

# Regulatory Impact Statement: Australian Code for the Transport of Explosives by Road and Rail - 3rd Edition

Report by Access Economics Pty Limited for

**Office of the Australian Safety and  
Compensation Council**

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## GLOSSARY OF COMMON ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACTDG	Australian Committee on the Transport of Dangerous Goods
ADG Code	Australian Code for the Transport of Dangerous Goods by Road and Rail
ADG 6	Australian Code for the Transport of Dangerous Goods by Road and Rail – 6 <sup>th</sup> Edition
ADG 7	Australian Code for the Transport of Dangerous Goods by Road and Rail – 7 <sup>th</sup> Edition
AEC	Australian Code for the Transport of Explosives by Road and Rail
AEISG	Australian Explosives Industry and Safety Group
AEC 2	Australian Code for the Transport of Explosives by Road and Rail – 2 <sup>nd</sup> Edition
AEC 3	Australian Code for the Transport of Explosives by Road and Rail – 3 <sup>rd</sup> Edition
AETSSG	Australian Explosives Transport Safety and Security Group
AFER	Australian Forum of Explosives Regulators
AN	ammonium nitrate
ANFO	ammonium nitrate and fuel oil
ASCC	Australian Safety and Compensation Council
CBA	cost benefit analysis
cif	cost, insurance and freight (value of imports)
COAG	Council of Australian Governments
DEEWR	Department of Education, Employment and Workplace Relations
ECASC	Explosives Competent Authorities Sub-Committee
fob	free on board (value of exports)
GDP	gross domestic product
IBC	Intermediate Bulk Container
ICAO TI	International Civil Aviation Organisation Technical Instructions
IMDG Code	International Maritime Dangerous Goods Code
NEQ	Net Explosive Quantity
NPV	net present value
NTC	National Transport Commission
OBPR	Office of Best Practice Regulation
PC	Productivity Commission
PIAA	Pyrotechnics Industry Association of Australia
RIS	Regulatory Impact Statement
SSAN	security-sensitive ammonium nitrate
UN 15	United Nations <i>Recommendations on the Transport of Dangerous Goods, Model Regulations</i> – 15 <sup>th</sup> revised edition
WRMC	Workplace Relations Ministerial Council

## EXECUTIVE SUMMARY

This Regulatory Impact Statement (RIS) has been prepared in accordance with the Council of Australian Governments (COAG) requirements to assess the impact on Australian Governments, industry and the community of implementing the proposed revised Australian Code for the Transport of Explosives by Road and Rail (Australian Explosives Code or AEC).

## BACKGROUND

Australia uses explosives for blasting purposes extensively in its mining industry, and also for quarrying. Other significant uses are for fireworks, ammunition and military purposes.

Given the magnitude of the risks, the use of explosives is subject to codes of practice and legislation where the emphasis is on safety and security.

Explosives are included as dangerous goods for regulatory purposes internationally. Within Australia there is a separate national code for the land transport of explosives, and separate legislation in most States and Territories for the use of explosives. However, regulations for the transport of explosives are covered mostly by regulations for the transport of dangerous goods. In order to maximise safety and security for the transport of explosives, it is important to maintain consistency with other relevant regulations and guidance material, and especially with international regulations and guidance material because large proportions of the explosives used in Australia are imported.

## STATEMENT OF THE PROBLEM

The current edition of the Australian Code for the Transport of Explosives by Road and Rail (AEC 2) was published in March 2000. It has now fallen behind the UN Model Regulations for the Transport of Dangerous Goods (UN 15) in relation to the classification, labelling, packaging and land transport of explosives. AEC 2 has also fallen behind the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG 7), and the International Maritime Dangerous Goods Code (IMDG Code 34/08). There is also a need to review the current security provisions for explosives contained in the AEC.

It is very important that consistency between international and domestic guidance material - and those of intermodal transport guidance material - be maintained, as out of date classifications could compromise safety by not taking account of new knowledge regarding the dangers of explosives. In addition to this, inconsistencies between various guidance materials could create confusion in the handling of explosives. In recent years, there has also been an added emphasis on domestic security arrangements for the land transport of explosives.

## OPTIONS

AFER has considered five options for revising the 2<sup>nd</sup> edition of the AEC (AEC 2):

- Option 1: Retain the Status Quo.
- Option 2: Minimal change to reflect the content of UN 15 but retaining the existing AEC 2 structure, format and concepts, together with updating the current security provisions.

- ❑ Option 3: Minimal change with self regulation by industry.
- ❑ Option 4: Revise the AEC to align with the content and structure of the 7<sup>th</sup> edition of the ADG Code (ADG 7) and the 15<sup>th</sup> edition of the UN Model Regulations (UN 15) to the extent possible.
- ❑ Option 5: Fully and directly adopt the UN Model Regulations, together with a set of domestic requirements.

The self regulatory approach of Option 3 is not consistent with the COAG principles for security provisions for security sensitive ammonium nitrate (SSAN), or the security addendum for explosives. Option 5 is not a practical solution because it is unlikely to be supported by the Australian Government.

## CONSULTATION

In March 2008, the Australian Forum of Explosives Regulators (AFER) released a package of documents including the AEC Consultation RIS, a draft AEC - 3<sup>rd</sup> Edition (AEC 3) and a public discussion paper.

The purpose of the consultation RIS was to gather feedback from interested parties on the costs, benefits and impacts associated with the implementation of a revised AEC.

A total of 18 submissions were received. While much of the comment received was technical in its nature, several submissions outlined concerns with the current inconsistency in the application of explosives legislation. While this issue is outside the scope of this RIS for Decision, it is helpful to understand the impact that these inconsistencies are having on the industry.

AFER members discussed all comments received and as a result further revisions have been made to the draft AEC.

Because of deficiencies in the quantitative data, Access Economics sought additional information from State and Territory regulators, the Australian Explosives Industry and Safety Group, the Pyrotechnics Industry Association of Australia, the Australian Explosives Transport Safety and Security Group, and key members of these groups, about the costs and benefits of the proposed changes to the AEC. While there was general support for revisions to AEC 2, few stakeholders were able to place dollar values on the costs and benefits.

Many of the submissions received in response to the Consultation RIS raised the matter of differences in legislation between jurisdictions, even though it was outside the scope of this RIS. They did however clearly indicate that consistency in legislative developments was a major issue for the explosives industry.

## IMPACT ANALYSIS

The purpose of the impact analysis is to compare the economic benefits and costs of the feasible options for the explosives industry, including transport operators and regulators. The analysis uses quantitative data as far as possible, but supplemented by qualitative data where necessary.

Assessments were made of the impact of Options 2 and 4 relative to Option 1. An important assumption was that jurisdictions would align their explosives legislation with AEC 3, without any additional restrictions, so that legislation and practice would be consistent nationally.

**Cost benefit analysis** (CBA) was used for those items where there were quantitative estimates of costs and benefits. This applied to the compliance costs and to one-off costs of training, as well as the ongoing benefits (or cost savings) to the industry and regulators.

The CBA for Option 2 compared with Option 1 produced a net present value (NPV) from 2009 to 2018 of \$13.7 million. Even without the assumption about uniformity of legislation and practice across Australia, the NPV was \$6.7 million. Sensitivity analysis showed that the NPV was always positive, even for the most unfavourable case of a low growth rate for explosives combined with minimum benefits, maximum costs and a high real discount rate.

Option 4 is similar to Option 2, except for a delay of one to two years in implementation, higher costs for development of AEC 3 and higher costs of training than for Option 2. These factors produced a lower CBA for Option 4 compared with Option 1 of \$8.9 million.

For both Option 2 relative to Option 1, and Option 4 relative to Option 1, the CBA showed net quantitative benefits. Only qualitative assessments were available for determining the benefits of safety and security, but these showed that both Options 2 and 4 would be an improvement on Option 1. It then follows that the total benefits must be positive, and therefore an update of AEC 2 is warranted.

The quantifiable net benefits relate primarily to the explosives industry, with smaller benefits for the regulators. The unmeasured benefits of improved safety and security relate to the whole community.

## PREFERRED OPTION

Although the impact analysis shows a higher NPV for Option 2 than Option 4, other factors and the uncertainties in the estimates underlying the analysis mean that Options 2 and 4 should be ranked equally in terms of net benefits out to 2018. The closer alignment of the AEC under Option 4 with the UN Model Regulations means that future revisions to the UN Model Regulations would be easier and less costly to accommodate and that there would be less confusion, less likelihood of errors and therefore greater safety. Option 2 has the advantage of being implemented sooner, but the benefit of Option 4, relative to Option 2, would increase gradually over time.

AFER made a decision to pursue Option 2 because revisions to AEC 2 could be produced and implemented within a relatively short time frame with minimum retraining costs. The short time frame was considered to be very important, given the additional effort and cost caused by the increasing divergence between AEC 2 and other guidance material relevant to explosives.

Option 4 is an extensive rewrite of AEC 2 using the structure of UN 15, as was used to update the 6<sup>th</sup> edition of the ADG Code to ADG 7 in 2007. It is understood that there are current difficulties with the acceptance of ADG 7, partly because the new structure is so different from that of ADG 6. Option 4 would, however, deliver a better product than Option 2 in the long term, but at this stage it may be premature to adopt the structure of UN 15 before sufficient time has elapsed to fully assess the impacts of the recently introduced ADG 7. It would also seem premature to introduce such a structure before explosives transport legislation is harmonised across jurisdictions.

The impact assessment supports the AFER decision to use Option 2.

## **REVIEW**

AEC 2 was released in 2000 and the UN Model Regulations and IMDG Code have diverged from it over the past 8 years. Given the extensive changes to be made to AEC 2, the current review, which was put on the agenda in 2006, was probably overdue. Similar divergences are likely in future years, and it is envisaged that AFER members will discuss the timing of future reviews.

Option 4 could be considered as part of a future review. This would have two advantages. It would enable changes to be made to the AEC every time the UN Model Regulations were updated, every two years, by a relatively simple process. It would also make it easier to incorporate the AEC into the ADG Code, if it were decided to take this approach.

There are two matters relating to explosives that are outside the scope of this RIS that may be considered by AFER for future reviews, well before the next reviews of the AEC and the ADG Code. Consideration might be given to incorporation of explosives into the ADG Code. Consideration might also be given to the means of harmonising explosives legislation between jurisdictions, especially in relation to transport.

**Access Economics**  
**11 September 2008**

## 1. INTRODUCTION

This Regulatory Impact Statement (RIS) has been prepared in accordance with the Council of Australian Governments (COAG) requirements to assess the impact on Australian Governments, industry and the community of implementing the proposed revised Australian Explosives Code (AEC).

In particular, the COAG principles for preparing a RIS state that *'the purpose of preparing a RIS is to draw conclusions on whether regulation is necessary and, if so, on what the most efficient and effective regulatory approach might be'* and that a RIS *'ensures that new or amended regulatory proposals are subject to proper analysis and scrutiny as to their necessity, efficiency and net impact on community welfare.'*<sup>1</sup>

This assessment has used a process designed to allow interested parties and stakeholders to identify the impacts of the proposals under consideration. It has also made use of information and data provided by stakeholders involved in the supply, transport and regulation of explosives. The methodology for the assessment was agreed between the Office of Best Practice Regulation (OBPR) and Access Economics, and is based mainly on cost benefit analysis (CBA).

### ABOUT EXPLOSIVES

Explosives, due to their physical, chemical and toxicological properties, can present an acute risk to life, health, property and the environment, especially when being transported.

The purpose of the AEC is to ensure the safety of the community from the activities associated with the transport of explosives. The AEC sets out the requirements for the transport of explosives by road and rail in Australia and is expected to be considered for adoption under explosives legislation in all States and Territories. Attachment A provides an outline of the State/Territory legislation concerned.

Although explosives possess the inherent properties outlined above, the potential for incidents to occur during transport operations – and the consequences of an incident should it occur – can be greatly reduced by following guidelines such as those set out in the AEC, particularly those relating to packaging methods, transport quantities and product compatibility.

### 1.1 THE UNITED NATIONS MODEL REGULATIONS

The UN Recommendations on the Transport of Dangerous Goods, Model Regulations (UN Model Regulations) are published by the *Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonised System of Classification and Labelling of Chemicals*, and are revised every two years. This committee ratifies changes to the UN Model Regulations that have been developed and adopted by the *Sub-committee of Experts on the Transport of Dangerous Goods*, of which Australia is a member.

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<sup>1</sup> Council of Australian Governments (COAG), Best Practice Regulation: A Guide for Ministerial Councils and National Standard Setting Bodies, October 2007, [http://www.obpr.gov.au/publications/coag2007/COAG\\_best\\_practice\\_guide\\_2007.pdf](http://www.obpr.gov.au/publications/coag2007/COAG_best_practice_guide_2007.pdf)

The UN Model Regulations remain the principal source of policy for the safe transport of dangerous goods, including explosives, internationally and domestically. The International Maritime Dangerous Goods Code (IMDG Code), International Civil Aviation Organisation technical instructions (ICAO TI) and Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) are all based on the UN Model Regulations. The IMDG and ICAO TI are updated every two years in response to revisions to the UN Model Regulations, whereas the ADG and AEC are currently updated from time to time.

The UN Model Regulations are changed over time in response to improved information, changes in the chemicals used and changes in technology. The emphasis is on safety, so as to avoid catastrophic disasters from the initiation of explosives loads in transport accidents or by other means. Changes in classifications, labelling and packaging requirements are based on controlled experiments and also investigations of incidents.

In 2007, the UN released the 15<sup>th</sup> Edition of the UN Model Regulations (UN 15)<sup>2</sup>.

## **1.2 ROLE OF THE AUSTRALIAN FORUM OF EXPLOSIVES REGULATORS**

The Australian Code for the Transport of Explosives by Road and Rail – 2<sup>nd</sup> Edition (AEC 2) was prepared with the advice of the Advisory Committee on the Transport of Dangerous Goods (ACTDG) and the Explosives Competent Authorities Sub-Committee (ECASC).

The role of ECASC is now vested in a new body called the Australian Forum of Explosives Regulators (AFER), which incorporates Commonwealth, State and Territory explosives regulators as well as representatives from the National Security Division of the Department of the Prime Minister and Cabinet and the Australian Explosives Industry and Safety Group (AESIG).

According to its Terms of Reference, one of AFER's primary roles is to 'promote the development and implementation of nationally consistent legislation and safety and security standards'. The AEC is being updated in accordance with this role.

In 2006, the Workplace Relations Ministerial Council (WRMC) agreed that AFER report to WRMC through the Australian Safety and Compensation Council (ASCC) on the development of nationally consistent explosives legislation.

## **1.3 DEVELOPMENTS**

Since the publication of AEC 2 in 2000, there have been a number of important developments.

- A review of the security requirements contained in the AEC was conducted with the participation of jurisdictions, relevant security agencies and industry, was completed in 2002. The review's recommendations were incorporated into an addendum to AEC 2 (Security Addendum).

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<sup>2</sup> United Nations, *Recommendations on the Transport of Dangerous Goods - 15th revised edition*, 2007

- ❑ The UN Model Regulations have undergone significant revisions and improvements. They are now up to the 15<sup>th</sup> revised edition (AEC 2 was based on the 11<sup>th</sup> revised edition – UN 11).
- ❑ Both the ADG Code<sup>3</sup> and the IMDG Code<sup>4</sup> have been revised and they are now up to their 7<sup>th</sup> edition and edition 34/08 respectively.
- ❑ National security advice gained from international events indicated that there was a high potential for ammonium nitrate (AN) to be used by terrorists and as such, Australia needed to introduce laws restricting access to AN. (AN is regularly used as a raw material for explosives in the mining and quarrying industries as well as fertiliser in the agricultural and horticultural industries). On the basis of the introduction of new Security Sensitive Ammonium Nitrate (SSAN) laws or principles in Australia, which have now been applied as security provisions in relevant state and territory legislation for activities related to SSAN<sup>5</sup>, explosives regulators have been advised that explosives legislation would need to reflect an equivalent level of security in regard to access to explosives.
- ❑ Due to international incidents where fireworks have produced mass explosion events, the UN has initiated a default classification system for fireworks, which is intended to be adopted nationally.
- ❑ Over the past two years, jurisdictions have been changing regulations and/or procedures to make use of these recent UN amendments.

## 1.4 UPDATE OF THE AEC

The major impetus for the update of the AEC came from increasing difficulties for regulators and industry in applying AEC 2 because of increasing misalignment with current national and international guidance material. There was also a recognised need to update the security provisions in AEC 2 to align them with the security requirements for SSAN. Industry is fully supportive of updating the AEC and has been involved in the process via the AEISG.

In May 2007, AFER agreed to proceed with an update of the AEC. The update was developed by a working group consisting of representatives of Commonwealth (Department of Defence, the Australian Maritime Safety Agency), state and territory explosives regulators, and representatives from AEISG and the road and rail transport industries.

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<sup>3</sup> National Transport Commission, *Australian Code for the Transport of Dangerous Goods by Road and Rail - 7th edition, 2007*

<sup>4</sup> International Maritime Organisation, *International Maritime Dangerous Goods Code, 2008 Edition, as adopted by IMO resolution MSC 262(84)*

<sup>5</sup> Council of Australian Government's Meeting, Communique, Attachment D: Principles for the Regulation of Ammonium Nitrate, Canberra, 25 June 2004

## 2. STATEMENT OF THE PROBLEM

The current edition of the Australian Explosives Code (AEC 2) was published in March 2000, and was designed to complement and be consistent with the 6<sup>th</sup> edition of the ADG Code and Amendment 29/98 of the IMDG Code. AEC 2 adopts the classification and labelling system for explosives as detailed in the UN 'Recommendations on the Transport of Dangerous Goods – 11<sup>th</sup> edition' (UN 11).

Currently the AEC's classification and labelling provisions are four editions behind the UN's 'Recommendations on the Transport of Dangerous Goods', which are now up to the 15<sup>th</sup> edition (UN 15). The AEC has also fallen behind the ADG Code (which has been revised, with the 7<sup>th</sup> edition released in September 2007), the IMDG Code, which is now up to Amendment 34/08, and the ICAO TI.

The continued misalignment of the AEC with domestic dangerous goods regulation and international maritime and air transport regulations could pose additional costs and risks for industry. Furthermore, the outdated nature of the AEC has led to a lack of consistency in its application in various State and Territory jurisdictions.

In addition, consistency between international and domestic guidance material - and that of intermodal transport guidance material - should be maintained, as out of date classifications could compromise safety by not taking account of new knowledge. In addition to this, inconsistencies between guidance material could create confusion in the handling of explosives, which could also compromise safety.

Further, security provisions are currently contained in an addendum to AEC 2, and it is desirable to incorporate these provisions into the main body of the AEC. Together with their inclusion in the main text, these provisions need to be updated in line with the general security requirements of UN 15.

Although UN 15 does address transport generally with limited references to road and rail transport, it is concerned primarily with how explosives are classified, labelled and packaged prior to transport.

Production by the Australian explosives industry is relatively small, and consistency between Australian and international codes and guidance material is important because there are appreciable quantities of imports. Inconsistencies between codes and guidance material for explosives lead to additional costs and inefficiencies for the industry and regulators. They could create confusion which could also lead to mistakes in the handling of explosives.

A related problem, which is outside the scope of this RIS, is that jurisdictions do not follow the AEC exactly, but impose their own additional requirements that vary across jurisdictions. This creates additional problems for the industry and transport because the majority of explosives are moved across states.

The magnitude of the problem depends on the quantities and types of explosives produced in Australia and imported, and the number of people involved. It also depends on the mode of transport.

## 2.1 DEFINITION OF 'EXPLOSIVES'

The definition of explosives used in the AEC is consistent with that used in UN 15 and ADG 7. This definition is centred on Class 1 dangerous goods, which includes explosive substances, explosive articles and other substances which are manufactured with a view to producing a practical, explosive or pyrotechnic effect.

In a broad sense, common types of explosives include:

- ❑ Blasting explosives - used in the mining, quarrying, civil construction and agricultural industries
- ❑ Munitions (ammunition and other military explosives (bombs, missiles, warheads and mines)), and
- ❑ Pyrotechnics (including fireworks).

It should be noted that Class 1 dangerous goods (explosives) form only a small part of the larger group known as dangerous goods, which encompass goods of Class 1 through to and including goods of Class 9. Although most Class 1 goods are carried in dedicated specially-equipped vehicles, the same transport operator or driver may transport dangerous goods of different Classes at different times, while Class 1 goods can in special circumstances be carried with goods of other Classes. For these reasons it is desirable for the AEC to use placards consistent with the ADG Code. Inconsistencies could lead to inefficiency and confusion, which in turn could also lead to mistakes and accidents.

The focus of the AEC is to provide a uniform basis for governing the road and rail transport of explosives. The AEC is applicable to both civilian and military explosives transport.

## 2.2 SCOPE OF THE 'EXPLOSIVES INDUSTRY'

The use of explosives in Australia is dominated by blasting for the mining and quarrying industries. Other significant uses are for fireworks, ammunition and military purposes. Different types of explosives are used for each.

Blasting mostly involves detonation of AN based explosives. For major mines, which account for at least 90% of the tonnage of explosives used in Australia, the AN based explosives are mixed on site. About 3 million tonnes of AN are transported to mines each year. AN by itself is generally a Class 5 dangerous good, especially where transported for mining purposes, but it can be a Class 1 explosive depending on its concentration and levels of combustible materials. It is treated as an explosive within the meaning of AEC 3 when it is carried in a mixed load with explosives. Legislation in Queensland and South Australia considers AN to be an explosive, but this now imposes no additional costs on industry or transporters relative to SSAN legislation in all jurisdictions, or as reflected in AEC 3. AN retains its Class 5 dangerous goods classification and is transported under the ADG Code.

The explosives used in mining, in addition to those mixed on site, are detonators, primers, boosters, packaged blasting explosives, blasting accessories and specialty products, including seismic.

In Australia, the manufacture of explosives (meaning Class 1 dangerous goods) is restricted to relatively small quantities of detonators, packaged explosives, pyrotechnics (including fireworks), ammunition and other munitions. Discussions with

industry indicate that large proportions of explosives are imported. However, official data for imports and exports (see Table 2–1) suggest that imports of explosives are much less than the domestic production of explosives, which was estimated to be about \$1,300 million in 2005-06<sup>6</sup>. This apparent contradiction arises because the ABS production data for explosives do not correspond to Class 1 explosives alone but are dominated by a large quantity of AN that is converted to an explosive mixture at mines.

Employment in the manufacture of explosives (including AN) in 2005-06 was estimated to be about 2,000<sup>7</sup>.

In 2007, exports totalled \$32.0 million (free on board or fob) and imports were \$85 million (customs value) (ABS 5368.0, Tables 12b and 13b). Comparison with the detailed entries in Table 2–1 reveals that these aggregate values must exclude most munitions, although they probably include some ammunition. The market value of imports would be higher than the customs value by at least the value of insurance and freight, plus any import duty (i.e., cif or cost, insurance and freight). Most ports have restrictions on quantities of explosives passing through the port at any time, in order to minimise the risk of damage, death and injuries in surrounding areas from accidental explosions. The majority of explosives imports for blasting are landed at isolated Port Alma in Queensland, near Rockhampton, and most munitions are imported through Point Wilson in Victoria<sup>8</sup>.

The estimates of production (and derived measures of total supply and domestic sales) in Table 2–1 for individual explosives are extremely imprecise and intended only as very rough illustrative approximations.

**TABLE 2–1: IMPORTS, EXPORTS AND ESTIMATED EXPLOSIVES PRODUCTION 2007, (\$M)**

	<i>Australian production</i>	<i>imports cif</i>	<i>total supply</i>	<i>domestic sales</i>	<i>exports fob</i>
Ammonium nitrate (AN)	1,200	44	1,244	1,191	53
<b>Class 1 explosives</b>					
Blasting explosives	150	43	193	164	29
Pyrotechnics	30	28	58	54	4
Munitions	20	248	268	216	52
<b>Total Class 1 explosives</b>	<b>200</b>	<b>319</b>	<b>519</b>	<b>434</b>	<b>85</b>
Total (including AN)	1,400	363	1,763	1,625	138

Sources: Imports and exports from ABS (special data request). Production values are Access Economics rough estimates inferred from ABS data and discussions with the explosives industry.

<sup>6</sup> Within 'other chemical products', values for explosives and ink are not available for publication, but their sum can be deduced by subtracting all other items from the total for other chemical products. The value for explosives is inferred from total sales and service income of \$1,659 million for explosives (ANZSIC 2541) plus ink (ANZSIC 2547) in ABS 8221.0, December 2007 (Table 2.2), less an estimate for inks based on data for earlier years.

<sup>7</sup> This is a very approximate value using the same data source as the preceding footnote and total employment for explosives and ink of 2,984.

<sup>8</sup> Ports restrict quantities of explosives in order to minimise risks to surrounding infrastructure, businesses and homes. Port Alma, near Rockhampton, is the major explosives port. It is isolated and there are no buildings nearby. Explosives are trucked inland to a store and then distributed to other parts of Australia. There is no similar commercial port elsewhere in Australia. It would be expensive to build another explosives port.

There is some uncertainty about the future proportion of the supply of explosives that is accounted for by imports. It appears to be increasing. The value of imports increased at an average compound rate of 18% a year from 1997 to 2005 (although it then declined by 18% in 2006 and 11% in 2007). An alternative view is that port restrictions will make it increasingly difficult to import the required quantities of explosives, so that increased domestic production of the more commonly used items may increase.

Military use corresponds essentially to munitions, but with the exclusion of some ammunition and the inclusion of some pyrotechnics. The large value for imports of munitions is due partly to high unit prices for some items. Imports include munitions for visiting forces, while exports include munitions for military action overseas.

Attachment B provides some data on the level of involvement by type of industry.

Rail transport accounts for an appreciable proportion of the movement of AN, but most Class 1 explosives are carried by road. Solid AN, in pelletised or prilled form, is carried by rail in sealed bulk containers, while emulsion AN is carried in sealed 'tanktainers'. There are transfers by road vehicle as necessary. Rail is suited to long distance movements, including between eastern states and Western Australia. There is strict attention to security and safety of explosives loads, particularly as trains inevitably pass through urban areas. The amounts of Class 1 explosives carried by rail vary over time according to contracts. The loads are typically (single) pallets packed in containers with other goods that are unlikely to cause ignition or fuel a fire in the case of an accident.

Road transport of explosives is restricted by licensing legislation in each state. Except for small quantities of explosives carried by general carriers, transport of explosives is undertaken by a small number of transport operators, explosives firms, and the military. Jurisdictions place tight restrictions on road vehicle routes, especially through urban areas, so as to maximise safety.

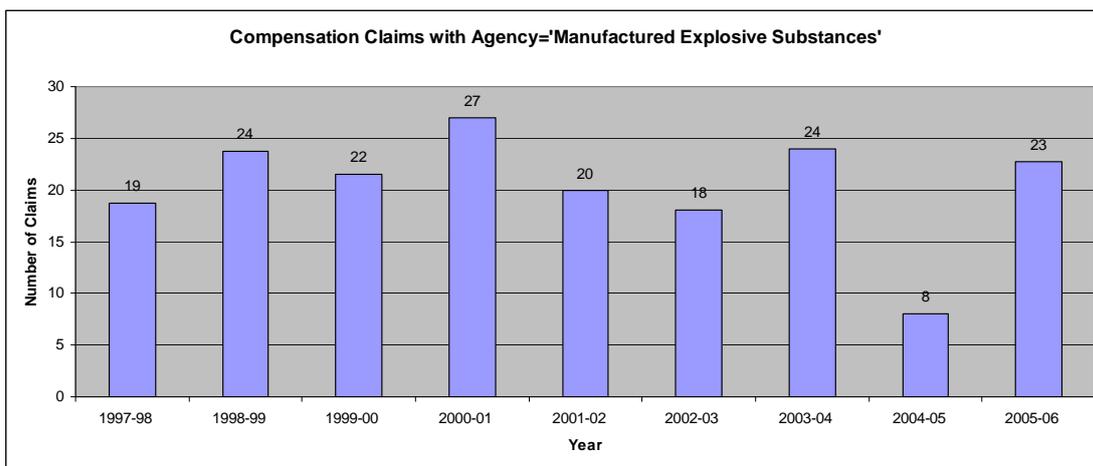
## **2.3 INJURIES IN THE TRANSPORT OF EXPLOSIVES**

It is difficult to determine the number of people working in the explosives industry as explosives may be used in a range of industries including manufacturing, transport, mining, agriculture and the pyrotechnics industry. It is even more difficult to determine from those working in this industry how many are actually involved in the transportation of explosives by road and rail.

In addition to this, there are limited data available regarding the amount of injuries that have occurred in this industry. Data taken from the National Dataset for Workers' Compensation Statistics indicate that there have been fewer incidents in the explosives industry when compared with other industries, but that when incidents occur they tend to be of high consequence.

The following chart (Figure 2-1) shows national data for claims specifically attributed to manufactured explosives substances including incidents relating to gun powder, fireworks, ammunition and percussion caps. These data do not include flammable or explosive substances not intended for that use.

Incidents relating to the transportation of explosives are included in these figures, but it cannot be determined how many actually relate to the transport of explosives.

**FIGURE 2-1: COMPENSATION CLAIMS RELATING TO MANUFACTURED EXPLOSIVES SUBSTANCES**

Source: National Dataset for Workers' Compensation Statistics

Between 1997-98 and 2005-06, 115 (62%) of these claims resulted in temporary incapacity to work; 65 (35%) in permanent incapacity and 4 (2%) were fatal. Of these fatalities, none were directly related to the transportation of explosives by road or rail. The average time lost from work for those temporarily incapacitated was four weeks. While the compensation claims mostly resulted in temporary incapacitation, permanent incapacity resulted in \$6,676,700 or 63.4% of the total cost of compensation claims from 1997-97 to 2005-06, with the average per annum being \$741,856.

These data are likely to understate the actual number of injuries in the explosives industry as a whole, as they include only those injuries for which a claim has been made, involving one week or more off work and accepted by the workers compensation authority. Self employed workers are also not included in the data.

## 2.4 REASONS FOR UPDATING THE AEC

A number of factors have been instrumental in AFER's decision to update the AEC.

- ❑ Currently, the classification, packaging and labelling provisions in AEC 2 are four editions behind the UN Model Regulations, currently at the 15<sup>th</sup> edition, which are revised every two years. Updating in line with the UN Model Regulations is necessary to ensure that these provisions are compatible with international guidance material. This will help promote safer practices, facilitate international trade and expedite responses to incidents, and may help reduce inconsistency across Commonwealth, State and Territory jurisdictions.
- ❑ AEC 2 is behind the ADG Code by one edition and the IMDG Code by three editions. The continued misalignment with the domestic dangerous goods code and international maritime and air transport guidance material could pose costs and risks for industry.
- ❑ Legislation in most jurisdictions references the AEC. As a consequence, the benefits of improved technology and/or safer packaging for explosives cannot be realised by the Australian explosives industry while referring to AEC 2. Most packaged explosives are now imported into Australia, with very little local manufacture. Therefore, the standards of packaging and labelling, employed by overseas manufacturers, legitimately working to international (UN) guidance

material, are not reflected within Australia because of the requirements of AEC 2. Hence to meet Australian requirements, the local explosives industry must either have their overseas suppliers change their normal processes/standards or re-label and re-package imports before distribution and use within Australia, or seek approval to import goods which are at variance with AEC 2. As a result additional costs are incurred to meet local legal requirements for no added safety or security benefit.

- ❑ Further, in terms of intermodal consistency, the maritime safety requirements for importing explosives by sea (IMDG Code) and air (ICAO TI) which have both been amended for international consistency with UN15, are now at variance with the road and rail explosives transport requirements (AEC 2) resulting in inconsistencies in freight container design and labelling standards. Therefore containers of explosives arriving by sea, the common mode of import, cannot simply be transferred to road and/or rail transport at the port of arrival. Again this can result in additional costs to the industry, for no added safety or security benefit.
- ❑ Because AEC 2 is outdated, jurisdictions have been granting permissions to industry to import explosives labelled and packaged in accordance with recent editions of the UN Model Regulations, IMDG Code and ICAO TI, although the extent of the approval differs across jurisdictions. This has resulted in a lack of consistency in the application of the AEC across jurisdictions, which is of importance because many explosives are moved through multiple jurisdictions, and permission must be obtained in each.
- ❑ The security provisions which formed the AEC 2 Security Addendum need to be incorporated into AEC 3. They also need to be updated in line with UN 15 general security requirements and the SSAN security requirements<sup>9</sup>. The aim of such a change is to limit opportunities for the illegal/unauthorised use of explosives.
- ❑ Increasing the consistency of the AEC with related codes and guidance material is expected to not only improve safety and security but to have economic benefits to industry through net reductions in costs.

## 2.5 OTHER ISSUES

### 2.5.1 DIFFERENCES IN LEGISLATION BETWEEN JURISDICTIONS

AEC is a national code, formulated by Commonwealth and State regulators. However, there is no corresponding national legislation. Legislation is determined separately by each jurisdiction (see Attachment A). While legislation in each jurisdiction generally embraces the AEC with regard to labelling and packaging, there are deviations from the AEC in some jurisdictions in relation to transport procedures.

Differences in explosives legislation between jurisdictions are of importance because they increase costs, and a very large proportion of explosives are moved between jurisdictions.

It is noted that differences in legislation between jurisdictions are outside the scope of this RIS, which is restricted to the AEC. They are included as an issue because many

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<sup>9</sup> Council of Australian Governments, *Communique 25 June 2004*, Attachment D

submissions drew attention to these differences and they are clearly of importance to stakeholders. Differences in legislation are referred to again in sections 5.3 and 8.3.2.

It should also be noted that the second edition of the code (AEC 2) is adopted or referred to under explosives legislation in most states and territories. It is anticipated that all jurisdictions will reference AEC 3 when it is published.

## **2.5.2 EXPLOSIVES AND SECURITY PROVISIONS**

Another issue is the overlap between the security provisions for explosives and AN. AN is generally a Class 5 dangerous good and hence not classified as an explosive but can be readily converted to an explosive mixture when mixed with fuel oil.

At the national level, security provisions for explosives are currently addressed by an addendum to AEC 2. These will be incorporated into AEC 3. COAG has agreed to a set of principles, outside the AEC, for the regulation of SSAN. The security provisions for SSAN are currently stronger than those for explosives, and the explosives provisions are being upgraded to match those for SSAN.

### **3. OBJECTIVE OF THE AEC**

The underlying objective of the AEC is to maximise safety and security when transporting explosives by road and rail. Given the magnitude of the risks involved, it is expected that codes of this nature are supported by regulation to ensure that these risks are managed effectively. To date this has been the case with AEC 2.

In the Australian context, the primary aim for developing AEC 3 is to improve on the current safety and security levels for the transport of explosives in Australia. This can be achieved by maximising consistency with UN 15 and ADG 7, enhancing the level of consistency in explosives regulation nationally including its interface with air and sea transport, and having a code and regulations that are easily understood and followed.

Supplementary considerations in developing AEC 3 are minimisation of regulatory costs and regulations that are easily administered.

The previous update of the AEC was in 2000. Given that both the explosives industry and regulators had requested a revised code due to the increasing deficiencies in AEC 2, AFER decided that the development of AEC 3 should be undertaken as quickly as possible and that it retain the current AEC 2 structure. Another reason for this decision was the need to align the AEC with ADG 7 in content, even if not in structure.

#### **3.1 GUIDING PRINCIPLES**

A number of the principles used in the development of the draft AEC 3 were:

- UN 15 to be used as the primary reference document
- alignment with the UN 15 for international consistency
- alignment with ADG 7 for national consistency
- Australian specific content to be retained where necessary
- retain the existing AEC 2 structure, format and concepts
- updates to the operational content of the AEC are to reflect jurisdictions recent operational changes and industry best practice, and
- security provisions are to be updated to meet current national requirements.

#### **3.2 CRITERIA FOR ASSESSING OPTIONS**

A number of options are considered in section 4. In principle, the assessment of options and selection of the preferred option would be on the basis of cost benefit analysis which took account of all relevant components of costs and benefits to determine which option had the highest net present value. It is sufficient to determine the differences in costs and benefits between the options without having to determine the actual costs and benefits.

Where some components of costs and benefits cannot be quantified, it is possible to reach conclusions using qualitative analysis. This is the case for safety and security benefits. In principle, costs and probabilities of various disasters and terrorist activities can be estimated, but these values are imprecise. This problem disappears if all the options achieve the same levels of safety and security or, alternatively, if all options improve on the current situation equally. Comparison of total net benefits then reverts to comparison of the quantifiable costs and benefits.

## 4. OPTIONS

This section outlines the options available for updating the AEC.

- Option 1**      **Retain the Status Quo:** the AEC would be maintained in its current form with no changes.
- Option 2**      **Minimal change:** this option covers minimum changes and includes updating the technical and operational content in the AEC while retaining the existing AEC 2 structure, format and concepts. This involves incorporating technical updates from UN 15 into the technical appendices, ensuring the chapters in the AEC reflect these updates, as well as the recent operational changes. This would also involve updating the current security provisions.
- Option 3:**      **Minimal change with self regulation by industry:** this option involves updating the AEC as for Option 2 and repealing the current explosives legislation in all jurisdictions.
- Option 4:**      **Revise the AEC to align with ADG 7 and UN 15 to the extent possible:** this would involve the full adoption, to the maximum extent possible, of UN 15, and would include retaining specific requirements from the AEC where necessary.
- Option 5:**      **Fully and directly adopt the UN Model Regulations:** this involves direct reference to UN 15 and then developing a set of domestic requirements to be used in conjunction with them.

### 4.1 OPTION 1: RETAIN THE STATUS QUO

Option 1 means the AEC would be maintained in its current form with no changes.

As the status quo refers to continuing with current practice there are no additional costs or benefits to business, government or the community. It needs to be noted, however, that if current practices can be improved, there would be continuing costs and risks involved in maintaining the status quo. These are discussed below.

AEC 2 is out of date, and as a consequence, the benefits of improved technology and/or safer packaging for explosives cannot be realised by the Australian explosives industry. Most packaged explosives are now imported into Australia, with very little local manufacture. As a consequence, the standards of packaging and labelling, employed by overseas manufacturers, legitimately working to international (UN) guidance material, are not reflected within Australia because of the requirements of AEC 2. To meet Australian requirements, the local explosives industry must either have their overseas suppliers change their normal processes/standards, or re-label and re-package imports on arrival into Australia, or obtain permission to import goods that are at variance with the AEC. As a result, additional costs are incurred to meet local legal requirements for no added safety benefit.

Further, in terms of intermodal consistency, the maritime safety requirements for importing explosives by sea (the IMDG Code) which have been amended for international consistency (UN 15), are now at variance with the road and rail explosives transport requirements (AEC 2) resulting in inconsistencies in freight container design

and labelling standards. Containers of explosives arriving by sea, the common mode of import, cannot simply be transferred to road and/or rail transport at the port of arrival under AEC 2 unless specifically approved by the regulator. Again this can result in additional costs for the industry and regulator, for no added safety and/or security benefit.

A lack of consistency in the application of the AEC across the states and territories also arises from the AEC being out of date, because jurisdictions differ in their adjustments and concessions to allow for AEC 2 being out of step with the most recent international guidance material, including the UN Model Regulations, IMDG Code and ICAO TI, that apply to imports and exports.

Furthermore, AEC 2 treatment of security issues relating to explosives is not up-to-date and falls short of the security requirements in the SSAN regulations which have been developed in accordance with the COAG SSAN principles.

## **4.2 OPTION 2: MINIMAL CHANGE**

Option 2 means minimum changes to the AEC and includes updating the technical and operational content while retaining the existing AEC 2 structure, format and concepts. This involves incorporating technical updates from UN 15 into the technical appendices, ensuring the chapters in the AEC reflect these updates, as well as the recent operational changes. This would also involve updating the current security provisions. The AEC would align better with other existing international guidance material (IMDG Code and ICAO TI) and the ADG Code while Australian specific content would be retained.

The content of Option 2 is aligned with the content of the UN 15 edition of the UN Model Regulations, even though Option 2 uses the structure, format and concepts of AEC 2 rather than those of the UN Model Regulations. The content of ADG 7 is aligned with the content of UN 14 and in parts with UN 15 (and ADG 7 uses the structure, format and concepts of the UN Model Regulations). It follows that the content of Option 2 is aligned indirectly with the content of ADG 7.

The advantage of this option is that the revised AEC can be produced within a relatively short time frame involving minimum costs. The revised AEC would retain the same format and be more familiar to those using the current AEC. Training costs, therefore, would be minimal for industry while security issues would be better addressed.

The revision of the AEC would address the national, international and intermodal inconsistencies as discussed under Option 1 and the related costs and risks.

However, there are disadvantages involved.

- ❑ The incorporation of future UN technical updates may be problematic due to the UN Model Regulations using a different approach to AEC 2.
- ❑ It is not a full and complete alignment with the UN Model Regulations and this may perpetuate a lengthy revision cycle and associated costs and resources necessary to keep up to date with international practice.

As a result of Option 2, the evolution of the AEC would bring about some key changes in the transport of explosives. These are discussed in section 5.1.

### **4.3 OPTION 3: MINIMAL CHANGE WITH SELF REGULATION BY INDUSTRY**

The COAG guide to Best Practice Regulation advises that the 'RIS should identify a range of viable options including, as appropriate, non-regulatory, self-regulatory and co-regulatory options'<sup>10</sup>. Option 3 has been included for this purpose.

Option 3 means that the AEC is updated according to Option 2 and the current explosives legislation is repealed in all jurisdictions. It relies on industry to ensure that the safe and secure transport of explosives is carried out, using the AEC for guidance.

This option is not consistent with COAG's agreement on a national approach relating to SSAN. This approach is based on an agreed set of principles<sup>11</sup>. These principles include Principle 15:

"Explosives Regulation

In view of these measures to be introduced for SSAN, which in some cases are more stringent than those for the control of explosives, states and territories should review their explosives regulations. In particular, states and territories should quickly move to:

- a) implement security checking for persons having access to explosives, and
- b) ensure penalties for breaches of explosives regulations are appropriately severe."

Option 3 is not a viable option for explosives because it does not satisfy security requirements. It is rejected not only on the basis of the current security provisions for SSAN, but also the risk that explosives could be stolen for terrorist purposes. While the risk of terrorist activities cannot be eliminated entirely, it is assumed that it would be much lower in a regulated environment than under self regulation.

The preceding remarks also apply to any other options that depend on self regulation.

### **4.4 OPTION 4: REVISE THE AEC TO ALIGN WITH ADG 7 AND UN 15 TO THE EXTENT POSSIBLE**

This would involve the full adoption, to the maximum extent possible, of UN 15, and would include:

- reproducing requirements (referring to ADG 7) where they match Australian requirements in the AEC, for example, adopting, in some cases, whole chapters from UN 15;
- adopting the structure, format, definitions and concepts of UN 15; and
- retaining Australian specific requirements from the AEC where necessary.

This would mean that the AEC would be more closely aligned with the ADG Code and UN Model Regulations than under Option 2 and that once an initial major change of this nature had been made to the AEC, future updates would be easier as they would be aligned directly with UN 15 onwards, and hence indirectly with the IMDG Code.

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<sup>10</sup> Council of Australian Governments (COAG), Best Practice Regulation: A Guide for Ministerial Councils and National Standard Setting Bodies, October 2007, page 10.

<sup>11</sup> COAG, Attachment D, 25 June 2004

It is noted that the update from ADG 6 to ADG 7 (for all dangerous goods except explosives) adopted the structure, format, definitions and concepts of UN 14. An update from AEC 2 to AEC 3 according to Option 4 would thus be well placed for amalgamating the explosives and (other) dangerous goods codes in the future, as has been suggested by the National Transport Commission<sup>12</sup>.

The revision of the AEC would address the national, international and intermodal inconsistencies as discussed under Option 1 and the related costs and risks. The key changes as analysed under Option 2 would also apply. The main difference from Option 2 would be the structure of the AEC. It might take users some time to become accustomed to the new structure, but it would be easier to make further changes to the AEC in the future.

However, significant resources and funding would be required to implement these changes and it would be some time before the AEC could be updated. In particular, significant training costs would be involved for industry and, given that it is envisaged that future development of the ADG Code would include information on explosives to more fully align with UN 15, changes of this nature may be a waste of resources at this time.

#### **4.5 OPTION 5: FULLY AND DIRECTLY ADOPT THE UN MODEL REGULATIONS**

This involves direct reference to UN 15 and then developing a set of domestic requirements to be used in conjunction with them.

In this option, technical requirements in relation to explosives would be brought immediately into line with the current edition of the UN Model Regulations, and in continuous alignment with them thereafter, thus harmonising with the ICAO TI, the IMDG Code and the International Air Transport Association regulations. In principle, this option would be less resource intensive and less costly with the end product being a small code referencing the UN Model Regulations. Only a small Australian Explosives Code would be required to cover Australian specific requirements not included in the UN Model Regulations, e.g. transport procedures such as safety equipment and segregation of explosives.

However, the UN Model Regulations are developed and used as the basis of regulatory requirements for air, sea, road and rail transport. Detailed duties and responsibilities are not set out in the UN Model Regulations, and the form of these 'model regulations' renders them unsuitable as Australian model or operational regulations without considerable redrafting. Requirements that are not relevant or appropriate to Australian conditions would therefore create problems with implementation, resulting in legislative intervention. There would be the danger of overlooking provisions in the revision cycle and issues associated with referencing international standards that would not apply in Australia. The complex nature of this solution where two documents need to be cross-referenced, kept up to date and used in tandem, one aligned with UN regulations and one dealing with local exceptions, has considerable potential for confusion and errors.

For the reasons outlined above this option is not a practical solution to updating an already complex technical code. Furthermore, the Australian Government has previously expressed concern about adopting international documents for use in

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<sup>12</sup> National Transport Commission, Development of the 7<sup>th</sup> Edition of the Australian Dangerous Goods Code, Draft RIS, November 2006, p. 47.

Australia, which may then take some time to modify or change should a problem be identified. On this basis alone, this is not a suitable option for Australia to adopt.

## **4.6 SUMMARY OF OPTIONS**

The self regulatory approach of Option 3 is not consistent with the COAG principles for security provisions for SSAN, or the security addendum for explosives. Option 5 is not a practical solution and is also unlikely to be supported by the Australian Government.

Options 2 and 4 would align the AEC with UN 15 and achieve much the same results in terms of consistency with international labelling and packaging. Option 4 would deliver a better product in the long term but it may be premature to change the structure of the AEC to be the same as the UN 15 structure at present, before sufficient time has elapsed to fully assess the impact on business of the recently introduced ADG 7.

Options 2 and 4 are single updates of the AEC that would make AEC 3 consistent with UN 15 and ADG 7 initially. The UN Model Regulations are updated every two years, but the options contain no subsequent updates of the AEC or the ADG Code. (AFER members will need to consider how future updates of the AEC are undertaken.)

AFER has focussed its attention on Option 2 as an alternative to Option 1. AEC 2 has been updated according to Option 2 to produce a code which is consistent with UN 15 and ADG 7. Updating according to Option 2 enabled a draft version of the AEC to be developed within a relatively short time frame and released for consultation and revision. This option should also present the least retraining costs to industry and regulators while achieving consistency with other codes and guidance material.

## 5. CONSULTATION

AFER released the Consultation RIS in March 2008 together with a draft Australian Explosives Code written according to Option 2. The Consultation RIS sought comments on the draft AEC 3 and responses to questions about the effects of revising AEC 2.

Section 5.1 summarises the major changes in the draft AEC 3 (for Option 2) compared with AEC 2. It also provides comments on costs and benefits of Option 2 relative to Option 1.

Section 5.2 summarises the submissions received in response to the Consultation RIS. The submissions proposed changes to the draft code and drew attention to drafting and technical errors. The proposed changes consisted of perceived and real inconsistencies with other codes and guidance material, and requests from industry to modify the draft AEC 3. Many submissions commented on differences in legislation between jurisdictions even though this is outside the scope of the RIS. These are outlined in section 5.2 as background to understanding the submissions. AFER examined all comments received and as a result, revisions were made to the draft document (see section 5.4).

The Consultation RIS outlined the options available but did not include discussion of their relative merits, except for qualitative comparisons between Option 2 and Option 1. Some data for this purpose were contained in the responses to AFER questions. Section 5.5 describes how additional quantitative and qualitative data were obtained by Access Economics through consultation with industry and regulators.

### 5.1 KEY CHANGES FROM AEC 2 TO PUBLIC COMMENT DRAFT AEC 3 UNDER OPTION 2

#### Security

In updating the security provisions of the AEC, the security addendum to AEC 2 has now been fully incorporated into the main body of AEC 3. The security provisions in AEC 3 have also been brought into alignment with the SSAN provisions and Chapter 1.4 of UN 15.

#### Portable tanks

A new part (Part 2) has been added to Chapter 5, allowing the transport of explosives in portable tanks as permitted under international arrangements. This was previously only permitted under specific approval of a Competent Authority.

#### Documentation

The term 'Transport Documentation' has now replaced 'Shipping Documentation' to cover all modes of transport and to be consistent with both ADG 7 and UN 15.

#### Labelling

To be consistent with UN 15, the AEC now requires packages of explosives to be labelled with the net explosive quantity (NEQ). The section on Requirements for Class Labels, Sub-Risk Labels and Placards has also been restructured to include new pictograms and to reflect both UN 15 and ADG 7 requirements.

### **Manual handling equipment**

The public comment draft of AEC 3 allowed the stowage of manual handling equipment such as pallet jacks and conveyor rollers while transporting explosives, provided that those devices are securely stowed either in a separate compartment or externally at the rear of the vehicle. This was intended to provide those transporting explosives more flexibility in meeting their OHS requirements. *(AFER later amended this change in response to submissions, see section 5.4.)*

### **Insurance**

The amount of insurance cover required for transporting explosives has been increased from \$1m to \$2.5m per event for Category 2 loads, and from \$2.5m to \$5m per event for Category 3 loads. This increase is in line with the increase stipulated in ADG 7, which was determined after consultation with industry and insurers and more adequately reflects the increased costs of Insurance.

### **Costs**

The Consultation RIS contained the following comments on expected costs and benefits arising from Option 2, pending quantitative input from industry and others.

#### *Training*

As the AEC is being updated to align with UN 15 and ADG 7, it is expected that some training and familiarisation costs would be involved. However, these are expected to be minimal, considering the revised AEC will retain the same format and users would already be familiar with navigation throughout the code.

#### *Labelling Changes*

The draft AEC 3 includes changes in labelling requirements for packages, unit loads, carry boxes and intermediate bulk containers (IBCs). They will be required to be labelled with the NEQ of the explosive(s) and the number of articles contained within the package or load. This may involve some additional costs, however these are expected to be short-term costs as imported products may have already complied with UN 15 and once locally manufactured products have their labels amended, this will be incorporated into the standard package labelling process.

#### *Insurance*

In AEC 2 the minimum insurance requirements were set at \$1 million to \$2.5 million. These are now set from \$2.5 million to \$5 million. Although this is a substantial increase in the level of insurance coverage, the increase in the actual insurance premiums paid by industry is not expected to increase significantly.

### **Benefits**

#### *Improvement in the safety and security level for the community*

A major benefit to the community will be an increase in the existing safety and security level for the transport of explosives, due to updating and aligning the AEC with current international and other domestic standards, including the national security requirements relating to SSAN. *(The analysis in section 6.2 finds that there are such benefits but there is insufficient information to identify a major benefit.)*

### *National consistency in land transport of explosives*

The draft AEC 3 allows for industry to operate in a nationally consistent way, resulting in time and cost savings. The updated AEC will also provide for inter-modal consistency.

### *International alignment*

The revised AEC will further facilitate trade and some savings may be realised for importers and exporters.

### *Timeframe and Resources*

Option 2 will utilise minimal resources while allowing the AEC to be revised and published within a relatively short time frame. This will obviously expedite the benefits as listed above.

## **5.2 SUBMISSIONS**

AFER received 18 submissions in response to the Consultation RIS and draft AEC 3 released on 26 March 2008. AFER examined 248 separate comments and proposals and, following discussion, made revisions to the draft AEC 3. The submissions can be viewed at <http://www.ascc.gov.au/ascc/AboutUs/WhatWeDo/AFER/>.

Submissions from regulators were concerned mainly with technical details. Submissions from industry tended to address issues of relevance to their particular part of the explosives industry. A summary of the main comments is provided. The major changes to the draft AEC 3 in response to submissions are described in section 5.4.

**Suppliers of blasting explosives** indicated a lack of consistency in the application of the AEC across jurisdictions. They were concerned about rejection of the blast barrier code in some jurisdictions, and continuation of the discretion of jurisdictions to accept or reject parts of the AEC. AEISG fully supports the security objectives of the COAG SSAN Principles and the alignment of Class 1 security requirements with SSAN requirements.

Submissions received from **suppliers of fireworks**, including the *Pyrotechnics Industry Association of Australia (PIAA)*, commented that safety in the fireworks industry is plagued by a widely diverse set of regulations by competent authorities. A strong risk management system is jeopardised by having to account for different systems when travelling on road or rail. Section 2.5 of the draft AEC 3 dilutes the national approach by referring to each 'state competent authority' for load regulation. It is the industry's belief that a failure to establish a uniform set of regulations relating to all aspects of fireworks operations is the primary risk to operations, transport and training. Fireworks industry practice often involves the transport of a wide variety of products to a display location, where the load is most probably a broad range of items in less than full carton amounts. The fireworks industry considered that the draft AEC 3 did not allow mixed classes of explosives in a carton and it also required labelling of the carton with NEQ or number of items. The industry indicated that the restriction on mixed classes was not practical for composite contents for fireworks displays. It suggested that the most sensible regulatory treatment of this requirement would be to allow the fireworks operator to pack mixed class fireworks into boxes and assume the most hazardous class.

Submissions were received from **transport operators**. Road freight operators sought uniform explosives regulations across jurisdictions. They argued for retention of EXPLOSIVES placards (signage) on vehicles, and argued against external storage of

pallet jacks and the introduction of portable communications units. The *Australasian Railway Association* sought uniform controls across states, including documentation and placards, and across all dangerous goods, as in ADG 7. It preferred the ADG 7 format (i.e. Option 4) and ADG 7 concepts.

A recurring theme in many submissions was the need for uniform regulations for explosives throughout Australia (see submissions from railways, road freight, AEISG, and fireworks). This RIS relates to the AEC, which is a national code, and is written from the perspective that all jurisdictions adopt the AEC. To the extent that jurisdictions may deviate from the AEC or may impose additional restrictions, these matters are outside the scope of this RIS. In practice, if transport operators are to avoid the costs of reloading at state borders, they conform to 'least common denominator' legislation.

Similarly, differences between jurisdictions in the licensing of explosives firms, explosives transport operators and drivers are also outside the scope of this RIS.

### **5.3 DIFFERENCES IN LEGISLATION BETWEEN JURISDICTIONS**

While the inconsistency in current jurisdictional legislative requirements is outside the scope of this report, many submissions addressed the problems created by these inconsistencies. It is important that these differences be noted so that the submissions described above can be more clearly understood.

In addition, the current differences in legislation are also important for the impact analysis described in section 6 because it is assumed that legislation in each jurisdiction is consistent with the AEC. In other words, any existing regulations in (some) jurisdictions that are additional to the AEC would disappear so that the costs of transporting explosives through multiple jurisdictions would fall. These current differences include that:

- ❑ Some jurisdictions require import documentation for all explosives entering the state
- ❑ South Australia does not allow steel material handling equipment to be carried in the same compartment as packaged explosives. Although an internal separate annex could be utilised, this usually means in practice that pallet jacks are carried externally or not at all.
- ❑ Licensing of transport operators, road vehicles and drivers varies across states
- ❑ South Australia does not currently grant approval for the use of 'blast barriers' on trucks to separate mixed loads of explosives from different Compatibility Groups within Class 1. South Australia sees its withdrawal of such permission as strictly a compliance issue.
- ❑ Some jurisdictions still do not legislate for security plans for explosives loads. This is despite these plans being required in the security addendum to the AEC developed in 2003 in response to the heightened security awareness in Australia following the terrorist incidents of 2001 and 2002.

### **5.4 CHANGES TO THE DRAFT AEC 3 IN RESPONSE TO SUBMISSIONS**

In considering all of the 248 comments received, AFER members agreed that certain sections of the draft AEC 3 required amendment. Although it is not possible in this document to advise all of those amendments, some of the significant changes include:

- ❑ The requirements for storage of pallet jacks (AEC 3 draft, 7.2.1(7)) were changed. The draft AEC 3 required that any manual handling equipment stored on a road vehicle must be stored externally or in a separate compartment to that containing the explosives. This was to minimise the possibility of sparks amongst explosives in the case of an accident. It related to pallet jacks which are used to move loads within the vehicle. In a presentation to AFER, the Australian Explosives Transport Safety and Security Group (AETSSG), a group of major transport operators for explosives, described how pallet jacks have been carried internally for about 20 years without causing any accidents and are in fact used to secure the load. They indicated that external storage would lead to significant cost increases, partly through damage to pallet jacks on rough roads but mainly through injuries caused by manually lifting the pallet jack on and off the vehicle. AFER agreed to change 7.2.1(7) to allow manual handling equipment to be stored within the same compartment as explosives provided that the equipment was suitably secured against the effects of vehicle movements and there was a segregating partition secured between the explosives and the equipment.
- ❑ Emergency Information Panels (EIPs) displayed on freight containers and vehicles are now permitted to display either the 'Proper Shipping Name' of the explosives being transported, or the word EXPLOSIVES as an accepted alternative. This reflects the view that the use of the word EXPLOSIVES on EIPs is recognised throughout the community. However, it is not mandatory. The change allows overseas containers displaying an EIP with the word EXPLOSIVES to be transported without modification.
- ❑ The meaning of 5.2.1 has been clarified to confirm that small mixed loads of explosives of different Divisions are allowed in one carton, with the Division for the carton determined according to Table 7.1 of the AEC 3. The fireworks industry suggested such an arrangement, based on a misunderstanding of AEC 2 and the public comment draft of AEC 3 (because it was already allowed for in both of these documents).
- ❑ A new clause (8.2.18) addresses precautions to be taken for overnight stops for road vehicles carrying low risk (Category 1) loads. (Similar arrangements for vehicles carrying Category 2 and 3 loads are already specified in 8.3.11(3).)
- ❑ The meaning of 8.4.4(3) has been clarified, to include that the attendant on a road vehicle can be replaced by providing the driver with a means of radio communication (e.g., portable UHF radio) that can be operated independently, away from the vehicle in the case of an emergency.

## 5.5 ADDITIONAL ACCESS ECONOMICS INQUIRIES

Submissions and responses to the Consultation RIS did not provide sufficient quantitative information for an impact analysis. Access Economics sought quantitative and qualitative information for this purpose from the explosives industry, transport operators and regulators. They explained their methodology to meetings of AFER and AEISG where it made contact with regulators, major players in the blasting part of the explosives industry and also explosives transport operators. It also met with representatives of the PIAA. The consultations are summarised in Table 5–1, but without detailing the key members contacted within the various groups. In most cases there were follow-up telephone calls to seek clarification and additional information as the process progressed.

**TABLE 5–1: CONSULTATIONS BY ACCESS ECONOMICS**

<i>Contact</i>	<i>Category</i>	<i>Type of consultation</i>	<i>Date / first contact</i>	<i>Contribution</i>
State regulators	regulator	telephone discussions	2-May-08	background information
AETSG members	road transport	telephone discussions	2-May-08	quantitative and qualitative estimates
Queensland Rail	rail transport	telephone discussions	2-May-08	background information
AEISG	blasting	presentation	7-May-08	background information
PIAA reps	fireworks	meeting	7-May-08	background information
Defence	munitions	telephone discussions	12-May-08	quantitative and qualitative data
AFER	peak body	presentation	20-May-08	established contacts
AEISG members	blasting	questionnaire, telephone	23-May-08	quantitative and qualitative data
PIAA	fireworks	questionnaire, telephone	26-May-08	no data provided
State regulators	regulator	questionnaire	29-May-08	quantitative and qualitative data
AMSA	sea transport	questionnaire	2-Jun-08	comment
Thales	munitions	telephone discussion	16-Jun-08	background information

Note: AMSA is the Australian Maritime Safety Authority.

Following on from the initial contacts and discussions, Access Economics requested information about the roles, magnitudes and growth rates of the different parts of the explosives sector. It also pursued questions in addition to those in the Consultation RIS. In particular, knowing that industry had requested an update of the AEC, and that the regulators supported an update, what were the expected benefits to the industry and regulators? There was general consensus that an update of the AEC was highly desirable, but respondents had difficulty quantifying the costs and benefits. The general picture that emerged was that the total additional costs were small. Access Economics focussed on the ongoing benefits of removing the existing costs associated with non-compliance of AEC 2 with international guidance material, such as the UN Model Regulations, IMDG Code and ICAO TI. These costs related to imports, and a little to exports, and consisted of a combination of:

- ❑ the additional cost of requiring overseas suppliers to label and package explosives according to AEC 2
- ❑ re-labelling and repacking imports before distribution within Australia, and
- ❑ seeking permission from each relevant jurisdiction to transport explosives by means of an exemption or allowance of a variation of the AEC. This resulted in additional costs for both suppliers and regulators.

The responses to these inquiries are embodied in the analysis described in section 6.

## **6. IMPACT ASSESSMENT**

### **6.1 BROAD APPROACH TO IMPACT ASSESSMENT**

#### **6.1.1 METHODOLOGY**

A methodology for the assessment of options and selection of the preferred option was agreed between Access Economics and the OBPR.

In principle, the assessment of options and selection of the preferred option is on the basis of cost benefit analysis (CBA) which takes account of all relevant components of costs and benefits to determine which option has the highest net present value. It is sufficient to determine the differences in costs and benefits between the options without having to determine the actual costs and benefits.

The analysis covered calendar years 2009 to 2018 inclusive, and costs and benefits were examined for regulators, transport operators, and suppliers of explosives separated into blasting, pyrotechnics and munitions. However, insufficient information was received to use CBA for all aspects of the assessment.

Only qualitative information was obtained about many of the costs and benefits of changes to the AEC. In such cases, it may be possible to reach some conclusions using qualitative analysis. Risk analysis is applied in section 6.2 to assess the net benefits of improved safety and security in the absence of reliable estimates of changes in costs and probabilities of various disasters and terrorist activities. The need to make comparisons between options disappears if all the options achieve the same levels of safety and security or, alternatively, if all options improve on the current situation equally. Comparison of total net benefits then reverts to comparison of the quantifiable costs and benefits.

#### **6.1.2 COST BENEFIT ANALYSIS**

The preferred methodology for assessment of options is cost benefit analysis, which depends on obtaining quantitative information about all the relevant costs and benefits. Information was received in the consultation process, firstly through submissions and responses to questions in the Consultation RIS. This was supplemented by additional discussions and questions put by Access Economics to the explosives industry, transport operators and regulators. However, insufficient information was received to use CBA for all aspects of the assessment. Only qualitative estimates were available for many items, although often these were sufficient to establish that magnitudes were negligible or small. To the extent that no estimates of benefits were provided in some cases, total benefits were underestimated.

CBA is used to assess the financial costs and benefits of aligning the classification, labelling and packaging of explosives with UN 15 and international and domestic codes and guidance material derived from it, and revisions to the AEC for the transport of explosives. Many of the costed changes have the objectives of improving safety and security. If the CBA analysis shows net quantitative benefits and the risk analysis for safety and security shows net benefits, even if only qualitative, then the total benefit must be positive.

The CBA consists of estimation of the costs and benefits for stakeholders over time, and calculation of the net present value. Stakeholders include explosives

manufacturers and suppliers, transporters, and regulators. The transport of explosives by small end users such as sporting shooters, minor fireworks operators, and small shotfirers is also affected by the code, in principle, but the total costs are assumed to be small and they have not been allowed for in the calculations. The wider community is clearly affected by safety and security during transport, but this has not been included in the CBA. Values in future years are discounted at a real rate of 3%<sup>13</sup> and the time horizon for the analysis is ten years.

### 6.1.3 OPTIONS CONSIDERED

The impact assessment focuses on Options 2 and 4 compared with Option 1 (the status quo). As discussed in section 5, Options 3 and 5 are not viable. Options 2 and 4 are similar in many ways. The analysis concentrates first on Option 2, and is then extended to Option 4.

As previously mentioned, Options 2 and 4 are single updates of the AEC that make AEC 3 consistent with UN 15 and ADG 7 initially. The UN Model Regulations are updated every two years, but no subsequent updates of the AEC or the ADG Code are specified in the options or allowed for in the analysis. (AFER members will need to consider how future updates of the AEC are undertaken.)

Option 1 does not correspond to just AEC 2. It is business as usual (BAU) which corresponds to AEC 2 and all the complications that go with it. It embraces developments since 2000, including the security addendum in 2003 and the security provisions for SSAN in 2004. (It is assumed that these have been adopted in all jurisdictions.) It includes the various and differing legislative arrangements and current practices in the jurisdictions. It also includes changes in regulations and/or procedures in jurisdictions over the past two years to allow for recent UN amendments to the classification of fireworks that recognise that the risk of fireworks exploding is greater than believed previously.

### 6.1.4 ASSUMPTIONS

There are some broad assumptions underlying the analysis.

- ❑ It is noted that the analysis is for the AEC, which is intended as a national code. Legislation is determined by jurisdictions, and individual jurisdictions currently impose regulations that are in addition to the national code, so that legislation differs between jurisdictions. It is assumed for the purposes of this analysis that all legislation in all jurisdictions will reference the revised AEC for guidance on road and rail transport of explosives in Australia and that legislation and practice will be consistent across jurisdictions. In recognition that the assumption may be unrealistic, the analysis includes the case where differences persist.
- ❑ It is assumed that the import share of each type of explosive remains the same each year, in which case the quantity of supply of that type of explosive can be used as an indicator of the quantity of imports of that type of explosive.
- ❑ It is assumed that around 1,000 vehicles are licensed to carry explosives. This number is based on data provided in Attachment B, recognising that many vehicles are licensed in multiple jurisdictions.

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<sup>13</sup> The real discount rate of 3% is derived in Access Economics (2008) *The Health of Nations: The Value of a Statistical Life*, Report for the Office of the Australian Safety and Compensation Council, Canberra, January.

- ❑ It is assumed that Option 2 would be implemented early in calendar year 2009 with one-off costs incurred during that year, and ongoing costs and benefits commencing mid-way through 2009.
- ❑ Option 4 would be implemented mid-way through calendar year 2010 with one-off costs incurred in 2010 and 2011, and ongoing costs and benefits commencing in 2011.

Additional detailed assumptions are made in estimating costs and benefits, and these are noted in the text (see sections 6.3.1 and 6.4).

## 6.2 SAFETY AND SECURITY

Although safety is a major driving force for revision of explosives codes, there is no information about reduced costs of explosives incidents as a result of these revisions. International guidance material for explosives, including the UN Model Regulations, IMDG Code and ICAO TI, are updated according to assessment of past explosives incidents and controlled tests using explosives. These assessments may lead, for example, to a reduction in the maximum quantity of a particular type of explosive allowed in one package, or the maximum quantity of an explosive to be carried on a vehicle. However, the assessments contain no report of the change in risk.

An additional safety consideration is that inconsistency between AEC 2 and other explosives guidance material, especially UN 15, leads to confusion within the industry and for emergency workers, and hence potential risks to safety. AEC 3 would introduce consistency and eliminate this confusion, provided that there was appropriate training.

The important safety issue for the transport of explosives is to avoid or minimise the possibility of an explosion if a vehicle is involved in an accident. Vehicle accidents cannot be eliminated entirely, although data reported by the Productivity Commission (PC)<sup>14</sup> show that the number of fatalities per vehicle for road vehicles carrying dangerous goods (including explosives) is less than 10% of that for road vehicles in general. The excellent safety record can be attributed to licensing, and the associated training and assessment procedures, which have resulted in a small number of specialised transport operators that are competent and responsible.

Information received to date indicates that incidents associated with the transport of explosives are rare. Thus there is insufficient information to estimate that there would be any reduction in the number of incidents or the severity of incidents.

There is even less information for security risks associated with the transport of explosives.

As such it is very difficult to estimate the benefits of improved security arrangements. In response to security incidents overseas, the security addendum to AEC 2 was introduced in 2003 and COAG principles for security provisions for SSAN were introduced in 2004. The changes in the security provisions for Options 2, 4 and 5 are relatively small. The major changes in costs and benefits associated with introduction of the security addendum and the security provisions for SSAN occurred in 2003 and 2004. AEC 3 is strengthened by the incorporation of security provisions but this does not reduce the risks appreciably. However, additional precautions for overnight stops of

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<sup>14</sup> Productivity Commission 2008, *Chemicals and Plastics Regulation*, Research Report, Melbourne, p. 180.

vehicles with Category 1 loads (8.2.18) and changes to communications systems (8.4.4(3)) improve security and safety and must reduce the probability of accidents and incidents.

When estimates of the cost and probability of a disaster are imprecise, **risk analysis** can be used to provide an estimate of the benefit (B) of a regulation according to the formula

$$B = (P_1 - P_2) C$$

where C is the approximate cost in economic terms of the disaster,  $P_1$  is the probability of the disaster occurring before regulation, and  $P_2$  the probability of the disaster occurring after regulation. Thus for a \$1,000 million disaster, if regulation reduced the annual probability of occurrence from 0.010 to 0.006, then the annual benefit would be \$4 million. This indicates that annual expenditure on regulation of up to about \$4 million would be justified.

Alternatively, this approach can be turned around and expressed as **break even analysis** which uses B and C to calculate the change in probability required to break even. For example, for a \$1,000 million disaster, additional expenditure of \$10 million on regulation would be justified if it reduced the probability of the disaster by 1% or more.

In the case of explosives, the risk of a major explosion is minimised by keeping explosives, and vehicles carrying them, out of populated areas and industrial areas. Regulation of ports and road vehicle routes are intended to achieve this. Using the cost of a disaster as \$1,000 million, the result presented in the previous paragraph can be applied to explosives.

Although the costs of explosives accidents and security incidents cannot be estimated with any precision, the changes in the AEC from Option 1 to Options 2, 4 and 5 would reduce the costs and probabilities of such events, even if only marginally.

This assessment will assume that Options 2, 4 and 5 have benefits for safety and security in terms of the costs of accidents and incidents. The associated changes in direct financial costs to industry and transport operators are included in the CBA analysis.

Another aspect of security is the number of persons with access to explosives. The Chief Inspector of Explosives in Queensland estimates that there would be approximately 25,000 persons in Queensland who would have legal access to restricted explosives. This is an estimated total across licensed activities including manufacture, imports, transport, storage, mining, quarrying, construction, agriculture, fireworks, ammunition, gunshops, special effects, blasting contractors and explosives trainers. Access Economics considers that the corresponding total for Australia could well be of the order of 100,000 persons.

For the purposes of the AEC, clause 8.2.16 requires that for explosives in Risk Categories 1, 2 and 3, 'The prime contractor or rail operator shall ensure that any person having unsupervised access to explosives, other than unrestricted explosives, has been security cleared prior to such access'. In addition, security clearances are required for drivers and all others riding on or escorting vehicles carrying high security risk loads of explosives (clause 8.8.6).

### 6.3 OPTION 2 COMPARED WITH OPTION 1

In the CBA analysis, benefits and costs are considered together because benefits arise mainly from reductions in costs rather than being direct benefits. However, the benefits of improved safety and security in terms of accidents and incidents are not well determined, as described in section 6.2, and are omitted from the calculation. The emphasis is on the changes in costs from Option 1 to Option 2, although the level of costs is of some interest for presenting the costs in context. The CBA relates to the Australian Explosives Code alone and it is assumed that legislation will be consistent with the AEC and consistent across jurisdictions.

The calculations relate to labelling and packaging, plus road and rail transport from door-to-door, including loading and unloading, and any storage, intermodal transfers and transfers between vehicles along the way.

There are different components of changes in costs for suppliers, transporters and regulators of explosives, and these three groups are treated separately. Some costs (such as training) apply only for a short transition period (e.g., a year), while others such as removal of the costs associated with differences in labelling and packaging between AEC 2 and UN 15 have ongoing effects.

Some of these costs depend on the type of explosive, mode of transport, and the transport path within Australia. Where major cost differences can be identified within such cost categories and data are available, calculations are undertaken separately for the different elements.

Ongoing costs are related to the quantities of explosives used, and in some cases with unit costs changing over time. Growth in explosives has to be allowed for in the calculations, but there are likely to be different growth paths over time for different sectors. We use the broad categories of blasting, pyrotechnics and ammunition/munitions, with default annual growth rates of 8% (advised by AEISG), 0% and 2%<sup>15</sup> respectively. Blasting is dominated by mining, but it also includes quarrying and construction. The zero growth rate for pyrotechnics is a judgement based on increasing restrictions on private use of fireworks, but an apparent increase in the number of public displays.

Table 6–1 summarises the anticipated types of costs and benefits of Option 2 relative to Option 1 for regulators, suppliers and transport operators. It also indicates whether the changes occur only once when the revised AEC is introduced, or whether there are continuing changes every year. Nearly all the increases in costs are for one year only, and nearly all the net benefits continue year after year.

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<sup>15</sup> Real output of public administration (and defence) in Access Economics, *Business Outlook*, March 2008.

**TABLE 6–1: CHANGES IN COSTS AND BENEFITS FOR OPTION 2 COMPARED WITH OPTION 1**

<i>Regulators</i>	<i>Suppliers</i>	<i>Transport</i>
<b>COSTS</b>		
Develop national code (1)	Training (1)	Training (1)
Print AEC 3 (1)	Relabel local goods (1)	Extra placards (1)
Amend legislation (1)	Prepare single documentation (1)	Extra communications (1)
Training (1)	Portable tanks (1)	Precautions for overnight stops (1)
	EXPLOSIVES labels on imports (2)	Increased insurance (2)
<b>BENEFITS</b>		
Less processing exemptions (2)	Less applying for exemptions (2)	Internal storage of pallet jacks (2)
Less work on classification (2)	Less relabelling overseas (2)	Single documentation (2)
Less confusion, more safety (2)	Less relabel imports (2)	Mixed loads with blast barrier (2)
	Less confusion, more safety (2)	Increased safety (2)
		Increased security (2)

Note: (1) denotes a one-off change over about one year; (2) denotes continuing change every year.

Most of the changes arise from changes in the AEC. However, carriage of certain mixed loads (provided there is a blast barrier) is already allowed for in AEC 2, and the benefits arise from the assumption that the situation in South Australia will return to this practice. It is assumed that all jurisdictions will adopt the revised AEC, including internal storage of pallet jacks, and have no restrictions in addition to the code.

The entries ‘less confusion, more safety’, ‘increased safety’ and ‘increased security’ are included in the table for completeness, but are not allowed for in the CBA calculations. The associated costs of extra communications equipment and precautions for overnight stops are included in the CBA.

Training refers to training fees and production lost during training, while familiarisation refers to slower operations and losses in productivity while personnel become accustomed to the revised AEC.

Table 6–1 lists several benefits that arise from aligning the classifications in AEC 3 with UN 15. These relate primarily to imports but there are corresponding smaller benefits for exports. At present, explosives imports arriving under the most recent international guidance material, such as the UN Model Regulations, IMDG Code and ICAO TI, are not compatible with AEC 2, although the differences can be waived for up to 5 days while the load is transferred directly to a warehouse for unpacking. There are at present three ways around the problem, all of which create extra costs for importers and/or regulators.

- ❑ Re-label and repackage imports to conform to AEC 2. This is additional work and cost for the importer, as well as the increased risks arising from additional handling.
- ❑ Arrange for overseas suppliers to label and package according to AEC 2. This increases prices of imports.
- ❑ Seek authorisation to import explosives that do not conform to AEC 2. This requires preparation of a submission to the regulator in each relevant jurisdiction, and processing of these applications by regulators. The authorisation may be by means of an ‘exemption’ or by ‘allowing a variation’. It may be for one shipment only, but is typically for several years or even indefinitely.

These additional costs are increasing over time as AEC 2 deviates increasingly from the latest editions of the UN Model Regulations, IMDG Code and ICAO TI. If AEC 3

were aligned with this international guidance material, the current deviations would be eliminated. Further deviations would appear in a few years but, for a particular year, the annual increases in costs under AEC 3 would most likely be smaller than those if AEC 2 continued to apply, because of the greatly improved alignment of AEC 3 with the international guidance material.

### **6.3.1 DATA FOR OPTION 2 COMPARED WITH OPTION 1**

Information about the changes in costs of moving from Option 1 to Option 2 cannot be derived from ABS data. It can be obtained only from the explosives industry, transporters and regulators. The objective is to obtain totals for Australia. Industry associations do not have this information and it is necessary to estimate Australian totals by extrapolating results obtained from individual firms and jurisdictions. There tend to be just a few major players in most sectors, so that the emphasis is on obtaining responses from these.

In order to add results across different explosives sectors and the categories used in Table 6–1, and to guard against the possibility of incomplete data in some sectors, it is desirable to have independent estimates of the relative sizes of the sectors and categories.

The initial source of data was responses to questions in AFER's Consultation RIS. In addition to general questions about the overall impacts and costs of adopting AEC 3, this sought cost information about training and familiarisation, security provisions, intermodal documentation, introduction of portable tanks, changes to placards on vehicles, labelling to include net explosive quantity, and storage of manual handling equipment (pallet jacks). Although quantitative responses were minimal, qualitative responses indicated the insignificance of some of the proposed changes and associated costs to industry.

Firms indicated that changes in costs were likely to be small, but were reluctant to estimate costs for individual components of cost changes, as listed above, and to distinguish between the major items of relabelling and retraining.

Access Economics obtained additional information through telephone discussions with key firms and supplementary email questions addressed to regulators and major players in the various parts of the industry. These discussions and questions addressed costs associated with introduction of the draft AEC, costs associated with AEC 2 that would be removed by alignment with the most recent editions of international guidance material such as the UN Model Regulations, IMDG Code and ICAO TI, costs that would be removed if legislation in all jurisdictions corresponded to the revised AEC, and background information about the size of the firm's activities. The focus of the discussions and questions varied across sectors and changed over time as more was discovered about the industry.

It is inevitable that most estimates of changes in costs will not be precise. This applies to estimates by firms and regulators provided in both submissions and subsequently, and extrapolations to national totals. However, the various estimates and qualitative comments are useful for establishing which changes in costs are dominant and which are very small.

Questions and responses were based on the March 2008 draft AEC 3. Access Economics made additional inquiries to take account of the subsequent changes to AEC 3 that were described in section 5.4.

### **COSTS TO REGULATORS**

The cost of development of the AEC is ignored in the calculations. The estimated cost for printing 500 copies of AEC 3 is expected to be about \$20,000.

Regulators considered that the cost of changes to legislation would be minimal, especially for those jurisdictions that refer to the AEC without specifying which edition. Discussion with Safework, South Australia revealed that the current South Australian legislation does not refer to the AEC, although much of its content is similar to the draft AEC 3. It refers to the IMDG Code (and hence indirectly to UN 15) in relation to the technical aspects of classification, packing, labelling, including package types, for explosives. It anticipates that it will reference AEC 3 when it is published. South Australian legislation for the transport of explosives is currently under review.

Responses to supplementary questions indicated that additional training for explosives inspectors and policy staff would cost about \$100,000, although the estimate per person varied considerably between jurisdictions. The response by Safework, South Australia referred to specific training for AEC 3. Some other jurisdictions felt that training for AEC 3 could be incorporated into general training. No information was received about additional training costs for emergency services and this was assumed to be another \$100,000.

### **COSTS TO SUPPLIERS**

Few responses have been received from suppliers of explosives. These responses together with discussions with industry suggest that total one-off costs for suppliers are about \$400,000. Costs associated with new multi-modal documentation and storage tanks are negligible. One-off costs are shared across training and familiarisation, one-off changes to labelling, and signage for vehicles.

Packages of explosives are now to be marked with the NEQ or number of items. No estimates of additional costs were received, although this was mentioned as an issue in some fireworks submissions. Additionally, where the Class label displayed on packaged explosives does not include the word EXPLOSIVES then a separate label depicting the word EXPLOSIVES will also need to be displayed on the outer packaging. An additional cost of \$25,000 a year has been assumed.

Suppliers to the Commonwealth Department of Defence adhere to the AEC and regulations in jurisdictions (unless otherwise necessary), even though Defence is exempted in some jurisdictions. The security provisions introduced additional costs when they were introduced, but there is no difference in cost to the military between Option 2 and Option 1.

### **COSTS TO TRANSPORT OPERATORS**

Most extra costs for transport operators are proportional to the numbers of drivers and vehicles. It is assumed that there are around 1,000 vehicles registered for transport of explosives.

It is assumed that one-off training costs would be around \$100,000, which corresponds to \$100 per vehicle. This result is based on just one quantitative response from a transport firm and qualitative results from others. The figure could be lower because manufacturers provide some training for transport operators.

Where the placard displayed on a freight container does not include the word EXPLOSIVES then a separate placard depicting the word EXPLOSIVES will also need to be displayed. Given this requirement, the additional cost of placards on freight containers is uncertain. Some of the costs of placards and training are borne by suppliers. The RIS for ADG 7 found that the cost of placards was \$430 per road vehicle<sup>16</sup>. Additional one-off costs to transport operators for placards are assumed to be \$100,000. It is noted that under the AEC there would be no need to change placards at borders.

For high risk loads (explosives in Category 3, as defined in Table 2.1 of AEC 3), where there is no attendant, the driver is to be provided with a means of radio communication (e.g., portable UHF radio) that can be operated independently, away from the vehicle in the case of an emergency (8.4.4(3)). The cost is about \$80 per vehicle. If one third of explosives vehicles are used for Category 3 loads, the total cost would be around \$27,000, although some vehicles may have such equipment already.

Precautions have been introduced for overnight stops of vehicles with low risk loads (Category 1, as defined in Table 2.1 of AEC 3) (8.2.18). This might apply to vehicles carrying small loads of blasting explosives or fireworks. One of the options is to fit an alarm to the vehicle. No cost information was received, but for 200 vehicles at \$150 per vehicle the cost might be around \$30,000.

No changes in transport costs are expected for deliveries to the Department of Defence. All military explosives transported by road have an accompanying vehicle, whether the load is carried by the military or a private contractor. The military carries some loads on its own vehicles, but most are carried by private contractors by road. A very small amount is carried by rail.

The increased minimum levels of insurance of \$2.5 million per event for Category 2 loads and \$5 million per event for Category 3 loads were not mentioned in submissions. This suggests that increases in insurance premiums are not a major issue. It is understood that suppliers with major loads already have large insurance cover. Safework, South Australia indicated, in response to supplementary questions, that increases would be restricted to about 55 vehicles at a total cost of \$8,000 to \$14,000. Recognising that insurance is national, extrapolation to other jurisdictions suggests that the total increase in insurance premiums, summed across all explosives, might be about \$50,000 a year.

## **BENEFITS TO REGULATORS AND SUPPLIERS**

Benefits to regulators and suppliers arise because additional costs associated with the import and export of explosives are eliminated by the alignment of AEC 3 with UN 15. As described above, three different methods are used to overcome the current inconsistencies between legal requirements for international and national loads.

- The explosives industry currently pays overseas suppliers around \$400,000 each year to vary their labelling and packaging to satisfy AEC 2.
- Around \$200,000 is spent relabelling and repackaging imports to satisfy AEC 2.

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<sup>16</sup> National Transport Commission, Development of the 7<sup>th</sup> Edition of the Australian Dangerous Goods Code, Draft RIS, November 2006.

- Additional expenditure on applications by industry to regulators for admission of non-compliant imports, together with processing by regulators, is around another \$100,000 each year.

The Commonwealth Department of Defence indicated that Option 2 would have no effect on costs for military purposes. The types of explosives used do not require re-classification, relabelling or repackaging. However, domestic suppliers of munitions to Defence currently incur some of the above costs on imports of munitions and on imports used in the manufacture of munitions. These costs are currently passed on to Defence, so that Defence would benefit in a small way from alignment of AEC 3 with UN 15.

### **BENEFITS TO TRANSPORT OPERATIONS**

Participants indicated that there would be a benefit from a single document for all modes of transport, but the benefit would be small.

Deliveries of explosives for blasting purposes are often a mix of different types of explosives. Mixed loads are permitted under restrictions specified in 7.3.2, including the use of an appropriate wall (commonly known as a 'blast barrier') to separate incompatible explosives. Current South Australian practice does not allow the use of blast barriers so that separate vehicles must be used for the transport of detonators. This applies to deliveries within the state and also to loads in transit through the state. The cost of an additional vehicle is about \$5,000 per load for deliveries within the state, and the additional cost of diverting a vehicle to avoid passing through South Australia is about the same. A road transport operator estimate of the total additional cost, which is passed on to the supplier, is in excess of \$1 million a year. The supplier estimate is around \$600,000. We will use the supplier estimate.

Amendments to the AEC to allow internal storage of pallet jacks are interpreted as the removal of a possible cost rather than an actual cost. No cost information was received from transport operators on this matter and it was not included in the calculations.

In addition, to put the changes in transport costs in perspective, total transport costs for explosives, excluding AN, are estimated to be around \$50 million per year, based on estimates received from suppliers, transporters and Defence. Thus a cost saving of \$600,000 per year corresponds to 1.2% of transport costs.

### **6.3.2 NET BENEFIT OF OPTION 2 RELATIVE TO OPTION 1**

The following calculations relate to the measurable net financial benefits of Option 2 relative to Option 1. They exclude the benefits of improved safety and security.

It is assumed that AEC 3 will be implemented early in 2009 with one-off transitional costs incurred during that year. Changes in total costs and total benefits are estimated annually from calendar year 2009 out to calendar year 2018 for Option 2 relative to Option 1 (BAU). Option 2 is proposed changes to AEC 2 to reflect UN 15, ADG 7, the IMDG Code, the security addendum and security provisions for SSAN. BAU means AEC 2 plus the existing security addendum, existing security provisions and existing legislation in jurisdictions. All values are expressed in real terms (i.e., in calendar year 2008 dollars) so as to avoid the need to estimate changes in prices. The NPV is then the sum of values each year over the forecast horizon, using a real annual discount rate of 3%.

Referring to section 6.3.1, the one-off costs of Option 2 are around \$220,000 for regulators, around \$400,000 for suppliers (training and new labels), and around \$257,000 for transport operators, giving total one-off costs of about \$877,000 in 2009.

Ongoing costs of Option 2 relative to Option 1 are about \$75,000 a year for insurance and marking of packages, although only \$37,500 for the second half of 2009.

The benefits of Option 2 relative to Option 1 for classification, labelling and packaging are spread across regulators and the industry. The ongoing costs of Option 1 increase as AEC 2 deviates more from UN 15 over time. Option 2 has a benefit in the second half of 2009 of about \$350,000 by eliminating the difference between AEC 2 and UN 15. However, AEC 3 will deviate from UN 15 over time as the UN Model Regulations are updated. The benefit in each future year (excluding any growth in the explosives sector) is about \$700,000. The future benefits might be even more if the slope of the cost of deviation curve increases over time, as expected, but we have received no evidence of this.

The benefit of Option 2 relative to Option 1 for transport is around \$600,000 a year, arising from the use of mixed loads when carrying explosives for blasting, but \$300,000 for the second half of 2009.

For the purposes of the calculation it is assumed that all one-off costs are incurred in 2009 and that changes to ongoing costs and benefits apply for half of 2009 and commence in full in 2010. For the ongoing costs and benefits it is necessary to allow for changes in the quantity of explosives over time. The ongoing costs (of insurance and marking NEQ on packages) relate primarily to fireworks, where it is assumed that there is zero growth.

The ongoing benefits relate primarily to explosives for blasting which, according to AEISG, have an assumed annual growth rate of 8%. We have received no benefits information for fireworks. Benefits for munitions are small. We have received no information about ammunition, but its contribution is expected to be small. Some ammunition is included in munitions, while the 'shooters' component is expected to be small.

Table 6–2 summarises the calculations of one-off costs, ongoing costs and ongoing benefits from 2009 to 2018. All one-off cost changes (such as training) are combined into one value. The term *classification*, used in relation to benefits, is used to denote all the cost reductions associated with classification, labelling and packaging. It is considered separately for blasting explosives and fireworks. While there are no quantitative data for other types of explosives, it is believed that the cost reductions are relatively smaller. Reductions in transport costs for blasting explosives are dominated by the assumed relaxation of restrictions on mixed loads.

Table 6–2 also contains the total quantity of explosives supplied each year (measured conceptually in tonnes), relative to the base year. Assuming that the import share of each type of explosive remains the same each year, it is a measure of the quantity of imports. It is also a measure of the explosives transport task. Because of lack of information about costs and benefits for other types of explosives, quantity changes are presented only for blasting and fireworks.

**TABLE 6–2: CHANGES IN COSTS AND BENEFITS OF OPTION 2 RELATIVE TO OPTION 1, 2009 TO 2018 (2008\$ MILLION)**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	NPV
	1	2	3	4	5	6	7	8	9	10	
<b>Quantity relative to 100 in 2009</b>											
Blasting	100	108	117	126	136	147	159	171	185	200	
Fireworks	100	100	100	100	100	100	100	100	100	100	
<b>Ongoing benefits (\$m)</b>											
classification (blasting)	0.35	0.76	0.82	0.88	0.95	1.03	1.11	1.20	1.30	1.40	
mixed loads (blasting)	0.30	0.65	0.70	0.76	0.82	0.88	0.95	1.03	1.11	1.20	
<b>Costs (\$m)</b>											
One-off - training etc	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ongoing - insurance and NEQ	0.04	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
<b>Net benefit (\$m)</b>	<b>-0.3</b>	<b>1.3</b>	<b>1.4</b>	<b>1.6</b>	<b>1.7</b>	<b>1.8</b>	<b>2.0</b>	<b>2.2</b>	<b>2.3</b>	<b>2.5</b>	
<b>Discounted net benefit (\$m)</b>	<b>-0.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.4</b>	<b>1.5</b>	<b>1.5</b>	<b>1.6</b>	<b>1.7</b>	<b>1.8</b>	<b>1.9</b>	<b>13.7</b>

Source: Access Economics, based on AFER questions, and additional questions and discussions with industry and regulators.

Notes: Except for the final row, annual values along each row have not been discounted. Classification denotes classification, labelling and packaging.

Estimated benefits in 2009 nearly offset the estimated one-off costs. Thereafter, the discounted net benefit climbs steadily from \$1.3 million in 2010 to \$1.9 million in 2018. The NPV from 2009 to 2018 is \$13.7 million, measured in 2008 dollars.

These results have been obtained using a combination of reliable data and estimates based on assumptions. The reliable data place lower limits on ongoing benefits, which clearly exceed the ongoing costs. The largest uncertainties are in the one-off costs, but even the maximum values for costs would be offset by ongoing benefits within a few years.

The analysis is based primarily on results for blasting explosives. The Department of Defence indicates that the revised AEC will impose no additional costs on munitions. There is little quantitative or qualitative data for fireworks, other pyrotechnics (including safety flares) or ammunition, although some ammunition and pyrotechnics are included in munitions. These sectors with little data are relatively small compared with blasting explosives and munitions, and cannot change the overall picture.

A major assumption has been that legislation and practice in all jurisdictions is consistent with the AEC. This accounts for transport benefits with a NPV of \$7.0 million for mixed loads of blasting explosives. Even without this assumption the NPV of Option 2 compared with Option 1 is \$6.7 million.

### 6.3.3 SENSITIVITY ANALYSIS FOR OPTION 2 COMPARED WITH OPTION 1

Uncertainties in the data underlying the results in Table 6–2 result in a range of NPV under alternative assumptions. Rather than examine every component of costs and benefits separately, the analysis is restricted to total one-off costs, total ongoing costs, ongoing benefits from mixed loads, total other ongoing benefits, and the real discount rate. An important underlying assumption is the growth in the use of blasting explosives.

The upper and lower values of costs and benefits are summarised in Table 6–3, together with the corresponding NPVs for 2009 to 2018 obtained by varying just one parameter at a time. The lower values of costs and benefits are based on fairly reliable data supplied by industry and are in most cases not much less than the conservative best estimates. The upper values are considerably higher, corresponding to the possibility of additional values from sectors where we had no data or little data.

The OBPR recommends use of a real discount rate of 7% with sensitivity testing for 3% and 11%<sup>17</sup>. Access Economics uses 3% for its OASCC studies, and in this report examines also 2% and 7%.

**TABLE 6-3: RANGES OF PARAMETER VALUES AND CORRESPONDING NPVs**

<i>parameter</i>	<i>lower value</i>	<i>best estimate</i>	<i>upper value</i>	<i>NPV for lower value \$m</i>	<i>NPV for best estimate \$m</i>	<i>NPV for upper value \$m</i>
annual growth in blasting explosives	AE	8%	10%	11.0	13.7	15.2
one-off costs (\$m)	0.40	0.88	1.50	14.1	13.7	13.1
ongoing costs/year (\$m)	0.04	0.08	0.30	14.0	13.7	11.9
ongoing benefits/y (mixed loads) (\$m)	0.00	0.60	1.50	6.7	13.7	24.2
ongoing benefits/y (other) (\$m)	0.60	0.70	1.50	12.5	13.7	23.0
real discount rate (%)	2%	3%	7%	14.6	13.7	10.8

Source: Access Economics, using data summarised in sections 6.3.1 and 6.3.2.

AE denotes Access Economics growth projections for the mining sector of 7.0% in 2010, 4.0% in 2011 and 2.7% in most other years<sup>18</sup>.

The benchmark for comparisons is the NPV of \$13.7 million obtained using best estimates for all parameters. The largest decrease in NPV (\$7.0 million) occurs where there is no ongoing benefit for mixed loads, i.e., where mixed loads are not carried in South Australia. The next largest decreases in NPV are \$2.9 million for a real discount rate of 7%, and \$2.7 million for using Access Economics growth data for the mining sector rather than the AEISG estimate of 8% a year indefinitely.

In the worst possible case, which combines the low AE growth rate with maximum costs, minimum benefits and a high discount rate, the NPV is \$1.3 million, consisting of a net cost of \$1.3 million in 2009 and net benefits of \$0.3 million in succeeding years.

In the unlikely case that the high growth rate combines with minimum costs and maximum benefits, the NPV is \$37.7 million, rather than \$35.7 million obtained by adding together the results for the individual changes. If mixed loads are not allowed, this best case NPV falls to \$18.5 million.

## 6.4 OPTION 4 COMPARED WITH OPTION 2

Options 4 and 2 are very similar. Rather than compare Option 4 with Option 1, it is simpler and more meaningful to compare Option 4 with Option 2.

Option 4 differs from Option 2 only in that AEC 3 would have the structure, format, definitions and concepts of UN 15 rather than AEC 2. This would improve the alignment of AEC with UN and the ADG Code, which would further reduce confusions that might arise from mappings of classifications from UN to AEC. It would also simplify the procedure for making future adjustments to the AEC. Differences between Option 4 and Option 2 would be restricted to the technical aspects of the classification, labelling and packaging of explosives. Options 4 and 2 would be identical in matters of transport and security that were specific to Australia.

<sup>17</sup> OBPR, *Best Practice Regulation Handbook*, August 2007, p. 120.

<sup>18</sup> Access Economics, *Business Outlook*, March 2008.

It is estimated that there would be a further delay of one to two years in adopting Option 4 compared with adopting Option 2. There would be a one-off additional cost of around \$0.8 million for re-writing the AEC, assumed to commence in 2009 and be completed part way through 2010. The major restructuring of the AEC would require far more training and familiarisation than the amount of around \$500,000 for Option 2. There was corresponding restructuring of the code for ADG 7 and the ADG 7 RIS found that the cost of training would be \$13.8 million spread over two years<sup>19</sup>. It is difficult to translate this into an estimate for explosives. It is assumed that training and familiarisation costs for Option 4 are around \$3 million, and spread equally over 2010 and 2011. The remaining one-off costs for placards etc. are incurred in 2010. It is assumed that the ongoing costs and benefits are the same as for Option 2, but do not commence until 2011.

Table 6–4 for the costs and benefits of Option 4 relative to Option 1 is similar to Table 6–2 for Option 2 relative to Option 1, but allows for the additional one-off costs in 2010 and 2011, and the delays in realising ongoing benefits. The results for calendar year 2012 onwards are identical to those for Option 2 relative to Option 1, but the differences in the early years mean that the NPV for Option 4 of \$8.9 million is \$4.9 million less than for Option 2.

**TABLE 6–4: CHANGES IN COSTS AND BENEFITS OF OPTION 4 RELATIVE TO OPTION 1, 2009 TO 2018 (2008\$ MILLION)**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	NPV
	1	2	3	4	5	6	7	8	9	10	
<b>Quantity relative to 100 in 2009</b>											
Blasting	100	108	117	126	136	147	159	171	185	200	
Fireworks	100	100	100	100	100	100	100	100	100	100	
<b>Ongoing benefits (\$m)</b>											
classification (blasting)			0.82	0.88	0.95	1.03	1.11	1.20	1.30	1.40	
mixed loads (blasting)			0.70	0.76	0.82	0.88	0.95	1.03	1.11	1.20	
<b>Costs (\$m)</b>											
One-off - revise AEC	0.53	0.27									
One-off - training			1.50								
One-off - other costs		0.27									
Ongoing - insurance and NEQ			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
<b>Net benefit (\$m)</b>	<b>-0.5</b>	<b>-2.0</b>	<b>-0.1</b>	<b>1.6</b>	<b>1.7</b>	<b>1.8</b>	<b>2.0</b>	<b>2.2</b>	<b>2.3</b>	<b>2.5</b>	
<b>Discounted net benefit (\$m)</b>	<b>-0.5</b>	<b>-1.9</b>	<b>-0.1</b>	<b>1.4</b>	<b>1.5</b>	<b>1.5</b>	<b>1.6</b>	<b>1.7</b>	<b>1.8</b>	<b>1.9</b>	<b>8.9</b>

Source: Access Economics, using Table 6–2 and assumptions summarised above.

The major differences between Option 4 and Option 2 arise in the possibility of lower costs of labelling and packaging in Option 4 because the classification of explosives would be better aligned with the UN Model Regulations. This is not shown in Table 6-4 because we have no data. Nevertheless, it is expected that the NPVs of Options 2 and 4 out to 2018 would be much the same.

Option 4 would have long term benefits relative to Option 2 in that the AEC would be easier to update in the future. It might even be practical to update the AEC every time the UN Model Regulations were updated, and the benefits of this would be greater if the ADG Code was updated at the same time. Another long term benefit would be a reduction in confusion between AEC, UN and ADG, and hence increased efficiency and safety. Option 4 would be an investment with future net benefits.

<sup>19</sup> National Transport Commission, Development of the 7<sup>th</sup> Edition of the Australian Dangerous Goods Code, Draft RIS, November 2006.

In summary, Option 4 would have a larger start-up cost than Option 2 and take longer to implement. It is likely to have the same net benefits as Option 2 in the medium term, and larger net benefits in the longer term.

## **6.5 SUMMARY IMPACT ASSESSMENT**

The quantifiable costs and benefits have been estimated using CBA analysis. This shows that Options 2 and 4 have net benefits relative to Option 1. The NPV of Option 2 relative to Option 1 is \$13.7 million, but only \$6.7 million if mixed loads are not carried in South Australia. Sensitivity analysis shows that the NPV is always positive, even for the most unfavourable case of a low growth rate and minimum benefits combined with maximum costs.

The NPV of Option 4 relative to Option 1 is \$8.9 million. The lower value than for Option 2 relative to Option 1 arises from delays in implementation and greater start-up costs. Benefits from better alignment with UN classifications have not been allowed for, but are likely to increase the NPV.

These results show that Option 2 has a higher NPV than Option 4, but the difference is likely to be small when allowance is made for the better alignment of Option 4 with UN classifications.

The safety and security benefits of Options 2 and 4 relative to Option 1 can be assessed only qualitatively, using risk analysis. They have net benefits which are essentially the same, although the better alignment of Option 4 with UN classifications means that it has the potential for less confusion and hence greater safety.

For both Option 2 and Option 4 relative to Option 1, the CBA shows net quantitative benefits and the risk analysis for safety and security benefits shows qualitative benefits, so that the total benefits must be positive. This means that an update of the AEC is warranted. However, within the uncertainties in the estimates underlying the analysis, Options 2 and 4 must be ranked equally in terms of net benefits out to 2018. Option 2 has the advantage of being implemented sooner, but the benefit of Option 4 relative to Option 2 would increase gradually over time.

The quantifiable net benefits relate primarily to the explosives industry and transport, with smaller benefits for the regulators. The unmeasured benefits of improved safety and security relate to the whole community, including some contributions to the explosives industry, transport and regulators.

## 7. CONCLUSION AND EVALUATION

AEC 2, the current edition of the Australian Code for the Transport of Explosives by Road and Rail, was published in March 2000, and is now four editions behind the UN Model Regulations for the classification, labelling, packaging and land transport of dangerous goods (UN 15). AEC 2 has also fallen behind the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG 7), and is five editions behind the current International Maritime Dangerous Goods Code. There is also a need to review the current security provisions for explosives contained in the AEC.

It is very important that consistency between international and domestic guidance material - and those of intermodal transport guidance material - be maintained, as out of date classifications could compromise safety by not taking account of new knowledge regarding the dangers of explosives. In addition to this, inconsistencies between guidance material could create confusion in the handling of explosives. In recent years, there has also been an added emphasis on domestic security arrangements for the land transport of explosives.

AFER has considered five options for revising the AEC:

- Option 1: Retain the Status Quo.
- Option 2: Minimal change to reflect the content of UN 15 but retaining the existing AEC 2 structure, format and concepts, together with updating the current security provisions.
- Option 3: Minimal change, as for Option 2, with self regulation by industry.
- Option 4: Revise the AEC to align with the content and structure of ADG 7 and UN 15 to the extent possible.
- Option 5: Fully and directly adopt the UN Model Regulations, together with a set of domestic requirements.

The self regulatory approach of Option 3 is not consistent with the COAG principles for security provisions for SSAN, or the security addendum for explosives (see section 4.3). Option 5 is not a practical solution and is also unlikely to be supported by the Australian Government. The complex nature of this solution may result in potential confusion and reference to international standards that do not apply in Australia (see section 4.5).

Impact assessments of Options 2 and 4 relative to Option 1 were made in section 6. An important assumption was that jurisdictions would align their explosives legislation with the AEC, without any additional restrictions, so that legislation would be consistent throughout Australia.

CBA was used for those items where there were quantitative estimates of costs and benefits. This applied to the compliance costs and to one-off costs of training, and to the ongoing benefits (or cost savings) to the industry and regulators. Only qualitative assessments were available for the benefits of safety and security, but it was clear that Options 2 and 4 would be improvements on Option 1.

The CBA for Option 2 compared with Option 1 produced a NPV from 2009 to 2018 of \$13.7 million. Even without the assumption about uniformity of legislation across Australia, which affects carriage of mixed loads of explosives, the NPV was \$6.7

million. Sensitivity analysis showed that the NPV was always positive, even for the most unfavourable case of a low growth rate for explosives and minimum benefits combined with maximum costs.

Option 4 is similar to Option 2 except for a delay of one to two years in implementation and additional costs for developing the AEC and then training. These factors produced a lower CBA for Option 4 compared with Option 1 of \$8.9 million.

For both Option 2 and Option 4 relative to Option 1, the CBA shows net quantitative benefits, and the risk analysis for safety and security benefits shows qualitative benefits, so that the total benefits are positive. This means that an update of the AEC is warranted.

Although the impact analysis shows a higher NPV for Option 2 than Option 4, other factors have to be considered. The closer alignment of the AEC under Option 4 with UN 15 means that future revisions to the UN Model Regulations would be easier and less costly to accommodate and that there would be less confusion, less likelihood of errors and hence greater safety. Given these considerations, and the uncertainties in the estimates underlying the analysis, Options 2 and 4 must be ranked equally in terms of net benefits out to 2018. Option 2 has the advantage of being implemented sooner, but the benefit of Option 4 relative to Option 2 would increase gradually over time.

AFER made a decision to pursue Option 2 because revisions to the AEC could be produced and implemented within a relatively short time frame with minimum retraining costs. The short time frame was considered to be very important, given the additional efforts and costs caused by the increasing divergence between AEC 2 and other guidance material. Bringing the AEC up to date gives all jurisdictions the opportunity to align with it, even if there are minor differences. Another consideration was that AEC 2 was so far out of date that there was a danger that it might be ignored, and then it would be more difficult to reinstate.

Option 4 is an extensive rewrite of the AEC using the structure of UN 15, as was used to update ADG 6 to ADG 7 in 2007. It is understood that there are difficulties with the acceptance of ADG 7, partly because it is so different. Option 4 would deliver a better product than Option 2 in the long run, but it may be premature to change the structure of the AEC to be the same as the UN 15 structure at present, before sufficient time has elapsed to fully assess the impact on business of the recently introduced ADG 7

The impact assessment supports the AFER decision to use Option 2.

## **8. IMPLEMENTATION AND REVIEW**

### **8.1 IMPLEMENTATION**

It is proposed that the third edition of the AEC be adopted by the Australian, state and territory governments. An implementation period can be agreed on at the time of declaration by the WRMC.

Adoption of AEC 3 will be achieved through existing legislative frameworks in all states and territories. Individual jurisdictions can choose to incorporate the AEC into their own regulatory framework or to use the AEC as a model for jurisdictional guidance material.

Adoption of AEC 3 will require coordinated action on the part of all parties involved. It is expected that the AFER, the WRMC and jurisdictions will continue to work together, along with industry bodies, to ensure the AEC 3 is understood and appropriately used.

### **8.2 REVIEW**

According to Principle 6 in COAG Best Practice Regulation<sup>20</sup>, the AEC should be reviewed periodically. AEC 2 was released in 2000 and the UN Model Regulations and IMDG Code have diverged from it over the past 8 years. Given the extensive changes to be made to AEC 2, the current review, which was put on the agenda in 2006, was probably overdue. Similar divergences are likely in future years, and it is envisaged that AFER members will discuss the timing of future reviews.

As part of a future review, consideration could be given to using Option 4 in which the AEC is restructured along the lines of the UN Model Regulations. This would have two advantages. It would enable changes to be made to the AEC every time the UN Model Regulations were updated, every two years, by a relatively simple process. It would also make it easier to incorporate the AEC into the ADG Code, if it were decided to take this approach.

There are two matters relating to explosives that are outside the scope of this RIS that may be considered by AFER for future reviews, well before the next reviews of the AEC and the ADG Code. Consideration might be given to the incorporation of explosives into the ADG Code. Consideration might also be given to the means of harmonising explosives legislation between jurisdictions, especially in relation to transport.

### **8.3 LOOKING FORWARD**

The RIS has encountered two matters relating to explosives that are outside the scope of the RIS but might be considered in the near future.

#### **8.3.1 INCORPORATION OF AEC INTO THE ADG**

The UN Model Regulations, to which the AEC is aligned, embrace all dangerous goods including explosives. From the perspective of updating the AEC and maintaining

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<sup>20</sup> COAG, *Best Practice Regulation, A guide for national councils and national standard setting bodies*, October 2007

consistency between all codes and guidance material, there would thus be benefits in developing a single Australian code that covered both explosives and all other dangerous goods. This possibility was raised in the RIS for ADG 7<sup>21</sup>. AFER is certainly aware of this matter, but its first priority has been to update the AEC. Consideration of Option 4 would be an important ingredient in such an amalgamation. A combined code would then lead to the possibility of updating the Australian code every time the UN Model Regulations were updated, which is currently every two years. The PC advised against combining AEC with the ADG Code before differences in explosives legislation between jurisdictions were resolved (see PC draft recommendation below).

### **8.3.2 UNIFORM LEGISLATION FOR EXPLOSIVES ACROSS JURISDICTIONS**

AEC is a national code, formulated by Commonwealth and state regulators, but without corresponding national legislation. Legislation is determined separately by each jurisdiction (see Attachment A). While legislation in each jurisdiction generally embraces the AEC with regard to classification, labelling and packaging, jurisdictions deviate from the AEC in differing ways for some details, especially for transport.

Differences in explosives legislation between jurisdictions are of importance because they increase costs for interstate movements. There are large interstate movements because most explosives are manufactured or landed at just a few places in eastern states, and many of them are used in Western Australia and other states. In order to transport explosives between states, it is necessary to conform to legislation in all relevant jurisdictions. Rather than re-arrange loads at state borders (although placards are changed if necessary), transport operators use procedures that satisfy all legislations that apply to the trip.

Many of the submissions received in response to the Consultation RIS raised the matter of differences in legislation between jurisdictions, even though it was outside the scope of this RIS. It is clearly a major issue for the explosives industry. This was also reflected in the findings and recommendations of the PC draft research report on Chemicals and Plastics Regulation<sup>22</sup>.

The PC noted that important differences in jurisdictional regulation of explosives transport are imposing unnecessary costs on industry (p. 192) and recommended that the AEC update be expanded to address these differences. In this context, the PC report also discusses the role of model (national) regulations accompanying ADG 7 (pp. 184-187).

#### **DRAFT RECOMMENDATION 7.3**

The current review of the Australian Explosives Code by the Australian Forum of Explosives Regulators (AFER) should be completed as expeditiously as possible to produce uniform regulations that are adopted and consistently applied by all jurisdictions.

The AFER should then immediately undertake a review of jurisdictional legislation and regulations for explosives transport, with the aim of achieving nationally consistent legislation and regulations to complement the uniformly adopted technical code. Any technical code issues not adequately resolved in the current review of the Australian Explosives Code (AEC3), should also be considered. (p.194)

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<sup>21</sup> National Transport Commission, Development of the 7<sup>th</sup> Edition of the Australian Dangerous Goods Code, Draft Regulatory Impact Statement, November 2006, Recommendations 8.2 and 8.3.

<sup>22</sup> Productivity Commission 2008, *Chemicals and Plastics Regulation*, Research Report, Melbourne.

## Regulatory Impact Statement: Transport of Explosives

The PC also examined the regulation of AN and found that differences between jurisdictions in the implementation of security provisions for AN were imposing unnecessary administration and compliance burdens (p. 267).

AFER is currently considering the issue of national model explosives legislation in Australia. This includes the transport of explosives.

An additional complication is that licensing for the transport of explosives is required separately in each jurisdiction, with separate fees, and the requirements for transport operators, road vehicles and drivers differ between jurisdictions. Transport operators indicated in discussions that they would prefer either mutual recognition of licensing between jurisdictions or else national licensing for the carriage of explosives.

## ATTACHMENT A – LEGISLATION AND AFER MEMBERS WITH RESPONSIBILITY FOR EXPLOSIVES BY JURISDICTION

Explosives and Related Legislation	AFER members with responsibility for explosives
<b>New South Wales</b>	
<ul style="list-style-type: none"> <li>• <i>Road and Rail Transport (Dangerous Goods) Act 1997</i></li> <li>• <i>Road and Rail Transport (Dangerous Goods) (Rail) Regulation 1999</i></li> <li>• <i>Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998</i></li> <li>• <i>Explosives Act 2003</i></li> <li>• <i>Explosives Regulation 2005</i></li> <li>• <i>Mines Inspection Act 1901</i></li> </ul>	WorkCover, NSW
<b>Victoria</b>	
<ul style="list-style-type: none"> <li>• <i>Dangerous Goods Act 1985</i></li> <li>• <i>Dangerous Goods (Explosives) Regulations 2000</i></li> </ul>	WorkSafe Victoria
<b>Queensland</b>	
<ul style="list-style-type: none"> <li>• <i>Explosives Act 1999</i></li> <li>• <i>Explosives Regulations 2003</i></li> </ul>	Department of Mines and Energy, Queensland

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Attachment A continued

Explosives and Related Legislation	AFER members with responsibility for explosives
<b>Western Australia</b>	
<ul style="list-style-type: none"> <li>• <i>Dangerous Goods Safety Act 2004</i></li> <li>• <i>Dangerous Goods Safety (Explosives) Regulations 2007</i></li> <li>• <i>Dangerous Goods Safety (Security Risk Substances) Regulations 2007</i></li> </ul>	Department of Consumer and Employment Protection, Western Australia
<b>South Australia</b>	
<ul style="list-style-type: none"> <li>• <i>Explosives Act 1936</i></li> <li>• <i>Explosives Regulations 1996</i></li> <li>• <i>Explosives (Fireworks) Regulations 2001</i></li> <li>• <i>Explosives (Security Sensitive Substances) Regulations 2006</i></li> <li>• <i>Occupational Health, Safety and Welfare Act 1986</i></li> <li>• <i>Occupational Health, Safety and Welfare Regulations 1995</i></li> </ul>	Safework, SA
<b>Tasmania</b>	
<ul style="list-style-type: none"> <li>• <i>Dangerous Goods Act 1998</i> — manufacture, transport, storage and sale of dangerous goods, and relevant activities</li> <li>• <i>Dangerous Goods (General) Regulations 1998</i></li> <li>• <i>Dangerous Goods (Road and Rail Transport) Regulations 1998</i></li> <li>• <i>Dangerous Goods (Fees) Regulations 1998</i></li> <li>• <i>Workplace Health and Safety Act 1995</i></li> </ul>	Department of Justice, Tasmania

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Attachment A continued

Explosives and Related Legislation	AFER members with responsibility for explosives
<b>Australian Capital Territory</b>	
<ul style="list-style-type: none"> <li>• <i>Dangerous Substances Act 2004</i></li> <li>• <i>Dangerous Substances (Explosives) Regulation 2004</i></li> <li>• <i>Dangerous Substances (General) Regulation 2004</i></li> <li>• <i>Occupational Health and Safety Act 1989</i></li> </ul>	WorkCover, ACT
<b>Northern Territory</b>	
<ul style="list-style-type: none"> <li>• <i>Dangerous Goods Act</i></li> <li>• <i>Dangerous Goods Regulations</i></li> <li>• <i>Dangerous Goods (Road and Rail Transport) Act</i></li> <li>• <i>Dangerous Goods (Road and Rail Transport) Regulations</i></li> </ul>	NT Worksafe
<b>Commonwealth</b>	
<ul style="list-style-type: none"> <li>• <i>OHS Act 1991</i></li> <li>• <i>OHS (Safety Standards) Regulations 1994 [Part 8 Explosives]</i></li> <li>• <i>Explosives Act 1961</i></li> <li>• <i>Explosives Transport Regulations 2002</i></li> </ul>	Comcare  Defence

## ATTACHMENT B – EXPLOSIVES INDUSTRY DATA

Type of industry	Number of businesses	Annual Turnover	Quantity of explosives used
<b>New South Wales</b>			
Blasting		na	na
Fireworks	320 pyrotechnicians	na	na
Explosives licences	Manufacture 28, import 33, store 133, supply 20, use of SSAN 20 (plus 13 individuals), explosives users 1,791, UHL security clearances 5,480		
Transport	35 licensed transport operators	na	na
<b>Victoria</b>			
Blasting	845 persons licensed to use explosives, 16 mobile processing unit (MPU) licences (one per vehicle)	na	na
Fireworks	230 licensed pyrotechnicians - conducting average 550 displays per year (over last three years) in Vic.	na	na
Transport	23 licensed road transporters of explosives, most with multiple vehicles, one licensed rail transporter.	na	na
<b>Queensland</b>			
Blasting	1000 persons (individuals and companies) licensed to use explosives	In excess of \$1 billion	1 million tonnes per year in Qld
Fireworks	27 licensed contractors employing 151 licensed operators and conducting 2,000 public displays per year in Qld.	\$5 million	150 tonnes per annum
Explosives licences	Import 47, export 16, manufacture 21, manufacture on site 17, MPUs 147, store 233, sell 286, shotfirer 939, use 155  About 25,000 persons in Qld have legal access to explosives.		
Transport	61 licensed transporters of explosives in Qld, 605 vehicles licensed	na	na

Type of industry	Number of businesses	Annual Turnover	Quantity of explosives used
<b>Western Australia</b>			
Blasting	2500 persons licensed to use explosives	\$1 billion	1 million tonnes per year
Fireworks	15 licensed contractors employing 75 licensed operators - conducting 180 public displays per year in WA. Four contractors import fireworks from overseas.	\$10 million	20 tonnes gross
Transport	20 licensed transporters of explosives in WA each with numerous vehicles - 300 explosive vehicle licences and 200 Mobile Processing Units MPU licences in total (one licence per vehicle).	\$500 million	1 million tonnes (including precursors)
<b>South Australia</b>			
Explosives licences	Factory 2, import 5, magazine 100, mix and use AN 157, premises 181, permits to purchase 225, blasters permit 719, SSAN certificates 237		Imports: 21,000 t AN/ANE (bulk), 1,500 t (packaged)
Fireworks	Pyrotechnician's licence 45	na	Imports 4.5 t
<b>Tasmania</b>			
Blasting	80-90 Businesses, 10 MPUs	na	8,000 tonnes, imports: 6,000 t AN/ANE, 200 t packaged
Pyrotechnics/ Fireworks	1 dominant fireworks operator 2 regular importers, exporters and retailers who sell fireworks. Several interstate contractors	\$5-10 million	na
Explosives licences	450 shotfirers (mines 250, fireworks 25, other 175), other individuals with access to explosives 50		
Transport	5 transport operators, 30 vehicles, 20 drivers licensed for Category 3	na	na
<b>Northern Territory</b>			
Information not received			
<b>Austalian Capital Territory</b>			
Explosives licences	Import 14, shotfirer 6, display operator 13, driver 1 (but licences in other jurisdictions are recognised)		