TAPS Today: Trans-Alaska Pipeline System Operations and Management Issues And Their Economic Drivers

Briefing for TAPS Stakeholder Workshop
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Copper River Watershed Project

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Game Plan for This Discussion:

A. Operational Issues

Keeping Oil in the Pipe – Safely

B. Management Issues

Prevention: The Name of the Game

C. Oversight Issues

Who's Got the Football?

D. Economics

Follow the Money

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A. Operational Issues – 1. Strategic Reconfiguration

Since early 2004, TAPS has been implementing the Strategic Reconfiguration project, which consists of (1) reducing number of pumping stations to 4 (able to handle approximately 1.1 million bpd, down from the 1988 peak of 2.1 million bpd), (1) replacing jet-engine powered pumps at remaining pumps stations with electric pumps capable of delivering varying pumping power and therefore better able to handle varying and low throughput, (3) conversion to automated pipeline control, de-manning pump stations (each of which had an operator who reported to the Operations Control Center at Valdez) and placing pipeline control entirely in the hands of the OCC, now located in Anchorage.

- **When the SR project began in 2004, Alyeska planned completion by the end of 2005; project not done yet; finish is now delayed until 2011, when Pump Station #1 conversion will be completed.**
- **Management of change is always an operational problem. (Are new facilities in place? If so, have new operating instructions replaced old procedures? How do new systems interface with facilities still under the old system?)**
- **Extension of SR project has placed TAPS at increased risk of operations errors. (Example: January 2007 fire at Pump Station #9 occurred as workers rushed to complete wiring for the first pump station to convert to electric pumps and automated operations.)**

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A. Operational Issues – 1. Strategic Reconfiguration (Continued)

Since early 2004, TAPS has been implementing the Strategic Reconfiguration project, which consists of (1) reducing number of pumping stations to 4 (able to handle approximately 1.1 million bpd, down from the 1988 peak of 2.1 million bpd), (1) replacing jet-engine powered pumps at remaining pumps stations with electric pumps capable of delivering varying pumping power and therefore better able to handle varying and low throughput, (3) conversion to automated pipeline control, de-manning pump stations (each of which had an operator who reported to the Operations Control Center at Valdez) and placing pipeline control entirely in the hands of the OCC, now located in Anchorage.

- **When TAPS now relies on its electronic control system rather than employees formerly located in Valdez and at pipeline pump stations (now de-manned), will operations problems (emergencies requiring immediate shutdown) and maintenance issues (requiring long-term planning and funding for remediation) be identified in a timely manner?**
- **In 2002, when the 30-year state and federal TAPS lease and right-of-way agreements of 1974 were being evaluated for renewal, Alyeska was already making plans to initiate SR. But the TAPS renewal Environmental Impact Statement did not consider SR long-term impacts. Instead, the EIS regarded plan elements as separate maintenance projects that (in theory) could be reviewed on its own under the renewed agreements.**

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A. Operational Issues – 2. Low-Flow Studies

The ability of electric pumps to handle reduced throughput (down to 200,000 bpd, according to one press account) was a major impetus for Strategic Reconfiguration. A low-flow investment study group was established in 2008 to assess and study the technical issues related to low throughput; results are expected to be completed by the end of 2010. Problems operating at low throughput are said to require investment that may not pay for itself when spread across the reduced number of barrels per day. Information has been held relatively tightly. Low-Flow problems stem from cooler temperature of oil coming into the pipeline, longer distances between pump stations (where the oil is reheated by pumping) and slower travel rates at reduced throughput (allowing heat to dissipate). Potential problems include:

- **Ice formation and wax deposits form more readily as oil, flowing more slowly, cools, creating (a) increased potential for pipeline blockages and (b) new corrosion problems for TAPS (internal corrosion, similar to the problems BP experienced on the North Slope in 2006).**
- **As satellite oil fields with heavier oil than that of Prudhoe Bay come on line, TAPS oil is also more viscous now than before.**
- **Pipeline operating temperature could drop below freezing, creating geotechnical problems for below-ground pipe (*e.g.*, frost heave).**

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A. Operational Issues – 2. Low-Flow Studies (continued)

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- **Information on low-flow studies has been tightly held and carefully released to support industry demands on the State aimed at enhancing the industry revenue from TAPS operations (*e.g.*, softer position on TAPS tariff and property tax assessments).**
- **Alyeska now says that TAPS operation below 500,000 bpd is problematical. However, an expert report says that with added heat at specific locations, as necessary, the system can operate down to 40,000 bpd.**
- **An associated problem that warrants careful, independent technical review is the Cold Restart requirement, which Alyeska has studied for many years but has not resolved.**

– Research Associates, May 5, 2010 (Draft)

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A. Operational Issues – 3. Corrosion and In-Line inspection (Pigging) Procedures

Pipelines face threats from two distinct types of corrosion (the loss of metal due to a chemical or electrochemical reaction): (1) external corrosion, which attacks the outer wall of the pipe, usually through breaks in protective coating; and (2) internal corrosion that forms rapidly under wax and sludge buildup on pipeline walls, often with the assistance of sulfate-reducing bacteria. Alyeska has fought external corrosion on TAPS for two decades by identifying pockets of corrosion and monitoring the rate of pipeline wall loss through in-line inspection (ILI) with "smart" pigs and, when confirmed by pipeline corrosions digs, repairing corroded locations with sleeves. Alyeska formerly sent cleaning pigs through the line once a month; now cleaning pigs are run weekly.

- **BP's difficulty identifying and mitigating internal corrosion was demonstrated by its 2006 North Slope oil spill that led to the temporary shutdown of the nation's largest oil field.**
- **As recently as 2008, Alyeska told government officials that TAPS did not have mainline internal corrosion problems (an assertion contradicted by its own records, according to federal pipeline monitors). However, it is now recognized that low throughput on TAPS creates the very conditions that can foster internal corrosion of mainline pipe and valves.**
- **Because internal corrosion is liable to occur much faster than external corrosion, Alyeska must devise faster methods for identifying and mitigating corrosion problems.**

A. Operational Issues – 3. Corrosion and In-Line inspection (Pigging) Procedures (Continued)

Due to increased wax buildup, in recent years cleaning pigs have frequently been damaged and smart pig runs have frequently failed.

- **The TAPS pigging system, developed through experimenting, with frequent revisions as pig technology developed and improved, calls for ILI every three years (now conducted using a "combo" pig that identifies corrosion wall loss, dents and pipe movements in a single run); it still takes many months to read and interpret the results.**
- **Alyeska preceded its 2009 "smart" pig runs with one month of cleaning pig runs at 4-day intervals and is installing a new pig trap at Pump Station #8 (which has been closed for a decade) to remove an ILI pig and insert a clean one before wax buildup renders its results unusable.**
- **Will the updated external corrosion system prove capable of detecting faster-forming internal corrosion in a timely manner?**

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A. Operational Issues – 4. Valve Maintenance and Replacement

To block or control the flow of oil, TAPS has 178 valves – 95 block valves (62 remote-control gate valves, 9 manual-control gate valves), 24 isolation valves at original pump stations) and 83 check valves that drop automatically to prevent back-flow. Alyeska boasted during construction its design called for more valves per mile than any other pipeline in the world. But valve closure at the wrong time or in the wrong sequence can cause serious damage by over-pressuring the upstream side or causing sudden movement due to pressure differential. Effective valve control and valve maintenance are vital to safe operations.

- **Since 1998, six mainline valves have been replaced and one has undergone major repairs.**
- **To deal with aging valves (some of which allowed leak-by into the valve body or leak-through to the adjacent portion of the line that was supposed to be isolated when tested between 1998 and 2000), Alyeska instituted a schedule to retest valves that were not sealing properly in seven years; all other valves were placed on 15-year testing cycle. (Since TAPS valves had a 30-year design life, it was assumed some would not be performing optimally after 20 years; the 15-year test cycle is based on one-half of the valve's original design life.) Test anomalies and gaps in the public record follow:**
- **One RGV that was replaced was not on the 7-year list.**

A. Operational Issues – 4. Valve Maintenance and Replacement (Continued)

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- **The unlisted RGV was later identified as a noisy valve. Of seven other RGVs listed as noisy, one has been retested (it sealed successfully).**
- **Three other check valves and one RGV that passed the original leak test (and therefore are not on the 7-year list) are now reported as having audible leaks.**
- **Of nine block and check valves identified with leak-through below the arbitrarily determined maximum allowable limit: 6 are reported as performing better on re-test in 2007 (due to a change in sealing lubricant); one showed no change; re-test data was not available for 2.**
- **Corrosion (40% wall loss) was found on the body of a valve whose performance improved.**

A. Operational Issues – 5. Automated Pump Stations and Pipeline Control Systems

In pipeline parlance, the controlling computer at the Operations Control Center (OCC) and the communications system between the OCC and the pump stations and valves constitute the main components of the SCADA, or Supervisory Control and Data Acquisition system. With pump stations automated and the OCC moved from the TAPS terminal at Valdez to Anchorage, the SCADA system is more important than ever. Without staff based at pump stations, will the TAPS operators be able to assure safe operations?

- **When the TAPS leak detection system has never detected a leak, is confidence in the automated SCADA system justified?**
- **When field personnel, no longer based at pump stations, view the pipeline through the windshield, will those engaged in maintenance identify potential problems or be invested in assuring that identified local problems are resolved?**
- **Do remote pipeline managers have sufficient knowledge of local conditions on the pipeline to identify potential problems or respond in a timely manner to emergency situations?**
- **Without input from personnel based on the pipeline right-of-way, how will remote pipeline managers acquire sufficient information about local conditions to apprehend and assess the impacts of natural external threats such as seismic events, floods and climate change?**

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B. Management Issues – 1. Prevention v. Response

"Keeping oil in the pipe" isn't just a slogan.
The name of this game is prevention.

JOINT PIPELINE OFFICE
Weekly Report 1/24/07
For additional information contact Rhea DoBosh at (907) phone 257-1338, fax 257-1397

JPO Oversight of Trans-Alaska Pipeline System (TAPS) – Compliance Monitoring

TAPS Oil Discharge Prevention and Contingency Plan (OSCP) Review – The Bureau of Land Management (BLM)/JPO has issued their annual approval of the OSCP for the year 2007 approval period. The approval addresses the general requirements for the annual review and the specific approval requirements. . . .

You may be wondering where spill response fits in my outline. By the time I present, I'm sure we will have talked at some length about response training, preparation and drills. But I have not reviewed a C-plan intensively since late 2003 (the plan on the right) and I know that some of you have worked on the problem of how to respond to a spill when containment in the fast-moving streams that cross TAPS and flow east into the Copper River is an extremely difficult problem. I therefore do not presume to tell you how to proceed on this issue. But I do know, from nearly 40 years working both sides of this issue, that **prevention** is pivotal, that economics drive Alyeska's performance and if we don't deal with underlying management issues we haven't a ghost of a chance of making response work.

Alaska Department of Environmental Conservation

Division of Spill **Prevention** and Response

Industry Preparedness Program

Trans Alaska Pipeline System (TAPS) Pipeline

Oil Discharge Prevention and Contingency Plan

Strategic Reconfiguration Amendment

Final Findings Document

December 31, 2003

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B. Management Issues – 2. The Keys to Prevention

"Keeping oil in the pipe" isn't just a slogan. The name of this game is prevention. There are two keys to prevention.

- **One of the keys to prevention is to identify problems in a timely manner – and to address them. Time and again we have seen this failure as a root cause of problems on TAPS.**

- **A second key is a well-funded maintenance program that is focused on reducing risks and relatively independent of cost considerations.**

- **Unfortunately, Alyeska management policies seem to be driven by a short-sighted and poorly grounded cost-cutting mentality. *(If time permits, I'll give a few examples of economic pressures coming from TAPS management with the next slide. To explain why the cost-cutting mantra is poorly grounded, I'll provide an overview of North Slope production and TAPS economics in Section D. below.)***

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B. Management Issues – 3. Personnel Issues

Over the years, TAPS management has struggled with the problem of making sure that workers are free to speak out when they have questions about the appropriateness – and particularly the safety – of the assignments they have been assigned. This problem created headlines in 1991, when Alyeska set up an industrial espionage program to try to identify and close off worker leaks to Congress. In 1993 Alyeska intimidation and harassment of its quality control staff led again to congressional hearings, an independent federal audit of TAPS management practices and the establishment of an employee concerns program. Oil industry jobs are relatively high paying; when a worker runs counter to his or her boss, there is often great pressure to get in line and shut up. If a problem comes to public attention, the complaining source is liable to be readily identifiable.

- **During the current recession, as Alyeska management tries to cut costs to match declining TAPS throughput, I believe this problem is at least as bad as – and probably worse than – it has ever been. (While my current experience is anecdotal, a clear public example is the Alyeska effort last winter to retire veteran Fairbanks-based employees and transfer their positions to Anchorage, where they would be filled by a younger and less experienced – and less expensive – work force.)**
- **(In addition to the episodes summarized above, similar pressure on workers were evident during the closure of Pump Stations 2, 6, 8 and 10 in 1996-1998; cost-cutting orders from the TAPS owners surfaced and was made public in 2002.)**

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B. Management Issues – 3. Personnel Issues (Continued)

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- **Safe operations are greatly enhanced when workers feel free to air their concerns without intimidation, harassment or the threat of losing their jobs.**

- **A significant difference between current and past employee concerns problems on TAPS is that at present both the TAPS and JPO employee concerns programs appear to be languishing.**

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C. Oversight Issues – 1. The Regulatory Framework: How Is It Working?

It is generally (but not always) the case that industry complies with the letter of statutory requirements. Concerned citizens therefore need to know how well the legal framework serves to protect the public interest, whether there are gaps in that framework, and whether the inter-agency oversight system is functioning effectively.

- **Government agencies appear increasingly reliant on industry reports that are not confirmed by on-site surveillance.**
- **The Joint Pipeline Office (JPO), a state-federal umbrella group that provides coordinated TAPS oversight, appears to be fragmenting. *(Federal agencies are moving to mid-town Anchorage, while state agencies remain at the downtown facility that formerly housed most JPO personnel.)***
- **A critical review of the state's failed risk assessment of oil & gas infrastructure by an independent national peer review panel appointed by the NRC's Transportation Review Board suggests state oversight may be dysfunctional.**
- **Some observers believe that vigorous state enforcement of environmental law is vitiated by fear that raising the cost of compliance will make Alaska less attractive than other developing regions. *(See Section D. for counter arguments.)***

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C. Oversight Issues – 2. The Regulatory Framework: Information Needed

It is generally (but not always) the case that industry complies with the letter of statutory requirements. Concerned citizens therefore need to know how well the legal framework serves to protect the public interest, whether there are gaps in that framework, and whether the inter-agency oversight system is functioning effectively.

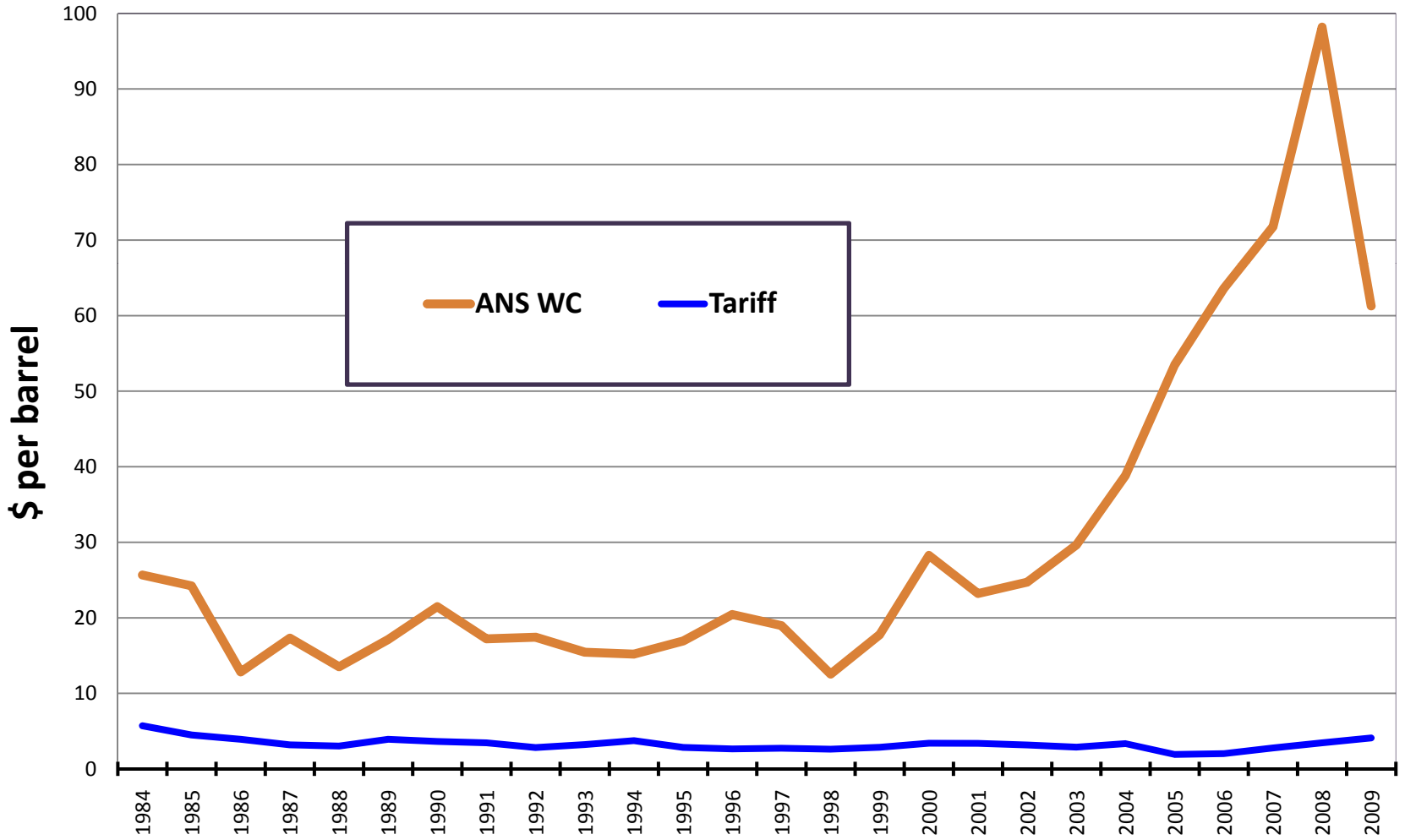
- **Agency responses to requests for information range from denial (sometimes citing national security restrictions) to provision of large quantities of information that require technical background to digest.**
- **Concerned citizen requests to industry for substantive information often go unanswered.**
- **The state's gap analysis, launched in 2007, has not been made public.**
- **With the decline of media reporting, concerned citizens may wish to take steps to secure better information about industry operations and government oversight, as well as access to facilities to confirm the validity of the information they are able to obtain.**

D. TAPS Economics – 1. Overlapping Ownership and Higher Oil Prices

The three companies that control more than 95% of North Slope production – BP, ConocoPhillips and ExxonMobil – also own more than 95% of TAPS through their shared subsidiary, the Alyeska Pipeline Service Company. Due to this highly unusual economic arrangement, even when prices plummet the owners, due to their overlapping ownership, have the benefit of a guaranteed profit on TAPS. Moreover, throughout the life of TAPS the owners have filed and defended higher – rather than lower – TAPS tariffs (shipping charges), even though they claim that as shippers, they want lower tariffs.

- **Over the last decade, long-term oil prices nearly tripled. Despite declining throughput, the industry's total profits on production and TAPS today are approximately equal to their profits in 2000, when oil prices were approximately $35.00 per barrel (inflation-adjusted) significantly above the 1991-2000 decade average.**
- **The present TAPS tariff of $4.10 per barrel constitutes roughly five percent of the market price of oil at $80 per barrel. *(See next slide.)***
- **I estimate that the Dept. of Revenue's forecast price of $75/bbl. yields an after-tax producer profit of nearly $20.00 per barrel.**

TAPS Tariff vs Crude Oil Price



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D. TAPS Economics – 2. Argument Continues over Pipeline Tariffs and Property Tax Assessments

Pipeline tariffs are but a small fraction of the per-barrel price of oil; property tax payments are an even smaller subset of the tariff. Nevertheless, the money is apparently worth fighting over. The three companies that control more than 95% of North Slope production and a similar share of TAPS battle with the state over both property taxes, which have risen in recent years, and pipeline tariffs, which have come down. For the first three decades of operation, the industry charged more than the just and reasonable tariff for oil shipped on TAPS (counter-intuitive, but it is a fact). A strong case can be made that during this period the pipeline was undervalued for property tax purposes.

- **Because shipping charges are subtracted before state production and income taxes and royalties are calculated, by overcharging themselves the TAPS owners could reduce their state payments on production – and handicap their independent North Slope competitors, who have to pay the higher tariff, (including a reasonable profit for the pipeline owners) out of pocket.**

- **Meanwhile, the TAPS owners fought – and continue to fight – for lower state property taxes, which are levied at 2% of the pipeline's assessed valuation. TAPS used to be assessed on the basis of its income stream, as if the pipeline were a stand-alone facility. But the state assessors recognize that the highest and best use of TAPS is for shipping valuable North Slope oil to market. *(See next slide for TAPS property tax valuation.)***

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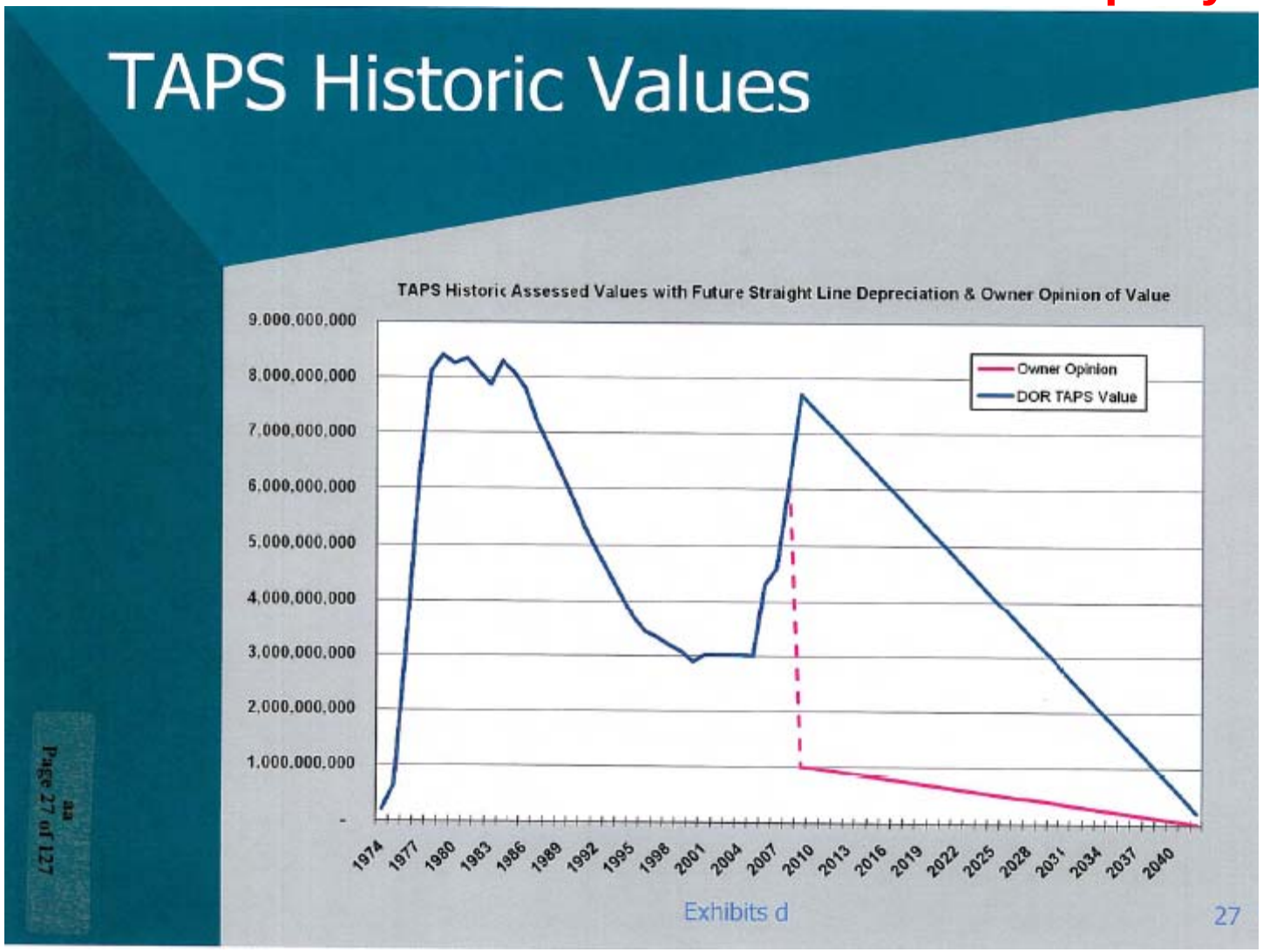
Historic and Forecast TAPS Valuation for Property Tax



– Alaska Dept. of Revenue, "Trans-Alaska Pipeline System Appeal of 43.56 Property Tax Assessment," May 19, 2009, p. 27.

– Research Associates, May 5, 2010 (Draft)

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A. TAPS Economics – 3. Paradox Explained – and Roughly Quantified

The flat spot in the chart between 2000 and 2004 reflects an agreement among the TAPS owners, the state and municipalities to value TAPS at at $3.0 billion, which would generate $60 million in property taxes. But the assessed valuation is now climbing, as property tax administrators have finally caught up with the TAPS owners, who continue to argue vociferously for lower property taxes (even as they defend higher tariffs). Here are some simple calculations:

- **At present throughput levels of 0.65 million bpd, if TAPS were still assessed at $3 billion, the pipeline property tax would generate $60 million, paid through the tariff at about $0.25/bbl. An assessment increase to $9 billion, would bring the TAPS property tax to $180 million, or about $0.76/bbl, increasing the tax and the tariff by about $0.50/bbl. (In the end, the owners would not pay the entire $180 million; the state would be contributing on the order of $54 million through reduced royalty, production tax and state income tax payments.)**

- **At the present throughput level of 0.65 million bpd, a $0.50/bbl. increase in the TAPS tariff would generate approximately $120 million that could be spent (say) on additional safeguards. (Of this amount, the state would be contributing on the order of $36 million through reduced royalty, production tax and state income tax payments.)**

– Research Associates, May 5, 2010 (Draft)

QUESTIONS OR COMMENTS?