



UBC SMART HYDROGEN ENERGY DISTRICT (SHED) - HYDROGEN GENERATION AND FUELING STATION

2025 CANADIAN GREEN BUILDING AWARDS

PART ONE



PART 1

PROJECT DESCRIPTION

Use for all categories. Projects are judged based on criteria of sustainable design, architectural merit and innovation. **Please submit Part 1 and Part 2 as separate pdf files.**



PROJECT CATEGORIES

Identify which Award category you are entering

- ☐ **1. Residential [small]**
Open to new or renovated buildings less than 600m² in area, of which a minimum of 75% is dedicated to single-family or multi-family residential uses.
- ☐ **2. Residential [large]**
Open to new or renovated buildings [typically multi-unit buildings or groups of related buildings] greater than 600m² in area, of which at least 75% is dedicated to residential uses.
- ☒ **3. Commercial/Industrial [small]**
Open to new or renovated buildings up to 2,000m² in area, of which more than 75% is dedicated to commercial or industrial uses.
- ☐ **4. Commercial/Industrial [large]**
Open to new or renovated buildings [or groups of related buildings] greater than 2,000m² in area, of which at least 75% of the floor area is dedicated to commercial or industrial uses.
- ☐ **5. Institutional [small]**
Open to new or renovated buildings up to 2,000m² in area, of which more than 75% is dedicated to institutional uses.
- ☐ **6. Institutional [large]**
Open to new or renovated buildings [or groups of buildings] greater than 2,000m² in area, of which at least 75% of the floor area is dedicated to institutional uses.
- ☐ **7. Mixed Use**
Open to new or renovated buildings [or groups of related buildings] of any size, in which no individual use exceeds 75% of the overall floor area.
- ☐ **8. Existing Building Upgrade**
Open to buildings of any size or type in which the primary focus of the work has been to enhance the performance or extend the life of an existing structure. Entries in this category are required to respond only to the submission criteria appropriate to the project.
- ☐ **9. Interior Design**
Open to interior design projects of any size or type. Entries in this category are required to respond only to the submission criteria appropriate to the project.

An award will be given in each category at the discretion of the jury.

PROJECT DETAILS

Project name: UBC Smart Hydrogen Energy District (SHED) - Hydrogen Generation and Fueling Station
Address: 6085 Thunderbird Blvd, Vancouver BC V6T 2A1
Year completed: 2024

PROGRAM AND CONTEXT

Project type: [Identify all uses occupying 10% or more of gross floor area]
On-site hydrogen production, advanced storage, and dispensing. Interpretive learning, and public art.

Project site: [Check all that apply]

- ☒ Previously undeveloped land
- ☐ Urban
- ☐ Rural
- ☐ Previously developed land
- ☐ Suburban

Other Building description: [Check only one]

- ☒ New
- ☐ Renovation
- ☐ Both [If both, list __% new and __% renovation]

STATISTICS* Provide the following metrics as applicable to your project.

- Site Area: 1390 m²
- Building gross floor area: 306 m²
- Energy Intensity: n/a KWhr/m²/year [Include both base building and process energy]

[optional: report energy intensity separately as follows:

- Energy Intensity, base building: n/a KWhr/m²/year
- Energy Intensity, process energy: n/a KWhr/m²/year

- Reduction in energy intensity: n/a %.
- State the reference standard on which the % reduction is based: MNECB, NECB or ASHRAE 90.1

[include version]: n/a

- Recycled materials content: n/a % by value
- Construction materials diverted from landfill: n/a %
- Regional materials by value: n/a
- Water consumption from municipal source: n/a litres/occupant/year

[Include both base building and process consumption]

- Reduction in water consumption: n/a %
- State the reference on which the % reduction is based: ☐ LEED or other ☐

This project does not have a defined occupancy or an energy use that is relevant to its floor area. However, its energy is supplied by PV power with battery back-up.

*NOTE FOR PART 9 RESIDENTIAL PROJECTS: PROVIDE THE STATISTICS ABOVE IF AVAILABLE. Include in the Executive Summary [see next page] the EnerGuide or the Home Energy Rating System [HERS] ratings if available, and the WalkScore rating [see www.walkscore.com]. Also, a qualitative assessment of project performance should be included in the appropriate sections of the narrative.

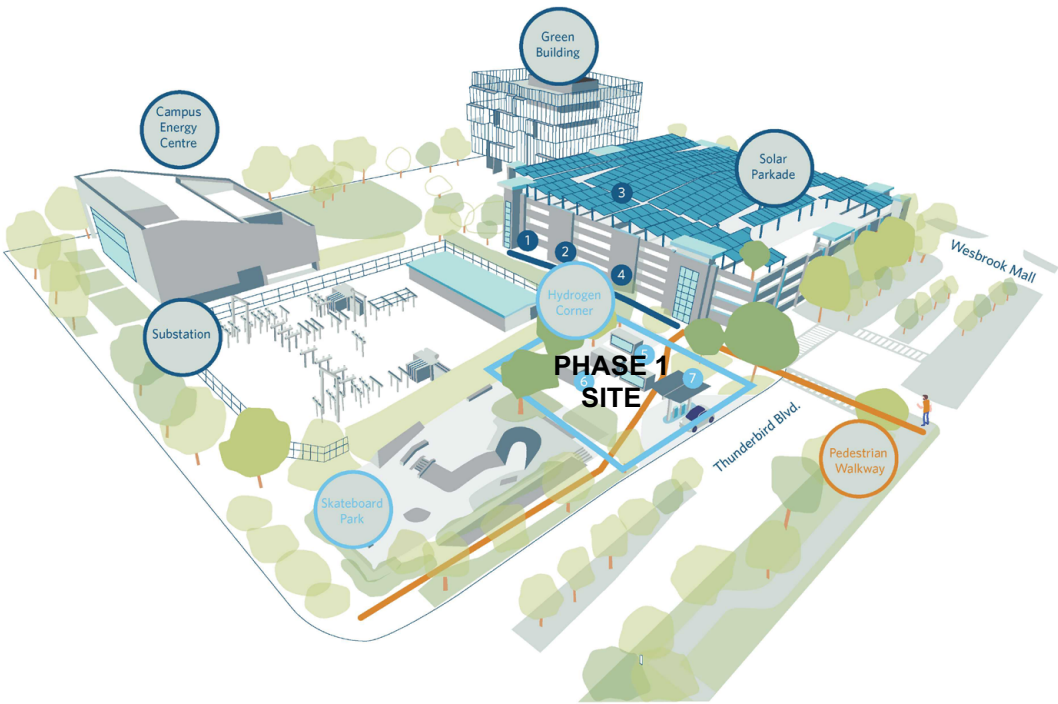
UBC HYDROGEN HUB PROJECT SUMMARY

The hydrogen production and fueling station at UBC Vancouver campus is part of a groundbreaking, multi-phase clean energy initiative that serves as a model for what can be achieved on a standard city block. Phase 0 includes an eHouse, providing critical energy management infrastructure. Phase 1 introduces the hydrogen station (this project), combining on-site hydrogen production, advanced storage, and fueling for passenger vehicles, transit buses, and fleet operations. Phase 2 adds a photovoltaic array atop an adjacent parking garage, integrating renewable energy into the project.

The station’s design reflects a thoughtful, forward-looking aesthetic that seamlessly integrates with UBC’s urban and natural surroundings. The architecture prioritizes user experience, with clear circulation pathways, intuitive functionality, and a welcoming appearance that invites community engagement with sustainable technology. Materials and finishes emphasize durability, safety, and sustainability, while incorporating natural elements to soften the facility’s presence within the campus.

Beyond functionality, the design aims to inspire and educate, positioning the station as both a working facility and a symbol of UBC’s commitment to innovation and environmental stewardship. By balancing advanced engineering with architectural sensitivity, the project demonstrates how clean energy infrastructure can be both highly practical and visually compelling in urban settings.

This project does not have a defined occupancy or an energy use that is relevant to its floor area. However, its energy is supplied by PV power with battery back-up.



“The UBC Smart Hydrogen Energy District (SHED) is yet another leap forward in building a clean economy and creating new opportunities for British Columbians” - Honourable Josie Osborne, Minister of Energy, Mines and Low Carbon Innovation

ONE STRATEGIC DECISIONS

Strategic decisions for the hydrogen station were largely shaped by proximities to other campus energy infrastructure, as well as a parking garage that could accommodate a large photovoltaic array as part of the larger project considerations. The site, previously an outdoor basketball court, was repurposed to capture a pedestrian desire line through the space, enhancing connectivity while integrating vehicle access and maintaining necessary safety clearances between equipment containers. Placement of equipment containers aligns with existing campus pathways to support accessibility and efficient movement. Program organization prioritizes safety, functionality, and public engagement, ensuring user-friendly operations and educational opportunities. The design transforms a recreational space into a functional, sustainable hub, advancing UBC’s climate goals and fostering innovation, collaboration, and community interaction.



KEYNOTE LEGEND

- | | | |
|--|--|---|
| <p>1 HYDROGEN STORAGE CONTAINER</p> <ul style="list-style-type: none"> - Hydrogen Storage Cylinders - Compressor Module - Concrete pad with 3m Safety Zone - Vinyl wrap graphic surface treatment, TBD <p>2 ELECTROLYZER CONTAINER</p> <ul style="list-style-type: none"> - Electrical Room - Electrolyzer - Supporting Equipment - Vinyl wrap graphic surface treatment, TBD <p>3 BIOSWALE / DETENTION BASIN</p> <ul style="list-style-type: none"> - Filters discharge water from electrolyzer process - Retains water for slow infiltration - Natural safety buffer | <p>4 VEHICLE FORECOURT / DISPENSER</p> <p>5 STORMWATER BASIN</p> <ul style="list-style-type: none"> - Canopy runoff - Drains to bioswale / detention basin <p>6 GRASS PAVING GRID</p> <ul style="list-style-type: none"> - Temporary staging area for hydrogen resupply truck when needed <p>7 EXISTING DECIDUOUS TREES</p> <p>8 TREES TO BE REMOVED</p> | <p>9 CONCRETE PATHWAY</p> <ul style="list-style-type: none"> - Establishes "desire line" connection to main north - south walkway <p>10 EXISTING BENCH</p> <p>11 EXISTING PATHWAY</p> <p>12 INTERPRETIVE "EDUCATION HUB"</p> <ul style="list-style-type: none"> - Infographic displays / panels <p>13 METAL GRATING</p> <ul style="list-style-type: none"> - Expose and feature piping trenches <p>14 EXISTING UNDERGROUND UTILITY VAULT</p> |
|--|--|---|

“By integrating energy, transportation, and design, SHED not only supports our CleanBC goals but it also positions British Columbia as a world leader in the hydrogen economy” - Honourable Josie Osborne, Minister of Energy, Mines and Low Carbon Innovation

TWO COMMUNITY

The hydrogen production and fueling station at UBC Vancouver campus enhances the public realm through thoughtfully designed spaces that integrate with campus pathways, inviting engagement and interaction. Landscaped areas, weather-protected zones, and interpretive displays educate visitors on hydrogen and renewable energy, transforming the station into a community asset.

Ample lighting and visible circulation pathways prioritize safety and accessibility, while rainwater management features celebrate the natural water cycle, blending functionality with sustainability. The rain chain manages runoff while poetically celebrating water, symbolizing the hydrogen production process. It enhances the facility’s aesthetics with the soothing sound of trickling water as it drains into nearby plantings.

By reducing reliance on fossil fuels, the project supports community resiliency, improving air quality and fostering energy diversification. It enriches the campus as a hub for innovation and collaboration.

“This new space gives UBC scholars significant new research and learning opportunities that will help shape our society and economy in the years ahead.” - UBC President and Vice-Chancellor Dr. Benoit-Antoine Bacon



Educational tour of site



“Rain chain” and stormwater basin, with seating



“Interpretive” pathway through the site

THREE

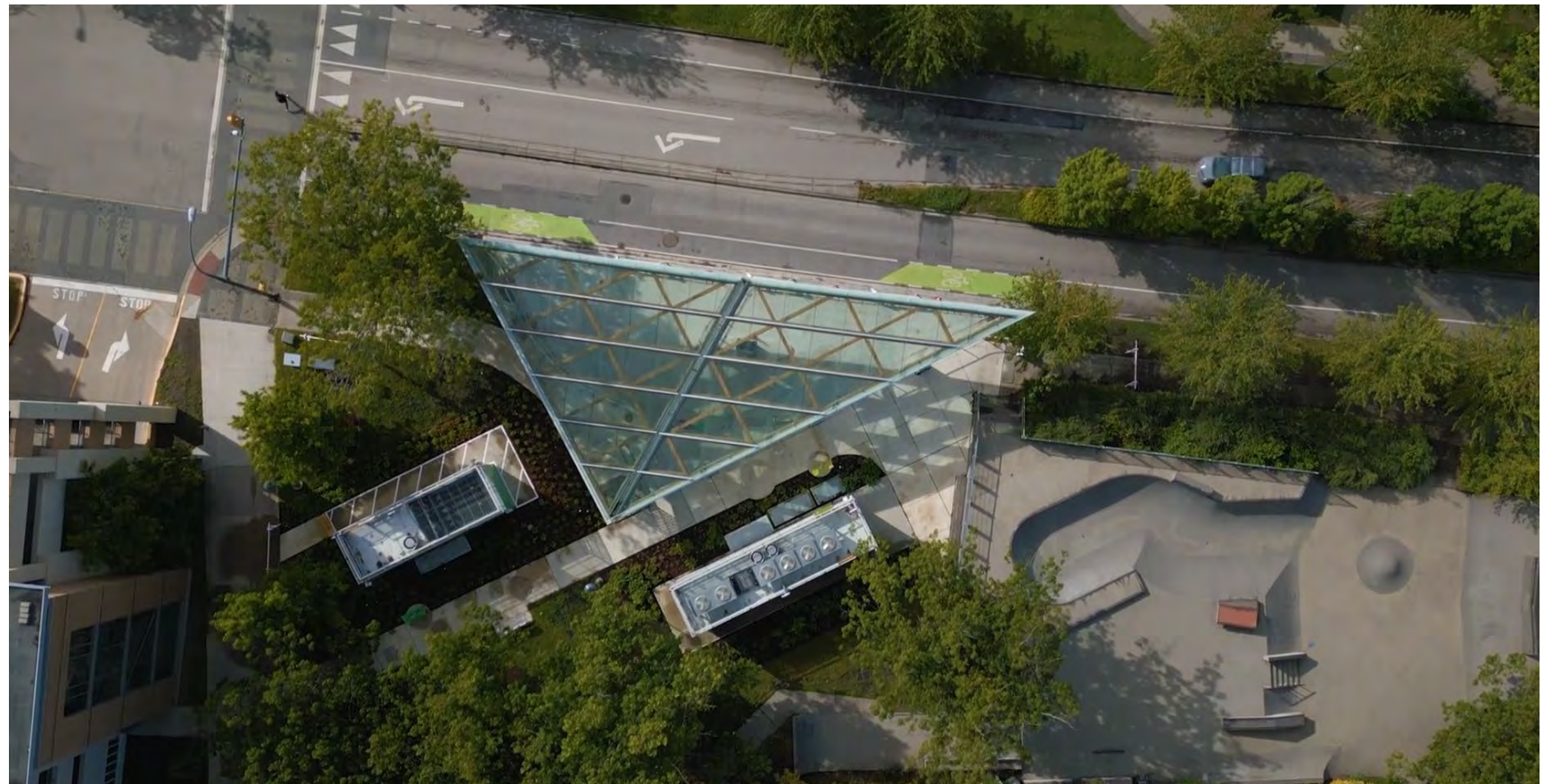
SITE ECOLOGY

The new hydrogen fueling station transforms a site dominated by asphalt into a more ecologically vibrant and socially engaging space. By preserving nearby mature trees and introducing a diverse planting palette of indigenous, drought-tolerant, and pollinator-friendly species, the project establishes a new vegetated ground plane that enhances biodiversity and reduces heat island effects.

Integrated pathways connect users to educational opportunities and create spaces for socialization, with a central seating area becoming a key node in UBC's outdoor space network. This thoughtful design not only improves site ecology but also aligns with the university's sustainability and community-building goals.



Original Site use, highlighting street trees and basketball court



Current site, highlighting mature trees and greenery. Site now features a skate park.

WHAT IF... a vehicle fueling station could be integrated into the public realm as an urban amenity?

SEVEN

ENERGY, PRESENT & FUTURE

The hydrogen fueling station at UBC integrates seamlessly into the campus's district energy system, serving as a pivotal element in the transition to a low-carbon future. By producing and distributing green hydrogen, it reduces greenhouse gas emissions and supports clean transportation. Its design anticipates the decarbonization of energy systems by enabling scalable and flexible hydrogen solutions. Beyond its immediate impact, the station serves as a launchpad for partnerships, business models, and spinoff ventures, providing a platform to demonstrate de-risked, scalable climate solutions. This forward-thinking project is a catalyst for innovation and aligns with long-term goals to eliminate reliance on fossil fuels.

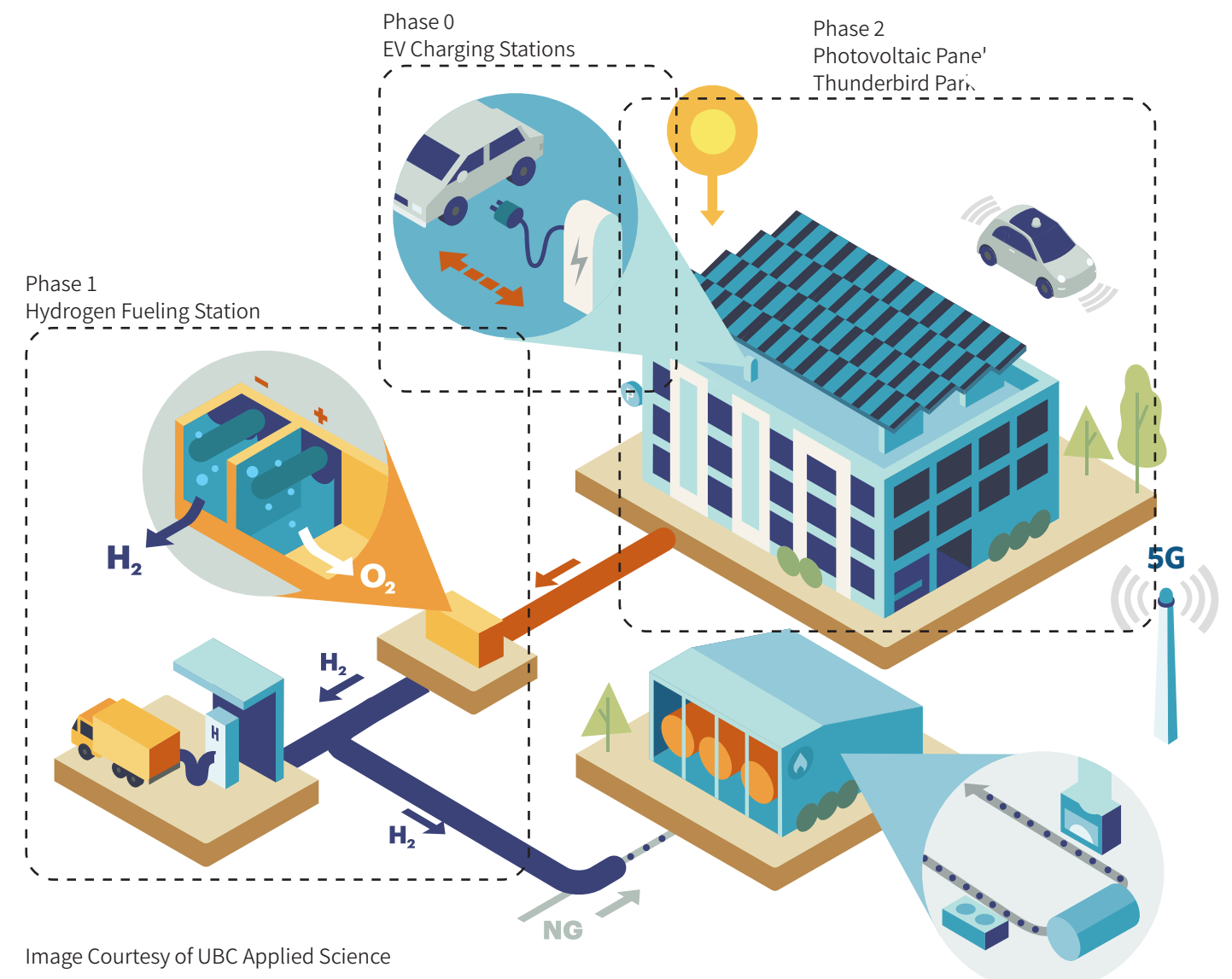


Image Courtesy of UBC Applied Science

“Hydrogen can play a critical role in Canada’s transition to a low-carbon economy...we demonstrate hydrogen as a bridge between renewable electricity and sustainable energy services.” - Dr. Walter Mérida, SHED research lead and professor of mechanical engineering in the faculty of applied science.

TEN

EDUCATION & INFORMATION SHARING

This project addresses sustainable design through a dual approach. Top-down, it aligns with UBC's climate leadership by integrating cutting-edge technologies like hydrogen production, renewable energy, and rainwater management, setting a benchmark for resilient, scalable infrastructure. Bottom-up, it fosters public awareness through interpretive signage, and visible sustainable elements that engage users and visitors, inspiring higher expectations for green building performance.

By blending innovation with education, the project demonstrates how institutional leadership and community engagement can work together to drive cultural shifts, encourage market transformation, and accelerate the adoption of clean energy and sustainable practices across the built environment.

"This is one example of the ground-breaking work taking place across our province that is propelling us towards a net-zero future." - Honourable Harjit S. Sajjan, Minister of Emergency Preparedness

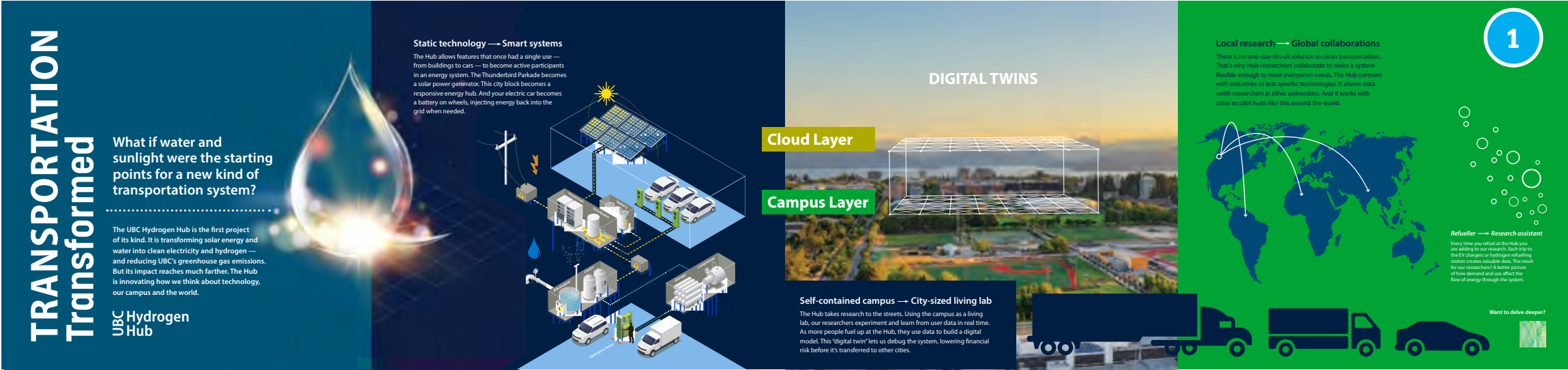


Electrolyzer container with system overview graphic

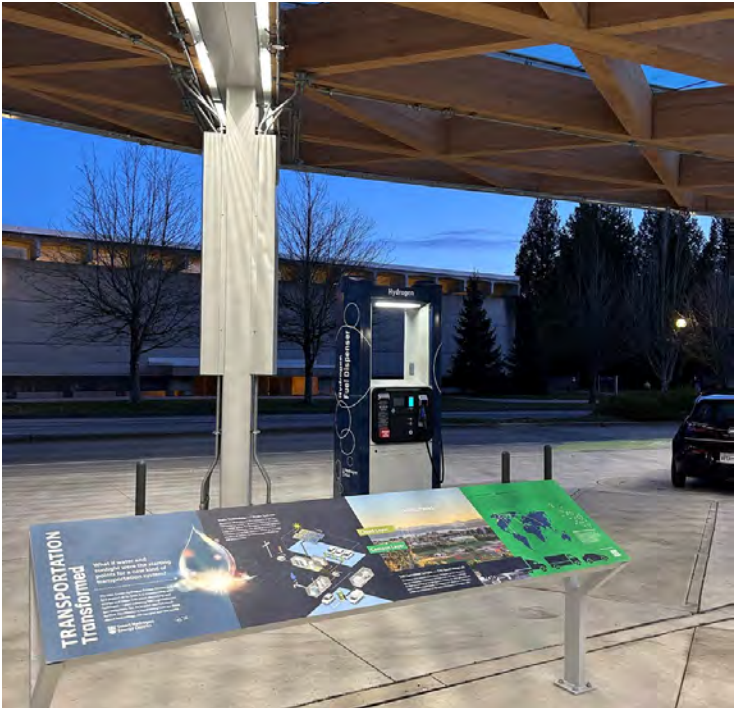


The images on the following pages go into more detail on the systems highlighted above as a part of the education and information sharing.

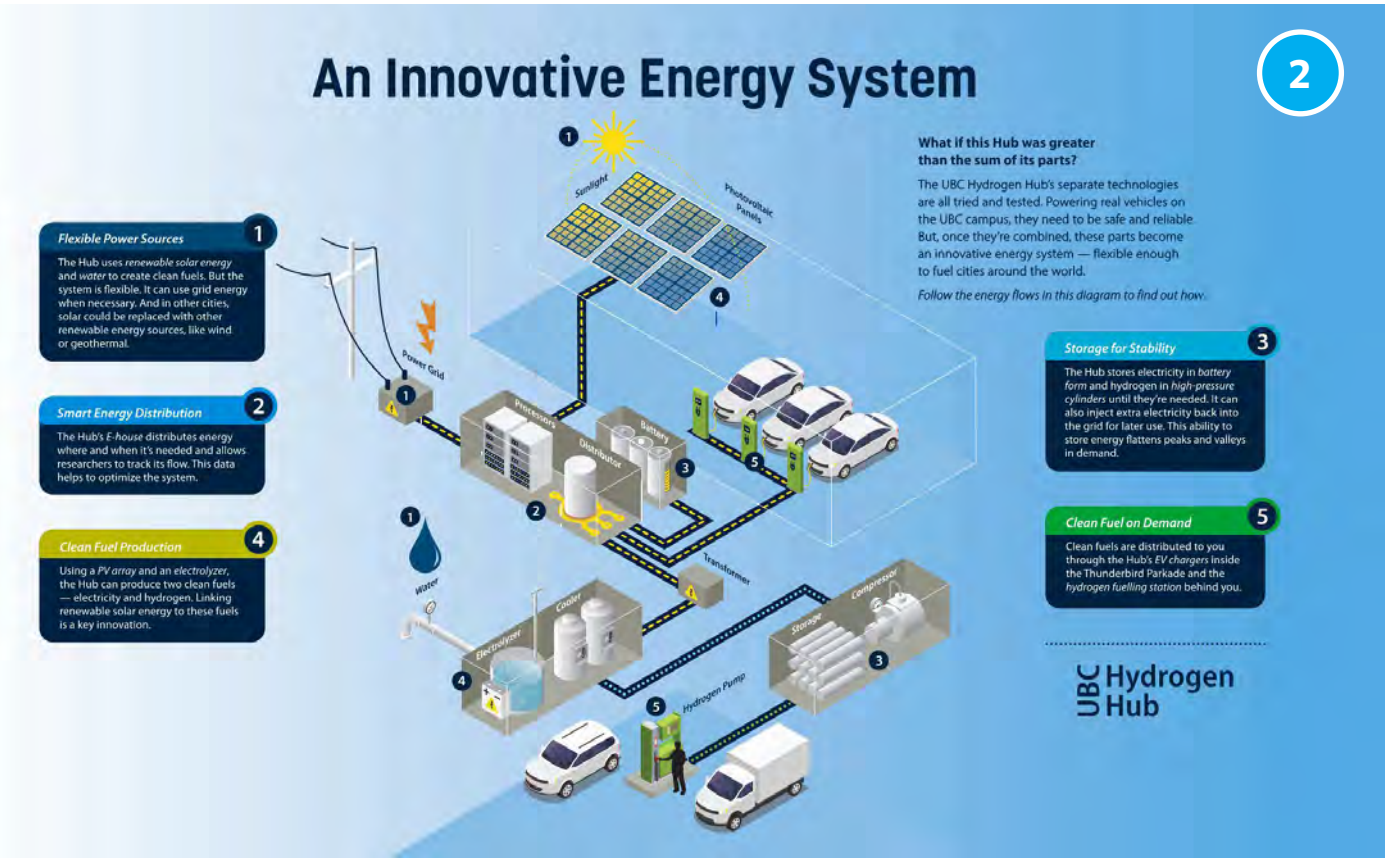
TEN EDUCATION & INFORMATION SHARING



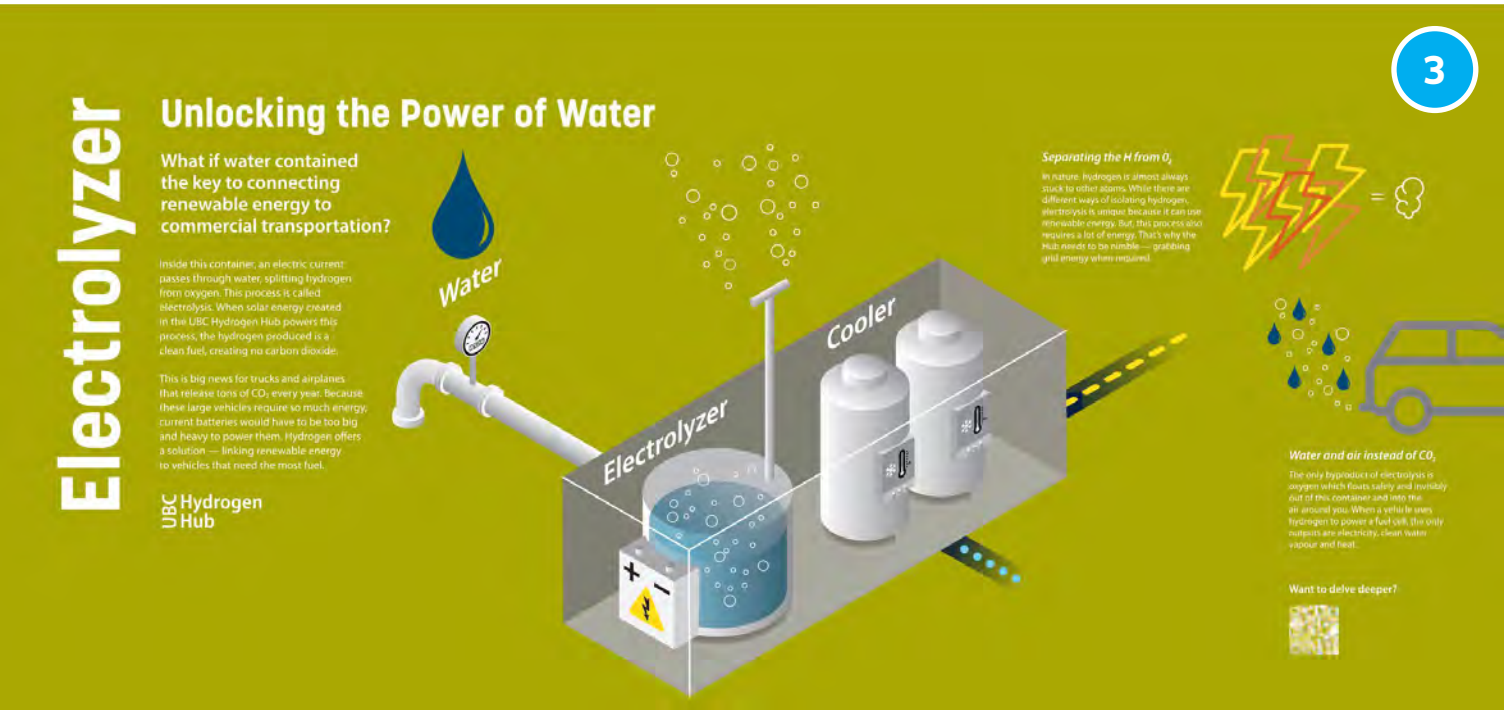
Project Overview graphic on reader rail



Project Overview graphic on reader rail - current day



System overview graphic on electrolyzer container



Electrolyzer overview graphic on reader rail

TEN EDUCATION & INFORMATION SHARING

Hydrogen Compressor and Storage

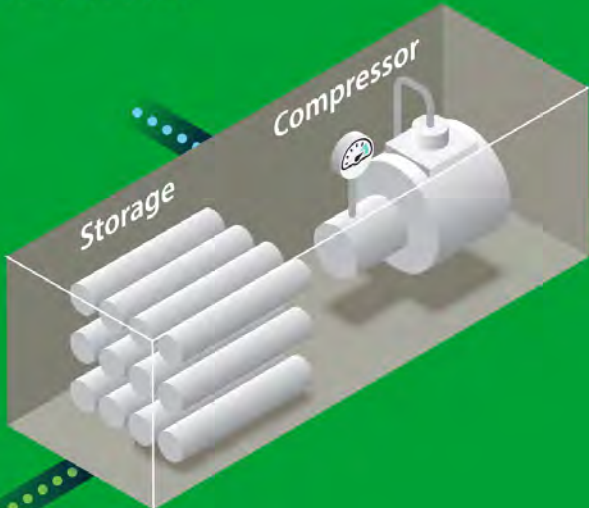
Hydrogen Under Pressure

What if we could fit more fuel into a smaller tank?

The hydrogen produced at the UBC Hydrogen Hub is lighter than air. With particles spaced far apart, this light, low-density gas takes up a lot of space at atmospheric pressure. To fit hydrogen into this container, a compressor must shrink it and store it at high pressures.

Compressing hydrogen does more than help store it in congested city settings. Fuel cell vehicles fill up in minutes instead of the hours it takes the average electric car to recharge. And because they pack a lot of energy into small tanks, certain fuel cell vehicles can drive as far as gas-powered cars, unlike electric vehicles that have a shorter range.

UBC Hydrogen Hub




Vehicles big and small

The Hub dispenses hydrogen at two pressures. Higher pressure, higher density hydrogen powers passenger vehicles where space is limited. Lower pressure hydrogen fuels larger vehicles like buses and trucks that have more room to store it. The Hub can produce enough usable hydrogen to fuel around 20 cars or 2 buses per day.

Safety first

Like all fuels, hydrogen is combustible. But unlike other fuels, in the rare event that hydrogen catches fire, it burns with a flame invisible to human eyes. To manage the risk, the Hub uses open air ventilation to prevent gas build up and "fire eyes" that detect flames that we can't. This means the Hub is always operating safely — and shuts down automatically if it isn't.

Want to delve deeper?



4

Hydrogen Compressor and Storage graphic on reader rail

Battery Energy Storage System

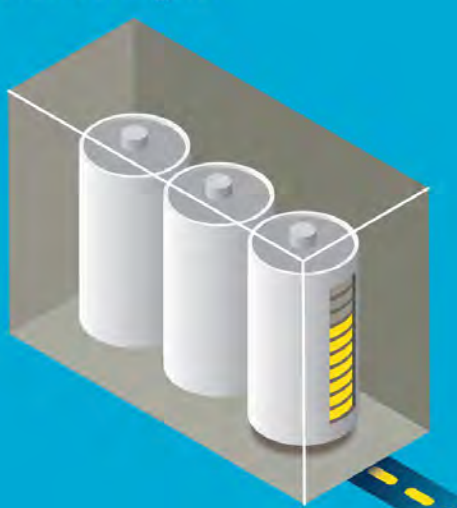
A Steady Source of Sunlight

What if this battery system had the power to integrate solar energy into our daily lives?

The sun is a powerful, renewable source of energy. But solar energy is not always available when we need it — like when we want to charge our electric vehicles after sunset. Time of day, clouds, rain and snow all affect how much energy PV arrays can produce.

That's why the UBC Hydrogen Hub uses this Battery Energy Storage System (BESS) to make intermittent renewable energy sources more stable. By pairing PV arrays with battery storage, it's possible to store energy during times of plenty — like a savings account for sunshine. Now solar energy can flow into the Hub even on rainy days.

UBC Hydrogen Hub




Stored sunshine

Like a larger version of your smartphone battery, this BESS converts electricity into chemical form. It stores as much as 554 kWh. That's enough to power your house for about two weeks. When needed, it reverts the process so an electrical current can power EV charging or hydrogen fuel production.

Better batteries, not bigger

This lithium-ion battery may seem big, especially compared to the one inside your computer or electric vehicle. But it's actually smaller than similar batteries available only a few years ago. As batteries evolve, they pack more energy into smaller spaces — an important quality for storing energy in a city.

Want to delve deeper?



5

Battery Energy Storage System (BESS) overview graphic on reader rail

E-House


Energy Where and When It's Needed

What if the technology inside this container could help transform a city block into a smart energy hub?

Think of this E-House like the nervous system of the UBC Hydrogen Hub. Inside, an Energy Management System sends energy to the right part of the Hub at the right time. The system can direct energy from PV arrays, and the grid to power electric vehicles, produce hydrogen fuel or be stored for later.

But the system inside this E-House doesn't make every decision on its own. As you read this, Hub researchers track the energy flow, adjusting it as necessary. They collect data, spotting patterns and efficiencies. The more energy that flows, the more data they have to build a case study to use in other cities.

UBC Hydrogen Hub




A digital twin is born

The E-House collects information about how much energy and hydrogen is made and used at the Hub. This data helps create a digital model or "twin" of the Hub. Using the model, researchers predict how systems like it might perform elsewhere, now and far into the future.

Stepping down the system

The Hub can give and take energy from the electrical grid at any time. But the voltage from the grid is higher than what's needed by the Hub. Like an energy translator, the twin listens to your right ensures the correct voltage flows to the right place.

Want to delve deeper?



6

E-House overview graphic on reader rail

PV Array

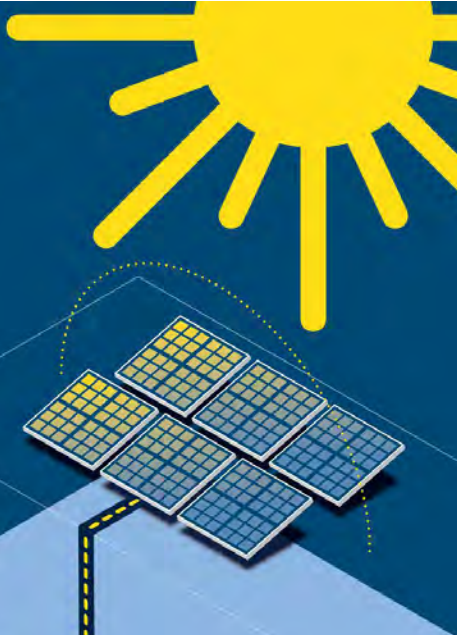
It Starts with Solar

What if research into clean fuel production was happening high above your head?

Four stories up, a photovoltaic array covers the Thunderbird Parkade's roof. On clear days, this series of solar panels converts sunlight into electrical energy. The UBC Hydrogen Hub uses this energy to make two alternative fuels — electricity and hydrogen.

But solar energy is only the starting point for our research. Solar energy is reliable and affordable. This makes it a good proxy, or stand-in, for studying how other renewable energy sources could fuel systems like this in other places. This means that hubs could pop up in cities like Rock Port, Missouri or Reykjavik, Iceland where wind or geothermal are plentiful.

UBC Hydrogen Hub




Harnessing solar power for a green future

By producing 1.1 GWh of renewable solar power a year, the Hub keeps 780 metric tons of greenhouse gases out of the air. That has the same impact as taking 170 gas-powered cars off the road for one year.

Flexible design for Raincover

So what happens when it rains — which happens a lot in Vancouver? The Hub is designed to take electricity from the grid to supplement its power needs. That means energy is always flowing, no matter the weather.

Want to delve deeper?



7

PV Array overview graphic on reader rail