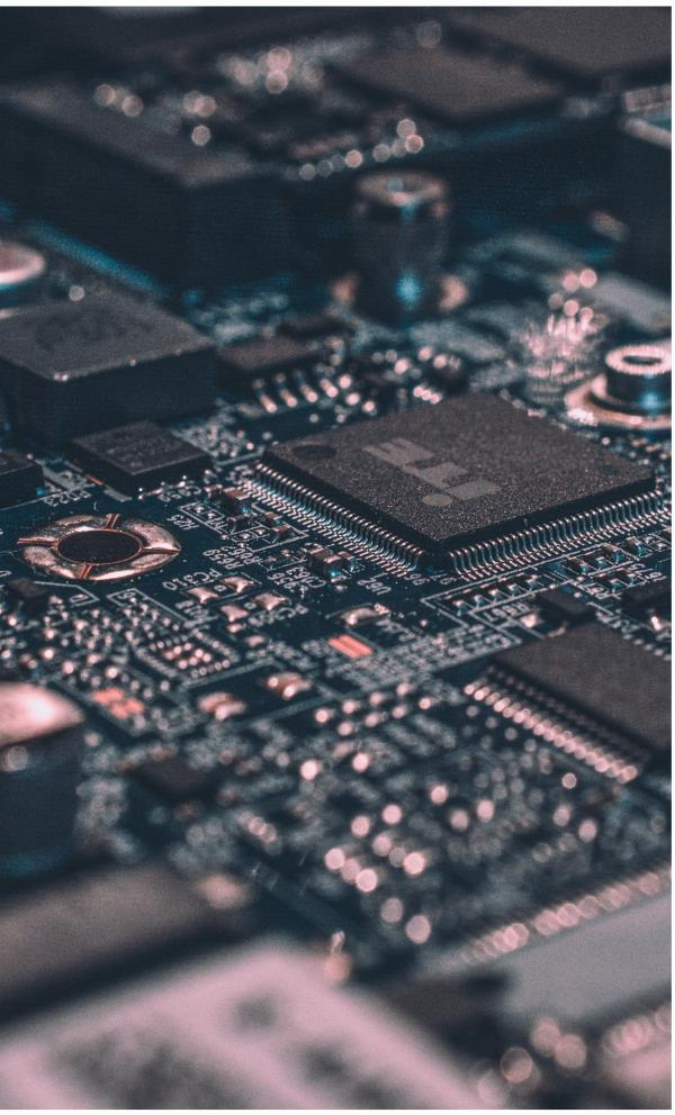
Request for Information

Energy Management System Request for Information



Request for Information on behalf of the participants in the Electric Mine Consortium

Date of issue
3 November 2022

ELECTRIC MINE CONSORTIUM

ENERGY MANAGEMENT SYSTEM

Contents

ENERGY MANAGEMENT SYSTEM

1. Background

The goal of the Electric Mine Consortium (EMC) is to accelerate progress towards the fully electrified, zero CO2 and zero diesel particulate mine by:

- Resolving technology choices.
- Shaping the supplier ecosystem.
- Influencing policy makers; and
- Communicating the business case.

A fully electric mine will incorporate a range of electric and battery-operated equipment, creating a different load profile to a conventional diesel-powered mine. Electricity supply for the mine will see new renewable energy sources gradually displace fossil fuel sources. The matching of energy supply to demand will become more complex, and there will be opportunities to optimize costs, productivity and carbon emissions within the electrical network.

The EMC is undertaking a Request for Information (RFI) process for an Energy Management System (EMS) to support electric mines. It is anticipated that all the EMC member companies will have an interest in implementing an EMS as they transition to electric mines.

The EMC members envisage implementing an EMS both at existing sites and at future greenfield projects. For existing sites, the EMS will be required to interface with legacy systems and processes that may have been supplied by multiple vendors.

The objectives of the RFI process are to:

- Understand what EMS products are available in the marketplace and the capability of those products to meet the required functionality.
- Select an EMS for trial at an EMC member mine site, and;
- Share the information on available EMS' within the EMC members to facilitate further engagement between suppliers and potential customers.

2. Purpose

This document describes the functionality required from an EMS for an electric mine.

3. Electric mine components

The electric mine will consist of the components shown in Figure 1 and are described further below.

Supply/source network:

The supply network for the electrical mine may consist of various sources, including network/grid connections, and islanded configurations sized for the mining load. The energy sources may include gas and diesel generation, renewable sources like wind, thermal and solar, and stored energy from battery or other technologies.

Mining network:

The mining network will consist of traditional surface infrastructure to supply offices, camps and workshops. Mining configurations may also include surface or underground mining infrastructure like crushers, conveyors, ventilation fans, refrigeration and shaft hoists.

The electric mine will have additional infrastructure in the form of surface and underground charging facilities. The surface charging infrastructure is less constrained by space whereas underground infrastructure is space constrained. Charging infrastructure may include fast and slow fixed charging stations, and mobile on-board charging where plugging into an electrical infrastructure is feasible.

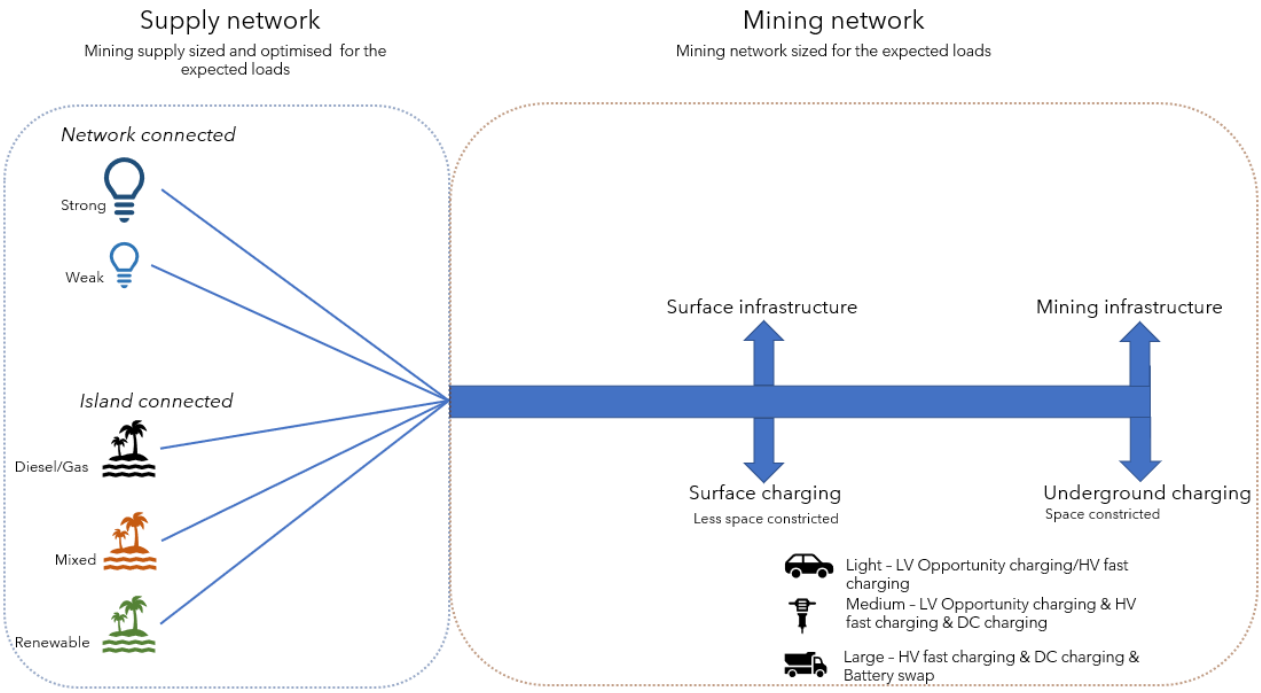


Figure 1: Mining network

4. Energy Management System (EMS) description

The key components of the EMS are laid out in Figure 2.

Sources of supply will consist of renewable sources like solar and wind generation, possibly combined with traditional thermal generation like diesel and gas generation. The electrical mine will likely also include various energy storage sources and where available a grid network connection.

The distribution system of the electric mine will have higher installed capacity than a conventional diesel powered mine and will likely be more closely monitored and controlled. Energy storage within the electric mine system will also be required to be controlled.

The load side of the electric mine will consist of controllable and uncontrollable loads. Uncontrollable loads may include safety-critical systems that must take primacy over an EMS, while controllable loads may be ramped up or down by an EMS to maintain source-load balance.

The EMS will likely consist of two major units, namely the Source control unit and the Production control unit. The Source control system will manage the network stability and capacity within the electric mine, while the Production system will manage the operation of mining loads and provide the Source control system with load forecast information.

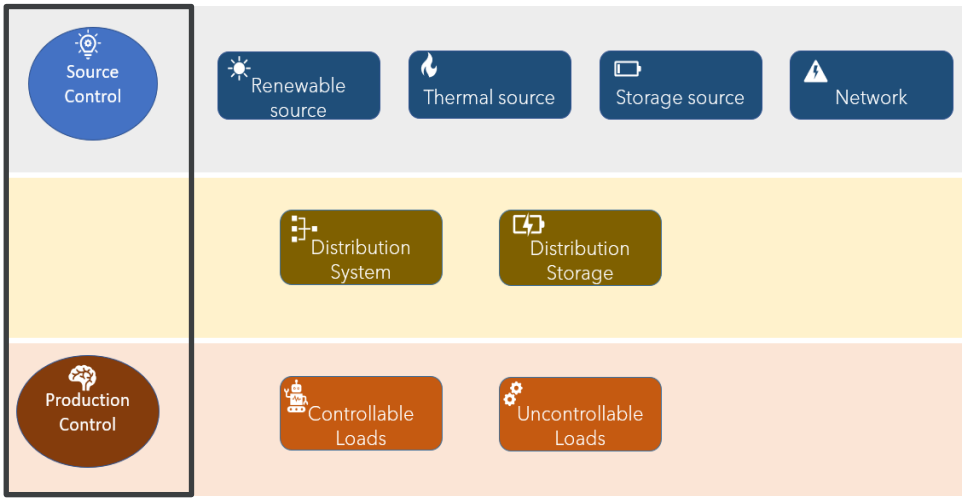


Figure 2: Key System Component Layout

The Distribution system shown in the power layer of the electric mine will connect all the individual components as shown in Figure 3.

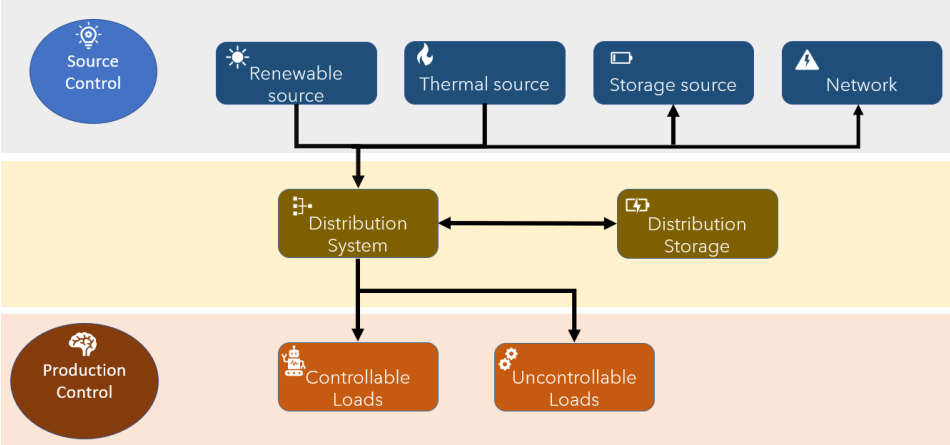


Figure 3: Power layer

The Information layer, shown in Figure 4, displays the information exchange requirements between the components of the electric mine. Some of these connections might have to be high speed connections to enable fast response to enable stable operation of the system. Some connections can be for information or status sharing. The source control will be required to manage the stability of the electrical system, while the production control will focus on management of production activities.

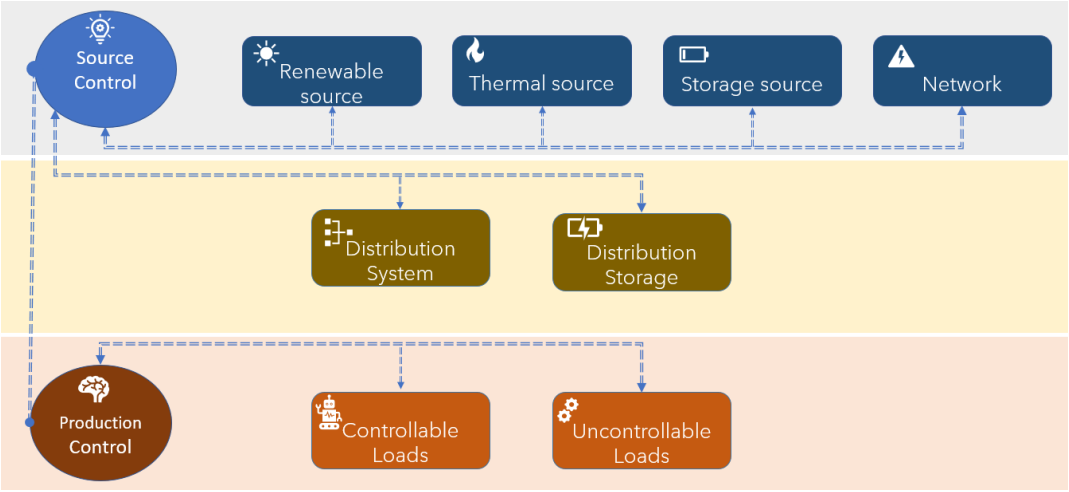


Figure 4: Information Layer

The control layer shown in Figure 5, shows control requirements within the system. Control operation may include:

- on/off operation control.
- ramping up or down operation; and
- enable automated response.

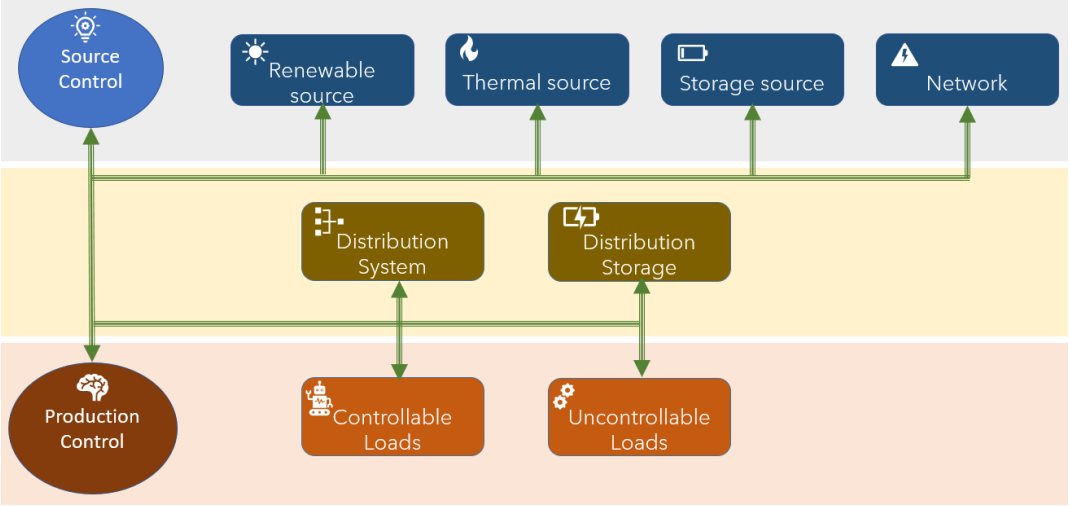


Figure 5: Control Layer

5. Requirements

The requirements for the electrical mine EMS have been separated into the information and control layers along with general requirements.

5.1 Information Layer:

1. The EMS will be capable of receiving statuses from all the components in the mine electrical network. This will include but is not limited to:
   - Open/close status.
   - Voltage, current and frequency status,
   - Ready/Running/standby or Out of Service Status,
   - State of charge (where applicable); and
   - Error and fault messages.

2. The EMS will be able to receive information and statuses from external systems. The other systems will share energy information to be used in the EMS operation. These external systems might include but are not limited to:
   - Electric fleet management systems.
   - Storage management systems; and
   - Weather forecast systems that can impact source and power requirements on site.

5.2 Control Layer:

1. The EMS will be able to give control signals to the various components in the network. These signals might include but are not limited to:
   - Open/close commands.
   - Enable/disable automatic operations.
   - Start or stop operations.
   - Increase/decrease operating rate.
   - In some cases, automatic response due to the speed required.
2. The EMS will be capable of scheduling, setting and/or adjusting the required response rates of components within the electrical network, e.g., ramp rates of inverter-controlled equipment (generation & loads).
3. The EMS will be capable of prioritizing loads and/or sources (generation & storage) based on an operating philosophy e.g., renewable focus/production focus.

4. The EMS will be able to schedule and enable operation of selected equipment at specified times.
5. The EMS will be capable of identifying predetermined electrical network conditions and respond appropriately e.g., performing load control by ramping loads up/down or shedding loads based on predetermined priority.

5.3 General system requirements:

1. The EMS will have the capability to balance generation, storage and load within the mine power system, thereby sustaining system stability whilst making use of the sources connected.
2. The EMS will have the capability to track and manage maximum demand for the site (where enabled).
3. The EMS will be able to import production forecasts, energy consumption forecasts and energy generation forecasts.
4. The EMS will be able to include weather forecasts to energy requirement forecasts and include a predetermined contingency where needed, e.g., production energy forecast 40MWh, Solar forecast 60MWh, 5 MW diesel generation on standby.
5. The EMS will enable the most affordable and available energy sources to be used and forecast energy requirements.
6. The EMS will be able to set and adjust energy priorities based on production forecasts or energy source profiles.
7. The EMS will be able to manage and balance VAR’s and Watt requirements within the network by making use of connected sources, e.g., generators and inverters.
8. The EMS will be capable of automatically managing starting procedures for large loads.
9. The EMS will be able to manage spinning reserve (artificial or thermal) for islanded systems.

6. Application details

6.1 Applications

Suppliers are invited to apply via the **EMS Supplier Application Form.** Questions asked within the form can be found in Schedule 1 below.

6.2 RFI Timeline

The indicative timeline for the RFI and potential selection process is set out in the below table.

Description	**Date**
Issue invitation for RFI	3 November 2022
RFI Information Session	9am, 15 November 2022 (AWST)
RFI closing date	5pm, 5 December 2022 (AWST)
Shortlisting and further engagement with suppliers	Following several weeks

The Information Session provides a chance for suppliers to ask EMC members any further questions about the EMS requirements and learn more about the RFI. It is strongly encouraged you email questions ahead of time or bring questions to the session.

Bookings for the Information Session can be made here: **https://www.trybooking.com/CDPGB**

6.3 Form of Acknowledgment

Applicants are requested to complete and return the Form of Acknowledgement set out in Schedule 2 within five (5) days of receipt of this RFI to indicate whether they will submit an application.

6.4 Additional Queries

Please contact **energymanagementEOI@stateofplay.org** if you have any questions about this RFI.

6.5 SCHEDULE 1

ENERGY MANAGEMENT SYSTEM RFI SUPPLIER APPLICATION FORM

Contact Details

- Email
- Company
- Energy Management System (EMS) Name
- Name

General Requirements

- Provide a description of your company/department. Please list: your core services, high level ownership structure, head office and major service locations/hubs, years of business operating experience, a description of your unique selling point and quantify experience in mining, mining related services or other industries.
- Provide a diagram of the solution and describe the approach applied, with the main components of the system defined.
- Describe the communication infrastructure that will be required to enable operation of the EMS.
- Provide a PowerPoint presentation pack (approx. 30-45 min) describing the EMS. A shortlist of presentations will be selected for feedback to the whole EMC group.
- Describe your company's engagement approach, and how the needs of the client will be understood and integrated into the solution.

Information Layer Requirements

- Describe the system status and resolution/refresh rate of data that the system can receive. (Spec 5.1.1)
- Describe the EMS system capabilities and limitations. (Spec 5.1.1)
- Describe how the EMS will receive and make use of data from other systems (system integration approach). (Spec 5.1.2)

Control Layer Requirements

- Summarise the control philosophy of the system. (Spec 5.2.1)
- Describe how settings are made, and a relevant example or case study. (Spec 5.2.2)

- Describe how prioritisation is achieved, with an application example. (Spec 5.2.3)
- Describe scheduling of equipment at certain times with application examples. (Spec 5.2.4)
- Describe how the EMS approaches load control, with an example of load control and/or load shedding based on priority. (Spec 5.2.5)

General System Requirements

- Describe how load, generation and storage balance is achieved in the system. (Spec 5.3.1)
- Describe an islanded system (hybrid system containing solar, storage and diesel generation) and network connected system as references in Fig 1 of the specification document. (Spec 5.3.1)
- Describe how the EMS will manage maximum loads. (Spec 5.3.2)
- Describe how load control and load shedding would be managed for a grid network connected mine. (Spec 5.3.2)
- Describe how forecasts will be imported and used in the EMS. (Spec 5.3.3)
- Describe any timeframe constraints on forecasts. (Spec 5.3.3)
- Describe how the EMS will optimise use of available energy sources. (Spec 5.3.4)
- Describe how the EMS will use forecasts to enable energy efficiency. (Spec 5.3.4)
- Describe how the EMS will incorporate weather forecasts including a contingency. (Spec 5.3.5)
- Describe how energy priorities are applied within the EMS. (Spec 5.3.6)
- Describe how the EMS will forecast energy requirements. (Spec 5.3.6)
- Describe how the EMS will manage and balance the energy network. (Spec 5.3.7)
- Describe how the EMS will start large loads. (Spec 5.3.8)
- Provide an example of the application of large load automatic starting. (Spec 5.3.8)
- Describe how the EMS will manage spinning reserve and electrical system security for islanded systems. (Spec 5.3.9)
- Please upload any other supporting documents

6.6 SCHEDULE 2

FORM OF ACKNOWLEDGEMENT

The Invitee must complete this Form of Acknowledgement and return by email to:

energymanagementEOI@stateofplay.org

REQUEST FOR INFORMATION – Energy Management System

With reference to the above Request for Information, we acknowledge receipt of the functional specifications issued on 3 November 2022. (Please tick whichever is applicable)

☐ We intend to submit an application for the Request for information.

☐ We do not intend to submit an application.

Company Name and ABN

_____

Contact Name

_____

Contact Position Title

_____

Contact Telephone Number

_____

Signature

_____

If you require an NDA to provide certain information on your EMS, please email

energymanagementEOI@stateofplay.org.