Open Letter - George Constandinides on Cypriot Government's Hydrogen Strategy

Dear Members of the Ministry of Energy, Commerce, and Industry of the Republic of Cyprus,

I am writing this open letter to share my perspective on the recently published Cypriot Government's Hydrogen Strategy. My name is **Dr. George Constandinides CEng MIMechE**, and I work as a Research Fellow at the Cyprus University of Technology as part of the EMERGE-i group. My background spans thermodynamics, fluid mechanics, and mechanical systems, with substantial experience in computational fluid dynamics (CFD), hydraulics and thermal systems. I am passionate about applying innovative engineering solutions to complex challenges. I do not self-proclaim to be a "hydrogen expert" however, I have been involved in projects ranging from gasification processes for syngas generation to ongoing research on **Solar-Assisted Ocean Thermal Energy Conversion.** The latter approach combines renewable energy with advanced engineering to produce hydrogen.

I had the opportunity to present at a Hydrogen Conference in Plzen, Czech Republic, in mid-March 2025. During the conference, representatives from all over the world presented cutting-edge work on generating, distributing, and studying the impacts of hydrogen. Notable speakers included:

- **Petr Mervart**, Minister of Industry and Trade of the Czech Republic, who discussed the Czech Hydrogen Strategy;
- **Veronika Vohlídková**, Member of the Board & Executive Director of HYTEP, highlighting the challenges the Czech Republic faces in producing hydrogen;
- **Gerhard Meindl** from Energiesysteme GmbH, presented the H2LEC concept, a working plant with an 8.75 MWel PEM Electrolyzer, integrated hydrogen storage, and fuel cells.

I believe these examples, alongside insights from other European partners, underscore the importance of a comprehensive, dynamic, and impactful hydrogen strategy—one that Cyprus can adopt and tailor to its unique conditions.

Reflections on the Cypriot Government's Hydrogen Strategy

The Cypriot Government's Hydrogen Strategy identifies two scenarios—**conservative** and **ambitious**—for hydrogen development through 2030 and 2050. However, as it stands, the strategy appears more like a preliminary study than a fully fleshed-out national plan. Neither scenario contains detailed roadmaps or clear benchmarks for translating strategic intent into on-the-ground implementation. This lack of specificity leaves Cyprus at a disadvantage in an

international race where other countries already consolidate their hydrogen policies with precise goals, timelines, and support mechanisms.

In its present form, the strategy does rightly identify certain near-term measures (2025–2030), such as creating pilot projects, encouraging public awareness, and setting up initial infrastructure. These are vital first steps. Nevertheless, achieving meaningful momentum depends on further, more detailed and measurable goals, stronger financing and investment schemes, and a robust framework for coordination among stakeholders. Let me address several points that, in my experience, are critical for success:

1. **Establish a Dedicated Programme Hydrogen Strategy Office**
   Day-to-day management of hydrogen initiatives requires an empowered entity to navigate technical, regulatory, and investment hurdles. Having a dedicated office—staffed by skilled individuals—means that the country can swiftly adjust to evolving technological and market conditions, while taking advantage of emerging best practices in the EU and worldwide. This office should coordinate with ministries, regulators, universities, and industry partners to move from broad statements to concrete actions.

2. **Set Specific, Measurable, Achievable, Relevant, Time-Bound (SMART) Goals**
   The current strategy needs to go beyond high-level projections. Cyprus should implement interim targets (e.g., annual capacity, investment levels, local manufacturing involvement, water-distillation capacities for electrolysis) to gauge progress. Without these reference points, it is impossible to measure the effectiveness of existing policies or make well-timed course corrections.

3. **Devise a Comprehensive Regulatory and Financial Framework**
   The near-term (2025–2030) focus must articulate incentives that encourage private-sector investment in hydrogen infrastructure. For instance:

   - **Investment Tax Credits** and **Low-Interest Loans** specifically for electrolyzer projects, storage, and distribution networks;
   - **Grants or Subsidies** to offset the high capital costs of pilot plants;
   - **Updated Codes and Standards** for hydrogen handling, transport, and usage safety;
   - **Public–Private Partnerships** to share the financial risk of early-stage projects.

4. **Strengthen Collaboration with Universities and Research Institutes**
   Cyprus has a strong tertiary education sector with ample R&D capability. Mobilizing local universities and research centers like the one I represent, the **Cyprus University of Technology**, as well as others, can help build up hands-on know-how. This includes collaborative testbeds—like small-scale electrolyzer demonstration sites or “living labs”—where local and international researchers, in partnership with

industry, pilot solutions in real-world conditions.

5. **Foster Cross-Border Synergies and Secure EU Funding**
   Hydrogen does not end at borders. Working more closely with neighboring countries—be it Greece, Israel, or others in the Eastern Mediterranean—could accelerate knowledge sharing and create harmonized regulations. On an EU level, the **REPowerEU** and **Clean Hydrogen** partnerships can unlock crucial funding. The lessons from the Czech Republic, Germany, and Spain show that making the most of European alliances and co-funding is a strategic multiplier.

Technological Priorities for Cyprus

1. Focus on Green Hydrogen from Renewables

Cyprus's rich solar irradiation and steady wind resources can underpin a truly **green** hydrogen economy via **electrolysis**. Any approach that continues to rely on fossil fuels for hydrogen production—even with partial carbon capture—risks major greenhouse-gas emissions and, importantly, fails to align with long-term EU decarbonization targets. In my own work on **Solar-Assisted Ocean Thermal Energy Conversion**, I have seen promising avenues for coupling renewable energy to water distillation and electrolysis. This synergy will be essential in Cyprus, given our limited freshwater resources.

2. Scale Distilled Water Production with Solar-Powered Distillation

Since hydrogen production demands purified water, the government should back solar-powered distiller plants to supply electrolyzers. This is inherently scalable, enabling "green desalination" that avoids straining Cyprus's freshwater resources.

3. Electrolyzer Stack Technology

The entire green hydrogen value chain depends on electrolyzer innovation. **Alkaline** and **PEM** (proton-exchange membrane) designs are mature; **AEM** and **SOEC** hold promise if costs continue to drop. Cyprus can form R&D alliances with institutions like **Nel, ITM Power, Siemens Energy**, and **thyssenkrupp**—global leaders continuously refining electrolyzers' performance and costs.

4. Sectoral Priorities—"Use Where It Is Needed Most"

Given hydrogen's complexities and cost, we should use it first in sectors that can be easily electrified. Your strategy mentions:

- **High-Temperature Industrial Heat** (cement, metal processing, etc.): Hydrogen can complement (though not fully solve) decarbonization.

- **Energy Storage**: With abundant sun and wind, hydrogen-as-a-battery can buffer intermittent production. Storing surplus renewable power as hydrogen helps address seasonal mismatch.

- **Heavy Transport, Shipping, Aviation**: Eventually, yes—but in the near term, demonstration projects should target smaller-scale or controlled deployments. Large-scale adoption for shipping or aviation will likely come later, once technologies and fueling infrastructure mature further.

Practical Concerns: Handling, Storage, and Transportation

Hydrogen is the smallest molecule, prone to leakage. It can cause **hydrogen embrittlement** in steel pipelines and is generally more challenging to transport than natural gas. In Europe, pipelines remain the main method for hydrogen transport, but only when generation and demand are geographically close. Elsewhere, hydrogen is trucked around in specialized cylinders—an expensive, safety-intense approach. Cyprus must plan carefully to avoid building infrastructure that either remains underused or is rendered obsolete by better technologies in just a few years.

On-site production and usage—especially at industrial hubs—makes sense in the short to medium term. It sidesteps the complexity and cost of large-scale hydrogen transport. Retrofitting or newly installing infrastructure must account for the dangers of hydrogen, ensuring safety codes and workforce training are in place.

Putting Costs into Perspective

Current estimates indicate that **Green Hydrogen** costs around 10–15 EUR/kg, more expensive than most fossil-derived hydrogen. Yet with economies of scale and technology breakthroughs, it can drop toward 5 EUR/kg or even lower. In the U.S., governmental initiatives aim for 2–3 USD/kg for green hydrogen by the end of the decade. Cyprus's strategic plan should define a cost roadmap—benchmarks for costs, volumes, and how each pilot project will feed lessons back into the system to push down the price per kilogram.

Conclusion and Recommendations

In summary, the Cypriot Government's Hydrogen Strategy has the right spirit but urgently requires a more **detailed roadmap**, **precise benchmarks**, and robust **organizational and financing** mechanisms. Specifically the Cypriot Government's Hydrogen Strategy requires:

1. **Dedicated Programme Hydrogen Strategy Office**: Oversee day-to-day progress and coordinate among stakeholders.

2. **Detailed Roadmap**: Define SMART milestones for 2025, 2030, and 2050, covering pilot projects, regulatory steps, water supply, and scaling of electrolyzer capacity.

3. **Focus on Generation from Renewables**: Exploit Cyprus's solar and wind resources for green hydrogen production and ensure robust, solar-powered water distillation.

4. **Technology Scale-Ups**: Support R&D on electrolyzer technologies through partnerships with established industrial players and research institutes.

5. **Hydrogen Valleys Acceleration**: Develop local "hydrogen ecosystems" that integrate production, storage, and usage—particularly near industrial or port locations.

6. **Implementation Support**: Ensure safe, standardized, and sustainable hydrogen usage. Build robust knowledge-sharing platforms and roll out educational initiatives.

7. **Synergies and Partnerships**: Cooperate closely with **Cyprus universities**, EU Member States, and international bodies. Engage in co-funding via **REPowerEU** and similar instruments.

8. **Robust Governance**: Maintain transparency, accountability, and alignment with EU directives, ensuring any office or agency has the legal authority and resources to act decisively.

The fundamental objective, from my viewpoint, is to shift Cyprus's hydrogen strategy from high-level aspirations to tangible, actionable steps. We have every advantage—sunshine, wind, intellectual capital, and strategic EU links—to become a credible hydrogen player in the Eastern Mediterranean. Let us seize this opportunity with a structured, forward-looking, and comprehensive plan.

Thank you for your time and for considering these insights. I welcome further discussions on how academia, industry, and government can collaborate to build a **green hydrogen future**—one that positions Cyprus competitively and sustainably in the emerging global hydrogen market.

Kind regards,

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Links:

QR: Open Letter - George Constandinides on Cypriot Government's Hydrogen Strategy

QR: Czech Hydrogen Strategy by **Petr Mervart**, Minister of Industry and Trade of the Czech Republic

QR: Challenges the Czech Republic faces in producing hydrogen by **Veronika Vohlídková**, Member of the Board & Executive Director of HYTEP

QR: H2LEC concept a working plant with an 8.75 MWel PEM Electrolyzer, integrated hydrogen storage, and fuel cells by **Gerhard Meindl** from Energiesysteme GmbH

QR: Hydrogen Economy Outlook Key messages March 30 2020 By **BloombergNEF** (BNEF)

QR: **EU** Clean Hydrogen Joint Undertaking Work Programme 2025