

Lecture 3: Global Energy Balance

Downstream sector

- Production
- Stuff that comes out of the well head
 - Natural gas
 - Water
 - Crude oil
 - Contaminates
- Step 1 of production is separation
 - Wet Crude Handling Facility (WCHF)
 - Older fashion
 - Did not care about natural gas
 - Just burned it off
 - Gas Oil Separation Plant (GOSP)
 - Current method
 - Get crude oil after initial separation
 - Then sent to a refinery
 - Want to separate the different chains from one another
 - Use heat to do fractional distillation and separate the hydrocarbon chains
 - Naphtha
 - Basic building block of gasoline
 - How do you measure the relative weights of oil (Heavy oil)
 - API gravity
 - American Petroleum Institute
 - For oil
 - $(141.5/\text{specific gravity of crude oil}) - 131.5$
 - Specific gravity of crude oil is around 5.0
 - The higher the API gravity, lower the actual specific gravity of the oil
 - Industry norms
 - $15^\circ - 39^\circ$ for heavy crude
 - nasty
 - toxic
 - tar-looking
 - high cost of refining
 - $40^\circ - 60^\circ$ for intermediate
 - honey in color
 - $60^\circ +$ for light oil
 - looks and feels kind of like baby oil
 - refining costs are very low
 - This matters because of the cost of refining the oil
 - Light
 - For water
 - $(141.5/1) - 131.5 = 10^\circ$

- What is a concession?
 - Define a territory, and the investor has full access to the subsurface resources in that defined territory
 - The production is the property of the investor
 - Ways sovereign is going to get a piece of the action
 - Signing bonus
 - Royalties
 - Taxes
 - Sovereign will still not have a lot of say
 - Overtime sovereigns had lots of dissatisfaction
 - Responses to dissatisfaction
 - Nationalization
 - Aramco became Saudi Aramco, for example
 - Expropriation
 - Compensate the investor
 - 50-50
 - Form a cartel
 - OPEC
 - Want to re-establish control
 - Have a say over investment and pricing decisions
 - Want money, too
 - For deep water drilling in international waters there are all sorts of treaties and rules governing terms of use
 - If you have just nationalized, what do you do if you're not going to give concessions?
 - Do it yourself
 - Saudi Arabia and Saudi Aramco
 - Since the 1970s there has been no foreign investment into upstream oil sector (Saudi Aramco)
 - Most capable national oil company in the world (Saudi Aramco)
 - Finance virtually everything on their own, too
 - Put a lot of money into the latest technology
 - The most supercomputers in the world, second to the NSA
 - Service contracts
 - Production Sharing Agreement (PSA)
 - Like a concession
 - Agreement between the sovereign and an investor dealing with a specified territory for a specified amount of time
 - Different than a concession
 - In PSA the sovereign will have more to say in what the investor will be doing with regards to investment of resources and monies
 - Government shares production with investor
 - Take total volume of production and spit it up based on specified amount agreed upon in contract
 - Initial compensatory product

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