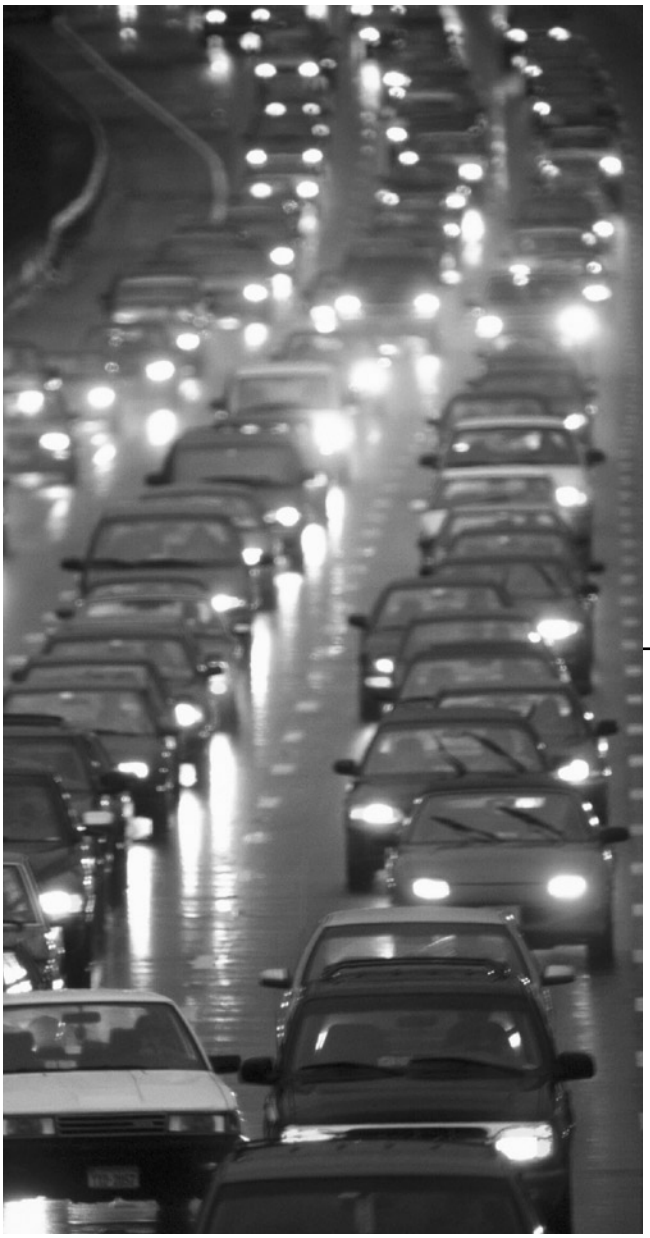

Creating Jobs, Saving Energy and Protecting the Environment

An Analysis of the Potential Benefits of Investing in Efficient Cars and Trucks

Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

Creating Jobs, Saving Energy and Protecting the Environment

An Analysis of the Potential Benefits of Investing in Efficient Cars and Trucks

The economic growth of our nation is tied to technology. From the steam engine and the automobile to the microchip and the Internet, a "can do" attitude of aggressive technology development and implementation has created millions of jobs and enormous wealth. Investments in technology to make cars and trucks more fuel-efficient provide the country with yet another opportunity to continue this trend.

Many technologies already exist, such as efficient engines and transmissions, high-strength steel and aluminum, better tires, and hybrid-electric powertrains. The investments required to deliver these more efficient products to consumers will pay off in the form of new jobs for the U.S. automotive sector and other industries throughout the country. In addition, consumers will save billions of dollars on gasoline, U.S. dependence on oil will be reduced, and emissions of global warming pollution will be cut significantly.

In order to quantify these benefits, the Union of Concerned Scientists estimated the effect of moving existing technologies into cars and trucks over the next 10 years to reach an average of 40 miles per gallon (mpg) by 2015. We found that:

- In 2015, the benefits resulting from investments in fuel economy would lead to 161,000 more jobs throughout the country, with California, Michigan, New York, Florida, Ohio, and Illinois topping the list.
- In the automotive sector, projected jobs would grow by 40,800 in 2015.
- For consumers, the cost of the new technology would more than pay for itself, saving a net $23 billion dollars in 2015 alone.
- In 2015, we would cut our national oil use by 2.3 million barrels per day—nearly as much as we currently import from the Persian Gulf [1]—and we would reduce emissions of global warming pollution from cars and trucks by 106 million metric tons of carbon.

1 During the first four months of 2004 we imported nearly 2.7 million barrels per day from the Persian Gulf according to the Energy Information Administration. (*www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/petroleum_supply_monthly/current/pdf/stable3.pdf*)

FUEL ECONOMY AND JOB CREATION

Investments in technology to make cars and trucks more efficient will create jobs in two ways:

Consumer Investments and Respending. Cars and trucks that go farther on a gallon of gasoline will save consumers money. Less money spent at the gas pump means more money available to spend on goods and services in other sectors of the economy. Some of that shift in spending would go back to the automobile industry to pay for the fuel economy improvement, creating jobs in the motor vehicle sector. The remainder benefits a variety of industries, creating jobs in manufacturing, agriculture, construction, and the service industry, among others.

Automotive Industry Investments. To improve fuel economy, automobile manufacturers and their suppliers would invest in new tooling and machinery, putting the technology they have developed to work. These investments would create jobs throughout the auto and finance industries. Passing these costs on to consumers—whose gasoline savings would outstrip the small increase in vehicle price—would more than cover the costs of increasing the workforce. When combined with jobs from consumer respending, these investments would boost the motor vehicle industry by 40,800 new jobs in 2015.

Consider this example: A pickup truck with the same performance, comfort, and safety available today could reach 31 mpg with existing technology. This improved pickup would save its owner about $3,400 over the life of the vehicle, compared with a retail price increase of less than $1,000.[2] That leaves $2,400 to spend elsewhere in the economy. The $1,000 price increase goes back to the automotive industry to cover investment and labor, with room for increased profit. This represents a 4.3 percent price increase over five years, or about 0.9 percent per year—about the same as the historical price increase of an average vehicle from 1989 to 1999.[3]

NATIONAL SECTOR-BY-SECTOR JOBS ANALYSIS

Table 1 shows the jobs that would be created in various industries by using technology to make more efficient vehicles that raise fuel economy to 40 mpg by 2015. The motor vehicle industry, for example, could add 40,800 jobs beyond current Bureau of Labor Statistics and Bureau of Economic Analysis projections. The national economy as a whole would gain 161,000 jobs. Only the oil industry and those industries tied to it (such as wholesale trade) would likely have fewer jobs than projected. But these jobs would not be lost; they would simply shift to other parts of the economy.

Table 1 **Increase in Jobs (by Industry) from Using Technology to Reach 40 mpg by 2015**

Industry	Net Increase in Jobs
Agriculture	6,200
Construction	11,200
Finance, Insurance, Real Estate	33,100
Government and Education	4,700
Manufacturing (excluding Motor Vehicles)	22,900
Mineral/Resource Mining and Petroleum Refining	(29,000)
Motor Vehicles	40,800
Retail Trade	20,200
Services	57,000
Transportation, Communication, Utilities	7,500
Wholesale Trade	(13,600)
Total	**161,000**

STATE-BY-STATE JOBS ANALYSIS

Our estimates suggest that 49 states and the District of Columbia would see increases in jobs ranging from 100 to more than 20,000, as shown in Table 2. Wyoming would see no increase in jobs in 2015, but this would change in the years to come, with an increase of 500 jobs by 2025.

2 An, F., D. Friedman, and M. Ross. 2002. *Fuel Economy Potential for Light-Duty Trucks*. Warrendale, PA: Society of Automotive Engineers 2002-01-1900. June.

3 Changes in vehicle price from S. Davis. *Transportation Energy Data Book*, Edition 21. Center for Transportation Analysis, Oak Ridge National Laboratory. September 2001, pp. 5–14.

In all states, job growth would be linked to consumers respending the savings they accrue from improved fuel economy. Moreover, some states could experience even greater job growth because they have a large share of the industries that see more job growth. Our results suggest that in 2015 California would show the largest growth with 20,500 jobs, followed by Michigan with 10,900 and New York with 9,100. Florida, Ohio, Illinois, Pennsylvania, and Texas would not be far behind, with 6,000 to 9,000 more jobs each in 2015.

Table 2 **Increase in Jobs (by State) from Using Technology to Reach 40 mpg by 2015**

State	Net Increase in Jobs	State	Net Increase in Jobs
AK	100	MT	400
AL	2,600	NC	5,200
AR	1,500	ND	300
AZ	2,800	NE	1,000
CA	20,500	NH	700
CO	2,200	NJ	4,400
CT	2,000	NM	600
DC	400	NV	1,100
DE	600	NY	9,100
FL	8,800	OH	8,400
GA	4,700	OK	500
HI	600	OR	2,000
IA	1,800	PA	6,600
ID	600	RI	500
IL	7,500	SC	2,400
IN	5,300	SD	500
KS	1,000	TN	4,100
KY	2,600	TX	6,400
LA	900	UT	1,300
MA	3,700	VA	4,400
MD	3,000	VT	400
ME	700	WA	3,400
MI	10,900	WI	3,500
MN	3,200	WV	600
MO	3,800	WY	0
MS	1,300		
		Total	**161,000**

NATIONAL ENERGY, CONSUMER, AND ENVIRONMENTAL BENEFITS

Table 3 shows the energy, economic, and environmental impacts of cars and trucks used in the United States today. Currently, the United States imports more than 50 percent of its oil. To purchase that oil, we send more than $200,000 every minute to other countries. Our dependence on oil imports will continue to grow, reaching nearly 65 percent by 2015, with the largest growth in oil demand coming from our cars and trucks.

The direct economic impact on consumers is significant. Consumers spent nearly $190 billion on gasoline in 2000 (and a lot more at today's high gas prices), and that spending is expected to grow 50 percent by 2015. Finally, our cars and trucks result in more emissions of the heat-trapping gases that cause global warming than most countries produce from their transportation, residential, commercial, and industrial sectors combined. This amounted to nearly 360 million metric tons of carbon-equivalent emissions in 2000, and these emissions are also expected to grow 50 percent by 2015.

Table 3 **Economic, Oil Dependence, and Environmental Indicators of U.S. Passenger Vehicle Travel**

	2000	2015
Gasoline		
Annual Fuel Use (billions of gallons)	121	182
Annual Fuel Costs (billions)	$186	$255
Oil and Other Petroleum Products		
National Oil Demand (millions of barrels per day)	20	25
Oil Imports (% of demand)	53%	64%
Passenger Vehicle Share of Oil Use	39%	47%
Global Warming Pollution		
Annual Global Warming Pollution (millions of metric tons of carbon equivalents, or MMTCE)	358	540

However, a different picture of the future emerges if investments are made in technology to make cars and trucks more fuel-efficient. If investments were made to reach a fuel economy of 40 mpg by 2015 (Table 4), consumers would cut their 2015 gasoline bills by 36 billion gallons per year, saving $50 billion at the gas pump. Of course this

new technology will cost more, but after paying for the vehicle technology, net consumer savings would still amount to $23 billion in 2015. Furthermore, we would reduce our oil dependence by 2.3 million barrels per day and cut emissions of global warming pollutants by 106 million metric tons per year.

STATE-BY-STATE ENERGY, CONSUMER, AND ENVIRONMENTAL BENEFITS

Table 5 shows that the benefits of putting technology to work to make more efficient vehicles will reach every state. California leads the pack with the largest consumer and oil savings. However, due to their heavy fuel demand,

Table 4 **Oil Savings, Consumer and Environmental Benefits from Using Technology to Reach 40 mpg by 2015**

Gasoline	
Annual Fuel Savings (billions of gallons)	36
Annual Fuel Cost Savings (billions)	$50
Net Savings (billions)	$23
Oil and Other Petroleum Products	
National Oil Savings (millions of barrels per day)	2.3
Global Warming Pollution	
Annual Global Warming Pollution Reduction (millions of metric tons of carbon equivalents, or MMTCE)	106

Table 5 **Oil and Consumer Savings (by State) from Using Technology to Reach 40 mpg by 2015**

State	Fraction of National Gasoline Use	Oil Savings (thousands of barrels per day)	Annual Net Consumer Savings (millions of 2001$)	State	Fraction of National Gasoline Use	Oil Savings (thousands of barrels per day)	Annual Net Consumer Savings (millions of 2001$)
AK	0.2%	4	45	MT	0.4%	8	84
AL	1.9%	43	428	NC	3.2%	74	730
AR	1.1%	25	247	ND	0.3%	6	61
AZ	1.8%	43	423	NE	0.6%	15	148
CA	11.1%	259	2,573	NH	0.5%	12	119
CO	1.5%	36	353	NJ	3.1%	72	713
CT	1.1%	26	256	NM	0.7%	16	158
DC	0.1%	3	30	NV	0.7%	17	166
DE	0.3%	7	67	NY	4.3%	100	995
FL	5.8%	135	1,336	OH	3.9%	91	907
GA	3.6%	84	830	OK	1.4%	32	314
HI	0.3%	7	69	OR	1.2%	27	269
IA	2.4%	56	553	PA	3.8%	89	885
ID	0.5%	11	114	RI	0.3%	7	71
IL	3.9%	90	897	SC	1.7%	40	398
IO	1.2%	27	268	SD	0.3%	8	75
KS	1.0%	24	235	TN	2.2%	52	516
KY	1.6%	37	363	TX	8.1%	188	1,866
LA	1.7%	39	391	UT	0.8%	18	178
MA	2.1%	49	487	VA	2.8%	65	642
MD	1.9%	43	429	VT	0.3%	6	63
ME	0.5%	12	123	WA	2.0%	47	470
MI	3.8%	89	883	WI	1.9%	44	433
MN	2.0%	46	454	WV	0.6%	15	145
MO	2.4%	55	549	WY	0.2%	6	57
MS	1.2%	28	275				
				Total	**100%**	**2,331**	**23,139**

Table 6 **Environmental Benefits (by State) from Using Technology to Reach 40 mpg by 2015**

State	Fraction of National Gasoline Use	Annual Global Warming Pollution Reduction (millions of metric tons of carbon equivalents)	State	Fraction of National Gasoline Use	Annual Global Warming Pollution Reduction (millions of metric tons of carbon equivalents)
AK	0.2%	0.2	MT	0.4%	0.4
AL	1.9%	2.0	NC	3.2%	3.3
AR	1.1%	1.1	ND	0.3%	0.3
AZ	1.8%	1.9	NE	0.6%	0.7
CA	11.1%	11.8	NH	0.5%	0.5
CO	1.5%	1.6	NJ	3.1%	3.3
CT	1.1%	1.2	NM	0.7%	0.7
DC	0.1%	0.1	NV	0.7%	0.8
DE	0.3%	0.3	NY	4.3%	4.6
FL	5.8%	6.1	OH	3.9%	4.2
GA	3.6%	3.8	OK	1.4%	1.4
HI	0.3%	0.3	OR	1.2%	1.2
IA	2.4%	2.5	PA	3.8%	4.1
ID	0.5%	0.5	RI	0.3%	0.3
IL	3.9%	4.1	SC	1.7%	1.8
IO	1.2%	1.2	SD	0.3%	0.3
KS	1.0%	1.1	TN	2.2%	2.4
KY	1.6%	1.7	TX	8.1%	8.5
LA	1.7%	1.8	UT	0.8%	0.8
MA	2.1%	2.2	VA	2.8%	2.9
MD	1.9%	2.0	VT	0.3%	0.3
ME	0.5%	0.6	WA	2.0%	2.2
MI	3.8%	4.0	WI	1.9%	2.0
MN	2.0%	2.1	WV	0.6%	0.7
MO	2.4%	2.5	WY	0.2%	0.3
MS	1.2%	1.3			
			Total	**100%**	**106**

Texas and Florida save enough on fuel to jump up to second and third, with New York close behind. The picture is quite similar for reductions in global warming pollution, with each state playing a significant role in reducing the overall impact on the climate (Table 6).

ANALYSIS METHODOLOGY

To estimate the potential impact on employment resulting from investments in fuel economy technology, we used industry-specific data derived from a macroeconomic impact analysis tool, IMPLAN (Impact Analysis for PLANning).[4] This model incorporates interactions among 528 industrial sectors using 21 economic variables to trace supply linkages and evaluate how changes in spending affect employment, wages, and the national gross domestic product.

To estimate the costs and savings from increasing fuel economy to 40 mpg by 2015, we used a modified version of the LEAP vehicle stock model from Tellus and our own cost/performance analyses.[5] The energy use analysis includes the following key assumptions: a mileage rebound of 10 percent; a vehicle price elasticity of one based on annualized vehicle cost over a five-year, five percent loan and fuel savings during the first five years; an average gasoline price of about $1.45 per gallon;[6] an average 15-year, 170,000-mile vehicle lifetime at today's 24 mpg; a discount factor of about 0.8 to convert federal test fuel economy values to real-world values;[7] and combined vehicle and upstream emissions of 10.9 kg/gallon of gasoline (24 pounds per gallon of gasoline).[8]

With these costs and savings and the industry-specific data from IMPLAN, we analyzed both the direct and indirect investments generated by technology improvements, as well as the respending of fuel cost savings. The analysis provided a national industry-by-industry breakdown of job impacts for the years 2015, 2020, and 2025. We

4 Initially developed by the U.S. Department of Agriculture. Data available from Minnesota IMPLAN Group (*http://www.mig-inc.com*).

5 Friedman, D., J. Mark, P. Monahan, C. Nash, and C. Ditlow. 2001. *Drilling in Detroit: Tapping Automaker Ingenuity to Build Safe and Efficient Automobiles*. Union of Concerned Scientists. Friedman, D. 2003. *A New Road: The Technology and Potential of Hybrid Vehicles.* Union of Concerned Scientists.

6 Based on the 2003 Annual Energy Outlook from the U.S. Energy Information Administration.

7 Ibid.

8 Based on data from Argonne National Laboratory's GREET model version 1.6 beta. (*http://www.transportation.anl.gov/greet*)

allocated the national impacts among the states using gasoline consumption data and prices in each state, along with state employment projections for each industry from the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA).[9] All job projections are evaluated as changes above and below the BLS and BEA values as a baseline. State-by-state energy and global warming pollution savings were apportioned based on 2000 annual state gasoline use from the Energy Information Administration.[10]

Both industry-specific and state-by-state analysis results represent estimates of the magnitude of employment impacts based on historical relationships. These estimates are subject to changing economic conditions, but indicate the strong positive directional effects of improving fuel economy.

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9 Data sources: U.S. Department of Labor, Bureau of Labor Statistics. 2001. *Employment and Output by Industry, 1990, 2000, and Projected 2010*. U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Regional Economic Analysis Division. 1995. *BEA Regional Projections to 2045: States*. U.S. Department of Energy, Energy Information Administration. May 2001. *State Energy Data Report 1999*. U.S. Department of Energy, Energy Information Administration. November 2001. *State Energy Price and Expenditure Report 1999*.

10 *http://www.eia.doe.gov/emeu/states/sep_sum/html/sum_btu_tra.html*

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