Unlocking Opportunities
A handful of employees of a major Canadian mining and metals company decide to start their own company through a management buyout of certain assets. The buyout team includes the President and CEO of 5N Plus. The 5N Plus team initially uses the high purity processing equipment at its former site, but soon develops a new primary refining plant in Montreal, which houses its hydrometallurgical operations.

5N Plus expands its facilities and acquires new refining equipment that strengthens its leadership in the markets it serves.

Seizing opportunities for growth, 5N Plus begins construction of its first international manufacturing facility in Eisenhüttenstadt, Germany.

SN Plus becomes a publicly traded company listed on the Toronto Stock Exchange.

SN Plus announces the acquisition of MCP Group and becomes the leading producer of specialty metals and chemical products. MCP was founded in 1863 and has a venerable corporate lineage that includes a merger with Sidech and leadership in metals and chemicals around the world.

SN Plus announces the acquisition of the remaining 33.33% ownership interest in its subsidiary Sylarus Technologies, located in St. George, Utah, and changes its name to 5N Plus Semiconductors.

Entering a complementary value-add business, 5N Plus acquires a Canadian company with significant intellectual property and processes for the manufacture of micron-size solar and additive manufacturing powders used in electronics markets.

AS WE BROADEN OUR GLOBAL SUPPLY AND DISTRIBUTION CHANNELS FOR SPECIALTY METALS AND CHEMICALS, WE’RE BUILDING A NEW AND EXCITING VALUE PROPOSITION FOR OUR CUSTOMERS AND PARTNERS.
Get to know 5N Plus

The specialty metals and chemicals we supply are key components in countless consumer and industrial products. They go into making the digital devices we carry in our pockets, and into satellites circling the earth. Customers use our products to make thin-film solar panels, pharmaceuticals, LEDs (light emitting diodes) and a multitude of other items that are essential to our way of life.

Headquartered in Montreal, Canada, and with strategically located facilities around the world, 5N Plus is among the leading suppliers of specialty metals, alloys and related chemicals.

Beyond being a trusted supplier, we strive to be a business partner. This means:

• Deploying proprietary and proven technologies to meet the specifications customers demand
• Securing long-term sourcing contracts with primary producers so that customers can depend on us
• And offering value-added services such as cradle-to-cradle recycling and R&D partnerships

Increasingly, 5N Plus is an innovator that unlocks new opportunities—all in the service of enhancing our customers’ competitiveness. We invite you to learn more about 5N Plus, and about our commitment to our business partners.
Covering the entire value chain from mining concentrates to high-end products and services, our operational scope and technical expertise are broad and deep.
From the Americas to Europe and Asia, our geographic scope is just as broad

With multiple facilities on three continents, 5N Plus is strategically situated close to resources, suppliers and customers. Our growing Asian presence includes minor metal recovery facilities in Laos and Malaysia, a bismuth chemicals manufacturing facility and an ultra-high purity gallium processing facility in China, and a partnership in South Korea for gallium chemicals production. We’re a reliable link in any supply chain.
We have an extensive and growing products and services portfolio. But as we see it, our main business is discovering and unlocking opportunities for our customers. This makes 5N Plus the ideal partner for driving your growth, revenues and competitiveness.

We're an opportunities company

We're a technology company

With focused expertise in specialized metals and chemicals, 5N Plus has accumulated a solid portfolio of proven proprietary technologies. This expertise overlaps a broad array of processes, ranging from bismuth and tellurium refining to mining concentrates to producing metals and alloys of 99.99999% purity or more.

We can mobilize our integrated R&D resources and experts to unlock new opportunities for your business, or enter into joint R&D ventures that enhance processes, develop new products or accelerate their path to market.
In a highly competitive world with a low margin for error, we understand what’s most important to you. You want a partner who is dependable, stable and delivers on promises. 5N Plus is that partner, giving you the flexibility and commitment you need to stay ahead of the competition. Our team thrives on thinking outside the box of conventional solutions. We look for ways to help you connect the dots across continents and industries, academic disciplines and business sectors.

Products and technologies are essential to our business, of course. But it’s the people that make 5N Plus truly different. We employ some of the most dedicated, knowledgeable and commercially astute minds in the industry.

With their longstanding service, our key people know the global players, markets, technologies and issues that matter to you. This makes them ideally equipped to grasp your business’s complexity, challenges and opportunities. And, under your guidance, begin contributing immediately to your competitiveness.
5N Plus is the world’s leading producer of bismuth and bismuth chemicals, which are used in a broad range of applications.

Among the most notable:

**Consumer products**
Bismuth is the main ingredient in a wide range of pharmaceuticals for stomach and ulcer treatment. Most over-the-counter antacids contain bismuth, as do some antibiotic creams and cosmetics.

**Electronics**
Bismuth’s low conductivity makes it ideal for varistors, capacitors, lightning arrestors and ferrite powders.

**Optical glass**
With their need for small lenses that have a high refractive index, manufacturers of mobile phone and digital camera lenses make extensive use of bismuth oxide.

**Paints**
Bismuth is widely used to manufacture yellow paints.

We have the certifications to supply bismuth products to FDA and GMP standards. While our portfolio includes bismuth in a wide range of purities and forms, we can also tailor a product to your specifications.
Bismuth helps to get the lead out

As society gradually reduces its dependence on lead, which is harmful to human health and the environment, bismuth has emerged as the preferred substitute. Bismuth strongly resembles lead in most properties except toxicity.

Bismuth’s use has grown significantly since the European Union’s Restriction of Hazardous Substances Directive. The directive calls for the reduction of lead in electronics, as well as for food processing equipment and copper water pipes. Other jurisdictions are following suit.

BISMUTH IS USED IN MANY COSMETICS, PARTICULARLY THOSE WITH IRIDESCENT PROPERTIES.

ACTIVE PHARMACEUTICAL INGREDIENTS CONTAINING BISMUTH ARE PRODUCED AT OUR FACILITY IN LÜBECK, GERMANY FOR WORLDWIDE DISTRIBUTION.
Powering the solar industry

Solar power generation is growing in importance, and is increasingly viewed by nations, industries and consumers as a key component of a diversified, low-carbon energy mix.

In this sector, 5N Plus supplies many of the active semiconductor materials to makers of the leading thin-film solar power generating technologies. We’re the longstanding supplier of choice of cadmium telluride (CdTe) to CdTe thin-film cell manufacturers, and we also serve producers of copper indium gallium selenide (CIGS) solar cells with their constituent products. Indeed, gigawatts of solar panels incorporating 5N Plus products are already installed in utility-scale projects, generating green energy to consumers worldwide.

5N Plus is also a preferred supplier of germanium wafers for the production of ultra-high efficiency solar cells. These cells are key components in satellite power generation and concentrated photovoltaic systems. In critical applications like these, product quality and reliability are everything.

Tellurium

5N Plus high-purity tellurium is used in a wide range of applications. Our ability to recover and recycle valuable materials from manufacturing scrap, such as tellurium, adds significant value to our offering and our partnerships with customers.
5N Plus is the leading producer of high-purity tellurium metal and alloys. In addition to its use in solar power generation and radiation detectors, tellurium is essential to a range of industrial and metallurgical applications. In particular, it’s a key ingredient, along with bismuth, selenium and antimony, in thermoelectric components used for solid state cooling and heating. Typical applications include power generation, waste heat recovery, and climate-controlled car seats.

5N PLUS SUPPLIES CdTe AND CADMIUM ZINC TELLURIDE (CZT) TO MANUFACTURERS OF HIGH PERFORMANCE X-RAY AND GAMMA RAY DETECTORS USED IN MEDICAL AND SECURITY APPLICATIONS. ULTRA-PURE METALS OF UP TO 7N (99.99999%) PURITY ARE REQUIRED TO PRODUCE THESE SOLID-STATE DETECTORS.
Much of the digital world would be nearly inconceivable without the metals and chemicals 5N Plus supplies. From the low melting point alloys in electronic assembly circuits to high performance semiconductors in mobile devices to the transparent conductive layers in flat screen displays, we’re a key supplier to the electronics and digital industry.

5N Plus is among the world’s leading suppliers of gallium and gallium chemicals to the electronics industry. In particular, our gallium products play an essential role in the LED industry value chain. The LED market is experiencing spectacular growth, as the world phases out less efficient lighting technologies in favor of low power-consumption LEDs for applications ranging from home and automobile to street and industrial lighting.

MOBILE DEVICES COULD NOT FUNCTION WITHOUT GALLIUM.

With gallium metal and chemicals production on three continents, our offering integrates into most supply chains. We refine gallium metal up to 7N (99.99999%) purity and produce it in a range of physical formats.
5N Plus is a significant supplier of indium and indium chemicals. One of the largest uses of indium is in the fabrication of indium tin oxide (ITO), which is essential to making the transparent electrodes in liquid crystal displays (LCD) and in touch screen technologies. Indium is also used in electronic, solar, optical and metallurgical applications. Among the latter, it’s a constituent in many low melting-point alloys.

5N Plus supplies indium in a broad range of formats. Customers can choose pure metal formats up to 7N (99.99999%) as well as compounds, chemicals and low melting point alloys. The indium we supply is typically used in the electronics, solar cell and optics markets.
Adding value through innovation

5N PLUS SEMICONDUCTORS

Occupying an exclusive niche defined by stringent quality, purity and reliability, 5N Plus Semiconductors supplies mission-critical products to highly risk-averse customers. Indeed, we are the only space-qualified germanium substrate supplier to the United States’ National Security Space (NSS) customers. We’re also one of only two National Defense Stockpile (NDS) qualified germanium suppliers worldwide.

The majority of the division’s business is to grow germanium crystals for satellite power generation. However, its product portfolio is evolving. The Utah-based division also produces indium antimonide (InSb) and gallium antimonide (GaSb) substrates for high-sensitivity infrared detectors and thermal imaging cameras.

5N Plus Semiconductors has shown a proven commitment to R&D and product development, and will partner with customers to develop unique semiconductor material systems solutions.

5N PLUS SEMICONDUCTORS SUPPLIES POLISHED WAFERS TO THE AEROSPACE AND COMMUNICATIONS INDUSTRIES. THESE WAFERS ARE SLICED FROM HIGH-PURITY SINGLE CRYSTALS GROWN IN THE COMPANY’S PRODUCTION CENTRE IN ST. GEORGE, UTAH.
5N PLUS MICRO POWDERS
Over the past several years, we have invested significantly in developing a high performance atomizing technology to efficiently manufacture fine metallic powders—down to the 1-25 micron range. Today, we’ve established the new 5N Plus Micro Powders production facility in our Montreal headquarters and main R&D centre.

In recent years the demand for high-quality fine metal powders has surged in concert with electronic assembly miniaturization and the emergence of 3D manufacturing. In electronics, these micro powders are used chiefly for solder pastes and conductive adhesives in mobile device and automotive applications. And in the burgeoning 3D printer market, they’re the material for producing complex, highly detailed shapes. The unique 5N Plus Micro Powders technology allows for the preparation of powders with consistent shape, uniform size distribution and controlled purity, ideally suited to meet the challenges of these demanding markets.

MICRON-SIZED POWDERS ARE USED IN 3D PRINTERS TO PRODUCE COMPLEX SHAPES.

Germanium
We grow and supply germanium wafers to manufacturers of high-efficiency cells for terrestrial and space applications, as well as germanium lenses for the semiconductor and optics industries.
Industrial applications

The specialty metals and related chemicals we supply help to turn the wheels of industry around the world. Whether it’s in metallurgy, to increase the machinability of steel; in glass making, to achieve discoloration; in rubber manufacture, to catalyze the vulcanization process; or in car-making, where low melting point solders bond disparate materials, customers rely on 5N Plus products.

Low melting point alloys

5N Plus supplies an extensive array of low melting point alloys (LMPA) or fusible alloys typically made with bismuth, lead, tin, cadmium and indium. LMPAs are used in optics, radiation screening, fusible core technologies, and in architecture and construction. They’re also essential to the automotive industry, particularly for glass-to-glass, glass-to-ceramic and glass-to-metal solders.

5N Plus has inherited a vast experience in producing these products. This means we have the expertise and flexibility to produce LMPAs to customer specifications, or design LMPAs with the low melting point properties that precisely fit the customer’s needs.

Selenium

We provide selenium to manufacturers of zinc selenide (ZnSe)—a compound that is transparent under infrared light and is used to make lenses for CO₂ lasers. Selenium is also used in glass production, in metallurgy, and as an active ingredient in some novel thin-film solar cell technologies.

Our selenium products, which we supply in powder, granule, shot, alloy and other formats, is essential to a range of customers, including manufacturers of CO₂ lasers and thin-film solar cells.
Primary sourcing

When you partner with 5N Plus, you’re also entering into longstanding partnerships with some of the world’s largest primary producers. These partnerships are, in fact, one of our biggest assets. For customers, they mean a stable supply from conflict-free parts of the world and assured quality, so you can make business decisions with confidence.

With our extensive know-how in metallurgical processes, we work hand-in-hand with primary smelting operations worldwide, helping them to unlock the full potential of their mining concentrates and by-products. Together, we broaden the opportunities for profitable minor metals refining, thus generating sustainable value for both our supply partners and our customers.
Recycling is good business

In today’s world, recycling is hardly an option. It’s a business necessity that reduces costs, shrinks your environmental footprint and strengthens corporate social responsibility. With stakeholders and governments increasingly demanding information about sustainable operations, good recycling practices can help to drive new business.

As a matter of policy and good business, 5N Plus takes an integrated, lifecycle approach to materials management and recycling. We are fully certified, with robust environmental, health and safety systems.

Over the years, we have developed significant expertise and unique technologies in the recovery, treatment and valuation of secondary materials, by-products, and scraps. These capabilities enable us to transform a potential liability into a supply or revenue stream. In the end, everyone wins—including the environment.

5N PLUS HAS RECYCLING PLANTS IN THREE CONTINENTS:
- EISENHÜTTENSTADT, GERMANY
- KULIM, MALAYSIA
- MONTREAL, CANADA
- VIENTIANE, LAOS
Antimony
Bismuth
Bismuth Beta Resorcylate
Bismuth Citrate
Bismuth Hydroxide
Bismuth Nitrate Solution
Bismuth Oxide
Bismuth Oxychloride
Bismuth Sodium Tartrate
Bismuth Subcarbonate
Bismuth Subcitrate
Bismuth Subgallate
Bismuth Subnitrate
Bismuth Subsalicylate
Bismuth Subsuccinylate
Cadmium
Bismuth Citrate
Bismuth Hydroxide
Bismuth Nitrate Solution
Bismuth Oxide
Bismuth Oxychloride
Bismuth Sodium Tartrate
Bismuth Subcarbonate
Bismuth Subcitrate
Bismuth Subgallate
Bismuth Subnitrate
Bismuth Subsalicylate
Bismuth Subsuccinylate
Cadmium Sulfide
Cadmium Telluride
Cadmium Zinc Telluride
Cobalt Nitrate
Cobalt Oxide
Gallium
Gallium Antimonide
Gallium Nitrate
Gallium Oxide
Gallium Trichloride
Germanium
Germanium Dioxide
Indium
Indium Antimonide
Indium Nitrate
Indium Oxide
Indium Sulfate
Indium Trichloride
Lead Chloride
Lead Nitrate
Lithium Sulfide
Low Melting Point Alloys
Nickel Nitrate
Selenium
Sodium Selenite
Tellurium
Tellurium Dioxide
Tin
Zinc
Zinc Selenite
Zinc Telluride

A partial list of our specialty products
To learn more about 5N Plus and the kind of opportunities we can unlock for your business, visit us at 5NPlus.com

Or better yet, contact us directly at sales@5NPlus.com