EDUCATION AND EXAMINATION COMMITTEE

OF THE

SOCIETY OF ACTUARIES

DESIGN AND PRICING (DP) RETIREMENT BENEFITS STUDY NOTE

RETIREMENT BENEFITS CASE STUDY-U.S.

REVISED IN 2007

This case study will be used as a basis for examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to the company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given

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Case Study - Course DP Retirement-U.S.

National Oil Company - Background

National Oil Company (NOC) is a large well-established company that services oil wells all over the United States (US). NOC has been in existence for over 30 years and has more than 10,000 full-time salaried and union hourly employees and over 6,000 part-time employees. The full-time workforce is reasonably stable, but turnover in the last 5 years has been greater than desired, due to competitors recruiting NOC's employees.

Normally, an undergraduate degree is a minimum requirement to obtain entry to the salaried workforce and many employees have graduate degrees. About half of NOC's salaried employees are recruited directly from university with the other half coming from competitors.

The company's financial position varies with the price of oil. As oil prices rise, oil companies become increasingly active and in turn require the services of NOC. Conversely, activity slows as oil prices drop. Despite this, the company is usually in a taxable position.

NOC has managed to be successful by staying on the cutting edge of technology. NOC prides itself in being state of the art in processes and software relevant to its industry. This has helped it to stave off competition from both inside and outside of United States. Although NOC is a major player in the industry within United States, there are larger players within and from outside of the country, with which NOC has to compete. From time to time, there are rumors of a takeover of NOC.

Summary of National Oil's Retirement Benefits

NOC maintains three defined benefit plans:

- a final-average pay defined benefit (DB) RPP for its full-time salaried employees;
- 2. a flat dollar DB RPP for its full-time hourly union staff; and
- 3. a non-eligible pension plan (referred to as the SERP) for its executives that is supplemental to the salaried RPP. This plan has no assets.

In addition, the company has a defined contribution RPP for its part-time workforce.

Extracts of Retirement Benefits Provisions and Financial Information

National Oil Full-Time Salaried Pension Plan

Eligibility Immediate

Vesting 100% after 2 years of plan membership

Normal Retirement Age 65

Early Retirement Age 55 with 2 years of plan membership

Best Average Earnings Average annual earnings during 60 consecutive months in

which earnings were highest

Earnings Basic pay, excluding overtime and bonuses

Normal Retirement Benefit 2% of best average earnings times years of service,

subject to tax system maximum

Accrued Benefit Benefit calculated as under the normal retirement benefit

formula using best average earnings and service as of

date of calculation

retirement precedes age 62

Form of Benefit If married, 60% joint & survivor benefit, without reduction.

If not married, single life annuity

Optional Forms of Benefit None

Indexing None

Termination Benefit Lump sum equal to actuarial present value of accrued

benefit

Pre-Retirement Death Benefit Lump sum equal to actuarial present value of accrued

benefit payable to named beneficiary

Disability Benefit Accrual of service while on long term disability

National Oil Full-Time Salaried Pension Plan

Historical Actuarial Valuation Results

	2003	2004	2005	2006	2007
Participant Summary - January 1					
Active Participants	 				
(a) count	4,243	4,293	4,305	4,268	4,286
(b) average age	44.9	44.7	45 6	45 6	45 5
(c) average service	15.6	15.5	15 5	15 2	15 4
(d) average future working lifetime	11.3	11.7	11.0	11.0	11.0
(e) average plan earnings (prior year)	64,000	65 000	67,000	67 200	67 300
Deferred Vested Participants					
(a) count	•	-	•	-	-
Pensioners (incl beneficiaries)					
(a) count	590	612	640	665	695
(b) average age	70.8	70.7	70.8	70.9	69.8
(c) average annual benefit	19,100	19,300	19,500	19,700	20,100

Plan Assets (numbers in \$000's) *

Change in Plan Assets during Prior Year					
Market Value of Assets at January 1 of prior year	545 745	529,366	674 861	772,639	860,847
Employer Contributions during prior year	31 532	40,145	37 000	39,789	-
Benefit Payments during prior year	(14,660)	(15,110)	(19,480)	(20,500)	(20,500)
Expenses during prior year	-	· · ·	· - ·	, <u>-</u>	- '
Investment return during prior year	(33,251)	120,461	80,257	68,919	119,084
Market Value of Assets at January 1 of current year	529,366	674 861	772,639	860,847	959,430
Rate of return during prior year	-6%	22%	12%	9%	14%
Average Portfolio Mix During Prior Year					
(a) Domestic Large Cap Equities	27%	30%	30%	29%	30%
(b) Domestic Small Cap Equities	24%	30%	27%	28%	27%
(c) Domestic Fixed Income	34%	25%	26%	27%	27%
(d) International Equities	8%	11%	13%	11%	11%
(e) Real Estate	3%	2%	2%	3%	3%
(f) Cash	<u>4%</u>	<u>2%</u>	<u>2%</u>	<u>2%</u>	<u>2%</u>
(g) Total	100%	100%	100%	100%	100%
Asset Class Returns during Prior Year.					
(a) Domestic Large Cap Equities	-14%	25%	15%	13%	23%
(b) Domestic Small Cap Equities	-18%	30%	14%	7%	18%
(c) Domestic Fixed Income	9%	5%	7%	3%	4%
(d) International Equities	-16%	40%	12%	17%	10%
(e) Real Estate	4%	3%	3%	12%	8%
(f) Cash	2%	1%	1%	2%	2%

^{*} numbers may not add due to rounding

National Oil Full-Time Salaried Pension Plan

Historical Actuarial Valuation Results

	2003	2004	2005	2006	2007	
Funding Valuation - January 1 (numbers in \$000's) *						
Actuarial Accrued Liability (a) Active participants (b) Petersed vector participants	502,139	570.617	616 733	633 605	643,703	
(b) Deferred vested participants (c) Pensioners	98,040	106,304	114,442	134,935	143,886	
(d) Total	600,179	676,921	731,175	768,540	787 589	
2 Actuarial Value of Assets	529,366	674,861	772,639	860,847	959,430	
3 Unfunded Actuarial Accrued Liability. (1d)-(2)	70 813	2 060	(41 464)	(92,306)	(171,841)	
4 Normal Cost (beg Of year)	32 188	36 814	39,789	41 685	41,799	
5 Change in Unfunded AAL during prior year: (a) Unfunded AAL at prior valuation date (b) Adjustment for Interest (c) Normal Cost Winterest less contributions (d) (Gain)/Loss on investment (e) (Gain)/Loss on termination (f) (Gain)/Loss on salary increases less than expected (g) (Gain)/Loss on mortality (h) (Gain)/Loss on retirement (i) (Gain)/Loss on assumption changes (j) (Gain)/Loss on all other factors (k) (Gain)/Loss on all other factors (l) Unfunded AAL at current valuation date 6. Actuarial Basis (a) Interest (b) Salary scale (c) Consumer Price Index	7,275 582 382 77,585 (2,200) (12,800) 200 (1,200) - - 988 70 813	70 813 5 665 (6,987) (77 110) (2,100) (19,700) (1,400) (2 800) 36,500 - (821) 2,060 7 00% 4 00% 3 50%	2,060 144 1 096 (32 404) (8 100) (13 800) (4 000) (4 700) 19,100 - (860) (41,464) 6 75% 3 75% 3 00%	(41,464) (2 799) 1 343 (16 115) (15 400) (23 700) (6 800) (7 400) 20 000 - 28 (92 306) 6 50% 3 50% 3 00%	(92,306) (6,000) 44,394 (63,795) (14,000) (25 000) (6 800) (8,500) - - 166 (171 841) 6 50% 3 50% 3 00%	
(d) Mortality (e) Turnover (f) Retirement age (g) Proportion married and age difference (h) Expenses	GAM83 Based on NOC experience for 1986-1988 Age 62 80% married, male spouse 3 years older than female spouse Assume all expenses paid by company					
(i) Asset Valuation Method		,	, -	шрану		
(j) Actuarial Cost Method			value of assets ated unit credit			
* numbers may not add due to rounding						
(a) Accumulated Benefit Obligation (b) Projected Benefit Obligation	(464 953) (715,313)	(520 608) (800 936)	(558,850) (859,770)	(587 537) (903 903)	(657 910) (1 012 170)	

National Oil Full-Time Salaried Pension Plan Reconciliation of Plan Participants (2003 - 2006)

	Active	Pensioners/ Beneficiaries	Total
1. Participants as of January 1, 2003	4,243	590	4,833
- New Entrants/Rehires	375	-	375
- Terminated Nonvested	(120)	-	(120)
- Terminated Vested (Lump Sum Cashout)	(175)	-	(175)
- Retirement	(28)	28	-
- Death w/ Beneficiary	(2)	2	-
- Death w/o Beneficiary	-	(8)	(8)
- Net change	50	22	72
2. Participants as of January 1, 2004	4,293	612	4,905
- New Entrants/Rehires	400	-	400
- Terminated Nonvested	(150)	-	(150)
- Terminated Vested (Lump Sum Cashout)	(200)	-	(200)
- Retirement	(35)	35	-
- Death w/ Beneficiary	(3)	3	-
- Death w/o Beneficiary	-	(10)	(10)
- Net change	12	28	40
3. Participants as of January 1, 2005	4,305	640	4,945
- New Entrants/Rehires	250	-	250
- Terminated Nonvested	(115)	-	(115)
 Terminated Vested (Lump Sum Cashout) 	(140)	-	(140)
- Retirement	(30)	30	-
- Death w/ Beneficiary	(2)	2	
 Death w/o Beneficiary 	-	(7)	(7)
- Net change	(37)	25	(12)
4. Participants as of January 1, 2006	4,268	665	4,933
- New Entrants/Rehires	300	-	300
- Terminated Nonvested	(130)	-	(130)
- Terminated Vested (Lump Sum Cashout)	(115)	-	(115)
- Retirement	(35)	35	-
- Death w/ Beneficiary	(2)	2	-
- Death w/o Beneficiary	-	(7)	(7)
- Net change	18	30	48
5. Participants as of January 1, 2007	4,286	695	4,981

National Oil Full-Time Salaried Pension Plan Age/Svc/Earnings as of January 1, 2007

Age (Years)

# Participants	< 5 150 35 900	5-10 140 46.100	Service (Years) 10-15	15-20	>50	Totals 290
	200,200	160	100 62,000	55 65,100	1 1	515 55,300
	195 59,400	208 66,300	186 70,200	211 76,300	201 77,800	1,001
	184 62,600	163 65,200	195 67,500	310 75,600	755 77,800	1,607 73,100
	168 61,200	77 64,100	87 68,100	81 73,900	431 74,200	844 70,000
	4 47,000	5 52,100	10 46,200	6 57,600	4 53,900	29 50,700
	901 53,700	753 60,200	578 67,100	663 74,600	1,391 76,600	4,286 67,300
	45.5 15.4 67,300					

National Oil Full-Time Salaried Supplemental Executive Retirement Plan (SERP)

Eligibility Immediate

Normal Retirement Age 65

Early Retirement Age 55 with 2 years of plan membership

Salaried Pension Plan without regard to tax system maximums less actual Accrued Benefit under the

Salaried Pension Plan

Normal Retirement Benefit Accrued Benefit

Early Retirement Benefit Accrued Benefit reduced by 0.25% per month that

early retirement precedes age 62

Commencement Date and Form

of Benefit

Must be same as under Salaried Pension Plan

Indexing None

Termination Benefit None

Pre-Retirement Death Benefit None

Disability Benefit None

	2004	2005	2006	2007
Participant Summary				
1 Active Participants		.,,		
(a) count	45	47	49	52
(b) average age	52.4	52.9	53.1	53.1
(c) average service	17.5	18.1	18.2	18 2
(d) average future working lifetime	70	6.5	6.3	63
(e) average earnings (prior year)	305,000	310,000	315,000	325,000
2. Deferred Vested Participants				
(a) count	-	-	***	-
3 Pensioners (incl beneficiaries)				
(a) count	13	14	15	17
(b) average age	69 0	69 6	70 4	70 1
(c) average annual benefit	12,500	12,900	13,100	14,000

Valuation Results (numbers in \$000's) *

1 Reconciliation of funded status at valuation date:				
 (a) Accumulated Benefit Obligation (b) Projected Benefit Obligation (c) Fair Value of Assets (d) Funded Status: (b) + (c) 	(10,015) (25,036) - (25,036)	(11,525) (28,813) - (28,813)	(13,505) (33,762) - (33,762)	(16,978) (42,444) - (42,444)
	,	992	1,074	1,340
2. Service Cost	911		•	•
Benefit Payments	163	181	197	238
4. Actuarial Basis				
(a) Discount rate	6.25%	6 00%	5.50%	5 00%
(b) Salary scale	4.00%	3 75%	3 50%	3 50%
(c) CPI (d) All other assumptions	3.50%	3 00%	3.00%	3 00%

^{*} numbers may not add due to rounding

National Oil Full-Time Hourly Union Pension Plan

Eligibility Immediate

Vesting 100% after 2 years of plan membership

Normal Retirement Age 65

Early Retirement Age 55 with 10 years of service

Normal Retirement Benefit \$75 per month times years of service for terminations/

retirements during 2003, 2004, and 2005

\$80 per month times years of service for terminations/

retirements during 2006 and beyond

Accrued Benefit Benefit calculated as under the normal retirement benefit

formula based on service and multiplier as of date of

calculation

Early Retirement Benefit Unreduced benefit at 62 with 30 years of service,

otherwise reduced by 0.25% per month that early retirement precedes Normal Retirement Age.

Form of Benefit With a spouse, 60% joint & survivor benefit without reduction

Without a spouse, single life annuity.

Optional Forms of Benefit None

Post-Retirement Indexing Lesser of 1% or CPI each year after pension commencement

Termination Benefit Lump sum equal to actuarial present value of accrued

benefit assuming no indexing

Pre-Retirement Death Benefit Lump sum equal to actuarial present value of accrued

benefit assuming no indexing, payable to named beneficiary

Disability Benefit None

National Oil Full-Time Hourly Union Pension Plan Historical Actuarial Valuation Results

	2003	2004	2005	2006	2007
Participant Summary - January 1					
Active Participants					
(a) count	6,437	6,376	6,295	6,253	6,321
(b) average age	45 1	45.5	46.4	46.5	46 3
(c) average service	16 2	16.7	17 3	17.4	17 2
(d) average future working lifetime	1 1.8	11.5	10.7	10.6	10.8
(e) average plan earnings (prior year)	37,100	38 032	39,500	39,800	39 600
Deferred Vested Participants					
(a) count	-	.	-	-	-
Pensioners (incl beneficiaries)					
(a) count	985	1,016	1,034	1,060	1,081
(b) average age	71.0	71.5	72.3	72.8	71.8
(c) average annual benefit	9,800	9,900	10,000	10,800	11,200

Plan Assets (numbers in \$000's) *

Change in Plan Assets during Prior Year					
Market Value of Assets at January 1 of prior year	306,848	306 622	380 679	444,857	504 928
Employer Contributions during prior year	19,000	24.000	33,000	34,400	42.000
Benefit Payments during prior year	(9,883)	(11 258)	(11,340)	(12,000)	(15,000)
Expenses during prior year	•	· •	-	-	-
Investment return during prior year	(9,342)	61,315	42,518	37,670	73,720
Market Value of Assets at January 1 of current year	306 622	380.679	444,857	504,928	605.648
Rate of return during prior year	-3%	20%	11%	8%	14%
Average Portfolio Mix During Prior Year					
(a) Domestic Large Cap Equities	21%	25%	29%	30%	30%
(b) Domestic Small Cap Equities	23%	25%	20%	21%	27%
(c) Domestic Fixed Income	47%	35%	38%	36%	27%
(d) International Equities	2%	10%	8%	9%	11%
(e) Real Estate	2%	2%	2%	2%	3%
(f) Cash	<u>5%</u>	<u>3%</u>	<u>3%</u>	<u>2%</u>	<u>2%</u>
(g) Total	100%	100%	100%	100%	100%
Asset Class Returns during Prior Year					
(a) Domestic Large Cap Equities	-14%	25%	15%	13%	23%
(b) Domestic Small Cap Equities	-18%	30%	14%	7%	18%
(c) Domestic Fixed Income	9%	5%	7%	3%	4%
(d) International Equities	-16%	40%	12%	17%	10%
(e) Real Estate	4%	3%	3%	12%	8%
(f) Cash	2%	1%	1%	2%	2%

^{*} numbers may not add due to rounding

National Oil Full-Time Hourly Union Pension Plan

Historical Actuarial Valuation Results

funding Valuation - January 1 (numbers in \$0)00's) *	2003	2004	2005	2006	2007
Actuarial Accrued Liability				·		
Active Multiplier	\$	75 \$	75 \$	75 \$	80 \$	80
(a) Active participants		281,619	376,579	435,162	507,668	548,941
(b) Deferred vested participants		-	-	-		-
(c) Pensioners		91,704	96,561	98,230	117,914	124,704
(d) Total		373,323	473,140	533 392	625 582	673 645
Actuarial Value of Assets		306,622	380,679	444 857	504,928	605 648
Unfunded Actuarial Accrued Liability: (1d)-(2)		66,701	92,460	88 534	120 655	67 997
Normal Cost (beg Of year)		17,384	22,550	25 154	29 176	31.915
Change in Unfunded AAL during prior year						
(a) Unfunded AAL at prior valuation date		32,959	66 701	92 460	88,534	120,655
(b) Adjustment for Interest		2,637	5 336	6 472	5 976	7,843
(c) Normal Cost w/interest less contributions		(2,389)	(6,185)	(10 027)	(8,709)	(12,292
(d) (Gain)/Loss on investment		34,255	(36 276)	(15 112)	(6 886)	(40 023
(e) (Gain)/Loss on termination		(1 500)	(8,000)	(6 700)	(10,400)	(6,000
(f) (Gain)/Loss on salary increases less than expected		-	(4.000)	(4.000)	/4 000)	(1,900
(g) (Gain)/Loss on mortality		200	(1,000)	(1,200)	(1,900) (550)	(400
(h) (Gain)/Loss on retirement		(250)	(500)	(750) 24 200	23,400	(400
(i) (Gain)/Loss on assumption changes		-	73,000	24 200	20,400	_
(j) (Gain)/Loss on expenses		- 789	(615)	(809)	(539)	114
(k) (Gain)/Loss on all other factors		109	(010)	(003)	31,729	
Change in active benefit multiplier Matter in active benefit multiplier	***	66,701	92,460	88 534	120 655	67 997
Actuarial Basis						
(a) Interest		8 00%	7 00%	6 75%	6 50%	6 50%
(b) Salary scale		N/A	N/A	N/A	N/A	N//
(c) Consumer Price Index		3 50%	3 50%	3 00%	3 00%	3 00%
(d) Mortality				GAM83		
(e) Turnover				experience for 19		
(f) Retirement age		Age 6	2 with appropriate	e early retirement	reduction, if any	
(g) Proportion married and age difference		80% mai			an female spouses	
(h) Expenses				penses paid by co		4.000
(i) Post-retirement indexing		1 00%	1 00%	1.00%	1.00%	1.00%
(j) Asset Valuation Method				t value of assets		
(k) Actuarial Cost Method			!	Unit credit		

(a) Accumulated Benefit Obligation (b) Projected Benefit Obligation	(471,564) (471,564)	(536 869) (536 869)	(606,033)	(747,565)	(865 471)

National Oil Full-Time Hourly Union Pension Plan Reconciliation of Plan Participants (2003 - 2006)

	Active	Pensioners/ Beneficiaries	Total
1. Participants as of January 1, 2003	6,437	985	7,422
- New Entrants/Rehires	200	-	200
- Terminated Nonvested	(100)	-	(100)
 Terminated Vested (Lump Sum Cashout) 	(120)	-	(120)
- Retirement	(40)	40	-
- Death w/ Beneficiary	(1)	1	- (40)
- Death w/o Beneficiary	_	(10)	(10)
- Net change	(61)	31	(30)
2. Participants as of January 1, 2004	6,376	1,016	7,392
- New Entrants/Rehires	120	-	120
- Terminated Nonvested	(75)	-	(75)
- Terminated Vested (Lump Sum Cashout)	(100)	-	(100)
- Retirement	(25)	25	-
- Death w/ Beneficiary	(1)	1	-
- Death w/o Beneficiary	-	(8)	(8)
- Net change	(81)	18	(63)
3. Participants as of January 1, 2005	6,295	1,034	7,329
- New Entrants/Rehires	150	-	150
- Terminated Nonvested	(80)	-	(80)
 Terminated Vested (Lump Sum Cashout) 	(75)	-	(75)
- Retirement	(35)	35	-
- Death w/ Beneficiary	(2)	2	- (4.4)
- Death w/o Beneficiary	-	(11)	(11)
- Net change	(42)	26	(16)
4. Participants as of January 1, 2006	6,253	1,060	7,313
- New Entrants/Rehires	170	-	170
- Terminated Nonvested	(30)	_	(30)
 Terminated Vested (Lump Sum Cashout) 	(40)	-	(40)
- Retirement	(30)	30	-
- Death w/ Beneficiary	(2)	2	-
 Death w/o Beneficiary 	-	(11)	(11)
- Net change	68	21	89
5. Participants as of January 1, 2007	6,321	1,081	7,402

National Oil Full-Time Hourly Union Pension Plan Age/Svc/Earnings as of January 1, 2007

Age (Years)

		۸ تن	Se 5-10	Service (Years) 10-15	15-20	>20	Totais
< 25	# Participants Average Salary	200 25,500	90 31,300	1 1	1 1	1 1	290 27,300
25-35	# Participants Average Salary	270 26,800	120 31,800	91 37,800	62 38,300	1 1	543 31,100
35-45	# Participants	275	350	320	659	441	2,045
	Average Salary	27,000	32,200	39,400	44,300	46,600	39,600
45-55	# Participants	120	160	300	688	895	2,163
	Average Salary	25,000	32,200	38,600	43,000	46,800	42,200
55-65	# Participants	95	62	94	186	801	1,238
	Average Salary	24,500	28,700	36,400	39,900	46,400	42,100
> 65	# Participants	8	9	11	8	6	42
	Average Salary	20,600	21,600	25,700	24,600	25,100	23,600
Totals	# Participants	968	791	816	1,603	2,143	6,321
	Average Salary	26,100	31,600	38,400	42,900	46,500	39,600
	Avg Age Avg Svc Avg Salary	46.3 17.2 39,600					

National Oil Part-Time DC Pension Plan

Eligibility Immediate

Vesting Immediate

Employer Contributions 50% match of employee contributions

Employee Contributions 3% of base pay

Plan Fund The employer invests the contributions in a balanced

fund There are no employee investment choices.

Account Balance Contributions are accumulated in member's individual

account earning investment income at the rate of return

earned by the Plan Fund

Loans Not permitted.

Benefit on Termination or

Retirement

Account balance is transferred to a LIRA/LIF for the member after one year from date of termination or retirement, unless employee has since returned to

employment with NOC.

Benefit on Death Account balance is payable to named beneficiary

National Oil Part-Time DC Pension Plan

Historical Results - January 1

	2003	2004	2005	2006	2007
Participant Summary					
(a) number participating during prior year (b) average age (c) average base pay	5,900 29.5 22,000 00	6,200 30.0 23 000 00	6,300 30.5 24,000 00	6,250 30.9 26,000 00	6,500 28.9 29,000 00

Plan Assets (numbers in \$000's) *

Change in Plan Assets during Prior Year.					
Market Value of Assets at January 1 of prior year	40,000	41,739	46,792	57,871	67,779
Employee Contributions during prior year	3 894	4,278	4,536	4,875	5,655
Company Contributions during prior year	1,947	2,139	2,268	2,438	2 828
Benefit Payments during prior year	(5,310)	(5,580)	(5,670)	(5,625)	(5,850)
Expenses during prior year	``	-	•	-	-
Investment return during prior year	1,208	4,216	9,945	8,220	4,837
Market Value of Assets at January 1 of current year	41,739	46,792	57,871	67,779	75,248
Rate of return during prior year	3%	10%	21%	14%	7%

^{*} numbers may not add due to rounding