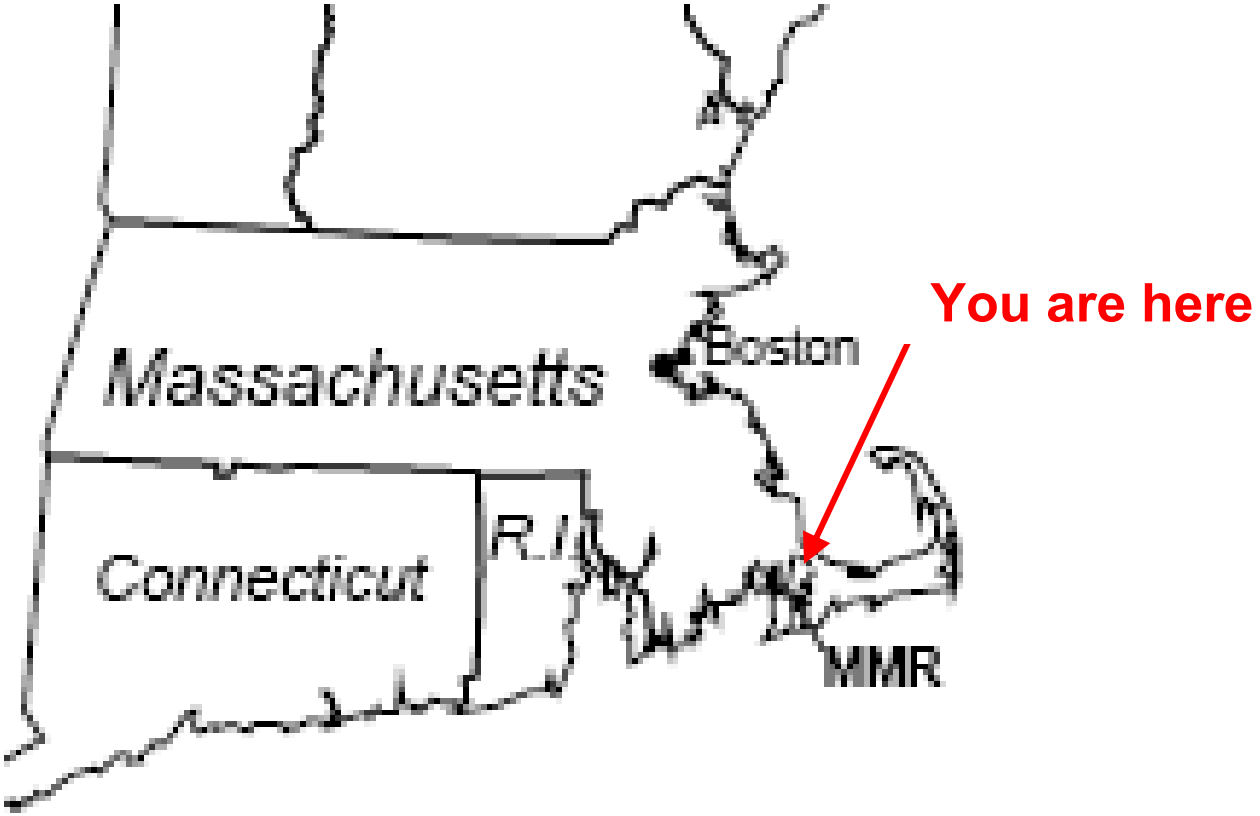
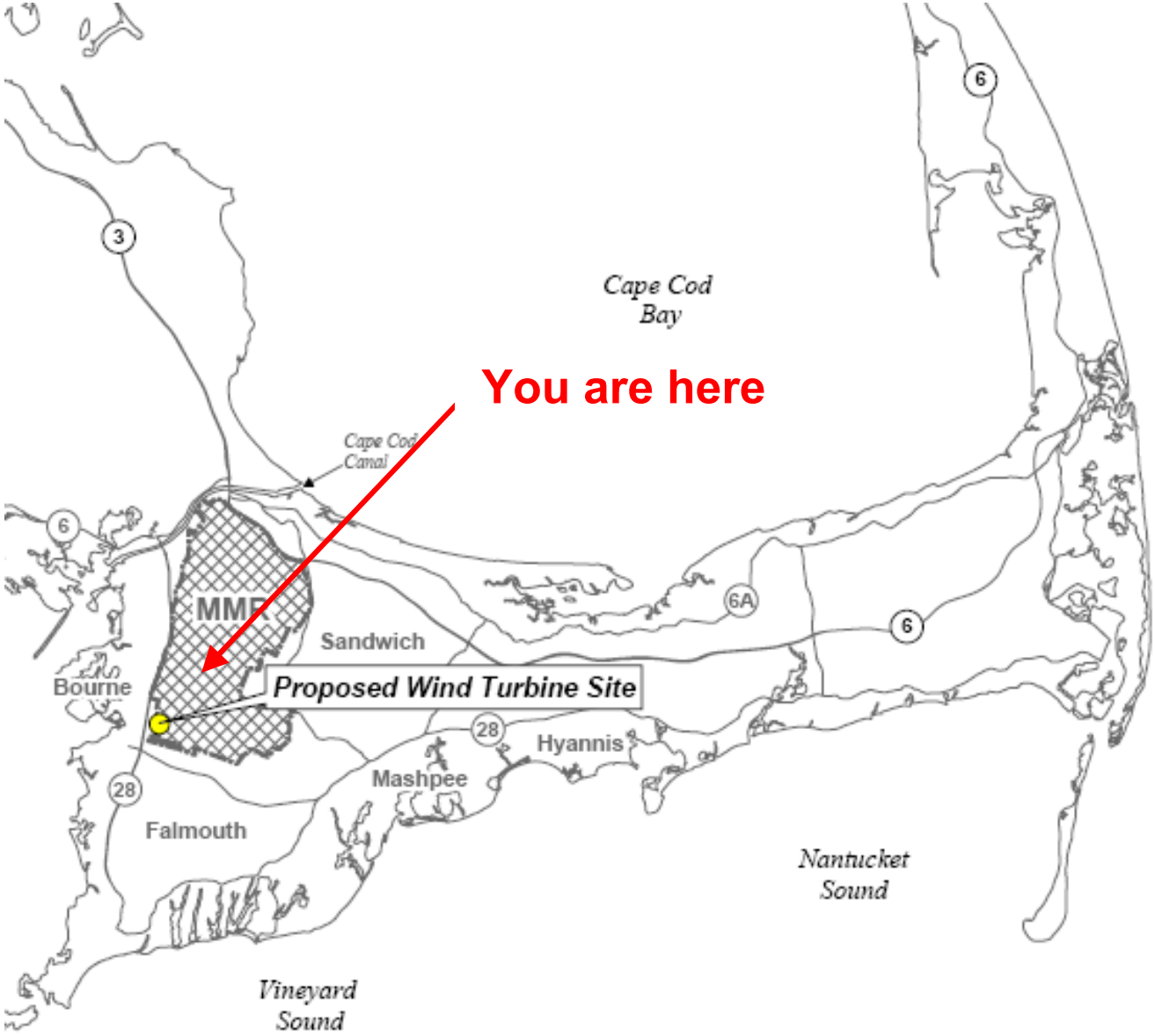

Welcome to MMR
(aka Otis AFB, Camp Edwards ArmyNG Base, Coast Guard Air Station Cape Cod, and others)

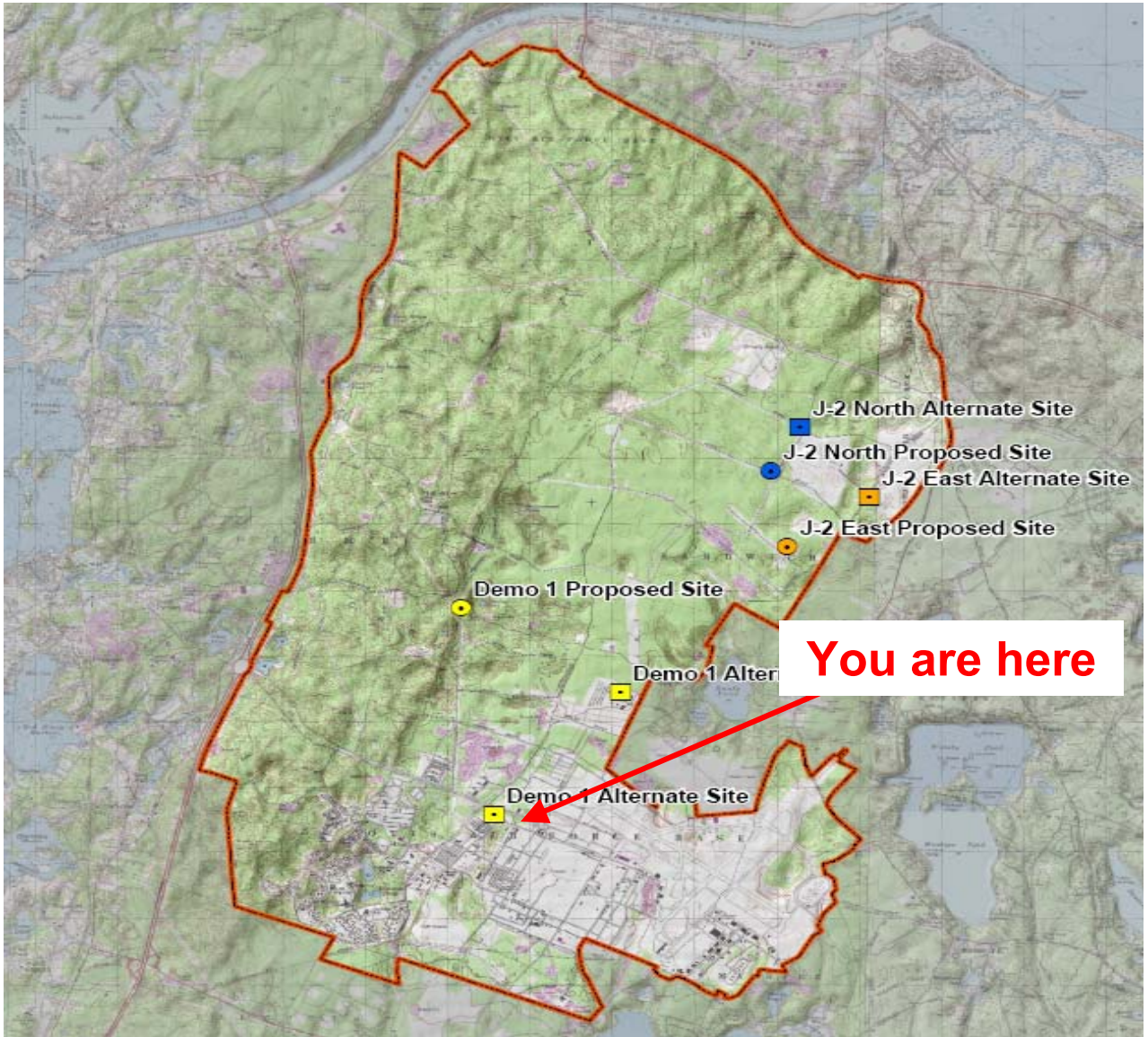
Orientation Slide #1



Orientation Slide #2



Orientation Slide #3



Orientation Slide #4

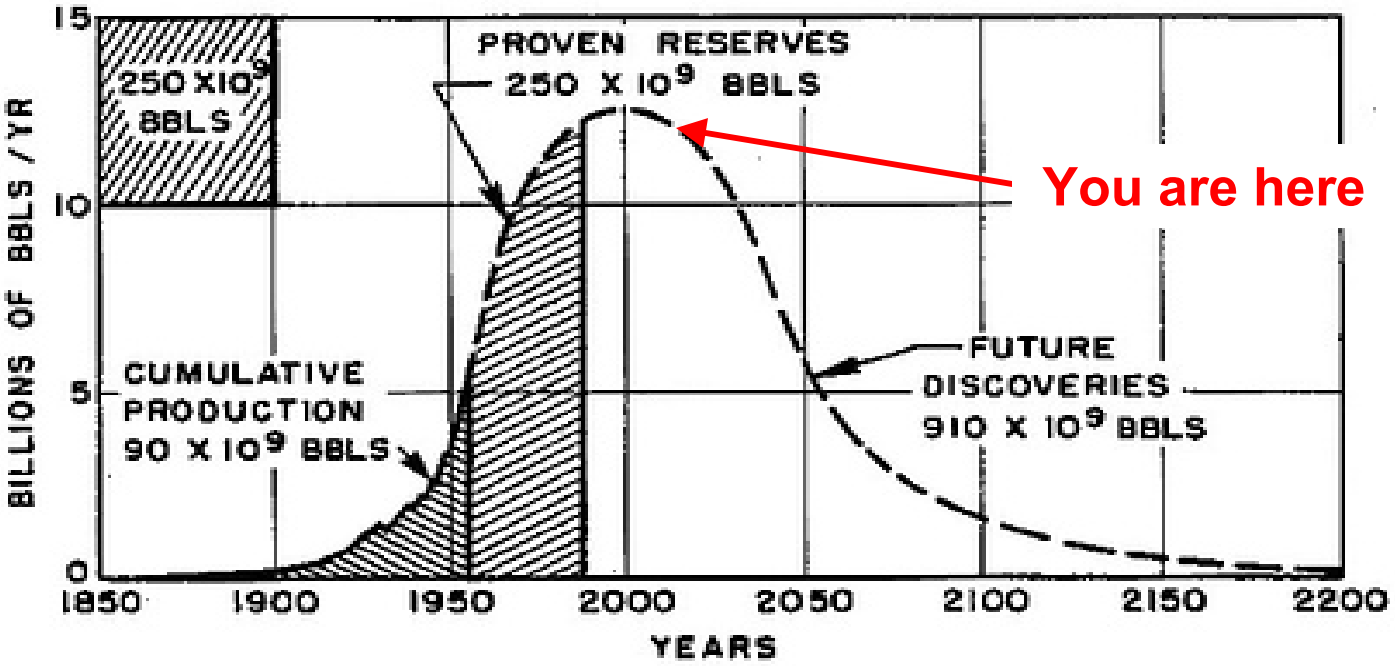
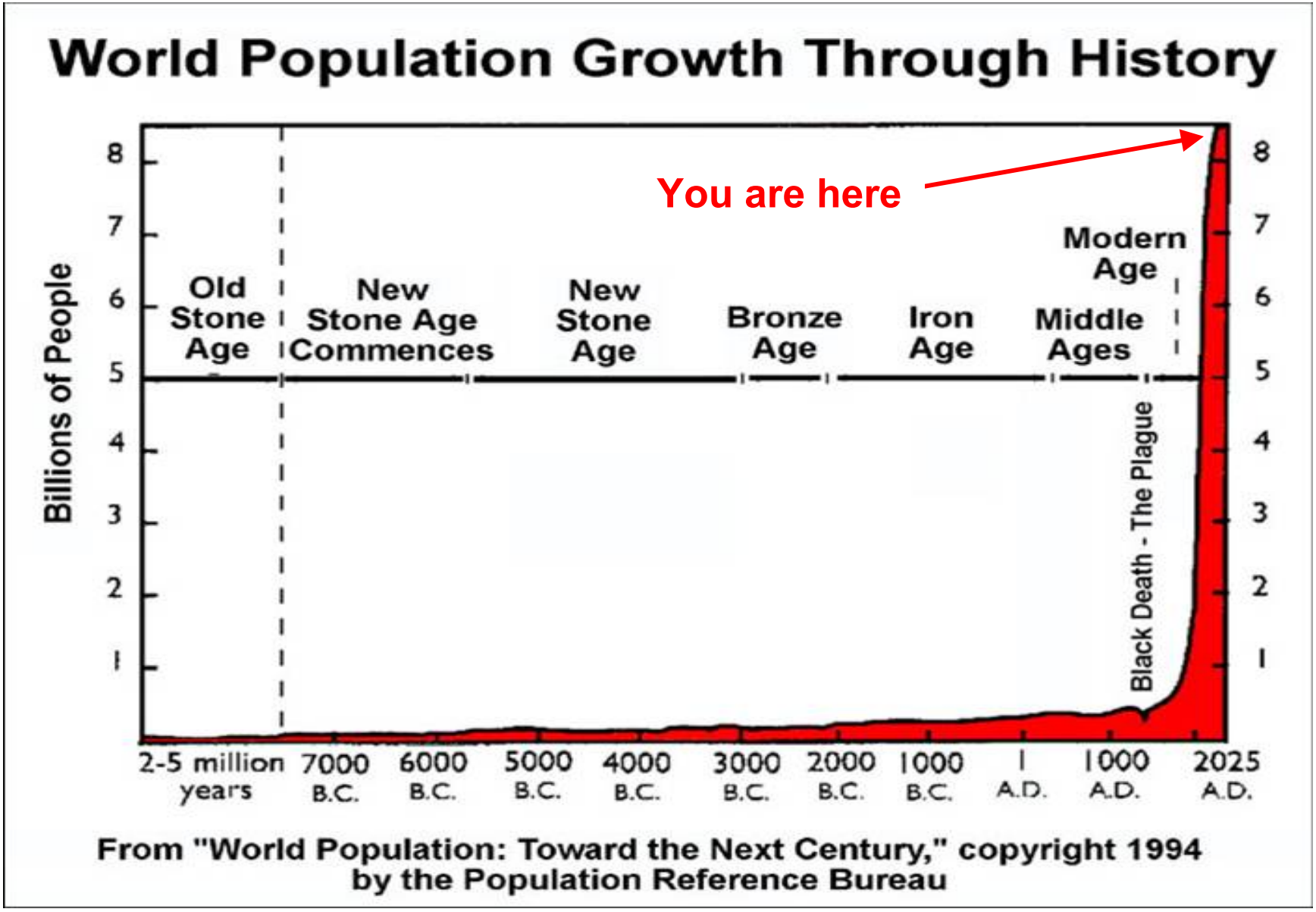
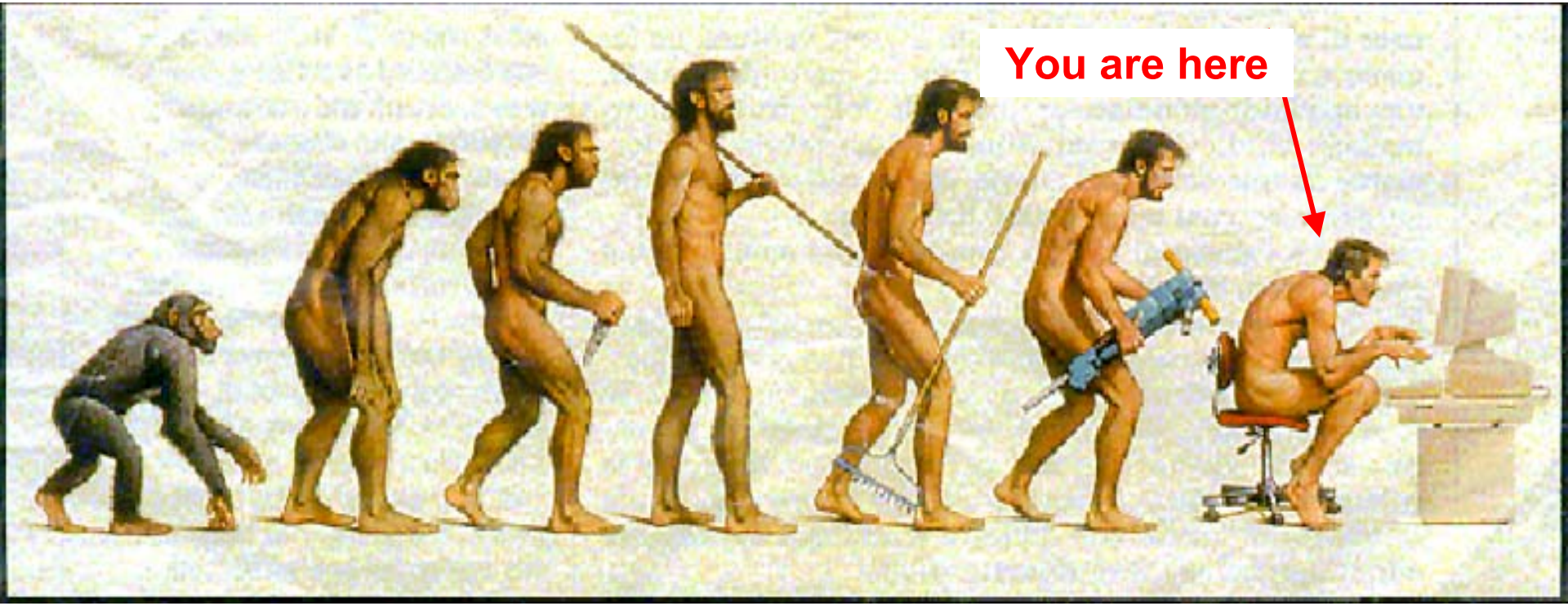


Figure 20 – Ultimate world crude-oil production based upon initial reserves of 1250 billion barrels.

Orientation Slide #5



Orientation Slide #6



Orientation Slide #7

Groundwater Treatment Energy Basics

- Submersible pumps move contaminated water to the treatment plant. Additional pumps move the water through the plant and back to the ground.
- It takes 8-12 kilowatts (kW) of electricity to pump 100 gpm.
- It takes roughly 2,000 kWhours (kWh) to move 1 million gallons of water.
- At $0.17 per kWh, it costs $340 to move 1 million gallons of water. Treatment systems at MMR range from 100,000 gpd to 2.9 mgpd (~$1,000 per day).
- AFCEE spends $2.2M per year on electricity (~13,000 MWh), IAGWSP will spend $450k per year (~2,600 MWh)

Air Emissions

- **Based on the regional power mix, annual MMR groundwater treatment plant power consumption results in at least:**
  - **13,000 tons of CO_2 (greenhouse gas),**
  - **43,000 pounds of SO_2 (acid rain),**
  - **42,000 pounds of NOx (acid rain and greenhouse gas),**
  - **Also particulate matter (smog), mercury (bio accumulation), and lead (health effects)**
  - **VOCs (almost twice as much as is being removed from the groundwater)**
- **Use http://oaspub.epa.gov/powpro/ept_pack.emissions?p_zip=23222&p_egcid=19876 to calculate your emissions**

Renewable Energy For Pump and Treat

- Meeting the goals of EPACT
  - Executive Order EO 13423 requires federal entities to expand the use of renewable energy and reduce use of electricity by not less than 3% by FY2009, 5% by FY2012, and 7.5% by FY2013
  - Renewable energy is counted double against the goal if the renewable energy is produced and used on-site at a federal facility
- Pump and treat systems are a perfect fit for renewable energy if the duration is longer than the pay back period
  - Grid tied - renewable source displaces some of the electric demand
  - Stand alone – most common renewable sources are intermittent so either combine renewables in a hybrid system or accept intermittent pumping

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