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Can Green Hydrogen Become Economically Feasible in Bangladesh? A Techno-Economic Perspective

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Abstract

Green hydrogen is emerging as a potential low-carbon energy option, but its economic feasibility depends strongly on local technological, financial, and energy conditions. This research blog examines the techno-economic prospects of renewable-powered green hydrogen production in Bangladesh, focusing on electricity cost, electrolyzer technology, financing, storage, and local manufacturing capacity. Existing studies show technical potential, but production costs vary across locations, system designs, and applications. This variation highlights the need for integrated, context-specific economic assessment. The blog argues that future evaluations should combine renewable resource availability, electrolyzer selection, investment costs, financing conditions, and intended applications. Pilot projects, transparent cost data, and local technological development will be essential for informed investment decisions.

Keywords: *Green hydrogen; techno-economic analysis; electrolyzer; renewable energy; Bangladesh*

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Rationale

Can Bangladesh produce green hydrogen at a cost that makes economic sense? This question is becoming more important as the country looks for cleaner energy options and ways to reduce dependence on fossil fuels. Green hydrogen is produced when renewable electricity powers an electrolyzer that separates water into hydrogen and oxygen. The technology is known. The harder question is whether the complete system can become affordable under the economic conditions of Bangladesh.

A research rationale should explain why a problem matters in its own context before presenting the wider argument (Hasan et al., 2026). This is especially important for green hydrogen. Its economics in Bangladesh cannot simply be copied from countries with different energy prices, financing conditions, and industrial infrastructure. Renewable electricity is still expanding. Imported technology can be expensive. Access to low-cost capital can also be difficult. These conditions directly affect hydrogen cost.

Techno-economic analysis connects technical performance with economic reality. How much electricity is needed? What type of electrolyzer should be used? How much will the equipment cost? What is the financing cost? A technically successful project may still be economically weak.

Existing studies show why this analysis is necessary. Hossain et al. (2023) identified strong potential for renewable hydrogen in Bangladesh, but also highlighted technological and economic barriers. Chowdhury et al. (2025) showed that a hybrid renewable system in Cox's Bazar could produce hydrogen at an estimated levelized cost of about $5.22 per kilogram. Mazumder et al. (2024) also found that the choice between locally developed and imported electrolyzers can significantly affect production costs.

Financing adds another layer. Sohel et al. (2026) showed that lower financing costs can substantially reduce the levelized cost of hydrogen. For Bangladesh, the financial structure itself can change the outcome. Green hydrogen should therefore be judged not only by technical efficiency, but also by local financial conditions.

Research Gap

The research gap lies in the limited integration of these economic factors within one Bangladesh-specific framework. Several studies have examined renewable hydrogen, electrolyzer choices, hybrid energy systems, and possible applications. However, they do not yet provide one clear answer to a basic question: under what conditions does green hydrogen become economically feasible in Bangladesh?

A research gap should identify what remains unresolved and why the missing knowledge matters (Hasnat et al., 2026). The problem is not that Bangladesh has no studies on green hydrogen. The problem is that the evidence is fragmented. Different studies use different locations, technologies, financing assumptions, energy sources, storage systems, and end uses. Their cost estimates therefore vary.

This variation reveals the research need. Hydrogen produced from solar electricity in one region may have a different cost from hydrogen produced through a solar-wind hybrid system elsewhere. An alkaline electrolyzer may also have a different cost and operating profile from a proton exchange membrane electrolyzer. A locally manufactured unit may reduce import-related costs. Each decision changes the economic picture.

The same issue appears in end use. Hydrogen for transport, industrial heat, electricity storage, fertilizer, or institutional energy systems cannot be evaluated through one common cost assumption. Saha et al. (2025) and Kalam et al. (2026) for example, found that hydrogen-based transport pathways remained less economically

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attractive than direct electric mobility under the conditions examined. Its value may therefore depend on where direct electrification is difficult or where hydrogen has a stronger industrial purpose.

The deeper gap is therefore the lack of comparable and context-sensitive techno-economic evidence. Bangladesh still needs studies that jointly examine renewable electricity cost, electrolyzer type, local manufacturing, financing, capacity factor, storage, and final use. Without this integration, policymakers may see isolated cost numbers without understanding the assumptions behind them.

Future Implications

The future of green hydrogen in Bangladesh should begin with careful economic testing. It should not begin with the assumption that every hydrogen project will be viable. Future implications in research blogging should connect evidence with policy, practice, and innovation (Khandakar et al., 2026). For Bangladesh, this means identifying where green hydrogen can create real value and where other low-carbon technologies may remain cheaper.

Future studies should compare electrolyzer technologies using Bangladesh-specific cost data. They should separate imported and locally developed systems. They should also test different renewable energy combinations. Solar-only projects may perform differently from solar-wind or grid-supported systems. Regional differences should be considered because renewable resources, infrastructure, and industrial demand vary across the country.

Financing should become a central part of future analysis. Lower-cost loans, concessional finance, public-private partnerships, and climate finance could change project economics significantly. Local manufacturing may also matter. If Bangladesh can develop domestic capability in electrolyzer components, engineering services, and maintenance, the country may reduce import-related costs and create new industrial opportunities.

Pilot projects will be especially important. Bangladesh does not need to move directly toward large-scale deployment. Smaller projects can test actual performance, production cost, maintenance needs, storage losses, and local operational capacity. Universities, industrial zones, fertilizer-related facilities, and selected renewable energy sites may provide useful testing environments. These projects should publish transparent data so that later investment decisions are based on evidence rather than expectation.

The real question is therefore not whether Bangladesh can produce green hydrogen. It can. The more important question is whether the country can produce it at the right cost, in the right place, and for the right purpose. Green hydrogen may become part of Bangladesh's future energy transition, but its success will depend on careful system design, realistic financing, local capability, and clear economic value.

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