



RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

OIL AND GAS DOCKET NO. 7C-0299305

THE APPLICATION OF APACHE CORPORATION, BROAD OAK ENERGY II, LLC, DEVON ENERGY PRODUCTION COMPANY, L.P. AND FORELAND OPERATING, LLC FOR UNLIMITED NET GAS OIL RATIO AUTHORITY AND CANCELLATION OF OVERPRODUCTION FOR THE LIN (WOLFCAMP) FIELD, IRION COUNTY, TEXAS

HEARD BY: Paul Dubois – Technical Examiner
Ryan Lammert – Administrative Law Judge

REPORT PREPARED BY: Karl Caldwell – Technical Examiner
Ryan Lammert – Administrative Law Judge

HEARING DATE: April 27, 2016
CONFERENCE DATE: August 1, 2017

APPEARANCES:

REPRESENTING:

APPLICANTS:

Sandra Buch

Apache Corporation, Broad Oak Energy II, LLC, Devon Energy Production Company, L.P. and Foreland Operating, LLC

Gregory Allen Hicks
Greg Wilkes
Randy Mendenhall
Jeff Hughes

Apache Corporation
Broad Oak Energy II, LLC
Devon Energy
Foreland Operating, LLC

EXAMINERS' REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Apache Corporation, Broad Oak Energy II, LLC, Devon Energy Production Company, L.P. and Foreland Operating, LLC (collectively, the "Applicants"), request unlimited net gas-oil ratio authority and the cancellation of all overproduction for the Lin (Wolfcamp) Field in Irion County, Texas. Notice of the application was provided to all

operators in the field. The application is unopposed, and the Technical Examiner and Administrative Law Judge (collectively "Examiners") recommend approval of the application.

DISCUSSION OF THE EVIDENCE

The Lin (Wolfcamp) Field was discovered on October 8, 1984 at a depth of 6,580 feet. The current oil allowable in the field is 111 BOPD, with a gas-oil ratio (GOR) of 2,000:1. As of January 2016, the well count in the Lin (Wolfcamp) Field is 1,168 wells.

The correlative interval for the Lin (Wolfcamp) Field is defined as the top of the Wolfcamp Formation to the top of the Strawn Formation. The entire correlative interval is from 6,255 feet to 8,720 feet as shown on the well log for API No. 42-235-35352. The Wolfcamp Formation is approximately 2,500 feet in thickness and requires multiple laterals to drain. In the Barnhart area of the Lin (Wolfcamp) Field, the Upper Wolfcamp is at an average depth of 6,462 feet, the net pay is 211 feet, with an initial reservoir temperature of 150 degrees, oil gravity of 46.1 API, gas specific gravity of 0.7929, and an initial solution GOR of 872 scf/STB. The middle Wolfcamp is at an average depth of 6,853 feet, with a net pay thickness of 209 feet, with an initial reservoir temperature of 163 degrees, oil gravity of 40.7 API, gas specific gravity of 0.82, and an initial solution GOR of 760 scf/STB.

The major phase of fluid in the field is oil, and the primary drive mechanism is solution gas drive. The initial GOR of wells completed in the field is approximately 700 to 800 scf/STB. The current field GOR for all wells is approximately 7,000 scf/STB, and the cumulative GOR of all wells in the field is approximately 4,600 scf/STB. A typical, or generic, Wolfcamp type curve shows wells initially produce at a rate of approximately 500 BOPD with an initial GOR of 900 scf/STB. The GOR of a generic Wolfcamp well rapidly increases within the first two months of production to above 2,000:1, and after a year and a half the GOR increases to 20,000:1. The GOR increases as a result of reservoir pressure decreasing and gas evolving from solution. In addition, offset wells in the Lin (Wolfcamp) Field are also lowering reservoir pressure, resulting in higher GORs. Production is influenced by the ability to connect channels and pockets within the reservoir, and there is a greater possibility of connecting pockets with horizontal wells as compared to vertical wells. However, vertical wells in the field have had some impact on GOR.

Apache has received overproduction letters from the Commission for several leases with wells completed in the Lin (Wolfcamp) Field. In addition to the requested unlimited net GOR for the Lin (Wolfcamp) Field, the Applicants are requesting cancellation of all overproduction in the field.

Step rate tests were performed on several wells to determine what happens to the wells when the wells are choked back. Test results show that as wells were choked back, the GOR of the wells either stayed the same or increased, and the wells could not produce

at a GOR of 2,000:1. Step rate tests conducted on several wells show that when you try to choke the wells back the GOR increases, sometimes to over 50,000 to 60,000 GOR. On younger wells when you try to choke the well back the well tends to load up and die.

Unlimited net gas-oil ratio authority was granted for the Garden City, S. (Wolfcamp) Field, in Oil and Gas Docket No. 08-0287087. The GOR in the Garden City, S. (Wolfcamp) Field was found to be a result of the volume of matrix contacted by fracture stimulation and the GOR was not expected to influence production. Greg Hicks, Apache's Senior Production Advisor believes this occurrence is also applicable to the Lin (Wolfcamp) Field. The goal is to connect the pockets of fracture systems in the reservoir. If operators are required to try to lower the GOR of wells in the fields it will load the wells up. An unlimited net GOR will not harm ultimate recovery. The oil reservoir is a solution gas drive reservoir, and a higher GOR is needed as wells are produced and gas comes out of solution as the reservoir pressure drops.

In Oil and Gas Docket No. 7C-0296494 several wells were granted increased net GOR authority in the Lin (Wolfcamp) field. A finding of fact in that case was that producing the wells with an increased gas limit would not reduce the ultimate recovery of oil and gas from the Lin (Wolfcamp) Field.

FINDINGS OF FACT

1. Notice of this hearing was provided to all operators in the field at least ten (10) days prior to the date of the hearing and no protests were received.
2. Apache Corporation, Broad Oak Energy II, LLC, Devon Energy Production Company, L.P. and Foreland Operating, LLC request unlimited net gas-oil ratio authority and the cancellation of all overproduction for the Lin (Wolfcamp) Field in Irion County, Texas.
3. The Lin (Wolfcamp) Field was discovered on October 8, 1984 at a depth of 6,580 feet. The current oil allowable in the field is 111 BOPD, with a gas-oil ratio (GOR) of 2,000:1.
4. The correlative interval for the Lin (Wolfcamp) Field is defined as the top of the Wolfcamp Formation to the top of the Strawn Formation.
5. Oil is the the major phase of fluid in the Lin (Wolfcamp) Field.
 - a. The primary drive mechanism is solution gas drive.
 - b. The initial GOR of wells completed in the field is approximately 700 to 800 scf/STB.
 - c. The current field GOR for all wells is approximately 7,000 scf/STB.

- d. The cumulative GOR of all wells in the field is approximately 4,600 scf/STB.
 - e. A generic Wolfcamp type curve shows wells initially produce at a rate of approximately 500 BOPD with an initial GOR of 900 scf/STB.
 - f. The GOR of a generic Wolfcamp well rapidly increases within the first two months of production to above 2,000:1, and after a year and a half the GOR increases to 20,000:1.
 - g. The GOR increases as a result of reservoir pressure decreasing and gas evolving from solution.
 - h. In addition, offset wells in the Lin (Wolfcamp) Field are also lowering reservoir pressure, resulting in higher GORs.
 - i. Production is influenced by the ability to connect channels and pockets within the reservoir, and there is a greater possibility of connecting pockets with horizontal wells as compared to vertical wells.
 - j. Vertical wells in the field have had some impact on GOR due to pressure depletion.
6. Apache has received overproduction letters from the Commission for several leases with well completed in the Lin (Wolfcamp) Field.
7. Apache Corporation, Broad Oak Energy II, LLC, Devon Energy Production Company, L.P. and Foreland Operating, LLC are requesting cancellation of all overproduction in the field.
8. Step rate tests were performed on several wells.
- a. As wells were choked back, the GOR of the wells either stayed the same or increased.
 - b. The wells could not produce at a GOR of 2,000:1.
 - c. Choking back the wells resulted in an increase in GOR, sometimes to a GOR of 50,000 to 60,000:1.
 - d. When choking back younger wells, the wells tend to load up and die.

9. In Oil and Gas Docket No. 7C-0296494 several wells were granted increased net GOR authority in the Lin (Wolfcamp) Field where it was determined that producing the wells with an increased gas limit would not reduce the ultimate recovery of oil and gas.

CONCLUSIONS OF LAW

1. Proper notice was issued as required by all applicable statutes and regulatory codes.
2. All things have occurred and been accomplished to give the Commission jurisdiction in this matter.
3. Approval of unlimited net gas-oil ratio authority and the cancellation of all overproduction for the Lin (Wolfcamp) Field will not cause waste and will not harm correlative rights.

EXAMINERS' RECOMMENDATION

Based on the above findings of fact and conclusions of law, the Examiners recommend approval of an unlimited net gas-oil ratio in the Lin (Wolfcamp) Field, Irion County, Texas, and cancellation of all overproduction in the field.

Respectfully submitted,



Karl Caldwell
Technical Examiner



Ryan Lammert
Administrative Law Judge