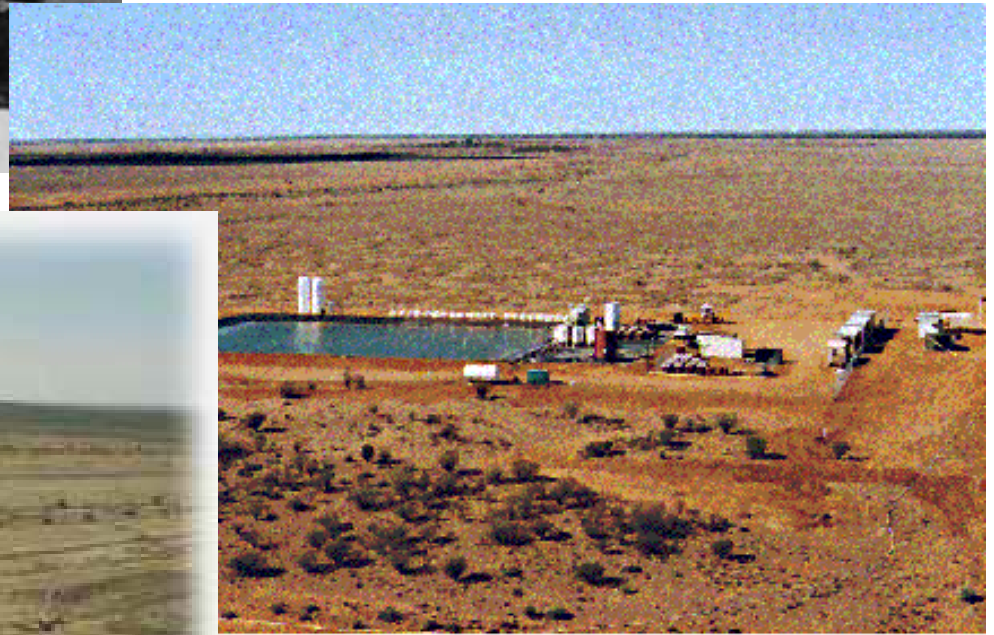


Honeymoon Uranium Mine South Australia







The chemistry of in-situ leaching

- Acid leach – using sulfuric acid
- Alkaline leach – uses bicarbonate and carbon dioxide
- Problem – any reactions with the rocks or sediments?

Yellowcake



Yellowcake, the commodity uranium-mining companies produce

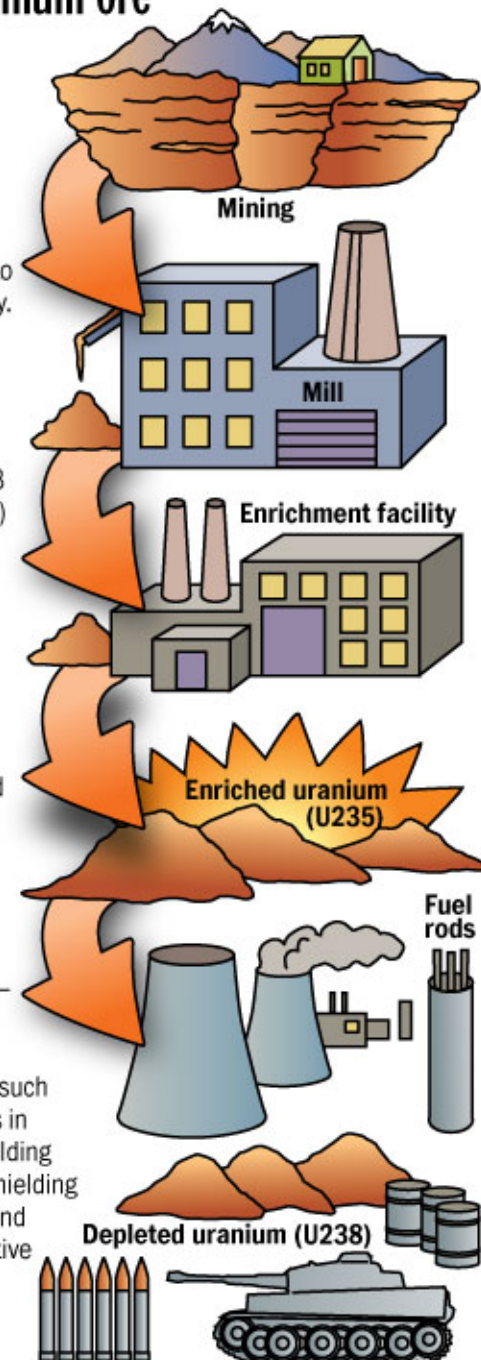
Refining and Enriching



Processing uranium ore

- 1 Mine** – Natural uranium ore is extracted or mined and sent to a fabrication facility.
- 2 Mill** – Ore is processed and sent to an enrichment facility.
- 3 Enrichment** – Natural uranium (U235 and U238, proportionally about 0.7 percent and 99.3 percent, respectively) is “enriched” to obtain the isotope U235 by removing most of the U238. (U238 becomes depleted uranium.)
- 4 Energy** – Enriched uranium is fabricated into fuel suitable for use in nuclear reactors and atomic weapons.

Depleted uranium – High-density DU is ideal for use in military applications such as armor penetrators in weapons, armor shielding for vehicles and as shielding material for storing and transporting radioactive materials.

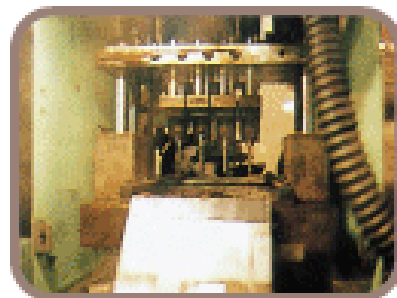


Fabrication of fuel pellets



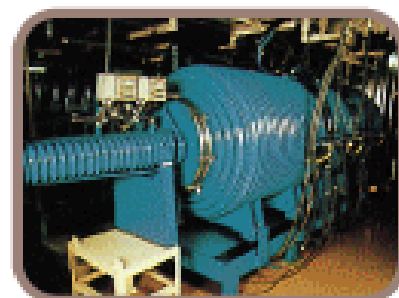
Homogenizing

Plutonium and uranium are blended for homogenization



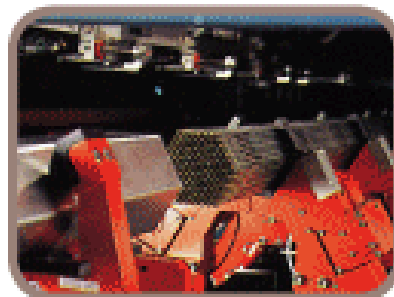
Pelletizing

The homogenized powder is compressed into pellets



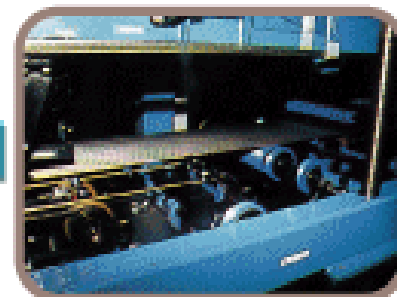
Sintering

Pellets are sintered at about 1700°C



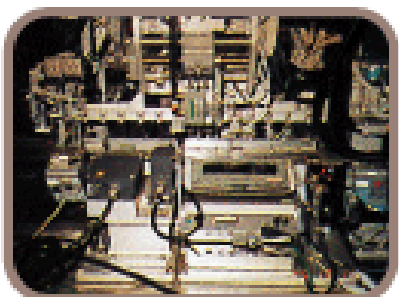
Assembling

Fuel pins are bundled into a fuel assembly



Pellet loading

Finished pellets are inserted into a cladding tube (fuel pin)



Inspection

Dimension, density and appearance of pellets are inspected

Pellets



A typical pellet of uranium weighs about 7 grams (0.24 ounces). It can generate as much energy as...



3.5 barrels of oil, or...

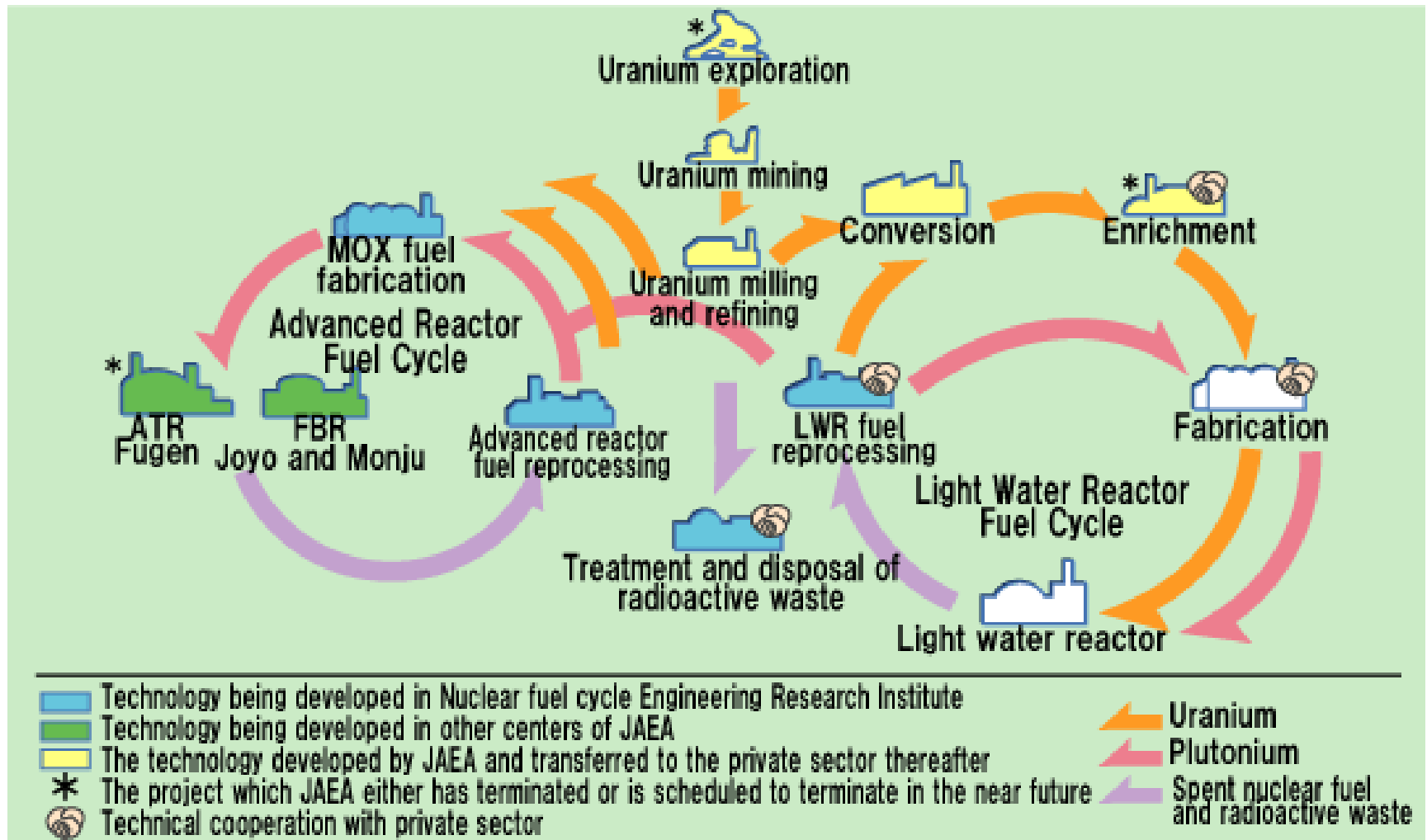


17,000 cubic feet
of natural gas, or...

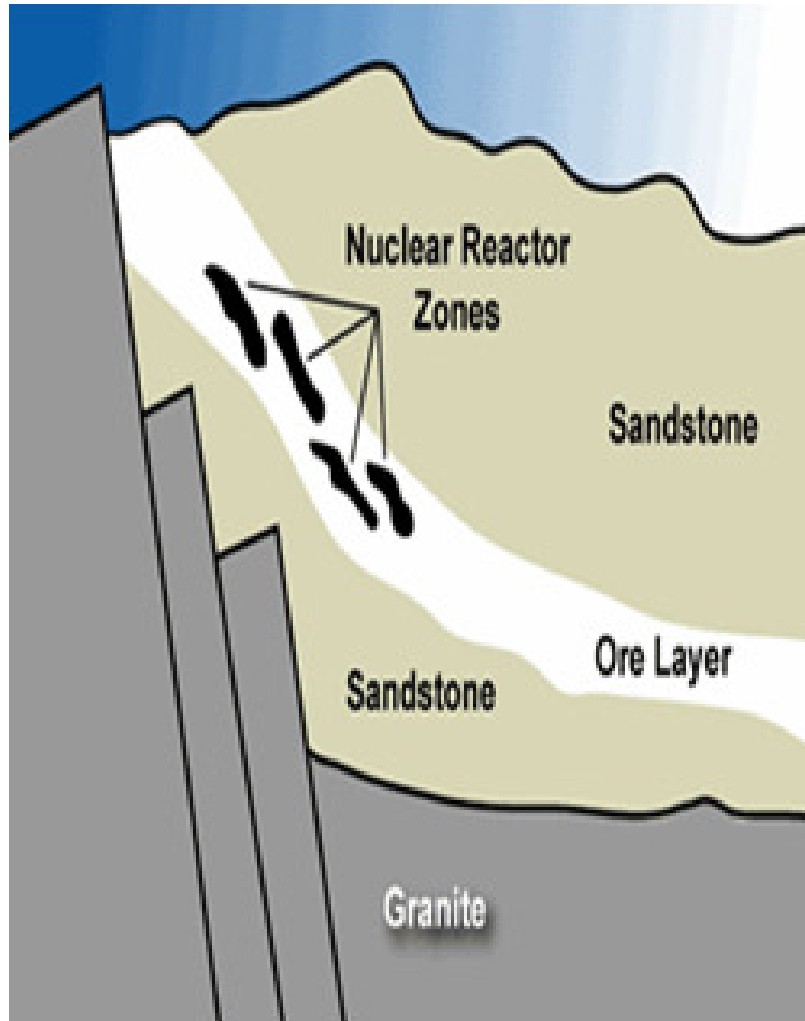


1,780 pounds of coal.

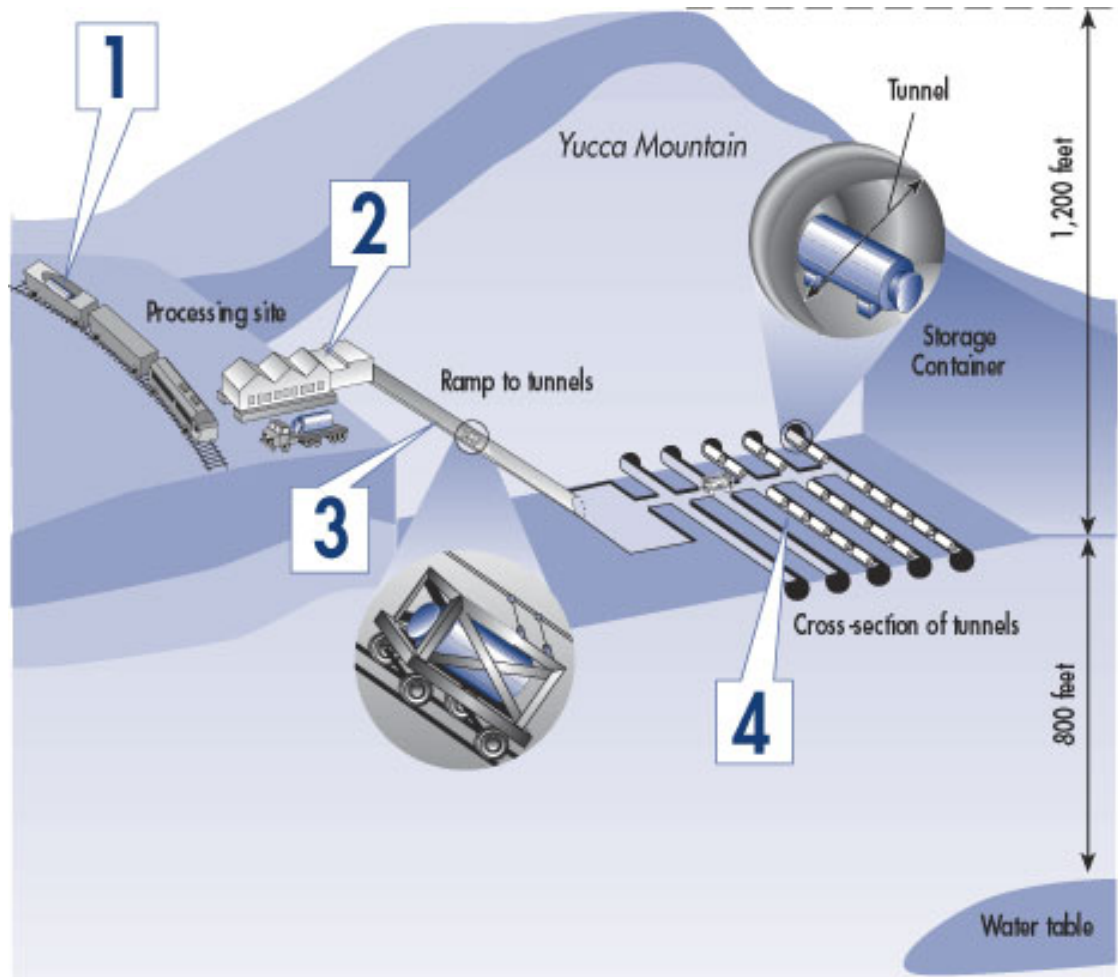
Cradle to Grave Cycle



A natural reactor



Yucca Mountain Storage





Chemistry Learning Objectives

- Significant Figures
- Density
- Percent Mass
- Balancing Equations
- Calculating Oxidation Numbers
- Nuclear Reactions
- $E = m c^2$