WATER on

Mining Makes It Happen ΤσΥΘ•Λο • ΥΓΡο

Silver, found as a pure free metal in the Earth, is used in crystalline silicon photovoltaic cells. When sunlight strikes the cells, the silver collects the trons generated and transforms them into electric current.

Zircon (Zirconium)

حربۍ ۱۹۲۵ در چ

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 \cdot 478 \sim 670 \wedge 70 \wedge Δ <code>fPun</code>, <code>def</code> Δ -<code>pee</code> Δ <code>d<UhfP</code>, <code>VhT-V</code> <code>pleub-Vannex</code>

The basic fuel for a nuclear power reactor is uranium — a heavy metal able to release abundant concentrated energy. About 14 per cent of the world's electricity is generated by nuclear power stations.

4ወዋት $_{c}$ V·4V $_{v}$ $4<C_{s}$ bL 4<U\Γ P_{r} ÞL $_{v}$ b\Γ $_{v}$ LRP-40 PT V-4VJ, -AL PLECTP, bl PlcTP, ALRP-47 ▷Γσˆ°Ρ∙ΔʹϭͿU°• ϤϤʹ 14 >°∀، Δσδ\ ▷Γσˆ°Ρ•ΔʹϭͿU° ▷C ຝˆ°Ρ\ P ∇ኒ ρσ·Δαιρ, ፋብαρς*

Zirconium (Zr)

Zirconium is primarily used for nuclear power. Long zirconium alloy (zircaloy) tubes containing uranium pellets form the fuel rods, the zirconium being hard, corrosion-resistant, and permeable to neutrons.

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AGGREGATES **Δισ.**Δ βσβ.Δσρσ.

Aggregates include hard rocks that require breaking up — igneous (granite, basalt), metamorphic (quartzite), and sedimentary (limestone, sandstone) and loose sand and gravel that have been broken up by natural processes. Aggregates are used to make concrete, the world's most widely used building material. Large hydroelectric dams for utility electricity generation are

- -Δ"dU° Δι'σ (bSaΔ' Δι'σ <5[™] Δι'σ), b·9^Padι' Δι'σ ('b"\\^' \d\repsilon'), \(\daggerapsilon'\) \(¬b° ⟨\rightarrow \rightarrow $\mathfrak{I}9$ b \mathfrak{l} $\mathsf{A}^{\prime}\mathsf{A}\mathsf{C}\sigma^{\prime}$ $\mathsf{A}^{\prime}\mathsf{C}\sigma_{\star}$ $\mathsf{A}^{\prime}\mathsf{C}\mathsf{A}\mathsf{C}$ $\mathsf{A}^{\prime}\mathsf{C}\mathsf{A}\mathsf{C}$ V9 C₃N Q_{ν}^{\star} Δb VbV_{ν} P U_{ν}^{\star} Q_{ν} Q_{ν}^{\star} Q_{ν} Q_{ν}

constructed from reinforced concrete.

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make up Rare Earth Elements (REEs). Although abundant in the Earth's crust similar to nickel and tin in abundance — they do not occur in large, concentrated deposits, so are difficult to mine. The minerals bastnäsite and monazite are the primary source of world REE supplies. REEs are integral to rechargeable batteries for electric and hybrid vehicles, powerful magnets in wind and tidal electricity turbine generators, and control rods in nuclear technology. Also, rare earth magnets reduce energy consumption in electrical appliances such as refrigerators.

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EARTH **₫º₽**⁵

Nearly all mined iron ore goes into the making of steel. Stainless steel is key to many energy-producing technologies such as hydro power, wind, and geothermal energy plant turbines; nuclear plants; and solar energy collecting plants.

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Nickel is key to clean energy. Nickel metal hydride (NiMH) batteries, used in hybrid electric vehicles (HEVs), contain about 10 kg of nickel. Hybrid cars with NiMH batteries produce 50 per cent less pollution and greenhouse gases than comparable gasoline cars. Rechargeable batteries made with nickel power cell phones, laptops, digital cameras, and other electronic devices.

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Silica (Si)

Most solar photovoltaic systems use silicon cells to turn the sun's rays into energy. These cells are typically made of silicon dioxide, which is made from quartz sand, a common and abundant natural resource.

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POMER to the People

▶Γσ°Ρ•Δ" Οσσ•

Canadians use a great deal of energy, equivalent to nearly 7,500 kg of oil per person annually. We also produce a great deal of energy, adding alternative energy sources and new power storage methods.

 Γ° CΔ Γ° CCΔ Γ° CCC









(**4,p**, **v**,**4v**_v) ΔΓC₂, **v**,**4v**_v,

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METALS & MINERALS

محه، ۲۰۹۷٬۰۹

Cobalt, produced as a by-product of copper and nickel mining, is critical for

(HEVs), laptops, cell phones, and other electronic devices.

9<r>
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Germanium (Ge)

on satellites and spacecraft.

CREDITS Project Coordinator: Janice Williams Editor: Victoria Stratton Artwork: Stephan Baker Design: TWG Communications

Translation: Wintranslation σοθΑνδο Φ<ΠΥνδοο ο σοριζίου νασφία Ενοδονδοο ο σοριζίου και για συρικά το πορικά κατά το πορικά τ

Metal/mineral photos courtesy of the following: ^-d^^ Lr'-a^bdba R.Weller/Cochise College: Garnierite, Molybdenite, Silver:

Robert Lavinsky/iRocks.com/Arkenstone: Bastnäsite, Cobaltite, Monazite, Platinum, Quartz, Rutile, Zircon; Maggie Wilson: Copper, Hematite,

ገړ Γንσ ታና ለ • ላ ለ ^ \

Sphalerite, Uraninite; Mining Matters: Limestone Produced in 2013 b P ▷∫Cσ・▷ 2013

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manufacturing the nickel metal hydride batteries found in hybrid electric vehicles

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Germanium, is a by-product of zinc mining. Despite costing more, it is more

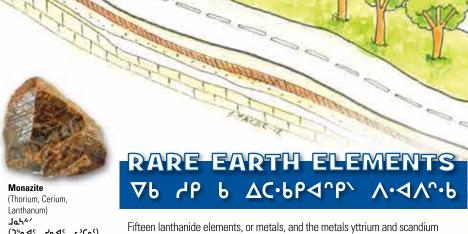
efficient than silicon at converting solar energy into electricity in photovoltaic

cells. Because they are efficient and lightweight, germanium solar cells are used

MiningMatters.ca







Bastnäsite (Cerium, Lanthanum, Yttrium, Neodymium) <^^o\ (אייס_נ' ה_יכס_נ' $\Delta' \cap \Delta'$, $\sigma \triangleright C^{\Delta} \Gamma \Delta'$

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Alternative Energy Technology

Alternative energy includes renewable energy that comes from natural, renewable resources such as sunlight, wind, water, and geothermal heat. Use of renewable energy has been increasing around the world. Hydroelectric power leads the way in Canada and other sources are on the rise. Another alternative source of power in Canada is nuclear energy.

Whatever energy sources we use, the metals and minerals of the Earth, along with the people who find and process them, make them possible.

ΛϽˇ ∇ ⊳ΠσЬU` ⊳Γσ°P•ΔϤU°

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NUCLEAR ENERGY L.d b L'b.d > Den'P. D'U

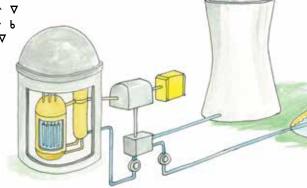
What's Inside? Zirconium, Uranium, Nickel, Copper, Iron, Rare Earth Elements (REEs) ዓ·b³ extstyle extsty

Nuclear energy is created when metal tubes containing uranium (fuel rods) are used to boil water, producing steam that drives electricity-generating turbines. Nuclear reactors generate a lot of energy using small amounts of uranium and do not emit greenhouse gases; however, they produce radioactive waste that must be managed.

Canada is one of the world's largest uranium producers and is a leader in nuclear research and technology. Atomic Energy of Canada, working with Canadian industry, developed CANDU nuclear power reactors, which are exported worldwide.

 $L \cdot d^ PL_P \cdot d_A \cdot PL_P \cdot d_A \cap PL_P \cdot$ ▷ለየበ/ ወላላ የሆ ለየጌትየደብ/ ፅ ⊳ሆ ሊረሚቴ Δኒሮ ▷ኒው ▷ኒው ◊ኒማብ/ የ PL 4<U1PF LL $L_{U}CV$ PLC^{Q} PL^{Q} PL^{Q} AC $AV_{L_{U}}$ A $d < C' + \Delta G + C' +$ Prcle, J.P. △ P.<\JJFP, P Vnac.P. bl σσPC.Δelpn.*

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WIND ENERGY DOG' 6 DO DOCONO' DOG PLANGUO

What's Inside? Copper, Iron, Molybdenum, Aluminum, Zinc, Rare Earth Elements (REEs) 9·6> ዻ²C C·6\x Þ\·ዻለጐ ለ·ዻለ^\, ዻ^ዾዾጐን, L፦ሀንፎ ላጔቬር, ጐ2\ ለ·ላለ心ь ቴ՞C Lb ∀b ረየ b ዾ•bየ ለ·ላለ^ъ6\

Wind turbines use wind to turn huge tower-mounted propellers, converting its energy to electricity. Well-situated wind turbines produce varying amounts of electricity, depending on the wind.

Canada has tremendous wind power potential. Strong, steady winds blow in every province and territory. Some of the best areas are offshore and along coastlines; Canada has the world's longest coastline. Ontario produces the most wind power, and the Canadian Wind Energy Association envisions wind power providing a significant amount of Canada's electricity by 2025.

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The People Aggra

Great career opportunities exist within the mining industry in all aspects of exploration, development, operations, and site reclamation. These are just a few of the possibilities. To learn about them and more, visit **www.acareerinmining.ca**

C'C $CA'd^-$ A'P' $aC\cdot A< P\cdot \Delta'$, b ΔS $PSC\sigma \cdot A'$ $9 \cdot b'$, b ΔS



Environmental Coordinator $b\sigma b\sigma' < bC^P < SI < \sigma \cdot C \cdot \Delta \sigma'$

GEOTHERMAL ENERGY 4CL,4.6, P DL Plca.4, ⊳Γσ^°•Δ∀U°

What's Inside? Molybdenum, Iron, Copper, Rare Earth Elements (REEs) 9・bっ dっC Сdb、、・L⊂∪っᢏ゚、 d△▷~っ \triangleright 5.47 σ \wedge 6.40 $^{\circ}$ 6 σ 6 L6 ∇ 6 56 6 Δ 66.6 Δ 6.7 $4^{\circ}P' \wedge 4^{\circ}P^{\times}$

Geothermal energy comes from heat found below the surface of the Earth. Years ago, hot springs gave people access to geothermal heat. Today, drilling into the Earth up to 3,000 meters gives greater access in two ways.

Hot water or steam below ground level is brought to the surface, or surface water is pumped down through hot ground and brought back up. The resulting hot water heats homes and buildings or turned into steam to turn electricity-generating turbines. Geothermal energy plants produce little pollution, operate day and night, and generate high rates of electricity.

A Geological Survey of Canada assessment found that Canadian geothermal resources could supply up to 10 per cent of our electricity. The most development potential exists in Western Canada. The Canadian Geothermal Energy Association believes that 5,000 MW of geothermal power could be

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SOLAR ENERGY ALL 6 Pr PSC G-14 Pro-P-24U°

What's Inside? Silver, Silica, Germanium, Molybdenum **٩٠**৮᠈ ᡏᢀᢗ ᢗᠨᠪ᠈ᠷ᠂᠘᠇ᡃᠵᡷ,᠂᠘᠆ᡖ,᠂᠋ᢧᡛᢧᠳᡏᡩ,᠂᠘᠆᠐᠈ᢅᡓᡲ᠆ᡖ᠘ᡗᡖ᠐᠙᠕᠂ᡐᡏ᠕ᡴ᠈ᡖᠷ

Solar energy, or energy from the sun, can provide lighting and heat as well as electricity. Solar photovoltaic (PV) technology uses solar panels to convert the sun's energy to electricity. PV panels can be on the ground, on building rooftops, or designed into building materials. In the future, everyday objects, such as clothing, car rooftops, and roads, could become power-generating solar collectors.

> Solar energy is generated during the day, when energy is most needed and most expensive. Solar power technologies help utilities match supply with demand and can reduce natural gas usage during peak periods. In Canada, southern Ontario, Québec, and the Prairies receive the most sunlight; however, solar installations exist across the country.

> > •ሳ^ሀσባ•Δ°, የተነባ•Δ°, ъ^ር Lb ኦፐσ^የ•Δሬሀ° ርየ ኦቦ ኦፓርσ•ዻ° $PL_{Q_0} P \cdot \nabla_{Q_0} Q \cdot \nabla_{Q_0} \nabla_{$ $\triangleright \Gamma \sigma^{\circ} P \cdot \Delta^{\circ} U^{\circ} \cdot P \triangleright A^{\circ} L^{\circ} U^{\circ} \cdot B \Delta^{\circ} \cdot B \Delta^{\circ} \cdot \nabla \sigma^{\circ} B U^{\circ} \cdot C \cap A^{\circ} U \cdot A \cup A^{\circ} U^{\circ} \cdot A \cap A^{\circ} U^{\circ$ $Cd^- \cdot d^\circ b \Delta b \sigma^\prime$, $\sigma^\circ C$ Ad $P\Gamma \cdot d$ $^\circ b \Delta b \sigma$ $d < \Gamma C \cdot \Delta \sigma^\prime x$ σb° $\Delta U Q$ $C \supset Cd^- \cdot d^\circ b \Delta b \sigma^\prime$, $\sigma^\circ C$ Ad A

VYTYVV PLAUGE PROPERTY PROPE $_{o}$ C $_{d}$ $\begin{picture}(20,10) \put(0,0){\line(0,0){4}} \put(0,0){\line(0,0){$$

HYDRO POWER JAY PLEUS PL

What's Inside? Copper, Iron, Aggregates, Silica, Aluminum, Gypsum 9.6° 4° C $C.6^{\circ}$ x $P.6.40^{\circ}$. 4° P^{6.9}. 6° P 6°

Hydroelectric power is produced by flowing water. Long in use, it is the most reliable and cost-effective renewable power generation technology available. When flowing water turns turbine blades, the turbine's electromagnets interact with the coils of a generator to create electricity. The water could flow from a natural waterfall or from behind a dam. After the water has helped create electricity, it flows back out to the river.

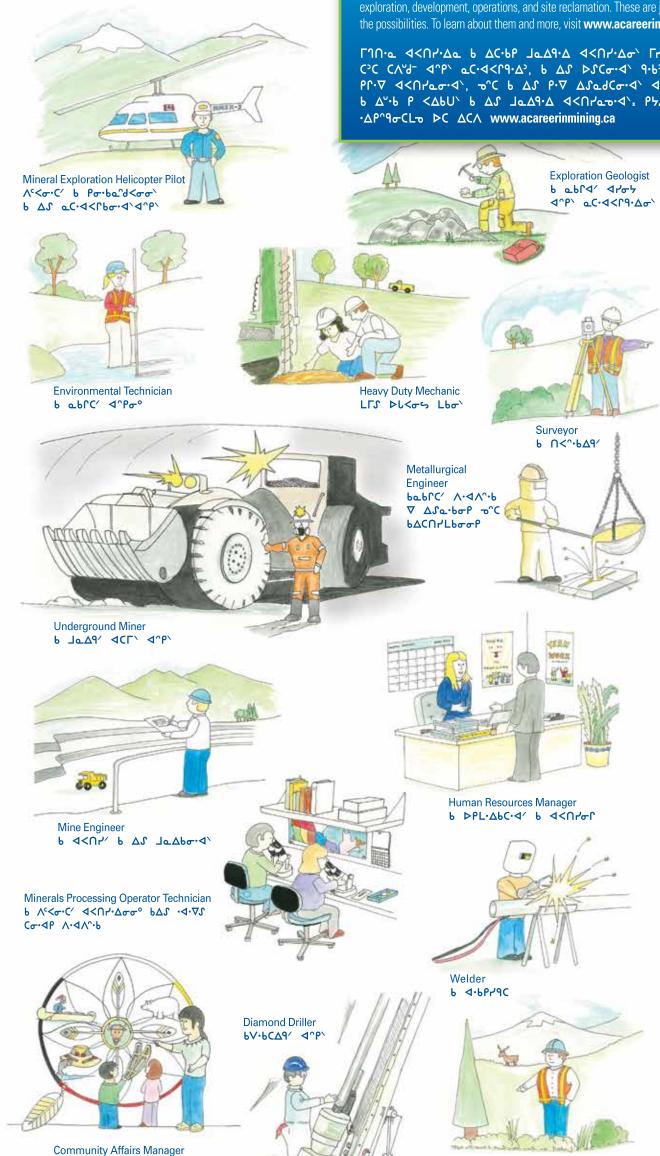
Hydro power is a flexible power source. Water can be stored in reservoirs and used to stabilize the electrical system when other renewable energy, such as wind and solar power, is reduced.

Canada's vast water resources include many flowing rivers that generate hydro power, providing over 60 per cent of our electricity.

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