Australia-Mongolia Extractives Program (AMEP)

DRAFT SUBMISSION TO THE FEASIBILITY STUDY WORKING GROUP, MINISTRY OF MINES AND HEAVY INDUSTRY

January 2020

(This document, hereinafter referred to as the “Draft Submission”, presents concepts for discussion by the Feasibility Study Working Group relating to the objectives of a feasibility study, how a feasibility study is applied, what is required of a feasibility study in order to meet the objectives, the feasibility study content, the review process and government involvement in that process mineral, and the regulation of feasibility study authors

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1) BACKGROUND

1.1. History

Feasibility studies are used in all jurisdictions as documents to assist project sponsors, investors and lenders in assessing the viability of mineral projects. A typical definition of feasibility study is provided in the Mongolian Code for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves, 2014 Edition (**MRC Code**), which states:

"*A Feasibility Study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study.*" [MRC Code, clause 39]

Over recent decades, feasibility studies have become more complex with more standardized formats in response to heightened perception of risk. This process has been driven, to a great extent, by financial institutions in their roles as both investors and lenders.

In Mongolia, mining licence holders are required by the Ministry of Mines and Heavy Industry (**MMHI**) to submit feasibility studies within one year of the grant of the licence. The form and content of these studies is established by "Regulations of Requirements of Scoping and Feasibility Studies and of Acceptance of Feasibility Study", as specified in the Appendix to Resolution 074 by the Minister of Mineral Resources and Energy dated 17 April 2012. It is understood that regulatory authorities require the Feasibility studies for several purposes, including:

(a) to confirm that the licence holder has actively progressed the project to a level of mature development that warrants retention of a mining licence.

(b) to confirm that the stated ore reserves are to be extracted in an appropriate and responsible manner;

(c) to provide operational information to the mines inspectorate; and

(d) to provide government with a project economic program which, when aggregated with other programs relating to other mining projects, enables government infrastructure planning and other national-level economic analysis..

As a project sponsor or financier has requirements for a feasibility study that differ from the requirements of the Mongolian regulatory authorities, so the content of

those studies will also differ. To differentiate between the two, this report terms those studies designed for use by project sponsors for investment purposes as "**commercial feasibility studies**" and those designed for use by regulatory authorities as "**statutory feasibility studies**".

1.2. Feasibility Study Working Group

Mongolian regulatory authorities have concluded that the context and content in which they use statutory feasibility studies requires review, and have constituted a Working Group to address the issues. The Working Group was constituted under Ministerial Order A/251, dated 23 December 2019, and comprises representatives of the Geological and Mining Policy Implementation and Coordination Department of the MMHI, the Strategic Policy and Planning Department of the MMHI, the Mineral Resources and Petroleum Agency, the Association of Surface Mining Engineers, the Council of Mining Professional Associations, the Mongolian Mining Designers Association, the Mongolian University of Science and Technology, the Mine Rescue Unit, the Mongolian Mineral Processing Association, the Building Material Manufacturers Association of Mongolia, and the Australia-Mongolia Extractives Program.

1.3. Purpose of this Report

The purpose of this report is to provide background information to the Working Group on various aspects relating to:

- the application and use of feasibility studies;
- the requirements of feasibility studies;
- the content of feasibility studies;
- the review process of feasibility studies, including the participation of regulatory authorities; and
- regulation of feasibility study authors

outside of Mongolia.

2) THE APPLICATION AND USE OF FEASIBILITY STUDIES

2.1. The Feasibility Study

At various stages of the development of a mining project, the project sponsor will conduct studies to facilitate strategic decisions. In the earlier stages, the lower level studies (scoping studies and pre-feasibility studies) are used as decision-making tools designed to assist the project sponsor in determining whether to progress, joint-venture, sell or relinquish the project. In the next stage, feasibility studies are used to determine whether project development into production is of interest to the project sponsor, potential investors and financiers (**Interested Parties**).

The purpose of the feasibility study is to provide a quantitative and qualitative analysis of the mining project and the environment it occupies and will occupy. Of the Interested Parties, the potential financiers are likely to be the most risk-averse, and are therefore likely to require more information before making an investment decision. Consequently, the context and content of feasibility studies has been most strongly influenced by the requirements of financiers. In recent times, a feasibility study that does not provide the information required by financiers is generally considered incomplete.

In countries with centralised governments modeled on the previous Russian or Chinese systems, the Interested Parties were all represented by various agencies of the government. These governments regulated feasibility studies in order not just to provide sufficient Interested Party information, but also to provide information to facilitate national-level planning, such as for infrastructure provision. In general, this did not result in an increase in provided information when compared to feasibility studies prepared elsewhere, as financiers in western countries nevertheless required analysis of sovereign and social risk irrespective of the project location.

2.2. Study Context

Feasibility studies sit within a spectrum of studies applied in most circumstances by project sponsors. In order of increasing cost and complexity, these are

- Scoping Studies
- Pre-feasibility Studies;
- Feasibility Studies; and
- Detailed Engineering Studies

Together, these studies are often described as ‘evaluation studies’ or ‘assessment’ studies. In the order they are listed, they are designed to provide an increasing level of completed engineering, and an increasing level of accuracy. Typical levels of completed engineering (measured as percentage of anticipated total project EPCM or percentage of anticipated total project engineering cost) and levels of accuracy are shown in Table 1 below.

Table 1: Typical Study Orders of Accuracy

Type of Study	Scoping	Pre-feasibility	Feasibility	Definitive Engineering
Completed engineering	1 to 2%	10 to 15%	15 to 25%	40 to 60%
Accuracy	±30 to 35%	±20 to 25%	±10 to 15%	±5 to 10%

The following definitions of the first three of these studies are typical, and are provided in the MRC Code.

'A Scoping Study is an order of magnitude technical and economic study of the potential viability of Mineral Resources that includes appropriate assessments of realistically assumed Modifying Factors together with any other relevant operational factors that are necessary to demonstrate at the time of reporting that progress to a Pre-Feasibility Study can be reasonably justified.'

'A Pre-Feasibility Study is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient for a Competent Person, acting reasonably, to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve at the time of reporting. A Pre-Feasibility Study is at a lower confidence level than a Feasibility Study.'

'A Feasibility Study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study.'

Almost invariably a project sponsor will undertake these studies in the sequence indicated, as it will require the confidence imparted by favourable results from the less-comprehensive study before embarking on the expensive option of delivering the more-comprehensive study. In rare circumstances, such as the extension of an existing operation,

2.3. Use by Regulatory Authorities

The use of commercial feasibility studies by regulatory authorities is rare.

The State of Victoria in Australia requires the submission of a study at pre-feasibility level or higher, as evidence of work performed and project status achieved, prior to granting a mining licence. However, the regulator is prepared to accept other evidence indicating intent to mine and capability as an alternative to a pre-feasibility study. Presumably, this alternative is particularly related to small scale mines and possibly to extensions of existing mining operations.

From the provided pre-feasibility study, the state authorities determine if the required environmental and social standards are likely to be met, and will grant the licence (or not) on the basis of this determination in conjunction with other determinations unrelated to the study. It is important to note that commencement of construction and land disturbance are contingent on the provision of supplementary licences and permits.

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3) FEASIBILITY STUDY REQUIREMENTS

As previously stated, the requirements of feasibility studies are derived from the expectations of the users, that is, the Interested Parties.

Interested Parties are primarily concerned with project return and project risk. They therefore require a feasibility study to address these areas, and that assessments of these provide quantitative outcomes in terms as unambiguous as practicable.

3.1. Project Return

Investors and providers of debt will have a “hurdle rate” for provision of capital. That hurdle rate may differ between various equity capital providers, and will certainly differ between the equity capital providers and the debt funding providers. Consequently, the anticipated cash flow models will need to provide the quanta and timing of providing capital, the rates of return to the project and the various funding parties, the payback periods for the project and the various fund providers, and the sensitivity of cash flow to change in project cost or revenue drivers.

3.2. Project Risk

Interested Parties will focus on issues and activities that have the capability of disrupting anticipated cash flows. This will extend to external matters such as the commodity market, macro-economic influences, political influences (international, national and local), social influences, supply chain, product disposal chain, and to internal matters such as geotechnical conditions, environmental issues, safety, labour issues, production capability in terms of both quantity and quality, and management capability.

3.3. Technical Information and Schedules

The Interested Parties expect that the provision of technical information and schedules are sufficient to allow the experienced reviewer to confirm (or otherwise) that the cash flow models have been competently compiled using adequate and most appropriate data. Therefore, an audit trail from source data to the final cost summary needs to be clearly laid out and readily traceable.

At feasibility study level, costs need to be derived from first-principles. Costs derived from ‘comparable’ operations are generally not acceptable. The exception to this statement is a feasibility study for an extension to an existing operation, in which case existing capital and operating costs, appropriately modified, may form a more accurate projection of future costs than a first-principles derivation might provide. This is further discussed under ‘Study Detail’.

4) FEASIBILITY STUDY CONTENT

Feasibility studies prepared for investment purposes have similar components irrespective of the project parameters. Obviously, certain components may be omitted or reduced according to the nature of the proposed operation. For example, an iron ore project intending to sell direct shipping ore (DSO) will restrict its study content on ore processing to crushing, screening and (perhaps) blending.

4.1. Study Segments

The principal sections of the study will be:

Executive Summary
The Study
- Terms of Reference
- Study Scope
- Study Management
- Study Team

The Project
- Location and Size
- Climate
- Existing Infrastructure
- Existing Land Use and Environment

Geology
- Regional Geology
- Project Geology
- Mineralisation
- Hydrogeology
- Exploration History
- Mineral Resource Estimation

Mining
- Mining Concept
- Geotechnical Assessment
- Mining Method
- Mine Design
- Mineral Reserve Estimation
- Mining Sequence
- Waste (rock) Disposal and Storage
- Mine Dewatering and Acid Drainage
- Mining Personnel Requirements
- Mining Plant and Equipment
- Mining Services Requirements
- Mining Technical Services Requirements
- Capital Costs
- Operating Costs

Processing
- Processing Concept
- Metallurgical Testwork
- Metallurgical Processing and Process Design
- Plant Site Geotechnical Assessment

- Process Plant Engineering
- Product Disposal
- Tailings Disposal
- Processing Personnel Requirements
- Processing Plant and Equipment
- Processing Services Requirements
- Processing Technical Services Requirements
- Capital Costs
- Operating Costs

Tailings Storage Facility

- Geotechnical Assessment
- Hydrology
- Design
- Operating Requirements
- Construction and Operating Schedule
- Capital Costs
- Operating Costs

Infrastructure and Services

- Geotechnical Assessment (site study)
- Land Ownership and Access
- Site Layout
- Site Facilities (workshop, warehouse, office, camp etc)
- Off-Site Facilities
- Roads and Earthworks (on-site and off-site)
- Power (supply and/or generation, distribution)
- Water (supply and disposal)
- Communications and Information Technology (IT)
- Fire Protection
- Operating and Maintenance Requirements
- Capital Costs
- Operating Costs

Environment

- Environmental Management
- EIS Terms of Reference
- EIS Baseline Studies
- EIS Outcomes
- Operational Requirements and Schedules
- Mine Closure
- Capital Costs
- Operating Costs

Site Administration

- Site General Management
- Commercial Management
- Security
- Occupational Health and Safety
- Human Resources – Organisation
- Human Resources – Terms and Conditions
- Human Resources – Training
- Government Liaison
- Community Liaison
- Personnel Requirements
- Plant and Equipment Requirements

- Capital Costs
- Operating Costs

Head Office and External Services

Project Implementation

- Mining Law and Code Compliance
- Permits and Licences
- Project Engineering
- Project Procurement
- Project Construction
- Commissioning and Start-Up
- Owner’s Activities and Requirements
- Project Implementation Schedule
- Owner’s Capital Costs

Financial

- Commodity Market
- Commodity Price Projections
- Project Capital Costs
- Corporate Capital Costs
- Project Operating Costs
- Corporate Operating Costs
- Royalties
- Taxation
- Cash Flow Projections
- Discounted Cash Flow Analysis
- Sensitivity Analysis

Risk

- Site Risk
- External Risk (social, political)
- Economic and Financial Risk
- Risk Analysis

Upside Cases (if applicable, based on known mineral resources not yet converted to mineral reserves)

Appendices

- Pre-feasibility Study (where applicable)
- Copies of Permits and Licences
- Geological Reports
- Mineralogy Reports
- Mineral Resource Reports
- Hydrology Reports
- Geotechnical Reports
- Mine Design, Engineering and Cost Estimation Reports
- Metallurgical Testwork Reports
- Process Plant Design, Engineering and Cost Estimation Reports
- Tailings Storage Facility Design, Engineering and Cost Estimation Reports
- Infrastructure Design, Engineering and Cost Estimation Reports
- Commodity Market Reports
- Project Execution Plan
- Mine Closure Plan
- Environmental Impact Statement
- Environmental Studies
- Community Engagement and other Social Reports
- Detailed Financial Models

Risk Analysis Studies

Many of the chapter headings are designed to correlate with functional management divisions within the proposed mining operation. For example, in the list above, the project sponsor has a range of functions (in addition to mining and processing) reporting directly to the site manager. Should these functional managers report to an administration manager (who then reports to the site manager), it is likely that a minor rearrangement of the headings will occur. Although the Environmental Manager may also report through the site administrative group, the "Environment" study section is of sufficient materiality to require its own chapter. Study authors may also consider "Human Resources" or other segments to warrant individual chapters, depending on risk assessment related to that activity.

It is important to recognize that any attempt to standardize a contents list permits sufficient flexibility to mirror the individual mining/processing is flexible enough to mirror the project's mining/processing activity flow and the project's management control system

In the United States of America, alternative groupings have been adopted for some feasibility studies, although the contained information is not significantly changed. These groupings are:

Volume 1: Management Summary
- Introduction and Summary
- Conclusions and Recommendations

Volume 2: Project Economics
- Forward
- Overview
- Schedule
- Capital Cost Estimates
- Operating Cost Estimates
- Product Marketing
- Business Climate and Investment Outlook
- Economic Analysis
- Financial Strategy

Volume 3: Technical Narrative
- Overview
- Mine and Primary Crushing
- Ore Conveyance System
- Processing
- Onsite and Offsite Requirements
- Tailings Disposal and Water Recovery
- Dump or Pad Leaching (if applicable)
- Downstream Extraction

Volume 4: Project Execution Plan
- Introduction
- Background (project history, project general description)
- Project Environmental Controls and Business Environment
- Project Execution Organisation
- Schedules and Labour Requirements
- Project Engineering Execution Basis

Project Procurement Execution Basis
Project Construction Execution Basis
Volume 5: Operating Plan
Introduction
Owner
Operating Departments
Recruiting
Training
Start-Up
Infrastructure and Support Services
Maintenance
Road Maintenance
Environmental
Administration and Support System
Communications
Safety
Security
Appendices

Although these groupings were publicly reported in 2011 (they appear in a well-recognised reference book), we have sighted no reports employing this particular configuration. Nevertheless, the detailed contents listing accompanying this grouping list indicates that they contain very similar information as conventional studies, albeit organized under different headings. Also, some of the content headings and list arrangements have influenced Canadian feasibility study layouts.

4.2. Influence of Public Reporting Codes

Canadian feasibility study layouts have been more strongly influenced by the requirements of National Instrument 43-100 (NI 43-101). Feasibility study results are reported to the market in a manner that needs to comply with the NI 43-101 form (copy attached in Appendix 1). The NI was introduced in response to the Bre-Ex scandal, and was intended to detail the requirements of summary documents which were required to be lodged. However, NI 43-101 reports on feasibility studies (which are mandatory for companies listed on Canadian stock exchanges) now tend to be 400 pages or more, and provide a level of information somewhere between the feasibility study executive summary and the full feasibility study less appendices. Because the NI 43-101 reports are so large, many study authors attempt to make the feasibility study layout and contents as compatible as practicable with the NI 43-101 prescribed layout, in order to ensure that data and findings are not represented to different parties in a different manner.

As in Canada, the Australian response was also to regulate the public reporting of studies rather than regulate the studies themselves. Nevertheless, again as in Canada, this has provided some impetus in setting minimum standards. This is established in the VALMIN Code which, unlike its counterpart valuation codes in other jurisdictions, covers not only public reports of valuations but also public references to technical reports, of which feasibility studies are a subset. Nevertheless, the Australian VALMIN Code is considered less prescriptive than the Canadian NI 43-101 reporting regime, and the VALMIN Code simply recorded what was considered by practitioners at the time as good practice.

In the United States it is expected that the recently-implemented US Securities Exchange Commission regulation S-K 1300 will mirror the impact of the Canadian NI 43-101 requirements, as the contents listing is similar.

4.3. Study Detail

Of equal importance to the scope of information indicated by the contents, is the detail (or depth) to which investigations have been conducted in seeking accurate projections. Without adequate depth, the required feasibility study levels of accuracy will not be achieved.

Indications of this depth are provided in a number of handbooks and technical publications.

An indication of depth with respect to mineral resources and mineral reserves is provided by the MRC Code, which considers the issues to be described throughout the Code, but particularly describes them in Table 1 under the headings ‘Estimation and Reporting of Mineral Resources’ and ‘Estimation and Reporting of Mineral Reserves’.

The widely-accepted system provided by the American Association of Cost Engineers (**AACE**) indicates depth requirements in cost estimation. Appendix 2 provides industry-specific depth determinations as listed in an Australian handbook, using the AACE project classification of Phase 3 for feasibility studies.

Where commercial feasibility studies are deficient, it is more often in the depth of investigation than in the breadth (or contents) of investigation. Some reviewed commercial feasibility studies include sections undertaken to depths only suitable for pre-feasibility studies or, occasionally, scoping studies. In these instances, the Interested Parties may request revision to the feasibility study to remedy the quality deficiency, or they may provide funding on a conditional or tranche basis if they are convinced that the risk profile is acceptable.

5) REGULATION OF FEASIBILITY STUDY AUTHORS

In most countries, feasibility studies are undertaken by the project sponsor or an independent, specialist, mineral project consulting or mineral project engineering company. Because of the required specialist skills, the trend is for a higher proportion commercial feasibility studies to be undertaken by the independent specialist company, except for the very largest project sponsors. The independent specialist company will retain sufficient, appropriately qualified, skilled and experienced individuals to author the study.

5.1. The Independent Specialist Company

These companies are registered in the manner of any other structured business within the jurisdiction in which they operate. However, they are generally not regulated (in the sense of registration) with any industry-oriented government authority unless they are actively seeking government work assignments. The specialist company survives (or not) on a commercial basis, having a reputation for the skill of its employed individual specialists, its ability to produce a high-quality product for a reasonable price, and its feasibility study history.

The companies may, however, subscribe for voluntary certification for international standards, such as the International Organization of Standardization's ISO 9001 accreditation for quality management systems. These accreditations are generally not obligatory, and are undertaken by the companies in order to enhance internal control and to gain market-place attractiveness.

5.2. The Individual Authors

The individual study authors are generally accredited. They hold appropriate tertiary education qualifications, and are registered members of an appropriate professional society. The professional society of which an author is a member is expected to have an enforceable code of ethics, and has the power to take disciplinary action against its members.

In some jurisdictions, authors who are engineering professionals (mining, civil, electrical, mechanical, metallurgical, process, environmental etc) are required to register with the state authority as a 'Professional Engineer' (or some similar nomenclature) before being allowed to undertake design, construction or reporting activities within that state. The award of this status may be by means of an examination or by a review of the applicant's qualifications and experience. The state may undertake the registration process itself, or delegate it to either a government-appointed board or an appropriate professional society. In Queensland (Australia), for example, the registration of mining engineers is delegated to the Board of Professional Engineers of Queensland, which in turn has delegated the assessment process to seven professional societies. The Australasian Institute of Mining Engineers conducts the assessment for mining-related disciplines.

6) THE FEASIBILITY STUDY REVIEW PROCESS

The review process of a commercial feasibility study has procedural steps which differ according to the identity of the report authors, and to the identity of their target audience.

A commercial feasibility study report that has been project managed by the project sponsor will often (but not always) be reviewed by an independent expert. The expert will be an individual or a team provided by a reputable consulting firm. The findings are attached to the study, often as the final chapter. Very large and highly reputable project sponsors sometimes avoid an independent check. On occasion, the reviewing firm or (more appropriately) other reputable consultants are retained to eliminate deficiencies detected in the study. This review is usually commissioned even if the work undertaken by the project sponsor was limited to managing the study and compiling and co-ordinating the component chapters.

A commercial feasibility prepared by an independent consulting firm will instead have an in-house review process, so no external review will be commissioned by the report authors. However, an external review may be commissioned by the project sponsor.

A further external review will be commissioned by any potential debt funder or group of debt funders. This will be undertaken by a mining consultancy which usually has significant experience in this type of due-diligence review and often will be a company which has undertaken previous reviews of other projects for the same potential lender. Although the review is commissioned by the potential lender, and the reviewing company has allegiance to no other party, the work will be paid for by the project sponsor.

In western countries in general, no review of the commercial feasibility study is conducted by any government authority. Should the project be considered of national significance, or be of particular scale and life to require significant national assistance with respect to the provision of public infrastructure, the project sponsor may elect to provide government with the feasibility study in order to facilitate government's decision-making process and assistance. In these situations, and in those jurisdictions where studies (either pre-feasibility or feasibility) are required as precursors to the award of mining licences, government appraisals of the feasibility studies are undertaken by suitably qualified persons employed in government departments. Where innovative technology is envisaged for the project, or where there is particular sensitivity because of public interest or potentially serious environmental impact, government may retain specialist advisers to assist in the review of the feasibility study. However, this review process is not nearly as intensive as the review process undertaken by the reviewers acting on behalf of the project sponsor or potential lender.

7) DISCUSSION

It is readily apparent that major differences exist between commercial feasibility studies and Mongolian statutory feasibility studies in both purpose and content. The Working Group desires to improve the quality of the feasibility study whilst retaining its purpose.

Listed below are some issues and suggestions for the Working Group to consider in its deliberations. Some of the suggestions are contradictory (in that they are not compatible with other suggestions), and may not fit within the required context. Nevertheless, it may benefit the recipients to formally reject unsuitable suggestions in determining a path forward.

It should be noted that the suggestions are made based on a knowledge of international practice, and not with any pretence of an intimate awareness of the Mongolian feasibility study appraisal process.

7.1. Purpose

The purposes as we understand of a statutory feasibility study are set out in the opening paragraphs of this report. Because of the wide variation in possible outcomes to any feasibility study review, the Working Group must confirm or adapt the specified purposes before embarking on determinations of required content. We recommend that, as this exercise progresses, the Working Group regularly revisits the list of purposes to ensure that its determinations adequately fulfil the purposes. Nevertheless, the Working Group may amend the list of purposes at any time during the review process should it consider it warranted.

The Working Group should determine whether, in its view, the MPC should '*accept*' or '*approve*' statutory feasibility studies. By '*approving*' the studies, the MPC is implying that, through its agency, the Government of Mongolia is taking a level of responsibility for the study outcomes. These outcomes include the planned safety of the operation, the maintenance of planned environmental impact, the maintenance of planned social impact, and peripherally the economic viability of the project.

In our view, no '*accepted*' plan should relieve the project sponsor from conducting a safe, environmentally-responsible mining operation in accordance with the laws and regulations of Mongolia. By '*accepting*' rather than '*approving*' a statutory feasibility study, the MPC would indicate no government assumption of responsibility for the study or its outcomes. The study may still be rejected by the MPC if it patently does not adhere to national standards and laws, but the review process would be significantly simplified.

7.2. Use of Alternative Documentation

In assessing the purpose of a feasibility study, it is important to consider the duration of its effective life. Rarely does a feasibility study have an effective life extending beyond six months without revision. In many cases that revision may only be required to focus on changes to commodity prices (which may have a

cascading impact on mineral reserves, expected feed grades, metallurgical recovery and mine life), but in other cases there may be material changes to social and physical environment. Project sponsors will only update feasibility studies until they have served their primary purpose: that is, until their statutory feasibility study is approved or they have raised the capital required to develop the project and the commercial feasibility study has been superseded by detailed engineering.

If regulators require ongoing information (in addition to annual reports) relating to proposed and actual mining operations, other sources may be employed. These include regularly updated life-of-mine (or long-term) mine plans and annual mine operating plans. Should these be available, then supplementary feasibility studies for an operating mine should only be required to review proposals for increase in production rate, increase in the mine footprint, significant change in the metallurgical process, or significant increase in infrastructure requirements. It should be noted that these supplementary documents, and in particular the annual mine operating plan, are considered as essential information for mines inspectors.

7.3. Timing

In many jurisdictions, feasibility studies are prepared when the project is tenured by exploration licence. If that approach was adopted in the Mongolian context, the feasibility study would become a pre-requisite of a mining licence, instead of the current system which permits a study to be completed within a year after award of a mining licence. As project funding is conditional on the grant of a mining licence, the period allowed for assessment should be less than that required to obtain conventional debt finance for the project. Conventional debt funding usually takes 6 months or more. However, the later periods of the debt funding program are occupied with bank lending committee meetings and preparing funding documentation. Therefore the suggested target review period is 3 to 4 months.

7.4. Level of Study

Outside of countries in the previous Soviet and Chinese spheres of influence, at least one other jurisdiction accepts pre-feasibility studies in lieu of feasibility studies for consideration in the award of a mining licence.

There are a number of advantages in accepting and/or assessing pre-feasibility studies instead of feasibility studies.

1) At least some of the submitted Mongolian statutory feasibility studies are at (or even below) commercial pre-feasibility study level with respect to the depth of analysis indicated. [NOTE: This comment is based on the availability and perusal of a very restricted sample]. There is therefore less of a step to be taken in order to improve the quality of submitted documentation.
2) In situations where semi-commercial production is required, this is conducted in accordance with mining licence requirements. See ‘Trial Mining’ below

There are at least two disadvantages adopting this approach in the Mongolian context:

1) A pre-feasibility study indicates a lower level of certainty that a project will proceed to production. Even if it does proceed to production, the production

profile and economic parameters are more likely to change from those determined in the study.

2) Acceptance of a pre-feasibility study as a pre-requisite to a mining licence means that there will be a longer project assessment and development period between granting of the licence and commencement of production.

7.5. Acceptance of Commercial Feasibility Studies

The Working Group may wish to consider whether the Minerals Professional Council (MPC) is prepared to accept for consideration commercial feasibility studies

Almost certainly if the MPC determines to consider commercial feasibility studies, the volume of material to review will be onerous. The MPC could streamline this by either (a) reviewing the entire study except for the appendices; or (b) more extremely, review only the study's executive summary. Again based on the very limited sample perused, Mongolian statutory feasibility studies in their entirety appear to be of similar or shorter lengths than the executive summaries of equivalent-project commercial feasibility studies.

Also, commercial studies will apply a mineral reserve classification system that is recognized by the likely sources of funds. Where the source of funds are investors through a stock exchange or a western bank, this will be a CRISCO-based system, such as the MRC Code. Consequently, the MPC would need to either be comfortable dealing with ore reserves classified under the MRC Code, or the feasibility study will need to reconcile the reported ore reserves between both reporting systems.

Compatibility between a feasibility study used for commercial purposes and one used for regulatory purposes is not only highly desirable, but is arguably essential. There is an alarming likelihood that information and analysis provided in the commercial feasibility study will differ, possibly materially, from that provided in the statutory feasibility study. This especially can occur where different mineral reserve classification systems are employed in the two studies. This can result in the users of the commercial feasibility study having different expectations of the project outcomes than the user of the statutory feasibility study.

7.6. Cost to Project Sponsor

If existing international commercial feasibility study standards are imposed on small-scale project sponsors, this will result in significant cost increases to those sponsors. For the larger scale projects this will not impose a burden as they already will require a commercial feasibility study for funding purposes. The requirement may actually reduce costs for larger scale projects if the same study (or study executive summary) can be used for both commercial and regulatory purposes.

7.7. Prescriptive Descriptions of Feasibility Study Contents

There is no feasibility study content listing that adequately covers all mining projects in all locations.

Should the Working Group determine that prescriptive lists are required to better cover the foreseeable range of Mongolian mineral projects , then it should prepare for at least the following project subdivisions:

- Open pit metalliferous
- Underground metalliferous
- Open pit coal
- Underground coal
- Open pit industrial minerals
- In situ leach brines and uranium

The Working Group should also determine whether additional classifications, such as underground industrial minerals, are applicable in the Mongolian context.

7.8. The Review Process

The review process for a commercial feasibility study requires a team of reviewers with the requisite skills and experience to comprehensively address the issues and project risks expected to be discussed in the feasibility study. The review program is intensive because of the tight schedule for obtaining project funding, but (as previously described) funding approval may still take 6 months or more because of the potential lender's internal approval process.

The Working Group should determine, in order to fit the purpose of the statutory feasibility study, whether it requires as intensive a review process.

7.9. Trial Mining

Where a project sponsor requires a small bulk sample for metallurgical test work or market appraisal, it is possible for the terms of an exploration licence in most jurisdictions to accommodate trial mining. However, where the activity is sizeable, the mining approach is innovative, or ground or water disturbance is significant, it may be necessary to control these activities under the conditions of a mining licence, with a commensurate level of regulatory oversight. This is particularly the case with in-situ leaching for uranium, where the handling of hazardous materials and the environmental impacts of a semi-commercial production facility are as significant as for a standard production facility.

The ability to impose mining licence-type oversight on trial mining and semi-commercial production activities under an exploration licence should be ascertained. Trial mining and semi-commercial production are usually activities undertaken after completion of a commercial pre-feasibility study but before completion of a commercial feasibility study, so this question impacts on the issues of appropriate study level and appropriate award timing.

LIST OF ACRONYMS AND ABBREVIATIONS

AACE	American Association of Cost Engineers
AMEP	Australia Mongolian Extractives Program
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
DSO	Direct shipping ore
EPCM	Engineering, procurement and construction management
ISO	International Organization of Standardization
MMHI	Ministry of Mines and Heavy Industry
MPC	Minerals Professional Council
MRC Code	Mongolian Code for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves
VALMIN Code	Australasian Code for Public Reporting of Technical Assessments and Valuations of Mineral Assets (Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists)

APPENDIX 1

NI 43-101 FORM (separate document)

APPENDIX 2 (SEPARATE DOCUMENT)

COST DETERMINATION LEVELS

APPENDIX 3

Differences between Mongolian (statutory) and Western (commercial) Feasibility Studies

	Mongolian (statutory)	**Western (commercial)**
Who requires FS	Government (MMHI)	Lenders and/or investors
Legal requirement/status	2012 regulation governs content and review process	no government regulation of FS but content influenced by public reporting codes (eg. NI 43-101 in Canada and Valmin in Australia)
Purpose of FS	to provide information to government to facilitate national-level planning and economic analysis. To confirm that licence holder has actively progressed the project to a level of development that warrants retention of a Mining Licence	to enable strategic investment decisions to be made in respect of the project
Depth/detail of information in the FS	Equivalent of a commercial pre-feasibility study	Depth guided by technical handbooks and codes eg. JORC and American Association of Cost Engineers. Depth must be sufficient to meet the required confidence level

Regulation of Authors	Companies preparing FS are accredited by the Ministry of Construction and Urban development	Specialist companies are not regulated by the government. They survive commercially on their quality and reputation. Individual professionals are accredited by appropriate professional society with an enforceable code of ethics.
Review process	MPC	Commonly reviewed by an independent expert(s). This is required by debt funders. No review by government.
FS requirements and content	Breadth of content in 2012 regulation is quite similar. Depth is pre-feasibility study equivalent.	Breadth and depth of information has to be sufficient to allow for assessment of project risk, project return and technical information to support cash flow models
Lifespan of FS	Five years. Companies are expected to stick to a long term feasibility study that doesn't take into account changes in commodity process and circumstances. Mongolian government uses feasibility studies to obtain information about projects that come from other documents in foreign jurisdictions	Short – only up to 6 months without being revised. Expected to be revised because of change in commodity prices, social, physical environment. Only updated until capital is raised – FS has no purpose after that. Then regulators get information about the mine from long term life-of-mine plan and annual mine operation plan.
Timing	After grant of Mining Licence – company has one year to submit. No time limit for MPC review process	FS often prepared during exploration licence tenure. Project funding assessment by lender usually takes 6 months and funds are conditional on FS. So

		FS assessment should be around 3-4 months so funding decision can be made
Size	Same size as the Executive Summary of a commercial FS	Thousands of pages (including appendices) because of need to assure lenders/investors about risk
Mineral Reserve Classification	Russian system	Bank or stock exchange will require a CRISCO classification system
Cost to project sponsor for review	Large scale projects have to produce a commercial type FS based on CRISCO reserves to obtain international funding and then convert to Mongolian classification system to pass through the FS process. Extra cost. Small scale projects could face significant extra costs if requirements of FS and/or intensity of review changes meaning they have to produce a more commercial level FS	No choice – sponsor has to pay for review to access funds for project