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Risk Resilience in Energy: Navigating Transitions and Losses

New York City April 3rd, 2024

Revisiting Saved Depreciation

Presented by:

Juan Lopez (QLDG); Brad Ebel (MDD); Peter Jones (BCS)

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What is Depreciation?

- “Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life”
  - IAS 16 – International Financial Reporting Standards
- A term that refers to two aspects of the same concept:
  - “an actual reduction in the fair value of an asset, such as the decrease in value of factory equipment each year as it is used and wears,
  - the allocation in accounting statements of the original cost of the assets to periods in which the assets are used (matching principle)”
    - Raymond H. Peterson, Accounting for Fixed Assets, John Wiley and Sons, Inc., 2002
- “The reduction in the value of an asset with the passage of time due in particular to wear and tear”
    - Oxford Dictionary

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Does it change in case of a loss or damage?

- In case of a total loss or major outage period?
  - accounting rules dictate that depreciation ceases

- What about in case of a partial loss?
  - Physical continues
  - Technological continues
  - Economical continues
  - Functional ("Wear and Tear") ceases

Technical Depreciation – “Wear and Tear”

- Equipment, assets or parts of assets
  - Not being used up
  - Not being consumed
- Thus, a savings
- Depreciation would be saved when you have an asset or equipment that is used by units or hours of production which is not damaged on a loss and not used during the indemnity period
- How is it measured?
  - Depreciation as a proxy

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MINING DDA - DEPRECIATION

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MINING DDA – DEPLETION

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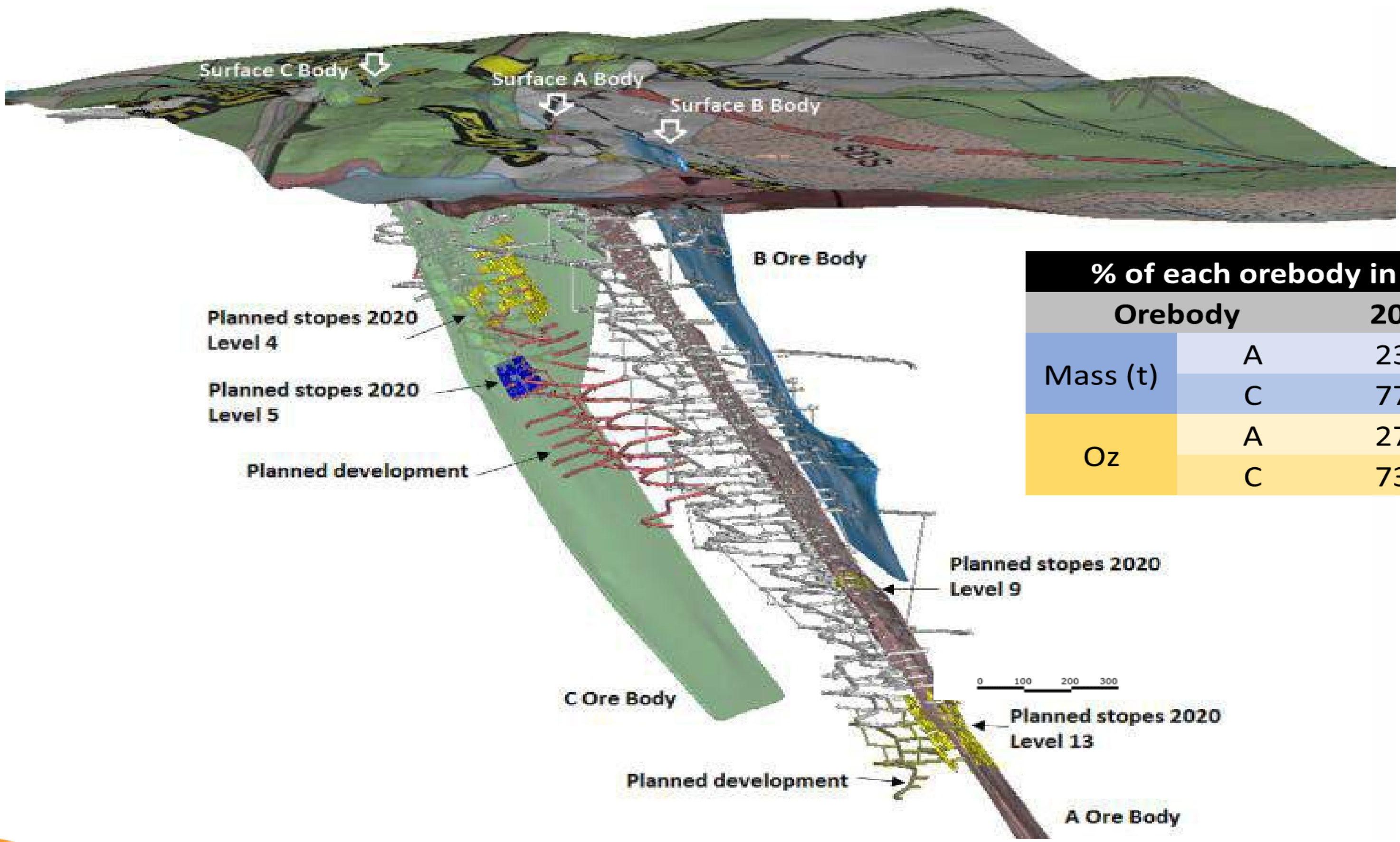
MINING DDA - AMORTIZATION



% of each orebody in Production			
Orebody		2018	2019
Mass (t)	A	23%	35%
	C	77%	65%
Oz	A	27%	45%
	C	73%	55%

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Principles of Depreciation "savings" - *

Principle No. 1 - Depreciation expense savings must be measurable and certain and should be related to an out of pocket savings. Cash is king;

Principle No. 2 - Capital costs result in cash expenditures at time of purchase; depreciation expense does not as it is simply an allocation of the historical cash expenditure; Review Historical and Planned CAPEX and OPEX

Principle No. 3 - There is nuance when determining a capital expenditures or depreciation savings. Nuance in whether the asset is destroyed, damaged, not damaged, or even existed at the time of the loss event; whether the asset is short term or long term; how the asset truly depreciates: time or usage or lack of usage or a combination; going concern of the entity; age of the asset. **There is clearly a professional judgment continuum.**

* - A Financial Damages Perspective

Principles of Depreciation “savings” - *

<u>Principle No. 4</u> - Putting aside accounting depreciation, the true life and of an asset and how it depreciates should be certain. Is there a tight correlation between throughput and the true “wasting of the asset”? Ie. catalyst.

<u>Principle No. 5</u> - Short term repetitive capital asset purchases that correlate with throughput are prime candidates for a true out of pocket savings. Depreciation “savings” measurement is often used “<u>as a proxy</u>” absent a precise cost savings for the next purchase; ie. repetitive catalyst costs; repetitive capital maintenance costs. Long-term assets typically would not result in a cash savings however an exception would be if the insured was going to replace that 40-yr asset in the near future and is scheduled on the CAPEX plan. “The fortuitous fire” factor. This would result in a significant cash savings.

* - A Financial Damages Perspective

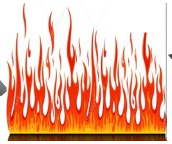
Beta Co. purchases major long-term asset in 2018 and the cost is depreciated for accounting purposes over 40 years

Day 1 of Commercial Operation

$100mm
Out of Pocket Cost
Sunk Cost (Cash)

Non-Cash Accounting Depreciation Exp. Book Allocation of the sunk cost over 40 years

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10



Year 11 Year 12 Year 13 Year 14 Year 15 Year 16 Year 17 Year 18 Year 19 Year 20

Year 21 Year 22 Year 23 Year 24 Year 25 Year 26 Year 27 Year 28 Year 29 Year 30

Year 31 Year 32 Year 33 Year 34 Year 35 Year 36 Year 37 Year 38 Year 39 Year 40

= $2.5mm a year of non cash depreciation

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Insured abandons plant rather than reinstates. Theoretical 3-yr As Was Where Was

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Questions

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April 3, 2024

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New York City April 3rd, 2024

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- Keynote – Sam Lightstone
- Conventional Power Generation
- Navigating Complex Mining Losses
- Current State of Renewables
- Utility Scale Batteries, Risk and Insurance
- Carbon Capture: Past, Present & Future
- Energy Transition Challenges

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Keynote Speaker

Sam Lightstone
Technology Executive

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Codeword #1

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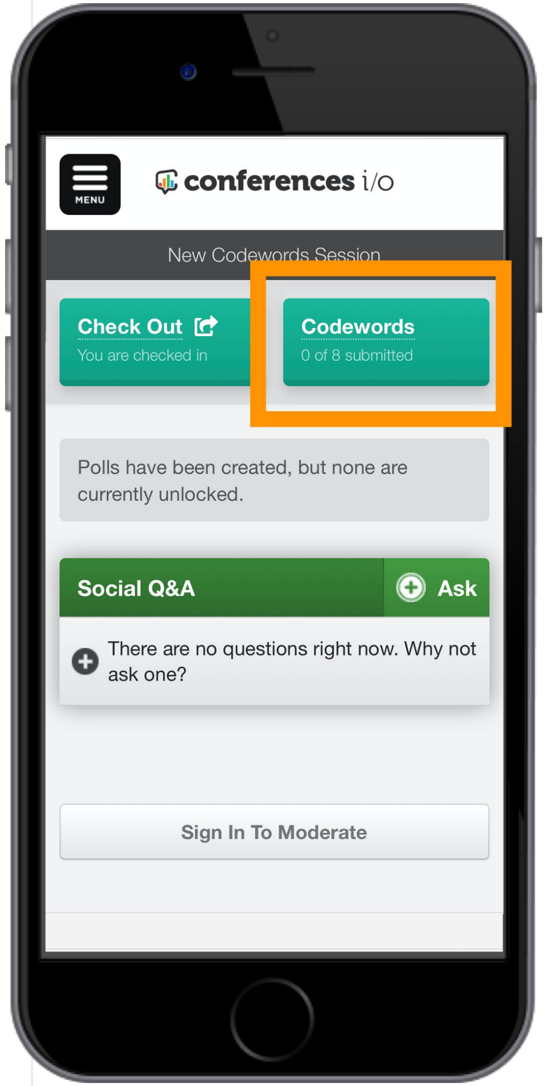

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Conventional Power Generation

Presented By

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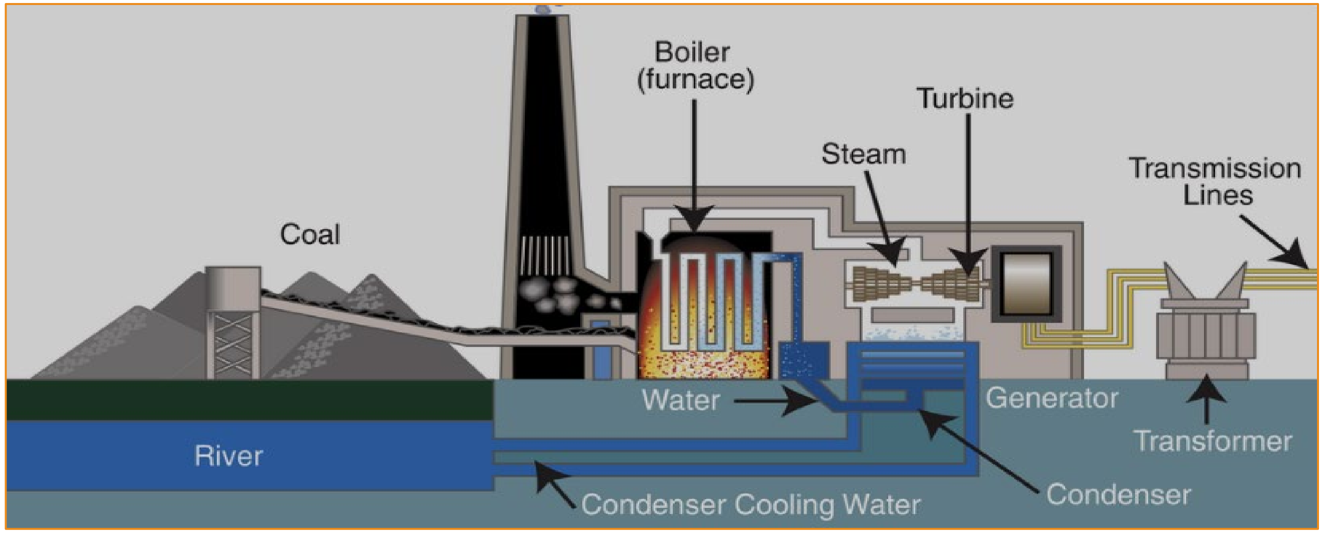
April 3, 2024

Power Generation: Three Major Categories

1. Fossil fuels (coal, natural gas, and petroleum hydrocarbons)
2. Nuclear energy
3. Renewables

Most electricity is generated with steam turbines



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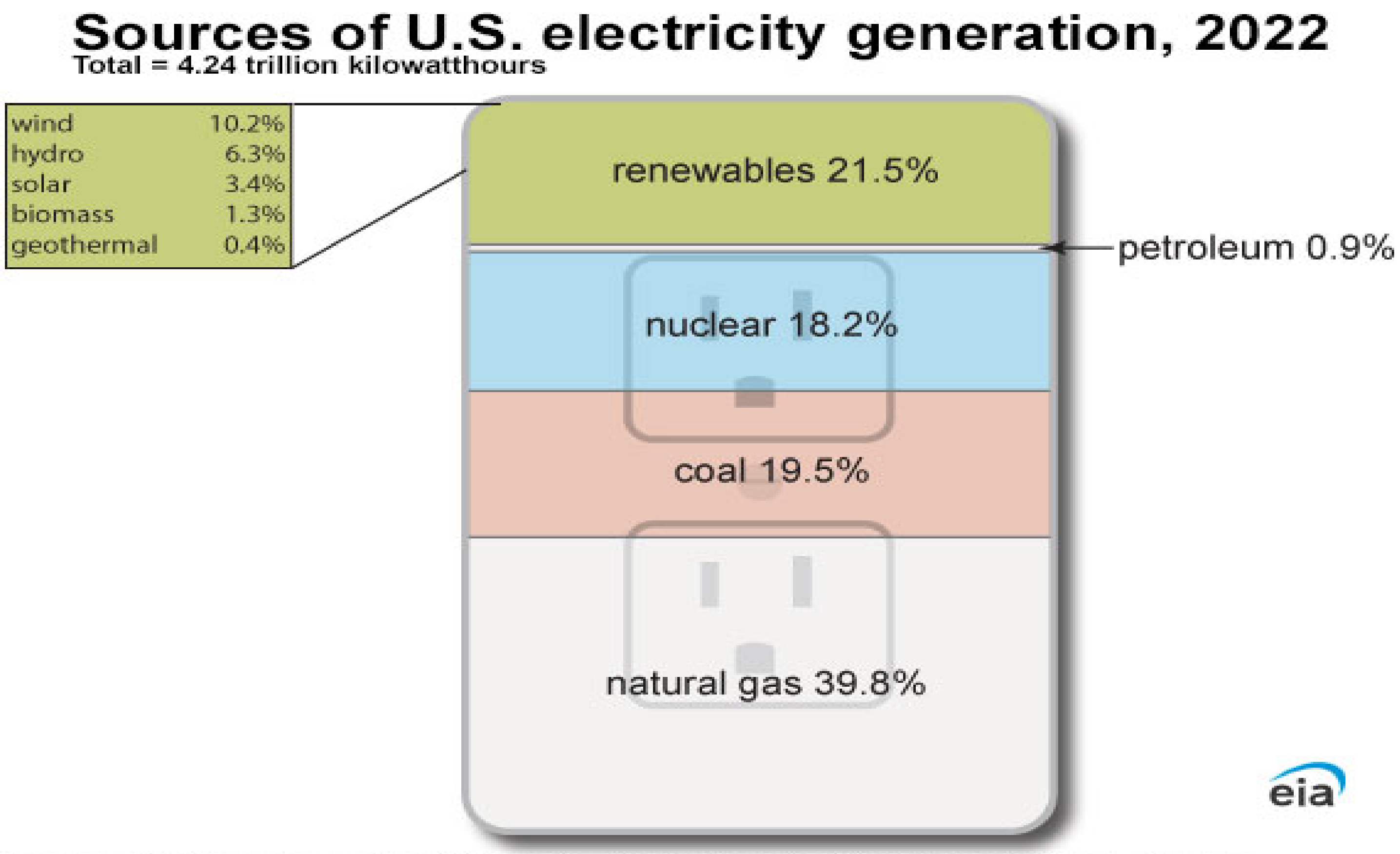
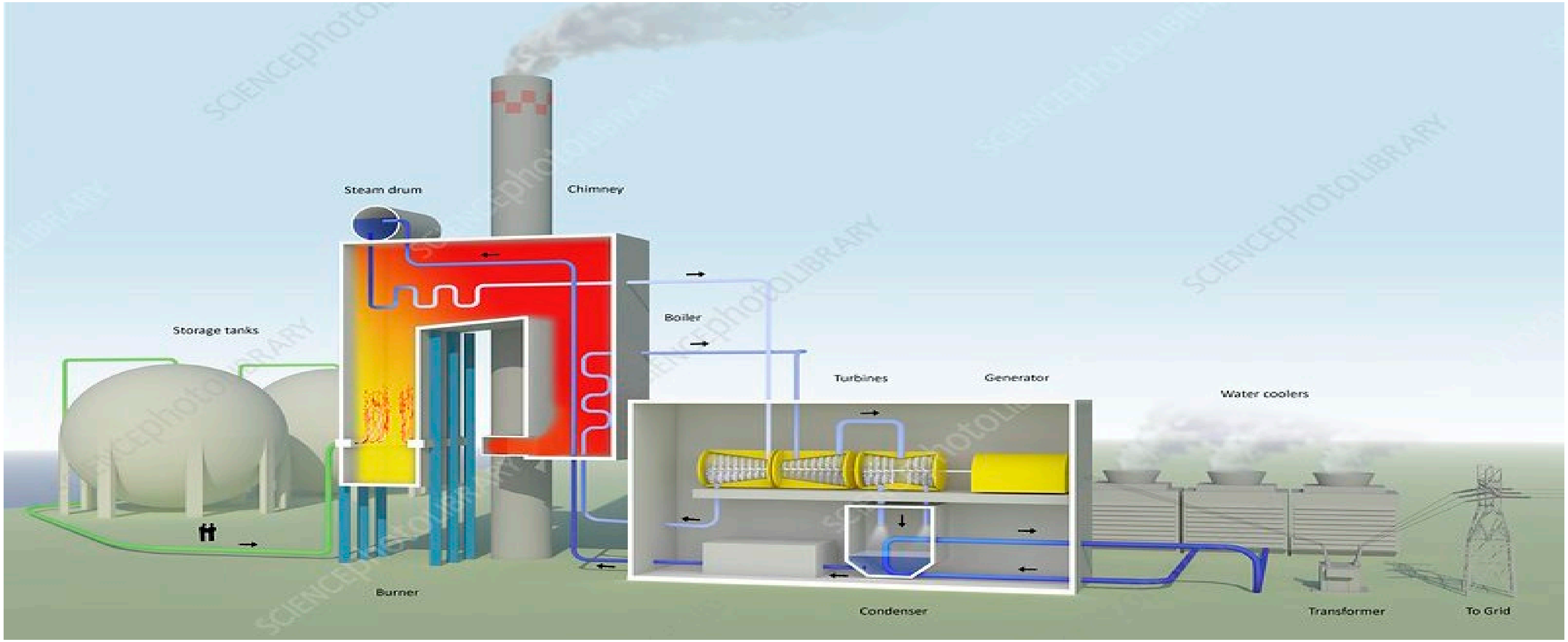
Conventional Power generation



Data source: U.S. Energy Information Administration, *Electric Power Monthly*, February 2023, preliminary data
Note: Includes generation from power plants with at least 1,000 kilowatts of electric generation capacity (utility-scale). Hydro is conventional hydroelectric. Petroleum includes petroleum liquids, petroleum coke, other gases, hydroelectric pumped storage, and other sources.

Natural Gas Power Plant Basics



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Steam Turbine Power Generation

- **Components**
  - Fuel supply to produce heat to boil water
  - Water conditioning system to ensure long term life
  - Boiler to generate Steam
  - Steam turbine to power electricity generator
  - Electricity Generator to generate electricity
  - Transformer to increase ~13,800 Volts to High voltage transmission voltage
  - Substation to control power transmitted
- Operating conditions: Condensing Steam Turbines
  - Pressure 1500 psi to 2400 psi in
  - Temperature 900 F to 1100 F
  - Efficiency 35-42%

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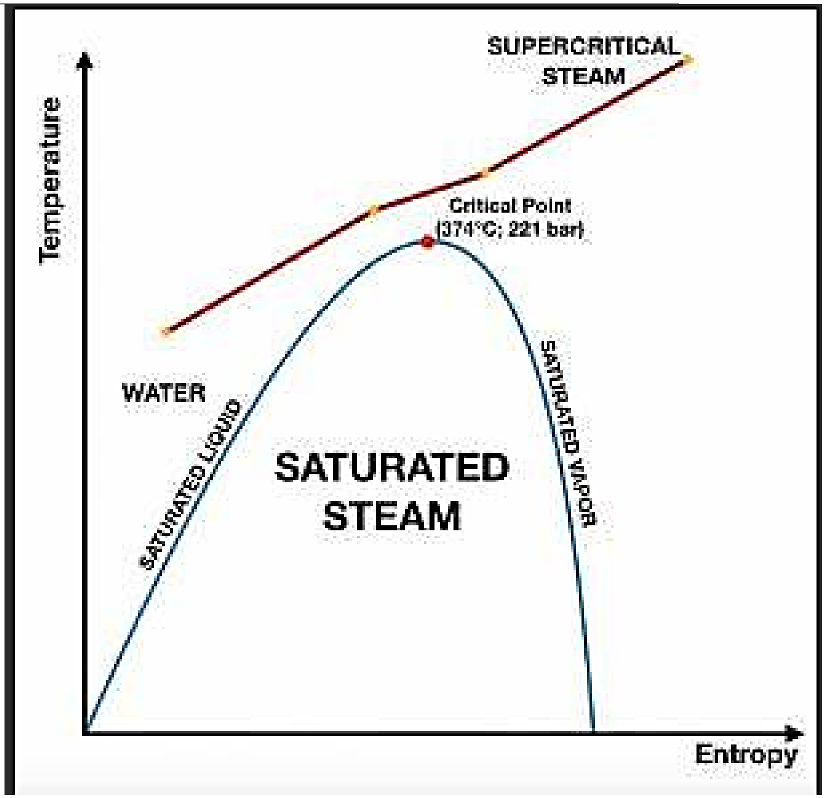
Steam Power Generation

Operating conditions Supercritical boilers

- Used to power Steam turbines over 300 MW
- Can work at temperatures over 705 °F and 3500 psi
- Boiler is suspended from metal structure

Operating conditions: Ultrasupercritical boilers

- Pressure up to 5000 psi
- Temperature up to 1400 °F
- Efficiency 47%
- Metallurgy of boiler tubes is the challenge



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Source: Materials Matter: The Advanced Ultrasupercritical Boiler Consortium (power-eng.com)

World Largest Power Generation Plants

Rank	Station	Country	Location	Capacity (MW)	Annual generation (TWh)	Type	Type of turbines used
1.	Three Gorges Dam	China	30°49′15″N 111°00′08″E	22,500	111.8 (2020)[8]	Hydro	32 Francis Turbines (700MW), 2 50 MW
2.	Baihetan Dam	China	27°13′07″N 102°54′22″E	16,000	60.24 (2021)[9]	Hydro	16 Francis Turbines 1000 MW
3.	Itaipu Dam	Brazil Paraguay	25°24′31″S 54°35′21″W	14,000	103.09 (2016)	Hydro	20 Francis Turbines 700 MW
4.	Xiluodu	China	28°15′52″N 103°38′47″E	13,860	55 (average)	Hydro	18 Francis Turbines 770 MW
5.	Belo Monte	Brazil	03°07′27″S 51°42′01″W	11,233	39.5 (average)	Hydro	18 Francis Turbines 624 MW
6.	Guri	Venezuela	07°45′59″N 62°59′57″W	10,235	47 (average)	Hydro	Francis Turbines. 10 - 725 MW, 4 - 180 MW, 3 - 400 MW, 3 -225 MW, 1-340 MW

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Image taken from https://www.powermag.com/understanding-hydro-turbine-draft-tubes-and-their-importance/ and https://www.energy.gov/eere/water/types-hydropower-turbines#:

Largest Natural Gas Burning Steam Turbine Power Plants

Rank	Station	Country	Location	Capacity (MW)
1.	Jebel Ali Power and Desalination Plant	United Arab Emirates	25°03′35″N 55°07′02″E	8,695
2.	Surgut-2	Russia	61°16′46″N 73°30′45″E	5,687[76]
3.	Higashi-Niigata	Japan	37°59′58″N 139°14′29″E	5,149
4.	Futtsu	Japan	35°20′35″N 139°50′02″E	5,040
5.	Tatan	Taiwan	25°01′34″N 121°02′50″E	4,984
6.	Kawagoe	Japan	35°00′25″N 136°41′20″E	4,802
7.	Burullus Power Station(German)	Egypt	31°31′46″N 30°48′32″E	4,800

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Source: https://en.wikipedia.org/wiki/List_of_largest_power_stations

Largest Coal Burning Steam Turbine Power Plants

Rank	Station	Country	Location	Capacity (MW)
1.	Tuoketuo	China	40°11′49″N 111°21′52″E	6,720
2.	Taean	South Korea	36°54′20.2″N 126°14′4.9″E	6,100
3.	Dangjin	South Korea	37°03′19″N 126°30′35″E	6,040
4.	Taichung	Taiwan	24°12′46″N 120°28′52″E	5,500
5.	Waigaoqiao	China	31°21′21″N 121°35′54″E	5,160
6.	Bełchatów	Poland	51°15′59″N 19°19′50″E	5,102

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Source: https://en.wikipedia.org/wiki/List_of_largest_power_stations

Largest Fuel Oil Burning Steam Turbine Power Plants

Rank	Station	Country	Location	Capacity (MW)
1.	Shoaiba	Saudi Arabia	20°40′48″N 39°31′24″E	5,600
2.	Ghazlan [no]	Saudi Arabia	26°51′15″N 49°53′56″E	4,528[67]
3.	Kashima	Japan	35°52′47″N 140°41′22″E	4,400[69]
4.	Anegasaki	Japan	35°29′06″N 140°01′00″E	3,600[67]
5.	Qurayyah	Saudi Arabia	25°50′40″N 50°7′31″E	3,927[67]
6.	Yokohama [ja]	Japan	35°28′36″N 139°40′44″E	3,379[67]
7.	Hirono	Japan	37°14′18″N 141°01′04″E	3,200[69]

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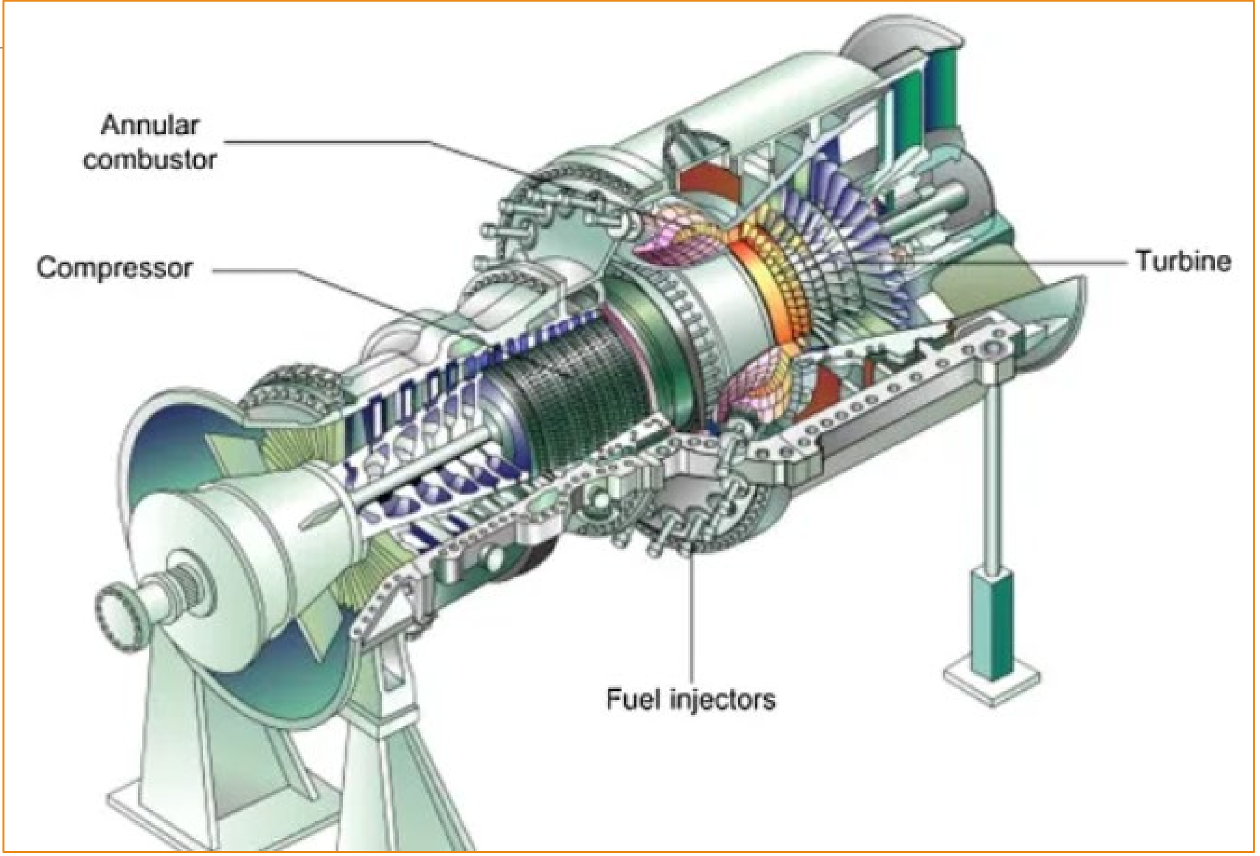
Source: https://en.wikipedia.org/wiki/List_of_largest_power_stations

Gas Turbine Power Generation

- Components
  - Axial Compressor to compress Air
  - Fuel supply mix and burn with air
  - Gas turbine to power axial compressor and electricity generator
  - Electricity Generator to generate electricity
  - Transformer to increase ~13,800 Volts to High voltage transmission voltage
  - Substation to control power transmitted



Gas turbine name is misleading to some, since a gas turbine can burn virtually any liquid fuel

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Source: https://medium.com/@arun_53509/components-of-a-gas-turbine-a-quick-overview-336da4b02b0e

Causes of Steam Turbine Failures

- Metal fatigue of blades
- Foreign Object Damage (FOD)
- Stress corrosion cracking
- Pitting corrosion in condensing turbines
- Flow induced distortion
- Fretting erosion and metal fatigue in blade tips
- Overspeed

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Image source: GE https://www.gevernova.com/steam-power/products/steam-turbines

Improvements in Gas Turbines Through the Years

Improvements have required:

Improvements in metals used in the manufacture of turbine blades

- Forging
- Casting
- Single Crystals
- Super alloys (Heat Resisting Alloys)

Cooling of blades

Development of Thermal Boundary coating

Results are Thermal efficiency of ~62% in combined cycle operation

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Improvements in Gas Turbines Through the Years: Cooling

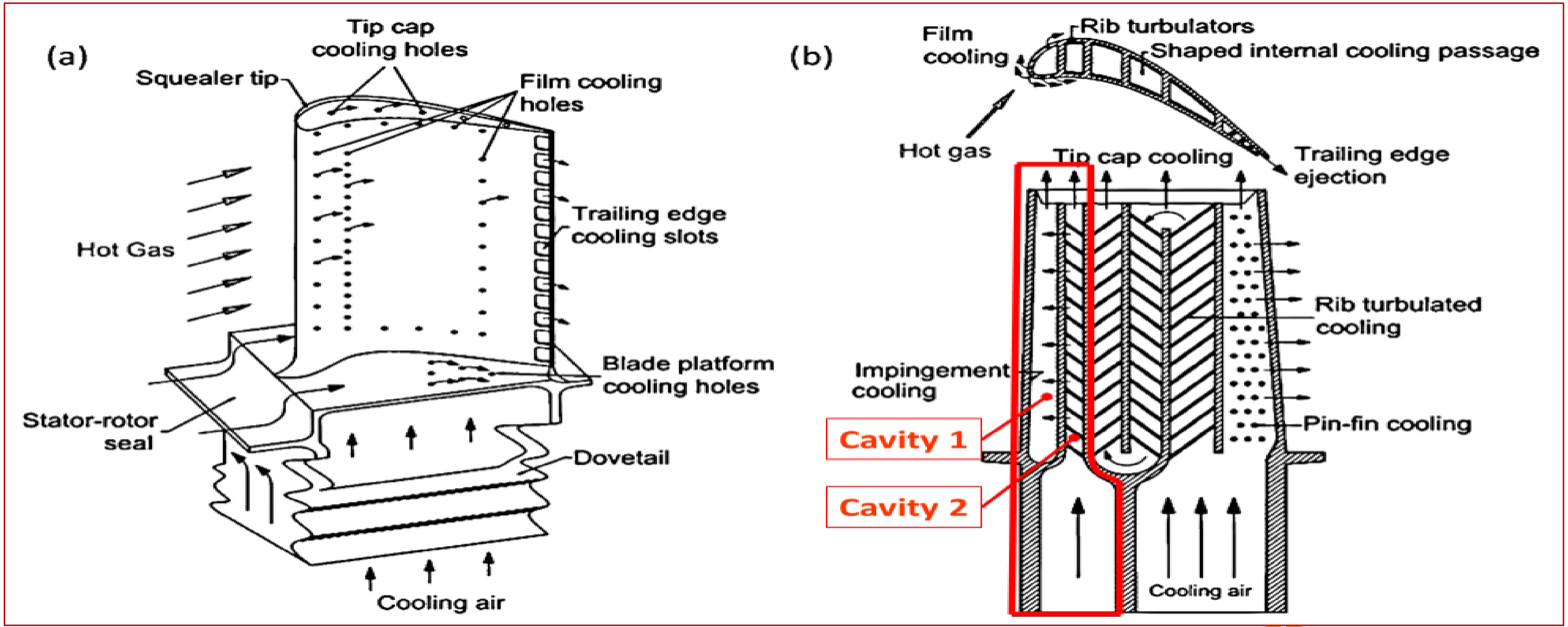

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Image Source : https://2022.help.altair.com/2022.2/flowsim/topics/internal/tutorials/tutorial_4_rotating_cooled_turbine_blade_internal.htm

Maintenance Standards (Life of Blades)

Typical life of turbine blades

First rows of stationary and rotating blades (~ first 3 or 4 rows)

- 50,000 Effective Operating Hours (EOH)
  - EOH depends on gas turbine operation Base load or Peaking and
  - Number of operational hours
- 50,000 hrs. listed is misleading as Gas turbine must be stopped at 25,000 EOH, and the coated blades removed, and replaced.
- Blades with 25,000 EOH are inspected, recoated then can be placed in operation for another 25,000 EOH.
- Uncoated blades operate at lower temperatures and are listed at lasting for 100,000 EOH.

Source: https://www.power-eng.com/emissions/policy-regulations/the-fall-of-the-f-class-turbine/#gref

Insurance Issues in Turbine failures:

Three common exclusions:

1. Defects Exclusions: *something is wrong*
2. Corrosion: *inherent characteristics*
3. Wear: *entropy is our destiny*

Most exclusions "add back" cover for loss caused by the excluded peril

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1. Defects Exclusions: Variations

1. "Cost of making good" defects of material workmanship design

2. LEG 2 Consequences exclusion

3. "Insure against" defects

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What is a defect”

- Imperfection or abnormality that impairs quality, function, or utility. (*Merriam Webster*)
- Fault or imperfection in a person or thing (*Collins Dictionary*)
- An imperfection or shortcoming especially in a part that is essential to the operation or safety of a product (*Blacks Law Dictionary*)

What is Defective Workmanship?

"Workmanship is the execution or manner of making or doing something."

- *Some courts limit to faulty product*
- *Some courts limit to faulty process*

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“Cost of Making Good…” Exclusion

The cost of making good defective design or specifications, faulty material, or faulty workmanship; however, this exclusion shall not apply to loss or damage resulting from such defective design or specifications, faulty material, or faulty workmanship, nor shall this exclusion apply to the mechanical or electrical breakdown of:

any boiler, pressure vessel, refrigerating system or any piping and accessory equipment or; any electrical or mechanical machine or apparatus used for the generation, transmission or utilization of mechanical or electrical power;

which has been installed, fully tested and contractually accepted by the First Named Insured and which is being, or has been, operated at the *Covered Location(s), in the capacity for which it was designed, as part of the Insured’s normal production process or processes.

LEG Defects Exclusions:

1/96 Outright Defects Exclusion-Broadest

2/96 Consequences Exclusion-Ensuing loss

3/06 Improvements Exclusion-Narrowest

LEG Defects Exclusions

- London Engineering Group "is a consultative body for Insurers of engineering class risks providing a forum for discussion and education."
- "The wordings were not intended to change the extent of the cover provided but to clarify the intent of current market practice."

LEG 2/96 – "Consequences"

- Most commonly used
- Provides coverage for damage caused by defect but not cost to avoid damage

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LEG 2/96 – "Consequences"

The Insurer(s) shall not be liable for:

All costs rendered necessary by defects of material workmanship design plan or specification and should damage occur to any portion of the Insured Property containing any of the said defects the cost of replacement or rectification which is hereby excluded is that cost which would have been incurred if replacement or rectification of the Insured Property had been put in hand immediately prior to the said damage.

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LEG 2/96 – "Consequences" Exclusion

Excludes:

- *Cost to replace defective blade*
- *Cost to tear out/access*

What is “damage”

LEG 2/96 and 3/06 clarify:

For the purpose of this policy and not merely this exclusion it is understood and agreed that any portion of the Insured Property shall not be regarded as damaged solely by virtue of the existence of any defect of material workmanship design plan or specification

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Corrosion and Wear Exclusions

7. PERILS EXCLUDED

This Policy does not insure loss or damage caused by or resulting from any of the following, regardless of any other cause or event that contributes concurrently or in any other sequence to the loss or damage:

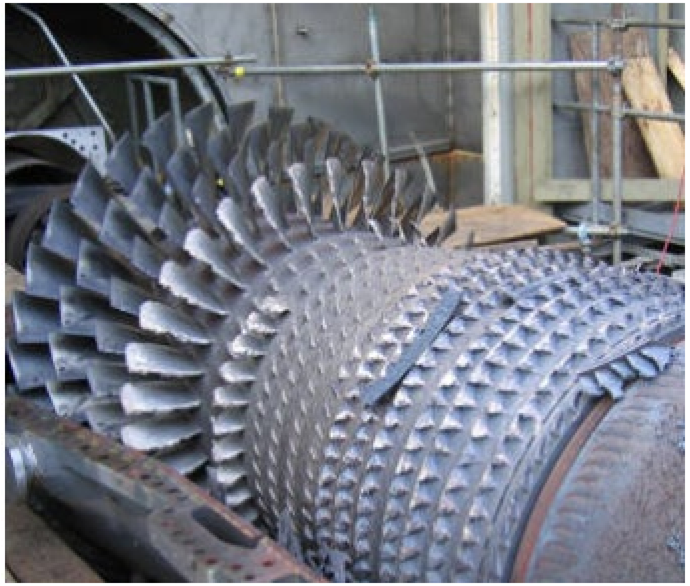
*   *   *

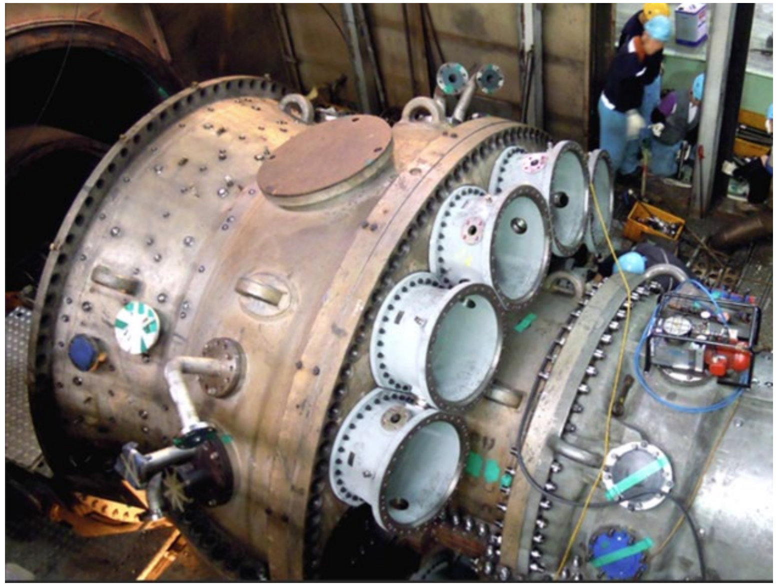
c) **Wear and tear, deterioration, rust, corrosion**, erosion, pollution, contamination, cavitation, inherent or latent defect, dampness or dryness of atmosphere, …; all unless loss by a peril otherwise insured against hereunder ensues and then the Company shall be liable only for such ensuing loss.

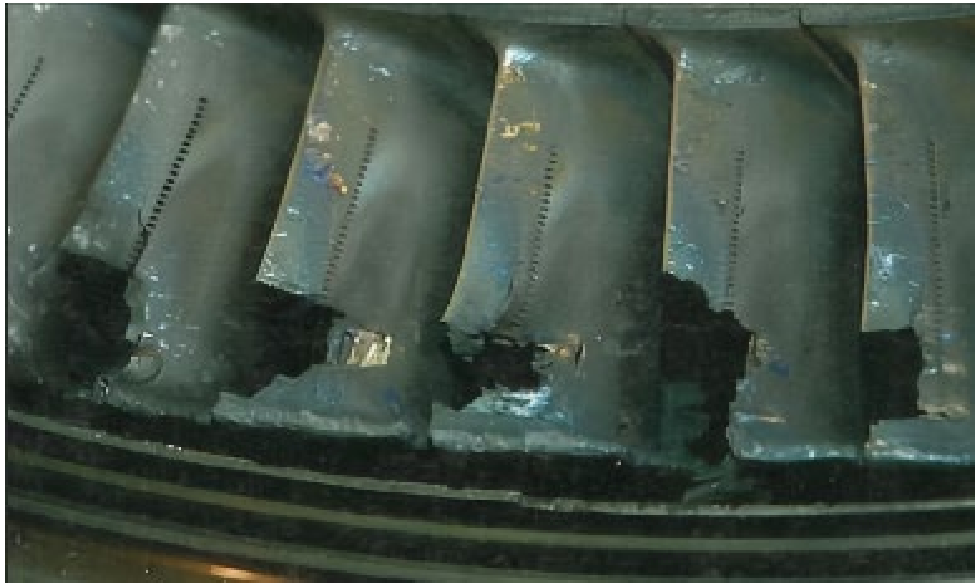
What is “Loss Caused by” excluded peril?

Does it require loss caused by separate peril?

Ensuing Loss







Compressor blade failure resulting in damage to combustion chamber and turbine blades

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Source: https://www.mistrasgroup.com/how-we-help/monitoring/gas-turbines/, GE Power, Gas & Turbine & blade & Failure - Search (bing.com)

Common Ensuing Loss
Gas Turbine Failures

- Cracks develop in Axial Compressor Blades
  - Broken blade damages blades downstream
  - Broken blades go through and damage combustors
  - Metal parts enter turbine section and damage stator (Nozzles) and rotating blades (buckets)
- Turbine blade failures
  - Fatigue or Creep failures can damage entire turbine stage

*** Fixing these issues would involve the cost of cooling down the turbine, opening, repairing unit, balancing, commissioning.**

Common Ensuing Loss Adjustment

- Blade failure resulted in damage to the combustion chamber and turbine blade.
- Blade failure found to be a result of an excluded peril.
- Adjustment would only reflect the cost related to the resulting (ensuing) damage.

Common Claim Adjustment Issues

- Inspection Expense
- Repair Options
- Saved Costs by Use of Spare

Claim Adjustment Discussion
Claim Scenario

- Named Insured : Anywhere Power
- Coverage Type : “All Risks” Property including Time Element
- Loss Reported : November 2022
- Cause of Loss : No coverage issues

Claim Adjustment Discussion
Facility

Facility : Two 758-megawatt combined-cycle power plants fueled by clean-Burning natural gas.

Train 1/2 : Construction Commenced July 2010
: Commercial Op Date (COD) T1: July 2012, T2: May 2013)
: 2 F-Class combustion turbines (CT1-1, CT1-2, CT 2-1, CT2-2)
: 2 SGen6-1000A air cooled electric generators (EG1-1, EG1-2)
: 1 Duct fired NEM heat recovery steam generators (HRSGs)
: 1 SST6- 5000 steam turbine (ST1-1)
: 1 SGen6-2000H electric generator (for each steam turbine)
: 1 SPPA-T3000 instrumentation and control system

Claim Adjustment Discussion
Claim Circumstance Summary

- CT1-1 was shut down for scheduled warranty work
- Bore scope inspection located abnormal deposit on the stage 1 turbine components (stationary vanes and rotating blades).
- CT1-1 turbine cover was removed for further detailed inspection.
- Abnormal deposits had bonded to the Thermal Barrier Coating (TBC).

Claim Adjustment Discussion
Insured Actions

- Based on the CT1-1 damages a decision was made to remove the CT1-2, CT2-1 and CT2-2 turbine covers to conduct detailed inspections.
- The internal inspections revealed no abnormal deposits or physical damage to the TBC.
- The turbines were closed and returned to service.

Claim Adjustment Discussion
Claim Submission

Insurance claim:

CT1-1 Stage 1 Components	US$ 5,300,000 (Parts)
CT1-1 Labor/Equipment	US$ 1,300,000 (Inspection/Repairs)
***CT1-2 Labor/Equipment**	*US$ 920,000 (Inspection)*
**CT2-1 Labor/Equipment*	*US$ 920,000 (Inspection)*
**CT2-2 Labor/Equipment*	*US$ 920,000 (Inspection)*
Total Claim Submission	US$ 9,360,000

** Turbine CT1-2, CT2-1, CT2-2 inspection: Increase of US$ 2,760,000*

Claim Adjustment Discussion
Insured's Position

- Acted prudently to determine if there were abnormal deposits or damage to the TBC in CT1-2, CT2-1 and CT2-2.
- By doing so, they potentially averted one or more future catastrophic failures that could have resulted in millions of dollars of damage.

<u>Polling Question</u>

How much of the US$ 2,760,000 should Insurers reasonably consider?

A: 0% B: 25%
C: 75% D: 100%

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Claim Adjustment Discussion
Claim Adjustment

Insured acted in a prudent manner, but the costs associated with the additional inspections were not covered under the Physical Damage or Time Element sections of the "All Risks" policy based on the following:

"ALL RISKS PROPERTY INCLUDING TIME ELEMENT"

DECLARATIONS

COVERAGE DESCRIPTION
*All risks of **direct physical loss or damage** including boiler explosion, machinery and electrical breakdown… and time element.*

Claim Adjustment Discussion
Claim Adjustment

SECTION I – PHYSICAL DAMAGE
3. PERILS INSURED
This Section of the Policy insures all risks of ***direct physical loss or damage*** *…except as excluded herein.*

SECTION II – TIME ELEMENT COVERAGE
2. EXTRA EXPENSE
In case of ***direct physical loss of or damage*** *to property insured hereunder occurring during the Term of Insurance, this Section of the Policy will also indemnify the Insured for Extra Expenses necessarily incurred by the Insured in continuing as nearly as practicable Normal business activities, providing always that such loss or damage was caused by an insured peril.*

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Claim Adjustment Discussion
Repair Option Considerations

Consider a Row 1 turbine blade liberated at combustion turbine (CT1-1)

- Repair Options to consider:
  - Develop scope of damage/repair…
  - Turbine blades, vanes, downstream impact to other rows
  - Parts availability and lead times
  - In Situ turbine vanes and blade replacement
  - Shop Repair (Lifting and transport costs)

Claim Adjustment Discussion
Repair Option Considerations

- Repair options are limited to
  - In-situ Repair
  - Shop Repair

- Replacement/Repairs
  - Deviation from LKQ parts/equipment due to availability and lead time
  - Resulting increased cost could be an adjustment issue
  - However, costs may be offset by reduction in Time Element impact

Claim Adjustment Discussion
Repair Option

SECTION I – PHYSICAL DAMAGE
5. VALUATION

At the time of loss, the basis of valuation will be as stated below or herein.

a) *(1) Real and Personal Property: The Replacement Cost, if actually repaired, rebuilt, or replaced within two (2) years; if not repaired, rebuilt, or replaced, the Actual Cash Value.*

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Claim Adjustment Discussion
Spares – Cost Mitigation Consideration

Spares, and their availability, are a key component to typical business operations involving rotating equipment.

Availability provide mitigation to potential business impacts; Full or partial mitigation can be achieved in some instances.

- Common Types of Spares:
  - Unit swap
  - Replacement rotor
  - Components, blades, vanes, etc.
- Availability!!!

Claim Adjustment Discussion
Spares – Cost Mitigation Consideration

- The use of Spares generally fall under the Time Element section of the Policy.
  - Spares are considered an Extra Expense
  - Subject to waiting period (in most, not always)
  - Potential Expediting Expense could apply
  - Can be a permanent installation
  - Can be temporary until a subject unit repair is complete
  - Associated expense could be in the form of a lease agreement
  - Or business 2 business expense

Claim Adjustment Discussion
Spares – Cost Mitigation

SECTION II – TIME ELEMENT COVERAGE

2. EXTRA EXPENSE

In case of direct physical loss of or damage to property insured hereunder occurring during the Term of Insurance, this Section of the Policy will also indemnify the Insured for Extra Expenses necessarily incurred by the Insured in continuing as nearly as practicable Normal business activities, providing always that such loss or damage was caused by an insured peril. There shall be no recovery under this policy for EXTRA EXPENSE incurred in the generation, transmission, purchase, replacement, trading, or distribution of electrical power, except as it is incurred to reduce the business interruption loss.

Claim Adjustment Discussion
Spares – Cost Mitigation

8. EXPEDITING EXPENSE

This Policy shall also pay the Insured for the reasonable extra cost of temporary repair and of expediting the repair of such damaged property of the Insured, including overtime and the extra cost of express or other rapid means of transportation, and the cost of installation and removal of spare equipment, subject to the sublimit stated within the Declarations.

Questions?

15 Minute Break

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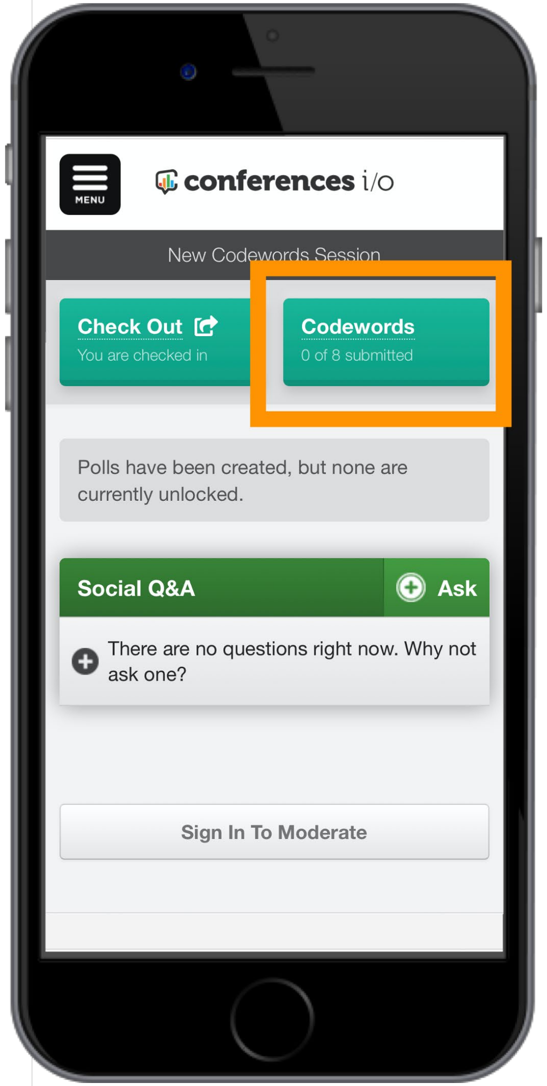

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Navigating Complex Mining Losses

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Agenda

1. Introductions
2. Types of Mines, Size and Scale
3. Approach to Handling Mining Claims
   - Typical Hazards and Obstacles
   - Site Access Issues
   - Information Requests / Early Communications
   - Local Licensing Requirements and Restrictions
4. Coverage Issues and Challenges

1. Introductions

Amanda Sorsak, BHSI

Amanda Sorsak joined Berkshire Hathaway Specialty Insurance when it opened its doors in Canada in early 2015. She is currently SVP, Head of First Party Claims in the Toronto office.

Prior to joining BHSI, Amanda held various adjustment and claims management roles, specializing in both Canadian and US Energy, Commercial Property and Builder's Risk. She has done significant field adjustment work including several major US CAT events. Amanda is a licensed Professional Engineer and began her insurance career as a loss prevention engineer at FM Global.

Bob Krywiak, McLarens Canada Inc.

Bob is a Chartered Insurance Professional CIP), a Canadian Certified Fire Investigator (CCFI-C) and Fellow of the Canadian Independent Adjusters' Association (FCIAA), internationally recognized in the adjustment of mining losses and claims.

Bob has been involved in the adjustment of major mining property and business interruption losses, both domestic and global. Bob is appointed as the control adjuster to Property Insurance Programs for several mining accounts.

Sam Weiss, Mound Cotton Wollan & Greengrass LLP

Sam is an associate at Mound Cotton Wollan & Greengrass LLP. His practice focuses on domestic and international insurance first-party commercial property insurance coverage, including energy, power, and mining losses, COVID-19, and coverage issues arising from CAT losses (including the 2020 U.S. civil unrest, and weather-related catastrophes). Sam also assists clients in coverage disputes involving product recall and kidnap, ransom, and extortion insurance. In addition to his litigation experience, Sam maintains an active arbitration practice.

2. Types of Mines, Size & Scale

Types of Mines

Surface

- Strip
- Open Pit
- Quarrying
- Highwall
- Placer
- In-Situ Leach
- Mountaintop
- Deep Sea

Underground

- Room & Pillar
- Retreat
- Shrinkage Stope
- Cut & Fill
- Cave
- Long Wall
- Drift & Fill
- Deep Sea

slido

Which country has the most operational mines?

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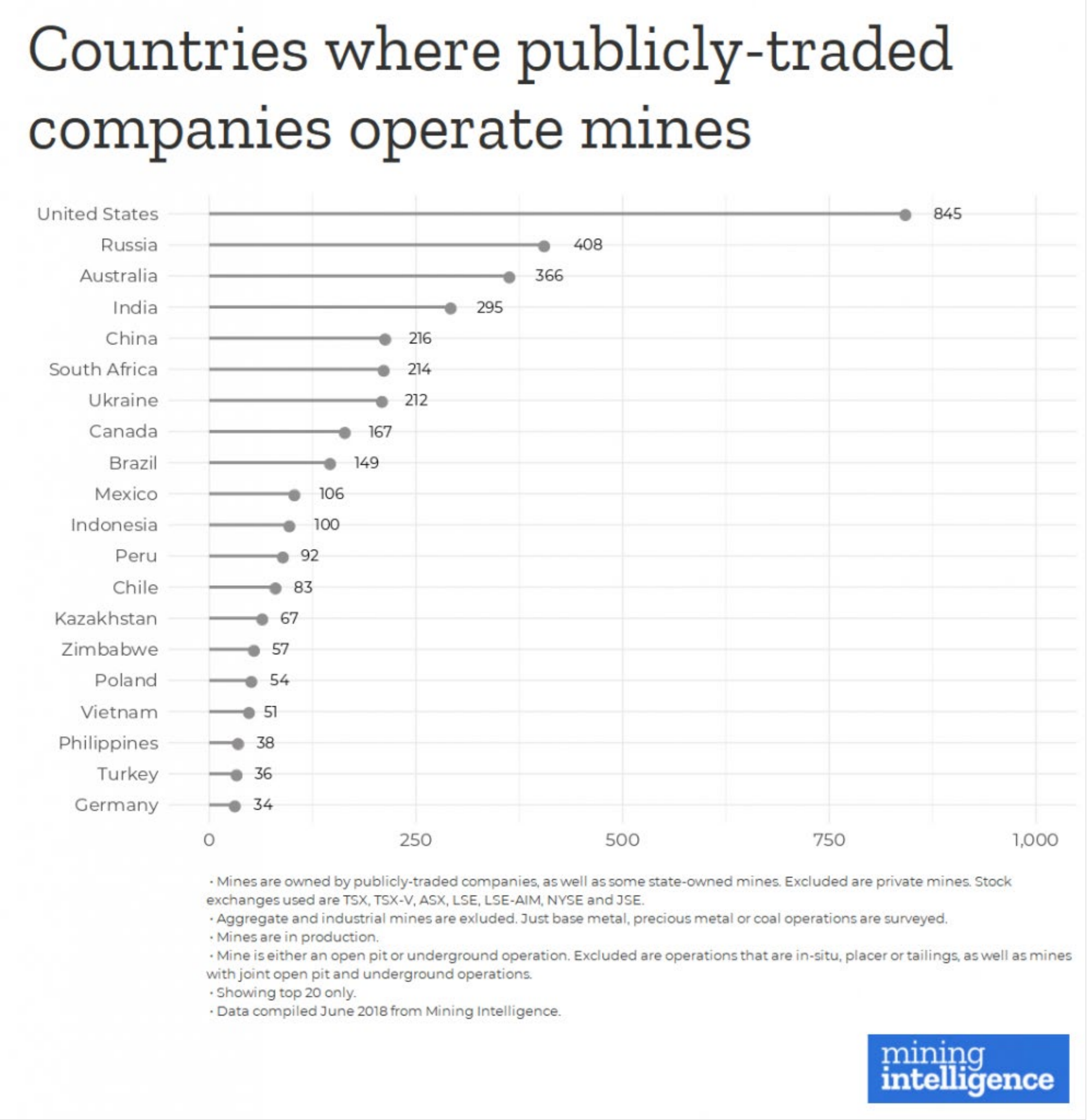
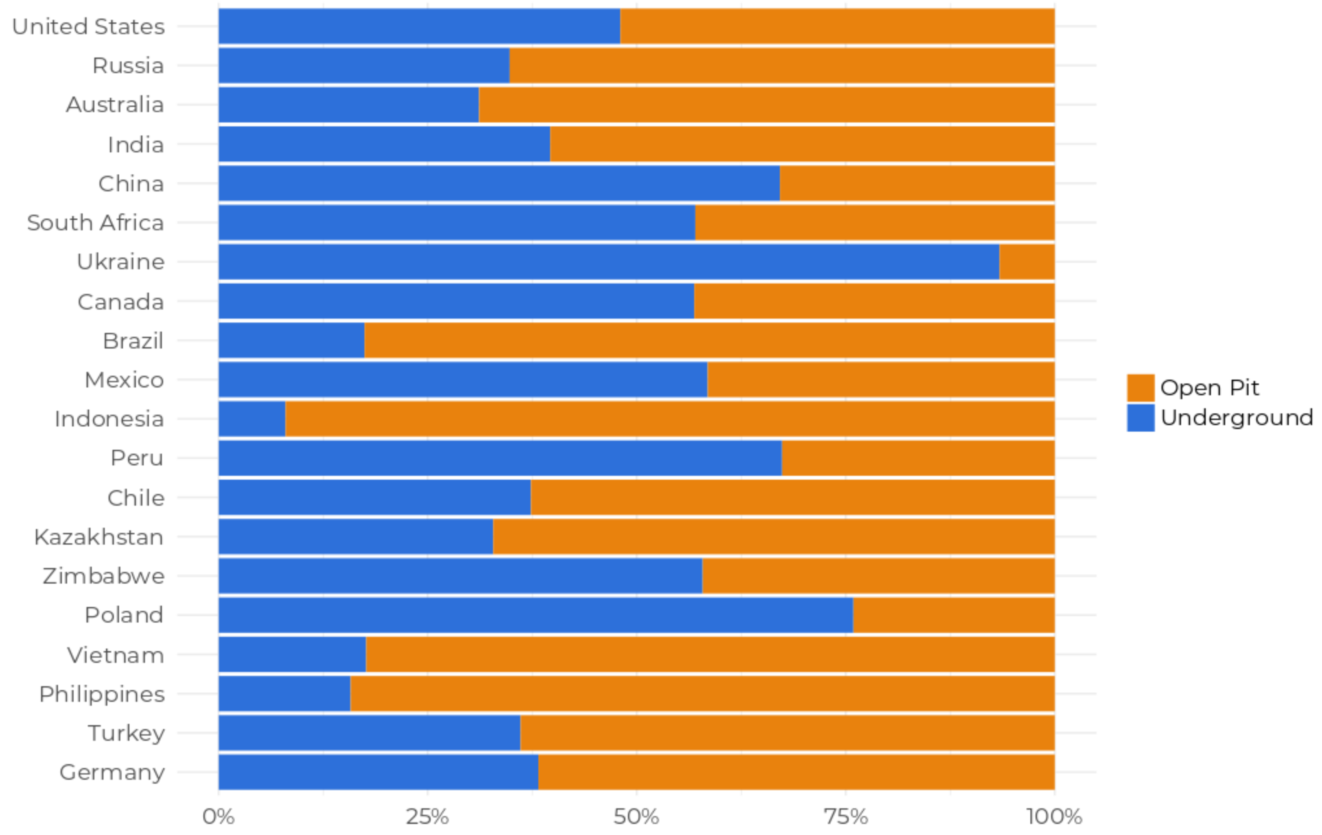
Operating Mines by Country 2018



Operating Mines by Country & Type

Underground and open-pit mines percentage



- Mines are owned by publicly-traded companies. Excluded are private mines and state-owned mines. Stock exchanges used are TSX, TSX-V, ASX, LSE, LSE-AIM, NYSE and JSE.
- Aggregate and industrial mines are exluded. Just base metal, precious metal or coal operations are surveyed.
- Mines are in production.
- Mine is either an open pit or underground operation. Excluded are operations that are in-situ, placer or tailings, as well as mines with joint open pit and underground operations.
- Showing top 20 only.
- Data compiled June 2018 from Mining Intelligence.

mining intelligence

Size & Scale

Nevada Gold Mines – NV, USA

Single largest gold-producing complex in the world

Consisting of:

- 10 underground & 12 Open Pit mines
- 7,000 employees - $1.1 B in total compensation
- Nevada Community Investment: $2.7 Billion
- 2023 Gold Production: 4.2-4.6 Million Oz
- 2023 Copper Production: 420-470 Million Lbs.
- 2022 State Taxes Paid: $302 Million

Goldstrike Mine – NV, USA

The Betze-Post deposits are up to 6,000 feet (1,800 m) long, 600 feet (180 m) thick and 800 feet (240 m) wide.

6,500,000 in proven gold reserves

Bingham Canyon Mine – Utah, USA

Largest man-made excavation

Open-pit mining since 1904

Deepest open-pit mine in the world – 0.75 miles deep

2.5 miles wide – covering 3 sq mi

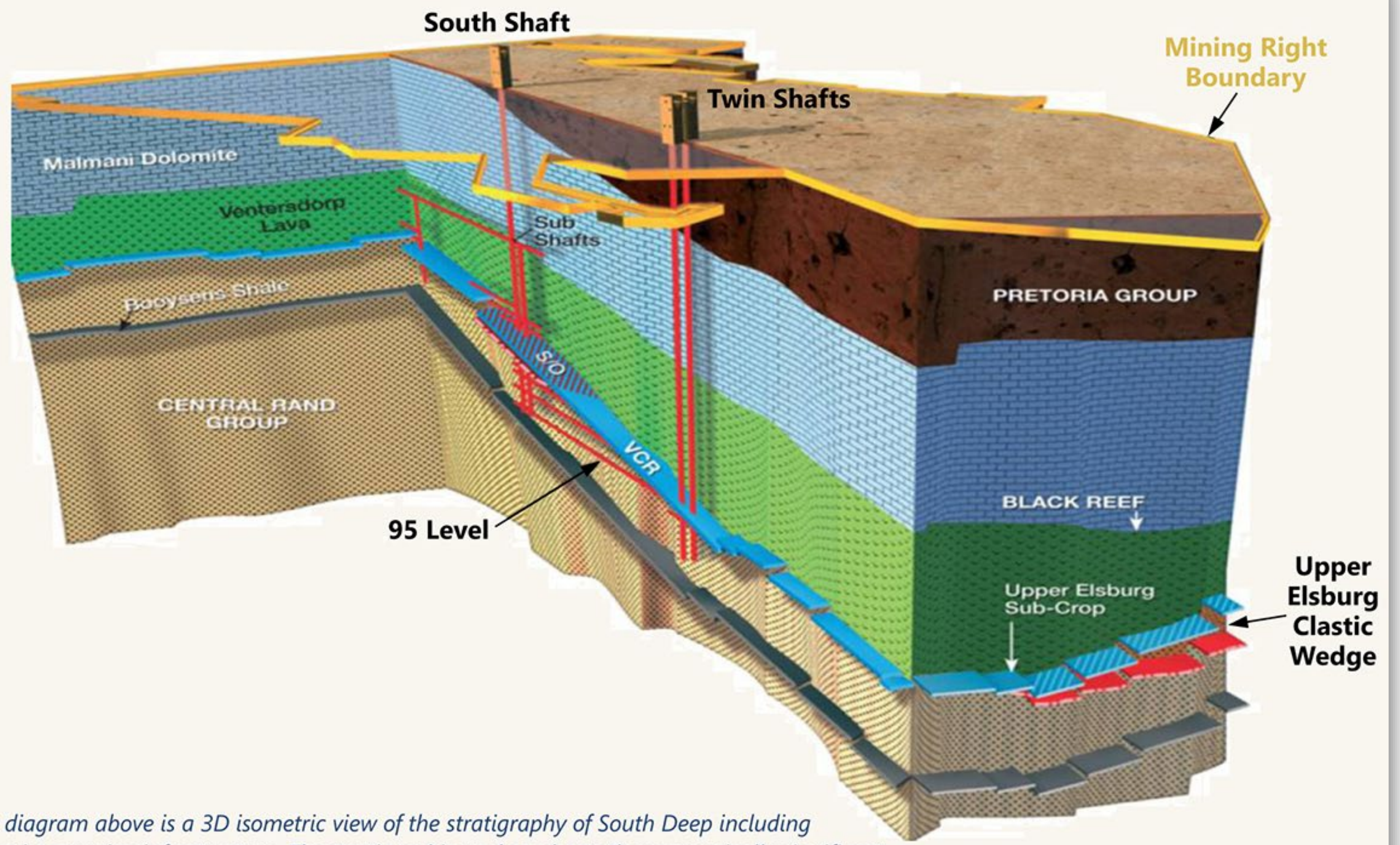
More than 19 million tons copper produced

South Deep Mine – South Africa

South Deep Gold Mine is a world-class bulk mechanised mining operation located in the Witwatersrand Basin.

Built to extract one of the largest known gold deposits in the world

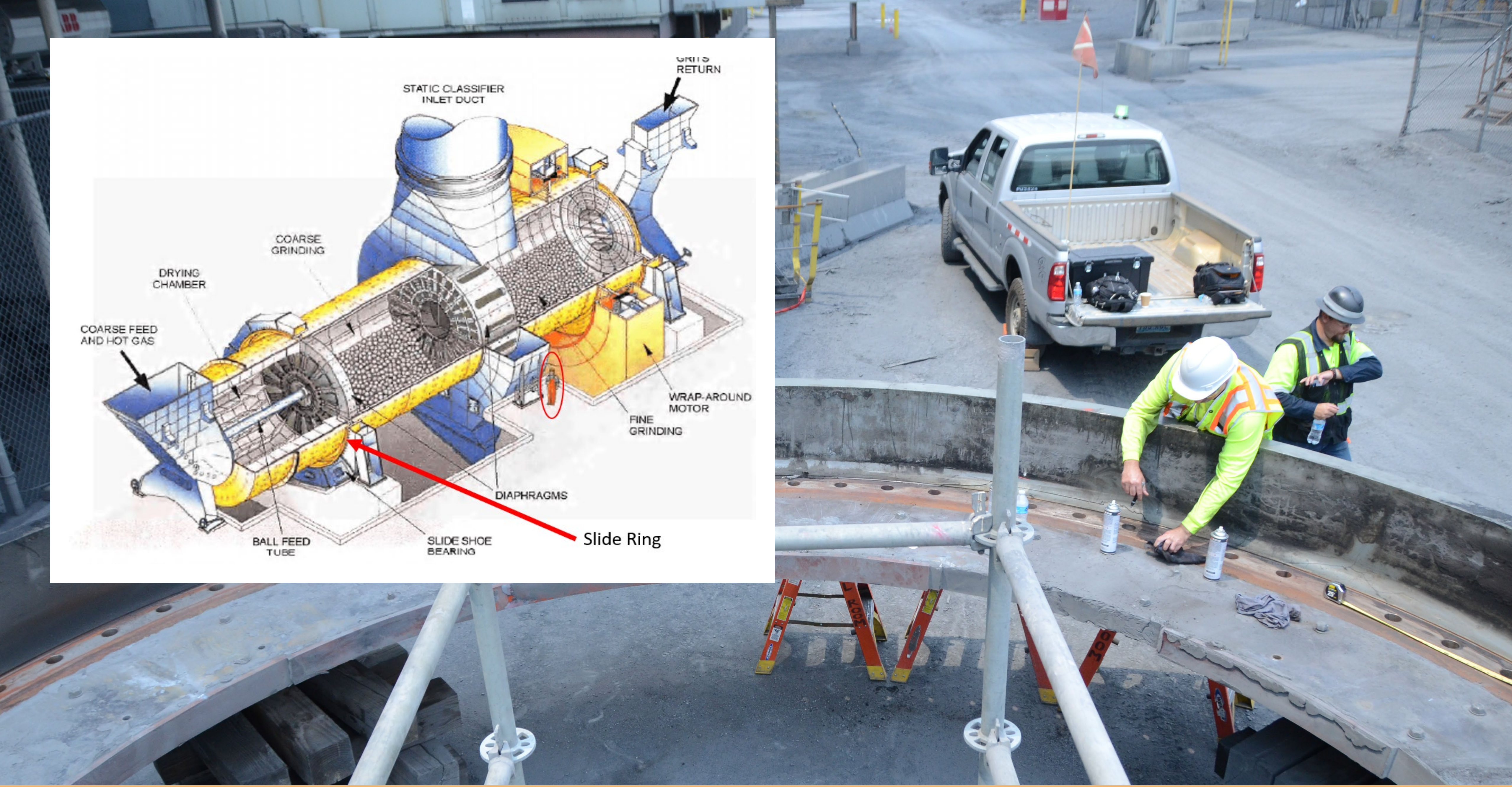
Boasts a mineral reserve of 32.19 million ounces. This is equivalent to approx 80,740 gold bullion bars.



The diagram above is a 3D isometric view of the stratigraphy of South Deep including the primary mine infrastructure. The stratigraphic package hosts the economically significant Upper Elsburg and VCR conglomerate units. The Upper Elsburg (red) forms a clastic wedge that attains a thickness of 120m in the east and truncates against the VCR (blue) to the west.

3. Approach to Handling Mining Claims

Typical Hazards and Obstacles



GRITS RETURN
STATIC CLASSIFIER INLET DUCT
COARSE GRINDING
DRYING CHAMBER
COARSE FEED AND HOT GAS
WRAP-AROUND MOTOR
FINE GRINDING
DIAPHRAGMS
BALL FEED TUBE
SLIDE SHOE BEARING
Slide Ring

Site Access Issues

Site Security

Information Requests & Early Communications

RFI's – Who/What:

- Scope
- Cost Estimates
- Time Element
- Coverage Extensions

Local Licensing Requirements & Restrictions

Challenging Juridictions:

- Chile
- Brazil
- Mexico

Local Restrictions and Licensing Requirements

- Loss Adjusters
- Information Flow
- Time Limits
- Interest on Undisputed Payments
- Insured Involvement in Adjustment of Claim

4. Coverage Issues and Challenges

Bring in the Lawyers: Wording Issues and Differences

Hypothetical Case Study

- Mine in a difficult to access area;
- Road approaching the mine is flooded by rainfall;
- Local authority then issues order first forbidding access to the road, then instituting weight limits for trucks transversing the road;
- Insured therefore cannot import goods necessary for the operation of the mine, causing the mine to limit or cease operations.

slido

Is this a covered loss

ⓘ Start presenting to display the poll results on this slide.

Wording Issues – Civil Authority

Interruption by Civil or Military Authority: This policy is extended to cover the loss sustained, as covered herein, during the period of time, not exceeding thirty (30) days, when access to or use of real or personal property is impaired by order or action of civil or military authority issued in connection with or following a peril not otherwise excluded by this policy.

CIVIL OR MILITARY AUTHORITY: This Policy covers the Actual Loss Sustained and EXTRA EXPENSE incurred by the Insured during the PERIOD OF LIABILITY if an order of civil or military authority prohibits access to the insured location provided such order is the direct result of physical damage of the type insured at the **insured location** or within five statute miles/eight kilometers of it.

Wording Issues – Civil Authority

Interruption by Civil or Military Authority: This policy is extended to cover the loss sustained, as covered herein, during the period of time, not exceeding thirty (30) days, when access to or use of real or personal property is impaired by order or action of civil or military authority issued in connection with or following a peril not otherwise excluded by this policy.

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Wording Issues – Ingress/Egress

Ingress/Egress: This policy is extended to cover the loss sustained, as covered herein, during the period of time, not exceeding thirty (30) days, when, as a result of damage by a peril not otherwise excluded by this policy, access to or egress from real or personal property insured herein is impaired.

INGRESS/EGRESS: This Policy covers the Actual Loss Sustained and EXTRA EXPENSE incurred by the Insured due to the necessary interruption of the Insured's business due to partial or total physical prevention of ingress to or egress from an insured location, whether or not the premises or property of the Insured is damaged, provided that such prevention is a direct result of physical damage of the type insured to property of the type insured

Wording Issues – Ingress/Egress

Ingress/Egress: This policy is extended to cover the loss sustained, as covered herein, during the period of time, not exceeding thirty (30) days, when, as a result of damage by a peril not otherwise excluded by this policy, access to or egress from real or personal property insured herein is impaired.

INGRESS/EGRESS: This Policy covers the Actual Loss Sustained and EXTRA EXPENSE incurred by the Insured due to the necessary interruption of the Insured's business due to partial or total physical prevention of ingress to or egress from an insured location, whether or not the premises or property of the Insured is damaged, provided that such prevention is a direct result of physical damage of the type insured to property of the type insured

THANK YOU FOR ATTENDING

QUESTIONS?

Break For Lunch

Return time 12:20PM

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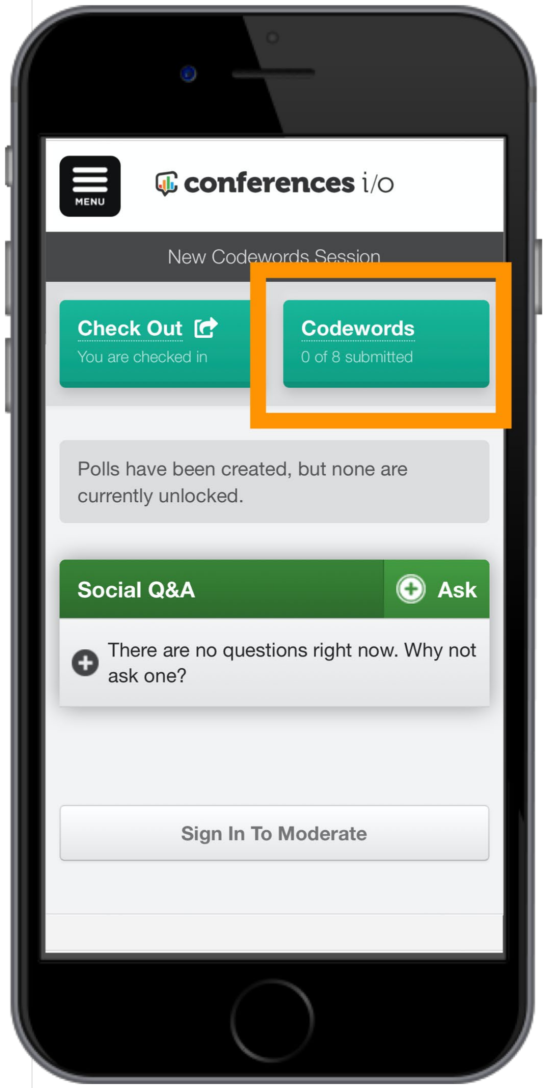

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CURRENT STATE OF RENEWABLES

Moderated By:

Darren Askari, GCube

Presenters:

Corey Greenwald, Clyde & Co

Nathan Kempf, Price Forbes

Scott Archer, Sedgwick

Tim Dowden, J.S. Held

DISCUSSION ITEMS

1. **OEM & ATTRITIONAL ITEMS**
   Who's On (the hook) First?
2. **NAT CAT & SECONDARY PERILS**
   Flood…Fire…Hail…Oh My!
3. **THE FUTURE**
   To Infinity (Net-Zero) and Beyond??

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OEM & ATTRITIONAL ITEMS

Who’s On (the hook) First?

1. OEM Warranty
   a. Key Clauses
   b. Gearbox Life Span and Failures
   c. Blade Items: Cracking, Delamination & LPS
2. Repair vs. Replace & Supply Chain Issues
3. Force Majeure Events
4. Geographic Locations

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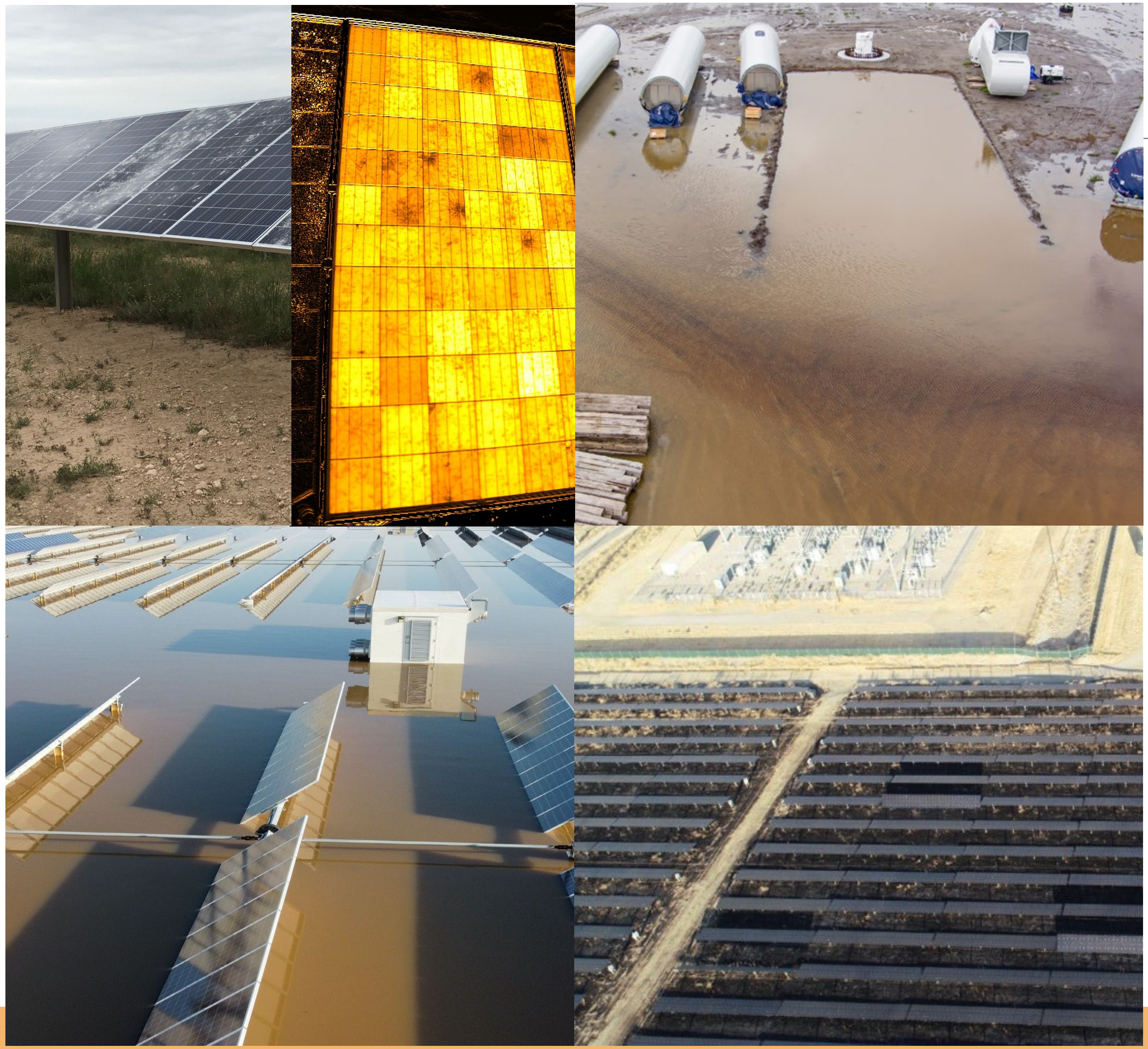
NAT CAT & SECONDARY PERILS

Flood…Fire…Hail…Oh My!



1. Overview of 2022 vs. 2023
2. Geographical Locations and SCS Risk
   a. Mitigating Measures
   b. Technology Gap
3. Definitions
   a. Microfractures
   b. Sub-limits and Deductibles

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THE FUTURE

To Infinity (Net-Zero) and Beyond??

"The renewables industry is at its most exciting time in the last 20 years."

Western US Regional Bank, Head of Power & Project Finance

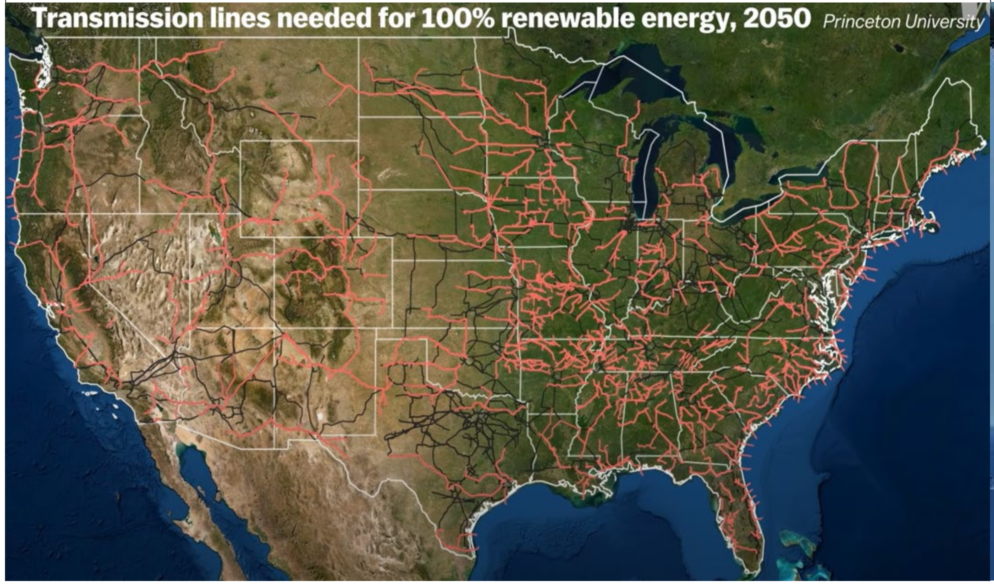
"The Inflation Reduction Act of 2022 (IRA) has created the greatest stimulus for renewables we have ever seen globally. It is causing a big focus on the US market. We need to see new capital come into the market."

Canadian CleanTech Company, CEO

https://www.projectfinance.law/tax-equity-news/2023/march/the-solar-plus-wind-finance-and-investment-summit-soundbites-the-tax-equity-market-and-transferability/

Vineyard Wind

America's First Large-Scale Offshore Wind Farm, Delivers Full Power from 5 Turbines to the New England Grid 68 megawatts delivered to New England grid, enough power for 30,000 Massachusetts homes. Gov. Healey, February 22, 2024



1. **Inflation Reduction Act**
2. **Capacity, Capacity, Capac…**
   a. **Insurance**
   b. **Transmission Lines**
3. **Offshore Wind**

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QUESTIONS?

Moderated By:

Darren Askari, GCube

Presenters:

Corey Greenwald, Clyde & Co

Nathan Kempf, Price Forbes

Scott Archer, Sedgwick

Tim Dowden, J.S. Held

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Utility Scale Batteries: Risk and Insurance

Moderator: Marc Giovannetti, Engle Martin

Presenters: Justin Voss, AES Corporation

Landis Knorr, GCube Underwriting

Ali Ashrafi, Thornton Tomasetti

Matthew Gonzalez, Zelle LLP

April 3, 2024 – NYC Conference

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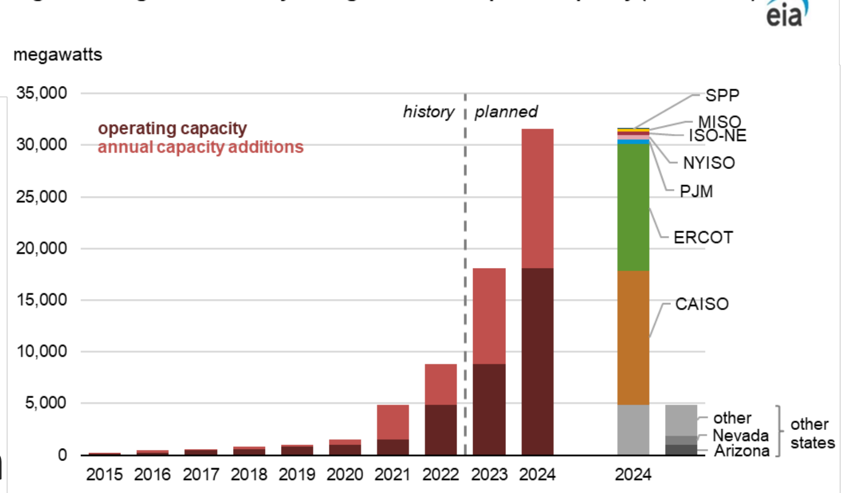
Overview

- Why is utility-scale energy storage relevant to the energy and power sector?
- Introduction to lithium-ion (Li-ion) Batteries and their risks and benefits
- Insurance questions and challenges
- Case study

Why is this relevant?

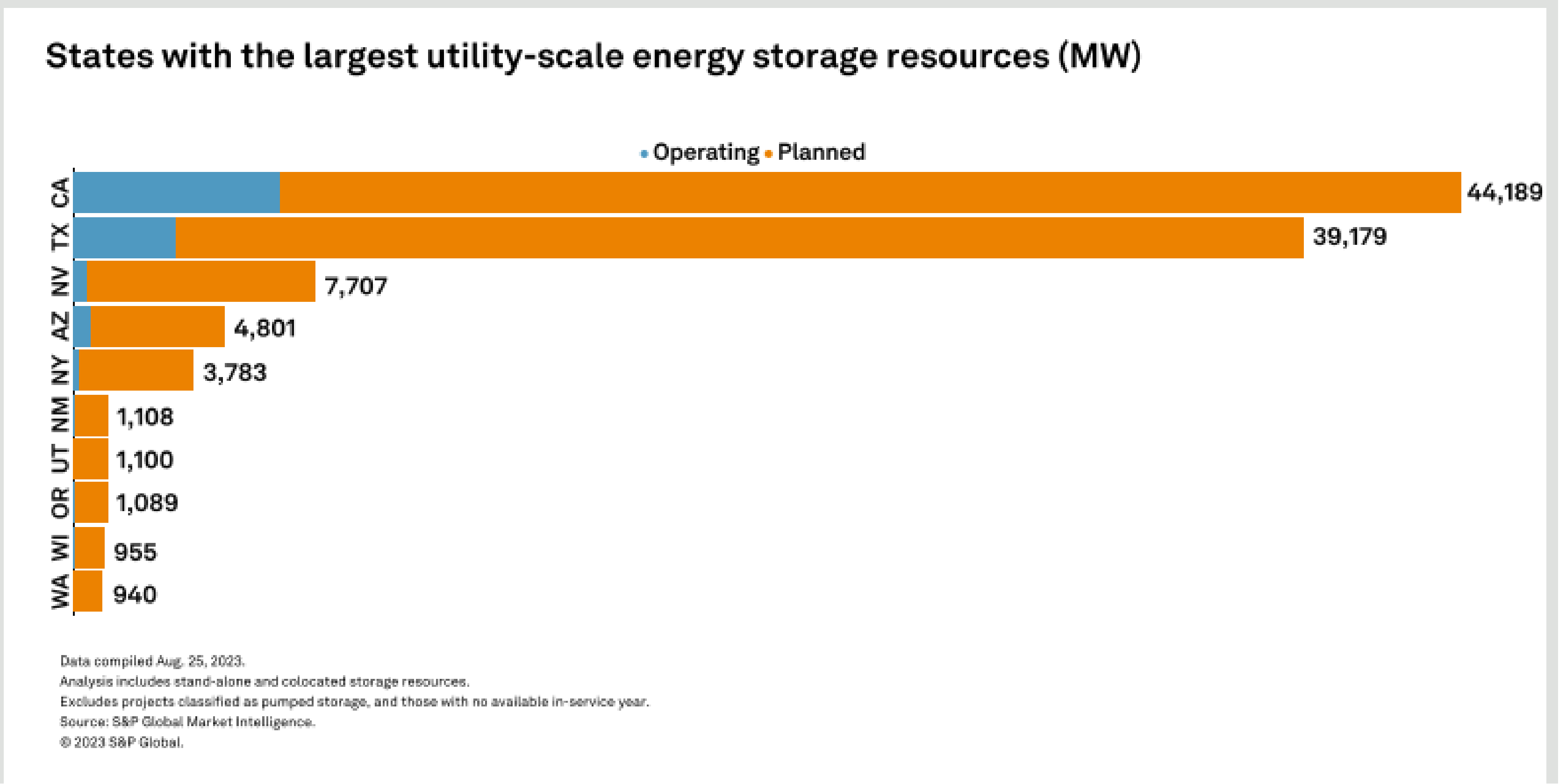
- Exponential growth in renewable energies and electrification
- Battery Energy Storage Systems (BESS) are essential to managing supply and demand cycles
- Li-ion battery is the dominant BESS technology
- Significant government incentives (e.g. Inflation Reduction Act)
- Seeing more stand-alone BESS projects (26.5 GW pipeline)
- $73B of battery gigafactories announced in the US in 2022

Figure 6. Large-scale battery storage cumulative power capacity (2015–2024)



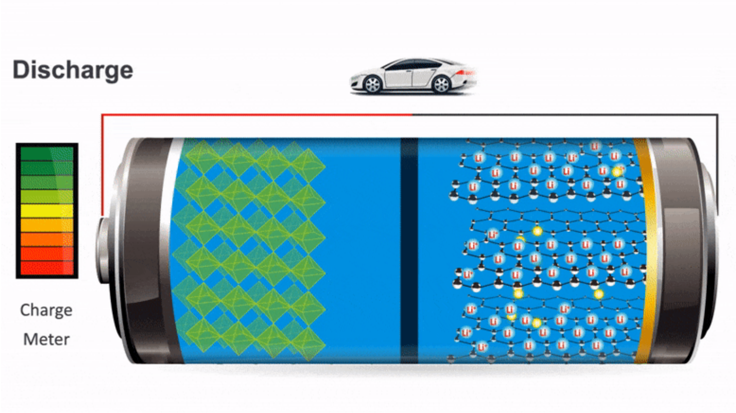
Data source: U.S. Energy Information Administration, *2022 Form EIA-860 Early Release, Annual Electric Generator Report*

Where is it deployed?



Lithium-ion Batteries

- Advantages in cycle life, long energy retainage, high energy and power density
- It is a family of technologies (differences in cathode chemistry, electrolyte, cell shape, Battery Management System (BMS), assembly into modules, racks, and units, fire suppression systems, etc.)
- Fast evolving technology means codes and standards are always trying to catch up
- Exponential growth creates interdependencies and vulnerabilities across the supply chain
- Need to operate in very controlled environments
- Next-generation batteries?



Dedicated buildings vs. containers

Dedicated buildings vs. containers

Containerized BESS solutions

- Faster construction and permitting process
- Flexibility to redeploy to other places
- Easier to contain the risks
- Can let it burn
- Not always the worst-case outcome

Dedicated BESS Building

- Higher battery density
- More efficient design for large capacity
- Responds to needs of expensive urban areas

- Smaller is easier
- Have a plan for before and after a thermal runaway

BESS Warranties

Product Warranty: A promise to repair the product if there is a defect.

Performance Warranty, protects four key attributes of a system over time. These are *capacity, energy or power, availability and round-trip efficiency,* or some combination of all of those.

- Standard 2-year warranties
- Extended warranties can be purchased.
- Warranties can be tied to operation with specific temperatures, state of charge, etc.
- Read warranties. There are huge variations.

Augmentation

- Augmentation is adding storage capacity to a project over time to:
  - Restore degraded battery capacity
  - Or increase capacity beyond original capacity
- Augmentation can also refer to addition of storage capabilities to a generation resource, such as wind or solar.

BESS case study

Background

- 20 containers spaced 7 ft apart and providing 20 MW and 80 MWh of nominal capacity.
- Actual initial capacity is 20% higher to account for loss of capacity over time
- Supports a solar PV power plant nearby
- One container damaged in fire

Interested Parties

- - Owner/Operator/EPC Contractor
- - Battery module provider (manufacturer)
- - Integrator (Battery Management System)
- - Offtaker/Utility (PPA/JV partner)

Insurance challenges– case study

- Many involved parties
- Emphasis on maintaining relationships with suppliers
- There is little field data and few precedents. Be ready for a range of outcomes.
- Easier to underwrite stand-alone BESS.
- Hard to adjust a complex case such as BESS loss due to earthquake in California
- Clean-up costs

DNV.GL Report

- Cell manufacturer
- Module and Rack integrator
- System Integrator
- Battery Maintenance System
- Temperature, humidity, and ventilation controls
- Enclosure
- Detection and Suppression system
- Electric supply
- Power backup
- Decisions after the incident

BESS - case study

RCA process is essential. Who is performing the RCA?

The Equipment Owner	The Integrator (BESS assembly and BMS)
• RCA used to improve processes and procedures • Cause of loss will be assigned to all contributing factors (increasing time for completion)	• Focus on battery defects or installation
The Battery Manufacturer (if different from the integrator)	**The Insurance Carrier**
• Inclined to focus on maintenance or battery management system	• Focus on cause of loss for coverage determination/subrogation

- Cost outcomes are heavily dependent on RCA outcome. The battery manufacturer may cover the cost of the replacement battery IF their RCA concludes the battery was the point of failure.
- At $200/kWh for a 4 MWhr BESS, the cost is 800k. A total loss (in a building) of 80 MWhr would have been $16M.

BESS – case study

“Like”, “Kind” and “Quality”

- Competing interests of JV partners (owner and utility) to decide on repair or replacement
- Most likely outcome of a fire is full replacement of the damaged containers (or entire BESS system if in a building) and repairs to other facilities. This creates choices and issues:

1) Do you replace with the same battery technology or manufacturer if there are questions about the reliability of the unit?
2) What are the supply chain replacement challenges? How do they relate to performance penalties in PPA agreement?
3) What if owner opts to decommission entire BESS (in lieu of replacement) due to public outcry?
4) If the Battery was augmented at the time of its installation, do you replace the battery with the same augmentation or its original design?
5) Does the PPA require an additional augmentation in the near future, forcing consideration of a surplus augmentation rather than taking the unit down in the future for scheduled upgrade to take place?

Q&A

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682

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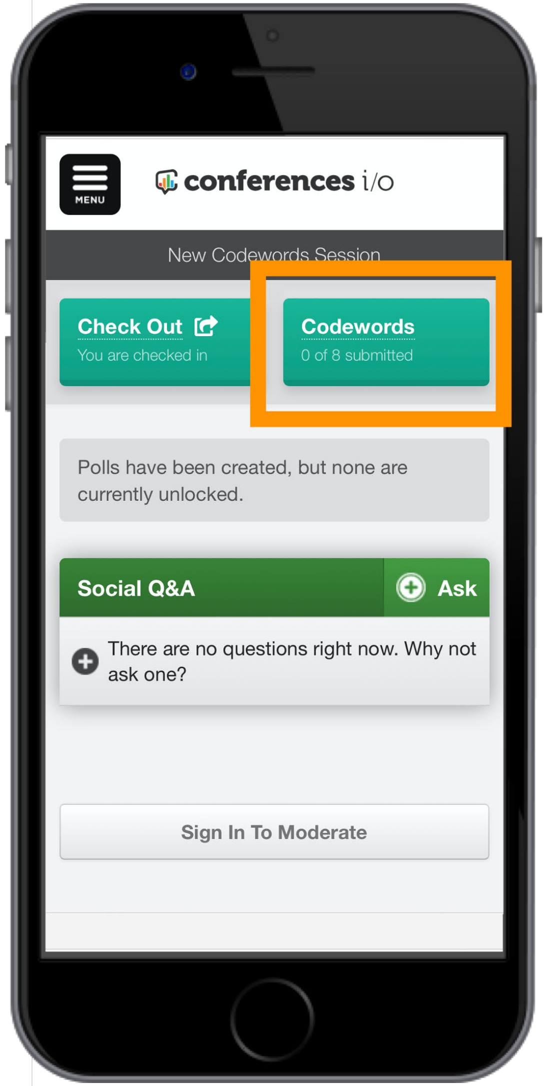

Carbon Capture:

Past, Present, and Future

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April 3, 2024

Introductions

HALL MAINES LUGRIN

Shareholder

HALL MAINES LUGRIN

Shareholder

SteegeXP

Managing Director

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Do you have any previous experience with CCUS projects from an insurance perspective?

ⓘ Start presenting to display the poll results on this slide.

What is CCS?

Common meanings:

- CCS: Carbon Capture and Storage
- CCS: Carbon Capture and Sequestration
- CCUS: Carbon Capture, Utilization, and Storage
- Terms are used synonymously but in practice CCS and CCUS are slightly different.

Definition:

- the process of trapping carbon dioxide produced by human industrial activity and storing it where it can no longer affect the atmosphere

What does CCS involve?

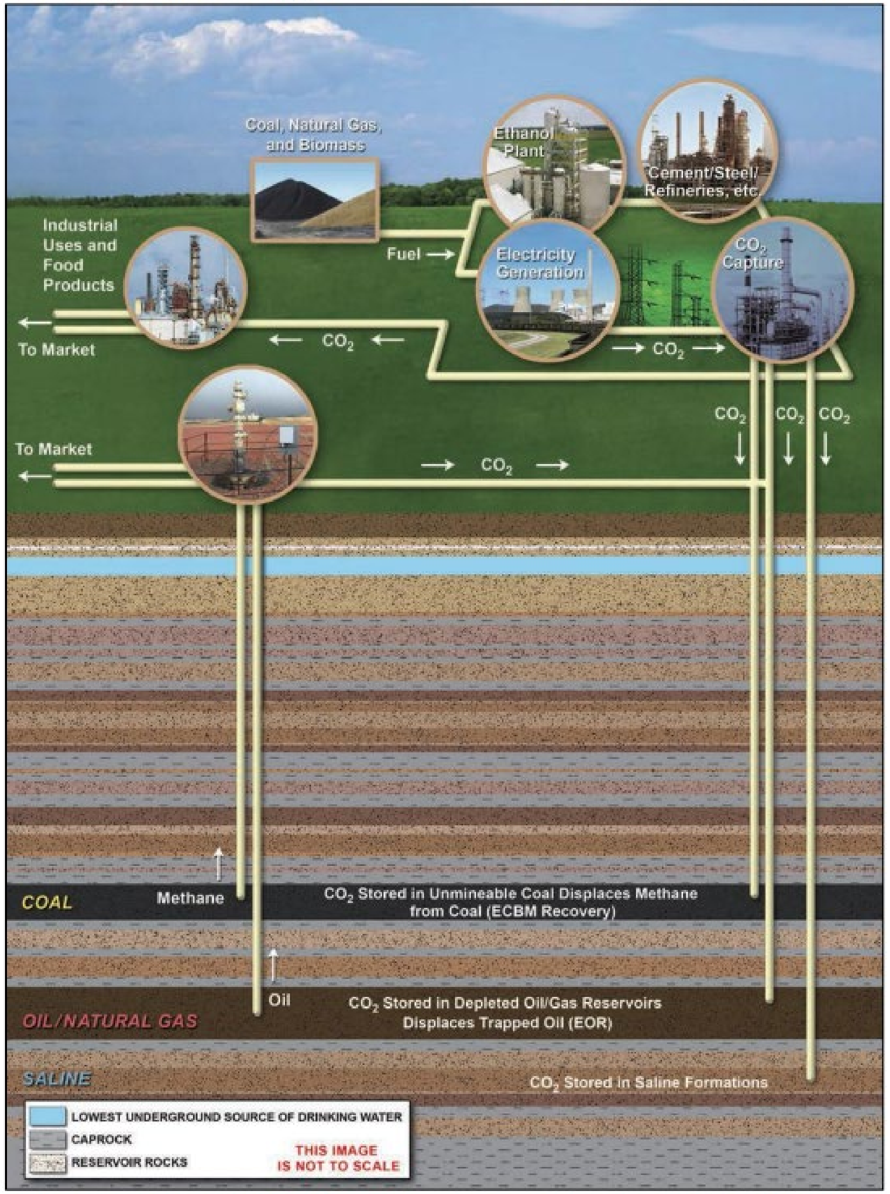
CO_2 is captured from large industrial point sources or directly from the air.

A giant vacuum cleaner sucks up emissions before they are released into the atmosphere.

After capture, CO_2 is transported to an offshore or onshore storage site.

Storage exits are sealed by structural tapping so CO_2 cannot escape.

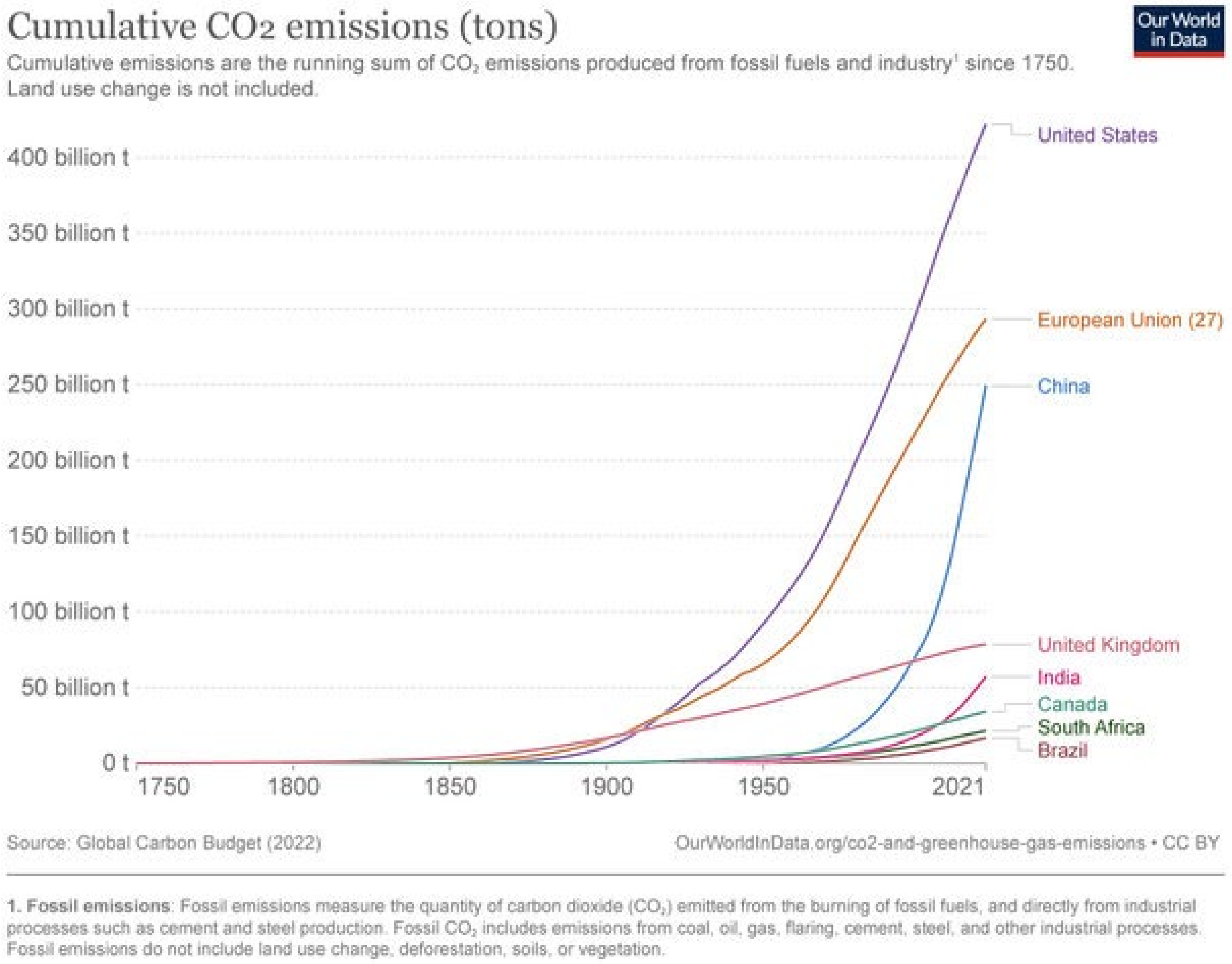
Figure 1. Options for an Integrated CCS Process: Capture, Injection, and Utilization



Source: U.S. Department of Energy, Office of Fossil Energy, "Carbon Utilization and Storage Atlas," Fourth Edition, 2012, p. 4.

US Plan for CCS

CO2 Emissions by Country



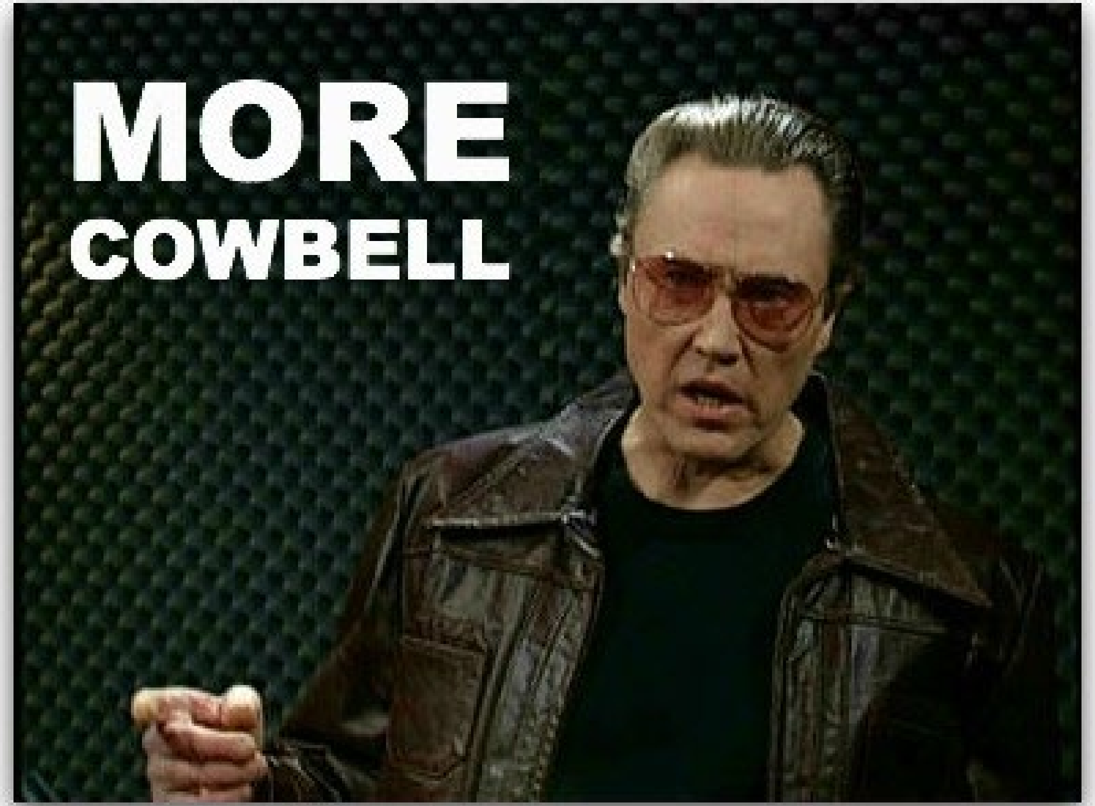
The Current State of Play: CCS

- According to the Global CCS Institute’s 2022 report, there were 194 large scale CCS facilities globally at the end of the year compared to 51 in 2019.
  - 61 were new CCS facilities added to the project pipeline in 2022
    - 30 of these projects are in operation
    - 11 are under construction
    - 20 are in various stages of development
- Of the total number of projects:
  - 94 are in the Americas (80 in the US)
  - 73 are in Europe (27 in the UK)
  - 21 are in Asia-Pacific
  - 6 in the Middle East
- The CO_2 capture capacity of all CCS facilities under development grew to 244 million tons per annum in 2022, an increase of 44% over the year

slido

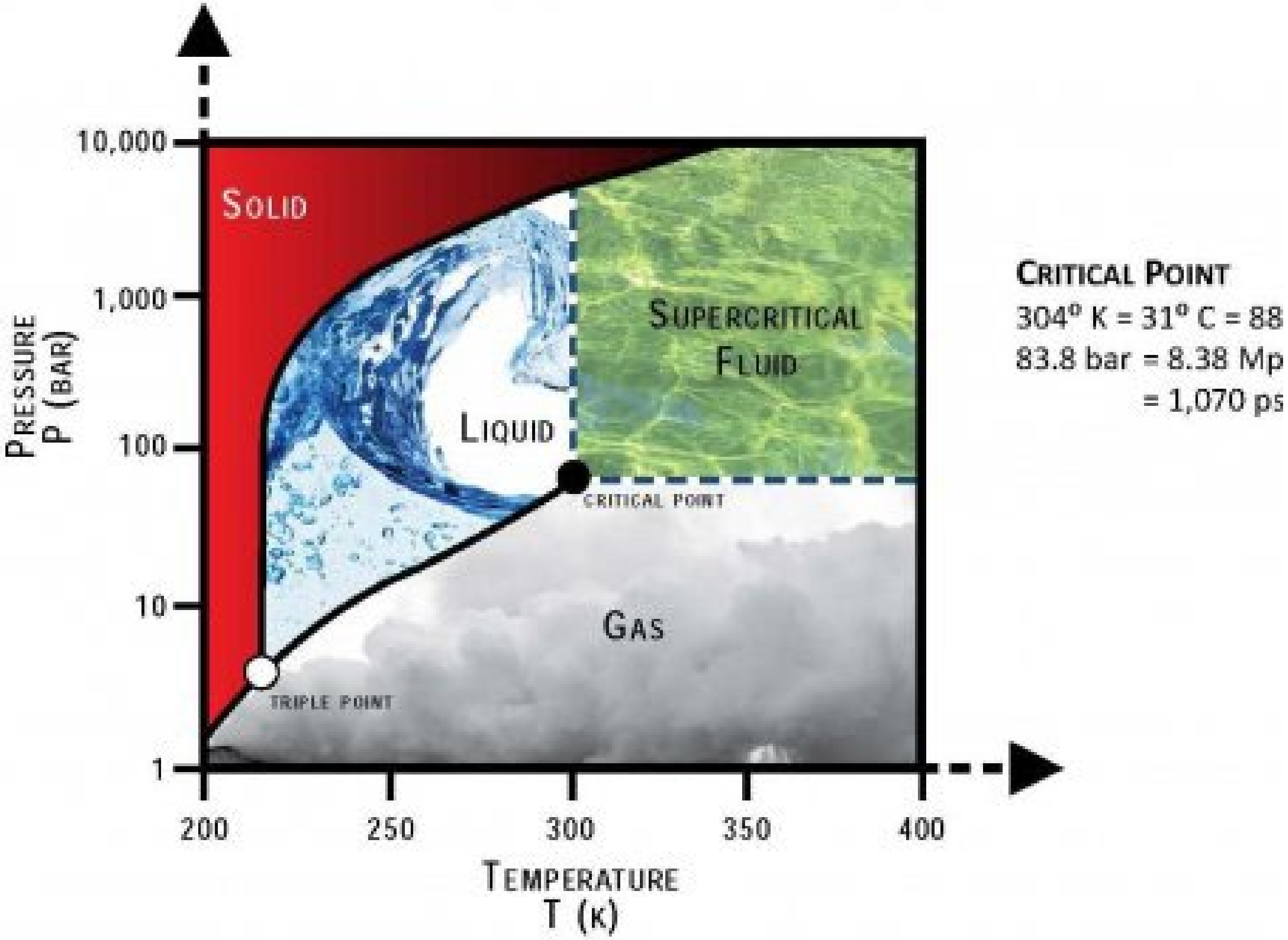
If all CCUS projects in development were complete, what proportion of total global CO2 emissions would be captured on an annual basis?

ⓘ Start presenting to display the poll results on this slide.



However, we need MORE!!!!

- If all CCS projects in development were complete, the total CCUS capacity would be approximately 0.7% of today's global greenhouse emissions.
- This can be construed multiple ways:
  - We are not doing enough…
  - The sector is merely a "drop in the ocean".
  - It is not profitable enough for companies to go all in on CCUS.



Super-critical Nature of CO2

slido

Are CO_2 injection wells used in EOR, a good corollary for the risk profile of CCS injection wells?

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Which of the following is not a risk associated with a loss of primary containment of super-critical CO_2?

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Which of the following products can be made / enhanced using carbon dioxide?

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THANK YOU

Questions?

Codeword #5

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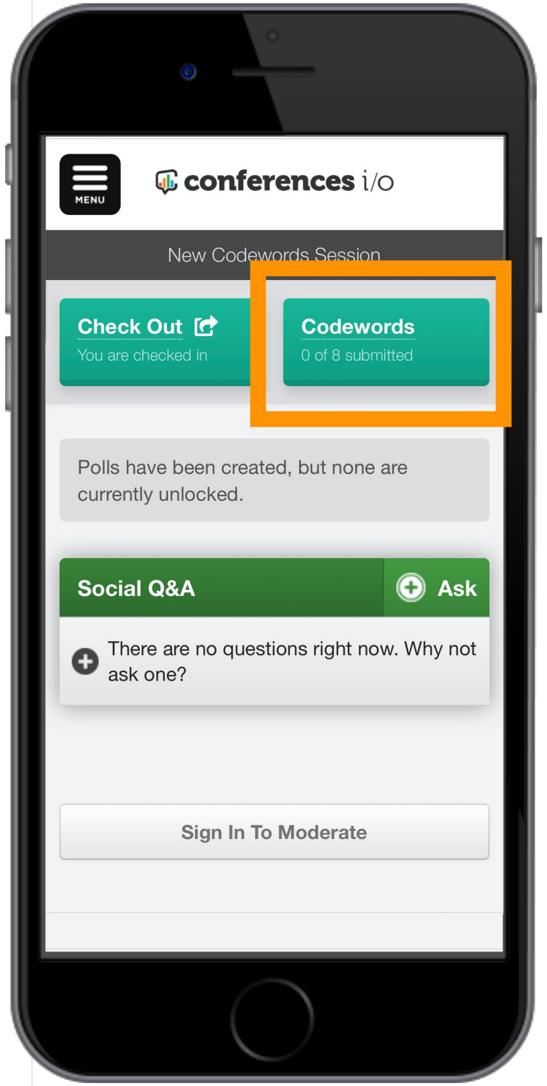

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15 Minute Break

Energy Transition – The Road Ahead

Moderator: Jeff Morgan, AXA XL

Panel Members: JD Lynch, AXA XL Underwriting

Karl Ehlert, MD&D

Laura Watson, AXA XL Risk Engineering

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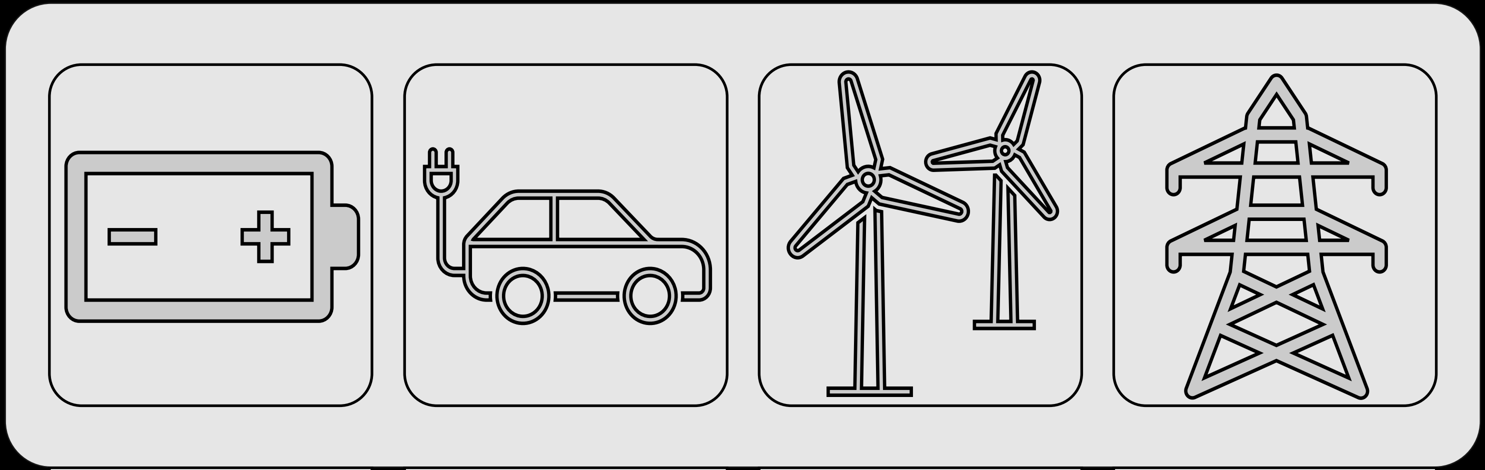
Energy Transition
The Road Ahead

Caution, it may be a bumpy Ride!

Critical Minerals
Discussion and Overview

- What are critical minerals and where they are located?
- What are the key mining requirements and
- Mineral Refining, Processing & Power Requirements

Critical minerals and their use



Rechargeable Batteries

- Lithium
- Cobalt
- Nickel
- Praseodymium
- Graphite

Electric Vehicle Motors

- Neodymium
- Dysprosium
- Terbium
- Praseodymium
- Copper

Wind Turbines

- Zinc
- Dysprosium
- Gadolinium
- Holmium
- Neodymium
- Praseodymium
- Samarium
- Terbium
- Nickel
- Copper

Power Lines

- Aluminium
- Copper

The US is heavily reliant on imports for almost all critical minerals. Over 80% from foreign sources.

For energy transition the focus is on copper, major battery metals (lithium, nickel, cobalt and graphite) and rare earth elements.

Australia is the worlds largest producer of lithium with 8 active mines. The single largest, Greenbushes, accounted for 20% of global production in 2021.

China dominates the processing and refining capacity of critical minerals, producing 60% of the worlds lithium and 80% of the worlds lithium hydroxide.

The European Union will need access to 18 times more lithium by 2030 from what is forecasted by Union Energy Transition standards.

Insurance products – what needs to change?

Chicken or egg?

Do we develop new policies now?

Or wait for demand and respond?

Build back greener

When will policy wording be implemented?

What are the challenges in the losses – including PD and BI

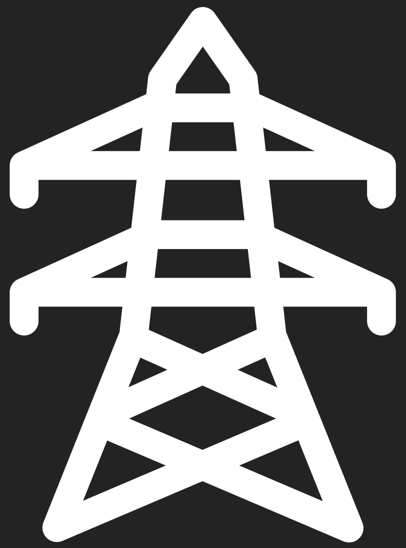
Renewable energy products

What do prior experiences with renewable energy products teach us?

How do government incentives and tax credits affect losses?

Mining partnership for critical minerals

Will insurers stand by mining clients through the transition from current to new operating models?



Power Generation Supply Chain and Infrastructure

Where is the US energy market today?

- Fossil fuel reliance
- Some progress where states are developing more renewable technologies and projects

Can we move away from fossil fuels, what are the challenges?

- How can wind and solar become reliable sources of energy?
- Is storage the answer?
- Storage requirements

Are there other sources to consider?

- Biofuels/Biomass
- Nuclear

Questions?

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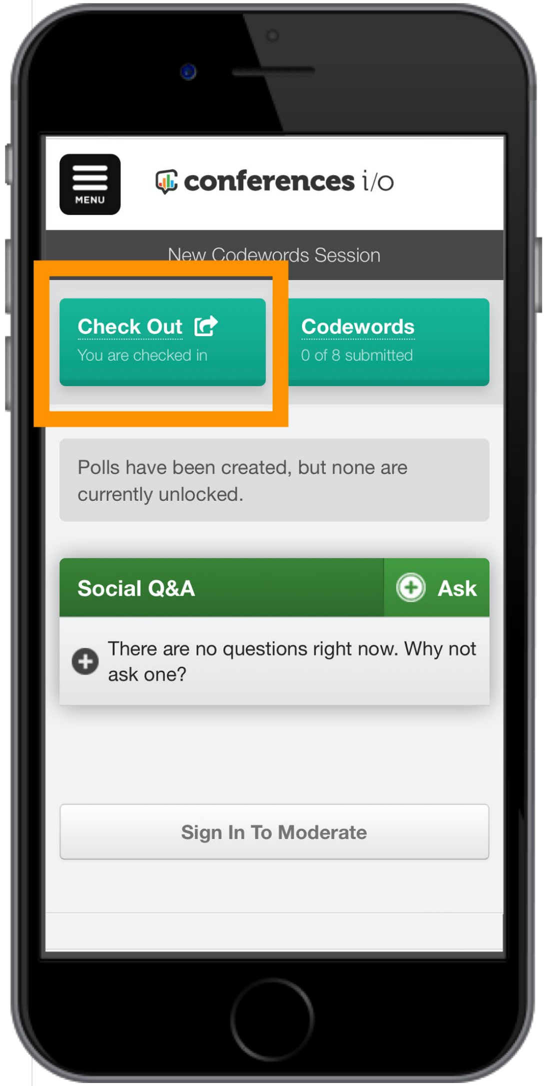
Don’t Forget To Check-Out Before You Leave!



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