

Islamic Republic of Iran

Organization for investment economic and technical assistance of Iran

## "Summary of Technical-Economical Prefeasible Study"

Name:

**Production of Magnesium Ingots from Dolomite**

Sector: **Non-metallic mineral industry**      Sub sector: **Non-metallic mineral**

isic code: **26991461**

The owner of:

**Industry, Mine and Trade**

Counselor plan:

**Razi University**

The Address:

**Kermanshah, Iran.**

Date of P.F.S:

2024/10/22

**Manager of Iran Investment Opportunities  
SHAHRIG Engineering Group**

[www.shahrig.com](http://www.shahrig.com)



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## 1- Abstract:

### PROJECT PROFILE - SUMMARY SHEET

Project Introduction	
<b>1- Project title: Production of Magnesium Ingots from Dolomite</b>	
<b>2- Sector:</b> Non-metallic mineral industry	<b>Sub sector:</b> Non-metallic mineral
<b>3- Products / Services:</b> <p>The product targeted by the plan falls under the Basic Metals Manufacturing Group (26), specifically within the subcategory for the manufacturing of other non-metallic mineral products not classified elsewhere (2699), including production of magnesium metal from dolomite (26991461) and cutting marble stone into slabs (2696512306).</p> <p>The products covered by the project fall under subchapters of tariff code (2519) of the Iranian Customs Regulations, titled: "Natural magnesium carbonate (magnesite); fused magnesium by electric melting, dead-burned magnesium obtained through calcination (sintered), even if containing small amounts of other oxides added before sintering; other magnesium oxides, even pure." These are imported and exported under tariff subcode (25191000).</p>	

**4- location (address):****Eslam Abad Gharb Economic Special Zone, Eslam Abad Gharb County, Kermanshah Province, Iran****Free Zone** ☐**Economic Special Zone** ☒**Industrial Estate** ☐**Main Land** ☐**5- Project description:**

According to existing standards, the extraction of magnesium from dolomite for establishing a magnesium ingot production unit with an annual capacity of 3,000 tons requires a total of 20,000 square meters of land. Out of this, 7,500 square meters will be dedicated to covered space, 12,500 square meters to uncovered space, and the remaining area will be allocated for open industrial grounds. The allotted land area for this project is 20,000 square meters, with any excess space designated for green areas and open spaces.

The necessary power supply and transformer capacity will be provided, with electricity sourced from the Eslamabad-e Gharb Special Economic Zone. Additionally, water supply rights from the same zone have been secured for the project. The plumbing for the outdoor areas, factory buildings, and other sections of the production unit will be carried out by qualified contractors.

The required machinery and equipment include a dolomite preparation unit, ferrosilicon preparation unit, fluorite preparation unit, material mixing unit for smelting, induction furnace, pigeon heat treatment process, steel retort process under vacuum conditions, output material separation unit, magnesium ingot casting unit, maintenance and repair workshop equipment, Gantry cranes and mobile cranes.

The raw materials and intermediary components required are dolomite rock, ferrosilicon, and fluorite.

In terms of human resources, the project will require 30 skilled workers, 41 unskilled workers, and 61 specialized personnel, employed directly.

**Project Status****6- Local / internal raw material access : 100%****7- Sale :****- Anticipated local market : 50%****- Anticipated export market : 50%****8 – Project total time (from start of activities to start of commercial operation in years): 15 years****Schedule****Start of activities :****Start of works at site****End of Works :****Start of commercial operation :**

**9- Project status :**

- Feasibility study available? Yes
- Required land provided? Yes
- Legal permissions (establishment license, foreign currency quota, environment, etc) taken? No
- Partnership agreement concluding with local /foreign investor? No
- Financing agreement concluding? No
- Agreement with local /foreign contractor(s) concluding? No
- Infrastructural utilities (electricity water supply, telecommunication, fuel, road, etc) procured? Yes
- List of know- how, machinery, equipment, as well as seller /builder companies defined? Yes
- Purchases agreement machinery, equipment and know-how concluded? Yes

**Financial Table****10- Financial structure :**

Descriptions	Local Currency Required			Foreign Currency Required Million Euro	Total Million Euro
	Million Rials	Rate	Equivalent in Million Euro		
Fix Capital	10186250	600	6111	6	6117
Current Capital	452355	600	272	0	272
Total Investment	10638605	600	6383	6	6389

- Value of foreign equipment / machinery 6 Million Euro
- Value of local equipment / machinery 4783 Million Euro
- Value of foreign technical know-how..... Million Euro
- Value of local technical know-how..... Million Euro
- Net present value (NPV): 2442 Million Euro
- Internal Rate of Return (IRR): 34 %
- Capital Rate of Return: 69 %
- Payback Period 2 year

**General Information****11 - Project type : Establishment ☒****Expansion and completion ☐****12- Company Profile**

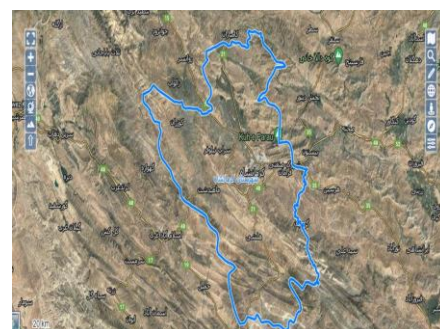
- Name (Legal/Natural persons): 1. Dr. Ehsan Khosravi 2. Dr. Yosef Mohamadifar
- Company's current activities: Razi University
- Address: Razi University, Taq-e Bostan, Kermanshah, Iran.
- Tel: +988334277605-6 Fax: +988334277605-6
- E-mail: [info@razi.ac.ir](mailto:info@razi.ac.ir) Web Site: <https://en.razi.ac.ir>
- Company's legal structure :
- Government ☒ Non-Governmental ☐ Public non-governmental ☐

## 2- Plan Location:

### 2-1. Province:

Kermanshah Province, spanning 25,009 square kilometers and centered around the city of Kermanshah, ranks as Iran's 17th largest province. Situated in western Iran, it lies between latitudes 33°40' to 35°18' N and longitudes 45°24' to 48°7' E. It borders Kurdistan Province to the north, Lorestan and Ilam Provinces to the south, Hamadan Province to the east, and shares a 371-kilometer border with Iraq to the west. The average elevation is approximately 1,200 meters above sea level. Kermanshah Province covers 1.5% of Iran's total area. According to current administrative divisions, Kermanshah includes 14 counties, 31 cities, 86 rural districts, and 2,793 inhabited villages. The 2016 Census by Iran's Statistical Center recorded a population of 1,952,434, with a density of 78 people per square kilometer across 25,009 square kilometers. The largest city, Kermanshah, serves as the provincial capital with a population of 946,651. In terms of road infrastructure, Kermanshah ranks 11th nationwide in total road length (excluding rural roads), 17th in highway and freeway length per 1,000 kilometers, and 18th in main roads. The city of Kermanshah holds the highest proportion of roadways due to its substantial area within the province.

Map Showing the Location of Province in Iran



With its extensive network of intercity and rural roads, Kermanshah Province is well-positioned to undertake ambitious road development plans, aiming to upgrade a significant portion of its road network to expressway standards. With six official border crossings (Khosravi, Parviz Khan, Sumar, Shushmi, Sheikh Saleh, and Tileh Koh) and substantial tourism potential, Kermanshah Province is well-positioned to significantly contribute to the country's foreign exchange revenue and national income. A key strategy to realize this potential is to invest in the development of its road infrastructure and transportation fleet. The Kermanshah International Airport is currently one of Iran's leading airports by flight volume, and the planned railway project will link it to the international Khosravi border and Iraq.

Kermanshah is predominantly mountainous, with 70.8% of its area classified as mountainous terrain. The remaining 22.1% consists of plains, while 7.1% is categorized as foothills. In terms of altitudinal classification, 76.5% of the province is situated within the 1000-2200 meter elevation range, with the 1400-1800 meter band being the most prevalent. If we divide Kermanshah Province into two primary elevation categories—below and above 1400 meters—approximately 58.2% of the province's area falls within the higher elevation

category, while the remaining 41.8% is at elevations below 1400 meters. Therefore, in addition to being a mountainous region, Kermanshah Province also has significant elevations. Kermanshah Province has a temperate mountainous climate. In the 4th century AD, this province, which was a pleasant village at the time, was chosen as the second royal residence of the Sassanian Empire. Extensive gardens were built in this area during the Sassanian period, providing a serene retreat for Sassanian monarchs for centuries. Throughout the Islamic period, Kermanshah was renowned for its pleasant climate, flowing waters, lush vegetation, and affordable goods. Writing in 290 AH, the geographer Ibn Faqih describes Kermanshah in his work 'Al-Buldan':

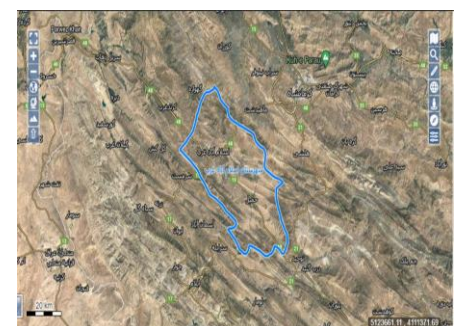
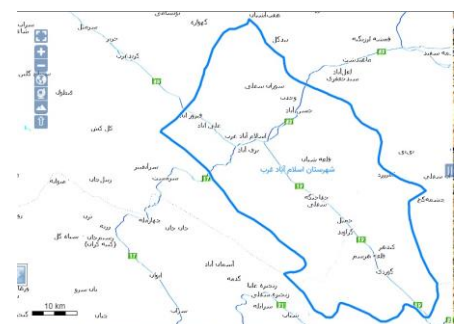
"From Madain to the Balkh River, Qabad traversed vast lands, yet nowhere did he find a region as enchanting as Kermanshah and the Hamdan-Asadabad pass. The purity of its air, the sweetness of its water, and the delight of its breeze compelled him to construct Qarmasin." Kermanshah experiences a maximum of 2999 hours of sunshine annually, with the highest solar radiation occurring in July and August, and the lowest in December and January. The climatic and ecological conditions of Kermanshah, characterized by moderate annual rainfall and relative humidity,



give rise to a landscape predominantly covered in forests and pastures. The region also features arable lands that are both irrigated and rain-fed. The annual average temperature in Kermanshah Province is approximately 14 degrees Celsius, and the average annual precipitation is 456.8 millimeters.

The primary inhabitants of Kermanshah are Kurds. Kermanshah Province is the ancestral homeland of numerous prominent Kurdish tribes, including the Zangeneh, Kalehor, Guran, Jaaf, Sanjabi, Qalakhany, Kelyayi, Bajlan, Zoleh, Jamir, as well as Laki tribes such as Jalalvand, Kakavand, Osmanvand, Payravand, and Balavand. Despite the official classification of Laks as a Kurdish subgroup, Kermanshah exhibits linguistic diversity, with Turkish-speaking communities, particularly the Sonqori Turks, residing alongside the Kilyayi Kurds in the city of Sanqor and Kelyai. The Sanqori dialect is a variety of Azerbaijani Turkish that is often described as a transitional form between Azerbaijani Turkish and Khorasan Turkish. Additionally, a community of Lors resides in Kangavar County, speaking the Luri-e-Salasi dialect. Over the past two centuries, migrants from other provinces, particularly Hamadan, Markazi, Isfahan, and Semnan, have settled in Kermanshah. Some non-Kurdish families, such as the Al-Aqa, Nojumi, Meybodi,

Map Showing the Location of the County in Kermanshah



Feyz Mahdavi, Shahrastani, Soduqi, Muhammadi Eraghi, Kazazi, Jaberi, and Dezfuli families, migrated to Kermanshah due to religious motivations to promote Shia Islam. These migrations have contributed to the distinctive Kermanshahi Persian dialect.

## **2-2. County:**

Islam Abad-e Gharb County covers approximately 2,125.05 square kilometers, accounting for 8.5% of the province's total area. This county is located in the southern part of the province and is bordered by Dalahu County to the north, Lorestan Province to the south, Kermanshah County to the east, and Gilan-e Gharb County to the west. This county has 2 urban centers, 2 districts, 7 rural districts, and

**Project Location**



172 inhabited villages. This county boasts a history spanning 6,000 to 7,000 years. Strategically situated at the intersection of Kermanshah, Ilam, Lorestan, and Khuzestan provinces, this county's importance is amplified by its location along the pilgrimage route to Karbala.

### **2-3. Project Location:**

Based on the initial phase of feasibility studies conducted for all counties in Kermanshah Province, the potential for plan implementation has been identified. Based on comprehensive assessments considering crucial factors such as raw material supply, infrastructure facilities, transportation networks accessibility, work force availability, environmental aspects, government incentives, and the competitive landscape, the Islam Abad-e Gharb Special Economic Zone has been identified as a promising location for the implementation of the proposed plan. The Special Economic Zone of Zagros, also known as the Islam Abad-e Gharb Special Economic Zone, is situated in Islam Abad-e Gharb County, Kermanshah Province. During the first provincial government visit to Kermanshah Province on September 30, 2006, the establishment of the Islam Abad-e Gharb Special Economic Zone was approved. This was subsequently ratified by the Islamic Consultative

Assembly on July 4, 2010, and the law establishing the Special Economic Zone was promulgated by the President on August 11, 2010. Initially, the Kermanshah Municipality Cooperation Organization was designated as the implementing agency for the Special Zone. However, from May 12, 2011, the responsibility was transferred to the Zagros Special Zone Organization. The Zagros Special Economic Zone was established with the objectives, including growth and development, implementing regional development policies, creating economic and industrial hubs, promoting the economic growth of the province, leveraging the potential of Kermanshah Province, attracting foreign and domestic investments, creating job opportunities, attracting knowledge and technology transfer, upgrading technology levels, adopting advanced and innovative economic technologies through scientific and industrial cooperation with international companies, supporting industries and industrialists, providing facilities for them, processing local raw materials into final products for export, reducing production costs to enter competitive global markets, and more. A 20,000 square meter area in Islam Abad-e Gharb County has been suggested as the location for this project. Given the required land area and the lack of sufficient land in the industrial parks of Islam Abad-e Gharb County, it is proposed that this plan

be located within the Islam Abad-e Gharb Special Economic Zone. This location is suitable in terms of its proximity to the dolomite mines in Islam Abad-e Gharb County, ensuring the supply of necessary raw materials, and its accessibility to Iraq through the border crossings of Parviz Khan and Khosravi. The necessary power transformers have been provided for this facility, and the electricity will be supplied by the Islam Abad-e Gharb Special Economic Zone. This facility will be supplied with water from the Islam Abad-e Gharb Special Economic Zone. All piping within the premises, including inside the warehouses and other parts of the production unit, will be carried out by a qualified contractor.

#### 2-4. Infrastructure Accessibility:

Row	Required infrastructure	Distance to the Project	Infrastructure Supply Source
1	Water	0	Islam Abad-e Gharb Special Economic Zone
2	Electricity	0	Islam Abad-e Gharb Special Economic Zone
3	Gas	0	Islam Abad-e Gharb Special Economic Zone
4	Telecommunication	0	Islam Abad-e Gharb Special Economic Zone
5	Main Road	5 km	-
6	Secondary Road	1 km	-
7	Airport	60 km	-

8	Port	600 km	-
9	Railway Station	55 m	-

### 3- Plan Technical Specifications:

#### 3-1. Product:

The intended product of the project belongs to the category of **Basic Metal Manufacturing (26)** and falls under the subgroup **Manufacture of Other Non-Metallic Mineral Products Not Elsewhere Classified (2699)**, specifically covering **Production of magnesium metal from dolomite (26991461)**.

The products under this plan are classified under subsections of tariff code (2519) according to Iranian Customs Regulations, titled: "Natural magnesium carbonate (magnesite); fused magnesium by electric melting, dead-burned magnesium obtained through calcination (sintered), even if containing small amounts of other oxides added prior to sintering; other magnesium oxides, even in pure form." These products are imported and exported under tariff subcode (25191000).

(Product/Sample Image)



#### 3-2. Plan Requirements:

### 3-2-1. Required Space and Infrastructure:

This project is designed with a capacity of 3,000 tons per year. After obtaining the necessary permits, construction will begin, and upon receiving the operational license, the project will commence its activities. Consequently, the project will be able to cover its expenses and generate annual revenue from its annual income, which is primarily derived from the sale of magnesium ingots. According to existing standards for magnesium extraction from dolomite, establishing a production unit for magnesium ingots with a capacity of 3,000 tons per year requires 30,000 square meters of land. Out of this, 5000 square meters will be allocated for covered spaces and 25000 square meters for uncovered spaces. The ceiling intended for the implementation of this project is 30,000 square meters of land, the excess land will be allocated for green space and open areas. For this complex, a concession and transformer with the desired power have been provided, which will be provided by the electricity of Islam Abad-e Gharb Special Economic Zone. Also, a water concession from Islam Abad-e Gharb Special Economic Zone has been provided for the complex. The plumbing of the area, inside the sheds and other parts of the production unit will be done by a qualified contractor.

#### Investment plan in land, landscaping and building sectors

Row	Title	Description	Investment required for the project		Total cost (million rials)
			Quantity/Quantity Required	Unit Purchase/Manufacture Price in Rials	
	Land	3 hectares of land in Islam Abad-e Gharb Special Economic Zone	30000	7500000	225000
	Landscaping	Detailed description	27000	461460	12460
	Construction	Sole	4500	64535500	290410
		Office	500	120000000	60000

		building and other buildings			
	The total		-	-	587870

### 3-2-2. Equipment and Machinery:

#### Main machinery and equipment required

Row	Title	Description	Quantity	Cost per Unit (Million IRR)	Total Cost (Million IRR)
1	Raw Material Preparation Unit	Dolomite preparation unit	1	3456500	3456500
		Ferrosilicon preparation unit	1		
		Fluorite preparation unit	1		
		Mixing unit for smelting	1		
2	Smelting Unit	Induction furnace	1	3666700	3666700
		Thermal process for pignon	1		
		Steel retort process under vacuum conditions	1		
3	Ingot Production Unit	Separation unit for output materials	1	845440	845440
		Magnesium ingot casting	1		
4	Maintenance Workshop Equipment	-	1	720	720
5	Gantry Crane	-	1	2080	2080
6	Mobile Crane	-	1	900	900
Total					7972360

#### Peripheral machinery and equipment

Row	Items	Description	Total Cost (million Rials)
	Power supply	5MW power distribution and the cost of purchasing panels and other related equipment and cabling	40000
	Heating system	Heating system for ancillary and production buildings	3000
	Cooling system	Cooling system for	3000



		ancillary and production buildings	
	Exhaust air conditioning fan	Air conditioning for production building	2500
	Ventilation fan and installation and commissioning	Air conditioning for ancillary building	720
	F.B. implementation	Auxiliary and production buildings	120
	Compressed air distribution network	Compressed air distribution for production building	2000
	Purchase and installation of telephone line	-	100
	Water branch and plumbing rights	-	3500
0	Purchase and installation of water purification and hardness equipment	-	1500
1	Fire extinguishing system	Including a central system, fire extinguishers, fire-resistant clothing, etc.	2500
2	Spare parts cost equivalent to 5% of the cost of machinery	-	398620
	The total		457560

### 3-2-3- Raw Materials and Intermediate Components:

Row	Description	Unit	Purchase Cost (Thousand IRR)	Annual Consumption (Ton)	Annual Cost (Million IRR)
1	Dolomite Stone	Ton	5840	25500	148920
3	Ferrosilicon	Ton	116800	2200	256960
4	Fluorite	Ton	20700	400	8280
<b>Total</b>					<b>414160</b>

### 3-2-4- Management and Human Resources:

Row	Skill Level	Number of Employees	Base Salary (Thousand IRR)
1	Specialist	30	180.000
2	Skilled	41	150.000

3	Unskilled	61	120.000
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- **Required Skilled Workers: 30 Individuals**
- **Required Unskilled Workers: 41 Individuals**
- **Required Specialists: 61 Individuals**

#### **4- Ownership and Legal Licenses:**

##### **4-1. Land Ownership:**

According to the Executive Regulations of the Law on the Establishment and Administration of Special Economic Zones of the Islamic Republic of Iran, the registration of companies or branches of representative offices intending to operate within a special economic zone, regardless of the level of domestic or foreign shareholding, as well as the registration of tangible and intellectual property rights in the zone, is the responsibility of the relevant Office of Deeds and Properties Registration upon the request of the zone's authority. This process follows the regulations for registering companies and industrial and intellectual property in free trade-industrial zones of the Islamic Republic of Iran, as set forth by Resolution No. 21453/T15011K dated 20 May 1995, along with its subsequent amendments.

The subdivision of real estate properties and the issuance of title deeds within the zone are carried out solely upon the request of the zone's authority by the relevant Office of Deeds and Properties Registration. The transfer of real estate between natural and legal persons within the zone is permitted at any stage with the zone's authorization and in compliance with the applicable regulations. Moreover, the issuance of separate title deeds is contingent upon the submission of a completion certificate issued by the zone's authority.

##### **4-2. Intellectual Property and Incentives:**

In order to extract magnesium from dolomite, there is no need to use high knowledge and the required technical knowledge exists in Iran. Today, the production of high-purity magnesium is of fundamental importance in various industries. The production of magnesium ingots by thermal reduction method has placed Iran among the producing countries and has the technology to extract magnesium from dolomite. The thermal reduction method has lower costs than other methods and the time required to produce this product is reduced using this process. Of course, the production must be in accordance with domestic standards.

#### **4-3. Legal Licenses:**

Both natural and legal persons engaged in any type of industrial or manufacturing activity within free zones or special economic zones require a business establishment license, which is issued by the relevant authority of the zone. Obtaining an industrial establishment license is a prerequisite for all investment activities in the manufacturing and industrial sectors.

Upon completion of the industrial unit and the successful completion of the trial production phase, provided that all the conditions and requirements specified in the establishment license are met, an operation license shall be issued to the industrial unit. The issuance of a license is a prerequisite for obtaining an establishment permit.

A commission comprising of representatives from the Ministries of Industries, Mines, and Trade; Agriculture; the Central Bank; the Islamic Republic of Iran Customs Administration; the Secretariat of the Supreme Council; and a representative of the zone is responsible for determining the permissible percentage (the amount of a product manufactured in an industrial unit that can be imported into the mainland as a domestic product without a registration order) and also for determining the value-added percentage (the amount of customs duty discount). The percentages are calculated based on the feasibility

study of the production unit, considering the required domestic and foreign raw materials

Every industrial and manufacturing unit needs a production certificate for each component of its product, specifying the manufactured item, domestic and foreign raw materials used.

The products manufactured by industrial units in free trade and special economic zones have four potential destinations:

- Consumption within the zone
- Shipment to the mainland
- Export to foreign countries
- Shipment to other zones

In this service category, businesses must indicate the end destination for their products.

## **5- Market Analysis and Competition:**

In recent years, magnesium has garnered significant attention due to its unique properties, most notably its low density, a higher strength-to-weight ratio compared to aluminum, the ability to form intermetallic compounds, and high chemical reactivity. Magnesium, as an intermediary commodity, finds extensive application in the aluminum and steel industries as an alloying element, a reducing agent, a desulfurizer, and more. The primary applications of magnesium and its alloys are in the automotive die-casting industry and aluminum alloy production. The aerospace and automotive industries are major consumers of magnesium alloys, aluminum-magnesium alloys, and magnesium-containing steels and cast irons. Other applications of magnesium include iron casting, desulfurization of steel, production of ductile iron, propellant in weaponry, purification of uranium, titanium reduction, sacrificial anodes for steel structures, wastewater treatment, and removal of heavy metals and silicates

in the ammonium removal process. Consumption of magnesium ingots in different industrial sectors include:

1- Automobile Industry: Utilized in manufacturing all types of automotive metal parts due to its lightweight, high strength, easy machinability, convenient formability, impact resistance, etc.

2- Aluminum Alloying: Applied in industries such as aerospace, high-speed trains, precision optical components, radiology equipment, and more.

3- Other Industries: Used in electronics, including televisions, computers, mobile phones, camcorders, telescopes, microwaves, and telecommunications equipment.

4- Desulfurization Process in Steel Production

5- Titanium Production

6- Defense, Missile, Aerospace Industries, and more

7- Casting Industry

8- Medical Applications: employed in orthopedic and fracture treatments, dental screws, spinal implants, etc.

9- Cathodic Protection for Corrosion Prevention: Used in industrial facilities such as refineries, petrochemical plants, docks, oil platforms, nuclear facilities, etc.

Magnesium ingots are available in both Iranian and Chinese varieties. The weight of a Chinese magnesium ingot ranges from 7 to 8 kg, while an Iranian ingot weighs between 10 to 11 kg. The specifications for both types of magnesium ingots are detailed in the table below:

Analysis of Chinese and Iranian Magnesium Ingots

Analysis of Chinese Magnesium			Analysis of Iranian Magnesium		
Row	Element	Weight Percentage	Row	Element	Weight Percentage
1	Mg	99.97	1	Mg	99.91

2	Al	0.0115	2	Zr	0.001<
3	Zn	0.0023	3	Zn	0.024
4	Mn	0.0155	4	Fe	0.021
5	Fe	0.0014	5	Ni	0.0011
6	Cu	0.0016	6	Al	0.00
7	Si	0.0121	7	Cu	0.0002 <
8	Ni	0.0005	8	Mn	0.001<
9	Ca	0.0020	9	Si	0.046

Magnesium production in Iran is economically advantageous compared to other metal production processes worldwide. Key benefits of magnesium production in Iran include:

- 1- Abundance of high-quality dolomite for magnesium extraction
- 2- Easy access to natural gas as an energy source
- 3- Eco-friendly production process with minimal pollution and water consumption
- 4- Low labor costs leading to increased employment opportunities
- 5- Significantly lower capital investment compared to other metals
- 6- The possibility of modular factory setup, reducing investment costs

The geological structure and discovered mineral deposits indicate that Kermanshah Province holds significant potential for non-metallic minerals, such as gypsum, limestone, building stone, marble, dolomite, natural bitumen, and sand. The vast dolomite reserves in Eslamabad-e Gharb County, along with magnesium deposits in the same area, present a unique potential for developing the mineral processing industry and magnesium ingot production.

### **5-1. Target Market Introduction:**

Industrial consumptions of magnesium can be broadly categorized into metallurgical and structural uses. Magnesium is consumed during metallurgical

processes through both physical and chemical reactions. In structural applications, components made of magnesium or its alloys are engineered to withstand mechanical loads. According to statistics, global magnesium production is approximately one million tons annually, with around 60% dedicated to metallurgical applications and 40% utilized in structural applications. However, this ratio is evolving. As research and development efforts to overcome the technological challenges associated with magnesium use intensify, the global demand for magnesium in structural applications is on the rise, with the automotive industry being the largest consumer for producing lighter components. In recent years, global demand for magnesium, particularly in the automotive industry and aluminum alloy production, has experienced significant growth. Furthermore, the expansion of steel and aluminum industries in Gulf Cooperation Council countries, coupled with the use of magnesium as a desulfurizing agent in steelmaking, has fueled the demand for magnesium in the region. In addition to its lightweight and high strength, magnesium possesses excellent energy absorption capacity and can be easily formed into various shapes through hot working processes. This metal finds extensive use in a wide range of industries, including automotive, alloying, aerospace, defense, petrochemical, and refining.

Raw materials, energy sources, a reliable consumer market, access to rail and maritime transportation infrastructure, a young and skilled workforce, and the availability of environmental protection solutions aligned with sustainable development are among the most important infrastructures required for magnesium production. A review of Iran's infrastructure in these areas shows that our country has the appropriate capacity for the production and utilization of magnesium in each of these cases.

Therefore, prioritizing the development of the magnesium production industry in the country's industrial and mining policies, and setting a target of producing 100,000 tons of magnesium in Iran, would position it as the second largest

magnesium producer in the world. This achievement, in addition to creating direct and indirect employment, would lead to the transformation of magnesium into a high-value-added product, foreign exchange earnings, export development, the expansion of related industries such as parts manufacturing, ferroalloy production, advanced component production for defense and aerospace, and the development of medical equipment industries, among others.

#### 6- Plan Physical Progress Timeline:

Yes ☐

No ☒

#### 7- Operational Program and Plan Implementation Schedule:

Below is the timeline for the project's execution

		Mt h. 1	Mt h. 2	Mt h. 3	Mt h. 4	Mt h. 5	Mt h. 6	Mt h. 7	Mt h. 8	Mt h. 9	Mt h. 10	Mt h. 11	Mt h. 12	Mt h. 13	Mt h. 14	Mt h. 15	Mt h. 16	Mt h. 17	Mt h. 18	Mt h. 19	Mt h. 20
Dolomite-based magnesium extraction	Feasibility Study																				
	Licenses																				
	Construction																				
	Equipment																				
	Training																				
	Operation																				



## 8- Project Financial Plan:

### 8-1 Cost Estimates:

#### Costs Estimates

Row	Item	Cost (Million IRR)
1	Fixed Capital Investment	10186250
2	Operating Costs (Working Capital)	452355
3	Financing Costs	10638605

#### Fixed Capital Investment Breakdown

Row	Item		Cost (Million IRR)
1	Land Purchase		225000
2	Landscaping and Site Improvement		12460
3	Construction and Civil Works		350410
4	Production Machinery & Equipment		7972360
5	Support and Auxiliary Equipment		457560
6	Environmental & Safety Equipment		22880
7	Overhead Costs		637790
8	Pre-Production Expenses	Feasibility Study	1778
		Project Management and Organization	892
		Technology Acquisition	21200
9	Contingencies		483920
Total			10186250

#### Working Capital Estimates (Production Costs)

Row	Item		Cost (Million IRR)
Ongoing Operating Costs			1641780
1	Raw Materials		414160
2	Human Resources		245540
3	Marketing (excluding Human Resources)		106200
4	Other Operating Expenses	Fuel and Energy	95270
		Repair and Maintenance	702430
		Unforeseen Expenses	78180
Fixed Costs			1542620
5	Raw Materials		0
6	Human Resources		61390
7	Marketing (excluding Human Resources)		0
8	Depreciation		1248410
9	Other Fixed Expenses	Fuel and Energy	23810
		Maintenance	175600
		Unforeseen Expenses	13040
		Insurance	20370
Total			3184400

### 8-2. Revenue Estimates:

### Revenue Estimates for the First 5 Years

Row	Product Item	Q1	Q2	Q3	Q4	Year 1	Year 2	Year 3	Year 4	Year 5
1	Magnesium Ingot	1416000	1416000	1416000	1416000	5624000	6018000	6372000	6726000	7080000
	Total	1416000	1416000	1416000	1416000	5624000	6018000	6372000	6726000	7080000

### 8-3. Project Operation Period:

Generally, production plans have three main lifecycle phases:

- Project Lifecycle (Construction Phase);
- Operational Lifecycle (Production Phase);
- Product Lifecycle.

The project life cycle is often equated with the construction phase, in which a lot of costs are usually paid. A successful project is one that can deliver this phase within a compressed timeline and at a reduced cost. This section requires the implementation of project management techniques with robust and timely controls to ensure that any issues identified can be rectified during the planning phase. The operation lifecycle, which is the same as the production lifecycle, encompasses the entire production phase and often designed to be 15 years. Throughout the operational phase, revenue and costs will be generated as a result of product sales. However, revenues typically exceed costs, otherwise the project would not be economically viable. During the operational lifespan, traditional project management techniques are not applied. Instead, production planning and operational process management are vital for the long-term success of magnesium extraction from dolomite, focusing on efficient maintenance and repairs throughout the utilization period.

### 8-4. Break-Even Analysis:

Annual Break-Even Percentage=  $\frac{\text{Total Sales (P)} - \text{Variable Costs (V)}}{\text{Total Fixed Costs}}$

$$\text{Annual Breakeven Percentage} = 1,542,620 / 7,080,000 - 1,641,780 = 28\%$$

The value of (P-V) holds particular significance and is referred to as the unit contribution margin. This figure represents the profit per unit or, in other words, the portion of each sale that contributes to covering fixed costs. As a result, the breakeven point is reached when the total contribution margin of all units equals the total fixed costs. In this context, the sales volume covers more than 28% of the fixed costs. The relationship between total sales revenue and total costs indicates that this plan operates at 28% above the annual breakeven point and generates profit for the company over three production cycles, thereby providing a margin of safety for production activities. In breakeven analysis, the margin of safety reflects the extent to which actual or estimated sales exceed the sales level required to break even by more than 28%.

#### Project Efficiency Indicators

Fixed Capital (Million IRR)	10186250
Cost of Production per Unit (IRR)	1019276
Gross Value Added (Million IRR)	5668370
Net Value Added (Million IRR)	4416260
Gross Profit (Million IRR)	4022170
Net Profit (Million IRR)	3890540
Per Capita Fixed Capital (Million IRR)	77168
Total Per Capita Investment (Million IRR)	80595
Rate of Return on Investment (%)	37
Payback Period (Years)	2

#### 8-5. Cost-Benefit Analysis:

##### Project Profitability Indicators

Present Value of Total Costs (Execution & Operation)	3184400
Present Value of Total Revenue (Execution & Operation)	7080000
Net Present Value (NPV)	4070988
Benefit-Cost Ratio (B/C)	2.2

Internal Rate of Return (IRR)	34%
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## 8-6. Project Sensitivity Analysis:

### Sensitivity Analysis

Discount Rate (%)	Net Present Value (NPV)
10	16201574
20	5549508
30	1051259
40	1101638-
50	2219414-
60	2825791-
70	3157233-
80	3331386-
90	3411438-
100	3433425-

## 8-7. Summary:

### Project Economic Analysis Summary

Type of Activity	Detailed Activity Description with Code (ISIC)	Manufactured Product	Nominal Capacity (Unit)
Industry and Mining	26991461	Magnesium Ingot	3000 Tons
Execution Period	Total Fixed Investment (Million IRR)	Annual Working Capital (Million IRR)	Required Workforce
20 month	10186250	452355	132 employees
Internal Rate of Return (IRR)	Net Present Value (NPV) (IRR)	Applicant Contribution (IRR)	Benefit-Cost Ratio (B/C)
34 %	4070988	2037250	2.2

## 8-8. Exchange Rate Fluctuations Estimates during Project Implementation

Regarding the procurement of machinery and equipment for the project, since a portion of the necessary equipment will be sourced from abroad, an increase in

the exchange rate will lead to higher initial investment costs for plan implementation. Conversely, a decrease in the exchange rate will reduce the initial investment costs.

Regarding the procurement of raw materials, given that all the required raw materials for the plan will be extracted from domestic mines located in Kermanshah Province, fluctuations in the exchange rate will not impact the production cost of the final product.

Regarding product sales, since a portion of the plan's revenue is expected to come from exports to other countries, an increase in the exchange rate will boost the revenue from sales. Conversely, if the exchange rate decreases, the products can be marketed domestically.

## **9- Capital Requirements, Funding Methods, and Collateral:**

### **9-1. Required Foreign Currency Investment:**

The amount of foreign currency required to procure the necessary machinery and equipment for project implementation is as detailed in the table below.

<b>Row</b>	<b>Year</b>	<b>Foreign Currency Requirement</b>
1	First	2252080
2	Second	4504160
3	Third	0
4	Fourth	0
5	Fifth	0

### **9-2. Participation and Funding Methods:**

The loan for magnesium extraction units from dolomite is part of the government's strategy to further support industrial activities and leverage supportive mechanisms to expand production facilities. For producers who lack sufficient financial resources to establish a magnesium extraction unit from dolomite, bank loans are available. However, obtaining such loans requires meeting specific conditions and criteria. One key condition is the economic

viability of the plan; if the costs exceed the expected revenues and profits, the plan will not be economically feasible and could result in significant losses for the producer. The Ministry of Industry, Mine, and Trade, under Clause A of Note 18 for Industry, Mine, and Trade and Clause A of Article 52 of the Annexation Law, provides loans and financial facilities in the fields of industry, mining, and trade. To promote fairness among new entrepreneurs entering these sectors, the Ministry aims to offer loans with relatively reasonable interest rates. It is evident that Clause A of Note 18 and Clause A of Article 52 of the Annexation Law are legal provisions established to grant financial facilities to investors in the sectors of industry, mining, and trade.

### **9-3. Payback Period:**

Based on the fixed and variable capital invested, and annual sales, the payback period for this project is typically realized within approximately 2 years.

### **9-4. Incentives, Features, and Benefits of the Plan:**

For implementing the magnesium extraction project from dolomite, government financing is commonly utilized, with the applicant's contribution capped at a maximum of 20%. In this project, the responsibility for developing and providing the necessary infrastructure is assigned to the Eslamabad-e Gharb Special Economic Zone. The land, equipped with access roads, water, electricity, gas, fiber optics, internet, and more, is made available to interested investors for a fee. Once investors secure the land and obtain preliminary approval and an operating license from the General Department of Industry, Mine, and Trade as well as the Environmental Protection Agency, they can access funding through programs like Clause A of Note 18 or Clause A of Article 52 of the Annexation Law by registering on the Sina system.

Applicants who contribute their own capital can use these facilities to develop the infrastructure for this production unit. Additional incentives under this plan include export bonuses for products sold overseas, exemptions from customs duties on the import of capital machinery, and guarantees for supplying raw materials and feedstock for downstream industries at export prices for at least 10 years during the operational phase. Furthermore, tax exemptions are granted on the total taxable income of industrial units until it reaches twice the amount of their registered and paid-in capital—100% in less-developed areas and 50% in other regions. Additionally, individuals who contribute capital to finance the plan or working capital for production units through partnership-based agreements are exempt from paying income tax equivalent to the minimum expected profit rate of such agreements (loan interest rate). If the investment leads to product exports, 100% of the income from the export of non-oil goods and services, and 20% of the income from the export of raw materials, will be subject to zero-rate taxation. Also, regarding the benefits of establishing a project in a special economic zone, the following can be mentioned:

- Commercial transactions between the zones and foreign countries or other special economic zones and free trade zones are exempt from customs duties, commercial profits tax, and all other import and export duties upon customs registration. They are also exempt from the restrictions and prohibitions of import and export regulations, except for legal and religious restrictions and prohibitions. Commercial transactions between the zones and other parts of the country, excluding the aforementioned zones, are subject to export and import regulations.
- Goods imported into the zone from foreign countries or free trade zones shall be subject to minimal customs formalities, and the domestic transit of goods imported into the zone shall be carried out in accordance with the relevant regulations.

- Goods imported into the zone from foreign countries, free trade zones, or other areas may be exported from the country without any customs formalities.
- The zone authority may, after classifying and valuating the zone, grant the right to use portions thereof to qualified natural or legal persons.
- Owners of goods imported into the zone may declare all or part of their goods to customs for temporary importation into the country, subject to the relevant regulations.
- Goods manufactured or processed in the zone shall be deemed as domestic products upon entry into other parts of the country, to the extent of the total value added and the value of domestic raw materials and components used therein, and shall be exempt from import duties.
- Foreign raw materials and components used in the manufacture or processing of goods shall be treated as domestic raw materials and components, provided that the import duties have been paid.
- The management of each zone is authorized to issue certificates of origin for goods exported from the zone upon the request of the applicant, subject to the approval of the Iranian Customs. Banks in the country are obligated to accept such certificates.
- Customs authorities are required to process requests from property owners for the transit of goods, as well as for direct transportation from alternative entry points to designated zones. They must also ensure the provision of adequate facilities to facilitate these operations.
  - The obligations of the Organization for Registration of Deeds and Properties of the country with regard to the registration of companies or branches of representative offices of companies intending to operate in the region, regardless of the level of domestic or foreign shareholding, as well as the registration of tangible and intellectual property in the region.



- All goods imported for the purpose of production or service provision in the zone shall be exempt from the general regulations governing imports and exports.