This investment will support the development of a device that uses electrochemistry to convert waste carbon dioxide into useful fuels and chemicals.

Opus 12 uses renewable electricity to convert carbon dioxide (CO2) – the primary culprit in anthropogenic climate change – into higher value chemicals like carbon monoxide (CO), methane (CH4), ethylene (C2H4), and 13 others. If Opus-12 succeeds, it will have cracked one of the grand challenges of our time: economically attractive carbon dioxide capture and utilization. Opus 12’s technology has two key impacts. First, Opus 12 creates carbon-neutral chemicals from waste CO2, displacing chemicals that are typically produced with fossil fuels. Second, by using CO2 to produce valuable chemicals, Opus 12 provides producers of waste CO2 with an economically viable option for waste utilization – a key enabler for investment in carbon capture from sources like power plants and cement plants.
Capturing waste CO2 and converting it to high value fuels and chemicals

Climate Impact Potential

Strategies to Reduce Emissions by 1 Gt C02e per year by 2050

- Create alternative travel methods or decrease travel miles
- Increase electrification of transportation sector
- Increase use of alternative transport fuels (e.g. biofuels, hydrogen)
- Increase building or industrial energy efficiency
- Increase carbon efficiency of fossil-fuel based transport
- Increase carbon efficiency of fossil fuel power plants
- Fuel switch from coal to lower carbon fuels
- **Sequester CO2 from fossil fuel-fired power plants**
- Increase electricity production from nuclear technologies
- Increase electricity production from renewables technologies
- Increase abundance or capacity of natural carbon sinks

This analysis is adapted from the Princeton University Carbon Mitigation Initiative's Stabilization Wedges.

**PRIME Climate Impact Assessment:** If successful, Opus 12 could mitigate over 1.5 billion metric tons of greenhouse gas emissions by 2050. This is equivalent to removing all of the coal plants in the United States for more than one year.
The Challenge of Carbon Dioxide Utilization

Opus 12's first market is the carbon monoxide market – a $40 billion global market. Carbon monoxide is used as a feedstock in a wide range of commercial and academic research applications, from chemistry to synthetic biology. Opus 12's primary competition will likely be the conventional methods for producing Opus 12’s target products (e.g., delivered carbon monoxide for Opus 12’s initial market). Traditional carbon monoxide production methods include steam reformation of methane and steam reformation of coke. Ethylene is produced almost exclusively by steam cracking of hydrocarbon feed stocks (i.e. petroleum). However, Opus 12 will also face competition from concurrent developments within the CO2 utilization market.

Direct Charitable Impacts

Opus 12’s solution protects the natural environment by decreasing demand for the extraction of fossil fuels. By producing chemicals or renewable methane from waste CO2, Opus 12 displaces equivalent fossil-fuel-derived chemicals. This reduces the need to extract coal, oil, and gas as chemical feedstocks; fossil fuel extraction imposes a heavy environmental toll, from the direct destruction of natural habitat through practices like mountaintop removal, fracking, deep-ocean drilling, and infrastructure development in remote and pristine areas, to accidental environmental contamination through chemical spills and leaks.

Advances Science

The U.S. White House, the U.S. Department of Energy, and the International Energy Agency (IEA) have all identified carbon capture and utilization technologies as high priority technological targets. However, to date, development and deployment of carbon capture and utilization technologies has remained limited due in part to a lack of viable and economic uses for the captured CO2. Opus 12’s technology is a breakthrough in this area. Opus 12 has already filed four patents, and expects to file up to 30 more in the coming five years. Furthermore, Opus 12's founders have published their research in leading journals such as Energy & Environmental Science and Journal of the American Chemical Society.

Indirect Charitable Impact from Climate Change Mitigation

Because this company helps to mitigate climate change, it also has indirect impacts on existing charitable purposes.

Promotes human health
Reduces pollution from fossil fuels and spread of disease

Alleviates poverty: natural disasters
Mitigates frequency and severity of natural disasters, which disproportionately affect the poor

Defends human rights
Protects communities most vulnerable to climate change effects

Combats community deterioration
Mitigates sea level rise and resource degradation

Protects the natural environment
Prevents ecosystem degradation and species extinction

Lessens the burdens of government
Reduces strain on infrastructure and need for climate-related assistance