RAILROAD COMMISSION OF TEXAS
HEARINGS DIVISION

OIL AND GAS DOCKET NO. 08-0303533

THE APPLICATION OF ZARVONA ENERGY LLC TO ADOPT SPECIAL FIELD RULES FOR THE EMMA (MISSISSIPPIAN) FIELD, ANDREWS COUNTY, TEXAS

HEARD BY: Karl Caldwell – Technical Examiner
Clayton Hoover – Administrative Law Judge

HEARING DATE: April 7, 2017
CONFERENCE DATE: June 6, 2017

APPEARANCES: **REPRESENTING:**

APPLICANT: Zarvona Energy LLC

Mickey Olmstead
Matt Jurgens

EXAMINERS' REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Zarvona Energy LLC ("Zarvona") requests to adopt permanent field rules for the Emma (Mississippian) Field, Andrews County, Texas. The Emma (Mississippian) Field was discovered in 1958 and is currently under Statewide rules. Zarvona proposes the following field rules:

1) Designate the correlative interval as 10,430 to 11,068 feet as shown on the Three Rivers Operating Company II, LLC University 30 Cobra No. 3033 Well (API No. 42-003-46646) Spectral Density Dual Spaced Neutron Spectral Gamma Ray Microlog, Andrews County, Texas as a single reservoir for proration purposes, designated as the the Emma (Mississippian) Field.

2) Adopt a well spacing rule of 330-foot lease line spacing and zero between well spacing. In addition, adopt spacing rules for horizontal wells, including a take point rule of 100 feet for first and last take point.

3) Maintain the current density of 40-acre oil units for vertical wells.

4) A maximum daily oil allowable for horizontal wells according to Statewide Rule 86(d)(5), and unlimited net gas-oil ratio authority for oil wells.

Zarvona is the only operator in the field and the application is unprotested. The Technical Examiner and Administrative Law Judge (collectively, "Examiners") recommend approval of the application.

DISCUSSION OF THE EVIDENCE

The Emma (Mississippian) Field was discovered on March 6, 1958 at a depth of 10,170 feet. The field has been under Statewide rules since its discovery. Zarvona is the only operator in the field at the current time, although there are some commingled wells in the vicinity operated by Elevation Resources. Zarvona has letters supporting the subject application from Elevation Resources and Saber Oil and Gas Ventures.

The April 1, 2017 oil proration schedule for the Emma (Mississippian) Field lists the Zarvona University 1-30 Unit, Well No. 1H as the only well in the field. This well was recently drilled and completed and is the first, true horizontal well in the field. There has been little development of the Mississippian interval in Andrews County, as only 22 wells have been completed since 1966. Cumulative production for Andrews County Mississippian-production, excluding the recently drilled University 1-30 Unit, Well No. 1H, is 454,927 BO and 8,995,897 Mcf gas. On average, Mississippian-production from wells completed in Andrews County produced 20,679 BO, 408, 904 Mcf gas with a GOR of 19,744:1, with a daily average for the first 12 months of production of 12 BO and 11 Mcf gas, with high GORs.

The base of the Emma (Mississippian) Field is currently the Woodford Shale Formation. Above the Woodford Shale is a clean carbonate, clean limestone, with low porosity at the bottom of the zone. Shale stringers are present higher in the carbonate section, and the carbonate section grades into a shale towards the top of the interval. The contact point between the carbonate section and shale section is the current top of the Emma (Mississippian) Field, referred to as the Mississippian top of the Emma (Mississippian) Field, as picked by Skelly Oil Company in 1956. Above this interval, are Mississippian-aged shales which Zarvona is targeting. Zarvona has dipole sonic data, hydraulic fracturing data, and tracer data indicating that the well completions extend downward to the Woodford Shale as the lower extent, to the shales above the carbonate section as the upper extent. The Mississippian-aged shale interval becomes more ductile towards the top of the interval, which acts as good frac barrier. Above this barrier is Atoka-aged rock.

Zarvona proposes to designate a correlative interval for the Emma (Mississippian) Field as the interval starting above the Woodford Shale as the base of the interval, to the top of the Mississippian-aged shales. Matt Jurgens is the vice president of operations for

Zarvona, overseeing all drilling, completions, and production operations. Mr. Jurgens believes that amending the Emma (Mississippian) Field interval is needed to protect correlative rights. With unconventional development, shales are now targeted intervals. As a result, Zarvona believes that the proposed correlative interval is necessary to protect correlative rights. Mr. Jurgens believes most of the high quality pay is in the shales, and data shows Zarvona's hydraulic fracture stimulations have created fractures from the Mississippian-aged shales above the carbonate section all the way down to the Woodford shale. Zarvona also believes some production comes from the carbonate interval in-between the Woodford Shale and upper shales. The proposed top of the Emma (Mississippian) Field does not overlap with any fields that Mr. Jurgens is aware. Above the top of the proposed correlative interval for the Emma (Mississippian) Field are the Fasken (Penn) and South Andrews (Bend) Fields. Mr. Jurgens did not find any other field in the nearby area that includes the Mississippian-aged shale intervals.

The Emma (Mississippian) Field has a GOR of 2,000:1. Zarvona is requesting an unlimited net GOR for the field. Andrews County Mississippian-production data, based on 22 wells, shows the GOR on average, to be 20,000:1, which excludes the recently completed University 1-30 Unit 1H. The GOR of the University 1-30 Unit 1H is expected to reach 6,000:1, which Mr. Jurgens considers to be typical of a solution gas reservoir.

In Mr. Jurgens' opinion, the University 1-30 Unit 1H is being produced fairly conservatively. Zarvona brought this well on-line at around 1,200 psi flowing tubing pressure, at 500 to 600 BOPD. Zarvona was limited on gas off-take, and to avoid flaring gas, Zarvona kept the well choked back. Otherwise, the well would have exceeded the 2,000:1 GOR Statewide rule. As the oil production rate has declined, gas has remained relatively constant. Zarvona has built infrastructure and will not need to flare gas if the proposed net GOR rule is adopted. However, Zarvona is concerned with GOR restrictions. In Mr. Jurgens' opinion, it will be difficult to produce wells and maximize production rates in the subject field without increasing the GOR limit above 2,000:1. Wells completed in the the Emma (Mississippian) Field have a higher solution GOR than the Statewide rule of 2,000:1 and there is a precedent for an increased, or unlimited net GOR for unconventional plays, as GOR in these unconventional plays does not affect recovery. Without an increase in GOR, production will be severely restricted.

The requested unlimited net GOR field rule has previously been adopted in several other fields. The Garden City, S. (Wolfcamp) Field in Glasscock County adopted an unlimited net GOR for wells in Oil and Gas Docket No. 08-0287087. The gas oil ratio in the Garden City, S. (Wolfcamp) Field was found to be a result of the volume of matrix contacted by fracture stimulation, and the gas-oil ratio is not expected to influence production in that field. A review of production data of all horizontal wells in the Garden City, S. (Wolfcamp) Field with production start dates in 2014, normalized at time zero and averaged over 24 months shows the average GOR for wells starts at approximately 2,000:1 and gradually increases, approaching a GOR of 7,000:1 at 24 months. A similar field rule has been adopted in Oil and Gas Docket No. 10-0269117 for the Pan Petro (Cleveland) Field, and in Oil and Gas Docket Nos. 02-0287458 and 02-0287862 for the De Witt (Eagle Ford) Shale Field.

Zarvona is also requesting lease line spacing of 330 feet, with zero between well spacing, and 100-foot lease line distance requirements from first and last take points for horizontal wells. The University 1-30 Unit 1H was completed with 210 feet between frac stages, and Zarvona did not see any evidence of interference between the stages. Therefore, Mr. Jurgens believes 100-foot first and last take point is appropriate as you are only draining what you frac. Mr. Jurgens believes the frac height growth is 600 feet, but the frac lengths are not very long.

Mr. Jurgens estimated the additional reserves added per section from the proposed lease line rule amendments from the current Statewide field rules based on the University 1-30 Unit 1H reserves. Mr. Jurgens estimated that adopting a 330-foot lease line rule as compared to the current 467-foot rule will enable Zarvona to drill an additional well per section, adding 1,435 MBOE. A 100-foot take point rule will add 734 feet of lateral length per well, and based on 7 wells per section, would add 1,490 MBOE per section. In total, the proposed field rules will recover an additional 2,925 MBOE per section that would otherwise be wasted.

Zarvona received a letter in support of the subject application from Elevation Resources, a company that is a partner in the University 1-30 Unit 1H well, and Elevation Resources is developing their own Emma (Mississippian) Field wells. Saber Oil and Gas Ventures operates offset acreage and also supports the subject application.

Zarvona agreed that, pursuant to the provisions of Texas Government Code §2001.144(a)(4)(A), this Final Order shall be effective on the date a Master Order relating to this Final Order is signed.

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. The Emma (Mississippian) Field was discovered on March 6, 1958 at a depth of 10,170 feet.

3. The Emma (Mississippian) Field is currently under Statewide rules.

4. The April 1, 2017 oil proration schedule lists Zarvona as the only operator in the field.

5. The April 1, 2017 oil proration schedule for the field lists the Zarvona University 1-30 Unit, Well No. 1H as the only well in the field. This well was recently drilled and completed and is the first, true horizontal well in the field.

6. Zarvona has letters in support of the application from Elevation Resources and Saber Oil and Gas Ventures.

7. Cumulative production for Mississippian production in Andrews County, excluding the University 1-30 Unit, Well No. 1H, is 454,927 BO and 8,995,897 Mcf gas. On average, wells produced 20,679 BO, 408, 904 Mcf gas with a GOR of 19,744:1, with a daily average for the first 12 months of production of 12 BO and 11 Mcf gas, with high GORs.

8. Zarvona proposes to designate a correlative interval for the field.

   a. The base of the Emma (Mississippian) Field is currently the Woodford Shale Formation.

   b. Above the Woodford Shale is a clean carbonate, clean limestone, with low porosity at the bottom of the zone.

   c. Shale stringers are present higher in the carbonate section, and the carbonate section grades into a shale higher in the interval.

      i. The contact point between the carbonate section and shale section is the current top of the Emma (Mississippian) Field, referred to as the Mississippian top of the Emma (Mississippian) Field, as picked by Skelly Oil Company in 1956. Above this interval, are Mississippian-aged shales which Zarvona is targeting.

      ii. Dipole sonic data, hydraulic fracturing data, and tracer data indicates that hydraulic fracture stimulations extend downward to the Woodford Shale and upward to the shales above the carbonate section in the Mississippian-aged rock.

      iii. The Mississippian-aged shale interval becomes more ductile towards the top of the interval, which acts as good frac barrier. Above this barrier is Atoka-aged rock.

   d. Zarvona proposes the correlative interval for the Emma (Mississippian) Field to be designated as the interval starting above the Woodford Shale, extending to the top of the Mississippian-aged shales.

   e. With unconventional development, shales are now targeted intervals.

   f. The proposed correlative interval for the field will protect correlative rights.

g. The proposed top of the Emma (Mississippian) Field does not appear to overlap with any fields in the area. Above the top of the proposed correlative interval for the Emma (Mississippian) Field are the Fasken (Penn) and South Andrews (Bend) Fields. Zarvona's vice president of operations did not find any other field in the nearby area that includes the Mississippian-aged shale intervals.

9. The GOR for the Emma (Mississippian) Field is 2,000:1.

10. Zarvona is requesting an unlimited net GOR for the field.

11. Andrews County Mississippian-production data, based on 22 wells, shows the GOR on average, to be 20,000:1. The GOR of the University 1-30 Unit 1H is expected to reach 6,000:1.

12. It will be difficult to produce wells and maximize production rates in the subject field without increasing the GOR limit above 2,000:1.

13. An unlimited net GOR field rule has previously been adopted in several other fields.

    a. The Garden City, S. (Wolfcamp) Field in Glasscock County adopted an unlimited net GOR for wells in Oil and Gas Docket No. 08-0287087. A review of production data of all horizontal wells in the Garden City, S. (Wolfcamp) Field with production start dates in 2014, normalized at time zero and averaged over 24 months shows the average GOR for wells starts at approximately 2,000:1 and gradually increases, approaching a GOR of 7,000:1 at 24 months.

    b. A similar rule has been adopted in Oil and Gas Docket No. 10-0269117 for the Pan Petro (Cleveland) Field, and in Oil and Gas Docket Nos. 02-0287458 and 02-0287862 for the De Witt (Eagle Ford) Shale Field.

14. Zarvona is requesting lease line spacing of 330 feet, with zero between well spacing, and 100-foot lease line distance requirements from first and last take points for horizontal wells.

    a. The University 1-30 Unit 1H was completed with 210 feet between frac stages.

    b. There is no evidence of interference between the frac stages.

15. Additional reserves will be added with the proposed lease line rule amendments.

a. Based on the University 1-30 Unit 1H reserves, it is estimated that adopting a 330-foot lease line rule as compared to the current 467 feet will enable Zarvona to drill an additional well per section, adding 1,435 MBOE.

b. A 100-foot take point rule will add 734 feet of lateral length per well, and based on 7 wells per section, would add 1,490 MBOE per section.

c. In total, the proposed field rules will recover an additional 2,925 MBOE per section that would otherwise be wasted

16. Zarvona agreed, that, pursuant to the provisions of Texas Government Code §2001.144(a)(4)(A), this Final Order shall be effective on the date a Master Order relating to this Final Order is signed.

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. Amending the field rules for the Emma (Mississippian) Field will prevent waste and protect correlative rights.

4. Pursuant to §2001.144(a)(4)(A), of the Texas Government Code, and the consent of the applicants, this Final Order is effective when a Master Order relating to this Final Order is signed on June 6, 2017.

EXAMINERS' RECOMMENDATION

Based on the above findings of fact and conclusions of law, the Examiners recommend that the Commission adopt permanent field rules for the Emma (Mississippian) Field, Andrews County, Texas.

Respectfully submitted,

Karl Caldwell
Technical Examiner

Clayton Hoover
Administrative Law Judge