HYBRID ELECTRIC VEHICLE (HEV) TECHNOLOGY FOR YEMEN

TECHNOLOGY DESCRIPTION

TECHNICAL DESCRIPTION

A hybrid electric vehicle (HEV) uses two or more distinct power sources, i.e., HEVs combine an internal combustion engine with one or more electric motors. Vehicles employed in urban areas like small passenger cars, local delivery trucks, and city buses benefit from hybridization and show substantially lower CO_2 emissions, ranging from 23 to 43% depending on the traffic dynamics.

For passenger cars, various levels of hybridization are possible, all giving rise to various CO_2 emission reductions at different costs. Small passenger cars benefit the most from strong downsizing in combination with micro hybridization. Cars running most of their kilometers on motorways do not benefit from hybridization mostly because on motorways vehicles drive at more or less constant speeds. Hybrid vehicles are still more expensive than traditional vehicles using an internal combustion engine. They have the advantage of higher fuel efficiency and reduced CO_2 emissions without additional infrastructure requirements.

The HEV needs an efficient promotion procedure for it to spread on a wide scale in the country. This technology option is suitable for the country and can contribute to the reduction of GHG emissions in major cities.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The Technology Readiness Level (TRL) for Hybrid Electric Vehicles (HEVs) in Yemen is approximately 6-7, as the technology has been demonstrated in relevant environments but lacks widespread operational use and integration into the local transportation system. The Commercial Readiness Index (CRI) is low, ranging between 1 and 2, due to factors such as limited imports, insufficient infrastructure, and the absence of supportive policies. This indicates a hypothetical commercial potential (CRI 1) with no significant market traction, progressing to early commercial trials in limited pilot settings (CRI 2).

CLIMATE RATIONALE OF THE TECHNOLOGY

The transport sector is a significant contributor to greenhouse gas (GHG) emissions, primarily due to its heavy reliance on fossil fuels. Over 90% of passenger transportation occurs via road vehicles, including private cars and buses, making this sector a priority for decarbonization.

Technological advancements like electric vehicles (EVs), hydrogen-fueled transport, and hybrid systems offer transformative solutions to reduce emissions by replacing conventional internal combustion engines. Additionally, smart transport systems, ride-sharing platforms, and renewable energy-powered public transportation can further optimize fuel use and lower emissions.

To maximize impact, these innovations must be supported by policies such as EV subsidies, investment in charging infrastructure, and enhanced public transit systems. Integrating these measures into climate strategies will significantly reduce emissions, improve air quality, and build climate resilience.

Transport, alongside energy, is the major sector contributing to GHG emissions due to the high fuel consumption. The transport sector is also the second largest sector that consumes fossil fuel to meet the energy demand, through the combustion process. The transport sector includes two main categories, namely the Passenger Category and the Freight Category. Road transportation involves Cars and Buses. More than 90% of passenger transportation is road transportation. However, passenger transportation is classified into two types, one of them is private, which involves the use of private cars.

In the base year 2010, the number of vehicles used for road transportation in Yemen totaled 408,643. Private cars consumed 26.55 million GJ of energy, accounting for 14.19% of the transport sector's total energy consumption of 187.10 million GJ. However, the prolonged conflict and resulting economic decline have significantly impacted the transport sector. By 2022, energy consumption in the transport sector had dropped to an estimated 101.18 million GJ, according to IEA estimates[1]. Specific statistics on the current number of vehicles or whether private cars now represent a larger share of total energy consumption remain unavailable.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIMELINE

HEV promotion can begin 2030, to reach 30% of vehicles on the road by 2030, once the required procedures are in place.

AMBITION FOR TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The ambition for the Technology Readiness Level (TRL) is to advance the HEV to TRL 8-9, where the technology becomes fully operational and solution-ready for large-scale adoption across the country. This will involve the ambition is to reach Commercial Readiness Index (CRI) 4-5, which represents early to growing commercial adoption, characterized by established demand and clear market acceptance.

EXPECTED IMPACTS OF THE TECHNOLOGY

The implementation of a HEV has several anticipated impacts, both environmentally socially, and economically. They are to:

- Reduce fossil fuel use, thus reducing greenhouse gas emissions, and improving urban air quality.
- Diversify energy sources and support sustainability.
- Raise awareness, promoting eco-friendly choices.
- Increase energy-efficient alternatives accessibility.
- Reduce fuel expenses for owners.
- Create jobs in construction, maintenance, and HEV
- Provide cost-effective transport, reducing commuting expenses for residents.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

[1] https://www.iea.org/countries/yemen/efficiency-demand

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

Legislations & by-laws that regulate the transport system almost don't exist or are not implemented because of the current political conflict, where the are only a few laws and legislations related to road transport that discuss the transport of people or goods between Yemeni cities generally and the role of the institutions that related with transport sector. Also, some of them have not been reached since 2015conflict because it is blocked on all governmental websites. Here, some legislations and laws have been reviewed in a summary to review some points related to the technology.

1-Minister of Transport Decision No. (137) of 2009 regarding the regulations, procedures, and requirements for licensing the practice of technical inspection activities for road transport vehicles: The law discusses some issues related to the requirements for light and medium-duty transportation inspection and operation. It mandates the use of technical inspection devices to measure and monitor vehicle emissions, including gases from petrol, diesel, and gas-powered vehicles to adhere to environmental protection laws to minimize pollution from transportation is required. Vehicles joining the system must not exceed a lifespan of three years, with an optional one-year extension, and can operate within a facility for up to five years, extendable by one year. Strict adherence to environmental protection laws to minimize pollution from transportation is required.

2-Ministerial Resolution No. (68) of 2009 regarding the regulation of land transport activities for passengers by buses:It mandates ongoing inspections and periodic maintenance of buses to ensure technical readiness and adherence to safety and security protocols before each trip.

3-Republican Decree No. (291) of 2008 establishing the General Authority for Regulating Land Transport Affairs: The law mandates the examination of imported transport means to ensure compliance with specifications, preventing entry of non-compliant vehicles to reduce environmental pollution in line with protection laws.

4-Law No. (33) of 2003 regarding land transport:The law discusses some issues related to developing and organizing land transportation services to support economic development. It includes preparing plans based on population needs, conducting studies for city and intercity transport conditions, and creating solutions. It emphasizes determining transportation departure and parking locations, complying with traffic laws regarding vehicle weights and dimensions, and organizing waiting and parking areas. It promotes investment expansion in transportation and stresses the necessity of providing buses specifically designed for urban transit.

5-Republican Decree No. (265) of 1997 regarding the organizational regulations of the Ministry of Transport:The law discusses some issues related to enhancing transportation services to identify suitable transport means and proposes strategic growth plans. Developing data-driven programs and technical studies on transportation use and its impact on roads and the environment is also essential.

All the articles in these laws discuss the general issues related to road transport and the role of all the entities related to the transport sector. Unfortunately, there is no sufficient legal and regulatory framework for the transport sector, especially public transport. . Therefore there is a need for specific laws.

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

1. Establish new financial policies such as market and consumer incentives to reduce HEV cost, including Bank facilities such as reducing loan interest and extending loan period, to increase ownership of HEV
2. Set up a legal and regulatory framework to create HEV market and other new transport technologies markets, through the establishment of professional institutions to support technical standards.

USEFUL INFORMATION

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LINKS TO TNA REPORTS

https://tech-action.unepccc.org/country/yemen/

Field Code Changed