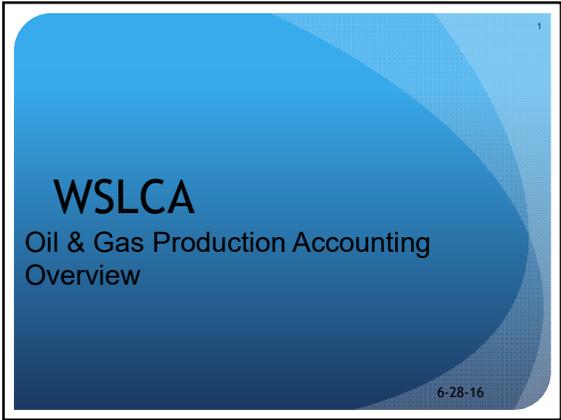




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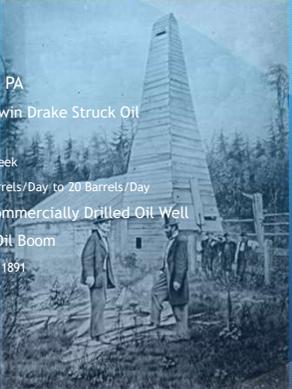
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1859

- Titusville PA
  - Col. Edwin Drake Struck Oil
    - 69ft
    - Oil Creek
    - 25 Barrels/Day to 20 Barrels/Day
  - First Commercially Drilled Oil Well
  - Starts Oil Boom
    - Peaks 1891



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1901

- Beaumont TX
  - Spindletop Gusher, Blew-out near Beaumont Texas
  - Proved Rotary Drilling Rig Effectiveness
  - Mud Circulating Systems



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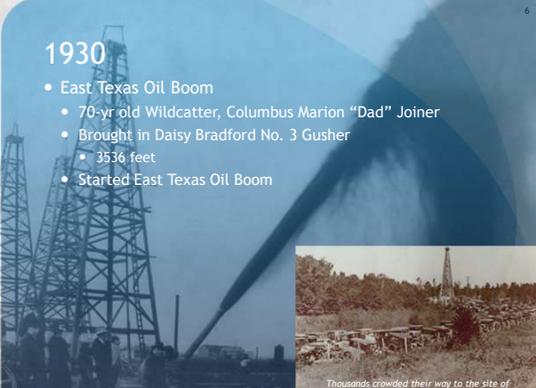
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1930

- East Texas Oil Boom
  - 70-yr old Wildcatter, Columbus Marion "Dad" Joiner
  - Brought in Daisy Bradford No. 3 Gusher
    - 3536 feet
  - Started East Texas Oil Boom



*Thousands crowded their way to the site of Daisy Bradford No. 3, hoping to be there when*

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10

### Production Operations

- Production operations encompasses:
  - Preparing the wellbore for production
  - Bringing fluids to the surface
  - Separating into oil, gas, and water streams that can be measured for quantity & quality
- Three phases of oil recovery
  - Primary production - natural reservoir drive/pressure
  - Secondary production - pump, water injection, gas lift
  - Tertiary recovery - injection of chemicals or CO2
- Keeping the oil flowing
  - Workovers - remedial operations to wellbore or equipment to maintain or restore production
  - Fracking - procedure to stimulate production by forcing a mixture of fluid & proppant into the formation under high pressure

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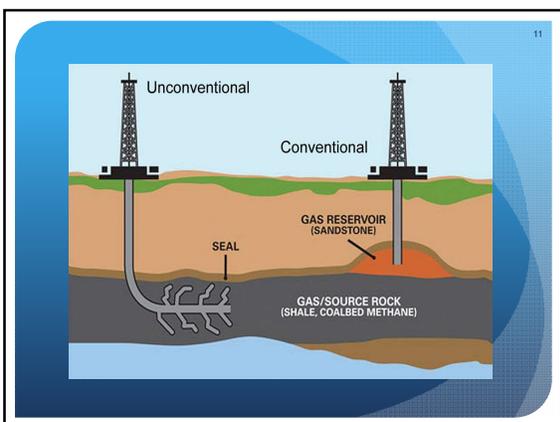
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12

### Oilfield Operations & Production Accounting

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### Oil Production Flow

Oil and Gas Lease

- Wellhead
- Separation
- Treatment
- Storage
- Measurement
- Conveyance



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### Production Reporting

- All states with oil & gas production require reporting of production and / or sales volumes monthly
- Many states also require reporting of non-sales volume dispositions such as: lease fuel, vent or flare, beginning and ending tank inventories, etc.
- Properties with federal interests also require production and sales reports monthly.
- The first state regulatory agency established to conserve its natural resources - Texas Railroad Commission

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### Production Reporting - Most Common Reports

- Texas Railroad Commission
  - Form PR Monthly Production Report - oil and gas by field or lease
- Oklahoma Corporation Commission
  - Form 1004 Monthly Unallocated Natural Gas Production
- Oklahoma Tax Commission
  - Form 300 Gross Production Monthly Tax report

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### Production Reporting - Most Common Reports

- Louisiana Department of Conservation
  - Form OGP Operators Monthly Oil & Gas Production Report
- New Mexico Oil Conservation Commission
  - Form C-115 Operators Monthly Report
- Federal Government Office of Natural Resource Revenue
  - OGOR Form Part A - Well Production
  - OGOR Form Part B - Product Disposition
  - OGOR Form Part C - Product Inventory

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### Oil Sales Contracts

- Sold by truck or through LACT meter
- Typically sold at tank battery, or unit batteries
- Contract term: either spot or evergreen
- Pricing terms refer to a posted price bulletin
- Purchaser may be: refiner, oil transporter, other oil company, pipeline company

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### Oil Sales Volumes

- LACT unit - need month end reading along with any quality adjustment data included
- Trucked oil - need all run tickets from all tank batteries from which oil sold
- Run tickets for a given field should be sequentially numbered in most cases
- Any owners TIK?

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### API Gravity

- ✓ PREFERRED - 40-45 (gasoline & diesel fuel)
- ✓ Light - > 31.1
- ✓ Medium - 22.3-31.1
- ✓ Heavy - < 22.3
- ✓ Bitumen < 10 (Alberta Sands)

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### Gas Field Operations and Production Accounting

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27

### Gas Production - Gas Well



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### Gas Production

- Gas is produced from an oil field or gas field
- State regulatory agencies determine if a reservoir is predominately an oil field or gas field
- Most states have different spacing requirements for oil wells and gas wells - usually gas wells have greater spacing between wells
- By its nature - gas flows into pipelines and not stored whereas oil may be stored on lease in tanks

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### Types of Gas

- Gas produced from a gas well is called gas well gas
- It can also be called non-associated gas
- Gas produced from an oil well is called casinghead gas
- It can also be called associated gas - which is not produced until the oil reserves are near depletion
- Sour gas has hydrogen sulfide (H<sub>2</sub>S) and is deadly

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### Types of Gas

- Residue gas (tailgate gas) is gas remaining after processing at a gas plant to remove NGLs and other contaminants
- Gas produced in the field may also contain nitrogen, helium, and CO<sub>2</sub> - all which must be removed before the gas can be sold
- Helium produced on federal lands must be reported and royalties paid to the Bureau of Land Management (BLM)
- Gas consumed for home heating is mostly made up of Methane with a trace of Ethane

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### Gas Measurement

- Natural gas is made up of hydrocarbons that are a vapor at atmospheric pressure and temperature
- This means gas has to be contained under pressure
- Gas is usually measured in terms of thousand cubic feet (MCF)
- Gas is also measured in terms of millions of British Thermal Units or BTUs (MMBTUs)
- Most gas is sold by MMBTUs and not MCFs

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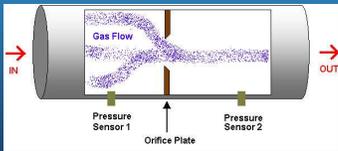
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### Gas Measurement

- Gas measurement is not precise - but close
- Most common meter is the Orifice Meter - a chart recording meter with an "orifice plate" that measures pressure difference before and after the orifice plate



The diagram shows a horizontal pipe with an 'IN' arrow on the left and an 'OUT' arrow on the right. Inside the pipe, a purple cloud of gas is labeled 'Gas Flow'. A vertical 'Orifice Plate' is positioned in the center of the pipe. Below the pipe, two 'Pressure Sensor' units are shown: 'Pressure Sensor 1' is located upstream of the orifice plate, and 'Pressure Sensor 2' is located downstream of it.

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### Gas Measurement

- Two other common types of gas measuring meters used are the Positive Displacement meter and the Flow meter
- Most flow meters measure gas based on the rotating speed of the internal turbine
- Positive displacement meters measure the flow of gas by dividing the gas flow into timed increments

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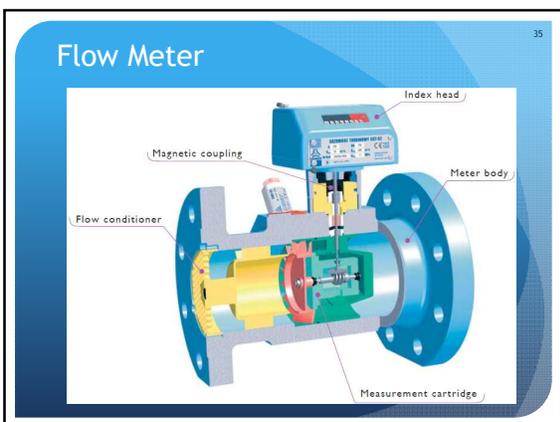
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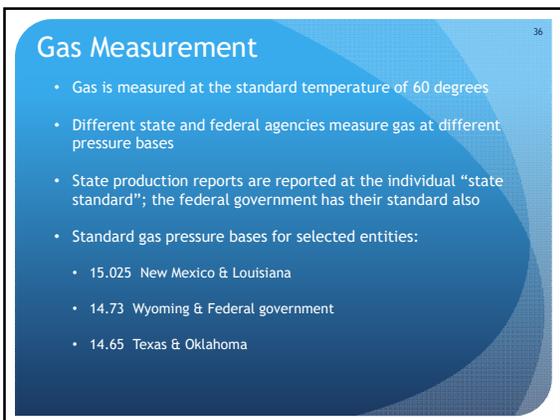
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### Gas Measurement

- To convert a gas volume from one pressure base to another, follow the formula:  

$$\text{Vol @ original PB} \times (\text{original PB} / \text{desired PB})$$
- To convert 10,000 mcfs @ 14.65 PB to 15.025 PB:  

$$10,000 \text{ mcf @ } 14.65 \times (14.65 / 15.025) = 10,000 \times .975 = 9,750 \text{ mcf}$$
- Boyle's Law - when temperature is constant, pressure and volume have an inverse relationship

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### Gas Measurement

- The heating content of gas is measured in British Thermal Units (BTU)
- One BTU is the energy needed to raise the temperature of one pound of water by one degree at one atmosphere (sea level)
- BTU content is determined by a lab analysis of a gas sample which determines the BTU per standard cubic foot (SCF)
- So, 1020 BTU gas would contain 1,020 BTUs per SCF at a certain pressure base
- And, one MCF of gas having a BTU of 1020 per SCF would have 1,020,000 BTUs or 1,020 MBTUs or 1.020 MMBTUs

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### Gas Measurement

- Total BTUs at one PB is the same as total BTUs at another PB
- So, 1 SCF of gas @ 14.65 PB having 1020 BTUs is the same as .995 SCF having 1020 BTUs @ 14.73 PB
- You have the same number of molecules at one PB (14.65) as you do the other PB (14.73), they are just squeezed tighter
- What that means for Revenue Accountants, is that the total value of a volume of gas at one PB must always equal the total value of that same volume of gas at another PB
- Most gas prices today are expressed as \$/MMBTU; under NGPA pricing in the 1980s, those prices were deemed to be at 14.73 PB

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**Gas Measurement** 40

- Example :  
MCF & BTU at 14.65 PB  
 $1.02 \text{ MMBTU} \times 10,000 \text{ MCF} \times \$2.00 / \text{MMBTU} = \underline{\$20,400}$
- If you increase the PB to 14.73  
Volume decreases =  $14.65 / 14.73 = .994569$   
 $.994569 \times 10,000 \text{ MCF} = 9,946 \text{ MCF}$   
  
BTU increases =  $14.73 / 14.54 = 1.005461$   
 $1.02 \text{ MMBTU} \times 1.005461 = 1.02557 \text{ MMBTU}$
- Check  
 $1.02557 \text{ MMBTU} \times 9,946 \text{ MCF} \times \$2.00 \text{ MMBTU} = \underline{\$20,400}$

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**Gas Measurement** 41

- Water vapor in the gas dilutes the BTU content of the gas
- Most gas contracts require that gas be limited to 7 pounds of water vapor or less per MCF
- Dry gas refers to gas with zero water vapor while saturated or wet refers to gas with water vapor
- Most gas volume statements now reflect BTUs or MCFs on a dry basis
- Water vapor is usually taken out at the wellhead by a gas glycol unit

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### Gas Measurement

- Conversion of wet to dry and dry to wet BTUs formulas:  
Wet to Dry Factor =  $PB / (PB - \text{Vapor Pressure of Water})$   
Dry to Wet Factor =  $(PB - \text{Vapor Pressure of Water}) / PB$
- Example: Assume 1,120 BTU/SCF wet @ 14.73 PB to dry  
 $1120 \times 14.73 / (14.73 - 0.2563) = 1120 \times 1.0177 = 1140 \text{ BTU/SCF}$
- Example: Assume 1,140 BTU/SCF dry @ 14.73 PB to wet  
 $1140 \times (14.73 - 0.2563) / 14.73 = 1140 \times 0.9826 = 1120 \text{ BTU/SCF}$

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### Gas Quality

- Natural gas produced in the field may have any number of contaminants that must be removed before the gas is sold
- Besides water vapor, nitrogen and carbon dioxide are inert gases found in some natural gas
- Hydrogen sulfide and helium may also be found in natural gas
- Other hydrocarbons such as natural gas liquids are also found in natural gas and will be discussed later

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### Production Reporting

- Most oil and gas producing states require some form of either production or sales volume reporting
- See the Oil Production Reporting Module 3 slides as several of the listed reports also cover gas
- Be sure and report gas volumes at the appropriate state standard pressure base
- Most state and federal agencies insist on electronic reporting for certain size companies
- Most agencies require operators to report 100% of volumes produced or sold even if there are TIK owners

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## Producer and Pipeline Imbalances

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## Basic Producer Imbalances

- AKA - Well imbalances
- Allocated deliveries > WI entitled volume = over-produced volume
- AKA - overbalanced, over delivered, over sold
- Allocated deliveries < WI entitled volume = under-produced volume
- AKA - underbalanced, under delivered, under sold
- In accounting terms - one is a credit, the other a debit

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## Producer Imbalances - Causes

- A TIK working interest owner markets his own gas
- A split connection at the sales point - two pipeline connections
- Gas volumes cannot be split exactly by WI on wells with split connections
- An owner with TIK gas loses his market
- In rare cases - operator suspends owner's gas due to delinquent payment of his share of operating expenses

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### Gas Accounting Methods

- Two methods of accounting for gas sales where gas balancing exist:
  - Sales Method - record revenue based on volume of gas sold at current sales price
  - Entitlement Method - record only your net revenue interest (NRI) of total gas sold at current sales price
- Sev taxes usually paid on sold volume and value
- Royalty payment methodology requires analysis depending on who they are

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### Gas Accounting - Sales Method

- Sales method - record revenue on volume and value of gas sold
- Sev taxes usually paid on volume and value sold
- If overdelivered - you record sales revenue until your share of remaining reserves are depleted
- If underdelivered - make sure reserves are adequate to make up your under delivery

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### Gas Accounting - Entitlement Method

- Entitlement method - record revenue on your NRI of gross volume sold at current price
- Difference between entitled volume and sold volume recorded as asset or liability
- During makeup - asset or liability reduced at weighted average price in the account
- Again - sev taxes usually paid on volume and value sold

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### Royalties Where Gas Balancing Exists

- Regardless of your accounting method - review lease provisions or consult with Legal to make sure royalties paid correctly
- State and Federal agencies have their own rules and regulations for how you are to pay their royalties
- Rule of thumb - check with your TIK working interest owners to make sure royalties paid correctly by all
- You do not want an audit or lawsuit to determine your accounting practice for paying royalties - that usually means penalties and / or interest assessments

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### Operator Gas Balancing Statement

- Working Interest Owner
- Working Interest Percent
- Volume Produced
- Entitled Volume
- Allocated or Sales Volume
- Over / (Under) Production
- Current Month Imbalance
- Cumulative Imbalance

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### Example of Gas Balancing Statement

**Producer/Producer Gas Imbalance Statement**  
**For the Month of:** \_\_\_\_\_ (1)

Operator (Preparer) Name: (2) \_\_\_\_\_ Name of Preparer: (8) \_\_\_\_\_  
 Facility Name: (3) \_\_\_\_\_ Phone or email: (9) \_\_\_\_\_  
 Facility Indicator: (4) \_\_\_\_\_ Balancing Units (MCF/MMBTU): (10) \_\_\_\_\_  
 Reservoir Name: (5) \_\_\_\_\_ Pressure Base: (11) \_\_\_\_\_  
 Location: (6) \_\_\_\_\_ Wet/Dry Basis: (12) \_\_\_\_\_

Date Prepared: (7) \_\_\_\_\_

(13) Transporter	(14) Operator/ Owner	(15) W/I	(16) Current Month Entitlement	(17) Production Deliveries	(18) Estimate /Actual	(19) Current Month Imbalance	(20) Cumulative Imbalance
<b>Total All Deliveries (21)</b>							

Note: Negative indicates that the imbalance is due (owed) to the Operator/producer.

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### Producer Imbalance Settlement

- Exhibit E is usually the Gas Balancing Agreement (GBA) to the Joint Operating Agreement (JOA)
- The GBA should detail every party's rights when a makeup of an under-delivery commences.
- The GBA should also address when reserves are depleted and imbalances still exist.
- Settlement options or procedures should be enumerated in the GBA

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### Settlement factors to consider

- Settle in cash or volume
- Exchange Agreements
- Offset gas imbalances
- Negotiate a value
- Carried Interest owners
- Record retention



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### Pipeline Imbalances

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### Transporter Allocations

- Pro-rate share based on confirmed noms
- Swing
- Entitlements



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### Transporter Allocation Based on Pro-Rata Share of Confirmed Noms

- Each producer/shipper confirmed nom volume divided by the total confirmed nominations = pro-rata share
- Multiply pro-rata share times the total delivered volume

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### Transporter Allocation Based on a Swing Volume

- Difference in confirmed noms and delivered volume = "the swing volume"
- "Swing" stays with the pipeline ("suspense") or a designated entity(s)

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### Transporter Allocation Based on Entitlements

- Producer/shipper entitlement ownership



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### Transporter Imbalance Issues

- Actual Production Volume
- Confirmed Nomination
- Pipeline/Transporter Delivered Volume
- Confirmed Volumes reported as Delivered Volumes on the Gas Balancing Statement
- Entitled volumes delivered are not the actual entitled volumes produced

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### Producer or Pipeline Imbalance??

- Do not be confused by the two types of imbalances
- They may both occur on the same well
- Make sure you understand your numbers, where they come from, and above all - TRACK YOUR GAS
- Confusion from either may lead to PPAs or adjustments later on so stay on top of them monthly
- Above all - ask questions!

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### Producer & Pipeline Imbalance Case

	Noms	Well Act	P/L Alloc	O / U
Co B	350	400	350	(50)
Co A + C	650	500	600	100

Co B  
TIK

Co A + C

Total Prod 900

	Entitled Vol	Actual Volume	O / U
Co A + C	585	500	(85)
Co B	315	400	85

Company	Percentage
Co A	50%
Co B	35%
Co C	15%

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## Private, State and Federal Royalties

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### Private Royalty

- Private royalty payments are perhaps the single most important payment an oil and gas company makes
- Without the mineral owner's lease - no drilling or development of the minerals in place would occur
- The lease therefore is the document that governs the duties and obligations of both the lessee and lessor
- The legal rights of each party to the lease are governed by the lease language

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### Private Royalty

- There are certain parts of the lease that revenue accountants should be made aware of by the Land Dept - such as:
  - Royalty payment dates on first and subsequent production
  - Royalty decimals if applicable
  - Royalty valuation basis
  - Royalty marketing deduction prohibitions if any
  - Right to royalty TIK
  - Right to audit

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### State Royalties

- Lands owned in trust by a state can be leased out for oil and gas development
- Unlike private royalty owners, the state usually has their own lease form that is given any potential operator
- Royalty rates vary by lease by area
- States typically have their own forms that operators fill out to report and remit their royalty payments

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### State Royalties

- Some states may also request supporting documentation to verify their royalty received
- Most state royalty agencies audit their royalty payments every 3 - 4 years - depending on that states statute of limitations
- States have the right and authority under most leases to look at and review any and all documentation the operator may have that may be pertinent to the conduct of their audit
- Companies with oil and gas marketing affiliates should be extra careful to be sure state royalties are paid correctly under their lease

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### Federal Royalties

- Federal royalties for oil and gas are administered by the Office of Natural Resource Revenue (ONRR), formerly called the Minerals Management Service (MMS)
- The exception is that royalties for federal helium are paid to the Bureau of Land Management (BLM) in Amarillo, TX
- After income taxes, oil and gas royalties are the second largest income stream for the federal government
- Like state and private royalties, the lease is the document that governs the duties and obligations of each party

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### Federal Royalties

- The ONRR has extensive regulations covering the calculation and remittance of their oil and gas royalties
- The ONRR currently has an aggressive audit program of producers, particularly on processed gas
- The ONRR is also responsible for the administration of royalties for Indian tribes who receive royalties on their lands
- In addition to royalty reporting, the ONRR has production reporting requirements on their properties

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### State Royalties

Louisiana	Office of Mineral Resources	Royalties	Monthly	25 <sup>th</sup> of month; 1 mo lag on oil, 2 mo lag on gas
Montana	State of Montana	Royalties	Monthly	1 <sup>st</sup> of month; 2 mo lag on oil, 3 mo lag on gas
Montana	Montana Dept of Revenue	Withholding	Quarterly	30 <sup>th</sup> of month after end of qtr
North Dakota	North Dakota State Land Dept	Royalties	Monthly	25 <sup>th</sup> of month; 1 mo lag on oil, 2 mo lag on gas
North Dakota	North Dakota Office of State Tax Comm.	Withholding	Quarterly	30 <sup>th</sup> of month after end of qtr
Wyoming	WYO Office of State Land & Investment	Royalties	Monthly	25 <sup>th</sup> of month; 1 mo lag on oil, 2 mo lag on gas

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### State Royalties

Texas	UT System	Royalties	Monthly	25 <sup>th</sup> of month; 1 mo lag on oil, 2 mo lag on gas
Texas	General Land Office	Royalties	Monthly	1 <sup>st</sup> of month; 2 mo lag on oil, 3 mo lag on gas
Oklahoma	Commissioner of the Land	Royalties	Monthly	End of 3 <sup>rd</sup> month
New Mexico	N. M. State Land Office	Royalties	Monthly	25 <sup>th</sup> of the 2 <sup>nd</sup> Month

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### Federal Royalties

- ONRR – Office of Natural Resources Revenue (MMS)**  
 Federal agency responsible for collecting, auditing, and disbursing revenues associated with mineral leases on federal and American Indian lands on a monthly basis from royalties, rents, and bonuses collected.
- Operators are responsible for paying the ONRR royalties on production from Federal leases
  - A Form 2014 and payment is submitted by the last day of the month following the month the product was sold.
  - For large companies with many federal properties the report is submitted electronically.
- BLM – Bureau of Land Management**  
 Royalties on helium sales




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## Thank You For Your Attendance

### Questions?

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