Calculating energy fees and their effects for an example family

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Purpose of this document

This document contains the calculations that were used to determine the effects of energy fees on a typical family. It is meant to be a supporting document for http://FairPriceEnergy.com. All of the statistics and figures that I used were taken from the Energy Information Administration (part of the Department of Energy). The documents that I used were:

1. Electric Power Annual 2004. Pages 13 and 14 contain information on the total electricity used and how much of each fuel was used to generate it.
2. Petroleum Prices, Sales Volumes & Stocks by State . Contains information about petroleum consumption and sales. Available from http://tonto.eia.doe.gov/dnav/pet/pet_sum_mkt_dcu_nus_m.htm.
3. Natural gas summary. Contains information about natural gas consumption and sales. Available from: http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm

Step 1: Relative carbon fee sizes

Carbon Fee

The carbon tax for a given fuel should be proportional to the amount CO_2 that it would add to the atmosphere. Thus, if a gallon of petroleum generates twice as much CO_2, it should have double the tax.

In the following calculations, I chose to use gallons for petrol, therms for natural gas, and tons for coal. I chose gallons and therms because they are familiar to consumers. Tons were chosen for coal because that is the unit used by the Energy Information Administration (EIA.gov).

EIA.gov provides us with two pieces of information that allow us to calculate the relative amounts of CO_2 that are emitted for coal, petroleum and natural gas. These are shown in Table 1 below. The first piece of information is the CO_2 generated per unit of energy obtained and the second is the amount of fuel necessary to generate a particular amount of energy. These values are shown in the table below. The relative CO_2/energy number tells you how carbon intensive the different fuels are. If we use coal to generate 1 megawatt-hour (MWhr) of energy, we would emit 1 unit of CO_2. However, if we use natural gas to create that same MWhr, we would only emit 0.55 units of CO_2. We see that natural gas is the cleanest fuel, while coal is the dirtiest. The second piece of information is the amount of each fuel that is needed to generate 1 MWhr. We can dived the first number by the second to find the relative amounts of CO_2 generated from a ton of coal, a gallon of petrol, and a therm of natural gas.

The final column of the table shows the relative carbon fee values for the different fossil fuels. With a little multiplication, we see that if petroleum were taxed at $1/gallon, the taxes for coal and NG would be $218.66/ton and $0.60/therm.

Fuel	Relative CO2/energy	Fuel amount per MWhr	Relative Fee
Coal	1	0.5 ton	2
Petroleum	0.75	82 gallons	0.00915
Natural Gas	0.55	100 therms	0.0055

Table 1: Calculating the relative fees for coal, petroleum, and natural gas

Step 2: Choosing the carbon fees and security fees

As stated in my plan, I believe that the sizes of the security and carbon fees would need to be based on estimates of the true cost to our society of those fuels. As a starting point, I feel that a security fee of $0.75 for petroleum and a carbon fee of $0.75 for petroleum are reasonable. From the results of step 1, this allows us to calculate the appropriately sized fees for natural gas and coal. Additionally, I have set the security fee for electricity generated from nuclear power plants at $0.05 per kWhr, to account for the difficulty of keeping nuclear materials out of dangerous hands.

Step 3: Calculating the total fees collected

From the Energy Information Administration, we can find the total amounts of coal, natural gas, and petroleum consumed in the United States during recent years. With the fee amounts in Step 2, we can calculate the total fees that are collected, assuming that future consumption will be similar. Of course, we hope that consumption of dirty and dangerous fuels will actually due to measures taken in order to avoid paying fees.

If we assume that the $633 billion that is collected in fees is distributed among 160 million taxpayers, then each taxpayer would receive a refund of nearly $4000. A family with two adults would receive $8000.

Fuel	Consumed	Fee size	Total collected
Petroleum	2.2×10^{11} gallons	$1.50	$330 billion
Natural Gas	2.2×10^{11} therms	$0.45	$99 billion
Coal	10^{9} tons	$164.25	$164 billion
Nuclear	8×10^{11} kWhr	$0.05	$40 billion
Total Fees collected			**$633 billion**

Table 2. Calculating the total fees collected

Step 4: The cost of electricity

The fees on electricity would depend upon how the electricity was generated. In Table 3, I have used the data and results of Tables 1 and 2 to calculate the cost of electricity (per MWhr), for a particular fuel mix (second column of Table 2). Simply, I calculated the amount of fuel required to generate the electricity, and its corresponding fee. Clearly, consumers and businesses would have an incentive to move to cleaner sources or to petition their electric company to. The result is that a fee of $70.86 would be charged for each MWhr, or ~$0.07 per kWhr.

Fuel	% of electricity from this fuel	Fuel amount per MWhr	Fuel required	Fee
Coal	50	0.5 tons	0.25 tons	$41.06
Natural Gas	30	100 therms	30 therms	$13.50
Petroleum	10	82 gallons	8.2 gallons	$12.30
Nuclear	8	1000 kWhr	80 kWhr	$4
Renewable	2	1000 kWhr	20 kWhr	none
Total cost per MWhr				**$70.86**

Table 3. The cost of electricity for a given fuel mix

Step 5: Costs for a typical family

Families would be affected by energy fees in two ways. First, they would pay fees directly when they purchase gasoline for their vehicles, natural gas to heat their homes, and electricity. These costs are fairly easy to estimate for a typical family. Second, they would notice an increase in price of other items because businesses would pass on their energy fees to consumers. The effect of these price increases on a particular family would be more difficult to calculate and would be very sensitive to the lifestyle that they led.

In Table 4 below, I calculated the direct fees for a "typical" family with two drivers and two taxpayers. The total fees paid comes to $2640, much less than the $8000 received in their fee return. The remaining funds would be partially need to pay for increases in the cost for products and services that they use.

Item	Assumptions	Cost
Automobile transportation	25,000 miles driven at 22 mpg (~1140 gallons)	$1704 in fees
Electricity bill	600 kWhr per month	$504 in fees
Heating bill	80 therms per month	$432 in fees
	Total family cost	**$2640**

Table 4. Energy fees for a typical family