nobel

LEVEL UP ENERGY

DETONATION

CARBON CAPTURE

NO_x REDUCTION

WELCOME TO NOBEL

Disruptive Energy.

Energy creation is fundamental to human life, and most energy creation still relies upon the combustion of fossil fuels. It is neither realistic nor sensible to abandon the current energy infrastructure. Nobel suggests a disruptive alternative: Innovate at the core of power generation, improve efficiencies, consume less fuel, and enable cost-neutral carbon capture integration. The result is a cost-effective solution for clean power generation.

Mission to upgrade the very dynamo of our civilization.

PRINCIPLE CHALLENGE

The energy produced through the combustion of fossil fuels sustains most of the world's current energy consumption.

SHIFT

Innovation within fuel consumption methods fundamentally approaches energy creation and climate impact mitigation in a completely different manner.

DISRUPT

By commercializing detonation, Nobel provides the energy sector with a cost-neutral alternative to carbon-neutral operation.

Solution for redefining alternative energy.

EXECUTIVE SUMMARY

Low complexity, **drop-in rotating detonation engine upgrade**, capable of disrupting 65% of the world's energy generation.

37,500+

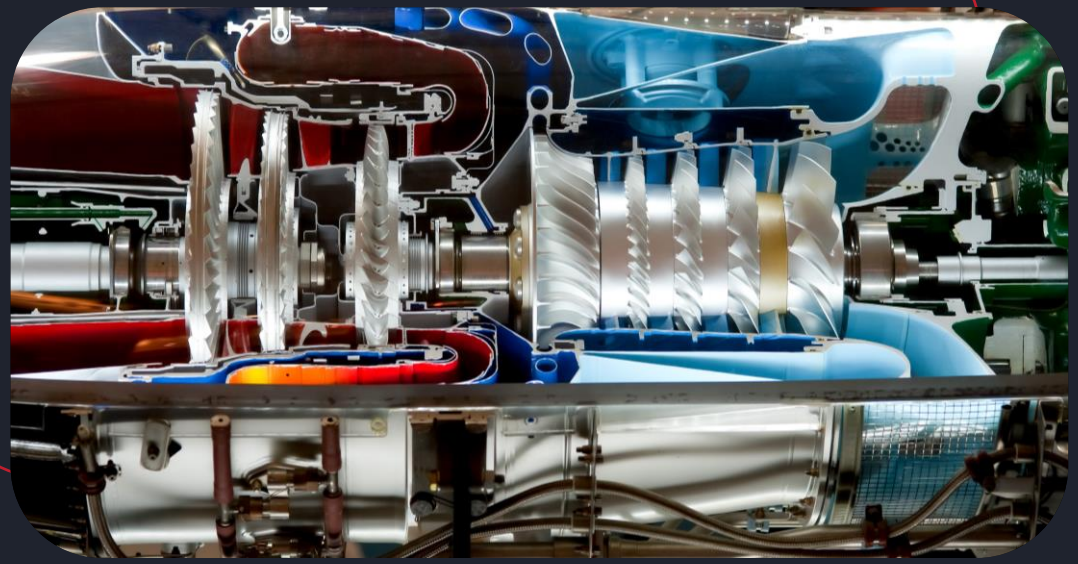
EXISTING ARCHITECTURE

Leveraging the current power generation infrastructure creates a massive market of power plants capable of directly integrating our solution.

15%+

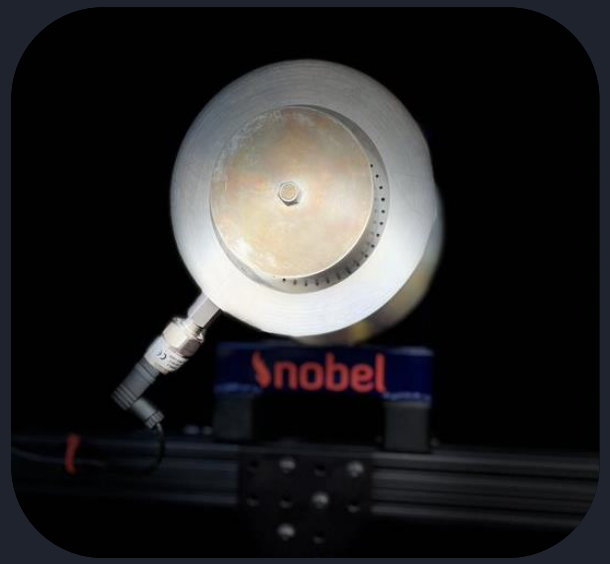
DISRUPTIVE APPLICATION

Efficiency gains from a commercial rotating detonation system equate to $15M in annual fuel savings per power plant, facilitating cost-neutral investments in carbon capture.



INNOVATE AT THE SOURCE

Our design goal is to establish a drop-in upgrade, maintaining the exact form/fit as current combustor designs, with subsequent qualification to operate in existing turbines. This architecture reuse will leverage existing land-based power facility capitalization, providing new value to existing systems that cost hundreds of millions of dollars to install



SOLUTION SPACE

Replace combustion with detonation.

The application of Rotating Detonation Engines (RDEs) is a novel concept which supersonically detonates a mixture of oxidizer and fuel rather than normal combustion. The result is more energy delivered per unit of fuel mass. 15% efficiency gains increases are typical, with theoretical gains expected as high as 25%.

01

Concept. Detonation yields more energy using the same amount of fuel consumed in combustion

02

Strategy. Upgrade combustion engines with a fuel-efficient detonation process through standard lifecycle replacement cadences for combustion chambers

03

Green without the premium. Cost neutral CO^2 capture at the source, considerably less NO_x generation

VALUE PROPOSITION

About natural gas consumption.

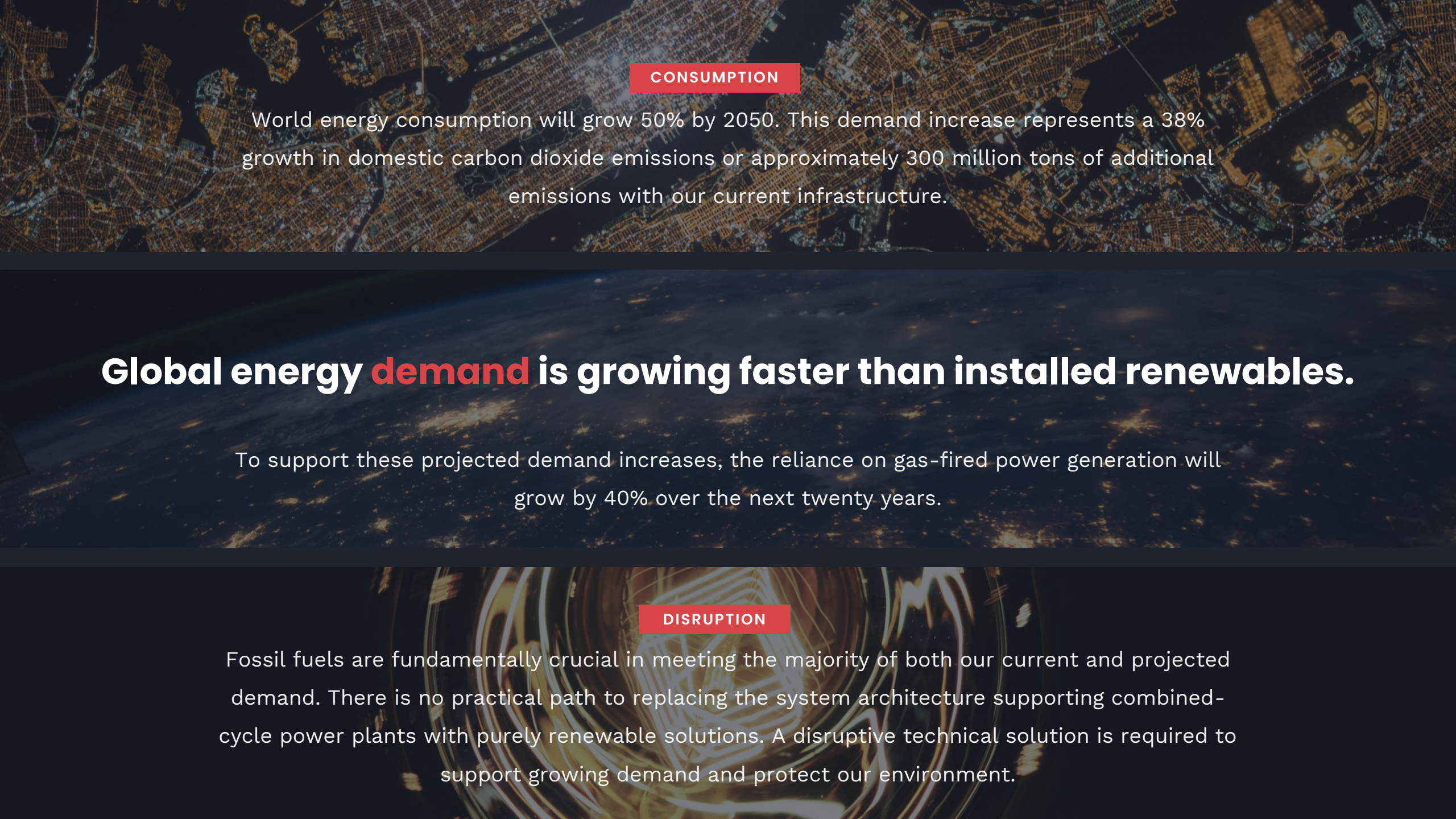
"In 80% of the world, energy will be bought where it is economic. You have to help the rest of the world get energy at a reasonable price" *– Bill Gates*

INFRASTRUCTURE

1,793 Domestic Plants (40% of U.S. Energy) built on ~78K combustion chambers requiring replacement every five years.

At gas prices of ~$3/MMBTU a plant runs at $250k in fuel costs per day. Realized gains in efficiency translate directly into average operational savings of $13.7M/year, supporting cost-neutral carbon capture improvements.

CONSUME LESS, GAIN MORE



CONSUMPTION

World energy consumption will grow 50% by 2050. This demand increase represents a 38% growth in domestic carbon dioxide emissions or approximately 300 million tons of additional emissions with our current infrastructure.

Global energy demand is growing faster than installed renewables.

To support these projected demand increases, the reliance on gas-fired power generation will grow by 40% over the next twenty years.

DISRUPTION

Fossil fuels are fundamentally crucial in meeting the majority of both our current and projected demand. There is no practical path to replacing the system architecture supporting combined-cycle power plants with purely renewable solutions. A disruptive technical solution is required to support growing demand and protect our environment.

Influence an energy miracle.

SOLVE THE RIGHT PROBLEM

Cost neutral to offset 90% CO^2 capture by using fuel efficiencies to drive direct air capture right at the source. Research shows significantly fewer NO_x emissions in detonation engines causal to shorter residence times. As a greenhouse gas, NO_x is 300 times more harmful than CO^2.

↓ 90% CO^2

COST-NEUTRAL SOLUTION TO ENABLE IMPROVED CARBON CAPTURE AT THE SOURCE

↑ 15% Efficiency

IMPROVED FUEL EFFICIENCY MEANS LESS CO^2 PRODUCED FOR THE SAME AMOUNT OF ENERGY

PRAGMATIC PATH TO A COST-EFFECTIVE CARBON-NEUTRAL ENERGY SECTOR

Source Capture.

DISRUPTIVE AT CREATION

Power plants face an average 13% increase in fuel consumption to integrate and sustain carbon-capture systems using the best currently available technology.

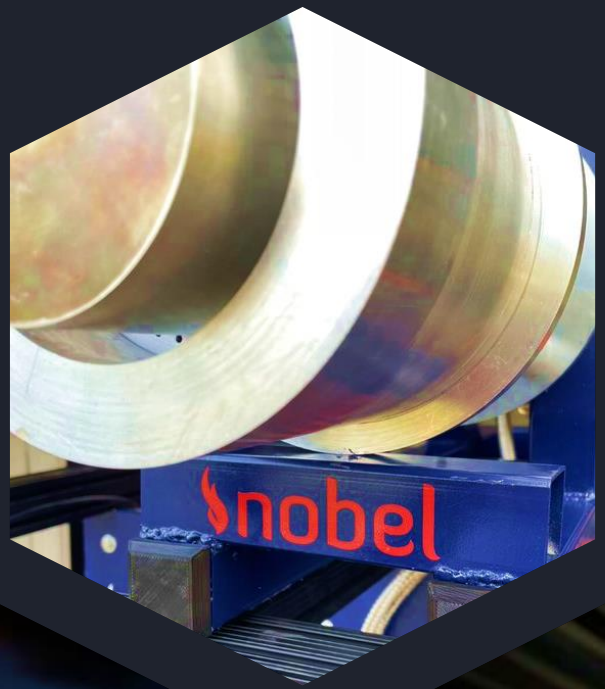
GREEN-PREMIUM

This "green-premium" is unsustainable; it places two fundamentally unacceptable constraints on providers; increased fuel consumption to power these systems and margin impacting procurement and integration.

NOBEL ALTERNATIVE

By utilizing detonation at the point of fuel combustion, Nobel introduces fuel efficiency gains of 15%; this is more energy produced for the same amount of fuel. As a result, the average power plant can deploy cost-neutral carbon capture at the source with existing technical solutions.

www. nobel-works.com



ICONOCLASTIC TECHNOLOGY ADOPTION

Nobel Vision.

Detonation is more efficient than combustion; let us redefine operations within energy generation regardless of application. Depending on the market, application benefits range from clean and efficient land-based power generation, higher miles per gallon for automotive, and improved specific fuel consumption for jet aircraft.

01 **SUSTAINABILITY**

02 **SCALABLE ENERGY**

Provide a low-complexity, directly applicable system that reduces NOX creation immediately while simultaneously enabling cost-neutral carbon capture.

03 **CO^2 REDUCTION**

04 **NO_X REDUCTION**

Lead a concrete plan for carbon-neutral land-based power generation by 2050.

ENHANCE GREEN

Flex Fuel for the Future.

SUPPORTS THE HYDROGEN ECONOMY

SUPPORTS THE ALLAM-FETVEDT CYCLE

Detonation engines enhance new green technologies. At our core, these systems are flex-fuel and work well with zero-emission fuels.

STRATEGIC GROWTH

Blue Ocean Opportunity.

Nobel Works accelerates the introduction and adoption of detonation engines into commercial markets. The company is now shifting from “stealth-mode” research and design into a C-Corporation actively working to finalize design maturation and shape subsequent go-to-market strategies. There are many available markets, practically anything that combusts fuel, including automotive, aerospace, power generation, naval, and rail freight. The largest of these is the Energy market, which can gain substantial savings from system efficiency gains while significantly improving their carbon impact by retrofitting their systems with detonation engines.

YEAR ONE MARKET $2.4M

TEAM WITH OEM/SERVICE PROVIDERS

Targeting adoption within 0.5% of domestic plants (10 Sites). 60 integrated and serviceable units within twelve months ($40K/unit)

YEAR THREE MARKET $21.6M

SCALE WITHIN THE DOMESTIC ENERGY MARKET

360 integrated units (2.7% of the domestic market) within three-years, drop-in replacement offerings for major OEMs, upgrade options with all major service providers. Serviceable market of 1,793 plants

BLUE OCEAN VIEWPOINT

LEVEL UP ENERGY WITHIN ALL MARKETS

10% of World GDP ($6T) spent on energy; target rich environment for technology adoption. 32K+ power plants worldwide. Naval, Air, and Rail distribution fuel costs; 90% of world trade moves by ship with 60% of costs associated with fuel.

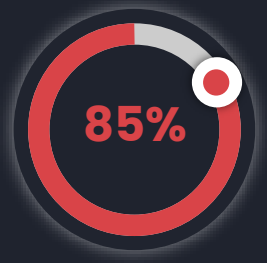
BY THE NUMBERS

Detonation as alternative energy.

Detonation engine technology represents a substantial saving to the end-user. These savings create a cost-neutral solution for installing carbon capture technologies capable of sequestering 90% of carbon dioxide creation at the source. Nobel enables margin expansion while addressing climate change at the source.

PROJECTED GROWTH

Even with renewables growth, the need for gas-fired generation will grow 40% to meet 2050 energy demands. There is no cost-effective solution to replace this existing architecture. Nobel suggests incrementally upgrading the core technology of gas-fired plants with detonation engines.



SAME ENERGY, LESS FUEL

$15M in average annual cost savings for a gas-fired powerplant. Produce the same amount of energy with 85% of the fuel.

WHY NOW

Technical discriminators.

Nobel has built and is currently testing prototypes with various oxidizer and fuel combinations. There are two primary areas where other systems have failed: Sustaining the detonation state and managing system temperature. For this system solution to be competitive, detonation technologies must deliver fuel savings at reasonable installed costs, be serviceable, and have similar endurance to conventional turbine combustors. Our solution is a drop-in upgrade, maintaining the exact form/fit as current combustor designs, with subsequent qualification to operate in existing turbines. This architecture reuse will leverage existing land-based power facility capitalization, providing new value to existing systems that cost hundreds of millions of dollars to install. Demonstrating a thermally managed system that can run for long periods is pivotal for any commercial or defense application.

COMMERCIALIZATION

Shift from academic “proof of concept” work. Nobel is tailoring the technology application to face commercial adoption, essentially designing for commercial use.

LEVERAGE GREEN

Nobel is translating technical challenges into green efficiencies. Technology application within science-based energy redefines the design constraint space.

“KEEP IT COOL”

Nobel has developed a system solution that is cooled using existing commercial solutions for heat management. Additionally, we have promising testing results of advanced coatings, materials, and design alternatives to alleviate risk associated with temperature.

“KEEP IT ON”

Current academia and defense RDE test events operate in terms of seconds. Modern commercial-grade turbines run for hundreds of hours without pause and thousands of hours before refurbishment. Turbines operate over a range of loads, resulting in exploration in throttling and control and characterizing all load demands.

A DETONATION SHIFT

Harness efficiency to rethink our energy challenges.

PRESSURE-GAIN COMBUSTION

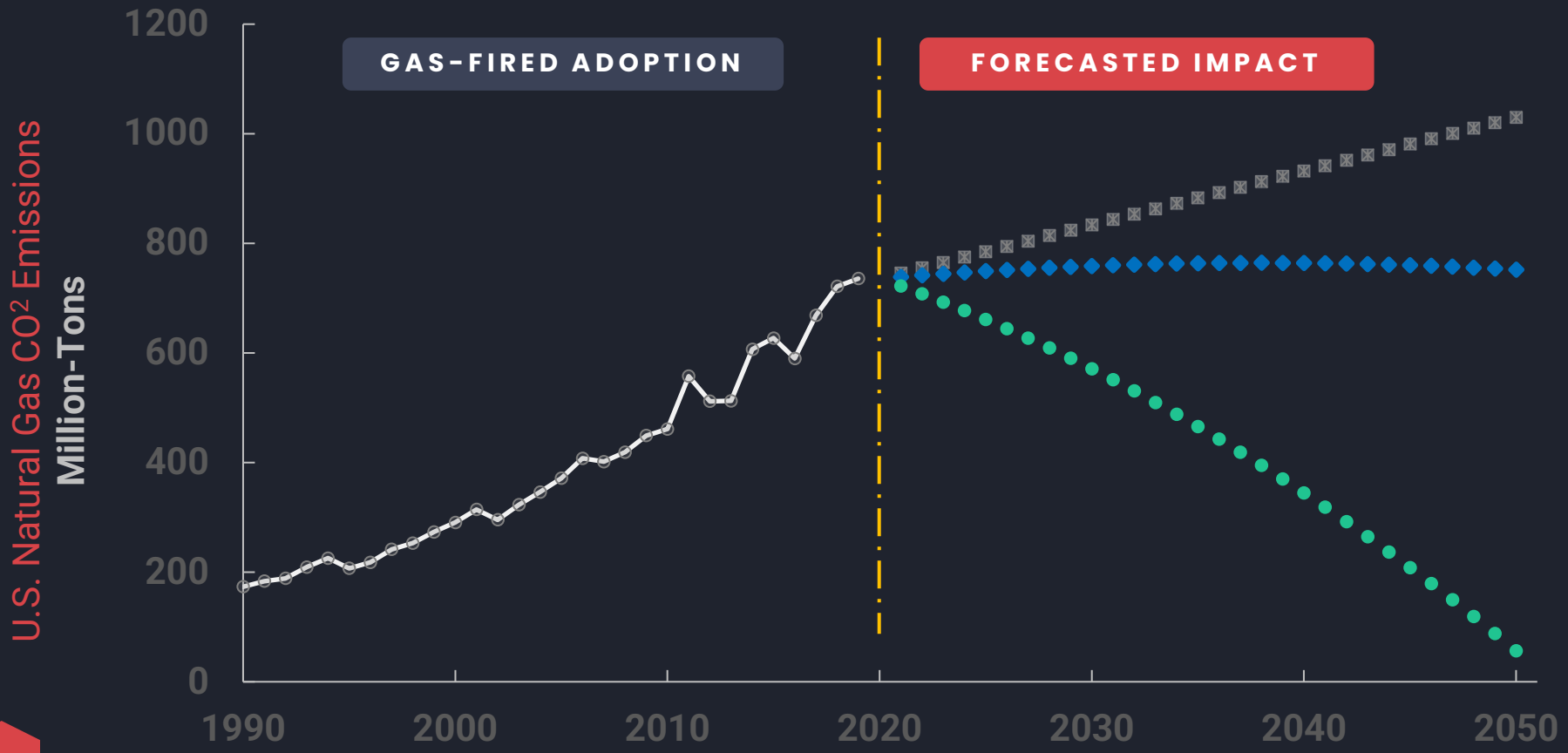
A mere 1% Improvement in Thermodynamic efficiency is equivalent to installing 17,300 commercial wind turbines, a 33% increase in the total number operating.

COST VS GAIN

Average sized commercial wind turbines cost $2.6M per wind turbine. $40B in capital cost to match the energy gain of 1% in efficiency.

Facilitate “green” without a premium.

Combustion of fossil fuels is at the heart of our global economies. Nobel is developing rotating detonation engine technologies that improve fuel efficiency by 15% versus typical combustion and reduce harmful emissions. Furthermore, rotating detonation engines offer a cost-neutral solution to augment existing in-plant carbon capture technologies, capturing 90% of carbon dioxide emissions while simultaneously reducing nitrogen oxide by-products.



COST OF DOING NOTHING. ADDITIONAL 300 MILLION-TONS IN EMISSIONS BY 2050

NOBEL SYSTEM INTRODUCTION AND 1%/YEAR MARKET CAPTURE; HOLDS CURRENT CO2 EMISSIONS

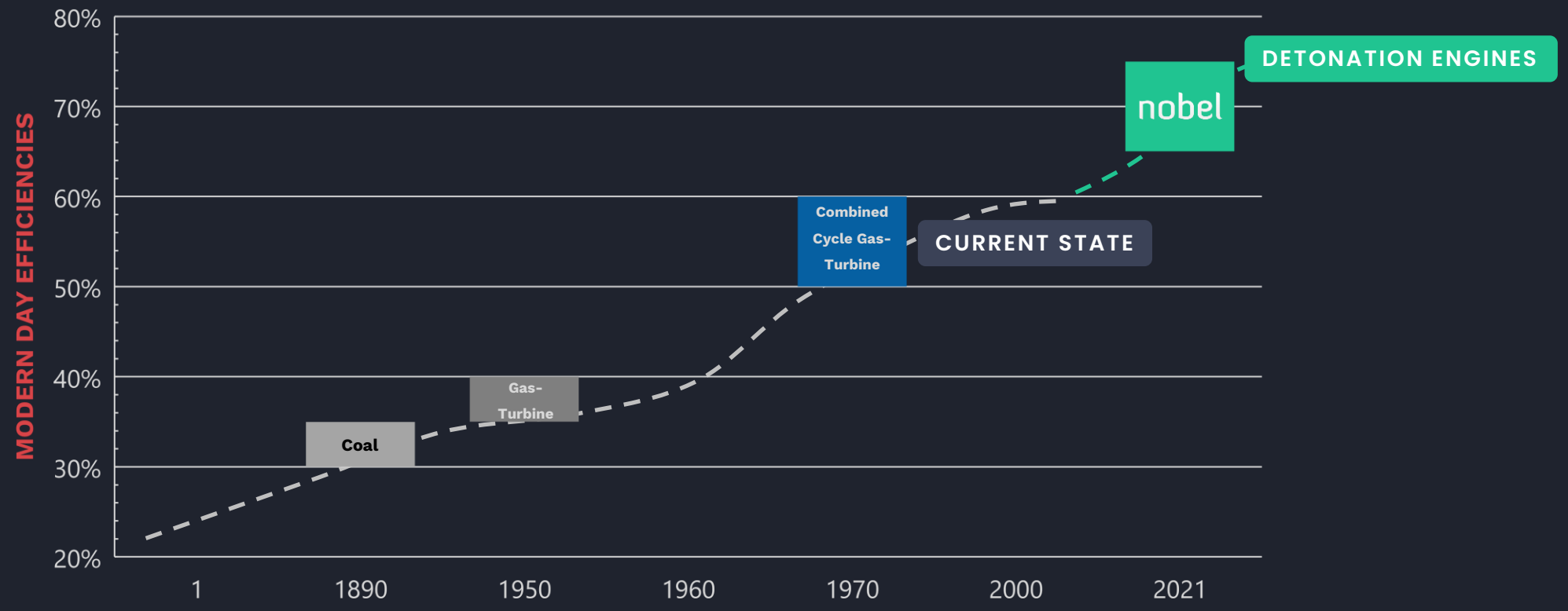
NOBEL SYSTEM INTRODUCTION AND 3.5%/YEAR MARKET CAPTURE; NET ZERO BY 2050

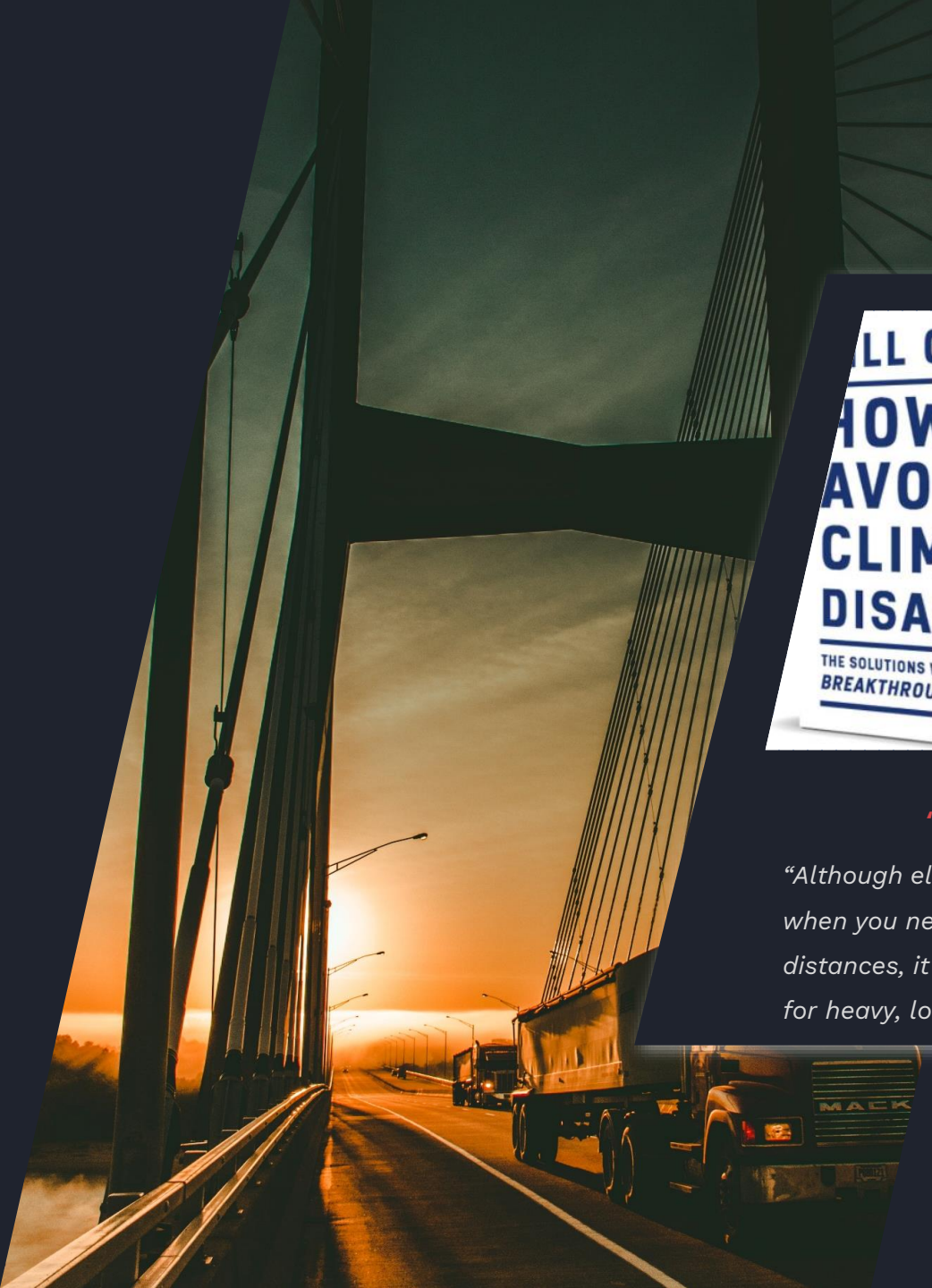
The Next-Generation of Energy Production.

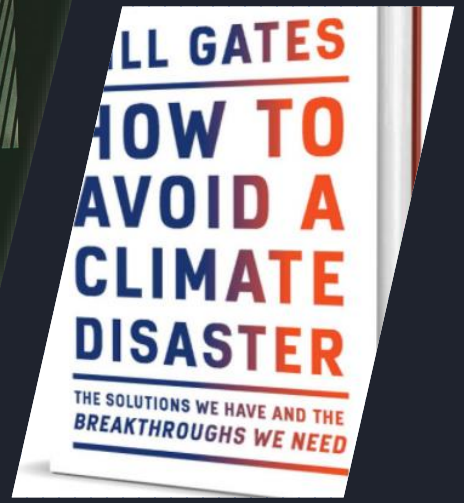
Natural gas plants produce 40% of the United States electricity, higher than any other source.

DUE FOR INNOVATION

Combined cycle gas turbines represented a true phase change in energy efficiency. The rapid adoption of these systems for power generation has far surpassed any other viable methodology. As a result, this architecture has become foundational to our civilization. This market is primed for innovation, specifically innovation that translates to reduced fuel consumption and increased reliability. These gains represent corresponding reductions in carbon dioxide emissions and nitrogen oxide creation while sustaining our power demand needs.







TRANSPORTATION AND AUTOMOTIVE MARKET

Augment electric vehicles and sustainable distribution.

Nobel supports carbon-neutral power generation to sustain growing EV power consumption demand. Additionally, we are primed to adapt into “long haul” markets where efficiency is critical: Aircraft, Naval, Rail, and OTR freight

“HOW TO AVOID A CLIMATE DISASTER” – BILL GATES

“Although electricity is a good option when you need to cover short distances, it’s not a practical solution for heavy, long-haul trucks.”

“Use electricity to run all the vehicles we can and get cheap alternative fuels for the rest.”

ENERGY

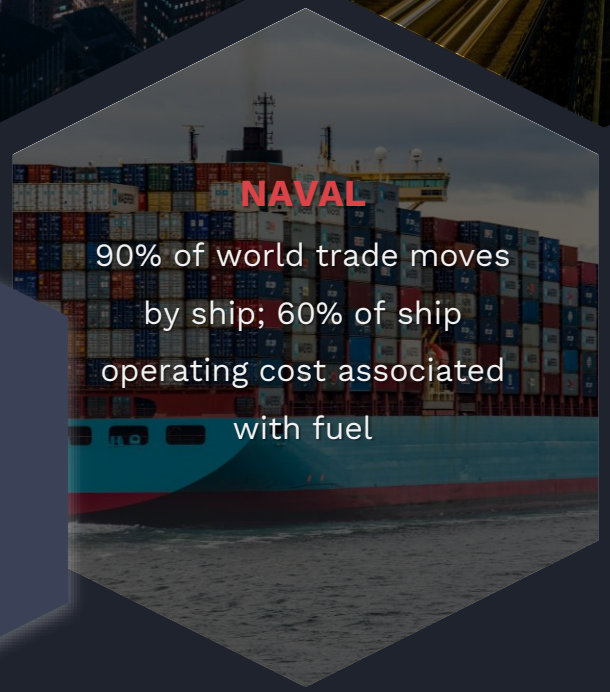
10% of World GDP, $6 Trillion annually; 38K existing power plants ideal for integration

AUTOMOTIVE

90M cars are produced annually; 400 million gallons of gasoline consumed daily

AEROSPACE

26k commercial jet aircraft. 173 million gallons of aviation fuel daily



NAVAL

90% of world trade moves by ship; 60% of ship operating cost associated with fuel

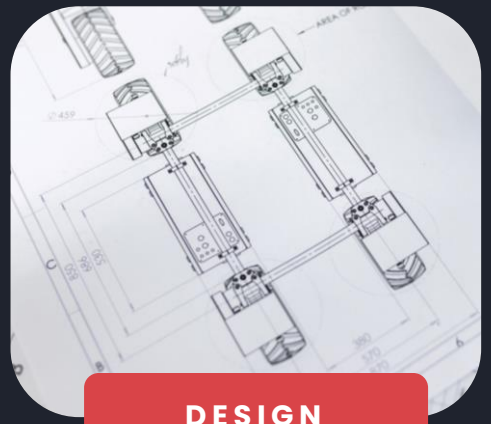
SUSTAINMENT

Scalable, low-maintenance solutions, manufactured with world-class sustainability processes and supported by industry-leading health metric systems.

Capabilities and capacities to provide results.

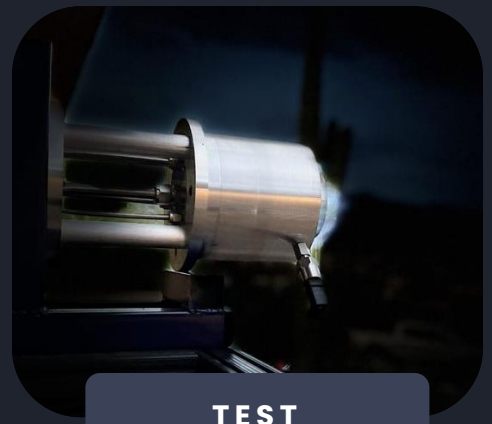
NOBEL SERVICES

Nobel has built and tested rotating detonation engines and operates against a traditional set of manufacturing and technical readiness gates. We are currently in early-stage research and development with promising test results showing conventional fuels can sustain detonation



DESIGN

Expertise in propulsion system design; Nobel's engineering core represents a competitive advantage.



TEST

Static and dynamic testing capability coupled with world-class hardware in the loop simulation.

MANUFACTURE

Internal low complexity machining, integration, and test system production capabilities.

Meet Our Team.

DR. JOHN ULLRICH

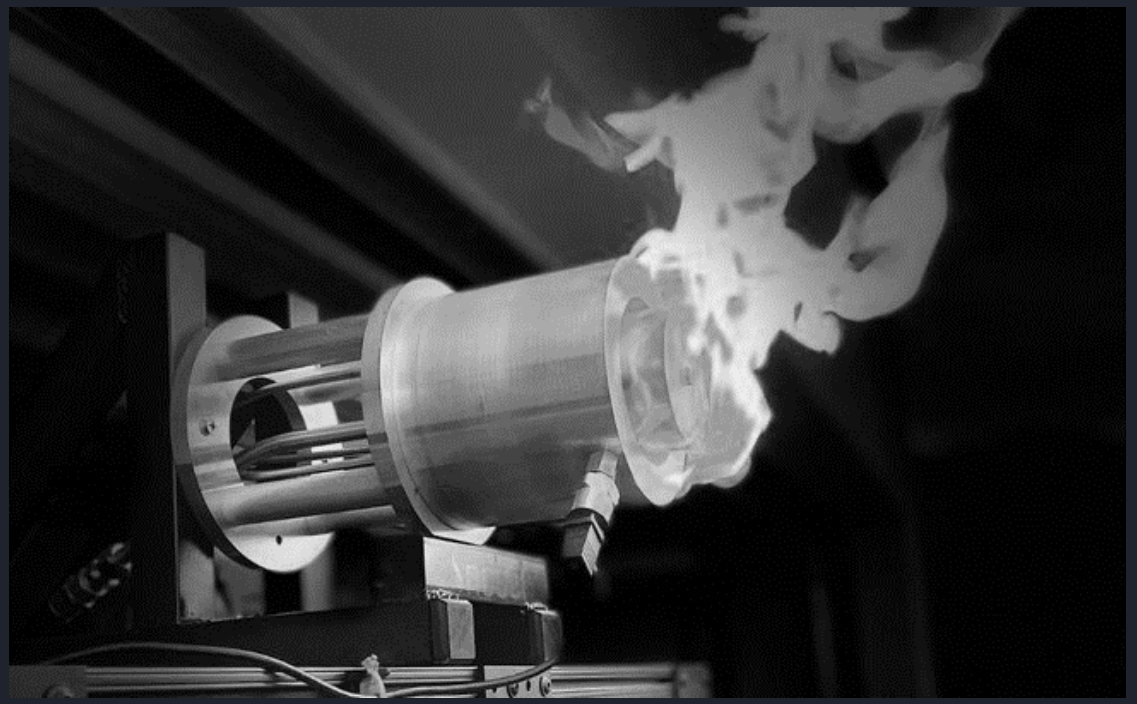
DR. JAMES VILLARREAL

DR. JACOB DENNIS

Nobel's founders include Dr. James Villarreal, Dr. John Ullrich, and Dr. Jacob Dennis. Dr. Villarreal's background is in rocket propulsion, and he worked at Raytheon Missiles & Defense for twelve years. Other than engineering, he has held leadership roles in supply chain strategy and program management. Dr. Ullrich has worked at Raytheon for thirteen years with intense experience in Operations, Factories, Systems, and Supply chains. Both Dr. Villarreal and Dr. Ullrich also teach at the University of Arizona. Dr. Dennis is a graduate of the prestigious propulsion school Purdue University and has worked twelve years in emergent technology, most with the Department of Defense.

FINANCIALS AND APPROACH

Operational Targets.



$7.1M
Initial ask through year two

$400K
Avg monthly burn rate

10,000 Hours Test
Industry first to demonstrate substantial operational execution

	Year 1	Year 2
Revenue	$146K	$1,354K
COGS	$125K	$1,039K
SG&A	$2,277K	$4,843K
EBITDA	($2,257K)	($4,528K)
Cum EBITDA	($2,257K)	($6,784K)

CAPITAL NEED

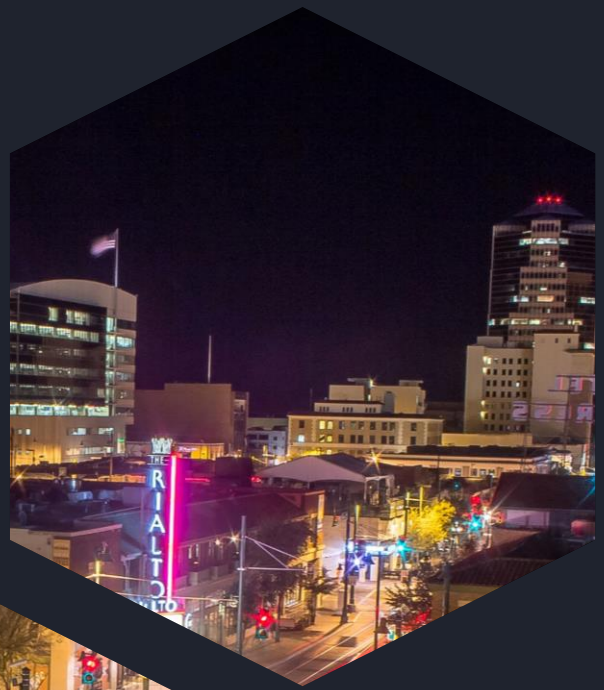
Year One Goal: Expand on prototypes; build long running robust systems. Fast cycle learning.

SCALE STRATEGY

Year Two Goal: Initial adoption. Detonation upgrades as part of regular lifecycle replacement.

RETURNS

Year Three Goal: Expand adoption. Translate manufacturing expertise into a competitive advantage.



NOBEL TEAM

Contact Us.

GET IN TOUCH

+602 448 1863

+520 289 4349

LOCATION

Tucson, Arizona, USA

OFFICE HOURS

Monday – Saturday

7 AM to 6 PM

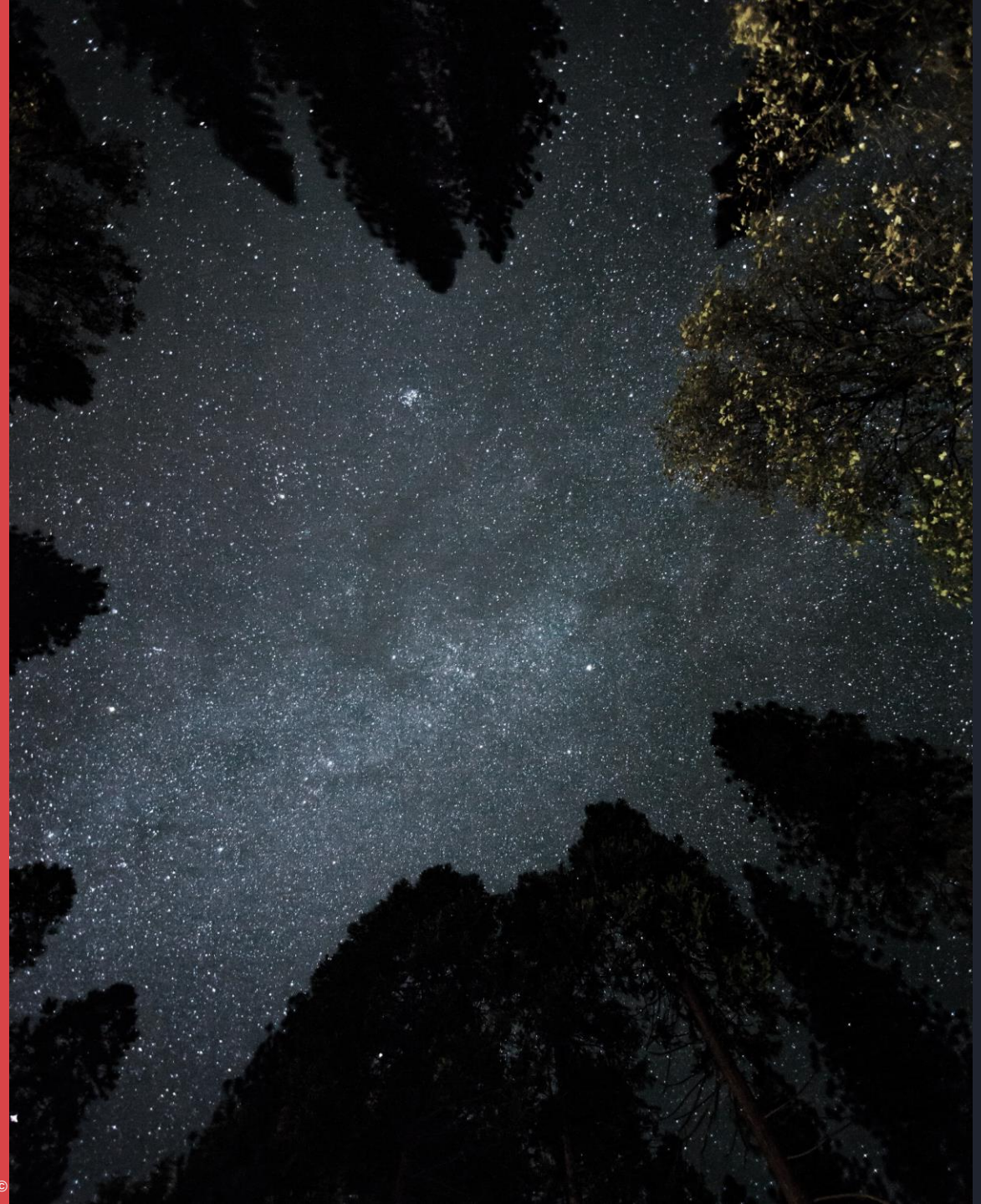
WEB OFFICE

enterprise@nobel-works.com

nobel-works.com

THANK YOU

NOBEL TEAM

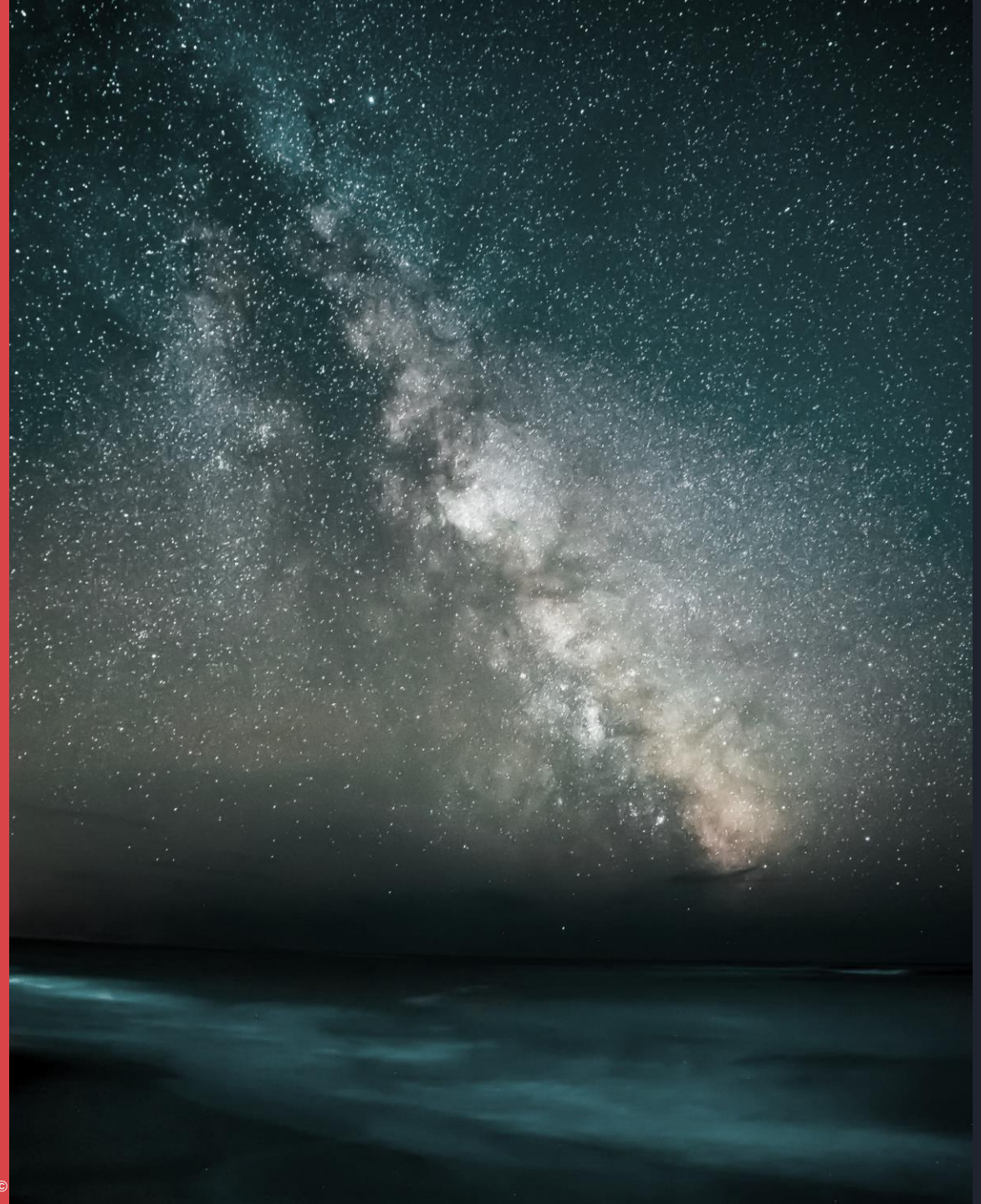


Dr. James Villarreal

CEO, FOUNDER

ABOUT JAMES

A cross-functional leader with a passion for building incredible, creative teams that excel in bringing new ideas to life. James has over fifteen years of experience in various leadership roles within program management, supply chain, and engineering. Notably, twelve years with Raytheon Technologies focused on new development programs and emergent technology, organizational change management, and program execution. James grew one program from 70 to 119 employees and in supply chain he managed over $1.2B in competitive source selection. In addition to working at Raytheon, James teaches senior and graduate-level Propulsion and Rocket Propulsion classes at Arizona Universities. He holds a Ph.D. in Aerospace Engineering from Arizona State University, 25 publications/proceedings, and 19 filed/granted patents.



NOBEL TEAM

Dr. John Ullrich

COFOUNDER

ABOUT JOHN

John has over fifteen years of experience in various operations, supply chain, and program leadership roles. Over the last thirteen years, he has assumed increasing levels of responsibility within Raytheon Technologies. John led supply chain program management for Close Combat Systems within the Land Warfare and Air Defense mission area in his most recent role. He was responsible for a portfolio of $400M in annual sales. In addition to working at Raytheon, John teaches Systems and Industrial Engineering at the University of Arizona. He holds a masters in Systems Engineering from Johns Hopkins University and a Doctorate in Engineering Management from George Washington University.

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