



# **ATTACHMENT 10.102 AA5 RISK MANAGEMENT APPROACH RESPONSE - RP 0379**

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**ATCO 2020-24 REVISED PLAN**

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# AA5 RISK MANAGEMENT APPROACH REPONSE

## TCO RP 0379

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**GAS DIVISION**

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# 1. INTRODUCTION

## 1.1 Background

The ERA have provided feedback on ATCO's AA5 Security of Supply Project submissions as part of *Economic Regulation Authority, Draft Decision on the Proposed Revisions to the Mid-West and South-West Gas Distribution System Access Arrangement for 2020 to 2024, Submitted by ATCO Gas Australia, 18 April 2019*<sup>[1]</sup>.

The ERA have agreed with the findings related to Security of Supply assessment assumptions put forward by technical consultant EMCa, documented in *EMCa, ATCO Gas Australia Proposed Access Arrangement for the Mid-West and South-West Gas Distribution Systems, Review of Technical Aspects of the Proposed Access Arrangement, March 2019*<sup>[2]</sup>.

EMCa assessed ATCO's Risk Management Framework, and provided their findings on how this has been applied in relation to Security of Supply projects. In EMCa's review of ATCO's AA5 Proposal, EMCa have stated that ATCO's quantitative likelihood descriptors are too conservative (by an order of magnitude) and are not in line with AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management<sup>[3]</sup>.

## 1.2 AA5 Draft Decision Feedback on Risk Management Framework

As part of EMCa's review of ATCO's Risk Management Framework, EMCa stated that they were not provided with any compelling reasons as to why ATCO's alternative risk management measures should be supported.

Relevant extracts from EMCa's report are provided below:

565. It appears that ATCO has 'cherry picked' the definitions from the BSI publication, including a more conservative approach to the assessment of likelihood. We consider that the applicable reference for likelihood class is AS4645.1:2018 Table B2

564. ATCO's descriptions for 'Remote' and Hypothetical' are an order of magnitude more conservative (risk averse) than the AS4645.1:2018 definitions. This is an important factor when ATCO combines the Likelihood class with the 'severity class' to determine the risk rating of events. ATCO advises that it selected the quantitative ranges by referring to a British Standards Institution (BSI) publication<sup>210</sup> in the absence of suitable Australian criteria. We are surprised that ATCO chose to rely on the BSI publication given that:

- the new version of AS4645.1:2018 was published in February 2018, having been available in draft since 2017; and
- ATCO's analysis of customer weeks lost published in April 2018 takes into account AS4645.1:2018, the results of which are relied upon in the same Network sustaining Business Cases as part of its expenditure justification.

580. As we have not seen compelling reasons from ATCO to support its alternative measures, definitions and criteria, we refer to the AS4645.1:2018 measures, definitions and criteria in our AA5 capex assessment.

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### 1.3 Purpose of Document

EMCa's findings in relation to ATCO's risk management approach, in particular frequency classifications, have supported their conclusion that ATCO's proposed Security of Supply expenditure is unlikely to satisfy the capex criteria.

The purpose of this document is to address EMCa's findings, and to provide compelling reasons to support ATCO's alternative measures.

ATCO's frequency classifications, summarised in **Table 1-1**, are included within Section 3.5.8 of the ATCO Gas Australia, Gas Distribution System Safety Case, TCO PL00005, Rev 6, 2017<sup>[15]</sup>.

**Table 1-1 ATCO's Frequency Classifications**

Qualitative Descriptor	Quantitative Value
Frequent	One or more per year ( $\geq 1$ per annum)
Occasional	One per year to one in a hundred years ( $1$ to $10^{-2}$ per annum)
Unlikely	One in a hundred years to one in ten thousand years ( $10^{-2}$ to $10^{-4}$ per annum)
Remote	One in ten thousand to one in a million years ( $10^{-2}$ to $10^{-4}$ per annum)
Hypothetical	Less than one in a million years. ( $<10^{-6}$ per annum)

## 2. ATCO'S QUANTITATIVE RISK APPROACH JUSTIFICATION

A quantitative risk assessment approach was developed in 2017 in order to support ATCO's qualitative risk assessments using suitable quantitative data and methodologies where available.

ATCO sought to develop a methodology that could be adopted across all assets and risk categories to ensure a consistent approach to risk assessment. In order to identify the most suitable approach, the following sources of information were considered:

- Applicable standards containing quantitative guidelines: *AS/NZS 4853:2012 Electrical Hazards on Metallic Pipe*<sup>[4]</sup>, *Draft AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management and Draft AS/NZS 2885.6 Pipelines Gas and Liquid Petroleum – Pipeline Safety Management*<sup>[5]</sup>; and
- Industry good practice.

It should be noted that during the time of the development of ATCO's quantitative methodologies, no quantitative likelihood descriptors were provided within current key applicable Australian Standards, with the exception of *AS/NZS 4853:2012 Electrical Hazards on Metallic Pipelines* which aligns to ATCO's methodology.

Both quantitative recommendations in *AS/NZS 4645.1* and *AS/NZS 2885.6* were in early draft and subject to public consultation periods.

ATCO has applied a quantitative risk approach to the following assessments:

- Security of supply risk assessments (Supply risk for  $\geq 1900$  kPa Maximum Allowable Operating Pressure (MAOP) pipelines);
- AS2885 Safety Management Studies (Safety risk for  $> 1900$  kPa MAOP pipelines);
- Mains Replacement Prioritisation (Safety risk for PVC  $< 700$  kPa MAOP); and
- Step Touch Mitigation Risk Assessments

The following sections provide an overview of sources that were considered when developing ATCO's alternative risk management approach.

### 2.1 AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management

*AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management*, Appendix B – Formal Safety Assessment Process (Normative) provides the requirements for conducting Formal Safety Assessments.

The likelihood classes provided by this standard are summarised in Table 2-1:

**Table 2-1 AS/NZS 4645.1:2018 Likelihood Classes**

Likelihood Class	Likelihood Description
Frequent	Expected to occur once per year or more typically 1 or more times per year
Occasional	May occur occasionally in the life of the gas distribution network typically 0.1 to 0.2 times per annum.

Likelihood Class	Likelihood Description
Unlikely	Unlikely to occur within the life of the gas distribution network, but possible typically 0.01-0.02 times per annum.
Remote	Not anticipated for this gas distribution network at this location, typically $10^{-3}$ to $10^{-5}$ times per annum.
Hypothetical	Theoretically possible but has never occurred on a similar gas distribution network.

While the Appendix is Normative, Clause B1 states:

***“This Appendix includes a set of consequences, likelihood and risk matrices which can be used in the form provided, or adapted to be in accordance with the requirements of the network operator or regulatory authority.”***

ATCO have chosen to adapt the provided likelihoods (as explicitly allowed by the standard) in order to:

- Align with good industry practice;
- Legal requirements; and
- Address significant errors included in the final revision of AS/NZS 4645.1:2018 which make it impossible for any network operator to fully adopt as it is written.

It is clear that AS/NZS 4645.1:2018 Appendix B contains significant gaps, errors and inconsistencies in frequency and consequence descriptors, including:

- Within the Unlikely and Occasional likelihood categories there is no coverage for events which may occur at a frequency between 0.02-0.099 times per annum, or 0.2 to 0.99 times per annum respectively;
- Unclear and inconsistent application of what the likelihood applies to. For example Occasional and Unlikely values apply within the “life of the distribution network”, while Remote applies to an asset “at that particular location”. These descriptors cannot be used to consistently risk rank due to the requirement to mix and match location specific and network wide risk which may result in skewed risk outcomes; and
- Failure to account for all ranges of supply consequence descriptions. For example, there is no consequence category which covers between 2 and 20 customer weeks lost.

Due to these errors and inconsistencies, all network operators must make adaptations to their own approach to ensure risk methodology is applied consistently across their network in accordance with good industry practice and legal requirements.

Note: These issues were raised to the AS/NZS 4645.1 committee by ATCO during the public consultation period and were not addressed. ATCO has been informed that the AS/NZS 4645.1 committee is currently considering Standards Australia processes for reviewing specifically Table B2.

As such, ATCO sought to develop a risk management framework as is explicitly allowed by the standard, with the support of Technical Regulator Building and Energy (previously EnergySafety).

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ATCO developed an alternative risk management approach in line with existing ATCO methodologies and good industry practice, and included this quantitative to qualitative correlation within the Safety Case revision, subsequently accepted by the Technical Regulator. Refer to Section 3 for more information on ATCO's approved Safety Case and legislative obligations for compliance.

With regard to EMCa's assessment of ATCO's supply risks as hypothetical, it should also be noted that AS/NZS 4645.1:2018 Table B2 states that:

***“Extreme care should be exercised when determining the likelihood as hypothetical, especially for event where the severity is major or above. The validation of this likelihood places a great reliance of the availability of information which may not be in the public domain”.***

This note encourages network operators to err on the side of caution when assessing a risk as hypothetical, where information is not readily available, however consequences are considered major or catastrophic.

In the case of Security of Supply Risk Assessments, EMCa have indicated that they are not aware of any instances where pipelines have required isolation and resulted in a loss of supply, supporting their hypothetical argument.

While this information may not be readily available in the public domain, ATCO are aware of several instances where high pressure pipelines have been punctured requiring isolation on similar networks within Australia (refer to *TCO RP 0380 AA5 Security of Supply Assumptions & Revised Risk Assessment* for further information).

Taking into account available information and considering this guidance note, ATCO does not agree with EMCa's finding that the probability of a pipeline puncture requiring isolation is hypothetical, where the probability is between  $10^{-5}$  to  $10^{-6}$  per km/year.

## **2.2 AS/NZS 2885.6:2018 Pipelines Gas and Liquid Petroleum – Pipeline Safety Management**

AS/NZS 2885.6:2018 is a new Part to the AS2885 suit of standards and applies to gas pipelines operating at >1900 kPa MAOP.

ATCO is currently required to comply with the 2012 versions of AS 2885 Part 1 and 3 as per the *Gas Standards (Gas Supply and System Safety) Regulations 2000*<sup>[6]</sup>. ATCO expects that the *Gas Standards (Gas Supply and System Safety) Regulations 2000* will be amended (timeframe unknown) to require ATCO to comply with the 2018 editions of AS/NZS 2885 Parts 1 and 3, which by default this will include the requirement to comply with the new AS/NZS 2885.6 2018 edition.

ATCO has conducted risk assessments of high pressure steel assets with MAOP of greater 1,050 kPa (typically 1,900 kPa and greater). These assets were either designed and constructed to editions of AS2885 that existed at the time of design and construction, AS1697 *SAA Gas Pipeline Code* for pipelines designed prior to the first edition of AS2885 (1987), or earlier codes if designed prior to 1975.

In accordance with the *Gas Standards Act 1972* and *Energy Coordination Act 1994* for ongoing operational pipeline risk assessments, assessing 'people', 'supply' and 'environmental' risks, ATCO is required to conduct risk assessments for assets with MAOP >1,900 kPa in accordance with the requirements of AS2885, and for assets with MAOP ≤ 1,900 kPa in accordance with AS4645.

Therefore ATCO's risk assessments need to use a risk framework that provides for consistency between risk assessments conducted under AS2885 and AS4645. ATCO's Security of Supply risk assessments use the guidance in AS/NZS 4645.1:2018 for the development of 'supply'



consequence to the downstream connected networks, and uses various published guidance documents to formulate its qualitative likelihoods to quantitative probabilities (refer below).

ATCO’s qualitative likelihoods to quantitative probabilities are one order of magnitude more conservative than AS4645, but are two orders of magnitude less conservative than the informative guidance in the new 2018 edition of AS2885.6 (refer below).

The new AS/NZS 2885.6:2018 Appendix F, introduces informative guidelines for frequency classes, summarised in Table 2-2.

**Table 2-2 AS/NZS 2885.6:2018 Frequency Guidelines**

Frequency Class	Frequency Description	Numerical Guidelines (events/1000 km/year)
Frequent	Expected to occur once per year or more	$\geq 1$
Occasional	May occur occasionally on the life of the pipeline	1 to 0.1
Unlikely	Unlikely to occur within the life of the pipeline, but possible	0.1 to 0.001 ( $10^{-1}$ to $10^{-3}$ )
Remote	Not anticipated for this pipeline at this location	0.001 to 0.00001 ( $10^{-3}$ to $10^{-5}$ )
Hypothetical	Theoretically possible but would only occur under extraordinary circumstances.	$<0.00001$ ( $<10^{-5}$ )

At first glance numbers appear to align to AS 4645, however it must be emphasised the AS2885 values apply on **an event per 1000 km per year basis**. ATCO has taken it that AS4645.1:2018 Table B2 in the absence of a stated criteria, refers to an “events at a location per year” basis for point assets such as pressure regulation facilities, or an “events per km per year” basis for linear assets such as pipelines. Therefore the new AS2885.6:2018 Table F1 numerical guidelines correlates to a difference of three orders of magnitude more conservative than AS4645.

As ATCO undertakes safety and supply assessments on a basis of events per km per year in line with accepted industry practice, application of this approach would result in risk outcomes **two orders of magnitude higher** than current results if ATCO applied the AS2885.6:2018 Table F1 numerical guidelines.

For example, Pipeline 91 (Two Rocks) is currently assessed as having a puncture probability of  $6.72 \times 10^{-6}$  per km per year. Multiplied by the length of the pipeline at 13.98 km, this results in a probability of  $9.4 \times 10^{-5}$  isolation events per year for the pipeline. This risk aligns to a likelihood of Remote using ATCO’s Risk Management Approach.

If applying AS/NZS 2885.6, the risk needs to be normalised to a 1000 km basis in order to be correlated against the frequency guidelines. In order to normalise the risk to the basis provided by the standard, the risk must be multiplied by  $1000 \text{ km} / 13.98 \text{ km} = 71.5$  times. For pipeline 91, this would result in a probability of puncture of  $9.4 \times 10^{-5} \times 71.5 = 6.72 \times 10^{-3}$ . This assessment would result in a frequency class of Unlikely and is two orders of magnitude higher than the ATCO Risk Management Approach.

In addition, as ATCO undertakes fatality calculations using the basis of probability of fatality per km per year, adopting this guidance would result in current safety risk outcomes two orders of magnitude higher than current assessed results. Many safety related risks on the network currently considered Low risk would become High risk if assessed in line with AS2885 guidance.

When comparing quantitative risk guidance provided in both AS/NZS 4645 and AS/NZS 2885, it becomes apparent that both standards require future refinement before a network operator can apply these guidelines without making adaptations or significant assumptions on how it should be applied.

### 2.3 AS/NZS 4853:2012 Electrical Hazards on Metallic Pipelines

AS/NZS 4835:2012 Electrical Hazards on Metallic Pipelines is the applicable Australian Standard for undertaking electrical hazard risk assessments on metallic pipelines and is implemented by ATCO to assess Step and Touch hazards on the network and inform required control measures to reduce risk to an acceptable level.

The prescribed methodology considers the basic equation:

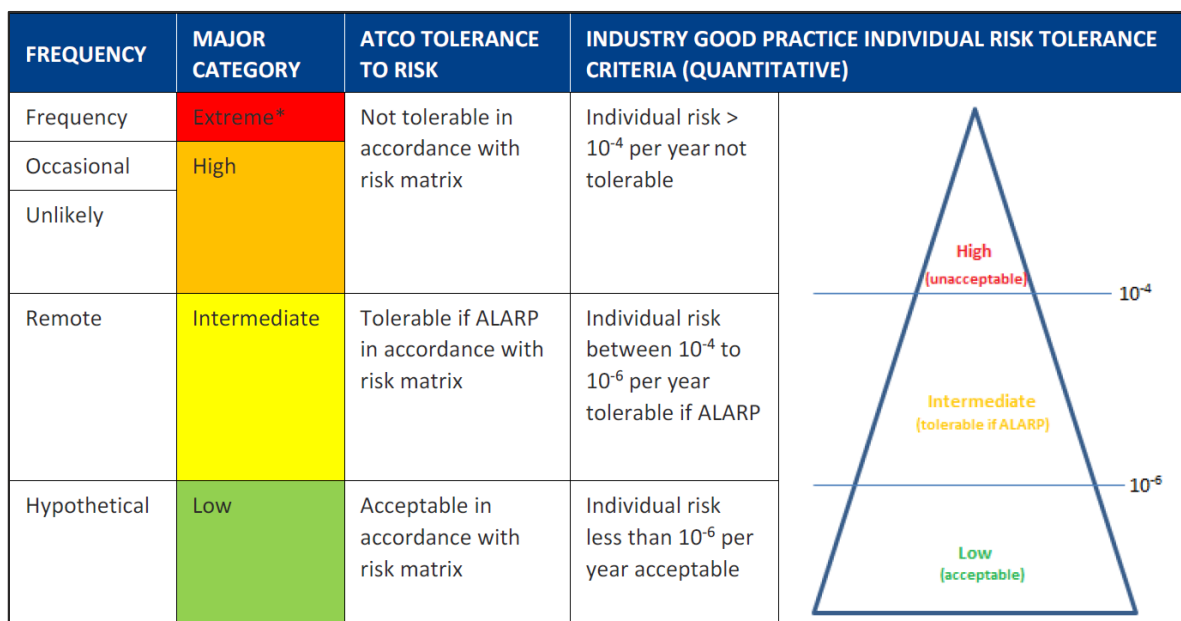
Risk = Probability of fibrillation × Probability of coincidence, where the probability of fibrillation is the probability that a voltage incident will occur in the critical part of the cardiac cycle and cause a fatality.

The probability of an individual fatality for those persons exposed to these hazards is categorized in three risk level regions:

- High risk for probability of fibrillation greater than  $10^{-4}$  per year;
- Intermediate risk for probability of fibrillation between  $10^{-6}$  and  $10^{-4}$  per year; and
- Low risk for probability of fibrillation less than  $10^{-6}$  per year.

ATCO’s qualitative to quantitative risk correlation has been developed in line with the prescribed individual fatality risk tolerance provided within AS/NZS 4835 (and other industry good practice sources described within this document) as illustrated in **Figure 2-1**.

One fatality is taken as a baseline which aligns to the ATCO consequence category of Major.



**Figure 2-1 ATCO Risk Tolerance Correlation**

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This prescribed risk tolerance criteria supports and is consistent with ATCO's risk management framework.

## 2.4 Industry Good Practice

After considering guidance from applicable Australian Standards, a review of industry good practice was undertaken to establish ATCO's alternative risk management approach.

The following key references were reviewed to guide ATCO on establishing quantitative tolerance criteria.

### 2.4.1 Safe Work Australia

The Safe Work Australia, Guide for Major Hazard Facilities, Safety Assessment, March 2012<sup>[7]</sup> refers out to the NSW Department of Planning, Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Planning<sup>[8]</sup> for risk tolerance criteria.

This guideline is regularly referred to and accepted across Australia within various industries for determining public risk tolerance. HIPAP states "The Department has adopted a fatality risk level of one in a million per year ( $1 \times 10^{-6}$  per year) as the limit for risk acceptability for residential area exposure", in line with ATCO methodology.

### 2.4.2 NSW Government, Department of Planning and Environment

The NSW Government, Department of Planning and Environment Planning Circular PS 18-010, issued 26 October 2018 provides information on development adjacent to high pressure pipelines transporting dangerous goods. The circular discusses the *State Environmental Planning Policy (Infrastructure) 2007* and levels of risk posed by pipelines which must be considered when considering development within the vicinity of pipelines, to ensure risks to people, property and the pipeline are within acceptable levels.

The Planning Circular states that any developments within the vicinity of a pipeline should prepare a risk assessment to demonstrate that risk criteria stipulated within NSW Department of Planning, Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Planning is met. The circular also states that "in assessing the tolerability of risk from high pressure pipelines, both qualitative and quantitative aspects need to be considered."

### 2.4.3 Government of Western Australia Department of Planning, Lands and Heritage

Planning Bulletin 87 – High pressure gas transmission pipelines in the Perth metropolitan area; provides guidance on matters to be taken into account by the WA Planning Commission, local governments and applicants in considering planning proposals in the vicinity of the Dampier to Bunbury Natural Gas Pipeline and the Parmelia Gas Pipeline, in the Perth metropolitan region.

The minimum setback distances to residential areas provided for each section of these pipelines is based on an individual fatality risk level of one in a million per year ( $1 \times 10^{-6}$  per year) or less.

### 2.4.4 WA Environmental Protection Authority (EPA)

The Environmental Protection Authority Guidance Note No.2 Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant, July 2000<sup>[9]</sup> was a guidance note provided by the WA EPA for use by industry when undertaking land use planning, to ensure risk posed to the public was tolerable. The Guidance Note stipulated  $10^{-6}$  as the acceptable tolerability of

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fatality for public risk. This guidance note has been redacted with the aim of allowing local authorities to develop their own individual guidelines, however this typically has not occurred.

ATCO (previously WAGN) referred to this guideline and included this tolerance within the Section 4.2.8.1.1 of the WA Gas Networks Gas Distribution System Safety Case (GD PL 0130), Rev 4, 2011<sup>[12]</sup>, indicating that ATCO has been aware of and applying this industry good practice criteria where appliance since at least 2011. Particularly, the Safety Case stated:

***“In an effort to reflect corporate values and commitments of WAGN to reflect contemporary societal values and expectations, the EPA Guidelines were applied as the ‘off-site’ risk criteria for the WAGN GDS. These criteria are a risk level in residential areas of one in a million per year ( $1.0 \times 10^{-6}$  pa) or less”***

#### 2.4.5 United Kingdom Health and Safety Executive (UK HSE)

The UK HSE is the primary health and safety regulatory body in the UK and is responsible for enforcing safety standards for various industries.

UK HSE’s document Reducing Risks, Protecting People, HSE’s Decision Making Process, 2001<sup>[10]</sup>, states that:

***“HSE believes that an individual risk of death of one in a million per annum for both workers and the public corresponds to a very low level of risk and should be used as a guideline for the boundary between the broadly acceptable and tolerable regions”***

This guideline of one in a million (or  $10^{-6}$ ) per annum correlating with the boundary between acceptable (low risk) and tolerable (intermediate risk) correlates with ATCO’s alternative approach.

#### 2.4.6 British Standard PD 8010-3:2009+A1:2013

British Standard *PD 8010-3:2009+A1:2013 Pipeline Systems Part 3: Steel Pipelines on Land – Guide to Application of Pipeline Risk Assessment to Proposed Developments in the Vicinity of Major Accident Hazard Pipelines Containing Flammables*<sup>[11]</sup> contains guidelines used to establish semi-quantitative methodology for calculating supply risk for High Pressure Steel Pipelines.

This standard refers to risk tolerance criteria required by the UK Technical Regulator UK HSE.

### 3. SAFETY CASE OBLIGATIONS

ATCO has developed and maintains a Gas Distribution System (GDS) Safety Case under the provisions of Part 4, Division 3 of the Gas Standards (Gas Supply and System Safety) Regulations 2000, made under the requirements of the Gas Standards Act 1972<sup>[13]</sup>.

The GDS covered by the Safety Case is as defined in Gas Distribution Licence 8 (GDL8), issued by the Economic Regulation Authority to ATCO Gas Australia under the Energy Coordination Act 1994<sup>[14]</sup>.

The current revision of the ATCO Gas Australia GDS Safety Case was accepted to form the prime reference to meet safety and technical compliance of the GDS by the Director of Energy Safety on 18<sup>th</sup> January 2018 under the provisions of Regulation 34 of the Gas Standards (Gas Supply and System Safety) Regulations 2000.

Building and Energy (previously Energy Safety) are responsible for ensuring ATCO’s approach to managing risk on the network is in line with any compulsory regulatory obligations, and take into

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consideration industry good practice as applicable. Building and Energy provided no objections to ATCO's alternative risk management approach, and supported the approach by way of acceptance of the Safety Case.

ATCO's accepted Safety Case is a legally binding document for which compliance is legislated. Section 3.5.8 of the Safety Case contains ATCO's quantitative to qualitative correlation.

With regard to legislative precedence, if there is a conflict between the accepted Safety Case and the Standards prescribed in the Safety Case, the obligations in the accepted Safety Case prevail.

## 4. REFERENCES

1. Economic Regulation Authority, Draft Decision on the Proposed Revisions to the Mid-West and South-West Gas Distribution System Access Arrangement for 2020 to 2024, Submitted by ATCO Gas Australia, 18 April 2019
2. *EMCa, ATCO Gas Australia Proposed Access Arrangement for the Mid-West and South-West Gas Distribution Systems, Review of Technical Aspects of the Proposed Access Arrangement, March 2019*
3. AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management
4. AS/NZS 4853:2012 Electrical Hazards on Metallic Pipe
5. AS/NZS 4645.1:2018 Gas Distribution Networks – Network Management
6. *Gas Standards (Gas Supply and System Safety) Regulations 2000*
7. Safe Work Australia, Guide for Major Hazard Facilities, Safety Assessment, March 2012
8. NSW Department of Planning, Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Planning
9. Environmental Protection Authority Guidance Note No.2 Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant, July 2000
10. UK HSE, Reducing Risks, Protecting People, HSE's Decision Making Process, 2001
11. PD 8010-3:2009+A1:2013 Pipeline Systems Part 3: Steel Pipelines on Land – Guide to Application of Pipeline Risk Assessment to Proposed Developments in the Vicinity of Major Accident Hazard Pipelines Containing Flammables
12. WA Gas Networks Gas Distribution System Safety Case (GD PL 0130), Rev 4, 2011
13. Gas Standards Act 1972
14. Energy Coordination Act 1994
15. ATCO Gas Australia, Gas Distribution System Safety Case, TCO PL00005, Rev 6, 2017
16. New South Wales Government, Department of Planning & Environment, Planning Circular PS 18-010, Development Adjacent to High Pressure Pipelines Transporting Dangerous Goods, 26 October 2018.
17. Government of Western Australia, Department of Planning, Lands and Heritage, Planning Bulletin 87 High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region.
18. *TCO RP 0380 AA5 Security of Supply Assumptions & Revised Risk Assessment*

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## 5. DOCUMENT APPROVAL

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Mandatory Reviewer:	Stuart Jobling	Manager Technical Compliance	27/05/2019
Mandatory Approver:	Russell Godsall	General Manager Network Operations	28/05/2019

## 6. DOCUMENT HISTORY

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1	20/05/2019	Marnie Foreman	Document Created