

EDUCATION AND EXAMINATION COMMITTEE
OF THE
SOCIETY OF ACTUARIES
DESIGN AND PRICING (DP)
RETIREMENT BENEFITS STUDY NOTE

RETIREMENT BENEFITS CASE STUDY–U.S.

UPDATED 08/09/10

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 - US

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 US. Although NOC is the largest player in the industry within US, there are larger players from outside of the country, with which NOC has to compete. From time to time, there are rumors of a takeover of NOC.

United States legislation and social programs will apply to NOC in this case study.

Summary of National Oil's Retirement Benefits

NOC maintains five retirement plans:

1. a final-average pay defined benefit (DB) qualified plan for its full-time salaried employees;
2. a flat dollar defined benefit qualified plan for its full-time hourly union staff;
3. a defined contribution (DC) qualified plan for its part-time workforce; and
4. a non-qualified pension plan (referred to as the SERP) for its executives that is supplemental to the salaried plan. This plan has no assets.
5. a retiree health and welfare plan for the full-time salaried and hourly union retirees. This plan has no assets.

Extracts of Retirement Benefits Provisions and Financial Information

National Oil Full-Time Salaried Pension Plan

Eligibility	Immediate
Vesting	100% after 5 years of plan service
Normal Retirement Age	65
Early Retirement Age	55 with 5 years of plan service
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
Early Retirement Benefit	Accrued benefit reduced by 0.25% per month that early retirement precedes age 62 for actives and terminated vested members
Form of Benefit	If with spouse, 60% joint & survivor benefit, without reduction. If without spouse, single life annuity
Optional Forms of Benefit	None
Indexing	None
Termination Benefit	Deferred Pension
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 and immediate pension without a reduction upon permanent and total disability

National Oil Full-Time Salaried Pension Plan
Historical Actuarial Valuation Results

2008 2009 2010

Participant Summary - January 1

<i>Active Participants</i>			
(a) count	4,293	4,305	4268
(b) average age	45.6	45.0	45.3
(c) average service	14	13	12.1
(d) average future working lifetime	11	11	11
(e) average plan earnings (prior year)	65,000	65,000	66,300
<i>Deferred Vested Participants</i>			
(a) count	-	-	-
<i>Pensioners (incl beneficiaries)</i>			
(a) count	612	640	665
(b) average age	68.2	67.5	67.0
(c) average annual benefit	30,000	31,000	32,000

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

<i>Change in Plan Assets during Prior Year:</i>			
Market Value of Assets at January 1 of prior year	959,430	922,971	744,096
Employer Contributions during prior year	-	12,000	11,990
Benefit Payments during prior year	(27,000)	(26,000)	(28,000)
Expenses during prior year	-	-	-
Investment return during prior year	(9,459)	(164,875)	(44,165)
Market Value of Assets at January 1 of current year	922,971	744,096	683,921
Rate of return during prior year	-1%	-18%	-6.0%
<i>Average Portfolio Mix During Prior Year:</i>			
(a) Domestic Large Cap Equities	32%	30%	30%
(b) Domestic Small Cap Equities	25%	10%	10%
(c) Domestic Fixed Income	23%	35%	35%
(d) International Equities	15%	20%	20%
(e) Real Estate	3%	0%	0%
(f) Cash	2%	5%	5%
(g) Total	100%	100%	100%
<i>Asset Class Returns during Prior Year:</i>			
(a) Domestic Large Cap Equities	-3%	-30%	-12%
(b) Domestic Small Cap Equities	-2%	-45%	-5%
(c) Domestic Fixed Income	4%	8%	1%
(d) International Equities	-5%	-35%	-10%
(e) Real Estate	5%	5%	3%
(f) Cash	3%	3%	1%

* numbers may not add due to rounding

National Oil Full-Time Salaried Pension Plan
Historical Actuarial Valuation Results

	2008	2009	2010
Actuarial Valuation - January 1 (numbers in \$000's) *			
1. Actuarial Accrued Liability:			
(a) Active participants	712,369	711,832	623,465
(b) Deferred vested participants	-	-	-
(c) Pensioners	144,051	208,320	234,080
(d) Total	856,419	920,152	857,545
2. Actuarial Value of Assets	922,971	744,096	683,921
3. Unfunded Actuarial Accrued Liability: (1d)-(2)	(66,552)	176,056	173,624
4. Normal Cost (beg. Of year)	52,768	54,756	51,526
5. Change in Unfunded AAL during prior year:			
(a) Unfunded AAL at prior valuation date	(171,841)	(66,552)	176,056
(b) Adjustment for Interest	(11,170)	(9,868)	12,324
(c) Normal Cost w/interest less contributions	44,516	44,042	45,936
(d) (Gain)/Loss on investment	9,459	228,993	92,011
(e) (Gain)/Loss on termination	(20,000)	(20,000)	(20,000)
(f) (Gain)/Loss on salary increases less than expected	(1,000)	(25,000)	(90,000)
(g) (Gain)/Loss on mortality	19,000	30,000	2,000
(h) (Gain)/Loss on retirement	63,000	50,000	45,000
(i) (Gain)/Loss on assumption changes	-	-	(37,000)
(j) (Gain)/Loss on expenses	-	-	-
(k) (Gain)/Loss on all other factors	1,484	(55,559)	(52,703)
(l) Unfunded AAL at current valuation date	(66,552)	176,056	173,624
6. Actuarial Basis			
(a) Interest	6.50%	6.50%	6.50%
(b) Salary scale	4.50%	4.50%	4.00%
(c) Consumer Price Index	2.00%	2.00%	2.50%
(d) Mortality	RP 2000	RP 2000	
(e) Turnover	Based on NOC experience for 2006 - 2008		
(f) Retirement age	Age 62		
(g) Proportion married and age difference	80% with spouse, Male spouses are 3 years older		
(h) Asset Valuation Method	Market value of assets		
(i) Actuarial Cost Method	Projected unit credit		

* numbers may not add due to rounding

**National Oil Full-Time Salaried Pension Plan
Reconciliation of Plan Participants (2007 - 2010)**

	<u>Active</u>	<u>Pensioners/ Beneficiaries</u>	<u>Total</u>
1. Participants as of January 1, 2007	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, 2008	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, 2009	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, 2010	4,268	665	4,933

National Oil Full-Time Salaried Pension Plan
Age/Svc/Earnings as of January 1, 2010

		Service (Years)						
		< 5	5-10	10-15	15-20	>20	Totals	
Age (Years)	< 25	# Participants	180	120	-	-	-	300
		Average Salary	35,900	46,100	-	-	-	40,000
	25-35	# Participants	235	143	90	55	-	523
		Average Salary	47,100	58,000	62,000	65,100	-	54,500
	35-45	# Participants	175	198	176	225	201	975
		Average Salary	59,400	66,300	70,200	76,300	77,800	70,400
	45-55	# Participants	164	328	739	273	157	1,661
		Average Salary	62,600	65,200	72,000	75,600	77,800	70,900
	55-65	# Participants	168	77	77	399	75	796
		Average Salary	61,200	64,100	68,100	73,900	74,200	69,700
	> 65	# Participants	4	3	1	2	3	13
		Average Salary	47,000	52,100	47,000	57,600	53,900	51,400
	Totals	# Participants	926	869	1,083	954	436	4,268
		Average Salary	52,600	61,500	70,600	74,400	77,000	66,300
		Avg Age	45.3					
		Avg Svc	12.1					
		Avg Salary	66,300					

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

Eligibility	Immediate
Normal Retirement Age	65
Early Retirement Age	55 with 10 years of service
Accrued Benefit	Accrued Benefit calculated under the provisions of the Salaried Pension Plan without regard to tax system maximums <u>less</u> 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

**Supplemental Executive Retirement Plan
Historical Valuation Results - January 1**

2008 2009 2010

Participant Summary

1. Active Participants			
(a) count	49	52	60
(b) average age	53	53	52
(c) average service	18	18	19
(d) average future working lifetime	6.3	6.3	6
(e) average earnings (prior year)	325,000	325,000	350,000
2. Deferred Vested Participants			
(a) count	-	-	-
3. Pensioners (incl beneficiaries)			
(a) count	20	30	30
(b) average age	69	66	66
(c) average annual benefit	21,200	22,000	22,000

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

1. Reconciliation of funded status at valuation date:			
(a) Accrued Benefit Obligation	(47,091)	(50,223)	(65,897)
(b) Fair Value of Assets	-	-	-
(c) Funded Status: (a) + (b)	(47,091)	(50,223)	(65,897)
2. Service Cost	1,211	1,236	1,509
3. Benefit Payments	224	660	660
4. Actuarial Basis			
(a) Discount rate	5.25%	7.50%	6.50%
(b) Salary scale	3.50%	3.50%	3.50%
(c) CPI	3.00%	3.00%	2.00%
(d) All other assumptions	Same as the Salaried Plan		

** numbers may not add due to rounding*

National Oil Full-Time Hourly Union Pension Plan

Eligibility	Immediate
Vesting	100% after 5 years of service
Normal Retirement Age	65
Early Retirement Age	55 with 5 years of service
Normal Retirement Benefit	\$80 per month times years of service for terminations/ retirements during 2005 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	Level Income Option, Lump Sum Option, and J&S75% Option
Post-Retirement Indexing	None
Termination Benefit	Deferred pension
Pre-Retirement Death Benefit	Lump sum equal to actuarial present value of accrued benefit, payable to named beneficiary
Disability Benefit	None

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

2008 **2009** **2010**

Participant Summary - January 1

<i>Active Participants</i>			
(a) count	6,321	6,395	6,225
(b) average age	46.3	46.0	46.1
(c) average service	17.2	17.0	17.3
(d) average future working lifetime	10.8	10.8	10.8
(e) average plan earnings (prior year)	49,500	51,000	53,100
<i>Deferred Vested Participants</i>			
(a) count	-	-	-
<i>Pensioners (incl beneficiaries)</i>			
(a) count	1,081	1,120	1,135
(b) average age	71.8	70.0	68.0
(c) average annual benefit	11,200	12,200	13,400

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

<i>Change in Plan Assets during Prior Year:</i>			
Market Value of Assets at January 1 of prior year	504,928	528,299	428,314
Employer Contributions during prior year	42,000	47,462	65,752
Benefit Payments during prior year	(15,000)	(17,000)	(17,000)
Expenses during prior year	-	-	-
Investment return during prior year	(3,629)	(130,447)	(27,161)
Market Value of Assets at January 1 of current year	528,299	428,314	449,904
Rate of return during prior year	-1%	-24%	-6%
<i>Average Portfolio Mix During Prior Year:</i>			
(a) Domestic Large Cap Equities	30%	32%	30%
(b) Domestic Small Cap Equities	27%	25%	10%
(c) Domestic Fixed Income	27%	23%	35%
(d) International Equities	11%	15%	20%
(e) Real Estate	3%	3%	0%
(f) Cash	<u>2%</u>	<u>2%</u>	<u>5%</u>
(g) Total	100%	100%	100%
<i>Asset Class Returns during Prior Year:</i>			
(a) Domestic Large Cap Equities	-3%	-30%	-12%
(b) Domestic Small Cap Equities	-2%	-45%	-5%
(c) Domestic Fixed Income	4%	8%	1%
(d) International Equities	-5%	-35%	-10%
(e) Real Estate	5%	5%	3%
(f) Cash	3%	3%	1%

* numbers may not add due to rounding

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

	2008	2009	2010
Actuarial Valuation - January 1 (numbers in \$000's) *			
1. Actuarial Accrued Liability:			
Active Multiplier	\$ 80	\$ 80	\$ 80
(a) Active participants	548,941	602,109	631,336
(b) Deferred vested participants	-	-	-
(c) Pensioners	124,704	143,472	167,299
(d) Total	673,645	745,581	798,635
2. Actuarial Value of Assets	528,299	428,314	449,904
3. Unfunded Actuarial Accrued Liability: (1d)-(2)	145,346	317,267	348,730
4. Normal Cost (beg. Of year)	31,915	35,418	36,493
5. Change in Unfunded AAL during prior year:			
(a) Unfunded AAL at prior valuation date	120,655	145,346	317,267
(b) Adjustment for Interest	7,843	9,448	20,622
(c) Normal Cost w/interest less contributions	(12,292)	(15,015)	(30,168)
(d) (Gain)/Loss on investment	37,327	165,777	56,586
(e) (Gain)/Loss on termination	(6,000)	(8,000)	(30,000)
(f) (Gain)/Loss on salary increases less than expected	-	-	-
(g) (Gain)/Loss on mortality	(1,900)	(3,900)	(35,000)
(h) (Gain)/Loss on retirement	(400)	(600)	(1,000)
(i) (Gain)/Loss on assumption changes	-	-	50,000
(j) (Gain)/Loss on expenses	-	-	-
(k) (Gain)/Loss on all other factors	114	24,212	424
(l) Change in active benefit multiplier	-	-	-
(m) Unfunded AAL at current valuation date	145,346	317,267	348,730
6. Actuarial Basis			
(a) Interest	6.50%	6.50%	6.50%
(b) Salary scale	N/A	N/A	N/A
(c) Consumer Price Index	2.00%	2.00%	2.50%
(d) Mortality	UP 94	UP 94	UP 94 AA 15
(e) Turnover	Based on NOC experience for 1986-1988		
(f) Retirement age	Age 62, with the appropriate early retirement reduction, if any		
(g) Proportion married and age difference	80% married, husbands 3 years older than wives		
(h) Asset Valuation Method	Market value of assets		
(i) Actuarial Cost Method	Unit credit		

* numbers may not add due to rounding

**National Oil Full-Time Hourly Union Pension Plan
Reconciliation of Plan Participants (2007 - 2010)**

	<u>Active</u>	<u>Pensioners/ Beneficiaries</u>	<u>Total</u>
1. Participants as of January 1, 2007	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
2. Participants as of January 1, 2008	6,321	1,081	7,402
- New Entrants/Rehires	220	-	220
- Terminated Nonvested	(50)	-	(50)
- Terminated Vested (Lump Sum Cashout)	(50)	-	(50)
- Retirement	(40)	40	-
- Death w/ Beneficiary	(6)	6	-
- Death w/o Beneficiary	-	(7)	(7)
- Net change	74	39	113
3. Participants as of January 1, 2009	6,395	1,120	7,515
- New Entrants/Rehires	50	-	50
- Terminated Nonvested	(50)	-	(50)
- Terminated Vested (Lump Sum Cashout)	(120)	-	(120)
- Retirement	(50)	50	-
- Death w/ Beneficiary	-	-	-
- Death w/o Beneficiary	-	(35)	(35)
- Net change	(170)	15	(155)
4. Participants as of January 1, 2010	6,225	1,135	7,360

National Oil Full-Time Hourly Union Pension Plan
Age/Svc/Earnings as of January 1, 2010

		Service (Years)						
		< 5	5-10	10-15	15-20	>20	Totals	
Age (Years)	< 25	# Participants	200	139	-	-	-	339
		Average Salary	40,000	45,000	-	-	-	42,100
	25-35	# Participants	256	105	91	62	-	514
		Average Salary	44,000	46,000	50,000	53,000	-	46,600
	35-45	# Participants	215	330	320	659	441	1,965
		Average Salary	49,000	45,400	53,400	54,300	55,900	52,400
	45-55	# Participants	120	160	315	688	895	2,178
		Average Salary	50,000	47,000	55,800	55,100	56,800	55,000
	55-65	# Participants	95	62	91	180	779	1,207
		Average Salary	49,000	49,600	56,200	56,900	58,200	56,700
	> 65	# Participants	7	6	5	3	1	22
		Average Salary	51,000	50,000	57,800	55,000	60,000	53,200
	Totals	# Participants	893	802	822	1,592	2,116	6,225
		Average Salary	46,000	51,700	58,400	54,900	57,100	53,100
		Avg Age	46.1					
		Avg Svc	17.3					
		Avg Salary	53,100					

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	Roll over options as well as maintaining the account balances in the plan or an option to purchase an annuity
Benefit on Death	Account balance is payable to named beneficiary

National Oil Part-Time DC Pension Plan
Historical Results - January 1

2008 2009 2010

Participant Summary

(a) number participating during prior year	6,500	7,000	6,800
(b) average age	28.9	29.2	30.8
(c) average base pay	29,000.00	30,000.00	31,000.00

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

<i>Change in Plan Assets during Prior Year:</i>			
Market Value of Assets at January 1 of prior year	67,779	75,248	63,072
Employee Contributions during prior year	5,655	6,300	6,324
Company Contributions during prior year	2,828	3,150	3,162
Benefit Payments during prior year	(5,850)	(6,300)	(6,120)
Expenses during prior year	-	-	-
Investment return during prior year	4,837	(15,325)	7,124
Market Value of Assets at January 1 of current year	75,248	63,072	73,562
Rate of return during prior year	7%	-20%	11%

* numbers may not add due to rounding

National Oil Full-Time Salaried and Union Retiree Health Benefit Program

Eligibility	Immediate
Earliest Retirement Age	55 and 10 years of service
Retiree Contributions	30% cost sharing
Retirement benefit	Retirees and their spouses may elect to participate in a self insured health plan
Death benefit	Coverage continues for the life of the spouse after death of an eligible employee
Benefits Covered - Pre 65	\$0 deductible; \$0 copay No lifetime maximum Office visits Hospital visits Surgery Prescription drugs
Benefits Covered - Post 65	\$0 deductible; \$0 copay No lifetime maximum Office visits Hospital visits Surgery Prescription drugs Government Benefits carve out

Retiree Health and Welfare Program
Historical Valuation Results

2008 **2009** **2010**

Valuation Results - January 1 (numbers in \$000's) *

1. Reconciliation of funded status at valuation date:			
(a) Accrued Benefit Obligation			
(i) actives	(835,331)	(846,706)	(1,345,645)
(ii) retirees	(538,528)	(591,077)	(707,121)
(iii) total	(1,373,859)	(1,437,783)	(2,052,766)
(b) Market Value of Assets	0	0	0
2. Service Cost (beg. of year)	52,208	52,919	84,103
3. Benefit Payments	27,000	30,000	32,000
4. Actuarial Basis			
(a) Discount rate	5.25%	7.50%	6.50%
(b) Return on assets	N/A	N/A	N/A
(c) Medical trend			
Initial rate	6.00%	7.00%	10.00%
Annual decrease	0.50%	0.50%	0.50%
Ultimate rate	4.50%	4.50%	5.00%
Year ultimate trend rate reached	2011	2014	2020
(d) CPI	3.00%	3.00%	2.50%
(e) Per capita claims cost - Pre 65	9,500	10,500	12,000
(e) Per capita claims cost - Post 65			
(f) Retirement assumption	Age 62 with 10 years of service		
(g) All other demographic assumptions	Same as those used for pension plans		

* numbers may not add due to rounding