I-PULSE
HighPowerSystems

WORLD MATERIALS FORUM

9th Edition,
World Materials Forum
6 – 7 July 2023

REINVENTING THE MINING INDUSTRY

POWER GREAT IDEAS

I-PULSE IS THE WORLD'S LEADING HIGH PULSED POWER COMPANY

Our proprietary technologies convert small amounts of electrical energy into enormous power to address a broad and growing suite of applications across multiple markets. Our technologies are proven, cost-effective, efficient and green.

Transforming, improving, discovering, imagining.

We prove that everything is possible when you power great ideas.

The world is rapidly transitioning to low-carbon technologies to combat climate change

Each of these technologies are mineral intensive, require large amounts of base minerals

per 3MW wind turbine

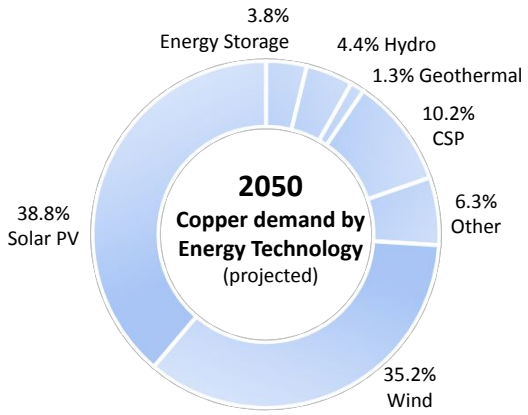
per MW of solar power generation

per MW stored

per EV passenger car

per EV trucks and buses

Copper is key for clean energy transition



Source: Copper Development Association Inc.

In the last 5000 years, about 500m/t of copper has been produced.

The world will need the same amount off copper for the next 25 years to meet the global demand

However, while mining is crucial to the clean energy transition,
it also accounts for up to 11% of global energy use

To benefit from the increase in mineral demand, existing and future project must adopt mining practices that minimize carbon and material footprint:

Energy Efficiency

Efficiency in
Mining Exploration

Robust Geological
Data

Carbon Footprint
reduction

Innovation in
Extractive Practices

Innovation in
Tailings Solutions

Use of Renewable
Energy

Innovation in
Mineral processing

I-Pulse propose a portfolio of sustainable technologies to support the future of mining.

OUR CORE TECHNOLOGY

At the heart of everything we do is

PULSED POWER

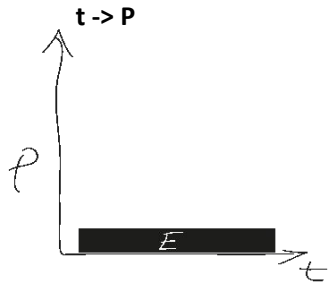
Unlike steady DC or AC power, Pulsed Power is a revolutionary new way to use electricity.

We have mastered the art of compressing very small increments of electrical energy into very brief, but gigantic bursts of power.

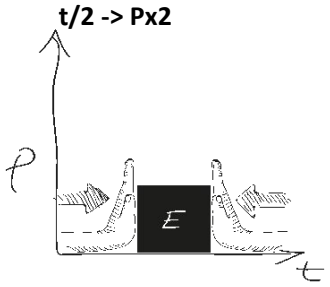
POWER IS KEY AND WE KNOW HOW TO PRODUCE A TREMENDOUS AMOUNT OF POWER WITH VERY LITTLE ENERGY

Our proprietary technologies convert **small amounts of electrical energy into enormous power** to address a broad and growing suite of applications across multiple end markets. Our technologies are proven, cost-effective, efficient and green.

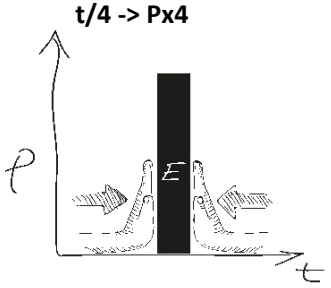
> *Pulse compression is capable of releasing the power output of a nuclear power reactor for a billionth of a second with the electrical energy stored in your wristwatch battery.*



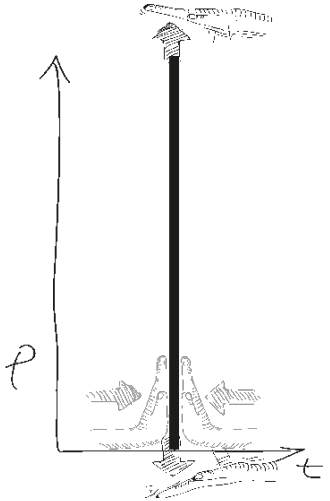
The power of a phenomenon results from the total energy applied divided by the time of application.



If you halve the duration (time compression), the power available will double.



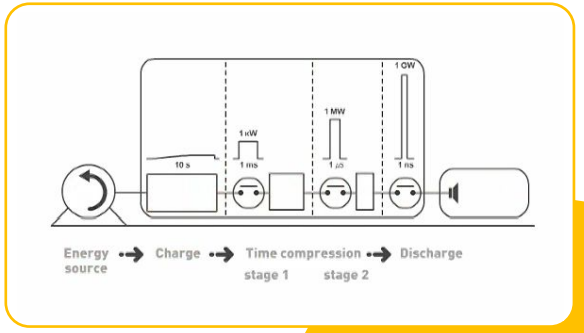
If you divide the time by 4, the power available is multiplied by 4, and so on.



What if you could divide the time by 1,000,000 (µs scale)?

THIS POWER ALLOWS US TO DO THINGS THAT WERE PREVIOUSLY IMPOSSIBLE

We use **low** average power(very low electricity cost) to create **gigantic instantaneous power**



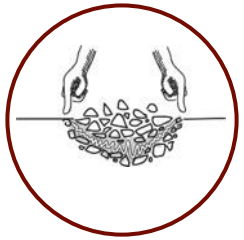
PULSED POWER CORE TECHNOLOGY

HIGH POWER ELECTRICAL FIELDS

can **reveal the presence of mineral or water resources** at significant depths

HIGH POWER SHOCKWAVES

to **break apart rocks** or to **reconnect geothermal production wells to reservoirs** by removing blockages



POWERFUL ELECTRICAL DISCHARGES

to **disaggregate rock** and **rapidly penetrate extremely hard rocks** for deep drilling or tunneling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I·ROX
REDUCES ENERGY AND CO_2 EMISSION IN ROCK COMMINUTION
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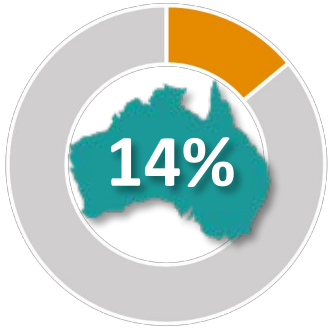
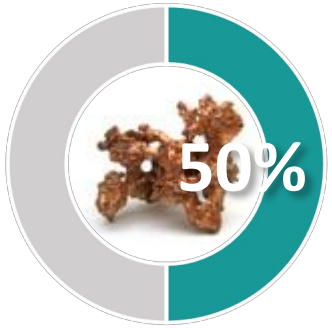
ENERGY EFFICIENCY IN ROCK COMMINUTION



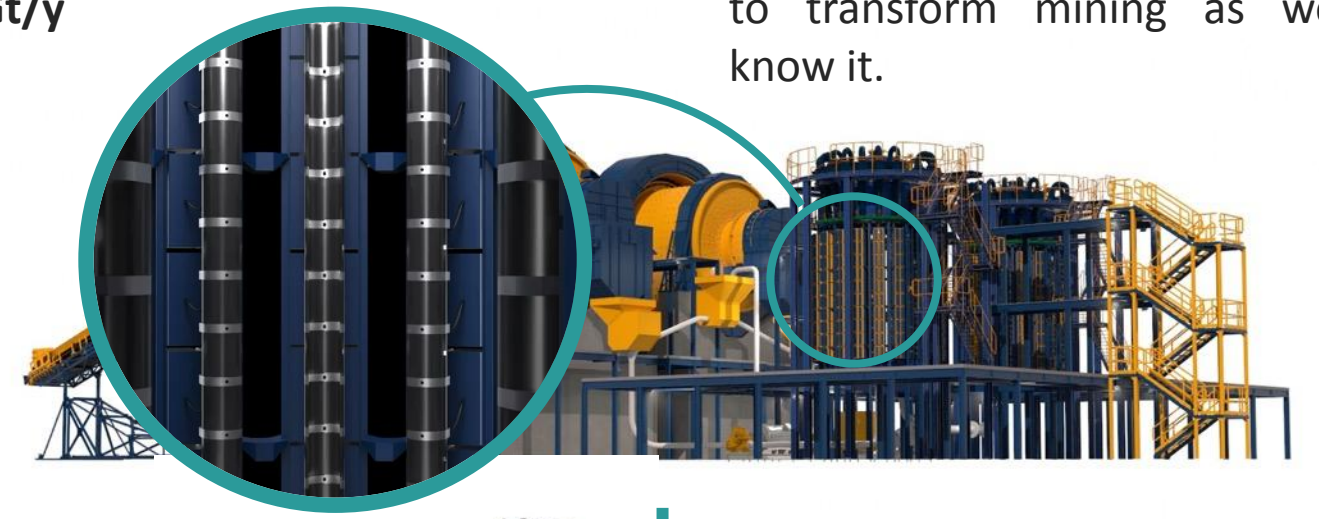
of electricity in **Australia** is used to crush rocks

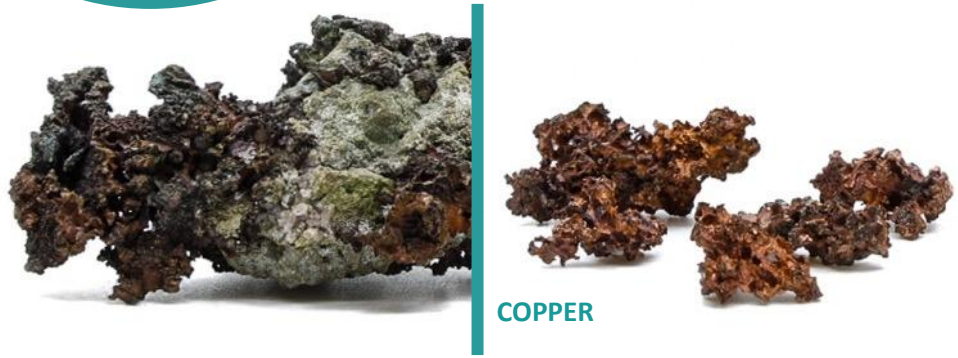


of energy is consumed in Cu milling

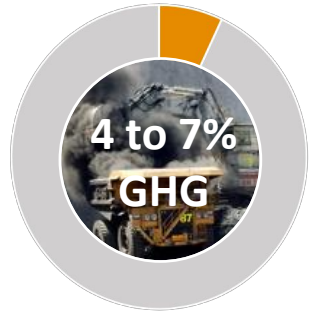
I-Rox Milling solution can reduce energy and hence CO_2 burden by **~0.5 Gt/y** just for Cu. This is 5% of the global reduction goal of **10Gt/y**

Reduced energy in mining would have a major impact on GHG. I-ROX offers an opportunity to Mining Majors to transform mining as we know it.

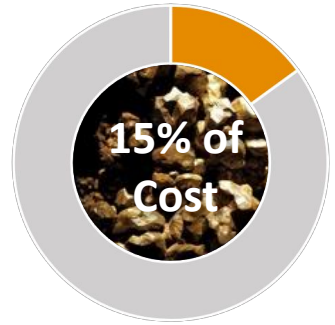




COPPER



Mining is responsible for **4% to 7% of global greenhouse-gas** (GHG) **emissions**

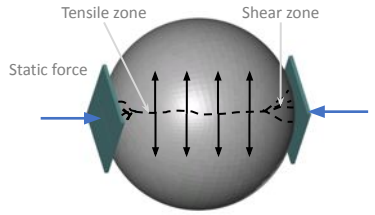
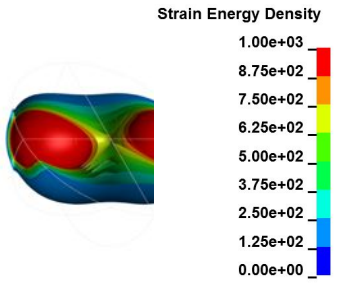
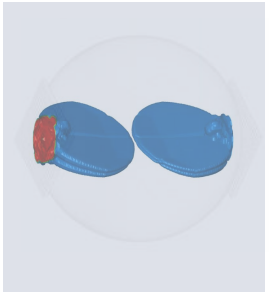
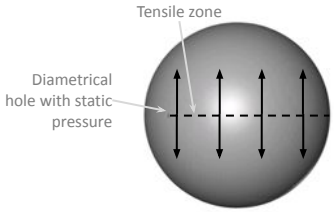
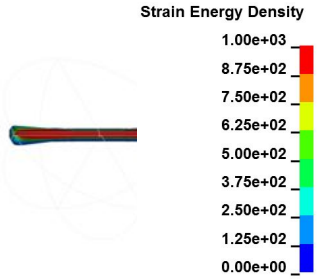
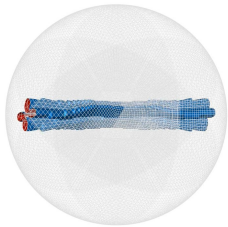


Recover critical metals at ≈15% of current cost and CO_2 burden

SIMULATION OF STATIC FRACTURE IN A SPHERICAL GRAIN

Ultimate strength of geomaterial is typically **10x lower in tensile** than compression.

Only dynamic waves can generate tensile stress intrinsically.

	TYPE OF STRESS WITH STATIC LOADING	ENERGY DENSITY JUST BEFORE CRACKS INITIATION	VIDEO OF DAMAGES	TOTAL REQUIRED ENERGY FOR RUPTURE
Compressive static loading # Conventional crusher loading type	Indirect tensile stress 			1061 J/m^2
				/20
Static pressure inside a small hole # Arc loading type	Direct tensile stress 			53 J/m^2

Pictures of energy densities shows an energy required much smaller to initiate cracks with a pressurized small hole.

Total energy required for fragmentation with a pressurized small hole is 20x smaller than with a compressive loading.

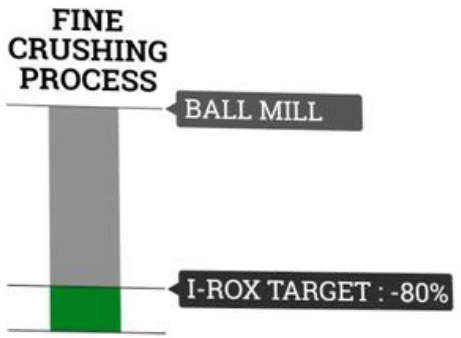
FINE CRUSHING

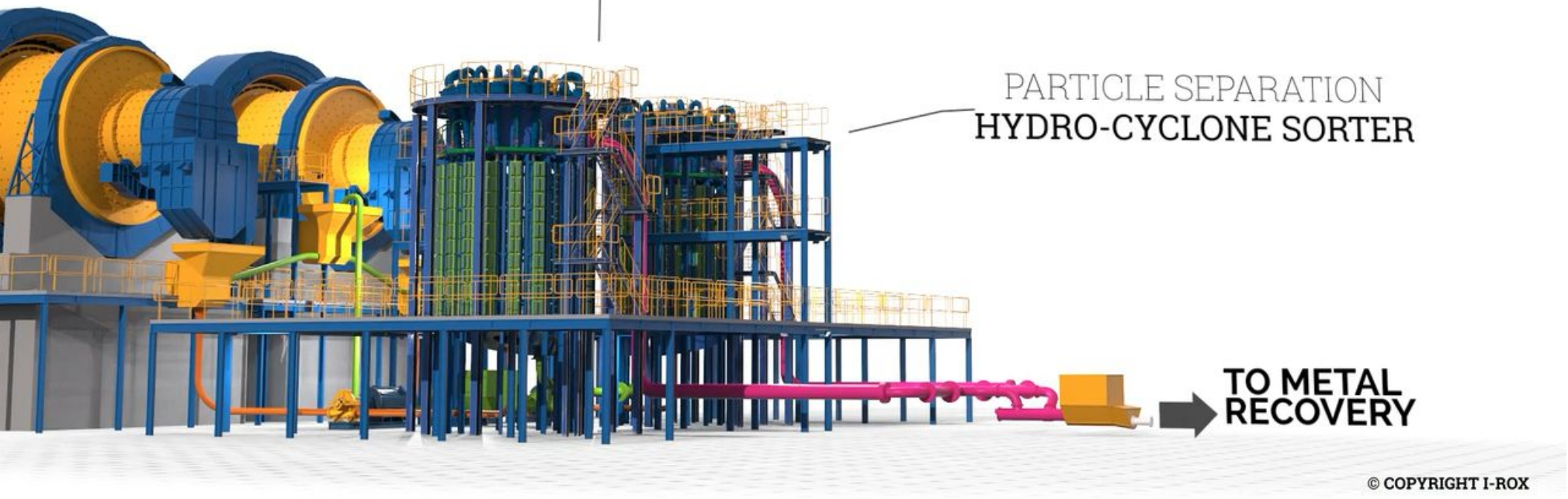
IROX PULSE CRUSHING

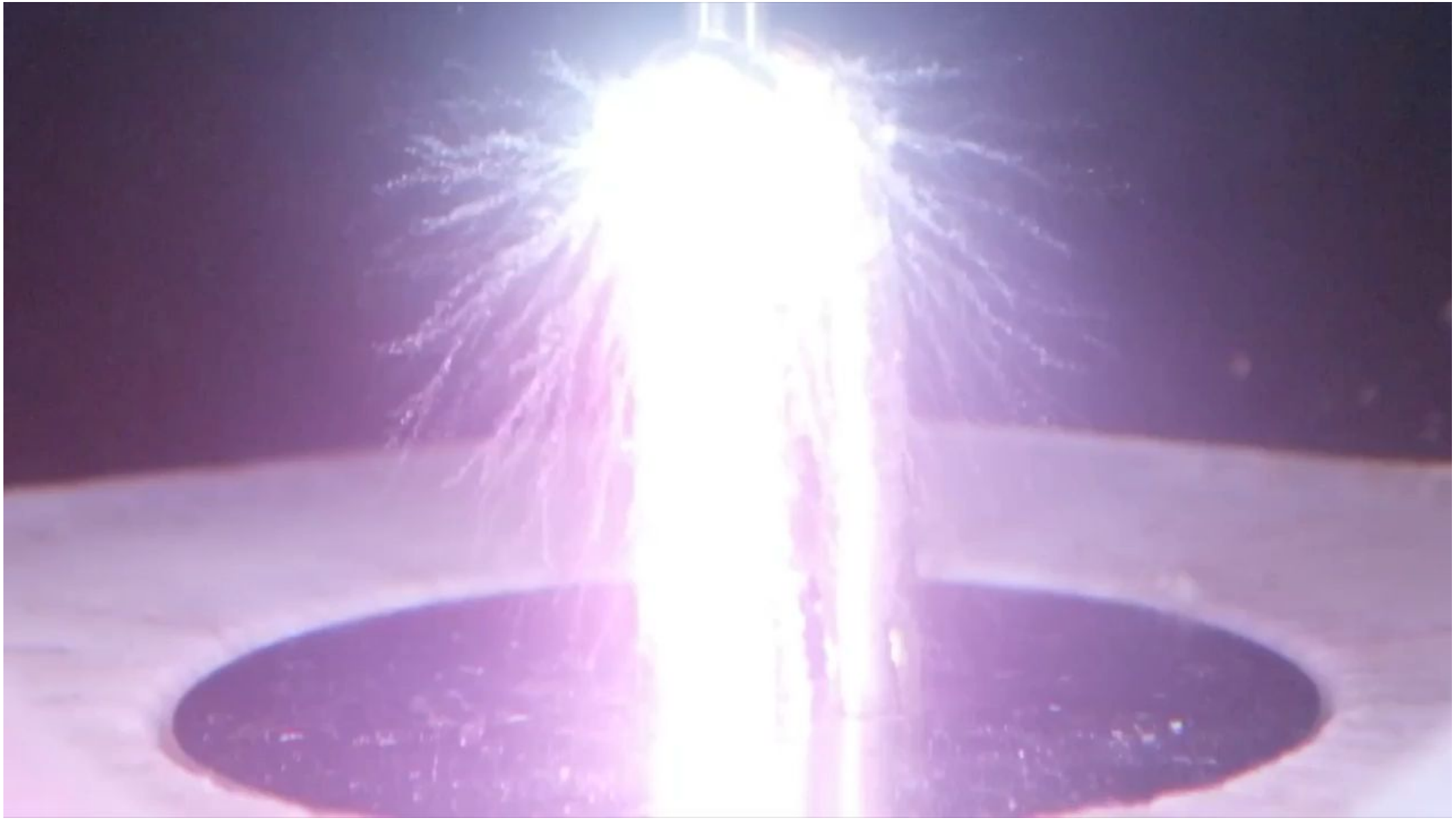
6 MW

1.6 kWh/t

1.2 mm -> 0.16 mm







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