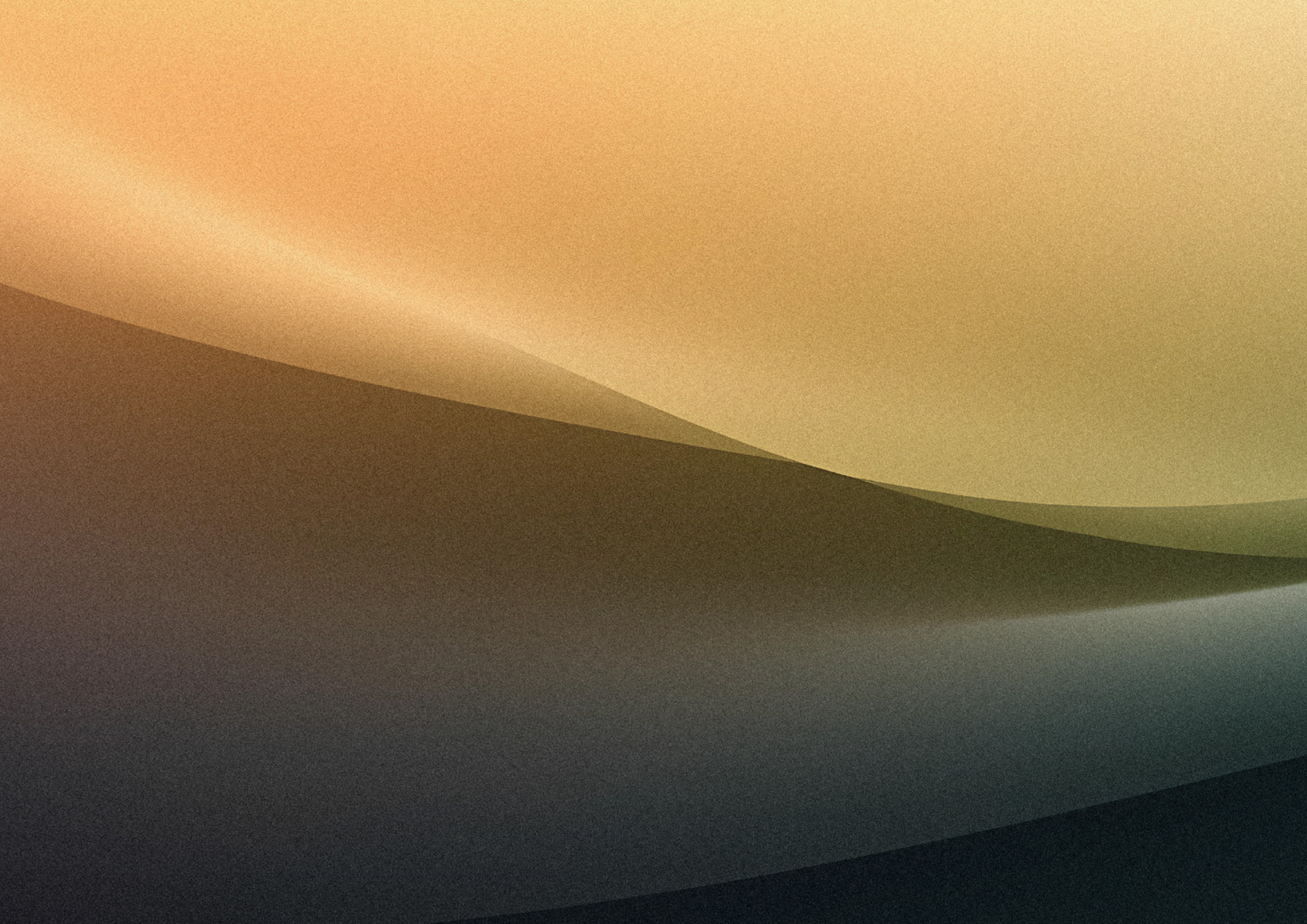

Harnessing The Power of The Sun

KMIT كُميت للتجارة

Focused Sun

Harnessing The Power of The Sun

كُميت للتجارة KMIT

Focused Sun

Preface

The sun stands as our most abundant energy source, and its potential to transform our world is limitless. Embracing solar energy offers a pathway to diminish reliance on fossil fuels, enhance air quality, and mitigate the effects of climate change.

We hope this brochure will inspire you to contemplate the ways solar energy could positively influence both your everyday life and business endeavors.

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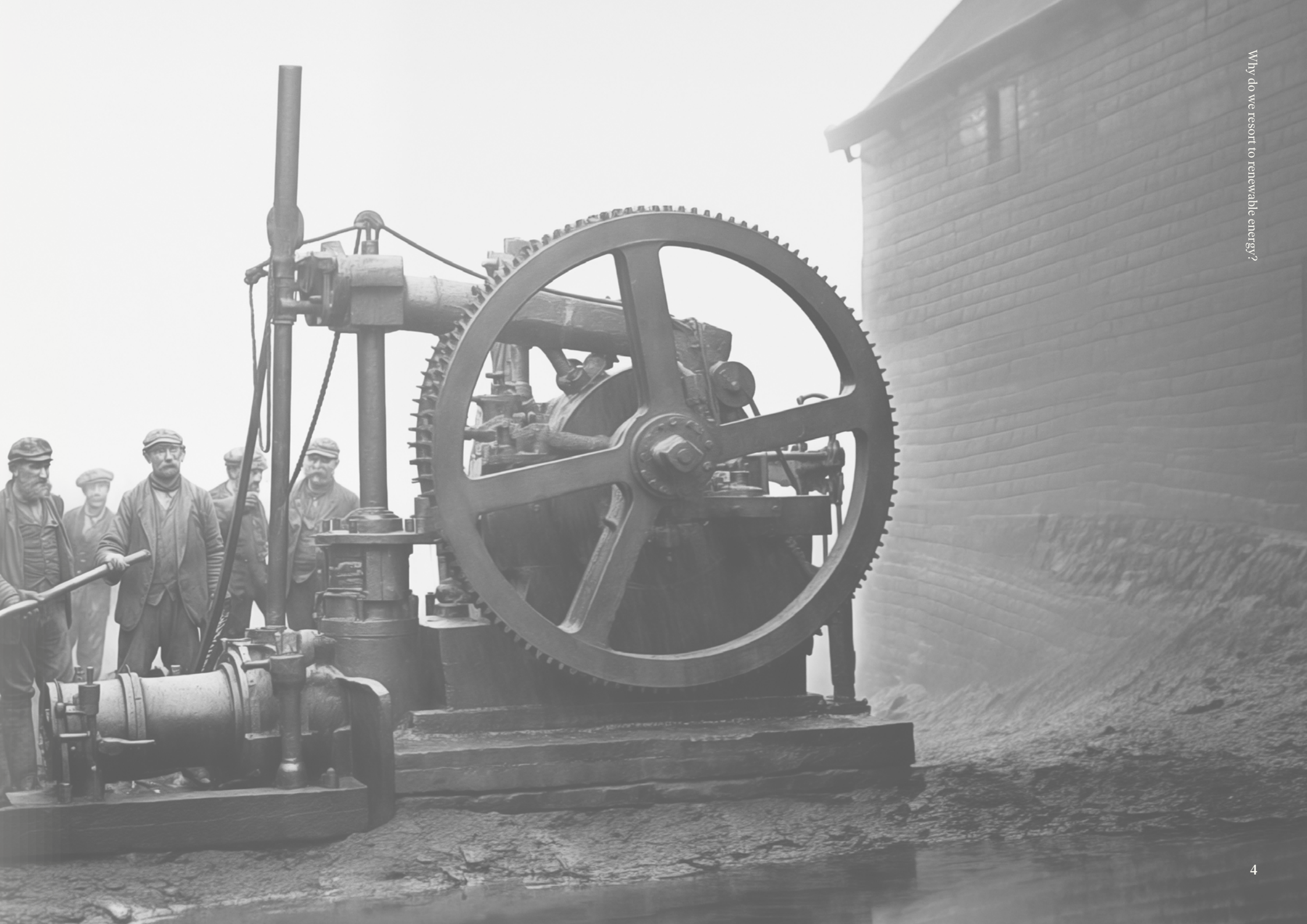
Why do we resort to renewable energy?

From Wood to Coal: A 18th Century Energy Revolution

By the early 18th century, people in Great Britain had used up most of their trees for building houses and ships and for cooking and heating. They were desperate for a new fuel source. So, they turned to coal, the hunks of black stone found near the surface of the earth. Coal burned longer than wood, so people started digging deeper to extract it. However, mining this coal proved difficult, as mines quickly flooded with water that needed to be removed; horses worked tirelessly to haul out buckets of water, but this process was slow and inefficient.

To the rescue came the Scottish inventor James Watt with his revolutionary steam engine. Powered by burning coal, the engine used steam to drive a piston. It proved extremely useful in pumping water out of mines. The mines have gone a lot deeper and the supply of coal had substantially increased. The use of this engine has revolutionized the mining industry, and set the stage to usher in the Industrial Revolution.

The Watt's engine was quickly adopted across many industries, revolutionizing manufacturing, transportation and trade. The engines replaced water-powered machinery, enabling factories anywhere. Cities grew as rural people moved to urban areas for factory work. More factories were built to utilize urban workforces and markets. By the late 1800s, coal replaced wood as the main energy source.



The Dawn of the Modern Oil Age

In 1822, the oil industry was in full swing. Around the world, the extraction of oil from whales went on as fast as the boats could bring it in. It was both used as a lubricants and illuminating oil. The Industrial Revolution drove growing demand for cheaper, more convenient lubricant and lighting sources. Whales, long providing fuel for lamps, were becoming harder to find. Prices rose accordingly.

The desperate situation caused some American entrepreneurs to consider petroleum, that annoying black liquid sometimes bubbling from the ground. It had just not been worth bothering with when wood, coal and whale oil were so cheap. In 1846, Canadian inventor Dr. Abraham Gesner developed a process to refine a liquid fuel from coal. This new fuel, which he named kerosene, burned more cleanly and was easier to produce than whale oil. Gesner's method was later improved upon by Samuel Martin Kier, who distilled lamp oil from crude oil. Kier is credited as the inventor of the first petroleum refining still. Within a few years, kerosene went on to become the lighting fuel of choice. Learning of Kier's flourishing Pittsburgh refinery, George Bissell, American entrepreneur, recognized opportunity in petroleum seeps near Titusville, Pennsylvania. He formed an oil company and hired Edwin Drake, credited as the oil industry's Father, who pioneered deeper drilling techniques and successfully discovered the world's first commercially viable oil well in the USA in 1859. This and kerosene demand triggered an oil rush and birthed the modern oil industry.

Oil Takes the Throne in 1964

Crude oil was refined primarily to produce kerosene, lubricants, and heavy oils. Gasoline was initially seen as a dangerous waste by-product of this refining. It was too volatile to be used in lamps so had little demand and was flared off. It wasn't until 1892, with the development of the internal combustion engines and the subsequent invention of the automobile, that gasoline was recognized as a valuable fuel.

With the rise of the automobile in the early 1900s and its use of gasoline, the production of petroleum increased dramatically. Oil found its true calling in the transportation sector. Once a luxury item, cars became within reach for many more consumers thanks to Henry Ford's development of the assembly line in 1913, which revolutionized the mass production of automobiles, making the Ford Model-T accessible to a broader range of people. By 1929, there were over 23 million automobiles on American roads. Oil overtook coal to become the world's largest energy source in 1964.

The world today is unrecognizable from that of the early 19th century. Human health and welfare have improved markedly, and the global population has increased from 1 billion in 1800 to almost 8 billion today. The fossil fuel energy system is the lifeblood of the modern economy. Fossil fuels powered the industrial revolution, pulled millions out of poverty, and shaped the modern world.

However, this had dire consequences ...

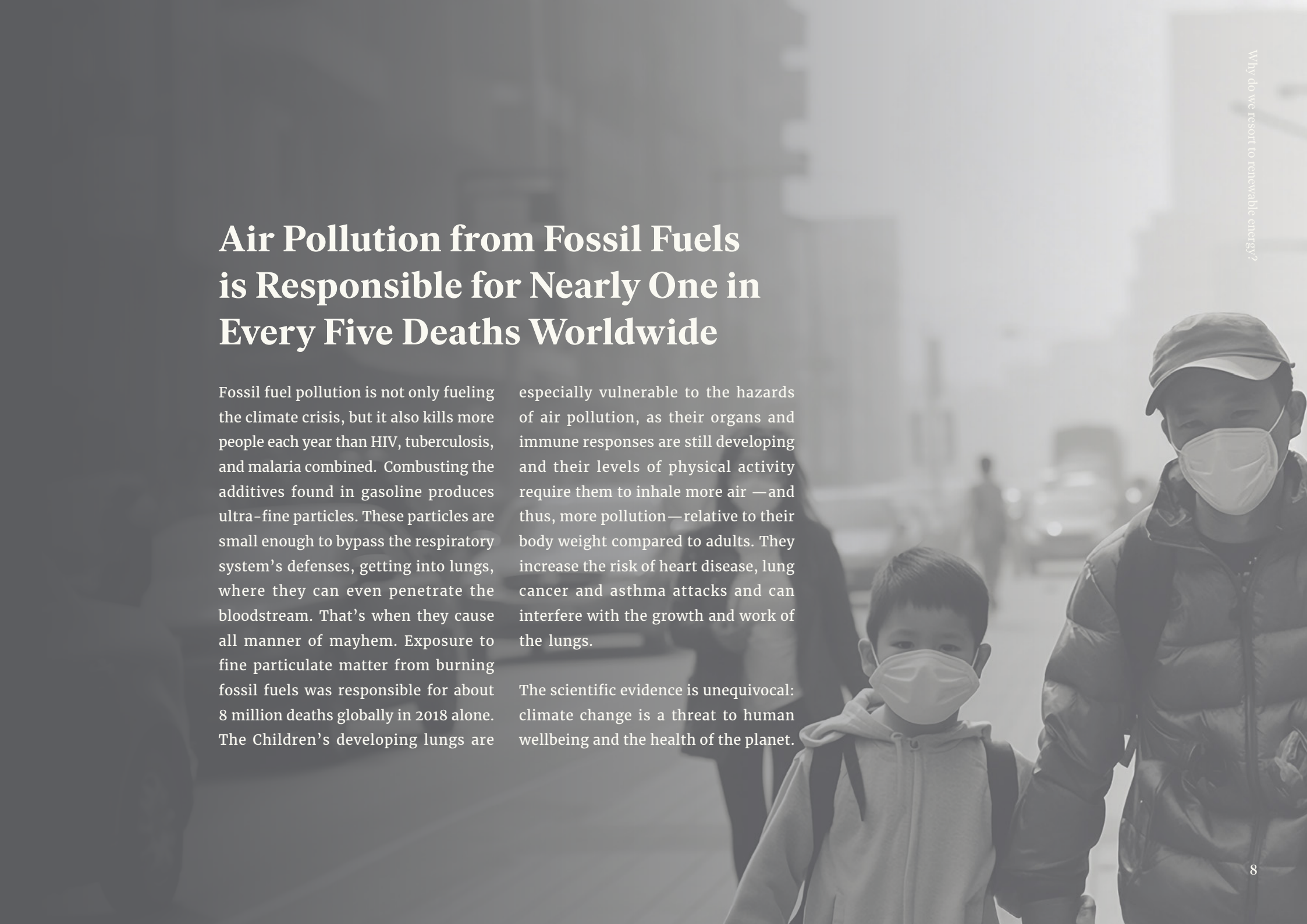
Planet in Peril: The Unrelenting Impact of Fossil Fuel Addiction

These carbon-intensive energy sources are the primary driver of climate change. Fossil fuels produce large quantities of carbon dioxide when burned. Carbon emissions trap heat in the atmosphere and lead to climate change, which is leading to rising seas due to melting ice sheets and glaciers and an increase in ocean temperatures, deadly heatwaves, water shortages and more frequent extreme weather events across the globe. Coal, oil, and gas development threaten waterways and groundwater through runoff, spills, and toxic fluids. Extracting and processing fossil fuels damages landscapes, fragments wildlife habitat, and destroys ecosystems. The impacts are immense and irreversible.

Air Pollution from Fossil Fuels is Responsible for Nearly One in Every Five Deaths Worldwide

Fossil fuel pollution is not only fueling the climate crisis, but it also kills more people each year than HIV, tuberculosis, and malaria combined. Combusting the additives found in gasoline produces ultra-fine particles. These particles are small enough to bypass the respiratory system's defenses, getting into lungs, where they can even penetrate the bloodstream. That's when they cause all manner of mayhem. Exposure to fine particulate matter from burning fossil fuels was responsible for about 8 million deaths globally in 2018 alone. The Children's developing lungs are especially vulnerable to the hazards of air pollution, as their organs and immune responses are still developing and their levels of physical activity require them to inhale more air —and thus, more pollution—relative to their body weight compared to adults. They increase the risk of heart disease, lung cancer and asthma attacks and can interfere with the growth and work of the lungs.

The scientific evidence is unequivocal: climate change is a threat to human wellbeing and the health of the planet.



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We do not inherit the earth from our ancestors, we borrow it from our children

Native American Proverb

To avert disastrous climate change, scientists agree that CO2 and other emissions must be reduced by 50% by 2030 and reach net-zero by 2050. To accomplish this, a transition away from fossil fuels and investment in clean energy is imperative.

Renewable energy is one of the most effective tools we have in the fight against climate change. In addition to the climate benefits that they will help deliver, renewables already provide a wide range of other benefits that far outweigh their costs. Switching to clean sources of energy, such as wind and solar, thus helps address not only climate change but also air pollution and health.

Energy is at the heart of the climate challenge – and key to the solution.

2

Why is this investment promising?

Ambitious Future Plan

Saudi Arabia's Vision 2030 is an ambitious plan that aims to diversify the country's economy and reduce its dependence on oil. One of the key pillars of this vision is the development of renewable energy sources and increase it's share in the country's energy mix and promote sustainable development.

One of the flagship initiatives is the Saudi Arabian National Renewable Energy Program (NREP), which aims to install 58.7 GW of renewable energy capacity by 2030, with a significant portion coming from solar power.

Promising investment opportunity

Supportive government policies, increasing efforts to meet power demand using solar energy, and decreased fossil-fuel dependency are expected to drive the market's growth. This is a promising investment opportunity.

The Kingdom of Saudi Arabia plans to increase its production of electricity from renewable sources from 0.4 gigawatts in 2021 to 58.7 gigawatts by 2030 to cover 50% of the Kingdom's energy needs.

3

Why do we prefer solar energy?

Abundant and Available

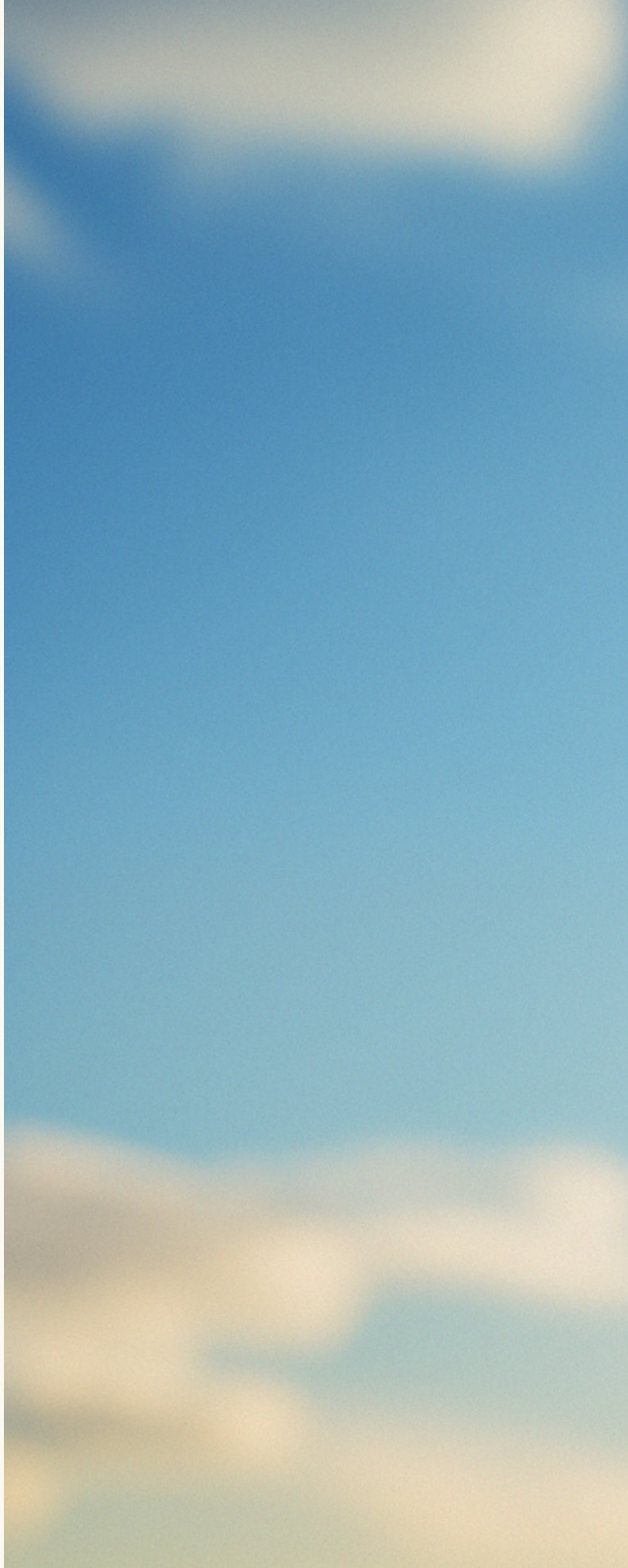
One of the strengths of solar energy is that it is self-generating and can be used anywhere.

Efficient and Versatile

Over the years, scientists have made some important advances in the development of solar technologies, notably improving the efficiency of collection and storage systems as well as their overall durability over time. Solar systems provide flexibility for building power plants of different sizes to suit local requirements.

Reduced costs

As the solar industry has grown, the production volume has increased, allowing manufacturers to optimize their operations and reduce costs. Solar power systems have Long-time warranty and low maintenance costs. Solar power is now the cheapest electricity.



> **An hour and a half of sunlight that reaches the planet's surface generates enough power to meet all of humanity's energy consumption for an entire year**

United States Department of Energy

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Sunlight or Sun Heat?

Capturing the sun's energy: A primer on solar power

Solar energy technologies convert sunlight into electricity or thermal energy. There are two main types of these technologies: photovoltaic and concentrated solar thermal.

Photovoltaics (PV) is the direct conversion of light into electricity. When the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electrical field in the cell, thus generating a direct electric current (DC). After the DC is generated, it is then converted into AC, usually using inverters, so that it will be distributed on the power network.

Concentrating solar thermal (CST) is an indirect method that generates alternating current (AC). CST systems use mirrors to reflect and concentrate sunlight onto receivers that collect solar energy and convert it to heat, which can then be used to produce electricity or stored for later use.

Heat: An untapped energy source

The law of conservation of energy states that energy can neither be created nor destroyed - only converted from one form to another.

The first step in traditional energy conversion is the combustion of fuel, usually fossil fuel, to produce heat. Heat produced by combustion may be used for heating, cooking, or industrial processes, or it may be further converted into motion or electricity. In US, around 84% of energy-related industrial emissions come from burning fossil fuels to provide heat for manufacturing processes like melting metals, and driving chemical reactions.

The premise of solar thermal conversion is that heat from the Sun replaces heat from combustion; fossil-fuel use and its threat to the environment and climate are thus reduced.

Combined heat and power

Combined heat and power (CHP) refers to the concurrent production of electricity or mechanical power and useful thermal energy (heating/cooling) from a single source of energy. It is a suite of technologies that can use a variety of fuels to generate electricity or power at the point of use, allowing the heat that would normally be lost in the power generation process to be recovered to provide needed heating and/or cooling, and to generate power for other industrial purposes. It is a more efficient way of generating energy for a facility, it can save money in energy bills. One emerging solution entails the optimized combination of solar, storage, and CHP which could provide “long-duration, onsite energy for sites with high-resilience needs with the least possible carbon emissions.

What makes CST systems the best option?

More Efficient

CST systems are more efficient than PV systems in converting sunlight into electricity by about three times

Easily Stored

CST systems uses heat storage: cheaper and easier than electricity storage. CST systems can operate even at night

More Versatile

CST systems offer a variety of outputs to meet diverse needs: heating, electricity, cooling, and industrial steam

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Why do we use the microgrid?

The types of concentrated solar thermal systems

While concentrated solar thermal systems can vary in shape and size, most facilities can be classified into one of four main categories:

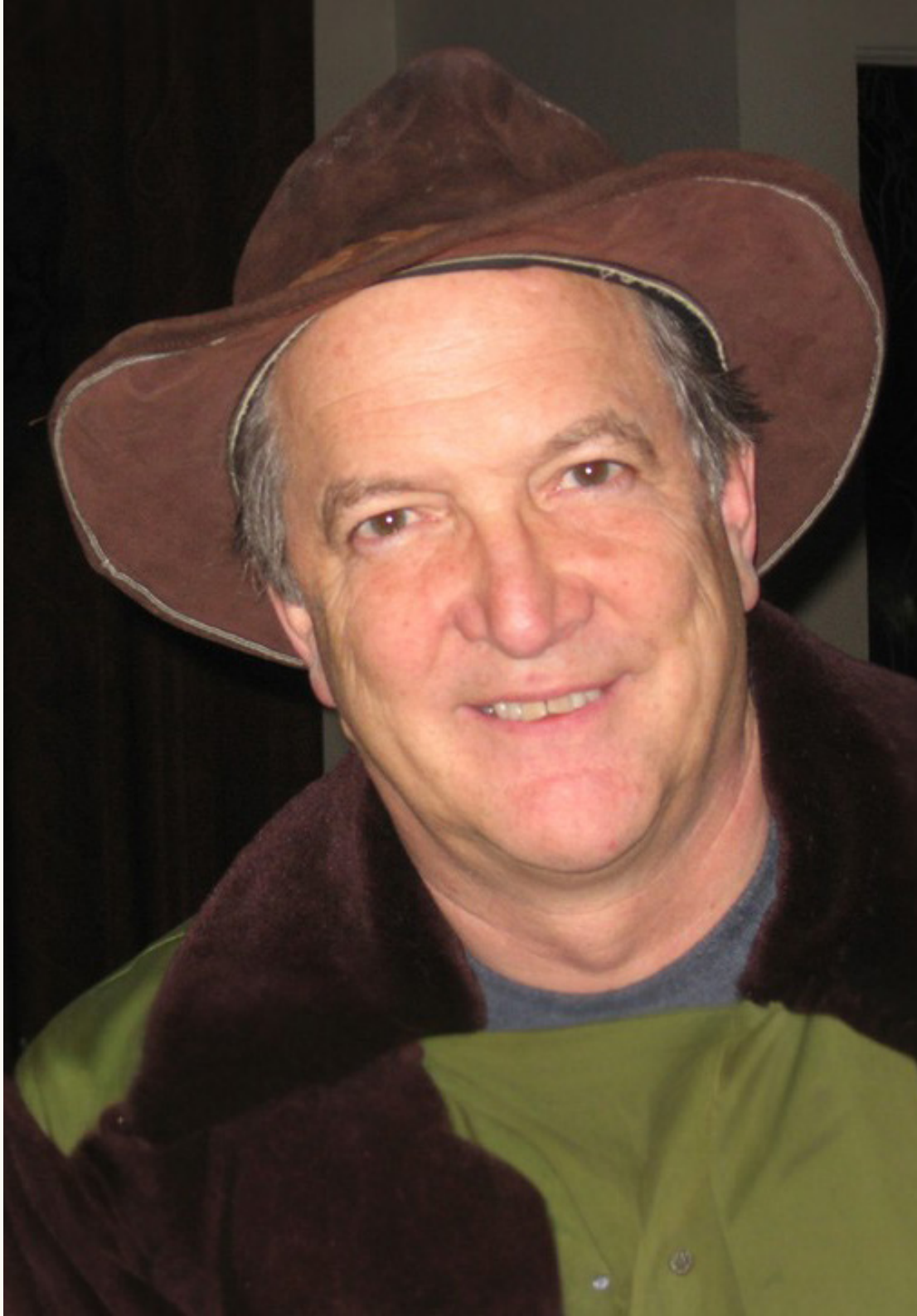
- Solar Towers
- Solar Dishes
- Parabolic Troughs
- Linear Fresnel Reflectors

Dr. Shawn Buckley

Dr. Shawn Buckley, PhD in Mechanical Engineering, is the CTO and Chairman of Focused Sun and the inventor of the patented FocusedSun technology for solar energy.

Dr. Buckley was a Mechanical Engineering professor at MIT, Berkeley, UCLA and Huazhong UST. He led the development of the MIT-Chevron solar module. His MIT group pioneered sandwich fabricated solar panels that could be made cheaply in local factories.

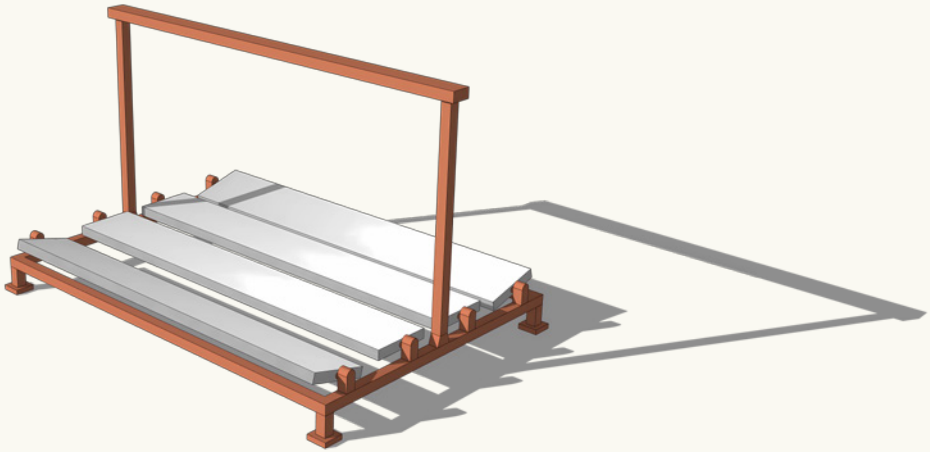
Dr. Buckley has 26 US patents, and founded 3 Silicon Valley companies selling advanced manufacturing equipment. Dr. Buckley wrote McGraw-Hill>s most successful solar energy book.

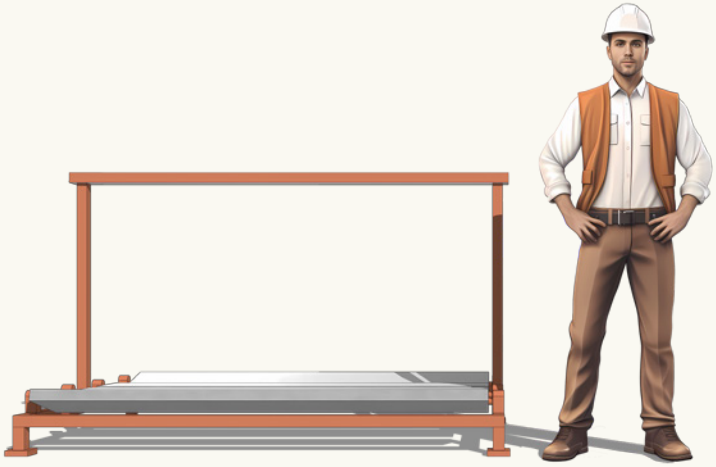


The Microgrid

Dr. Buckley developed an affordable modular solar system based on linear Fresnel technology, which he called the Microgrid. Microgrids are small local electric grids for supplying energy to gated communities, shopping malls, resorts, remote clinics and agricultural projects. They are powered by systems that can generate electricity day or night. Microgrids can disconnect from the electrical grid during emergencies or power outages.

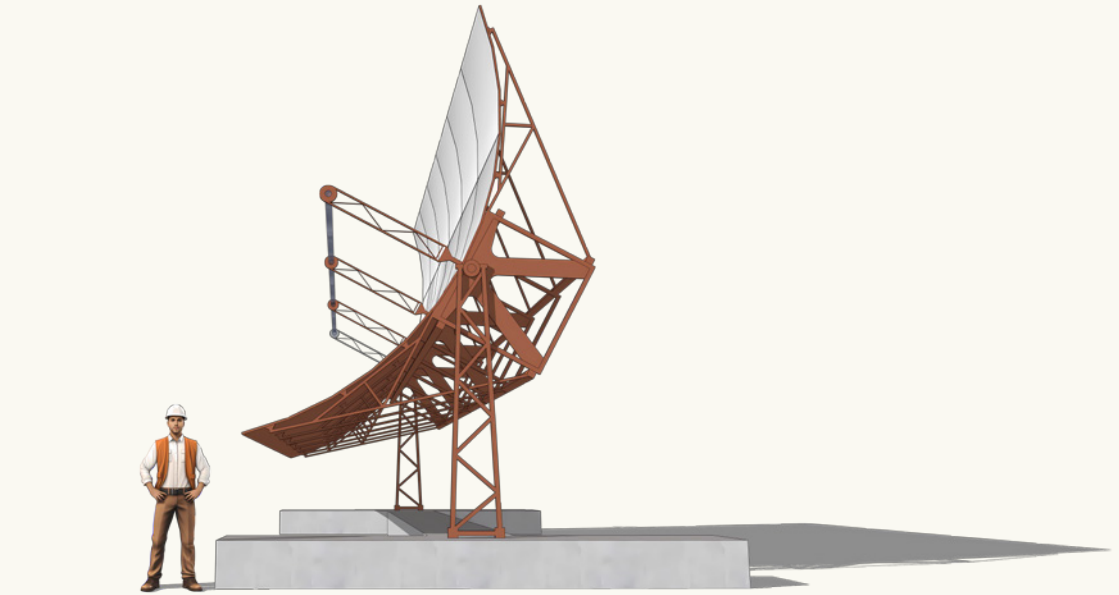
Focused Sun's microgrid is a low-cost, mass-produced module that extracts both electricity and heat from the sun and is easy to install and maintain. The reflector is designed to withstand high wind loading over its faces while maintaining accurate focusing of solar energy on the absorber of the module.

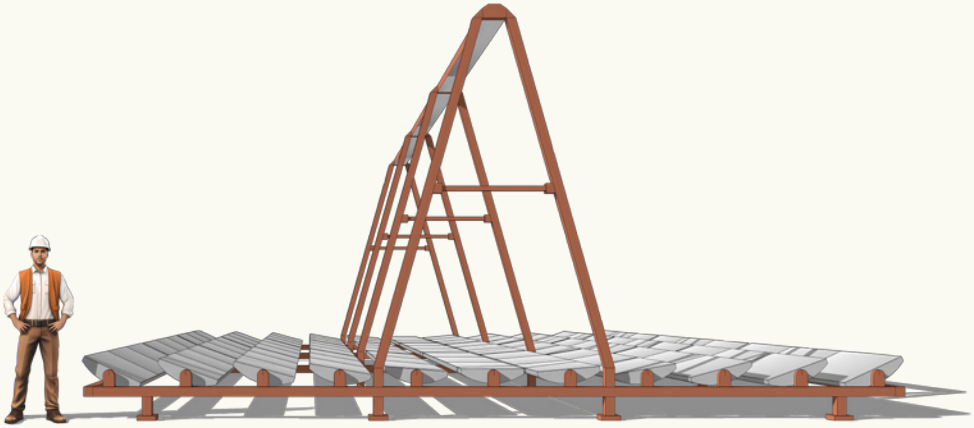




Miniature unit

The lightweight solar module from Focused Sun is designed to be efficient in shipping, installation, and durability. Its interlocking design allows for easy packing and transportation. The fragile components are embedded within the structure to prevent damage during shipment. The deployment process is also simple and straightforward. One of the dominant structural loads of any solar energy system is wind loading. When wind hits a structure, it applies a force on each cm^2 of the structure's surface. The larger the surface area, the greater the wind force. The Microgrid's compact size minimizes the negative effects of wind, eliminating the need for the large and complex structural support required in traditional parabolic or linear Fresnel systems.

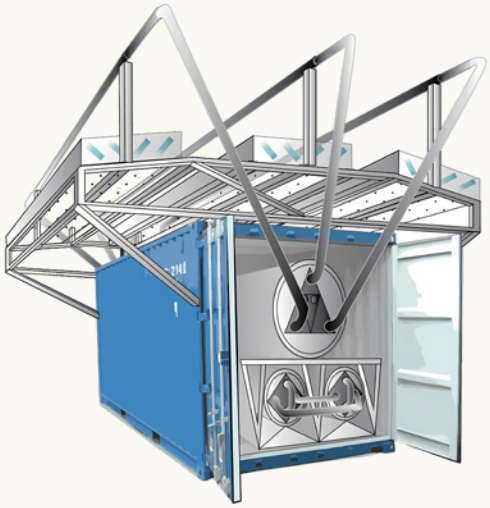




An award from US Department of Energy

A team led by David Warsinger, an assistant professor of mechanical engineering at Purdue University in Indiana, has reached the quarter-finals of the US Department of Energy's $9 million Solar Desalination Prize. The Purdue team, which includes two company partners, NiekAab Desal and Focused Sun, has created a technology called NoAir which uses high-temperature solar heat and a hybrid of desalination technologies to purify high salinity water.

Making fresh water out of seawater usually requires huge amounts of energy. Energy costs account for one-third of total desalination plant costs over its lifetime. The team received the recognition for a technology to use solar power to purify high salinity water, such as treating desalination brine or produced water from oil and gas extraction. This technology promises high energy efficiency with minimal electricity consumption.



What makes the microgrid unit an ideal choice?

Cheaper

The Focused Sun microgrid unit features low-cost, easy-to-maintain components that can be installed by low-skilled workers. The simplicity of installation reduces labor costs, and the low-maintenance components minimize ongoing costs.

Smaller

The unit's lightweight, interlocking design makes it easy to ship, transport, and install. This flexibility makes the unit suitable for a wide range of applications, from small-scale distributed generation to community power plants.

Durable

The module frame uses double wall construction that structurally withstands failure to lifetime loads while simultaneously minimizing the materials used in the frame structure.

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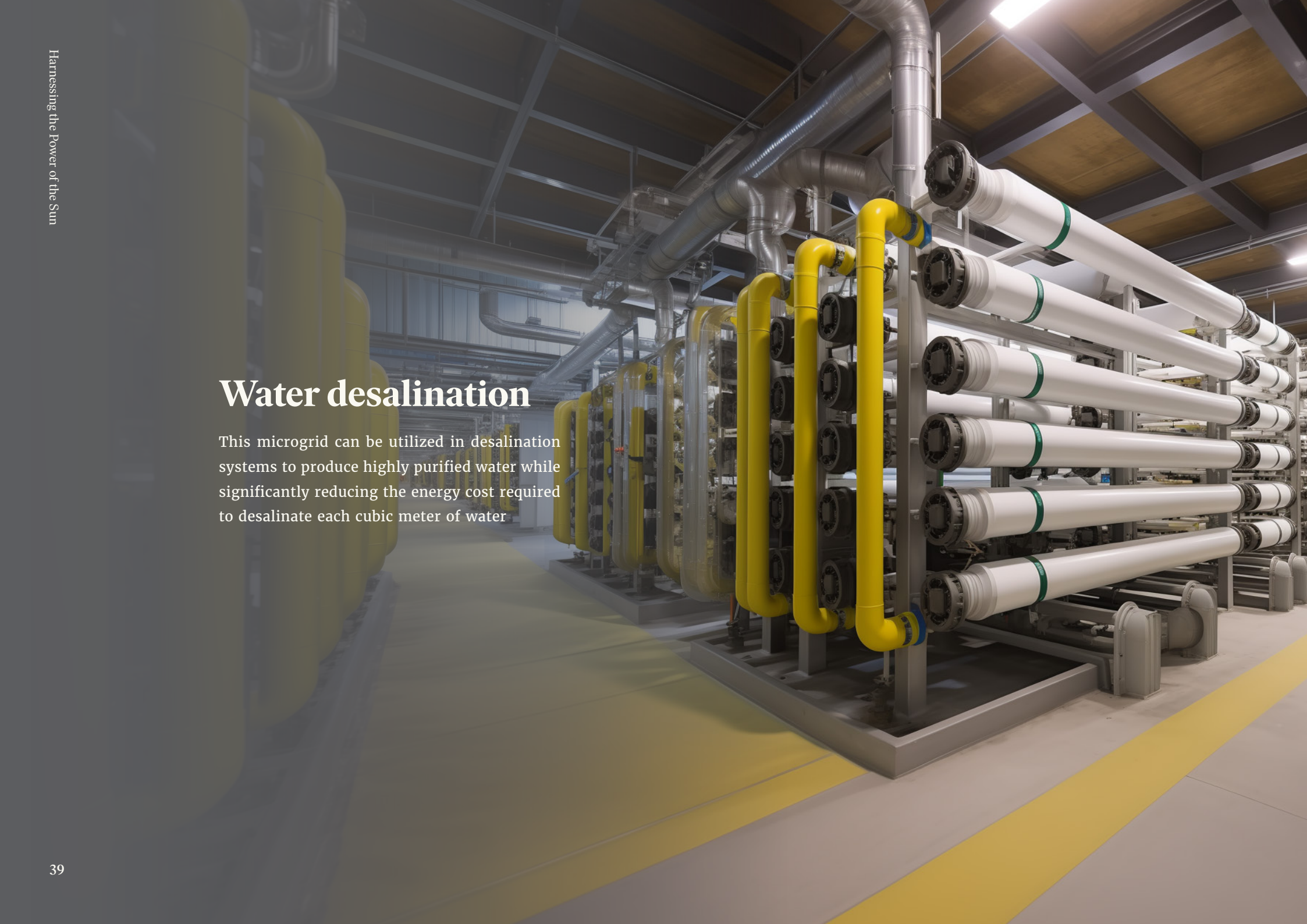
Where can the microgrid be used?

Electrical generation

On-site electricity generation offered by this microgrid is cost-effective when compared to other generators, without the need for extensive distribution networks and with the flexibility of feeding them from the national grid if necessary.

Heat generation

Reducing operational costs by providing an alternative to fossil fuels for heat generation in a wide range of industrial applications, from food processing to chemical processes that require very high temperatures

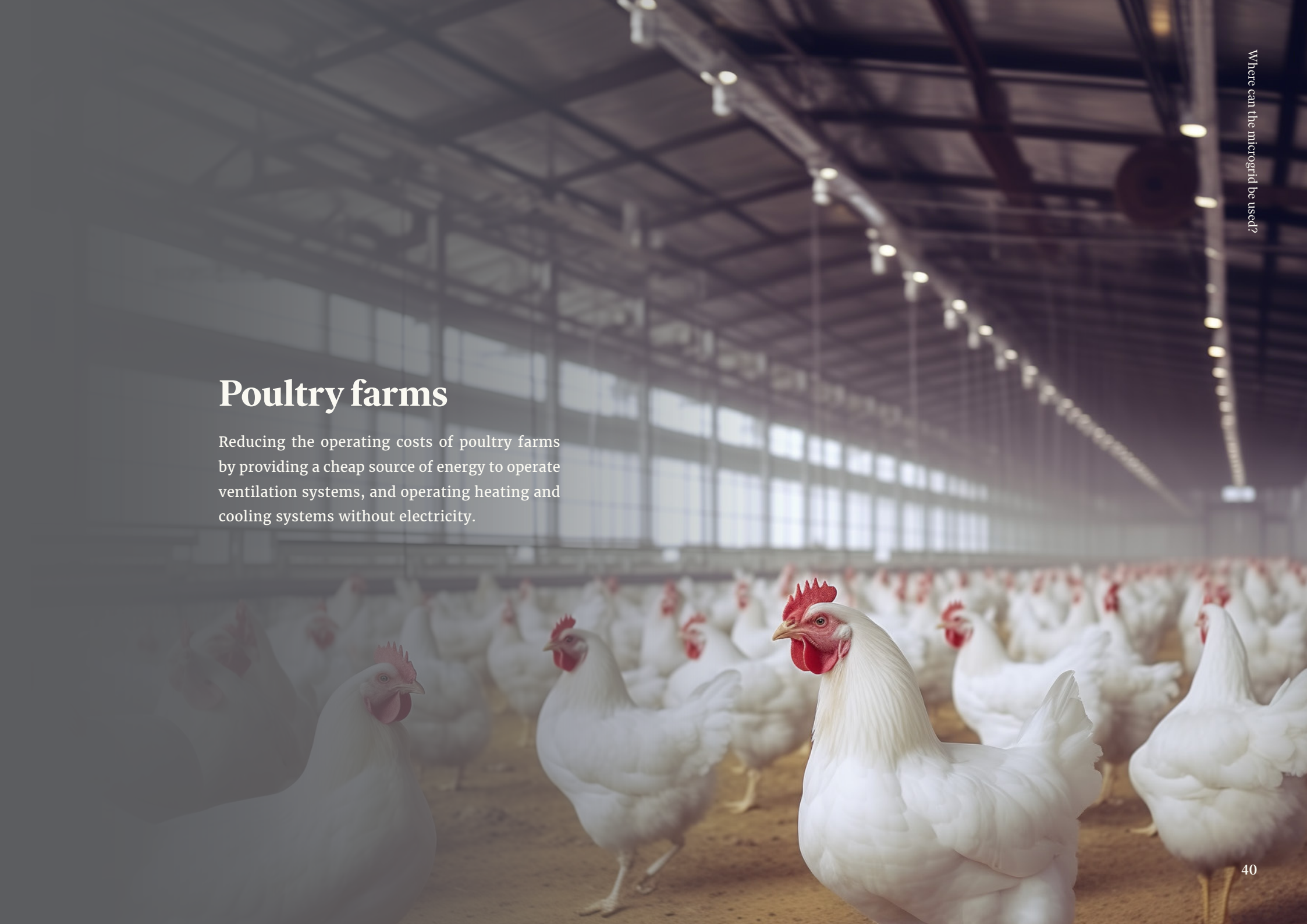


Water desalination

This microgrid can be utilized in desalination systems to produce highly purified water while significantly reducing the energy cost required to desalinate each cubic meter of water

Poultry farms

Reducing the operating costs of poultry farms by providing a cheap source of energy to operate ventilation systems, and operating heating and cooling systems without electricity.



Agriculture

Reducing operational costs by providing a cheap source of energy to pump water from wells, irrigate land with center pivot irrigation, and provide electricity and heat for various uses.

Greenhouses

Reducing the operational costs of greenhouses and extending the growing season by maintaining constant temperatures and lighting all the time, allowing farmers to grow crops year-round

Cooling Warehouses

Reducing operational costs by using absorption chillers that operate on heat rather than electricity, which are considered to be the most efficient in locations with year-round cooling loads such as cold storage and freezing warehouses.

Food industry

Pasteurization processes can account for up to 30% of the total energy demand in dairy plants. Operating costs can be efficiently reduced by using solar energy as an alternative heat source in the dairy industry.

For more inforamtion...

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