21ST CENTURY SUPERSTRUCTURES

otf.

A riveting new series exploring the most futuristic, future-proofed and environmentally-friendly building projects since the turn of the millennium

8 x 60′

INTRO

The engineering feats of the 20th century were iconic - think of the construction of the Empire State Building or the Hoover Dam.

Such ingenuity hasn't faltered in the 21st century, which is full of awe-inspiring engineering achievements that are equally extraordinary and ground-breaking!

These incredible 'superstructures' were made in the 21st century, using innovative ecofriendly engineering techniques, ready to meet the environmental challenges of the modern world.

None of these world-beating achievements would have been possible without the dramatic growth of science and technology, as well as cutting edge innovations in sustainability and renewable energy over the past century. In as little as 20 years, we have achieved many things once thought impossible, and made headlines that were previously just plotlines from scifi films.

With incredible access to cutting-edge buildings, institutions and experts around the world, this fascinating series showcases the greatest and greenest engineering feats of the 21st century – revealing the jaw-dropping science that made them possible – demonstrating just how far we have come and where we may be heading next as a result of these pioneering science and engineering techniques.

Packed full of "WOW!" facts and take-home information, we will use stunning animations, graphics and schematics to help explain the deep 'inner workings' of each incredible superstructure as well as feats of scientific, environmental and architectural genius that are now buried beneath layers of concrete and steel.

We'll also look at how each structure has been futureproofed - using 21st century technologies to protect against 21st century (and beyond) climate challenges and manmade disasters, as well as sustainably meeting the energy needs of today and tomorrow.

Along the way, we'll uncover the unbelievable stories behind each 21st century superstructure – revealing the epic obstacles that innovative engineers had to overcome, from extreme temperatures to dizzying heights to eye-watering financial costs to hugely ambitious sustainability goals.

With unprecedented access to some of the world's most mindblowing feats of engineering this millennium, each episode showcases one truly groundbreaking, supersustainable superstructure.

We meet those closely involved in the breakthrough – the frontmen and women as well as the unsung heroes behind the scenes, who reveal the 'scientific journey' they embarked on, involving blood, sweat and tears, in order to bring these ambitious, high-stakes projects to fruition, and we find out how some buildings almost didn't happen at all.

Experts from a range of disciplines will put these achievements into a wider social, historical and scientific context, revealing more about how these superstructures have made their mark on the world.

Each episode will be structured around 4 narrative beats:

INSIDE THE STRUCTURE - We begin by taking the superstructure as it is now, with the designers and engineers revealing all of the inner workings, key 'wow!' information, and amazing environmental features. What is it that makes this so extraordinary?

HISTORY - We then take a step back and look at the history and origins of the structure. We'll learn about the people who tried and failed to make similar buildings in the past, before meeting the successful ones and seeing what makes them such pioneers.

CONSTRUCTION & ENGINEERING - We then go deeper into the design and construction of this structure. Those closely involved in the project will talk us through the biggest challenges and how they overcame them. From new materials to unconventional shapes, from renewable energy to innovative green engineering, what elements of the construction were truly unprecedented?

FUTURE - What is the future of the structure into the remainder of the 21st century and beyond? Those that designed it will analyse its lifespan and how its futureproofed against disasters. Then our roster of experts will discuss how it fills the energy and environmental needs of both today and tomorrow.

Together, these narrative beats provide the most in-depth, fascinating and revelatory examination of the world's most remarkable 21st century engineering superstructures. The combination of cutting-edge science, breathtaking visuals, and inspirational stories of humans fighting back against climate change and environmental damage will leave the viewer with a sense of wonder and a new appreciation for our greatest achievements and the futuristic world we now live in.

EXAMPLE EPISODES

- World Trade Center, Bahrain
- Gardens By The Bay, Singapore
- The Burj Khalifa, Dubai
- The Eden Project, UK
- Suzlon One Earth, India
- Bosco Verticale, Italy
- SoFi Stadium, US
- Copenhill, Denmark

WORLD TRADE CENTER, BAHRAIN

INSIDE THE CENTER

The Bahrain World Trade Center is a pair of towers, each 50 stories high and rising to a height of 240m. Each tower sits above a three-story podium slab that supports the weight of the 47 office floors above. In the podiums are entertainment complexes, containing restaurants, shopping and parking. The two towers are linked via three 31m skybridges, each holding a 225 kW wind turbine, producing in total 675 kW of wind power capacity. Each of the turbines measure 29m in diameter, and face north in the direction of the Persian Gulf winds.

HISTORY

The Bahrain World Trade Center is world's first skyscraper to incorporate wind turbines in its design, making it a true engineering marvel and sustainability superstructure. Previous attempts at integrating wind turbines into buildings had all been abandoned because it was too costly and disruptive to adapt an existing structure. The BWTC, as a new building project in an optimal location for harnessing wind energy, offered the ideal opportunity to create the first skyscraper with wind turbines. Construction started in 2004 and was completed in 2008, taking approximately 4 years and costing roughly $150 million.

WORLD TRADE CENTER, BAHRAIN

CONSTRUCTION & ENGINEERING

The concept for the design came from traditional Arabian wind towers: the sail-shaped buildings on either side are designed to funnel wind through the gap, acting like aero-foils to accelerate the wind passing through the turbines. The sail shape did cause difficulties during construction as there were hardly any straight lines or walls which made in pouring the concrete tricky. Because the bridges had to be extra strong to withstand the weight of the turbines, there were already problems lifting the bridges into place. But the power of the wind, which the building would eventually harness, made lifting the bridges even more difficult, and construction managers had to carefully time the lifts with the movements of the winds. However, the build was completely safely, and extensive tests were conducted to ensure the structure could withstand all sorts of different loads and wind pressures.

FUTURE OF THE CENTER

The wind turbines were turned on in 2008 and the power generated provides up to 15% of the office towers' electricity needs, more than a GWh of energy a year. In addition to this, it includes by solar powered lighting, reflection pools for evaporative cooling, enhanced insulation and a drainage system that recycles water. The Bahrain World Trade Center is not just an innovative, energy-efficient building - it is a symbol of a more sustainable future. It has inspired further projects, including the Strata SE1 in London, which not only has wind turbines, but has them integrated into the building (as opposed to attached to it).

GARDENS BY THE BAY, SINGAPORE

INSIDE THE GARDENS

Gardens by the Bay, an iconic Singaporean destination, is a sprawling 101-hectare garden comprising three distinct waterfront gardens: Bay South, Bay East, and Bay Central. Designed by a team of architects, including Grant Associates and WilkinsonEyre, the project showcases innovative environmental design and sustainability principles. Its most striking features are the Supertrees, towering vertical gardens ranging from 25 to 50 meters in height, which are embedded with photovoltaic cells to generate solar power, and the two climate-controlled conservatories, the Flower Dome and the Cloud Forest. These structures utilize advanced technologies to minimize energy consumption, such as a natural ventilation system, efficient LED lighting, and sustainable cooling methods.

HISTORY

Gardens by the Bay was conceived as part of Singapore's vision to transform itself from a "Garden City" to a "City in a Garden." The concept was inspired by the rich history of garden design, from ancient Babylon's Hanging Gardens to London's Kew Gardens. The international design competition launched in 2006 sought to create a world-class garden that would elevate Singapore's status as a global city and demonstrate the nation's commitment to sustainability. After an extensive selection process, the winning team, comprising Grant Associates and WilkinsonEyre, was chosen to bring the ambitious project to life, creating a modern-day botanical marvel.

GARDENS BY THE BAY, SINGAPORE

CONSTRUCTION & ENGINEERING

The construction of Gardens by the Bay presented numerous challenges, requiring innovative engineering solutions to support the unique structures and their sustainable design features. For the Supertrees, a combination of steel, reinforced concrete, and planting panels was used to create strong yet lightweight structures capable of supporting the lush vertical gardens. In the conservatories, a grid shell structure and a unique ETFE (ethylene tetrafluoroethylene) material were used to create an energy-efficient envelope that maximizes natural light and maintains optimal conditions for the diverse plant species within. Furthermore, an on-site biomass boiler was built to convert horticultural waste into energy, significantly reducing the carbon footprint of the entire complex.

FUTURE OF THE GARDENS

Gardens by the Bay represents a bold vision for the future of urban green spaces, showcasing the potential for harmoniously integrating nature and technology within modern cityscapes. As climate change and rapid urbanization continue to shape our world, the lessons learned from this project will undoubtedly influence the design and construction of sustainable, future-proofed structures in the 21st century and beyond. By serving as a living laboratory for innovative environmental solutions, Gardens by the Bay will continue to inspire architects, city planners, and policymakers worldwide, pushing the boundaries of what is possible in the pursuit of a greener, more resilient future.

BURJ KHALIFA, U.A.E.

INSIDE THE BURJ KHALIFA

The Burj Khalifa breaks records for the most number of records it has broken: it's the tallest structure ever, the building with the most floors (163), it has the world's longest elevator, it has the world's highest nightclub, held the largest light and sound show staged on a single building height, and so on... It is a staggering 828 meters tall, soaring over Dubai. It's three times as tall as the Eiffel Tower and nearly twice as tall as the Empire State Building. Laid end to end, its pieces stretch over a quarter of the way around the world. It has 57 elevators, a total floor area of 310,000 m². Armani Hotel takes up most of the lower levels, followed by residences in the middle levels. Corporate offices start from levels 111 onwards, plus 3 observation decks and a restaurant higher up. The tip of the Burj Khalifa can be seen from nearly 100 km away on clear days, and the temperature at the top is 15°C lower than the bottom. It is surrounded by the world's largest dancing fountain system, which you can sail on in traditional boats.

HISTORY

From the start of the age of skyscrapers at the dawn of the 20th Century, the United States, and especially New York City, was known for having the world's tallest buildings. For four decades (1931-1971) it was the Empire State Building, followed by the World Trade Center and then the Sears Tower in Chicago. The title then shifted eastwards with Kuala Lumpur's Petronas Towers holding the record from 1998-2004 and then Taipei 101 from 2004 until Burj Khalifa came along. The arrival of Burj Khalifa was notable not just for breaking the record but absolutely demolishing it. Until it came along the increases on the record were in the region of 2-20%, going all the way back to medieval times. Burj Khalifa was an astonishing 62% increase on Taipei 101. And it still remains much, much taller than any other building in the world. Excavation began in January 2004. Six years later, the Burj Khalifa finally opened in January 2010. The justification for this mega-mega-project was to gain international recognition for the UAE and encourage diverse investments into the country, which was heavily dependent on oil exports, which were at risk of price crashes. The point of the building was to put Dubai on the map, and to achieve this with something truly sensational.

BURJ KHALIFA, U.A.E.

CONSTRUCTION & ENGINEERING

The Burj Khalifa cost $1.5 billion to build, making it amongst the 50 most expensive buildings ever made. It required colossal levels of materials, such as the 330,000 cubic meters of concrete, equal to the weight of 100,000 elephants. The hot climate was a huge challenge, meaning that the concrete had to be mixed with ice and poured in the structure at night. 10 km worth of steel bars were buried 164 feet deep to impress stability in its foundation. At the peak of construction, 12,000 workers worked on the building each day. One of the biggest challenges was to engineer the building to withstand the extreme heat, reaching more than 50°C in summer. 300 cladding specialists individually hand-cut 26,000 glass panels, each glazed with reflective aluminum. The next problem was the wind. The Burj was designed to have a spiraling Y-shape which disrupts the flow of the wind, and employs a 'buttressed core', which has each wing of the building buttressing the others via a six-sided central core for added stability. But the shape wasn't just functional: it was also inspired by traditional Islamic architecture and by the spider lily, a desert flower cultivated throughout the UAE.

FUTURE OF THE BURJ KHALIFA

When the building was complete, the work certainly didn't stop there. Now, 10,000 people can be living and working in the building at any given time, making it almost like a town in itself. It takes 36 workers three months to clean the 24830 windows from top to bottom. It was built for a 100 year lifespan but it is not on an active seismic zone, is designed to withstand extreme winds and temperatures, and has numerous fire safety measures. For example, the stairways and the elevators are not only protected by reinforced fireproof concrete but also has refuge areas on every 25 floors which has are pressurised to keep out smoke. Every year 15 million gallons of water are collected as condensation from the tower's cooling systems, and used to irrigate the landscaping and plants around it. For the moment, Burj's title as world's tallest building is fairly safe. But eventually it is hoped that construction will resume on the Jeddah Tower in Saudi Arabia, designed by the same people that planned the Burj Khalifa, and it will become the first 1km high building.

THE EDEN PROJECT, UK

INSIDE THE PROJECT

The Eden Project, located in Cornwall, UK, is a remarkable global garden housed within a series of massive, interconnected geodesic domes called Biomes. Designed by Grimshaw Architects, the Biomes are made of hexagonal and pentagonal ETFE (ethylene tetrafluoroethylene) cushions, creating a lightweight and energy-efficient structure that allows light to penetrate and provides ideal conditions for the diverse range of plant species contained within. The two primary Biomes, the Rainforest Biome and the Mediterranean Biome, recreate distinct climates and ecosystems, enabling visitors to explore various environments and learn about the importance of biodiversity and sustainability.

HISTORY

The Eden Project was the brainchild of Tim Smit, a Dutch-born British entrepreneur, and was developed in collaboration with Grimshaw Architects and engineering firm Arup. The concept was born out of Smit's desire to create a unique attraction that would reconnect people with the natural world and promote the understanding and responsible management of vital plant resources. Built within a disused china clay quarry, the Eden Project was a monumental undertaking that sought to demonstrate the power of transformation, regeneration, and human ingenuity in the face of environmental challenges.

THE EDEN PROJECT, UK

CONSTRUCTION & ENGINEERING

The construction of the Eden Project posed a multitude of engineering challenges, particularly in designing the unique Biomes. The geodesic dome design, inspired by the work of inventor and architect Buckminster Fuller, was chosen for its lightweight and efficient properties. The Biomes' framework consists of tubular steel and galvanized steel nodes, while the ETFE cushions, selected for their exceptional strength and light transmission qualities, are held in place by aluminum cladding. The site's uneven topography and the need to maintain specific climatic conditions within the Biomes necessitated innovative solutions, such as the use of a tensioned cable system and a sophisticated environmental control system.

FUTURE OF THE PROJECT

As a living laboratory for environmental education, research, and sustainable development, the Eden Project has already had a significant impact on the way people view their relationship with nature and the environment. As we move further into the 21st century and confront the escalating challenges of climate change and resource depletion, the lessons learned from the Eden Project will become increasingly relevant. The project's ongoing initiatives, such as the development of the Eden Geothermal energy plant, will continue to explore and promote sustainable solutions. The Eden Project serves as a powerful example of what can be achieved through the integration of architectural innovation, environmental stewardship, and a commitment to a greener, more resilient future.

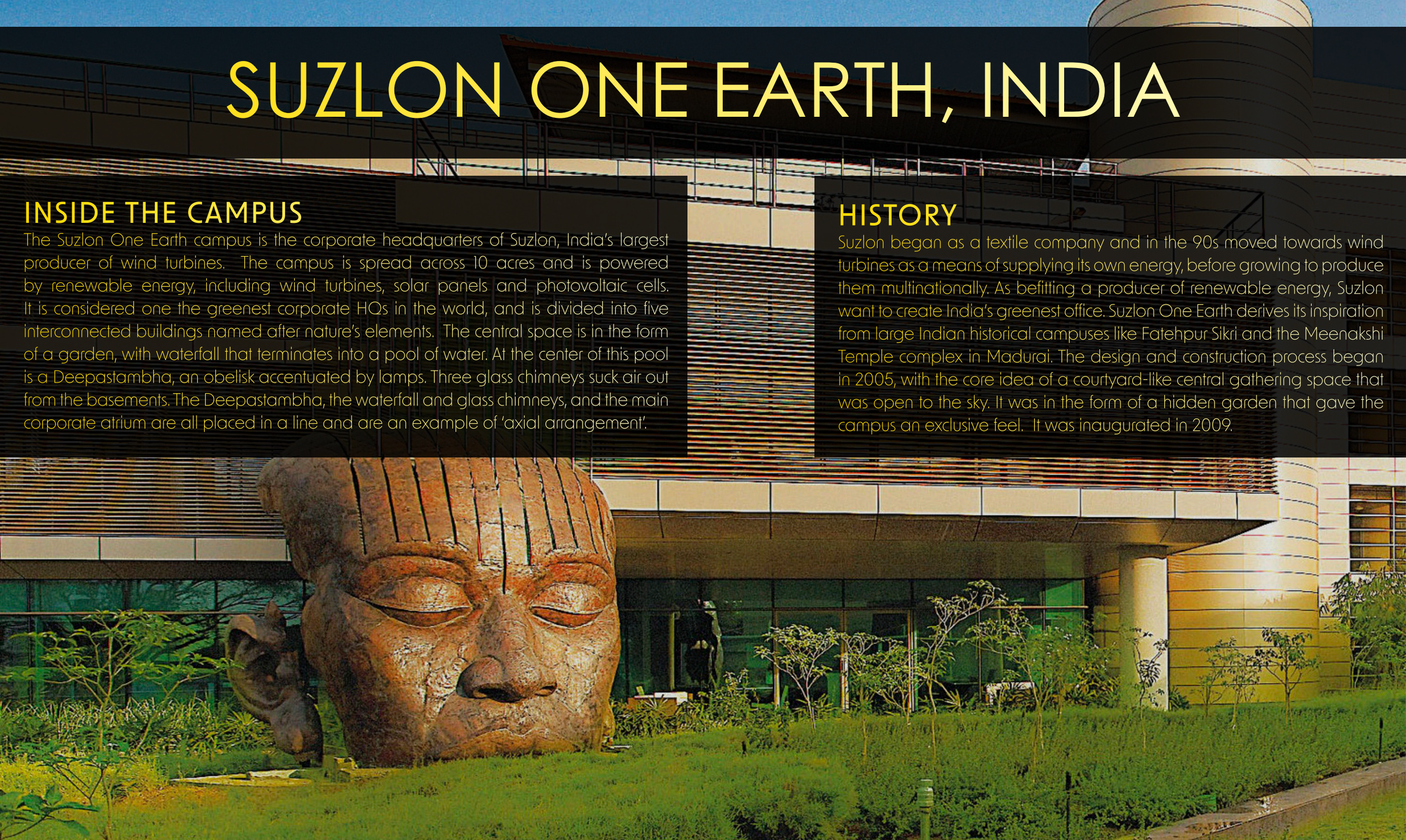
SUZLON ONE EARTH, INDIA

INSIDE THE CAMPUS

The Suzlon One Earth campus is the corporate headquarters of Suzlon, India's largest producer of wind turbines. The campus is spread across 10 acres and is powered by renewable energy, including wind turbines, solar panels and photovoltaic cells. It is considered one the greenest corporate HQs in the world, and is divided into five interconnected buildings named after nature's elements. The central space is in the form of a garden, with waterfall that terminates into a pool of water. At the center of this pool is a Deepastambha, an obelisk accentuated by lamps. Three glass chimneys suck air out from the basements. The Deepastambha, the waterfall and glass chimneys, and the main corporate atrium are all placed in a line and are an example of 'axial arrangement'.

HISTORY

Suzlon began as a textile company and in the 90s moved towards wind turbines as a means of supplying its own energy, before growing to produce them multinationally. As befitting a producer of renewable energy, Suzlon want to create India's greenest office. Suzlon One Earth derives its inspiration from large Indian historical campuses like Fatehpur Sikri and the Meenakshi Temple complex in Madurai. The design and construction process began in 2005, with the core idea of a courtyard-like central gathering space that was open to the sky. It was in the form of a hidden garden that gave the campus an exclusive feel. It was inaugurated in 2009.



SUZLON ONE EARTH, INDIA

CONSTRUCTION & ENGINEERING

The overall idea when designing One Earth was to create a 'landscaper', not a 'skyscraper'. Most of the working areas of the campus, are 'Served Spaces.' These spaces were in the form of adaptive cold shells that can accommodate modular walls and furniture systems. There were a number of traditional Indian features built in to counterbalance the global, high-tech nature of the company. For example, in the Wind Lounge (a museum and library in the learning center), there is a very traditional Indian Chowk here, with kund-like steps leading into a water pool shaded by photovoltaic panels allowing filtered light in, as if through an ancient jaali. Windows are arranged for natural ventilation, and have aluminium blinds to reduce heating by daylight. Lower, thinner and longer building shapes increase the ratio of windows to volume, further enhancing the natural ventilation in these hot and dry conditions.

FUTURE OF THE CAMPUS

Historically, Indian corporations have imitated the west in the design of their buildings, which are glass and steel structures designed for cold winters. But in the hot and dry climate of India, these glass boxes require huge amounts of costly air conditioning. Suzlon One Earth, on the other hand, is designed to reduce air con, and also uses sustainable practices like rainwater harvesting, on-site waste conversion and an 'Office in Garden' design to maximise daylight use. 154 KW of electricity is produced on site (four-fifths wind and one one-fifth photovoltaic). All other energy is produced in the Suzlon wind mill farms. As 92% of the energy consumed is through the means of sustainable energy, it is considered a Zero Energy Project, and the campus has achieved a LEED Platinum and Teri Griha 5 Star certification. It is model of corporate campuses of the future.

BOSCO VERTICALE, ITALY

INSIDE THE TOWERS

Bosco Verticale, designed by Stefano Boeri Architetti, is a groundbreaking residential complex in Milan, Italy, that consists of two towers that integrate trees, shrubs, and plants into their balconies. This vertical forest houses over 800 trees and 14,000 plants, which together absorb approximately 30 tons of CO2 and produce 19 tons of oxygen per year. The lush greenery not only helps to filter air pollution and reduce the urban heat island effect but also enhances biodiversity by providing a habitat for birds and insects. The vertical forest concept aims to increase green space in densely populated urban areas, contributing to improved air quality and well-being for its residents.

HISTORY

The concept of integrating nature and architecture has been a long-standing pursuit among architects and visionaries. Early examples include Frank Lloyd Wright's "Fallingwater," which harmoniously combined architecture with nature, and visionary architect Buckminster Fuller's geodesic domes. However, the idea of a vertical forest remained largely unexplored until Stefano Boeri and his team sought to address the challenges of urban densification and environmental pollution. Inspired by the desire to create more sustainable, greener urban environments, Bosco Verticale became a pioneering project, setting a precedent for similar structures worldwide.

BOSCO VERTICALE, ITALY

CONSTRUCTION & ENGINEERING

The construction of Bosco Verticale posed several unique challenges, particularly in terms of structural engineering and plant selection. To support the weight of the trees and plants, the buildings' reinforced concrete structure was designed to accommodate additional loads and wind forces. Specialized irrigation and drainage systems were also developed to manage water and nutrients effectively. The selection of suitable plant species was a collaborative effort involving botanists and horticulturists, considering factors such as maintenance, light requirements, and wind resistance. The result is a diverse array of greenery that thrives in the unique vertical environment, creating an ever-changing façade that evolves with the seasons.

FUTURE OF THE TOWERS

As the world continues to urbanize, Bosco Verticale serves as an innovative model for integrating greenery into densely populated cities, addressing environmental challenges and improving residents' quality of life. The success of this project has already inspired similar structures in other cities globally, such as Trudo Vertical Forest in Eindhoven, the Netherlands, and Wonderwoods in Utrecht, the Netherlands. The vertical forest concept will likely continue to evolve, with further advancements in sustainable technologies and building materials, contributing to more resilient and environmentally friendly cities in the 21st century and beyond. As Bosco Verticale demonstrates the potential for a harmonious coexistence between nature and urban living, it will undoubtedly influence future architectural and urban planning decisions, ultimately shaping the cities of tomorrow.

SOFI STADIUM, US

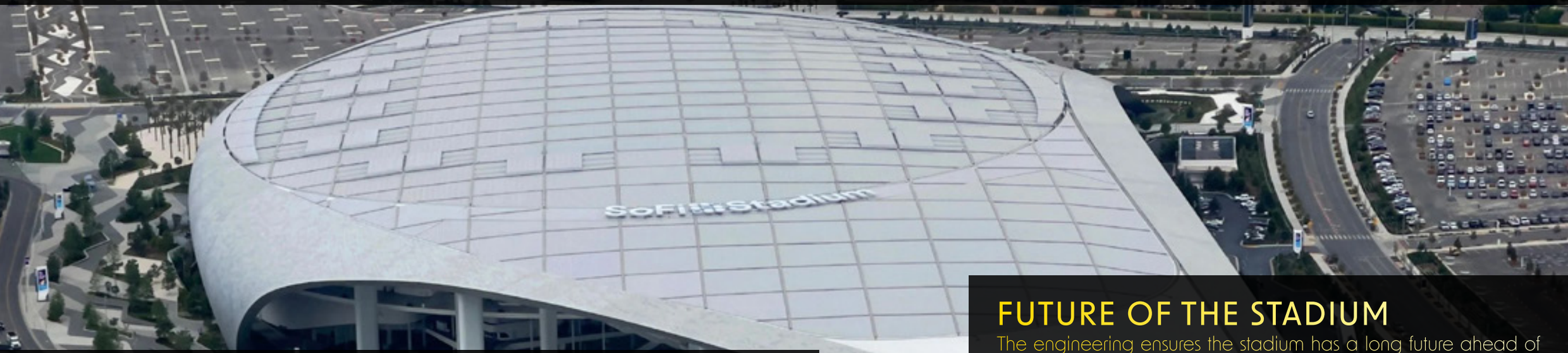
INSIDE THE STADIUM

California's SoFi stadium, a beacon of futuristic and sustainable design, is home to the NFL's Los Angeles Rams and Los Angeles Chargers. It can hold 70,000 fans, which can be expanded to 100,000. Above them is an enormous canopy and a 4K video screen which weighs 1000 tons and displays 80 million pixels. The complex is nearly 300 acres and features solar panels, energy-efficient lighting, and water-saving systems. It has an attached music and theatre venue, the YouTube Theater, which has a capacity of 6,000 seats. The stadium is the world's biggest in terms of floor surface (288,500 m2) and roof surface (75,000 m2).

HISTORY

LeBron James described SoFi Stadium as "the best stadium in the world" and "architecturally, the greatest thing I've ever been in". It's the most expensive stadium ever built, by some distance, coming in at an astonishing $5.5 billion, more than double the second most expensive stadium, and one of the costliest buildings of all time. The site was previously home to the Hollywood Park racecourse. There had been plans to build a site there since the 90's but none had come to fruition, until billionaire Stan Kroenke announced plans to relocate the St Louis Rams back to Los Angeles, and in 2015 the local council approved the plan, with construction completed in 2020. The focus on green engineering and sustainability was a key aspect of the project's vision.

SOFI STADIUM, US



CONSTRUCTION & ENGINEERING

The designers took inspiration from the Californian "indoor-outdoor lifestyle", so the stadium is partly open-air to let the sea wind flow in, but the canopy roof protects against direct sunlight and rain while still allowing guests to see the sky. The stadium is only 3 miles away from the nearest airport and directly under the main flight path, so to comply with the Federal Aviation Administration's strict height restrictions, SoFi is actually 30m below ground level. To keep the construction time down the hole was excavated and then walls were built up the edge concurrently with the stadium structure inside the bowl. The walls were made of concrete and wire mesh panels, with over 300,000 square feet of concrete and panels installed, the equivalent of more than five football fields. The roof the largest of its kind ever built, and is comprised of 302 ETFE panels, including 46 mechanized vents that allow the heat generated by the tens of thousands of spectators to dissipate away. The roof is isolated from the rest of the structure in case of seismic activity, and the remainder relies on a 20,000-ton steel truss compression ring with additional support from thirty-seven earthquake-resistant columns.

FUTURE OF THE STADIUM

The engineering ensures the stadium has a long future ahead of it, even factoring in California's seismic activity. SoFi Stadium hosted the last Super Bowl and will show the next Wrestlemania, as well as parts of the 2026 World Cup and the 2028 Olympics. Lavish suites with ultrapremium catering start at $10,000 a game, rising all the way to $1 million for the Super Bowl. SoFi is not just disaster-proof but one of the world's most sustainable stadiums. The aerodynamic shape pulls ocean breezes in and the opening in the roof can "tune" the wind flow to allow better cooling. The cooling systems inside the stadium collect rainwater and then store it in man-made lakes, before being dispersed into neighboring wetlands. This saves about 26 million gallons of water per year and even helps migrate stormwater away from the city. The stadium's design, which prioritizes energy efficiency, water conservation, and the overall well-being of fans and the environment, sets a new standard for future stadiums and large-scale event venues around the world.

COPENHILL, DENMARK

INSIDE THE BUILDING

Copenhill is the first (and possibly last) combined waste-to-energy power plant and ski slope. It's as if being the world's cleanest waste-to-energy plant wasn't enough - they needed to give it yet another use. The plant burns the city's household waste producing energy for heating and electricity. Above that is are ten floors of administrative and conference space. And on top of its huge sloping roof, there is a ski slope (the same length as an Olympic half-pipe), a hiking path and the tallest artificial climbing wall in the world.

HISTORY

The plant was built on an industrial area which had already been turned into a makeshift extreme sports park by the public. The seed of the idea for Copenhill came back in 2002 when a company called PLOT drew up plan for a ski slope on the roof of a Copenhagen department store. That never happened, but in 2011 the same won a design competition for a new waste-to-energy power plant, and they decided to incorporate their old idea. The plant opened on 30 March 2017, at cost of $670 million. It was named the 'World Building of the Year' at the 2021 World Architecture Festival.

COPENHILL, DENMARK

CONSTRUCTION & ENGINEERING

Copenhill is an exceptionally complex building: it's not just a power plant that they made first and then realised they could put a ski slope on top. The building was engineered for both purposes, requiring a complex geometric shape that combines the needs of a double-curved ski slope with the space needed for all the machinery. Consequently the structure needed to be built from an unusual array of steel girders. The hope was that Copenhill would release its steam in a ring formation, and a kickstarter fundraising campaign was launched. However, they discovered that "there were no smoke ring-emitting manufacturers in the yellow pages" and the idea was never realised. Nevertheless, the chimney is still rather impressive, coming in at 345 tons. It has no ground support and is instead connected to the steel structures only at the top, giving the impression it is hanging off it. To produce the district's energy, the facility connects condensers from the turbine to the electrical grid and also heat exchangers which link up to the heating supply.

FUTURE OF THE BUILDING

The Danish capital of Copenhagen has pledged to become the world's first carbon-neutral city by 2025. Copenhill is a big part of that. The plant converts 440,000 tons of waste a year into enough electricity and heating for 150,000 homes. Moreover, the building includes an environmental education hub, and even the roof addresses the challenges of the microclimate of such a large plant, absorbing heat, removing air particulars and minimising stormwater runoff. Truly a superstructure for the 21st century and beyond.

EXAMPLE EXPERTS

Roma Agrawal

Roma Agrawal MBE is a structural engineer, designed bridges, sculptures and skyscrapers, including in the world-famous London building The Shard. She is the author of 'Built' and 'How Was That Built?' as well as host of the 'Building Stories' podcast and has appeared as an expert on TV shows such as 'Abandoned Engineering', 'Superstructures: Engineering Marvels', and 'World's Greatest Palaces'

Diébédo Francis Kéré

Diébédo Francis Kéré is a Germany-based architect who became the first black person to win the Pritzker Architecture Prize. Educated at the Technical University of Berlin, he now holds a professorship in Architectural Design and Participation at the Technical University of Munich. He is recognised for creating innovative, sustainable and collaborative works.

Anna Heringer

Anna Heringer is a German architect and proponent of sustainable architecture. She won the Aga Khan Award for Architecture for the METI Handmade School in Bangladesh and in 2011 received a Global Award for Sustainable Architecture. She is the author of 'The Future of Architecture' and 'Upscaling Earth: Material, Process, Catalyst'.

Michel Virlogeux

Dr. Michel Virlogeux is a French structural engineer and bridge specialist. He is known for designing numerous bridges in Europe, including the Normandy Bridge, the Vasco da Gama Bridge in Lisbon, and most famously the Millau Viaduct. He has received numerous awards for his work and is an International Fellow of the Royal Academy of Engineering.

EXAMPLE EXPERTS

Martin Jochman

Martin Jochman is a British architect who is the designer of The InterContinental Shanghai Wonderland. He co-founded the design studio JADE + QA and has over 25 years of experience in design and construction of many major buildings in the UK and internationally in Europe, Middle East and China, such as the Jumeirah Beach Hotel and Wild Wadi Water Park in Dubai.

Savina Carluccio

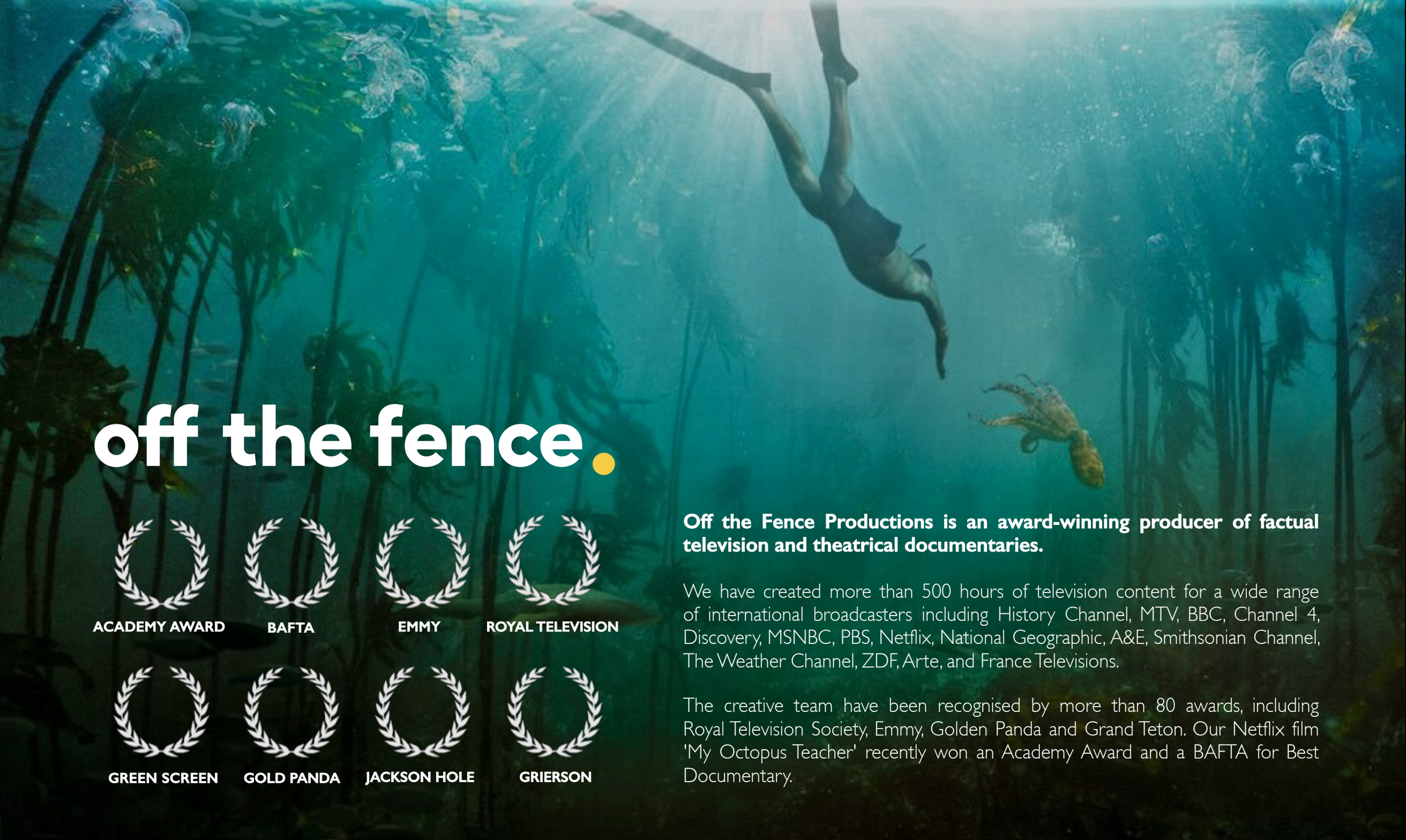
Savina is a chartered civil engineer who specialises in infrastructure advisory work, helping large infrastructure clients to future-proof and make smarter use of existing assets, data or processes. Savina's work focuses on transport innovation, risk and resilience to extreme weather and climate change. She is Executive Director at International Coalition for Sustainable Infrastructure (ICSI).

Oliver Schwabe

Oliver Schwabe leads Arup's Advanced Building Engineering team in Germany. He is an expert in energy-efficient and sustainable planning of building engineering. He has over twenty years of design and management expertise in new construction and retrofit projects and has worked on hospital, theatre, university, office and laboratory buildings.

Jonathan Fashanu

Jonathan Fashanu is a chartered civil and structural engineer, with a large portfolio of international projects that include residential and mixed-use developments, offices and retail spaces and industrial buildings. He is the co-founder of Dash studio, integrated architecture and engineering studio with a strong emphasis on sustainability and responsible construction.



off the fence.

ACADEMY AWARD

BAFTA

EMMY

ROYAL TELEVISION

GREEN SCREEN

GOLD PANDA

JACKSON HOLE

GRIERSON

Off the Fence Productions is an award-winning producer of factual television and theatrical documentaries.

We have created more than 500 hours of television content for a wide range of international broadcasters including History Channel, MTV, BBC, Channel 4, Discovery, MSNBC, PBS, Netflix, National Geographic, A&E, Smithsonian Channel, The Weather Channel, ZDF, Arte, and France Televisions.

The creative team have been recognised by more than 80 awards, including Royal Television Society, Emmy, Golden Panda and Grand Teton. Our Netflix film 'My Octopus Teacher' recently won an Academy Award and a BAFTA for Best Documentary.