Escopeta Oil’s search for Cook Inlet’s ‘missing giants’

Independent shopping offshore Alaska prospects, using new seismic technology

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Petroleum News

The U.S. Department of Energy’s recently published report on Alaska Cook Inlet natural gas hypothesizes that there are missing giants — large oil and natural gas fields — that remain to be found in Cook Inlet. And U.S. Geological Survey scientists have theorized that only 4 percent of the oil which could have been generated by Cook Inlet basin source rocks has ever been identified.

Houston-based independent Escopeta Oil, one of the inlet’s largest state oil and gas leaseholders, thinks it has identified two of these missing giants in its Kitchen and East Kitchen prospects. Escopeta’s executives believe their two prospects contain substantial amounts of oil and gas and are looking for a partner so that Escopeta can bring in a jack-up rig.

Excerpts from DOE’s Cook Inlet basin gas study

The following information was taken from the executive summary of the U.S. Department of Energy’s South-Central Alaska Natural Gas Study, which was released in June.

Summary conclusions

The Cook Inlet basin is the source for all of the natural gas used in south-central Alaska. This gas supplies the residential and commercial demand for utility gas and electricity generation and two industrial facilities, Agrium’s fertilizer plant and the ConocoPhillips Marathon LNG plant, in Nikiski, Alaska on the Kenai Peninsula.

- The current remaining proven reserves represent about a 9-year supply at current demand rates.
- The estimated ultimate recovery for existing Cook Inlet gas fields is approximately 8.5 trillion cubic feet.
- Ninety-five percent of the gas was found before 1970 during exploration for structurally trapped oil.
- There was no gas-focused exploration until the late 1990s.
and drill an exploration well.

Escopeta President Danny Davis told Petroleum News in July that the company hopes to have partners in place in time to begin permitting this fall and bring a jack-up rig to the inlet next year to drill the prospects, which are offshore the Kenai Peninsula, north of Nikiski.

The Kitchen and East Kitchen prospects are in 70 feet of water close to the Kenai industrial complex. They represent 10 years of work by the company, including studies by geologists with Cook Inlet experience and, more recently, the reprocessing of seismic by Houston-based Apex Metalink Inc. with its proprietary technology.

**Prudhoe Bay happened**

How could there be missing giants in Cook Inlet, a hydrocarbon basin which has been in production for nearly 50 years? A basin which sits on the doorstep of Anchorage, the oil company capital of Alaska?

“There were always a few questions that were unanswered when we were doing work in the inlet, in relation to the fields,” said Bob Warthen, a consulting geologist working with Escopeta. Warthen has worked the inlet since 1967, first for Union Oil where he was a regional geologist for 26 years, and then as a consultant.

“And after Prudhoe Bay was discovered, the inlet became a stepchild, so the working scenarios in the inlet were strictly a development-type scenario — develop the existing properties. Consequently very little exploration work has been done,” he said.

Geologists were reassigned and transferred away from work in the inlet, first to “Prudhoe Bay; then you

The Cook Inlet basin lacks numerous medium to large gas fields when viewed from the geologic expectation of a lognormal distribution of field size and reserves. A total Cook Inlet gas resource endowment of 25 to 30 trillion cubic feet original-gas-in-place is postulated.

- The potential exists for an additional 13 to 17 tcf of conventionally recoverable gas in the Cook Inlet basin in addition to the 8.5 tcf recoverable gas already discovered.

- These resources are expected to be largely biogenic gas in stratigraphic or combination traps.

- No exploration has yet occurred for stratigraphic accumulations.

Proven reserves in known fields are forecast to meet demand until 2012 for the base case, which assumes the Agrium fertilizer plant shuts down in 2005 as a result of lack of sufficient quantities of low-cost gas and that LNG export ends when the current contract and export license expires in the first quarter of 2009.

A shortage will occur by 2009 unless new reserves are found and developed, or industrial use is curtailed. Large seasonal swings in demand and very limited gas storage could lead to seasonal shortages before 2009.

New gas is being discovered and developed as a result of the stimulus being provided by higher prices and market demand.

- Reserves growth is expected to occur in response to an increase in real prices. A recent contract has indexed prices to a 36-month average of Lower 48 reference prices (Henry Hub).

See DOE’s report on web site http://www.cookinletoilandgas.org/
had restructuring; then you had downsizing; then you had the oil problems in '85 and '86 — the oil price collapse; then more restructuring; then you had company mergers," Warthen said.

“And all of this translated to people: people were transferred out; they were furloughed; some of them migrated to other professions — they weren’t coming back; some of them died. We’ve lost some significant talent in the inlet just because they passed away … Bob Levine … Charlie Selman. … I’m probably one of the few guys left working the inlet that started in the early days. There’s very few of us remaining and actively exploring,” he said.

**Developing prospects**

After Warthen took an early retirement from Unocal in 1992, he began working all the available data on the inlet, including well information and seismic, and looked at rocks, trying “to get a better understanding of the intricacies of the formations.”

And he developed a basin map, “let’s just call it an idea map, or as Danny (Davis) calls it, our ‘play book’,” he said.

That idea map, in different iterations, identified acreage acquired by Escopeta, which began looking for opportunities in Alaska in 1993 and bought its first leases in the state in 1994. The company now owns some 128,000 acres of state oil and gas leases in the Cook Inlet basin (see map on page 9).

An early prospect that Escopeta was involved in, and subsequently sold, was at Cape Starichkof, where ConocoPhillips Alaska drilled the Hansen wells at the Cosmopolitan unit.
Because Escopeta has worked on a number of prospects in the inlet, it took several years to do the work and assemble the leases for Kitchen and East Kitchen. “We basically had other things that required our attention in the inlet rather than some of the ideas that I had,” said Warthen.

**Reevaluating Cook Inlet**

The work Warthen originated on the inlet was focused on the petroleum system and potential untested habitats and traps for hydrocarbons. In addition to Warthen, geologists Walter Wells and Frank Banar, retired from Mobil, contributed to Escopeta’s “idea map,” hiring on as consultants for Escopeta.

“Reservoir rocks are not a problem in Cook Inlet: every horizon has reservoir rocks with varying porosities and permeabilities that are basically reasonable,” Warthen said. “Trapping was not really a problem either,” since available seismic provides “a decent understanding of the style of traps and accumulation mechanisms.”

Walter Wells did a search for everything written on the petroleum systems in the inlet, Warthen said. “When we started looking at the three things that you need for a prospect — the trap, the reservoir and the charge — we started really focusing on the petroleum system, on the migration path, the generating area, and we looked at a lot of the seminal USGS reports from some of the real experts in that field, and even interviewed some of them.”

The theory on migration of oil, Warthen said, is that the migrating oil finds a path, and then travels along that path, not deviating from it.

“When it leaves the source area, it migrates up dip and fills the deepest
traps first," he said. “As these are filled the oil continues to migrate up dip filling the shallowest traps in turn.”

**Only 4% of oil identified**

U.S. Geological Survey geologists have theorized that only 4 percent of the volume of oil that theoretically generated from Cook Inlet source rock has ever been identified.

Some of the oil could have leaked out of the basin, Warthen said. And there has been a theory that the basin tilted and the oil remigrated. If the basin tilted, he said, some traps would be pretty well filled and others are going to be only 15-20 percent filled.

But the known traps are filled between 58 and 65 percent, except Middle Ground Shoal, which Warthen said was filled 80 to 85 percent.

The Escopeta acreage position at Kitchen and East Kitchen is “just to the east of Middle Ground Shoal and situated directly overlying the Tertiary/Mesozoic depocenter and we believe the early oil is migrating in an east-west direction,” Warthen said.

Because of the known migration path of oil in the inlet, it is believed that oil migrated into the Kitchen prospect traps, filled those, and subsequently migrated on to Middle Ground Shoal and then into other fields, and “that’s the reason why Middle Ground Shoal is about 80 to 85 percent filled and the rest of these (farther along the migration path) are less (filled),” Warthen said. “We believe that these prospects are among the ‘missing giants’ postulated by the U.S. Department of Energy,” he said.

Warthen said the Kitchen prospect got its name “because we kept referring to this area here as the area where the oil was ‘cooked’, i.e. being the
Reprocessing and remapping

Escopeta has not shot any proprietary seismic, but it has purchased existing seismic from a number of companies and used those lines to delineate the area, to look at the prospect from "a structural standpoint," Warthen said.

Escopeta has had the seismic lines it acquired reprocessed and based on that reprocessing it has remapped the Kitchen complex area.

The southern part of the prospect that contains East Kitchen has never been identified, Davis said, "and this feature extends another eight miles beyond the original tested anticline." The South Cook Inlet anticline has been remapped and is now "about 15 to 16 miles long and about three to four miles wide," he said. The Shell SRS No. 1 well on the northern flanks tested 360 barrels of oil per day from a lower Tyonek sand, he said, however other prospective pays were never tested due to collapsed casing.

"The southern half of the anticline is what we’re calling our East Kitchen prospect, and it has never been drilled. In effect, it is a major anticline with demonstrated hydrocarbons that have not been adequately tested,” Davis said.

“We took 1980’s seismic data and applied some new techniques to it: reprocessing, petrophysical studies on the rocks, sophisticated log analysis on the logs ... gravity magnetic data, to back up our regional studies,” Warthen said.

So what do the combined studies indicate to Escopeta about potential Kitchen and East Kitchen reserves?

Escopeta consultants estimate potential reserves at East Kitchen as
2.33 trillion cubic feet of gas and 457 million barrels of oil, Davis said. For Kitchen the numbers are 3.95 tcf of gas and 829 million barrels of oil.

**A new processing technique**

One very important thing Escopeta did, said Frank Banar, was to have the data reprocessed using a process called wavelet energy absorption, which has been used in Asia, West Africa and Siberia. In China, he said, the process was used in basins which have both coal and gas, and where the gas needed to be identified on the seismic.

Because Cook Inlet has both coal and gas, the process seemed appropriate, “and so we were the first ones to do that here in Alaska,” Banar said. In addition to the seismic processing for gas, Apex Metalink also have a process for fluids identification.

The wavelet energy absorption processing “showed some significant gas reserves on the Kitchen and East Kitchen structures, especially in the Tertiary section, where abundant coal beds have generated major dry gas reserves,” Banar said.

Current Cook Inlet production is from Tertiary formations: dry gas from Sterling, Beluga, and upper Tyonek; oil from the lower Tyonek and Hemlock. There is no production from the older Cretaceous and Jurassic in the upper Cook Inlet basin, although surface oil seeps are known from the Jurassic Tuxedni formation. The Tuxedni, said Warthen, has been identified by the USGS as the source rock for all of the oil present in the Hemlock.

Davis said potential deep gas below the Tertiary is a separate prospect. The objectives at Kitchen and East Kitchen are the major producing Cook Inlet formations, the Sterling, Beluga,
Tyonek and Hemlock. Escopeta does not attribute any reserves to pre-Tertiary, he said, but considers them a very viable future target based upon present seismic interpretations.

**Big structure south of old well**

One of the things the Department of Energy report notes, said Davis, is that the inlet has been explored for structural traps but not for stratigraphic traps. “There was no concentrated exploration for stratigraphic-type plays or potential below where they’ve found everything in the Hemlock (formation).” East Kitchen is a structural trap, he said, while Kitchen is a faulted stratigraphic trap first proposed by the USGS.

Looking at seismic, Davis said, just a few miles south of the Shell No. 2 SRS, “we had a large anticlinal structure there, and we couldn’t figure out why it hadn’t been drilled.” One interesting thing about Kitchen, he said, is that seismically it looks very much like the Beluga River field.

Escopeta had Core Lab of Houston do a petrophysical analysis of the Shell South Cook Inlet No. 2 well, one and a half miles north of Escopeta’s East Kitchen location. This well was drilled in 1965, had numerous oil and gas shows and casing was set, however the well was suspended and never tested in 1965, Escopeta said. No core data was available from the well, but Core Lab said core was available from the North Cook Inlet Unit No. B-01 well, and a “porosity permeability relationship was derived and the model applied” to the Shell No. 2 well. The lab said “results indicate that the South Cook Inlet No. 2 well appears to indicate some hydrocarbon potential,” and estimated 252 feet of gas pay and 303 feet of oil pay which was bypassed.
First partners, then a jackup

At one time, Davis said, Forest, ConocoPhillips, Prodigy and Escopeta were interested in working together to bring a jackup rig into the inlet. Collectively, “we had nine wells identified to be drilled with the jackup rig, unfortunately we were not able to move forward together.”

Escopeta doesn’t have any three-dimensional seismic, but Davis said that at this point, he wants to put money into drilling, rather than into 3D, “as 3D will not change the size of our structure, but will be an excellent tool for field development.”

Davis said that if drilling at East Kitchen confirms Escopeta’s interpretation, the plan is to set a production platform over the well so that the location could be produced.

Companies unfamiliar with Alaska

Davis said Escopeta needs partners to go ahead, however, he said, “finding partners for Alaska is a unique search.”

Some say the project is too costly, some want 3D seismic shot before they commit.

But most Lower 48 companies are just not familiar with Alaska, Davis said.

“They don’t know the potential. It’s not their operating backyard. They haven’t seen what I’ve been able to see through Bob’s, Frank’s and Walter’s eyes.”

What is the attraction for Escopeta? Cook Inlet has major reserves and an existing gas market.

“In my opinion,” Davis said, “there’s more current potential in what we have identified here than what some
independents are pursuing on the North Slope.”

If they find gas on the North Slope, he said, they have no market, while in Cook Inlet, “it’s approaching a five-dollar market right now.”

Davis said companies also ask: “If we get up there, what else can we do?” If Escopeta is right about the reserves in the Kitchen and East Kitchen prospects, he said, “they’ll be drilling out here for the next 30 years. Because you’re going to set a platform on East Kitchen and probably two on Kitchen: that’s plenty for a company to do,” he said, referring to a map of the area.

“Plus, Bob (Warthen), Frank (Banar) and Walter (Wells) have other ideas, and we have other projects that we’re going to chase so there’s a lot, a lot more to do.”

**Is there production to purchase?**

One thing Cook Inlet apparently doesn’t currently offer, Davis said, is production that can be purchased. “One big independent in Houston said, ‘look, if you had some production we could buy up there, we’d buy the production and then we could combine that and we could drill your wells’.”

But, Davis said, “at today’s prices of $45 oil and $4.74 gas, it is time to drill wells, especially those that will lock up major reserves, and not buy production.”

What Escopeta is doing matches up with the Department of Energy report’s description of two-phase exploration history in mature basins, first exploration for structural traps like the company’s East Kitchen prospect, Davis said, and then a second phase focused on stratigraphic plays like the company’s Kitchen
“At this point in time Cook Inlet exploration is still in the structural prospect phase,” he said. “Few if any exploration plays have been pursued and drilled solely on stratigraphic trapping concepts. Based on exploration results in basins elsewhere, this implies as much as 50 percent or more of the basin’s reserve potential has not been investigated,” Davis said.

That’s what Escopeta is doing at Kitchen, he said, and the new seismic interpretation shows what the company believes is major oil and gas accumulations.

“Major companies have had success drilling behind WEA (wavelet energy absorption) and I think it works,” Davis said of the new APEX Metalink seismic processing technique. “We spent considerable money on processing and we’re the first ones to use that process here in the Cook Inlet basin chasing stratigraphic traps and that’s what we’re doing in the Kitchen prospect.”

Davis said Escopeta can take the results of the well drilled at East Kitchen, relate the logged oil and gas pays directly to the wavelet energy absorption and wavelet fluid absorption processed seismic anomalies “and get a very strong idea of what to expect at our Kitchen prospect, thus greatly reducing risk.” He said the East Kitchen prospect “is very similar to ConocoPhillips’ Cosmopolitan discovery. “We are drilling on an anticline up dip from actual tests for oil, 57 bopd at Cosmo and 360 bopd for East Kitchen with large upside potential for natural gas up hole.”

Davis said that Wells, Banar and Warthen’s “geological predictions were right on target for the successful
Hanson well at ConocoPhillips' Cosmopolitan prospect. I think we are getting ready to do the same exact thing again at East Kitchen, with the only difference being (that) the reserve potential at East Kitchen is almost three times as big.”

The Kitchen prospect, he said, is a 25,000-acre stratigraphic trap “that holds possible 3.9 tcf (of gas) and 829 million barrels of oil.

“I think there is plenty of oil and gas in our Kitchen prospects for any company large or small to be participating in for years to come,” Davis said. “Escopeta has been actually doing business in the Cook Inlet basin for over 10 years. We were in the right place, at the right time, with our own in-house geological studies and resources to build an exploration opportunity of a lifetime,” he said.

“Alaska”, said Davis, “is definitely the place to explore for world-class oil and gas reserves.”

*Editor’s note: Kay Cashman, Petroleum News publisher and managing editor, and Kristen Nelson, Petroleum News editor-in-chief, conducted the interview for this story.*