Faculty of Design

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# Intelligent ecosystem open-pit mining GIGAMap

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# Intelligent Ecosystem
# Open Pit Mining



**ENVIRONMENT**
- Reduced Dust
- Quieter
- Cleaner Soil
- 90% Reduced Water Impact
- Limited GHCs
- Biodiversity Retained

**SOCIETY**
- Employees/Unions
- Community
- Regional
- Federal

**ECONOMIC**
- Mining
- Maintenance
- Supply / Logistics

## DECISION

## INFORMATION

**Applications**
- ERP Systems
- Energy, Water, and Waste Systems
- Business Intelligence Systems
- Operations /Asset Systems
- Production Systems
- Programmable Logic Controllers

**Communication Infrastructure**

**Sensors / Data Collection**

## MATERIAL

**Mining Equipment**
- Modular Trucking System
- LNG Self-Driving Trucks
- Mid-Process Ore Charcterization
- Electrolytic Water Treatment
- Energy Wave Drilling & Rock Heat Treatment
- Hard Rock Continous Miners
- Hybrid Air Vehicles
- Continuous Electric Light Rail
- Conveyors
- Electric Equipment Hoist

## ENERGY

**Energy Networks**
- Demand-Side Management Application
- Synchronized Grid
- Energy Storage

**Generation Equipment**
- Combined Cycle Synthetic Natural Gas Turbine
- Steam Turbine
- Wind
- Solar PV
- Solar Thermal
- Heat Conversion
- Geothermal

### Central process diagram

- Plan
- Design
- Schedule
- Report
- Analyze / Simulate / Visualize Work + Energy
- Performance Management
- People/Asset Tracking
- Data Collection — Data Storage
- System Automation
- Cyber Security
- Integrated People/Machine Communication

### Process stages

**Explore** | **Produce** — Continuous | **Process** — Continuous

- Hybrid Air Vehicle
- LNG Equipment
- Surveillance
- Geosurvey
- Critical Supplies
- People Transport
- Communication / Differential GPS
- Wireless & Satellite Communications
- Open Pit
- Continuous Electric Light Rail
- Inspection Drone
- Solar PV Battery
- Solid Waste
- Gravitational Energy Storage
- Heap Leach
- 40km
- 20km
- Ore Sorting Sensor
- Continuous Hard Rock Mining
- Heat to Weaken Rock
- Light Electric Haul Trucks
- Rapid Wireless Charging
- Equipment Lift
- Small Truck Service Station
- Work + Energy Synchronized
- Battery Storage
- SG Synchronized Grid
- Rail Maintenance
- Heat Storage
- Crushing
- Grinding
- Concentration
- Solar Thermal
- ORC
- Heat Exchanger
- Refining / Pelletization
- Inspection Drone
- To Civil Works
- Wind Turbines
- Pumped Storage
- Pump Generator
- Solar PV
- Heat Storage
- Geothermal Heat
- Steam Turbines
- Sunlight
- Concentrated Solar Thermal Heat
- Energy-Wave Drilling
- Utility Grid
- Combined Cycle Natural Gas Storage
- Electrolysis Liquefaction
- Methanation
- Catalytic Solar Hydrolysis
- $CO_2$
- $H_2$
- $H_2$ Storage
- LNG Truck
- LNG
- Fuel Cell
- Natural Gas Pipeline
- Heat and Energy To Community
- Electrolytic Water Purification
- Transit

### SHAREHOLDER VALUE

**Return + Risk**
- Long & Short Term
- Strategic, Operating & Financial
- Revenue
- Profit
- Asset Utilization

**Capital Intensity**
- Enhance Partnerships

**People Intensity**
- Production
- Processing
- Attract Better Talent

**Water Intensity**
- Reduced Water Dependence

**Energy Intensity**
- Energy Security

### SOCIETAL VALUE

**Federal**
- GDP Growth
- Cluster Development
- Foreign Direct Investment
- Federal Tax Base

**Regional**
- Regional Taxes
- Economic Development

**Community**
- Property Taxes
- Greater Economic Multiplier
- Education
- Health Care
- Strong Communities
- Sustainable Energy

**Employees**
- Value-Added Jobs
- Advanced Skills
- Enhanced Employee Wellness
- Distributed Work Centres
- Diversity

### ENVIRONMENTAL VALUE

**Federal**
- Ecologically Accountable
- Natural Resource Preservation
- Reduced Climate Impact

**Regional**
- Impact Minimization

**Community**
- Reclamation
- Sustainable Communities
- Local Building Materials

**Employees**
- Clean Air
- Clean Water

**USE** — **DO** — **GET**

**Deloitte.**