# DESERT-VISION

رؤية VISION 2030

المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

**The world's largest power complex**, a **100 GW** thermosolar system, delivers clean energy **24/7**, producing **800 TWh pa**.
The waste heat and regulating energy of the **DESERT-VISION** power plant enable the **$CO_2$-free desalination up to 57 billion $m^3$ of seawater per year** - creating life and sustainable growth from solar energy.

Beneath the flat solar mirrors, a **1,600 $km^2$ oasis** with a pleasant microclimate comes to life - a visionary fusion of energy, water and much more.

**DESERT-VISION** transforming the nation with the power of the desert sun into
**a new Golden-Era**.
***The true Spirit of Vision 2030***

## A Proposal for the Kingdom of Saudi Arabia's 2030 Transformation

### A New Chapter in the History of Energy

Our concept for the **Kingdom of Saudi Arabia's Vision 2030** is built on the idea of creating a completely new, multifunctional thermosolar power plant - a technological, ecological, and economic masterpiece with revolutionary performance metrics and a unique value-added concept that fits seamlessly into the strategic matrix of Saudi Arabia's transformation.

This brief concept paper will not delve into technical details, but rather highlight the key features and transformative potential of the project.

### A Power Plant that grows from within

The project begins with a 1 GW pilot plant, whose architecture already integrates the foundation for scalable expansion up to 100 GW.

"Growing from within" in this context means:
With the first plant, a state-of-the-art manufacturing and development complex is simultaneously established - capable of producing around 80 % of all components required for future expansion phases.

The system is thus self-sufficient, reproducible, and exponentially scalable - representing an industrial evolution based on a closed-loop structure.

### Performance Data – A New Dimension

Electrical Capacity: 100 GW, continuous 24/7 operation with up to 8,000 full-load hours per year
**Annual Output: 800 TWh**

**For comparison:**
This energy volume equals the production of 100 medium-sized nuclear power plants - or nearly twice Saudi Arabia's current total electricity generation (430 TWh p.a.). At present, roughly 99 % of this energy still comes from fossil sources.

### Seawater Desalination - Power from waste Heat

The plant's thermal waste heat is fully utilized to produce around 4 billion m³ of freshwater annually.

### Seawater Desalination through the Utilization of Regulating Energy

Instead of throttling back the output of the **DESERT-VISION** multifunctional thermosolar power plant during periods of energy surplus, this regulating energy can be purposefully directed to a regulation-based reverse osmosis (RO) desalination system to convert seawater into high-quality freshwater. This approach integrates

energy optimization, grid stabilization, and water production into a single, coherent system.

Through intelligent load management and variable pressure control, modular RO units can flexibly respond to fluctuations in energy generation. In this way, the desalination system becomes an active regulatory component within the energy infrastructure: it absorbs excess electricity, stabilizes the grid, and simultaneously transforms surplus power into a valuable resource — freshwater as a secondary form of energy and life support.

Assuming conservatively that about 20% of the annually generated 800 TWh of the **DESERT-VISION** system - approximately 160 TWh - is directed to desalination, then at a specific energy consumption of 3 kWh per cubic meter, an additional **53 billion m³** of freshwater per year could be produced. This volume corresponds to the annual water demand of more than one billion people living in arid regions.

### The Potential of Seawater Desalination within the DESERT-VISION System

By integrating waste heat recovery and grid-balancing energy utilization, the DESERT-VISION multifunctional thermosolar complex has the potential to produce up to **57 billion m³ of freshwater per year - entirely $CO_2$-free** and driven by surplus solar power. In this integrated framework, water ceases to be a limiting factor for development and instead becomes a strategic co-product of sustainable energy generation.

To contextualize this magnitude:

- **Saudi Arabia** currently produces approximately **4 billion m³** of desalinated freshwater annually.
- The **global total desalination capacity** is estimated at about **37 billion m³** per year.

**The projected seawater desalination capacity of the DESERT-VISION system alone would therefore reach around 57 billion m³ per year - representing an increase of approximately 54 percent over the present global capacity.**

This approach marks a paradigm shift in the relationship between energy and water systems. Instead of consuming additional power, desalination becomes an integral component of a closed thermodynamic cycle, utilizing residual heat and regulating energy that would otherwise remain unused. The result is a synergistic nexus of renewable energy production, water security, and sustainable regional development, particularly suited for arid and semi-arid zones.

**More information about balancing energy**

## The 1,600 km² Oasis - a new City beneath the Mirrors

Beneath the shallow solar fields emerges a 1,600 km² shaded area with a pleasantly moderate microclimate right in the middle of the hot desert.

This area, roughly the size of Riyadh, can be used multifunctionally:

- as the site of a new $CO_2$-neutral city,
- as an industrial hub with direct access to low-cost energy and water, or
- as the world's largest agricultural development zone.

Thus, this is not merely a power plant - it is a complex ecosystem uniting energy, water, food production, and industrialization in one place.

## $CO_2$ Savings and Certificate Revenues

The project's annual $CO_2$ reduction - averaged across gas, oil, and coal - amounts to approximately 480 million tons.
At a carbon certificate price of around € 80 per ton (as of October 2025), this corresponds to a potential annual revenue of about **€ 38.2 billion, with a rising trend**.

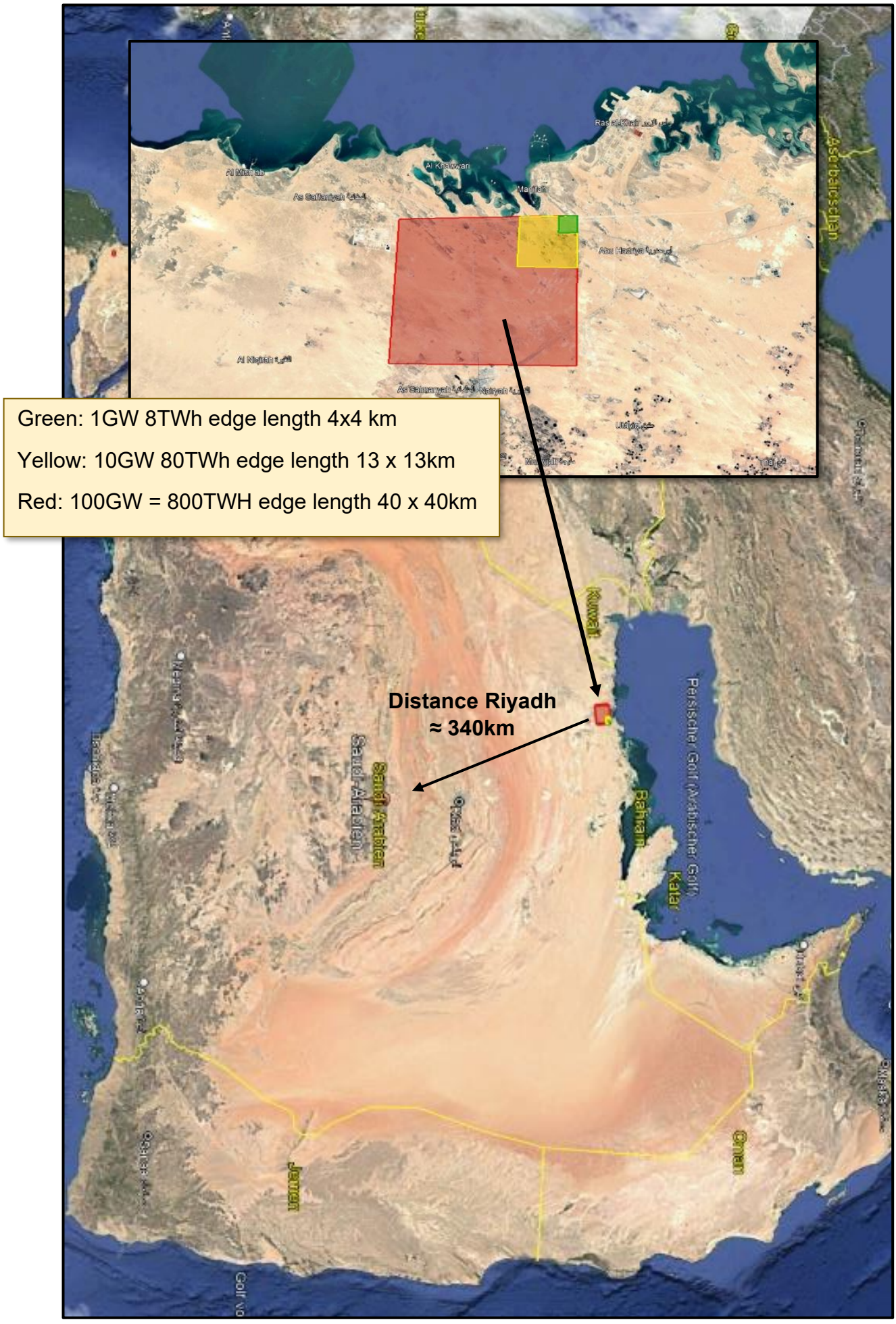
## Financial Logic – A Self-Sustaining System

The project's multifunctionality creates diversified revenue streams from the very first stage:
Electricity, water, industrial output, $CO_2$ certificates, and export technologies.

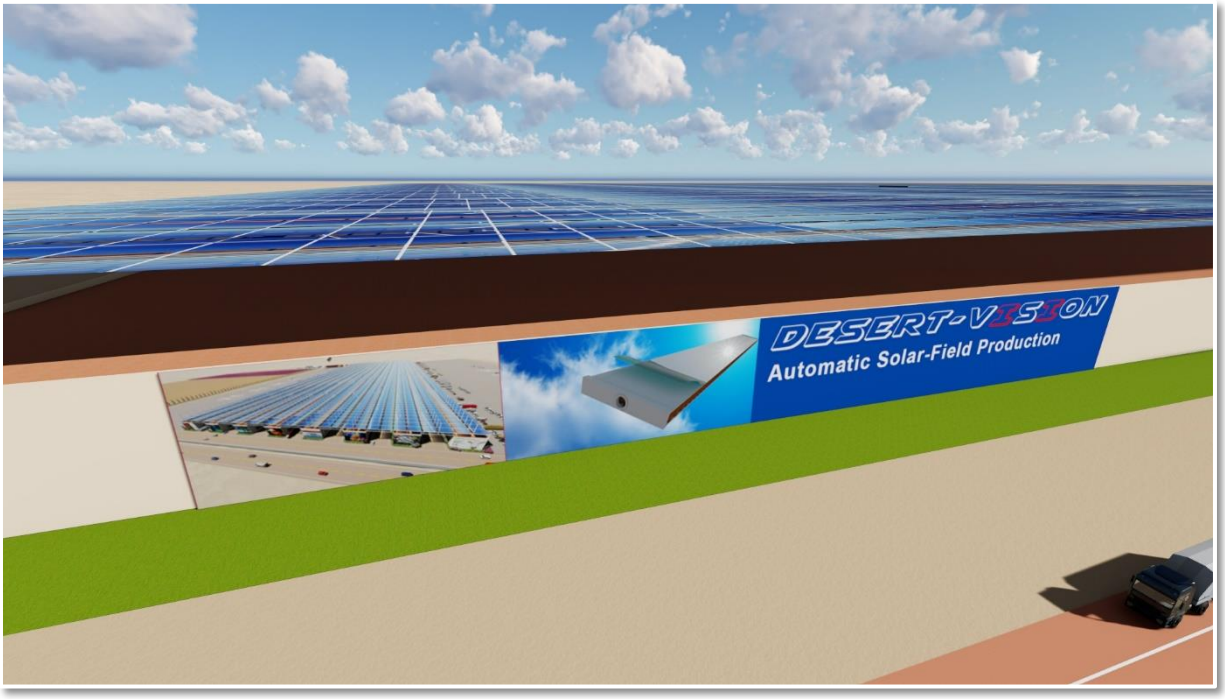
This allows the system to finance its own expansion - growing not only technically, but economically from within.

## The Result

A model project for sustainable development, technological sovereignty, and economic transformation - a flagship of Vision 2030 and a prototype for the post-fossil era.


Green: 1GW 8TWh edge length 4x4 km
Yellow: 10GW 80TWh edge length 13 x 13km
Red: 100GW = 800TWH edge length 40 x 40km
Distance Riyadh
≈ 340km
Kuwait
Saudi-Arabien
Bahrain
Katar
Persischer Golf (Arabischer Golf)
Jemen
Oman

**Beneath the mirror roof— examples of innovation and applied technology**


The photograph shows the integrated production and assembly facility located directly beneath the industrial section of the expansive mirror canopy. Within this highly automated manufacturing zone, all mirror components of the thermosolar power complex are produced - from the initial glass substrate through coating, shaping, and precision assembly to the fully completed mirror modules, including all drive and tracking systems.

In quantitative terms, the mirror assemblies account for approximately **80% of all components** required for the construction of the power plant, forming the core of its industrial manufacturing structure.

In addition, the complex houses the production of key components for the **Multi-Stage Flash (MSF)** and **Reverse Osmosis (RO)** desalination systems. The integration of these production lines on-site not only accelerates the overall construction process but also ensures that the **major share of value creation remains within the host countries**.

This approach embodies a forward-looking industrial strategy: by establishing **manufacturing, assembly, and technological expertise** directly on location, the project fosters the development of sustainable industrial capacity, the creation of qualified local employment, and the long-term transfer of knowledge — all essential foundations for an autonomous, regionally anchored energy and water economy.


**Solar Venice – The City of Light, Water, and Vision**

This project description presents a fascinating vision that unites the power of the sun, the proximity of the sea, and human creativity into one coherent and inspiring concept.

The **DESERT-VISION Power Plant**, planned near the Persian Gulf, opens entirely new perspectives for sustainable development and intelligent land use.
It combines large-scale energy generation, seawater desalination, and urban innovation into an integrated system - creating, beneath its vast solar mirror field, the foundation for one of the most visionary ideas of our time.

The total solar field covers about **1,600 square kilometers** - an area nearly the size of London.
Roughly 20 percent of this area, around **320 square kilometers**, is reserved for the development of a unique, self-sufficient urban landscape:

**Solar Venice - a place where energy, architecture, and human experience merge into a harmonious whole.**

At the shores of the **Persian Gulf**, where the shimmering solar sea of **DESERT-VISION** meets the horizon, a place of extraordinary attraction is taking shape - a Venice beneath the mirrors, conceived as an oasis of culture, beauty, and vitality.

Across more than 320 square kilometers, a landscape of canals, lagoons, and shimmering waterways unfolds - all directly connected to the Persian Gulf.
In this way, inland waters and the sea merge into a single living system, forming a paradise for boating, sailing, water sports, and recreation.

Beneath the shade of the solar fields, a world emerges that blends history and modernity:
Arcades, bridges, palazzi, and alleys in the style of old Venice, reimagined with sustainable materials and timeless elegance.
The canals are lined with cafés, boutiques, galleries, and ateliers, while along the waterways rise prestigious office buildings, conference centers, and residences - spaces for creativity, business, and inspiration in an atmosphere of refined tranquility.

At the coastline, the city opens to a 40-kilometer-long beach promenade - a glittering boulevard of hotels, restaurants, theaters, parks, and marinas.
Here, Mediterranean lightness meets Arabian vastness: visitors stroll between sea and waterways, travel by boat into the heart of the lagoon, or relax in floating gardens beneath the solar canopy.

*Living in the pleasant partial shade beneath the mirrored roof on the rooftop terraces of the buildings.*

Above the city, a second breathtaking world unfolds:
A vast park landscape on the rooftops connects the buildings into a green, walkable terrain — with promenades, cafés, observation decks, open-air stages, art installations, and sports areas.
Directly beneath the solar mirrors, this elevated garden offers a temperate, light-filled environment where nature, architecture, and technology coexist in perfect harmony.

It becomes a space of encounter, recreation, and reflection - suspended between sky and water, sheltered yet open to infinity.

As night falls, Solar Venice transforms into a symphony of light and motion - reflections of water and glass shimmer across the canals, and the architecture itself seems to breathe.
The result is a rare balance of romance, modernity, and vitality - the kind of timeless allure that turns cities into legends.

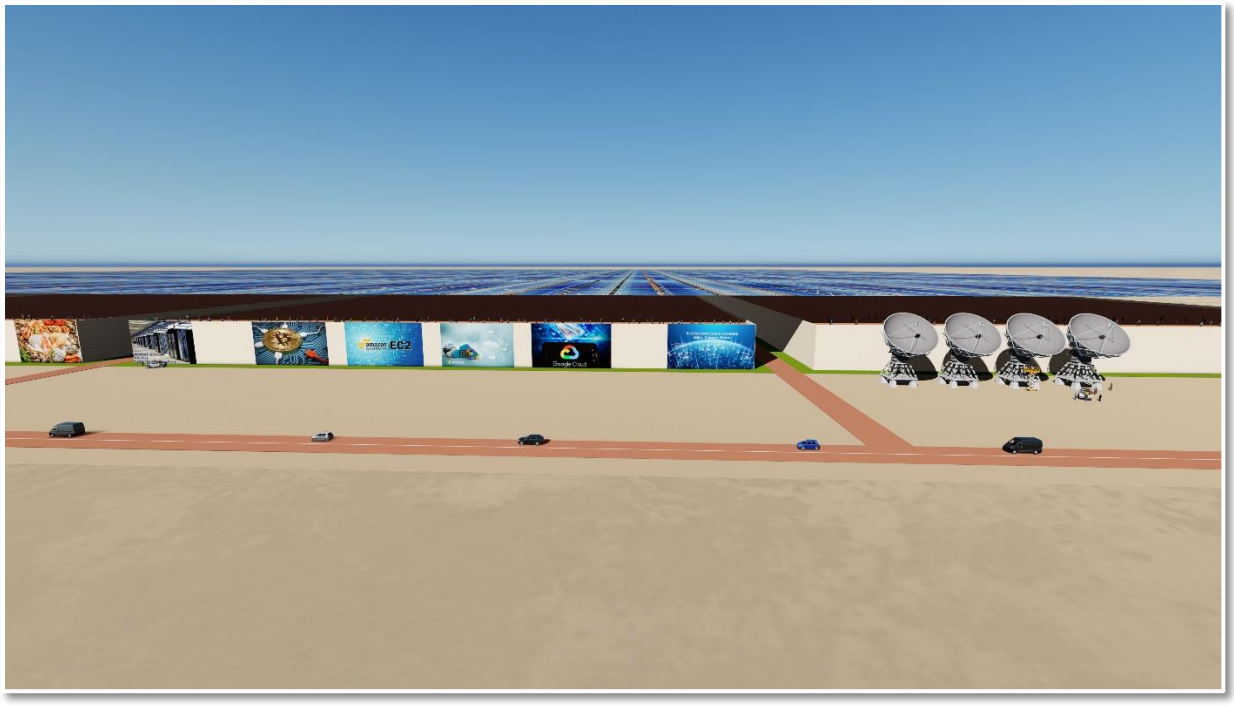
Solar Venice is more than a destination - it is a symbol of how energy, beauty, and sustainability can coexist as one vision.
A city that will attract millions of visitors, proving that sustainability is not a limitation, but an elevation of human creativity and quality of life.

**A Model of Successful Transformation**

With Solar Venice, a landmark project arises that embodies the vision of a new, sustainable era for the Gulf region - a place where ecological responsibility, economic strength, and cultural vibrancy form a single integrated system.

It stands as a paradigm of successful transformation, perfectly aligned with the principles of the **Kingdom of Saudi Arabia's Vision 2030**:

**Energy as a source of prosperity, innovation as a driver of progress, and quality of life as the true measure of development.**



**Digital Nexus – Intelligence Beneath the Mirror Roof**

At the heart of the **DESERT-VISION** complex, one of the world's most advanced and energy-efficient zones for server and chip technology could emerge.

It would harness the virtually limitless, $CO_2$-free power generation of the plant to meet the rapidly growing energy demands of digital infrastructure - from global data centers to highly specialized semiconductor research and production.

Beneath the protective mirror canopy, stable climatic conditions could be created and optimized through intelligent heat recovery and cooling water systems.
This would form an energy-integrated environment in which server farms, chip fabrication, and research facilities operate in a closed, circular system - with minimal resource consumption and maximum efficiency.

Through ultra-fast satellite connectivity, the complex could be directly linked to global data and communication networks, positioning the **DESERT-VISION** system as a strategic digital hub between Africa, Asia, and Europe - a true Digital Nexus, both geographically and technologically.

In synergy with abundant solar power, advanced storage technologies, and a fully emission-free infrastructure, a new kind of technology campus could take shape: an autonomous, climate-neutral innovation ecosystem encompassing the full lifecycle of digital technology - from research and design to production and the operation of high-performance servers for artificial intelligence, cloud computing, and blockchain systems.

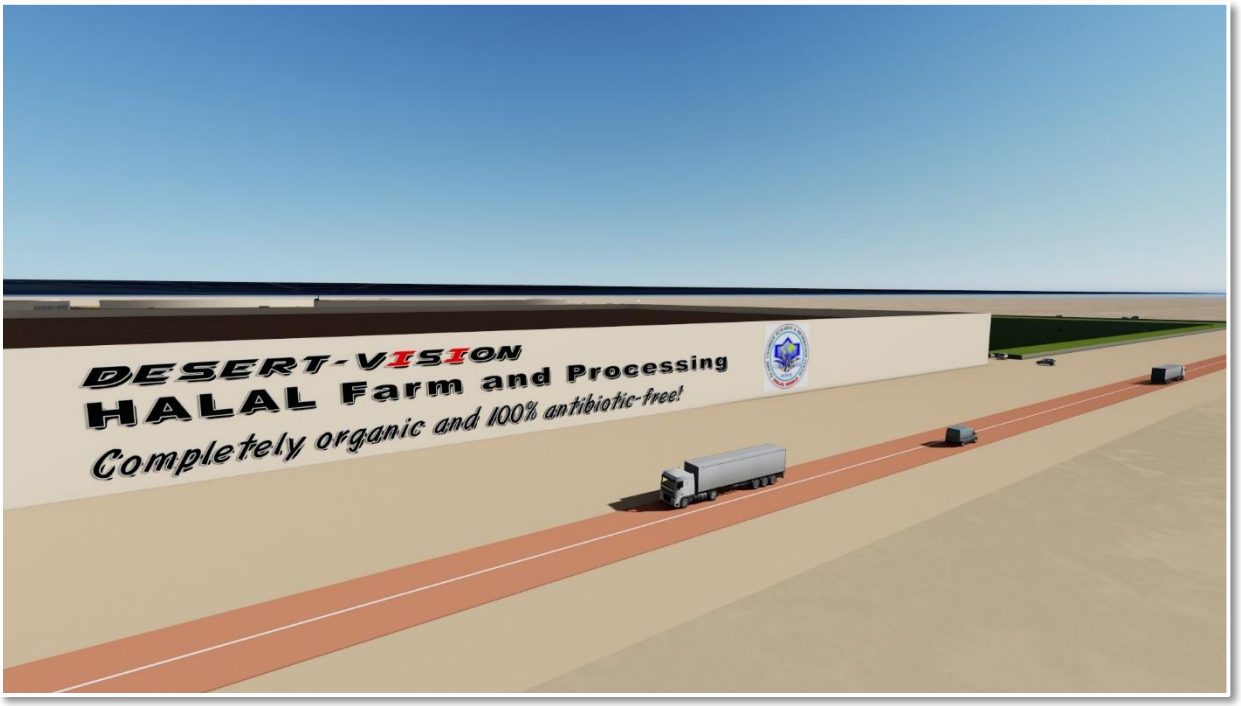
This fusion of energy, intelligence, and infrastructure could transform the region into one of the world's leading centers for next-generation technology - a key pillar of the Kingdom of **Saudi Arabia's Vision 2030**, symbolizing the nation's evolution from fossil dependency to digital excellence.

**Digital Nexus – where the sun provides the energy, water ensures the cooling, and knowledge shapes the future.**


DESERT-VISION
Vertical-Farming
DESERT-FOOD


DESERT-VISION
Vertical-Ocean
DESERT-Seafood


DESERT-VISION
Absolutely antibiotic-free
DESERT-FARMING
Committed to animal welfare


DESERT-VISION
HALAL Farm and Processing
Completely organic and 100% antibiotic-free!


**From Desert to Harvest – Food Production Beneath the Solar Roof**

Beneath the vast mirror fields of the **DESERT-VISION System**, a new generation of high-tech, climate-controlled food production cities could emerge - an advanced, automated, and resource-efficient agro-industrial complex powered entirely by **100% $CO_2$-free solar energy.**

These interconnected centers would integrate seawater desalination, water recycling, precision agriculture, vertical farming, and aquaculture into a comprehensive food production ecosystem for the future.
Within these controlled environments, vast quantities of both plant-based and animal-based food could be produced - including vegetables, fruits, grains, algae, seafood, fish, and high-quality beef and lamb.
All production would be pesticide-free, emission-neutral, and waste-free, operating within a closed, energy-optimized cycle.

**The potential output would exceed the Kingdom's domestic food demand many times. over.**

Beyond production, the **DESERT-VISION System** could incorporate the entire processing chain - from primary cultivation to industrial-scale processing, packaging, cooling, and global logistics.
This would create a fully self-sufficient agro-industrial ecosystem, capable of transforming raw materials directly on-site into premium, high-value products with exceptional economic return.

Such vertical integration would not only guarantee maximum efficiency and food security, but also make the project one of the most economically lucrative systems in the world.
With global demand for sustainable, high-quality food rising rapidly, the Kingdom could become one of the most profitable and technologically advanced food producers on the planet.

In addition, the site would serve as a center of intensive research and technological innovation.
International experts, universities, and private partners could collaborate here on next-generation solutions for sustainable livestock breeding, aquaculture, crop optimization, and food processing technologies.

In doing so, the **DESERT-VISION System** would establish new global standards for sustainable, climate-neutral, and resource-efficient food production.

Thus, the **DESERT-VISION System** would be far more than an energy project: it would become the backbone of a new, integrated economic structure, merging energy, water, food, and technology into one intelligent and regenerative cycle. A system that fosters self-sufficiency, prosperity, and sustainability, while laying the foundation for a new industrial and ecological identity for the Kingdom.

In line with **Vision 2030**, this concept would not only ensure food security, but also accelerate the Kingdom's transformation into a knowledge-based and innovation-driven economy.

**It would stimulate new industries, create high-value jobs, and strengthen Saudi Arabia's long-term global competitiveness.**

At the same time, the project would carry immense symbolic importance:
as a beacon of next-generation food production, the **DESERT-VISION System** could become one of the most prestigious and transformative initiatives worldwide - a living symbol of progress, responsibility, and technological sovereignty.

Through **DESERT-VISION, the Kingdom of Saudi Arabia** could become a global model of sustainable transformation - a nation that uses its natural energy not only to power the world, but to feed it, while driving research, innovation, and prosperity for future generations.

**DESERT-VISION – harnessing the power of the sun to create nourishment, innovation, and sustainable growth.**

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## Beyond the Solar Roof – The Outer Transformation of the DESERT-VISION System

While beneath the vast mirror fields of the **DESERT-VISION** System energy, research, and high-tech production form the nucleus of a new civilization, a second transformation unfolds beyond the solar canopy - an economic, ecological, and cultural revolution that could redefine the Kingdom of Saudi Arabia and its position within the global economy.

### A New Industrial Era - The Rise of the Green Metals Nation

Surrounding the **DESERT-VISION power complex**, a new industrial landscape emerges: a $CO_2$-free heavy-industry zone powered directly by clean solar energy.

Here, the Kingdom's abundant mineral resources - iron ore, bauxite, copper, and rare earths - are no longer exported as raw materials but refined within the country itself. Through advanced metallurgical processes, green steel, aluminum, copper, and high-tech alloys are produced - the essential materials of the global energy transition.

This new industrial value chain positions the **Kingdom as a leading global supplier of "Green Metals"**, manufactured without fossil fuels and certified for carbon-neutral production.

**"Green Metals made in Saudi Arabia" becomes a mark of quality and responsibility – a symbol of innovation and industrial sovereignty.**

Economically, this shift creates a new national backbone of value creation: profits, technology, and employment remain in the country, and the Kingdom becomes a strategic industrial partner for global manufacturing - from electric mobility to construction, from renewable infrastructure to high-tech components.

Together with the nearby industrial port of **Ras Al-Khair**, this industrial belt forms an integrated system of energy, production, and export, making the **Kingdom of Saudi Arabia** one of the most competitive and sustainable industrial hubs in the world.

**Agricultural Expansion - Turning Water into Wealth**

Parallel to industrialization, a second pillar rises: the agricultural expansion and ecological renewal of the desert.

With the 57 billion cubic meters of freshwater generated annually by **DESERT-VISION**, around 45 billion cubic meters can be dedicated to large-scale irrigation - enough to cultivate 4 to 7.5 million hectares of fertile land.

This area could give rise to vast fields of wheat, corn, rice, and dates, interspersed with fruit groves and oilseed plantations.

As the wind moves across the golden waves of grain, light and motion merge into a living ocean of harvest - a vision once unimaginable in this land of sand.

Such production would exceed the **Kingdom's domestic demand many times over**, providing food for **more than 200 million people** and establishing **Saudi Arabia** as a strategic exporter of sustainable crops.

In a world increasingly defined by drought and scarcity, this transformation turns water into a new form of energy – an instrument of stability, prosperity, and peace.

**Re-Greening the Land - The Return of Life**

A significant portion of this freshwater can also be devoted to re-greening and afforestation.

By allocating 30 to 50 percent of the irrigated area to forests, vegetation belts, and natural restoration, the Kingdom of Saudi Arabiacould create **2 to 4 million hectares of new green landscapes - a living, breathing heart in the center of the Arabian Peninsula.**

**Between the industrial zones and agricultural plains, forests, oases, and valleys would stretch toward the horizon.**

Acacias, palms, tamarisks, and desert grasses would stabilize the soil and cool the air, while birds, insects, and native wildlife would return to their natural habitats. The desert would bloom again, transforming into a vibrant, biodiverse cultural landscape.

The ecological benefits would be profound: lower regional temperatures, reduced erosion, higher soil fertility, and the capture of tens of millions of tons of $CO_2$ annually.

These green zones would not only protect the environment but also enhance quality of life, offering parks, forests, and natural spaces where people could live, work, and reconnect with nature.

In the early evenings, when the air cools and the scent of earth and blossoms rises, the vision becomes tangible: people walking through shaded paths, children playing near water, and families witnessing the rebirth of their homeland. It is a return of life itself — nurtured by the power of the sun.

**A New Economy – And a New Way of Living**

What happens beyond the solar roof is not mere expansion; it is the external expression of a new civilization.

The **DESERT-VISION System** unites energy, industry, agriculture, and ecology in one coherent model of regeneration.

Energy produces water, water enables agriculture, agriculture renews the land — and from this cycle emerges a new form of wealth: sustainable, self-perpetuating, and shared. People will live in flourishing cities surrounded by green fields and forests, linked by canals, parks, and shimmering landscapes.
They will experience the transformation of their country - from desert to abundance, from isolation to vitality.

Economically, this marks the emergence of a post-fossil economy, founded on industrial excellence, agricultural productivity, and ecological balance.
It is a nation that uses its energy not only to power the world, but to feed it, renew it, and inspire it.

**DESERT-VISION – beneath the mirrors, the technology of the future;**
**beyond them, a reborn land of fertility, beauty, and lasting prosperity.**

## Conclusion – A Project in the Spirit of Vision 2030

The **Vision 2030 of the Kingdom of Saudi Arabia** is far more than a national strategy.

It is an act of courage - a declaration of faith in the future, in human ingenuity, in sustainability, and in global responsibility.
It demonstrates that true transformation is not about limitation, but about the power to create a better reality through one's own vision and will.

In this very spirit stands the **DESERT-VISION System**.

It is not merely an energy project or a technological achievement - it is a comprehensive vision that unites all the pillars of **Vision 2030**: sustainable energy, economic diversification, food security, research, industrial value creation, and ecological regeneration - all integrated into one coherent and transformative system.

Few initiatives could embody the essence of **Vision 2030** as completely as this one.

**DESERT-VISION transforms the Kingdom's natural energy into prosperity, its desert into abundance, and its ambition into global inspiration.**

It is a project that, at first glance, may leave one breathless - because of its immense scale, its depth, and its potential impact.

Yet, every technology within it has already demonstrated its proof of concept, again and again, in projects across the world.

**There is no technical uncertainty - only the need for the courage to implement it.**

**It is a project that uses resources without consuming them, that creates wealth without pollution, and that builds stability not only for the Kingdom, but for the entire world.**

**With its vast impact on energy, industry, agriculture, and the environment, this initiative could become the central symbol of Saudi Arabia's transformation - a shining beacon of innovation, resilience, and progress.**

**It represents the power of a nation to turn vision into reality, and desert into future.**

**Vision 2030 – Saudi Arabia's powerful plan for the future.**

**DESERT-VISION is its perfect realization.**