Atomic-Age Narrow Gauge – Radium, Vanadium, Uranium, and the Rio Grande Southern Railroad



Steve Hart April 2025

Discovery of Radium – 1898



- Mme. Marie Curie isolated radium from Austrian pitchblende ore
- Samples of yellow ore sent from Montrose, CO to France
- French scientists identified the yellow ore as uranium-bearing
- Ore named "carnotite" after French President Sadi Carnot
- Radium used primarily for treating cancer

Uravan Mineral Belt (gridded area)

Mineral belt became center of U.S. radium industry by 1900



Uravan Belt and the RGS



Paradox Valley



Center of Uravan Mineral Belt

2000' Deep Dolores River Canyon Looking North

300MY Pennsylvanian sandstone at canyon bottom, 100MY Dakota Sandstone capping the top



Carnotite Mining 1900-1910

- 1900 Rare Metals Mining & Milling Co. founded at 3227 Champa in Denver
- 1901 first U.S. radium extraction plant was constructed by RMMC in Naturita
- 1903-04– name changed to Western Refining Co., then renamed Dolores Refining Co.
- 1908 renamed American Rare Metals Co.
- Profitable by shipping refined ore to Europe

U.S. Bureau of Mines Denver Research Lab –1910

- Foster Building, 16th
 Street, downtown
 Denver
- Lab stimulated exploration for "rare earth" metals:
 - Radium
 Vanadium
 Uranium



Vanadium Mill along RGS



In 1910, Primos Chemical Co. built a mill at Newmire. RGS next to San Miguel River. Later name changed to "Vanadium"

Primos Vanadium Mill: 1910-1920



On the RGS at Big Bear Creek, 2 miles east of Sawpit

RGS Passengers Arrive at Newmire



Note new ties and no track ballast, 1910?

Vanadium Miners at Primos Mine



Note candles in holders stuck in the rock walls

Uravan Mining Camp



- Standard Chemical Co. of PA built Joe Jr. Mill in 1912
- "Uravan" from shortening of "URAnium + VANadium"

Uravan 1914



Joe Jr. Mill to left, 1912 boarding house to right

The State of Transportation in 1912



Stage from Placerville to Norwood and Naturita

Milling Equipment for Uravan Arrived at Placerville via RGS



Leaving Placerville for Uravan



Only 56 miles to go!

Ore Shipment to RGS at Placerville



100# bags shipped by pack mule or wagon 56 miles, then unloaded and loaded into box cars by hand

Uravan Truck-Train



During WWI, Standard Chemical replaced wagons with Mack trucks-trailers to ship bagged ore to Placerville

Standard Chemical Co. Tank Car at Placerville



More efficient was tanker trucks with solution pumped into NG tank cars, then into SG tank cars at Montrose

National Radium Institute, South Denver – 1913-1916



- MD & NY doctors funded & BuMines built NRI
- Note 2 small buildings in center in 1916 photo

NRI Mining Engineeer Showing Radioactive Log – 1915



Carnotite also called "carbonite" by miners

NRI's Long Park Mill – 1915



15 tons per day; milled ore stacked in 100-lb burlap bags

NRI Production – 1914-1916

- WWI cut off radium supplies from Europe
- Original goal was to produce 7.5 grams of metallic radium for cancer treatment
- ~1,000 tons of ore was mined and milled in the Paradox Basin by NRI miners
- 11 grams of radium were produced in 3 yrs.
- Average cost was \$80,000 per GRAM

World War I Peaks in Radium Production



Gold = \$20/oz(\$240/lb.)

1914 Prices:

Carnotite ore = \$0.04/lb

Yellowcake $(U_3O_8) = \$8/1b$

Radium = \$120,000/gm (\$55M/lb !)

Radium Co. of Colorado

RCC offices at 18th and Blake St. in downtown Denver





RCC processing plant located on Tejon St. in West Denver adjacent to 3' C&S (South Park) line

RCC Dial Painting Subsidiary

- During WWI, radium sulfide was produced for glow-in-the-dark aircraft dials and rifle sights
- RRC formed the Cold Light Manufacturing Co. at East Colfax Ave. and Race St.
- Radium dial painters were mostly young women, who used camel-hair brushes
- In early 1920's, dial painters suffered gum and jaw cancers from tipping brushes with tongue
- Site became IHOP at 2001 East Colfax in 1970s

Bureau of Mines Research Lab Moves to Golden – 1916-1920



BuMines moved to a new \$43,000 building at Mackay School of Mines in Reno in 1920

Radium Bust – 1922

- 1914 uranium found in Congo (Belgians kept secret from Germans) • 1921 - discovery revealed: Carnotite = $1-3\% U_3O_8$ Congo ore = >25% U₃O₈ • 1922 - Radium prices dropped by >50%• 1923 - Miners left Uravan District per CU prof
- RCC designed Belgian plant



Shinkolobwe Mine

Paradox Basin Vanadium Mill – late 1930s



As war loomed, U.S. steel mills increased production of vanadiumsteel armor plating for ships and tanks

New Vanadium Corp. of America Naturita Mill

Durango Silver-Lead Smelter



Durango - 1882 - Ted Kierscey Collection

1882 – smelter built 1929 – smelter closed



1939 - USV reopened smelter 1939-1943 – vanadium plant 1943-1946 – uranium plant

WW II Tonnage on RGS

FIGURE 3 TOTAL TONNAGE HAULED BY RGS IN WORLD WAR II



1943 Exec Order closed all gold-silver mines unless they produced lead or zinc

11-1943 Wreck of RGS #455



So how did General Groves and the Los Alamos atomic scientists respond to scenes like this?

BPR Roads Built during WW II

Mine or District	County	Length (miles)
Atkinson	Montrose	6.2
Barlow Creek	Dolores	3.4
Calamity-Mesa Creek	Mesa & Montrose	45.0
Carpenter Flats	Montrose	15.0
Gypsum Valley	San Miguel	19.4
Island Mesa	San Miguel	13.0
LaSal Creek	Montrose	1.5
Legin	San Miguel	5.2
Lion Creek	Montrose	14.0
Long Park	Montrose	13.0
New Cashin	Montrose	3.2
Monogram Park-Dry Creek	Montrose/San Miguel	26.2
Spud Patch-Snyder	San Miguel	6.0
Dolores Group	Various CO & UT	162.8
	TOTAL MILEAGE	333.9

Trucks Replaced Trains for Hauling Uranium in 1945



USV Durango Uranium Plant 1948



Plant reopened in 1948 and operated to 1960 Note light-colored tailings immediately to right of plant Post-war Tourism Replaced Uranium

But scenery and tourism were not enough to keep the RGS alive !



Uravan Mineral Belt Today



Uranium industry crashed after 1979 PA Three-Mile Island nuclear accident
Uranium mills at Durango, Naturita, Dove Creek, & Slick Rock cleaned up under UMTRA, 1980 – 1989

• Primos Vanadium - 1990's Superfund site

• Mines reclaimed by CO MLRD in 1990s



Uravan Cleanup under Superfund – 1983 - 2000



Only CO-landmarked 1912 boarding house and stable remained

Landmarking is NOT Preserving !



1912 Uravan boarding house and stable in February 2007

National Radium Institute Cleanup by DR Superfund Site



1982 – Robinson Brick & Tile still operating
Note 2 small buildings in foreground

NRI Cleanup under Superfund



NRI site now Home Depot on South Santa Fe
I-25 & Broadway Light Rail Station to east

CSM Cleanup - 1988



- 1985 Bureau of Mines connection rediscovered
- 1986 my Radium Boom article in *Mines Magazine*
- 1988 1894 Engineering Hall decontaminated

Now We're Left Only With These Remnants of the First Boom ...



Primos Mine tramway tower near Sawpit

Waste rock from radiumuranium mines in the Paradox Valley

And These Scenes of the RGS!



RGS Placerville depot



Tank at Trout Lake





Goose #5 on C&TS

RGS #20 at CRRM

THE END

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