CNIC
CANADIAN NUCLEAR ISOTOPE COUNCIL

Agescan International

Tungsten Application

Nuclear Industry

AGESCAN TUNGSTEN

AGESCAN INTERNATIONAL
A Specialty Materials Company

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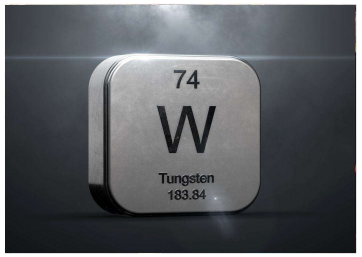
1. Company Overview

Agescan International Inc. specializes in the development, manufacturing, and global distribution of high-performance tungsten and non-ferrous alloy materials.

Our product categories span:

- Tungsten Heavy Alloy (WHA)
- Tungsten Copper (WCu)
- Cemented Carbide & Pure Tungsten

With over 20 years of expertise, our vertically integrated production ensures quality, reliability, and rapid customization to customer requirements.



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1. Company Overview

Manufacture Capacity

- **Established in 2003 with 600,000 sq. ft. of manufacturing space and 80 skilled technicians**
- Annual production capacity: 1,000 metric tonnes of high-performance metal products
- Equipped with advanced Metal Injection Molding (MIM) and precision pressing technologies
- Capable of producing both standard and custom tungsten alloy components
- Strong partnerships with top universities support ongoing R&D and innovation
- In-house R&D team includes a materials science professor, metallurgists, and senior engineers
- Global reputation for quality, technical capability, and product reliability

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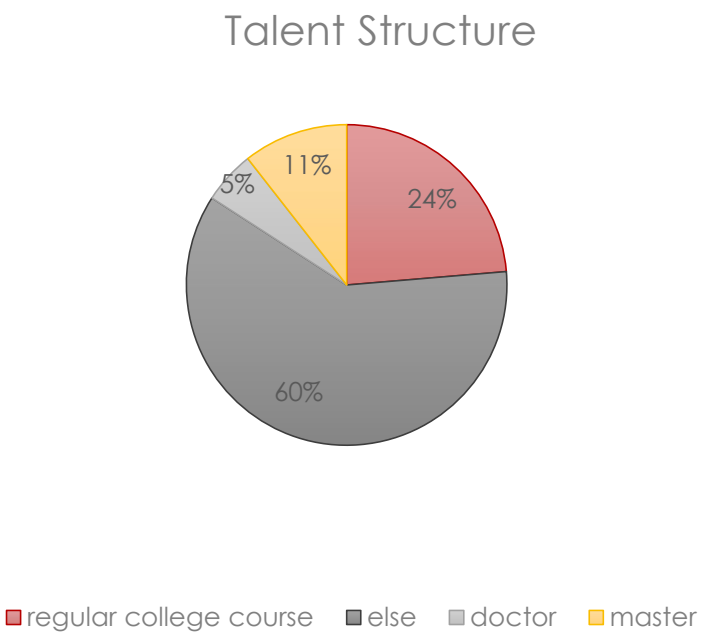
2. Research & Technical Expertise

- Over 45 R&D and production specialists including:
  - 13 PhDs
  - 16 Masters
- In-house R&D team led by a senior materials science professor
- National patents across multiple proprietary technologies
- Strategic partnerships with leading universities
- 30+ testing and analytical systems



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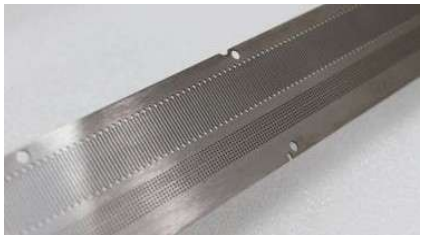
3. Product Portfolio

Nuclear Medical Applications

- Shielding Components
- Collimators
- MLC
- X-Ray Tube Anodesand Rotors
- Isotope Containers and Syringes



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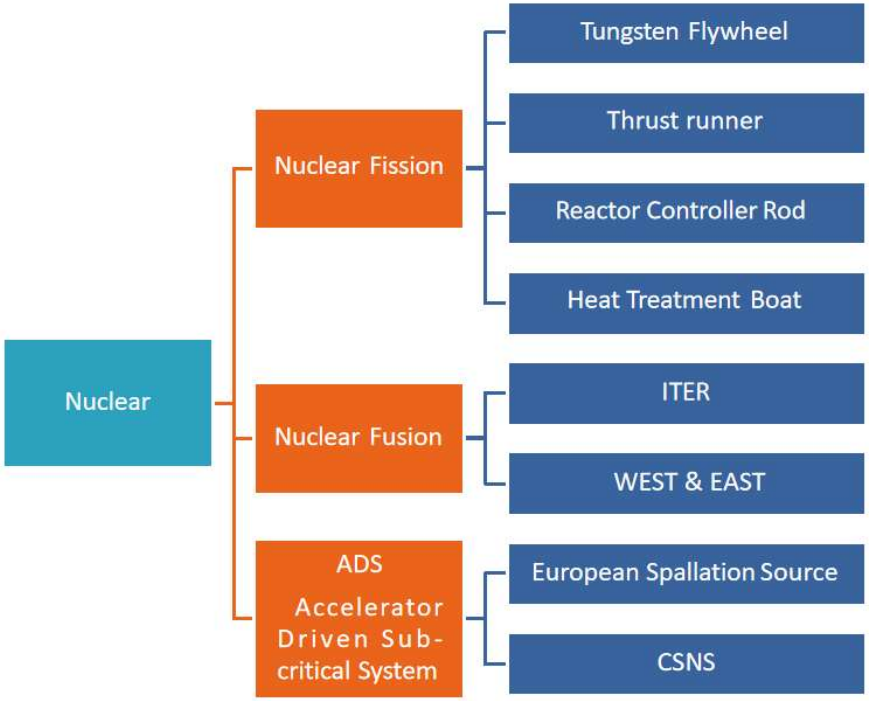
4. Key Applications

Nuclear Fission & Fusion Applications



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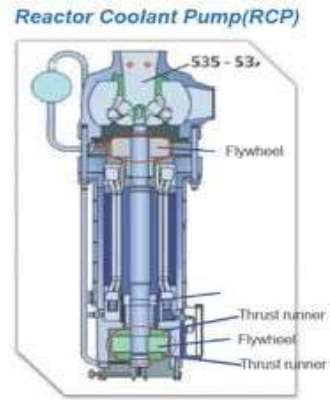
4. Key Applications

Case Study 1 – Thrust Runner of Reactor Coolant Pump



- Granted **two national patents** related to thrust runner manufacturing for nuclear reactor coolant pumps
- Published **five peer-reviewed journal articles** on thrust runner research and development
- Successfully passed **friction pair tests and rack tests**, demonstrating excellent operational performance
- Achieved a significant **breakthrough in domestic production** of reactor coolant pump components
- Expected to deliver **substantial economic benefits** with the expansion of installed nuclear capacity

Key Patents:

- *Method for Preparing the Thrust Runner of Reactor Coolant Pump for Nuclear Power Station* — **CN105195989AC**
- *Method for Preparing Stainless Steel Surface Wear-Resistant Layer by Hot Isostatic Pressing* — **ZL 201310139426.0**
- *Method for Preparing Nuclear Power Thrust Runner by HIP Diffusion Bonding* — **ZL 201310139394.4**

Thrust Runner

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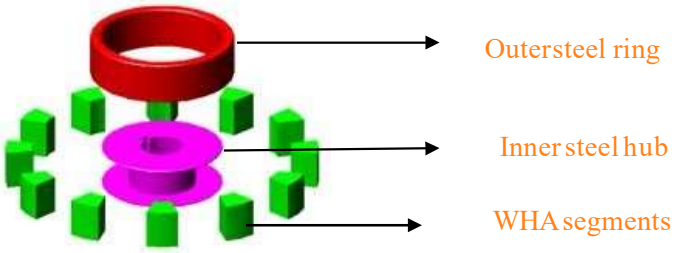
4. Key Applications

Case Study 2 – Flywheel of Reactor Coolant Pump

- The **AP1000 reactor's main pump** features **inertial flywheels** at both upper and lower sections
- The flywheel, together with the **impeller and motor rotor**, forms the main rotor assembly
- In the event of **power loss**, the flywheel provides residual motoring energy to sustain **coolant circulation** and enable **natural core cooling**
- The Flywheel assembly integrates **tungsten alloy blocks** using a **shrink-fit method** requiring:
    1. Precise heating temperature and timing
    2. High assembly accuracy
    3. Clean and smooth contact surfaces
    4. Experienced technical personnel for execution
- Tungsten **high-density** alloys are ideal for inertial flywheels in Generation III+ nuclear reactors
- The high-density tungsten ensures **reliable energy retention**, supporting safe shutdown and core cooling during emergency conditions



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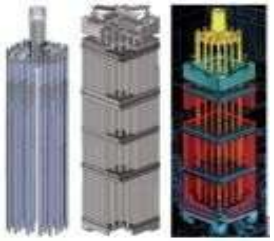
4. Key Applications

Case Study 3 – Control Rod

- **CAP1000 tungsten control rod assembly** features **low reactivity**, enabling fine-tuned reactivity adjustments through mechanical means
- Reduces reliance on the **Chemical and Volume Control System (CVCS)** for adjusting **boron concentration** in reactor coolant
- Significantly minimizes **daily reactor wastewater treatment**, simplifying overall **system design and operation**
- During **base load operation** and **load-following conditions**, the assembly automatically repositions to **maintain stable coolant temperature**
- **Insertion or withdrawal** of the control rod helps compensate for:
    1. Fuel burnup
    2. Power fluctuations
    3. Temperature variations
    4. Xenon concentration changes in the reactor core



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4. Key Applications

Case Study 4 - Molybdenum Boat for Nuclear Fuel Sintering

Molybdenum Boat Applications

- **Nuclear fuel sintering** (as a carrier for uranium blocks)
- **Vacuum evaporation** and **coating processes**
- **Capacitor sintering**, **thermocouple sheaths**
- **Electronic** and **electric power** industries
- **High-temperature furnaces** (vacuum, ammonia, industrial)

Material Features

- Withstands **extremely high temperatures**
- Easy to process into complex boat geometries
- Offers **excellent dimensional stability**, **corrosion resistance**, and **creep resistance**
- Maintains shape and performance over extended use

Material Upgrade Option

- **Molybdenum-lanthanum (Mo-La) boats** available for enhanced performance
- Doped with **0.3%–0.7% lanthanum oxide**, resulting in:
    1. Higher recrystallization temperature
    2. Better ductility
    3. Reduced risk of embrittlement or fracture

Customization & Supply

- Fully **customizable designs** available upon client specification
- In production since **2012**
- Successfully passed qualification testing at the **Indian Nuclear Fuel Complex** and is now **supplied in batches**

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4. Key Applications

Case Study 5 - European Nuclear Center — ALICE project

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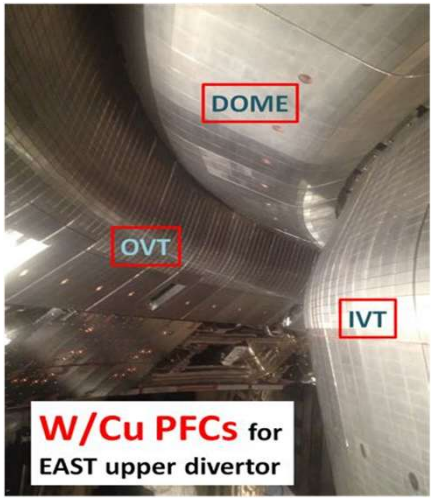
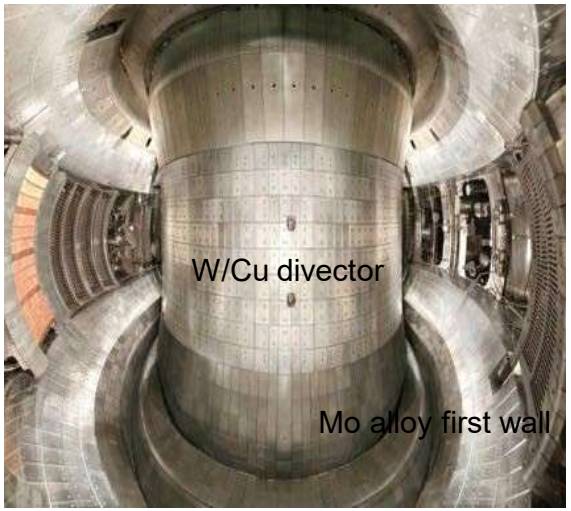
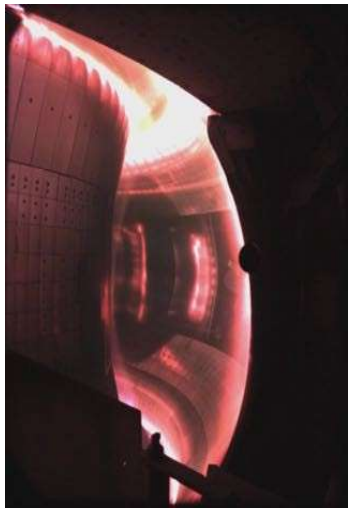
4. Key Applications

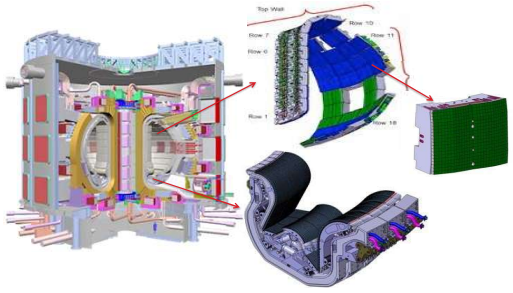
Case Study 6 - EAST Nuclear Fusion Project







- PFCs+CB assembly: 80
- IVT/OVT/DOME: 80 each
- Monoblock PFUs: 720
- Monoblock W: 15,000
- Flat-type PFUs: 240 Flat W tiles: 24,000
- E-beam seam: > 4000
- W raw powders: > 10 tons CuCrZr plates: > 8 tons CuCrZr tubes: 720pcs/360m



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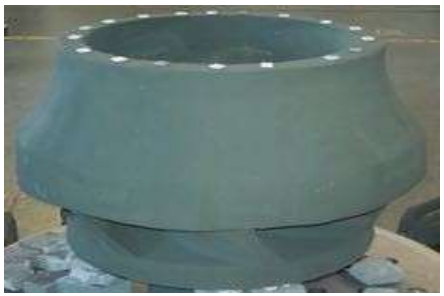
4. Key Applications

Case Study 7 - Impeller of Reactor Coolant Pump (HIP Technology)



- HIP engineering & technology center;
- The largest HIP units –HIP1300;
- HIP densification treatment at the top of the list international;
- Wealth experience of maintain

Type	HIP-1300	HIP-850	HIP -750	HIP-400
Working Size (mm)	Φ1325 × 2100	Φ810 × 2500	Φ680 × 1200	Φ360 × 800
Max Temperature (℃)	1350	1400	1350	1900
Max Pressure (MPa)	150	200	150	200
Max weight of workload (KG)	6000	5000	1000	300
URC	No	Yes	No	Yes
Time per cycle (hour)	24	12	18	12
Cycle per year	200	300	350	350

CNAS IAF Nadcap AS 9100

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4. Key Applications

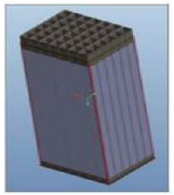
Case Study 8 - Neutron Absorber Materials

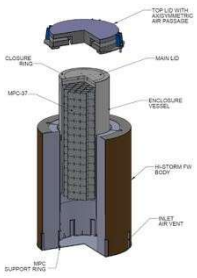
💉 Al/B_4C Neutron Absorber Alloy

- Composite material made from **standard aluminum alloy** with **enriched boron-10 (^{10}B)**
- Designed for use in **spent fuel storage**, **reactor shielding**, and **transport casks**
- Available Forms: Sheet, Strip, Tube, Bars
- Annual output: **300 metric tones**

Material Grades And Chemical Composition Of Al/B4c

Grade	B_4C wt%	Aluminum Alloy wt%
HY10B10	10	/balance
HY10B15	15	/balance
HY10B20	20	/balance
HY10B25	25	/balance
HY10B30	30	/balance
HY10B31	31	/balance
HY10B33	33	/balance
HY10B35	35	/balance





✅ Key Advantages

- **No dimensional swelling** in spent fuel environments
- **No hydrogen ignition risk** during dry storage
- Maintains **structural integrity** under intense **neutron and gamma irradiation**
- Offers **excellent mechanical and structural performance**

🏭 Technological Achievements

- Successfully developed high-performance **neutron absorber plates**, evaluated as **equivalent or superior** to foreign products
- Validated by experts during a **China Nuclear Energy Association** technical review on **November 29, 2015**
- Marked a major breakthrough in **domestic industrialization** of neutron absorber materials

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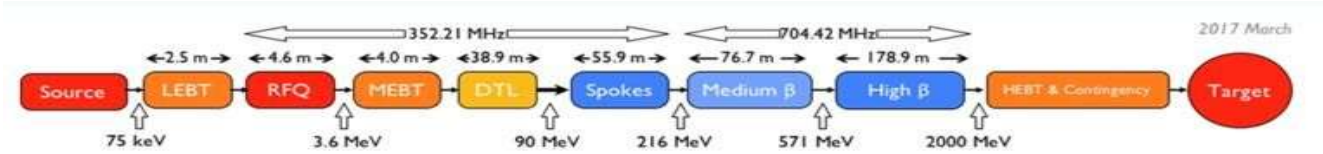
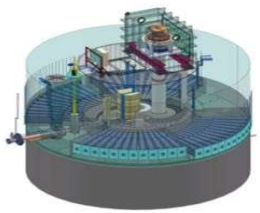
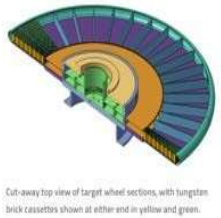
4. Key Applications

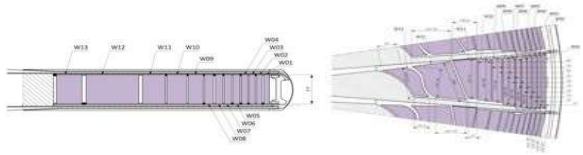
Case Study 9 – European Spallation Source (ESS)

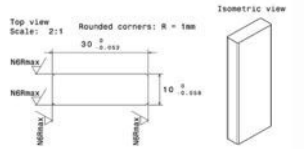






Cut-away top view of target wheel sections, with tungsten brick cassettes shown at either end in yellow and green.





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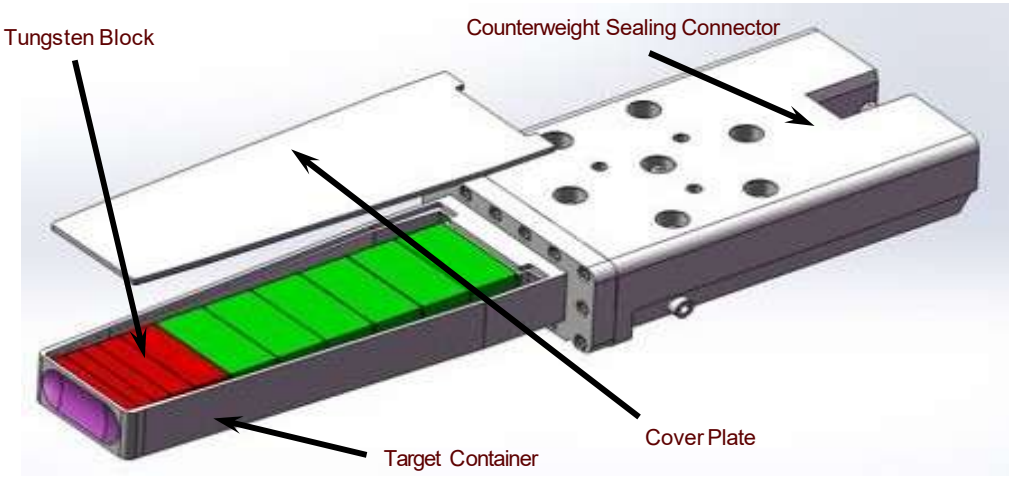
Case Study 10 – China Spallation Neutron Source (CSNS)

- The **China Spallation Neutron Source (CSNS)** is a national high-tech research facility developed under the **11th Five-Year Plan**. It serves as a multidisciplinary platform at the forefront of international scientific research.
- At the core of CSNS is a **tungsten spallation target**, located at the center of the target station. When **high-energy proton beams** bombard the tungsten target, neutrons are generated. These neutrons are moderated and directed toward test samples, enabling precise analysis of **material microstructures** and their **physical and chemical properties**.



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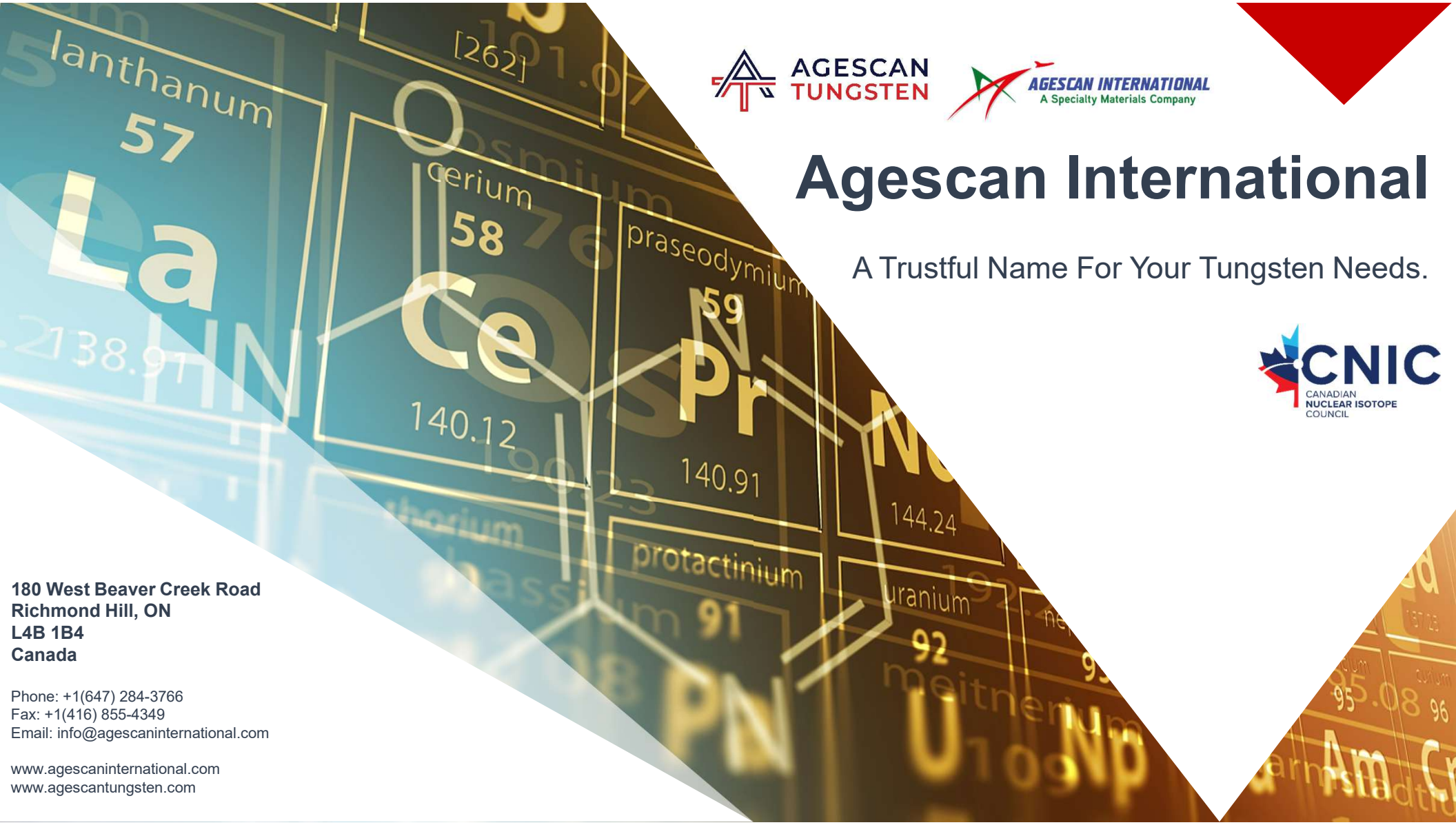

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