



Project Proposal for Ph.D.

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| Project Details (The research problem must clearly indicate the need for an interdisciplinary approach) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Project Title                                                                                           | An exploratory study of the hydrogen fuel for long haul freight truck transportation demand                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Project Summary<br><br>(Minimum 500 and maximum 2000 characters)                                        | <p>Hydrogen fuel cell vehicles (HFCVs) offer a promise in terms of the carbon footprint reduction and zero-emissions. Long haul trucks carry a large proportion of freight besides emitting GHGs in many parts of the world. This study aims to explore the feasibility of HFCVs adoption on long haul trucks.</p> <p>The quest for shifting to cleaner energy, particularly Zero-Emission vehicles (ZEV) in transportation sector has led to the exploration of alternate sources. The quantum freight traffic (in terms of payloads) carried on roads in most parts of the world far outweigh the other modes. Any reduction in emissions within this sector would result in a huge drop in the greenhouse gas (GHG) emissions.</p> <p>In the recent past the alternative fuels such as, electricity, hydrogen, advanced biofuels and renewable synthetic fuels are used to power ZEVs. However, the Battery electric vehicles (BEVs) and hydrogen fuel cell vehicles (HFCVs) are the commonly used, commercially available ZEV technologies. The quest for the reliable, affordable and safe alternatives is a challenge. HFCV as a freight transport is an alternative worth exploring.</p> <p>Hydrogen fuel-cell trucks (HFCTs) can play a critical role in substituting the diesel trucks and achieving carbon neutrality in freight sector. The key elements in harnessing the hydrogen is a bit complicated. This involves the production, distribution, storage and end use. It is essential thus to understand the instability of hydrogen, while it is possible to store in liquid and gaseous forms.</p> <p>As on today, the entire world has more than 1000 hydrogen fueling stations distributed in 35 countries. Asia and China have more stations than any other country. Interestingly India has only one or two while Australia has seven stations.</p> <p>This study aims to explore the feasibility of Hydrogen fuel-cell trucks (HFCTs) in terms decision parameters: technical, economic, social and environmental factors.</p> <p>Expected Outcomes:</p> <div><div>1) Identification of the factors influencing the proliferation of the HFCTs</div><div>2) Willingness to pay for the hydrogen fuel-cell trucks</div><div>3) Assessment of the demand for <i>the</i> Hydrogen fuel-cell trucks (HFCTs) in India</div></div> |
|                                                                                                         | <p><b>Bibliography:</b></p> <p>Greene, D.L., Ogden, J.M. and Lin, Z., 2020. Challenges in the designing, planning and deployment of hydrogen refueling infrastructure for fuel cell electric vehicles. <i>ETransportation</i>, 6, p.100086.</p> <p>h2stations.org</p> <p>Wanniarachchi, S., Hewage, K., Wirasinghe, C., Karunathilake, H. and Sadiq, R., 2023. Hydrogen fuel supply chains for vehicular emissions mitigation: A feasibility assessment for North American freight transport sector. <i>International Journal of Sustainable Transportation</i>, 17(8), pp.855-869</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|  | Yan, J., Wang, G., Chen, S., Zhang, H., Qian, J. and Mao, Y., 2022. Harnessing freight platforms to promote the penetration of long-haul heavy-duty hydrogen fuel-cell trucks. <i>Energy</i> , 254, p.124225. |
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| Ph.D. Supervisors+<br>(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD) |                   |                                            |                                                                          |
|--------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------|--------------------------------------------------------------------------|
| Role                                                                                             | Name of Faculty   | Academic Unit in IITD/Institute/University | Email ID (Official)                                                      |
| Supervisor 1*                                                                                    | J. Madaan         | Management Studies                         | <a href="mailto:jmadaan@dms.iitd.ac.in">jmadaan@dms.iitd.ac.in</a>       |
| Supervisor 2                                                                                     | K Ramachandra Rao | Civil and Environmental Engineering        | <a href="mailto:rrkalaga@civil.iitd.ac.in">rrkalaga@civil.iitd.ac.in</a> |

\*Supervisor 1 must be from IIT, Delhi.  
 +All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.  
 \$The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

| Project requirements (Student qualifications, experience required, etc)<br>*The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)                                           |
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| <ul style="list-style-type: none"> <li>MBA (Operations and Management) /M.Tech (Engineering) with transportation or allied interests and demand modelling.</li> <li>Masters in Statistics or Econometrics</li> </ul> |

| Source of fellowship/funding and project number<br>(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any) |
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| Candidate with his/her own fellowship.                                                                                           |

| Role of Faculty Members involved: |                                             |
|-----------------------------------|---------------------------------------------|
| Supervisor-1                      | Problem formulation, conceptualization,     |
| Supervisor-2                      | Problem formulation, scope, demand analysis |

- Note :-**
- Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SIRe.
  - Declaration:-** Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SIRe student.
  - PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.
  - If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.
  - A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.
  - The third supervisor’s name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.
  - If Institute fellowship is being sought, then DRC approval of the parent department of Supervisor 1 is required at the time of selection.