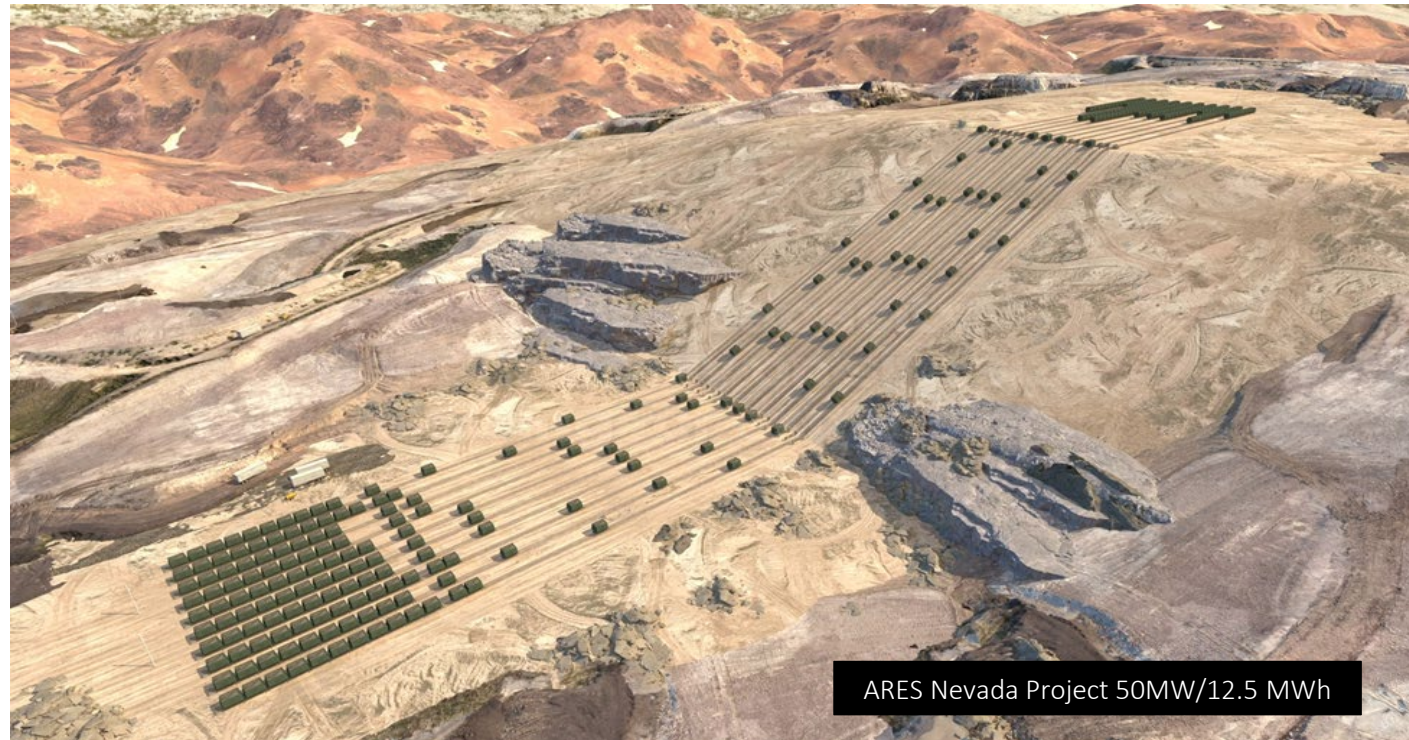


Advanced Rail Energy Storage (ARES)

Market Needs & Technology Overview

Russ Weed
Chief Development Officer

Thermal-Mechanical-Chemical
Energy Storage Workshop -
Storage Deployment
August 11, 2021



ARES Nevada Project 50MW/12.5 MWh

Market Requirements for Grid Modernization & Resiliency, Renewable Supply



Energy Storage Which Is:

- Low Cost ($\leq \$0.05/\text{kWh}$, 20+ yr total cost of ownership)
- Durable (20-40 yrs life, minimal degradation)
- Reliable ($\geq 95\%$ uptime, non-flammable)
- Flexible (15min to 12+hr duration)
- Made in America



≈



Li-Ion Batteries Are Electro-Chemical Challenges



<https://www.energy-storage.news/news/nec-delivers-orsted-first-20mw-standalone-grid-battery-project>

Lister Drive Grid Substation
Liverpool, England
September 14-15, 2020
20MW Li-ion Battery



<https://www.liverpoolecho.co.uk/news/liverpool-news/live-updates-fire-rips-through-18934842>

Li-Ion Batteries Are Electro-Chemical Challenges

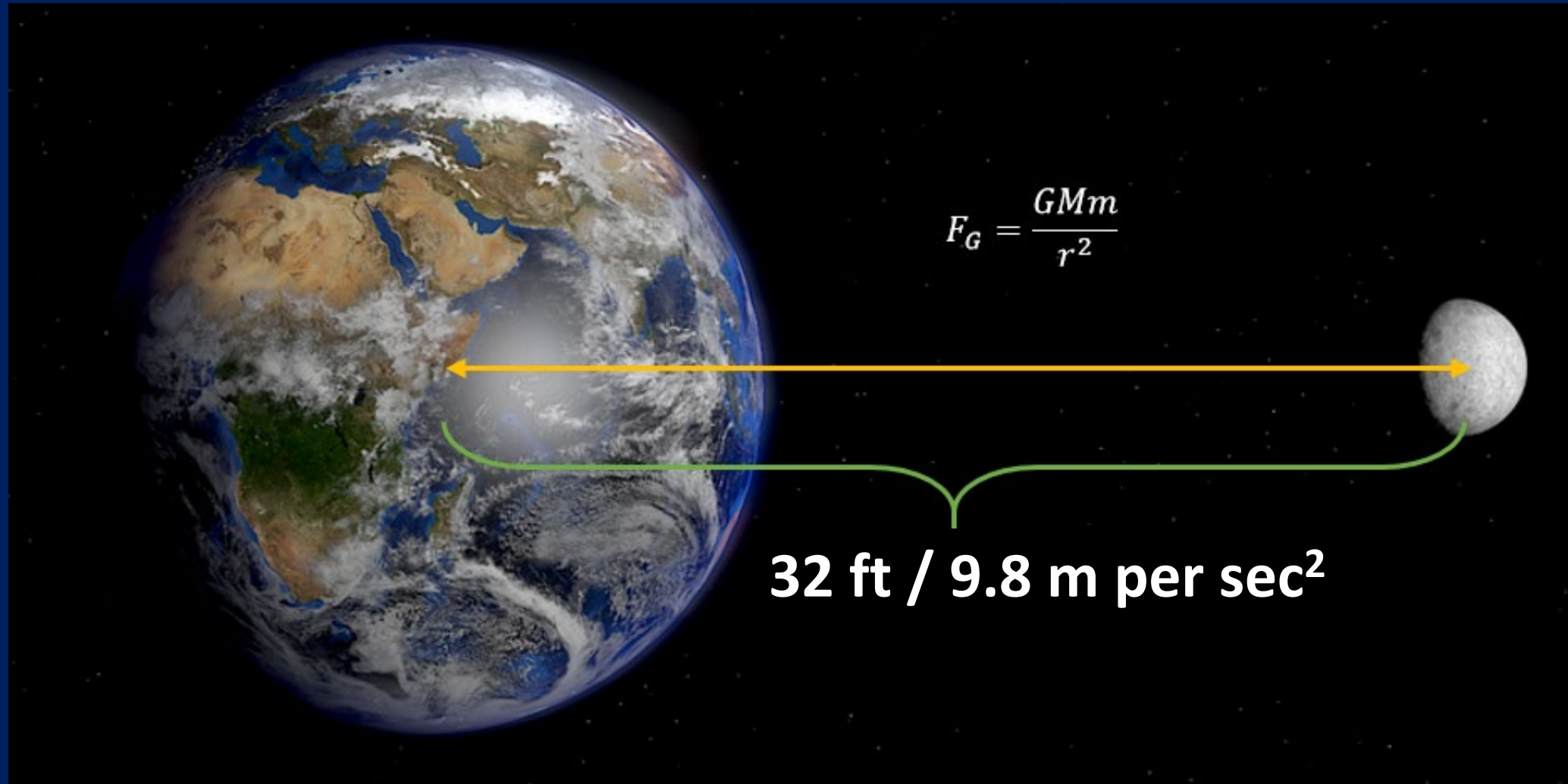


Fengtai District power station
Beijing, China
April 16, 2021
25MWh Li-ion Battery



[2 firefighters die in battling Beijing's power station fire - Chinadaily.com.cn](http://chinadaily.com.cn)

Gravity as Active Species



The Power of Gravity



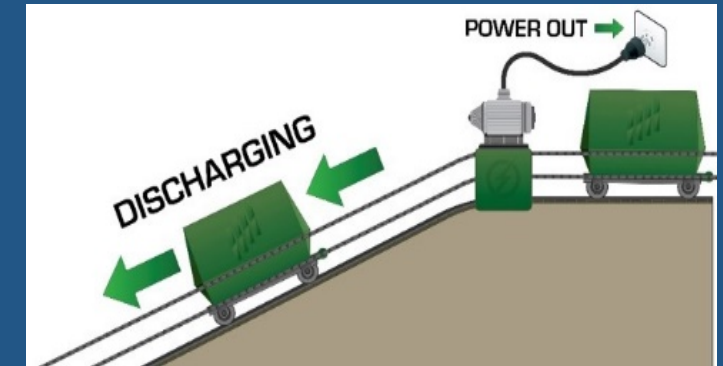
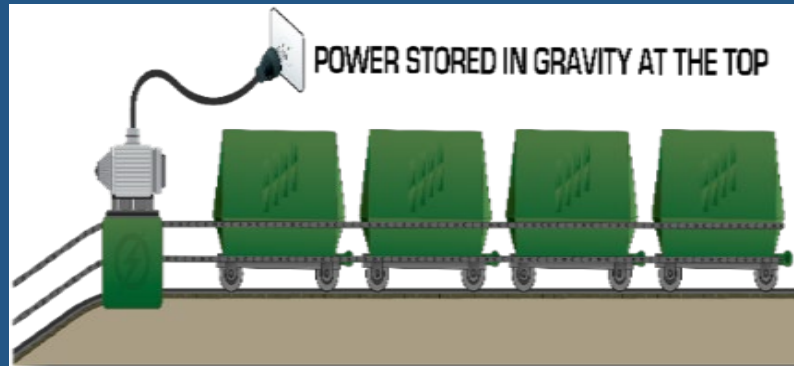
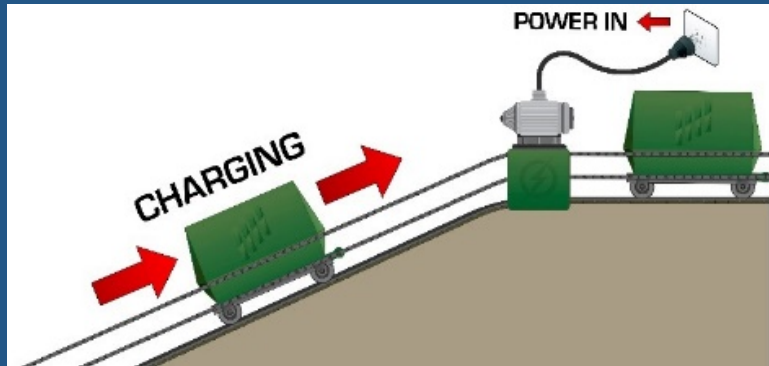
**250 kWh
Energy
Per Mass Car**

662,000 lbs

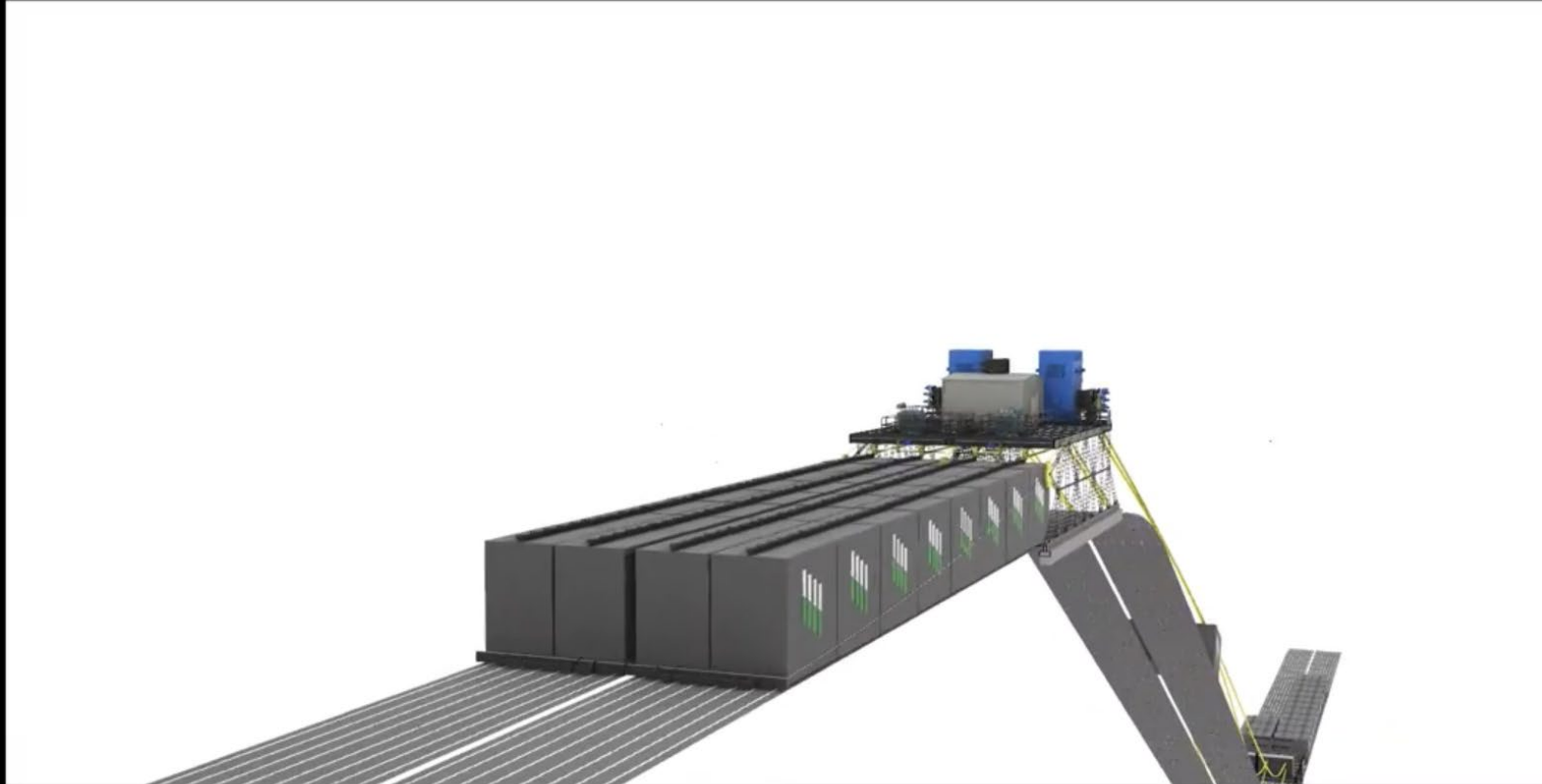
1000 ft elevation gain

1kWh = 3,600,000J

ARES Rail-Based Gravity Storage - Concept



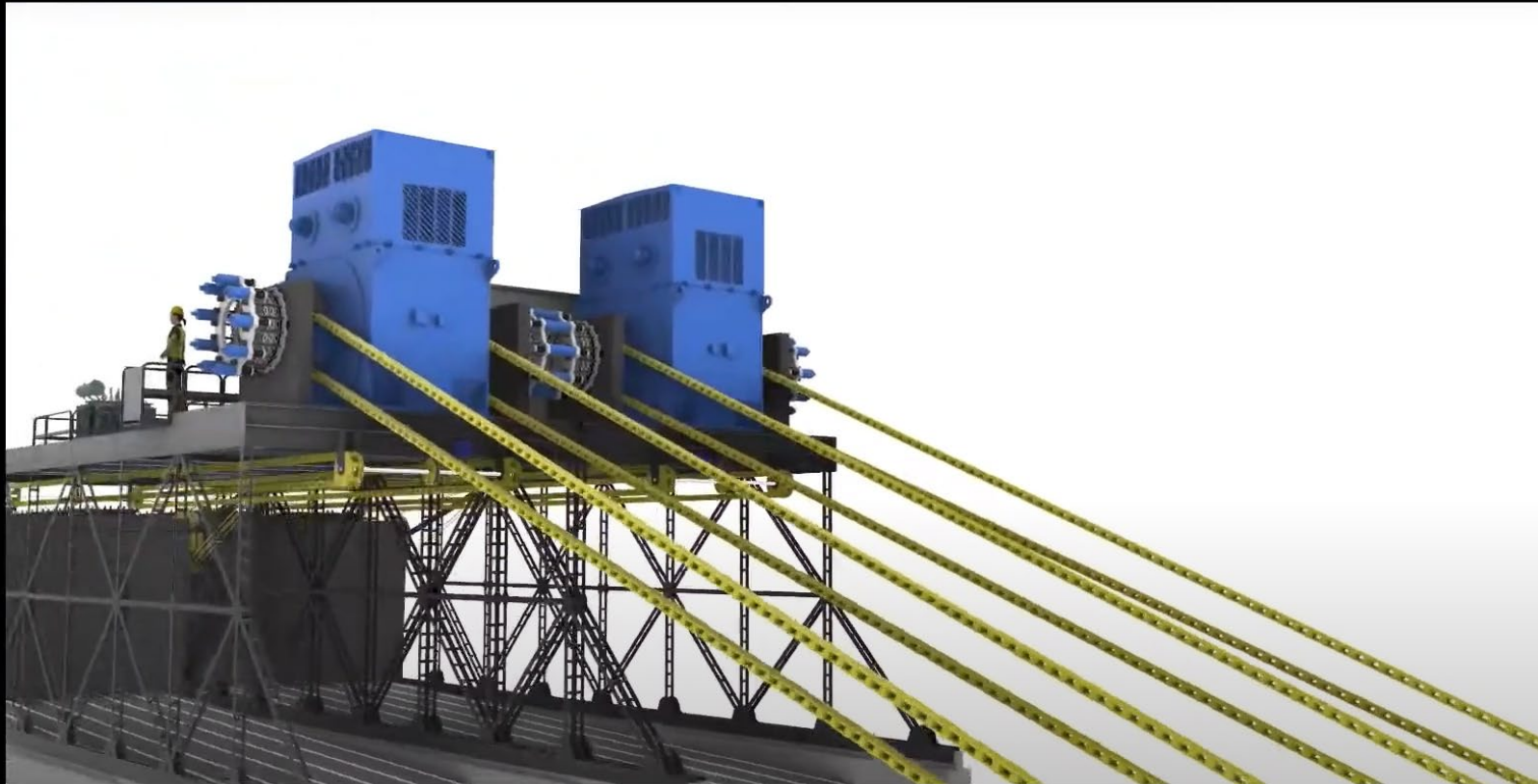
ARES Rail-Based Gravity Storage – Engineering Design



ARES Rail-Based Gravity Storage – Engineering Design



Feb 9 ARES GravityLine Animation



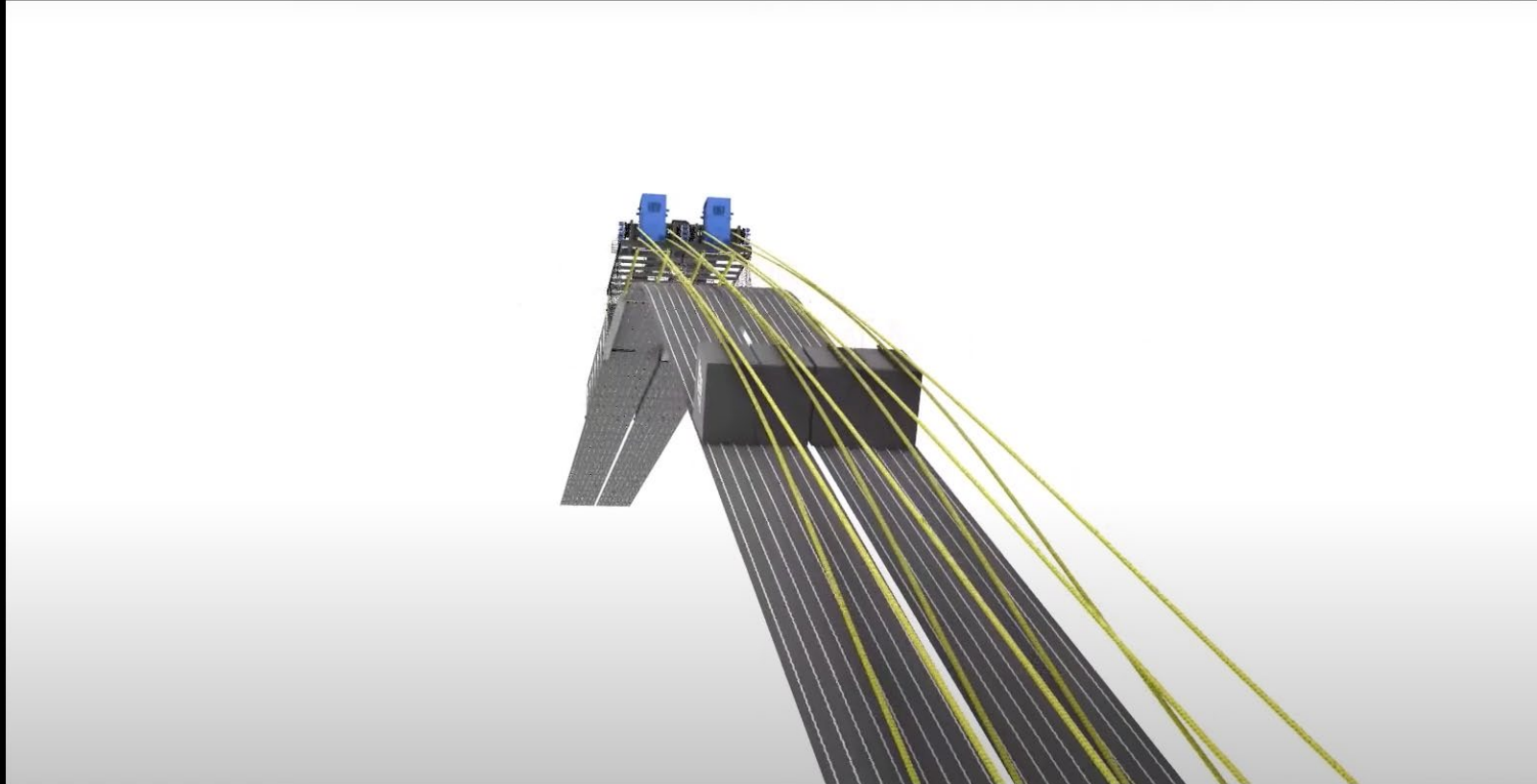
0:34 / 1:09



ARES Rail-Based Gravity Storage – Engineering Design



Feb 9 ARES GravityLine Animation



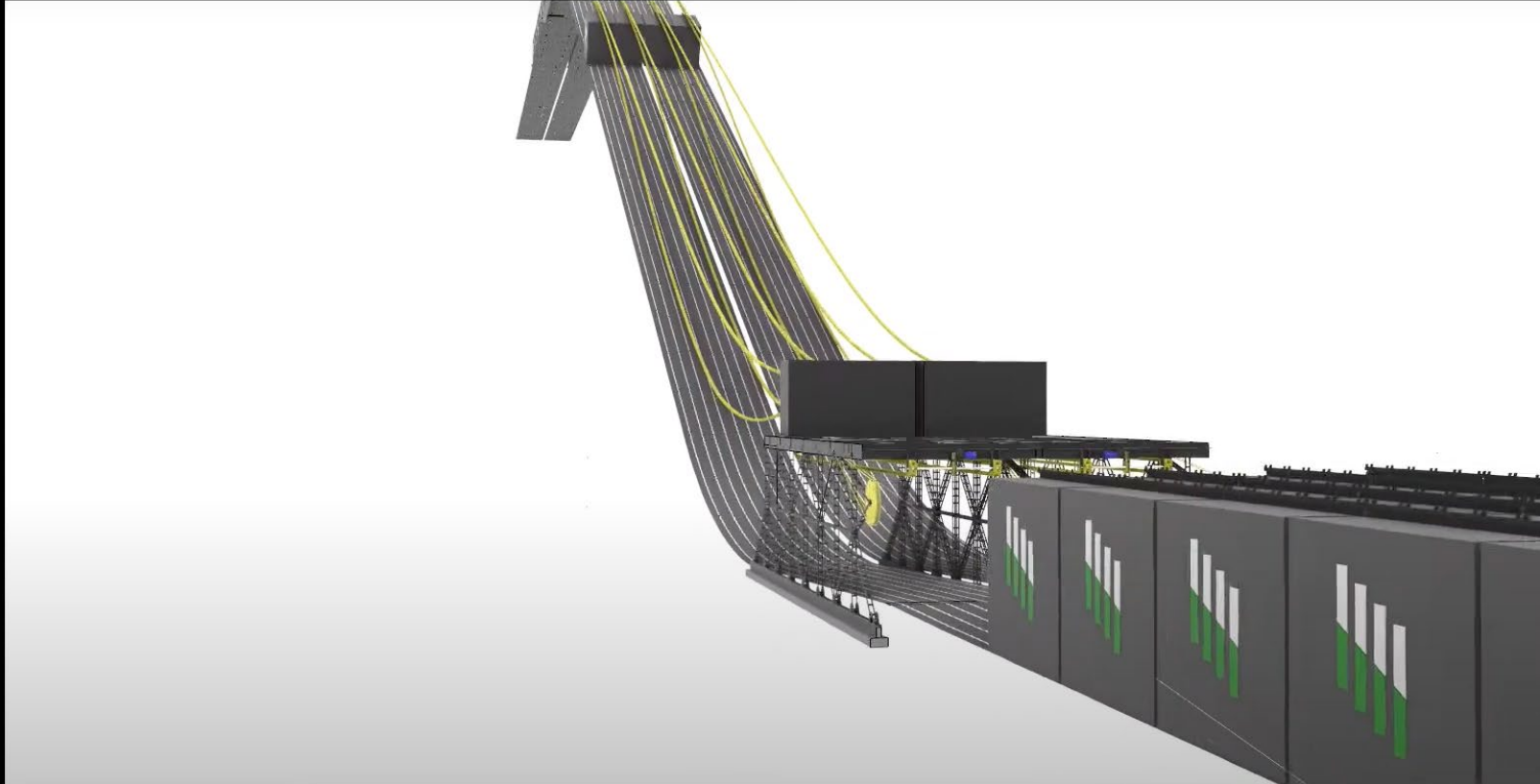
▶ ⏮ 🔊 0:50 / 1:09



ARES Rail-Based Gravity Storage – Engineering Design



Feb 9 ARES GravityLine Animation



Play (k)

▶ ⏮ 🔊 1:00 / 1:09



Application to ARES Nevada Project



ARES Nevada Project – Pahrump

ARES GRAVITY PROJECT



ARES Nevada Project – Gamebird Pit

Scroll for details

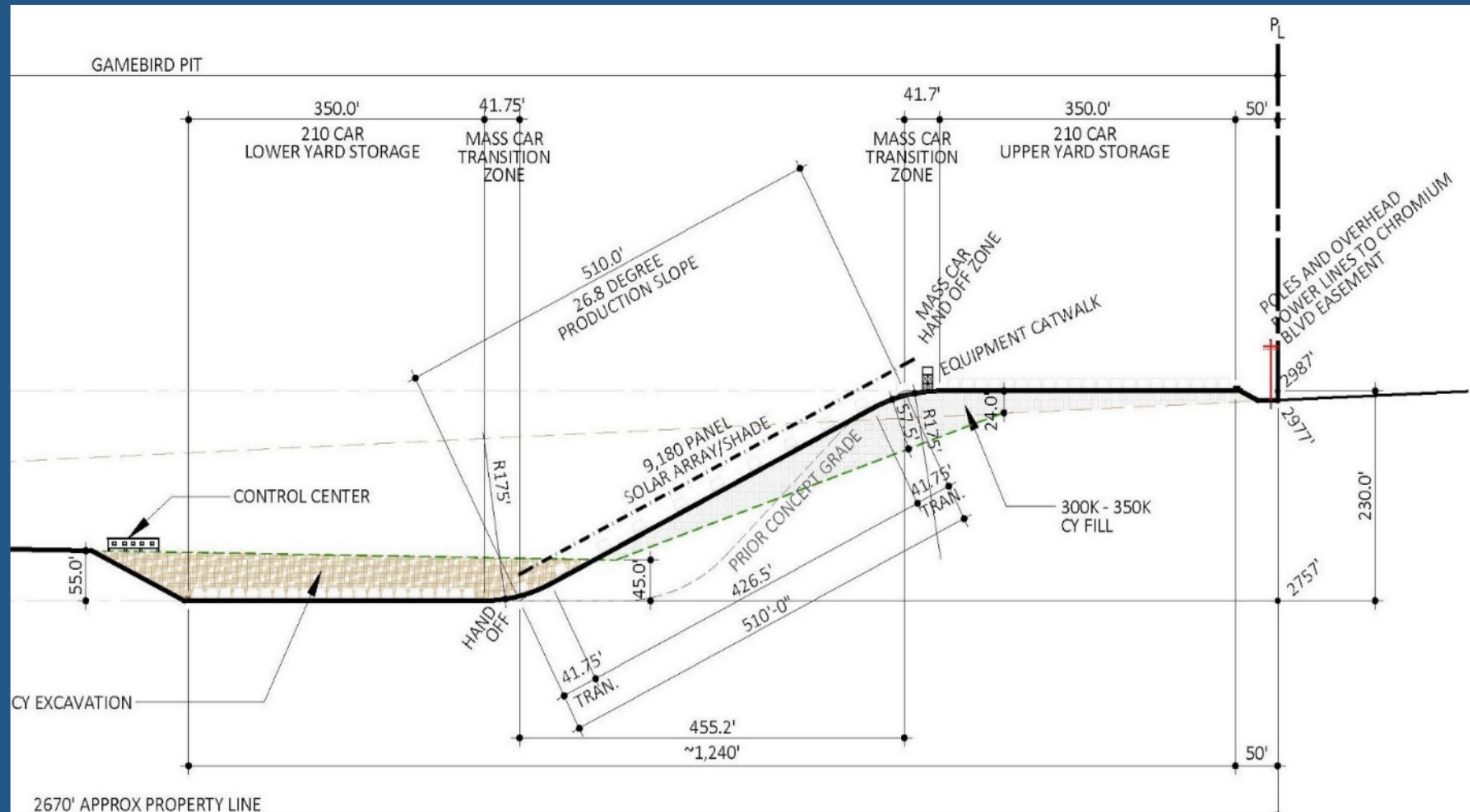


Gamebird Pit In Operation Today

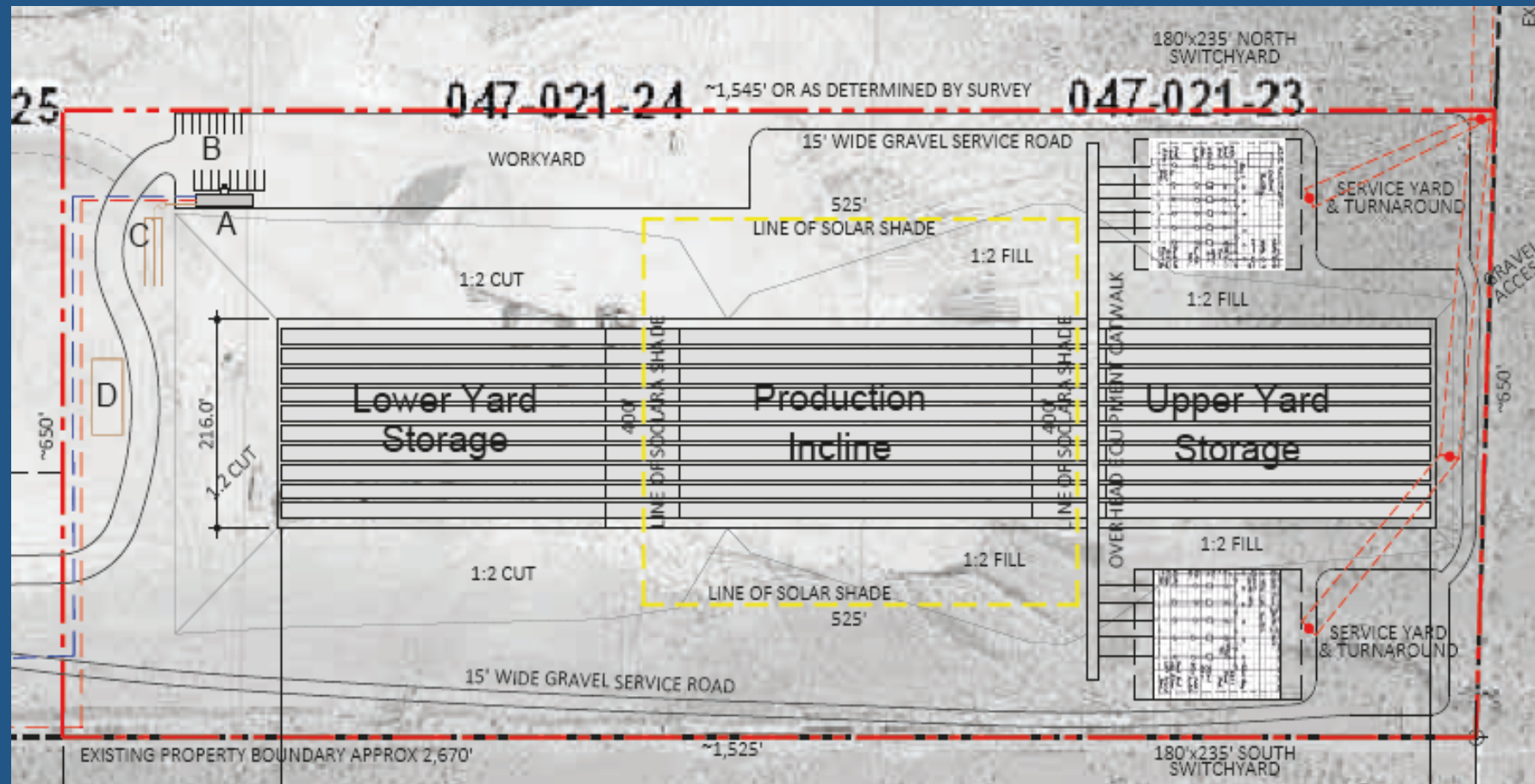


DRONE VIDEO: <https://youtu.be/oH-Lq9U5IGI>

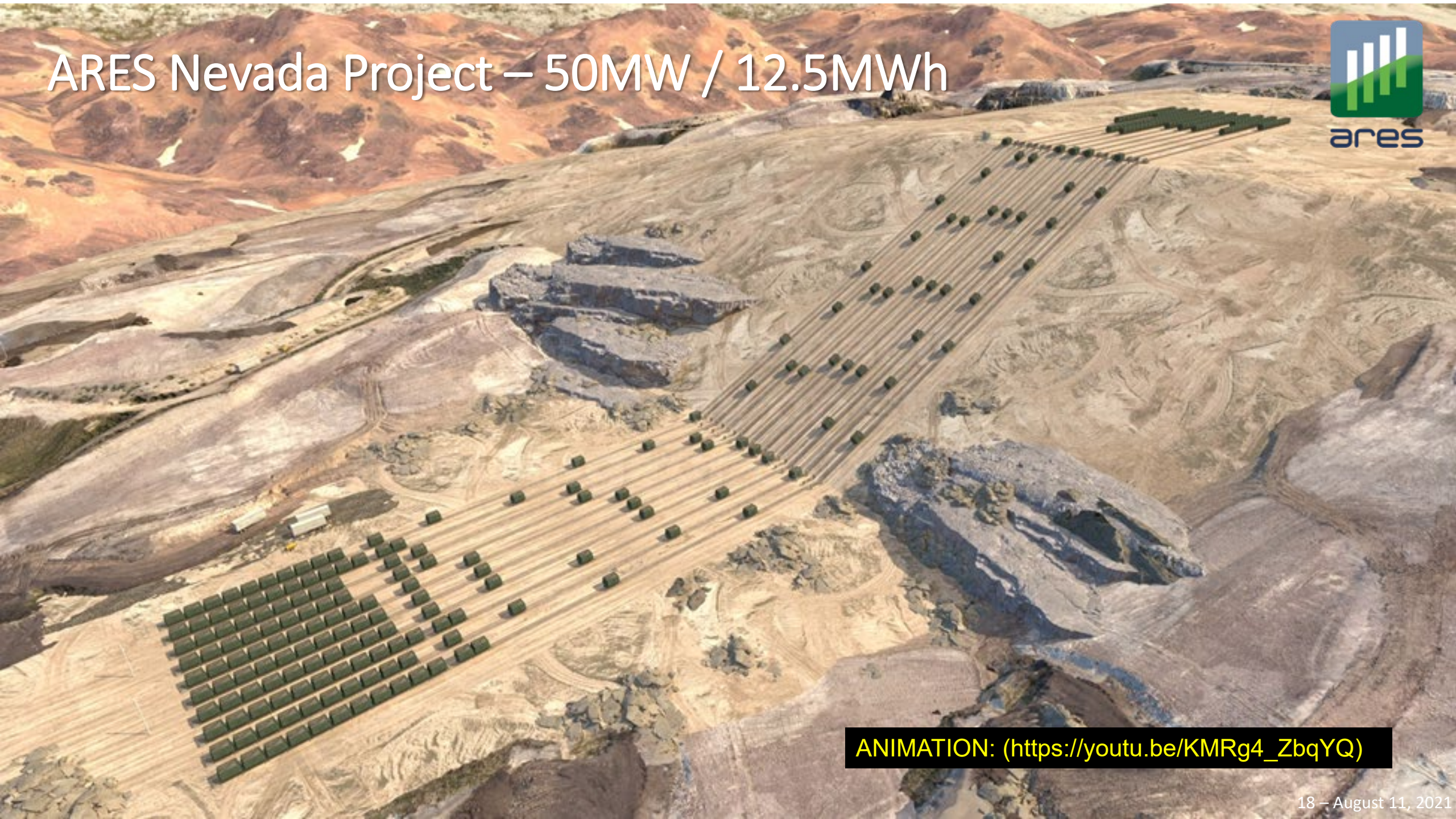
ARES Nevada Project Design - Gamebird Pit



ARES Nevada Project Design - Gamebird Pit



ARES Nevada Project – 50MW / 12.5MWh



ANIMATION: (https://youtu.be/KMRg4_ZbqYQ)



ARES Nevada Project – Late 2020 ground-breaking

<https://youtu.be/DRSu5O056NM>

Thank you



To Thermal-Mechanical-Chemical
Energy Storage Workshop organizers

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[ARES North America - The Power of Gravity](#)