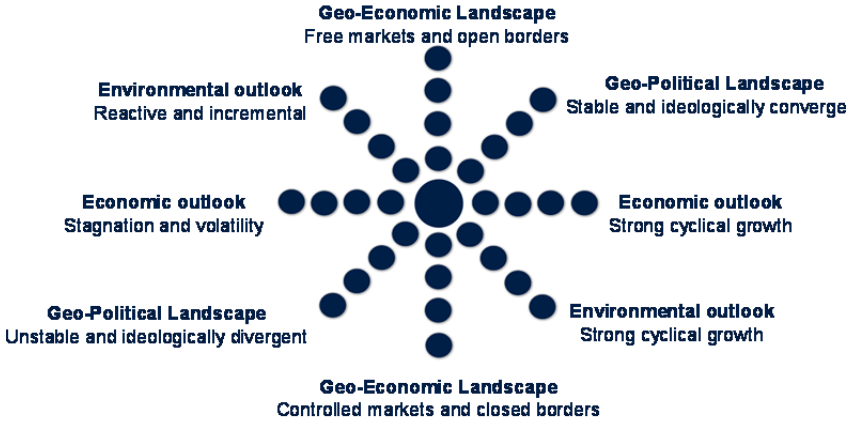
- global population growth will continue to increase demand for minerals;
- the number of people living in cities and consuming a higher share of resources will continue to place pressure on the demand for resources;
- meeting demand for some minerals will remain challenging as access to resources and other supply side issues become increasingly difficult;
- UK population will increase significantly - more than elsewhere in Europe – due to higher birth rates and working age immigration; and that
- higher population will drive up demand for minerals and energy (even in a more resource efficient world).

2.3 The scenario framework

The scenarios focus on and explore four broad areas of critical uncertainty for the world in 2050:

- Geo-economic landscape
  - *Will economic power be shared equally or unequally?*
  - *Will cross-border flows be more open or more closed?*
  - *Will markets be free or controlled?*
- Geopolitical landscape
  - *Will the geopolitical landscape be stable or unstable?*
  - *Will there be ideological convergence or divergence between regions?*
- Economic outlook
  - *Will change be more predictably cyclical or more extreme and unpredictable?*
  - *Will average global GDP grow rapidly or stagnate?*
- Environmental outlook
  - *Will the response to climate change be decisive and ambitious or reactive and incremental?*

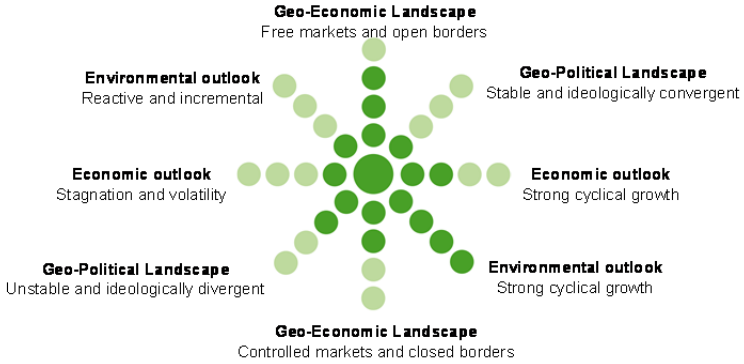
Taken together, these four areas of critical uncertainty define a scenario framework that describes the key characteristics of the future:



The three UKMF scenarios – *Green Britain, Britain Powering Growth* and *Insular Britain* - explore what the UK might be like if the world moves more in one direction than another.

The three scenarios are described briefly in Sections 2.4 – 2.6. The table at Section 2.7 summarises their key characteristics.

2.4 Green Britain



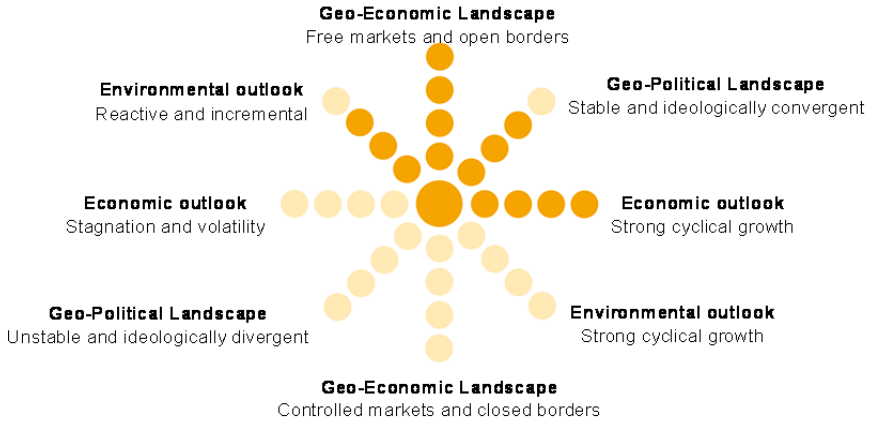
Green Britain describes a world in which

- global growth is low;
- some – but not all – nations take a co-ordinated and ambitious approach to tackling environmental challenges;
- there is a push for free markets and open borders but continuing instability leads to protectionist tendencies; and
- environmental issues are critically important to the UK.

The UK is a nation where the environment lies at the heart of economic and social policy. Economic growth remains important, but only if it is achieved within environmental limits. Cities are the engines of that growth, creating centres of knowledge, commerce and industry. The UK is performing well overall, but there are some significant regional differences. Distributed power generation is commonplace and recycling is an economic as well as an environmental necessity. Land use is geared towards food, energy production and some mineral production.

The UK is part of the Green Trade Alliance, a partnership of nations seeking to promote green growth. The measure of green growth is GDP+ - which balances environmental impact, economic sustainability and social wellbeing. GDP+ drives all Alliance members' policy making.

2.5 Britain Powering Growth

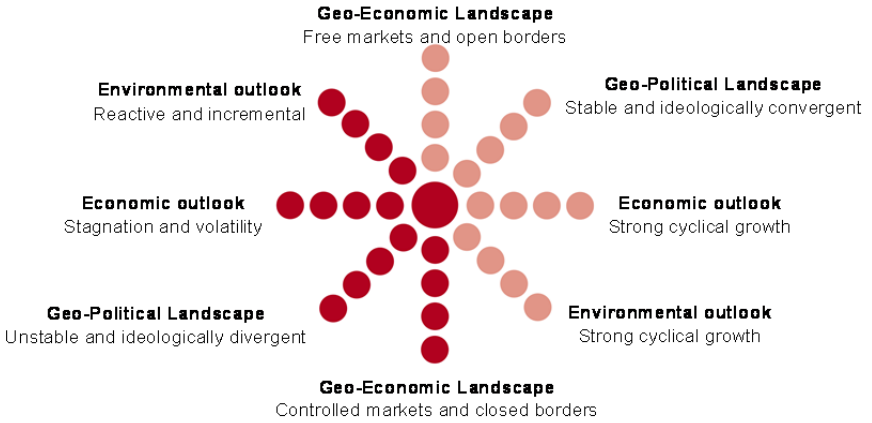


Britain Powering Growth describes a world in which

- free markets and open borders generate strong cyclical growth;
- the world is geopolitically stable;
- short termism is prevalent and nations take a reactive and incremental approach to environmental issues; and
- the UK economy is strong and the largest in Europe.

The UK's success is built on its knowledge industries: financial services, science and technology, education, leisure and the creative and design industries. The UK is regarded as one of the most progressive societies in which to live and work and is a magnet for the knowledge workers who travel constantly around the world, creating value and opening markets**.** It's a 24/7 society and demand for travel, goods and services is high. The UK's wealth creators are supported by an army of service providers who work long hours to meet the needs of their client group. Consumption is high and society's waste footprint is growing inexorably and, it appears, unsustainably. Britain has a thriving nuclear industry.

2.6 Insular Britain



Insular Britain describes a world in which

- globalisation has failed and economic stagnation prevails;
- geopolitical instability leads to controlled markets and closed borders;
- global warming has not been tackled and there is a reactive and incremental approach to environmental challenges; and
- resource security is the dominant issue in the UK and the state takes control to maximise use of domestic resources.

The UK is no longer part of the EU and its economy is weak. It still produces some oil and gas and has expanded its renewables sector but it struggles to achieve energy self sufficiency. The price and availability of imported energy cannot be guaranteed and the government exercises strong control. Energy is rationed and travel is restricted. The UK can no longer rely on migrant labour and citizens work long past historical "retirement ages". Land is worked intensively to produce food and energy and rural communities have grown significantly. Global warming continues to create unpredictable weather that affects both energy supply and food crops.

2.7 Characteristics of the scenarios

Green Britain	Britain Powering Growth	Insular Britain
• Global growth is low • Some nations take a co-ordinated and ambitious approach to tackling environmental challenges • Push for free markets and open borders but continuing instability leads to protectionist tendencies • Environmental issues are critically important to the UK. Economic growth remains important, but only if it is achieved within environmental limits • Cities are the engines of growth, creating centres of knowledge, commerce and industry • The UK is performing well overall – but there are some significant regional differences • Distributed power generation is commonplace • Recycling is an economic as well as an environmental necessity • Land use is geared towards food, energy production and some mineral production	• Free markets and open borders generate strong cyclical growth • The world is geopolitically stable • Short termism prevails. Nations take a reactive and incremental approach to the environment • The UK economy is the largest in Europe • UK success is built on its knowledge industries: financial services, science and technology, education, leisure, creative and design • The UK is regarded as one of the most progressive societies in which to live and work • Knowledge workers travel constantly around the world, creating value and opening markets. The UK is a 24/7 society and demand for travel, goods and services is high • Wealth creators are supported by service providers who work long hours to meet the needs of a demanding client group • Increasing consumption of goods and high-impact services means that society's waste footprint is growing unsustainably • Britain's nuclear industry is thriving	• Globalisation has failed - economic stagnation prevails • Geopolitical instability leads to controlled markets and closed borders • Global warming has not been tackled and there is a reactive and incremental approach to environmental challenges • The UK is no longer part of the EU. Its economy is weak • The UK still produces some oil and gas and has expanded its renewables sector but struggles to achieve self sufficiency • The price and availability of imported energy cannot be guaranteed • Government exercises strong control. Energy is rationed and travel is restricted • Citizens work long past "retirement age" • Land is worked intensively to produce food and energy. Rural communities have grown • Global warming continues to create unpredictable weather that affects both energy supply and food crops

3 Structure of the scenario workshop

3.1 Introduction

The scenario workshop took place at the Institute of Materials, Minerals and Mining on 5 November 2013 and was attended by 40 people drawn from the Forum, wider industry, Government and the public sector, academia and industry consultants.

3.2 Objectives and output

The key objective for the workshop was to stimulate discussion of the UKMF scenarios, to develop a more detailed understanding of what they mean for the UK and to explore their implications for the minerals sector.

The key output from the scenario workshop is this report which documents the main conversations and sets out the group's thoughts on key messages that the Working Group needs to promote about the future of the sector.

3.3 The approach

Participants worked throughout the day in 6 groups, each of which discussed all three scenarios. The workshop was divided into four main segments:

- an introduction to the project, to scenario thinking and to the UKMF scenarios;
- a short 'warm up' discussion to help participants focus on the future. The discussion used a futures oriented question as a stimulus: *If you could speak to someone from 2050 who could tell you about UK mineral supply, what would you like to ask?*[1]
- presentation and discussion of each of the three scenarios (in groups and in plenary) to explore their implications for the UK and for the minerals sector; and
- a final plenary discussion to review the key issues emerging from the discussion and to explore the relative plausibility of the scenarios.

3.4 Working with the scenarios

Following presentation of each scenario, groups discussed a series of questions to deepen their understanding of the narrative and build a shared picture of what it might mean for the minerals sector. The specific questions that each group considered were

- What do you like about this scenario? What do you not like?
- What does the scenario mean for how Britain lives, works and consumes?
- What are the risks for the UK? The opportunities?
- What are the implications of the scenario for sourcing and supply of minerals in the UK?
- Is the UK a net exporter or importer of minerals? Why?
- What are the risks and rewards facing your stakeholder group in this scenario?
- Assume that this is what the future will look like. With that knowledge, what recommendations should the Forum Working Group make?

The output from these scenario discussions is presented in Sections 4 – 6 of the report. A high level summary is set out in Annex 5.

[1] The group's response is set out in Annex 4

3.5 Exploring plausibility and favourability

At the end of the workshop, we asked the group which scenario they thought was

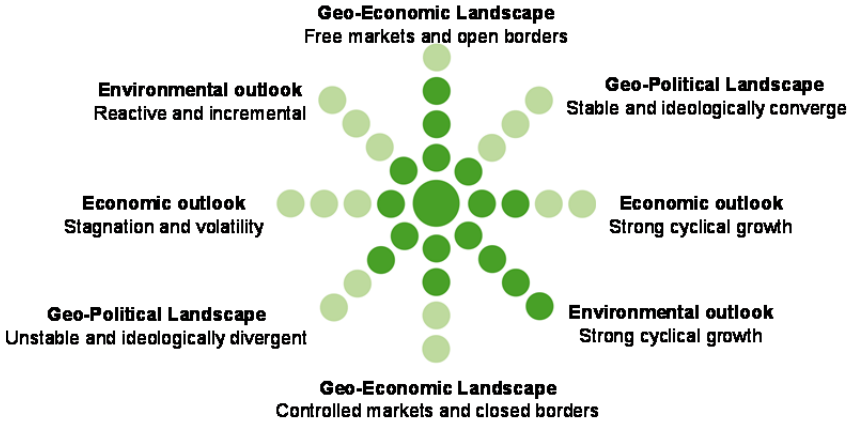
- most plausible;
- most favourable to UK;
- most favourable for UK society;
- most favourable for the minerals sector;
- closest to now;
- closest to the future that individuals personally aspire to;
- closest to the future that demands the biggest change in the minerals sector;
- closest to the future that individuals' own organisation is planning for; and
- closest to the future that Government policy is creating.

The vote is not scientific; rather, it is designed to provide insight into a group's perspective on the strategic choices and options facing them as they look to the future.

The result is set out with our commentary in Section 7.

4 Green Britain

4.1 The scenario



- global growth is low
- some – but not all – nations take a co-ordinated and ambitious approach to tackling environmental challenges
- there is a push for free markets and open borders but continuing instability leads to protectionist tendencies
- environmental issues are critically important to the UK

The UK is a nation where the environment lies at the heart of economic and social policy. Economic growth remains important, but only if it is achieved within environmental limits. Cities are the engines of that growth, creating centres of knowledge, commerce and industry. The UK is performing well overall, but there are some significant regional differences. Distributed power generation is commonplace and recycling is an economic as well as an environmental necessity. Land use is geared towards food, energy production and some mineral production.

The UK is part of the Green Trade Alliance, a partnership of nations seeking to promote green growth. The measure of green growth is GDP+ - which balances environmental impact, economic sustainability and social wellbeing. GDP+ drives all Alliance members' policy making.

4.2 The vote

At the end of the workshop discussion, participants voted on whether they liked the scenario or not:

Really, really like	7	18	13	0	**Really, really don't like**

Around two thirds of the group liked *Green Britain*. The aspects of the scenario the group liked are that

- Sustainability matters
  - *The environment is high on the agenda*
  - *There is long term sustainable growth*
  - *We are husbanding resources*
  - *There is some shape for the future*
  - *The limits of a finite planet have been taken on board*
  - *We value the environment as a commodity*
- Resilience is valued
  - *This scenario provides a long term future – society is coping with change*
  - *We have achieved behavioural change*
- Social equity is high
  - *There is greater social equity*
  - *It's an idyllic society*
  - *There's equal access to goals and to quality of life*
- There's a focus on innovation
  - *Innovation is galvanised (may be too radical…?)*
  - *The scenario promotes efficiency*
  - *Leasing of metal based products is common*

- The value of minerals is better appreciated

There were, nevertheless, a lot of elements of *Green Britain* that participants didn't like:

- It costs a lot to get to – and stay - here
  - *There's an economic pain barrier to get through in 2020s and 30s*
  - *Reduction of consumerism = lowering of growth*
  - *Lack of travel over greater distances*
  - *Costs of raw materials and transport will increase*
  - *It's not clear how the UK funds itself*
- The economy has been scaled down
  - *No large scale manufacturing means no competitive advantage*
  - *This is likely to limit inward investment*
- Resource use is carefully managed
  - *Use of energy is frowned upon*
  - *Lack of engines/noise/fuel consumption – no more Top Gear…!*
  - *Lack of development of the resource base*
  - *Are we exporting the UK's CO_2 footprint?*
- There is less personal freedom
  - *More self control required*
  - *Signing away some personal freedom*
  - *Possible loss of individuality and loss of independence*
  - *Not having a car*
  - *Loss of leisure and nature conservation due to changes in land use*
- The UK is very reliant on it's partners
  - *We're very reliant on international agreements*
  - *There aren't enough strategic countries in the GTA*
- It's hard to maintain momentum
  - *There's tension between the blocs inside GTA and outside it*
  - *It's difficult getting people to buy in and to understand why these changes are necessary*
  - *There's perceived danger of long term decline socially and economically*
  - *Growth of the cities may be hard to sustain and may create tensions between urban and rural communities*

4.3 What life is like in *Green Britain*

Cities thrive	Consumption is lower	Lifestyle is capped	The environment is cleaner	There is a more sustainable energy mix	Wealth creation is challenging	The political environment is stable
• Cities thrive • We may see more industry in the cities • There will be large population movement to the cities • More durable buildings/ construction • Building down, better insulation, easy to light • Cities depending on rural for food, energy	• Consumption is lower • Consumption is more efficient, with increased taxes on consumables • There's a reduction in long distance travel • People will lease gadgets, not own them or buy new ones every year • Certain things are much more expensive – eg flights	• Lifestyle is "capped" and more regulated • The decrease in living standards [as we transition from the past to this scenario] might lead to public disorder • Affordability may be an issue for many people • Less travel means stronger communities • Greater 'work from home" culture means less social interaction • More holidays taken at home gives an economic boost • Improving health? • Behavioural change	• The environment is cleaner • Environmental improvements bring a better quality of life • More environment awareness • Ultimately, it depends on whether the UK is looking solely to improve its own environment or whether there is a drive to improve the global environment	• The energy mix will be a realistic scenario • Smaller local power stations • Shared renewable energy resource before using Carbon energies	• Green Britain lends itself to a service based economy rather than to manufacturing. There is a decline in heavy industry and energy intensive industries • Maintaining quality of life depends on attracting investment • More indigenous manufacturing • Better employability policy • Is this affordable? Does it pay for itself? • Wealth creation is challenging	• The political environment is stable • More local co-ordination • Disparity in society/wealth (or more equal society)

4.4 Strategic challenges facing the UK

Access to land is limited	Society struggles to adapt	Sustaining lowered growth is difficult	The UK has become less powerful
• State control over land use • Ability to access resources • Land will be less available for primary extraction • Land premium will push out extractive industries • Land unavailable for recreational use	• Buy-in from people • Increased cost of living • Risk of declining living standards – disposable income • Being left behind in the green revolution vs the rest of the world; reduction in standard of living • Social unrest due to sacrifices • Because of trying not to pass on environmental impacts, prices might increase in UK because of not optimising sourcing from the lowest cost base	• Risk of lower economic growth than "rest of the world" • More dependent on imports • Risk of investment shifting to other countries • Negative balance of payments • Competitiveness • Jobs changing to repair and manufacture • Migration of big business/ entrepreneurs to faster growth countries	• Declining global influence • Small public sector • Limited scope for implementing this scenario for the UK than for a much bigger country with more space (eg Canada) • Can innovation continue? • Some essential things will come from overseas GTA

4.5 Strategic opportunities facing the UK

Green technologies provide growth opportunities	The long term future is more assured	The sustainable lifestyle is attractive to people	New jobs and skills have emerged
• Stimulate and develop less invasive technologies • Investment in green technology • Develop and export "green expertise" • Grab the green industry from competitors • Hub of "knowledge transfer" • Innovation - in design and across industry	• Long term future more assured by living within environmental limits • Reversal of decades of environmental decline • Resource efficient - increasing longevity • Improved – or possibly only maintained - environment	• Co-operation between people • Less consumption • Self sufficiency • Community wellbeing • More inward migration as people are attracted by the sustainable life style	• New types of jobs • New skills for people • More opportunities for low skilled people • Deindustrialisation and industry exported to less green world

4.6 Sourcing and supply of minerals in *Green Britain*

The UK needs to be self sufficient	We need to maximise recycling	Effective recycling lowers consumption and increases efficiency	Focussed regulation drives change	Supply requires careful strategic management
• High pressure to supply internally • Less reliant on energy imports (ie energy minerals) • Self sufficiency maintained or improved • Don't want to pass environmental impact overseas to trading partners so UK tries to source minerals from UK sources as far as possible • Stable UK supply of [now] energy minerals	• Maximised recycling • Pushing of recycling (effective) • Reduced pressure on primary production	• More efficient use of primary/recycled minerals • Would consume less primary minerals, more recycling, less waste • Less recycled aggregates if less demolition due to more durable buildings/structures • Use less materials over all • Take less out of ground, do more with it	• Permissions linked to legacy restoration • Presumption against development unless total sustainability and of national [perhaps international] importance • There will have to be trade and movement	• Pressure on areas with good quality hard rock/attractive upward areas • Minerals: added value and high energy use industry likely to go

4.7 Imports and exports

Overview	Energy	Construction	Other minerals
• Husbanding of resources is essential • Labour costs are high • The UK needs to import some minerals – such as metals – but there are export opportunities for others such as potash and kaolin	• Energy is imported when it's needed to top up renewable production • Consequently, the UK is a net importer	• Construction is self sufficient –it's too expensive to transport and importing is against green credentials	• Opportunities for some mineral exports (potash)

4.8 Risks and rewards facing stakeholders

Industry		Citizens		Government	
Risks	**Rewards**	**Risks**	**Rewards**	**Risks**	**Rewards**
Costs will increase • Fuel and operating costs will increase • Risks in energy costs, risks to energy security **Competition will increase** • In a relatively low growth economy – with less demand – there will be cut-throat competition • Competition over land use & amenity • Decentralised energy provision – small and micro grids, mostly for domestic uses **Need for long term strategy to manage supply** • Conflict between short term politics and need for long term vision/planning • Risk in accessing materials due to environmental constraints	**Export opportunities will increase** • New market opportunities • New materials created here and exported • A knowledge economy: net exporter of skills and knowledge • New marketing opportunities linked to selling green credentials • Innovations exported **Sustainable business growth offers potential** • Potential for longer – term business certainty (eg through leasing and recycling) • Corporate social responsibility rewards	**Cost of living will increase** • Cost of living increase • Prices higher – less minerals in the world **Choice will be reduced** • Less choice • Less travel **Central government will take more control** • Planning legislation will be more authoritative • Localism will be gone **Citizens will need to retain a global focus** • Possible danger of becoming insular	**Society will have a sense of shared purpose** • Marvellous sense of wellbeing • No more compelling to have goods • More adaptive society - less travel, higher taxes, green taxes • No more NIMBYism • Communities are compelled to meet their own needs **Change will create new opportunities** • Better environment to live and work in • Increased industrialisation	**The transition will be difficult domestically** • Very high risk to start “pain for gain” • Two tier world reinforced as heavy industry is exported • Low productivity • Out of sync with rest of world **Societal divisions could be reinforced** • Rural urban divide • Pressure on urban environments • Social cohesion (population density) • Social disorder • Ageing population and the pension time bomb **Different approaches may cause global instability** • Non-compliance from other countries • May create political instability worldwide – risk of war…?	**Societal wellbeing will increase** • Stable economy and standards of living guaranteed if we get it right • Social cohesion/ sense of identity • Economic growth • Good environment • Health improvement

4.9 Recommendations to support future development of the sector

Participants were asked to assume that *Green Britain* is what the future will look like – and, with that knowledge, to suggested recommendations the Forum Working Group should make about future development of the sector.

Their recommendations fell into seven broad areas:

- **Secure political commitment to the development of a long term vision for the sector**
  - *The sector needs clear long term political vision*
  - *Try to get cross party consensus – it requires longer term thinking*
  - *Develop a clearer resource based policy – which covers energy*
  - *Have a specific government department look at a natural resource policy over a long time horizon and set out its strategic long-term management and resource policy*
  - *Clarify what are our environmental policies*
  - *We require an industrial strategy if we are to manage the transition to the 'green' world effectively and sustain a productive manufacturing industry*

- **Develop thinking on paying for environmental externalities**
  - *More research into the concept of GDP+*
  - *Shift from GDP to GDP+*

- **Plan for sustainable living**
  - *Government must make more effort to educate the population in environmental awareness – otherwise we won't get to it in the first place*
  - *Seek improved resource efficiency and better resource use overall*
  - *Strong environmental mitigation against climate change*
  - *Conduct more research into improved recycling and waste minimisation. Develop a better understanding of waste streams – industrial and domestic – so we can optimise recycling*
  - *Provide clarity on how infrastructure in cities can be delivered*

- **Manage our resources**
  - *Carry out a fundamental review of acceptable resource use*
  - *Raise public awareness of the importance of minerals – if you cannot grow it, you have to mine it*
  - *Focus on life-cycle management of finite resources – and on safeguarding them*
  - *Continue to improve knowledge of mineral resource potential of the UK*

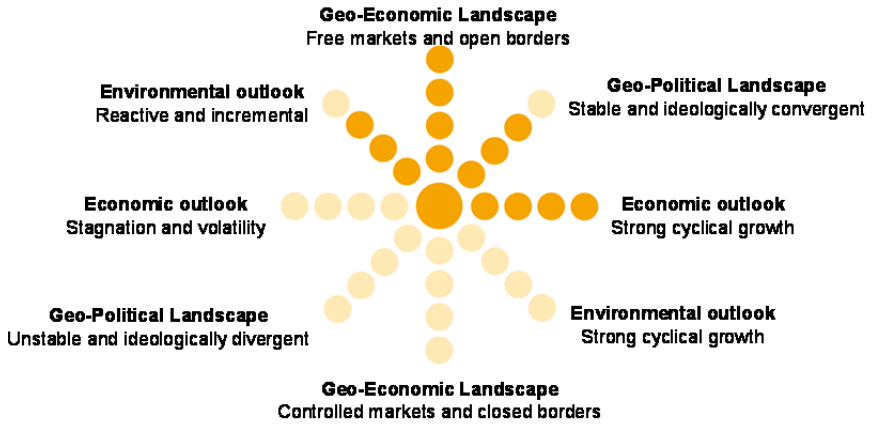
- **Invest in green technology**
  - *Major skills investment in green technology: education and skills have to be provided for the minerals and green industries*
  - *Production and survival in a green way*
  - *Needs investment*
  - *Consider new town development – more self sufficient*

- **Set up processes to review and monitor transition of the sector to make sure it is on the right track**
  - *Research and monitor activity to ensure the sector is on the correct path towards improved sustainability; initial ideas may need correcting*
  - *Test whether there is a danger of moving to green energy too quickly and destroying economic development*

- **Encourage global collaboration**
  - *Redouble international efforts to encourage expansion of the alliance*

5 Britain Powering Growth

5.1 The scenario



- free markets and open borders generate strong cyclical growth
- the world is geopolitically stable
- short termism is prevalent and nations take a reactive and incremental approach to environmental issues
- the UK economy is strong and the largest in Europe

The UK's success is built on its knowledge industries: financial services, science and technology, education, leisure and the creative and design industries. The UK is regarded as one of the most progressive societies in which to live and work and is a magnet for the knowledge workers who travel constantly around the world, creating value and opening markets**.** It's a 24/7 society and demand for travel, goods and services is high. The UK's wealth creators are supported by an army of service providers who work long hours to meet the needs of their client group. Consumption is high and society's waste footprint is growing inexorably and, it appears, unsustainably. Britain has a thriving nuclear industry.

5.2 The vote

At the end of the workshop discussion, participants voted on whether they liked the scenario or not:

Really, really like	0	7	21	7	**Really, really don't like**

Just over three quarters of the group didn't like *Britain Powering Growth*. The elements of the scenario that people didn't like are

- It's an unequal world
  - *The economy is unbalanced*
  - *The poor continue to work longer*
  - *There's no trickle down effect*
  - *Socially divisive*
  - *Lack of social concern/cohesion*
  - *Growing tensions at all scales*
- There's no time to smell the roses
  - *Long hours culture*
  - *24/7 – poor work life balance*
  - *No sense of well-being*
  - *Maxed out world*
- People don't care
  - *Selfish*
  - *Lack of community*
  - *No one has time to enjoy the environment*
  - *Not socially cohesive – long hours, not appreciating the environment*
  - *Negative social and environmental side*

- *Export CO_2 footprint*

- The world is short sighted
  - *Short termism*
  - *Boom and bust*
  - *No sustainability of growth*
  - *Ignores economic opportunities afforded by the environment and global opportunities to market it*
  - *Lack of long term planning – energy, resources*
  - *Quite insular*
- Society has limited resilience
  - *Too focussed on one industry*
  - *Heavily reliant on external supply of resources*
  - *No land production*
  - *Depletion of natural capital*
  - *Potential to come to a quick and bloody end – drop off cliff*
- Climate change is not being tackled
  - *Lack of concern re climate change and the environment*
  - *Intensification of global climate change*
- We're just emptying the bank…
  - *Deficiency of indigenous resources (minerals and water)*
  - *Environmental degradation*
  - *No sustainability*
  - *No resource efficiency*
  - *Not dealing with waste*
  - *Lack of control (from executive point of view)*
  - *Finite*
  - *UK never likely to be the largest in Europe*

A fifth of the group liked the scenario. The particular elements people liked are that

- The economy is strong
  - *This is economically positive*
  - *Economic prosperity and a strong business environment*
  - *Inward investment opportunities*
  - *We can buy whatever we want from wherever at the best possible price*
  - *High employment rate*
  - *Offers opportunities for innovation*
- Industry is doing well
  - *Cutting edge/ competitive focus*
  - *Many sectors doing very well – and OK for others*
  - *Thriving nuclear industry – self sufficiency and low carbon impact*
  - *The knowledge workers create wealth*
- People have a high standard of living
  - *Lots of wealth and plenty of disposable income*
  - *People get richer*
  - *Can afford social care and other services*
- People have freedom of choice
  - *Live where you want, no guilt*
  - *Stability*
  - *Personal freedom*
  - *Less government interference*
- It builds on trends we can see today
  - *The knowledge industries are already happening*
  - *Elements of this exist now. Britain is generally dynamic*

5.3 What life is like in Britain Powering Growth

Growth creates wealth	An open economy is essential for continued prosperity	Work dominates people's lives	People have little time for taking the long view	Short termism prevails	The environment is under pressure
• Strong economic growth (no change to behaviour – but no longer doing it on credit!) • High quality of life for those with high incomes (and the converse applies as well…) • Much higher standard of living which may translate into more concern for the environment and green issues • Excellent education infrastructure • Less skilled/less able people may have fewer employment opportunities	• The UK is more dependent on other countries • Free market = cheapest source • Security of supply is important • Russia likely to drop prices, suck you in and then raise prices	• People live to work and consume – they have little free time • Work harder, consume more • Negative effect on environment and social values means that society could become fragmented • Breakdown of social cohesion might happen because of short term work contracts and therefore moving [a lot] for employment • Lack of social cohesion	• Eat, live and be merry today – tomorrow is bad again • Profligate society • Selfish and unfair society	• Continuous boom-bust scenario – short termism prevails • High consumption – especially of energy • Consumption limited only by what is available and what can be imported • Technology led environment	• Increasing pressure on resources (water) • We have a degraded environment • Climate change really kicking in globally

5.4 Strategic challenges facing the UK

Environmental degradation is increasing rapidly	Resources are depleting	Security of supply cannot be guaranteed	Continued growth in the UK is dependent on imports	Global markets create volatility	Social issues are pressing
• Lack of environmental protection • May be less incentives to reduce waste and recycle • Irreversible damage to the environment and to ecosystems service • Cumulative negative impact on the environment • Rampant climate change • Shocks – changes in agriculture, extreme weather events • Migration and refugees due to climate change • Threats to stability from climate migration	• High demand for resources • Long term mismanagement of land • Rapid resource depletion and waste generation	• Food security from competition of land use • Security of supply – food, minerals • Intensive trade wars due to unconstrained free markets • Conflict potential	• High dependence on overseas supply (products, minerals) • High dependence on overseas multi-nationals • The UK relies on the BRIC countries who control resources • No real power – lies with the BRICS • Might become increasingly reliant on some specialised minerals	• Boom and bust • Price volatility • Global political instability • High risk of bust in the UK as it is dependent on services industry • Fewer customers for our knowledge • How to manage balance of payments – strength of currency? • Increased prospect of war	• Open borders have increased inward migration • Excessive population and overcrowding due to attractive economy • Divided society – rich getting richer, poor getting poorer • Health/access to healthcare is a growing concern • Less well resourced education system – ie people less able to adapt • Lack of social cohesion and increasing civil unrest

5.5 Strategic opportunities facing the UK

The economy is growing	The UK has the opportunity to become a leader in tackling sustainable development	The UK can invest in the skills and innovation needed to achieve sustainable development
• Short term prosperity • Significant innovation and export opportunities • Relatively full employment • Ability to generate wealth • Construction and infrastructure booming – greater need for minerals • Maximise the UK's own resources • Encourage resource colonialism – ie take control of other countries' resources	• Capacity to adapt and mitigate effects • Ability to "fix" environments • Use the wealth to create a sustainable future • New products, innovation (anything goes society) technology • Being seen as a progressive leader – to lead the charge	• Provides opportunities for society • Continuous innovation (high skills level) • Education and training for post boom future

5.6 Sourcing and supply of minerals in *Britain Powering Growth*

Demand has increased	Production has increased	The market decides	Security of supply is fragile	No strategy for UK supply
• Demand for minerals would increase – society is consuming a lot • High investment in infrastructure implies a large demand for construction materials – not only aggregates • Strong demand for all types of minerals • Wanting to import large quantities of minerals (especially energy)	• Primary production has increased, recycled materials have decreased • Greater pressure on domestic sources • Shale gas, new coal technologies • Complete disregard for ethical sourcing	• This is a free market scenario so there is little support for indigenous mineral companies • Market driven – "buy where it's cheapest" (including imports) • We have a strong economy that is able to purchase much of our mineral requirement from overseas – except, perhaps, aggregates • Tensions over land use – people don't like minerals	• Rapid depletion • Any 'world class' UK mineral deposits will probably be foreign owned and would not necessarily be utilised in the UK • High dependence on overseas supply/ multinational supply • No allegiance from multinationals • Increased sterilisation of resources	• No investment for resource production in the UK • No strategy for UK mineral/energy supply • Lack of UK investment • No manufacturing • Poor scenario for indigenous mineral resources • CCS? Maybe seen as expensive or unnecessary

5.7 Imports and exports

Overview	Energy	Construction	Other minerals
• The UK is a high consumer and therefore a net importer of most minerals • We haven't got everything we need and because we're rich enough and we couldn't care less about exporting environmental impact	• Energy importer	• Construction is self sustaining	• UK remains a net exporter of some industrial minerals - which we bring back as products

5.8 Risks and rewards facing stakeholders

Industry		Citizens	
Risks	**Rewards**	**Risks**	**Rewards**
Barriers to production will increase • Tension over land use – land lost to climate change and expanding towns • Unable to get land to extract minerals • More expensive to obtain land and obtain permission to extract • Cost of operating quarries and hauling minerals **Business will be more competitive** • Risk of global competition • Competition for use of land between businesses **Infrastructure will be weaker** • Capacity of transport networks • Business continuity and power outages **Public opinion will be unfavourable** • Protests from population about environmental concerns • Heightened challenge of NIMBYism due to increased need for mineral extraction and industrial development and housing **Political challenges will increase** • Threat of instability and conflict over resources • More international companies mean less tax revenue for governments (so countries become weaker)	**Strong demand means big rewards** • Open market for selling goods • Strong demand means building industry and higher profits • Major financial rewards to international companies • Bounteous rewards	**Societal tensions will increase** • Densely packed island • Uneven social cohesion • Total consumer choice dependent on income stream • Majority population are have nots and are disenfranchised • Increased crime – gated communities • Gentrification occurring in the countryside **Individualism will increase** • Huge NIMBYism • No time to engage with the community **Environmental risks will increase** • Water availability will become a serious issues in some parts of the country – but not unfixable • The stress of living in this environment might encourage people to move overseas • BANANA - build absolutely nothing	**Rewards will be unevenly distributed** • Uneven economic rewards • Citizens have power to change things – but the haves are NIMBYs • Greater movement of people because of open borders

Government	
Risks	**Rewards**
Some big challenges to maintaining the *status quo*	**Plenty of funding available to build a stronger society**
• Threat of rapid collapse of the fragile economic system	• Opportunities for tax-raising from strong economy
• Consequences of social unrest	• Higher tax revenue means higher potential to help society
• Government left to pick up the pieces (on the environment)	• UK more influential in Europe and world affairs
• Government run by big business and local control	• Enjoy the ride while it lasts
• Nuclear waste	• Freedom
• Danger of large elderly non-work force – how do you pay for them?	

5.9 Recommendations to support future development of the sector

Participants were asked to assume that *Britain Powering Growth* is what the future will look like and, with that knowledge, to suggested recommendations the Forum Working Group should make about future development of the sector.

Their recommendations fell into six broad areas:

- **The UK needs an effective policy framework for managing future supply of minerals**
  - *Markets may not deliver everything we hope for*
  - *Promoting security of supply must be an objective*
  - *We must be more proactive about securing energy supplies – coal gasification; coal methane, shale gas*
  - *The UK may need targeted government intervention to protect key national assets*
  - *We should consider stockpiling minerals in the UK to prevent complete downturn in case of bust*
  - *Supply in this scenario is based on cost alone - so the only way the UK minerals industry survives is by competing on cost or having a unique supply*

- **The UK needs an effective policy framework for managing future demand for minerals**
  - *The UK needs policies to promote resource efficiency*
  - *We need a low carbon energy policy to complement nuclear*
  - *Be more proactive in reassuring the public*

- **Develop foresight to anticipate future development**
  - *BGS needs to be properly resourced so we understand indigenous and international mineral resources*
  - *We can't rely on reactive environmental approaches, especially when dealing with potentially irreversible impacts such as global warming and sea level rise; waiting until after the "tipping" point has been reached is too late*
  - *The UK may be exposed to several risks - we therefore need to be very alert to external change*
  - *The cost of fossil based energy is a known unknown and may mean that the cost of extracting oil will be higher. Can quarrying equipment be run on natural gas?*
  - *We must invest in our knowledge base*
  - *Complete geo-surveys – expand Tellus. Know what our resources are*

- **Boost the resilience of the UK industry**
  - *Increase focus on building up UK business/supply chains*
  - *Review strategic alliances outside the UK*
  - *Strong regulatory framework to ensure business thrives but still with government in control of the democratic process*
  - *Government has to manage the cycle to take tax in the good times to fund the bad times – 'smooth the curve'*
  - *Policies to ensure private sector/companies provide more effective CSR policies*
  - *Need higher skill for government to manage effectively*

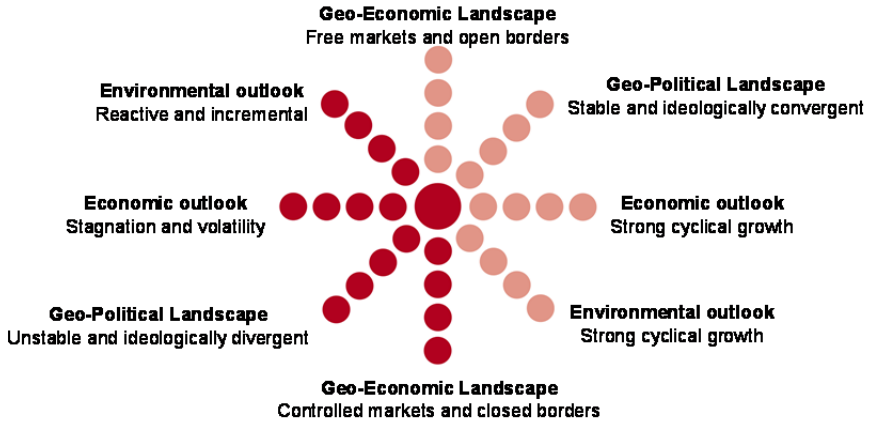
- **Basic infrastructure needs to be systematically reviewed and managed**
  - *Ensure basic infrastructure is correct*

- *Improve import infrastructure*
- *Invest in manufacturing and heavy industry (although this doesn't secure supply)*
- *The transport network needs to be self sufficient to move minerals around the country*
- *Infrastructure for moving people needs improvement*

- **The long term strategy needs to consider a range of contingencies**
  - *This is not a sustainable future and there needs to be a plan B*
  - *Contingency plan for a rainy day – bust will happen*
  - *Rebuild the army*

6 Insular Britain

6.1 The scenario



- globalisation has failed and economic stagnation prevails
- geopolitical instability leads to controlled markets and closed borders
- global warming has not been tackled and there is a reactive and incremental approach to environmental challenges
- resource security is the dominant issue in the UK and the state takes control to maximise use of domestic resources

The UK is no longer part of the EU and its economy is weak. It still produces some oil and gas and has expanded its renewables sector but it struggles to achieve energy self sufficiency. The price and availability of imported energy cannot be guaranteed and the government exercises strong control. Energy is rationed and travel is restricted. The UK can no longer rely on migrant labour and citizens work long past historical "retirement ages". Land is worked intensively to produce food and energy and rural communities have grown significantly. Global warming continues to create unpredictable weather that affects both energy supply and food crops.

6.2 The vote

At the end of the workshop discussion, participants voted on whether they liked the scenario or not:

Really, really like	0	1	13	21	**Really, really don't like**

The group (almost unanimously) disliked *Insular Britain*:

- Living standards are declining
  - *Declining living standards – even possible rationing*
  - *Work burden – long hours, low wages*
  - *Declining cities will continue to decline*
  - *Retrogressive to 'wartime austerity'*
  - *Discourages innovation*
- Environmental challenges are growing
  - *Impact of climate change*
  - *Major negative impact on the environment*
  - *Carbon intensive*
  - *Damaged environment*
  - *Pollution? All guilty*
- Society is less open minded
  - *Societal decay – society is hostile, unforgiving, less open minded*
  - *Inevitable conflicts within the UK between haves and have nots*
  - *Tribal approach to strangers*
- Britain is isolated
  - *Closed borders*

- *International isolation*
- *Isolated culturally as well as environmentally*
- *Protectionist policies lead to economic inefficiency on a local scale*
- *Manufacturing decline because we can no longer access markets or materials*
- *The UK doesn't have much to offer in a barter system*

- The state is in control
  - *Government control/nationalisation*
  - *State control, nationalisation*
  - *Strong state control*
  - *Every man for himself…*
- Access to resources is restricted
  - *Access to resources restricted*
  - *Security of supply*
  - *Energy instability*
  - *Reduced access to energy*
  - *Short term insecurity and possible panic due to lack of continuity and supply*
  - *Uncertain access to international minerals/products, uncertain prices*

Despite the negative view of the scenario as a whole, there were aspects of it that participants did like:

- The UK is self reliant
  - *Self reliance*
  - *Self sufficiency – this is a happily cheerful UK that "digs for victory"*
  - *High level of self sufficiency*
  - *Sounds like 1947!*
- Recycling and resource efficiency are important
  - *Closed loop recovery/recycling*
  - *The emphasis on renewable production and recycling resources*
  - *Recycling and resource efficiency*
  - *Improvements in energy efficiencies*
  - *Good focus on optimising efficiency of use of materials because of scarcity*
- The UK has a strong community spirit
  - *Dunkirk spirit/ sense of community*
  - *Communities and family connections*
  - *Family bonds*
  - *Some degree of increased community spirit (cf the Blitz) – but at risk of tribalism*
- Innovation is important
  - *Innovation (from desperation) - a community strength*
  - *Adapting what we have*
  - *Improved innovation in use of marginal resources (sub-economic at present)*
  - *Efficiency and innovation (too local)*
  - *Innovation/investment in some areas (such as recycling)*
  - *Design and innovation – this sector has grown*
- Mineral production is strong
  - *Mineral production for domestic consumption*
  - *Good for domestic minerals industry*
  - *Niche opportunities*

6.3 What life is like in *Insular Britain*

The UK is struggling to keep afloat	Consumption has fallen and choice is reduced	Society faces many challenges	Communities pull together in the face of adversity	People work long and hard	Big questions remain about social cohesion
• Centrally planned economy stifles innovation • Lack of choice • Lower standard of living • Poor infrastructure • Growth of elite – polarisation of society • Property inheritance more important	• Make do society • Lifestyle/consumer choice limited • Consumption of basic necessities, not luxuries • Consume less, particularly imports • Consume less – reduced choice, utilitarian • Less waste • Low resource, low energy style of living	• Increased deprivation, division and loss of 'power' • Low hopes for the future (cf war time Britain) • Reduced employment opportunities • Black market economy/corruption • Restrictive of freedom • Potential social conflict – some people are armed • Isolation has increased	• Localism • People travel less • More community based society • Stronger communities • Living a more local life – cities decline, rural life increases • Self-reliant as far as possible • Need to be more multi-talented, rediscovery of traditional skills	• More employment in agriculture • More manual work, reduced demand for education • More healthy – food intake changed • More sustainable lifestyle • Long working life	• Move back to rural communities – who owns the land? A feudal system? State regulation? • Agitation for devolution – Wales, Cornwall etc – to another level • Poor international relations – nothing to bargain with

6.4 Strategic challenges facing the UK

The environment is damaged	Government is under resourced and fire fighting	The economy is in decline	Production is fragmented	Society hangs by a thread
• Derogation of environment • Power cuts • Irreversible damage to ecosystem services • Short term decisions and resulting impacts on the environment through not protecting for long term • Being able to buy the resources we need – access and affordability	• Reduced taxation revenue – reduced services to government • Lack of investment • No public participation in planning development • No longer the UK as one country	• UK vulnerable on trade/security • Economically restricted by limited markets • UK globally insignificant • Detached from other countries • Risk to standard of living • Low incomes, high cost • Economy vs necessity • Black economy	• Fragmentation of production to smaller units • Food production	• Widening gap between 'haves' and 'have nots' • Social cohesion may breakdown • Anarchy – establishment failure – leading to collapse • Reduced recreation • Social rejection/ competition • Sustainable but miserable

6.5 Strategic opportunities facing the UK

Innovate constantly	Find new ways to trade	Maximise resource use	Increase mineral production	Pull together
• Problem solving will be key • Innovation, new solutions to problems are required	• Alternative funding options co-operatives etc • Barter trade for specific elements • Co-operatives – power, minerals, food • Might encourage manufacturing	• Maximise resource efficiency • All natural assets are exploited to the full • Recovering & recycling is promoted. Land fill can be mined • Live within your means • Government control of land might help sustainability	• Might create some innovation in sourcing minerals • Increased development of indigenous resources (all types) • More new quarries – consequently fewer environmental controls • Lead production could increase	• Equal society • Empowerment of communities • Family cohesion • Less territorialism • Profitability – no choice • Self balancing – if reduce demand; population reduction

6.6 Sourcing and supply of minerals in *Insular Britain*

Focus on self sufficiency	Look for innovative way to maintain supply	Regulation to optimise production
• Try and do what we can from our own resources - but major deficiencies in resource could create very difficult conditions in sourcing metals in particular • Materials for construction become more local • Maximise use of UK resources • Look for economies of scale to ensure self sufficiency • Focus on self sufficiency where possible	• Innovate to find ways of replacing imported products (eg slate) • More recycling and recovering of metals essential to overcome difficulties of importing (eg specialist technology metals) • Black market of some metals? Metal theft? • Tungsten exchange for other elements • May form military partnership - UK can provide military support for a mineral rich country	• The industry would be much less constrained by policy and environmental concerns – permissions would increase • Increased pressure to obtain minerals nationally where we can get them • More government regulation – not necessarily nationalisation, but government able to insist that sources are worked • We might see some nationalisation (eg coal after WW2) • Grab it if you can

6.7 Imports and exports

Overview	Energy	Construction	Other minerals
• Much less trade, but net importer of minerals that we don't have • Imports are restricted to essentials - only those required for niche products/uses	• The UK is a net importer because we are unlikely to be completely self sufficient in energy. Can the UK afford it though? • A strong drive to be self sufficient in energy (coal?)		• Hoarding, rather than export of those we do have

6.8 Risks and rewards facing stakeholders

Industry		Citizens		Government	
Risks	**Rewards**	**Risks**	**Rewards**	**Risks**	**Rewards**
Investment is reduced • Reduced investment • Large companies moving overseas • Reduced development so reduced demand **Demand declines** • Decline for aggregates • Lack of demand for products • Less primary material produced because of lower demand • …but growth in rarer minerals (including metals and minerals) • Closed markets **Production is compromised** • Government control of prices • Conflict with need for more intensive agriculture	**Markets may be more predictable** • Assured domestic market at high prices • Certainty in terms of business planning • Opportunities for smaller companies and local suppliers • More recycling **Opportunities for increased production** • Greater access to indigenous minerals • Opportunity for increased production of energy minerals • More efficient production • Non-economic deposits may become economic if we can't import • Opportunities for closed loop industries, vertical integration • Increased opportunities for exploiting marginal resources (eg bauxite in N Ireland; tin in Cornwall; some coal)	**Quality of life will fall** • Lower opportunities • Poorer environment • Poor infrastructure • Lack of work **Insecurity will rise** • Crop failure – possible starvation • Vulnerability of cartels and racketeering **UK will be marginalised** • Global conflict – we are a bit player	**Communities might feel more empowered** • Might be some local community cohesion • Self reliance for the young • Resilience of the young **UK will be self reliant** • Out of EU • State employment	**UK will be politically and economically isolated** • Lack of influence internationally • Economic vulnerability • Outlook too insular • Forced to seek partners of convenience to secure supply • Lack of wider innovation **Social unrest** • Supply constraints mean rationing • Industrial and social unrest • The state is larger - police, army needed to maintain control • Only the autocratic elite will benefit • Emigration rises, reinforcing the downward spiral **Demographics are a challenge** • Cost of ageing population rises	**Government has greater control over resources** • Greater control/ management of resources

6.9 Recommendations to support the future development of the sector

Participants were asked to assume that *Insular Britain* is what the future will look like – and, with that knowledge, to suggested recommendations the Forum Working Group should make about future development of the sector.

Their recommendations fell into six broad areas:

- **Develop a national contingency plan**
  - *Land use plan – a Ministry of resources?*
  - *Develop the UK's national capability*
  - *Processing, facilities need to be redeveloped*
  - *Take a controlled/planned approach to the economy*
  - *Develop a natural resources planning function*
  - *Complete Tellus*
  - *This scenario emphasises the importance of maintaining some degree of security of supply by promoting the use of less resources but making Britain into a good place to do business*

- **Bring forward legislation to encourage behaviours that protect supply**
  - *Promote reuse and recycling*
  - *Promote efficiency*

- **Invest in renewables**
  - *Invest in renewable/low carbon energy*
  - *Improve access to energy sources, including renewable energy (eg water powered mill)*
  - *Encourage decentralised energy, small installations at community scale*

- **Invest in the UK Skill base**
  - *The UK needs a strong knowledge base - nationalised for economic function*
  - *Develop geological skills*
  - *Develop education with a particular focus on practical skills*

- **Increase efforts to keep global trade open**
  - *Maintaining free trade and avoiding protectionism is important*
  - *Ensure barriers to trade are low*
  - *Keep international agreements operating*
  - *Re-open geo-political dialogue to redevelop multi-lateral trade*
  - *Reverse protectionism policies (but not unilaterally)*

- **Identify areas of strategic importance that may need development under difficult economic or political conditions**
  - *Government has to make it easier for the minerals industry to supply what companies need*
  - *Increased geo-exploitation*
  - *Reduce environmental constraints*
  - *Promote restarting the working of minerals in deposits previously considered uneconomic*

7 Plausibility and favourability of the scenarios

7.1 The Vote

Following discussion of all three scenarios, participants voted on which one they thought to be

- most plausible;
- most favourable to UK;
- most favourable for UK society;
- most favourable for the minerals sector;
- closest to now;
- closest to the future that individuals personally aspire to;
- closest to the future that demands the biggest change in the minerals sector;
- closest to the future that individuals' own organisation is planning for; and
- closest to the future that Government policy is creating.

The results are presented in the following table.

	Most Plausible	Most favourable to UK plc	Most favourable for UK society	Most favourable for the minerals sector	Closest to now	Closest to the future you personally aspire to	The future that demands the biggest change in the minerals sector	Closest to the future your organisation is planning for	Closest to the future Govt policy is leading to
Green Britain	10	12	29	2	0	32	20	18	9
Britain Powering Growth	22	22	6	29	32	3	0	12	21
Insular Britain	3	1	0	4	3	0	15	4	5

7.2 Commentary

The vote is not scientific; rather, it is designed to provide insight into a group's perspective on the strategic choices and options facing them as they look to the future.

In this workshop, the vote suggested that

- Around two thirds of the group saw *Britain Powering Growth* as the most plausible scenario; and nearly all the group saw it as the scenario which is closest to now, suggesting they believe the *status quo* is likely to remain in place.
- This view is underpinned by – or is perhaps due to – the perspective that *Britain Powering Growth* is closest to the future that the majority of the group (60% of the vote) believe that government policy is creating.

As the vote in section 5.2 showed[2], however, *Britain Powering Growth* is not a future that the group liked very much. This suggests that the industry is on a development path that it feels uneasy about.

It also suggests a possible relationship between the scenarios: that, should the UK and the rest of the world continue on the current path, we will sooner or later find ourselves in a future that

(i) resembles *Britain Powering Growth*;

(ii) cannot – as the group identified – be sustained; and

(iii) will therefore lead to one of the other two scenarios.

The logic of the scenario stories suggests that the more positive scenario – *Green Britain* – will only happen (or the UK will only be part of it) if Britain takes an early, proactive and strategic perspective of the future development of the sector. Failing to do so – failing to divert the UK and global economy away from *Britain Powering Growth* - risks the UK falling into the more negative and challenging future defined by *Insular Britain*.

The vote suggests, too, that the industry might be more prepared to make this transition than might be expected, since nearly everyone chose *Green Britain* as closest to the future they personally aspire to

Furthermore, just over half the group suggested their organisation is already planning for a future that is closer to *Green Britain* than to *Britain Powering Growth*.

[2] Whether the group really, really like or really, really don't like the scenario

8 Conclusions and recommendations

8.1 Introduction

This section of the report offers our perspective on the outcome of the scenario conversations and on the key activities that the sector should promote. We're not suggesting these are the only recommendations that need to be followed up; rather that they seem to be a good starting point.

We have made 6 recommendations. The first four relate to what government should do; that last two are more focussed on the sector itself.

8.2 Secure political commitment to the development of a shared long term vision for the sector

All three scenario discussions highlighted the need for some form of high level vision or policy framework for the sector as a whole.

The scenarios highlight a range of emerging risks and uncertainties that will have an impact on production and consumption of minerals in the future. The sector - and the UK overall – have a better chance of mitigating these risks and uncertainties if they can work together to anticipate and respond to them.

It therefore makes sense for policy makers to work alongside the minerals sector to develop a shared long term vision that acknowledges future risk and uncertainty, that defines the sector's strategic role in the UK and that sets a broad framework to guide policy for the foreseeable future.

The process of developing the vision will help policy makers understand the challenges facing the sector and help in the development of policy and legislation that anticipates change in the marketplace and works with industry to manage long term production and supply.

Developing the vision is essential – without it, there is real danger that policy will become reactive and will drive changes to supply that will fail to protect the sector over the long term.

8.3 Plan for sustainable living

Sustainability is core to the future success of the industry. It is also core to continued global security.

More than many industries, perhaps, the minerals sector is right at the sharp end of what 'sustainability' means. It might be argued that UK society is rather conflicted on these issues at the moment – there is widespread acceptance of the need to address sustainability but less willingness to accept some solutions 'in my back yard', for example.

We therefore recommend that part of the vision building process must be to explore what a planning framework for a sustainable future looks like.

We also suggest that the sector aims to develop a shared perspective on how it can manage sustainable production; that is, how it can optimise supply and profitability at the same time as developing new processes and technologies to manage environmental impact.

Two further recommendations that came out of the workshop seem to fit neatly here:

- **Develop thinking on paying for environmental externalities**, which recommends carrying out further research into GDP+; and
- **Bring forward legislation to encourage behaviours that protect supply**, which is perhaps a response to the general observation that the general population is slow to make the changes to its behaviour that are required to deliver a sustainable future.

8.4 Set up processes to review and monitor transition of the sector to make sure it is on the right track

The discussion of *Green Britain* raised two important issues about transitioning the UK to a more sustainable future:

- [we need to] research and monitor activity to ensure the sector is on the correct path towards sustainability; initial ideas may need correcting; and

- [we need to] test whether there is a danger of moving to green energy too quickly and destroying economic development.

These two comments emphasise that a shared vision is not a sufficient condition for success – delivery must be managed. Government and industry must therefore be able to monitor progress towards the vision and must be able to adjust the path if necessary. These adjustments must be founded on evidence – and that evidence needs to be collected – and must be made in collaboration.

Delivering the vision will therefore require continued discussion and collaboration between government and industry.

8.5 Boost the resilience of the UK industry

The vision – and subsequent policy framework – needs to support the industry's resilience to adapt and to survive. Developing a shared vision will help, but the vision needs to be supported by realistic polices that support the industry's capacity to adapt and continue to meet the UK's strategic needs.

8.6 Develop foresight to anticipate future development

Effective visioning requires foresight - conversations during the workshop noted that the sector "*can't rely on reactive environmental approaches, especially when dealing with potentially irreversible impacts such as global warming and sea level rise; waiting until after the "tipping" point has been reached is too late."*

The sector needs to build its knowledge of current trends and developments that could shape the future, understand their implications for the sector and for individual businesses and disseminate that knowledge widely. It also needs to find a mechanism to review what it means.

The process involved in building this foresight (usually called horizon scanning) is technical, but doesn't need to be complicated. We recommend that the UKMF consider options for developing scanning - in house or contracted out.

The scanning activity should also provide an important input to future conversations with government about progress towards achieving the vision.

8.7 Continue to work together and challenge yourselves

Our final recommendation is not drawn from the workshop, but is a reminder that government and a shared vision can do so much – but the sector must continue working together to understand future developments and to build resilience to change.

We were struck during the workshop conversations how well the sector appears to be achieving this already. We recommend that the sector continues on this path.

Annex 1: UK Minerals Forum Future Minerals Scenarios Working Group

UK Minerals Forum Working Group

Dr Joseph Mankelow, Chairman Working Group, BGS

David Highley, Secretary Working Group

Andrew Bloodworth, British Geological Survey

Bob Brown, Campaign to Protect Rural England

Lauren Darby, British Ceramic Confederation*

Jim Davies, Environment Agency

Bob Fenton, MAUK/MIRO/CBI Minerals Group

Peter Huxtable, British Aggregates Association/CBI MG

Jeremy Lake, English Heritage

Bob LeClerc, Executive Secretary, CBI Minerals Group

Jerry McLaughlin, Mineral Products Association

Mark North, Kier Mining/CBI Minerals Group

Dr Ian Selby, The Crown Estate/CBI Minerals Group

Michelle Spence, Derbyshire CC/POS

* *Corresponding member*

Annex 2: Workshop participants

Richard Bate, Green Balance

Teresa Brown, British Geological Survey

Rachael Bust, The Coal Authority

John Campbell, Fergusson Group

Jane Chelliah-Manning, Dept for Business, Innovation and Skills

John Cowley, Mineral & Resource Planning

Ken Cronin, UK Onshore Operators Group

Jim Davies, Environment Agency

Peter Day, Oxfordshire CC/POS

Eimear Deady, British Geological Survey

Aurelie Delannoy, Mineral Products Association

Steven Fidgett, Alliance Planning

Phil Garner, CoalPro

Alan Gibbon, MIRO

Tony Hartwell, Environmental Sustainability Knowledge Transfer Network

Jonny Hazell, Green Alliance

Lester Hicks, Chairman, UK Minerals Forum

David Highley, Secretary Working Group

Ken Hobden, Mineral Products Association

Nick Horsley, Sibelco UK/Mineral Products Association

David Howard, Environment Agency

Richard Howard, The Crown Estate,

Martin Hunt, Forum for the Future

Peter Huxtable, British Aggregates Association/CBI MG

Carolyn Jewell, Royal Society for the Protection of Birds

Jeremy Lake, English Heritage

Martin Layer, Smith & Sons (Bletchington) Ltd

Bob LeClerc, Executive Secretary, CBI Minerals Group

Hugh Lucas, Aggregate Industries/MPA/CBI Minerals Group

Dr Joseph Mankelow, Chairman Working Group, BGS

Professor David Manning, Newcastle University

Dr Brian Marker, UK Minerals Forum

Jerry McLaughlin, Mineral Products Association

Mark North, Kier Mining/CBI Minerals Group

Mark Plummer, Department for Communities and Local Government

Dr Ian Selby, The Crown Estate/CBI Minerals Group

Joanne Smith, Welsh Assembly Government

Michelle Spence, Derbyshire CC/POS

Gary Staddon, Imerys,

Jennie Thomas, Cleveland Potash

Dr Alan Thompson, Cuesta Consulting

Chris Waite, Secretary, UK Minerals Forum

Lonek Wojtulewicz, Leicestershire CC/POS

Annex 3: Drivers for Future UK Mineral Supply

The drivers fall into 7 main categories:

Politics

- Policy
- Sustainability agenda
- Legislation/regulation
- Geopolitics
- Economic instruments
- UK/EU
- Short term vs long term planning

Society

- Place protection
- Demographics
- Population growth
- Migration
- Consumer behaviour
- Competition for land

Environment

- Climate change
  - Mitigation
  - Adaptation
- Emissions reduction
- Impact of weather patterns
- Awareness of contribution to CO2
- Access to water
- Biodiversity

Energy

- Cost
- Infrastructure
- Mix
- Security

Technology

- Costs of production - effects of emerging technology
- Alternative materials/mineral substitution
- New uses for materials
- Improve recycling
- Energy innovation (incl low carbon technologies)
- Increased automation

Economics

- Industry structure
- Value of the £
- Indigenous vs imports
- Shift in markets
- New resource consuming countries
- Economic shocks
- Land values
- Monetary vs non-monetary valuation

Construction & Infrastructure

- Investment
- Resource efficiency
- Transport network changes

- Ethical sourcing

Annex 4: If you could speak to someone from 2050 who could tell you about UK mineral supply, what would you like to ask?

Groups considered this question as part of the introductory stage of the workshop. The (few) responses we gathered in plenary are

- When did the last major industry leave the UK because of energy costs?
- What's the energy mix?
- What proportion of UK minerals is supplied domestically?
- What is it politically acceptable to remove from the ground?
- Do we under-value self reliance?
- How are primary and secondary industries linked?
- Do we have an effective resource policy?
- What steps have we taken to move away from the use of scarce resources?
- What are the implications and impacts of growth?
- What has happened over climate change – how much have global temperatures increased (or decreased)?

Annex 5: Comparison across the scenarios

Characteristics of the scenarios

Green Britain	Britain Powering Growth	Insular Britain
• Global growth is low • Some nations take a co-ordinated and ambitious approach to tackling environmental challenges • Push for free markets and open borders but continuing instability leads to protectionist tendencies • Environmental issues are critically important to the UK. Economic growth remains important, but only if it is achieved within environmental limits • Cities are the engines of growth, creating centres of knowledge, commerce and industry • The UK is performing well overall – but there are some significant regional differences • Distributed power generation is commonplace • Recycling is an economic as well as an environmental necessity • Land use is geared towards food, energy production and some mineral production	• Free markets and open borders generate strong cyclical growth • The world is geopolitically stable • Short termism is prevalent and nations take a reactive and incremental approach to environmental issues • The UK economy is strong and the largest in Europe • UK success is built on its knowledge industries: financial services, science and technology, education, leisure and the creative and design industries • The UK is regarded as one of the most progressive societies in which to live and work • Knowledge workers travel constantly around the world, creating value and opening markets. The UK is a 24/7 society and demand for travel, goods and services is high • Wealth creators are supported by an army of service providers who also have to work long hours to meet the needs of a demanding client group • Increasing consumption of goods and high-impact services means that society's waste footprint is growing unsustainably • Britain's nuclear industry is thriving	• Globalisation has failed - economic stagnation prevails • Geopolitical instability leads to controlled markets and closed borders • Global warming has not been tackled and there is a reactive and incremental approach to environmental challenges • The UK is no longer part of the EU. Its economy is weak • The UK still produces some oil and gas and has expanded its renewables sector but struggles to achieve self sufficiency • The price and availability of imported energy cannot be guaranteed • Government exercises strong control. Energy is rationed and travel is restricted • Citizens work long past historical "retirement ages" • Land is worked intensively to produce food and energy. Rural communities have grown significantly • Global warming continues to create unpredictable weather that affects both energy supply and food crops

What life is like

Green Britain	Britain Powering Growth	Insular Britain
• Cities thrive • Consumption is lower • Lifestyle is capped • The environment is cleaner • There is a more sustainable energy mix • Wealth creation is challenging • The political environment is stable	• Growth creates wealth • An open economy is essential for continued prosperity • Work dominates people's lives • People have little time for taking the long view • Short termism prevails • The environment is under pressure	• The UK is struggling to keep afloat • Consumption has fallen and choice is reduced • Society faces many challenges • Communities pull together in the face of adversity • People work long and hard • Big questions remain about social cohesion

Strategic challenges facing the UK

Green Britain	Britain Powering Growth	Insular Britain
• Access to land is limited • Society struggles to adapt • Sustaining lowered growth is difficult • The UK has become less powerful	• Environmental degradation is increasing rapidly • Resources are depleting • Security of supply cannot be guaranteed • Continued growth in the UK is dependent on imports • Global markets create volatility • Social issues are pressing	• The environment is damaged • Government is under resourced and fire fighting • The economy is in decline • Production is fragmented • Society hangs by a thread

Strategic opportunities facing the UK

Green Britain	Britain Powering Growth	Insular Britain
• Green technologies provide growth opportunities • The long term future is more assured • The sustainable lifestyle is attractive to people • New jobs and skills have emerged	• The economy is growing • The UK has the opportunity to become a leader in tackling sustainable development • The UK can invest in the skills and innovation needed to achieve sustainable development	• Innovate constantly • Find new ways to trade • Maximise resource use • Increase mineral production • Pull together

Sourcing and supply of minerals

Green Britain	Britain Powering Growth	Insular Britain
• The UK needs to be self sufficient • We need to maximise recycling • Effective recycling lowers consumption and increases efficiency • Focussed regulation supports change • Supply requires careful strategic management	• Demand has increased • Production has increased • The market decides • Security of supply is fragile • No strategy for UK supply	• Focus on self sufficiency • Look for innovative way to maintain supply • Regulation to optimise production

Risks and rewards facing stakeholders

Green Britain		Britain Powering Growth		Insular Britain	
Risks	**Rewards**	**Risks**	**Rewards**	**Risks**	**Rewards**
Industry • Costs will increase • Competition will increase • Need long term strategy to manage supply	**Industry** • Export opportunities will increase • Sustainable business growth offers potential	**Industry** • Barriers to production will increase • Business will be more competitive • Infrastructure will be weaker • Public opinion will be unfavourable • Political challenges will increase	**Industry** • Strong demand means big rewards	**Industry** • Investment is reduced • Demand declines • Production is compromised	**Industry** • Markets may be more predictable • Opportunities for increased production
Citizens • Cost of living will increase • Choice will reduce • Central government will take more control • Citizens will need to retain a global focus	**Citizens** • Society will have a sense of shared purpose • Change will create new opportunities	**Citizens** • Environmental risks will increase • Individualism will increase • Societal tensions will increase	**Citizens** • Rewards will be unevenly distributed	**Citizens** • Quality of life will fall • Insecurity will rise • UK will be marginalised	**Citizens** • Communities might feel more empowered • UK will be self reliant
Government • The transition will be difficult domestically • Societal divisions could be reinforced • Different approaches may cause global instability	**Government** • Societal wellbeing will increase	**Government** • Some big challenges to maintaining the *status quo*	**Government** • Plenty of funding available to build a stronger society	**Government** • UK will be politically and economically isolated • Social unrest • Demographics are a challenge	**Government** • Government has greater control over resources

Annex 6: Possible variance in production and consumption across the scenarios

As part of each scenario conversation, groups discussed how production, consumption and self sufficiency might change. The result of these qualitative discussions is set out in this Annex.

Green Britain

	Trend in consumption	Self sufficiency (%)		Production					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↓	↓	↘	↓	↓↓	↓
Natural Gas	↓	100	60	↓	↓	↓	↓	↑↑	↓
Coal	↘	50	35	↗	↓↓	↓↓	↓	↑	↓
Shale Gas				≠	↑	↗	↗	↑↑	
Construction Minerals									
Aggregates	↓↓	100	100	→	↓	↗	↘	→	↑
Brick clay	↓↓↓	100	100	→		↗	↘	→	↑
Cement	↓↓	95	80	→		↗	↘	→	→
Kaolin	↓↓↓	100	100		↘	↓	↗	→	↓
Ball Clay	→	100	100		↓↓	→	↗	→	→
Silica Sand	→	100	100			→	→	↓	↓
Gypsum	↓	80	70	→		↗	→	→	↓
Salt	→	100	90			→	↗	→	→
Potash	↓↓	100	100	↑		↗	↗	↑↑	→
Fluorspar	↓↓	80	65	↗		→	↗	↑	→
Barytes	↑	55	30	↓		↗	↗	↑	→

	Trend in consumption	Self sufficiency (%)		Consumption					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↘	↓	↘	↓	↓↓↓	↓
Natural Gas	↓	100	60	↑	↘	↘	↓	↑↑	→
Coal	↘	50	35	→	↓↓	↓	↓	↑	↓
Shale Gas				≠	↑	↗	↗	↑↑	
Construction Minerals									
Aggregates	↓↓	100	100	↗	↑	↗	↘	→	↑
Brick clay	↓↓↓	100	100	→		↗	↘	→	↑
Cement	↓↓	95	80	→		↗	↓	→	↑
Kaolin	↓↓↓	100	100		↘	↓	→	→	→
Ball Clay	→	100	100		↓↓	↗	→	→	→
Silica Sand	→	100	100			↗	→	↑	↓
Gypsum	↓	80	70	→		↗	→	→	→
Salt	→	100	90			→	→	→	→
Potash	↓↓	100	100	↑		↗	→	↑↑	↓
Fluorspar	↓↓	80	65	↗		↗	→	→	↓
Barytes	↑	55	30	↘		↗	→	↑	→

	Trend in consumption	Self sufficiency (%)		Self Sufficiency					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↘	↓	→	↑	100%	↓
Natural Gas	↓	100	60	↘	↓	↘	↑	100%	→
Coal	↘	50	35	→	↓↓	↓	↑	100%	↑
Shale Gas				↘	↑	↗	↑	100%	
Construction Minerals									
Aggregates	↓↓	100	100	→	↑	→	→	100%	→
Brick clay	↓↓↓	100	100	→		→	→	100%	→
Cement	↓↓	95	80	→		↗	↗	100%	↓
Kaolin	↓↓↓	100	100		100%	→	→	100%	↓
Ball Clay	→	100	100		100%	↗	→	100%	→
Silica Sand	→	100	100			↗	→	↓	↓
Gypsum	↓	80	70	→		→	→	100%	↓
Salt	→	100	90			→	→	100%	→
Potash	↓↓	100	100	→		→	→	100%	→
Fluorspar	↓↓	80	65	↘		↗	↗	100%	→
Barytes	↑	55	30	→		↗	↗	100%	→

Britain Powering Growth

	Trend in consumption	Self sufficiency (%)		Production					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↓		↓	↘	↓	↓
Natural Gas	↓	100	60	↓		↓	↘	↓	↓
Coal	↘	50	35	↓		↓	↗	↓↓	↓
Shale Gas				↑		↑	↑		↑
Construction Minerals									
Aggregates	↓↓	100	100	↑		↑	↑	↑↑	↑
Brick clay	↓↓↓	100	100	↑		↑	↑	↓↓	↑
Cement	↓↓	95	80	↑		↑	↑	↓↓	↑
Kaolin	↓↓↓	100	100		→	↗	→	↓	↑
Ball Clay	→	100	100		→	↗	→	→	↑
Silica Sand	→	100	100	↗		↑	→	→	↑
Gypsum	↓	80	70	↑		↑	↗	→	↑
Salt	→	100	90	→		→	→	→	↑
Potash	↓↓	100	100	↑		↑	↗	↓↓↓	↑
Fluorspar	↓↓	80	65			↗	↘	→	↑
Barytes	↑	55	30	↗		↑	→	→	↑

	Trend in consumption	Self sufficiency (%)		Consumption					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↗		↑	↑	↑↑	↑
Natural Gas	↓	100	60	↗		↑	↑	↑↑	↑
Coal	↘	50	35	↗		↑	↑	↑↑	→
Shale Gas				↑		↑	↑		↑
Construction Minerals									
Aggregates	↓↓	100	100	↑		↑	↑	↑↑	↑
Brick clay	↓↓↓	100	100	↑		↑	↑	↑	↑
Cement	↓↓	95	80	↑		↑	↑	↑	↑
Kaolin	↓↓↓	100	100		→	→	→	↓	↑
Ball Clay	→	100	100		→	→	→	→	↑
Silica Sand	→	100	100	↗		↑	→	→	↑
Gypsum	↓	80	70	↑		↑	↗	→	↑
Salt	→	100	90	→		→	→	→	↑
Potash	↓↓	100	100	→		↑	↗	↓↓↓	↑
Fluorspar	↓↓	80	65			↗	→	→	↑
Barytes	↑	55	30	↗		↑	→	→	↑

	Trend in consumption	Self sufficiency (%)		Self sufficiency					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↓		↓	↓	↓	↓
Natural Gas	↓	100	60	↓		↓	↓	↓	↓
Coal	↘	50	35			↓	→	↓↓↓	↓
Shale Gas				→		→	→		
Construction Minerals									
Aggregates	↓↓	100	100	→		→	→	100%	↓
Brick clay	↓↓↓	100	100	→		→	→		→
Cement	↓↓	95	80	↗		↘	→		↑
Kaolin	↓↓↓	100	100		100%	→	→	100%	↓
Ball Clay	→	100	100		100%	→	→	100%	→
Silica Sand	→	100	100	→		→	→	100%	→
Gypsum	↓	80	70	↘		→	→	100%	↓
Salt	→	100	90	→		→	→	100%	↓
Potash	↓↓	100	100	→		→	→	100%	↓
Fluorspar	↓↓	80	65			→	→	100%	↓
Barytes	↑	55	30	→		→	→	100%	↓

Insular Britain

	Trend in consumption	Self sufficiency (%)		Production					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↘		↓	↘	→	↓
Natural Gas	↓	100	60	↘		↓	↓	→	↓
Coal	↘	50	35	↑		↑	↑	↑	↑
Shale Gas				↑		↑	↗	↑	↑
Aggregates	↓↓	100	100	↘		↘	↘	→	↑
Brick clay	↓↓↓	100	100	↘		↘	↘	→	↑
Cement	↓↓	95	80	↘		↘	↗	→	↑
Kaolin	↓↓↓	100	100	↗	↓	↓	↘	↑	↑
Ball Clay	→	100	100	↗	↓	↘	↘	→	↑
Silica Sand	→	100	100	→		↑	→	→	↑
Gypsum	↓	80	70	↘		↗	↘	→	↑
Salt	→	100	90	→		↘	↘	↑	↑
Potash	↓↓	100	100	↑		↘	↓	↑	↑
Fluorspar	↓↓	80	65			→	→	↑	↑
Barytes	↑	55	30	↘		↑	→	→	↑

	Trend in consumption	Self sufficiency (%)		Consumption					
	2000-10	2000	2010	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Energy Minerals									
Oil (Output)	↘	100	90	↘		↓	→	→	↓
Natural Gas	↓	100	60	↘		↓	↓	→	↓
Coal	↘	50	35	↑		↑	↑	↑	↑
Shale Gas				↑		↑	↗	↑	↑
Aggregates	↓↓	100	100	↘		↘	↘	→	↑
Brick clay	↓↓↓	100	100	↘		↘	↘	→	↑
Cement	↓↓	95	80	↘		↘	↗	→	→
Kaolin	↓↓↓	100	100	↗	↓	↓	→	↑	→
Ball Clay	→	100	100	↗	↓	↑	→	→	→
Silica Sand	→	100	100	→		↑	→	→	↑
Gypsum	↓	80	70	↘		↗	→	→	↑
Salt	→	100	90	→		↘	↘	↑	↑
Potash	↓↓	100	100	↑		↘	→	↑↑	↑
Fluorspar	↓↓	80	65			→	→	↑	↑
Barytes	↑	55	30	↘		↑	→	→	↑

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Oil (Output)	↘	100	90	↘		↓	↘		↓
Natural Gas	↓	100	60	↘		↓	↘		↓
Coal	↘	50	35	↑		↑	↑		↓
Shale Gas				↑		↑	↗	100%	↑
Aggregates	↓↓	100	100	→		→	→	100%	↑
Brick clay	↓↓↓	100	100	→		→	→	100%	↑
Cement	↓↓	95	80	→		→	↑	100%	↑
Kaolin	↓↓↓	100	100	→	100%	→	→	100%	↑
Ball Clay	→	100	100	→	100%	→	→	100%	↑
Silica Sand	→	100	100	→		↑	→	100%	→
Gypsum	↓	80	70	→		→	↗	100%	↑
Salt	→	100	90	→		→	→	100%	↑
Potash	↓↓	100	100	→		→	→	100%	↑
Fluorspar	↓↓	80	65			↑	→	100%	↑
Barytes	↑	55	30	→		↑	→	100%	↑