

**BEFORE THE STATE CORPORATION COMMISSION  
OF THE STATE OF KANSAS**

BEFORE COMMISSIONERS: Pat Apple, Chair  
Jay Scott Emler, Commissioner  
Shari Feist Albrecht, Commissioner

In the Matter of the Application of Cross )	
Bar Energy, LLC for a Permit to Authorize )	Docket No. 17-CONS-3689-CUIC
the Injection of Saltwater Into the )	
Vigle VW-6 Well Located in Greenwood )	CONSERVATION DIVISION
County, Kansas, and an Amendment to the )	
Injection Permit to Change the Authorized )	License No. 33245
Injection Rate and Pressure. )	

**PREFILED DIRECT TESTIMONY**

**OF**

**THOMAS LARSON, P.E.**

1 Q. Please state your name, professional address and education background for the  
2 Commission.

3 A. Thomas Larson, my professional address is 562 West State Road 4, Olmitz, Kansas 67564.  
4 I hold a Bachelor of Science degree in Ceramic Engineering from the University of Illinois  
5 at Urbana-Champaign (1981), a Master of Business Administration degree from the same  
6 University (1982) and a Master of Science degree in Petroleum Engineering from the  
7 University of Oklahoma (1984).

8 Q. Please relate your work experience in the oil and gas industry.

9 A. Currently, I am president and the owner of Larson Engineering, Inc.

10 Q. How many years have you owned and operated Larson Engineering?

11 A. Larson Engineering was formed in 1986. Prior to that I was a Production Engineer for  
12 Standard Oil Company in Midland, TX and a Production Engineer for Energy Reserves  
13 Group in Oklahoma City, OK and Great Bend, KS.

14 Q. Please briefly describe your work experience in the oil and gas industry.

15 A. I have supervised the drilling, completion and workover of more than 600 wells as a  
16 Production Engineer and consultant. I have drilled more than 300 wells for my own  
17 exploration program. Larson Operating Company, a subsidiary of Larson Engineering,  
18 Inc., currently operates more than 135 leases. I have appraised leases for individuals and  
19 estates, FDIC, banks and Kansas District Courts. I have presented expert witness testimony  
20 in front of the Kansas Corporation Commission and Kansas District Courts. I have  
21 designed and am operating three waterfloods in Kansas. I am in the process of installing  
22 two more Kansas waterfloods. Also, I am a Registered Professional Engineer in the State  
23 of Kansas.

1 Q. Mr. Larson, are you familiar with the Application in this Docket by Cross Bar Energy,  
2 LLC?

3 A. Yes. I have reviewed the Application filed in this Docket for the Vigle VW-6 pressure  
4 maintenance well.

5 Q. Would you describe for the Commission the Vigle VW-6 and its intended operations if  
6 this Application is granted?

7 A. Yes. The Vigle VW-6 is located in the Southwest Quarter of Section 14, Township 23  
8 South, Range 10 East, Greenwood County, Kansas. The well was originally drilled in 1989  
9 to a depth of 2180 feet and completed as a Bartlesville Sandstone oil well, with perforations  
10 from 2097 to 2114 feet. The well ceased to produce economic volumes of oil and the  
11 Applicant, Cross Bar Energy, LLC, now wishes to convert the well to a pressure  
12 maintenance injection well with a maximum authorized injection pressure of 1,000 psi and  
13 a maximum authorized injection rate of 400 barrels of water per day.

14 Q. Mr. Larson, how does an injection well work and what is the benefit?

15 A. We use injection wells in waterfloods. Waterflooding of an oil field uses water injection  
16 to increase oil production rate and, ultimately, oil recovery from the field. The science of  
17 waterflooding dates back to the early 1900's. As we produce oil, reservoir pressure drops.  
18 We inject water into a wellbore to maintain reservoir pressure or repressure the reservoir.  
19 In the process, injected water pushes or "drives" oil towards producing oil wells. As a  
20 result, we can often double recoverable oil from an oil field. One other very important  
21 comment – we intentionally waterflood at pressures below the formation fracture pressure.  
22 That's the pressure where the rock fractures or breaks. Injecting at higher pressures defeats

1       our purpose. We want our injected water to stay in the oil bearing reservoir. If injected  
2       water leaves the reservoir, our waterflood is unsuccessful.

3   Q.    Mr. Larson, will any of the fluid injected be fresh water?

4   A.    No. As a matter of fact, there are no fresh water resources in the vicinity of this well.

5   Q.    What is the history of water injection in the area?

6   A.    The Vigle VW-6 is located in the Burkett Oil Field in northern Greenwood County. The  
7       Burkett Field, discovered in approximately 1922, produces from the Bartlesville Sandstone  
8       at a depth of about 2100 feet. The reservoir is a typical "shoe-string" sand bounded above  
9       and below by impermeable Pennsylvanian-age Cherokee Shale. The reservoir is a narrow  
10       sand body approximately 4 miles long and one mile wide, with an average thickness of  
11       approximately 30 feet. As of May of this year, the Burkett Field had produced 9,709,336  
12       barrels of oil, with current production of approximately 115 barrels oil per day. Most of  
13       the Burkett Field was unitized in 1939 and waterflooding commenced in the Bartlesville  
14       Sandstone formation between 1939 and 1942. Waterflooding, using injection wells similar  
15       to the proposed Vigle VW-6, has occurred continuously in the field ever since.

16   Q.    Mr. Larson, given the history of the Burkett Field and the amount of water injected in the  
17       Bartlesville formation to enhance production of oil, do you believe there is any relationship  
18       between injection of these fluids and earthquakes in Greenwood County?

19   A.    There has been injection in the Bartlesville formation in the Burkett Field for  
20       approximately 78 years, and to my knowledge, there have been no recorded earthquakes in  
21       Greenwood County in that time. I believe there is over 1,250 feet of distance between the  
22       Bartlesville Sandstone, the oil-bearing reservoir in the Burkett Field, and the basement  
23       rocks where earthquakes originate. In other words, there is no correlation between

1 injection of water to enhance production of oil in the Burkett Field and the causation of  
2 earthquakes.

3 Q. Mr. Larson, in your opinion, is the injection of water in the Vigle VW-6 well a safe and  
4 sound production practice in the Burkett Field?

5 A. Absolutely, yes. The history I have just recited and in my general experience with water  
6 flooding in Kansas makes economic and environmental sense to maximize production from  
7 this existing field. I believe that the introduction of pressure maintenance through wells  
8 such as the Vigle VW-6 prevents waste of economic and natural resources in this field and  
9 presents no danger.

10 Q. One more question, as a registered Professional Engineer and one experienced in designing  
11 and operating secondary recovery operations utilizing pressure maintenance wells like  
12 Vigle VW-6, what is your professional opinion with regard to the Application before this  
13 Commission?

14 A. I highly recommend that the Application be approved as submitted as I think it is a safe  
15 and prudent operating proposal.

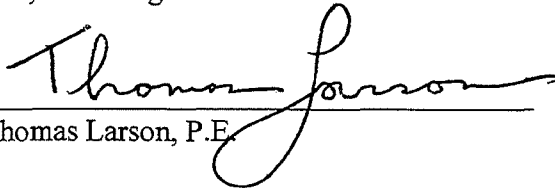
**PREFILED DIRECT TESTIMONY OF THOMAS LARSON**

**DOCKET NO. 17-CONS-3689-CUIC**

**VERIFICATION OF THOMAS LARSON**

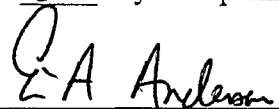
STATE OF KANSAS           )  
  ) ss:  
BARTON COUNTY            )

Thomas Larson, being first duly sworn, deposes and says that he is the Thomas Larson referred to in the foregoing document titled "Prefiled Direct Testimony of Thomas Larson" before the State Corporation Commission of the State of Kansas, that he is an officer of Larson Engineering, Inc., and that the statements therein were prepared by him or under his direction and are true and correct to the best of his information, knowledge and belief.

  
\_\_\_\_\_  
Thomas Larson, P.E.

SUBSCRIBED and SWORN to before me this 29<sup>th</sup> day of September, 2017.



  
\_\_\_\_\_  
Notary Public

My Appointment Expires: 12/21/20

## CERTIFICATE OF SERVICE

I hereby certify that on this 2nd day of October, 2017, the above **Prefiled Direct Testimony of Thomas Larson, P.E.** was electronically served on:

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