

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 8672
1465 SCOMM 55: JNT. SPEC. COMM. ON STATE TAX POLICY, 1986-1987

1265

FOOTNOTES

- (1) Petroleum Revenue, Alaska Department of Revenue, December 1986
- (2) Ibid.
- (3) 1982 Tax Capacity of the Fifty States, Advisory Commission on Intergovernmental Relations, May 1985.
- (4) Ibid.
- (5) Guide to the New Tax Reform Law, Price Waterhouse, October 1986.
- (6) Ibid. p. vii.
- (7) Ibid. p. ix.
- (8) Ibid.
- (9) See data description in the METHOD section of this report.
- (10) The Book of the States (1986-87 edition), The Council of State Governments, 1986.
- (11) "The Impact of Collapse of the World Oil Market on the Alaska Economy", Scott Goldsmith, Institute for Social and Economic Research, University of Alaska, March 1986.
- (12) Revenue Sourcebook, Alaska Department of Revenue, (January 1987).
- (13) Fuel, Conservation, & Individual Credits Relative to the Individual Income Tax, Alaska Department of Revenue, (January 1980 and July 1981).
- (14) Guide to the New Tax Reform Law, Price Waterhouse, October 1986.
- (15) Revenue Sourcebook, Alaska Department of Revenue, (January 1987).
- (16) Fuel, Conservation, & Individual Credits Relative to the Individual Income Tax, Alaska Department of Revenue, (January 1980 and July 1981).
- (17) Public Finance, Rosen, 1985.
- (18) Revenue Sourcebook, Alaska Department of Revenue, (January 1987).
- (19) Fuel, Conservation, & Individual Credits Relative to the Individual Income Tax, Alaska Department of Revenue, (January 1980 and July 1981).
- (20) Petroleum Revenue, Alaska Department of Revenue, December 1986

SECTION II

REVENUE POTENTIAL OF A GENERAL SALES TAX

**Revenue Potential
of a
General Sales Tax
December 1986**

**Prepared by
Alaska Department of Revenue
Research Section
Vincent Wright, Chief**

**Mary Ellen Frank, Economist
Al Zangri, Economist
Dave Tonkovich, Economist**

INTRODUCTION AND PURPOSE OF STUDY

Current revenue projections for fiscal years 1988 through 1992 indicate that revenues generated by petroleum related activities (Oil and Gas Corporate Net Income Tax, Oil and Gas Property Tax, Oil and Gas Severance Tax and Oil and Gas Royalties) will comprise over 81.5 percent of total unrestricted General Fund Revenues for the period. Therefore, state government is presently very dependent on these sources of revenue. Finding sources of additional revenue is becoming increasingly important.

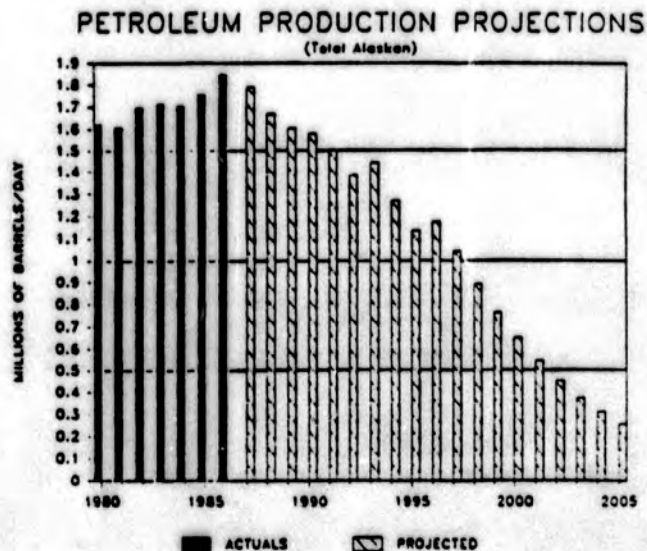
Prudhoe Bay oil production has already peaked. Total Alaskan production is currently projected to decline from over 1.848 million b/d in fiscal year 1986 to under 400,000 b/d by fiscal year 2005. This represents a compound annual average rate of decline of 7.9 percent.⁽¹⁾ Other North Slope fields which are currently projected to begin producing will only partially offset this decline. These projections are based only on the development of presently known and economically developable reserves. Additional discoveries may be made in the future, but their development as well as the development of some currently known but high cost reserves is highly dependent on the future growth of real oil prices. In addition, these future discoveries may be made on federal OCS lands from which the state would receive little or no revenues. Future petroleum revenues are therefore both exhaustible and highly uncertain.

TABLE 1

PETROLEUM PRODUCTIONS PROJECTIONS
(Millions of Barrels/Day)

FISCAL YEAR	TOTAL ALASKAN
1980	1.621
1981	1.609
1982	1.696
1983	1.714
1984	1.704
1985	1.714
1986	1.848
1987	1.842
1988	1.738
1989	1.687
1990	1.558
1991	1.499
1992	1.384
1993	1.287
1994	1.257
1995	1.237
1996	1.098
1997	1.182
1998	1.020
1999	0.898
2000	0.775
2001	0.674
2002	0.593
2003	0.515
2004	0.450
2005	0.284

FIGURE 1



Alaska North Slope oil prices, meanwhile, have dropped from a high in 1981 of \$33.67 per barrel to a 1987 low of \$8.50 (the average is projected to be \$12.59 for the year). These prices have become extremely volatile and difficult to predict. Even if production wasn't declining, this volatility in oil prices and riskiness of oil related revenues could undermine the major source of revenue for this state. To a large extent, this has already happened.

TABLE 2

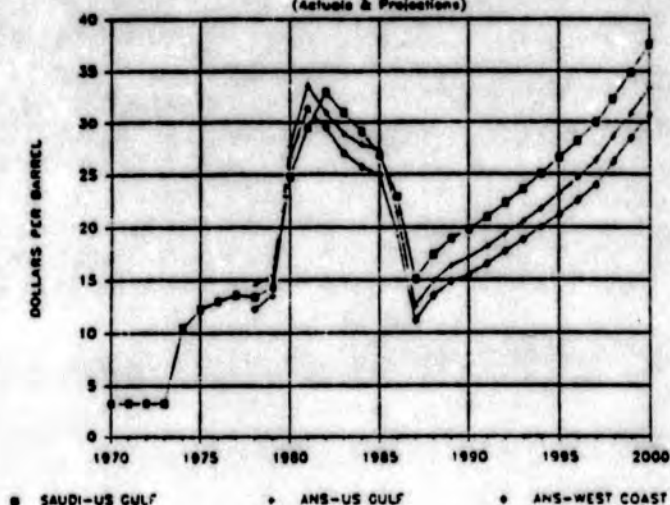
ACTUAL & PROJECTED CRUDE OIL PRICES
(Dollars per barrel)

FISCAL YEAR	SAUDI US GULF	ANS US GULF	ANS WEST COAST
1970	3.25		
1971	3.25		
1972	3.25		
1973	3.25		
1974	10.45		
1975	12.50		
1976	13.04		
1977	13.61		
1978	13.46	14.60	12.30
1979	14.41	15.50	12.70
1980	24.75	27.60	26.50
1981	29.45	33.67	31.42
1982	22.99	21.07	29.50
1983	21.05	20.87	27.00
1984	29.10	27.82	25.68
1985	26.80	27.25	24.92
1986	22.90	21.28	19.76
1987	15.15	12.59	11.19
1988	17.29	14.97	12.57
1989	10.95	16.77	14.90
1990	19.77	17.10	15.52
1991	20.96	18.16	16.52
1992	22.21	19.27	17.70
1993	23.62	20.52	18.82
1994	25.03	21.09	20.02
1995	26.55	22.18	21.20
1996	20.10	21.67	22.57
1997	29.95	26.20	24.01
1998	22.26	20.60	24.18
1999	24.91	20.95	20.46
2000	27.62	22.45	20.07

FIGURE 2

CRUDE OIL PRICES

(Actuals & Projections)



The purpose of this study is to develop a model that will allow us to evaluate the revenue potential and burden of general sales tax proposals presented by Legislative and Executive policy makers. We have presented alternative structures here primarily for illustrative purposes, and in no way wish to suggest these are proposals of this Department or section. The value of these alternatives is comparative, illustrating the way different structural elements in a tax can be altered to obtain various results, and to show what scope of information it is possible to generate in response to a proposal. We have evaluated the advantages and disadvantages, as well as preliminary estimates of fiscal impact, for each of our illustrative general sales tax alternatives in order to suggest what kinds of questions could be asked about various proposals.

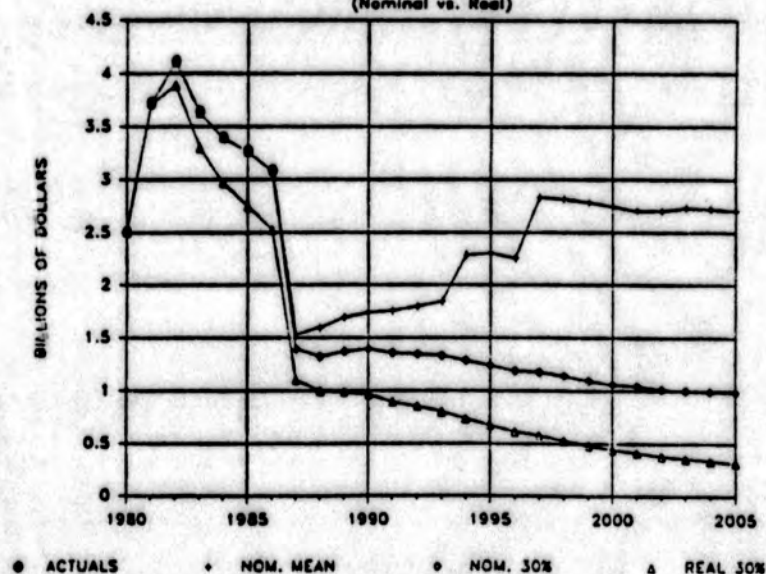
It should be noted at the outset, that it will be practically impossible to replace petroleum revenues with taxes on individuals or other industrial sectors given the present structure of the Alaskan economy. In fiscal year 1984 the gross wellhead value of North Slope oil production was approximately \$10.6 billion⁽²⁾ while the estimated gross production of all other nongovernmental industrial sectors was only \$8.7 billion and total disposable personal income was \$6.8 billion. In addition, oil production has been high profit sector and thus supported much higher levels of taxation than other more marginal industrial sectors. Also, many other industries are currently supported, directly and indirectly through state government spending of oil revenues.

TABLE 3
GENERAL FUND UNRESTRICTED REVENUE PROJECTIONS
(Nominal vs. Real)

FISCAL YEAR	ACTUALS	ESTIMATES MEAN CASE (NOMINAL \$)	ESTIMATES 50 % CASE (NOMINAL \$)	ESTIMATES 50 % CASE (REAL \$/1981)
1980	2.501			
1981	3.718			3.718
1982	4.108			3.891
1983	3.631			3.298
1984	3.390			2.948
1985	3.260			2.746
1986	3.076			2.522
1987		1.525	1.299	1.105
1988		1.601	1.325	1.000
1989		1.697	1.374	0.992
1990		1.748	1.398	0.965
1991		1.763	1.359	0.897
1992		1.802	1.249	0.851
1993		1.851	1.224	0.800
1994		2.290	1.287	0.722
1995		2.207	1.241	0.672
1996		2.254	1.191	0.612
1997		2.830	1.178	0.576
1998		2.810	1.143	0.520
1999		2.779	1.090	0.482
2000		2.728	1.062	0.444
2001		2.690	1.045	0.414
2002		2.699	1.020	0.382
2003		2.720	1.004	0.358
2004		2.718	0.997	0.327
2005		2.699	0.989	0.317

FIGURE 3

GENERAL FUND UNRESTRICTED REVENUES
(Nominal vs. Real)



TAX CAPACITY AND TAX BURDEN ON ALASKANS

The assessment of the burden of taxation is a complicated problem. Statutes determine who is legally responsible for a tax. In contrast the economic incidence of a tax is the change in the distribution of private real income brought about by a tax. Different taxes can be shifted to differing extents from the person or business legally responsible to other individuals or businesses.

In less rigorous terms, concepts such as burden are examined by resorting to state-by-state comparisons of taxes paid usually on a per capita basis or in relation to some measure of revenue capacity. Because measures such as per capita income are poor measures of revenue capacity alternative concepts have been developed. One such measure involves the concept of a representative tax system (RTS).⁽³⁾

"The RTS is designed to answer this question: what would be the total revenue of each of the 50 states if every state applied identical tax rates - national averages - to each of 26 commonly used tax bases?"

Tax effort is a companion concept that indicates the overall tax burden placed on the base as defined by the tax capacity concept. A tax effort index is created by dividing the state's actual tax collections by its estimated tax capacity and multiplying by 100.

"The result may be interpreted as a measure of how much a state chooses to exploit all its potential tax bases relative to other states. If a state has a tax effort beneath the national norm, it will have an effort index under 100. Conversely, if a state has a tax effort in excess of the national average, it will have an effort index over 100."

The most current estimates of these ratios is in an Advisory Commission on Intergovernmental Relations publication Tax Capacity of the 50 States. Dated May 1985, the book is based on tax data for 1982. While aged, the numbers are indicative of Alaska's state and local tax burden relative to other states.⁽⁴⁾

Indexes of this sort can often hide subtleties in the underlying relationships. For instance the effort variables are developed using per capita measures which hide the fact that a substantial portion of the tax may be paid by out-of-state visitors or seasonal workers. Alaska, for instance, shows a high effort for hunting and fishing licenses. Although care has to be exercised in their interpretation, the figures indicate that Alaska residents are taxed at relatively low levels on income and sales when compared to residents of other states.

Overall Alaska shows a high tax effort because of our resource based taxes. However, effort measures are considerably below national norms for several major taxes commonly found in other states. Column two below shows the relative importance of major taxes and column three shows Alaska's effort index for these taxes.

<u>Tax</u>	<u>State-Local Tax Collections as % of U.S. Total</u>	<u>Alaska Effort Index 1982</u>
General Sales	23.5%	29.1
Selected Sales	11.7%	102.0
License Taxes	3.5%	118.0
Individual Income	19.7%	.7
Corporate Income	5.6%	95.0
Property	31.8%	105.0
Estate and Gift	.9%	22.9
Severance	3.4%	278.8

GENERAL DESCRIPTION AND STRUCTURE OF RETAIL SALES TAXES

General Sales Tax

A general sales tax could be enacted at the State level. Alaska currently has no sales tax at the State level, however seven boroughs and at least fifty-two smaller municipalities do levy some form of sales tax. The rates levied range from one percent to five percent. The base upon which these rates are levied also varies with different exemptions being allowed in various communities. If a sales tax were enacted at the State level it would be in addition to the tax at the local level, however, it should be noted that Anchorage and Fairbanks, the two most populous municipalities in the State currently have no sales tax.

Currently forty-five of the fifty states levy some form of sales tax at the state level. Sales taxes are a significant source of state government revenues in most of the states which levy them. Sales taxes account for 48.8 percent of all State tax collections. The sales tax base varies considerably as to exemptions allowed and the degree to which services are taxed from one state to another. Food purchases, except restaurant meals and alcohol, are exempt in twenty-eight of the forty-five states. Prescription drug purchases are exempt in forty-three states. Gas and electric utility bills are exempt to some degree in thirty-two states. Five states exempt clothing purchases to some degree. Also, four states allow some credit for sales taxes paid against state income tax liability. These various exemptions and credits are meant to ameliorate the regressive incidence of the sales tax.

Services are taxed very comprehensively including all personal and professional services in only three states. Twenty-five states either tax no services or tax services very narrowly and selectively such as laundry and cleaning or advertising and selected business services. The remaining seventeen states tax services to a considerable degree although not comprehensively with most exempting professional services.

The rates levied on taxable purchases of goods and services also varies considerably from state to state with a low of three percent to a high of seven and one half percent. The median rate levied by states which exempt food is five percent and by those which do not exempt food is four percent.

Retail sales taxes tax consumer expenditure, thereby taxing income at its use, in contrast to income taxes, which taxes income at its source. The basic elements of any tax structure apply to the retail sales tax. These are tax base, rate(s) and credits against tax owed.

Tax Base

Tax base is characterized by what is included, excluded, and deductible from the base. It is also affected by the presence of exemptions from the tax.

Retail sales are the primary base of state and local sales taxes. Sales for resale generally are excluded to avoid problems of multiple taxation. While a general retail sales tax can logically cover services, in most cases services are excluded. Thus, a substantial portion of consumer expenditure is not taxed. A few services are, however, included in the tax bases of some states. These include admissions, lodging and public utility services.

Equity considerations lead some state to exclude particular retail sales from the tax base. The most common exclusions are prescription drugs and food for consumption at home. Some taxing states allow non resident visitors to obtain exemption certificates for sales tax. All sales tax states have use taxes as part of their sales tax structure. These use provisions apply to goods bought outside the state and brought into the state for consumption.

Tax Rates

Tax rates are applied to the tax base. They can be separated into rate groups for various consumer goods. This can be done to help make the tax more equitable, (i. e. taxing goods more highly that are consumed by higher income taxpayers (luxuries and non health services) or taxing subsistence items (basic food purchases, children's clothing or utilities) at low rates or not at all . The tax rate can also be applied differentially for other social policy goals, i. e. to tax goods with high social cost associated with them, such as alcohol, at higher rates, or to tax goods associated with low tax capacity at low rates or not at all, eg. medications and health services.

Tax Credits

Tax credits against tax owed are deducted after the rate is applied to the tax base. Tax credits are available for special expenditures and can be effective in avoiding penalties for or encouraging those qualifying expenditures. Credits can also be used to offset amounts paid to other government; thereby preventing double taxation of the same transactions.

EVALUATION OF ALTERNATIVES

The tables presented in this report summarize only the projected quantitative impacts of two sales tax proposals. Other issues do arise, however. Each of the elements of the tax structure can be tailored to affect different taxpayers differently (or to try and affect them identically). The alternative tax structures we present will each be analyzed briefly on a number of issues including how they affect taxpayer groups, how easily administered they are and how politically palatable they might be.

In general, the issues which should be considered with respect to measures to increase revenues are as follows.

Economic Efficiency: What effect does the proposed tax have on incentives and economic decision making? How does the tax alter consumption, production or resource allocation decisions?

Equity: Who bears the burden of the tax and how does that burden compare with ability to pay or benefits received? Is the tax progressive or regressive with respect to income and/or wealth?

Elasticity: What is the sensitivity of the tax revenue yield to changes in economic or demographic conditions? As income or population increase or decrease, does tax revenue increase or decrease in greater, lesser or equal proportion?

Administrative Efficiency: How costly is the tax to administer in terms of resources devoted to administration and compliance relative to the revenue yield of the tax? Who bears the burden of administrative cost, the taxpayer, the State or the tax collector (if different from the State)?

Political Feasibility: How acceptable is the proposed tax to the legislature and/or the electorate given existing social, political, and economic conditions? Who benefits, who loses, and who has the most political power?

Additionally, we are concerned with three other issues.

Interstate Capture: How much of the tax owed by nonresident taxpayers who work or travel in Alaska is it possible to capture?

Intergovernmental Effects: Does the tax erode the tax base of higher level (federal) or lower level (local) governments? If such erosion should be mitigated, how can it be done? Do higher level or lower level government taxes erode the State tax base? If such erosion should be mitigated, how can it be done?

Inflation Effects: What is the effect of inflation on the elements of the tax structure and the burden on the taxpayer? If this should be mitigated, how can it be done?

Efficiency

As is the case with many other taxes it is difficult to make definitive statements on how different types of sales taxes influence consumer welfare. The public finance literature suggests that it is unlikely that efficiency will require a general sales tax with the same tax rate for each commodity but recognizes the problems involved in differentiating rates among different commodities.

Elasticity

It is difficult to determine precisely how the sales tax will vary over time as income and disposable income changes. An increase in income will have different implications for revenues depending on the distribution of that increase. An increase which goes primarily to high income households may have a significantly different impact than a similar increase distributed mostly to low income groups. The reason is that high income households may at the margin spend only a small fraction of their income on taxable commodities.

With this caveat in mind it can be stated that a broad based retail sales tax is generally a fairly stable source of revenue. Consumption expenditures do not fluctuate as widely as personal income as individuals may alter savings while maintaining consumption over the short term. The yield from the tax should move roughly in proportion to movements in income, population and prices and will likely be less elastic than an individual income tax.

Equity

The conventional view of the distributional effects of a general sales tax is that it is regressive. As annual income rises, the proportion of household income devoted to consumption falls. Hence the amount of tax paid is a higher proportion for low income households.

Two arguments are commonly invoked against this conventional reasoning. First, some argue that the proportion of lifetime (as opposed to annual) income that is devoted to consumption is roughly the same at all income levels. Second, the regressivity argument implicitly assumes that the taxes on a good are borne entirely by the consumers of the good while in reality some shifting does occur.

In an attempt to deal with the regressivity concern some sales tax systems tax certain items consumed intensively by the poor at low rates or exempt these items completely. This is not without problems. For instance, while food expenditures are a large item in the budget of poor people they can also comprise a high proportion of income at higher levels. In addition such selective treatment causes administrative problems such as whether certain items (e.g. soft drinks) are in the favored category (e.g. food). Some states with both income and sales taxes utilize a sales tax credit against income tax liability as a device for dealing with equity concerns.

Administrative Compliance

The main attraction of sales taxes is probably its ease of administration. It is collected from sellers at the retail level which means fewer individuals to deal with than is the case with income taxes.

The main administrative complexities arise when it is unclear if some type of transaction creates a tax liability. Arbitrary distinctions are often made such as taxing food consumed at a restaurant but exempting the same meal if taken home for consumption. Also, tax evasion remains a problem.

In many states which have both state and local general sales taxes some efficiencies are achieved by piggybacking the local tax onto the state system. Compliance costs fall mostly on retailers with some states compensating stores for costs by allowing them to keep some percentage of their tax obligation.

Nonresident Taxpayers

Sales taxes will be paid by nonresident workers and tourists to the extent that they consume goods in the state. Some states such as Washington reduce this payment through issuance of tax exempt cards which apply to purchases which are ultimately consumed out-of-state.

Intergovernmental Effects

Under the new federal tax law state and local sales taxes are no longer deductible. This weakens the sales tax as an alternative to a state income tax as the latter retains its deductible status.

Some concern needs to be given to the effect of a state sales tax on those municipalities which have sales taxes or might adopt such taxes in the future. For instance, the imposition of a four percent state tax on top of a four percent local tax adds substantially to the cost of in-state purchases. Such rates would create incentives for consumers to avoid Alaska taxes by catalogue ordering or combining shopping with vacation or business trips.

Political Acceptability

In terms of political acceptability, sales taxes have been traditionally supported by higher income groups fearing increased property or income taxation. They have been opposed by labor organizations primarily on equity grounds and retailers who feared loss of business and compliance costs. Sales taxes are not as visible as income taxes in that the tax is levied in small bits each time a purchase is made rather than in larger amounts through payroll withholding or payments at year end. Since Alaska has never had a state sales tax, it is questionable whether the legislature would enact such a major new tax on individuals until oil revenues decline significantly.

Discussion of Estimates

The data presented in the table provides an approximation of the revenues which might be realized by a sales tax on differently configured tax bases. Examination of 1985 provides a good bench mark as the next several years will likely show lower levels of receipts and sales because of the economic slow down caused by lower oil revenues.

A one percent tax on retail sales in 1985 would have raised about \$40 million. If all services were taxed, the same one percent rate would generate an additional \$14 million. Finally, a one percent tax on electric utility sales for both residential and commercial customers would realize in the neighborhood of \$3 million. In total then a very broad based sales tax in a good year would have raised about \$57 million. This figure would not include revenues from a use tax and is most certainly an upper bound in the sense that virtually all retail and service transactions are covered. Exclusions of various items would correspondingly lower revenues. For instance, if all sales of food stores were excluded nearly \$9 million less in revenue would be realized. Note that some sales of food stores would likely remain taxable. However, we do not have the data to separate food and non-food sales for such establishments.

Higher tax rates would of course increase revenues. It is probably not valid to assert that a four percent rate would raise four times as much revenue because individuals will make some adaptations to the additional cost of purchased goods and services. Bartering, catalogue purchases and substitution of second hand purchases for new cars or appliances would likely occur.

The second table projects sales tax revenues for a tax based on retail sales. The analysis assumes that retail sales are a constant percentage of personal income for the years covered in the table.

ESTIMATED YIELD OF 1 % SALES TAX
VARIOUS TAX BASES 1985

SIC CODE FOR INDUSTRY	INDUSTRY	ESTIMATED RECEIPTS OR SALES \$	YIELD FROM 1 % TAX \$
RETAIL TRADE:			
52	BUILDING MATERIALS	\$387,270,000	\$3,872,700
53	GENERAL MERCHANDISE	\$462,926,000	\$4,629,260
54	FOOD STORES	\$990,572,000	\$9,905,720
55	AUTO DEALERS (EXCL 554)	\$600,134,000	\$6,001,340
554	GASOLINE SERVICE STATIONS	\$215,048,000	\$2,150,480
56	APPAREL & ACCESSORIES	\$137,886,000	\$1,378,860
57	FURNITURE	\$172,315,000	\$1,723,150
58	EATING & DRINKING	\$547,137,000	\$5,471,370
59	MISC RETAIL (EXCL 591)	\$439,277,000	\$4,392,770
591	DRUG & PROPRIETARY STORES	\$157,031,000	\$1,570,310
	TOTAL RETAIL TRADE	\$4,009,596,000	\$40,095,960
SERVICES:			
70	HOTELS AND LODGING	\$184,503,000	\$1,845,030
72	PERSONAL SERVICES	\$64,985,000	\$649,850
73	BUSINESS SERVICES	\$270,034,000	\$2,700,340
75	AUTO REPAIR GARAGES	\$105,228,000	\$1,052,280
76	MISC REPAIR SERVICES	\$61,727,000	\$617,270
78	MOTION PICTURES	\$12,871,000	\$128,710
79	AMUSEMENT & RECREATION	\$28,092,000	\$280,920
80	HEALTH SVCS EXCEPT HOSPITALS	\$232,111,000	\$2,321,110
81	LEGAL SERVICES	\$136,933,000	\$1,369,330
82	EDUCATIONAL SERVICES	\$8,786,000	\$87,860
83	SOCIAL SERVICES	\$13,099,000	\$130,990
891	ENGR ARCHIT SURVEY	\$247,033,000	\$2,470,330
992	ACCTG AUDIT BOOKKEEPING	\$56,979,000	\$569,790
	TOTAL SERVICES	\$1,422,371,000	\$14,223,710
ELECTRIC UTILITIES			
	RESIDENTIAL	\$150,605,000	\$1,506,050
	COMMERCIAL	\$147,987,000	\$1,479,870

PROJECTED SALES TAX REVENUES
WITH AND WITHOUT SALES OF FOOD STORES
APPROXIMATE YIELD FOR EACH 1 % OF TAX

YEAR	ESTIMATED SALES OF ALL RETAIL ESTABLISHMENTS	YIELD OF 1 % TAX	ESTIMATED SALES IF FOOD STORES EXEMPTED	YIELD OF 1 % TAX
1985	\$4,009,600,000	\$40,096,000	\$3,119,000,000	\$31,190,000
1986	\$3,945,500,000	\$39,455,000	\$3,066,700,000	\$30,667,000
1987	\$3,762,000,000	\$37,620,000	\$2,924,100,000	\$29,241,000
1988	\$3,835,500,000	\$38,355,000	\$2,981,200,000	\$29,812,000
1989	\$3,929,600,000	\$39,296,000	\$3,054,400,000	\$30,544,000
1990	\$4,072,600,000	\$40,726,000	\$3,165,600,000	\$31,656,000
1991	\$4,174,300,000	\$41,743,000	\$3,244,600,000	\$32,446,000
1992	\$4,325,600,000	\$43,256,000	\$3,362,200,000	\$33,622,000

DATA DESCRIPTION, LIMITATIONS AND USE

CENSUS OF RETAIL TRADE

Description of data used in estimates

Each five years the U.S. Department of Commerce undertakes a series of economic censuses. The last census available is that done for 1982. The next census will occur in 1988 for the year 1987. The censuses for Retail Trade and Service Industries for 1982 provided the data for this analysis. While these publications are dated they provide the best available information on level of receipts and sales by industry groupings. The industry groupings are important as they provide a framework for projecting sales and receipts to current levels and also for approximating the impact of excluding particular sales (e.g. food, drugs) from the tax base.

Data for these reports is compiled from administrative records of various federal agencies and from mail surveys. Data is presented for each kind of business or operation classified (unless disclosure rules apply) and includes:

1. Number of establishments
2. Annual sales or receipts
3. Annual payroll
4. First quarter payroll
5. Paid employees for pay period including March 12th

METHOD

GENERAL DESCRIPTION OF MODELLING OR ESTIMATING PROCESS

Methodology for Estimates

Because the census data applies to 1982 it was necessary to develop a procedure which would both update the information and also provide a basis for forecasting future levels of sales and receipts. The procedure involved two steps:

1. Extrapolation to 1985. Because 1985 is the last year with complete data on many major economic variables it serves as the starting point for this analysis. The Alaska Department of Labor prepares the Statistical Quarterly, a publication which presents industry specific data (SIC codes) on a number of reporting units, payroll and average wages. After some refinements for differences in census and labor coverage, labor data for the period 1982-85 was used to estimate 1985 levels of census variables.
2. Projection to future years. The level of retail sales estimated for 1985 was expressed as a percentage of personal income in that year. A separate forecast of personal income for future years was used along with this percentage to approximate the level of retail sales for the forecast period. This approach assumes that the relationship of retail sales to personal income will not vary dramatically. Because there is considerable variation among sales tax states in the treatment of services these values were not projected forward. An examination of the 1985 levels provides an indication of potential revenues obtainable from taxes on various categories of services.

FOOTNOTES

- (1) Petroleum Revenue. Alaska Department of Revenue, December 1986
- (2) Ibid.
- (3) 1982 Tax Capacity of the Fifty States. Advisory Commission on Intergovernmental Relations, May 1985.
- (4) Ibid.

SECTION III

ELF REPORTS AND PAPERS

ANALYSIS OF ELF ALTERNATIVES

**State of Alaska
Department of Revenue
December 4, 1986**

The Effect of Four Possible Changes in the ELF on State of Alaska Severance Tax Revenues

The purpose of this brief note is to examine the effect of changing the relationship of the Economic Limit Factor (ELF) to State of Alaska Severance taxes. The ELF is a number with a value of between zero and one which is multiplied by the nominal severance tax rate or the cents per barrel tax floor to reduce the severance taxes paid as an oil or gas producing lease approaches its economic breakeven point. This analysis will specifically examine how changes in the application of the ELF and in the ELF itself impact oil revenues and production. The focus will be on the North Slope. Cook Inlet production will be considered separately since the economics of these producing fields are dominated by costs associated with the shutdown and abandonment of older low productivity oil wells located on expensive offshore production facilities.

Specifically the following four possible changes are investigated.

1. Eliminate application of the ELF to the current \$.80 per barrel tax floor.
2. Change the ELF formula to one similar to that proposed in HB545 and modified by OMB in which the exponent is modified to raise the tax rate on fields with total field productivity in excess of roughly 100,000 barrels per day and lower the tax rate on fields with production less than this amount.
3. Establish a new severance tax floor at \$1.50 not subject to the ELF and index it for inflation.
4. Eliminate the ELF entirely.

These hypothetical changes in the severance tax law are analysed using the Department of Revenue Petroleum Revenue Forecasting Simulation Model. All assumptions concerning oil prices, transportation costs, and market deliveries are the same as were used in preparing the Department's December 1986 forecast of petroleum production revenues.

The simulation model is used because it can show the changes in average expected revenues and oil production due to a change in the tax law over a wide range of price and transportation cost assumptions. Further, since it is the model used to make the official State forecast of severance tax revenues it conveniently illustrates how the current forecast would change if the severance tax law were changed.

As a general principle, any of the changes in the severance tax mentioned above will increase the average expected taxes levied on the oil producers in the State. Since higher taxes make producing oil a more costly enterprise it is likely that in some instances this higher cost will make production unprofitable. In a broad sense then, it would be nice to know the tradeoff between the increased tax revenue to the State and the reduced investment in oil production and consequently reduced tax base due to the increased cost of producing oil.

Such an investigation is possible but since so many assumptions have to be made, the results will always be subject to dispute. As a practical matter oil producing companies are not a homogenous group with respect to risk preference or financial capacity. One has only to look at the companies producing on Alaska's North Slope to appreciate this distinction i.e. Amerada Hess as compared to Exxon. It is also important to stress that the companies are the one's who make the decisions affecting production and any financial model such as the one used in this analysis can only make reasonable assumptions about the parameter values the companies themselves would choose (price, discount rate, or capital outlay). Further this analysis can only examine the relative merits of oil production in the State of Alaska, since we do not have accurate data on oil production prospects globally. Finally this analysis is done without examining the issue of budget constraints which obviously all in the oil business are facing given the current depressed price situation.

There too many unknowns for this analysis to delve in depth into the relative regional economic impact of public expenditure vs.

private expenditure in the State of Alaska so the discussion will be limited to the effect of changes in ELF on State petroleum revenues and barrels of oil and not on whether those changes make sense for the Alaskan economy.

Eliminate the application of the ELF to the cents per barrel tax floor

This would essentially guarantee the State a minimum severance tax payment for every barrel of oil produced in the State (currently \$. 80 per barrel). Tables 1 and 2 show the change in average expected revenues and production for each of the North Slope oil fields assumed to be in production between the present and 2005. Fixing the severance tax floor would increase average expected revenues between 1987 and 2005 by \$135.42 million in nominal dollar terms or \$95.98 million discounted at 8%. The disincentive to produce created by the fixed floor results in a decrease in average expected production of over 19 million barrels of oil. One way of looking at it is that the State gains an average of roughly \$7.00 for every barrel of oil production foregone.

Prudhoe Bay production is effected the most by this change in the severance tax. This is primarily because after primary recovery Prudhoe will still have a tremendous amount of oil in the ground which may be recoverable with additional investment. On the other hand Kuparuk and some of the other more marginal fields can be seen to provide the lion's share of the average expected revenue increase. This is because these fields currently have calculated ELF's which are much lower than Prudhoe so that at prices which trigger the cents per barrel tax these fields will experience a relatively larger increase in their tax bill.

Modify the ELF Exponent to Reflect Total Field Production

This proposed change in the ELF is contained in a bill submitted in the Alaska House of Representatives in the Spring of 1986. In

Table 1

Production Impact of Fixed Severance Tax Floor = \$.80/bbl
(Millions Bbls.)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	-.04	0	0	0	-.04
1988	-.77	-1.01	-.08	-.08	-.08	0	0	0	-2.02
1989	-.68	-.12	-.11	-.26	-.10	0	0	0	-1.27
1990	-.60	-.12	-.16	-.29	-.13	0	0	0	-1.30
1991	-.56	-.12	-.11	-.31	-.20	0	0	0	-1.30
1992	-.52	-.09	-.11	-.27	-.20	0	0	0	-1.19
1993	-.48	-.09	-.12	-.26	-.24	0	0	0	-1.19
1994	-.45	2.22	-.21	-.19	-.24	0	0	0	1.13
1995	-.40	1.42	-.22	-.11	-.23	0	0	0	.46
1996	-.50	1.18	-.17	-.04	-.26	0	0	0	.21
1997	-.34	-.73	-.11	-.01	-.31	0	0	-2.99	-4.49
1998	-.64	-.72	-.05	.02	-.44	0	0	-1.50	-3.33
1999	-.59	-.49	-.03	.05	-.25	0	0	-.03	-1.34
2000	-.42	-.38	0	.05	-.16	0	0	-.20	-1.11
2001	-.40	-.31	0	.06	-.06	0	0	-.15	-.86
2002	-.02	-.32	0	.05	-.04	-.02	0	-.03	-.38
2003	-.02	-.25	0	.03	-.03	0	0	-.09	-.36
2004	-.01	-.23	0	.03	-.02	-.03	0	-.57	-.83
2005	-.01	-.20	0	.01	-.01	-.02	0	-.02	-.25
Total	-7.41	-.36	-1.48	-1.52	-3.04	-.07	0	-5.58	-19.16

Table 2

Revenue Impact of Fixed Severance Tax Floor = \$.80/bbl
(Millions \$)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	.10	29.66	1.70	0	.50	0	0	0	31.96
1988	9.50	8.92	.11	1.38	.27	0	0	0	20.18
1989	5.16	5.37	0	2.66	.64	0	0	0	13.83
1990	2.74	3.83	-.03	1.51	.30	0	0	0	8.35
1991	3.35	4.37	-.02	1.45	.58	0	0	0	9.73
1992	2.21	4.14	-.03	.84	.38	0	.01	0	7.55
1993	2.71	3.53	-.03	-.01	.66	0	.02	0	6.88
1994	3.12	19.80	.13	-.05	.96	0	.07	0	24.03
1995	2.70	17.43	.10	-.02	1.02	.09	.03	0	21.35
1996	1.75	15.58	.05	.04	.87	.09	.02	0	18.10
1997	1.34	-1.42	.03	.07	.66	-.01	0	0	.67
1998	.30	-2.50	.03	.09	.34	-.02	-.01	0	-1.77
1999	-.53	-3.17	.05	.14	.22	-.02	0	0	-3.31
2000	-.13	-3.51	.07	.13	.13	-.03	-.01	0	-3.35
2001	.13	-3.76	.06	.13	.13	-.06	-.01	0	-3.38
2002	.05	-3.95	.05	.10	.07	-.13	-.01	0	-3.82
2003	.01	-4.09	.05	.08	.05	-.10	0	0	-4.00
2004	-.07	-3.97	.04	.05	.04	-.14	-.01	0	-4.06
2005	-.08	-3.68	.04	.03	.03	-.16	0	0	-3.82
Total Revenue									
Nominal	34.36	82.58	2.40	8.62	7.85	-.49	.10	0	135.42
10% disc	20.07	57.69	1.63	5.21	3.64	-.06	.05	0	88.24
8% disc	22.15	62.23	1.73	5.71	4.18	-.09	.06	0	95.98

this example the formula specification is the one used in the presentation by Dr. Tom Chester at the Tax Committee's September meeting. The formula used in HB545 raises the tax rate on fields with production in excess of roughly 80,000 barrels per day and lowers the rate for lower production rates. The modification presented by Dr. Chester changes the trigger to roughly 100,000 barrels. The purpose of this change is to increase the effective tax rate over current law for "large oil fields" while at the same time keeping severance taxes from discouraging investment in smaller oil fields. Practically speaking it effectively increases revenues to the State through the impact on the prolific Prudhoe Bay field.

Tables 3 and 4 illustrate the field by field impact on revenue and production of this change in the severance tax law. Average expected revenues through the year 2005 increase \$2270.52 million in nominal dollar terms (\$1073.67 million discounted at 8%). As might be expected because of the upside potential of the higher effective tax rate on large fields, should oil prices grow over time the large reserves of Prudhoe contribute the most to this revenue increase. Average expected production would decrease by 28.41 million barrels under this tax regime. Once again the disincentive to produce additional barrels from the large Prudhoe Bay field accounts for the largest share of estimated production decrease. However because the tax burden is lowered for some fields, West Sak and Seal Island actually show greater average expected production. This ELF alternative increases State revenues by roughly \$80 for every barrel of oil production foregone.

Establish a New Severance Tax Floor at \$1.50 Not Subject to the ELF and Index it for Inflation.

Tables 5 and 6 show the field by field effect of this alternative on average expected production and average expected revenues. Indexing the severance tax floor from a \$1.50 base results in an increase of revenues of \$1797.17 million through 2005 in nominal dollar terms (\$1195.04 discounted at 8 percent). This alternative has a devastating impact on average expected

Table 3

Production Impact of OMB Altered Exponent
(Millions Bbls.)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	-.01	-.01	0	0	-.02
1988	-.71	-.05	0	-.02	-.01	0	0	0	-.79
1989	-.63	-.12	0	-.04	-.01	0	0	0	-.8
1990	-.57	-.12	-.01	-.04	-.01	0	0	0	-.75
1991	-.55	-.11	-.01	-.05	-.02	0	0	0	-.74
1992	-.47	-.09	-.01	-.07	-.02	0	-.13	0	-.79
1993	-.45	.09	-.02	-.07	-.03	0	-.23	0	-.71
1994	-2	.23	-.43	-.06	-1.31	0	-.24	0	-3.81
1995	-1.73	.17	-.35	-.06	-1.09	.79	-.3	0	-2.57
1996	-2.37	.15	-.28	-.05	-.9	.72	-.31	0	-3.04
1997	-3.05	-.33	.05	-.05	-.86	.77	-.29	2.99	-.77
1998	-3.19	-.2	.04	-.04	-.68	.7	-.24	1.4	-2.21
1999	-2.72	-.21	.05	-.04	-.57	.62	-.32	-.09	-3.28
2000	-2.18	-.16	.05	-.03	-.49	.61	-.26	.01	-2.45
2001	-2.04	-.13	.06	-.02	-.39	.61	-.2	.05	-2.06
2002	-1.62	-.09	.05	-.02	-.28	.77	-.17	-.07	-1.43
2003	-1.32	-.07	.03	-.01	-.22	.81	-.09	-.03	-.9
2004	-1.06	-.09	.03	-.02	-.2	.73	-.06	.45	-.22
2005	-1.17	-.08	.02	-.01	-.15	.48	-.03	-.13	-1.07
Total	-27.83	-1.21	-.73	-.7	-7.25	7.6	-2.87	4.58	-28.41

Table 4

Revenue Impact of OMB Altered Exponent
(Millions \$)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	5.94	29.29	-.35	0	-3.35	0	0	0	31.53
1988	93.85	38.51	-.7	-2.18	-5.84	0	0	0	123.64
1989	106.32	49.2	-1.92	1.06	-4.8	0	0	0	149.86
1990	114.56	55.31	-2.31	1.08	-5.18	0	0	0	163.46
1991	117.43	40.61	-2.38	1.14	-1.45	0	0	0	155.35
1992	121.4	21.83	-3.43	1.26	-1.61	0	-2.76	0	136.69
1993	124.53	17.32	-4.07	1.71	2.49	0	-3.42	0	138.56
1994	124.27	14.59	-7.22	-3.66	8.69	0	-3.35	0	133.32
1995	122.99	11.42	-7.32	-2.74	6	2.56	-3.53	0	129.38
1996	121.97	5.22	-7.15	-5.63	.76	5.32	-3.83	0	116.66
1997	121.16	2.47	-4.86	-6.91	1.21	15.03	-5.19	0	122.91
1998	123.22	-2.01	-4.39	-6.67	-6.63	17.42	-5.89	-2.87	112.18
1999	123.31	-5.48	-3.66	-5.19	-13.47	20.38	-6.2	-1.7	107.99
2000	123.55	-8.42	-2.85	-3.65	-17.84	27.9	-8.1	-1.26	109.33
2001	118.02	-9.7	-1.81	-2.21	-18.53	31.67	-8.17	-2.3	106.97
2002	112.28	-7.83	-1.49	-1.19	-16.1	41.71	-8.97	-2.37	116.04
2003	106.24	-5.79	-.61	-.45	-12.2	46.2	-10.48	-3.11	119.80
2004	99.26	-4.25	-.2	-.02	-7.99	34.3	-10.51	-4.04	106.55
2005	91.89	-3.1	.17	.06	-5.27	17.56	-9.72	-1.29	90.30
Total Revenue									
Nominal	2072.19	239.19	-56.55	-34.19	-101.11	260.05	-90.12	-18.94	2270.52
10% disc	781.96	166.60	-22.23	-9.90	-28.72	56.40	-22.67	-3.96	917.48
8% disc	927.72	179.68	-26.39	-12.54	-35.58	75.37	-29.26	-5.33	1073.67

Table 5

Production Impact of Indexed Fixed Floor
(Millions Bbls.)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	-.21	0	0	0	-.21
1988	-15.79	-2.93	-.32	-.69	-.44	0	0	0	-20.17
1989	-14.15	-2.4	-.45	-2.18	-.61	0	0	0	-19.79
1990	-12.48	-2.4	-.49	-1.97	-.79	0	0	0	-18.13
1991	-11.77	-2.17	-.44	-1.87	-1.18	0	0	0	-17.43
1992	-10.74	-1.9	-.44	-1.84	-1.18	0	.25	0	-15.85
1993	-9.35	1.68	-.45	-1.86	-1.42	0	.43	0	-10.97
1994	-8.24	-.77	-.47	-1.34	-1.44	0	.42	0	-11.84
1995	-7.15	.04	-.51	1.09	-1.43	.06	.46	0	-7.44
1996	-7.23	.1	-.45	.82	-1.45	.03	.49	0	-7.69
1997	-6.87	-1.95	-.29	.63	-1.64	0	.5	2.99	-6.63
1998	-5.93	-1.65	-.27	.47	-1.28	-.01	.52	1.5	-6.65
1999	-5.46	-1.02	-.31	.37	-.79	-.04	.54	.03	-6.68
2000	-4.12	-.93	-.21	.36	-.57	-.04	.43	.2	-4.88
2001	-3.43	-.91	-.18	.35	-.37	-.06	.36	.15	-4.09
2002	-1.93	-.79	-.08	.08	-.23	.02	.32	.03	-2.58
2003	-1.84	-.91	-.04	-.02	-.25	.03	.27	.09	-2.67
2004	-2.12	-.94	0	-.02	-.32	.06	.2	.57	-2.57
2005	-1.88	-.67	0	-.01	-.36	.06	.16	.02	-2.68
Total	-130.48	-20.52	-5.4	-7.63	-15.96	.11	5.35	5.58	-168.95

Table 6

Revenue Impact of Fixed Indexed Floor
(Millions \$)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	223.91	80.84	5.87	0	2.27	0	0	0	312.89
1988	180.5	58.65	2.21	8.56	7.33	0	0	0	257.25
1989	109.65	44.29	6.21	32.07	14.94	0	0	0	207.16
1990	77.65	37.84	7.34	32.63	16.36	0	0	0	171.82
1991	76.29	36.51	7.13	34.7	26.88	0	0	0	181.51
1992	55.19	30.8	5.4	33.15	25.8	0	4.68	0	155.02
1993	43.17	24.46	5.27	23.42	29.17	0	5.72	0	131.21
1994	34.04	36.88	4.44	17.49	27.57	0	4.36	0	124.78
1995	24.57	30.63	3.56	13.49	25.57	5.28	3.4	0	106.50
1996	15.6	25.97	2.67	9.99	22.87	5.05	2.43	0	84.58
1997	10.22	6.09	2.04	7.53	20.46	5.51	0	0	51.85
1998	1.43	2.25	1.39	5.39	14.16	3.78	-.71	.07	27.76
1999	-2.09	.32	.8	3.76	10.22	2.46	-1.18	.04	14.33
2000	-1.79	-1.03	.42	2.2	7.62	.98	-.92	.04	7.52
2001	-1.61	-2.26	.02	-.1	5.84	.86	-.87	.02	1.90
2002	-2.19	-3.08	-.05	-.15	4.29	.39	-.98	.01	-1.76
2003	-5.34	-4.78	-.07	.1	2.71	.2	-.95	0	-8.13
2004	-8.9	-5.29	.03	.07	.61	.01	-.76	-.01	-14.24
2005	-8.95	-4.84	.05	.04	-.33	-.12	-.63	0	-14.78
Total Revenue									
Nominal	821.35	394.25	54.73	224.34	264.34	24.4	13.59	.17	1797.17
10% disc	562.83	247.88	30.11	117.70	117.13	7.82	7.57	.05	1091.10
8% disc	604.33	270.22	33.57	132.65	135.90	9.72	8.60	.06	1195.04

production which is reduced by nearly 170 million barrels. This impact on production is a direct result of the increased likelihood that such a tax would cause a premature shutdown in the already producing oil fields or would make additional investment uneconomic. This alternative has a most dramatic effect on Prudhoe Bay production because it significantly increases the probability that Prudhoe Bay shuts down prematurely. As will be seen, eliminating the ELF entirely results in much greater expected revenue without as severe an effect on production. This is because with the percent of value tax the State shares in the high oil price value cases and also shares the loss in the low oil price case (down to the current \$.80/bbl floor). The fixed indexed floor fails to reflect the relative change in profitability of falling oil prices. The indexed floor increases State revenue by roughly \$10 for every barrel of production foregone.

Eliminate the ELF Entirely

This alternative would remove entirely the severance tax relief given to low productive oil wells.

Tables 7 and 8 show the revenue and production effect on a field by field basis. Total average expected revenues through the year 2005 increase by \$5082.43 million, \$2111.87 million discounted at 8 percent, while average expected production falls by 84.67 million barrels. Prudhoe Bay because it dominates North Slope production over the next ten years accounts for over half of the increased revenue. Kuparuk one of North America's largest fields because its current ELF is roughly .6 accounts for the largest relative increase.

Prudhoe Bay with its large reserves accounts for a 28 million barrels of the production loss, while the West Sak field with its relatively low productive high cost wells accounts for another 21 million barrels of the average expected decline in production. Eliminating the ELF increases State revenue by roughly \$19 for every barrel of oil production foregone.

Table 7

Production Impact of Eliminating the ELF
(Millions Bbls.)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	-.05	0	0	0	-.05
1988	-1.1	-1.01	-.08	-.15	-.09	0	0	0	-2.43
1989	-.96	-.18	-.11	-.51	-.12	0	0	0	-1.88
1990	-.85	-.18	-.16	-.55	-.15	0	0	0	-1.89
1991	-.8	-.17	-.12	-.58	-.22	0	0	0	-1.89
1992	-.72	-.14	-.12	-.6	-.22	0	-.3	0	-2.1
1993	-.67	-.13	-.13	-.62	-.27	0	-.5	0	-2.32
1994	-1.19	-.52	-.67	-.49	-4.76	0	-.5	0	-8.13
1995	-.99	-.87	-.61	-2.49	-3.9	-1.41	-.55	0	-10.82
1996	-3.2	-.73	-.5	-1.98	-3.23	-1.71	-.57	0	-11.92
1997	-2.97	-.8	-.14	-1.56	-.48	-2.13	-.58	-2.99	-11.65
1998	-2.65	-.7	-.08	-.19	-.44	-1.97	-.6	-1.92	-8.55
1999	-1.63	-.47	-.09	-.07	-.2	-1.69	-1.75	-.64	-6.54
2000	-.79	-.39	-.08	-.16	-.09	-1.55	-1.45	-.74	-5.25
2001	-1.01	-.37	-.1	-.21	.06	-1.3	-1.23	-.69	-4.85
2002	-1.75	-.39	-.08	-.1	.19	-2.93	-.34	-.55	-5.95
2003	-2.61	-.5	-.06	-.02	.17	-2.63	-.27	-.62	-6.54
2004	-2.15	-.64	-.03	.01	.05	-2.49	-.2	-1.06	-6.51
2005	-2.04	-.58	-.05	-.08	-.06	-1.15	-.14	-.8	-4.9
Total	-28.08	-8.77	-3.21	-10.35	-13.81	-20.96	-8.98	-10.01	-104.17

Table 8

Revenue Impact of Eliminating the ELF
(Millions \$)

Year	Prudhoe	Kuparuk	Milne	Endicott	Lisburne	West Sak	Pt. Thomson	Seal Island	Total North Slope
1986	0	0	0	0	0	0	0	0	0
1987	5.76	30.42	2.03	0	.58	0	0	0	38.79
1988	100.45	38.53	1.17	3.19	.57	0	0	0	143.91
1989	114.81	49.32	3.08	13.28	7.21	0	0	0	187.7
1990	125.23	55.31	3.9	14.88	13.53	0	0	0	212.85
1991	129.21	56.02	4.01	15.87	21.39	0	0	0	226.5
1992	134.94	59.97	5.59	17.84	23.66	0	3.2	0	245.2
1993	140.42	59.92	6.48	24.57	33.16	0	4.07	0	268.62
1994	148.74	62.93	3.18	24.04	3.76	0	3.93	0	246.58
1995	148.9	59.93	2.92	9.4	13.16	10.7	4.29	0	249.3
1996	152.12	63.71	2.91	11.01	21.54	14.22	4.86	0	270.37
1997	162.67	60.9	5.07	11.81	46.78	28.35	6.7	0	322.28
1998	167.04	60.34	4.95	22.4	47.85	33.54	7.66	-2.04	341.74
1999	169.48	58.82	4.63	22.23	47.02	39.63	-6.57	3.12	338.36
2000	171.87	57.33	4.11	20.46	46.3	55.66	-2.08	4.45	358.1
2001	167.58	54.07	3.56	15.26	45.39	64.29	2.72	5.41	358.28
2002	163.87	50.23	3.11	11.19	44.26	48.56	14.08	6.66	341.96
2003	159.23	30.89	2.54	10.03	41.89	60.19	13.48	9.99	328.24
2004	154.36	19.41	1.87	7.3	37.3	72.01	13.56	11.64	317.45
2005	147.21	12.71	.32	4.91	33.15	67.92	13.51	6.47	286.2
Total Revenue									
Nominal	2663.89	940.76	65.43	259.67	528.5	495.07	83.41	45.7	5082.43
10% disc	948.54	383.01	26.18	98.23	157.56	107.91	20.72	8.45	1750.61
8% disc	1137.24	448.57	30.79	116.89	196.10	143.89	26.70	11.68	2111.87

Summary and Analysis

All four of the proposed changes in the severance tax result on average in increased State revenues. Average expected oil production, however, is lower due to the negative impact of potentially higher taxes on expected profitability.

The effect of each of these proposed changes is analysed using the Monte Carlo simulation model. This type of model evaluates many possible combinations of variables effecting oil production revenues including high prices where taxes are not so important in determining development feasibility and low prices where taxes may be an important consideration in deciding whether or not a project is viable. The output of the model is determined not only by the scenarios of the prices and costs and quantities entered as input into the model but also by the probability assigned to each scenario. The model results, in this case State petroleum production revenue by year to the year 2005, are depicted as the probability distribution of possible outcome. Another way of looking at the output is to say many possible outcomes are evaluated and this is what to expect on average will occur. The analysis of these changes in severance tax law is of course only as good as the input into this model. Department of Revenue analysts have weighted the inputs into the model which may or may not correspond to the way in which the different producing oil companies would weight them. Further the feasibility part of the model uses a hurdle rate 8% real and assumes no budget constraints and no competing global investment alternatives. Those caveats aside the results of this analysis are summarized as follows.

1. Fixing the severance tax floor at \$0.80 per barrel has the least impact on expected State revenues and has the least negative impact on expected North Slope production.

2. Eliminating the ELF entirely, generates the largest average expected increase in State revenue.
3. Increasing the fixed floor to \$1.50 and indexing it to account for inflation has the greatest negative effect on average expected production.
4. Because the real upside potential for State revenue continues to depend on the share of the value of Prudhoe Bay production taken by the State, modifying the ELF to reflect total field productivity is the most efficient alternative in terms of dollars gained for every barrel foregone (\$80 per barrel as opposed to \$7 per barrel for the fixed \$.80 per barrel ELF alternative). This is because this tax increases revenues while at the same time mitigating the negative effect on average expected production. The ranking of ELF alternatives using this type of revenue maximizing criteria is as follows.

1) Modified Exponent ELF	\$80/bbl
2) Eliminate ELF	\$49/bbl
3) Indexed Floor	\$10/bbl
4) Fixed \$.80/bbl Floor	\$7/bbl

5. The production disincentives are generally associated with development of the so called marginal fields, and enhanced recovery investment in Prudhoe Bay and Kuparuk although in some very low price cases no doubt potentially higher taxes cause even these already producing fields to be shut-in.

The above analysis says nothing about the impact of any of these hypothetical tax changes on Cook Inlet. Currently Cook Inlet production is roughly 50 thousand barrels per day. Because much of current production is from a large number of wells with average daily production less 300 barrels, the ELF under current law is zero or nearly zero for most oil producing leases. As a result FY 1986 oil severance collections are estimated to be less than \$2 million or roughly \$.12 per barrel. If a minimum tax of \$.80 per barrel were levied, assuming no fields were abandoned,

severance taxes would increase to \$12.73 million. Although there is a considerable difference in terms of well productivity and profitability among the Cook Inlet fields, given the economics of field abandonment it is likely that the bulk of production would continue even with higher taxes burden. On the other hand additional investment in further production would no doubt be much much lower than it would be under the current tax regime. It may be important to note that Cook Inlet oil production is an integral part of the regional economic base on the Kenai Peninsula. Eliminating the ELF would probably shutin Cook Inlet production. The modified exponent ELF would have no negative impact on Cook Inlet because all these fields produce much less than 100,000 bbls/day.

TRANSCRIPT OF PRESENTATION ON ELF
given by Gregg Erickson
TAX POLICY COMMITTEE MEETING - September 11, 1986

TAPE 2, SIDE 1, COUNTER #238

The ELF was established in 1977 and as Mr. Monkman told you, the ELF is a tax break. The purpose of the ELF as it was established in 1977 was to reduce the tax rate. Oil producers like the ELF. Any proposal to [increase] the ELF is [not] going to win favor with the oil producers and give them more money, allow them to keep more of the proceeds of the production of oil than they keep now.

The ELF can reduce the tax rate by a lot or it can reduce the tax rate by a little depending on one major factor. And that is the average per well productivity. If the average well in a field produces 300 B per day, that field will pay a lower tax rate under the ELF, other things being equal, than if the average per well productivity in the field is 1000 B per day. The average per well productivity is always the major factor in establishing the ELF and it needs to be kept in mind. We'll be coming back to that again later.

The ELF is always a number, and the number is always between zero and one. If you like, you can think of the ELF as a percentage that's applied to the regular nominal percentage tax rate. That's another important concept.... Right now, Alaska has a nominal percentage severance tax rate of 15% for some fields and 12.25% for some fields, and some fields change around from 15 to 12.25% because of amendments to the severance tax law that were adopted in 1981 and we'll talk about those later. That nominal tax rate gets reduced by the ELF by multiplication of this number (between zero and one, remember) times the nominal percentage rate. So, if the ELF is .5 (one-half) then the nominal tax rate is reduced by a half. So, [if] the ELF is .5 and our nominal percentage rate is 15%, the effective percentage rate is half of 15%, or 7.5%. Oil companies like the ELF, it reduces their tax rate.

I think that we can understand how this works best now by taking you to the never-never land of charts and graphs. (*) I know that it's a hard thing for some people to grasp the kind of geometric concepts we are going to be dealing with, so, Mr. Chairman, if it's alright with you, I'd be appreciative if people would interrupt me and say that they don't understand a particular concept that I'm trying to get across.

This is a picture of the Economic Limit Factor. Start out by looking at the two axes here, the two lines. The lower axis right here is...daily output per well. [It] starts out here at 50, but you can imagine it going even further down here, to zero. That means 50 B of oil per day, per well. It goes way on up here to 2500, 2800 B per day per well. The other axis on this chart is the ELF. And as I told you before, if you recall, it's a number between zero and one. [Y]ou see those numbers here, starting at 0 at the bottom, .5 in the middle and 1 at the top. If you have an oil field and the ELF is 1.0, you get no tax reduction because your nominal tax rate is multiplied times 1 which means it's not changed at all. If your ELF is .5, it's multiplied by one-half, it means you pay half of the nominal tax rate. If your ELF is 0, you pay no tax at all. Oil companies like the ELF.

You notice that fields have different average daily production, some fields have very high productivity in comparison to others. Prudhoe Bay field has, or had, because this graph was originally made about nine months ago, an average

(* Refer to charts attached to transcript.)

daily productivity as calculated for the ELF of around 2500 B per day per well. Milne Point, on the other hand, has a lower productivity and Kuparuk has a lower productivity still. If we applied the ELF in exactly the same manner to Prudhoe Bay, to Milne Point, and Kuparuk, it affects them differently. Prudhoe Bay, because it has the highest productivity, gets the least tax break. Kuparuk, because it has the lowest per well productivity, gets the biggest tax break from the ELF. And if we had a field down in this region, it would get an even bigger tax break from the ELF.

Now we say that the ELF is a function. [T]hat means it depends on the daily output per well. That means that if you know the daily output per well you can, or at least you have been able to in the past, determine what the ELF is going to be, what number between zero and one gets multiplied times that nominal tax rate to produce the effective tax rate, which is what Mr. Nelson and his oil company people are really concerned about, the effective tax rate. And it's really what the State of Alaska is concerned about too. In terms of all the factors that we're concerned about on severance taxes, it's the effective rate that people have to pay that makes the difference, not whether the nominal rate is 15% or 30% or 2%.

Now, you'll notice that this curve has a shape that puts every point out here as we move to the right along this lower axis, we also move at every point up on the fractions of the ELF axis. Except for this region down here at the bottom, we'll be coming back to this as we calculate the ELF, but that region is the economic limit region.

The framers of the legislation in 1977, that christened the ELF, that created the ELF, decided that they wanted to insure that fields of relatively low productivity such as they expected to develop among the Cook Inlet fields at that time, would not be forced to shut down before the cost of [operating] the fields exceeded the value of the oil that was being produced. And there was a problem that Milton Lipton and many others spoke to the Legislature about and they called it the premature shut-down effect. If you had too high a tax burden at these low productivity, and presumably low profitability fields,...those fields would shut down, even though they could continue to make profits if the taxes were reduced and continue to make, at least if not profits, at least enough money to bear their operating costs and to keep the jobs and keep the economic activity represented by those fields. Economist and experts and business people alike agreed that it didn't make much sense to shut a field down before the actual cost of production exceeded the value of the oil. Taxes, and royalties too, were dead weight that had to be carried by the production of those fields and so this device was created to, at least as far as the severance tax is concerned, eliminate that dead weight drag on those fields that might otherwise shut [them] down.

We'll come back to that concept so it's not necessary that everybody grasp that in its entirety. But, I'd like to stop right now while we've got this graph in front of us and ask any member of the committee, with your permission, Mr. Chairman, if they have any questions or if there's anything I've covered so far that doesn't compute.

COUNTER #377

(QUESTION from Sen. Eliason: Just a general question, the lower level of production, there, and in fact what they're paying is only 7½% or is it the 15%, is that what we're saying.)

We're saying that Prudhoe Bay, under these assumptions, which are a little bit out of date right now, is paying 83% of, in the case of Prudhoe Bay, 15%. And Tom Chester, our expert, or maybe Mr. Nelson who probably knows a lot about Prudhoe Bay too, can give you the exact number.

(QUESTION from Sen. Eliason: The question of course, or the point was, in other words, that's the 7½%, that low production field is paying 7½% rather than the 15.)

If the nominal rate on Kuparuk was 15% that would be true. However, the nominal rate on Kuparuk is, if I am correct, 12.25%. [They're] paying half of that, that's correct.

(COMMENT from George Nelson: I want to make one correction because in Prudhoe Bay we're paying, based on one, 15% simply because of the fact that for the first ten years, by the law, the factor cannot, if it calculates out above .7, it's always going to be 1. So it's July 1987 before Prudhoe Bay can really use ELF to the advantage of reducing that percent.)

Mr. Nelson is absolutely correct. The reason, and I'm sorry I gave the misrepresentation if I did, that Prudhoe Bay's actual tax rate was reflected by this calculation, because as he says, there's a special exception in the law for Prudhoe Bay which was established in the 1981 tax amendments. But, the ELF by itself works this way, and if the ELF applies, which it does not right now to Prudhoe Bay, Prudhoe Bay would be paying 83% of whatever its nominal rate would be.

(QUESTION from Rep. Grussendorf: The ELF is based on the output per well, or site. What are advantages or disadvantages if we went by field?)

The output per well was chosen, it's my opinion anyhow, that in 1977, it was chosen by the legislature as the factor to determine the ELF because they believed that that was the most readily measurable indicator of field profitability and they wanted to have lower taxes for fields that had lower profits and higher taxes for fields that had a higher profit. But they wanted to retain the concept of a severance tax, as Mr. Monkman mentioned to you. They didn't want to create an income tax here and call it a severance tax, although, they in effect got a little bit close to that perhaps at times.

They chose this one factor recognizing, I think, that there were a lot of other factors that affect profits as well. And for example, we have here Kuparuk, which may well be a more profitable field than Milne Point, and yet the Milne Point has a very small number of relatively high productivity wells, or at least was anticipated to have that situation. And Kuparuk has a relatively larger number of lower productivity wells. As a consequence, Kuparuk gets a bigger tax break than Milne Point. That shows in effect, the arbitrariness, if you will, of just using daily output per well as the indicator of relative profitability. Because if the situation I just described is true, if Kuparuk is a more profitable field than Milne Point, then this ELF factor has not produced the results that I think the framers of the legislation in 1977 wanted to produce. And it might well be that that problem is a consequence of the failure of this ELF factor to reflect total field size. [T]here are a number of factors, indeed, besides daily output per well and total field size, that could be taken account of in an ELF kind of calculation. And the framers chose daily output per well.

(QUESTION from Rep. Sund: How is the curve generated?)

We're going to take you all through that, in excruciating detail, I'm afraid.

(QUESTION from Sen. Eliason: Could also the ELF be construed as an incentive to put more wells in a field?)

Indeed, it could be. However, there are technical provisions in the law which say that you really don't look at number of wells, you look at the number of days that a well operates multiplied. So, it's really well days that are used to try to prevent the incentive, or eliminate any incentive for gold-plating or over-drilling a field. Now, I don't know that any studies have been made to indicate whether or not there is any residual incentive or not. My

suspicion is that its minor if it is. You'll see those technical provisions when we go through the actual translation of the ELF which is coming next.

(QUESTION from Bart Garber: On your graph, the figures on the bottom line, those are constants for the formula, they don't ever change?)

The figures on the bottom line change for every field, from day to day.

(QUESTION from Bart Garber: No, I understand that, what I'm saying is as far as the formula itself goes, to determine the ELF rate, the number of barrels pumped per well don't change?)

[I don't] know if I understand your question correctly. Let me rephrase it and tell me if I'm getting back to you. Does a well this year pumping at 1300/bbl per day get exactly the same ELF this year as it will five years from now if the law doesn't change?

(QUESTION from Bart Garber: No, that's not what I meant. My question is are those figures constant there. Will you always use those figures. In other words, if a well is pumping at 1300/bbl daily output per day, I'm not saying will that well remain constant, I'm saying will that figure remain constant at wherever you're at on ELF?)

Like at .7. If you'd asked me that question last year, or 13-14 months ago, I would have said yes, absolutely. But, I would have been wrong because, as Mr. Monkman mentioned, there is a provision in the law which [was never] really thought [much about], to change this production-at-the-economic-limit number. You'll see how that enters into it later on. And it's nobody's fault but my own that I would have misanswered your question, but I think there were a lot people who would have made the same mistake a year and a half ago.

(QUESTION from Gordon Harrison: I see a question, Gregg, to follow up on, Sen. Eliason's question about the number of wells. Is well spacing regulated, the number of wells that is, by the Oil and Gas Conservation Commission?)

Yes it is. Indeed, the Alaska Oil and Gas Conservation Commission establishes regulations and when the oil companies wish to change the average spacing, they need to get permission. However, the Commission grants or withholds that permission based on generally a reference to engineering practice rather than economic analysis. Or at least that is to my understanding.

COUNTER #523

(QUESTION from Rep. Grussendorf: Gregg, that was the concept of the formula?)

We go from the general, and that can be called general, to the formula itself. Now folks, don't automatically assume that you can't figure this out. This is the formula, the ELF here equals this mathematical construction. We're going to take you through this mathematical construction and it's not nearly as complicated as it seems. The only thing that you may find unfamiliar, and I think most of you will have had some familiarity with it, is the use of the exponent. This little 'exp' in the formula means that the expression following it is, taken together, an exponent. If you recall what any...exponent says, you raise the number to a power, and if the exponent is two, that means you multiply the number by itself. So, four squared ([a four] with a little two above it) means four times four, and that's all we're doing here, but a little more complex than that because we use fractional exponents. But, that's the principle.

The formula has in it abbreviations because if you wrote the whole thing out it would just be too long. And one of those abbreviations, the first one,... ELF,... is an abbreviation [that] stands for Economic Limit Factor. The second abbreviation is PEL. It stands for Production at the Economic Limit. Now you recall the graph we showed you just a moment ago, had a zero tax rate at [an] average daily per well production of from zero to 300 B. The concept

behind that was that it would probably take about, it's a real rough and arbitrary kind of number, but nevertheless, take about 300 B a day for an average well in the average field to make its expenses. Now there's all sorts of things that vary. [O]bviously the cost of the well can vary enormously. [A]s we've discovered, the amount of money you get from the oil can vary enormously, and all these affect how many barrels you have to produce to just cover your operating expenses. Incidentally, the operating expenses in the statute were defined very, very narrowly. But, as a rough approximation...the law says you will take 300 B unless a showing is made otherwise. And up to now, everyone has calculated their ELF using 300 B, so we use it here today in our calculation. [I]t's defined in the law as times the number of wells and times the number of days the well is operating, actually defined as well days. So that the production at the economic limit for this month for this hypothetical field which is similar to Prudhoe Bay,...would be 4,869,000 B. The concept there is that if the Prudhoe Bay owners could get 4,869,000 barrels [per month], they would at least make their expenses. So we plug that number, 4,869,000, into the formula at this point, and at the bottom down here....

The second factor in the formula is the total production for the field for the month. Since we're talking about 300 B per day, and yet the tax gets paid on a monthly basis, we have to calculate in the total number of barrels in the field per the whole month. And that's just simply the monthly production, but we've also shown it here as the result of multiplying the average number of operating wells during the month times the number of days of production for the month times the average daily production per well. And in the example here, we show 541 wells, assuming each of them operated for 30 days, and the average per well productivity was 2,477 B per well, that means they actually produced forty million barrels in that month. So, they actually produced, if this example is correct, roughly 20-25 times as much oil as is necessary under this very rough calculation to meet their operating expenses that we calculated up here in this calculation.... Remember this may not actually be enough to meet their operating expenses, or maybe much more. [I]t's what the statute says you use, and I'm explaining not anything that's in the statute when I say operating expenses, but the concept. Well, actually it is in the statute elsewhere, but it's the concept here that we're talking about.

Then we have to plug in the number of well days in the exponent, and that's calculated simply as the number of operating wells during the month times the number of days each well operates. For example, in our case here,...541 wells [times] thirty days gives us [about] 16,000 well days.

Now we come to the calculation. But let me stop right here and talk about these definitions.... Does anybody have anything that they don't understand about these definitions so far?

END OF TAPE 2, SIDE 1, COUNTER #638

TAPE 2, SIDE 2, COUNTER #001

(Beginning of tape unintelligible.)

...show us that it should be more. Up to now, it has been 300 B a day because the operators have either not come in, or if they have, have not satisfied the requirements that they satisfy.

(QUESTION from Sen. Abood: Where do the numbers (tape unintelligible) to break even?)

Three hundred. It's in the statute itself. It says "it shall be presumed to be 300/bbl per day per well, unless..." etc.

(QUESTION from Rep. Martin: Is it possible to look at this formula as a disincentive for oil production. To me, the more they produce, the more tax burden that they have. In a way, it may be worthwhile for production companies

to say let's keep it at a certain level, and therefore we know that our tax factor will be decreased.)

That's entirely possible. The formula is based, however, on the assumption that these more productive fields are more profitable. Now if that assumption doesn't hold or the higher profits are not more than enough to counterbalance the higher taxes, then your supposition could be correct.

(QUESTION from Rep. Martin: Especially at the lower price market, I can see where they want to produce as much as they want at the high prices, because they get more and more percentage of the profit. But in this flexibility we have now, what's to say that a company won't say hey, now it's our turn to pay less taxes and get more profit at the lower price market?)

Well, if I was an oil company, I [c]ould certainly say that.

Now, we have to go and plug these numbers in where...these acronyms [were]. Let's go back up and look at the formula again one more time.

* * *

[There are] two parts to the ELF formula: the exponent, which is everything within these parentheses starting here and going over to here, and the inverse function, which is everything within these parentheses starting here and going over to here.

In calculating, let's go through the inverse function first. We plug in the PEL right here, the Production at the Economic Limit, which we calculated up here, and that's 4,800,000 some barrels. We plug in the Total Production here, and that's 40 million, and we divide 40 million into 4,800,000. Now, 4,800,000 is a lot smaller number than 40 million, so the result is less than 1. It's a fraction and in this case it's .12, a little over 1/10th. After we make this division, we plug that number in right there.

Now the formula says that you take that little fraction and subtract it from 1. So we do that here, and we get the result of .8789. Now if there was no exponent, that would be the ELF. And indeed, as you will see, as we go back over the history of the 1977 session, that as originally proposed...was all there was to the ELF, was just that calculation we just made. And if that had been the case, and the ELF applied to this particular field, then the nominal tax rate would be multiplied times .8789 to produce the effective tax rate. The effective tax rate would be 88 percent, roughly, [of] the nominal rate. But for reasons that we'll come back to later, the exponent got added.

The exponent is calculated by a constant here, which is 460 (that's a dimensionless constant, it's in the formula, it's in the statute, it's plugged into anything you do with the ELF under this current law) times the number of well days, and that's 16,230, so we plug that in right there, times the PEL, which we calculated up here as some 4,800,000. We can multiply or divide these in any order we want. And [when] we do that,...divide the 16,000 by the formula, and you get a very small number, and you multiply it by 460, it gets large enough so it's always generally over 1. And the results here, if you'd want to take a calculator and do it, multiply 460 times 16,000, and divide the results by some 4,800,000, you get this number. Let me stop right there and see if people have followed me so far.

COUNTER #59

(QUESTION from Rep. Sund: Where does the 460 come in and what's the theory behind it?)

I'd like to defer that until we get into the discussions in the free conference committee in 1977, because I think that's the easiest place to bring that in, but I'll tell you right now that it was a means of...changing the shape of this curve, and it was a means basically of pushing this curve this way. We'll get back to that.

So we've got now this inverse function which has been reduced down to .87, and if it wasn't for the exponent, that would be the ELF, and we've got this exponent. Now normally, this exponent is written just a little bit above the number to which it applies, but because the exponent is so large, we use this different notation, this 'exp'. And if you look in the statute, 43.55, you will find that formula just exactly as we've written it here. The number comes out to 1.5 and probably most of you are not familiar with raising a number to a fractional power, but you can think of it like this. Suppose this exponent was 2, that would look a lot more familiar. It would say .87 squared, with a little tiny 2 right above here and that would be the same thing as we've got written here, except with this being a 2 instead of a 1.5.

Well now what happens when you multiply, usually you think when you square a number it gets bigger, like 4 squared, raised to the second power is 16, that's a bigger number than 4. Now if the number being raised to the power is less than 1 however, you're multiplying a fraction times a fraction and when you multiply a fraction times a fraction you get a number that is smaller. And, in fact, if you multiplied, if the number here was just .8, and the exponent here was 2, you would be multiplying 8 times 8, which is 64, which would make this number here not 64, but .64. In other words, it would reduce it. And that's indeed what happens here. Because this exponent is greater than one, and so if the exponent was one, it would have no effect on this number, and if it was smaller than this number it would make it bigger. But we don't have to worry about that. Basically, if you've got a calculator, plug it in and press the exponent button and it will do it for you.

The result of raising .8789 to the 1.5 power is .82. It's higher than it would be if we were raising .8 to, squaring it, and you can see how that relationship goes, I hope. This is the one part that involves mathematics that most people probably aren't familiar with, but fortunately we have calculators now [so] we [don't] have to be familiar with it.

Does anybody have any questions about the basic calculation about the ELF.

Okay, what happens when we change some of these numbers. Well I ran through three examples here just to show you quickly the results of some adjustments to this ELF calculation. [I]n this case we've increased the exponential constant. It was 460, [and] it is 460 in the statute. What if that number were 1000. Well, we've run through here, and I won't take you through it at any length because you have in front of you the printed copy of this. I've highlighted with bold numbers every number that has changed from our previous example. This number is changed, this number is changed, and this number is changed.

The result of an increase in the exponential constant is a decrease in the tax. The exponent gets larger, you take a larger exponent and apply it to the same basic ELF and the result is a smaller number. Like raising a number to the third power instead of to the second power. So, just to go over it again, if the exponential constant is increased, the tax gets decreased, and in 1977, as you'll see, this was one of things that the free conference committee which met for almost two weeks argued and argued and argued about.

COUNTER #119

(QUESTION from Sen. Abood: Was that where your 460 came in?)

The 460 was the number that previously took the place of 1000. Yes, the answer to your question is yes.

(QUESTION from Sen. Abood: I understand that. In the free conference they argued this 1000 to 460?)

Well, 1000 wasn't one of their options, but they argued the difference between 750 and 300.

(QUESTION from Sen. Abood: This was an arbitrary figure that they were trying to work out?)

They wanted this curve, as you'll see, to look the way they wanted it to. And that number, this 1000 or 460 or 300, makes a significant difference on how that curve looks and who gets hit with a tax jab and who doesn't.

(COMMENT from Sen. Abood: So more is less.)

In this case, more is less. An increase in the exponential constant means a decrease in the tax. And you may not be surprised to learn that the Senate, in 1977, wanted a bigger exponent and the House wanted a smaller one.

(COMMENT from Sen. Abood: I wasn't there at the time.)

(QUESTION from Sen. Eliason: Do you have the names of the free conference committee members?)

I certainly do. (Pause) Let's take a look here at the results if the exponential constant is reduced. [It's] just the opposite, I've run it here from 460 down to 300. I've run through the calculations in exactly the same way. The exponent here becomes 1. And if you recall our earlier discussion, an exponent of 1 means that the number to which it is applied is unchanged. The result is an increase in the taxes you would expect. What happens if, remember there's another constant in the calculation, and that was the PEL here, the 300/bbl per day in our other calculation, here I show in Case 4, the results of changing that 300 to 400. Now this change could come about as...a consequence of the law being changed. The law currently says the production at the economic limit is assumed to be this calculation right here with 300. If they change the law to make it 400, the result would be as we'll show you here now. It could also come about as a consequence of the oil companies petitioning and the Dept. of Revenue approving a higher PEL allowance for a particular field. The result, I won't carry you all the way through this, just go down to the bottom, is in this case, a very small decrease in the tax. Basically we're saying here this is the amount of oil you get for free, and naturally that reduces the tax.

Now if this had been, the result here is reduction from .822, I believe, to .816, a very small reduction. But if this had been a much smaller field, and if this factor in the calculation right here had been smaller, the result could have been much more significant in terms of a tax reduction. But the principle [still] holds, and that is when the PEL constant is increased, the tax decreases. And that tends to be more important for the smaller fields, but it holds true for all fields. And I won't show you another example, because it's just the other way around. If the PEL constant is decreased, the tax increases.

That is how the tax is calculated and now it seems like the best way is to run this sort of backwards to show you how [the legislature got to this point] ([though] nobody really knows what went through the collective collegial bodies' minds when they make a decision like this). [W]hat was in the minds of the legislators who grappled with these problems in 1976 and 1977, [what were] some of things that they were thinking about? [T]o do that, I'd like to start with the tax law as it existed in 1977. This chart is actually from the 1977 session, and the axes here are the average barrels per day, the same axes that we had on our other chart, and the percentage tax rates, not the ELF here, this is the total percentage tax paid. So it's similar to what the ELF is but in this case we didn't have an ELF at the time and we're looking at the effective tax rate which, in the case of the '77 law, was the same as the nominal rate.

Let's focus on this scalloped curve right here. This is the law as it existed in 1977. It had been adopted in the 1973 special session. Some people call it the pipeline session. The law provided that the first 300/bbl of oil produced from a well during a day were taxed at 5%. And with what's an increasing block structure, which is very similar to the kind of structure that

you pay [on] your electric bills in most areas, except reversed. With electric bills, you usually pay less for the higher consumption, and in this case, the more you produce, the higher was your tax rate. Now those blocks produced this kind of scalloped appearance when they're applied to the average daily production and the rate that you're actually paying. For the next 700 B the rate was 6%. So you paid 5% on the first 300 B and 6% on the next 700 B, which meant that the average rate, which is what we're talking about here, never quite got up to 6%, because you always had this low price block down here. The next block, the final block, which was everything over 1000 B was taxed at 8% flat tax. So that if you've got it way, way out here, you eventually got close to 8%, and it was about 7.5% here around 3,500 B per day. That was the tax as it stood, so the effective rate, if you had 4,000 B per day of production, was about 7.6%. The top marginal block was 8%. Nobody was taxed more than 8%. If you were very, very productive in terms of average daily per well production, your tax rate was approaching 8%.

COUNTER #206

Okay, what was wrong with that? Why did the legislature want to change it? Well, I think there were two things in the minds of this special oil and gas and pipeline impact committee when they proposed what became known as House Bill 144. They wanted to reduce the tax rate for low productivity fields. This is the same kind of declining block structure under the bill that was introduced by the special committee that was formed to study this. And that bill reduced the tax rate for fields with productivities of less than about 1200-1300 B per day and increased the tax rate, substantially increased the tax rate for the high productivity fields. It was a device, a proposal that would have increased the taxes for the fields that have high average daily production and would have decreased the taxes for fields with low average daily production. Why did they want to do that? Well, clearly one thing that was in their mind and that they said in their report was that they were fearful that a 5% rate on these low blocks would cause Cook Inlet fields to shut down in some future year. They were seeing the gradual decline in productivity of the Cook Inlet fields and there was concern that that was something that they didn't want to see, they didn't want to see those jobs lost, and they didn't want to see the dead weight economic loss of shutting down a field when it was actually producing enough oil to make its cost. So they proposed that the first 100 B of oil paid absolutely no tax at all, and the next 200 B pay tax at the rate of 3% and so on, on up, so that the maximum tax rate was, if I recall correctly, 12%, it may be 12½%, I don't recall the top block. But as you can see, this was a very hefty tax increase for these more productive fields.

The Dept. of Revenue had, through 1976 and 1977, been conducting a major study of oil and gas taxes and it to this day remains a very, very useful piece of work. I have a copy with me in my briefcase back there right today in case questions come up that I can't answer, because it is even now, though somewhat out of date, a very useful document. It is primarily authored by John Messenger and his associate Tom Williams. As a result of that study and discussions within the administration and the Dept. of Law and the Dept. of Revenue, and Governor Hammond at that time, they came forward and introduced a proposed legislation that would have looked, had it been adopted, like this curve shown here. It contained an Economic Limit Factor without the exponent. Remember, in most cases, the exponent was a factor that when raised, reduces the tax.

The problem, I think, that some people saw with that was that it created too high a tax, too soon. In other words, a field here with, let's say 300/bbl of productivity would be paying tax of around 7%. That was even higher than the existing tax here and it was exactly those kinds of fields that the special oil

and gas committee was concerned with in terms of providing some tax breaks for them. Their proposal provided substantial tax breaks for every field producing less than 1300/bbl per day, that is a break in comparison with the laws that stood at that time. So there were attempts made to adjust the Economic Limit Factor...in the administration's bill. And that intent, since there were really only two factors you could adjust in that bill, one was the Production at the Economic Limit, which in their bill was 100. They said well if you don't want to lower that, let's just increase it, and so here was a, this was never introduced as a bill but was discussed as a proposal, Economic Limit Factor of 1000. Well, without the exponent, what happens is that this curve gets pushed this way, it actually gets pushed, this point gets moved to here and this curved area gets pushed down to here. That didn't produce the result that people were comfortable with either because it was felt that the result was even too big a tax break for the fields that were in this region right here. And, as well, when you gave that tax break, the result was the depression of the curve over in this region here. You couldn't avoid it if the calculation of the formula was such that if you moved this over here, this part came down as well. So, I think the desire was, and this is my guess, there was some evidence in the written record to indicate that this was what in fact was in the minds of some legislators, they wanted to give this break here, but they didn't want to give this big a break out here, and they couldn't figure out a way to do it with the Economic Limit Factor that the Dept. of Revenue had presented. And legislators kept saying, well, I'd like to use the Dept. of Revenue's formula because it's always good to get the administration's bill passed and put your amendments on the administration's ideas rather than try to do it the other way around, but they were saying, "We want a curve that incorporates the administration's formula, but one that more closely approximates what we've got here in our own bill. Can you give us an ELF factor that produces this?" And the result was the exponent because the exponent allowed you to push this part of the curve this way, to push the curve inward without pushing this part down very much, pushing this outer edge down very much.

It's interesting, some people say that these kinds of complications in law wouldn't happen if the legislature and the administration didn't have a bloated bureaucracy to dream up crazy ideas like this. And I think that's absolutely true, but it wasn't the bureaucracy that dreamed up the idea because they wanted to complicate the law, it was because the legislators and the policy makers came and said I want to accomplish a result, how do we do it? And that's how it happened that the ELF got an exponent.

COUNTER #302

The two bills that...ended up in free conference committee then had three things that they could adjust. The nominal rate, the exponential constant and the Production at the Economic Limit, and they also had a cents-per-barrel factor which I can get into if you like. I think it's probably worthwhile covering, but I think I'd like to reserve it for a little bit later.

In terms of the nominal rate, the house bill suggested 12.5% of value, the Senate wanted 11.5% of value, two different nominal rates which meant that the senate bill's curve headed up towards 11.5, never quite got to it, and the house bill was above it, was headed up towards 12.5, also never quite reaching it. The presumed Production at the Economic Limit in the house bill was 300/bbl per day and in the senate bill was 100/bbl per day, which was to say that the house bill gave a bigger tax break under the PEL, than did the senate bill. I think that reflected the greater concern in the House with the production problems that might in the future occur in Cook Inlet, or that were seen as a potential future problem in 1977.

The final factor that the free conferees were arguing about for those two weeks was the exponential constant, and the Senate wanted 750 and the House wanted 300. And to make a long story short, they compromised. In the very last minutes, as often does, it came together very quickly with a compromise which was a very small reduction in the House's proposed nominal rate from 12.5 down to 12.25, and they got to the end where they were arguing about hundredths of a percentage point, and they compromised on the House's part, or really a willingness on the Senate's part to adjust that exponential constant downward and there was some disagreement among the various oil companies as to their reactions to that and I don't think any of that disagreement ever got on the record, but it least it was said that some of the smaller oil companies operating in Cook Inlet felt that some advantage for the larger oil companies had been gained at their expense. I don't know if that's true, but that was an interesting side light on the negotiations and discussions.

COUNTER #348

There were probably ten or, there were a multitude of curves of this nature drawn and I think that's about all I can tell you about what went on in 1977 free conference. But the formula we worked through today arose out of those kinds of political compromises and I think it's the fact that the free conferees had to get in to this material as deeply as they did and as we have done today that has persuaded Gordon Harrison to ask me to go into as deeply as I have.

There are a whole lot of additional things that probably should be talked about, including the cents-per-barrel differences in 1977. The House proposed a cents-per-barrel tax...with an annual adjustment to the cents-per-barrel, based on the GNP deflator, basically based on inflation. So, had the House provision in that regard been adopted, the cents-per-barrel floor would have risen each year to keep pace with inflation and we haven't calculated what it would have been. The House proposed 93¢ per barrel, so it clearly would have been somewhere well above \$1.00 by now as a floor for the severance tax.

There's another interesting side light. The Dept. of Revenue initially proposed in 1977 and later retracted, or withdrew, a proposal to provide a royalty credit against severance tax, and it was a cute little device that would have, had it been legal, or had it been adopted, would have protected royalty revenues with a floor of sorts, in effect, using the severance tax as a means of providing a floor under royalty revenues as well. Senator Ferguson, who was around all this time, and Sen. Eliason haven't said anything about these, I hope that your memory ... accords with mine on these points.

The Senate had proposed a cents-per-barrel floor of 75¢ per barrel and had said that there would be no escalator. They compromised on that at 80¢ per barrel and that's where the 80¢ per barrel comes from that's in our law today. That's a good stopping place, I think, for the moment. There are a whole lot of other things to go into, but now is probably a good time to pause.

What comes next, if we want to go into it, Mr. Chairman, is the procedure for establishing the Production at the Economic Limit. The 1981 amendments, which of course gave us the tax system we have and which substantially changed the applicability of the ELF, as Mr. Nelson pointed out earlier, the ELF doesn't at this moment apply to Prudhoe Bay and that's because of what was done in 1981. Do you want to go on to those right now, Mr. Chairman, or do you want to pause at this point?

COUNTER #398

(QUESTION from Rep. Grussendorf: What would be your timing on that, Gregg?)

I think the 1981 amendments we could probably get through before lunch, and probably finish up this whole thing before lunch, unless you want to take an early lunch. I guess I'm getting a little hoarse, but that's alright.

(QUESTION from Rep. Grussendorf: Are there any objections to continuing?)

(QUESTION from Sen. Abood: One question, Mr. Chairman, I want to be sure it's straight. The only two fields that are affected are the Milne Point and the Kuparuk at this present time, is that correct?)

Affected by the ELF? I don't believe that's correct, but I would defer to my colleague, Tom Chester, who's probably looked into it. Cook Inlet fields, of course, are affected as well. And I think...

(QUESTION from Sen. Abood: But you were saying, if I may, Prudhoe Bay is not effected by it, but Kuparuk and Milne Point according to this graph, is affected by it?)

The Kuparuk field does have the ELF applied in calculation if its taxes, and the Milne Point field does as well, yes.

(QUESTION from Sen. Abood: So everything but Prudhoe Bay is affected by it?)

At this time, that's correct. (tape unintelligible) It appears that that would be the case, yes, unless the law is altered.

In 1981, let me back up, because there's one thing I should really say that I am not really the expert to talk, or the person to profess any expertise on, and that is the procedures under which the Production at the Economic Limit can be modified. And I am going to defer to Mr. Monkman or Ms. Vogt or Dr. Logsdon, if you want to go into more detail on those procedures. They're dealing with them on a daily basis. But the 1977 law, both versions, the House version and the Senate version, had a provision that said if the oil companies came in and could show that the costs of their production, and the bill defined costs very narrowly, although it left some ambiguities which I think may be a matter of some concern, if the oil companies could come in, or any oil company, any producer, could come in and show that its costs or the revenue from the production of the given 300 B was not enough to cover its narrowly defined costs, then the company would be entitled to, and the Dept. of Revenue was directed to grant, a higher Production at the Economic Limit. That factor, that provision was, I must say in my memory, not particularly a matter of concern to either side in the negotiations. There was concern that the language be written very tightly and of course, as usually often happens in this case, the concern of those of us who were drafting at the direction of the committee was to define those costs very narrowly. It turns out that that wasn't the problem, and as is often the case, it's the problem you don't think about is the one that comes back and grabs [you]. So, if there are further questions on that, I think I'd like to defer and have them direct it to the Dept. of Revenue, since they're in administrative hearings and are thinking a lot about it, if it's alright with Mr. Monkman.

COUNTER #458

(QUESTION from Rep. Grussendorf: Any last questions of Gregg, here on PEL?)

Let's go on to 1981 then. In 1981, I don't think we want to go through the long history of the 1981 situation, but in brief, the state had been sued with respect to the constitutionality of its oil and gas corporate income tax. And as a result of the deliberations in the 1981 session, there were attempts to settle that lawsuit legislatively, that is to remove the provisions of the petroleum corporate income tax that was passed in '78, which offended the oil companies, and thus settle the law suit. Those efforts came to naught, but there were efforts and concern on the part of the administration of Governor

Hammond to limit the state's liability by substituting another kind of tax that would not be so legally, at least would not be subject to the legal vulnerabilities that some people thought the oil and gas corporate income tax, that was then called, by shorthand, separate accounting, was supposedly vulnerable to.

The legislature decided to repeal the separate accounting tax and substitute a different tax which, it was felt, would be less subject to legal threat. The result of that change was a substantial reduction in revenue to the state. And to counterbalance that reduction, significant changes were made in the 1977 severance tax. The effect of those changes were to increase the tax rate at Prudhoe Bay from what was then about 11% up to 15%. This was done by establishing in the law, what I call in a shorthand way, the ten-year ELF trigger. And the ELF trigger says that any time a field has been in production for ten years, if that field began production before 1981, that it, the ELF goes into effect only after ten years of production. That is why Prudhoe Bay does not have the ELF applied in calculating its effective tax rate right now. Now there was also another trigger in the 1981 law and that's the .7 trigger. And I know this sounds very confusing and it is because the 1981 amendments were confusing. They were, in my opinion anyhow, kind of jury-rigged to produced the revenue result that was needed to balance the losses of revenue resulting from the change in the separate accounting to modified apportionment tax in the income tax side.

The theory behind it however, there was a theory behind those changes, and the theory behind the changes was that a field would be entitled in general (and this wasn't in the law this was sort of the theory behind it) to five years of production with a tax rate of 12.25% and that thereafter the tax rate would go up to 15%. Since Prudhoe Bay had already producing for five years in 1981, it meant that Prudhoe Bay had about five years to go without, actually in terms of the effective date about seven years to go, and with a tax rate that was not affected by the ELF. In addition, that unfortunately didn't get enough money to make up the difference, and so it was rather arbitrarily the law was designed so as to apply a 15% rate to Prudhoe Bay during the present time on the distinction that it came into production earlier and that they were going give a better tax situation to the smaller fields that were expected to come on after 1981.

COUNTER #536

So the result is that Prudhoe Bay has a calculated ELF of about .8 right now, which being above .7, doesn't trigger the .7 trigger, which if it did would cause the ELF to be applied. As a result, Prudhoe Bay pays a full 15% tax and will do so until it has been in production for ten years, which happens next year. That change means that there will be a significant reduction in the amount of severance taxes that the Prudhoe Bay field will produce for the State of Alaska.

That reduction sometimes gets caught in a kind of semantic difficulty. [I]t certainly is a reduction from the tax that is currently being paid by the oil companies on their Prudhoe Bay properties and their Prudhoe Bay production. It is not, however, a reduction from the current tax law, so I think it's useful in discussing this to remember that semantic distinction there. Usually we can say current tax and compare it with something else, in this case the word current tax can have two quite different meanings. So that is...one kind of ELF legacy, if you will, that is left over from the 1981 session: the ten years is running out and Prudhoe Bay is waiting to get its ELF.

The second legacy, and one that really works the other way, is that the five years that fields are allowed to produce at 12.25%, and this only applies to the newer fields, means that in the 1990's or late 1980's some of these newer

fields are going, actually they'll all be in the 1990's, are going to have a significant tax increase. Endicott for example, is going to be subjected to about an increase from, I don't know what the effective rates are, but it's about a 20% severance tax increase in about 1991-1993 (I don't have that sheet in front of me, but Tom Chester will talk to you later about the revenue effects of these things and show that to you) because the nominal rate changes from 12.25 to 15% in that year. Now if those fields are marginal, it's probably [not] something you want to hit with an extra tax burden at that time. That is another legacy left by the 1981 amendments.

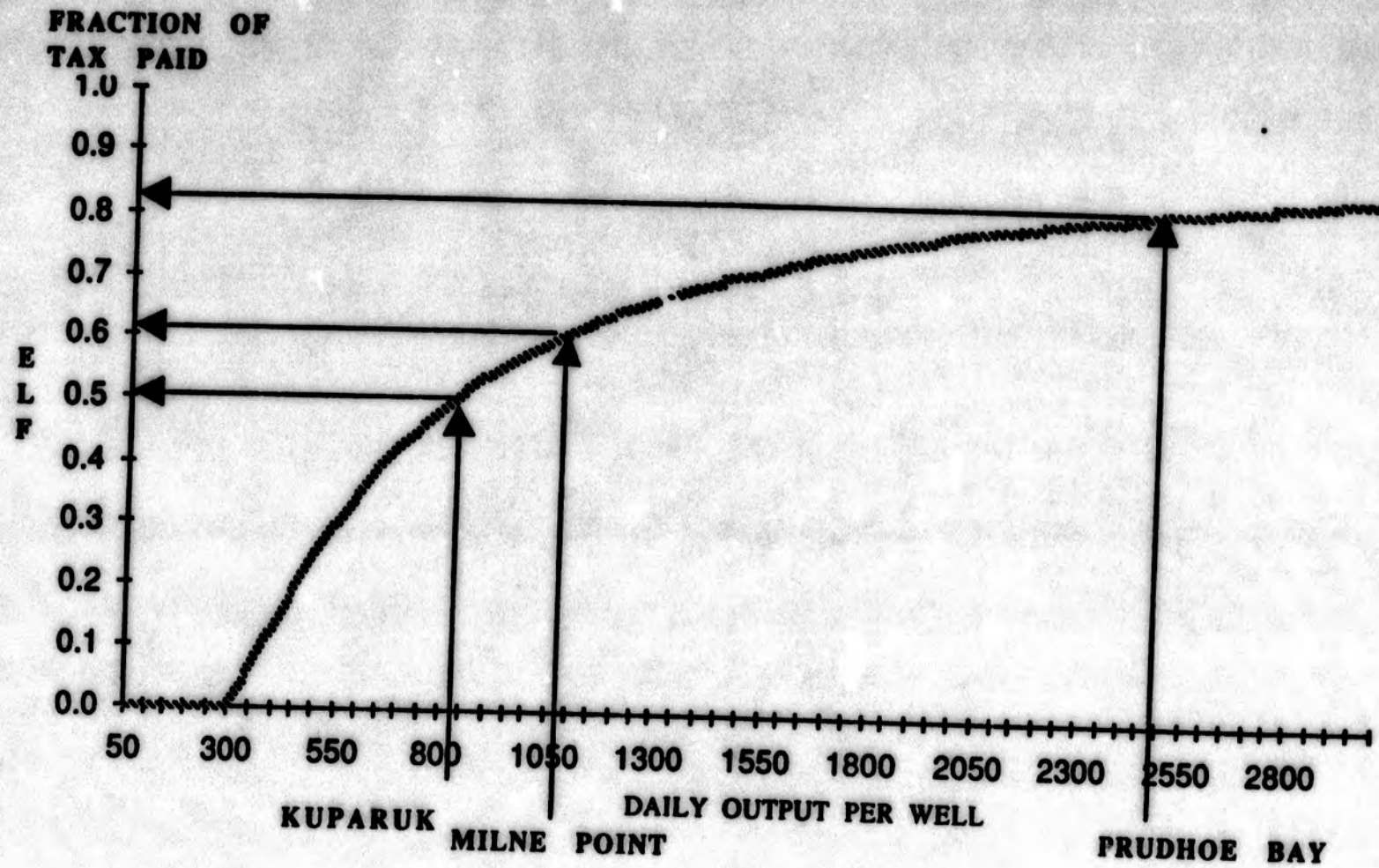
There is, of course, the legacy of the 1977 session, in what Mr. Monkman has descriptively called the "trap door in the floor." That is the application of the ELF to the cents-per-barrel which means that the tax rate could in fact fall to zero. Something that I don't think was contemplated or thought about one way or the other very much at the time the bill was drafted, although others may have a different opinion on that. So there are at least these two legacies from the 1981 amendments, and those may or may not be something you'll be interested in looking at further.

That concludes my presentation, and I am to be followed, presumably this afternoon, by my colleague, Tom Chester, who will discuss with you the revenue implications of these legacies, if you will, and the ways that those revenue implications could be altered, some of the ways that those revenue implications could be changed.

(QUESTION from Rep. Grussendorf: Before we break, do we have any questions of Gregg? When we come back, we'll be dealing with revenue effects of ELF and then the previous proposals to change ELF. Will coming back at 1:00 be acceptable with you? Let's recess until 1:00.)

END OF TAPE 2, SIDE 2, COUNTER #633

ECONOMIC LIMIT FACTOR



CASE 1

HOW THE ELF IS CALCULATED

$$\text{ELF} = (1 - [\text{PEL}/\text{TP}])\exp(460 \cdot \text{WD}/\text{PEL})$$

PEL = (Production at the Economic Limit) =
(300 barrels per day)*

(average number of operating wells during the month)*
(number of days of production for the month).

EXAMPLE

$$\text{PEL} = 300 \text{ barrels} * 541 \text{ wells} * 30 \text{ days} = 4,869,000 \text{ barrels per month}$$

TP = (Total Production for the field for the month) =

(average number of operating wells during the month)*
(number of days of production for the month)*
(average daily production per well).

EXAMPLE

$$\text{TP} = 541 \text{ wells} * 30 \text{ days} * 2477 \text{ barrels per well} = 40,201,710 \text{ barrels per month}$$

WD = (Well Days) =

(number of operating wells during the month)*
(number of days each well operates)

EXAMPLE

$$\text{WD} = 541 \text{ wells} * 30 \text{ days} = 16,230 \text{ well days}$$

CALCULATION EXAMPLE

$$\text{ELF} = (1 - [\text{PEL} / \text{TP}])\exp(460 \cdot \text{WD} / \text{PEL})$$

$$\text{ELF} = (1 - [4,869,000/40,201,710])\exp(460 \cdot 16,230/4,869,000)$$

$$\text{ELF} = (1 - .1211) \exp (1.533)$$

$$\text{ELF} = (.8789) \exp (1.533)$$

$$\text{ELF} = .82$$

CASE 2

WHAT HAPPENS WHEN THE EXPONENTIAL CONSTANT IS INCREASED?

$$ELF = (1 - [PEL/TP])\exp(1000*WD/PEL)$$

PEL = (Production at the Economic Limit) =
(300 barrels per day)*
(average number of operating wells during the month)*
(number of days of production for the month).

EXAMPLE

$$PEL = 300 \text{ barrels} * 541 \text{ wells} * 30 \text{ days} = 4,869,000 \text{ barrels per month}$$

TP = (Total Production for the field for the month) =
(average number of operating wells during the month)*
(number of days of production for the month)*
(average daily production per well).

EXAMPLE

$$TP = 541 \text{ wells} * 30 \text{ days} * 2477 \text{ barrels per well} = 40,201,710 \text{ barrels per month}$$

WD = (Well Days) =
(number of operating wells during the month)*
(number of days each well operates)

EXAMPLE

$$WD = 541 \text{ wells} * 30 \text{ days} = 16,230 \text{ well days}$$

CALCULATION EXAMPLE

$$ELF = (1 - [PEL / TP])\exp(1000*WD / PEL)$$

$$ELF = (1 - [4,869,000/40,201,710])\exp(1000*16,230/4,869,000)$$

$$ELF = (1 - .1211) \exp (3.333)$$

$$ELF = (.8789) \exp (3.333)$$

$$ELF = .65 \quad \text{RESULT: A DECREASE IN THE TAX}$$

CASE 3

WHAT HAPPENS IF THE EXPONENTIAL CONSTANT IS REDUCED?

$$ELF = (1 - [PEL/TP])\exp(300 \cdot WD/PEL)$$

PEL = (Production at the Economic Limit) =
(300 barrels per day)*
(average number of operating wells during the month)*
(number of days of production for the month).

EXAMPLE

$$PEL = 300 \text{ barrels} * 541 \text{ wells} * 30 \text{ days} = 4,869,000 \text{ barrels per month}$$

TP = (Total Production for the field for the month) =
(average number of operating wells during the month)*
(number of days of production for the month)*
(average daily production per well).

EXAMPLE

$$TP = 541 \text{ wells} * 30 \text{ days} * 2477 \text{ barrels per well} = 40,201,710 \text{ barrels per month}$$

WD = (Well Days) =
(number of operating wells during the month)*
(number of days each well operates)

EXAMPLE

$$WD = 541 \text{ wells} * 30 \text{ days} = 16,230 \text{ well days}$$

CALCULATION EXAMPLE

$$ELF = (1 - [PEL / TP])\exp(300 \cdot WD / PEL)$$

$$ELF = (1 - [4,869,000/40,201,710])\exp(300 \cdot 16,230/4,869,000)$$

$$ELF = (1 - .1211) \exp (1)$$

$$ELF = (.8789) \exp (1)$$

$$ELF = .8789 \quad \text{RESULT: AN INCREASE IN THE TAX}$$

CASE 4

WHAT HAPPENS WHEN THE PEL CONSTANT IS INCREASED?

$$ELF = (1 - [PEL/TP])\exp(460*WD/PEL)$$

PEL = (Production at the Economic Limit) =
(400 barrels per day)*
(average number of operating wells during the month)*
(number of days of production for the month).

EXAMPLE

$$PEL = 400 \text{ barrels} * 541 \text{ wells} * 30 \text{ days} = 6,492,000 \text{ barrels per month}$$

TP = (Total Production for the field for the month) =
(average number of operating wells during the month)*
(number of days of production for the month)*
(average daily production per well).

EXAMPLE

$$TP = 541 \text{ wells} * 30 \text{ days} * 2477 \text{ barrels per well} = 40,201,710 \text{ barrels per month}$$

WD = (Well Days) =
(number of operating wells during the month)*
(number of days each well operates)

EXAMPLE

$$WD = 541 \text{ wells} * 30 \text{ days} = 16,230 \text{ well days}$$

CALCULATION EXAMPLE

$$ELF = (1 - [PEL / TP])\exp(460*WD / PEL)$$

$$ELF = (1 - [6,492,000/40,201,710])\exp(460*16,230/6,492,000)$$

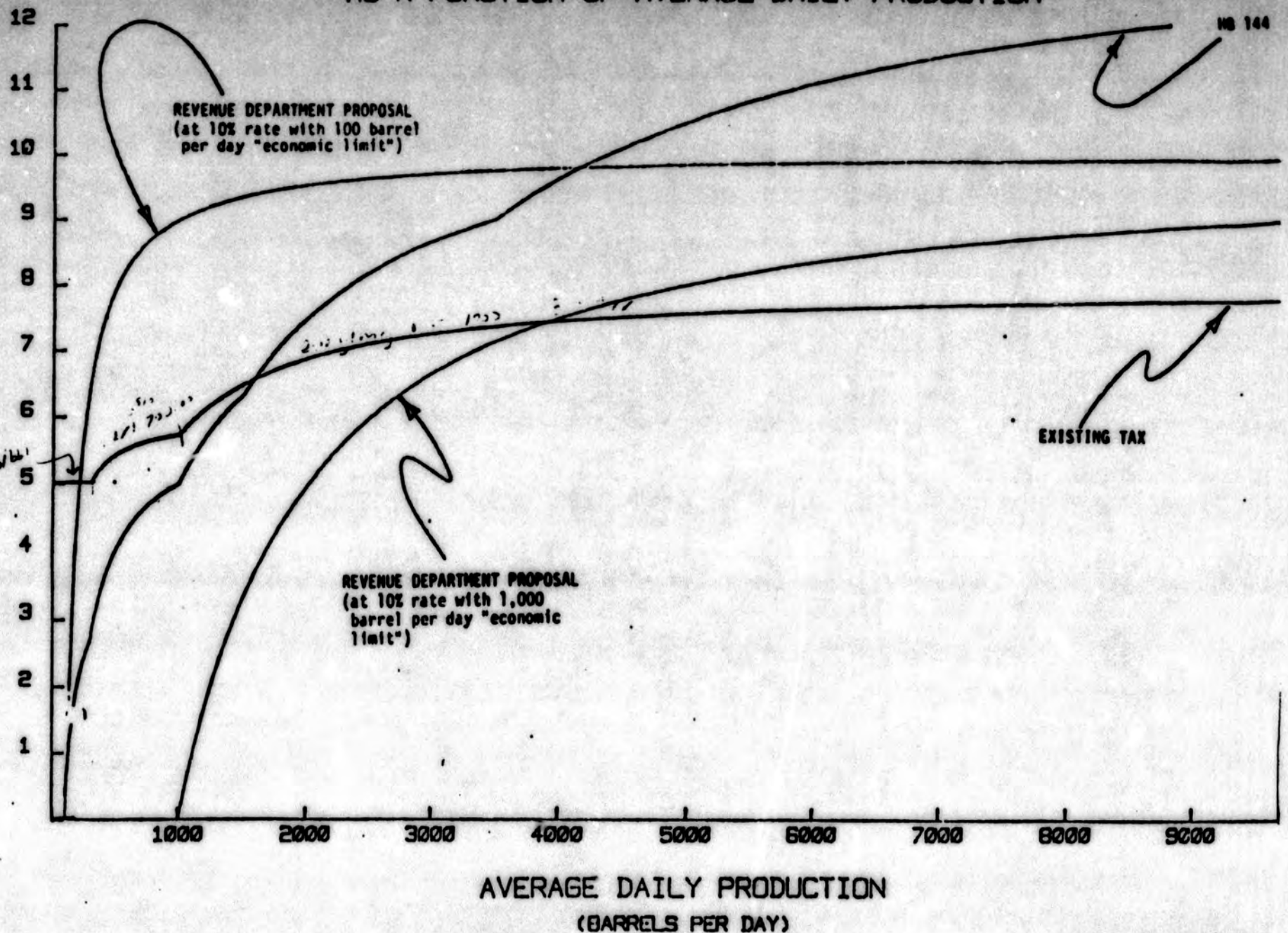
$$ELF = (1 - .1615) \exp (1.150)$$

$$ELF = (.8385) \exp (1.150)$$

$$ELF = .816 \quad \text{RESULT: A DECREASE IN THE TAX}$$

EFFECTIVE SEVERANCE TAX RATE AS A FUNCTION OF AVERAGE DAILY PRODUCTION

EFFECTIVE SEVERANCE TAX RATE
(PERCENT)



DON Y=10*(X-100)/X; INITIAL F(X)=15114.03

DON Y=10*(X-1000)/X; INITIAL F(X)=6700.14

LEGISLATIVE AFFAIRS AGENCY
RESEARCH DIVISION
15 February 1977

Office Correspondence

STANDARD
ALASKA PRODUCTION

TO: G. W. Nelson

DATE: October 16, 1986

FROM: G. J. Abraham

CC NO:

SUBJECT: Proposed Severance Tax Changes

YOUR REF:

I have some serious concerns with the proposals before the Joint Special Committee on State's Tax Policy (Committee) to alter the Economic Limit Factor (ELF). Implementation of the proposals to amend or eliminate the ELF presented by ONB at the September 11, 1986 meeting could result in decreased recovery at Prudhoe Bay and could significantly impact future exploration and production activities in Alaska.

Prudhoe Bay Development

Prudhoe Bay is a field of 10 billion barrels of recoverable liquids out of 22 billion barrels in place. Approximately five billion barrels have already been produced leaving a reserve of five billion barrels. Up to four billion barrels of that remainder could be recovered under current State tax law with the wells and facilities in place. Premised on these tax laws, over \$5 billion has been spent in the last four years on the drilling of 285 new wells and projects such as Waterflood, Gas Lift, and Enhanced Oil Recovery/Natural Gas Liquids (EOR/NGL).

Recovering the remaining one billion barrels will require additional capital investment in facilities and drilling. Many of these future investment decisions are only marginally economic. This future development and some of the expected production from the current wells and facilities is jeopardized by the proposed changes to the ELF.

Additionally, Prudhoe Bay contains 12 billion barrels unrecoverable with current technology. Some of this currently unrecoverable oil could be recovered with improved technology and major capital investment. Significant increases in taxation will curtail the research necessary to pursue these thinly margined projects and further reduce potential future State revenues.

The ELF is important in decisions to continue development within the Prudhoe Bay Unit. Consider, for example, the decision to drill additional wells at Prudhoe. Removal of the ELF benefit will in many cases make additional wells uneconomic. Four hundred or more future wells will be required to realize the additional one billion barrels referenced. Preliminary studies show that elimination of the ELF could

reduce future drilling at Prudhoe Bay by over 25%, reducing ultimate recovery and industry and State revenues. From the State's perspective, direct losses accrue in the areas of royalty, production tax, income tax and annual property taxes as well as in the secondary areas of employment and economic stimulation.

An ELF modification which involves an additional total field production factor would eliminate some projects which increase field production by raising the severance tax rate on the whole field and thus making the incremental project unattractive. From a broader perspective, selectively penalizing large fields like Prudhoe will curtail their development short of their full potential as discussed above. Further, penalizing large fields discourages unitizations which are an efficient means of managing a reservoir for maximum benefit to the industry and the State.

Alaskan Development Impact

In addition to the Prudhoe Bay impacts, tax increases could have significant adverse effects on future Alaskan oil development. Decisions to proceed with exploration and development projects are based on after-tax economics. There are three tax related factors:

- Cash to finance the project,
- Competitive after-tax returns on investment, and
- Stable business environment.

Cash to Finance the Project

Standard has invested \$12 billion on Alaskan exploration, development and transportation. This investment record for TAPS, Prudhoe Bay, Endicott, Kuparuk and Mukluk, demonstrates the company's willingness to invest in Alaska when competitive after-tax returns are projected.

The oil industry, as well as the State of Alaska, has a severely constrained cash flow. Virtually all major oil companies have significantly reduced 1986 exploration and development budgets and workforce. Standard's 1986 original capital budget for Alaskan field development has been reduced from \$923 million to \$675 million. Standard's workforce was reduced in July by 172 people.

Increasing industry taxes through changes to the ELF will further reduce the industry's ability to continue to invest in Alaska.

Competitive After-Tax Returns On Investment

The future commitment of available exploration and development funds to Alaska will depend on whether the projected returns are competitive with alternative uses of the funds. The ELF is also critical in this regard.

Modification or elimination of the ELF which increases the effective tax rate on major fields will discourage exploration. Arctic exploration involves expensive, high risk ventures such as Mukluk. These risks are taken to find major, profitable fields such as Prudhoe Bay and Kuparuk. Smaller fields are generally a by-product of these efforts. Where the taxation system reduces significantly the profitability of a major field, the high cost exploration risks will not be taken and neither large nor small additional Alaskan fields will be found.

Stable Business Environment

A fair and stable taxation system is a critical component in any business environment. Under the current taxation system, production taxes can be reduced by the ELF where the wellhead value closely approaches the operating costs allowing continued production. Alaska's highest in the nation production tax rate of 15% and highest in the nation production tax floor of 80¢ per barrel will be reduced for Prudhoe by about 20% after ten years of production.

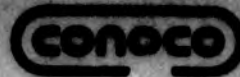
The large Alaskan development expenditures outlined above were determined to be economic based on existing tax laws. Changes in these laws - which result in tax increases - send several unwelcome messages to the oil industry. One message is that the industry could expect tax increases in major fields after the major capital outlays have been made. A second message is that during hard times for the industry and the State, oil industry tax increases will be considered regardless of their impact on the industry.

It is easy to estimate the State revenues to be generated by tax increases. It is difficult to quantify the very real lost future production and the consequent losses to State revenue and the overall Alaskan economy that will be incurred as a result of the enactment of a severance tax increase.

Recommendation

In light of the adverse impacts of increased severance taxes on the Prudhoe Bay Unit and other future industry exploration and development activities, I recommend that these comments be forwarded to the Committee. Hopefully they will provide the Committee with a more balanced perspective in which to consider tax policy and the resulting longer term implications.


G. J. Abraham



1000

John R. Kemp
Division Manager

Conoco Inc.
3201 'C' Street, Suite 200
Anchorage, AK 99503

September 4, 1986

Joint Special Committee on State's Tax Policy
Senator Frank Ferguson, Chairman
1024 W. 6th Street, Suite 203
Anchorage, Alaska 99501

Dear Senator Ferguson:

The high drilling and production costs and the decline in the value of crude oil significantly impacts the development of new fields in Alaska. It also impacts the decision to continue operating any fields in the State. One of the cost factors, the State's oil and gas production tax, is directly controlled by the State. The modifications and revisions to the present production tax statutes may be the deciding factor for future oil and gas development in Alaska.

The present production tax is based on a monthly production rate at the economic limit OF 300 barrels/day times the number of well days. This is called the economic limit factor (ELF). The statutory presumption is that the ELF represents the producer's break-even point. It is presumed that the producer is making profit from the production of oil and gas before reaching the ELF. The ELF, however, may be rebutted. Rebutting the presumption allows a producer to establish by clear and convincing evidence that the break-even point is higher than 300 barrels for the field or unit. Successfully rebutting the ELF and establishing a new ELF results in a downward adjustment of the production tax payable by the producer.

The legislators who enacted the production tax statutes were farsighted and concerned that a rigidly structured production tax would force producers of economically marginal fields or units to shut down wells prematurely. See, e.g., Governor's transmittal letter for S.B. 238, March 11, 1977, 7th Journal, at 540-41. Prior to 1977, production tax liability was calculated on a rigid stair-step approach with incremental increased taxes based on the amount of production.

This approach was insensitive to the problems of marginal fields and the geographic variation of cost and production.

Early in 1977 after the introduction of the Senate and House production tax bills which would have continued the stair-step approach, the Alaska Department of Revenue published an in-depth comprehensive report titled "Alaska's Oil and Gas Tax Structure", a study with recommendations for improvement. See testimony of Sterling Gallagher, Commissioner of the Department of Revenue, before the House Finance Committee, April 14, 1977. In developing the presumptive ELF factor, the legislature has provided a mechanism to allow production tax relief to producers of marginally economic fields. The present production tax allows the producers to establish their actual break-even point and to be assessed production tax from the point of the field or unit's production at a profit. In essence, the producer is not forced to pay taxes while in a negative profit or loss situation. The provisions for this production tax relief are not automatic. The producer must request a formal hearing and prove by clear and convincing evidence that its break-even point is different than that presumed by the statute. The economic sensitivity in the current production tax statutes allow the State to grant relief to producers of marginally economic fields and allows the production operations to continue, rather than to shut-in during times of unprofitability.

Proposals for new legislation to change the ELF provisions are now under consideration. Conoco urges the legislature to look to the future of Alaska. In the short run, the State may benefit by establishing a fixed minimum tax. It is anticipated that the minimum tax would approximate the current 80 cents per barrel resulting from the presumed ELF. A production tax at this rate could contribute to the shut-in of Milne Point Unit. Shut-ins of these types of units and the prohibitive effect of a fixed tax on the development of new fields means a reduction in the State's employment rate and a detriment to the local economy. It also means a reduction in both the State and local ad valorem taxes. Alaska's economy will stagnate.

Conoco urges the State to maintain the current tax structure. Careful and thoughtful analysis was used in the establishment of the production tax, with the ultimate goal of maximizing both income to the State and the conservation of the State's most valuable non-renewable resource. A panic-induced tampering with the existing law may produce deleterious effects in both near term and long term economic stability. In the alternative, if action on the production tax must be undertaken, Conoco strongly urges that the first 50,000 barrels per

Senator Frank F. uson
September 4, 196.
Page 3

day of production from a unit be exempted from any proposed changes in the tax structure. This provision would maintain the original intent of maximizing resource utilization in economically vulnerable units. This type of provision will encourage the continued operation of Milne Point and other small units. It is also farsighted enough not to require yearly amendments and changes and, thus, will encourage the continued development of the oil and gas fields of Alaska.

Yours very truly,


FCR John R. Kemp
Division Manager

vv
HG/AEH
520.0

Standard Alaska
Production Company
900 East Benson Boulevard
P.O. Box 196612
Anchorage, Alaska 99519 6612
(907) 564-5423

G.N. Nelson
President

STANDARD
ALASKA PRODUCTION

September 4, 1986

Senator Frank Ferguson
Co-Chairman
Joint Special Committee on the State's Tax Policy
PO Box 131
Kotzebue, Alaska 99752

Dear Senator Ferguson:

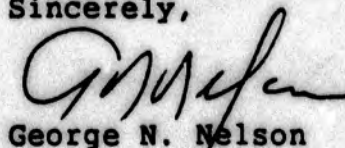
I recently received the enclosed paper on the Economic Limit Factor prepared by Tom Williams and I thought it would be of interest to you and perhaps other members of the Special Committee. The paper presents an overview of the ELF, explains how it functions and why it was originally written into Alaska's statutes.

Tom prepared the paper at the request of the Alaska Oil and Gas Association Tax Committee. I must emphasize, however, that it is not an official AOGA position paper and should not be taken as such.

A copy of this paper is being also sent to Rep. Grussendorf and I leave it to your discretion to distribute it to other committee members.

I look forward to seeing you on September 11.

Sincerely,



George N. Nelson

cc: Rep. Ben Grussendorf w/enclosure

**THE ECONOMIC LIMIT FACTOR
IN ALASKA'S OIL AND GAS PROPERTIES
PRODUCTION TAX**

By Thomas K. Williams

September 1986

About the Author

Thomas K. Williams may rightfully lay claim to being the "father of the ELF" since he was the one who first proposed the idea of an economic limit factor for the production tax in late 1976, when he was Director of Petroleum Revenue for the Alaska Department of Revenue. As director, he had immediate responsibility for administering the state's oil and gas tax laws, and he drafted many of the regulations that are still in effect for those taxes. Mr. Williams was director from September 1975 until April 1979, when he became Commissioner of Revenue for the remainder of Governor Hammond's second term. Prior to joining Revenue Mr. Williams was an Assistant Attorney General for the state, specializing in oil and gas matters. He is currently Vice President and General Counsel of Cook Inlet Region, Inc. Mr. Williams received bachelor's and master's degrees in history from Princeton and Harvard, respectively, and earned his law degree at Stanford. He has lived in Alaska since 1973.

TABLE OF CONTENTS

	<u>Page</u>
What Is the ELF?	1
How the ELF Works: The Basic Theme.	4
Reasons for the ELF.	9
How the ELF Works: Variations on the Theme.	19
A. Introduction to the Exponent.	19
B. The PEL Presumption: To Rebut or Not to Rebut?.	20
C. The ELF's Incentive to Continue Development Drilling in "Mature" Fields. . .	22
Appendix A: A Review of How Exponents Work.	A-1

WHAT IS THE ELF?

The Economic Limit Factor, or ELF, is a mathematical formula that changes the rate of tax on oil and gas production under Alaska's Oil and Gas Properties Production Tax (the "Production Tax"), AS 43.55. Without the ELF, these rates would be the nominal rates set out in the statute -- 15 percent 1/ of the value of taxable oil production 2/ (12.25% during the first five years of production from a lease or property 3/) or \$0.80 per barrel, 4/ whichever is greater. 5/ The \$0.80 cents-per-barrel amount is for oil having an API gravity of 27 degrees, and it is increased or decreased by half a cent for each degree above or below 27 degrees, respectively, in the API gravity of the actual oil produced. 6/ This adjustment to the cents-per-barrel amount

-
- 1/ AS 43.55.011(b) (15 percent rate for oil produced after June 30, 1981).
 - 2/ AS 43.55.011(a) excludes "any oil the ownership or right to which is exempt from taxation". Such exempt oil almost invariably is state or federal royalty oil.
 - 3/ AS 43.55.011(b) ("for a lease or property coming into commercial production after June 30, 1981, the percentage-of-value amount equals 12.25 percent of the gross value . . . of taxable oil produced from the lease or property in the first five years after the start of commercial production and equals 15 percent . . . thereafter").
 - 4/ AS 43.55.011(c). This statute also specifies a cents-per-barrel rate of \$0.60 for "taxable old crude oil", referring to "old oil" under former federal oil price controls. With the expiration of those controls, there is no longer any current production to which the \$0.60 rate applies.
 - 5/ AS 43.55.011(a) requires payment of the Production Tax on the basis of the greater amount, with the percentage-of-value amount deemed to be the greater if both amounts happen to be equal. It used to be necessary to establish which amount was being used when both amounts were equal because former AS 43.55.011(d) (repealed by § 18, ch. 116, SLA 1981) called for certain payments into the Alaska Native Fund when the Production Tax was paid on the cents-per-barrel basis.
 - 6/ AS 43.55.012(b).

for API gravity is made before the ELF is applied. 7/ For taxable gas, the nominal tax rate is greater of ten percent of its value or \$0.064 per thousand cubic feet (Mcf) 8/ before applying the ELF.

The ELF ranges in value from zero to one, although the way the formula is set up, it could approach, but never actually reach, one. However, by statute, if the calculated value of the ELF under the formula is greater than 0.7 for oil during the first ten years of production from a lease or property, then the ELF is defined to have a value of one; 9/ after ten years of production, the ELF equals its calculated amount under the formula, whether it is above or below 0.7. 10/ There is no corresponding rule changing the value of the ELF for gas from its calculated value under the gas ELF formula. 11/

The actual tax rate for taxable production from a lease or property equals the nominal tax rate multiplied by the ELF for that lease or property. Thus for instance, with oil, as the ELF varies from one down to zero, the effective

7/ Under AS 43.55.011(a) "[t]he tax is equal to either the percentage-of-value amount calculated under (b) of this section or the cents-per-barrel amount calculated under (c) of this section, whichever is greater, multiplied by the economic limit factor". AS 43.44.011(c) states "[t]he cents-per-barrel amount equals . . . \$0.80 per barrel . . . as adjusted by AS 43.55.012 [providing for the API gravity adjustment.]". Thus, the API gravity adjustment applies in determining the cents-per-barrel amount under "(c) of this section", and then, if that amount is greater than the percentage-of-value amount, it is multiplied by the ELF.

8/ AS 43.55.016. The reference in AS 43.55.016(c) to an "adjust[ment] by AS 43.55.012" in the \$0.064 cents-per-Mcf rate refers to provisions in AS 43.55.012 that have since been repealed. AS 43.55.012(b), the only portion of AS 43.55.012 currently remaining in effect, is applicable only to oil. The reference to AS 43.55.012 is therefore an artifact from prior versions of the statute and no longer has any application; the cents-per-Mcf rate is uniformly \$0.064 per Mcf (before applying the ELF).

9/ AS 43.55.013(b)(3).

10/ AS 43.55.013(b)(4).

11/ AS 43.55.013(c).

rate of tax can range between something at or very near its nominal rate of 15 percent (or \$0.80 per barrel, if greater), down to zero. 12/

12/ The cents-per-barrel and cents-per-Mcf rates represent, in effect, floors on the prices used for Production Tax purposes. If prices drop below these floor levels, the cents-per-barrel or cents-per-Mcf rate kicks in. However, neither of these represents any sort of floor on the actual amount of tax collected. As explained below, the purpose of the ELF is to scale down the burden of the Production Tax so that the tax does not cause the cessation of production before the property would otherwise reach its economic limit (break even point). If the amount of production needed to break even equals the amount currently being produced, the ELF makes the tax zero whether the tax is calculated on a percentage-of-value basis or on the cents-per-barrel (or cents-per-Mcf) basis.

HOW THE ELF WORKS: THE BASIC THEME

The ELF depends primarily on two things. One is the volume of production needed to "break even" so that the gross value of the production just equals the total direct operating costs (as defined in the statute) for producing that oil or gas. The other is the volume of production actually produced during the month in question.

These two factors have a determinative role in the changing economics of an oil and gas property during its productive life, and the ELF attempts to recognize the economics and set the effective tax rate at appropriate levels throughout that productive life. In general the cost of producing an additional barrel of oil or an Mcf of gas starts off relatively low and increases with time, until eventually the cost of getting the next barrel or Mcf gets so high that it is no longer profitable to continue producing. This point at which operations cease to be profitable is called the economic limit.

The ELF, which gets its name (Economic Limit Factor) from this concept of an economic limit, takes an approximation of how much production is needed to break even at the economic limit, 13/ and then compares that production rate

13/ The statute makes an approximation of the operating costs at the economic limit by specifically listing certain types of operating costs that one would reasonably expect to continue being incurred right up until the economic limit is reached. Such costs are "royalty, production supplies, purchased fuel, routine maintenance, and wages and benefits of employees working on the production operations." AS 43.55.013(e) (oil); AS 43.55.013(h) (gas). Other current costs are specifically excluded from the calculation of the operating costs at the economic limit because one would reasonably expect them to have been discontinued or no longer incurred by the time the economic limit is reached. These excluded costs are capital expenditures, tangible or intangible drilling expenses, costs of well workovers, and costs of replacement or repairs other than routine maintenance. All of these are excluded because they represent expenses or capital investments that a reasonable person would have discontinued making once the property got close enough to its economic limit that the additional cost or investment no longer promised to pay for itself. Amortization and depreciation are excluded because all past capital investments ordinarily should be fully amortized or depreciated before

(footnote continues on next page)

at the economic limit (PEL) to the volume actually being produced. This ratio is an indicator of the profitability of the lease or property. The smaller PEL is in proportion to the total production (TP) currently being produced, the more profitable the lease or property is and, theoretically, the better it can bear a greater "slice off the top" for the Production Tax. Hence the ELF approaches one (and the effective tax rate approaches its maximum possible rate) when the property is most profitable, but later as the property becomes more and more expensive to operate and less and less profitable, the ELF decreases and scales down the tax rate, until finally both the ELF and the tax are zero when the economic limit is reached.

An example will illustrate exactly how this occurs. In its simplest form, the ELF is one minus the ratio of PEL to TP. Put into algebraic terms, the formula for the ELF is:

$$\text{ELF} = 1 - [\text{PEL}/\text{TP}],$$

where PEL is the production rate needed to cover the projected direct operating costs at the economic limit, and TP is total current production. This is the present formula

(footnote continued from previous page)

the property reaches its economic limit. Taxes are excluded because (a) the ELF would have reduced the Production Tax to zero when the property reaches the economic limit and (b) ad valorem taxes, even on a replacement-cost basis of assessment, should reflect the fact that there is no remaining economic life for the assets and hence they would be fully depreciated for assessment purposes at the economic limit (the third tax, the conservation tax of one eighth of a cent per barrel, AS 43.57, is disregarded as having a minimal effect). Insurance and overhead are excluded because they were not considered to be sufficiently "direct" in nature. The costs of terminating production operations and shutting down the property are excluded because they are not costs of production, but costs of ceasing production; if anything, the financial advantage (due to the time value of money) to be gained by deferring the termination costs might be enough in itself to induce an operator to continue producing a property even after it reaches what would ordinarily be its economic limit (i.e., after its production revenue started falling short of the direct operating expenses for continuing that production). The statute also allows the Department of Revenue to adopt regulations that include additional direct operating costs that are not specifically set out in the statute; the Department has adopted no regulation including any such additional types of cost.

for the gas ELF 14/ (formerly, when there were still federal oil price controls, it was also the formula for "old oil" production 15/).

Suppose there is a gas-producing property for which the PEL is determined to be 150,000 Mcf per month. Suppose further that initial production from this property is 500,000 Mcf per month. The ELF will be:

$$\begin{aligned}\text{ELF} &= 1 - [\text{PEL}/\text{TP}] \\ &= 1 - [150,000/500,000] \\ &= 1 - [0.300000] \\ &= 0.700000\end{aligned}$$

The effective rate of tax will be seven percent of the value of the gas (0.700000 times the nominal rate of 10% equals 7%) or \$0.0448 per Mcf (0.700000 times the nominal rate of \$0.064 equals \$0.0448), whichever is more.

Now suppose the property continues producing at 500,000 Mcf per month for five years, and then, starting in year six and each year thereafter, the rate of monthly production drops by 70,000 Mcf. The following table shows what the ELF and the effective tax rates will be during the life of this property:

Year	Production Rate	ELF	Effective Tax Rate	
			% of Value	\$ per Mcf
1 - 5	500,000	0.700000	7.00000%	\$0.044800
6	430,000	0.651163	6.51163	0.041674
7	360,000	0.583333	5.83333	0.037333
8	290,000	0.482759	4.82759	0.030897
9	220,000	0.318182	3.18182	0.020364
10	150,000	0.000000	-0-	-0-

14/ Id. ("The economic limit factor for gas production of a lease or property equals one minus the ratio of the monthly production rate at the economic limit to the production during the month for which the tax is to be paid").

15/ Former AS 43.55.013(a), repealed by § 18, ch. 116, SLA 1981 ("The economic limit factor for old crude oil production of a lease or property equals one minus the ratio of the monthly production at the economic limit to the production during the month for which the tax is to be paid").

As one can see from this table, when current production starts to decline, the ELF starts falling off too, but at a somewhat slower rate. For example, between Years 5 and 6 production in this illustration falls from 500,000 to 430,000 Mcf, a drop of 14 percent (the drop of 70,000 is 14% of 500,000), but the ELF drops from 0.700000 to 0.651163, a decline of only 6.9767 percent (the change of 0.048837 in the ELF between Year 5 and Year 6 is 6.9767% of 0.700000). However, as the table clearly shows, the ELF eventually does fall off fast enough to get to zero when the economic limit is reached.

What this means in practical terms is that the ELF operates to keep the effective tax rate from initially falling off quite as rapidly as does the profitability of the property measured by the ratio of current production to production at the economic limit. Thus the State's Production Tax collections are higher than they would be if the ELF scaled the tax rate down in direct proportion to the property's profitability.

There is one other thing that this illustration reveals about the ELF, and that is why the effective tax rate cannot ever equal the nominal rates set out in the statute (except of course where there is a special statutory rule making the ELF one if its computed value under the formula is greater than 0.7). The reason is that the ELF itself can approach, but never quite reach, the value of one. For the ELF to equal one, the ratio of production at the economic limit to current production must be zero. 16/ In mathematical terms,

16/ In the "complex" explanation of the ELF, the effects of the exponent in the oil ELF are explained. With the exponent, there is theoretically a second way for the ELF to equal one, and that is if the exponent is zero and the number to which the exponent is to be applied is not equal to zero. However, since the exponent is, in effect, the ratio of 460 barrels a day per well to the actual average daily production rate per well during the month in question, the exponent cannot be zero unless actual production were infinite (this is because 460 divided by any finite number, no matter how huge, will yield a number greater than zero; otherwise, if zero were the quotient, one would be able to reverse the process and multiply that huge but finite number by that quotient (zero) and get back to 460, but zero times any finite number is always zero). Since an infinite production rate is one of the two possible conditions that are described in the "simple" version of the ELF as making the ELF exactly equal to one, there is no practical difference between the "simple" and "complex" versions as to why the ELF is always less than one in the physical world.

if $1 = ELF$, then $1 = 1 - [PEL/TP]$.

Clearly, $[PEL/TP]$ must equal zero for this equation to be true, since if any number other than zero is subtracted from one, the result will not equal one. Thus,

$$PEL/TP = 0, \text{ or}$$

multiplying both sides of this last equation by TP,

$$PEL = 0 \times TP.$$

There is no finite number for TP which will, when multiplied by zero, yield a value for PEL other than zero. This is because zero times any finite number is always zero. And so, if the ELF is to equal one, either current production (TP) is infinite (which is possible in mathematics, but not in the physical world) or PEL equals zero (again, a practical impossibility, since no field would have costs of production equal to zero, especially at its economic limit).

Thus, the larger current production becomes in proportion to PEL, the closer the ELF comes to a value of one, but it never reaches one under the formula in the real world.

REASONS FOR THE ELF

The ELF operates to reduce the effective rate of the Production Tax as an oil and gas property nears its economic limit; i.e., the point where the income (gross value) from producing a barrel or Mcf of production from that property is just enough to cover the costs of producing that barrel or Mcf. At the end, when the property actually reaches its economic limit, the ELF makes the tax rate zero. Why has this ELF feature been included in the Production Tax?

The reasons for the ELF are both historical and economic. Prior to the enactment of the ELF in 1977, Alaska had a "stair stepped" Production Tax on oil in which the tax depended on the average daily rate of production per well. The first 300 barrels a day per well were taxed at five percent of their gross value, the next 700 barrels a day were taxed at six percent, and average daily production in excess of 1,000 barrels a day per well was taxed at eight percent. ^{17/} In addition, there were three similarly "stair

^{17/} Former AS 43.55.010, repealed by § 9, ch. 136, SLA 1977. The three-tiered "stair step" tax (enacted in ch. 4, FSSLA 1973) replaced an earlier four-tier version, in which the four "stair steps" for percentage-of-value had been enacted first (ch. 247, SLA 1970), with the cents-per-barrel rates added later (ch. 101, SLA 1972). The four "steps" in the original progressive tax rate structure were 0 - 300 barrels a day per well (3% rate), 301 - 1,000 barrels a day per well (5% rate), 1,001 - 2,500 barrels a day per well (6% rate), and 2,500+ barrels a day per well (8% rate). When the cents-per-barrel rates were added to the Production Tax in 1972, they were coupled with a credit for royalty payments to the State, the intent and effect of which was to set a floor on combined state revenues from royalty and Production Tax, corresponding to a "wellhead" price of \$2.65 a barrel (which would have dropped to \$2.50 on July 1, 1980 if the law had remained in effect). If prices dropped under that floor, the "lost" royalty income would be made up by the corresponding reduction in the royalty credit against the cents-per-barrel rates. See ch. 101, SLA 1972; 1972 House J. 915-916 (Governor Egan's transmittal letter for House Bill 817, introducing the royalty credit concept; the House Finance Committee took the substance of HB 817 and incorporated it into a House Committee Substitute for a Senate Bill, SB 168, that had already passed the Senate; the version that became chapter 101 of the 1972 Session Laws was the Second Free Conference Committee

(footnote continues on next page)

stepped" cents-per-barrel rates -- \$0.16875 on the first 300 barrels a day, \$0.2025 on the next 700, and \$0.27 on anything over 1,000 barrels a day. 18/ These cents-per-barrel rates were for oil having an API gravity of 27 degrees, and they were increased or decreased by two percent for each degree of API gravity that the actual oil production was over or below 27 degrees. The actual tax to be paid was the higher of the two, percentage-of-value or cents-per-barrel. 19/ The cents-per-barrel amount would be greater when the "wellhead" price 20/ fell below \$3.375; for higher

(footnote continued from previous page)

Substitute for SB 168, SFCCS HCS SB 168). Litigation over this and other enactments of the 1972 Legislature quickly ensued -- Amerada-Hess Corp., et al., v. State (Superior Ct. No. 72-2719 Civil), ARCO Pipe Line Co. v. Herbert (Superior Ct. No. 72-2798 Civil), Mobil Pipe Line Co. v. State (Superior Ct. No. 72-2720 Civil), consolidated. Legislation enacted by the 1973 Special Session, including repeal of the royalty credit provisions, made part of the litigation moot and allowed the remainder to be settled.

18/ Former AS 43.55.015(a), repealed by § 9, ch. 136, SLA 1977. Actually, the base cents-per-barrel rates (before any adjustment for API gravity) were not constant, but changed from month to month based on monthly changes in the Wholesale Price Index for crude petroleum from the Index for the month of December 1973. See former AS 43.55.015(c); Union Oil Co. of Cal. v. Dept. of Revenue, 560 P.2d 21 (Alaska 1977) (upholding the Department's regulation, former 15 AAC 05.694, which made the December 1973 Index the base Index). This monthly adjustment to the cents-per-barrel rates, in turn, meant that the effective floor price for the Production Tax revenue (i.e., the price at which the cents-per-barrel tax became greater than the percentage-of-value tax) also varied from month to month, depending on the Index.

19/ Former AS 43.55.010(e).

20/ The issue of what is the "wellhead" for royalty and Production Tax purposes has itself been hotly disputed. In Alaska when oil emerges from the ground at the "Christmas tree" atop the well casing, it is cleaned and dehydrated and separated from associated and dissolved gases before it is in a marketable condition. After it has gone through the surface equipment to make it marketable, it is then metered and either sold or

(footnote continues on next page)

prices, the percentage-of-value amount would be the greater. ^{21/} Thus, the cents-per-barrel rates, in effect, established a floor price for the value of the oil for Production Tax purposes, regardless of how low the actual "wellhead" price might fall.

To illustrate how the "stair step" tax worked, suppose a property had 10 wells and produced 450,000 barrels of 27-degree API gravity, valued at \$10 apiece during a 30-day month. The tax would be calculated as follows:

(footnote continued from previous page)

transported away from the property through some common carrier pipeline. In a number of other states, the "wellhead" price is effective at the outlet of the tank gauge or custody transfer meter at which it is first measured in a marketable condition. In Cook Inlet and on the North Slope, it may be miles between the Christmas tree and the custody transfer meter, and the separators and dehydrators represent significant expenditures. If the incidence of the tax or the royalty is at the custody transfer meters, none of the costs incurred upstream from that point for the gathering lines, separators and dehydrators and associated equipment would be deducted in determining the price or value for purposes of paying the tax or royalty. Conversely, if the incidence of the tax or royalty is at the Christmas tree, then all those costs are deducted in determining the price or value on which the tax or royalty is computed and paid. The phrase "wellhead price," while commonly used, can therefore be misleading or at least ambiguous in the Alaskan context, since it is unclear whether it refers to the price at the custody transfer meter or a price further upstream, perhaps as far as the Christmas tree. The Production Tax is based on the "gross value at the point of production", which is specifically defined to be the point of measurement (as opposed to the Christmas tree); see AS 43.55.140(6), 15 AAC 55.210(6).

- ^{21/} Five percent of \$3.375 equals \$0.16875, which is exactly what the cents-per-barrel rate was for the first "stair step." Six percent of \$3.375 is \$0.2025, the same as the rate for the second "step," while eight percent of it is \$0.27, the rate for the third. By 1977 the escalation in the cents-per-barrel rates due to the Wholesale price Index (see note 16, above) had raised the effective floor from its original \$3.375 to approximately \$6.10.

0 - 300 bbl/day "stair step": 10 wells, times 300 barrels per well a day, times 30 days, equals 90,000 barrels in this "stair step" of the 450,000 total taxable barrels produced. Five percent of 90,000 barrels at \$10 each equals \$45,000. 90,000 barrels times the cents-per-barrel rate of \$0.16875 22/ equals \$15,187.50.

301 - 1,000 bbl/day "stair step": 10 wells, times 700 barrels per well a day, times 30 days, equals 210,000 barrels in this "stair step", of the remaining 360,000 barrels that didn't fall into the first "step". Six percent of 210,000 at \$10 each equals \$126,000, while 210,000 times the \$0.2025 cents-per-barrel rate equals \$42,525.

1,000+ bbl/day "stair step": 450,000 total barrels, minus the 90,000 barrels falling in the first "stair step" and the 210,000 barrels falling in the second, leaves 150,000 barrels to fall in this top "step." Eight percent of 150,000 at \$10 a barrel is \$120,000, and at \$0.27 a barrel the cents-per-barrel amount is \$40,500.

The total percentage-of-value amount would be \$45,000 plus \$126,000 plus \$120,000, or \$291,000. This is greater than the cents-per-barrel amount of \$98,212.50 (\$15,187.50 + \$42,525 + \$40,500), so the actual tax would be paid on the percentage-of-value basis. The effective rate of tax in this example would be 6.47 percent (\$291,000 total tax, divided by a total value of \$4,500,000 for the 450,000 barrels, equals 0.0647).

After this tax system was enacted in October 1973 (ch. 4, FSSLA 1973), factors affecting the Alaska oil and gas market changed dramatically. The Arab oil embargo of the United States in early 1974 caused oil prices, which had doubled since the previous May, to redouble. Construction of TAPS finally began in 1974, but costs for constructing

22/ For simplicity, the example uses the original rates set out in the statute. In actual practice, those rates would first have been adjusted for changes in the crude oil Wholesale Price Index (WPI). One might also note that, by having 27 degree API gravity oil in the example, the example does not show how to make the API gravity adjustment of two percent in the WPI-escalated cents-per-barrel rates per degree above or below 27 degrees would be made. For an example illustrating all these aspects of the former tax, see Alaska Department of Revenue, Alaska's Oil and Gas Tax Structure: A Study with Recommendations for Improvement (February 1977) (the "1977 Tax Study"), pp. II-6 to II-10.

that project continued to skyrocket over all earlier projections. The federal government imposed a complex system of price controls on crude oil and refined products, with a big question mark deliberately left in the system as to how Prudhoe Bay oil would fit into it all once that field came into production.

Uncertain as to what all these changes might mean in terms of the profitability of Prudhoe Bay and the appropriate level and type of state taxation, the Alaska Legislature in 1975 retained Tanzer Economic Associates, Inc. to conduct an economic analysis of Prudhoe Bay, its profits, and the effects of state taxation policy on those profits. In January 1976 Tanzer's results were released. ^{23/} The "Tanzer Report" concluded that Alaska could significantly increase the overall level of its tax burden on Prudhoe Bay and still provide a sufficient degree of profitability to reward the oil companies there for investing in the development of the field.

A flurry of legislative proposals to increase oil taxes immediately followed, ranging from "excess profit" taxes to a "separate accounting" income tax, with higher Production Tax rates as an option somewhere in between. In the face of misgivings by the Department of Revenue about some of the proposals and the lack of a clear legislative consensus about which proposal(s) to adopt, Governor Hammond prevailed upon the Legislature to give the Department a year to make a comprehensive study of Alaska's then current tax structure and make recommendations in early 1977 about any changes that should be made. ^{24/} Because of strong support in the Senate for a "separate accounting" income tax ^{25/} and be-

^{23/} Tanzer Economic Associates, Alaska's Prudhoe Bay Oil: Profitability and Taxation Potential (January 9, 1976).

^{24/} The 1976 Legislature, through a Committee Substitute for Senate Concurrent Resolution 101 (CS SCR 101), resolved that the Legislative Council, through its Interim Committee on Oil and Gas Leasing and Taxation Policy, was to cooperate with the Administration in making a comprehensive and definitive study of Alaska's oil and gas leasing and taxation policies, with recommendations for improvement.

^{25/} "Separate accounting" is one of two basic ways of determining how much of a multistate business's taxable income is attributable to its activities in a particular state for purposes of that state's income tax. It attempts to isolate the in-state activities from the rest of the business and see how much income results

(footnote continues on next page)

cause of criticism of the state income tax as early as 1973, 26/ the Department of Revenue and the Legislative Council engaged Professors Jerome M. Ziefman and Kenneth G. Ainsworth to make a special study of the income tax. 27/

The Department's report -- Alaska's Oil and Gas Tax Structure: A Study with Recommendations for Improvement (February 1977) (the "1977 Tax Study") 28/ -- was transmitted to the Governor on February 11, 1977. Besides incorporating the criticisms and recommendations of Professors Ziefman and Ainsworth about the income tax, the 1977 Tax Study examined the Production Tax, the state ad valorem tax on pipelines and production and exploration equipment and facilities, and the reserves tax. In its review of the Production Tax, the 1977 Tax Study noted:

. . . Typically production taxes do not reflect the expenses incurred to obtain the production. The tax is either some specified percentage of the gross value of the production or a flat fee of so

(footnote continued from pervious page)

from the in-state activities. The other way is "apportionment," in which a slice of the business's total income is attributed to its in-state activities on the basis of a prescribed formula. Of the consultants advising the Legislature in the mid-1970s, perhaps the most respected was Milton Lipton of Walter J. Levy & Associates. He and Dr. Michael Tanzer of Tanzer Economic Associates, Inc. were preeminent advocates of separate accounting as the way to reform the state income tax and even Alaska's oil and gas tax structure in general.

26/ Milton Lipton, "Testimony at the Joint Hearings of Proposed Oil and Gas Legislation before the House and Senate resources Committees" (March 23, 1973 transcript), p. 7.

27/ Ziefman and Ainsworth, The Taxation of the Petroleum Industry under Alaska's Corporate Income Tax (January 9, 1977).

28/ The principal draftsmen of the 1977 Tax Study were John R. Messenger, then Deputy Commissioner of Revenue (Taxation), and Thomas K. Williams, then Director of the Department's Petroleum Revenue Division. Important editorial review and suggestions were made by Dr. David L. T. Knudson, Petroleum Economist in the Petroleum Revenue Division. Revenue Commissioner Sterling Gallagher closely supervised the preparation of the report.

many cents per unit of production. Since it is not based on net proceeds of the production operation, the production tax simply represents another cost of doing business to the producer. 29/

. . . .

Once a discovery has been made and production begins, however, the production tax (and the landowner's royalty) can have a more significant impact on the economics of the production operation and the associated decisions. As operating costs rise during the life of the field, the profit margin shrinks. At some point the total production costs overtake the value of the oil or gas produced, and production can then be continued only by operating at a loss. As one of the costs of doing business, the production tax contributes to the total costs and tends to hasten the time when this break-even point (called the economic limit) is reached. 30/

Besides this negative economic effect of production and severance taxes in general, the 1977 Tax Study drew attention to a particular problem with the "stair step" tax as it applied to areas of Alaska where the operating costs differed greatly from each other:

The current State oil production tax contains a "stair step" feature which is intended to alleviate the adverse impact that a production tax can have on an oil well operating close to its true economic limit. . . . The "stair step" feature of the existing oil production tax schedule is an attempt to reduce the tax rate as production falls closer to the true economic limit. The tax rate declines from 8% to 6% to 5% as individual well output falls. Unfortunately, the current "stair steps" appear to be sized incorrectly.

Economic factors governing production operations vary widely in the State of Alaska. Some areas in the State are located close to the refinery market and have low operating costs. In these areas wellhead values are high. As a consequence, the true economic limit (measured in barrels per day) for these properties can be quite low: 50 to 75 barrels a day per well, or even lower, in some cases in Cook Inlet.

29/ 1977 Tax Study, p. V-19.

30/ Id., p. V-21.

Other crude oil wells in Alaska are not located close to refinery markets and could have extremely high operating costs. The netback value in the field for these isolated areas is lower than in Cook Inlet and the operating and capital costs can be much higher than in Cook Inlet. Accordingly, the true economic limit (measured in barrels per day) for these producing properties can be quite high. Depending on the property, this limit might range from 300 to perhaps 1000 barrels per day [per well]. There is, then, a rather wide range of values which can be generated regarding the minimum production level at which Alaska crude oil wells can be operated.

From this perspective, an economic flaw in the existing or any other "stair step" production tax schedule becomes obvious. By establishing a fixed schedule of "stair stepped" tax rates, the State crude oil production tax is based on the faulty assumption that production economics are similar in Cook Inlet, Prudhoe Bay, and everywhere else in Alaska. 31/

To take care of these problems, the 1977 Tax Study made the following recommendation to replace the "stair steps" with the ELF: 32/

The Department of Revenue recommends perfecting the "stair step" approach as a means of eliminating effects of the production tax on the economics of oil production operations. The key to doing so is not found by creating a series of "steps" and rates that succeed in this for any one area of the State, such as Cook Inlet. As explained in Chapter V, a well producing 1000 bar-

31/ Id., pp. V-28 to V-30.

32/ The original idea for an economic limit was by the then Director of the Petroleum Revenue Division of the Alaska Department of Revenue, Thomas K. Williams, in response to criticism, particularly by Milton Lipton, about the adverse economic effects of the Production Tax on properties as they near their economic limit. The precise formula for the ELF proposed in the 1977 Tax Study (and still the formula for the gas ELF) was developed jointly by Mr. Williams and Dr. David L. T. Knudson, Petroleum Economist in that division. The exponent for the oil ELF and the number 460 appearing in the exponent were features added during the legislative process as the result of work by Alan Latham, who was working for the Legislature.

rels a day may be quite a money maker in Cook Inlet but be mediocre or even marginal in other areas of the state such as the Interior or North Slope. Consequently the "stair steps" that succeed for the Inlet won't eliminate the economic effects of the tax elsewhere. Conversely, "stair steps" designed to eliminate those effects [for] production on the North Slope would give too much away to production in the Inlet.

To eliminate this difficulty, the Department of Revenue recommends an Economic Limit Factor (ELF), based on the ratio of the rate at the true economic limit to the current production rate, as a mechanism for scaling down the tax rate as the production declines toward the economic limit. This would be done by multiplying a basic tax rate times the difference between unity (the number, one) and the ratio of rate at limit to current rate.

. . . .

If the tax law conclusively sets the rate at the economic limit at some specific rate like 200 barrels a day per well, the ELF becomes simply one more economically rigid structure like the present "stair steps." It would not respond to the great regional differences in economic scale for production operations in Alaska. But the great advantage of the ELF over any specific set of "stair steps" is that it can be tied to the actual economic condition of a property anywhere in the state (emphasis in original) 33/

This was the first public proposal to adopt the ELF as a replacement for the "stair steps" in the Production Tax. Instead of a series of discrete "steps" in production rates at which tax rates changed, the ELF represented in effect a smooth curve, a series of an infinite number of "steps" each infinitesimally small. But beyond simply smoothing the "steps" into a continuous curve, the ELF had the additional advantage of allowing the whole curve itself to be shifted, to reflect the rate of production needed for that particular property to cover its basic operating costs at the economic limit. It could reflect the fact that in remote areas of Alaska like Prudhoe Bay, the rate of production needed merely to break even would be very much greater than the rates needed to break even in the more accessible areas like Cook Inlet and the Kenai Peninsula. Thus, the adverse economic

33/ 1977 Tax Study, pp. VI-17 and VI-19.

effects on the economic life of an oil and gas property were no longer a necessary evil of a tax based on gross production value as the Production Tax is.

Governor Hammond acted on this recommendation by introducing Senate Bill 238 to the 1977 Session of the Legislature. 34/ After much legislative wrangling, an amended version of this bill (FCCS HCS CSSB 238) finally passed, and the ELF became part of the Production Tax. 35/

34/ See 1977 Senate Journal, pp. 540-541 (Governor's transmittal letter).

35/ Ch. 136, SLA 1977.

HOW THE ELF WORKS: VARIATIONS ON THE THEME

A. Introduction to the Exponent. The ELF formula for gas production (and formerly for "old oil" under now expired federal oil price controls) is simple and straightforward in its operation. It is merely one minus the ratio of production at the economic limit (PEL) to current production (TP), or to put it into mathematical symbols:

$$\text{ELF} = 1 - [\text{PEL}/\text{TP}]$$

As current production (TP) declines toward the "break even" rate (PEL), the ratio of PEL to TP gets larger and larger, eventually equaling one when TP has declined to the point that it equals PEL. At that point, the ELF becomes $1 - 1$, or zero. The tax is then also zero.

This same formula is at the root of the ELF for oil, except that there is, in addition, an exponent that is applied to it. (For a review of how exponents work and what fractional exponents mean, see Appendix A.)

The exponent in the oil ELF is a fraction whose numerator is 460 times the number of "well days" in the month when the oil was produced, and whose denominator is the monthly production rate at the economic limit. The number of well days is simply the sum for all wells of the number of days each of them was operated during the month. If 10 wells were each operated for 30 days during a month and two others were operated for 25 days each, then the number of well days is 350 (10 times 30, plus two times 25).

Depending on what PEL is, the exponent may be greater than, equal to, or less than one. If it is greater than one, the exponent is a "net power function" -- that is, the effect of raising to a power equal to the numerator of the exponent outweighs the effect of taking the a root equal to the denominator of the fraction. Conversely, if it is less than one, the exponent is a "net root function" and the effect of taking the root outweighs that of raising to the power.

As set out in the "simple" explanation of the ELF, the value of one minus the ratio of PEL to TP is always less than one and can range all the way down to zero. For numbers between zero and one, the effect of a "net power function" is to make the result smaller than the starting number. For example, 0.9 squared is 0.81; 0.01 to the fifth power is 0.0000000001; 0.5 to the "1.000001"-th power is 0.499999653. Conversely, the effect of a "net root function" on this range of numbers is to produce a larger number: the square root of 0.81 (0.81 raised to the "one half"-th power) is 0.9; the fifth root (the "1/5"-th or

"0.2"-th power) of 0.0000000001 is 0.01; and 0.5 to the "0.999999"-th power is 0.500000347.

The value of PEL therefore has an important but subtle effect on the exponent. If PEL corresponds to more than 460 barrels a day per well, the exponent becomes a "net root function" and makes the value of the ELF larger than the starting number to which the exponent is applied. On the other hand, if PEL is less than 460 barrels times the number of well days, the exponent is a "net power function" and makes the final value of the ELF less than the number to which the exponent is applied.

B. The PEL Presumption: To Rebut or Not to Rebut?
PEL appears twice in the oil ELF formula -- once in the exponent and once in the calculation of the number to which the exponent is applied:

$$ELF = (1 - [PEL/TP])^{([460 \times WD]/PEL)}$$

For oil there is a rebuttable presumption that PEL equals 300 barrels times the number of well days in the particular month. ^{36/} The presumption may be rebutted only once a year, and if it is rebutted, the value that is demonstrated to be the proper PEL must be used for that entire calendar year. ^{37/} If the presumption is not rebutted, then the formula for the ELF is, in effect, the following:

$$ELF = (1 - ([300 \times WD]/TP))^{(460/300)}$$

The decision to rebut the presumption or not, presents some subtle trade-offs that must be carefully considered before proceeding. On the one hand, if the presumption is not rebutted, then the exponent is a "net power function," which produces a result that is smaller than the number to which the exponent is applied. On the other hand, if the presumption is rebutted and shown to be greater than 300 barrels per well day, then the ratio of PEL to current production will be made greater, leaving a smaller number to which the exponent is applied. If the demonstrated PEL is still less than 460 barrels per well day, the exponent will remain a "net power function" although, as the value for PEL approaches 460 barrels per well day, the effectiveness of the exponent in reducing the number to which it is applied will diminish. The effects of rebutting the PEL -- that is, the reduction in the difference between one and the ratio of PEL to current production (that difference being the number

^{36/} AS 43.55.013(d).

^{37/} Id.

to which the exponent will be applied), and the "net power function" nature of the exponent -- will both be working in the same direction and reduce the ELF.

If PEL equals 460 barrels per well day, the exponent becomes exactly equal to one and has no effect at all on the number to which it is applied. The effect of rebutting the presumption is then simply the reduction in the difference between one and the ratio of PEL to current production, which will still yield a lower ELF than if the presumption were not rebutted.

Beyond 460 barrels per well day, the demonstrated PEL will turn the exponent into a "net root function," which will tend to offset the advantage to be gained by reducing the difference between one and the ratio of PEL to current production. Although that advantage always outweighs the offsetting effect of the exponent (in other words, it is always worth rebutting the presumption if possible, because doing so reduces the final value of the ELF), the extent to which this happens depends on how what the current average daily production per well is. The higher the production rate, the smaller the net effect is from rebutting the presumption.

The following table illustrates this for four cases: Case 1 has current average production of 500 barrels a day per well; in Case 2 it is 1,000 barrels a day per well; in Case 3, 5,000 barrels a day per well; and in Case 4, 10,000 barrels a day per well, corresponding roughly to the expectations in early 1977 for what would be the situation with the Prudhoe Bay field by the beginning of 1978. 38/

38/ The throughput capacity of TAPS represents a physical constraint on the rate of production from North Slope fields. TAPS had been planned to start up in three phases: the first at a throughput of 600,000 barrels a day; the second and 1.2 million barrels a day; and the third at 1.5+ million. Until the third phase was implemented, TAPS's throughput capacity represented the upper limit at which the Prudhoe Bay field could be produced (Phase 3 would be at or above the maximum efficient rate for Prudhoe Bay of 1.5 million barrels a day). By early 1977 the first two phases had been "telescoped" together, so that TAPS was expected to be at 1.2 million barrels a day by the end of the year. That was, of course, before the fire and explosion at Pump Station 8 while the pipeline was being filled. However, for purposes of analyzing the ELF, the assumptions used by the Legislature and the Administration reflected the planned 1.2 million-barrel-a-day rate of production from the field into TAPS, with approximately 120 producing wells.