



- 1. The Structure of the Industry** - Topics include: **hydrocarbon characteristics**; **gases** (*types of gases, gas uses, wet/rich gas, dry/lean gas, condensate, gas processing, NGLs*); **crude oil** (*types of crude, crude oil uses, gravity measurement and sulfur content*); **oil and gas measurement units and valuation issues**; **industry sectors** (*description of activities in each sector*); **types of unconventional production**; **industry participants** (*integrated companies, independent producers, national oil companies, midstream companies, and contractors/suppliers*); **world crude oil market** (*exporters, importers, OPEC, production and price trends*); **world gas production and impact of LNG**; **LNG overview** (*liquefaction, transportation, re-gasification, exporters/importers, and U.S. activity*); and **unconventional shale and tight rock development in the U.S.** (*how horizontal drilling and hydraulic fracturing developed and expanded, impact on production and prices, most-active development areas, and map of U.S. rig counts*).
- 2. Petroleum Geology and Exploration** - Topics include: **organic source of oil and gas** (*aquatic micro-organisms, where they thrive and how they deposit organic debris*); **sedimentation and sedimentary rock** (*sources of sediments, how they can mix with and preserve organic debris, organic shale, other types of sedimentary rock, and rock layer formation*); **rock porosity and permeability**; **oil and gas formation** (*how organic debris can mature into oil and gas, impact of burial depth, and oil and gas windows*); **oil and gas subsurface migration** (*what causes migration and how oil and gas can flow through porous and permeable rock layers*); **changes over geological time** (*impact of plate tectonics, paleomap sequence of how the earth has changed, and when and how U.S. unconventional areas were formed*); **U.S. sedimentary basins** (*maps showing location and thickness of basins and current focus areas within those basins*); **geological example using the Permian Basin** (*how formed, oil and gas migration into conventional traps, refocus on unconventional formations*); **conventional traps** (*trap structures, reservoir rock, and impermeable seal rock*); **why unconventional shale and tight-rock development requires horizontal drilling and hydraulic fracturing**; **overview of exploration methods and tools**; and **seismic survey procedures**. This section makes extensive use of animations to reinforce the subject matter.
- 3. Mineral Rights and Leasing** - Topics include: **how mineral rights ownership in the U.S. differs from the rest of the world**; **how mineral rights ownership is distributed in the U.S.** (*private, state, Indian, federal, and land patents*), **land survey methods** (*rectangular survey vs. metes and bounds*); **severability of mineral and surface estates** (*rights of the mineral estate owner to use the surface*); **ownership of oil and gas production** (*fugacious nature of oil and gas and Rule of Capture*); **common state conservation laws and regulations** (*well spacing, density restrictions, production allowables, gas flaring, permitting and reporting*); **horizontal well spacing examples**

(multi-well pads, lateral spacing, boundary distances, take-point gaps, off-lease spudding, and stacked laterals); oil and gas leasing (why leasing is done, key lease terms, working interests, royalty interests, and example of royalty statement); joint ownership of mineral estate (why it is common, undivided ownership, net mineral acres and net revenue interest), pooling and unitization (why done and forced vs. voluntary); joint operations (how there can be multiple working interest owners in the same work area and an overview of joint operating agreements); title opinions and division orders; mention of other types of oil and gas interests not covered; and a brief overview of federal leasing.

4. **Drilling and Completion** - Topics include: **well planning; site preparation, rig mobilization; rig structure and functions; drilling tools (bottom hole assembly, MWD/LWD, drill pipe); drilling fluids/mud; all phases of drilling a horizontal well (vertical sections, curve section and lateral section); casing and cementing; directional drilling; hydraulic fracturing (plug and perf method); flowback; tubing and packer; Christmas tree and digital sensors; and advanced methods (micro-seismic during fracturing, batch drilling, walking/skidding rigs, and zipper fracs).** Energy Training Resources has exclusive rig-floor video and down-hole animations of the drilling and completion process that is used throughout this section.

5. **Development and Production Operations** – Topics include: **brief overview of an oil and gas project evaluation (typical revenues and costs, annual projections, and cash flow discounting); well evaluation tools (logging, coring and drillstem tests); brief overview of how reservoir modeling and simulation can be used in development planning; conventional reservoir characteristics (how oil and gas behave in a reservoir and factors involved in reserves estimation); artificial lift; surface processing facilities (animation showing modern unconventional production site layout including flow lines, separator, heater treater, tanks, water pump off, vent gas and flaring); production phases (primary, secondary and tertiary/EOR with animations of each); and oil and gas reserves classifications.**