Towards Creating a Green Brand for Iran's Energy Sector

WHITE PAPER

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Executive Summary

A green brand is a set of attributes and benefits designed to minimize the brand's environmental impact and creating a positive perception of the brand as eco-friendly. In industry, a large number of activities are presented as eco-friendly; however, to determine whether such activities are actually helpful for the environment is somehow difficult. Due to the complicated nature of industrial products and also lack of sufficient information in this regard, it is difficult to find out which brands actually comply with green standards. Therefore, to develop a precise base for understanding this issue, it is necessary to provide sufficient information for stakeholders about environmental challenges and how to face and solve them; hence, comparing them with actions taken by the brand makes it clear which activities are eco-friendly and can be called "green activities".

In this paper, two key environmental challenges posed by the energy industry, two principles are introduced as a framework for creating a green brand in the energy sector of Iran: reducing greenhouse gas emissions (especially CO_2) and reducing particulate matter concentration in cities. These two principles, along with their solutions, as the bases for evaluating the energy industry, are used as a yardstick to analyze MAPNA Group activities to determine which of the group's activities have been carried out to create a green brand.

1. Introduction

Brands are meaningful systems which incorporate values, ideas, associations, feelings and emotions and constitute a coherent identity (Chandler et al, 2002; Collins et al, 1983; Farquhar et al, 1992). A green brand is a set of attributes and benefits designed to minimize the brand's environmental impacts and creating a positive perception of environmental concern (Hartmann et al., 2005). The green brand strategy tries to achieve attributes and benefits by which be able to minimize its environmental impacts. To do so, a green brand needs to enhance its consumers' understanding on its healthy environmental activities and inform them about the benefits achieved through such activities (Simão and Lisboa, 2017).

It is easy to claim that you are a green brand, but it is difficult to verify the evidence, especially in the industry. Because of the nature of the industrial products it is not easy to determine which brand complies to green activity standards. Thus, it is necessary to aid industrial experts or provide information to people relying on which they would be able to find out which sort of activities are eco-friendly.

In this paper, concerning the most important negative consequences of energy sector, i.e. greenhouse gas emissions and the increased particulate matter concentration in megacities, some solutions are suggested, which it make possible for us to determine eco-friendly activities in this sector. Then, accordingly some activities of MAPNA Group will be reviewed.

2. Statement of the problem

Since the most important and the most recognized negative consequences of the energy sector (in both production and consumption stages) are greenhouse gas emissions and particulate matter concentration, their two major consequences, climate change and air pollution in megacities, are analyzed. Of negative aspects of greenhouse gas emissions we can point to the impact of climate change on both infrastructure and economy (Stern, 2006), quality of life and health related issues (McMichael et al., 2006). For air pollution in large cities, high mortality and morbidity rate can be pointed that in a city like Tehran which inflicts an economic cost of 2.6 billion USD per year (Heger and Sarraf, 2018).

To counter the impacts of these problems, various enterprises and industrial businesses, especially those who are active in the energy sector of Iran, need to define and implement eco-friendly activities, also known as green activities. Hence, many enterprises try to introduce their activities as eco-friendly in order to be perceived as a green brand, but determining the effectiveness of their activities to tackle such problems is not easy. Later in this paper, a framework based on authenticated international reports is introduced to be employed as a standard for determining which activities are eco-friendly and are in line with creation of a green brand.

3. Framework for creating a green brand in the energy sector of Iran

Regarding the technologies used in the energy sector (at both production and consumption stages) and also dependence on energy in various sectors, generation and emission of greenhouse gas and the increased concentration of particulate matters are unavoidable, hence, the activities that counteract those issues in the energy sector are regarded as green activities. Therefore, what is important in determining green activities is that how it is possible to reduce greenhouse gas emissions and particulate matter in the energy sector.

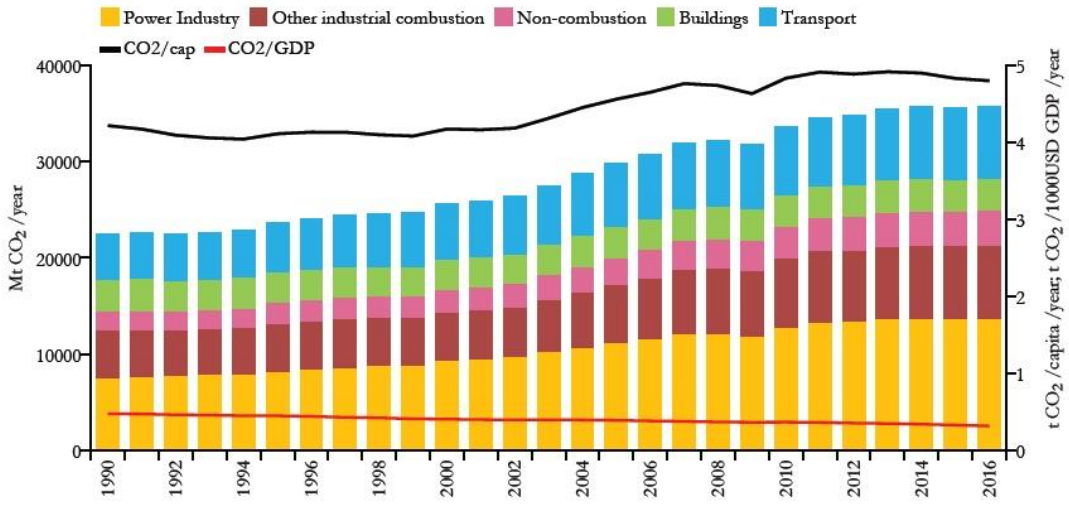
Hence, this paper will seek approaches to achieve two mentioned principles and introduce methods used to reduce both greenhouse gas emissions and particulate matter in cities in order to set criteria for assessing the green activities of enterprises that are active in the field of energy.

3.1. Greenhouse gas emissions

Climate change is a phenomenon recognized across the world as the most important consequence of greenhouse gas emissions. The phenomenon is prevalent among the Middle East countries, especially Iran. Climate change in Iran has resulted in excessive heat, dry air, high levels of humidity, torrential rains and storms in some regions, inflicting material and non-material costs on the country. According to credible forecasts, among the Middle East countries, Iran will experience an increase of 2.6 °C in mean temperatures and a 35% decline in precipitation in the next decade (Mansouri et al, 2019).

According to statistics released by the World Bank website in 2014, China is the largest emitter of carbon dioxide gas which is the main cause of global warming and climate change, followed by the United States and India.

Figure 1 indicates the amount of CO_2 generation and emission across the world based on various sectors (1990-2016) (Janssens-Maenhout et al, 2017).

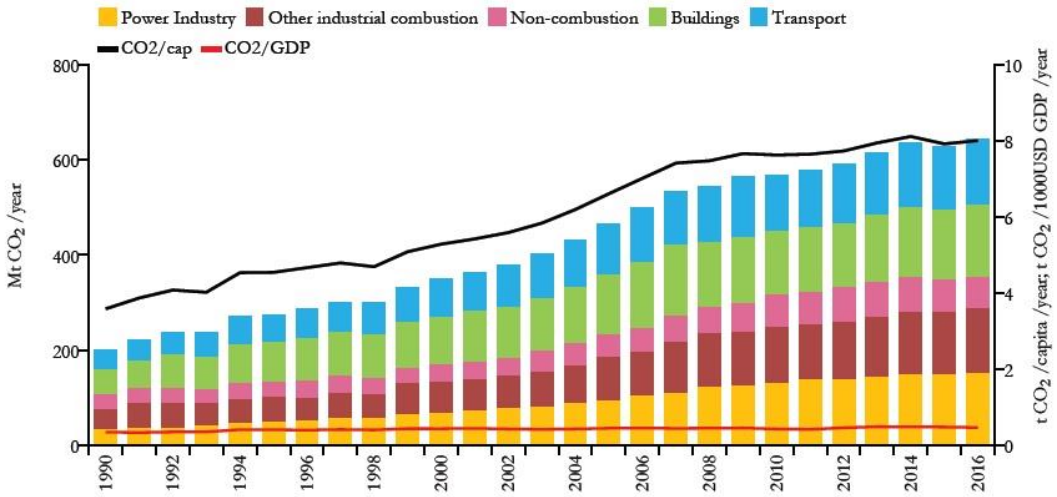


Year	Mt CO_2/yr	t CO_2/cap/yr	t CO_2/kUSD/yr	population
2016	35753.306	4.796	0.321	7461900000
1990	22450.442	4.215	0.479	5328680000

Fig.1: Amount of CO_2 emissions caused by consumption of fossil fuels in different sectors across the world

What is interesting is that despite increased CO_2 emissions in different sectors, including power industry and transport sector, the CO_2 emissions per capita in the world has been declining within recent years (since 2012). In the same direction, CO_2 emission versus Gross Domestic Product (GDP) per capita chart is descending, which indicates that the countries' approach and technology developments have been in favor of declining CO_2 emission, which is promising. Nonetheless, Iran ranks seventh in the world in terms of emitting CO_2. This means Iran emits CO_2 as much as advanced industrial countries like Germany and South Korea (World Bank website).

Figure 2 indicates both the generation and emission of CO_2 in Iran by different sectors, from 1990 to 2016. (Janssens-Maenhout et al, 2017).



Year	Mt CO_2/yr	t CO_2/cap/yr	t CO_2/kUSD/yr	population
2016	642.560	8.002	0.476	80277428
1990	201.720	3.589	0.353	56226185

Fig.2: Amount of Co_2 emissions generated by fossil fuels in different sectors of Iran

As Figure 2 shows, the generated CO_2 gas in all sectors is ascending and it has experienced a remarkable growth in power, other combustion-based industrial activities and the transport sector. Likewise, despite the global trend, the CO_2

emission per capita is ascending and CO2 emission versus GDP per capita is approximately fixed in Iran. Therefore, to conclude our remarks, it can be said that the efficiency of fossil fuels consumption in Iran is low; a trend which needs more serious attention.

3.2. Solutions to Reduce Greenhouse Gas Emissions

The negative consequences of climate change need to be reduced through enhancing energy efficiency, sustainable transportation, renewable energy technologies, energy storage and transport, and forest expansion. To do so, it is necessary to change the nature of industries; in other words, the green and eco-friendly approaches must be prioritized. The main driving force for this change is the power industry. The power industry would be effective in reducing the emission of the greenhouse gas through planning and implementing the following steps (Janssens-Maenhout et al, 2017):

- Improving the current energy generation technologies;
- Decentralization of the energy system through extending small-scale generation and distribution units and attracting consumers' participation;
- Digitalizing in order to pave the way for enhancing energy efficiency.

Enhancing energy efficiency through improving the current energy generation technologies would be meaningful in different sectors of this field; in this regard, increased efficiency in thermal power plants, improved energy efficiency in buildings, implementing optimal systems for intra-city commuting and transportation, continuous improvement of vehicle engines, producing electric vehicles, launching artificial intelligence systems in the transportation industry which work based on self-learning neural networks can be mentioned.

Another approach is extension of renewable energies and decentralization of energy generation sources, an approach which is gaining momentum across the globe. Moreover, **today, energy storage through attracting consumer participations is one of the best ways to realize decentralization.** Electric vehicles can be a good example for this case. EVs are considered as an energy source for consumers: when there is a surplus production, the electric vehicles store the power and later, by providing a portion of the required energy for transportation sector, actually distribute the energy at the right time.

The increased reliability in the energy distribution system mostly depends on the precise control and balance between energy demand and supply, which is met through digitalization process. For instance, because of their geographical distribution, multiplicity and the nature of the energy, renewable energies may bring some problems in demand and supply control and balance.

Therefore, given what was mentioned here, it can be concluded that **increased energy efficiency** is the most important principle to reduce greenhouse gas emission in the power industry which causes climate change. Energy efficiency can be increased through four approaches (explained in detail in Table 1):

Table 1: Approaches to reduce greenhouse gas emissions through enhancing efficiency in the power sector

Item	Implementation period	Financial cost	Effectiveness
Improving energy generation technologies	Middle-term	Average	High
Decentralization of energy generation and distribution sources	Middle-term	Average-High	High
Energy storage through attracting consumer participation	Long-term	Low-Average	High
Digitalization of energy control systems	Long-term	High	High

3.3. Particulate matter concentration in cities

Air pollution is a problem that most Iranian megacities suffer from. For instance, as figures indicate, in Tehran metropolitan area, in average, 16% and 20% of days were in unhealthy conditions with a high level of population in 2018 and 2019 respectively (Tehran Air Pollution Monitoring Company website).

As Figure 3 shows, in 2018, in comparison to 62 world megacities with relatively similar conditions, Tehran ranked 12th in terms of air pollutant concentrations (Heger and Sarraf, 2018).

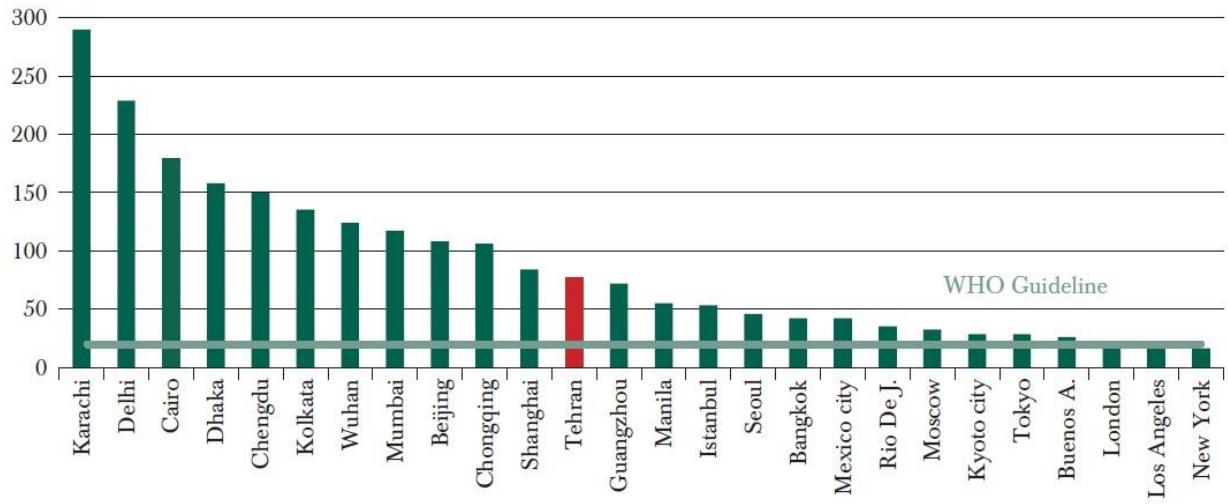


Fig.3: Air pollutant concentrations in megacities (µg/m^3)

Tehran air pollution stems from various sorts of particulate matters with different sources, including mobile sources (vehicles), energy convertors (refineries and electric power plants), industries, household and commercial consumers, and gas terminals. As Figure 4 indicates, vehicles (70%) account for the highest percentage of particulate matters in Tehran (Shabhazi et al, 2016b).

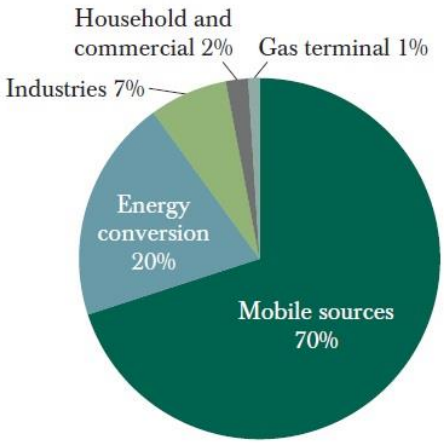


Fig. 4: pollution sources of particulate matters in Tehran

As Figure 5 shows, particulate matters in Tehran's air consist of two parts. The first part has a natural origin which is due to particles that may be found in any kind of air, which in average accounts for one fourth of particulate matters in Tehran. The second part of particulate matters scattered across Tehran has a human origin, which are categorized as "other elements" and the concentration of each of them would vary throughout the year. In the larger segment, vehicles account for the highest percentage (Arhami et al, 2017).

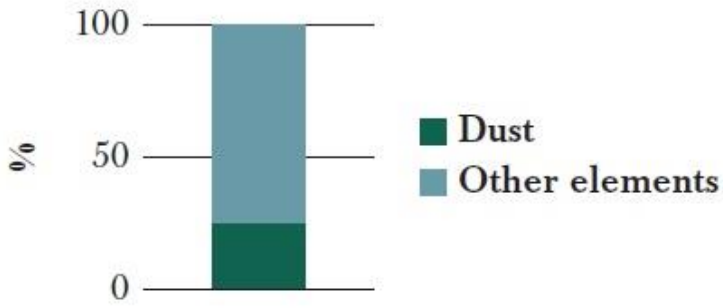


Fig. 5: Contributions to particulate matter

Based on Figure 5 and the high share of vehicles in generating particulate matters in the Tehran air, which is due to human elements, this paper will further analyze its details.

Vehicles are divided into three general classes:

- Motorcycles
- Cars (including taxi cabs, pick-ups and passenger cars)
- Heavy-duty vehicles (HDVs)

There are 4.24 million vehicles in Tehran: more than 80% of which (3.37 million) are passenger cars (Heger and Sarraf, 2018). As Figure 6 indicates, 90% of cars are passenger cars, 8% are pick-ups and 2% are taxi cars. The second largest class is motorcycles (760 thousand pieces), which account for about 18 percent of vehicles. The smallest class is heavy-duty vehicles (HDVs), which account for about 2% (100000 pieces) of vehicles in Tehran (Hosseini and Shahbazi, 2016).

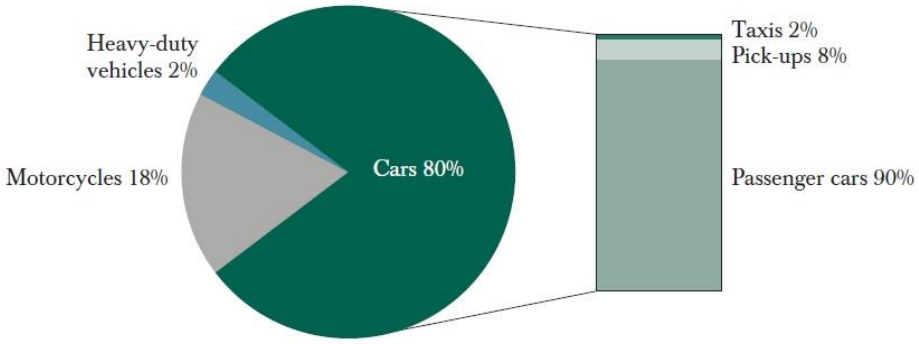


Fig. 6: Type of registered vehicles in Tehran (2013-2014).

As Figure 7 indicates, the majority of share, e.g. more than 85%, of the particulate matters emission in Tehran air is produced by heavy-duty vehicles, though they account for only 2 percent of total vehicles in Tehran. HDVs are followed by

motorcycles (12%) and passenger cars (3%). Despite the high number of passenger cars and their heavy traffic load, their share to generate particulate matters in the air of Tehran City is only 3%, hence a special attention needs to be paid to HDVs more than ever (Shahbazi et al, 2016b).

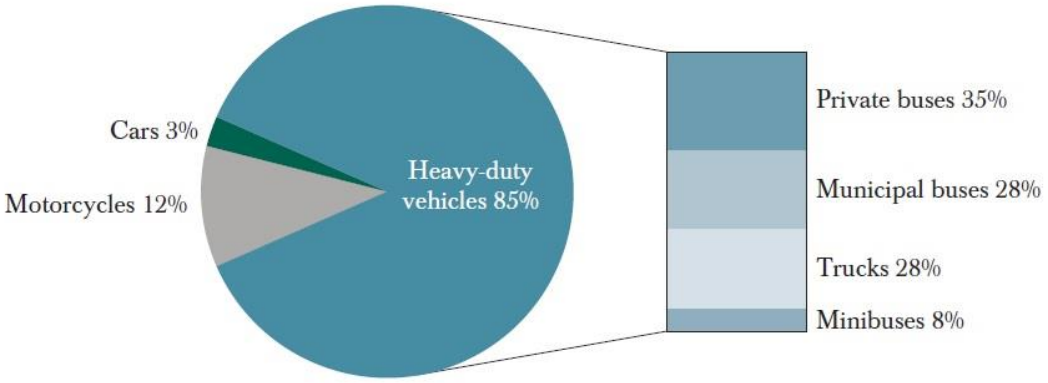


Fig. 7: Share of various vehicles to generate particulate matters in Tehran air

As Figure 7 shows, HDVs account for 85% of the particles in Tehran air, while private and municipal buses' shares are 35% and 28% respectively. This list is followed by trucks (28%) and minibuses (8%). Thus, regarding the diesel fuel of HDVs, the particulate matters generated by them are considerably more than that generated by the gasoline vehicles.

3.4. Solutions to reduce particulate matter concentration in cities

Reducing concentration of particulate matters, especially in megacities, regarding the climate change, needs short-term approaches. As the World Bank's report, which has analyzed pollution of Tehran air, (Heger and Sarraf, 2018), reducing the particulate matters concentration was considered as a key principle to reduce the pollution of megacities and some approaches were proposed based on three

criteria: period of implementation, project's financial cost and the effectiveness of the project to reduce the concentration of particulate matters.

According to these three criteria, the proposed approaches of the World Bank were ranked in terms of significance and were presented through three following priorities (Heger and Sarraf, 2018):

3.4.1. First Priority

Those approaches which can be implemented with a low or average cost in short term and are highly effective in reducing air pollution are prioritized. The four following solutions were suggested as priorities:

- Implementing a program to replace old diesel HDVs with modern ones or to scrap them.
- Implementing a comprehensive initiative for equipping diesel HDVs with particulate filters.
- Expanding low emission zones based on vehicles pollution degree.
- Improving monitoring and enforcement system.

The scrappage program for both heavy and light old vehicles has been implemented successfully in most countries including China, the United States, Germany, Mexico, Chile; thus, if implemented correctly in Iran, it could be effective. Similarly, the comprehensive initiative of equipping diesel HDVs to particulate filter can start with municipal buses and can be subsequently extended to private buses, minibuses and trucks after conducting the related tests.

Along with expanding low emission zones, entrance fees will be defined for cars and motorcycles based on their polluting degrees. This depends on classifying vehicles based on their age, technology and polluting degree; such information is

stored in a database and then according to the mentioned criteria, the relevant entrance fees for the low emission zones will be set. For instance, the entrance fees for the electric and hybrid cars would be zero in order to encourage people to use more such vehicles.

Improving the monitoring system of vehicles includes integrating databases of all cars and monitoring cameras, i.e. the entire data of vehicles including their age, polluting degree, technical inspection certificate issuance date, where and when they entered the low emission zone, would be gathered in a single database. Thus, a control system based on variable fees can be launched for various sorts of vehicles.

3.4.2. Second Priority

Besides these initial priorities, four other priorities regarding the three mentioned criteria were proposed, which are considered as second tier priorities:

- Incentives to use electric and hybrid cars including HDVs, passenger cars and motorcycles.
- Incentives for non-motor transportation including walking and cycling.
- Extending bus rapid transit (BRT) lines and converting BRT to light rail transport (LRT)
- Expansion of subway lines.

The reason for placing the abovementioned solutions as second priorities, despite their high influence in reducing air pollution is that their implementation is very costly and time-consuming.

3.4.3. Third Priority

Eventually, the third priority is strengthening and extending capacity of recording and monitoring air pollution information systems, which can be effective in making decisions and determining solutions. The third priority is very important for the effective implementation of the first and second priorities and in fact it forms the basis for setting priorities and solutions.

Therefore, regarding the abovementioned priorities, solutions which can be launched by the active companies in the energy sector in order to reduce particulate matters concentration in cities are summarized in Table 2:

Table 2: Solutions that energy companies can use to reduce concentration of particulate matters in megacities

Item	Implementation period	Financial cost	Effectiveness
Upgrading the current diesel HDVs (installing particulate filters)	Short term	Low	High
Manufacturing clean or low-emission HDVs	Middle-term	Average	High
Manufacturing electric and hybrid cars and related infrastructure	Middle-term	Average	High
Expansion of LRT lines	Middle-term	High	Average
Expansion of subway lines	Long term	High	High

3.5. Conclusion

Given what was explained here, all activities conducted by the energy industry to reduce greenhouse gas emissions and to reduce particulate matters concentration in the cities are categorized as green and eco-friendly activities. Therefore, the framework for creating a green brand in the power industry can be summarized as Table 3:

Table 3: Green Brand Creation Framework in the Power Industry

Principle	Item	Implementation period	Financial cost	Effectiveness
Reducing greenhouse gas emissions	Upgrading energy generation technologies	Middle-term	Average	High
	Decentralization of energy generation and distribution sources	Middle-term	Average-High	High
	Energy storage through attracting consumers' participation	Long-term	Low-Average	High
	Digitalization of energy control systems	Long-term	High	High
Reducing concentration of particulate matters in the air of cities	Upgrading the current diesel HDVs (installing particulate filters)	Short term	Low	High
	Manufacturing clean or low-emission HDVs	Middle-term	Average	High
	Manufacturing electric and hybrid cars and related infrastructure	Middle-term	Average	High
	Expansion of LRT lines	Middle-term	High	Average
	Expansion of subway lines	Long term	High	High

Given the principles and solutions proposed in Table 3, the activities taken by MAPNA Group, as company active in the energy sector, will be reviewed.

4. MAPNA Group

MAPNA Group is an industrial enterprise comprising the parent company and more than forty subsidiaries, which are active in various fields such as engineering, construction and development of thermal power plants, renewable energy power plants, power and heat co-generation utilities, engineering, executing and developing offshore and onshore oil and gas projects, execution of rail transport projects, medical imaging services, electrification, operation, repair and maintenance services in these areas, and financing and investment.

The most important measures taken by MAPNA Group are mentioned here and are analyzed based on the framework proposed for creating green brand in the power industry.

4.1. Construction and Conversion of Simple Cycle Power Plants to Combined-Cycle Ones

In average, the efficiency rate of fuel to power conversion is 33% in thermal power plants, that is, nearly two-third of the consumed fuel is released as heat in the atmosphere, which in turn both pollutes the environment and makes the earth warmer. On the other hand, combined cycle power plants enjoy a +50% efficiency. This means that the combined cycle power plants generate electricity which is equal to what is generated by the steam power plants with a much less fuel consumption rate; thus, conversion of simple cycle power plants to combined cycle power plants falls within the technological upgrade category and reduces emission of greenhouse gases.

MAPNA Group is able to convert simple cycle to combined cycle power plants. So far, the conglomerate has launched numerous combined cycle power plant projects across different parts of the country, out of which we can point to Jahrom, Damavand, Shirvan, Parehsar, Ardestan, Kerman, Yazd and Kahnuj power plants.

4.2. Renewable Energy Generation (Wind and Solar Power Plants)

The biggest share for reducing air pollution in Iran has been reserved for development and expansion of renewable energies, because as studies made by the United Nations Framework Convention on Climate Change (UNFCCC) on Iran have shown, generation of 100 MWs of energy by wind or solar power plants would save consumption of 90 million liters gasoil, preclude emission of 250 thousand tons of CO_2, and prevent consumption of 250 thousand cubic-meters of water. Energy generation through wind and solar power plants not only decentralizes energy generation sources, but also generates no pollution in form of greenhouse gases and/or particulates; hence such power plants are categorized as the cleanest means of energy generation.

MAPNA Group's measures with regard to construction of wind power plants are summarized in Table 4:

Table 4: Wind Power Plants of MAPNA Group

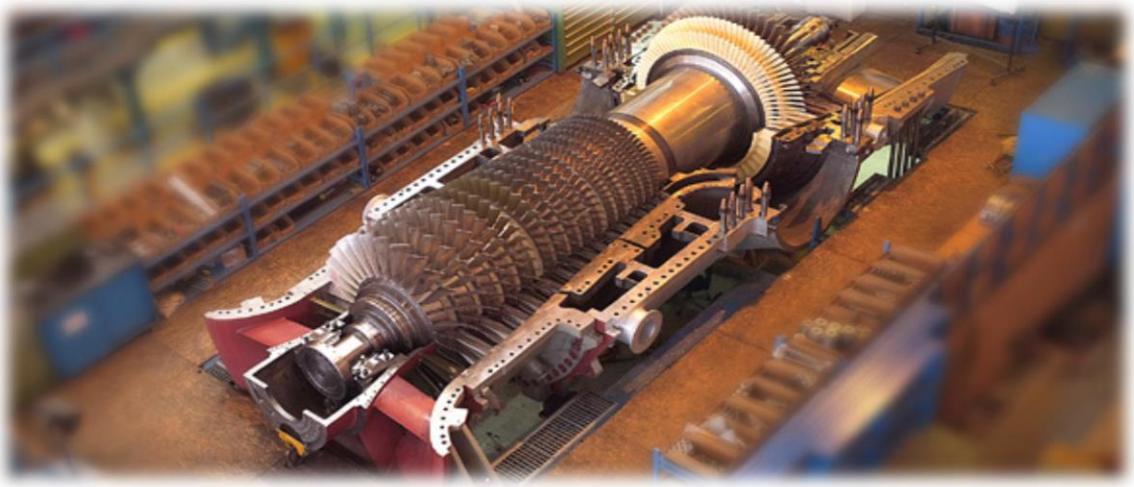
Project	Location	Units	Each unit's capacity in ISO condition (MW)	Project's total capacity in ISO condition (MW)
Kahak Power Plant (development of phase I)	Qazvin Province, Takestan	2	2.5	5
Kahak Power Plant (Phase II)		8		20
Kahak Power Plant (Phase III)		12		30
Kahak Power Plant (Phase IV)		20		50
Takestan Power Plant I		20		50
Takestan Power Plant II		10		25
Khaf Power Plant I	Khorasan Razavi Province, Khaf	22		55
Khaf Power Plant II		28		70
Aq Kand Power Plant	East Azarbaijan Province, Mianeh	20		50

In the same line, MAPNA Group is planning to generate electricity from solar energy using photovoltaic cells. Construction of 5- and 10-MW solar plants by MAPNA Group is now under review.

4.3. Optimization of turbines

Optimization of turbines, a fundamental part and driving engine of power plants, is a measure taken to upgrade energy generation technologies. It plays a key role in reducing fossil fuels consumption and as a result, reduction of greenhouse gas emissions. Design and manufacture of MGT-70 (3) is a measure carried out by MAPNA Group in this regard. In comparison to the original version, MGT-70 (3) has a higher efficiency and has reached the efficiency of 36.4% and 55% in simple cycle and triple-pressure combined cycle respectively. Moreover, its fuel consumption has been reduced as much as 20 million cubic-meters annually and as a result, CO_2 emissions have been reduced as much as 40 thousand tons per year compared with the original version.

In the same direction, another achievement of MAPNA Group is technology transfer to manufacture the exclusive F-class turbines, whose efficiency is 2-5% higher than E-class turbines. With a power generation capacity of over 300 MWs, F-class turbines boast 40 percent and 59 percent efficiency rate in simple and combined cycles respectively. Furthermore, fuel consumption of F-class turbines is considerably lower and they are more compatible with the environment.



4.4. Small-scale Power Plants and Turbines

Decentralization of power generation sources is another solution to reduce greenhouse gas emissions. Mobile power plants have many advantages in this regard: they can be deployed where peak demand needs to be managed or emergency power is needed during force majeure conditions. Therefore, besides reducing atmospheric pollutants' concentrations in a particular region, the generation efficiency would increase and power loss in transmission and distribution lines considerably will be prevented. MAPNA Group has started to design mobile power plants with a capacity of 25 MW, which are able to supply sustainable electricity for urban areas with a population of about 100,000 people.

Likewise, as a mechanical drive 42-MW gas turbine, MGT-40, which was manufactured by MAPNA Group in medium scale and in C-class, is able to supply our electricity demands. MAPNA 42-MW gas power plants can switch to either natural gas or liquid fuel. Given Iran's status as one of the top seven countries with the highest capacity for generating flare gas, this gas can be used as fuel in this type of power plants to reduce greenhouse gas emissions accordingly.

4.5. Manufacturing Electric Vehicles

Initial preparations have been made by MAPNA Group to manufacture electric buses. Plans to electrify the first diesel bus in Mashhad City are on the way. Manufacturing and replacing diesel urban buses with electric buses can counter a great part of air pollutions in the megacities, which are due to particles generated by diesel HDVs.

MAPNA Group is also planning to electrify passenger cars. EV prototypes have been built on Iranian automobile platforms. Electrification of these cars is economical because of minor required changes in the current platforms; thus, MAPNA Group is able to provide both full-electric and hybrid electric vehicles.

The increasing use of electric cars requires stations for charging these cars. Construction of the first EV charging station for electric cars and motorcycles in Tehran Milad Tower Complex is the first step taken by MAPNA Group in this direction.

4.6. Participating in Expansion of Subway Lines

Expansion of subway lines is a means to reduce air pollution in cities. Provided that they are expanded properly, subway lines citizens will switch to this form of clean transportation. MAPNA Group is playing a significant role in expansion of subway lines in various cities across Iran and given its capabilities, handles projects related to power supply systems, cabling, RS post, LPS post, signaling system, telecommunication systems, SCADA and monitoring systems.

5. Conclusion

Energy supply is a key source of air pollution and greenhouse gas emissions. Therefore, the principles designed to create a green brand in the energy sector must be followed in order to reduce the negative consequences of this industry. These principles include upgrading energy generation technologies, decentralization of energy generation sources, consumer participation and digitalization of energy control systems to increase their efficiency and upgrading the current diesel HDVs (installing particulate filters), manufacturing clean or low-pollution HDVs, manufacturing electric and hybrid vehicles and their necessary infrastructure, expanding LRT and subway infrastructure. MAPNA Group has carried out different actions in this regard, most of which fall under the framework of creation of a green brand; however, some of them need some improvements.

Construction of and conversion to combined cycle power plants, optimizing turbine performance, manufacturing small-scale turbines and constructing small-scale power plants, constructing wind and solar power plants, manufacturing different hybrid and electric vehicles and participating in expansion of subway lines projects are just some instances of green activities by MAPNA Group which are carried out in the framework of creation of green brand in the energy sector.

MAPNA Group is ready to take bigger steps to attract investment and expand renewable energies whose polluting rate is almost zero, because thermal power plants (either combined cycles or simple cycles), regardless of their efficiency rate, inevitably cause pollution. It is worthy to say that in Iran, thermal power plants account for the largest portion (approximately 80%) of energy generation portfolio; thus, to create a completely green brand in Iran, investment approaches by both government and even private entities in the energy sector must change.

It is evident that the primary beneficiary in refashioning MAPNA Group as a green brand is MAPNA Group itself; because regarding its market expansion strategy, along with focusing on the environmental issues, there would be an opportunity in which MAPNA can align its interests with that of the society and consequently, start to expand its products portfolio and market, which in turn it will bring about material and non-material benefits for both the corporation and the society. Given what was mentioned in this paper, it can be said that within the past few years, MAPNA Group's approach has changed from a well-known industrial company in the field of thermal power plants into a dynamic, innovative and green enterprise in the field of energy, which, considering the society's concerns, has decided to conduct its activities in line with sustainable conservation of the environment.

6. References

- www.airnow.tehran.ir
- Arhami, M. & Hosseini, V. & Shahne, M. & Bigdeli, M. & Lai, A. and Schauer, J. (2017). Seasonal Trends, Chemical Speciation and Source Apportionment of Fine PM in Tehran. Atmospheric Environment 153: 70–82.
- Bergmüller, Ralph. & Schwarz, Andreas. And Tischler, Stephan. CLIMATE CHANGE CHALLENGES AND SOLUTIONS IN INFRASTRUCTURE PLANNING AND ADAPTATION.
- Chandler, J. and Owen, M. (2002). Developing Brands with Qualitative Market Research. Sage Publications, London.
- Collins, L. and Carey, C. (1983). The Crisis in Branding or do Brands Have a Future?. Proceedings of the Market Research Society Conference, MRS, London.
- Farquhar, P. & Han, J. & Herr, P. and Ijiri, Y. (1992). Strategies for leveraging master brands. Marketing Research, 4(3) 32-43.
- Hartmann, P. & Ibanez, V. A. and Sainz, J.F.F. (2005). Green branding effects on attitude: functional versus emotional positioning strategies. Marketing Intelligence and Planning, 23(1) 9-29.
- Heger, Martin. and Sarraf, Maria. (2018). AIR POLLUTION IN TEHRAN: HEALTH COSTS, SOURCES, AND POLICIES. ENVIRONMENT AND NATURAL RESOURCES GLOBAL PRACTICE DISCUSSION PAPER 06. The World Bank.
- Hosseini, V. and Shahbazi, H. (2016). Urban Air Pollution in Iran. Iranian Studies 49 (6): 1029–1046.
- Janssens-Maenhout, G. & Crippa, M. & Guizzardi, D. & Muntean, M. & Schaaf, E. & Olivier, J.G.J. & Peters, J.A.H.W. and Schure, K.M. (2017). Fossil CO2 & GHG emissions of all world countries. JRC SCIENCE FOR POLICY REPORT. European Commission.
- Lídia Simão & Ana Lisboa. (2017). Green Marketing and Green Brand – The Toyota Case. Procedia Manufacturing 12. 183 – 194.

- Mansouri, Daneshvar M.R. & Ebrahimi, M. and Nejadsoleymani, H. (2019). An overview of climate change in Iran: facts and statistics. Environmental System Research.
- McMichael, A. J. & Woodruff, R. E. and Hales, S. (2006). Climate change and human health: present and future risks. Lancet, vol. 367, pp. 859-869.
- Shabhazi, H. & Reyhanian, M. & Hosseini, V. and Afshin, H. (2016b). The Relative Contributions of Mobile Sources to Air Pollutant Emissions in Tehran, Iran: An Emission Inventory Approach. Emission Control Science and Technology 2 (1): 44–56.
- Shahbazi, H. & Taghvaee, S. & Hosseini, V. and Hosseini, A. (2016a). A GIS Based Emission Inventory Development for Tehran. Urban Climate 17: 216–229.
- Stern, N. (2006). The Economics of Climate Change: The Stern Review.
- World Bank staff based on data from the World Health Organization (WHO), 2016.
- World Bank Website: www.worldbank.org.