

# Carbon Free Future (CFF)

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A State-Owned National Wealth Engine: Rebuilding Britain's Industrial Backbone.

## *The "Grand Slam" Pitch:*

*"CFF isn't just a power project; it's a **National Wealth Engine**. By funding this through the state, we cut out foreign middlemen and private dividends. We use the by-products to run our NHS and grit our roads for free, and we use the massive earnings to set a **fixed, low-cost British price** for energy. We aren't just building reactors; we're building a future where the UK is the cheapest, cleanest place in the world to live and do business."*

## Executive Summary

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- **What CFF is:** A network of 25 coastal mega-sites, each with 7 British-made SMRs, large-scale electrolysis, and desalination. It is the new backbone of a fossil-free UK.
- **State-Owned Mission:** Built by the state, for the people. Funded via 50-year National Mission Bonds to ensure 100% UK sovereignty and zero economic leakage.
- **The Public Dividend:** High-purity oxygen is provided **free to the NHS**; concentrated brine is provided **free to Councils** for winter roads. Surplus is sold to industry to subsidize energy costs.
- **Fixed-Price Prosperity:** The state sets a "British Standard Price" for electricity and hydrogen, decoupling the UK economy from volatile global gas markets forever.
- **National Safety Valve:** CFF sites dynamically switch between hydrogen production and grid injection, providing the ultimate backup for wind and solar.
- **British Jobs:** A "Skills Passport" transitions 100,000+ North Sea workers into high-wage, long-term roles in the CFF fleet.

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## 1. What CFF Is, In Plain English

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Carbon Free Future (CFF) is a plan to rebuild the United Kingdom's energy system around a new kind of coastal infrastructure. Instead of a handful of giant nuclear plants and a patchwork of gas stations, the country would build a fleet of identical coastal hubs. Each hub combines small modular reactors (SMRs), large-scale electrolyzers, desalination, hydrogen processing and industrial facilities.

CFF is a **National Utility**. It treats energy as a foundation for the economy, not just a commodity to be traded. By owning the means of production, the British state can guarantee energy security and price stability for generations.

## Key Facts

- **25 Coastal Mega-Sites** strategically located in industrial heartlands.
  - **175 SMRs** (7 per site) providing 82 GWe of firm, low-carbon capacity.
  - **35,000 Tonnes/Day of Green Hydrogen** to replace fossil gas in heat and industry.
  - **100% British Supply Chain:** Modules built in UK factories, installed by UK workers.
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## 2. How a Single CFF Site Works: "Sea-to-Street"

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Each site is a massive chemical and energy refinery. It takes in seawater and uranium; it sends out hydrogen, oxygen, minerals, and electricity.

### 2.1 The Core Components

- **Seven SMRs:** Provide steady, 24/7 baseload power.
- **Desalination:** Converts seawater into high-purity water for electrolysis.
- **Electrolysers:** Split water into Hydrogen (for fuel) and Oxygen (for the NHS/ Industry).
- **3-Mile Safety Ring:** A strict physical buffer between the nuclear island and the hydrogen processing zone for maximum safety and regulatory ease.

### 2.2 The Public Dividend: NHS & Roads

In a state-owned model, by-products are public assets:

- **Oxygen for the NHS:** Hospitals receive high-purity oxygen at zero cost, removing a major procurement burden from the health service.
  - **Brine for Councils:** Desalination brine is processed into road-salt and provided free to the DfT and local councils to keep Britain moving in winter.
  - **Surplus Sales:** Once public needs are met, surplus oxygen and minerals (Lithium, Magnesium) are sold to the private sector to generate revenue for the Treasury.
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## 3. The Funding & Wealth Model

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### The National Mission Bond

The project is funded by 50-year **Sovereign CFF Bonds**. Because the state is the owner and the primary customer, the risk is minimal. This allows the UK to borrow at the lowest possible rates, cutting out the 10-15% "private equity tax" seen in traditional projects.

### 3.1 The "British Standard Price"

Because the state owns the infrastructure, it can set the price of energy based on the cost of production, not global market speculation.

- **Social Tariff:** Guaranteed low-cost hydrogen for home heating.
- **Industrial Tariff:** Fixed, 20-year energy prices to attract global manufacturing back to the UK.

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## 4. Dynamic Grid Support: The National Safety Valve

CFF is the ultimate partner for renewables. It solves the "Dunkelflaute" (cold, still winter days) problem.

- **Normal Mode:** SMRs run electrolyzers to create a massive strategic reserve of hydrogen.
- **Emergency Mode:** When wind/solar drop, electrolyzers ramp down instantly, diverting up to 2.9 GW of power per site directly into the National Grid.
- **Result:** The grid stays stable without needing to burn expensive, imported natural gas.

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## 5. Why 7 SMRs? The Fleet Effect

- **Resilience:** If one unit trips, the site stays at 85% capacity. No massive grid shocks.
  - **Learning Curve:** Building 175 identical units allows UK factories to perfect the process, driving down costs by up to 47% over the rollout.
  - **Speed:** Staggered commissioning means the first SMR on a site can start earning revenue while the others are still being installed.
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## 6. A Hydrogen-Heavy Future: 2055

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By 2055, the UK has transitioned to a hydrogen-first economy:

- **70% of Heating** via hydrogen boilers (avoiding the massive cost of retrofitting every home with heat pumps).
  - **70% of Light Vehicles** are Hydrogen Fuel Cell (FCEV).
  - **Heavy Industry & Shipping** run entirely on hydrogen or ammonia.
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## 7. Risks and Challenges

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- **Political Continuity:** Requires a cross-party "Energy Lock" to prevent future privatization.
  - **Supply Chain:** Requires a 25-year guaranteed order book for UK steel and manufacturing.
  - **Skills:** Success depends on the "Skills Passport" to transition 100,000 North Sea workers.
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## Appendix: Technical Capacity & Flows

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### A1 - Installed Capacity (2055)

Source	Capacity (GW)	Notes
CFF SMR Fleet	82	25 sites; 7 SMRs each; 100% UK IP
Offshore Wind	80	Integrated with CFF storage
Solar PV	50	Rooftop and utility-scale

### A2 - Hydrogen Allocation (1,050 TWh/yr)

Sector	TWh/yr	Share
Home & Commercial Heat	250	24%
Industrial Feedstock	220	21%
Heavy Transport (HGVs/Ships)	270	25%
Other (Aviation/Exports/Grid)	310	30%