

## **Susitna-Watana Cost Analysis Worksheet**

Final Report version, dated 26 June 2013

prepared by

Steve Colt

[sgcolt@uaa.alaska.edu](mailto:sgcolt@uaa.alaska.edu)

Institute of Social and Economic Research

University of Alaska Anchorage

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This worksheet constitutes part of Deliverable #5

Cost of service (COS) components  
used in simplified ratemaking model

Table 1

	Component
1	Fuel and purchased power expense
2 +	Nonfuel operation and maintenance expense
3 +	Depreciation of power production plant
4 +	Interest on debt used to finance power production plant
5 =	<b>Power production cost of service</b>
6 +	Transmission cost (operating and capital)
7 +	Distribution cost (operating and capital)
8 +	Admin & General cost (operating and capital)
9 =	<b>Total cost of service</b>
10 +	Authorized margins
11 =	<b>Authorized total revenue requirement</b>

Table ?2 amended version of COS

	Component
1	Fuel and purchased power expense
2 +	Nonfuel operation and maintenance expense
3 +	Repayment of debt principal
4 +	Interest on debt used to finance power production plant
5 =	<b>Power production cost of service</b>
6 +	Transmission cost (operating and capital)
7 +	Distribution cost (operating and capital)
8 +	Admin & General cost (operating and capital)
9 =	<b>Total cost of service</b>
10 +	Possible additional "interest coverage" required by bondholders
11 =	<b>Authorized total revenue requirement</b>

Carbon tax

0.053 tons per mmbtu  
100 \$/ton tax  
5.3 \$/mmbtu  
7300 btu/kWh  
0.0073 mmbtu/kWh  
0.03869 \$/kWh

## Susitna Watana Cost Analysis

### Assumptions

Item	units	value
Selected case number (1,2,3)		3
Installed capacity	MW	600
Energy output delivered to Railbelt grid	MWh	2,800,000
Service lifetime	years	100
Total capital cost - overnight basis	2012\$ billion	4.480
Debt-financed fraction		100%
Grant-financed fraction		0%
Long-term debt interest rate	nominal %	4.0%
Long term debt repayment period	years	30
Short-term debt rate (during construction)	nominal %	2.0%
Financed reserve fund - ratio to debt service	ratio	1.00
Interest rate earned on short-run lending of FRF	nominal %	2.0%
Required debt service coverage ratio	ratio	1.00
General inflation rate	% per yr	2.50%
Annual O&M incl. capital replacements	2012\$ billion	0.018
Ratio of retail kWh sold to kWh delivered to Railbelt grid		0.95
Transmission, distribution, & admin cost	2012\$/kWh	0.048
TIER for utility basis financing		1.20
Retained margins fund target balance	ratio to int. pmt	2.00

### Results

#### Cost of power to ratepayers in year 2012\$

##### Rates based on debt service

		2024
Production cost per retail kWh sold	2012\$/kWh	0.10
plus: Transmission, distribution, admin	2012\$/kWh	0.05
Cost of power to retail customer	2012\$/kWh	0.15

##### Rates based on interest and depreciation

		2024
Production cost per retail kWh sold	2012\$/kWh	0.10
plus: Transmission, distribution, admin	2012\$/kWh	0.05
Cost of power to retail customer	2012\$/kWh	0.15

### Calculations

Variable	units	OpYearnum Yearum--> Year--->
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#### Escalation indexes (2012=1.00)

Inflation index @ 2.5% per yr

#### Capital Stock = debt principal = "rate base"

HDR March 2009 outlay pattern, amounts	\$2008 million	6,875.00
	check: sum=1?	1.000
Construction outlay amounts (pattern x overnight)	2012\$ billion	
Construction outlay amounts (pattern x overnight)	\$nominal billion	5.370

Debt-financed outlay	\$nominal billion
State AK cash (grant) outlay	\$nominal billion
Debt principal BOY	\$nominal billion
Interest to be capitalized into debt	\$nominal billion
Additions to debt from outlays	\$nominal billion
Debt principal EOY	\$nominal billion
Debt principal at start of operation	\$nominal billion
Reserve fund = 1 year DS on plant	\$nominal billion

### Cost of service and revenue requirements based on debt service

line	item	units
1	<b>Operating expenses</b>	
2	Annual O&M incl. capital replacements	2012\$ billion
3	<b>Subtotal operating</b>	2012\$ billion
4		
5	<b>Debt service</b>	
6	Debt service payment on electric plant debt	\$nominal billion
7	Interest payment (net) on financed reserve fund	\$nominal billion
8	Total debt service nominal dollars	\$nominal billion
9	<b>Subtotal debt service</b>	2012\$ billion
10		
11	<b>Total production cost of power</b>	2012\$ billion
12		
13	<b>Revenue requirements</b>	
14	Recovery of direct production cost	2012\$ billion
15	Additional recovery to meet DS coverage reqts	2012\$ billion
16	Application of retained earnings	2012\$ billion
17	<b>Total revenue requirement for production cost</b>	2012\$ billion
18	MWh delivered from powerhouse	MWh
19	MWh retail sales at customer meters	MWh
20	<b>Production revenue reqt per kWh sold</b>	2012\$/kWh
21	Transmission, distribution, admin cost	2012\$/kWh
22	<b>Total rev reqt = cost of power to retail customer</b>	2012\$/kWh

### Debt service and debt principal accounting - nominal dollars

Debt principal BOY	\$nominal billion
Debt service payment	\$nominal billion
Interest	\$nominal billion
Principal	\$nominal billion
Debt principal before retirement from ret. earnngs.	\$nominal billion
Debt retirement from retained earnings	\$nominal billion
Debt principal EOY	\$nominal billion

### Financed reserve fund

FRF balance BOY	\$nominal billion
Repayments of FRF principal	\$nominal billion
FRF balance EOY	\$nominal billion

### Retained earnings fund

REF balance BOY	\$nominal billion
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Interest earned on REF	\$nominal billion
Additions to REF to meet DS coverage	\$nominal billion
Misc withdrawals from REF	\$nominal billion
Balance before application to retirement of debt	\$nominal billion
Target REF balance = remaining principal EOY	\$nominal billion
REF allocation to debt retirement	\$nominal billion
REF allocation to COS	\$nominal billion
REF Balance EOY	\$nominal billion
Item: interest payment on financed RF	\$nominal billion

### Cost of service and revenue requirements based on interest and depreciation

line	item	units
1	<b>Operating expenses</b>	
2	Annual O&M incl. capital replacements	2012\$ billion
3	<b>Subtotal operating</b>	2012\$ billion
4		
5	<b>Depreciation</b>	
6	Electric plant BOY	\$nominal billion
7	Depreciation	\$nominal billion
8	Electric plant EOY	\$nominal billion
9	Total depreciation in nominal dollars	\$nominal billion
10	<b>Subtotal depreciation</b>	2012\$ billion
11		
12	Interest on outstanding debt	\$nominal billion
13	Total Interest in nominal dollars	\$nominal billion
14	<b>Subtotal interest</b>	2012\$ billion
15		
16	<b>Total production cost of power</b>	2012\$ billion
17		
18	<b>Revenue requirements</b>	
19	Recovery of direct production cost	2012\$ billion
20	Margin to meet TIER of 1.2	2012\$ billion
21	Application of retained margins in excess of target	2012\$ billion
23	<b>Total revenue requirement for production cost</b>	2012\$ billion
24	MWh delivered from powerhouse	MWh
25	MWh retail sales at customer meters	MWh
26	Production Rev Req't per kWh sold, in 2012\$	2012\$/kWh
27	Trans, dist'n, admin cost	2012\$/kWh
28	<b>Total Rev Req't = cost of power to retail customer</b>	2012\$/kWh
	<b>Debt service and debt principal accounting</b>	
	Debt principal BOY	\$nominal billion
	Debt service payment	\$nominal billion
	Interest	\$nominal billion
	Principal	\$nominal billion
	Debt principal EOY	\$nominal billion
	<b>Financed Reserve Fund</b>	
	FRF balance BOY	\$nominal billion
	Repayments of FRF principal	\$nominal billion

FRF balance EOY \$nominal billion

**Retained margins fund**

RMF balance BOY \$nominal billion  
 Interest earned on RMF \$nominal billion  
 Additions of margin to meet TIER of 1.2 \$nominal billion  
 Withdrawals from RMF \$nominal billion  
 Balance before application of excess to COS \$nominal billion  
 Target (may be increasing in nominal \$) \$nominal billion  
     Application of excess toward COS \$nominal billion  
 RMF balance EOY \$nominal billion

Item: interest payment on financed RF \$nominal billion

**Natural Gas Turbine comparison analysis**

**Assumptions**

Selected case number (1,2,3)		2
Item	units	value
Capacity	MW	180
Annual capacity utilization factor		0.5
Annual energy output at busbar	MWh	788,940
Heat rate	btu/kWh	7,300
Overnight capital cost per kW	2012\$/kW	2,000
Overnight capital cost for plant	2012\$ billion	0.360
Lead time	years	4
Fixed O&M	2012\$/kW-yr	14.60
Variable O&M	2012\$/MWh	3.00
Annual O&M cost	2012\$ billion	0.005
Debt-financed fraction		100%
Grant-financed fraction		0%
Long-term debt interest rate	nominal %	6.0%
Debt repayment period	years	30
Economic lifetime	years	30
Short-term debt rate (during construction)		6.0%
Financed reserve fund - ratio to debt service	ratio	0.00
Interest rate earned on short-run lending of FRF	nominal %	2.0%
Required debt service coverage ratio	ratio	1.25
General inflation rate	%	2.50%
Ratio of kWh sold to kWh at busbar		0.95
Trans, dist'n, admin cost	2012\$/kWh	0.048
Natural gas price trajectory		high
Natural gas price trajectory choice (1,2)		2

**Results**

**Cost of power to ratepayers in year 2012\$**

**Rates based on debt service**

		<b>2024</b>
Production cost per retail kWh sold	2012\$/kWh	0.21
plus: Transmission, distribution, admin	2012\$/kWh	0.05

Cost of power to retail customer 2012\$/kWh 0.26

**Calculations**

Variable	units	OpYearnum Yearnum--> Year--->
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**Escalation Indexes (2012=1.00)**

Inflation index @ 2.5% per yr

**Capital Stock = rate base = debt burden**

Construction outlay pattern (sum=1)	checksum=	1.00
Construction outlay amount	\$nominal billion	
Debt-financed outlay	\$nominal billion	
State AK cash (grant) outlay	\$nominal billion	
Debt principal BOY	\$nominal billion	
Interest to be capitalized into debt	\$nominal billion	
Additions to debt from outlays	\$nominal billion	
Debt principal EOY	\$nominal billion	
Debt principal at start of operation	\$nominal billion	
Reserve fund = 1 year DS on plant	\$nominal billion	

**Fuel price**

2 Selected fuel price	2012\$/mmbtu \$/kWh fuel cost
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**Fuel Price Library**

1 Case 1 Railbelt IRP	2012\$/mmbtu
2 Case 2 LNG Imports pegged to AEO Brent	2012\$/mmbtu

**Cash flow debt service basis cost of service and revenue requirements**

line	item	units
1	<b>Operating expenses</b>	
2	Fuel	2012\$ billion
3	Annual O&M	2012\$ billion
4	<b>Subtotal operating</b>	2012\$ billion
5		
6	<b>debt service</b>	
7	Debt service payment on electric plant debt	\$nominal billion
8	Interest payment (net) on financed reserve fund	\$nominal billion
9	Total debt service nominal dollars	\$nominal billion
10	<b>Subtotal debt service</b>	2012\$ billion
11		
12	<b>Total production cost of power</b>	2012\$ billion
13		
14	<b>Revenue requirements</b>	
15	Recovery of direct production cost	2012\$ billion
16	Additional recovery to meet DS coverage reqts	2012\$ billion
17	Application of retained earnings	2012\$ billion
18	<b>Total revenue requirement for production cost</b>	2012\$ billion
19		
20	MWh delivered from powerhouse	MWh



21	MWh retail sales at customer meters	MWh
22	<b>Production revenue reqt per kWh sold</b>	2012\$/kWh
23	Transmission, distribution, admin cost	2012\$/kWh
24	<b>Total rev reqt = cost of power to retail customer</b>	2012\$/kWh

Info item Fuel cost per kWh sold 2012\$/kWh

#### **Debt service and debt principal accounting**

Debt principal BOY	\$nominal billion
Debt service payment	\$nominal billion
Interest	\$nominal billion
Principal	\$nominal billion
Debt principal before retirement from ret. earnings.	\$nominal billion
Debt retirement from retained earnings	\$nominal billion
Debt principal EOY	\$nominal billion

#### **Financed Reserve Fund**

FRF balance BOY	\$nominal billion
Repayments of FRF principal	\$nominal billion
FRF balance EOY	\$nominal billion

#### **Retained Earnings Fund**

REF balance BOY	\$nominal billion
Interest earned on REF	\$nominal billion
Additions to REF	\$nominal billion
Misc withdrawals from REF	\$nominal billion
Balance before application to retirement of debt	\$nominal billion
Target REF balance = remaining principal EOY	\$nominal billion
REF allocation to debt retirement	\$nominal billion
REF allocation to COS	\$nominal billion
REF Balance EOY	\$nominal billion

Item: interest payment on financed RF \$nominal billion

As of 10/31/2012 This section is reserved for future development:

#### **Gas option**

##### **Utility basis cost of service and revenue requirements**

line	item	units
1	<b>Operating Expenses</b>	\$ billion
2	Annual O&M	\$ billion
3	<b>*Subtotal Operating</b>	\$ billion
4		
5	<b>Depreciation and rate base accounting</b>	
6	Electric plant BOY	\$ billion
7	Depreciation	\$ billion

8	Electric plant EOY	\$ billion
9	<b>*Total Depreciation</b>	\$ billion
10		
11	<b>Interest</b>	
12	Interest on outstanding debt	\$ billion
13	<b>*Total Interest</b>	\$ billion
14		
15	<b>**Total Production Cost of Power</b>	
16		
17	<b>Revenue Requirements</b>	
18	Recovery of direct production cost	
19	Margin to meet TIER of 0.06	
20	Application of retained margins in excess of target	
21	<b>Total Revenue Requirement for Production cost</b>	
22		
23	MWh delivered from powerhouse	MWh
24	MWH retail sales at customer meters	MWh
25	Production Rev Req't per kWh sold to retail customer	\$/kWh
26	Trans, dist'n, admin cost	\$/kWh
27	Total Rev Req't = cost of power to retail customer	\$/kWh
	<b>Debt service and debt principal accounting</b>	
	Debt principal BOY	\$ billion
	Debt service payment	\$ billion
	Interest	\$ billion
	Principal	\$ billion
	Debt principal EOY	\$ billion
	<b>Financed Reserve Fund</b>	
	FRF balance BOY	\$ billion
	Repayments of FRF principal	\$ billion
	FRF balance EOY	\$ billion
	<b>Retained margins fund</b>	
	RMF balance BOY	\$ billion
	Interest earned on RMF	\$ billion
	Additions to RMF	\$ billion
	Withdrawals from RMF	\$ billion
	Capital replacements	\$ billion
	Other	\$ billion
	Trial Balance	\$ billion
	Target (may be increasing in nominal \$)	\$ billion
	Application of excess toward COS	\$ billion
	RMF balance EOY	\$ billion
	Item: interest payment on financed RF	\$ billion

Library values

case 1	case 2	case 3
600	600	600
###	###	2,800,000
100	100	100
5.190	5.490	4.480
100%	100%	100%
0%	0%	0%
5.0%	6.0%	4.0%
30	30	30
2.0%	6.0%	2.0%
1.00	0.00	1.00
2.0%	2.0%	2.0%
1.00	1.25	1.00
2.50%	2.50%	2.50%
0.018	0.018	0.018
0.95	0.95	0.95
0.048	0.048	0.048
1.30	1.40	1.20
2.000	2.000	2.000

AEA  
 AEA  
 AEA  
 AEA 0.8631985 1.60  
 author 3.51 ratio of cap  
  
 AEA, sens  
 AEA  
 AEA, sens  
 AEA, sens  
  
 AEA, sens  
 AK OMB FY14 guidance  
 AEA, author calcs from HDR 2009  
 Author calcs from Energy Statistics  
 Author calcs from CEA 2012 ann rept  
  
 CEA rate filing, sens  
 Author assumption

2035	2050	2073
0.08	0.06	0.01
0.05	0.05	0.05
0.13	0.10	0.05
<b>2035</b>	<b>2050</b>	<b>2073</b>
0.05	0.02	0.01
0.05	0.05	0.05
0.10	0.07	0.06

0	1	2	3	4	5	6	7	8	9
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1.00	1.03	1.05	1.08	1.10	1.13	1.16	1.19	1.22	1.25
140	48	62	62	690	690	883	992	992	772
2.0%	0.7%	0.9%	0.9%	10.0%	10.0%	12.8%	14.4%	14.4%	11.2%
0.091	0.031	0.040	0.040	0.450	0.450	0.575	0.646	0.646	0.503
0.091	0.032	0.042	0.044	0.496	0.509	0.667	0.768	0.788	0.628

0.091	0.032	0.042	0.044	0.496	0.509	0.667	0.768	0.788	0.628
-	-	-	-	-	-	-	-	-	-
-	0.091	0.125	0.170	0.217	0.718	1.241	1.933	2.740	3.582
-	0.0018	0.003	0.003	0.004	0.014	0.025	0.039	0.055	0.072
0.091	0.032	0.042	0.044	0.496	0.509	0.667	0.768	0.788	0.628
0.091	0.125	0.170	0.217	0.718	1.241	1.933	2.740	3.582	4.282

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Library values

case 1	case 2	dormant
180	180	180
0.50	0.50	0.50
788,940	788,940	788,940
7300	7300	7300
2,000	2,000	2,000
0.360	0.360	0.360
4.0	4.0	4.0
14.6	14.6	14.6
3.00	3.00	3.00
0.005	0.005	0.005
100%	100%	100%
0%	0%	0%
5.0%	6.0%	6.0%
30	30	30
30	30	30
2.0%	6.0%	2.0%
1.00	0.00	1.00
2.0%	2.0%	2.0%
1.00	1.25	1.10
2.50%	2.50%	2.50%
0.95	0.95	0.95
0.048	0.048	0.046
low	high	
1	2	2

0.4563085

2035	2050
0.23	0.22
0.05	0.05

0.28      0.27

0            1            2            3            4            5            6            7            8            9  
2012      2013      2014      2015      2016      2017      2018      2019      2020      2021

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1.0000    1.0250    1.0506    1.0769    1.1038    1.1314    1.1597    1.1887    1.2184    1.2489

									0.25	0.25
-	-	-	-	-	-	-	-	-	0.110	0.112
-	-	-	-	-	-	-	-	-	0.110	0.112
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	0.110
-	-	-	-	-	-	-	-	-	-	0.007
-	-	-	-	-	-	-	-	-	0.110	0.112
-	-	-	-	-	-	-	-	-	0.110	0.229

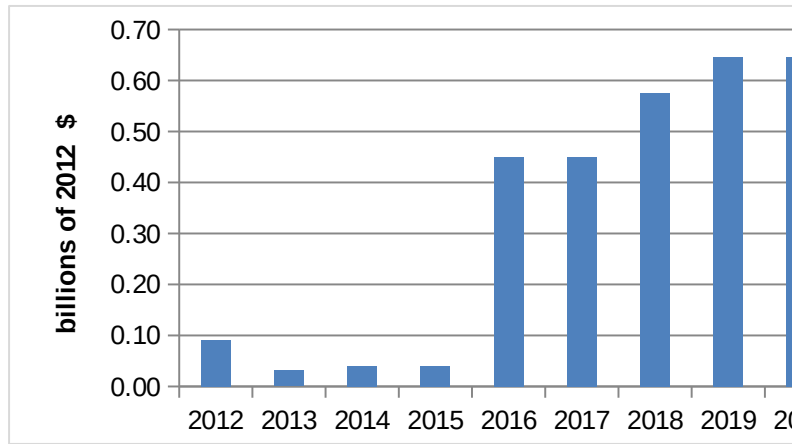
6.62      6.95      7.06      7.15      7.29      7.14      7.11      7.60      8.70      8.98  
19.26    17.42    17.45    17.28    17.45    17.78    18.11    18.45    18.80    19.15

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Capital cost per kWh



	10	11	1	2	3	4	5	6
	2022	2023	2024	2025	2026	2027	2028	2029
	1.28	1.31	1.34	1.38	1.41	1.45	1.48	1.52
	772	772						
	11.2%	11.2%	-					
	0.503	0.503						
	0.644	0.660	-	-	-	-	-	-

0.644	0.660	-	-	-	-	-	-
-	-	-	-	-	-	-	-
4.282	5.012	5.772	6.003	6.243	6.493	6.752	7.023
0.086	0.100	0.231	0.240	0.250	0.260	0.270	0.281
0.644	0.660	-	-	-	-	-	-
5.012	5.772	6.003	6.243	6.493	6.752	7.023	7.303
	5.772	2.16993813519					
	0.334						

	2024 amount	2025	2026	2027	2028	2029
per kWh sold						
	0.018	0.018	0.018	0.018	0.018	0.018
	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
	0.334	0.334	0.334	0.334	0.334	0.334
	0.007	0.007	0.007	0.007	0.007	0.007
	0.340	0.340	0.340	0.340	0.340	0.340
0.10	<b>0.253</b>	<b>0.247</b>	<b>0.241</b>	<b>0.235</b>	<b>0.229</b>	<b>0.224</b>
	<b>0.271</b>	<b>0.265</b>	<b>0.259</b>	<b>0.253</b>	<b>0.247</b>	<b>0.242</b>
	0.271	0.265	0.259	0.253	0.247	0.242
	-	-	-	-	-	-
	-	-	-	-	-	-
	<b>0.271</b>	<b>0.265</b>	<b>0.259</b>	<b>0.253</b>	<b>0.247</b>	<b>0.242</b>
	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
	<b>0.10</b>	<b>0.10</b>	<b>0.10</b>	<b>0.10</b>	<b>0.09</b>	<b>0.09</b>
	0.05	0.05	0.05	0.05	0.05	0.05
	<b>0.15</b>	<b>0.15</b>	<b>0.15</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>
per kWh sold						
2.170	5.772	5.669	5.562	5.451	5.335	5.215
0.125	0.334	0.334	0.334	0.334	0.334	0.334
	0.231	0.227	0.222	0.218	0.213	0.209
	0.103	0.107	0.111	0.116	0.120	0.125
	5.669	5.562	5.451	5.335	5.215	5.089
	-	-	-	-	-	-
	5.669	5.562	5.451	5.335	5.215	5.089
	<b>0.334</b>	0.334	0.334	0.334	0.334	0.334
	-	-	-	-	-	-
	0.334	0.334	0.334	0.334	0.334	0.334
	-	-	-	-	-	-

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
5.669	5.562	5.451	5.335	5.215	5.089
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
0.013	0.013	0.013	0.013	0.013	0.013

	2024 amount	2025	2026	2027	2028	2029
	0.018	0.018	0.018	0.018	0.018	0.018
	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
	5.772	5.714	5.657	5.599	5.541	5.483
	0.058	0.058	0.058	0.058	0.058	0.058
	5.714	5.657	5.599	5.541	5.483	5.426
	0.058	0.058	0.058	0.058	0.058	0.058
	<b>0.043</b>	<b>0.042</b>	<b>0.041</b>	<b>0.040</b>	<b>0.039</b>	<b>0.038</b>
	0.231	0.227	0.222	0.218	0.213	0.209
	0.231	0.227	0.222	0.218	0.213	0.209
	<b>0.172</b>	<b>0.164</b>	<b>0.157</b>	<b>0.151</b>	<b>0.144</b>	<b>0.137</b>
	<b>0.233</b>	<b>0.224</b>	<b>0.216</b>	<b>0.208</b>	<b>0.201</b>	<b>0.193</b>
	0.233	0.224	0.216	0.208	0.201	0.193
	0.034	0.033	0.031	0.030	0.029	0.027
	-	-	-	-	-	-
	<b>0.267</b>	<b>0.257</b>	<b>0.248</b>	<b>0.239</b>	<b>0.229</b>	<b>0.220</b>
	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
	<b>0.10</b>	<b>0.10</b>	<b>0.09</b>	<b>0.09</b>	<b>0.09</b>	<b>0.08</b>
	0.05	0.05	0.05	0.05	0.05	0.05
	<b>0.15</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>	<b>0.13</b>	<b>0.13</b>
per kWh sold						
2.170	5.772	5.669	5.562	5.451	5.335	5.215
0.125	0.334	0.334	0.334	0.334	0.334	0.334
	0.231	0.227	0.222	0.218	0.213	0.209
	0.103	0.107	0.111	0.116	0.120	0.125
	5.669	5.562	5.451	5.335	5.215	5.089
	-	-	-	-	-	-
	-	-	-	-	-	-

-	-	-	-	-	-
-	0.0462	0.0925	0.1388	0.1852	0.2316
-	0.001	0.002	0.003	0.004	0.005
0.046	0.045	0.044	0.044	0.043	0.042
-	-	-	-	-	-
0.046	0.092	0.139	0.185	0.232	0.278
0.462	0.454	0.445	0.436	0.427	0.417
-	-	-	-	-	-
0.046	0.092	0.139	0.185	0.232	0.278
-	-	-	-	-	-



749,493	749,493	749,493	749,493	749,493	749,493
<b>0.21</b>	<b>0.21</b>	<b>0.21</b>	<b>0.21</b>	<b>0.22</b>	<b>0.22</b>
0.05	0.05	0.05	0.05	0.05	0.05
<b>0.26</b>	<b>0.26</b>	<b>0.26</b>	<b>0.26</b>	<b>0.26</b>	<b>0.27</b>
0.156	0.159	0.162	0.165	0.168	0.171

per kWh sold

0.66  
0.05

0.497	0.491	0.484	0.477	0.470	0.462
0.036	0.036	0.036	0.036	0.036	0.036
0.030	0.029	0.029	0.029	0.028	0.028
0.006	0.007	0.007	0.007	0.008	0.008
0.491	0.484	0.477	0.470	0.462	0.453
-	-	-	-	-	-
0.491	0.484	0.477	0.470	0.462	0.453

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

-	0.0067	0.0137	0.0209	0.0284	0.0361
-	0.000	0.001	0.001	0.002	0.002
0.007	0.007	0.006	0.006	0.006	0.006
-	-	-	-	-	-
0.007	0.014	0.021	0.028	0.036	0.044
0.491	0.484	0.477	0.470	0.462	0.453
-	-	-	-	-	-
-	-	-	-	-	-
0.007	0.014	0.021	0.028	0.036	0.044

-	-	-	-	-	-
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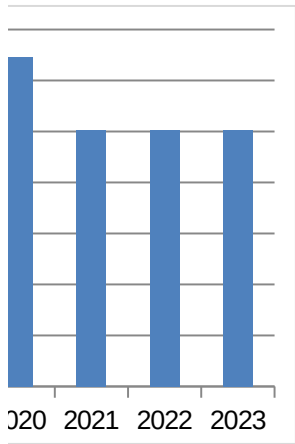


2024 amount	2025	2026	2027	2028	2029
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0.024	0.025	0.025	0.026	0.027	0.027
<b>0.024</b>	<b>0.025</b>	<b>0.025</b>	<b>0.026</b>	<b>0.027</b>	<b>0.027</b>

5.772	5.714	5.657	5.599	5.541	5.483
0.058	0.058	0.058	0.058	0.058	0.058





7	8	9	10	11	12	13	14
18	19	20	21	22	23	24	25
2030	2031	2032	2033	2034	2035	2036	2037
1.56	1.60	1.64	1.68	1.72	1.76	1.81	1.85

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-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
4.959	4.824	4.683	4.536	4.384	4.226	4.061	3.890
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

2030      2031      2032      2033      2034      2035      2036      2037

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0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>

5.426	5.368	5.310	5.253	5.195	5.137	5.079	5.022
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
5.368	5.310	5.253	5.195	5.137	5.079	5.022	4.964
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
<b>0.037</b>	<b>0.036</b>	<b>0.035</b>	<b>0.034</b>	<b>0.034</b>	<b>0.033</b>	<b>0.032</b>	<b>0.031</b>

0.204	0.198	0.193	0.187	0.181	0.175	0.169	0.162
0.204	0.198	0.193	0.187	0.181	0.175	0.169	0.162
<b>0.131</b>	<b>0.124</b>	<b>0.118</b>	<b>0.112</b>	<b>0.105</b>	<b>0.099</b>	<b>0.093</b>	<b>0.088</b>

<b>0.186</b>	<b>0.178</b>	<b>0.171</b>	<b>0.164</b>	<b>0.157</b>	<b>0.150</b>	<b>0.143</b>	<b>0.137</b>
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0.186	0.178	0.171	0.164	0.157	0.150	0.143	0.137
0.026	0.025	0.024	0.022	0.021	0.020	0.019	0.018
-	-	(0.019)	(0.034)	(0.032)	(0.031)	(0.030)	(0.028)
<b>0.212</b>	<b>0.203</b>	<b>0.176</b>	<b>0.153</b>	<b>0.146</b>	<b>0.139</b>	<b>0.132</b>	<b>0.126</b>

2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
<b>0.08</b>	<b>0.08</b>	<b>0.07</b>	<b>0.06</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<b>0.13</b>	<b>0.12</b>	<b>0.11</b>	<b>0.11</b>	<b>0.10</b>	<b>0.10</b>	<b>0.10</b>	<b>0.10</b>

5.089	4.959	4.824	4.683	4.536	4.384	4.226	4.061
0.334	0.334	0.334	0.334	0.334	0.334	0.334	0.334
0.204	0.198	0.193	0.187	0.181	0.175	0.169	0.162
0.130	0.135	0.141	0.146	0.152	0.158	0.165	0.171
4.959	4.824	4.683	4.536	4.384	4.226	4.061	3.890

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

-	-	-	-	-	-	-	-
0.2779	0.3242	0.3703	0.3859	0.3746	0.3629	0.3507	0.3381
0.006	0.006	0.007	0.008	0.007	0.007	0.007	0.007
0.041	0.040	0.039	0.037	0.036	0.035	0.034	0.032
-	-	-	-	-	-	-	-
0.324	0.370	0.416	0.431	0.418	0.405	0.392	0.377
0.407	0.397	0.386	0.375	0.363	0.351	0.338	0.325
-	-	0.030	0.056	0.056	0.055	0.053	0.052
0.324	0.370	0.386	0.375	0.363	0.351	0.338	0.325
-	-	-	-	-	-	-	-







15	16	17	18	19	20	21	22
26	27	28	29	30	31	32	33
2038	2039	2040	2041	2042	2043	2044	2045

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1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.26
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-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
3.711	3.526	3.333	3.133	2.924	2.707	2.482	2.247
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

2038      2039      2040      2041      2042      2043      2044      2045

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0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>

4.964	4.906	4.849	4.791	4.733	4.675	4.618	4.560
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
4.906	4.849	4.791	4.733	4.675	4.618	4.560	4.502
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
<b>0.030</b>	<b>0.030</b>	<b>0.029</b>	<b>0.028</b>	<b>0.028</b>	<b>0.027</b>	<b>0.026</b>	<b>0.026</b>

0.156	0.148	0.141	0.133	0.125	0.117	0.108	0.099
0.156	0.148	0.141	0.133	0.125	0.117	0.108	0.099
<b>0.082</b>	<b>0.076</b>	<b>0.071</b>	<b>0.065</b>	<b>0.060</b>	<b>0.054</b>	<b>0.049</b>	<b>0.044</b>

<b>0.130</b>	<b>0.124</b>	<b>0.118</b>	<b>0.111</b>	<b>0.105</b>	<b>0.099</b>	<b>0.093</b>	<b>0.088</b>
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0.130	0.124	0.118	0.111	0.105	0.099	0.093	0.088
0.016	0.015	0.014	0.013	0.012	0.011	0.010	0.009
(0.027)	(0.026)	(0.025)	(0.023)	(0.022)	(0.021)	(0.020)	(0.019)
<b>0.120</b>	<b>0.113</b>	<b>0.107</b>	<b>0.101</b>	<b>0.095</b>	<b>0.089</b>	<b>0.083</b>	<b>0.078</b>

2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<b>0.09</b>	<b>0.09</b>	<b>0.09</b>	<b>0.09</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>

3.890	3.711	3.526	3.333	3.133	2.924	2.707	2.482
0.334	0.334	0.334	0.334	0.334	0.334	0.334	0.334
0.156	0.148	0.141	0.133	0.125	0.117	0.108	0.099
0.178	0.185	0.193	0.200	0.208	0.217	0.226	0.235
3.711	3.526	3.333	3.133	2.924	2.707	2.482	2.247

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

-	-	-	-	-	-	-	-
0.3249	0.3112	0.2969	0.2821	0.2667	0.2506	0.2339	0.2166
0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.004
0.031	0.030	0.028	0.027	0.025	0.023	0.022	0.020
-	-	-	-	-	-	-	-
0.362	0.347	0.331	0.314	0.297	0.279	0.260	0.241
0.311	0.297	0.282	0.267	0.251	0.234	0.217	0.199
0.051	0.050	0.049	0.048	0.046	0.045	0.044	0.042
0.311	0.297	0.282	0.267	0.251	0.234	0.217	0.199
-	-	-	-	-	-	-	-







23	24	25	26	27	28	29	30
34	35	36	37	38	39	40	41
2046	2047	2048	2049	2050	2051	2052	2053

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2.32	2.37	2.43	2.49	2.56	2.62	2.69	2.75
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-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
2.003	1.750	1.486	1.212	0.926	0.630	0.321	0.013
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

2046      2047      2048      2049      2050      2051      2052      2053

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0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>

4.502	4.444	4.387	4.329	4.271	4.214	4.156	4.098
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
4.444	4.387	4.329	4.271	4.214	4.156	4.098	4.040
0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
<b>0.025</b>	<b>0.024</b>	<b>0.024</b>	<b>0.023</b>	<b>0.023</b>	<b>0.022</b>	<b>0.021</b>	<b>0.021</b>

0.090	0.080	0.070	0.059	0.048	0.037	0.025	0.013
0.090	0.080	0.070	0.059	0.048	0.037	0.025	0.013
<b>0.039</b>	<b>0.034</b>	<b>0.029</b>	<b>0.024</b>	<b>0.019</b>	<b>0.014</b>	<b>0.009</b>	<b>0.005</b>
<b>0.082</b>	<b>0.076</b>	<b>0.071</b>	<b>0.065</b>	<b>0.060</b>	<b>0.054</b>	<b>0.049</b>	<b>0.044</b>

0.082	0.076	0.071	0.065	0.060	0.054	0.049	0.044
0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.001
(0.018)	(0.016)	(0.015)	(0.014)	(0.013)	(0.012)	(0.011)	(0.010)
<b>0.072</b>	<b>0.066</b>	<b>0.061</b>	<b>0.055</b>	<b>0.050</b>	<b>0.045</b>	<b>0.039</b>	<b>0.034</b>

2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
<b>0.03</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<b>0.08</b>	<b>0.07</b>	<b>0.07</b>	<b>0.07</b>	<b>0.07</b>	<b>0.06</b>	<b>0.06</b>	<b>0.06</b>

2.247	2.003	1.750	1.486	1.212	0.926	0.630	0.321
0.334	0.334	0.334	0.334	0.334	0.334	0.334	0.334
0.090	0.080	0.070	0.059	0.048	0.037	0.025	0.013
0.244	0.254	0.264	0.274	0.285	0.297	0.309	0.321
2.003	1.750	1.486	1.212	0.926	0.630	0.321	(0.000)

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



-	-	-	-	-	-	-	-
0.1986	0.1798	0.1603	0.1400	0.1189	0.0969	0.0741	0.0504
0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.001
0.018	0.016	0.014	0.012	0.010	0.007	0.005	0.003
-	-	-	-	-	-	-	-
0.221	0.199	0.177	0.155	0.131	0.106	0.081	0.054
0.180	0.160	0.140	0.119	0.097	0.074	0.050	0.026
0.041	0.039	0.037	0.036	0.034	0.032	0.030	0.028
0.180	0.160	0.140	0.119	0.097	0.074	0.050	0.026
-	-	-	-	-	-	-	-







31	32	33	34	35	36	37	38
42	43	44	45	46	47	48	49
2054	2055	2056	2057	2058	2059	2060	2061

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2.82	2.89	2.96	3.04	3.11	3.19	3.27	3.35
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-	-	-	-	-	-	-	-
18.721	19.470	20.249	21.059	21.901	22.777	23.688	24.636
0.749	0.779	0.810	0.842	0.876	0.911	0.948	0.985
-	-	-	-	-	-	-	-
19.470	20.249	21.059	21.901	22.777	23.688	24.636	25.621

2054	2055	2056	2057	2058	2059	2060	2061
0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>

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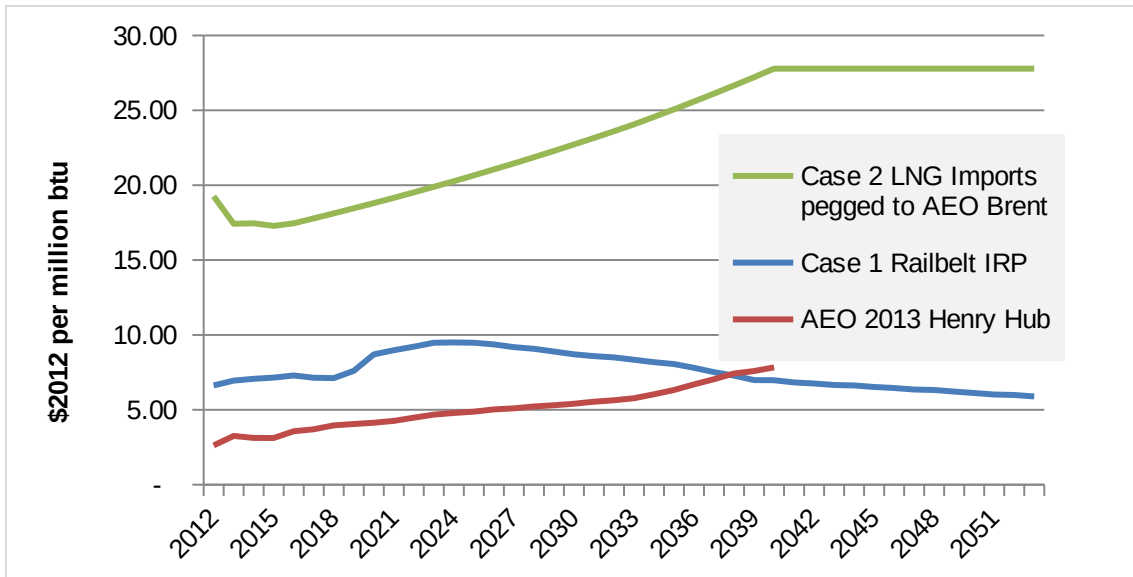


0.0257	-	-	-	-	-	-	-
0.001	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
0.026	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
0.026	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



31	32	33	34	35	36	37	38
42	43	44	45	46	47	48	49
2054	2055	2056	2057	2058	2059	2060	2061

2.8210    2.8915    2.9638    3.0379    3.1139    3.1917    3.2715    3.3533



2054	2055	2056	2057	2058	2059	2060	2061
------	------	------	------	------	------	------	------



3.983	3.925	3.867	3.810	3.752	3.694	3.636	3.579
<b>3.983</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>4.033</b>	<b>0.110</b>	<b>0.111</b>	<b>0.112</b>	<b>0.114</b>	<b>0.115</b>	<b>0.117</b>	<b>0.118</b>
4.033	0.110	0.111	0.112	0.114	0.115	0.117	0.118
-	-	-	-	-	-	-	-
<b>4.033</b>	<b>0.110</b>	<b>0.111</b>	<b>0.112</b>	<b>0.114</b>	<b>0.115</b>	<b>0.117</b>	<b>0.118</b>
2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
1.52	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
1.64	0.17	0.17	0.18	0.18	0.19	0.19	0.19

39	40	41	42	43	44	45	46
50	51	52	53	54	55	56	57
2062	2063	2064	2065	2066	2067	2068	2069

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3.44	3.52	3.61	3.70	3.79	3.89	3.99	4.09
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-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25.621	26.646	27.712	28.820	29.973	31.172	32.419	33.715
1.025	1.066	1.108	1.153	1.199	1.247	1.297	1.349
-	-	-	-	-	-	-	-
26.646	27.712	28.820	29.973	31.172	32.419	33.715	35.064

2062	2063	2064	2065	2066	2067	2068	2069
0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>

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39	40
50	51
2062	2063

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3.4371      3.5230



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2062      2063      2064      2065      2066      2067      2068      2069





3.521	3.463	3.406	3.348	3.290	3.232	3.175	3.117
<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>0.120</b>	<b>0.121</b>	<b>0.123</b>	<b>0.124</b>	<b>0.126</b>	<b>0.128</b>	<b>0.129</b>	<b>0.131</b>
0.120	0.121	0.123	0.124	0.126	0.128	0.129	0.131
-	-	-	-	-	-	-	-
<b>0.120</b>	<b>0.121</b>	<b>0.123</b>	<b>0.124</b>	<b>0.126</b>	<b>0.128</b>	<b>0.129</b>	<b>0.131</b>
2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18
0.20	0.20	0.21	0.21	0.22	0.22	0.23	0.23

47	48	49	50
58	59	60	61
2070	2071	2072	2073

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4.19	4.29	4.40	4.51
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-	-	-	-
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-	-	-	-
-	-	-	-
35.064	36.467	37.925	39.442
1.403	1.459	1.517	1.578
-	-	-	-
36.467	37.925	39.442	41.020

2070	2071	2072	2073
0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
0.018	0.018	0.018	0.018
-	-	-	-
-	-	-	-
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000
<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>
0.05	0.05	0.05	0.05
<b>0.05</b>	<b>0.05</b>	<b>0.05</b>	<b>0.05</b>

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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

	2070	2071	2072	2073
0.018	0.018	0.018	0.018	0.018
<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>	<b>0.018</b>
3.117	3.059	3.001	2.944	
0.058	0.058	0.058	0.058	
3.059	3.001	2.944	2.886	
0.058	0.058	0.058	0.058	
<b>0.014</b>	<b>0.013</b>	<b>0.013</b>	<b>0.013</b>	
0.000	0.000	0.000	0.000	
0.000	0.000	0.000	0.000	
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	
<b>0.032</b>	<b>0.031</b>	<b>0.031</b>	<b>0.031</b>	
0.032	0.031	0.031	0.031	
-	-	-	-	
-	-	-	-	
<b>0.032</b>	<b>0.031</b>	<b>0.031</b>	<b>0.031</b>	
2,800,000	2,800,000	2,800,000	2,800,000	
2,660,000	2,660,000	2,660,000	2,660,000	
<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	
0.05	0.05	0.05	0.05	
<b>0.06</b>	<b>0.06</b>	<b>0.06</b>	<b>0.06</b>	



2070

2071

2072

2073

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2070	2071	2072	2073
0.075	0.077	0.079	0.081
<b>0.075</b>	<b>0.077</b>	<b>0.079</b>	<b>0.081</b>
3.117	3.059	3.001	2.944
0.058	0.058	0.058	0.058



3.059	3.001	2.944	2.886
<b>0.058</b>	<b>0.058</b>	<b>0.058</b>	<b>0.058</b>

0.000	0.000	0.000	0.000
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>

<b>0.133</b>	<b>0.135</b>	<b>0.137</b>	<b>0.139</b>
--------------	--------------	--------------	--------------

0.133	0.135	0.137	0.139
-	-	-	-

<b>0.133</b>	<b>0.135</b>	<b>0.137</b>	<b>0.139</b>
--------------	--------------	--------------	--------------

2,800,000	2,800,000	2,800,000	2,800,000
2,660,000	2,660,000	2,660,000	2,660,000
0.05	0.05	0.05	0.05
0.19	0.19	0.20	0.20
0.24	0.24	0.25	0.25

Tornado diagrams  
 Year 2024 production cost of power

**Pasted**

Susitna year 2024 production cost per kWh in 2012\$

Item	units
Installed capacity	MW
Energy output delivered to Railbelt grid	MWh
Service lifetime	years
Total capital cost - overnight basis	2012\$ billion
Debt-financed fraction	
Grant-financed fraction	
Long-term debt interest rate	nominal %
Long term debt repayment period	years
Short-term debt rate (during construction)	nominal %
Financed reserve fund - ratio to debt service	ratio
Interest rate earned on short-run lending of FRF	nominal %
Required debt service coverage ratio	ratio
General inflation rate	% per yr
Annual O&M incl. capital replacements	2012\$ billion
Ratio of retail kWh sold to kWh delivered to Railbelt grid	
Transmission, distribution, & admin cost	2012\$/kWh

Susitna year 2024 production cost per kWh in 2012\$

Tornado diagrams  
 Susitna Cost of power

Base:

assumption value  
 low

Assumption

Capital cost

reference = 5.19 billion

4.480

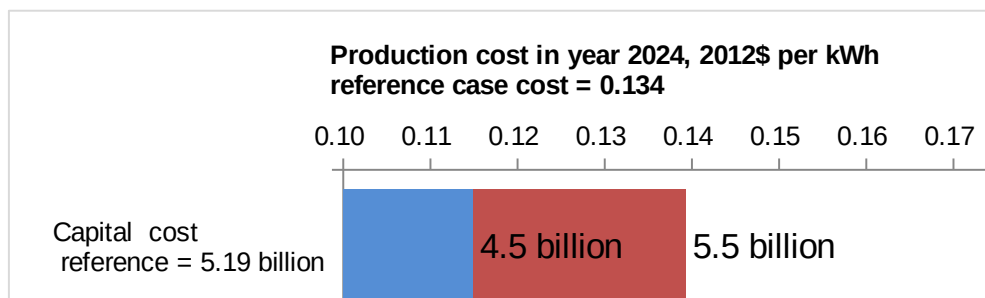
Interest rate

during / after const.  
 reference = 2% / 5%

2% / 4%

Debt svc coverage

reference = 1.00



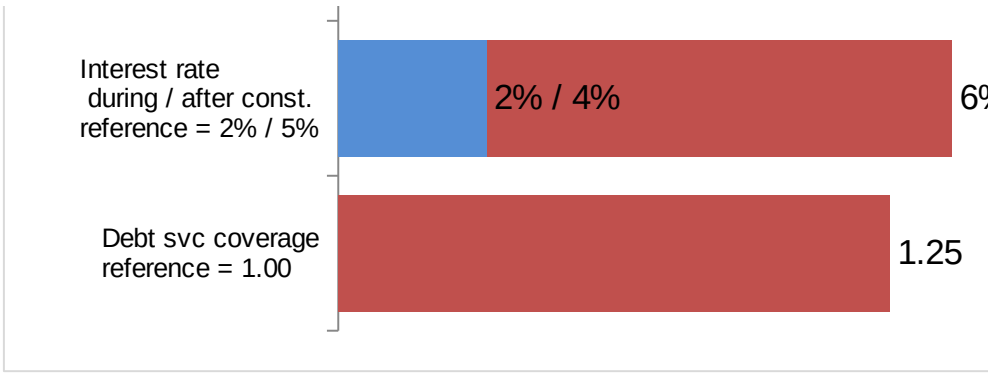
Interest rate  
during / after const.  
reference = 2% / 5%

2% / 4%

6%

Debt svc coverage  
reference = 1.00

1.25



Paste from: Paste to:

Value by formula	reference	capital cost		Interest rate		DS coverage	
		low	high	low	high	high	high
600	600	600	600	600	600	600	600
2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
100	100	100	100	100	100	100	100
4.480	5.190	4.480	5.490	5.190	5.190	5.190	5.190
100%	100%	100%	100%	100%	100%	100%	100%
0%	0%	0%	0%	0%	0%	0%	0%
4.0%	5.0%	5.0%	5.0%	4.0%	6.0%	5.0%	5.0%
30	30	30	30	30	30	30	30
2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	6.0%	2.0%
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.25
2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
0.10	0.13	0.11	0.14	0.12	0.17	0.17	0.16

0.1320

s	result values	
high	low	high
5.490	0.115	0.139
6% / 6%	0.117	0.170
1.25		0.163

0.18

6 / 6%

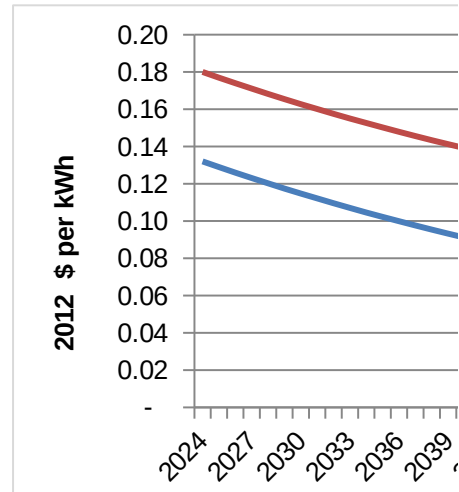


**Results transferred from rate analysis tab for easier pasting to below:**

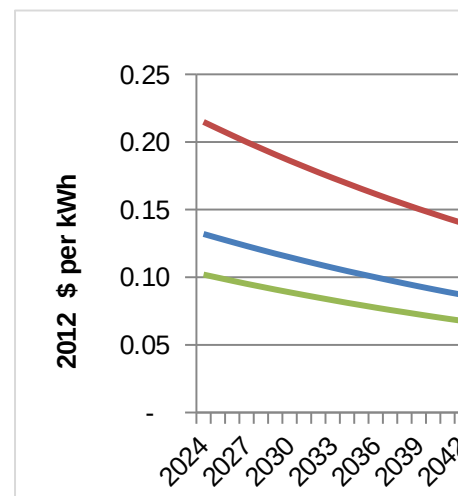
(debt service basis)		1	2	3
Case		2024	2025	2026
3 Susitna	Production cost per kWh sold	0.10	0.10	0.10
3 Susitna	Retail revenue req't per kWh sold	0.15	0.15	0.15
2 Gas	Production cost per kWh sold	0.21	0.21	0.21
2 Gas	Retail revenue req't per kWh sold	0.26	0.26	0.26

**Pasted results for graphing**

		1	2	3
		2024	2025	2026
1 Susitna	Production cost	0.13	0.13	0.13
1 Susitna	Retail revenue req't	0.18	0.18	0.17

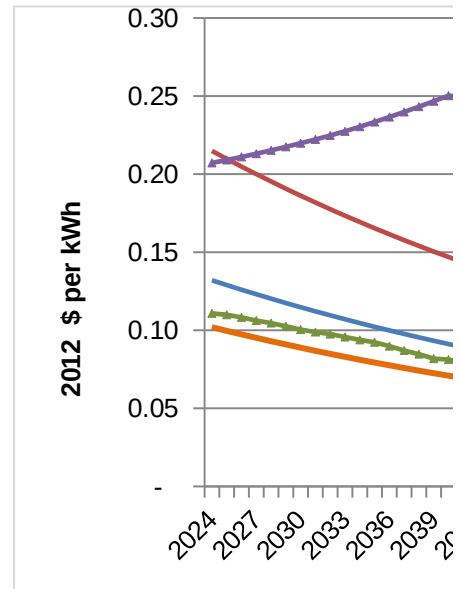


Case 1	0.13	0.13	0.13
Case 2	0.21	0.21	0.20
Case 3	0.10	0.10	0.10

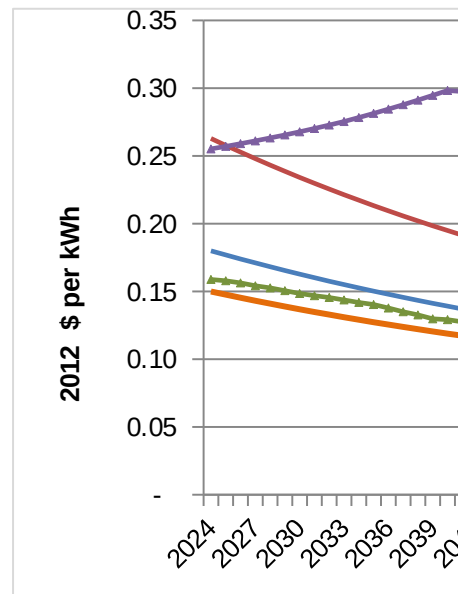


**Pasted values for multiple cases**

<b>Production cost per kWh sold</b>	2024	2025	2026
Susitna Case 1	0.13	0.13	0.13
Susitna Case 2	0.21	0.21	0.20
Susitna Case 3	0.10	0.10	0.10
Natural Gas Case 1	0.11	0.11	0.11
Natural Gas Case 2	0.21	0.21	0.21



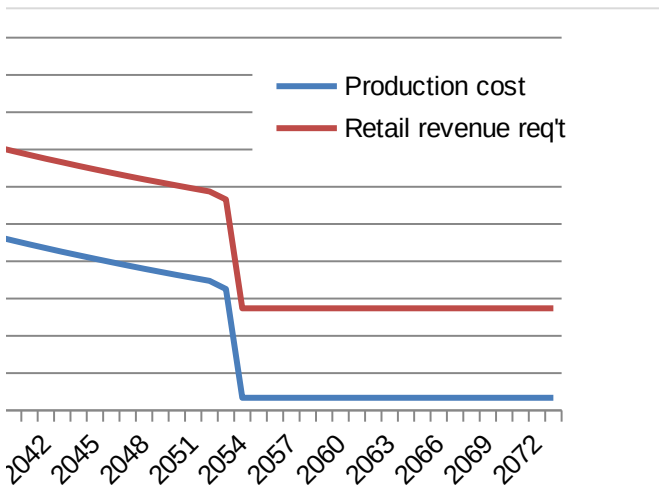
<b>Retail revenue req't per kWh sold</b>	2024	2025	2026
Susitna Case 1	0.18	0.18	0.17
Susitna Case 2	0.26	0.26	0.25
Susitna Case 3	0.15	0.15	0.15
Natural Gas Case 1	0.16	0.16	0.16
Natural Gas Case 2	0.26	0.26	0.26



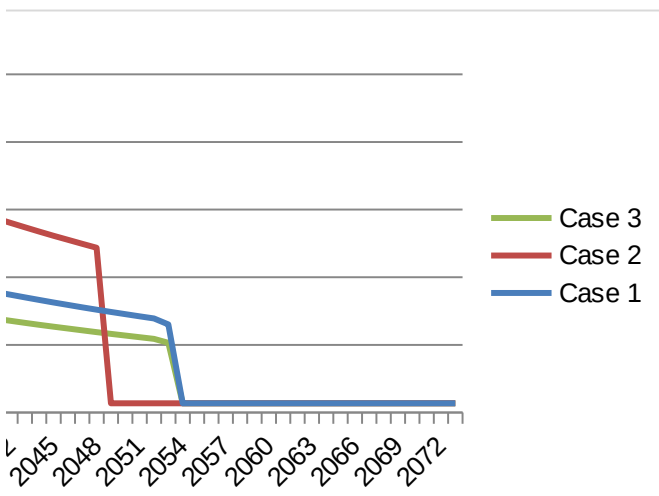


4 2027	5 2028	6 2029	7 2030	8 2031	9 2032	10 2033	11 2034
0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08
0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13
0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.23
0.26	0.26	0.27	0.27	0.27	0.27	0.28	0.28

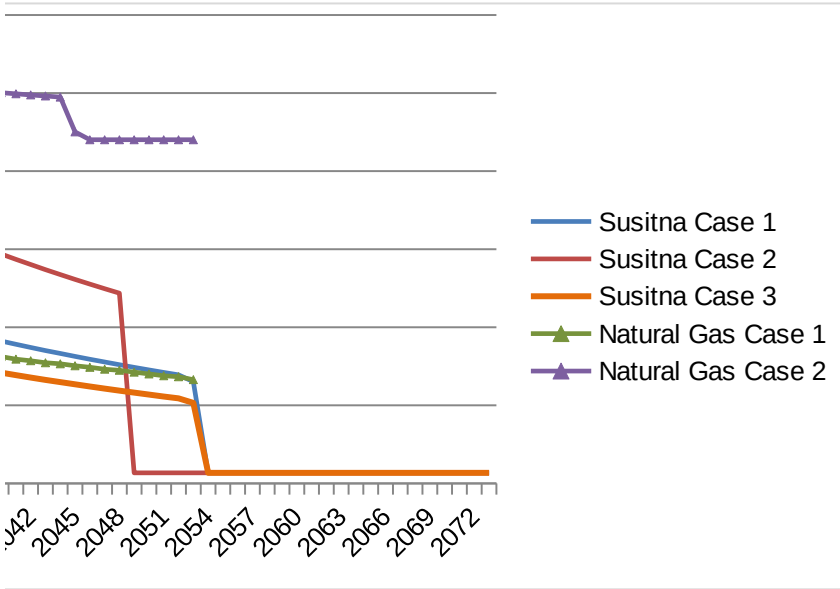
4 2027	5 2028	6 2029	7 2030	8 2031	9 2032	10 2033	11 2034
0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10
0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15



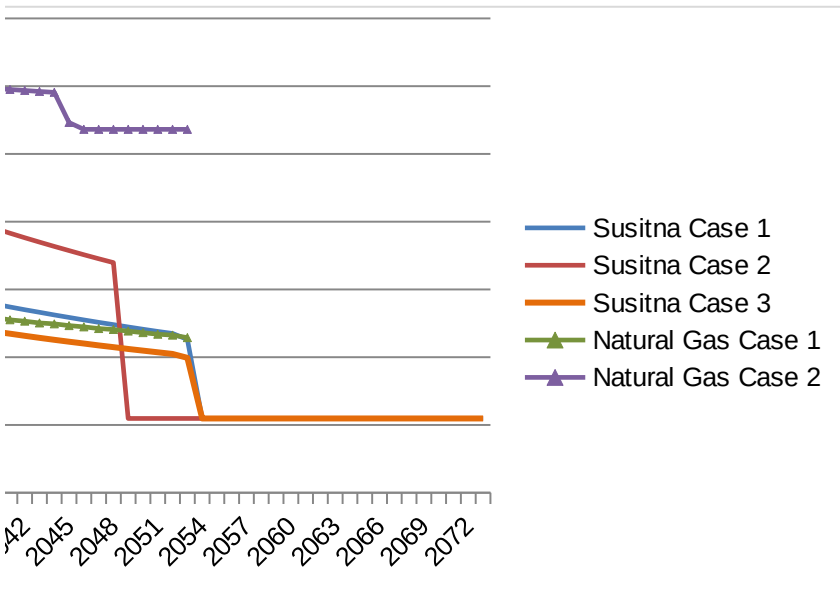
0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10
0.20	0.20	0.19	0.19	0.18	0.18	0.17	0.17
0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08



	2027	2028	2029	2030	2031	2032	2033	2034
	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10
	0.20	0.20	0.19	0.19	0.18	0.18	0.17	0.17
	0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08
	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.09
	0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.23



	2027	2028	2029	2030	2031	2032	2033	2034
	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15
	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22
	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13
	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14
	0.26	0.26	0.27	0.27	0.27	0.27	0.28	0.28



12 2035	13 2036	14 2037	15 2038	16 2039	17 2040	18 2041	19 2042
------------	------------	------------	------------	------------	------------	------------	------------

0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07
0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12

0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.25
0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.30

12 2035	13 2036	14 2037	15 2038	16 2039	17 2040	18 2041	19 2042
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0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14

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0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14
0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07

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2035	2036	2037	2038	2039	2040	2041	2042
0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14
0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07
0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08
0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.25

2035	2036	2037	2038	2039	2040	2041	2042
0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14
0.21	0.21	0.21	0.20	0.20	0.19	0.19	0.19
0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12
0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13
0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.30



2043	2044	2045	2046	2047	2048	2049	2050
0.09	0.08	0.08	0.08	0.08	0.08	0.07	0.07
0.14	0.13	0.13	0.13	0.12	0.12	0.01	0.01
0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07
0.25	0.25	0.23	0.22	0.22	0.22	0.22	0.22

2043	2044	2045	2046	2047	2048	2049	2050
0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12
0.18	0.18	0.18	0.18	0.17	0.17	0.05	0.05
0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10
0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12
0.30	0.30	0.27	0.27	0.27	0.27	0.27	0.27

28 2051	29 2052	30 2053	31 2054	32 2055	33 2056	34 2057	35 2058
0.06	0.05	0.05	0.01	0.01	0.01	0.01	0.01
0.10	0.10	0.10	0.05	0.05	0.05	0.05	0.05
0.22	0.22	0.22	-	-	-	-	-
0.27	0.27	0.27	-	-	-	-	-

28 2051	29 2052	30 2053	31 2054	32 2055	33 2056	34 2057	35 2058
0.07	0.07	0.07	0.01	0.01	0.01	0.01	0.01
0.12	0.12	0.11	0.05	0.05	0.05	0.05	0.05

0.07	0.07	0.07	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.06	0.05	0.05	0.01	0.01	0.01	0.01	0.01

2051	2052	2053	2054	2055	2056	2057	2058
0.07	0.07	0.07	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.06	0.05	0.05	0.01	0.01	0.01	0.01	0.01
0.07	0.07	0.07	-	-	-	-	-
0.22	0.22	0.22	0	0	0	0	0

2051	2052	2053	2054	2055	2056	2057	2058
0.12	0.12	0.11	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.10	0.10	0.10	0.05	0.05	0.05	0.05	0.05
0.12	0.12	0.11	-	-	-	-	-
0.27	0.27	0.27	-	-	-	-	-





2059	2060	2061	2062	2063	2064	2065	2066
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
-	-	-	-	-	-	-	-
0	0	0	0	0	0	0	0

2059	2060	2061	2062	2063	2064	2065	2066
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



2067	2068	2069	2070	2071	2072	2073
0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01
-	-	-	-	-	-	-
0	0	0	0	0	0	0

2067	2068	2069	2070	2071	2072	2073
0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05
-	-	-	-	-	-	-
-	-	-	-	-	-	-

Capital replacements workup  
 Low Watana = 4 turbines  
 raw data from HDR March 2009  
 \$ million (year 2009)

Calendar Year	Operating year	replace turbine runners	replace governors	rewind rotors and stators	rehab transformers	structural and xmission repairs
Years 1-50						
2024	1					
2025	2					
2026	3					
2027	4					
2028	5					
2029	6					
2030	7					
2031	8					
2032	9					
2033	10					
2034	11					
2035	12					
2036	13					
2037	14					
2038	15					
2039	16					
2040	17					
2041	18					
2042	19					
2043	20	20		2		
2044	21					
2045	22					
2046	23					
2047	24					
2048	25					
2049	26					
2050	27					
2051	28					
2052	29					
2053	30					
2054	31					
2055	32					
2056	33					

2057	34				
2058	35				
2059	36				
2060	37				
2061	38				
2062	39				
2063	40	20	2	40	3.6
2064	41				
2065	42				
2066	43				
2067	44				
2068	45				
2069	46				
2070	47				
2071	48				
2072	49				
2073	50				
2074	51				47.5
2075	52				
2076	53				
2077	54				
2078	55				
2079	56				
2080	57				
2081	58				
2082	59				
2083	60	20	2		
2084	61				
2085	62				
2086	63				
2087	64				
2088	65				
2089	66				
2090	67				
2091	68				
2092	69				
2093	70				
2094	71				
2095	72				
2096	73				
2097	74				
2098	75				
2099	76				
2100	77				
2101	78				
2102	79				
2103	80	20	2	40	3.6
2104	81				

2105	82
2106	83
2107	84
2108	85
2109	86
2110	87
2111	88
2112	89
2113	90
2114	91
2115	92
2116	93
2117	94
2118	95
2119	96
2120	97
2121	98
2122	99
2123	100

FERC re- license	Total	Inflation index	Total nominal dollars	Sinking fund BOY	SF payment end of yr	SF draw end of yr	SF earnings BOY basis	SF EOY
	87.6		278.4113					-24.58457
0	1.344889	0	0	0	2.6706	-	0.1068228	2.777394
0	1.378511	0	2.777394	2.70	-	0.2189186	5.691883	
0	1.412974	0	5.691883	2.72	-	0.3364982	8.748952	
0	1.448298	0	8.748952	2.75	-	0.4597809	11.9543	
0	1.484506	0	11.9543	2.77	-	0.588995	15.31387	
0	1.521618	0	15.31387	2.80	-	0.7243776	18.83382	
0	1.559659	0	18.83382	2.82	-	0.8661756	22.52056	
0	1.59865	0	22.52056	2.85	-	1.0146454	26.38078	
0	1.638616	0	26.38078	2.87	-	1.1700541	30.42141	
0	1.679582	0	30.42141	2.90	-	1.3326791	34.64966	
0	1.721571	0	34.64966	2.92	-	1.5028091	39.07304	
0	1.764611	0	39.07304	2.95	-	1.6807443	43.69935	
0	1.808726	0	43.69935	2.97	-	1.8667969	48.53672	
0	1.853944	0	48.53672	3.00	-	2.0612916	53.59358	
0	1.900293	0	53.59358	3.02	-	2.2645661	58.87872	
0	1.9478	0	58.87872	3.05	-	2.4769715	64.40126	
0	1.996495	0	64.40126	3.07	-	2.6988732	70.1707	
0	2.046407	0	70.1707	3.10	-	2.930651	76.19693	
0	2.097568	0	76.19693	3.12	-	3.1726999	82.4902	
22	2.150007	47.30015	82.4902	3.15	(47.30)	1.5334248	39.86904	
0	2.203757	0	39.86904	3.17	-	1.7215846	44.7612	
0	2.258851	0	44.7612	3.20	-	1.9182708	49.87504	
0	2.315322	0	49.87504	3.22	-	2.1238245	55.21944	
0	2.373205	0	55.21944	3.25	-	2.3386003	60.80361	
0	2.432535	0	60.80361	3.27	-	2.5629671	66.63715	
0	2.493349	0	66.63715	3.30	-	2.7973086	72.73002	
0	2.555682	0	72.73002	3.32	-	3.0420238	79.09262	
0	2.619574	0	79.09262	3.35	-	3.2975276	85.73572	
0	2.685064	0	85.73572	3.37	-	3.5642515	92.67054	
0	2.75219	0	92.67054	3.40	-	3.8426444	99.90876	
0	2.820995	0	99.90876	3.42	-	4.133173	107.4625	
0	2.89152	0	107.4625	3.45	-	4.4363228	115.3444	
0	2.963808	0	115.3444	3.47	-	4.7525986	123.5676	



0	3.037903	0	123.5676	3.50	-	5.0825253	132.1457
0	3.113851	0	132.1457	3.52	-	5.4266492	141.0929
0	3.191697	0	141.0929	3.55	-	5.785538	150.424
0	3.27149	0	150.424	3.57	-	6.1597823	160.1543
0	3.353277	0	160.1543	3.60	-	6.5499965	170.2999
0	3.437109	0	170.2999	3.62	-	6.9568191	180.8773
65.6	3.523036	231.1112	180.8773	3.65	(231.11)	-1.8635329	-48.45185
0	3.611112	0	-48.45185	3.67	-	-1.7912513	-46.57253
0	3.70139	0	-46.57253	3.70	-	-1.7150786	-44.59204
0	3.793925	0	-44.59204	3.72	-	-1.6348589	-42.50633
0	3.888773	0	-42.50633	3.75	-	-1.5504304	-40.31119
0	3.985992	0	-40.31119	3.77	-	-1.4616248	-38.00224
0	4.085642	0	-38.00224	3.80	-	-1.3682669	-35.57494
0	4.187783	0	-35.57494	3.82	-	-1.2701748	-33.02454
0	4.292478	0	-33.02454	3.85	-	-1.1671589	-30.34613
0	4.39979	0	-30.34613	3.87	-	-1.0590225	-27.53458
0	4.509784	0	-27.53458	3.90	-	-0.9455605	-24.58457
	4.622529	0					
	4.738092	0					
	4.856545	0					
	4.977958	0					
	5.102407	0					
	5.229967	0					
	5.360717	0					
	5.494734	0					
	5.632103	0					
	5.772905	0					
	5.917228	0					
	6.065159	0					
	6.216788	0					
	6.372207	0					
	6.531513	0					
	6.6948	0					
	6.86217	0					
	7.033725	0					
	7.209568	0					
	7.389807	0					
	7.574552	0					
	7.763916	0					
	7.958014	0					
	8.156964	0					
	8.360888	0					
	8.569911	0					
	8.784158	0					
	9.003762	0					
	9.228856	0					
	9.459578	0					
	9.696067	0					

9.938469	0
10.18693	0
10.4416	0
10.70264	0
10.97021	0
11.24447	0
11.52558	0
11.81372	0
12.10906	0
12.41179	0
12.72208	0
13.04013	0
13.36614	0
13.70029	0
14.0428	0
14.39387	0
14.75371	0
15.12256	0
15.50062	0

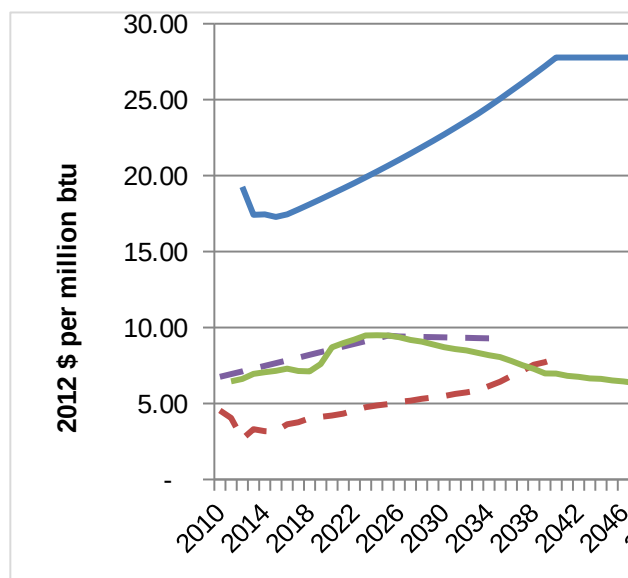
SF  
payment  
in 2012\$

1.99

## Natural Gas Price Trajectories

### Summary re-statement for graphing

	2010	2011	2012
Natural gas price 2012 \$ per million btu			
AEO 2013 reference case Henry Hub	4.54	4.05	2.66
Low: Black & Veatch 2010 Railbelt IRP		6.46	6.62
Fay July 2012 reference case based on Henry Hub	6.75	6.94	7.12
High: LNG import gas price based on AEO Brent projection			19.26



U.S. GDP Deflator 2005=1.000 (for converting 2011\$ to 2012\$)	2010	2011	2012
	1.110	1.134	1.154

### Black & Veatch Railbelt IRP

[http://www.akenergyauthority.org/RIRPFiles/Alaska\\_RIRP\\_Final\\_Report\\_120409/AlaskaF](http://www.akenergyauthority.org/RIRPFiles/Alaska_RIRP_Final_Report_120409/AlaskaF)

	2010	2011	2012
Natural Gas \$ per million btu (nominal\$)		6.30	6.62
Inflation index used by BV (2.5% per year)	2.5%	0.976	1.000
Natural Gas \$ per million btu (2012\$)		6.46	6.62

Compare to Hilcorp consent decree limits nominal \$

Delivery charge to CEA power plant (avg from Q3 2013 fuel surcharge filing)

Delivered price to power plant using consent decree price cap nominal \$

Summary for Table

	2012	2024	2040	2050
2012 dollars per million btu	6.62	9.50	6.97	6.12

### ISER July 2012 fuel price projections for AEA REF

[http://www.iser.uaa.alaska.edu/Publications/2012\\_07-Fuel\\_price\\_projection\\_2012-2035.p](http://www.iser.uaa.alaska.edu/Publications/2012_07-Fuel_price_projection_2012-2035.p)

ISER Henry Hub Projection (\$/MMBtu), real 2011\$	6.75	6.94	7.12
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ISER Henry Hub Projection (\$/MMBtu), real 2012\$	6.87	7.06	7.25
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**Potential LNG Import Price based on AEO 2013 Brent Crude projections**

AEO 2013 Brent Crude spot price (\$/bbl) real 2011\$	81.31	111.26	108.50
AEO 2013 Brent Crude spot price (\$/bbl) real 2012\$	82.74	113.22	110.42
Regasified CIF Cook Inlet formula (Scott 2012 p. 14)	2.20 plus		0.1545
Regasified imported LNG CIF Cook Inlet 2012\$	14.98	19.69	19.26

Summary for Table

	2012	2024	2040	2050
2012 dollars per million btu	19.26	20.27	27.78	27.78

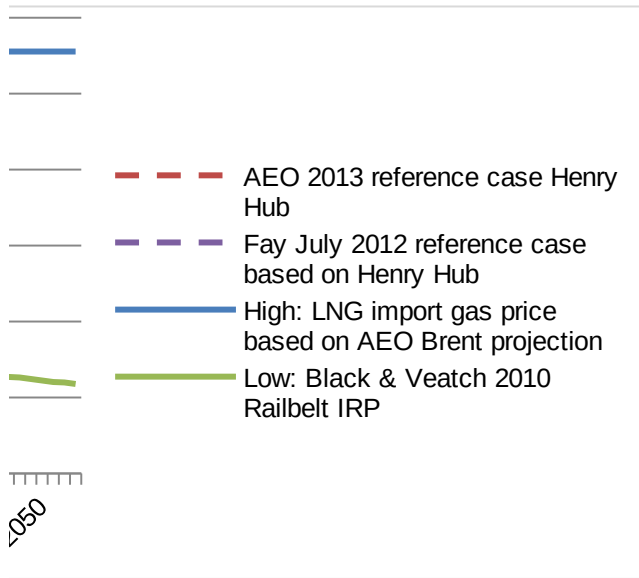
**Not used directly - additional checking of how EIA calculates GDP deflator**

AEO 2013 Brent Crude spot price (\$/bbl) nominal\$ per	79.61	111.26	110.43
Implicit price index (2011=1.00)(calculated)		1.00000	1.01775
AEO GDP chain-type price index Macro Indicators table	1.11	1.13369	1.15382
price index data normalized to 2011=1.00 (check)		1.0000	1.01775

**Not used directly - AEO Low Oil Price Case**

AEO 2013 Brent Crude spot price (\$/bbl) real 2011\$	81.31	111.26	108.50
Brent Crude spot price, real 2012\$/bbl	82.75	113.24	110.43
Implied Japan LNG 2012\$ price using Scott p. ES-1	13.19	17.72	17.30
Japan LNG Nominal \$ using B&V inflation index compare to BV Japan LNG price Table 7-2			17.30

	2013	2014	2015	2016	2017	2018	2019	2020
	3.31	3.18	3.17	3.63	3.76	4.03	4.12	4.21
	6.95	7.06	7.15	7.29	7.14	7.11	7.60	8.70
	7.30	7.48	7.66	7.84	8.02	8.20	8.38	8.56
	17.42	17.45	17.28	17.45	17.78	18.11	18.45	18.80



[RIRPFinalReport-Part2of6.pdf](#)

	2013	2014	2015	2016	2017	2018	2019	2020
	7.12	7.42	7.7	8.05	8.08	8.25	9.03	10.6
	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218
	6.95	7.06	7.15	7.29	7.14	7.11	7.60	8.70
	6.60	6.86	7.13	7.42	7.72			
	0.51	0.51	0.51	0.51	0.51			
	7.11	7.37	7.64	7.93	8.23			
	100%	99%	99%	99%	102%			

[df](#)

	7.30	7.48	7.66	7.84	8.02	8.20	8.38	8.56
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7.43	7.61	7.80	7.98	8.16	8.34	8.53	8.71
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96.81	97.00	95.91	97.00	99.08	101.20	103.36	105.57
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98.51	98.71	97.60	98.71	100.82	102.98	105.19	107.44
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Brent \$/bbl Brent used as a proxy for ANS and JCC

17.42	17.45	17.28	17.45	17.78	18.11	18.45	18.80
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100.20	101.81	102.21	104.99	108.87	112.99	117.23	121.73
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1.03507	1.04962	1.06571	1.08238	1.09881	1.11653	1.13419	1.15307
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1.17345	1.18995	1.20818	1.22709	1.24571	1.26580	1.28582	1.30722
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1.03507	1.04962	1.06571	1.08238	1.09881	1.11653	1.13419	1.15307
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96.81	84.70	78.70	73.67	69.00	68.80	68.70	68.90
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98.53	86.20	80.10	74.98	70.22	70.02	69.92	70.12
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15.53	13.70	12.79	12.03	11.33	11.30	11.28	11.31
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15.92	14.39	13.78	13.28	12.82	13.10	13.41	13.78
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		10.89		11.69		12.25	
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<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
4.33	4.56	4.76	4.87	4.96	5.11	5.18	5.31
8.98	9.21	9.47	9.50	9.47	9.36	9.18	9.07
8.74	8.93	9.11	9.29	9.47	9.41	9.40	9.38
19.15	19.52	19.89	20.27	20.65	21.05	21.45	21.86

<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
11.21	11.79	12.43	12.77	13.06	13.23	13.3	13.47
1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485
8.98	9.21	9.47	9.50	9.47	9.36	9.18	9.07

8.74      8.93      9.11      9.29      9.47      9.41      9.40      9.38



8.89	9.09	9.27	9.45	9.64	9.58	9.57	9.55
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107.83	110.14	112.50	114.91	117.36	119.88	122.44	125.06
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109.74	112.08	114.48	116.93	119.43	121.99	124.60	127.27
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19.15	19.52	19.89	20.27	20.65	21.05	21.45	21.86
-------	-------	-------	-------	-------	-------	-------	-------

126.50	131.55	136.80	142.24	147.90	153.82	159.96	166.37
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1.17307	1.19437	1.21601	1.23788	1.26019	1.28312	1.30639	1.33027
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1.32990	1.35404	1.37857	1.40337	1.42866	1.45466	1.48104	1.50811
---------	---------	---------	---------	---------	---------	---------	---------

1.17307	1.19437	1.21601	1.23788	1.26019	1.28312	1.30639	1.33027
---------	---------	---------	---------	---------	---------	---------	---------

69.20	69.50	69.80	70.10	70.40	70.70	71.00	71.30
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70.43	70.73	71.04	71.34	71.65	71.96	72.26	72.57
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11.36	11.40	11.45	11.49	11.54	11.59	11.63	11.68
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14.19	14.60	15.02	15.46	15.91	16.37	16.84	17.33
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12.54	12.74
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<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>	<b>2036</b>
5.39	5.49	5.63	5.73	5.87	6.14	6.43	6.81
8.89	8.71	8.58	8.49	8.34	8.18	8.05	7.80
9.37	9.35	9.34	9.32	9.31	9.29	9.27	
22.28	22.71	23.15	23.60	24.06	24.55	25.06	25.58

<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>	<b>2036</b>
13.53	13.58	13.72	13.92	14	14.08	14.21	14.11
1.522	1.560	1.599	1.639	1.680	1.722	1.765	1.809
8.89	8.71	8.58	8.49	8.34	8.18	8.05	7.80

9.37      9.35      9.34      9.32      9.31      9.29      9.27 Extended by

9.54      9.51      9.50      9.48      9.47      9.45      9.43

127.74    130.47    133.26    136.12    139.03    142.18    145.41    148.71

129.99    132.77    135.61    138.52    141.48    144.69    147.98    151.34

22.28    22.71    23.15    23.60    24.06    24.55    25.06    25.58

173.07    180.04    187.33    194.87    202.68    211.04    219.73    228.76

1.35490    1.37994    1.40573    1.43164    1.45782    1.48430    1.51106    1.53829

1.53604    1.56443    1.59366    1.62304    1.65272    1.68273    1.71308    1.74395

1.35490    1.37994    1.40573    1.43164    1.45782    1.48430    1.51106    1.53829

71.60      71.90      72.20      72.50      72.80      73.10      73.40      73.70

72.87      73.18      73.48      73.79      74.09      74.40      74.70      75.01

11.72      11.77      11.81      11.86      11.90      11.95      11.99      12.04

17.84      18.35      18.88      19.43      19.99      20.57      21.16      21.77

<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>	<b>2041</b>	<b>2042</b>	<b>2043</b>	<b>2044</b>
7.16	7.55	7.72	7.97				
7.51	7.28	6.98	6.97	6.82	6.76	6.65	6.62
26.11	26.65	27.21	27.78	27.78	27.78	27.78	27.78

<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>	<b>2041</b>	<b>2042</b>	<b>2043</b>	<b>2044</b>
13.93	13.84	13.59	13.91	13.96	14.17	14.3	14.59
1.854	1.900	1.948	1.996	2.046	2.098	2.150	2.204
7.51	7.28	6.98	6.97	6.82	6.76	6.65	6.62

S. Colt:

Extended by S. Colt:

152.09	155.54	159.07	162.68				
154.77	158.28	161.88	165.55	165.55	165.55	165.55	165.55
26.11	26.65	27.21	27.78	27.78	27.78	27.78	27.78

238.16	247.92	258.03	268.50
1.56595	1.59389	1.62207	1.65044
1.77530	1.80698	1.83892	1.87109
1.56595	1.59389	1.62207	1.65045

74.00	74.30	74.60	74.90
75.31	75.62	75.92	76.23
12.08	12.13	12.17	12.22
22.40	23.05	23.71	24.40

<b>2045</b>	<b>2046</b>	<b>2047</b>	<b>2048</b>	<b>2049</b>	<b>2050</b>	<b>2051</b>	<b>2052</b>
6.52	6.45	6.35	6.32	6.22	6.12	6.02	5.99
27.78	27.78	27.78	27.78	27.78	27.78	27.78	27.78

<b>2045</b>	<b>2046</b>	<b>2047</b>	<b>2048</b>	<b>2049</b>	<b>2050</b>	<b>2051</b>	<b>2052</b>
14.73	14.94	15.07	15.37	15.5	15.64	15.77	16.08
2.259	2.315	2.373	2.433	2.493	2.556	2.620	2.685
6.52	6.45	6.35	6.32	6.22	6.12	6.02	5.99



2053

5.89

27.78

2053

16.21

2.752

5.89



165.55

27.78

Report Annual Energy Outlook  
 Scenario ref2013  
 Datekey d102312a  
 Release Date December  
<http://www.eia.gov/analysis/projecti>

SUP000 **1. Total Energy Supply, Disposition, and Price Summary**  
 (quadrillion Btu, unless otherwise noted)

<i>Supply, Disposition, and Prices</i>		2010	2011	2012
<b>Production</b>				
SUP000:ba_Crude	Crude Oil and Lease Condensate	11.59	12.16	13.58
SUP000:ba_Natura	Natural Gas Plant Liquids	2.78	2.88	3.08
SUP000:ba_DryNa	Dry Natural Gas	21.82	23.51	24.44
SUP000:ba_Coal	Coal 1/	22.04	22.21	20.95
SUP000:ba_Nuclea	Nuclear / Uranium 2/	8.43	8.26	8.05
SUP000:ba_Hydro	Hydropower	2.54	3.17	2.74
SUP000:ba_Bioma	Biomass 3/	4.05	4.05	3.97
SUP000:ba_Renew	Other Renewable Energy 4/	1.31	1.58	1.77
SUP000:ba_Other	Other 5/	0.76	1.20	0.90
SUP000:ba_Total	<b>Total</b>	<b>75.31</b>	<b>79.02</b>	<b>79.48</b>
<b>Imports</b>				
SUP000:ca_Crude	Crude Oil	20.14	19.46	18.70
SUP000:ca_Petrol	Liquid Fuels and Other Petroleum 6/	5.26	5.24	4.13
SUP000:ca_Natura	Natural Gas 7/	3.83	3.54	3.32
SUP000:ca_Other	Other 8/	0.52	0.43	0.41
SUP000:ca_Total	<b>Total</b>	<b>29.75</b>	<b>28.66</b>	<b>26.56</b>
<b>Exports</b>				
SUP000:da_Petrol	Liquid Fuels and Other Petroleum 9/	4.86	6.08	5.87
SUP000:da_Natura	Natural Gas 10/	1.15	1.52	1.53
SUP000:da_Coal	Coal	2.10	2.75	3.08
SUP000:da_Total	<b>Total</b>	<b>8.11</b>	<b>10.35</b>	<b>10.49</b>
SUP000:ea_Discre	<b>Discrepancy 11/</b>	<b>-1.40</b>	<b>-0.36</b>	<b>-0.51</b>
<b>Consumption</b>				
SUP000:fa_Petrol	Liquid Fuels and Other Petroleum 12/	37.76	37.02	36.40
SUP000:fa_Natural	Natural Gas	24.32	24.91	26.20
SUP000:fa_Coal	Coal 13/	20.81	19.66	17.82
SUP000:fa_Nuclea	Nuclear / Uranium 2/	8.43	8.26	8.05
SUP000:fa_Hydro	Hydropower	2.54	3.17	2.74

SUP000:fa_Biomas	Biomass 14/	2.87	2.74	2.71
SUP000:fa_Renew	Other Renewable Energy 4/	1.31	1.58	1.77
SUP000:fa_Other	Other 15/	0.31	0.35	0.38
SUP000:fa_Total	<b>Total</b>	<b>98.35</b>	<b>97.70</b>	<b>96.07</b>

**Prices (2011 dollars per unit)**

SUP000:ha_WorldC	Brent Spot Price (dollars per barrel) 16/	81.31	111.26	108.50
SUP000:ha_ForLo	West Texas Intermediate Spot Price (dollars per b	81.08	94.86	92.49
SUP000:ha_GasPr	Natural Gas at Henry Hub (dollars per mmBtu)	4.46	3.98	2.62
SUP000:ha_CoalM	Coal, Minemouth (dollars per ton) 17/	36.37	41.16	44.32
SUP000:ha_CoalM	Coal, Minemouth (dollars per million Btu) 17/	1.80	2.04	2.18
SUP000:ha_CoalD	Coal, Delivered (dollars per million Btu) 18/	2.42	2.57	2.63
SUP000:ha_Electri	Electricity (cents per kilowatthour)	10.0	9.9	9.4

**Prices (nominal dollars per unit)**

SUP000:nom_Impc	Brent Spot Price (dollars per barrel) 16/	79.61	111.26	110.43
SUP000:nom_ForL	West Texas Intermediate Spot Price (dollars per b	79.39	94.86	94.13
SUP000:nom_Gas	Natural Gas at Henry Hub (dollars per mmBtu)	4.37	3.98	2.66
SUP000:nom_Coal	Coal, Minemouth (dollars per ton) 17/	35.61	41.16	45.11
SUP000:nom_Coal	Coal, Minemouth (dollars per million Btu) 17/	1.76	2.04	2.21
SUP000:nom_Coal	Coal, Delivered (dollars per million Btu) 18/	2.37	2.57	2.68
SUP000:nom_Elec	Electricity (cents per kilowatthour)	9.8	9.9	9.6

1/ Includes waste coal.

2/ These values represent the energy obtained from uranium when it is used in light water reactors. The total energy is much larger, but alternative processes are required to take advantage of it.

3/ Includes grid-connected electricity from wood and wood waste; biomass, such as corn, used for liquid fuels production demand from wood. Refer to Table 17 for details.

4/ Includes grid-connected electricity from landfill gas; biogenic municipal waste; wind; photovoltaic and solar thermal non-electric energy from renewable sources, such as active and passive solar systems. Excludes electricity imports and nonmarketed renewable energy. See Table 17 for selected nonmarketed residential and commercial renewable energy.

5/ Includes non-biogenic municipal waste, liquid hydrogen, methanol, and some domestic inputs to refineries.

6/ Includes imports of finished petroleum products, unfinished oils, alcohols, ethers, blending components, and re-exports.

7/ Includes imports of liquefied natural gas that are later re-exported.

8/ Includes coal, coal coke (net), and electricity (net). Excludes imports of fuel used in nuclear power plants.

9/ Includes crude oil, petroleum products, ethanol, and biodiesel.

10/ Includes re-exported liquefied natural gas.

11/ Balancing item. Includes unaccounted for supply, losses, gains, and net storage withdrawals.

12/ Includes petroleum-derived fuels and non-petroleum-derived fuels, such as ethanol and biodiesel, and coal-based coke, which is a solid, is included. Also included are natural gas plant liquids and crude oil consumed as a fuel. Re-excludes renewable liquid fuels consumption.

13/ Excludes coal converted to coal-based synthetic liquids and natural gas.

14/ Includes grid-connected electricity from wood and wood waste, non-electric energy from wood, and biofuels from the production of liquid fuels, but excludes the energy content of the liquid fuels.

15/ Includes non-biogenic municipal waste, liquid hydrogen, and net electricity imports.

16/ Annual average price for Brent crude oil on the Intercontinental exchange.

17/ Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from prices published in EIA data reports where it is weighted by reported sales.

18/ Prices weighted by consumption; weighted average excludes residential and commercial prices, and export freight. Btu = British thermal unit.

MmBtu = Million Btu.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding. Data for 2010 and 2011 are model results and may differ slightly from official EIA data reports.

Sources: 2010 natural gas supply values: U.S. Energy Information Administration (EIA), Natural Gas Annual 2010, DOE/EIA-0131(2010) (Washington, DC, December 2011).

2011 natural gas supply values: EIA, Natural Gas Monthly, DOE/EIA-0130(2012/07) (Washington, DC, July 2012).

2010 and 2011 natural gas spot price at Henry Hub based on daily data from Natural Gas Intelligence.

2010 and 2011 coal minemouth and delivered coal prices: EIA, Annual Coal Report 2011, DOE/EIA-0584(2011) (Washington, DC, September 2011).

2011 petroleum supply values and 2010 crude oil and lease condensate production: EIA,

Petroleum Supply Annual 2011, DOE/EIA-0340(2011)/1 (Washington, DC, August 2012).

Other 2010 petroleum supply values: EIA, Petroleum Supply Annual 2010, DOE/EIA-0340(2010)/1 (Washington, DC, August 2012).

2010 and 2011 crude oil spot prices: Thomson Reuters.

Other 2010 and 2011 coal values: EIA, Quarterly Coal Report, October-December 2011, DOE/EIA-0121(2011/4Q) (Washington, DC, December 2011).

Other 2010 and 2011 values: EIA, Annual Energy Review 2011, DOE/EIA-0384(2011) (Washington, DC, September 2011).

Projections: EIA, AEO2013 National Energy Modeling System run ref2013.d102312a.

2013 2014 2015 2016 2017 2018 2019 2020 2021

ok 2013

Reference case

r 2012

[on-data.cfm#annualproj](#)

2013 2014 2015 2016 2017 2018 2019 2020 2021

14.61	15.35	15.58	16.08	16.03	16.02	16.10	15.95	15.75
3.12	3.66	3.74	3.84	3.99	4.03	4.11	4.14	4.16
24.53	24.38	24.56	25.69	25.96	26.49	26.89	27.19	27.54
20.83	20.95	21.12	20.17	20.68	21.05	21.47	21.74	21.85
8.10	8.24	8.57	8.78	8.98	9.15	9.25	9.25	9.29
2.65	2.70	2.76	2.83	2.83	2.83	2.83	2.83	2.84
4.09	4.14	4.25	4.40	4.55	4.67	4.83	5.00	5.11
2.05	2.09	2.12	2.12	2.15	2.17	2.19	2.22	2.25
0.86	0.74	0.76	0.79	0.82	0.83	0.83	0.83	0.83
<b>80.85</b>	<b>82.25</b>	<b>83.46</b>	<b>84.70</b>	<b>85.98</b>	<b>87.24</b>	<b>88.51</b>	<b>89.16</b>	<b>89.61</b>

17.70	16.06	16.08	15.53	15.54	15.32	15.07	15.02	14.97
4.35	5.54	5.63	5.68	5.55	5.52	5.53	5.55	5.56
3.34	3.30	3.38	3.47	3.33	3.04	2.78	2.58	2.36
0.34	0.30	0.21	0.17	0.13	0.12	0.11	0.11	0.12
<b>25.73</b>	<b>25.20</b>	<b>25.30</b>	<b>24.85</b>	<b>24.55</b>	<b>24.00</b>	<b>23.49</b>	<b>23.26</b>	<b>23.02</b>

5.77	6.17	6.04	5.93	5.78	5.60	5.46	5.37	5.24
1.58	1.79	1.89	2.15	2.44	2.52	2.60	2.67	2.75
2.63	2.74	3.00	3.01	3.03	3.05	3.07	3.13	3.14
<b>9.98</b>	<b>10.70</b>	<b>10.94</b>	<b>11.08</b>	<b>11.25</b>	<b>11.17</b>	<b>11.13</b>	<b>11.17</b>	<b>11.13</b>
<b>0.33</b>	<b>0.19</b>	<b>0.09</b>	<b>0.12</b>	<b>0.15</b>	<b>0.17</b>	<b>0.19</b>	<b>0.21</b>	<b>0.23</b>

36.14	36.48	37.04	37.29	37.42	37.52	37.59	37.54	37.43
25.87	25.56	25.86	26.81	26.65	26.69	26.74	26.77	26.82
18.31	18.35	18.18	17.17	17.63	17.99	18.38	18.59	18.68
8.10	8.24	8.57	8.78	8.98	9.15	9.25	9.25	9.29
2.65	2.70	2.76	2.83	2.83	2.83	2.83	2.83	2.84

2.80	2.79	2.88	3.01	3.14	3.25	3.38	3.53	3.65
2.05	2.09	2.12	2.12	2.15	2.17	2.19	2.22	2.25
0.33	0.34	0.32	0.33	0.32	0.32	0.31	0.31	0.33
<b>96.26</b>	<b>96.56</b>	<b>97.72</b>	<b>98.35</b>	<b>99.13</b>	<b>99.90</b>	<b>100.68</b>	<b>101.04</b>	<b>101.27</b>

96.81	97.00	95.91	97.00	99.08	101.20	103.36	105.57	107.83
87.81	88.30	88.21	91.33	96.08	98.70	101.26	103.57	105.83
3.25	3.12	3.12	3.57	3.70	3.96	4.05	4.13	4.26
43.03	43.80	45.68	48.69	48.85	48.89	48.84	49.26	49.73
2.13	2.18	2.27	2.39	2.41	2.42	2.43	2.45	2.48
2.56	2.62	2.64	2.71	2.72	2.73	2.74	2.77	2.80
9.2	9.2	9.2	9.3	9.4	9.4	9.4	9.4	9.4

100.20	101.81	102.21	104.99	108.87	112.99	117.23	121.73	126.50
90.88	92.68	94.00	98.85	105.57	110.20	114.85	119.43	124.15
3.36	3.28	3.32	3.86	4.06	4.42	4.59	4.77	5.00
44.54	45.98	48.68	52.71	53.68	54.59	55.40	56.81	58.33
2.20	2.29	2.41	2.59	2.65	2.70	2.75	2.83	2.91
2.65	2.75	2.81	2.94	2.99	3.05	3.10	3.19	3.29
9.5	9.7	9.8	10.1	10.3	10.5	10.7	10.8	11.0

ergy content of uranium

duction; and non-electric

mal sources; and  
s using renewable sources  
: energy data.

renewable fuels such as ethanol.

sed synthetic liquids. Petroleum  
fer to Table 17 for detailed

eat and coproducts used in the

s from average minemouth prices

ae-alongside-ship (f.a.s.) prices.

(Washington, DC, November 2012).

C, July 2011).

(Washington, DC, March 2012).

er 2012).

**2022      2023      2024      2025      2026      2027      2028      2029      2030**

**2022      2023      2024      2025      2026      2027      2028      2029      2030**

15.42    15.09    14.74    14.50    14.11    13.91    13.71    13.54    13.47  
4.17    4.21    4.22    4.20    4.08    4.01    3.94    3.89    3.85  
27.99    28.36    28.78    29.22    29.58    29.99    30.12    30.24    30.44  
22.17    22.46    22.48    22.54    22.73    22.78    22.83    22.97    23.25  
9.35    9.41    9.47    9.54    9.54    9.54    9.54    9.54    9.49  
2.84    2.84    2.85    2.86    2.86    2.86    2.86    2.86    2.87  
5.14    5.16    5.21    5.27    5.28    5.30    5.35    5.39    5.42  
2.26    2.28    2.29    2.32    2.35    2.39    2.43    2.47    2.50  
0.84    0.85    0.85    0.85    0.86    0.87    0.87    0.87    0.88  
**90.19    90.66    90.89    91.29    91.40    91.64    91.65    91.76    92.18**

15.16    15.25    15.43    15.57    15.94    16.02    16.13    16.26    16.33  
5.56    5.51    5.49    5.47    5.43    5.41    5.39    5.35    5.33  
2.31    2.32    2.35    2.36    2.39    2.43    2.50    2.56    2.63  
0.12    0.10    0.15    0.17    0.11    0.16    0.20    0.23    0.13  
**23.15    23.18    23.41    23.57    23.87    24.02    24.22    24.40    24.41**

5.19    5.13    5.10    5.14    5.17    5.18    5.19    5.21    5.25  
3.03    3.32    3.61    3.92    4.18    4.45    4.52    4.61    4.71  
3.16    3.17    3.15    3.18    3.21    3.29    3.35    3.41    3.51  
**11.39    11.62    11.86    12.25    12.56    12.92    13.06    13.24    13.47**

**0.24      0.25      0.26      0.27      0.28      0.29      0.30      0.30      0.30**

37.35    37.20    37.05    36.87    36.68    36.48    36.32    36.17    36.08  
26.93    27.00    27.15    27.28    27.41    27.58    27.70    27.79    27.95  
18.98    19.21    19.29    19.35    19.45    19.47    19.49    19.60    19.70  
9.35    9.41    9.47    9.54    9.54    9.54    9.54    9.54    9.49  
2.84    2.84    2.85    2.86    2.86    2.86    2.86    2.86    2.87



3.68	3.72	3.76	3.82	3.84	3.85	3.89	3.91	3.94
2.26	2.28	2.29	2.32	2.35	2.39	2.43	2.47	2.50
0.32	0.31	0.31	0.30	0.30	0.29	0.29	0.29	0.28
<b>101.72</b>	<b>101.97</b>	<b>102.18</b>	<b>102.34</b>	<b>102.43</b>	<b>102.46</b>	<b>102.51</b>	<b>102.62</b>	<b>102.81</b>

110.14	112.50	114.91	117.36	119.88	122.44	125.06	127.74	130.47
108.14	110.50	112.91	115.36	117.88	120.44	123.06	125.74	128.47
4.48	4.67	4.79	4.87	5.02	5.09	5.22	5.30	5.40
50.60	51.07	51.52	52.02	52.58	53.36	53.90	54.74	55.64
2.52	2.55	2.57	2.60	2.63	2.67	2.70	2.74	2.79
2.84	2.88	2.91	2.94	2.97	3.00	3.03	3.06	3.10
9.4	9.4	9.5	9.5	9.5	9.6	9.6	9.7	9.7

131.55	136.80	142.24	147.90	153.82	159.96	166.37	173.07	180.04
129.16	134.37	139.76	145.38	151.25	157.34	163.71	170.36	177.28
5.35	5.68	5.93	6.14	6.44	6.65	6.94	7.18	7.45
60.44	62.10	63.78	65.55	67.47	69.71	71.71	74.17	76.78
3.01	3.10	3.18	3.27	3.37	3.49	3.59	3.71	3.85
3.40	3.50	3.60	3.70	3.81	3.92	4.03	4.15	4.28
11.3	11.5	11.7	12.0	12.2	12.5	12.8	13.1	13.4



3.98	4.02	4.08	4.15	4.23	4.34	4.48	4.60	4.75
2.53	2.59	2.68	2.79	2.91	3.05	3.21	3.39	3.60
0.28	0.28	0.27	0.27	0.26	0.27	0.29	0.29	0.29
<b>103.05</b>	<b>103.29</b>	<b>103.57</b>	<b>103.97</b>	<b>104.41</b>	<b>104.89</b>	<b>105.44</b>	<b>106.12</b>	<b>106.85</b>

133.26	136.12	139.03	142.18	145.41	148.71	152.09	155.54	159.07
131.26	134.12	137.03	140.18	143.41	146.71	150.09	153.54	157.07
5.53	5.63	5.77	6.04	6.32	6.69	7.04	7.42	7.59
56.22	56.73	57.15	57.78	58.57	59.10	59.75	60.25	60.79
2.81	2.84	2.87	2.90	2.94	2.97	3.00	3.03	3.05
3.13	3.15	3.18	3.21	3.25	3.29	3.32	3.36	3.39
9.7	9.8	9.9	9.9	10.1	10.2	10.4	10.5	10.7

187.33	194.87	202.68	211.04	219.73	228.76	238.16	247.92	258.03
184.52	192.01	199.76	208.08	216.70	225.69	235.03	244.73	254.78
7.78	8.06	8.41	8.96	9.55	10.30	11.02	11.83	12.31
79.03	81.22	83.31	85.76	88.51	90.91	93.56	96.04	98.61
3.96	4.07	4.18	4.30	4.44	4.57	4.70	4.83	4.95
4.40	4.51	4.64	4.77	4.92	5.06	5.20	5.35	5.50
13.7	14.0	14.4	14.8	15.2	15.8	16.3	16.8	17.3

2040

2040	2011- 2040
13.12	0.3%
3.89	1.0%
33.87	1.3%
23.54	0.2%
9.44	0.5%
2.92	-0.3%
6.96	1.9%
3.84	3.1%
0.89	-1.0%
<b>98.46</b>	<b>0.8%</b>
16.89	-0.5%
4.82	-0.3%
2.01	-1.9%
0.84	2.4%
<b>24.55</b>	<b>-0.5%</b>
5.71	-0.2%
5.56	4.6%
3.79	1.1%
<b>15.06</b>	<b>1.3%</b>
<b>0.32</b>	<b>--</b>
36.07	-0.1%
29.83	0.6%
20.35	0.1%
9.44	0.5%
2.92	-0.3%

4.91	2.0%
3.84	3.1%
0.29	-0.6%
<b>107.64</b>	<b>0.3%</b>

162.68	1.3%
160.68	1.8%
7.83	2.4%
61.28	1.4%
3.08	1.4%
3.42	1.0%
10.8	0.3%

268.50	3.1%
265.20	3.6%
12.92	4.1%
101.14	3.1%
5.08	3.2%
5.65	2.8%
17.8	2.0%

## Year 2012 update

		\$million		MWh sales
Total op revenue		267.0		2,606,723
retail	55.9%	149.2	45.2%	1,178,239
wholesale	39.5%	105.5	51.3%	1,337,249
economy	3.4%	9.1	3.5%	91,235
	98.8%			

Source:

CEA 2012 Annual Report

[http://www.chugachelectric.com/system/files/annual\\_reports/2012\\_annual\\_report\\_1.pdf](http://www.chugachelectric.com/system/files/annual_reports/2012_annual_report_1.pdf)

## Original analysis using year 2011 data

CEA Annual Report

[http://www.chugachelectric.com/system/files/media-room/2011\\_annual\\_report\\_f](http://www.chugachelectric.com/system/files/media-room/2011_annual_report_f)

	<u>2011</u>
Operating revenues	\$283,618,369
Operating expenses:	
Fuel	139,179,413
Power production	16,853,232
Purchased power	25,861,814
Transmission	6,809,401
Distribution	13,387,477
Consumer accounts	5,465,315
Administrative, general and other charges	22,169,039
Depreciation	32,616,175
Total operating expenses	<u>262,341,866</u>
Interest expense:	
Long-term debt and other	18,681,680
Charged to construction	(1,934,703)
Interest expense, net	<u>16,746,977</u>
Net operating margins	4,529,526
Nonoperating margins:	
Interest income	297,983
Allowance for funds used during construction	159,916
Capital credits, patronage dividends and other	585,837
Total nonoperating margins	<u>1,043,736</u>
Assignable margins	<u>\$5,573,262</u>

See accompanying notes to financial statements.

## Assets

2011

### Utility plant:

Electric plant in service	\$862,362,243
Construction work in progress	206,005,783
Total utility plant	<u>1,068,368,026</u>
Less accumulated depreciation	<u>(470,282,210)</u>
Net utility plant	598,085,816

### Other property and investments, at cost:

Nonutility property	84,735
Special funds	420,783
Investments in associated organizations	11,134,496
Total other property and investments	<u>11,640,014</u>

Construction work in progress	206,005,783
Total utility plant	1,068,368,026
Less accumulated depreciation	(470,282,210)
Net utility plant	598,085,816
Other property and investments, at cost:	
Nonutility property	84,735
Special funds	420,783
Investments in associated organizations	11,134,496
Total other property and investments	11,640,014
Current assets:	
Cash and cash equivalents, including repurchase agreements of \$100 in 2011 and \$12,008,821 in 2010	17,118,118
Special deposits	149,701
Restricted cash equivalents	122,006,738
Fuel cost under-recovery	1,213,484
Accounts receivable, less provision for doubtful accounts of \$408,429 in 2011 and \$307,169 in 2010	42,373,995
Materials and supplies	32,994,454
Prepayments	1,911,789
Other current assets	229,858
Total current assets	217,998,137
Deferred charges, net	25,205,690
Total assets	\$852,929,657

## KILOWATT – HOURS

TOTAL: 2,704,411,682

Total MWh sales	2,704,412	16,853,232
retail	1,170,000	3
wholesale	1,300,000	8,113,235
economy	0.087043 235,400	8,739,997
		500
		17.48

\$ million		\$million	MWh sales	per kWh sold
Total op revenue		283.6	2,704,412	0.105
retail	53.4%	151.5	1,170,000	0.129
wholesale	38.4%	108.9	1,300,000	0.084
economy	7.2%	20.4	235,400	0.087
	99.0%			

Year 2011 detail (from original analysis, probably not used)

items:	depreciation	32.6
	interest	18.7

Production expense			
	Fuel	139.2	0.051
	Power production	16.9	0.006
	Purchased power	25.7	0.009
	depreciation on production plt	8.1	0.003
	Interest on production plant	4.7	0.002
	Total production (calc)	195	0.072

Nonproduction expense		
Trans. & Dist.	20.2	0.007
Admin, Genl, cust accts	27.6	0.010
depreciation on nonproductn	24.5	0.009
Interest on nonproduct'n plant	14.0	0.005
Total nonproduction	86	0.032
Total (calc)	475.4	0.104

Plant split:	\$million	
Production plant	215.35	25.0%
Transmission & Distn Plant	509.90	59.1%
General, unclassified, intangible, other	137.11	15.9%
Total electric plant in service	862.36	
CWIP	206.01	
Total electric plant	1,068.37	
less: accumulated depreciation	(470.28)	
Net plant	598.09	

See below for debt info:

**(11) Debt**

Long-term obligations at December 31 are as follows:

CoBank 3 and 4, 2.64% variable rate notes maturing in 2022, with interest payable monthly and principal due annually beginning in 2003

CoBank 5, 2.64% variable rate note maturing in 2012, with interest and principal payable monthly

2001 Series A Bond of 6.55%, maturing in 2011, with interest payable semi-annually March 15 and September 15

2002 Series A Bond of 6.20%, maturing in 2012, with interest payable semi-annually February 1 and August 1

2011 Series A Bond of 4.20%, maturing in 2031, with interest payable semi-annually March 15 and September 15 and principal due annually beginning in 2012

2011 Series A Bond of 4.75%, maturing in 2041, with interest payable semi-annually March 15 and September 15 and principal due annually beginning in 2012

Total long-term obligations



2001 Series A Bond of 6.55%, maturing in 2011, with interest payable semi-annually  
March 15 and September 15

2002 Series A Bond of 6.20%, maturing in 2012, with interest payable semi-annually  
February 1 and August 1

2011 Series A Bond of 4.20%, maturing in 2031, with interest payable semi-annually  
March 15 and September 15 and principal due annually beginning in 2012

2011 Series A Bond of 4.75%, maturing in 2041, with interest payable semi-annually  
March 15 and September 15 and principal due annually beginning in 2012

Total long-term obligations

Less current installments

Long-term obligations, excluding current installments

per kWh sold

0.102

0.127

0.079 0.048 additional RR for retail

0.099

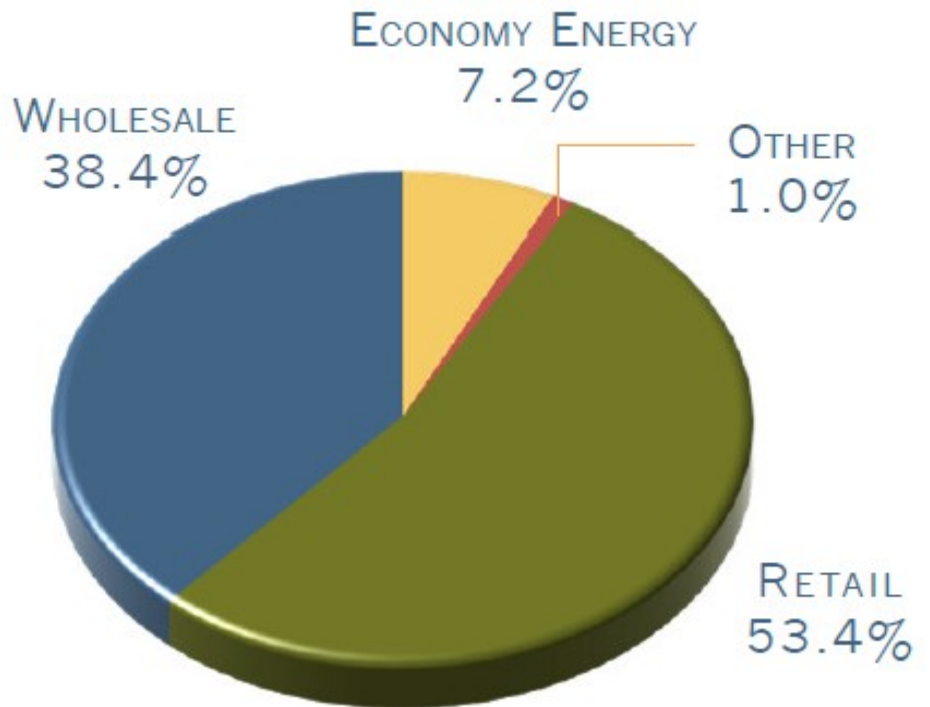
[or\\_website.pdf](#)

2011  
33,618,369

39,179,413  
16,853,232  
25,861,814  
6,809,401  
13,387,477  
5,465,315  
22,169,039  
32,616,175  
52,341,866

18,681,680  
1,934,703  
16,746,977  
4,529,526

297,983  
159,916  
585,837  
1,043,736  
\$5,573,262



2011

\$862,362,243  
206,005,783  
1,068,368,026  
(470,282,210)  
598,085,816

84,735  
420,783  
11,134,496  
11,640,014

206,005,783
1,068,368,026
(470,282,210)
598,085,816
84,735
420,783
11,134,496
11,640,014
17,118,118
149,701
122,006,738
1,213,484
42,373,995
32,994,454
1,911,789
229,858
217,998,137
25,205,690
\$852,929,657

total O&M  
assumed variable O&M per MWh  
variable O&M  
fixed O&M  
MW gas capacity

0.045 additional RR for retail

0.064

	<u>2011</u>	<u>2010</u>
Account payable	\$33,659,141	\$35,402,290
Principal payable	791,177	1,899,528
semi-annually	0	150,000,000
semi-annually	120,000,000	120,000,000
semi-annually	90,000,000	0
semi-annually	185,000,000	0
	<u>\$429,450,318</u>	<u>\$307,301,818</u>

ni-annually	0	150,000,000
ni-annually	120,000,000	120,000,000
ni-annually	90,000,000	0
ni-annually	185,000,000	0
	<u>\$429,450,318</u>	<u>\$307,301,818</u>
	<u>133,360,210</u>	<u>2,851,500</u>
	<u><u>\$296,090,108</u></u>	<u><u>\$304,450,318</u></u>

BY

OTHER  
1.0%



RETAIL  
53.4%

county_numeric	county_ANSI	county_name
	13 02013	Aleutians East Borough
	16 02016	Aleutians West Census Area
	180 02180	Nome Census Area
	60 02060	Bristol Bay Borough
	70 02070	Dillingham Census Area
	164 02164	Lake and Peninsula Borough
	261 02261	Valdez-Cordova Census Area
	150 02150	Kodiak Island Borough
	50 02050	Bethel Census Area
	270 02270	Wade Hampton Census Area
	185 02185	North Slope Borough
	188 02188	Northwest Arctic Borough
	20 02020	Anchorage Municipality
	68 02068	Denali Borough
	90 02090	Fairbanks North Star Borough
	122 02122	Kenai Peninsula Borough
	170 02170	Matanuska-Susitna Borough
	100 02100	Haines Borough
	105 02105	Hoonah-Angoon Census Area
	110 02110	Juneau City and Borough
	130 02130	Ketchikan Gateway Borough
	195 02195	Petersburg Census Area
	198 02198	Prince of Wales-Hyder Census Area
	220 02220	Sitka City and Borough
	230 02230	Skagway Municipality
	275 02275	Wrangell City and Borough
	282 02282	Yakutat City and Borough
	240 02240	Southeast Fairbanks Census Area
	290 02290	Yukon-Koyukuk Census Area

	census 100% count population April 2010	DOLWD population July 1, 2012	Census 2010 total housing units	Census 2010 occupied housing units
aea_energy_region	c_population	pop_2011	ch_total	ch_occupied
Aleutians	3,141	3,172	747	553
Aleutians	5,561	5,546	1,929	1,212
Bering Straits	9,492	9,730	4,008	2,815
Bristol Bay	997	1,035	969	423
Bristol Bay	4,847	4,947	2,427	1,563
Bristol Bay	1,631	1,693	1,502	553
Copper River/Chugach	9,636	9,783	6,102	3,966
Kodiak	13,592	13,870	5,303	4,630
Lower Yukon-Kuskokwim	17,013	17,548	5,919	4,651
Lower Yukon-Kuskokwim	7,459	7,672	2,183	1,745
North Slope	9,430	9,584	2,500	2,029
Northwest Arctic	7,523	7,651	2,707	1,919
Railbelt	291,826	296,197	113,032	107,332
Railbelt	1,826	1,820	1,771	806
Railbelt	97,581	97,615	41,783	36,441
Railbelt	55,400	56,369	30,578	22,161
Railbelt	88,995	91,697	41,329	31,824
Southeast	2,508	2,620	1,631	1,149
Southeast	2,150	2,148	1,771	913
Southeast	31,275	32,290	13,055	12,187
Southeast	13,477	13,686	6,166	5,305
Southeast	3,815	3,951	1,994	1,599
Southeast	5,559	5,814	2,992	2,194
Southeast	8,881	8,985	4,102	3,545
Southeast	968	965	636	436
Southeast	2,369	2,411	1,428	1,053
Southeast	662	656	450	270
Yukon-Koyukuk/Upper Tanana	7,029	7,080	3,915	2,567
Yukon-Koyukuk/Upper Tanana	5,588	5,655	4,038	2,217
Aleutians	8,702	8,718		
Bering Straits	9,492	9,730		
Bristol Bay	7,475	7,675		
Copper River/Chugach	9,636	9,783		
Kodiak	13,592	13,870		
Lower Yukon-Kuskokwim	24,472	25,220		
North Slope	9,430	9,584		
Northwest Arctic	7,523	7,651		
Railbelt	535,628	543,698		



Southeast	71,664	73,526
Yukon-Koyukuk/Upper Tanana	12,617	12,735
	710,231	722,190

Census  
2010  
vacant  
housing  
units

ch_vacant	climate_zoEUS_regicd_rural	
194	7 rural	1
717	7 rural	1
1,193	8 rural	1
546	7 rural	1
864	7 rural	1
949	7 rural	1
2,136	6 southeast	0
673	7 southeast	0
1,268	8 rural	1
438	8 rural	1
471	9 rural	1
788	8 rural	1
5,700	7 railbelt	0
965	8 railbelt	0
5,342	8 railbelt	0
8,417	7 railbelt	0
9,505	7 railbelt	0
482	7 southeast	0
858	6 southeast	0
868	6 southeast	0
861	6 southeast	0
395	6 southeast	0
798	6 southeast	0
557	6 southeast	0
200	6 southeast	0
375	6 southeast	0
180	6 southeast	0
1,348	8 railbelt	0
1,821	8 rural	1

	ACPI-U	
APF annual returns	1980	85.5
9.1% over 27.5 yrs	1981	92.4
6.0% over 10 yrs	1982	97.4
AKPF 2011 Annual Report	1983	99.2
	1984	103.3 estimated
	1985	105.8    101.3
	1986	107.8
	1987	108.2 estimated
	1988	108.6    201.4
	1989	111.7
227,500,000	1990	118.6    0.025323
418.43082005084	1991	124.0
	1992	128.2
	1993	132.2
	1994	135.0
	1995	138.9
	1996	142.7
	1997	144.8
	1998	146.9
	1999	148.4
	2000	150.9
	2001	155.2
	2002	158.2
	2003	162.5
	2004	166.7
	2005	171.8
	2006	177.3
	2007	181.2
	2008	189.5
	2009	191.7
	2010	195.1
	2011	201.4

CPI on 1/1/84

CPI on 7/1/11

average annualized inflation