CHP+ADU=<GHG is a Renewable Electrical Energy Source offering a District energy system for electrical power in remote locations with the additional benefits of refined products such as diesel and kerosene. The ADU uses waste flu gas exhaust heat from the Turbine which generates electrical power using fuels such as field gases and or processed fuels.

Electrical power from the Turbo Refinery® systems offer the most unique remote electrical generation system available today. The CHP+ADU system utilizes the waste exhaust heat from the Turbine to support a ADU which, if necessary, can provide the fuel to run the turbine creating a circular economy. Another waste energy / fuel source is associated natural gas, specifically flared gas, which can be used as primary or secondary fuel for the gas turbine.

Two-thirds of the fuel used in conventional power plants is exhausted as waste heat to oceans, rivers, and the atmosphere. In total, U.S. power plants waste more energy than most countries – including major economies like Japan – consume for their entire economies. This waste heat can be recovered and put to productive use through combined heat and power (CHP) systems.

On September 16, 2010, the **Environmental and Energy Study Institute** (EESI) held a briefing on how district energy systems can tap into local renewable thermal resources and waste heat to reduce our use of fossil fuels, and proposed legislation to encourage the implementation of thermal energy infrastructure. More than 30 percent of all U.S. energy consumption is used for thermal purposes – heating and cooling buildings and industrial processes – and much of this energy comes from fossil fuels. However, some communities are instead using local renewable sources of thermal energy, as well as power plant and industrial "waste" heat. District energy systems connect these thermal resources to energy consumers by piping water and/or steam to buildings for space heating, domestic hot water, air conditioning and industrial process energy.

- District energy systems can help strengthen energy security by reducing the need for imported foreign oil and improve economic development by keeping energy dollars in the local economy.
- The Thermal Renewable Energy and Efficiency Act of 2010 (TREEA) is intended to stimulate investments in low-carbon thermal energy infrastructure, focusing on use of renewable energy sources to supply heating and cooling. Major provisions include a renewable thermal production tax credit, expanded availability of tax-exempt bonds for district energy infrastructure, and modified authorization for institutional sustainable infrastructure.

ACCESS TO ELECTRICITY

In 2021, 754 million people worldwide did not have access to electricity. Rising prices slowed progress towards universal access to modern energy services, and in 2022 the number of people without electricity access was projected to grow by 20 million (mainly in Sub-Saharan Africa), to reach an estimated 774 million. Around 75 million people who recently acquired access to electricity may no longer be able to afford it, and in 2022 around 100 million people were projected to revert to using traditional biomass for cooking, with negative impacts on health and livelihoods.

As of 2022, an estimated 2.4 billion people worldwide did not have access to clean cooking facilities, with 40% of them residing in Sub-Saharan Africa and 55% in developing Asia. The number of people using traditional biomass, coal and kerosene for cooking was projected to increase in 2022 due to soaring fuel prices.

CHP+ADU=<GHG provides a local solution for both electrical requirements and cooking with Kerosene which is a product create by the CHP+ADU. Additional diesel is created, and the distribution supports the local economy for both commercial and residential needs.

Fossil Fuel Companies Are Failing to Transition

Fossil fuel companies are increasingly rebranding as "energy companies", as awareness about climate change grows and societal acceptance of fossil fuel use plummets. At the same time, some governments have shifted their political priorities in a push to phase out oil and gas production, although fossil fuels remain heavily subsidised. In one example of high-level political action, the Beyond Oil and Gas Alliance (BOGA) brings together key players in the international arena – including the governments of Costa Rica, Denmark, France, Tuvalu, and Vanuatu – in a call for a "massive increase in energy efficiency and renewable energy investment".

Many oil companies have designed internal scenarios for net zero emissions by 2050 to showcase their commitments to long-term decarbonisation and to guide their strategic decision making. However, most companies continue to rely heavily on fossil fuels as the main component of their business portfolio. A 2022 study found that scenarios by BP, Equinor and Shell were inconsistent with the emission reduction goals outlined in the Paris Agreement. Scenario updates in 2023, such as Shell's Sky 2050, show that to keep global temperature rise below 1.5 degrees Celsius, oil and gas production need to stop growing, and solar PV and wind power must ramp up significantly, adding an estimated 950 GW of solar PV and more than 90,000 wind turbines annually by 2050.

But fossil fuel companies are not ambitious enough. In 2022, in the context of the global energy crisis, the five biggest western fossil fuel companies – Chevron, ExxonMobil, Shell, BP and TotalEnergies – earned their **highest profits ever, totalling USD 195 billion, or 120% more than in 2021**. Despite widespread commitments towards net zero emissions by 2050, as of 2022 low-carbon solutions averaged only 17% of the total capital investment of the top seven fossil fuel companies (p *see Figure 11*) and accounted for only 1.13% of total global investment in clean energy, while investments in renewables are not clearly disclosed.

In 2013, Shell published its New Lens Scenarios focused on mountains and oceans, which, for the first time, featured scenarios with energy-system modeling to 2100, enabling the viewing of long-term transitions in their entirety. These scenarios showed that the application of CO2-targeted policy frameworks would lead to net-zero emissions in the energy system by the end of the century.

However, because these falls short of the goal set by the Paris Agreement on climate change, the Sky Scenario looks at a possible decarbonization pathway of achieving net-zero emissions from energy use by 2070.

In the Sky scenario, oil consumption would rise through 2025 before beginning to decline, drop in the 2030s and fall below current levels after 2040. Liquid hydrocarbon fuel consumption would decrease by 50% between 2020 and 2050 and fall by 90% by 2070. The scenario also includes sector transformations in transport, buildings, industry, electricity, and energy.

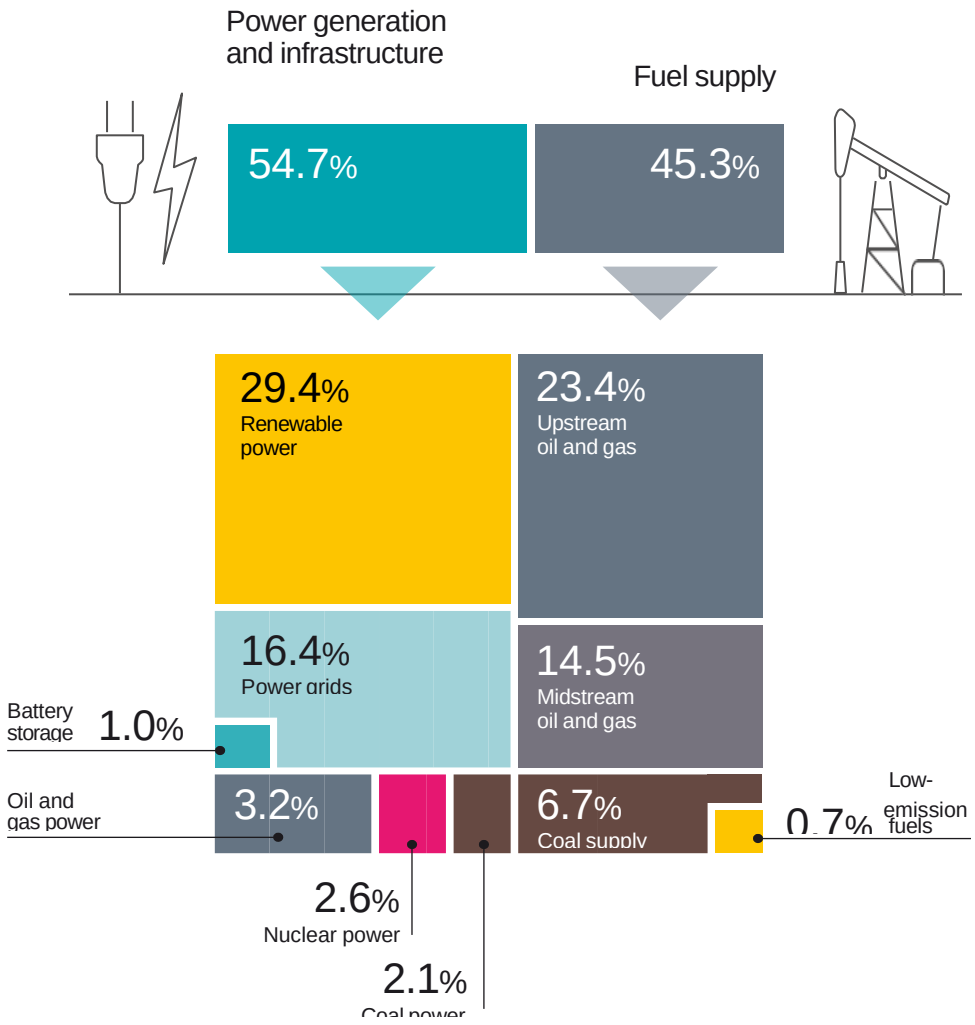
The Sky Scenario is based on the following assumptions from now to 2070:

- a change in consumer mindset where people preferentially choose low-carbon, high-efficiency options to meet their energy service needs.
- a step-change in energy efficiency.

- carbon-pricing mechanisms adopted during the 2020s, leading to a CO2 cost embedded in consumer goods and services.
- **the electrification rate of final energy more than triples, with global electricity generation nearly five times the current level.**
- new energy sources grow by a multiple of fifty, with primary energy from renewables surpassing fossil fuels in the 2050s.
- 10,000 large carbon capture and storage (CCS) facilities are built, compared to fewer than 50 in operation in 2020; and
- net-zero deforestation is achieved, and an area the size of Brazil is reforested offering the possibility of limiting warming to 1.5°C.

Shell is one of the world's largest publicly traded oil companies and produces approximately 3.7 million barrels of oil equivalent per day.

Global Investment in the Energy Sector, by Type, 2022



Note: "Low-emission fuels" include modern liquid and gaseous bioenergy, low-emission hydrogen, and low-emission hydrogen-based fuels.