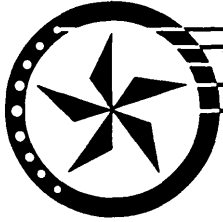


Tulameen
889003



BRIGHT STAR VENTURES

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Toll Free# 800 884-3864

News Release
Symbol: BSV.V

August 16, 2001

Platinum-Palladium Exploration Program Commences Tulameen, British Columbia

Bright Star Ventures Ltd (the "Company") is pleased to announce the commencement of a Phase 1 exploration program on the Company's Platinum Group Element ("PGE") claims in the Tulameen area, 14 km northwest of Princeton, B.C. The claims, accessible by an extensive network of newly developed logging roads, encompass the headwaters of several streams wherein over 20,000 ounces of PGE were recovered, many in rough nuggets with host rock still attached.

The Phase 1 program comprises a detailed field study of known mineral occurrences on the claims consisting of geological mapping, extensive stream sediment sampling, and prospecting/sampling of newly discovered mineral occurrences. The Phase 1 program's primary objective is to strategize a line cutting, EM-Mag-VLF program to be conducted in September to establish targets for a fall drilling program. A secondary objective is to locate new PGE discoveries in the area, which is the source of 20,000 ounces of Platinum nuggets recovered from the Tulameen river and tributary streams. The key areas of focus will be coarsely disseminated chromite-enriched zones in dunite, which the BC Ministry of Mines and Energy identified as hosting PGE mineralization with the potential for commercial exploitation.

The Company has retained TR Prospecting Ltd., which is fielding a five-man team led by Bill Yeomans with the assistance of Dr. Tom Richards, Ph.D., Geologist, Dr. Mikkel Schau, Ph.D. Geologist, and two prospectors with substantial experience in the area. Both Drs. Richards and Schau have more than 30 years of extensive geological experience with specialization in PGE deposits. Drs. Richards and Schau have agreed to serve on the Company's advisory board, along with Dr. Bruce Perry, Ph.D., Geologist.

Dr. Richards, Ph.D., Geologist, has written and lectured extensively on the geological models of various mining regions in B.C. Dr. Richards has prepared a detailed analysis of various models for the different Platinum (Pt) and Palladium (Pd) occurrences in the Tulameen area. His analysis concluded that there could be several different models in which both Pt and Pd have occurred in this area.

Dr. Schau, Ph.D., Geologist has worked with PGE mineralization in BC and has specialized in PGE deposits based on his extensive geological experience with mafic intrusions and extrusions as well as PGE chemistry and ore deposits. His recent projects and work experiences have included working on PGE mineralization in Nunavut and the PGE-rich mafic suites of the Raglan Region in Nunavik.

The Company expects the current exploration program will be completed before the end of August 2001 with results expected in early September. Based on the results of the current program, the Company will file Notice of Work this September for a more detailed exploration program, including drilling of specific targets in the next 60 days pending receipt of the required permitting.

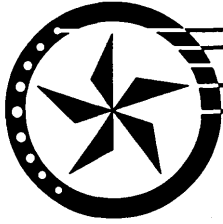
For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

"Reg Handford"

Director

The Canadian Venture Exchange has not reviewed and does not accept responsibility for the adequacy or accuracy of the content of this press release.



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News Release
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August 9, 2001

Acquisition of Hop Claims on Lodestone Mountain, BC And Appointment of New Director

Bright Star Ventures Ltd (the "Company") is pleased to announce that it has entered into an option agreement to acquire 10 units, (the "Hop Claims"), located near the headways of the southern tributary of Blackburn Creek, approximately 2.7 kilometers east-southeast of the summit of Lodestone Mountain, and 21 kilometers due west of Princeton BC. The underlying geology of the claims are hosted in syenodiorite, syenite, and syenogabbro/gabbro of the Early Jurassic Tulameen Ultramafic Complex, (TUC), proximal to the eastern contact with metavolcanic rocks of the Upper Triassic Nicola Group.

Previous exploration programs have confirmed sporadic copper mineralization exposed in an outcrop over a length of 35 meters. The strongest mineralization occurs in the northern part of the showing, emplaced along a structurally controlled set of conjugate fractures, striking 128 and 210 degrees. The fractures are filled with chalcopyrite and bornite, with or without quartz, over widths of up to 5 millimeters. Disseminated pyrite occurs throughout the host rock. A high-grade chalcopyrite stringer assayed 23.0 grams gold per ton, 89.5 grams silver per ton and 7.49% copper. The property has the potential for a porphyry copper and gold deposit. The Company will issue 5,000 common shares for this acquisition with a further payment of \$20,000 on or before August 1, 2005.

The Company is also pleased to announce the appointment of Mr. Reginald Clarke Handford as a director. Mr. Handford has 17 years experience as a broker and securities analyst in Vancouver, Canada. Mr. Handford holds a Master of Science Degree from Simon Fraser University. Currently Mr. Handford is a consultant to public, private and governmental agencies.

The Board also wishes to announce the resignation of Mr. Jesse Chan as a director and president of the company and wish to thank Mr. Chan for his valuable contributions during the past several years. The Board of directors will be meeting shortly to elect a new president.

Bright Star Ventures plans to conduct an exploration program for platinum group metals during the 2001 field season. For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

"Kenneth Y. Lee"

Director

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News Release
Symbol: BSV.V

September 18, 2001

BRIGHT STAR IDENTIFIES NUMEROUS NEW MINERAL OCCURENCES IN TULAMEEN EXPLORATION PROGRAM

Management of Bright Star Ventures Ltd (CNDX – “BSV”) is pleased to announce that results from a recently completed sampling/exploration program have been received and compiled, resulting in the discovery of **numerous new significant zones of mineralization** on Bright Star’s properties located in the Tulameen region of B.C.

Each zone below is indicated by multiple samples of consistent rock type and assay values.

BJP-1 Zone. Four samples, described as chalcopyrite veinlets in epidiorite, assaying from 0.2% to 0.8% copper.

Valley Zone. Five samples, described as pyritized pyroxenite altering to hornblende, assaying up to 0.40-g/t palladium, 0.51-g/t platinum, and 2.0% copper.

Amy-2 Zone. Five samples, described as sheared chlorite-altered epidiorite with chalcopyrite, assaying up to **2.29 g/t gold, 0.32 g/t palladium, with highly anomalous copper values up to 3.0%.**

Hines Creek Zone. Two samples, described as a polymetallic central shear vein system, assaying up to 0.45-g/t gold, 0.26-g/t palladium, and 0.7% copper.

Numerous other discrete samples collected returned elevated gold, platinum-palladium, and copper values.

In addition to the new occurrences, BSV controls the Grasshopper Claims, where previous work identified **five zones of chromium-platinum** mineralization where **values consistently range from 1.15 g/t to 2.92 g/t platinum**, with isolated occurrences up to 16-g/t platinum and 20% chromium. A small sampling program on the Grasshopper Claims returned assays up to **1.35 g/t platinum**, consistent with historical values.

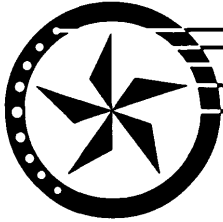
Bright Star’s geological team is of the opinion that the mineral occurrences on the Tulameen properties contain significant values and warrant more detailed evaluation with a geophysical, geochemical, prospecting/mapping program in order to delineate drill targets. For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

“Reg Handford”

Director

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News Release
Symbol: BSV.V

August 27, 2001

Bright Star Acquires Tulameen Platinum Property with Recorded Values up to 16.0 g/t Platinum

Bright Star Ventures Ltd ("Bright Star") announces it has entered into an option agreement to acquire a 100% interest, subject to a 2% net smelter return, in the 36-unit Grasshopper Platinum Claims, located in close proximity to platinum properties recently acquired by the Company in the Tulameen River region, northwest of Princeton, B.C.

The Grasshopper Claims are platinum-chromite prospects along the southwest flank of Grasshopper Mountain. The claims are located in a 5.5 km by 2.5 km area underlain by dunite and peridotite of the Early Jurassic Tulameen Ultramafic Complex, a zoned Alaskan-type intrusive complex. The dunite-rich core of the complex extends south-southeast from Grasshopper Mountain for 5 kilometres to Olivine Mountain claim group and is successively fringed by zones of clinopyroxenite and gabbro.

Previous exploration programs on these claims have confirmed platinum-bearing chromite found in a northwest-trending zone, 800 metres long and up to 300 metre wide. Chip samples yielded elevated platinum values in five larger outcrops (Zones A, B, C, D, and E) and numerous smaller occurrences within this zone. The highest platinum values were in vicinity of zones C and D, which assayed up to 16.0 grams per tonne platinum over 1.8 metres. In 1986, drilling on these claims by Newmont Exploration of Canada Ltd. intercepted values of 9.26 g/t platinum over 3.05 metres.

Bright Star has the right to earn a 100% interest in the Grasshopper Claims by paying \$40,000 in cash and \$200,000 in exploration expenditures over the next two years, by issuing 300,000 common shares of the capital stock of the Company and maintaining \$25,000 in annual property payments starting in the third year with a single \$400,000 payment due on August 1, 2006.

Bright Star's Tulameen properties are accessible by an extensive network of newly developed logging roads and encompass the headwaters of several streams where over 20,000 recorded ounces of platinum nuggets, some with host rock still attached, have been recovered.

Bright Star has recently completed Phase I exploration programs, which included sampling of the Newmont drill target areas as well as sampling of new prospects on the Grasshopper Platinum Claims, and prospecting/sampling of the Olivine Mountain, Lodestone Mountain, and Hop Claims. Results, including assays, are expected in mid-September 2001.

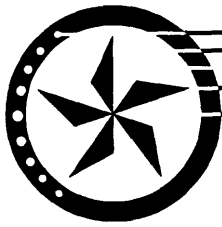
For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

"Reg Handford"

Director

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News Release

October 16, 2001

Symbol: BSV.V

AIRBORNE EM-MAGNETIC SURVEYS ON BRIGHT STAR VENTURES' PLATINUM PROJECT IN TULAMEEN B.C.

Bright Star Ventures (BSV-CDNX) is pleased to announce the commissioning of airborne EM-Magnetic surveys on the Company's PGM and base metal mineral properties in the Tulameen River area located in the southern part of British Columbia.

Survey Details

FUGRO Airborne Surveys has been contracted to complete 340 kilometres of aerial surveys, which is planned to cover all of Bright Star's properties encompassing the Tulameen Ultramafic Complex. Flight lines will be flown at line spacings of 300 metre intervals, while mineralized areas will be flown with a line spacing of 150 metre intervals. Final analysis of the data will be completed within a 2 to 3 week period.

Co-ordinated Exploration Strategy

Bill Yeomans, Field Manager, will be on site with the geophysical crews to discuss new exploration target areas identified with the Em-Magnetic survey and initiate a follow-up prospecting program of the new target areas during the month of October. This aggressive approach is expected to result in the rapid development of Bright Star's Platinum Group and Base Metal prospects.

Tulameen Area Background

Bright Star Ventures has acquired a substantial land package near the Tulameen River northwest of Princeton B.C. The area has a long history of placer gold and platinum production, and some limited modern exploration, including a 1986 drill program with results of 3 metres grading 9.26 g/t Platinum. Much of the property was heavily forested until very recent active logging created new roads and exposed mineralized outcrops, making the properties more accessible and providing important new understanding of the regional geology. The northern end of Bright Star's contiguous claim groups is located only 17 kilometres from the Coquihalla Highway, thus enabling cost-effective exploration programs.

Recent Bright Star Exploration

During the summer of 2001, Bright Star undertook a prospecting/sampling exploration program that resulted in the discovery of numerous new significant zones of mineralization.

During the summer of 2001, Bright Star undertook a prospecting/sampling exploration program that resulted in the discovery of numerous new significant zones of mineralization.

BJP-1 Zone is a copper occurrence with values ranging from 0.2% to 0.8% copper.

The Valley Zone was a Platinum Group Metal-Copper discovery, with preliminary grab samples assaying 0.40-g/t palladium, 0.51-g/t platinum, and 2% copper. This is a magmatic, net-textured sulfide occurrence in syenogabbro.

The Amy-2 Zone is a highly significant mineral occurrence with values of 2.29 g/t gold, 0.32 g/t palladium, and up to 3% copper obtained from preliminary grab samples.

The Hines Creek Zone samples assayed 0.45 g/t gold, 0.26 g/t palladium, and 0.7% copper.

Grasshopper Mountain Claims

The summer 2001 program did not focus on the recently acquired Grasshopper Mountain claims. The extensive data base, developed largely by Newmont Exploration in the 1980's, indicates values up to 16 g/t platinum over 1.8 metres on surface, and up to 9.26 g/t platinum over 3.05 metres from drilling. These are highly significant results, and the airborne EM-Mag survey now under way will aid in determining the extent of these high-grade mineralized zones.

Summary

To date Bright Star Ventures has identified four different styles of PGE mineralization in discrete zones throughout the Tulameen complex, including magmatic, net-textured copper-sulfide mineralization with Pt-Pd in syenogabbro, a Pt-Cr mineralized system in the dunite core (previously explored by Newmont), a disseminated Cu-Au-Pd mineralized system in diorites and coarse grained mafic intrusive rocks, and PGE mineralization associated with magmatic Fe and Ti oxides hosted in hornblende clinopyroxenites. These four different styles of PGE mineralization are indicative of the excellent potential for the Tulameen properties to host one or more bulk tonnage and/or high-grade polymetallic mineral discoveries.

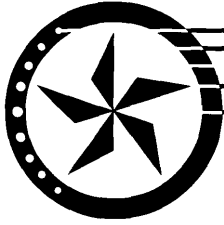
The current Fugro helicopter-supported EM-Magnetic survey and follow-up prospecting program will greatly enhance Bright Star's ability to develop these highly prospective exploration targets and generate information on new areas of interest throughout the entire property. It is anticipated that multiple drill targets will be generated upon completion of the next phase of exploration on the properties. For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

"Reg Handford"

President & Director

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News Release
Symbol: BSV.V

October 30, 2001

**BRIGHT STAR VENTURES LTD
COMPLETES AIRBORNE EM/MAG SURVEYS
AND SIGNS MEDIA RELATIONS AGREEMENT**

Management of Bright Star Ventures Ltd (BSV-CDNX) is pleased to announce the completion of airborne EM/Mag surveys on its contiguous, +9,000-acre land package in the Tulameen region of B.C. The properties cover a large portion of the northern section of the Tulameen Ultramafic Complex, a formation similar to those, which host most of the worlds' Platinum Group Metal deposits. The Tulameen River and tributaries have recorded production of over 20,000 oz of placer platinum, mostly from streams draining from the Bright Star properties.

In August 2001, Bright Star conducted a prospecting/sampling program to evaluate areas of the Tulameen properties, which had little to no previous exploration history. This program resulted in the discovery of several widely spaced, significantly mineralized zones with strong copper values (from 0.7% to 3%) and Platinum Group Metal values (ranging from 0.5 g/t platinum & 0.4 g/t palladium to 2.3 g/t gold & 0.32 g/t palladium). As well, previous work by Newmont Exploration on the Grasshopper Mountain portion of Bright Star's properties identified a dunite core of the Tulameen Ultramafic Complex, which returned values up to 16-g/t platinum from surface sampling.

The airborne EM/Mag survey will lead to a better understanding of the geology of the complex as well as to the identification of major structures and how they relate to the wide variety of PGM mineralized systems present in the complex. The new interpretation should also lead to the identification of new target areas for the 2002 field season. A total of 320 line kilometers of EM/Mag were flown, at line spacings of 300 metre intervals over reconnaissance areas, and 150-metre line spacings over areas of known mineralization. An interpretation of the EM/Mag survey results should be made available to the company within 2-3 weeks.

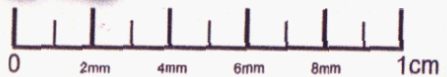
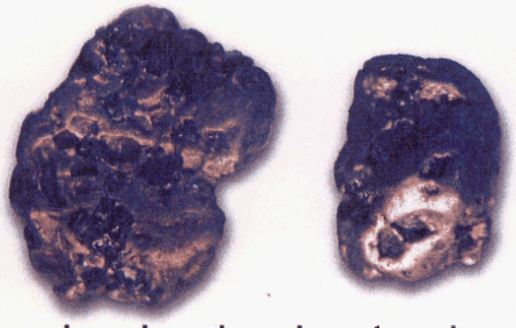
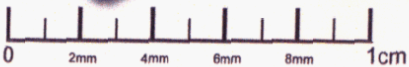
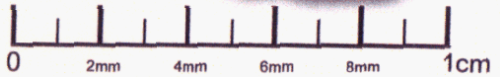
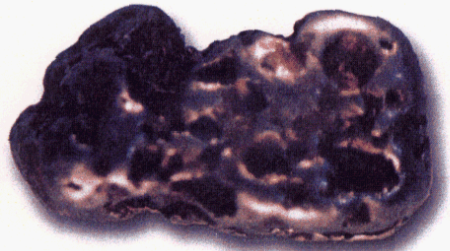
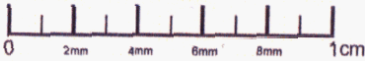
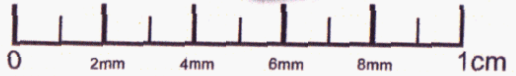
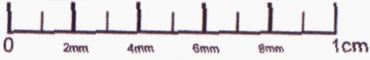
Bright Star Ventures announces that it has engaged National Media Associates of La Canada, California to provide media and financial relations. Terms of the engagement include a fee of \$2,500 per month for a six-month period. For more information, visit our website at www.brightstar-ventures.com.

On behalf of the Board

"Reg Handford"

President & Director

The Canadian Venture Exchange has not reviewed and does not accept responsibility for the adequacy or accuracy of the Press Release.



Platinum Nuggets recovered from various rivers and creeks in the Tulameen, B.C. area



BRIGHT STAR VENTURES

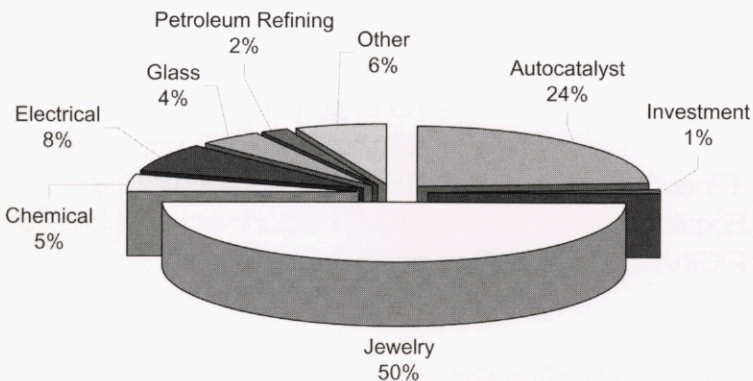
A Bright Future in Platinum & Palladium Exploration

Platinum Group Metals

Precious Metals of the New Millennium

Platinum Group Metals ("PGM"s) are generally defined as platinum, palladium, and rhodium. Much stronger and more durable than gold, these most scarce of precious metals possess unique qualities which are increasingly important to many processes and products in our high-technology world. Growing PGM applications include automobile catalytic converters, petroleum, chemical refining, computer hard drives, coatings and even dentistry and medicine.

2000 Platinum Demand by Application



As well as a multitude of industrial uses, the platinum market is supported by a strong jewelry demand. (source: Johnson Mathey - Platinum 2000).

As global demand increases at a rate averaging 5% annually, PGM supply lags behind. 85% of the world's PGMs are produced in Russia and South Africa, where social unrest and political uncertainty create growing concerns over supply disruptions. North American PGM production is currently a distant third place.

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**North American PGM discoveries
will receive strong market interest.**

Bright Star's Opportunity

Bright Star Ventures is a public company (BSV-CDNX) which has identified the need for new PGM production and acquired a large land package in one of the few areas of North America with **strong prospects for a PGM discovery - the Tulameen area of British Columbia.**

**620,000 grams of Platinum were
recovered from rivers and creeks
in the Tulameen Region**



Tulameen Platinum & Palladium Projects

Tulameen Location

Bright Star's properties are located in the Cascade Mountains of southwestern British Columbia, approximately 26 kilometres northwest of the town of Princeton. Access is via 24 kilometres of paved road from Princeton to the village of Tulameen, and then branching off on all season logging roads. The local logistics are excellent, as active logging is opening areas inaccessible less than ten years ago.

A three hour drive from Vancouver; the Tulameen area has produced PGM metals from placer deposits in rivers and creeks since the 1880's. Many of the early miners found an unfamiliar white metal in their gold pans - platinum nuggets! At the turn of the century, the Tulameen was North America's leading platinum producer. Recovered platinum nuggets were typically rough, coarse, and often still attached to host rocks. These are strong indications of a local lode source.

Tulameen Regional Geology

The Tulameen Ultramafic Complex, covering an area of 64 square kilometers, is classified as an Alaskan-type ultramafic complex and as such is a prime potential host for exploitable deposits of Platinum Group Metals. The gabbro of the Complex appears to be most conducive to PGM mineralization along its contact with a hornblende olivine clinopyroxenite (the Nicola Group volcanics) and most of Bright Star's properties were selected with this contact-zone model in mind.

Bright Star has acquired the right to earn a majority interest in several key Tulameen properties which encompass the headwaters of the platinum-producing rivers and streams. BSV currently controls over 9,000 acres of the Tulameen Ultramafic Complex. Almost all PGM production world-wide originates from ultramafic rocks, which also have excellent base-metal (copper, nickel) potential.

BJP Project - 3,200 acres

Lode Stone Mountain

- Staked by a PhD geologist who authored his graduate thesis on Platinum Group Metal potential in the Tulameen District.
- Four VLF-EM conductors defined to date, in association with strong PGM-base metal soil anomalies. Two conductors greater than 1 km long.
- 1 km wide ovoid precious-and-base metal anomaly - favourable porphyry target similar to profitable past-producing copper/gold mines in the area.
- Drill targets already identified on several of these BJP Project anomalies.

Grasshopper Project - 1,400 acres

Grasshopper Mountain

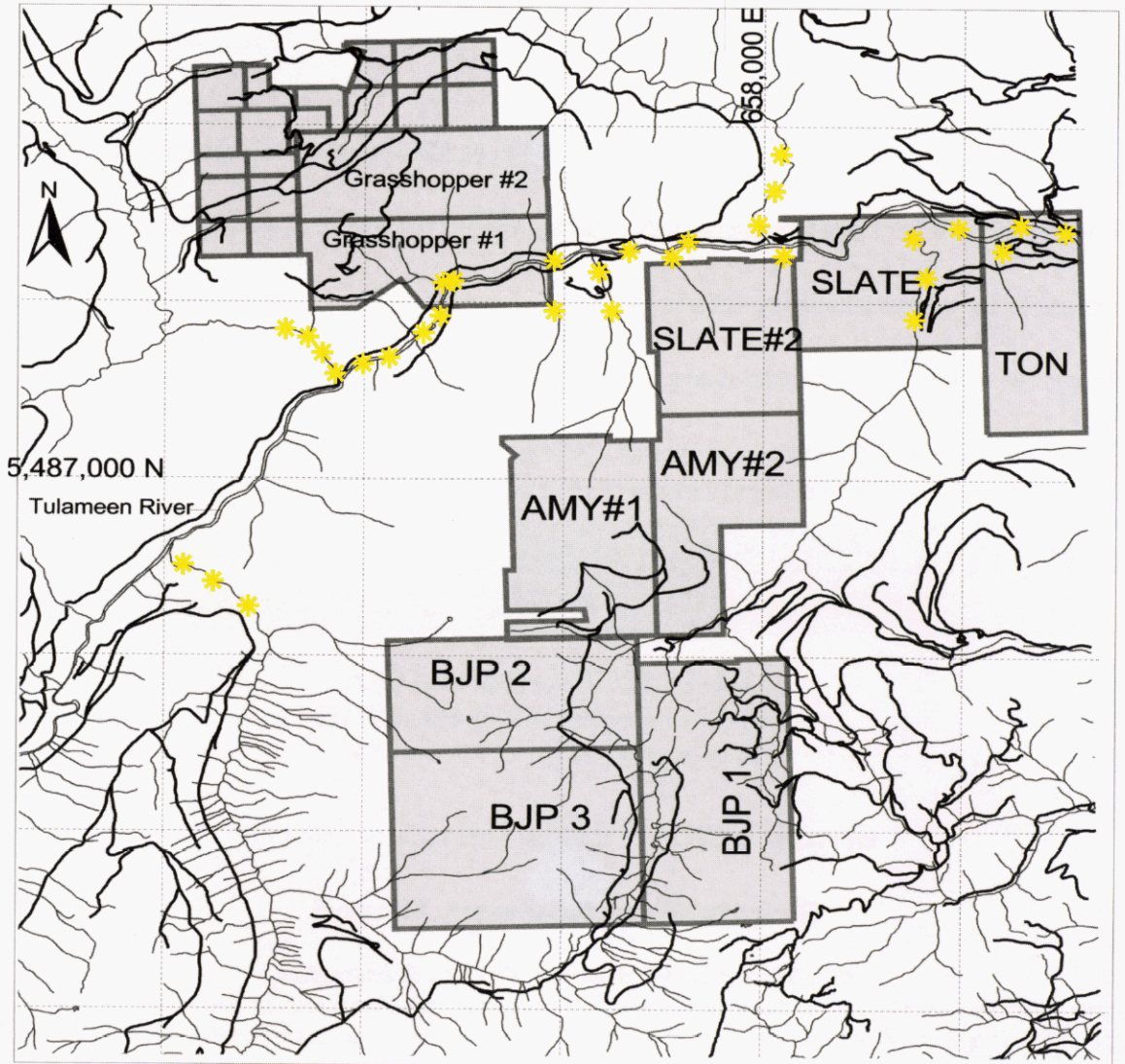
- Five large outcrops discovered with significant PGM values.
- Platinum-bearing chromite zone 800m by 300m
- Channel samples - 7.8 g/t Platinum, 20.0% Chromium (3 metres)
-15.0 g/t Platinum, 5.6% Chromium (2 metres)
- Previous drilling (in 1986) by Newmont Exploration Canada Ltd returned 9.26 g/t PGM over 3.05 metres.

Golden Spike Project - 4,400 acres

Olivine Mountain

- Central core of the Tulameen Ultramafic Complex.
- Never explored with modern geological tools and techniques.
- Prospecting returned highly anomalous PGM values from microscopic PGM minerals such as tulameenite and sperrylite found in chromitiferous dunite (B.C. Ministry of Energy and Mines).

Bright Star Ventures Ltd. Claim Map



LEGEND

-  NAD 83
-  Rivers and Creeks
-  Roads
-  Claims - Bright Star Ventures Ltd.
-  Placer Platinum

Exploration Plans

Phase One August 2001

- Detailed study of known mineralization
- Geological mapping, sediment sampling
- Prospecting and sampling of new mineralization

Phase Two September 2001

- Line cutting, EM-Mag-VLF surveys
- Establish and refine drilling targets

Phase Three October/November 2001

- + 5000 ft drill program
- Assess results for expanded 2002 programs

Summary

Bright Star Ventures (BSV-CDNX) - Positioned to Provide Opportunity.

- Significant properties with a well-documented history of placer platinum and gold production.
- Largest landholdings in Tulameen area, with additional acquisitions in negotiation.
- Ongoing exploration programs (sampling, trenching, EM-Mag surveys).
- Several drill targets already identified.
- Drill programs on prioritized targets slated for Fall, 2001.
- Small active float - 1.2 million shares. 75% of issued/outstanding shares (total approximately 8 million) under control of management and associates.

DEDICATED TO BUILDING A SUCCESSFUL MINING EXPLORATION AND DEVELOPMENT COMPANY.

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email: ir@brightstarventures.com

Bright Star Advisory Board

Dr. Thomas Richards, Ph.D., Geologist

Dr. Richards has written and lectured extensively on the geological models of various mining regions in B.C., including authoring a detailed analysis of platinum and palladium occurrences in the Tulameen area.

Dr. Mikkel Schau, Ph.D., Geologist

Dr. Schau specializes in PGE mineralization. His extensive experience includes recent work on PGE-bearing intrusives in Canada's Arctic regions and in B.C.

Dr. Bruce Perry, Ph.D., Geologist

Dr. Perry based his graduate thesis on PGE mineralization in the Tulameen area. His work experience has included positions as Mine Manager of large copper-gold mines in the B.C. Interior.

Legal Counsel
Werbes and Sasges

Investor Relations
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Register at:

www.brightstar-ventures.com

to ensure you receive all press releases and updates, and you'll automatically be entered into our draw for a Platinum Eagle Coin [valued at approximately \$600.00]

PGM Substitution in Auto Catalysts

Palladium prices have risen from around \$120 per ounce in early 1997 to more than \$1,100 recently. Platinum prices have risen from around \$350 in 1999 to \$640 in early January 2001. Rhodium prices went from \$1,200 in 1989 to \$7,000, briefly, in 1990, only to fall to record lows around \$175 in 1997 and then recover to around \$2,200 at present.

These markets are going through a tremendous period of upheaval. There is much confusion in the markets as to why prices are so volatile, and what the future holds for these metals.

Part of the confusion relates to the on-going use of all three metals in catalytic converters used to reduce harmful emissions from automotive exhaust, and what future trends in the use of these metals may bring. Strong demand for all three metals, including from the auto industry, has been a factor in pushing prices higher. The higher prices now are stimulating changes in the ways auto companies use these three metals.

This briefing paper is intended to try to provide some background to assist market participants in understanding this issue. It is critical to the platinum, palladium, and rhodium markets.

At present there is an acceleration of a shift away from such heavy dependence on palladium to more use of platinum and rhodium in catalysts. This reverses a trend that started in the early 1990s, when auto companies started using more palladium and reducing their per-vehicle use of platinum and rhodium. In fact, the shift away from palladium began at some automakers in 1997 and 1998. It has accelerated in the past year, as palladium prices, supply, and overall market conditions have deteriorated sharply.

The shift back toward platinum away from palladium is expected to continue over the next few years.

In fact, this shift is one of the major factors that has

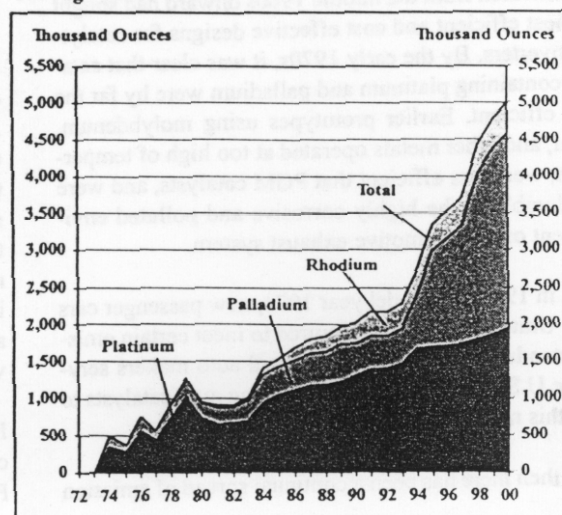
helped pull platinum prices higher over the past 15 months. As auto catalysts have shifted from palladium to platinum, it has increased demand for platinum. **This shift also is one of the factors that suggest that platinum prices will remain higher than many market observers expect in the future.** With platinum prices lower than palladium prices, even at recent levels or higher, platinum once more is the preferred metal in this and other industrial applications where the two metals can be substituted.

At least three points should be made about these shifts back and forth among the platinum group metals.

First, almost all of the substitution is within the PGM complex of metals. There does not appear to be too great of scope for substituting base or transitional metals for PGMs in this application. As you will read later in this piece, a tremendous amount of research has been conducted for more than 30 years searching for such alternative technologies. After more than three decades and billions of dollars in research, PGMs still remain

World PGM Auto Use

Through 2000



PGM Substitution in Auto Catalysts

the favored metals, due to their superior performance in this application.

The second point is that the substitution among PGMs is occurring primarily along a spectrum. For most vehicles, it is not a matter of platinum or palladium, but rather a shift in the ratio of metals within the catalyst.

Third, a critical but often overlooked point is that it is not just platinum versus palladium. It is more a matter of platinum and rhodium versus palladium. This is important because of the even greater scarcity and higher prices for rhodium, which serves as a brake in the shift away from palladium, at least to a small extent.

Know Your History

Platinum group metals have been used in auto catalysts since 1973. In the late 1960s, as air pollution became an international issue that clearly needed attention, research began in ways to reduce air pollution from automotive exhaust, factories, home heating systems, and other sources of emissions. Automobiles and trucks were the source of a large proportion of total air pollution, so this source was targeted early.

The first emission standards occurred in the United States, in the Clean Air Act of 1970. By the time that legislation was passed, it was clear that the best available technology for reducing the emissions of harmful gases from automotive exhaust were catalytic converters. Research from the middle 1960s onward had sought the most efficient and cost effective designs for catalytic converters. By the early 1970s, it was clear that catalysts containing platinum and palladium were by far the most efficient. Earlier prototypes using molybdenum, nickel, and other metals operated at too high of temperatures, were less efficient than PGM catalysts, and were less durable in the highly corrosive and polluted environment of an automotive exhaust system.

Thus, in 1973, for model year 1974, new passenger cars in the United States were required to meet certain emission standards for the first time, and auto makers serving the U.S. market used PGM-bearing auto catalysts to meet this need.

Since then there has been a continual spread of emission

standard regulations to Japan, Europe, Australia, Mexico, urban India, and many other countries. Additionally, the application of emission standards has spread within these countries to include trucks, buses, and other vehicles. On top of this, the emission regulations have continually tightened in most countries. Starting with the 1980 model year in the United States, for example, emission standards expanded to include nitric oxide and nitrous oxide emissions, which led to the inclusion of rhodium in catalysts along with platinum and palladium.

For the past two decades, these three metals have been used in conjunction with each other in most auto catalysts. During the 1980s and early 1990s, the auto catalyst population was considered to be relatively homogeneous, in that most vehicles used tri-metallic three-way catalysts that contained roughly the same proportion of platinum, palladium, and rhodium one to the other. The amount of metal used per car or truck varied with the size of the vehicle and engine, but the ratio of PGMs in the catalyst was roughly the same throughout the industry.

This was true from country to country, for the most part. As Europe phased in auto emission standards beginning in the middle of the 1980s, there was a subtle yet important shift. Since European vehicles tend to operate at higher rpms and engine temperatures, they needed more rhodium, which put pressure on the rhodium market and helped contribute to the quintupling of rhodium prices at the end of the 1980s.

By 1988, the ability to shift the ratios of PGMs in auto catalysts was becoming technically more possible. Automakers were hesitant, for various reasons. One was the economics of the shift. The cost savings were not too great at that time, and there were real concerns that such a shift would upset the PGM markets and reduce the long-term supply of critically needed platinum and rhodium. Another was technical: If the palladium intense catalysts did not have the longevity of traditional three-way catalysts, automakers could get hit with very expensive recalls.

It had happened earlier, in the early 1980s. The auto companies had tried to thrift, or reduce, the per-auto PGM contents in response to the high prices of these

PGM Substitution in Auto Catalysts

metals in 1980 and the severe recession in the auto market worldwide from 1980 through 1982. Some of these catalysts with reduced PGM use failed in the middle of the 1980s, while they still were under five-year or 50,000-mile warranties, causing auto companies to suffer expensive recalls. They had saved perhaps \$25 per car in PGMs earlier, but they were facing \$150 per car in recall programs a few years later. This experience flavored automakers' opinions and helped reinforce a very cautious approach toward instituting changes that could prove costly later.

The 1990s and The Shift to Palladium

By the early 1990s this was changing. The U.S. auto market was hit by a recession and reduced sales in 1990 and 1991. Europe and Japan followed shortly behind, and experienced even more severe auto market declines. Profitability plummeted, and most automakers radically revised their management structure and operating procedures. They became more willing to innovate and to operate on a shorter-term basis.

The rhodium price meanwhile rocketed to \$7,000, and stayed above \$1,500 for most of the time from 1990 through 1992. This helped encourage automakers to shift from platinum and rhodium to higher palladium loadings. Market conditions helped. Palladium prices remained very low at this time. Post-Soviet Russia sharply stepped up its palladium sales from stockpiles, helping to keep palladium prices low and palladium supplies ample.

Further technical changes helped, especially moving some catalysts closer to the engine. This meant they operated at higher temperatures, where palladium would be less susceptible to being corrupted by sulfur and lead in the exhaust.

As a result of the confluence of these events, auto companies began shifting their loadings in some vehicles, reducing the platinum and rhodium and increasing the palladium used per catalyst. This was not universal. Some automakers were more aggressive in their approach to the palladium-intense technology than others. Some shifted toward palladium in some vehicle models, but not in others. The auto industry showed a dramatic shift in management in its willingness to adopt

a growing heterogeneity of the auto catalyst population it was using.

Another factor in this was the multi-certification of vehicles, in which automakers would certify that a given car with a given engine size would meet emission standards using one of several catalysts. This allowed automakers increased flexibility in using various catalysts. Some cars actually could shift from palladium-intense catalysts to more traditional ones in the middle of a model year, if PGM market conditions warranted such a move. (It is not clear that such moves ever were made, but the fact that automakers gave themselves this flexibility is important to remember.)

The Shift Back to Platinum

Since 1997 the PGM markets have been very volatile and tumultuous. Palladium supplies have dried up. There is a great deal of speculation about the long-term availability of palladium from Russian supplies, and whether the government has much, if any, palladium remaining in inventories that it would be willing to sell into the international market. Prices have risen sharply, and the forward palladium market has dried up.

The auto industry has become extremely concerned with its palladium exposure. Public announcements are rare, given the industry's reticence in publicly discussing such issues, but there have been some public statements by auto industry executives about their ability and long-term plans to shift away from palladium back toward platinum. Again, one must remember that this is a shift along a spectrum. It is not necessarily a move toward not using palladium. The indications are that the auto industry will move back toward ratios more typical in the 1980s over the next few years. Also, this is an acceleration of a shift began several years ago.

Other Trends

Other factors have combined to boost auto use of platinum in recent years. There have been four trends. One was the increased use of all PGMs as the number of vehicles being manufactured and sold rose. The second was the increased use of PGMs per vehicle as emission standards spread to more countries, covering larger percentages of the automobiles being manufactured and

PGM Substitution in Auto Catalysts

sold. The third was the increased stringency of emission standards in each market, and the related spread of emission standards to more vehicles. The fourth trend was the shift toward larger vehicles, with larger engines.

Looking forward, it would seem that the first trend is in a cyclical period of weakness. Auto companies expect to see sales weak in the first half of 2001, but expect a recovery either later this year or early in 2002. The second and third trends remain in place. The fourth trend may have peaked in 2000, especially if petroleum prices remain high. Thus, it would appear that the future use of PGMs in total, and platinum specifically, in auto catalysts is likely to expand further in the years ahead.

From a longer-term perspective, there has been some concern that the internal combustion engine will be replaced as the basis of automotive power, leading to a time when auto emissions no longer are a problem and catalysts are not needed. CPM Group's view has been that fuel cells, electric cars, and other alternative transportation power sources are unlikely to have any major effect in reducing the reliance on gasoline powered engines for many years to come. Insofar as fuel cells now represent the most likely alternative vehicle power supply, the use of platinum in fuel cells and fuel reformers for fuel cells would offset some of the negative impact such a shift would have on platinum. That said, we do not expect fuel cells to take any major portion of the automotive market for many years to come, if at all.

Conclusions for Investors

There is a shift in the loadings of PGMs in auto catalysts underway at present, away from such intense reliance on palladium toward increased use of platinum.

This shift in auto use of platinum has been one of several factors that have helped push platinum prices to their highest levels since the middle of the 1980s. These demand patterns, along with continued tight supplies, concerns over Russian supply trends, and growth in platinum use in other industrial applications, are likely to keep platinum prices higher than otherwise might be expected, and could push platinum prices higher still over the next few years.

While some market observers have been suggesting that PGM prices, especially those for palladium, are bound to collapse and decline sharply from current prices, this may not happen, and CPM Group does not necessarily expect this. The fact is that these markets have changed in major ways that may represent "permanent" changes. This could allow prices to remain higher than they have been historically, representing these secular shifts in supply and demand. These metals are used in various high tech applications. They always have been expensive metals to use, even before the recent price increases. Thus, they have tended to be used in applications where they are critical, and to some extent manufacturers' abilities to shift out of them due to high prices and tight supplies are limited.

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Fuel Cells and Platinum:

Position Yourself for a New Era in Power Generation

A SPECIAL REPORT BY PLATINUM GUILD INTERNATIONAL, (USA)

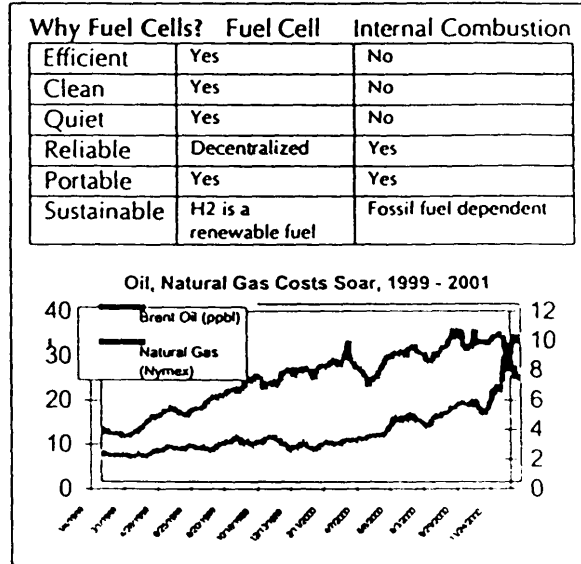


The economy of California, if considered independently, is the 6th biggest economy in the world. Not only is California an economic heavyweight, it is also a trendsetter and a testing ground for the rest of the US. Currently the news is filled with the details of California's energy crisis. The state is suffering serious economic losses, which are a result of the following factors:

- Higher oil prices
- Surging natural gas prices
- A breakdown of the old power utility model of centralized, regulated producers
- Acute environmental concerns, resulting in the blocking of new power plant construction

These developments are bringing urgency to the development of efficient, decentralized, and environmentally friendly technologies. One technology seems best able to provide an effective solution: the fuel cell.

Recent energy market trends have converged with technological advances in fuel cells, spurring adaptation and commercialization efforts by the world's leading industries. The result of these efforts will be that an entirely new paradigm in power generation will emerge, as will a whole new sector of platinum demand.



Pipe Dream or Industrial Reality? Look who's talking...

- Jürgen Schrempp, CEO of DaimlerChrysler: "The problem of how to ensure sufficient supply of energy that is environmentally friendly is the key challenge of the future, and we see fuel cells as the solution." So far, DaimlerChrysler has spent \$600m to develop its fuel cell car, and will spend another \$900m or so over the next 10 years, with fuel-cell cars on the market by 2004.
- Ford's chairman, Bill Ford, recently proclaimed: "I believe fuel cells will finally end the 100-year reign of the internal combustion engine." Ford too has invested over half a billion dollars in this technology.

Recent disruption in the energy markets has reminded the "New Economy" of the importance of "Old Economy" power generation:

- Rolling power blackouts swept through the State of California this winter; further state involvement in the energy markets and price setting is likely to add to the problem
- A spring heat wave caught the Northeast flat-footed, while its stationary power systems were undergoing maintenance and repair
- The Pacific Northwest's troubled salmon runs are causing that region to question its reliance upon hydroelectric power
- High oil prices have worked to lower consumer spending on other items, and to lower corporate profits this past year
- Spiraling natural gas prices have had similar effects, with no near term relief in sight

In this environment, corporations are working harder than ever to provide a solution to their own power generation needs, and to meet the needs of consumers. Further pressure is added by environmental considerations, as more and more governments institute incentives for “green” technology implementation. As a result, investment in fuel cell technology, for both stationary power generation and for the automotive sector, is now counted in the billions of dollars.



DaimlerChrysler's Jeep Commander fuel-cell powered prototype

Fuel cells promise to answer many of the above issues by chemically generating electricity from hydrogen, with water as the only byproduct. Hydrogen is the most abundant element in the universe, and in practice this hydrogen can come – though not always so cleanly or cheaply – from a multitude of sources.

The Major Players

Industry heavyweights who are now investing billions of dollars in the development and deployment of fuel cell technology reads like a “Who’s Who” of advanced technology:

- General Electric
- Toyota
- DaimlerChrysler
- Ford
- Ballard Power Systems
- General Motors
- Honda
- United Technologies (UT)
- Exxon
- Fuel Cell Energy

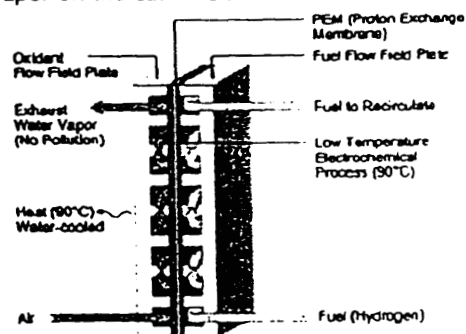
...and many more. As *The Economist* put it in a special feature heralding “the hydrogen age”, fuel cells will next carry the baton passed from fire, to water, to steam, to oil, as the primary power source for mankind’s endeavors. These companies are investing now to ensure they are ready to capitalize on the coming wave.

The Doubters

Some market analysts have expressed concerns that fuel cell technology has existed for decades as the “technology just around the corner.” The skeptics are right in that over-optimism regarding the technology’s commercial viability has come and gone in waves, from as early as the 1970s. In addition, significant cost barriers must be overcome before fuel cell technology becomes truly competitive with existing internal combustion power alternatives. Nevertheless, there has been no precedent for the level of investment and industry participation now seen, and projections given now by motor companies refer to specific model years. Indeed, those interested in installing a natural gas powered fuel cell can at this time locate distributors at General Electric’s website (<http://www.gepower.com/microgen/>)

How Fuel Cells Work

As described by Ballard Power Systems, a Proton Exchange Membrane (PEM) fuel cell consists of a membrane electrode assembly and two flow field plates, combined into a fuel cell stack. The number of stacks helps determine the amount of power. Hydrogen and air are supplied to an anode where a platinum catalyst promotes separation into protons and electrons. On the opposite side air flows through to the cathode where oxygen in the air attracts the hydrogen protons through the PEM. The electrons are captured as useful electricity through an external circuit, and combine with the protons and oxygen to produce water vapor on the cathode side.



As Bear Stearns stated in a recent report on Distributed Energy Services, **even more important than the marginal cost of power may be its consistent supply.** To the degree that fuel cells may play a role in distributed energy markets, shorter term cost disadvantages may well be overcome by the advantage of being independent from an overloaded power grid.

Fuel Cell Consumer Applications

- **Stationary** – Will be used to provide power for households, buildings, institutions, and even whole neighborhoods. PEM fuel cells of the type being developed by PlugPower, GE, and Ballard (for instance) will help to provide for the needs of the smaller end of this market.
- **Automotive** – Here, the platinum-using PEM fuel cell has received the most attention and attracted the most investment. With high power densities and lower operating temperatures, the PEM (proton exchange membrane) is the fuel cell type to be used when the majors roll out their first commercial vehicles.
- **Marine** – While not as large as the automotive market, this segment may add significantly to the overall platinum demand projections
- **Micro-applications** – Consumers will readily switch to the power source that yields the most mobility. Further advances in miniaturization and economies of scale will eventually make fuel cells competitive with existing battery technology

Applications that will use micro-fuel cells:

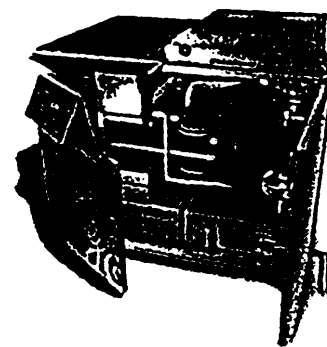
- Laptops
- Cell Phones
- PDAs (e.g. Palm Pilots)
- Pagers
- GPS Systems



Micro-Applications for Fuel Cells

Stationary computer servers, PCs, monitors, routers, and internet switches are not the only source of surging power demand. Indeed the mobile computing and communications market is seeing even higher rates of growth than the traditional, stationary technology segment of the market. Nearly all of these mobile applications are currently operated on battery power. However, the limits of battery technology leave consumers far from satisfied: the need to carry various plugs and adapters, the need to periodically recharge, and the performance decay that batteries exhibit. Innovations in fuel cell design will make it possible to deliver on the promise of truly

mobile power. Consumer electronics firms, from cell phone makers to laptop computer manufacturers, are examining the possibilities of powering their devices with fuel cells. In a fuel cell powered device, rather than recharging or replacing batteries, users of mobile electronics will buy fuel "refills". In practice this may take either the form of liquefied hydrogen-based fuel, the process not unlike refilling a Zippo lighter, or it could be in the form of replacing hydrogen-storing nano-tube cartridges.



GE's Microgen will allow home users to generate their own electricity, cleanly and quietly. GE is currently soliciting interest from vendors, and the units will soon be available on the market.

What This Means to Investors in Platinum

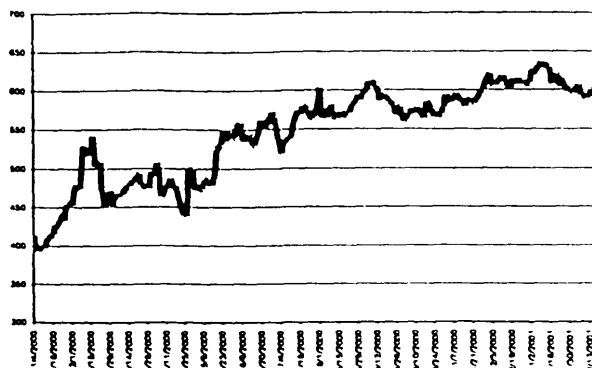
Current, conservative estimates put fuel cell based demand for platinum in the year 2010 at 500,000 ozs. p.a. for automotive applications, with an additional 200,000 ozs. p.a. for stationary applications. Investing in platinum is an entirely

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different proposition from investing in fuel cell technology stocks. Platinum is an extremely important commodity to the various tech sectors, with a growing base of demand. The purpose of this report is to illustrate how a whole new source of platinum demand, based in PEM fuel cells and reformers, will open up an additional avenue of demand for this important metal.

The platinum market has been driven on the demand side by the opening up of entirely new markets, be it the development of Chinese jewelry demand or through technological innovations. The platinum market has had two consecutive years of supply deficits, with prices increasing by over 45% in 2000. Mining company plans for expansion of production might not be able to keep up with the varied sources of demand for platinum in the years to come. With a whole new realm of platinum demand opening up with fuel cell technology, the outlook for platinum is indeed strong.

Pt Nearby Contract (NYMEX) Prices, 2000 - 2001



Helpful Links on Fuel Cells, and Platinum (hyperlinks will only work on electronic versions of this report):

[Platinum Guild International \(NY\)](#)

[AlliedSignal](#)

[Analytic Power \(now Dais-Analytic\)](#)

[Argonne National Laboratory](#)

[Ballard Power Systems, Inc.](#)

[California Fuel Cell Partnership](#)

[Dais Corporation \(now Dais-Analytic\)](#)

[Daimler-Benz](#)

[Degussa-Huels](#)

[Electric Power Research Institute](#)

[ElectroChem, Inc.](#)

[Energy Efficiency/Renewable Energy Network](#)

[Energy Partners, Inc.](#)

[Energy Ventures Inc.](#)

[National Energy Technology Laboratory](#)

[Federal Technology Alert on Natural Gas Fuel Cells](#)

[Ford](#)

[FuelCell Energy](#)

[Nissan](#)

[Oak Ridge National Laboratory](#)

[ONSI Corporation](#)

[Osaka Gas](#)

[Johnson Matthey's Platinum Page](#)

[Fuel Cell Industry Report](#)

[Fuel Cells 2000](#)

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[Schatz Energy Research Center \(SERC\)](#)

[Siemens](#)

[Tokyo Electric Power](#)

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