ZEN Graphene is a next-gen nanomaterials technology company. Nanotechnology has tremendous potential to enhance existing solutions and enable new innovations in a number of industries. ZEN is currently focused on three primary areas of commercialization with a significant R&D pipeline and substantial upside potential:

1. **Health**
   - ZENGuard™ for indoor air quality & PPE markets
   - Antimicrobial compound as a therapeutic and healthcare product

2. **Advanced Materials**

3. **Clean Technology**

100% owned Albany Pure™ Graphite deposit also offers potential for vertical integration longer term (NPV of $438mm – 2015 PEA)

**ZEN ROI Strategy**

- Returns from monetizing current market opportunities (ZENGuard™)
- Optimizing supply chain near term; full vertical integration longer term
- Intellectual Property development with substantial scale and upside optionality
Next-Gen Nanomaterials  Why Graphene?

What is Graphene?

- A nanomaterial consisting of a single layer of carbon atoms arranged in a honeycomb lattice that has **extraordinary properties**

Why is it unique?

<table>
<thead>
<tr>
<th>Property</th>
<th>How it Can Be Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely high surface area-to-mass ratio</td>
<td>Treat Disease – Transporting antimicrobial agents to target viruses, bacteria and fungi</td>
</tr>
<tr>
<td></td>
<td>Protection Against Pathogens – Antimicrobial agent on PPE and air filters to reduce transmission; preventative medical use</td>
</tr>
<tr>
<td>Impermeable to hydrogen</td>
<td>Water &amp; Air Purification – Filters, H\textsubscript{2}O purification, desalination, gas storage, hydrogen generators, waste management</td>
</tr>
<tr>
<td>200x stronger than steel</td>
<td>Building Materials Additive – Composite materials &amp; alloys; additive to rubber, plastics, aluminum and concrete</td>
</tr>
<tr>
<td>Stretches to 120% of its original size</td>
<td>Polymer Additive – Coatings, additives and wearable technologies</td>
</tr>
<tr>
<td>10x thermal conductivity of copper</td>
<td>Composite/Polymer Additive – Composite materials, polymers, coatings, concrete, heat sinks/spreaders</td>
</tr>
<tr>
<td>1000x capacity of copper</td>
<td>Clean Energy - Longer battery life, faster charge times, semiconductors, solar</td>
</tr>
</tbody>
</table>

Graphene has enormous potential to **make the world safer, cleaner and more efficient**; **ZEN is positioned to benefit in a number of these high-growth areas**
# Next-Gen Nanomaterials

## ROI Strategy

<table>
<thead>
<tr>
<th>What We Focus On</th>
<th>Why It Matters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Returns from Monetizing Our Current Opportunities</strong>&lt;br&gt;Commercializing our current intellectual property (IP)</td>
<td><strong>Cash Generation</strong>&lt;br&gt;- There is significant need and demand for ZENGuard™-enabled solutions&lt;br&gt;- Generates cash flow to support future growth and creates shareholder value</td>
</tr>
<tr>
<td><strong>Optimizing Our Supply Chain</strong>&lt;br&gt;Long-term vertical integration strategy focused on development of graphene production capacity, supply agreements and our 100% owned Albany Pure™ Graphite deposit</td>
<td><strong>Production Execution</strong>&lt;br&gt;- Ensures competitive, consistent and stable input for our proprietary graphene-based solutions (i.e., graphite and graphene oxide for coating/compound production)&lt;br&gt;- A well-established supply chain, production processes and marketing presence in the graphene space gives us an extremely strong footing ahead of potentially tremendous market growth</td>
</tr>
<tr>
<td><strong>IP - Building Our Portfolio</strong>&lt;br&gt;Positioning ourselves to thrive by developing partnerships and securing new IP in high-growth areas like healthcare, advanced materials and clean tech</td>
<td><strong>Future Growth Engine</strong>&lt;br&gt;- There are numerous applications for graphene. We need to understand the most attractive and practical opportunities to ensure we allocate resources and establish partnerships to functionalize graphene and develop IP in the right areas&lt;br&gt;- Protects our ability to serve high-growth markets with unique, proprietary solutions</td>
</tr>
</tbody>
</table>
ZENGuard™ Antimicrobial Coating

- We have developed a non-toxic, antimicrobial coating that is 99+% effective against numerous pathogens, including COVID-19. Initial testing completed at Western University’s BSL-3 ImPaKT facility; 98% effective after 108 days
- Successfully tested against bacteria and fungi as well, with results demonstrating greater than 99.9% efficacy based on ISO standards. Provides for significant opportunity beyond COVID-19
- Can be utilized on PPE, filtration media (HVAC filters) and other materials such as paper, cardboard etc. as a preventative ‘catch-and-kill’ mechanism. *Global provisional patents filed*

### Target Market

<table>
<thead>
<tr>
<th>Target Market</th>
<th>Estimated Size</th>
<th>Where We Can Create Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Protective Equipment (PPE)</td>
<td>&gt; US $52.0B$1</td>
<td>• ZENGuard™ on masks, gloves and other PPE to protect front-line workers, the public and reduce spread of pathogens (including and beyond COVID-19)</td>
</tr>
<tr>
<td>Indoor Air Quality</td>
<td>&gt; US $66B$2</td>
<td>• ZENGuard™ on air filters to kill airborne pathogens in homes, schools, hospitals and commercial and industrial spaces</td>
</tr>
</tbody>
</table>

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$1$ Source: 2019 estimate per fortunebusinessinsights.com; over $90B in 2027

$2$ Source: 2020 global HVAC filter estimate of US $12.9B per fortunebusinessinsights.com; 2020 US furnace filter market estimated at US $21.3B per researchandmarkets.com. Management estimates US represents 40% of global furnace filter demand for illustrative purposes only
Testing & Approvals

- Confirmation from two independent testing organizations that our coating does not inhibit air flow rates
- Masks with ZENGuard™ successfully passed requirements as a level 1 Medical Device for ASTM Level 1, 2 and 3 – the highest level for surgical masks
- Third-party testing confirmed ZENGuard™ on masks did not lead to any skin irritation or sensitivity

Commercialization & Production

- Agreements with Trebor Rx for a first-year minimum of 100M masks/filters and a minimum of 100M nitrile gloves with ZENGuard™
- Significant interest from other potential partners for ZENGuard™ on PPE and air filtration products
- ZENGuard™ production capacity (coated mask equivalent):
  - June: ~32 million
  - November: ~800 million
- Engineering company (Bantrel) engaged to design and source equipment for production at industrial scale
Final approval of ZENGuard™–enhanced masks in Canada dependent on additional information requests from Health Canada

- Further data has been requested to reaffirm ZENGuard™’s well-established efficacy and safety profile; currently performing additional testing to support this, including bacterial and viral filtration efficiency

- Fully committed to working with Trebor and Health Canada to bring additional protection through our ‘catch-and-kill’ mechanism to those that need it most as quickly as possible
Assumptions:
• 1.5 trillion masks being used globally per year
• We believe steady state demand could be ~60% of current need or ~930 billion
• We assume gross margin per mask could range from $0.03 to $0.06

Other Considerations:
• Secular shift in societal approach to PPE expected to support global demand above pre-pandemic levels (hospitality, food, janitorial etc.)
• Governments seeking to build PPE reserves
• Increase in aging population globally means a higher number of higher-risk patients in the healthcare system and in public
• Emerging market usage represents significant growth opportunity

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Source: Estimate per ASC Publications “COVID-19 Pandemic Repercussions on the Use and Management of Plastics” (accessed Jan 2021)
Exam & Single-Use Glove Market Opportunity

Assumptions:
- 585 billion gloves are needed globally per year.\(^1\)
- We believe steady state demand could be ~75% of current need or ~439 billion
- We assume gross margin per glove ranging from $0.01 to $0.04

Other Considerations:
- Secular shift in societal approach to PPE expected to support global demand above pre-pandemic levels (hospitality, food, janitorial etc.)
- Governments seeking to build strategic PPE reserves
- Increase in aging population globally (higher number of higher-risk patients in healthcare system & in public)
- Emerging market usage represents huge growth opportunity (Asia is ~80% lower than North America today.\(^1\))

1 Source: Ansell Oct 27, 2020 Capital Markets Day presentation
Assumptions:
• Estimated 2020 air filtration market of US$66.3B¹
• Volume assumes average cost per filter of ~US$12

Other Considerations:
• Secular shift in approach to air quality and safety – especially for airborne viruses like COVID-19 – expected to support global demand above pre-pandemic levels (hospitals, schools, commercial, industrial, residential, air travel)


Actively exploring opportunities and partnerships to begin commercializing ZENGuard™ on air filtration media
We have developed a patent pending graphene-based compound with 99.9% effectiveness against SARS-CoV-2 and other harmful pathogens, including AMR organisms:

- Broad-spectrum compound 99.9% effective against viruses, bacteria and fungi – including four gram-positive and nine gram-negative bacteria with antimicrobial resistance
- Viricidal testing against SARS-CoV-2 completed at Western’s Biosafety Level 3 laboratory; antibacterial testing completed at McMaster University and Mount Sinai Hospital
- Testing revealed minimum inhibitory concentration < 1µg/ml to achieve 99.9% effectiveness
- Cytotoxicity results recorded no adverse effects on lab animals after seven days of repeated dosing at several thousands times higher than the MIC; no gross findings at necropsy
- Potential for upper/lower respiratory tract infections, digestive tract and topical for eyes, ears, foot care, wound care etc.
- Ingestion Good Laboratory Practice compliant safety study announced for treatment of C. Difficile and Vancomycin Resistant Enterococcus
- ZEN is actively exploring other options to balance commercialization opportunities for our compound, taking into consideration many factors, including the size of the opportunity, potential partners and anticipated timing

> US $100B

(Total global market estimate for antibiotics, antiviral drugs and antifungal drugs annually)

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1 Source: 2020 antibiotic technologies market per researchandmarkets.com (US$44M); 2019 antiviral market estimate per statista.com (US$52M); 2019 antifungal market estimate per bccresearch.com of US$148
Long-term vertical integration strategy focused on development of graphene production capacity, supply agreements and our 100% owned Albany Pure™ Graphite deposit.
We will leverage currently available capabilities – supplemented by third-party purchases – to meet near-term demand for ZENGuard™ while we invest in our own internal capacity and integrate our supply chain.

Longer term, our graphene oxide capacity gives us optionality to supply other end-use markets we don’t serve directly.
## Intellectual Property – Building Our IP Portfolio

### Developing partnerships and securing new IP in high-growth areas

<table>
<thead>
<tr>
<th>Growth Market</th>
<th>Graphene Enhancement Opportunity</th>
<th>Potential Benefits &amp; Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthcare &amp; PPE</strong></td>
<td>• ZENGuard™</td>
<td>• External protection from viruses, bacteria and fungi (PPE, air filtration, surfaces)</td>
</tr>
<tr>
<td></td>
<td>• Aptamer virus detection</td>
<td>• Rapid, ultra-sensitive, low-cost biosensor to detect antigens/antibodies</td>
</tr>
<tr>
<td></td>
<td>• Antimicrobial compound</td>
<td>• ZENGuard™ is a precursor for developing our potential medical breakthrough: a proprietary graphene-based compound with antibiotic, antiviral, and antifungal properties for therapeutic use in humans (topical, ingestion, intranasal)</td>
</tr>
<tr>
<td></td>
<td>• Graphene synthesis &amp; quantum dots</td>
<td>• Graphene production at scale to help de-risk supply chain</td>
</tr>
<tr>
<td></td>
<td>• Aluminum</td>
<td>• Enhanced strength and electrical conductivity for automotive industry</td>
</tr>
<tr>
<td><strong>Advanced Materials</strong></td>
<td>• Cement-based composites</td>
<td>• Enhanced strength and longevity for construction industry</td>
</tr>
<tr>
<td></td>
<td>• Polymers</td>
<td>• Enhanced strength, longevity and conductivity; versatile replacements for metallic electromagnetic shields</td>
</tr>
<tr>
<td></td>
<td>• Corrosion protective coating</td>
<td>• Reduce corrosion and enhanced longevity for steel</td>
</tr>
<tr>
<td><strong>Clean Technology</strong></td>
<td>• Aerogel and Li-ion batteries; graphene-wrapped silicon anode</td>
<td>• Lower-cost, reduced weight, higher performance and capacity energy storage applications</td>
</tr>
<tr>
<td></td>
<td>• Dehumidification membranes</td>
<td>• Remove humidity with significant reduction in energy (air conditioning)</td>
</tr>
</tbody>
</table>

### Academia

- University of Ottawa
- McMaster University
- University of Guelph
- University of Toronto
- University of British Columbia
- University of Waterloo

### Government

- NSERC
- Defence
- National
- Analog Devices
- Next Generation Manufacturing Canada
- Ontario

### Corporate

- TREBOR
- DLR
- Mitacs
- NAVY
- Marine
- Orion
- Oceana
- Defence
- National
- Analog Devices
- Next Generation Manufacturing Canada
- Ontario
Next-Gen Nanomaterials - Catalysts

2021
- Health Canada review process
- Commercialization of ZENGuard™ coating for the PPE markets (masks & gloves)
- Commercialization of ZENGuard™ coating for the Indoor Air Quality market
- Milestones related to our potential medical breakthrough antimicrobial therapeutic
- Continuing to develop high-impact graphene applications and building our IP portfolio

2022+
- Progressing our proprietary potential medical breakthrough antimicrobial Therapeutic
- De-risking supply chain by securing graphite and production for our antimicrobial compound. Continuing the permitting and environmental baseline process at our Albany graphite deposit and exploring strategic options
- Continuing to develop high-impact graphene applications and building our IP portfolio
ZEN ROI Strategy

- **Returns** from monetizing current market opportunities (*ZENGuard™*) for PPE and indoor air quality applications
- **Optimizing** supply chain near term; full vertical integration longer term
- **Intellectual Property** development with substantial scale and upside optionality

**ZEN ROI Strategy**

- **Next-Gen Nanomaterials**
  - Expect H2 *revenue and cash flow generation* from *ZENGuard™* for PPE and indoor air quality applications
  - Graphene oxide and *ZENGuard™* production build out progressing; evaluating options for Albany development
  - **IP – Substantial upside and optionality** from intellectual property development in the high-growth areas of health, advanced materials and clean tech
This presentation contains "forward-looking information" within the meaning of applicable Canadian securities legislation and United States federal securities laws. Forward-looking statements include, but are not limited to, estimates and statements with respect to ZEN Graphene Solutions Inc. future exploration and development plans, objectives or goals, to the effect that ZEN Graphene Solutions Inc. or management expects a stated condition or result to occur, including the PEA, expected timing for release of sample analyses and a resource estimate, the expected uses for graphite or graphene in the future, and the future uses of the graphite from ZEN Graphene Solutions Inc. Albany deposit, the adequacy of ZEN Graphene Solutions Inc. financial resources, business plans and strategy, and other events or conditions that may occur in the future. Generally, forward-looking information can be identified by the use of forward-looking terminology such as "potential", "plans", "expects", or "does not expect", "is expected", "budget", "scheduled", "estimates", "forecasts", "intends", "anticipates", or "does not anticipate", or "believes" or variations of such words and phrases or state that certain actions, events or results "may", "could", "would", "might", or "will be taken", "occur", or "be achieved". These forward-looking statements are subject to a number of assumptions, risks and uncertainties, many of which are beyond our control, which could cause actual results to differ materially from such forward-looking statements. As such, undue reliance should not be placed on these forward-looking statements. The forward-looking statements in this presentation are made as of the date hereof and ZEN Graphene Solutions Inc. disclaims any intention or obligation to update or revise any forward-looking statements in this presentation as a result of new information or future events, except as may be required under applicable Canadian securities legislation or applicable US federal securities laws.
ZEN’s graphene precursor material is from a unique graphite resource located in Ontario

Unique Geology & Near Infrastructure

- Albany Graphite yields a significant advantage in the production of graphene products
- A very rare, large resource of igneous-hosted, fluid-derived microcrystalline graphite
- Easily accessible and located near infrastructure (railway, road, and ports)
- Albany Deposit is located on Constance Lake First Nation traditional lands. MOU signed in 2018 towards creating a Project Partnership Structure (PPS) to guide the deposit development. The PPS ensures shared governance, decision-making and support for community engagement.

Large Graphite Resource

- Total Indicated Cg Resource: 968k tonnes
- Total Inferred Cg Resource: 445k tonnes
- Base case after-tax NPV of $438 million (24% after tax IRR) (2015 PEA)
Newly constructed ~25,000 sq ft of B1 industrial zoning in Guelph, Ontario

3-year lease with 3-year option beginning February 1\textsuperscript{st}, 2021
• Graphite purification and graphene production
• Scaling up production capacity
• Graphene products available for R&D and commercial use
• R&D pipeline with interests in monomers, polymers, metal alloys, corrosion coatings, biosensors along with the production of graphene oxide and graphene quantum dots.
RAPID DETECTION

- Aptamer-assisted graphene oxide-based technology
- For a rapid virus & antibody/antigen detection test
- Ultrafast technology, 5 – 10 minutes
- Low cost, less than $5.00 per test
- Ultra-sensitive detection (<200 pM IgG/IgM)
Graphene-Enhanced Concrete

Work at University of Toronto
• Increased Compressive Strength by 39% with a low loading of 0.02% Graphene
• Increased Flexural Strength by 81% with a low loading of 0.02% Graphene Oxide

Work at Ben Gurion
• Faster curing time - from 28 to 8 days
• Use 25% less cement therefore reduce CO₂ by same amount
• Increased compressive strength by 34% and tensile strength by 62%

• Applications work on Albany tailings as a partial cement replacement and filler material for the concrete industry
• Currently seeking industrial partnerships focusing initially on large volume markets for graphene
Graphene-based corrosion protection coatings are being developed to protect against corrosion in ships’ hulls as well as equipment used in the construction, petrochemical and transport sectors. Testing shows improved wear resistance, extend engine life, increase fuel efficiency, and increased engine power in vehicles.

Preliminary results on the use of ZEN's Graphene in an epoxy corrosion-inhibiting coating for steel showed minimal corrosion (3% of surface) after 10 days when exposed to highly corrosive saline solution vs other samples.

ZEN has received a Mitacs Elevate grant to fund a two-year project studying graphene as a corrosion protective coating for steel.
Battery Development Collaborations

- Developed a graphene-wrapped silicon anode material with 1,600-1,800 mAh/g\(^1\) with > 90% capacity retention over 300 cycles compared to current graphite anode battery technology that has a capacity of ~370 mAh/g
- We are continuing to advance graphene and silicon anode technology while using the anode material as the basis for a potential novel solid-state battery

- Created a graphene aerogel composite anode material; preliminary results achieved a 2 wt.% loading of graphene and specific discharge capacity of 2,800 mAh/g and a discharge capacity of 1,300 mAh/g after 50 cycles at a current capacity of 186 mA/g
- Addition of 5% rGO to the Carbon Black anode material increased the capacity from 115 mAh/g to 488 mAh/g while a battery consisting of 100% rGO had a capacity of 840 mAh/g

✓ Current research collaborations have shown significant promise for graphene in future battery technology
✓ Our unique graphite deposit in Canada gives us optionality to this growing market as technology continues to evolve

\(^1\) Weight includes both the silicon and carbon
A BURGEONING INDUSTRY – MASSIVE GROWTH POTENTIAL

The 2019 Canaccord UK research report estimates worldwide graphene sales are likely to take off over the next few years reaching US$4.8B by 2030.

Graphene's commercial potential lies in its ability to enhance and improve existing materials at a very low load factor making it a viable solution in the cost/benefit calculation for commercial applications.

Markets in which graphene is already competing with other additives amount to more than US$150B in value.

Canaccord’s central case implies a Compound Annual Growth Rate (CAGR) of 45% in revenue over a decade 2030E from current levels.
Approximate offer prices for various product types (listed in USD per ton)

<table>
<thead>
<tr>
<th>TYPE OF GRAPHENE</th>
<th>PRICE PER TON*</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNP</td>
<td>$30,000</td>
</tr>
<tr>
<td>MLG</td>
<td>$40,000</td>
</tr>
<tr>
<td>FLG</td>
<td>$90,000</td>
</tr>
<tr>
<td>vFLG</td>
<td>$750,000</td>
</tr>
</tbody>
</table>

*These are base prices for these products. Parameters that could affect prices include flake size (lateral dimensions), degree of functionalization purity and structural (intrinsic) defects - it is not yet clear how the market values these qualities.

Source – The Graphene Council, March 2020
## Capital Structure

**TSXV:** ZEN  
**OTCQB:** ZENYF

<table>
<thead>
<tr>
<th>Shared Issued</th>
<th>88,263,390</th>
<th>Expiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warrants 435,378</td>
<td>@ $0.80</td>
<td>June 22, 2021</td>
</tr>
<tr>
<td>1,501,584</td>
<td>@ $0.50</td>
<td>December 9, 2021</td>
</tr>
<tr>
<td>1,482,253</td>
<td>@ $0.80</td>
<td>July 6, 2022</td>
</tr>
<tr>
<td>867,600</td>
<td>@ $3.00</td>
<td>April 8, 2023</td>
</tr>
<tr>
<td>Options 6,831,667</td>
<td>Avg. Weighted price: $1.13</td>
<td></td>
</tr>
<tr>
<td>Fully Diluted</td>
<td>99,381,872</td>
<td></td>
</tr>
</tbody>
</table>
Leadership – Officers/Directors

Greg Fenton, (Chief Executive Officer, Director): is a seasoned investment professional, with a Bay Street career spanning nearly 30 years. He has worked in various capacities with ever-increasing responsibility in both the Canadian banking and investment management sectors. Greg has been a partner in three investment management firms, heading the Risk Solutions Group at Scotiabank and leading Liability Driven Investment Group at National Bank Financial. Greg currently leads a company providing balance sheet optimization and investment services to Canadian and international corporations. His experience spans many disciplines: capital markets, investment management, actuarial, pension, insurance, accounting, tax and risk management.

Dr. Francis Dubé, O. D., B. Sc. (Director and Executive Chairman): completed a Bachelor of Science at Waterloo, and then obtained an Optometry degree at the Université de Montréal in 1997. Previously, as an entrepreneur, Dr. Dubé was a director and Co-founder of Cannacure Corp., a private cannabis company that he saw to a successful buyout of $40 million. As a result of his role with Cannacure, Dr. Dubé has gained significant experience in strategic planning, fundraising, and capital markets.

Brian Bosse, (Chief Financial Officer, Director): Brian has been a respected professional investor for nearly 30 years with corporate capital allocation policy being his key business specialty. Formerly Brian served Dundee Corporation’s Goodman & Company Investment Counsel as portfolio manager of the Goodman Bluespring Fund. He earned an honors degree from the Lazaridis School of Business and Economics in Waterloo Ontario plus the Chartered Financial Analyst designation. Brian joined ZEN Graphene Solutions in May 2018 as director and officer following a successful proxy battle.