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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Wednesday, June 8, 1994

The Commission met in open session, pursuant to notice, at 10:00 a.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
FORREST J. REMICK, Commissioner
E. GAIL de PLANQUE, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

WILLIAM C. PARLER, General Counsel

JOHN HOYLE, Acting Secretary

DR. JAY E. HAKES, Administrator, EIA

MARY J. HUTZLER, Director, Office of Integrated Analysis and Forecasting, EIA

SCOTT B. SITZER, Director, Energy Supply and Conversion Division, EIA

ROBERT T. EYNON, Chief, Nuclear and Electricity Analysis Branch, EIA

J. ALAN BEAMON, Team Leader, Electric Utility and Non-Utility Analysis, EIA

JAMES HEWITT, Economist, Nuclear and Financial Analysis

P-R-O-C-E-E-D-I-N-G-S

10:00 a.m.

CHAIRMAN SELIN: Good morning, ladies and gentlemen.

We're pleased to welcome the representatives of the Energy Information Administration to brief the Commission on the EIA forecast of electricity supply and demand through the year 2010. Mr. Hakes, the Administrator, Ms. Hutzler, the Director of Integrated Analysis and Forecasting and Mr. Eynon, the Chief of the Nuclear and Electricity Analysis Branch will give the presentations.

The EIA develops and publishes assessments of the long-term outlook for international energy markets. These assessments are used by decision makers and energy analysts in the public and private sectors. They provide a valuable service. We at the Commission follow these really quite closely.

We're pleased to have you here today. We also noticed that your forecasts are for a lower rate of energy growth than any across the board and I'm sure along the way you'll explain this. Usually you try to find somebody on the left and somebody on the right for some shelter, but I guess we commend you on

your intellectual courage for just saying what you think.

Copies of the viewgraphs are available at the entrances to the room.

Commissioners?

COMMISSIONER REMICK: Nothing.

CHAIRMAN SELIN: Mr. Hakes?

DOCTOR HAKES: Thank you, Mr. Chairman.

The projections that we're presenting today are based on the National Energy Modeling System, which is a new system that we've brought on-line this year and has been developed in the last few years with some advice from the National Research Council. This is a model that provides a 20 year time horizon. It provides an integrated supply and demand and conversion system and it does provide for regional representation. It's a powerful model in that it has many powerful levers that allow us to do "what if" scenarios and it also, of course, features the major drivers like the growth in the economy and oil prices.

We have to add the usual caveats that come with these kinds of models. They do not predict the future in certain important respects. We, for instance, freeze policy as of October 1, 1993. It's likely that we will continue to see policy changes

that will impact these numbers, but we cannot anticipate those in this kind of model.

(Slide) If I could have the second slide.

These are the issues that we thought you would be interested in today, the assumptions, the national electricity supply, regional electricity review and uncertainties. I have with me, as you suggested, Mary Hutzler and Bob Eynon to help in this briefing.

(Slide) If I could have chart number 3, we would start to get into the substance.

At the base of a lot of what we do is the world oil price. This is a difficult area, as you would know from previous forecasts over the years. But we basically show that in the year 2010 in real dollars, the price of a barrel of oil would be $28.00. We have a range there from a low case scenario to a high case of about $20.00 to $34.00. We show most of the increase in price coming after the turn of the century.

The reason we have provided price ranges is there's a lot of uncertainties here. We don't know how aggressive conservation will be. We don't know how vigorously OPEC will expand its capacity and we don't know for sure what kind of production might

occur outside of OPEC. So, all of these factors can move the numbers higher or they can push them lower.

CHAIRMAN SELIN: And Doctor Hakes, what's the role of the gas price? Is that a derived from the oil price or is that an independent projection?

DOCTOR HAKES: There's some relationship because they can't compete in certain ways, but in some ways they don't compete and it's not as close a relationship as we've shown in the past.

MS. HUTZLER: But it is derived independently. Obviously you have associated gas and non-associated gas. So, on the associated side, there is some dependencies there. But it is derived independently and we do look at additional capacity that needs to come on, so the delivered price forecast for gas includes those factors.

CHAIRMAN SELIN: And for each of the oil prices, do you look at an appropriate range of prices for natural gas?

MS. HUTZLER: There's a different price that's calculated for each of the different world oil prices and it's determined within the model based on the factors of how much demand you have for gas, how much new pipeline capacity you might need and how much gas you produce.

CHAIRMAN SELIN: So you don't posit a range of prices for natural gas. At each oil price there is, for each year, a price for natural gas in the model?

MS. HUTZLER: That's correct.

CHAIRMAN SELIN: I see. Okay.

DOCTOR HAKES: Yes. The two drivers that we do the ranges for are the economic growth and oil. Of course we can do scenarios on other factors.

(Slide) If I could have the next chart, please.

These are the economic growth assumptions that go into this analysis. As you can see, the growth rates are going down as we go on each decade. I think this is generally -- we work with the DRI model in developing these economic forecasts. They are not exactly the same as the DRI model because we do factor in influences from world oil prices. But these are pretty conventional assumptions and we do have the ranges of high and low growth.

(Slide) If I could have the next one.

This is another way basically of presenting the same information. You can see the numbers there. For the 1990s we show a reference growth rate of 2.1 percent. Obviously this year is

well above that. That would be for the forecast period from 1990 to 2010.

(Slide) Okay. If I could have the next slide.

Most of these charts are from our Annual Energy Outlook which we publish each year. I believe that this chart is not and I always like to warn when it's not a zero based graph. But this shows the relationship between the growth of the economy, the growth of primary energy, carbon emissions and population. I think it's quite helpful. Basically the difference between energy growth and economic growth would be energy efficiency and to some extent shifts in the industrial sector where we are perhaps doing less heavy manufacturing and more information technology.

CHAIRMAN SELIN: As I remember, if you had shown the growth in electricity, that would be between the energy line and the GDP line.

DOCTOR HAKES: Yes.

CHAIRMAN SELIN: In other words, a larger share of energy is electrified over time.

DOCTOR HAKES: Yes. And then the difference between carbon growth and primary energy growth would be nuclear and hydro and other non-carbon

emitting sources of energy. Population is just on there to give again sort of another frame of reference to compare against. You will see that we do not anticipate a stabilization of carbon emissions based on the factors that we're currently including. But as I say, the policy initiatives were frozen as of last October.

(Slide) The next slide breaks out the same factor, energy intensity, which was part of the previous slide and looks at the industrial sector where we're able to look at this in some depth. One of the striking features in recent energy history has been the improved intensity within the industrial sector and we do project that that continues to go down. This is the major explanation for why the lines diverge between energy consumption and economic growth.

COMMISSIONER REMICK: Could we go back -- excuse me -- that slide. I'm not sure, the thousand BTU per 1992 dollar, but for what purpose? Consumed in industry? There's something I'm missing there.

DOCTOR HAKES: Right. For dollar of output, how many BTUs did it take per dollar of output.

COMMISSIONER REMICK: Okay. For

industrial.

DOCTOR HAKES: Yes.

COMMISSIONER REMICK: Okay.

DOCTOR HAKES: Just parenthetically, one of the real issues now for the global warming analysis is what kind of intensities are going to be achieved in the developing nations that are achieving very rapid growth and we are coming out with some work on that in another couple weeks.

(Slide) The next slide on the relationship between electricity sales and economic growth rates is one that I think you might have some interest in as well as some questions. They show that even with relatively stable prices that electricity will not grow as fast as it has in the past. Back in the early '70s you have an electricity growth rate of over seven percent and well above the economic growth rate. Basically from the mid-'80s to the present you have a situation where the growth of the economy and the growth of electricity have run fairly parallel. What makes these lines start to diverge is things like the appliance efficiency standards under the Energy Policy Act of 1992 and previous legislation, growth and demand side management programs, and these are both having quite heavy impacts in the residential and

commercial sectors. Lighting is clearly a big factor in the commercial sector. In refrigerators, there is tremendous growth. In the next few years, the minimum required refrigerator will be 52 percent more efficient than the -- was it the average on the market or the best on the market? I don't have that exact number, but the efficiency gains in refrigerators are of the magnitude of 50 percent.

CHAIRMAN SELIN: That raises an interesting question. Normally when you look at price and volume you get a J curve that in the short-term demand for anything, whether it's electricity in kilowatt hours or cars or what have you is sort of independent of price. So, if you drop price, the demand doesn't go up as fast as the price drops. If it's exports and your currency is devalued, you just have fewer dollars. But in the long run, people use more of something as the price goes down. Now, maybe demand for refrigeration is sort of independent of kilowatt hours, but I would think in the commercial sector and maybe even in the residential sector as the efficiency and the price goes down in terms of kilowatt hours, people would electrify more than they would otherwise do you and you would see after a few years that the electricity growth would, in fact, pick

up again because a whole lot of things become efficient to do with electricity when you have these higher efficiencies that you would not normally do with electricity.

First, is that right? Second, insofar as it's right, does the model catch this or do you --

DOCTOR HAKES: That's a very good analytic point because if you look at what happened in the automobile sector as you had the efficiency of gains people drove more.

CHAIRMAN SELIN: Right. Okay. That's a simple way --

DOCTOR HAKES: Yes.

CHAIRMAN SELIN: Clear way of putting it.

DOCTOR HAKES: That's an important analytic question and one that we've looked at and tried to take into account. The home, of course, you'd have to replace natural gas to have a strong impact there.

CHAIRMAN SELIN: Well, you would have, I would think, a higher percentage and new homes would have electricity given these high standards than would otherwise. People make -- developers make decisions as to whether new homes will be electrified or use gas, or is that too small an effect to --

DOCTOR HAKES: The other side of the coin is there have been for a long period of time restraints on the use of natural gas for home heating, for instance. So, in the last survey we did, there was actually growth in natural gas.

MS. HUTZLER: In fact, we're not seeing that so much recently, that is switching heating fuels. For instance, in the Northeast we thought that oil would actually go down, also in the Mid-Atlantic States for heating. In fact, our most recent survey has shown that new homes are still being heated with oil in the Northeast and that in the Middle Atlantic Region that oil is still maintaining its share. So, we, in our recent date, have not seen the shift into electricity for heating fuel.

CHAIRMAN SELIN: Even though efficiency -- relative efficiencies of electricity compared to the direct burning of oil or gas is improving or has it not improved yet?

MS. HUTZLER: Is that improving? I don't think it is.

MR. BEAMON: Gas and oil furnaces are all so extremely efficient. I don't think that they're improving. The shift from your average gas or oil furnace right now to a new one is a big jump in

improvement and efficiency also.

CHAIRMAN SELIN: So, it's not just electrical efficiency that's improved. Having taken the wind out of my sail, I still want to ask you the methodological question, which is would your model catch this? In other words, would demand for electricity depend on efficiencies or is that just fixed?

MS. HUTZLER: It's not fixed. We do show efficiency improvements over time and, in fact, that's how we represent the golden carrot program for refrigerators and that sort of thing. But you do get saturation of refrigerators. People may have two refrigerators in their home, but they're not going to have ten just because it gets more efficient. Of course there are other uses for electricity, such as the whole PC area that we have going on.

CHAIRMAN SELIN: Yes, but they don't depend much on price either. I would think that new houses, commercial applications, industrial applications would be very sensitive to efficiency, that within a given house --

MR. BEAMON: In markets where there are dual fuel competition, heating and air conditioning especially, there are electric and gas represented and

the relative prices of them are compared in the model and it makes those choices.

CHAIRMAN SELIN: Yes. And you're saying in such markets it's not just electricity that's improving in efficiency but all fuels?

MR. BEAMON: All fuels.

COMMISSIONER REMICK: I was a little surprised by the spread you predict also because of the continuing increase in recent years toward greater electrification in industrial applications. Now, you show that the increase in efficiency is apparently going to overcome that, but what indications have we that that's the case? Are you predicting less conversion to electrical use in industrial applications and is it certainly in evidence? In other words, electricity growth and TDP --

MR. BEAMON: I think later that Mary is going to talk about it. But amongst the end use sectors, industrial is growing fairly close to GDP. In terms of electricity, we'd expect to continue to see electrification in the industrial sector. It's declines in the residential and commercial sectors that are bringing this gap across, not in the industrial sector.

MS. HUTZLER: And that's mainly due to the

Energy Policy Act and to the National Appliance Energy Conservation Act. Now, I think two years ago when we briefed you we had a growth rate for electricity about 1.9 percent, which is right under the GDP.

CHAIRMAN SELIN: Right.

MS. HUTZLER: And at that time I think we told you we were evaluating EPAct and that that rate would come down because of the standards and if you've got improved appliances out there that people need to purchase when they turn over their stock and we do have a stock turnover in the model. We don't assume that's going to happen right away. We do it based on what historically has happened. That we would see a smaller growth rate for electricity and I think in AEO '93 we had a 1.6 percent growth rate.

But what had happened at that time was we didn't put in efficiency improvements in future years beyond what we knew about --

CHAIRMAN SELIN: We saw a one step improvement and then a couple years ago you just had assumed efficiencies would stay constant. Here you certainly keep getting better and better.

MS. HUTZLER: Yes, because we didn't know exactly what the mandated efficiency standards would be in the legislation. They just say in future years,

for instance 1998, there would be improvements, and we needed to get more studies as to what those rates would be. I think Lawrence Livermore Laboratory came out with some rates and we've picked up on those. So, that's brought the electricity growth rate down further.

CHAIRMAN SELIN: Just a fairly minor question, but is there any evidence that stock turns over faster as efficiencies improve? I mean is there any correlation between how -- do people trade in their refrigerators faster if the efficiency is much higher?

MS. HUTZLER: I don't believe we've seen any of that.

Alan, do you know if --

MR. BEAMON: That's certainly what utilities are pushing for in some of their DSM programs that are aimed at retrofit market, not the new market. I mean they're going after them, picking up old refrigerators and getting them to trade them in. So, there's some of that happening.

MS. HUTZLER: But I don't think we've picked that up in the data yet because our consumption surveys go on every three years. So, we may be seeing more of that as we get more data in.

CHAIRMAN SELIN: This is really quite a spectacular change since two years ago, the divergence between the rate of electricity growth and GDP growth.

COMMISSIONER REMICK: Or a dramatic change from the situation today.

MS. HUTZLER: Yes.

DOCTOR HAKES: One other assumption that's built into this is we do have data reported to us by utilities on plans for demand side management programs and we project by the year 1997, I believe, that those expenditures will run about $4 billion. Those are the numbers that have been reported to us.

COMMISSIONER REMICK: That's an interesting subject too with the competitiveness in the utility industry. How willing are people going to be able to put those costs -- the ratepayers paying for those costs, how willing are they going to be to put those in when they're competing with other utilities who perhaps do not have to introduce those demand side management efforts which run the cost up to the customer?

DOCTOR HAKES: That's a dynamic element in this process. Of course once in which there will be probably some policy input.

CHAIRMAN SELIN: Commissioner Remick has

put it as a question, but I'll make it as affirmative statement. I think utilities are going to do a lot less than they say they're going to do in demand side management.

DOCTOR HAKES: That's why I wanted to point out that assumption.

MR. BEAMON: Your generating utilities might, but you might see the move go to your T&D utilities. They may become the efficiency people.

CHAIRMAN SELIN: The guys who will still keep monopolies.

MR. BEAMON: They'll still be regulated and still be -- and so it will move away from your generating companies.

COMMISSIONER ROGERS: There's quite a great deal of fine structure in these results out after the year 2000. Can you give any comments --

CHAIRMAN SELIN: The Republicans come back, you see.

COMMISSIONER ROGERS: I beg your pardon?

CHAIRMAN SELIN: The Republicans come back.

COMMISSIONER ROGERS: Can you remark on some of these bumps and jags in the curve? I mean the one that catches my eye particularly is at about 2009.

What happens there? Something dramatic must have happened or expected to happen. What is it? Do you know?

MS. HUTZLER: No, we don't know right now. We usually look at these in five year periods and only look at 2005 to 2010. So, we'll have to get back to you with that answer.

COMMISSIONER ROGERS: I mean something clearly is happening out there near the end there around 2009 that suddenly the GDP takes off and electricity is dropping.

DOCTOR HAKES: We're not assuming cold fusion.

CHAIRMAN SELIN: Your consistency checks really look at rolling averages though, don't they, as opposed to year to year?

DOCTOR HAKES: Yes. We do a short-term forecast that goes out about two years into the future where we try to fine tune historic events and things like that. A model of this sort takes a lot to change its direction.

COMMISSIONER ROGERS: That's why it's interesting.

DOCTOR HAKES: (Slide) I think the next chart will show, as well, some of the uncertainties in

this area and some of our thinking. I apologize for using a non-zero based chart because I think graphically it sort of over exaggerates a little bit. But let me walk through this.

The top line is what residential energy consumption would be if you froze 1991 technology. The next line below that reflects our reference case which is our principal projection and how much less residential energy consumption will be based on the factors that we have just been discussing, like the appliance efficiency standards. The bottom line is what would happen if people bought the most efficient appliances that were on the market. What we've done is used -- that's based on appliances that are already available with the exception of refrigerators where by law efficiency gains will have to be occurring during the period.

The difference between the top line and the second line in 2010 is about a ten percent reduction in residential energy consumption. The difference between the top line and the bottom line is about a 25 percent reduction. Now, this is not to say that there would be much likelihood that the bottom line could occur, but it's fairly conservative in its assumptions about technology and it does provide a way

in which demand side managements might interact with appliance efficiency laws to reduce from what we projected. Obviously our best guess is the projection at this point. But there's room both at the top side and the bottom side for movement from that projection.

CHAIRMAN SELIN: This best case assumes that stock is replaced at the same rate for all three curves, but it's replaced by better technology. So, there's an even better case which is that the utilities can get people to replace stuff that's still serviceable just because the operating cost would be low.

DOCTOR HAKES: Correct.

CHAIRMAN SELIN: And if you drew fuel shares, is there any difference in the mix between --

DOCTOR HAKES: (Slide) That's the next slide. We anticipated that that question might arise. One can see that the efficiency potentials exist really both for electricity and natural gas. A lot of the same work on the appliance side that goes on on the electric appliances occurs on gas appliances as well. These savings are cumulative over the whole period. They're not annual savings by any stretch. But it shows -- in this case the bottom line would be the frozen technology. The darkest bars would be

the -- what we're projecting and the red bar would be the best technology.

CHAIRMAN SELIN: So turn it around the other way. The electricity share would actually be larger than -- I mean the electricity share would be larger in the best case because there'd be even greater savings in gas than in electricity.

DOCTOR HAKES: There's more room at this point for efficiency gains.

CHAIRMAN SELIN: Yes. What does that mean?

DOCTOR HAKES: Pardon?

CHAIRMAN SELIN: Does that mean yes?

DOCTOR HAKES: Yes, more opportunities for gas.

CHAIRMAN SELIN: Oh, okay.

DOCTOR HAKES: (Slide) The next chart on prices, I think, relates to your previous question about the impact of prices because we are showing quite -- I think it's dramatic and sort of the stability of prices. Now, these are constant dollars. So, these would be increases above inflation. But over the forecast period, electricity would demonstrate the slowest rate of growth. Natural gas would be at the highest rate. Someone might argue,

"Well, you're burning these fuels to create electricity," but as you're aware the fuel cost is not the major cost in the production of electricity.

CHAIRMAN SELIN: I've got a lot of questions on this.

DOCTOR HAKES: Yes, I thought you might.

CHAIRMAN SELIN: First of all, the coal guys have just come up with a coal impartial study that shows that it's always going to be cheaper to use coal to generate electricity than to use gas. Are they assuming an even faster growth in natural gas prices than is here? Do you know what I'm talking about?

MS. HUTZLER: I haven't seen that study.

CHAIRMAN SELIN: It's a study that was reported in --

MR. BEAMON: I think it's coal productivity. They're assuming coal prices go down.

CHAIRMAN SELIN: I see. But they also looked at a range of natural gas prices that were pretty hefty increases from today. This 1.7 percent a year growth in natural gas, which is pretty hefty, would other people predict an even faster growth in natural gas prices? How do your projections of gas prices compare?

DOCTOR HAKES: The gas industry projects a lower growth.

CHAIRMAN SELIN: What about the other four or five one year reports compared to your overall results with four or five projections?

MS. HUTZLER: We're about in the range of other projections for gas prices.

CHAIRMAN SELIN: On gas prices?

MS. HUTZLER: Yes. But I'm not familiar with the coal study you're talking about, so I don't know how to compare that.

CHAIRMAN SELIN: Well, I only saw a report of it in the Energy Daily. I didn't actually see the study.

The second is -- I'm sure you have this later on, but the fuels that are used to produce electricity, do you have a curve later on for what share comes from gas as opposed to coal?

MS. HUTZLER: We show generation and capacity additions, but I don't --

CHAIRMAN SELIN: Is that very sensitive? Is that very sensitive to the relative price of the fuels? I mean gas price has got to be really an important consideration.

MS. HUTZLER: It is.

MR. BEAMON: It's important, but you've got an enormous embedded stock of coal. It's not going to get rid of that. So, you can't change the share very much when coal is already 50 some percent.

MS. HUTZLER: But we do bring a lot of new gas plants on.

CHAIRMAN SELIN: But if you look at the increments.

DOCTOR HAKES: Right. If you just look at the increments, it's very sensitive to totals.

CHAIRMAN SELIN: Okay. And the third is I guess it goes back to your assumptions. What have you assumed about competition in the electricity industry when you've looked at these prices in terms of wheeling, wholesale wheeling, retail wheeling, unlimited wheeling? What are the assumptions on the electricity market?

MS. HUTZLER: We do look at non-utility producers and estimate their cost and where it's economic we will have them being the marginal supplier of electricity. We do have some interregional power sales. But on wheeling itself, do we --

CHAIRMAN SELIN: I guess my real question is as long as you have a cost-based basis for electricity prices, they're going to go up pretty

fast. If you get real market competition for electricity, you would think that would --

MR. BEAMON: We're still at this point dealing with a cost-based system.

CHAIRMAN SELIN: So, if you did this over next year, it might be an even slower growth in electricity prices.

MR. BEAMON: It potentially would be slower depending on what you did with the transition cost.

CHAIRMAN SELIN: There are a whole lot of folks that are already starting to write off an electrical generator, starting to write off capital costs a lot faster than they were doing already, which presumably would lead to lower prices and more competitive prices.

MS. HUTZLER: That's true.

CHAIRMAN SELIN: So, you haven't assumed market -- I mean is this new kind of a more efficient electricity market having an impact on electricity prices yet?

MS. HUTZLER: Not in terms of the pricing algorithm.

CHAIRMAN SELIN: Well, therefore, going back to the economic argument, if electricity prices

actually feel in real terms, would your model show more electrical use or is it pretty inelastic?

MS. HUTZLER: It would show more, but I don't think it would be a lot additional. It would be some additional, mainly because of the slow stock turnover in the other industries and that kind of thing.

CHAIRMAN SELIN: Okay.

DOCTOR HAKES: (Slide) The next chart is on electricity sales. It repeats some of the information presented before, but it shows the variation that would be foreseen based on different rates of economic growth. In our high economic growth scenario we would show the rate being 1.5.

CHAIRMAN SELIN: That's the rate of growth of electricity?

DOCTOR HAKES: Yes.

CHAIRMAN SELIN: And what's the rate of growth of the economy in the high --

MS. HUTZLER: 2.4.

CHAIRMAN SELIN: And for the other two cases?

MS. HUTZLER: The economy is 2.1 for the reference case and 1.8 for the low.

CHAIRMAN SELIN: So, you have a fixed

ratio of electrical growth and economic growth or do they just scale up in proportion?

MS. HUTZLER: That's not how we represent it though.

CHAIRMAN SELIN: I mean it works out that way?

MS. HUTZLER: Yes. Right, exactly.

CHAIRMAN SELIN: Okay.

DOCTOR HAKES: Let's see. Do I have one more?

MS. HUTZLER: Yes.

DOCTOR HAKES: (Slide) Yes. The final chart in my part of the presentation --

CHAIRMAN SELIN: I'm sorry. What I said is wrong. Between a low and a high you have a 33 percent difference in the economic growth rate and you have a 50 percent difference in the electricity growth rate. So, electricity grows relatively faster in the high growth model than in a low growth model.

MR. BEAMON: In the industrial sector that's driving it.

CHAIRMAN SELIN: So, that basically supports the point Commissioner Remick made earlier. Okay.

DOCTOR HAKES: The last chart in my

section shows the various sector demands for electricity. Industrial in the year 2010 will be the largest sector with 38 percent. Residential will be 31 percent and commercial 30 percent. There's an additional factor here that while small may be of some analytic interest, we're showing 1.6 percent for the transportation sector.

CHAIRMAN SELIN: It's now electrical cars.

DOCTOR HAKES: Yes. And if you'd like, we can share with you assumptions about price and range and things like that in which this was based. We are actually showing when it comes to all alternative fuel cars that ten percent of the new cars sold in the year 2005 will be alternate fuel vehicles. That's based mainly on policy decisions that are already in the works or already in force. We have tried to break that down. Some people have suggested we shouldn't have tried to do that, but try to break it down into the different kinds of vehicles and the major alternate fuel vehicles would be natural gas and some form of electric.

CHAIRMAN SELIN: Do you have a curve someplace that shows baseload and peak capacity that goes with these consumptions? Do they go up just in tandem or is the ratio of average to peak improved as

you go to electrical vehicles and things like that that use presumably off-hour charging?

MR. BEAMON: We don't have a curve, but the curve flattens just slightly over time. The penetration is not big enough to move it too much.

CHAIRMAN SELIN: And what about the other -- I mean all these demand side managements. Is there an improvement in general in the electrical industry in terms of --

MR. BEAMON: It depends on who you talk to. Some of the curves apparently and recently have been actually getting steeper rather than flatter. But generally we'd expect some flattening. One, the growth in the industrial sector growing faster relative to other sectors is going to flatten the curve because it would tend to be more level curves there.

CHAIRMAN SELIN: And the second thing is I would assume that the three sectors have different elasticity to price, that residential would be pretty much fixed and industrial would be quite sensitive to price or is that not --

MR. BEAMON: True.

CHAIRMAN SELIN: So, someplace, although you don't have them here, you would have curves like

this for each of the three cases? You have three economic cases.

MS. HUTZLER: Are you talking about elasticity curves?

CHAIRMAN SELIN: Well, I'm talking about just the shares under the three different price assumptions. If you have those, could you send those over at some point?

COMMISSIONER REMICK: So your model is predicting in the residential area no net increase. In other words, the efficiency will about equal the growth and population, is that it?

MR. BEAMON: It's very close. Residential only grows, what, about .7 percent a year?

MS. HUTZLER: Yes. There's only about a quad increase.

DOCTOR HAKES: Okay. At this point, Mr. Chairman, I'd like to turn it over to Mary Hutzler.

MS. HUTZLER: (Slide) Next chart, please. The chart before, Dave. Okay. There we are.

We've already talked about our lower growth rate for electricity demand. However, even with that growth rate there is increases in electrification and we also have retirements of capacity. So, the utilities do need to meet an

increasing demand for electricity. There are a number of ways to do this. First, we can increase the utilization of existing plants. We can extend the lives of existing plants. We can import electricity from other countries. We can purchase power from non-utility generators and we can introduce demand side management programs. After all of that, of course we construct power plants and I'll talk to you about each of these in turn.

First of all, on the utilization of electric power plants, we all know that the utility industry over built in the 1970s and '80s because they perceived a higher growth rate for demand and in actuality it only achieved about half that amount. So, back in 1970, coal power plants, their utilization rate was around 69 percent. That came down to 53 percent in 1978 because of the over building and we have it going back up in the forecast and maintaining a rate of 68 percent by 2010.

In terms of the nuclear industry, the utilization rate has increased as the industry has developed and in late 1980s we're at a 57 percent capacity factor. Recently the power plant performance of nuclear plants has really achieved a high and we're at 72 percent in 1993 and we have it going to 74

percent in 2010.

CHAIRMAN SELIN: That's just an input. I mean -- or is there --

MS. HUTZLER: The max is an input. So, the 74 percent is an input, but where it achieves it is model determined.

In terms of combined cycle plants, you can see that in the mid-'80s we actually started that industry and the capacity factor, of course, was low. It got pretty high with a few plants that came on board. It's coming down currently because we have new plants entering in. So, the average comes down. But we have it reaching the nuclear power plant capacity factor in the 2000 range, exceeding 70 percent. You'll see --

CHAIRMAN SELIN: Would that be very price sensitive?

MS. HUTZLER: It is price sensitive and that's why it comes down in the year 2005. In that time period, we have coal power plants coming back. We have them being built because the gas price gets pretty high. In fact, whenever -- gas will hit price doubling from 1990 to 2010, which is $3.47.

CHAIRMAN SELIN: You have coal plants coming on or starting construction?

MS. HUTZLER: Being built and coming on, both, and you'll see that in a later graph.

CHAIRMAN SELIN: Okay.

COMMISSIONER ROGERS: Well, just on that, again there is this dramatic drop starting in 2005 of the combined cycle. I noticed in your Outlook '94 Report that there was a dramatic takeoff in wind energy in 2005.

MS. HUTZLER: Yes.

COMMISSIONER ROGERS: I have a question on what the basis of that is at sometime. But there seems to be an awful lot happening at 2005 in these models.

MS. HUTZLER: That's because of the gas price and the oil price getting up there at that point in time. In this modeling system we introduced a new methodology that allows wind to compete as a fuel saver. So, if building new power plants is cheaper than running existing power plants, which it does when the price gets high enough for oil and natural gas, we do allow wind to be built and that's what's happening in the post-2005 period for wind. And you'll see a chart later that shows the difference between the low oil price case and the high oil price case, what that phenomena does.

CHAIRMAN SELIN: You're very sensitive. A couple cents increase in coal and all of a sudden you get a major -- I mean gas or oil, you get a major shift to coal and wind.

MS. HUTZLER: The model is very sensitive to future prices of fossil fuels. We do a lifecycle costing methodology to determine what capacity should be built and we assume future prices will be an adaptive methodology of past history. If you change that, if you assume perfect foresight in that, it does change what your build pattern will be.

CHAIRMAN SELIN: You're in effect assuming that when people make construction decisions they know what the price of fuel will be when the stuff comes on-line.

MS. HUTZLER: Well, the model uses a number for it. We can assume different assumptions. But planners assume different numbers as well.

CHAIRMAN SELIN: This is really sort of haggling. I'm sorry about that. When you decide to build a plant, you're looking at a range of prices. The actual decision is made saying gas will be someplace between $2.25 and $2.75 a thousand cubic feet. People don't know what the price will be when the plant comes on. They only know what the price is

when they make the decision. That's too subtle for the model to catch?

MS. HUTZLER: Well, the model needs a point estimate essentially. But that's why we do a range. We do different world oil price scenarios and different macro scenarios.

CHAIRMAN SELIN: But in each of the scenarios you assume the planners know what the price will be when --

MS. HUTZLER: Yes.

MR. SITZER: Well, we assume that they will trend out from recent trends.

CHAIRMAN SELIN: What does that mean?

MR. SITZER: That over the most recent four or five or six year period, that those trends will continue into the future and that that's what the planners believe will happen.

MS. HUTZLER: Yes, but you can do that at different rates, of course.

(Slide) Next chart.

This one is on our life extension assumptions. What you see here is our life extension assumptions for coal and oil and gas. Essentially we're assuming 343 gigawatts of capacity will be life extended by the utility industry. The reason for that

is that utilities report to us what their future plans are and they have only reported to us that they're going to retire 14 gigawatts of capacity, which is not very much. We also assume that an additional 36 gigawatts of fossil fuel capacity will be retired. These are the smaller units. They're less than 100 megawatts.

CHAIRMAN SELIN: Non-utility or some utility and some not utility?

MS. HUTZLER: These are all utility.

CHAIRMAN SELIN: All utility? And on nuclear do you assume no life extension?

MS. HUTZLER: We assume no life extension.

CHAIRMAN SELIN: Forty years.

MS. HUTZLER: And then it's 40 years, right?

MR. BEAMON: Correct.

MS. HUTZLER: Forty years.

CHAIRMAN SELIN: I don't know what the right number is, but I'm absolutely certain that almost no power plant will run just 40 years. If there's a life extension program, they'll go on. Otherwise they'll come off well before their 40 years are up in many cases.

COMMISSIONER REMICK: What is your basis

for assuming no life extension, the fact that the utility has not reported they intend to or is that some kind of an assumption by the group?

MS. HUTZLER: For nuclear plants?

Jim, do you want to discuss that?

MR. HEWITT: As you are very well aware, no utility has taken advantage of your license renewal program. In fact, the two pilot plants have both dropped out. So, it basically just froze the retirement date at the end of their current operating license.

CHAIRMAN SELIN: We have a new offer to be put on the table. Maybe you'll pick it up next time.

MS. HUTZLER: Okay. Do you think they'll take advantage of it?

CHAIRMAN SELIN: Yes. I mean I believe there will be a significant number of utilities, which is someplace between a quarter and three-quarters, that will take advantage. Or at least they'll run to their 40 years, which they probably wouldn't do otherwise and then a lot of them will take advantage of going forward.

MS. HUTZLER: But we are allowing them to run to their 40 years.

CHAIRMAN SELIN: Yes, but without life

extension most of them won't even run to the 40 years. You face a large capital increase at the end of 32 or 33 years and if there's no stock option to extend -- I mean we see that already in more politically charged places, but we see that already.

COMMISSIONER REMICK: I would say assuming no extension is a very arbitrary decision that is very questionable in my mind. You're making assumptions on the others without indications from industry, I assume, of extension and I think that's a very arbitrary decision.

MS. HUTZLER: What do you think it would be in terms of percent of the plants in life extension?

COMMISSIONER REMICK: I don't know what percent, but I feel very, very strongly it's greater than zero percent.

MS. HUTZLER: But it may in fact balance out for the ones that don't go to 40.

COMMISSIONER REMICK: That's possible.

MS. HUTZLER: Yes. Yes, because certain plants are going to come off-life earlier, as the Chairman indicated, and some are going to go further, but will it balance out on average? I mean it's hard to predict what every plant in the country would do.

CHAIRMAN SELIN: I think a fair statement is when you do this next year you'll have a lot more information because we don't have a practical rule on the books now. We probably will by next year and then it's not just whether you can get an extension. The perceived cost of getting an extension -- the perceived cost to the utilities of getting an extension has gone down dramatically from two years ago. Once there's a concrete rule on the books, when you talk to them next year I think you'll get real answers whereas now they're answering a hypothetical question.

MS. HUTZLER: Yes. Of course it's difficult for utilities right now. It's hard to get any answers from them on any of these subjects because the whole industry is in such turmoil, especially with the deregulation issues. So, it's very hard to foresee the future.

COMMISSIONER de PLANQUE: But for the other fuel sources, are you saying you are getting real data on which you're basing these numbers from the utilities?

MS. HUTZLER: No. What we're saying is we're getting data in terms of their retirements and they're not retiring and we've seen them keep their

plants on-line, and they have done extensive maintenance. Based on seeing that kind of thing, we are assuming that that's happening.

COMMISSIONER de PLANQUE: Okay.

MS. HUTZLER: And we do --

CHAIRMAN SELIN: If that were the rule, you would then over estimate the nuclear extensions because the nuclear plants are essentially run as if they're going to run forever. I mean people have to make greater investments in maintenance, greater capital replacement, et cetera, unless they've already decided to close down early. For instance, their power plants, which I wouldn't name, that have changed steam generators which I think are unlikely to even run the 40 years because of economic or waste decisions. So, if you just looked at their behavior as opposed to what they say, you would come out over estimating the lifetime of the plants rather than on the rest of it.

MS. HUTZLER: Well, at the time we were doing these forecasts there was a lot of discussion in the press about the nuclear units and the Trojan issue and that plant not being continued. So, there was a lot of controversy as to are these plants going to continue. But we would certainly like to get your new

information. We'll certainly use that for our next set of forecasts.

CHAIRMAN SELIN: We keep changing the rules. So, it's a little hard for them to predict what's going on. But I think it will be pretty stable by the time you do your next survey.

MS. HUTZLER: And we do include the cost of life extension and they range from over $100.00 a kilowatt to $218.00 a kilowatt for coal.

CHAIRMAN SELIN: That's pretty cheap.

MS. HUTZLER: Yes, it is. So, that's one reason why these fossil plants get to --

CHAIRMAN SELIN: You assume clean air just sort of freezes at Clean Air Act 2 and no further tightening up of clean air regulations?

MS. HUTZLER: That's right. They have to maintain that 8.9.

CHAIRMAN SELIN: That's actually the biggest uncertainty in capital cost in existing coal plants is to know what the government is going to require of them rather than just how to keep them running.

MS. HUTZLER: There are a lot of uncertainties.

MR. BEAMON: What they did with carbon.

MS. HUTZLER: Yes, carbon is the biggest one. And we didn't do anything, as Mr. Hakes said, about carbon in this year's forecast. We do not have the stabilization plan in here.

CHAIRMAN SELIN: Is there technology available that would get them a higher thermal efficiency than they now have?

MR. BEAMON: They can certainly get more efficient. There is carbon reduction technology, but it takes about 30 or 40 percent of the energy of the plant. So, it would hardly make them economic, but scrubbers were pretty expensive when they were first introduced too. So, I don't know.

MS. HUTZLER: (Slide) Okay. Moving onto the next chart.

This shows our retirements. Essentially we have --

CHAIRMAN SELIN: The nuclear just as they come to the end of their 40 year term, I assume?

MS. HUTZLER: Yes, exactly. And of the 15.7 gigawatts nuclear, there are four units that have already retired since we started this at 1990 that include Rancho Seco, Yankee Rowe, San Onofre and Trojan. The remaining units are -- there are 13.1 gigawatts that we have in the forecast. Coal and gas

come out about equal in terms of their retirements. The other category is hydro and turbines.

(Slide) Dave, the next chart, please?

This chart takes a look at our trades with Canada and Mexico. If you take a look at history, we reached a peak in terms of net imports of 46 billion kilowatt hours in 1987. The top line shows gross imports from Canada and Mexico. The bottom line is our gross exports. So, the middle line is what our net imports are.

In 1990 you will see --

CHAIRMAN SELIN: I don't understand. What happened in 1990?

MS. HUTZLER: 1990 was a drought in Canada that affected their hydro. They also had coal units down to be retrofitted with scrubbers and they also had some problems with nuclear plants. So, they couldn't give us the power they were giving us in the past and we only got two billion kilowatt hours in terms of net imports in that year.

CHAIRMAN SELIN: Is there a Canadian EIA?

MR. BEAMON: Yes, there's a Canadian statistical --

CHAIRMAN SELIN: What do they do for forecasts because I think there's going to be gross

closing down of uneconomic power plants in Canada. I really think availability of cheap electricity for export to the United States is going to change.

MR. BEAMON: You just explained our reduction in our forecast.

MS. HUTZLER: Our forecast, yes.

CHAIRMAN SELIN: Is that based on -- I mean Hydro Canada operates a whole bunch of plants. You can only generate electricity at six cents and sell it at three cents for so long. I just don't believe they're going to continue to operate that way.

MS. HUTZLER: Right. And that's what -- we keep file of contracts and that's what we're seeing in the future, that there will be termination of contracts and that's why -- in fact, we're going to be supplying more power. So, you see these gross exports going up in the late 1990s and you're actually seeing our net imports coming down because of those contracts not being renewed.

CHAIRMAN SELIN: Is this almost all Canada or is this --

MS. HUTZLER: Yes, 99 percent Canada.

CHAIRMAN SELIN: Are people talking about building plants in Mexico and exporting to the United States or anything like that?

MR. BEAMON: Discussion right on the part of the grid that's synchronized, right on the border, but not too much on non-utilities, I think.

MS. HUTZLER: And it wouldn't be a good deal. It's just a small amount.

(Slide) Okay. Next chart, Dave.

We're moving on to the non-utilities share of total generation now. Back in the '60s, I guess, the --

CHAIRMAN SELIN: Non-utilities include IPPs or just industrial generators?

MS. HUTZLER: Actually, this particular chart includes everything, co-generators, IPPs and what we call exempted wholesale generators that came about with EPAct and the revisions to PUHCA.

CHAIRMAN SELIN: What's an example of an exempt generator?

MS. HUTZLER: Alan, do you want to discuss it?

MR. BEAMON: Discuss what it is?

CHAIRMAN SELIN: Just give me an example. I don't know what that is.

MR. BEAMON: Well, in the recent EPAct, they revised the PUHCA legislation so that basically anybody who can become an independent generator and if

they can meet certain criteria they don't have -- they had a big issue on market power and whether they own transmission lines in the area and all of that. They came become what they classify as an exempt wholesale generator and not have to file with the SEC as a utility and they're relieved of those requirements.

CHAIRMAN SELIN: It's another kind of IPP?

MS. HUTZLER: Yes, exactly.

MR. BEAMON: It's another kind of IPP, right.

CHAIRMAN SELIN: And if you have a utility selling electricity out of his region, does that show as a non-utility in your projections?

MR. BEAMON: Right.

MS. HUTZLER: Yes.

CHAIRMAN SELIN: So, it's -- okay.

MS. HUTZLER: Okay. Essentially we had about seven percent of the share of total generation in 1970 being non-utilities. That was mainly co-generators back in that time in industrials. When electricity prices from utilities became cheap, the industrials bought from utilities, so that share declined at three percent in 1980. But we had PURPA in 1978 which brought about the requirement that utilities had to purchase power from qualifying

facilities and after that got out of the courts we found many sales going to utilities. So, by 1990, we exceeded the historical share of seven percent. Also by 1990 we had the amount of sales to utilities equaling the amount of generation for own use that these industrial co-generators had. In our projections we have it growing to ten and a half percent by 2000 and almost 15 percent in 2010.

CHAIRMAN SELIN: Could you talk a little bit about you make these projections and, in particular, now sensitive are they to electricity pricing?

MR. BEAMON: Well, with respect to the exempt wholesale generators, we compete them just as with utilities. We have a price structure, a capital structure, assumed capital structure in there for the non-utilities and we compete them straight over with a utility power plant. They'll be selected if they're less expensive.

Are you talking about the avoided price of electricity?

CHAIRMAN SELIN: Yes.

MR. BEAMON: We make an assumption about what the purchase price will be to the co-generators and that's passed to our industrial model and they

choose whether to generate themselves or whether to add co-generation to that.

CHAIRMAN SELIN: What's behind my question is that up until now if you want to be a non-utility generator, you had to build something. In other words, you had to make a major capital investment. But as wheeling becomes easier, and given your answer that a utility that's wheeling to another district is a non-utility generator, it becomes more of a pricing and marketing decision in the long-term. So, I would expect that the growth in non-utility U.S. generation could be even greater than this if --

MR. BEAMON: If you're including interregional trade, we didn't include that.

CHAIRMAN SELIN: That's what I meant to ask you.

MR. BEAMON: I think I misspoke on that. We don't include them as non-utilities now. That's just interregional trade --

CHAIRMAN SELIN: Okay.

MR. BEAMON: -- amongst utilities.

MS. HUTZLER: (Slide) Okay. Dave, next chart.

The next two charts we're going to look at the DSM, demand side management energy savings. This

first chart shows the growth between 1990 and 1997. These are the numbers that utilities report to us as their plans on their forms. We go from 19 billion kilowatt hours to 73. In terms of percent of demand, it's .7 in 1990 and 2.4 in 1997.

COMMISSIONER REMICK: How do they separate out savings from demand side management from recession, efficiency, conversion from high energy intensive uses? How do they separate that out? Are these just projections of what they think they've saved by these efforts?

MR. BEAMON: These are purely their projections.

COMMISSIONER REMICK: Yes. Okay.

CHAIRMAN SELIN: So there's no model here? In other words, if competition leads to an even lower rate of growth in electricity prices and therefore DSM becomes relatively more expensive, we don't have a way to fit that.

MR. BEAMON: It becomes less economic. So, yes, they wouldn't do it.

COMMISSIONER REMICK: What incentive is it to report large numbers? How much do you believe these numbers?

MS. HUTZLER: I think we think they're

reasonable and the way we test that is we take a look at what our model produces in terms of savings but total savings that include conservation and efficiency and we take a look at what percent these numbers represent. It is less than half of that. I don't remember the exactly numbers, but it's in a range that we think these could be plausible. It is embedded in our efficiency in terms of the way we represented it today.

MR. BEAMON: We can't answer how much of what they're reporting might be free ride.

COMMISSIONER REMICK: Yes.

MS. HUTZLER: Yes.

MR. BEAMON: It might have happened anyway. So, we're not sure about that.

MS. HUTZLER: Yes. That's where the statistics really become complicated.

CHAIRMAN SELIN: But you do have -- I mean peeking ahead, which I know is immoral, your kilowatt hour per dollar of DSM is much better in '97 than '93.

MS. HUTZLER: (Slide) Yes. Why don't we move on to the next chart then.

CHAIRMAN SELIN: Is there reason to believe that that's true?

MS. HUTZLER: Well, this is what the

utilities are anticipating that they're going to spend in terms of getting the savings that you saw in the previous chart. So, they're talking about that kind of planning in terms of their own expenditures. It's an 18 percent annual growth rate, so it is pretty steep.

CHAIRMAN SELIN: Yes. But look, they're getting 15 kilowatt hours per dollar of expenditure in '93 and they're getting 20 kilowatt hours per dollar of expenditure in '97. That goes against everything that I understand.

MR. BEAMON: Well, you've got to realize that in the early years all the DSM expenditures were on -- they were on load saving programs, not on energy saving programs. So, you wouldn't have expected to see too much energy savings for them. And then the reverse is you seem to see almost a 50/50 or even more toward the energy savings programs now that they're actually out there pushing air conditions, pushing refrigerators instead of pushing peak load programs and interruptible load programs and all these programs that shaved their peak load but didn't shave energy.

CHAIRMAN SELIN: I see. So, the right measure from the utility's point of view is cost of generation, not --

MR. BEAMON: Well, it's both because now they're having programs that affect both peak and energy.

CHAIRMAN SELIN: So you don't think -- I mean basically what's to be saved in load leveling has been saved by '93 and the additional expenditures are going into energy savings?

MR. BEAMON: Well, they're still going to save load leveling by putting it in an air conditioner, but they're also going to save energy. So, it has an impact on both.

CHAIRMAN SELIN: So, basically you've confused me at this point. I thought it was pretty clear that that was wrong, but utilities have been complaining to us that they've gotten about what they can get fairly easily and that what they see they have to spend for demand side management just isn't going to be economical from here on in.

MR. BEAMON: Well, if you think of the history, just residential programs, if you look at it years ago, the major programs they were pushing to consumers were things like cycling programs where they'd come put a box on your air conditioner. So, they cycled that thing off during peak demand. That shaved the peak but it didn't affect their energy.

You'd have a rebound effect outside of the peak and that would come back. Now they're going and pushing whole new air conditions to the guy and it cuts his energy across all of his uses, not just the peak. So, you have a different impact.

MS. HUTZLER: (Slide) Okay. Can I have the next chart, Dave?

COMMISSIONER REMICK: Am I correct that the DSM expenditures are also increased cost to the customer?

MR. BEAMON: Absolutely.

CHAIRMAN SELIN: Well, at least their increase per kilowatt hour. That way they'd be not increased per day of refrigeration or something like that.

MS. HUTZLER: Okay. Moving on to the amount of additional capacity we feel is needed to meet the demand and also to replace the retirements that we have. We see 172 gigawatts of new capacity being needed. Some of this is already planned by utilities at 67 gigawatts, but we feel that utilities and non-utilities need to build an additional 105 gigawatts to meet the demand and also the retirements.

If you take a look at the chart, you'll see that in the early years we're building turbines

and combined cycle units. There are 42 gigawatts of turbines and 50 of combined cycle units. The reason for that is that they have shorter lead times and the economics show that they are favorable to them in the shorter time frame, particularly with the inexpensive gas prices.

In the post 2005 period, we do have coal coming back because of the higher gas prices at that point and we have 43 gigawatts of coal. Also, we're losing most of our nuclear plants that are being retired in the post 2000 period. So, coal is replacing some of those.

Renewables, we have 27 gigawatts coming on-line and again post 2005 we have more renewables in a lot of wind because of the fuel saver issue. The nuclear we have six gigawatts of capacity that we see that's all planned. One unit is Comanche Peak that's already come on-line and the other four units we see are the TVA units, Watts Bar 1 and 2 and Bellefonte 1 and 2.

CHAIRMAN SELIN: So, those are inputs to the model. I mean you've looked at the real world and just said --

MS. HUTZLER: That's right.

CHAIRMAN SELIN: So, since our judgment is

not necessarily worse than yours in nuclear, we can set that aside and talk about the others.

MS. HUTZLER: Okay.

CHAIRMAN SELIN: The renewables are also projected? Up until 2005 they're assumed and then they come out of the model?

MS. HUTZLER: No. What happens here is that any units that the utilities report to us as planned units are embedded in the forecast. They report that information directly to EIA and it's totally enhanced by the utility. Then our model determines what other units we need to build to meet demand. We have unplanned units coming on in probably 1997 already because we'll need more demand than the utilities say. For instance, they might not report a turbine plant to us because they can get it up in a year or two.

CHAIRMAN SELIN: I'm just talking about renewables.

MS. HUTZLER: Oh, just renewables?

CHAIRMAN SELIN: Because the renewables are so complex. You need land and --

MS. HUTZLER: Yes. Okay. Most of those are planned units up to certainly the late 1990s. But post 2000 we're building additional --

CHAIRMAN SELIN: And then you're just assuming that if the price is attractive they can find the land and handle any of our mental issues thereafter when you're passed the planned units.

MR. BEAMON: There are supply curves in the model of resources when availability. They've made -- Scott could probably talk more about it than I can, but they have made decisions on where they are most advantageous and how much is available in each one of the regions of the country.

CHAIRMAN SELIN: Okay. So you don't just assume infinite availability --

MR. BEAMON: No.

MS. HUTZLER: No.

MR. BEAMON: We represent various different wind classes and represent how much of it would be available in each region and at what cost.

MR. SITZER: We have different resource levels for wind, solar and geothermal in the model that we're trying to represent.

COMMISSIONER REMICK: Could you explain the difference between turbine and combined cycle? You mean just straight gas turbine as your turbine? Is that it?

MR. BEAMON: Right.

MS. HUTZLER: Yes.

CHAIRMAN SELIN: And the coal, if I understood the discussion up until now correctly, which I'm not sure I did, this big steep increase in coal assumes that at the year 2000 when people had to make the decision to build this, they had a point estimate for coal that gas would get much more expensive on January 14th, 20005.

MS. HUTZLER: Yes.

CHAIRMAN SELIN: Because I think in the real world you wouldn't see such a steep increase. The real benefit of gas from an investors point of view is if the lifetime costs are comparable to coal, the front end costs are much lower and therefore they can hedge their investment better. I wouldn't think you'd see such a steep increase in coal construction if you used perceived prices as opposed to point estimates of prices.

MS. HUTZLER: Well, you do see the combined cycles coming in pretty steep.

CHAIRMAN SELIN: I am surprised that even with the high prices of coal you have so much -- I mean of gas, you have so much new gas capacity coming on after 2005.

MS. HUTZLER: But the chart looks it, Alan.

MR. BEAMON: No, I mean it's not that much more. That's a cumulative number. So, it continues that way. But gas efficiencies are fairly high too for combined cycle units, even with some increasing --

CHAIRMAN SELIN: Well, but you have as much turbine as combined cycle until 2003 or so.

MR. BEAMON: Well, right now, in the short-run, many of your utilities are heavily over base-loaded. So, even with less attractive gas prices they would be building turbines.

MS. HUTZLER: (Slide) All right. Next chart.

This chart shows the difference between the amount of capacity needed between our low, mid and high macroeconomic growth cases. If you recall, we had a difference of .5 percentage points between the growth rate in the low case for electricity of one percent and the high case 1.5 percent. And the difference amounts to 69 gigawatts of capacity.

CHAIRMAN SELIN: But your retirement rate is assumed to be independent of the growth rate for electricity.

MS. HUTZLER: Yes.

CHAIRMAN SELIN: That's probably not right. I mean think about how people make decisions.

Unless they knew 20 years in advance what the growth rate would be, they would phase down faster if they saw lower growth rates and keep things longer if they saw --

MS. HUTZLER: Well, part of it is economics too though. I mean if it's cheaper to keep that plant on, why build a new one?

CHAIRMAN SELIN: Because -- I mean the main thing is you don't know if it's cheaper or not. It depends on things you can't tell. So, you keep them around for another year or two.

MS. HUTZLER: Yes, that's true.

CHAIRMAN SELIN: What I'm saying is I think in the real world the difference in cumulative capacity between the high and the low cases wouldn't be this great, but people would hedge by making different decisions on extending their existing plants.

MS. HUTZLER: Okay. One point to note in this particular chart is that the fossil steam and the greater the amount of capacity you need the more fossil steam you have and that's the biggest difference between those different bars.

(Slide) Okay. Next chart, Dave.

This chart shows generation by fuel type.

Coal is where we get most of our generation from. In terms of shares in 1990, it's 55 percent and it maintains that at 54 percent in 2010.

We have a slightly different story here between nuclear and gas than we did last time we briefed you. Last time we told you gas was going to become the number two in terms of generation. This year we still have nuclear as number two. Its share declines from 20 percent to 17 percent. The reason why we do get increasing amount of generation even with the retirements I mentioned is the capacity factor improvement.

CHAIRMAN SELIN: Just for your own information, I personally believe that capacity factors will, in fact, be even higher than you have them there by the year 2010 because the plants -- well, first of all, I think life will be extended. Secondly, obviously the plants with the better capacity are more likely to extend their life. So, there will be a kind of a selection out and you'll end up with 76, 77 percent capacity factor by the end of this period. So, between the two, some plant life extension and some higher factors, I think the actual generation will be somewhat greater than projecting. This is not assuming new plants at all.

MS. HUTZLER: Okay. All right. We do have gas, of course, going up from a ten percent share to a 14 percent share, oil going down and there's a slight increase in renewables in terms of a share from 11 to 13 percent. The next --

CHAIRMAN SELIN: That includes hydro?

MS. HUTZLER: Yes, that includes hydro.

CHAIRMAN SELIN: So, the actual increase in renewable is very small. All this wind is relatively small compared to the baseload. What are you assuming about hydro in the Northwest, for instance? You're not assuming a lot of shutdowns?

MS. HUTZLER: No. No. We're mostly assuming that what's there will remain there.

CHAIRMAN SELIN: I see.

MS. HUTZLER: Very little change.

CHAIRMAN SELIN: I don't think that's right. I think the environmental pressure against dams is going to get much, much stronger by that time period.

MR. BEAMON: I think it would mostly be some of these very small dams. You might not see much change in capacity.

CHAIRMAN SELIN: Is that right?

MR. BEAMON: I'm not sure.

MS. HUTZLER: Did you think that in the Northwest they would actually be closing down some?

COMMISSIONER REMICK: Or reducing capacity because of environmental -- fish life concerns and so forth. Well, they're already doing it.

CHAIRMAN SELIN: Grossly speaking, I think TVA will continue where it is and the Bonneville Power Authority will reduce significantly. But they know better than we do.

MR. SITZER: We're fairly conservative about our assumptions on hydro until we know more about the relicensing process which is going to be kicking up in the next couple years.

MS. HUTZLER: (Slide) Okay. Next chart, please.

This one shows the breakdown of the renewables by type and essentially over two different cases, our world oil price case. This is the chart I mentioned to you before where I wanted to explain to you what was happening with wind because we had the four fold increase between our low world oil price case that only gets to $20.00 in 2010 versus our high price case that gets to $34.00 per barrel of oil in 2010. That increase is due to the use of wind as a fuel saver because it's cheaper to build it than to

use existing oil and gas.

CHAIRMAN SELIN: What's biomass?

MS. HUTZLER: Biomass is mostly in our NUGS category and mostly in our industrial category.

MR. SITZER: It's wood.

MS. HUTZLER: Yes, wood.

CHAIRMAN SELIN: My own feeling, and I have no basis for this whatsoever, is I think by the year 2010 you're going to get a significant environmental -- what's the right word -- complaint about air, about wind, a backlash.

COMMISSIONER REMICK: With the growth in developing countries of burning of coal and so forth and worldwide impact on that, I think there's going to be pressure on countries like the United States that have the ability and the alternate technologies and so forth. There's going to be pressure on us to do more to cut down the world's emission of carbon and so forth and where the developing countries either can't or won't.

CHAIRMAN SELIN: I just don't think North Dakota is going to want to cover itself with windmills after awhile.

MS. HUTZLER: Well, actually, we don't have North Dakota covering itself with windmills, and

that turns out to be a terrible --

CHAIRMAN SELIN: Where are they?

MS. HUTZLER: Most of these windmills are California, the Northeast and the South.

CHAIRMAN SELIN: Really?

MS. HUTZLER: Yes. And it turns out they believe a lot of wind capacity in the north, but we don't have a lot of demand in the north and we have lots of coal plants there. So, we don't need it based on demand.

CHAIRMAN SELIN: I thought California without subsidies wasn't really economical. Is that not true?

MS. HUTZLER: Well, you have to realize we only have about 10 gigawatts of wind and if you spread out a little bit here and there. But you're right, California is not bringing in a lot of wind, but I think we have a little bit coming from California.

MR. BEAMON: We actually have -- it's only about ten gigawatts. It looks like a big number because it was starting from a small number, but this is not all that big.

MS. HUTZLER: Right. We do have some geothermal and that's mainly for baseload power in California where they're not going to use coal and

they're not building nuclear.

(Slide) We can move onto the next graph.

CHAIRMAN SELIN: The state capital is meant to have a high density of wind. Is that the idea?

MS. HUTZLER: We already talked a little bit before about our electricity price which we have growing at .3 percent a year. What we tried to do here is to show you why the price wasn't grown very much by taking the price and distributing it into the components, capital, O&M, fuel. We also added wholesale power. Let me talk about fuel first.

We do have increases in our fossil fuel. So, of course that line should be going up and it does. O&M, we find on a per kilowatt hour basis that that's fairly constant. We've seen that in the past and we see that in the forecast as well. Capital, what's happening --

CHAIRMAN SELIN: That's nominated by what happens at coal plants.

MS. HUTZLER: Probably mostly by coal, because that's 50 percent of the generation. But, of course, we do have gas, nuclear.

CHAIRMAN SELIN: Coal is relatively high, O&M relatively low fuel compared to --

MR. BEAMON: But there's T&D equipment too, transmission and distribution.

CHAIRMAN SELIN: Oh, I see.

MR. BEAMON: That can be rather significant in some regions.

MS. HUTZLER: Okay. On the capital side, we have the existing plants being depreciated and then the new plants coming on-line. However, because we have the large base of plants, if you divide the new capital cost of a per kilowatt basis in terms of all the sales, we actually have the capital component decreasing because we've depreciated the main bulk of power plants.

CHAIRMAN SELIN: Do you have a handy dandy factor for cost per kilowatt for new plants of the coal plants and the turbine?

MS. HUTZLER: Did you want per kilowatt? I think -- isn't coal around $1300.00?

MR. BEAMON: Around $12, $1300.00.

MS. HUTZLER: Yes, between $12 and $1300.00 per kilowatt.

CHAIRMAN SELIN: And what about the gas price?

MR. BEAMON: I would depend on whether it's a turbine or not. You have $300.00 or $400.00

turbines. I think it would be $5, $600.00 for combined cycle, but I'd have to get them exactly.

CHAIRMAN SELIN: Those are certainly reasonable costs.

MS. HUTZLER: Okay. Wholesale power is increasing here mainly because we're purchasing more and more power from non-utilities. It's not the cost itself that's going up, but we're just getting more of it.

CHAIRMAN SELIN: Say that again.

MS. HUTZLER: Wholesale power. That represents the increase in non-utility generation.

CHAIRMAN SELIN: Oh, it's not per kilowatt hour of wholesale power, it's per kilowatt of total electricity.

MR. BEAMON: Total, right, and their share is going up.

CHAIRMAN SELIN: So the cost per kilowatt hour purchased is assumed to be --

MR. BEAMON: It's cheaper or they wouldn't be buying it.

MS. HUTZLER: Right, exactly.

MS. HUTZLER: (Slide) All right. Moving on to the next chart.

This shows again why the capital component

of price is actually declining and what we've graphed here on an index basis is sales, which of course are growing, the rate base where you can see that depreciation of existing plants is being offset by the capital additions and it's fairly stable until the post 2005 period where the capital additions are going up. But because of the steeper rate of growth and sales, if you take the rate base and divide it by sales, you essentially have the capital component of price going down in the latter years.

CHAIRMAN SELIN: I think that that rate base curve is going to be very different next year when you start seeing the effect of prospective competition on what the utilities are doing with their rate base. Now, all their incentive is to get as much as they can into the rate base and now we see Florida Power and Light and a couple of the others starting to actually mark down their rate base to get their competitive cost -- the cost more competitive.

MS. HUTZLER: So you think it's going to be lower?

CHAIRMAN SELIN: Yes. I think -- I mean, there won't be any real difference in the spending, but the accounting will be quite different, that a whole lot of folks have capital costs in their rate

base because it's a cost-based rate. And since you can't sell electricity at two prices, one competitively and the other to the rate base, as their interest turns more to competitive markets their incentive to try to push everything they can into the rate base will change and they're just going to start writing off their base faster.

MS. HUTZLER: Okay.

(Slide) All right. Next chart, Dave.

We've included this chart just to make mention that we do have the Clean Air Act amendments of 1990 incorporated. You can see what happens here is that between 1990 and 2000 we do have a lot more low sulphur coal, 148 million tons being consumed. In the post 2000 period, we do go back to consuming medium sulphur coal and that's because we're retrofitting plants with scrubbers and we have new emission abatement technology. Our high sulphur coal in all of these has decreased.

The allowance cost that we've estimated within the model is about $230.00 per ton in 1990, two dollars in 2000, and it increases to 290 in 2010.

Oh, and our retrofits, we have 23 gigawatts of coal capacity being retrofitted.

CHAIRMAN SELIN: Just to ask you a

malicious question that's irrelevant to this, did you do the model with and without -- I mean with different assumptions on the ability to trade allowances? Does free trading allowance really reduce total emissions?

MS. HUTZLER: We didn't do different assumptions.

MR. BEAMON: We didn't do it without it. We assumed there was a national cap involved to trade under.

MS. HUTZLER: Okay. We're going to move next into our regional analysis and I just wanted to mention again --

CHAIRMAN SELIN: Before you do that, I'd like to come back -- tell me again how you get the price of natural gas and would it be feasible to actually run different assumptions on natural gas or is that once you fix the oil price and the growth the natural gas price is fixed?

MS. HUTZLER: It's probably -- we can probably change it, but it is endogenously determined in the model where we represent the cost of drilling and we have a discounted cash flow model for oil and gas supply, and after that we take a look at whether we have enough pipeline capacity to get it to end users.

CHAIRMAN SELIN: You're assuming that reserves are not a limit, I mean, that there's plenty of gas and it's a question of what is it going to cost --

MS. HUTZLER: No, there is a reserve base that we deal with. We do have technological improvement that increases that at a two percent per year rate, but the reserve base is a limiting factor.

CHAIRMAN SELIN: I think the gas companies are getting more sophisticated in their accounting and they're starting to take into account that reserves are not infinite and therefore when you sell gas you're reducing your reserves. Up until now the accounting has been essentially that the gas is free and the more you sell the more your income is, but if you have to really keep track of a reduction in stock as you sell then you're very sensitive to price and how much you produce and I don't think the models pick that up.

MS. HUTZLER: Where do you think the gas price -- are you thinking it's low --

CHAIRMAN SELIN: I happen to think gas will be higher than what people think it will be, but you have pretty high growth rates and maybe I'm wrong. FERC thinks it's going to be lower, thinks there's

lots and lots of gas and people will continue to just consume it based on short-term considerations.

MS. HUTZLER: Most people think there's lots and lots of gas and there are people who forecast lower prices for gas than we do.

CHAIRMAN SELIN: Thank you.

MS. HUTZLER: We're pretty well in the mid-stream of those prices.

Okay. I just wanted to make a note that we did change our modeling system. So last time when we briefed you we were talking about federal regions, this time we're going to be talking about different kinds of supply regions which are NAERC and NAERC subregion-based and Bob Eynon is going to tell you more about that.

MR. EYNON: The national forecasts which we've described to you are developed using regional models of electricity markets and the basis for those markets are the North American Electric Reliability Councils and selected subregions. And the reason why we want to take a look at these regions is that individual regions show characteristics which are considerably different from the national average. Access to fuel supply and the resulting fuel mix are different among the regions. The ownership of the

electricity supplies, whether they are investor owned utilities, publicly provided, or non-utility suppliers, result in differences in prices.

In EIA's 1992 Electric Power Annual the average industrial price for electricity nation-wide is 4.8 cents per kilowatt hour. However, if you look at the price for electricity in Washington State, the industrial price for that year was 2.2 cents per kilowatt hour, and in Rhode Island it was 9.2 cents a kilowatt hour, so a factor of four variation due to access of supplies and the ownership patterns. So for that reason we want to take a look at regions.

CHAIRMAN SELIN: The people in Washington still think they're being over-charged for electricity even at the lowest rate.

MR. EYNON: What I would propose to do here is to go through these regions by making two counterclockwise circuits around the country, beginning first in Ohio, going up through the Midwest and down through the Southwest and up the East Coast, and then a second circuit from the Rocky Mountains up through the Northwest and California. So, as we go through this, you might want to keep that in mind.

(Slide) Next chart, please.

Perhaps I ought to explain this chart a

little bit. The icons represent the U.S. average for the particular fuel share. The bar on the left represents 1990 and the bar on the right represents 2010. We're going to begin by looking at ECAR, which is the region centered around Ohio and the states that adjoin it.

One thing that we can observe from Ohio is that coal dominates the generation in this region. It's substantially higher than the national average. In terms of meeting needs in the future, this region is expected to need a substantial amount of capacity which will be met by coal.

CHAIRMAN SELIN: Mr. Eynon, for us it would be most useful to spend relatively more time in those areas that have average or above average nuclear stuff.

MR. EYNON: Okay.

CHAIRMAN SELIN: Because that would affect the economics of extension and also if there were new plants they're likely to be in places that already have nuclear utilities.

MR. EYNON: (Slide) Okay. If we could turn to the next chart then, that might be of more interest.

COMMISSIONER REMICK: Incidentally, just

a side interest. I come from Pennsylvania and because of that Ohio use of coal it rains vinegar at times in Central Pennsylvania literally, the pH equivalent to vinegar.

MR. EYNON: MAIN is an area which includes Illinois, Eastern Michigan and -- I'm sorry.

CHAIRMAN SELIN: A very heavy nuclear area?

MR. EYNON: Yes. Eastern Wisconsin, I'm sorry, and Western Michigan. It's typical of the regions of the country except that it has more nuclear. Here again we're expecting most of the growth to be met with coal. We are projecting retirements of nuclear plants. We have Dresden 2 retiring and Point Beach 1 retiring over this period. As a result, the nuclear contribution in this region is expected to decline.

CHAIRMAN SELIN: Do you have charts that show growth rates by region?

MR. EYNON: I can indicate what they are. In this region, sales growth rate is 1.2 percent.

CHAIRMAN SELIN: That's really almost more relevant than the share for what's of interest to us.

MR. EYNON: Electricity sales are projected in MAIN to grow at 1.2 percent.

CHAIRMAN SELIN: And what about price?

MR. EYNON: Price is projected to grow at .8 percent.

CHAIRMAN SELIN: So that's considerably higher than --

MR. EYNON: It's considerably higher than the national average of .3 percent.

CHAIRMAN SELIN: Why is that, so much nuclear?

MR. EYNON: There's a very heavy capital component associated with the nuclear plants in that region.

CHAIRMAN SELIN: But why should that increase the price? You mean continuing capital?

MR. EYNON: Continuing capital additions that are required. The capital component is driven by both the additions and the rate of growth of electricity. So, if the sales rate increased more rapidly, the capital component is spread over more kilowatt hours.

CHAIRMAN SELIN: So you've got a high nuclear share and a low growth rate.

MR. EYNON: Yes.

CHAIRMAN SELIN: So the capital growth then adds the high price. Okay.

MR. EYNON: I would like to jump ahead then to the Southern TVA VACAR region. As we indicated earlier, we are -- this is the one region in the nation where we expect new nuclear additions. Watts Bar 1 and 2 and Bellefonte 1 and 2 are scheduled to be completed over the period. We will be retiring Robinson 2. Even with the growth of nuclear capacity in this region, the growth in electricity sales are such that nuclear loses some of its share, a slight reduction in it share.

CHAIRMAN SELIN: What were those two rates, the growth rate and the cost rate?

MR. EYNON: The sales are 1.5 percent and prices are -.2 percent. So, this region is actually increasing capacity more rapidly than any other region in the nation. I think they need some 30 gigawatts of capacity by 2010. Even with the nuclear additions that we're projecting, the share declines for nuclear.

CHAIRMAN SELIN: Did the two enrichment plants fall in this region, Portsmouth and Paducah?

MR. EYNON: We have not included those here.

CHAIRMAN SELIN: Well, that's going to have a terrific impact on demand. They each use 4,000 to 8,000 megawatts. If one of them closes, which a

lot of people think is going to happen, that will have a really discernible impact on demand. But I'm not sure whether it's in this region or the Ohio, Illinois region.

COMMISSIONER REMICK: Ohio. I'm not sure either.

CHAIRMAN SELIN: I mean you might not see it so much on the national basis, but that would have a really large regional impact.

MR. EYNON: If we could move on then to the next region, which is Florida, a subregion of the same council. Florida is characterized by a somewhat atypical mix of capacity in that it has somewhat less coal than the nation on average.

CHAIRMAN SELIN: The price is that high? I didn't realize it was that high.

MR. EYNON: But it's much more dependent on oil.

CHAIRMAN SELIN: This is electricity generated in Florida or consumed in Florida?

MR. EYNON: Generated.

CHAIRMAN SELIN: That's interesting. I didn't realize they still had that much coal.

MR. BEAMON: Some of that coal serving in this is right up there in Georgia. They're buying it.

MR. EYNON: This is generation.

MR. BEAMON: There are a couple plants that even though they're geographically outside of Florida, they're owned by Florida. If they're owned by Florida and operated to dispatch against Florida, we included them in the Florida plants. There are several of those.

CHAIRMAN SELIN: And what were your growth rates for this?

MR. EYNON: In Florida, sales of 1.6 percent and price is .3 percent, same as the national average for prices.

CHAIRMAN SELIN: I thought people were projecting a greater growth rate in electricity in Florida. I'm surprised it's not higher. That's still pretty high.

MR. EYNON: It's higher than our national average.

CHAIRMAN SELIN: And why does the nuclear drop so much?

MR. EYNON: Turkey Point 3 and 4 are retired close to the end of the period and it reduces the nuclear share and gas gains over the period.

CHAIRMAN SELIN: I think that's very unlikely to happen, by the way. If, in fact, you have

this rate of electricity growth and particularly in South Florida, Turkey Point would be high candidates for plant life extension.

MR. EYNON: Turning next to the Mid-Atlantic Area Council, that's the Pennsylvania, Jersey, Maryland system. Again, this region is characterized with higher nuclear share than the average. Over the period, we're projecting Peach Bottom 2 and 3 to retire as well as Oyster Creek. As a result, the nuclear share declines here.

CHAIRMAN SELIN: What's the growth rate for this area?

MR. EYNON: Sales are .8 percent and price is .1 percent. So it has more sluggish growth than the rest of the nation. Most of the increased demand is going to be met with coal and natural gas and some renewables, mostly wind.

CHAIRMAN SELIN: Are these new coal plants or are they just getting --

MR. EYNON: These are new coal plants after the turn of the century.

CHAIRMAN SELIN: I find it hard to see nuclear closing and new coal plants being built at the same time. I mean, Peach Bottom is a pretty good plant. I can't really predict what the utilities

would do, but, given that combination, they'd be tempted to keep their nuclear capacity instead of reducing that and adding coal. If you really want to generalize, those regions that already have a lot of nuclear, it's less likely that they will close the nuclear plants and add coal capacity. Those regions that don't have much nuclear, you know, obviously don't have the nuclear option. They would probably add a lot of coal.

MR. EYNON: The next region of interest is New York. Here we have a region which is characterized with substantially less coal than the national average and much more dependence on oil and natural gas. During the forecast period, we're projecting that Nine Mile Point 1 will retire and Ginna will retire.

CHAIRMAN SELIN: We actually have a relatively large number of troubled plants, nuclear plants from an economic point of view. If anything, it's more likely to be the other way. The price pressure on Indian Point and Nine Mile is considerable. Is there new capacity being added here?

MR. EYNON: Well, this region -- if you turn to the next chart, you can see what's going on.

(Slide) Utilities actually generate less

in the future in this region than they are currently generating today because demand growth is very sluggish. I didn't give you those numbers. Sales in this region, growth is the lowest in the nation. It's .4 percent and prices are projected to grow at slightly faster than the national average of .4 percent also.

CHAIRMAN SELIN: They're already very high.

MR. EYNON: We'll get to that in just a second.

(Slide) In the next chart you can see that utilities are projected to generate less electricity in the future, be more dependent on non-utility sources as well as purchased power from other utilities, principally from PJM and from Canadian electricity sources. So, even though we're quite pessimistic about growth of Canadian imports, there are some inputs coming to this region.

(Slide) The next chart shows you what happens to price in this region. The chart shows the U.S. price and the New York price currently hovering around ten cents a kilowatt hour. It's projected to grow in the future to be at roughly about 10.5 cents a kilowatt hour compared with the national average of

7.6 cents a kilowatt hour. The reason why the price grows here whereas in other regions it doesn't grow has to do with the capital component again. The capital component, rather than declining, is increasing. Because sales growth is so slow, the kilowatt hour charge per dollar capital is higher than it would be otherwise.

(Slide) I'd like to turn next to New England, which has a higher nuclear share than the typical region, substantially less coal. The story here is somewhat similar to New York. The sales growth rate in this case is .7 percent, slightly more than New York but substantially below the national average, and prices again are projected to grow at .4 percent.

We're projecting that Haddam Neck and Maine Yankee as well as Millstone would retire over the period, so the nuclear share declines. The nuclear share decline, of course, is a combination of available capacity plus the assumptions about the performance of plants. We do in each of these regions assume improving the performance from its current rates up to 74 percent, so the results here are the combination of the assumptions about performance and the available capacity.

(Slide) This region, in terms of total capacity, you can see from the next chart is similar to New York in that they're expected to generate less electricity. Utilities are expected to generate less electricity in the future than they are today. Eleven percent of their supplies will come from purchases and imports and 23 percent are projected to come from NUGs. That means almost well over a third of the power in this region is going to be provided by other than utilities.

(Slide) Again we have, in the following chart, we show what the prices are. It's a story that's very similar to New York, prices currently running at nine cents a kilowatt hour and projected to remain at that level. There is a slight attenuation in the capital component of prices which keeps the price from growing even more quickly than it would otherwise.

(Slide) I'd like to skip some regions now and move on to California, which is near the end. This region has substantially less coal than the nation on average and depends much more heavily on gas, principally fired in steam plants, not the new combined cycle plants that we're talking about.

In terms of the nuclear contribution we

expect it to decline in the future because of the retirement of San Onofre which has already occurred, Diablo Canyon, Diablo Canyon 1 and 2. The renewables contribution is expected to increase principally because of geothermal increases some 30 billion kilowatt hours over the period. This region has substantially higher prices than the nation in general. The sales increases here are 1.4 percent and prices .8 percent.

What's interesting about California also is that about 35 percent of the power in 2010 is projected to come from non-utility supplies and imports into the region, purchase of power expected to be 28 percent. So fully almost two-thirds of the power in this region is going to come from other than utility sources.

(Slide) I'd like to spend just a minute or two than dealing with some of the uncertainties associated with this forecast.

Since we've already indicated demand is a huge -- there's a substantial amount of uncertainty associated with demand growth because of uncertain economic growth, technological choice that's assumed in the end use side as well as the impacts of EPAct.

We've made some assumptions about oil and

gas price expectations. We've incorporated an adaptive expectation into this model. What planners actually use for decision making could be different and it would result in perhaps different decisions being made.

As has been indicated, there is a substantial amount of uncertainty about demand side management programs, whether as we move into a more competitive environment these programs will persist and whether the levels of expenditures that we've assumed for demand side management programs will actually be realized.

The climate action plan has not been incorporated in this analysis and if it were would perhaps change the results in significant ways and would have serious impacts on fossil fuels, especially coal.

And finally, technological development, changes in efficiencies and electric technologies and penetration of electric vehicles and the like could also have substantial impacts on the results.

CHAIRMAN SELIN: This is very interesting. Could I come back to the gas price?

MS. HUTZLER: Yes.

CHAIRMAN SELIN: If drilling you just

assume is so much per thousand cubic feet, it's a continuous price, is this also for pipeline or do you have quantum increases as you go above certain levels?

MS. HUTZLER: It increases when you go over certain levels.

CHAIRMAN SELIN: And it's done in a quantum, not just an increased -- it's not just an increased cost of gas above a certain volume but a fixed increase for a pipeline and then you get to spread it over more and more gas up to a point and then another pipeline?

MS. HUTZLER: That's correct.

CHAIRMAN SELIN: I think I was wrong. I think you've got reasonably realistic estimates of gas price. I doubt that they could go up much faster than you've estimated.

Ken?

COMMISSIONER ROGERS: No, I don't have any questions.

CHAIRMAN SELIN: Commissioner Remick?

COMMISSIONER REMICK: No, I find it very interesting and I realize that -- I guess I don't question the models. The outcomes depend upon the assumptions and one has to make certain assumptions. There's no question about it. There might be some as

an individual I would disagree, but you're presumably the experts on these things.

I would ask a question. How much are these assumptions based on your best technical estimates aside from any political input into that? I'm not talking about political when you have laws into effect and so forth, but is it truly your best professional technical inputs into these or whoever is providing the inputs?

DOCTOR HAKES: We have both statutory protection as well as I think protection by custom that there is -- the Policy Office, for instance, at the Department of Energy may have one set of figures. The Climate Action Plan may have a set of figures. We independently arrive at our own set of figures. We will sometimes circulate publications to industry and other people for technical advice, but these represent really EIA's version, EIA's position and not necessarily the Department of Energy's position.

COMMISSIONER REMICK: Fine. In my past life, I used to subscribe to a number of your publications on electricity consumption and energy consumption and so forth. I found them very, very good and interesting. I have not used them as much in recent years, but I think you put out some very very

interesting information.

DOCTOR HAKES: Thank you.

COMMISSIONER REMICK: It would be very interesting if your models somehow you'd go back maybe 15 or 10 years ago and say if we had this model then and knowing what we do then what the projections would have been for 1994, 1993.

Thank you very much.

CHAIRMAN SELIN: Commissioner de Planque?

COMMISSIONER de PLANQUE: I just have a couple questions.

Does your model account for possible social changes, for example population shifts in areas of the country?

MS. HUTZLER: We do look at that and track what the Census Bureau tells us about population and growth. For instance, they just made a change where there are more immigrants coming in the country than they thought and the birth rate is actually different than what they previously had and we factor all those things in on a regional basis.

COMMISSIONER de PLANQUE: In terms of forecasting as well?

MS. HUTZLER: Yes.

COMMISSIONER de PLANQUE: What about

things as difficult to get your arms around as shifts in work place with the computer age and all of that, potential shifts with more people working at home rather than in centralized businesses? Does anything like that get taken into account?

MS. HUTZLER: That's more difficult and less of that's taken into account because we do that based on past data.

COMMISSIONER de PLANQUE: Sure.

MS. HUTZLER: Those trends aren't there and it is pretty difficult to do that, so we're not as good on that.

COMMISSIONER de PLANQUE: Okay. On page 174 of your report you give about five factors that you say are most likely responsible for no new orders in the nuclear area. Can you tell me how you derive those factors or what they're based on? If you need refreshment, I can tell you what they are.

MS. HUTZLER: No. I think we have those memorized.

COMMISSIONER de PLANQUE: Okay. One of them caught my eye, the uncertainty in licensing and regulatory process, but the rest of them have to do with public concerns. What do you base those on?

MR. HEWITT: Public concerns in the

things as difficult to get your arms around as shifts in work place with the computer age and all of that, potential shifts with more people working at home rather than in centralized businesses? Does anything like that get taken into account?

MS. HUTZLER: That's more difficult and less of that's taken into account because we do that based on past data.

COMMISSIONER de PLANQUE: Sure.

MS. HUTZLER: Those trends aren't there and it is pretty difficult to do that, so we're not as good on that.

COMMISSIONER de PLANQUE: Okay. On page 174 of your report you give about five factors that you say are most likely responsible for no new orders in the nuclear area. Can you tell me how you derive those factors or what they're based on? If you need refreshment, I can tell you what they are.

MS. HUTZLER: No. I think we have those memorized.

COMMISSIONER de PLANQUE: Okay. One of them caught my eye, the uncertainty in licensing and regulatory process, but the rest of them have to do with public concerns. What do you base those on?

MR. HEWITT: Public concerns in the

financial markets.

COMMISSIONER de PLANQUE: So these are all based on financial assessments?

MR. HEWITT: No. Maybe I don't understand your question.

COMMISSIONER de PLANQUE: Well, you give five factors why you assume no nuclear plants would be built and I'm trying to figure out what's the basis of establishing those five factors. How do you know --

MR. HEWITT: It's our own judgment based upon readings in the financial market and the political arena.

COMMISSIONER de PLANQUE: So these aren't based on any surveys, necessarily, of utilities? This is just your own thinking on these items?

MR. HEWITT: It's our own expert judgment.

MS. HUTZLER: Now, you should realize that we're saying no nuclear plants through the year 2010.

COMMISSIONER de PLANQUE: Right.

MS. HUTZLER: That doesn't mean that --

COMMISSIONER de PLANQUE: Yes, I understand.

MS. HUTZLER: -- 2010 period. We would assess that differently.

COMMISSIONER de PLANQUE: Okay. Thank you

very much. I appreciate this, very interesting.

CHAIRMAN SELIN: Doctor Hakes, would you talk a little bit about other people's projections? Is the structure -- in your report, you compare this with four or five other projections. Would the structures be fairly similar in terms of ratio between electricity growth rate and overall energy or electricity and GDP?

MS. HUTZLER: Okay. We're showing a lower electricity demand forecast than --

CHAIRMAN SELIN: Than anybody else.

MS. HUTZLER: Yes, that's very true. In the other areas we're pretty close and we're pretty much midstream, such as in the gas price that you were asking before, and the difference is because of the further treatment of efficiency standards due to the National Appliance Energy Conservation Energy Act and EPAct that we came down. It will be interesting to see if other forecasters do --

CHAIRMAN SELIN: So you just think the others haven't caught up yet?

MS. HUTZLER: That's one part of the thinking. DOE policy is actually below us. When they did their Climate Change Action Plan they did a new baseline. They're at 1.1 percent for electricity, so

they're slightly below us. There are changes that are taking place that people haven't updated yet. Whether we'll be midstream in the future or not, I don't know.

CHAIRMAN SELIN: I see.

MS. HUTZLER: And I'm not even sure what our forecast will be next year because there are a lot of different things going on, as you even brought up, one of which is deregulation, how that will affect the electricity price and how that will affect demand.

CHAIRMAN SELIN: You know, obviously we're very sensitive to stuff which for you is pretty peripheral, which is whether there are 109 or 106 or 104 nuclear power plants, and I realize that these are pretty broad estimates. And I sort of apologize, but we're not really apologizing. We just want to call your attention to, you know, a U.S. government publication says no new orders until 2010 at the same time as we're killing ourselves to certify new designs. Nevertheless, I don't think this really has much of an effect on your overall figures, but it might be useful to discuss some of these regional extension assumptions. I think as you get into region by region they become relatively more important.

And this is a nice card. It looks like it was done just for us. We appreciate it.

DOCTOR HAKES: Our model takes 24 hours sometimes to run on a mainframe computer. This card has a run time of about five seconds. It has quite a bit on it.

CHAIRMAN SELIN: Actually, in '74 and '75, I was a consultant to the FEO and worked with the people who were setting up EIA, so it's very satisfying to me to see how the organization has grown in not only size but in stature and independence.

We thank you very much for the reports and you're to be congratulated on just the extent of the work and the robustness of the things that you do, so thank you very much for coming.

DOCTOR HAKES: We're available for additional analysis, if you would like.

CHAIRMAN SELIN: I do hope you will come back next year when you have your next set of things done and I would appreciate if you could just do that breakdown of the electricity market at different price levels. That would be helpful.

MS. HUTZLER: We would be more than happy to work with you in terms of looking at each of these plants on a regional basis. If there's somebody you want us to work with, we'll be happy to do that.

CHAIRMAN SELIN: I just think we'll know

a lot more in three months than we do now. I mean, I could give you my guesses on region, but they're going to change drastically. But once we get the rule out and people have a chance to comment on it, and that's imminently, then I think we'll have a much clearer idea of what people are intending in terms of extending licenses.

MS. HUTZLER: Well, a compact, we can try to incorporate that in our next round of projections.

CHAIRMAN SELIN: Okay. Fine. Thank you very much.

DOCTOR HAKES: We thank you.

(Whereupon, at 11:50 a.m., the above-entitled matter was adjourned.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON ELECTRICITY FORECAST FROM ENERGY INFORMATION ADMINISTRATION (EIA) ANNUAL ENERGY OUTLOOK

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: JUNE 8, 1994

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Carol Lynch

Reporter's name: PETER LYNCH

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Electricity Supply and Demand Through 2010

Presented to the

Nuclear Regulatory Commission

June 8, 1994

Briefing Agenda

- Major Assumptions
- National Electricity Supply
- Regional Electricity Review
- Uncertainties

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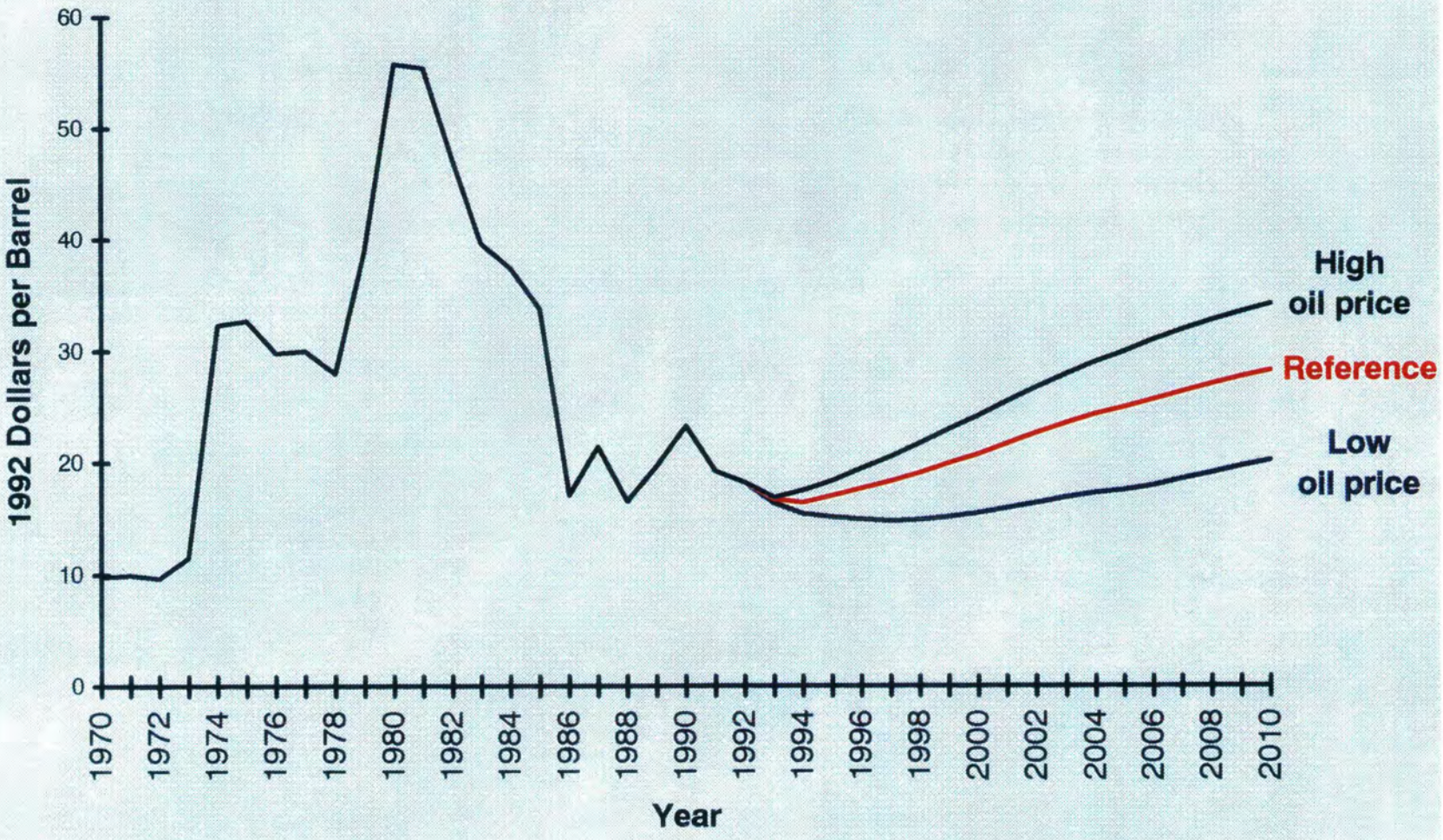
World Oil Prices



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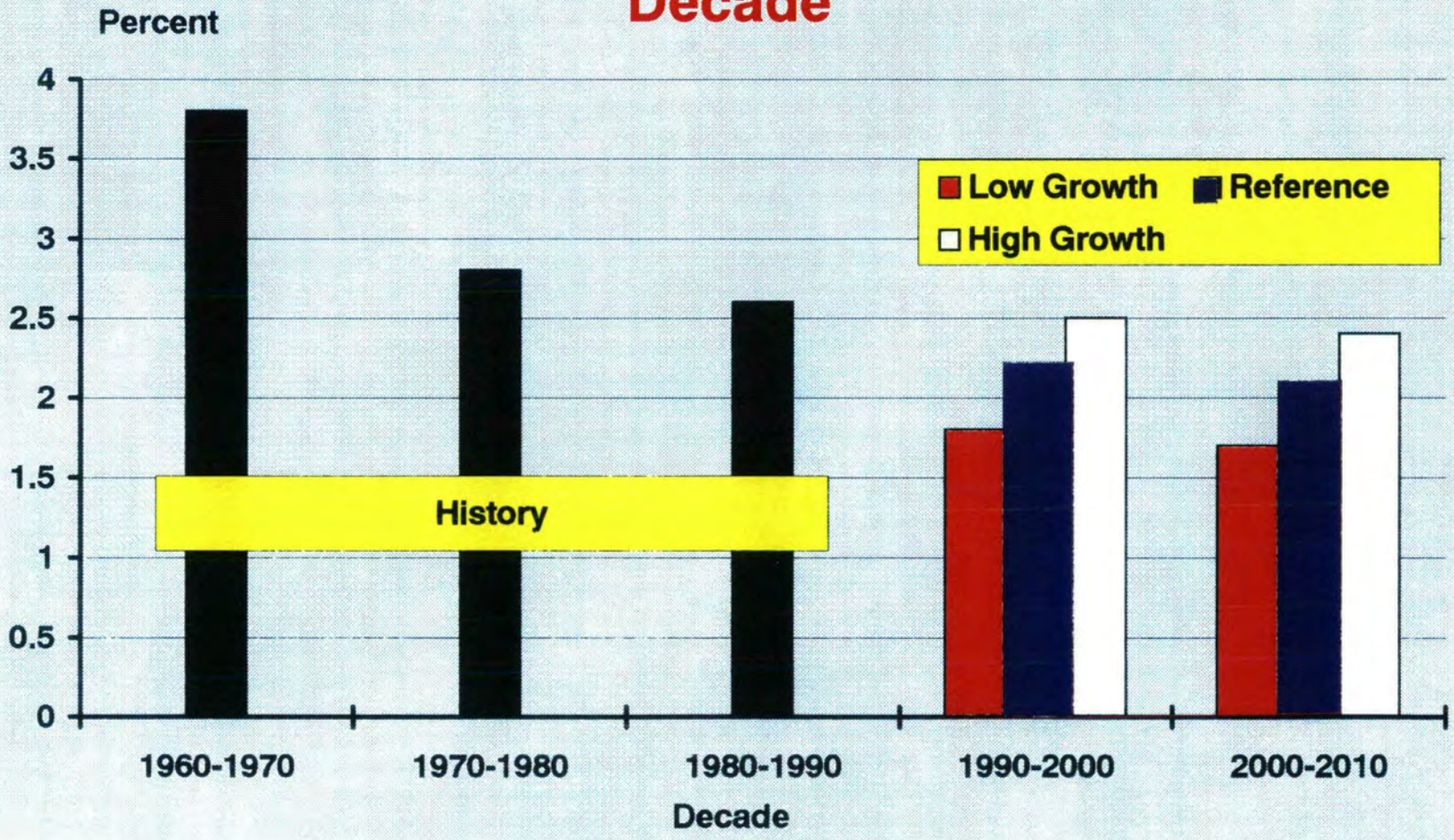
Average Annual Real GDP Growth by Decade



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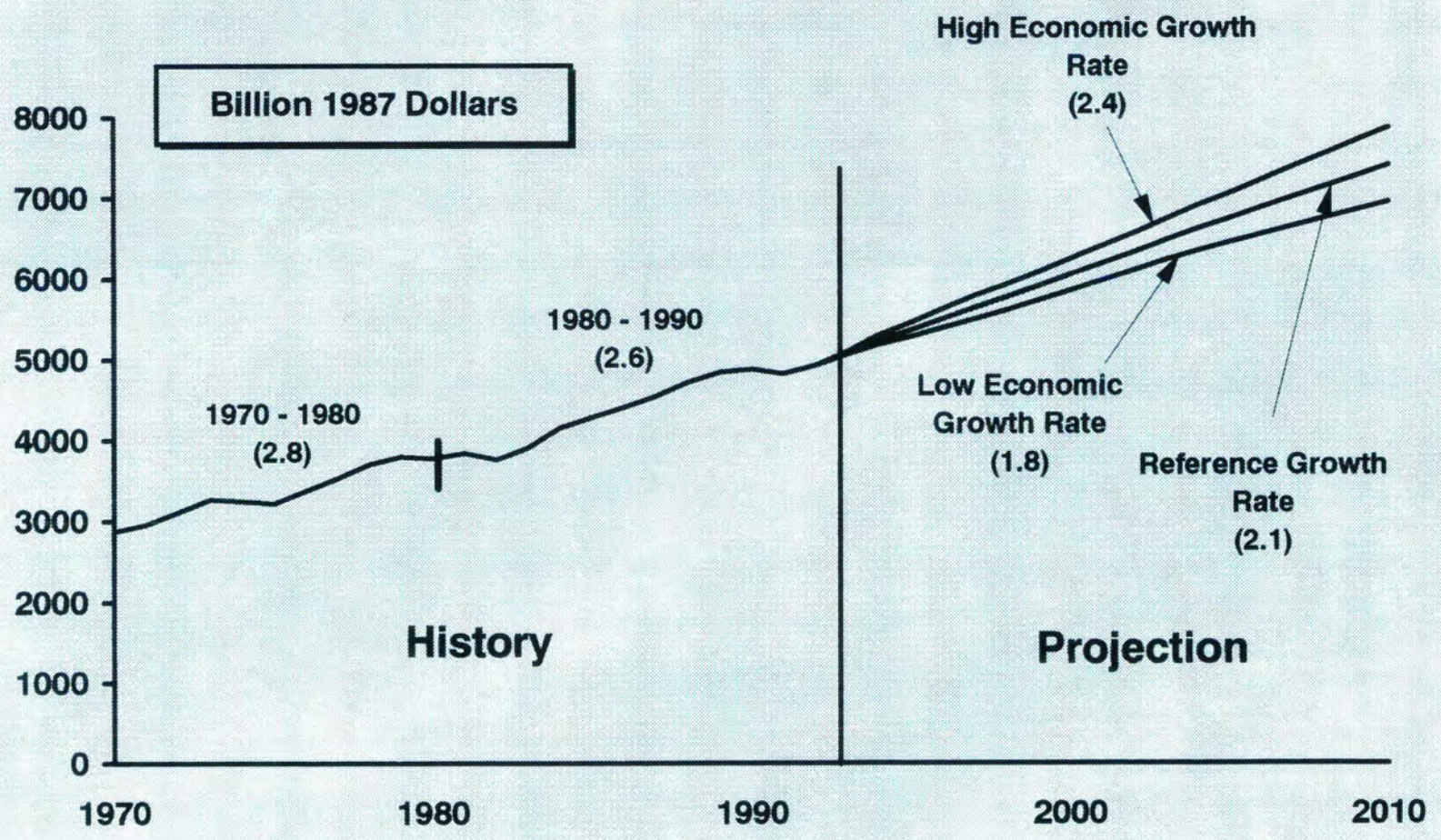
U.S. Gross Domestic Product
1970 - 2010



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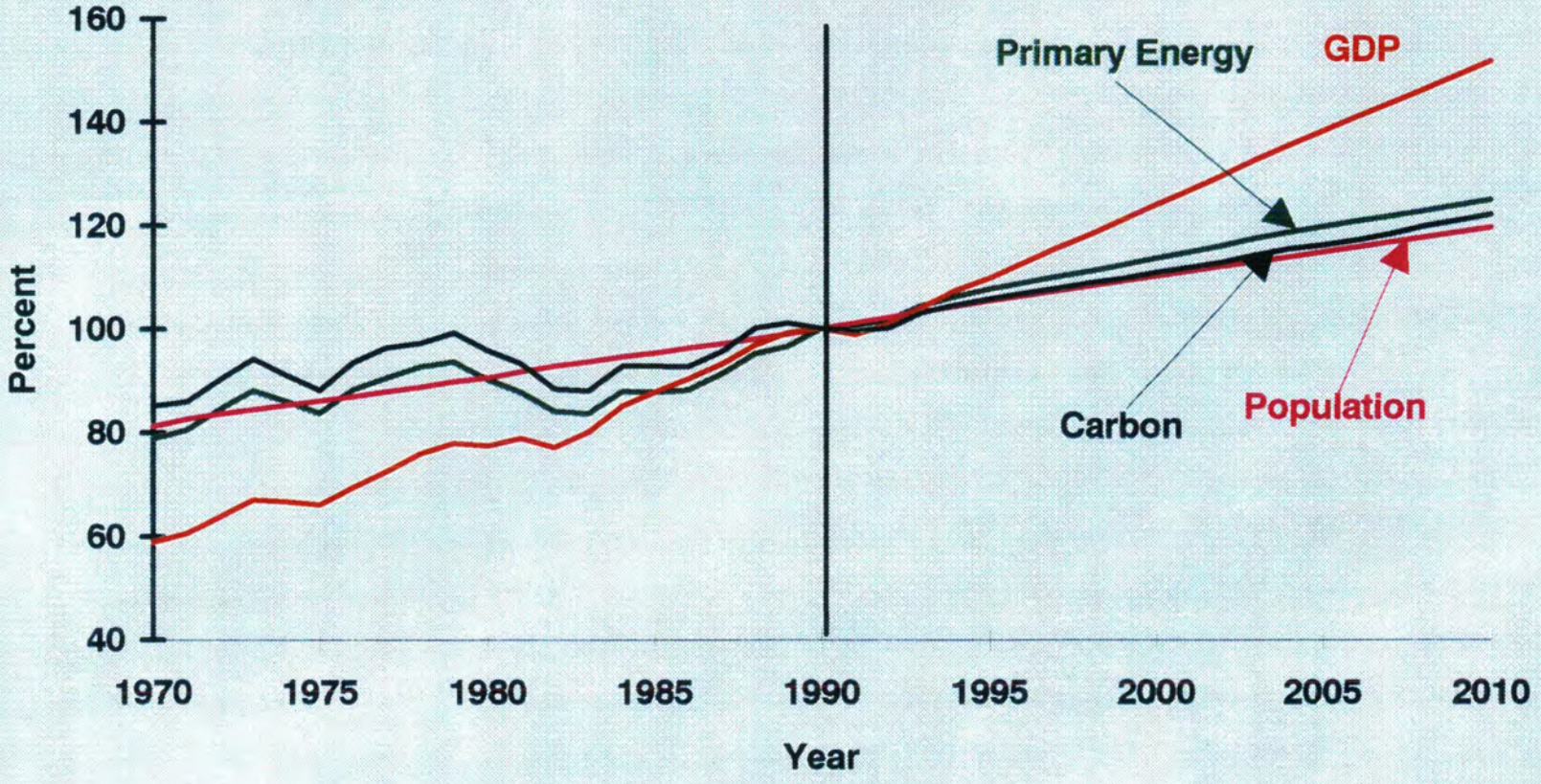
Note: ( ) = annual GDP growth rate

Indices of Economic Growth, Energy Consumption, Population and Carbon Emissions (1990=100)



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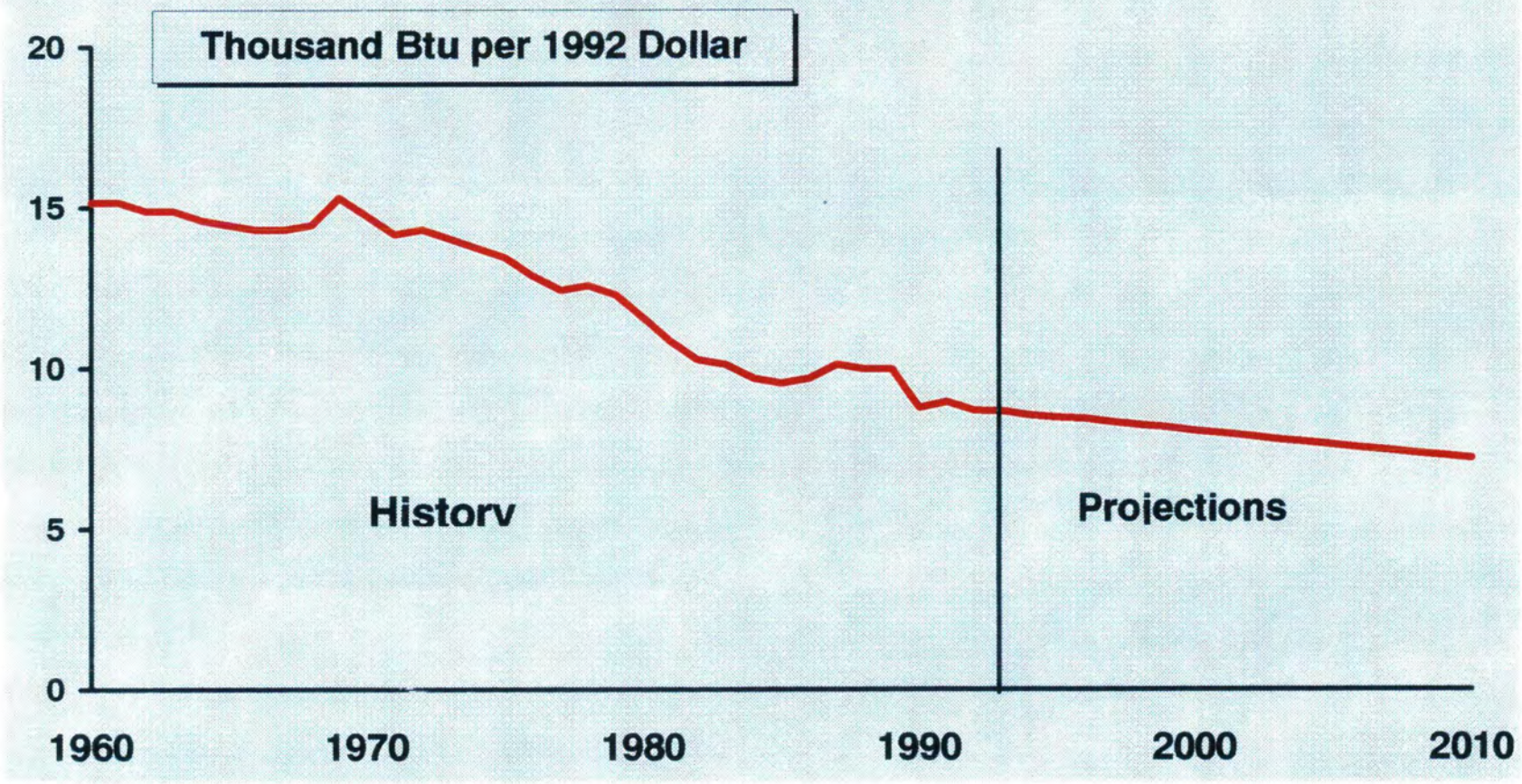
U.S. Industrial Energy Intensity
1960 - 2010



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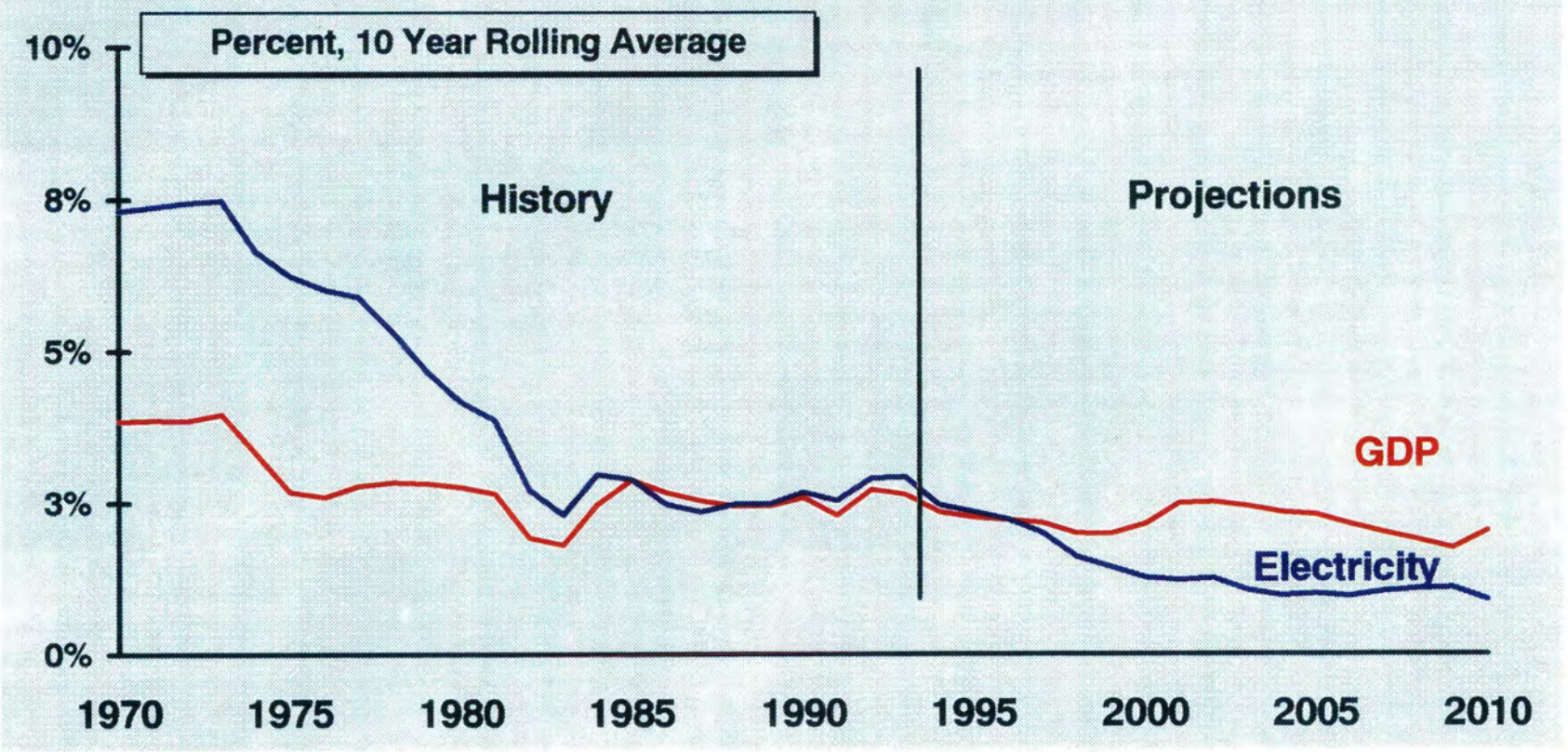
Electricity Sales and Economic Growth Rates
1970 - 2010



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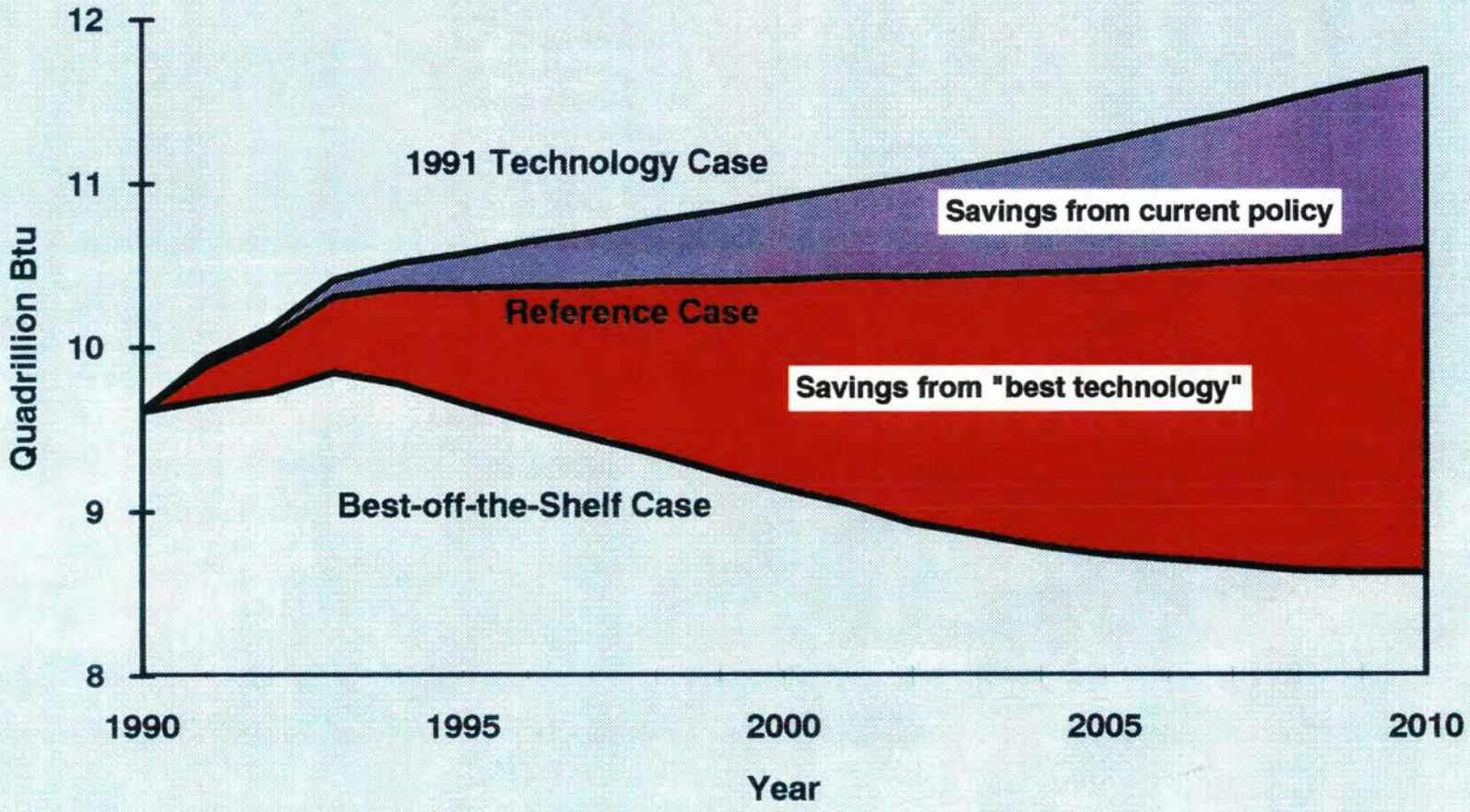
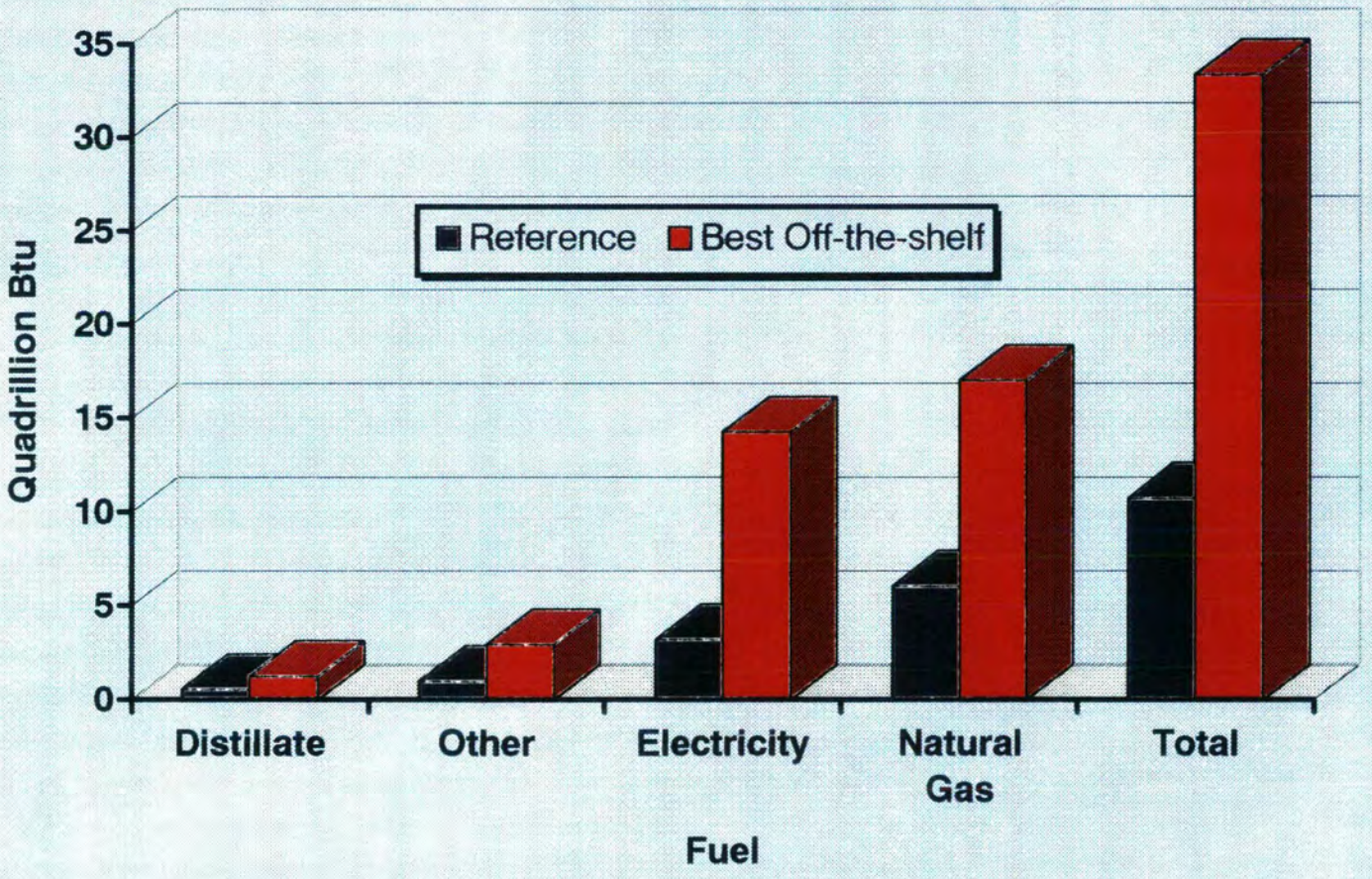
Residential Energy Consumption in Three Scenarios, 1990-2010



Cumulative Energy Savings From Efficiency Gains in Two Scenarios, Residential Sector, 1990-2010



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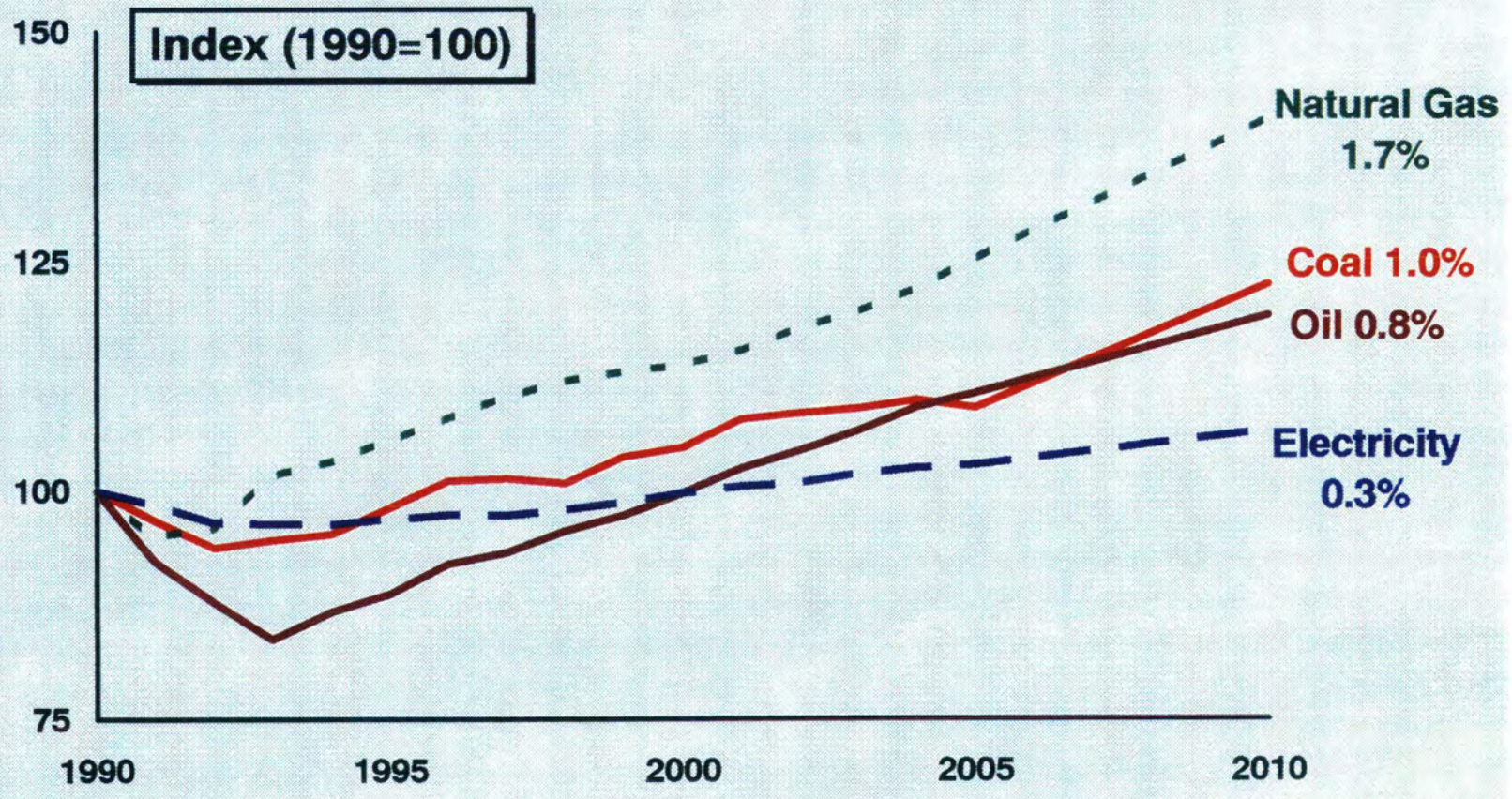
Energy Prices : Relative Indices 1990 - 2010



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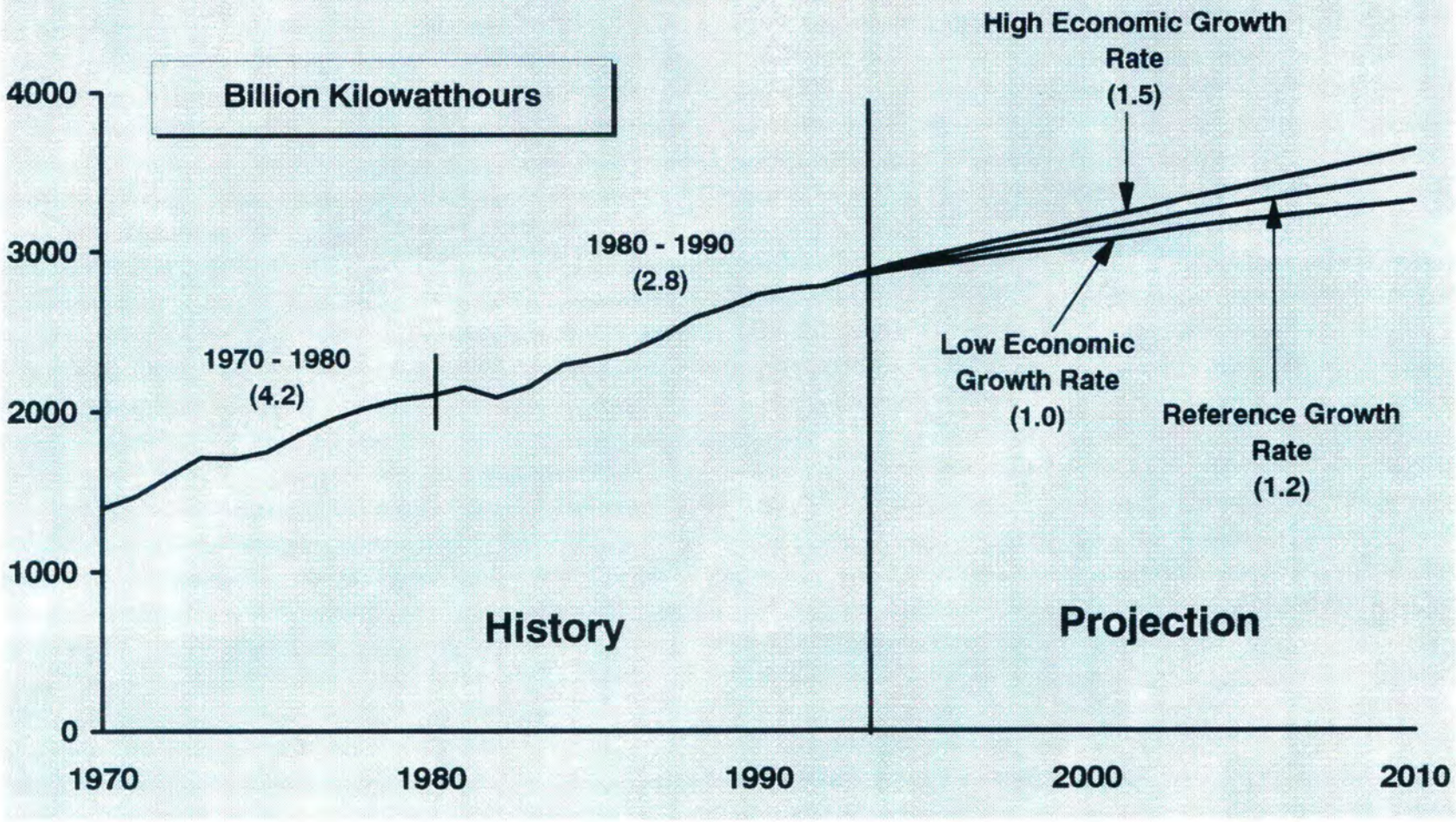
Electricity Sales
1970 - 2010



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Note: ( ) = annual electricity sales growth rate

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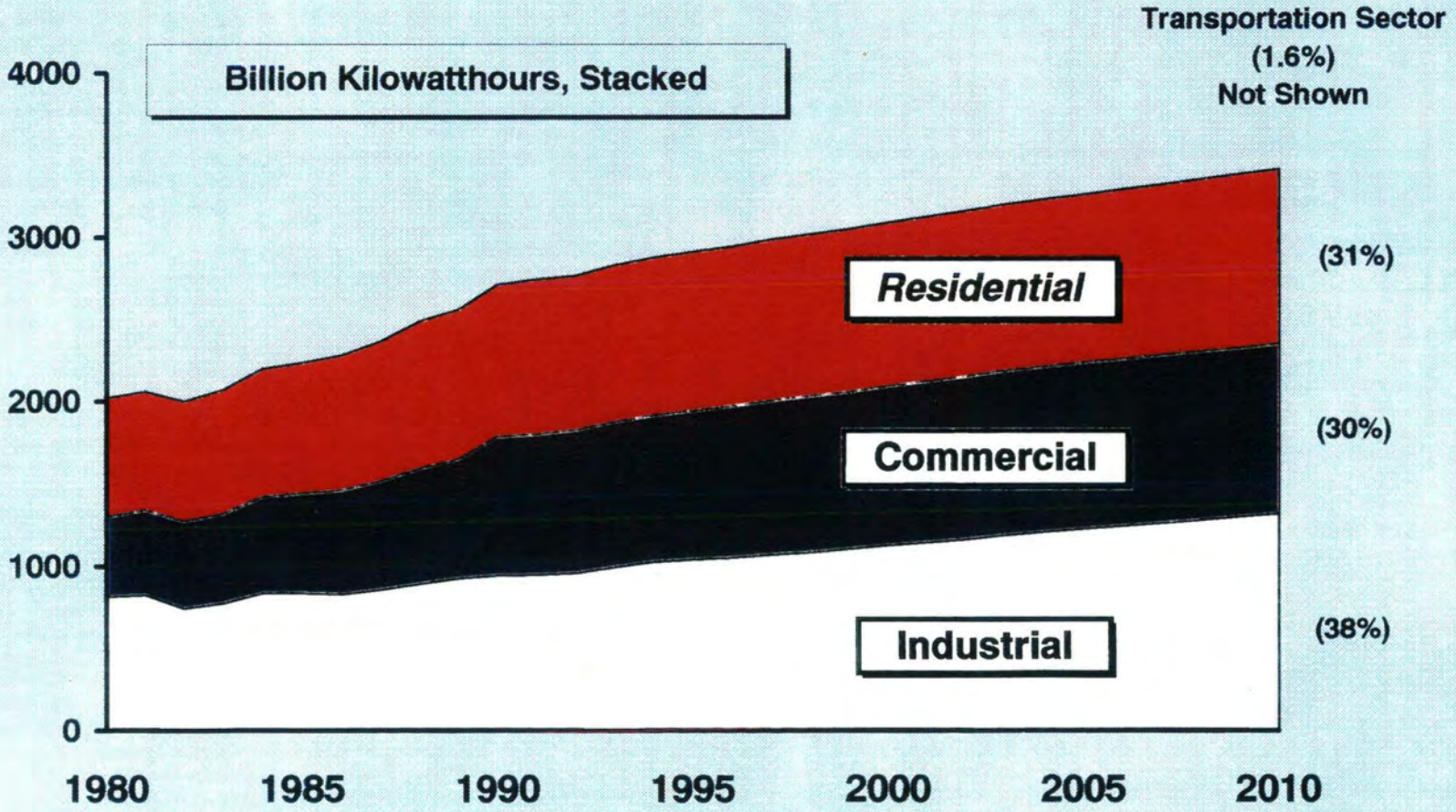
Electricity Sales
1980 - 2010



OIAF/01/94 Note: (*.*%) indicates percentage of total sales in year 2010

Meeting the Demand for Electricity

- Increased Utilization of Existing Plants
- Extending the Lives of Existing Plants
- Electricity Imports
- Growing Reliance on Nonutility Generators
- Demand-Side Management
- Constructing New Plants

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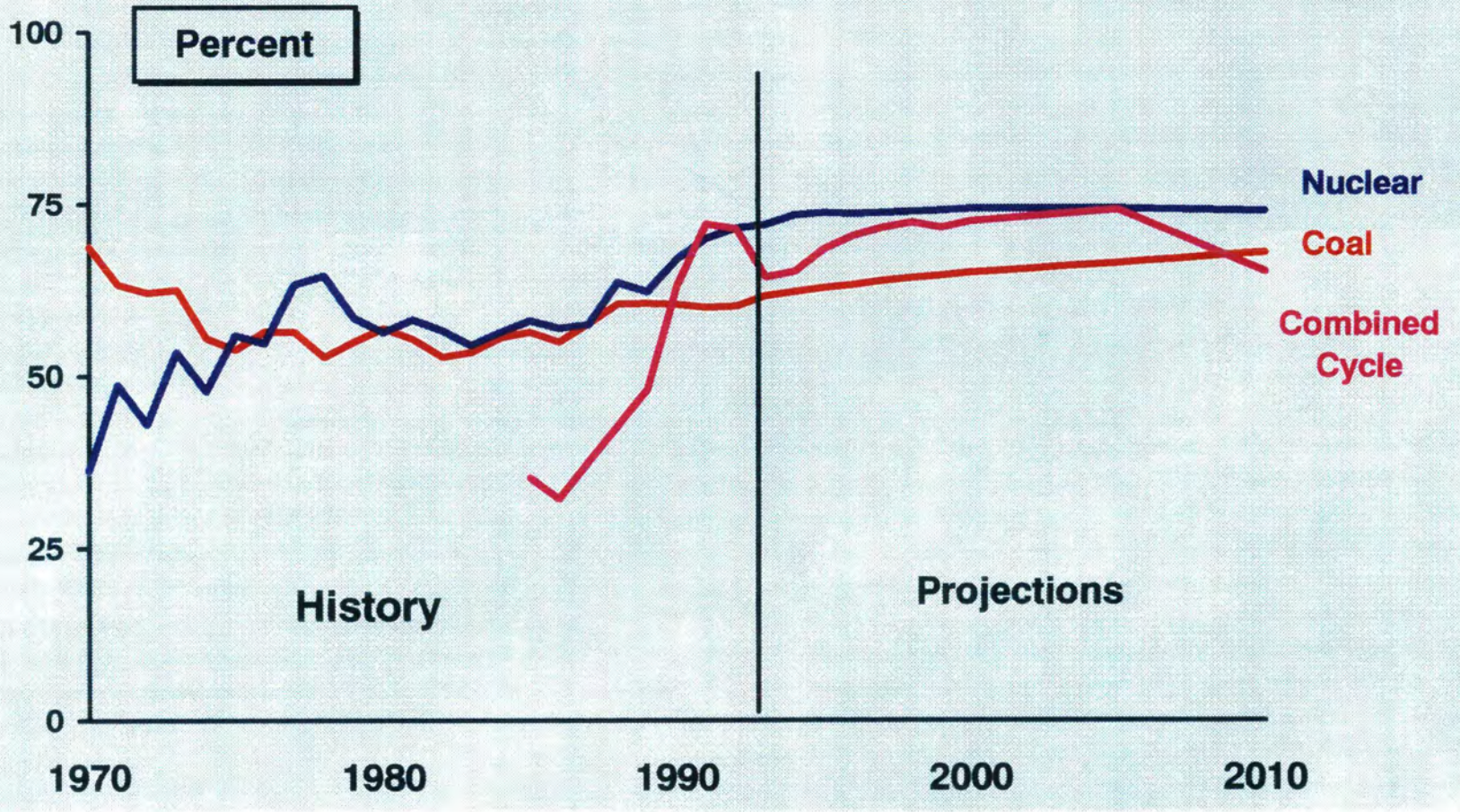
Utilization of Utility Power Plants
1970 - 2010



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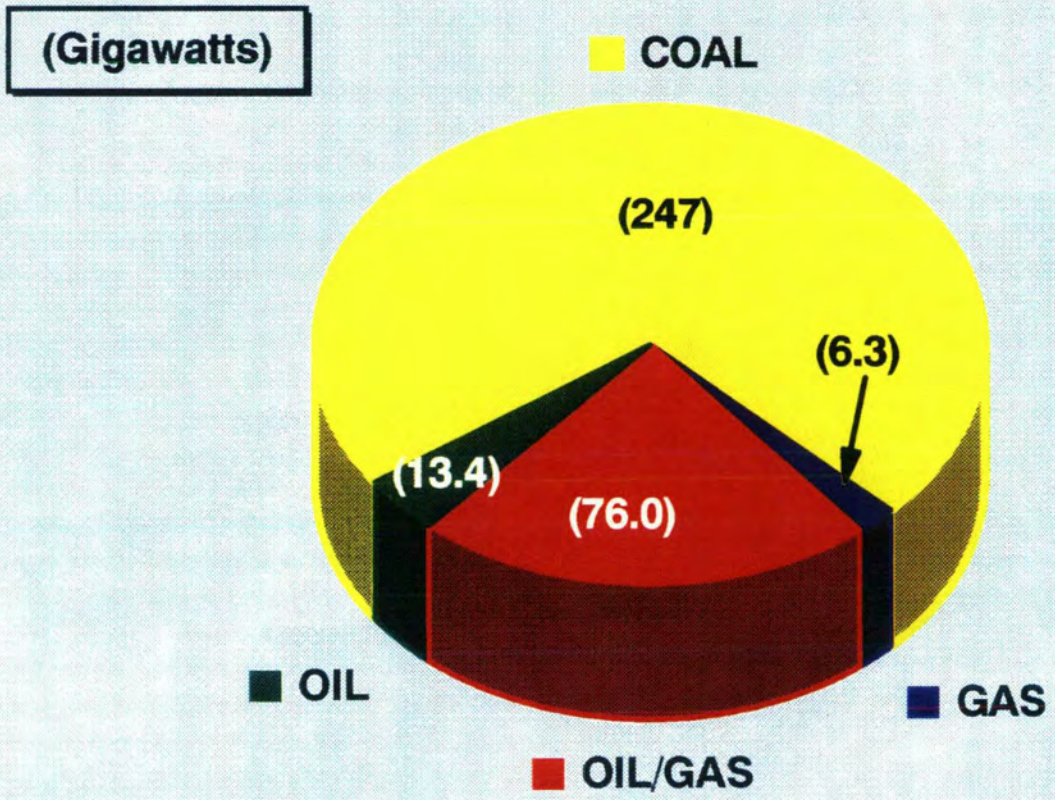
Life Extension Assumed
1990 - 2010



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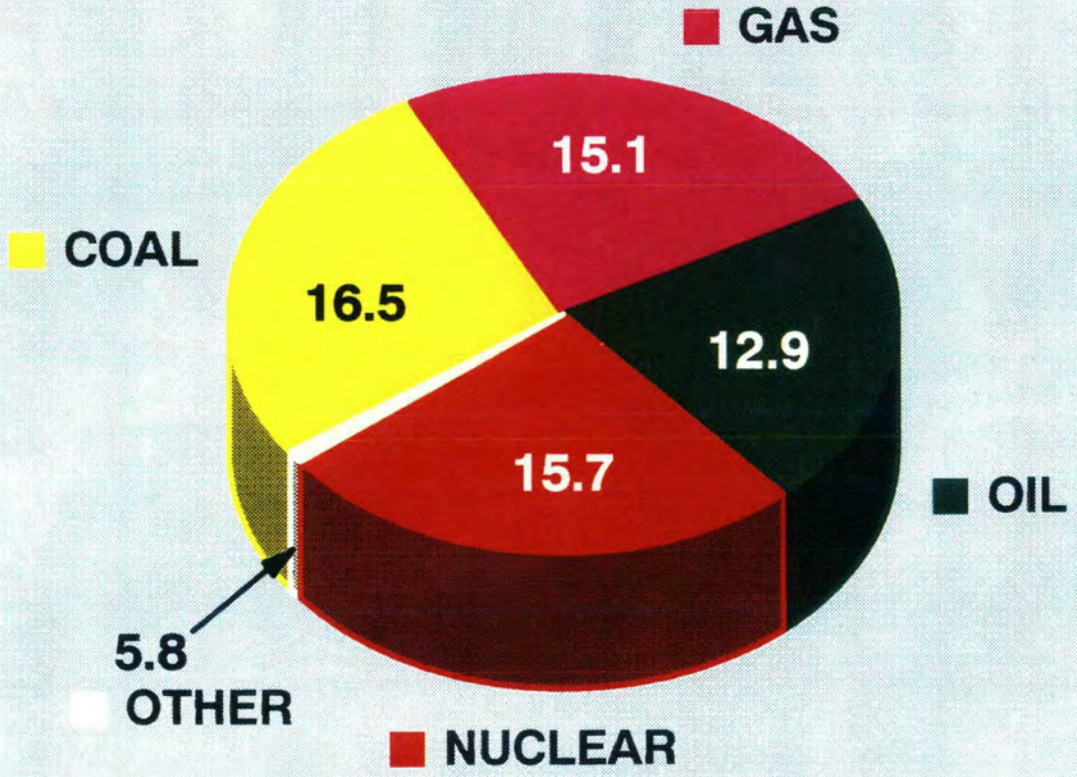
RETIREMENTS
1990 - 2010

(Gigawatts)



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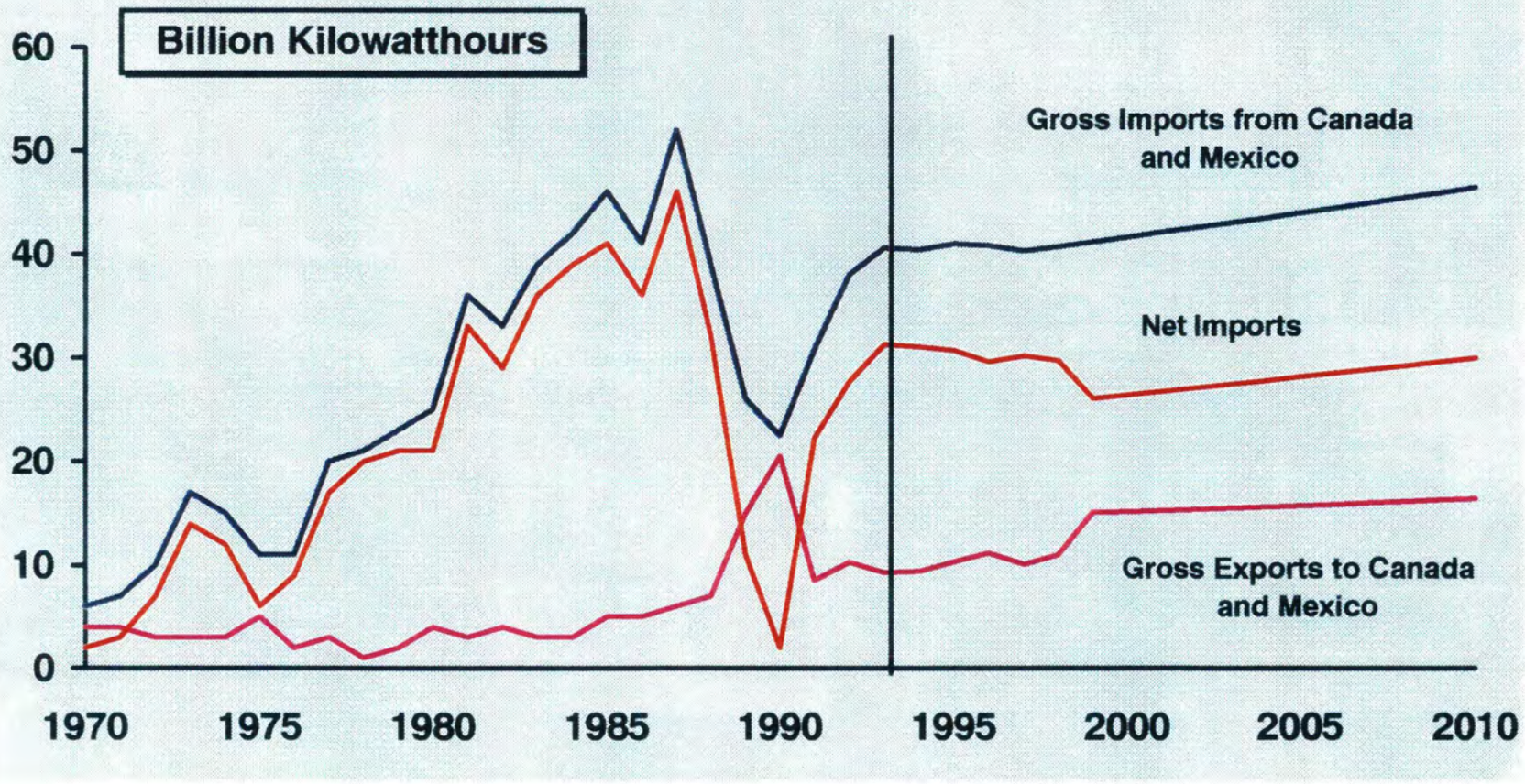
Electricity Trade with Canada and Mexico
1970 - 2010



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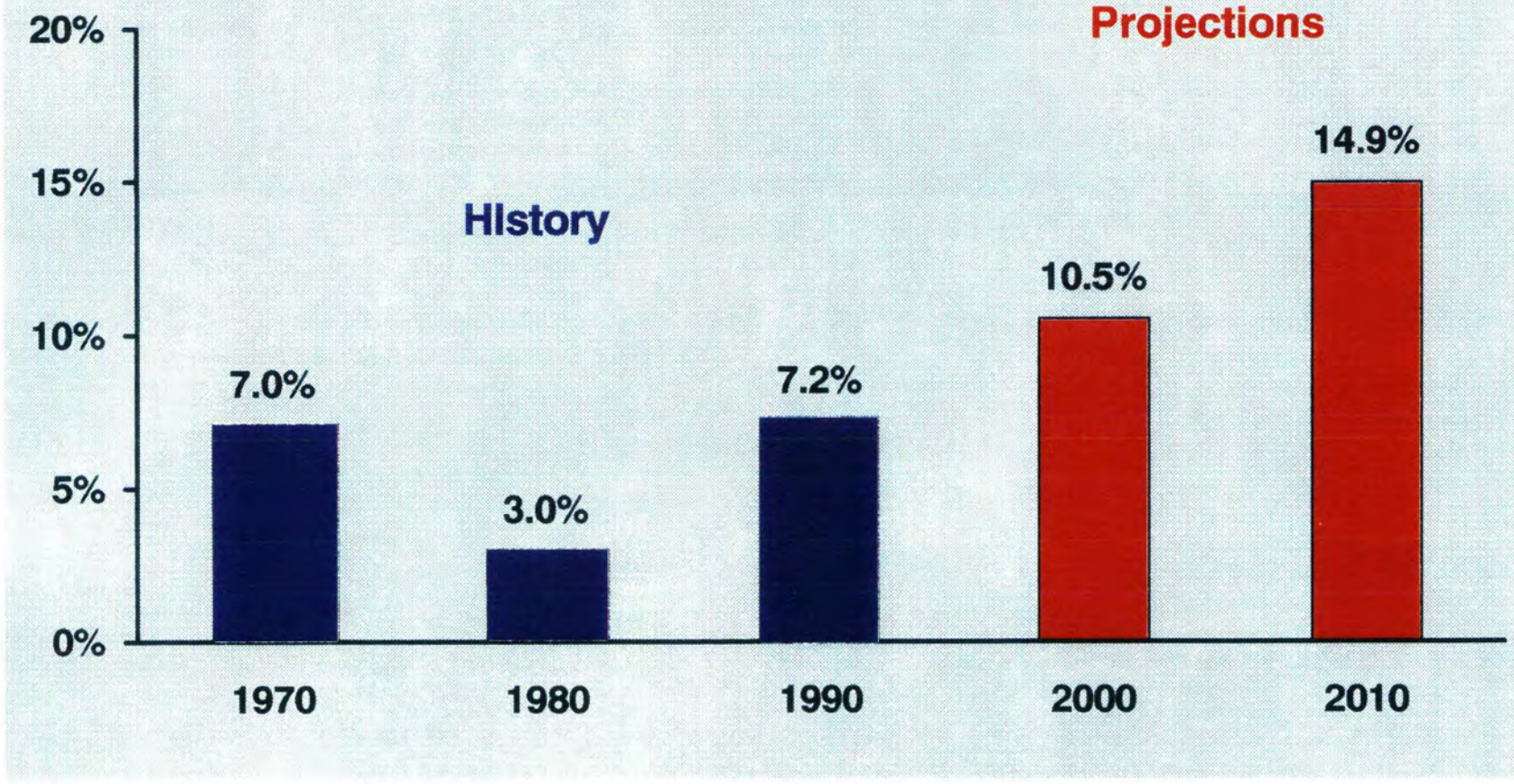
NONUTILITY SHARE OF TOTAL U.S. GENERATION



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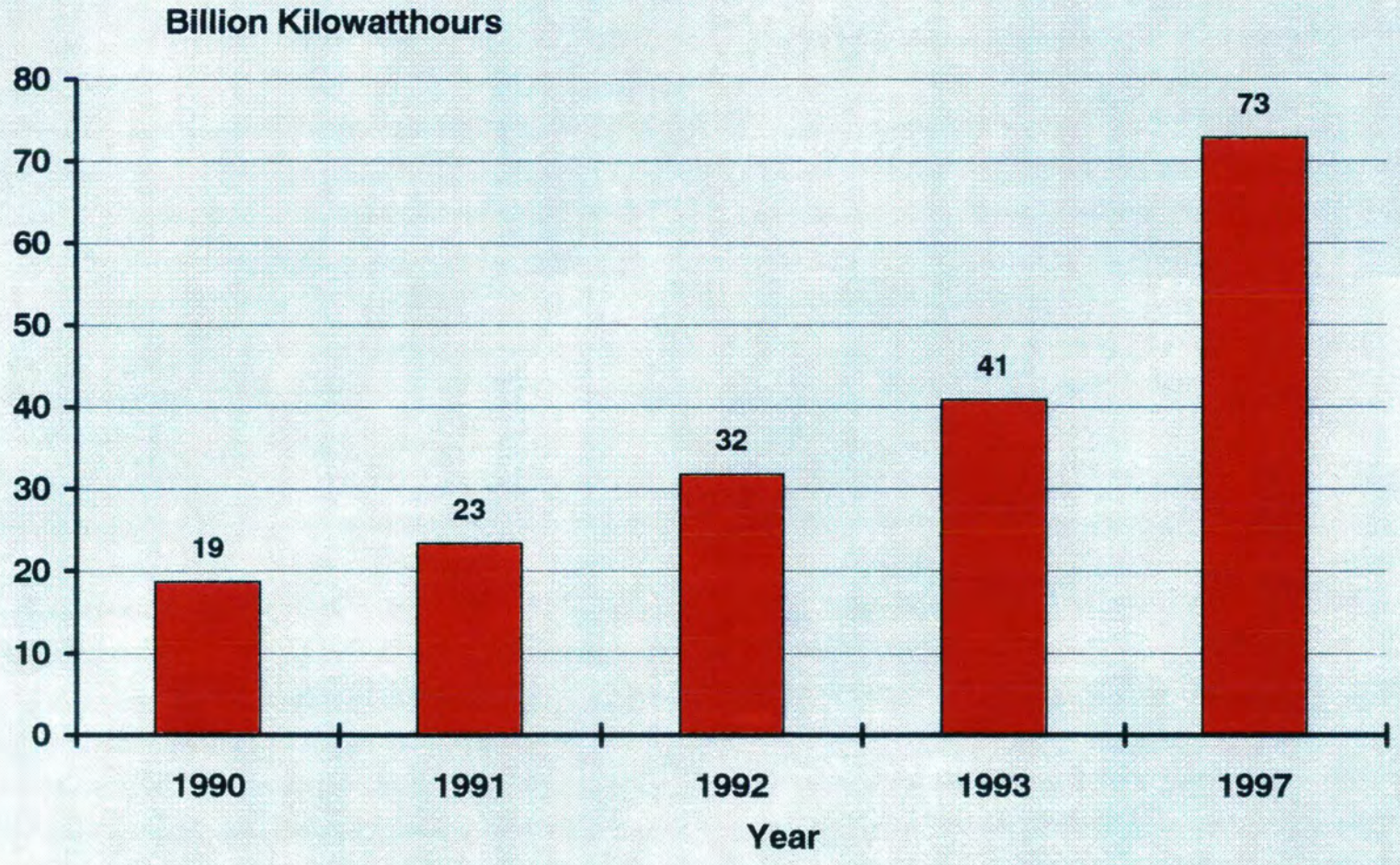
DSM Energy Savings



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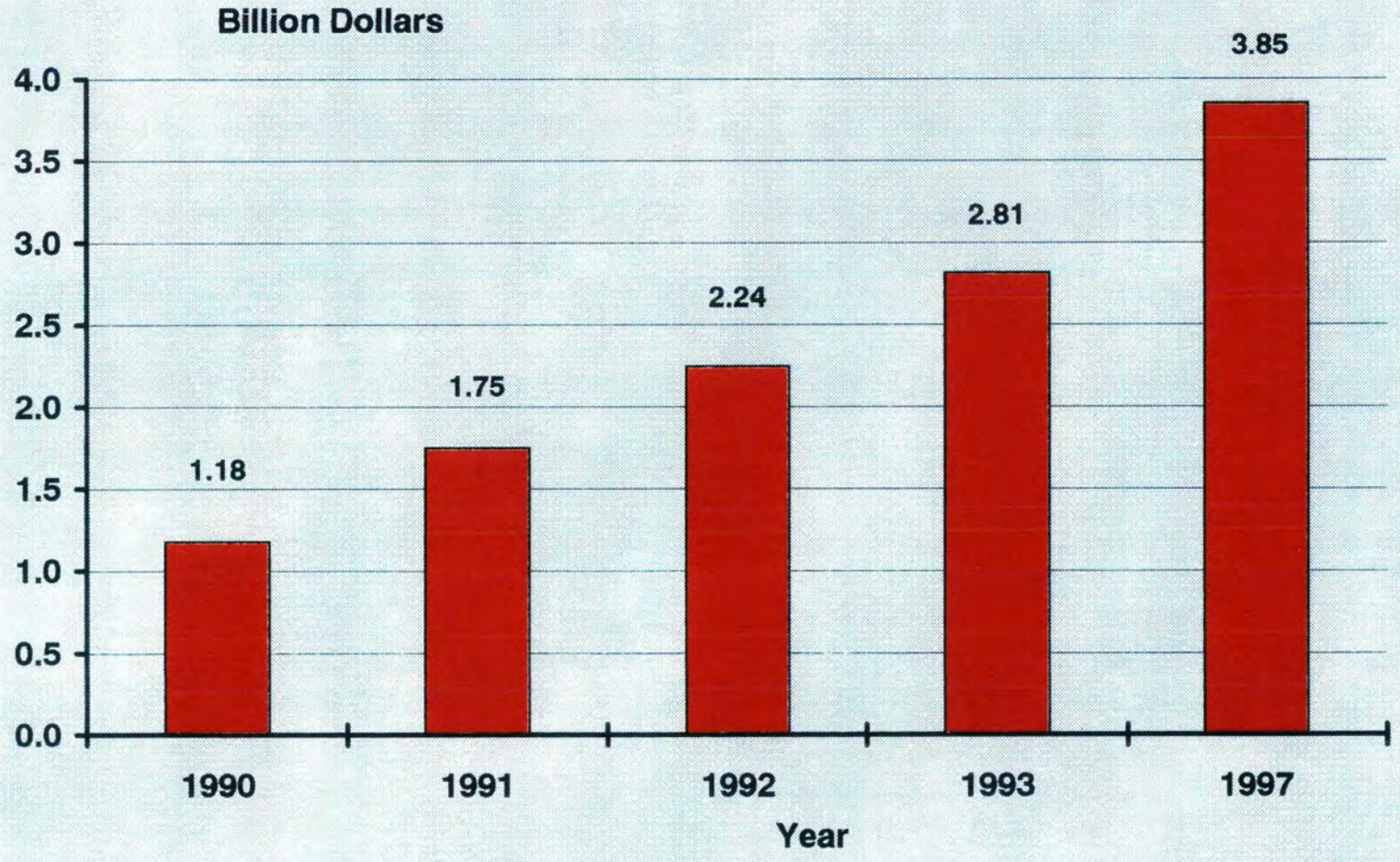
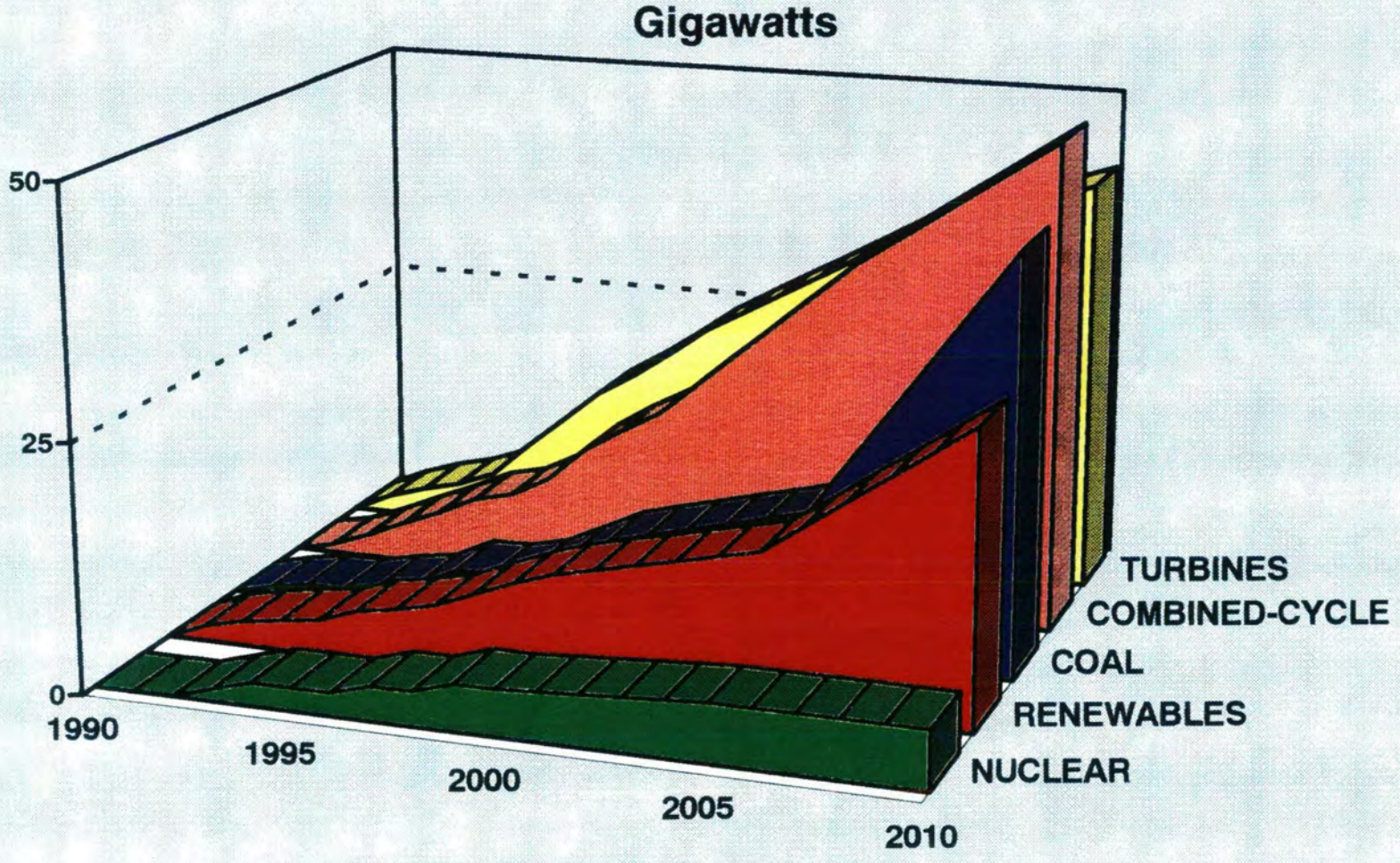
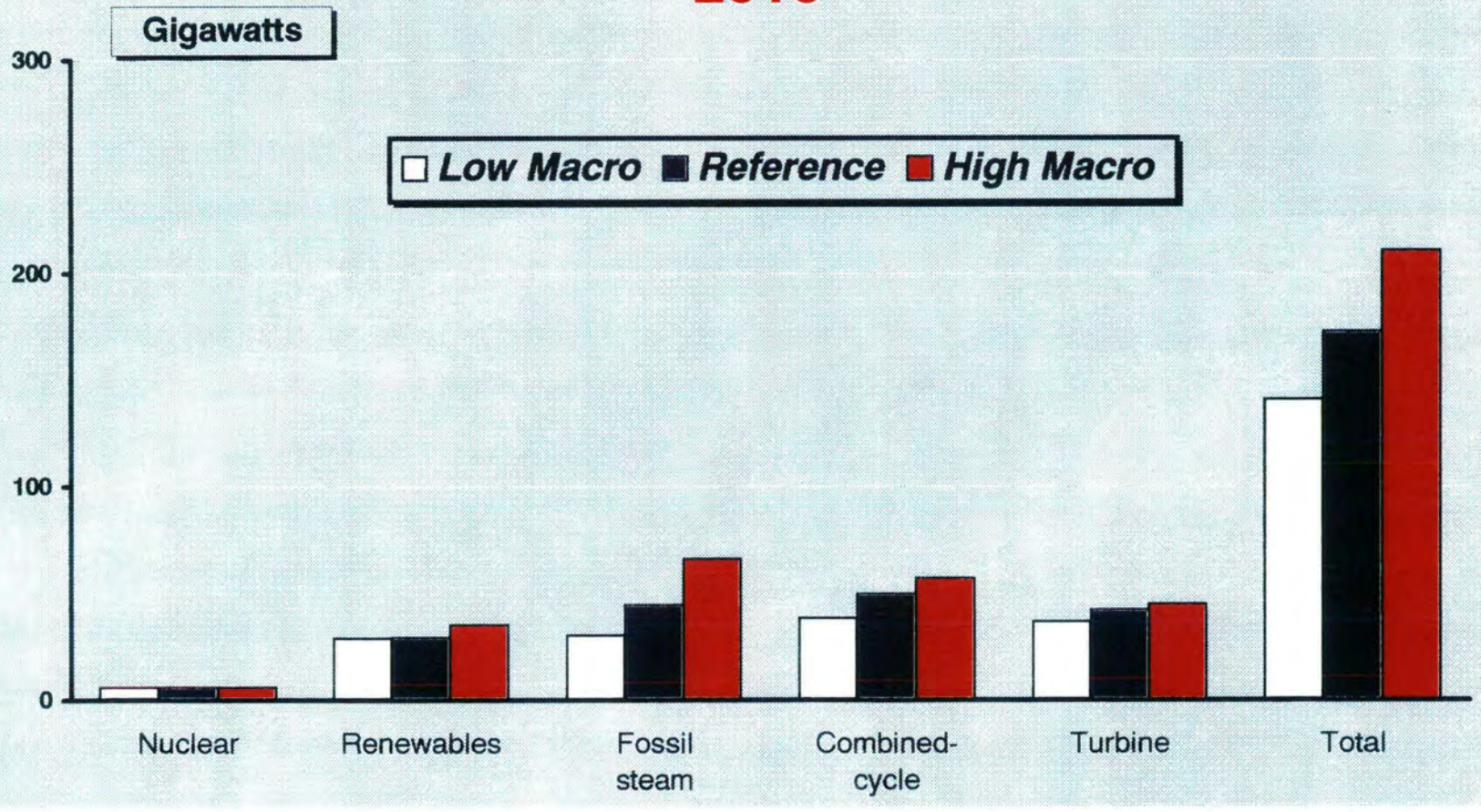
DSM Expenditures



Cumulative Additional Needed Capacity
1990 - 2010



Cumulative Additional Needed Capacity
Low, Mid, High Macroeconomic Growth
2010



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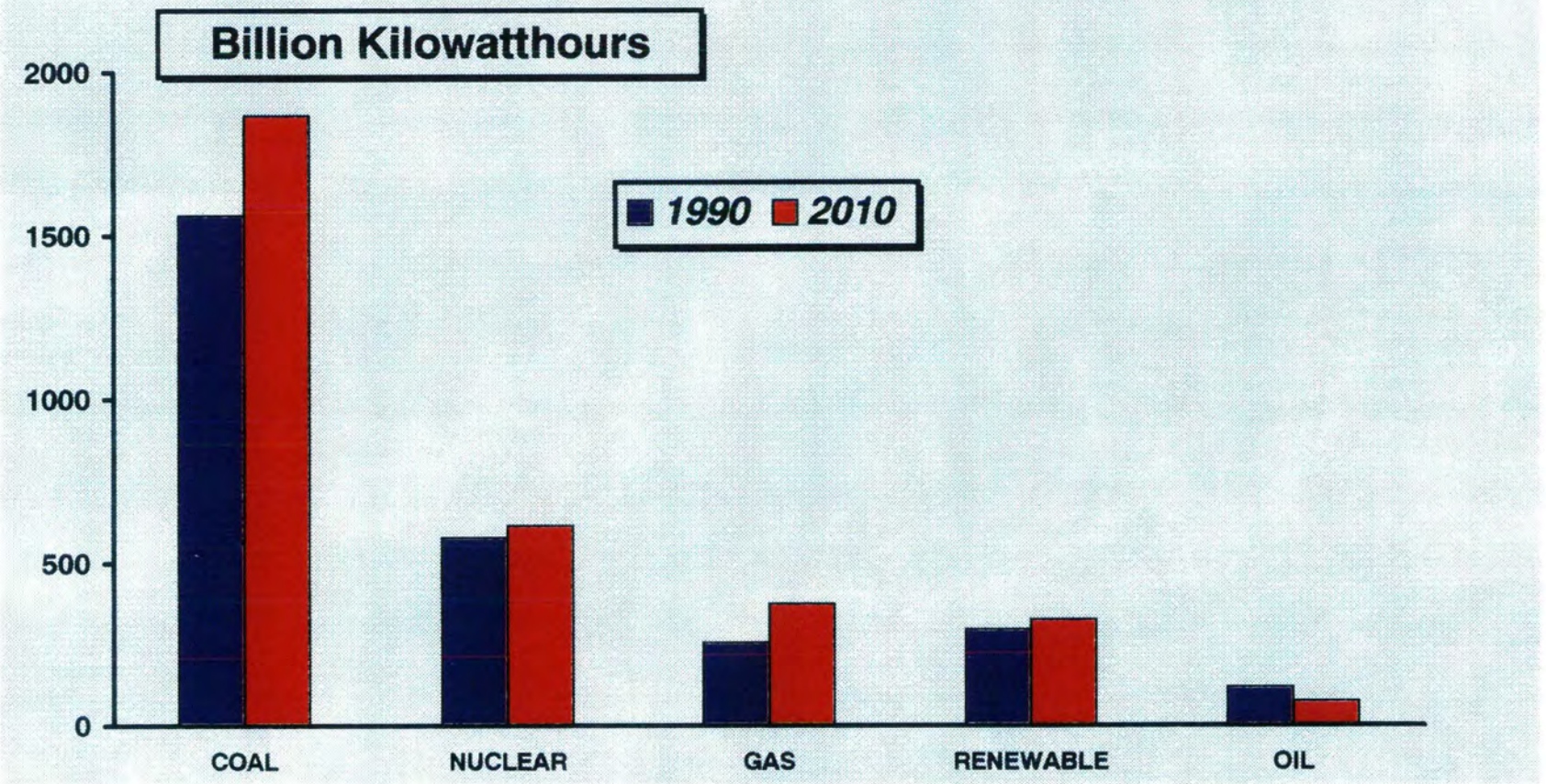
Generation by Fuel Type
1990 and 2010



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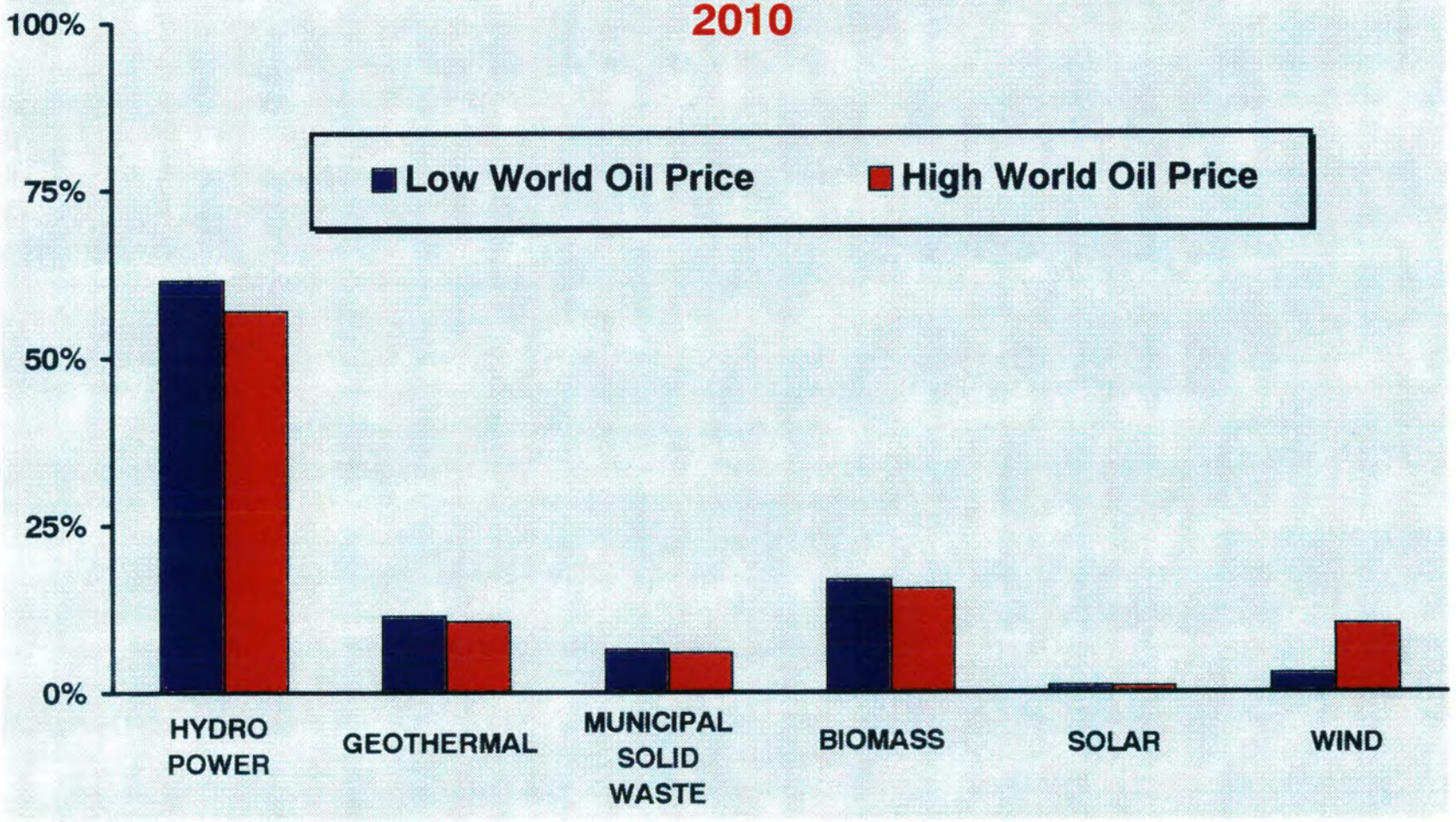
Electricity Generation from Renewable Sources
Share of Total Renewable Generation
2010



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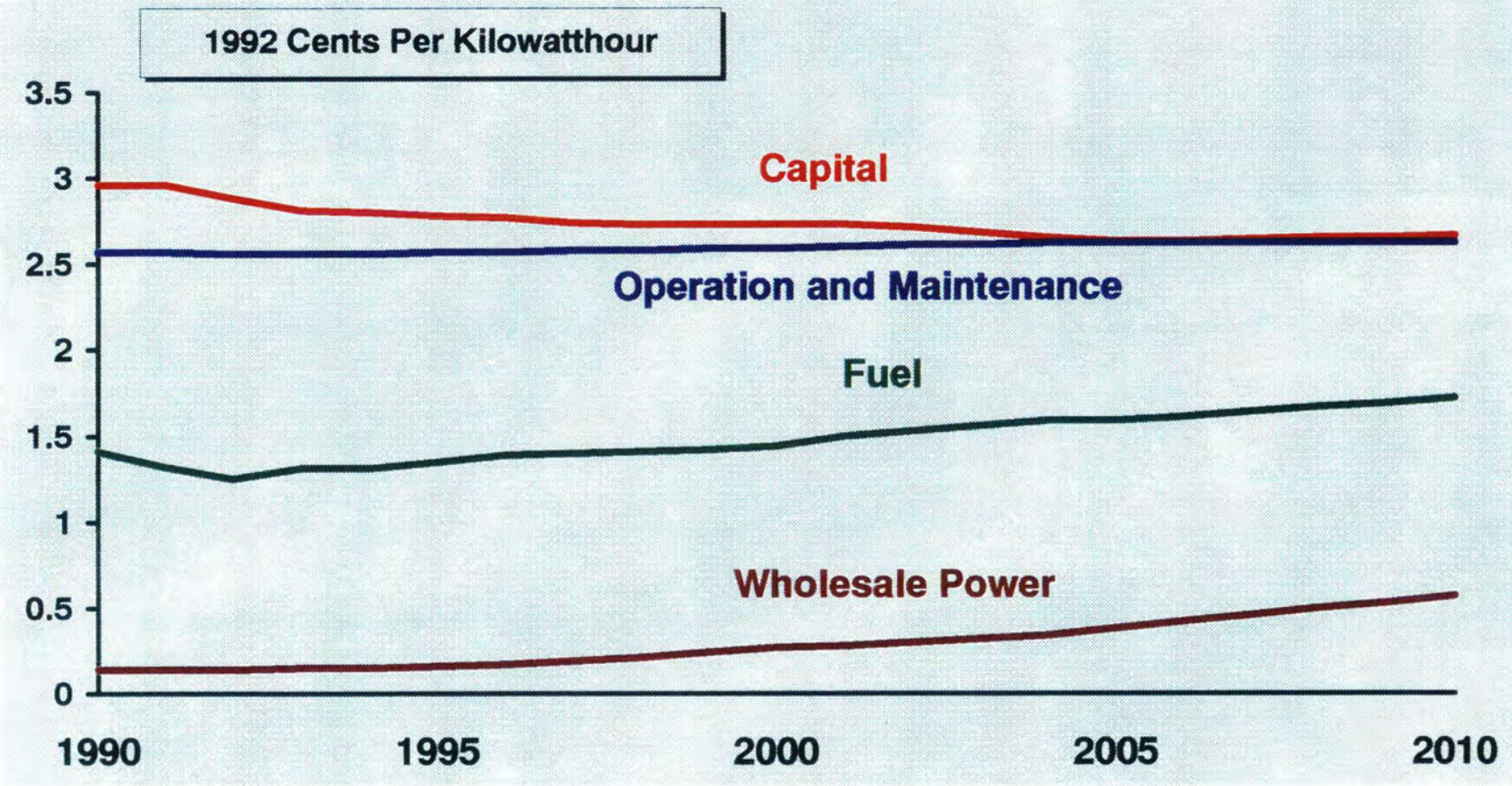
Components of Electricity Price
1990 - 2010



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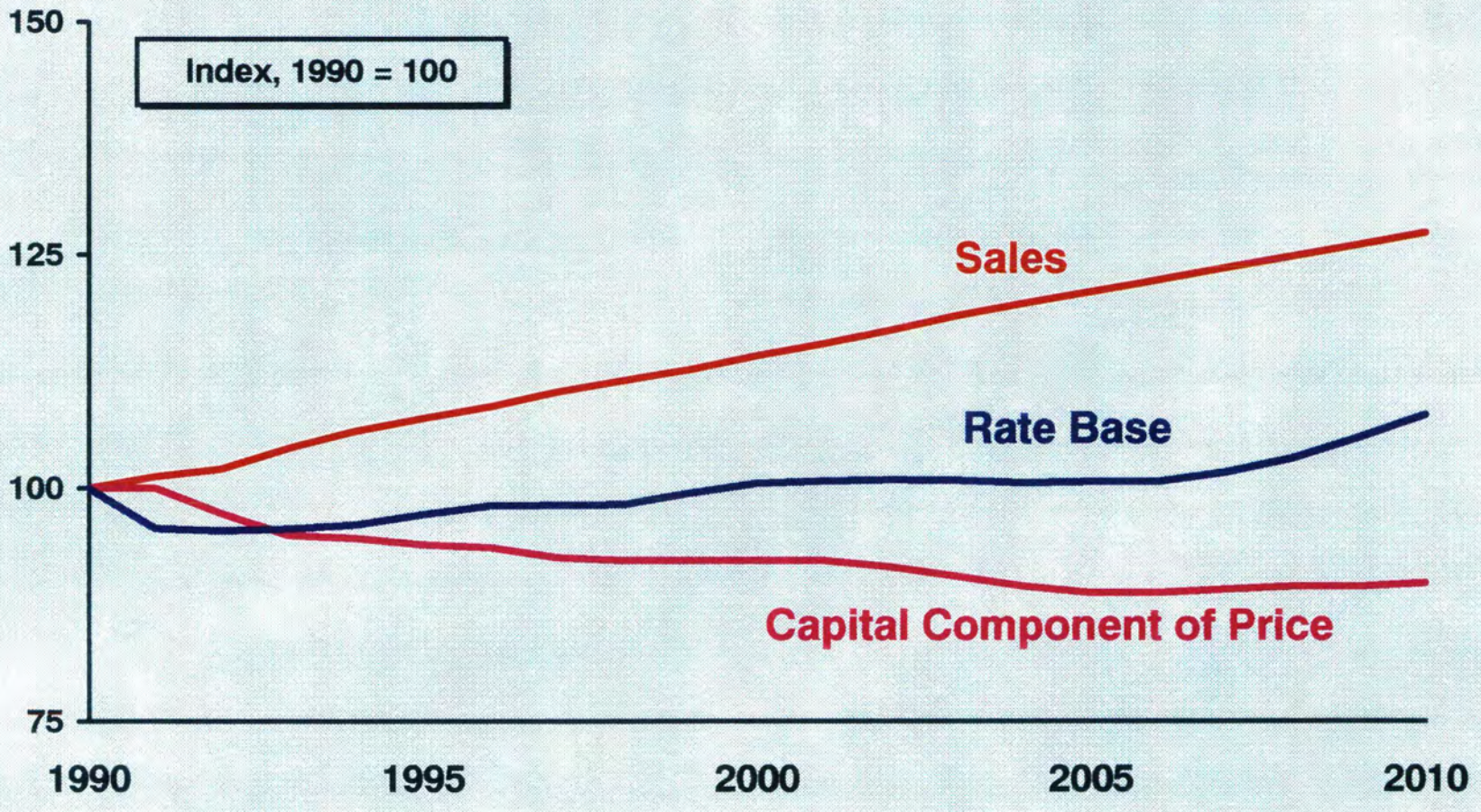
Indices of Capital Cost Factors
1990 - 2010



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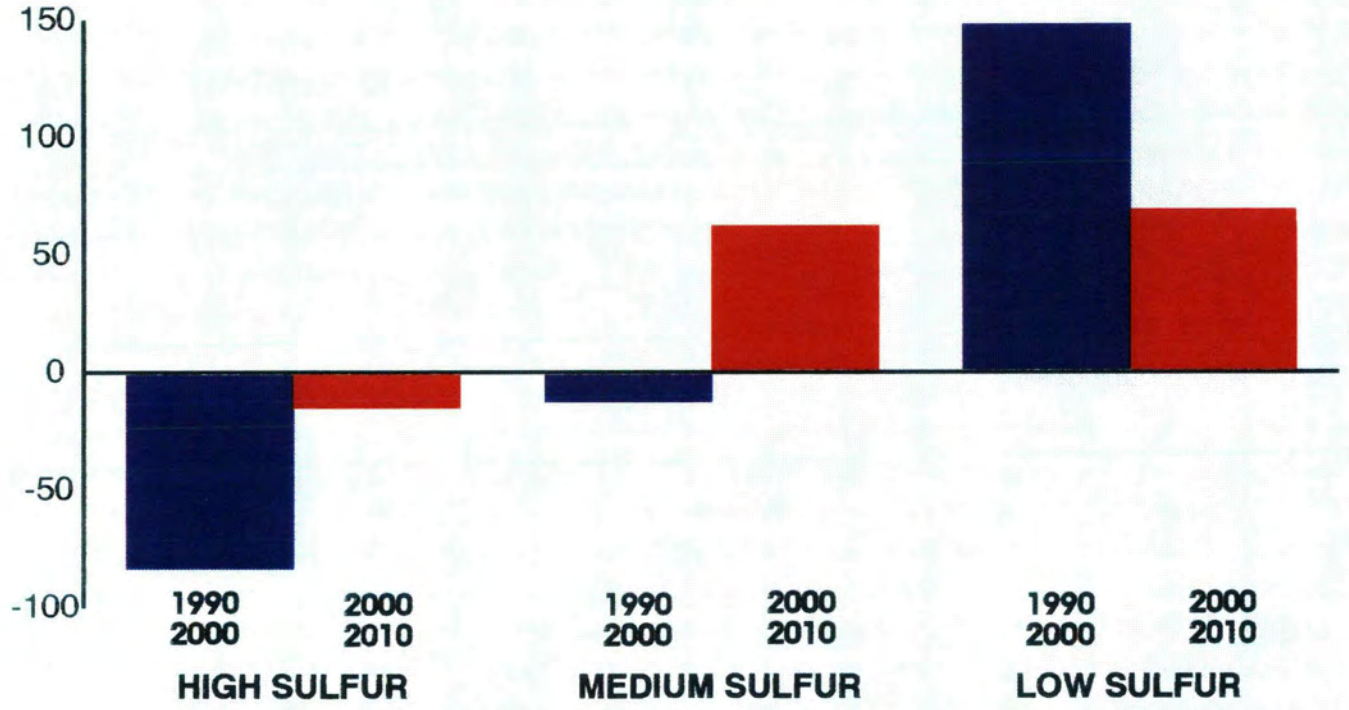
Change in coal consumption by sulfur content, 1990-2010

(million short tons)



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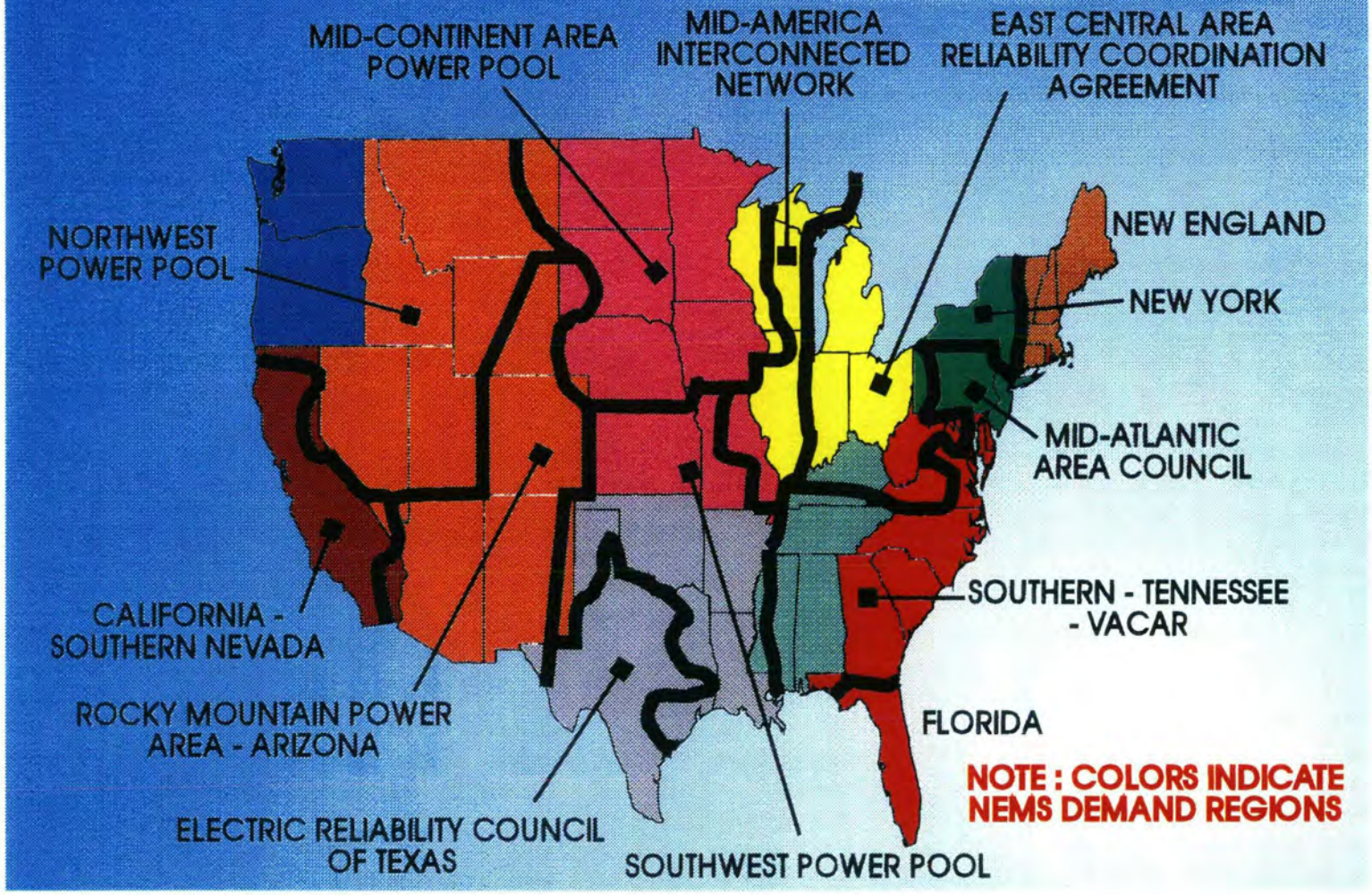
EMM SUPPLY REGIONS



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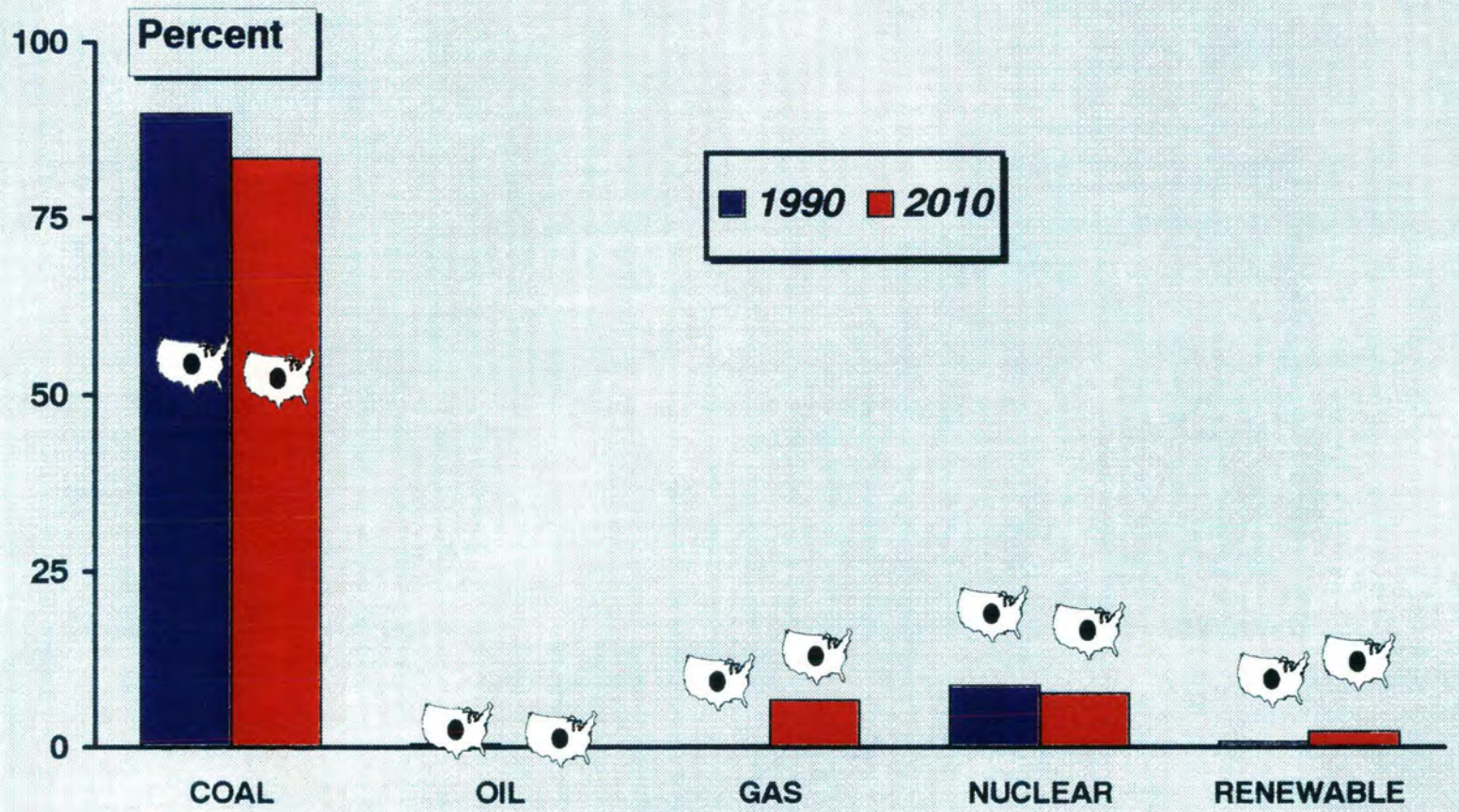
Generation Share By Fuel, 1990 and 2010

East Central Area Reliability Coordination Agreement



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Note: Icons indicate national averages

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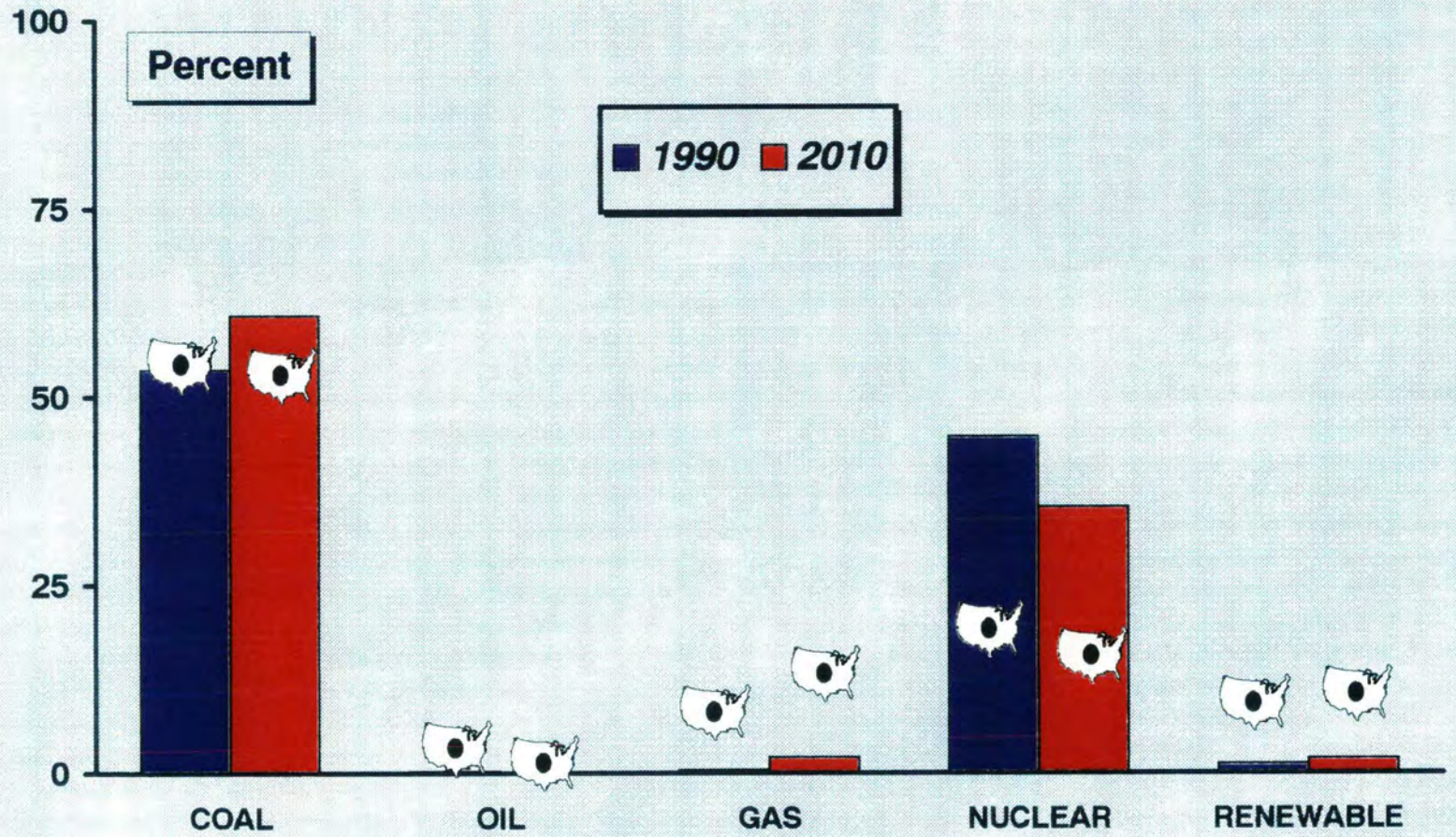
Generation Share By Fuel, 1990 and 2010
Mid-America Interconnected Network



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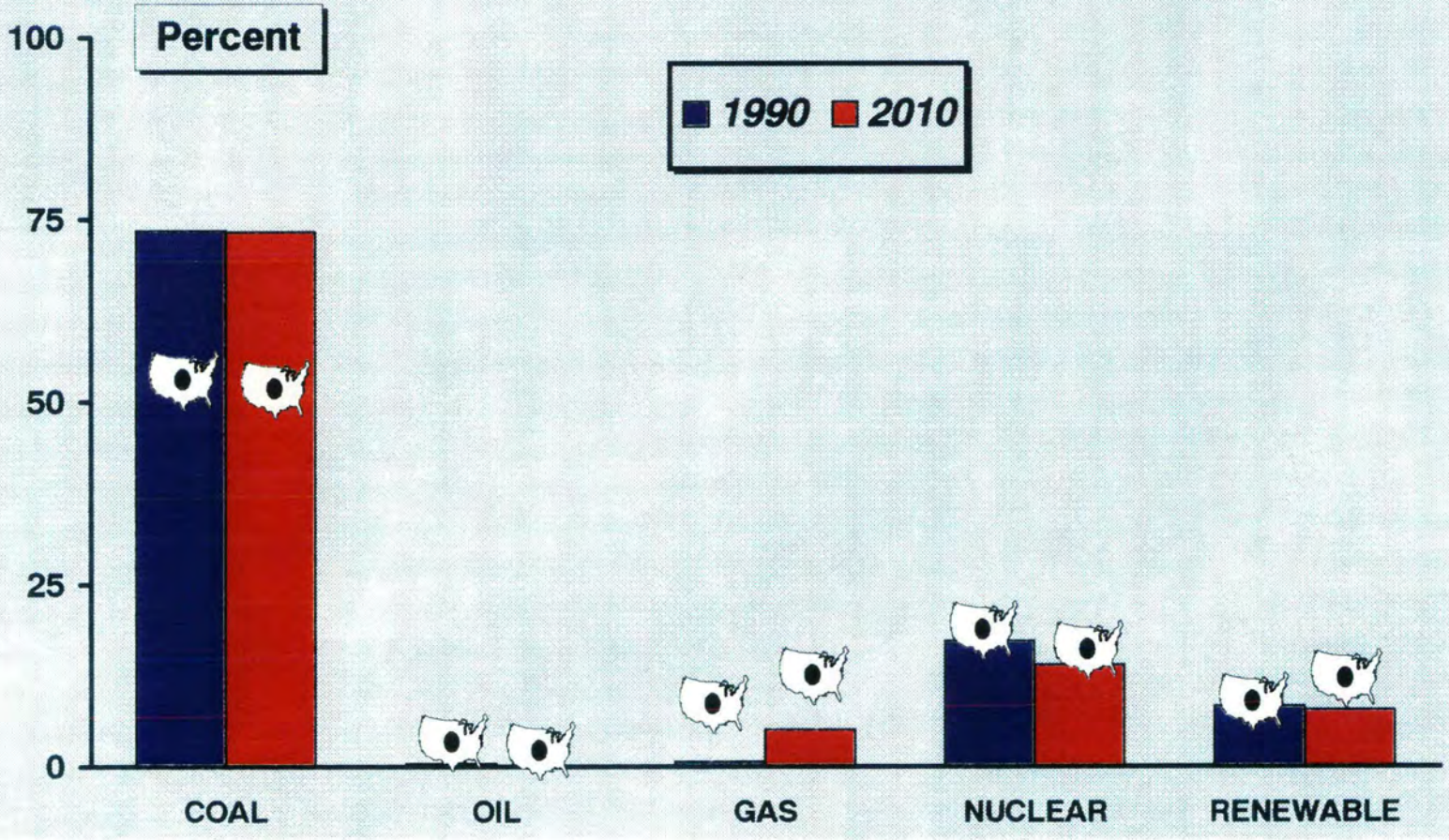
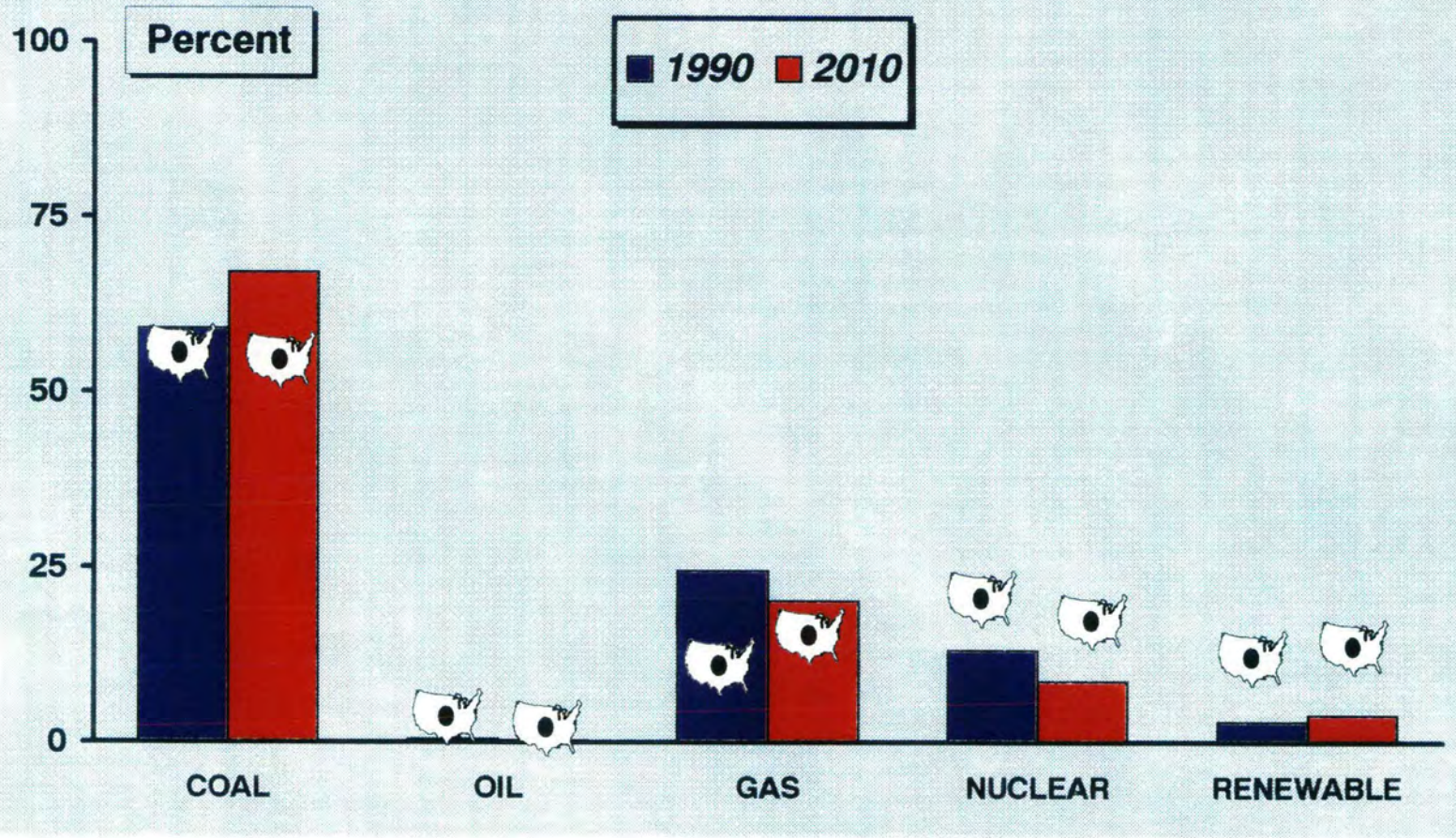
Note: Icons indicate national averages

Generation Share By Fuel, 1990 and 2010
Mid-Continent Area Power Pool



Note: Icons indicate national averages

Generation Share By Fuel, 1990 and 2010
Southwest Power Pool



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Note: Icons indicate national averages

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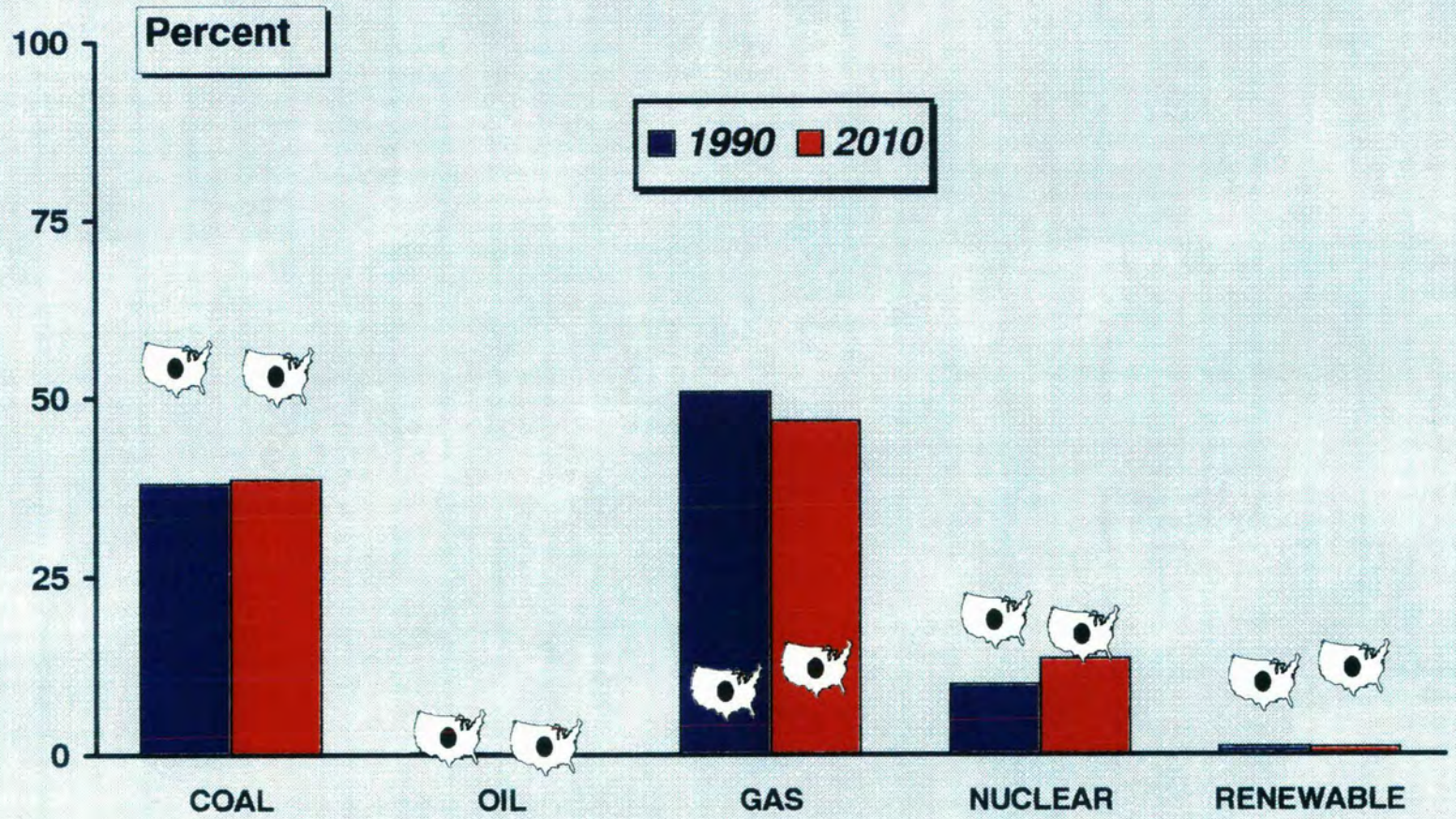
Generation Share By Fuel, 1990 and 2010
Electric Reliability Council of Texas



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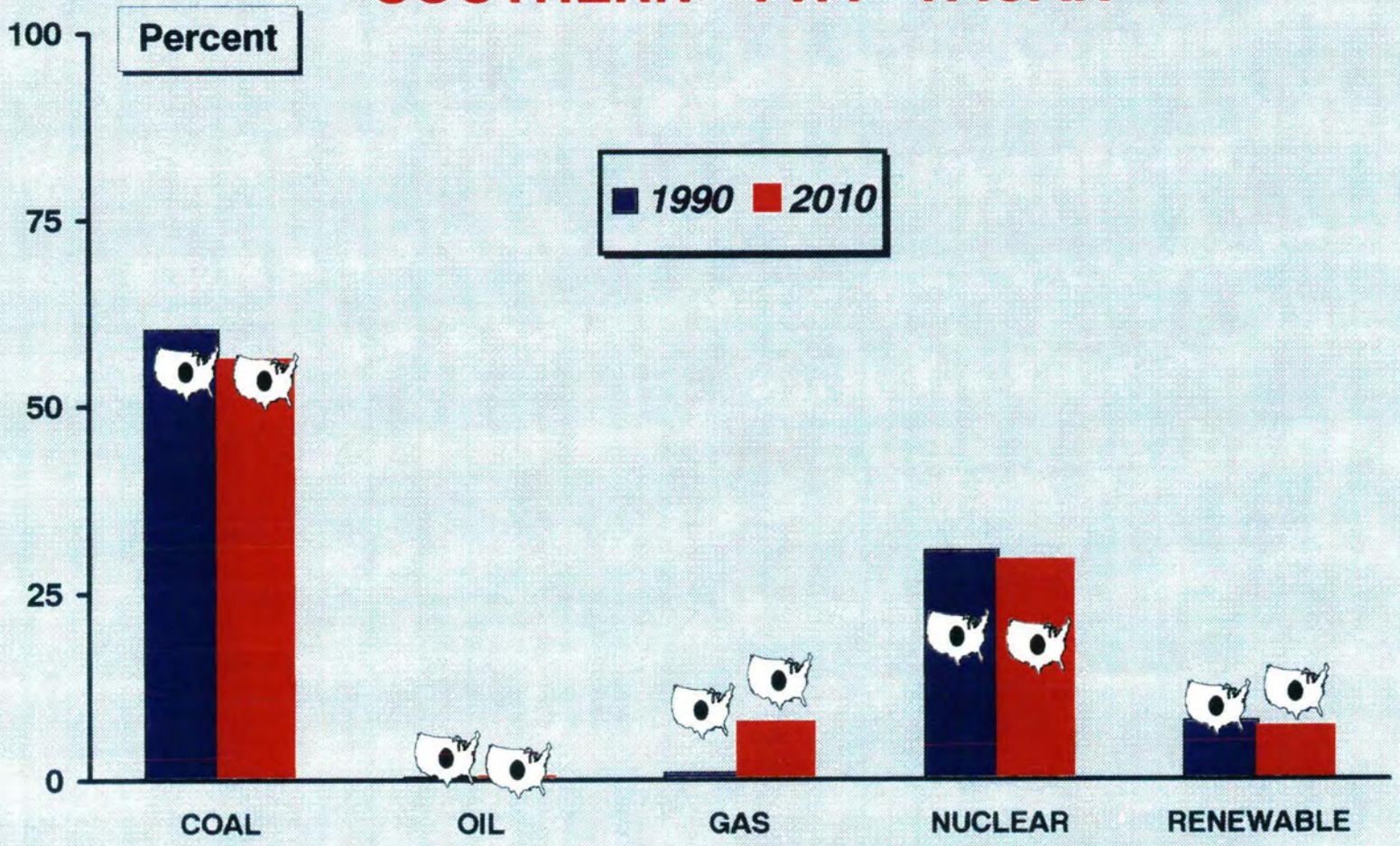
Note: Icons indicate national averages

Generation Share By Fuel, 1990 and 2010
SOUTHERN - TVA - VACAR



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Note: Icons indicate national averages

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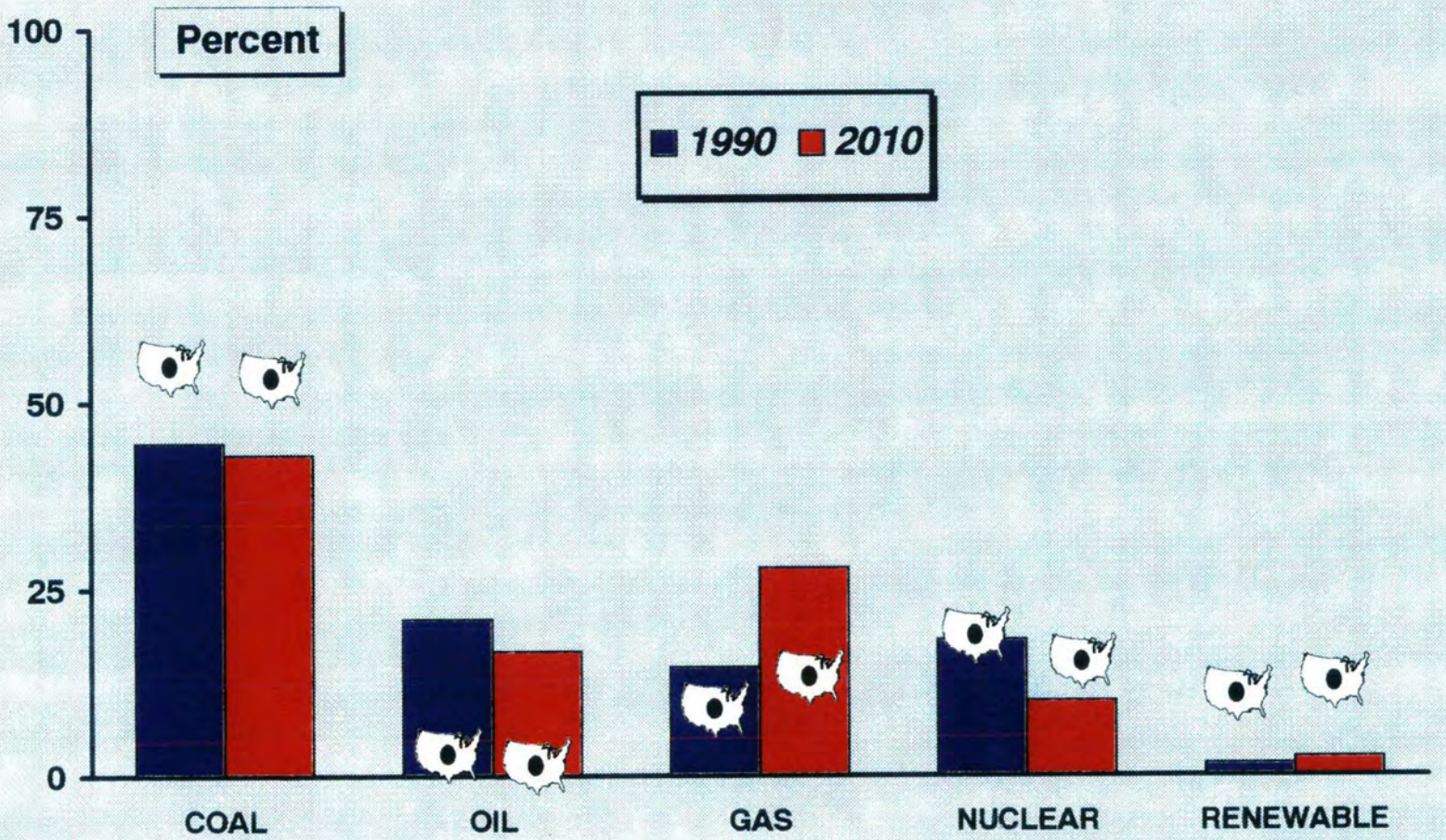
Generation Share By Fuel, 1990 and 2010
Florida



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Note: Icons indicate national averages

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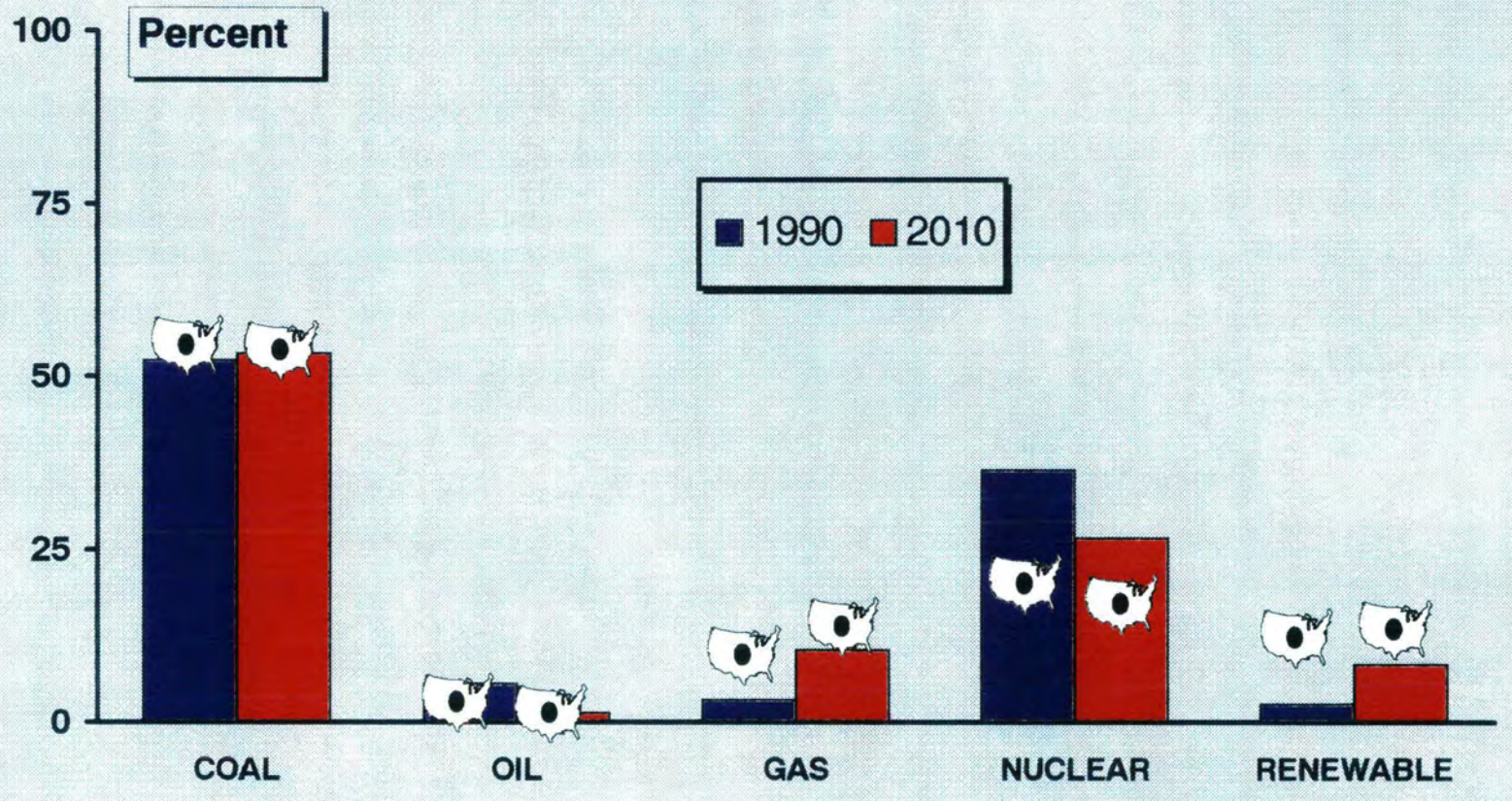
Generation Share By Fuel, 1990 and 2010
Mid-Atlantic Area Council



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Note: Icons indicate national averages

Energy Information Administration

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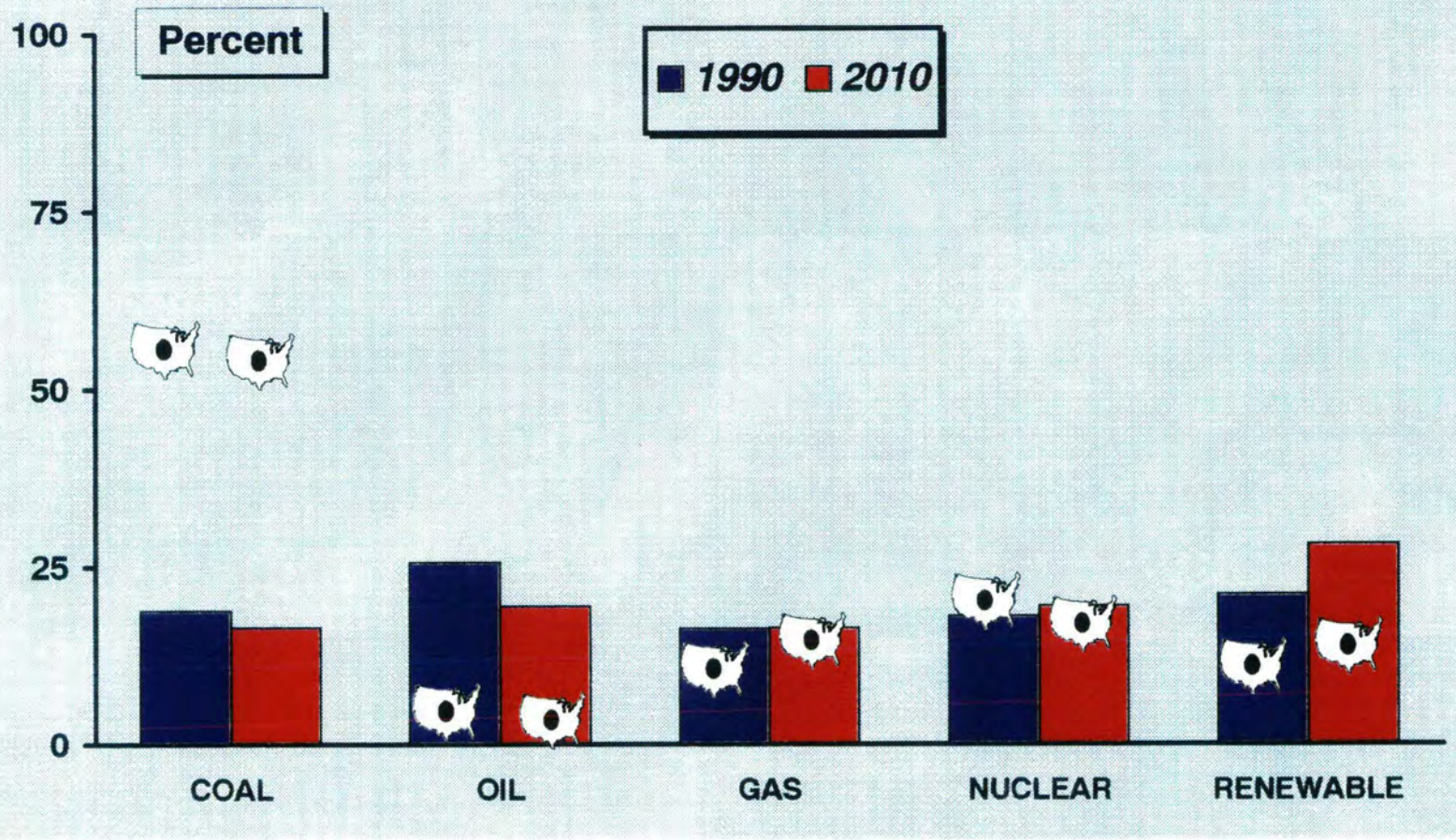
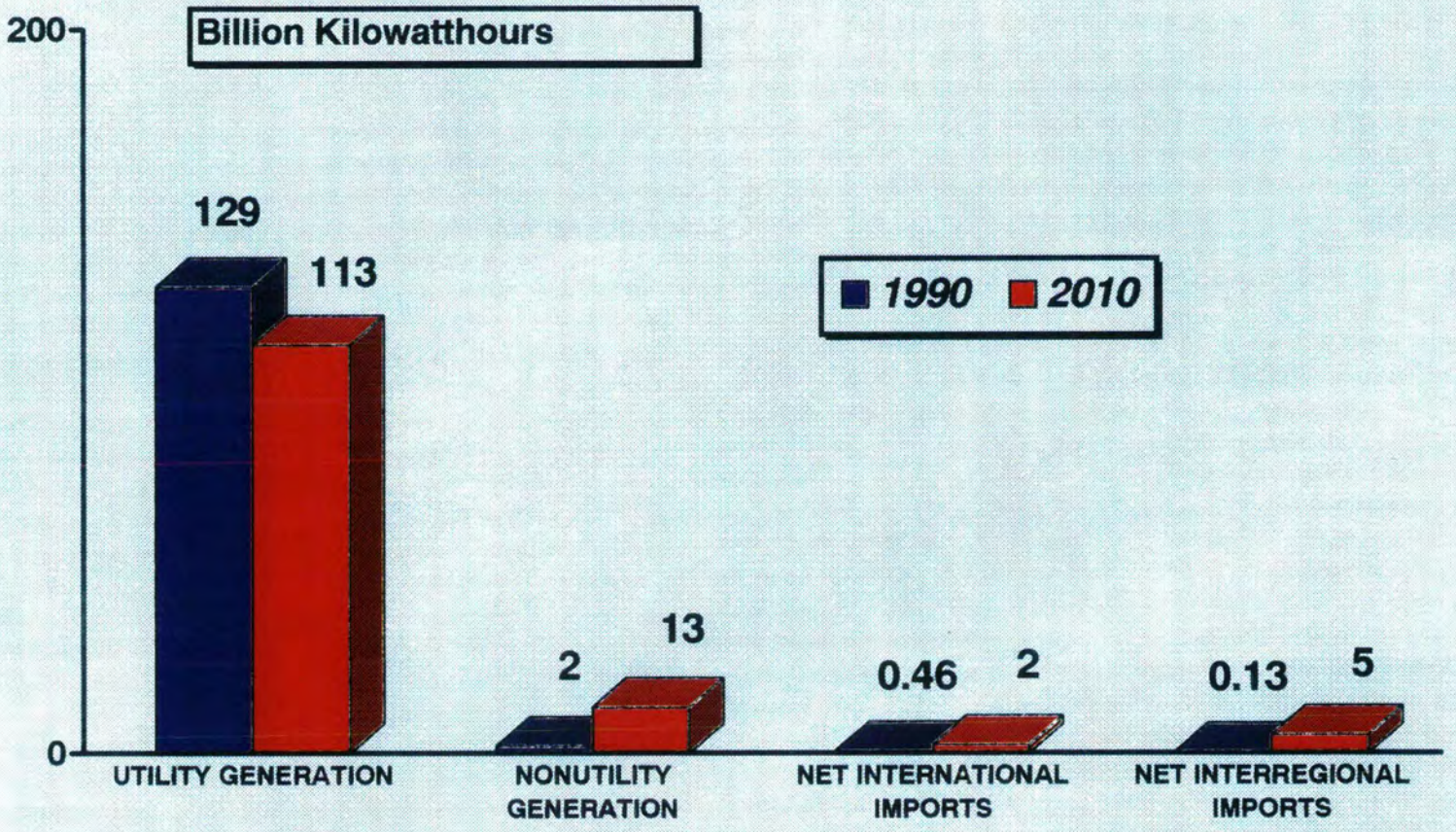
Generation Share By Fuel, 1990 and 2010
New York



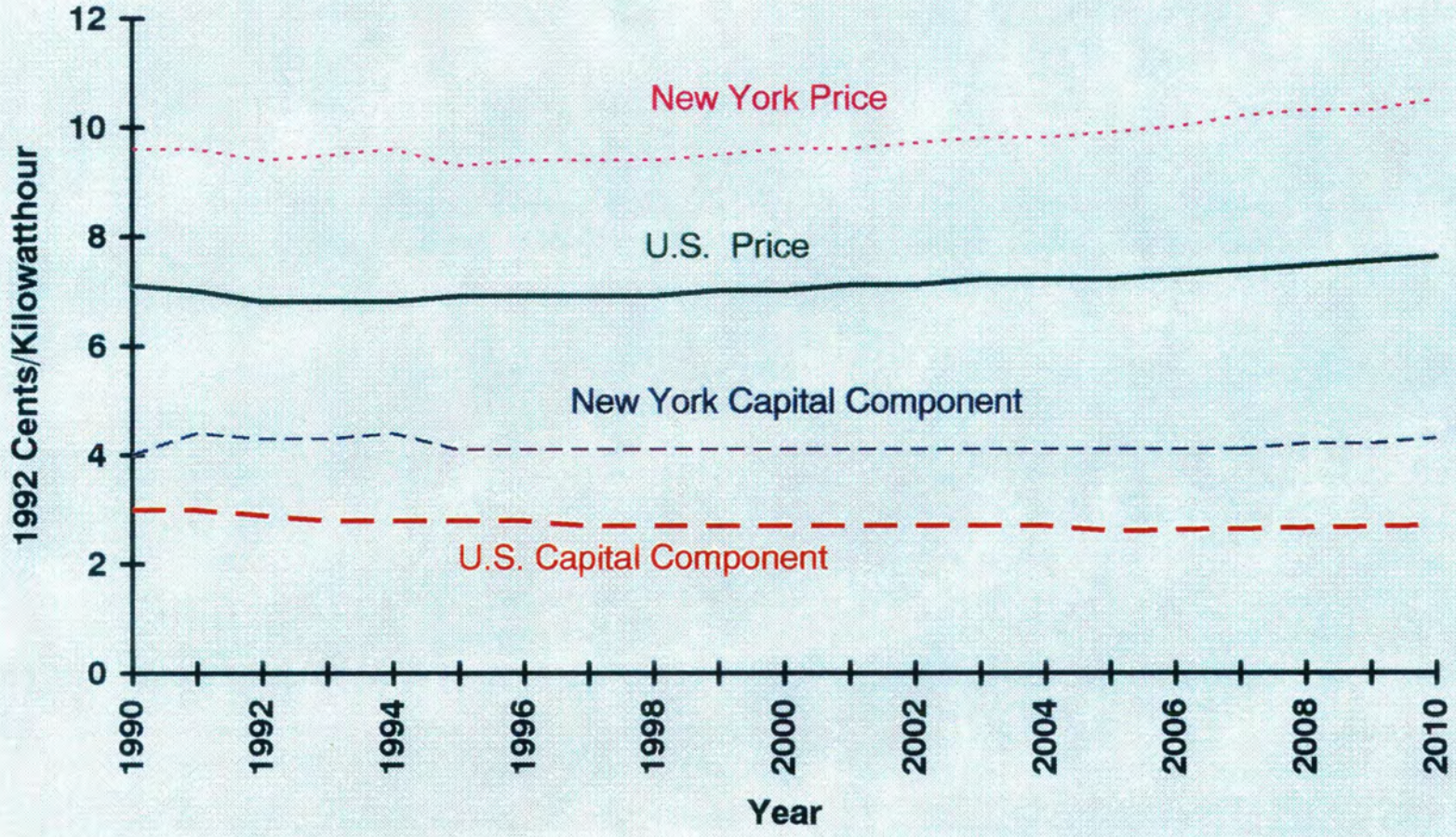
OIAF/01/94

Note: Icons indicate national averages

Electricity Supply, 1990 and 2010
New York



New York Region Capital Component and Electricity Price



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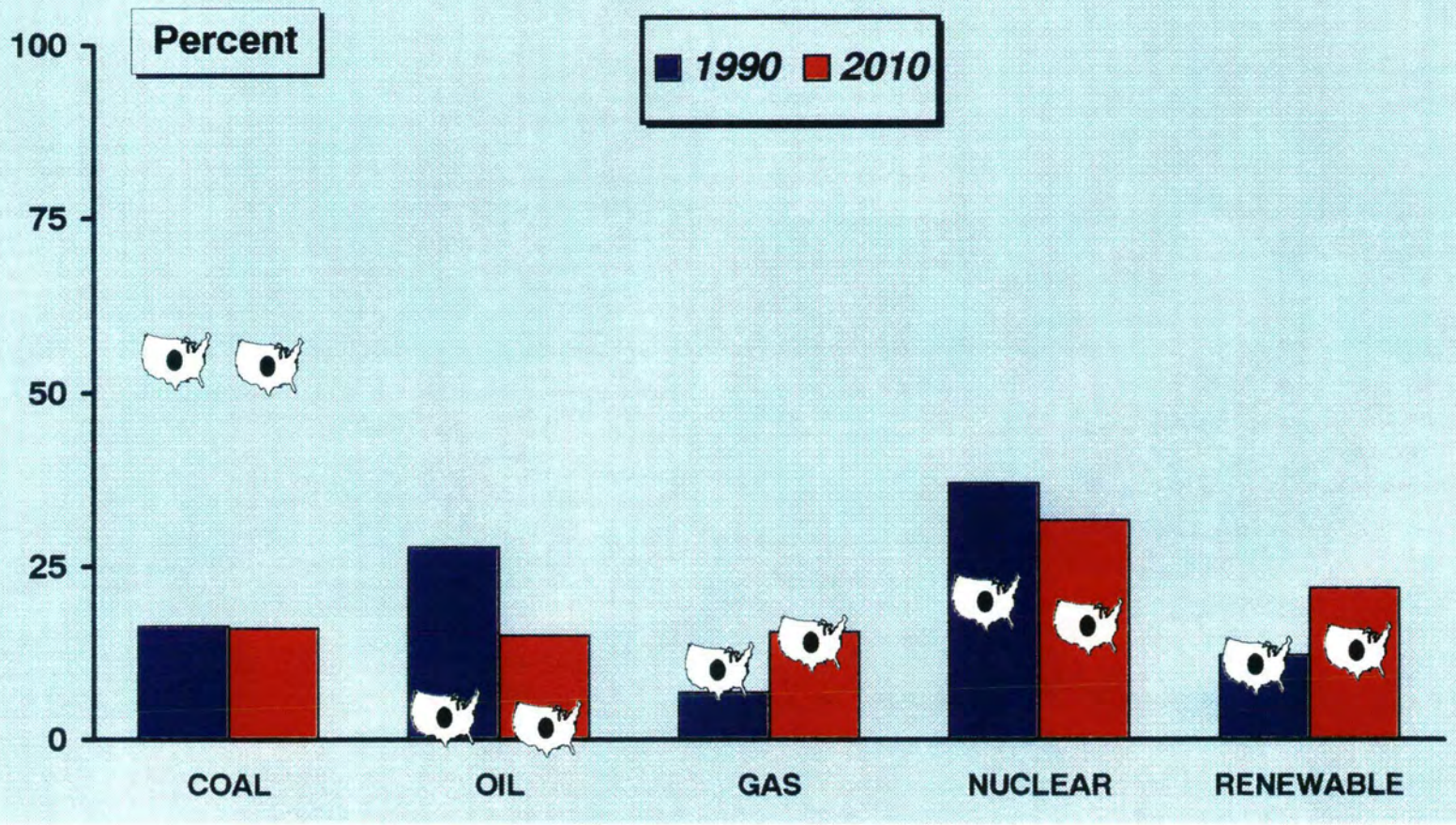
Generation Share By Fuel, 1990 and 2010
New England

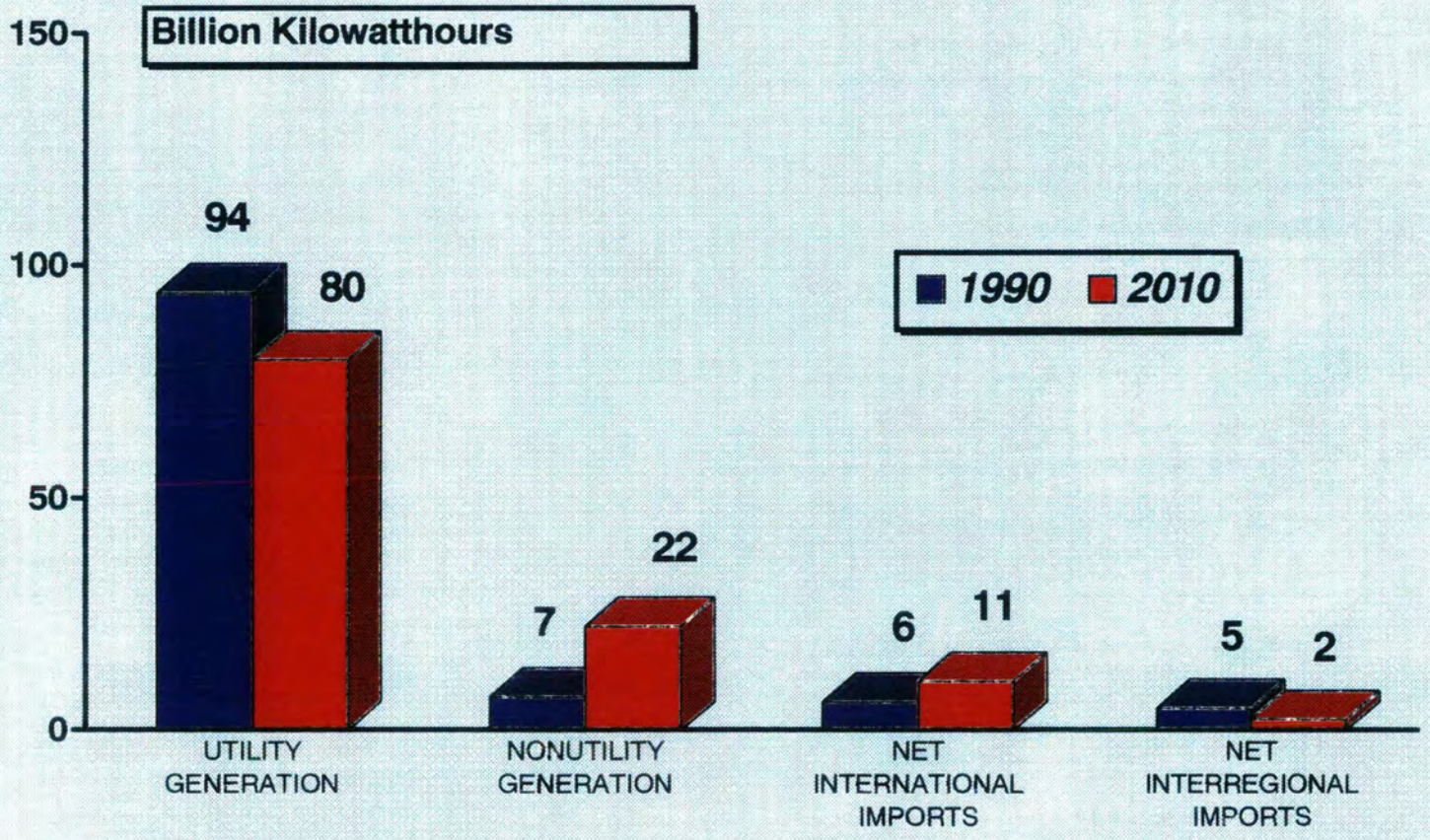


OIAF/01/94

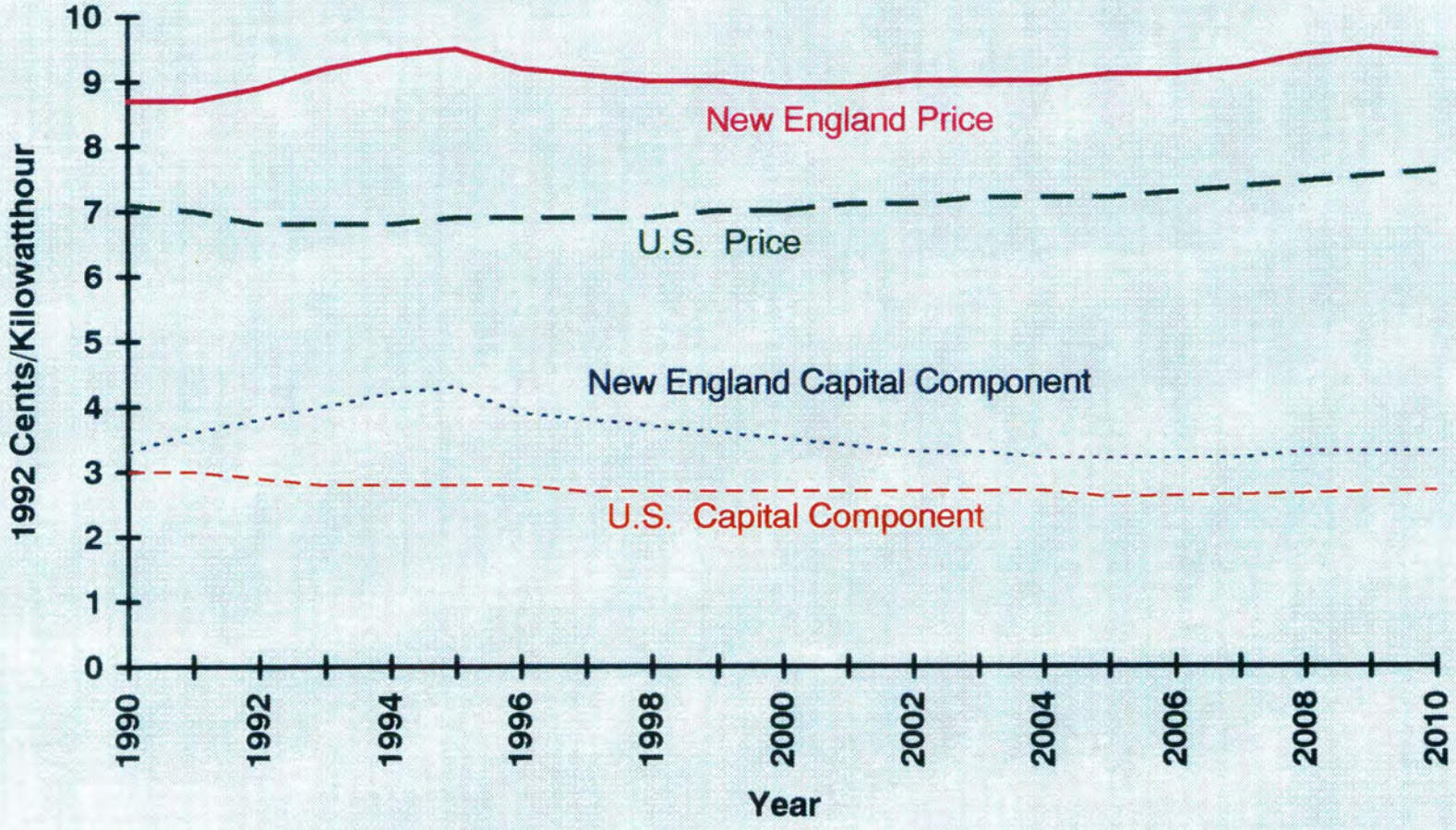
Note: Icons indicate national averages

EIA

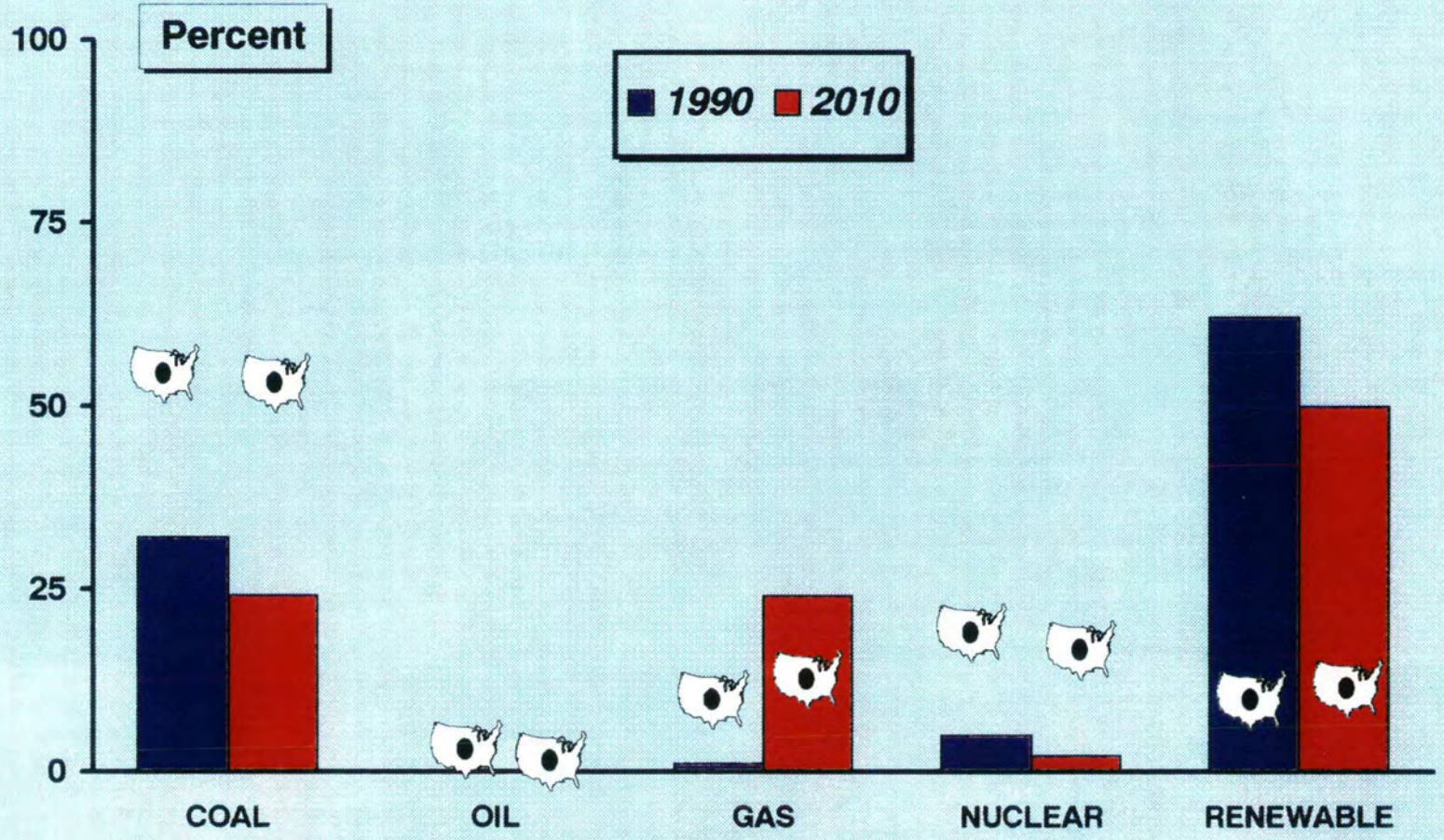
Electricity Supply, 1990 and 2010
New England



New England Region Capital Component and Electricity Price



Generation Share By Fuel, 1990 and 2010
Rocky Mountain - Arizona - New Mexico



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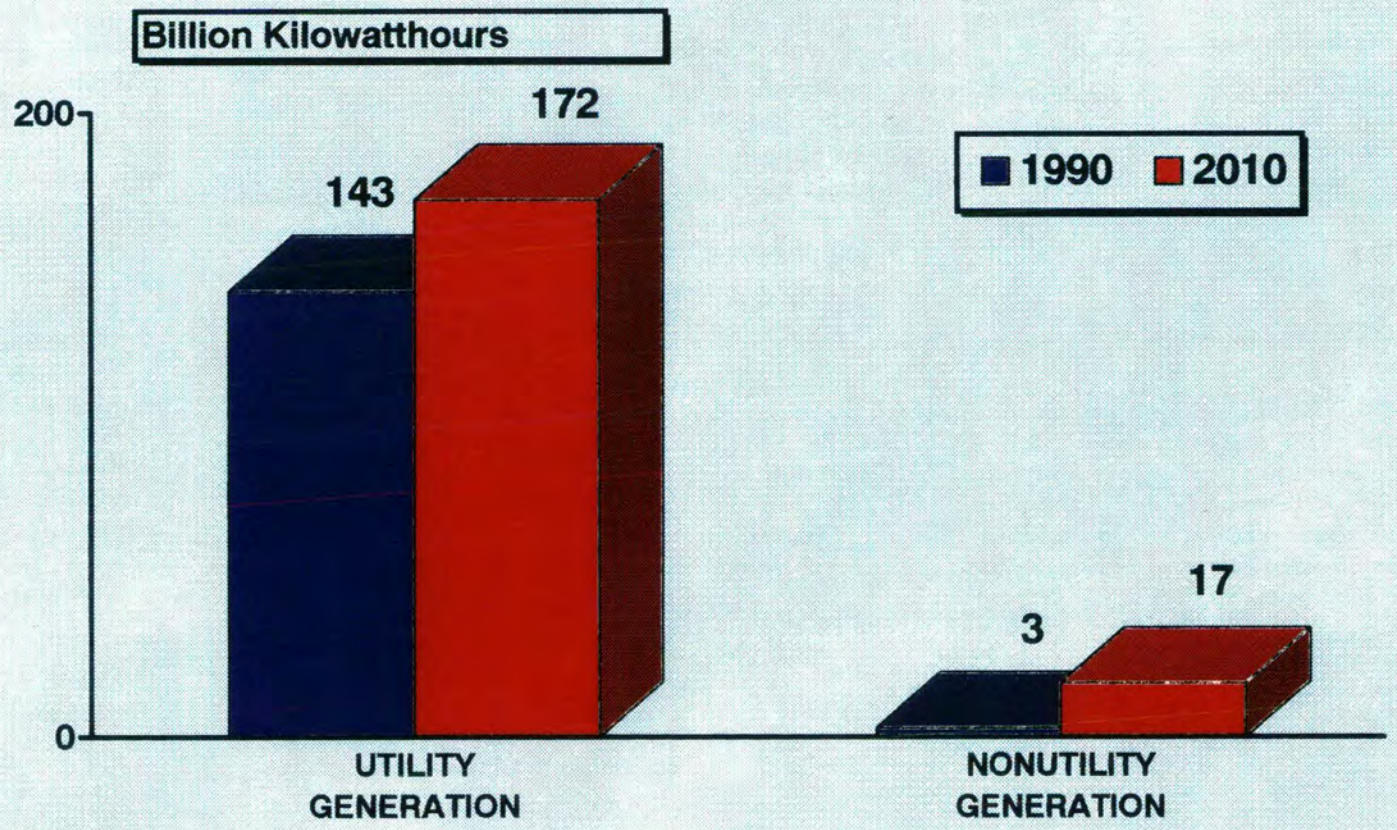
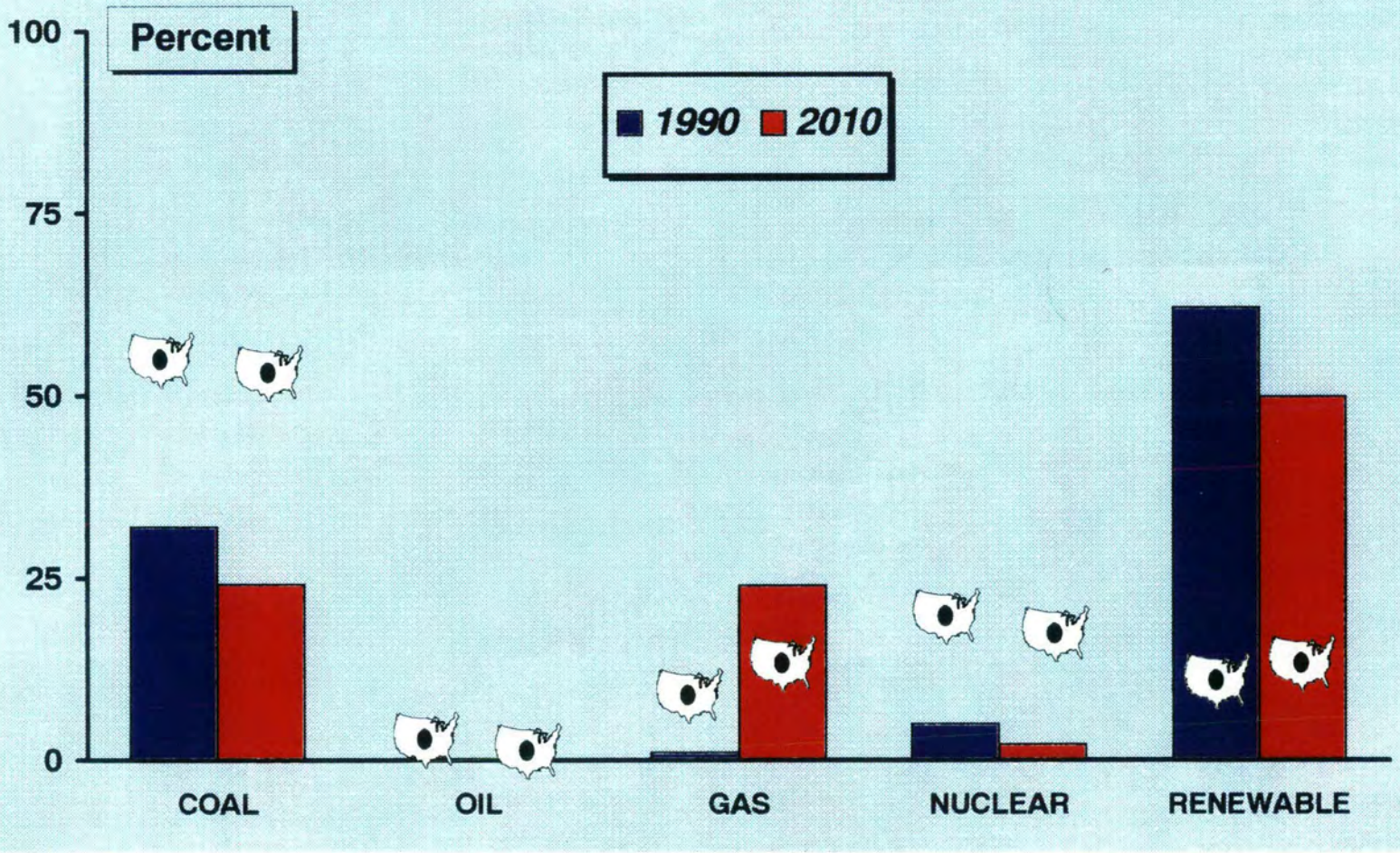
Note: Icons indicate national averages

Electricity Supply, 1990 and 2010
Rocky Mountain - Arizona - New Mexico



Generation Share By Fuel, 1990 and 2010
Northwest Power Pool



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Note: Icons indicate national averages

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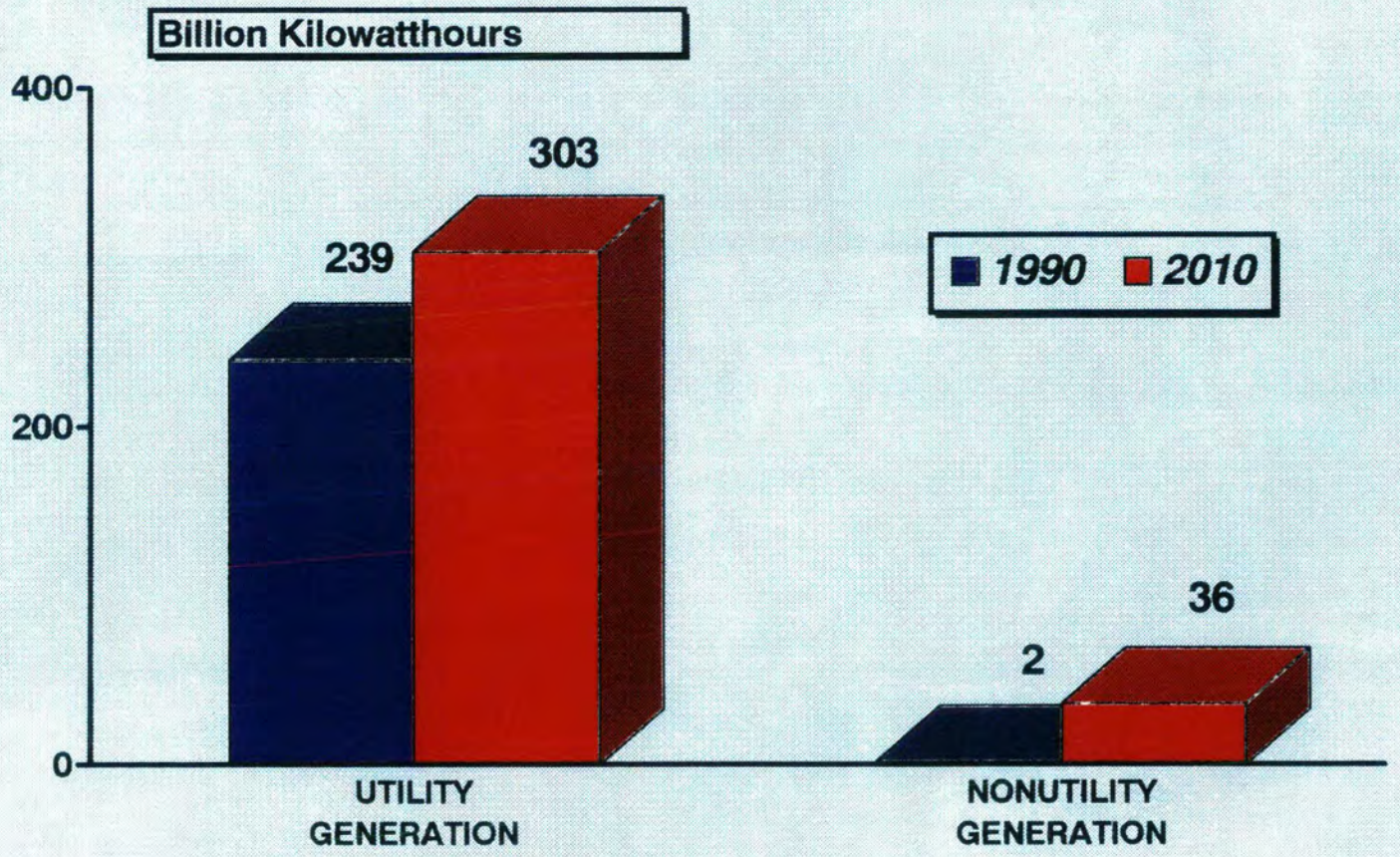
Electricity Supply, 1990 and 2010
Northwest Power Pool



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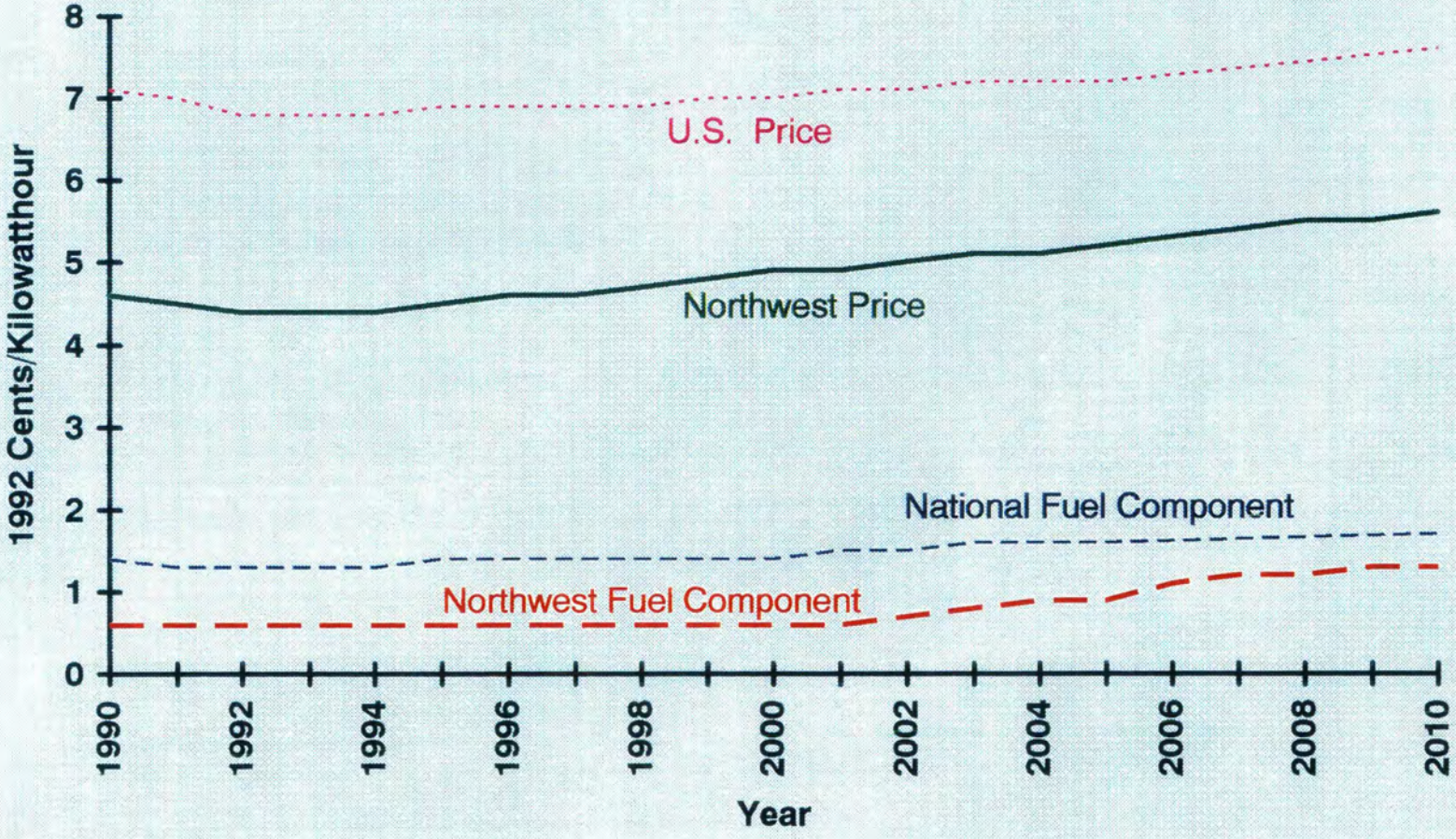
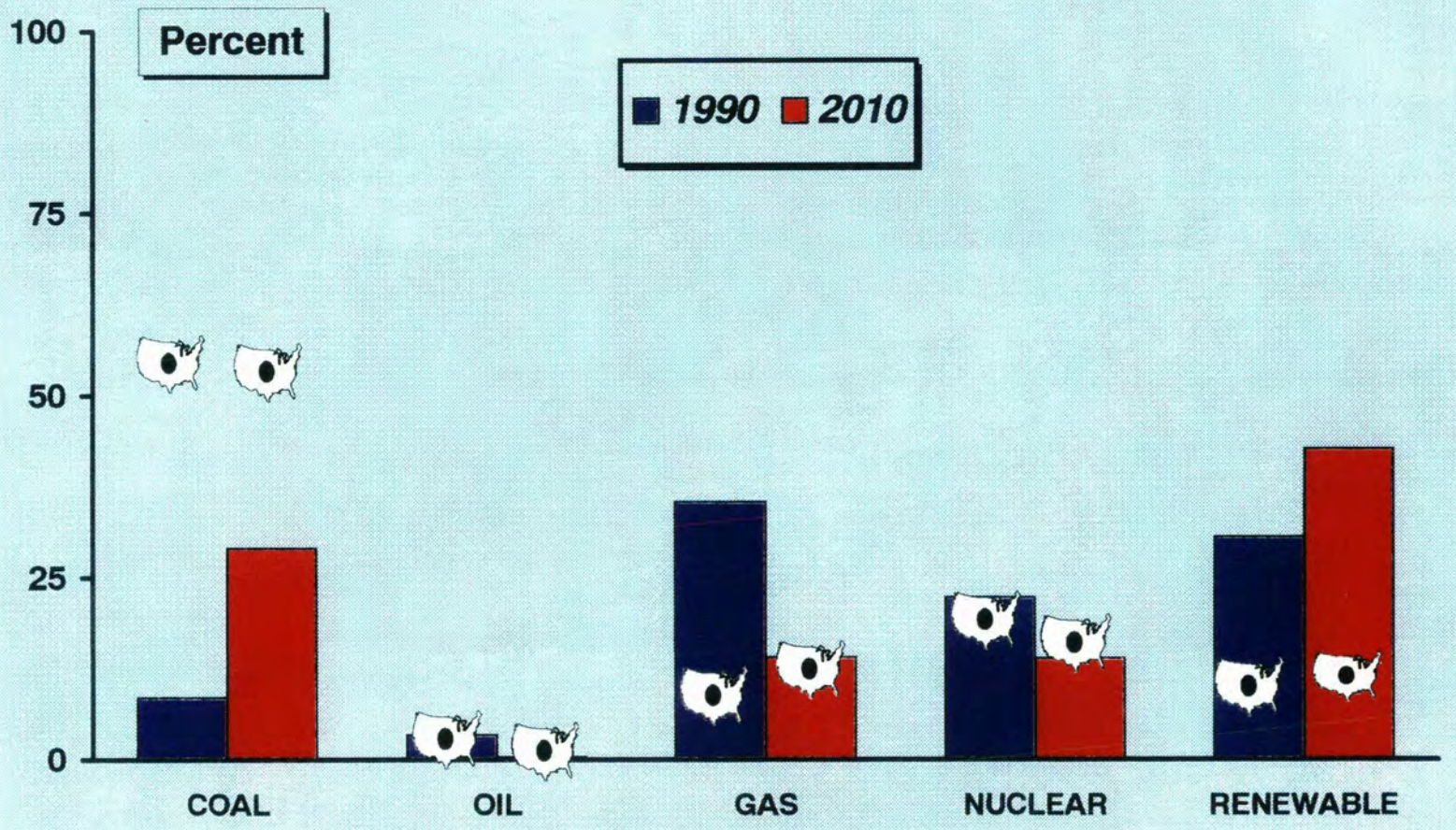
Northwest Region Fuel Component and Electricity Price



Energy Information Administration

EIA

Generation Share By Fuel, 1990 and 2010
California-Southern Nevada Power



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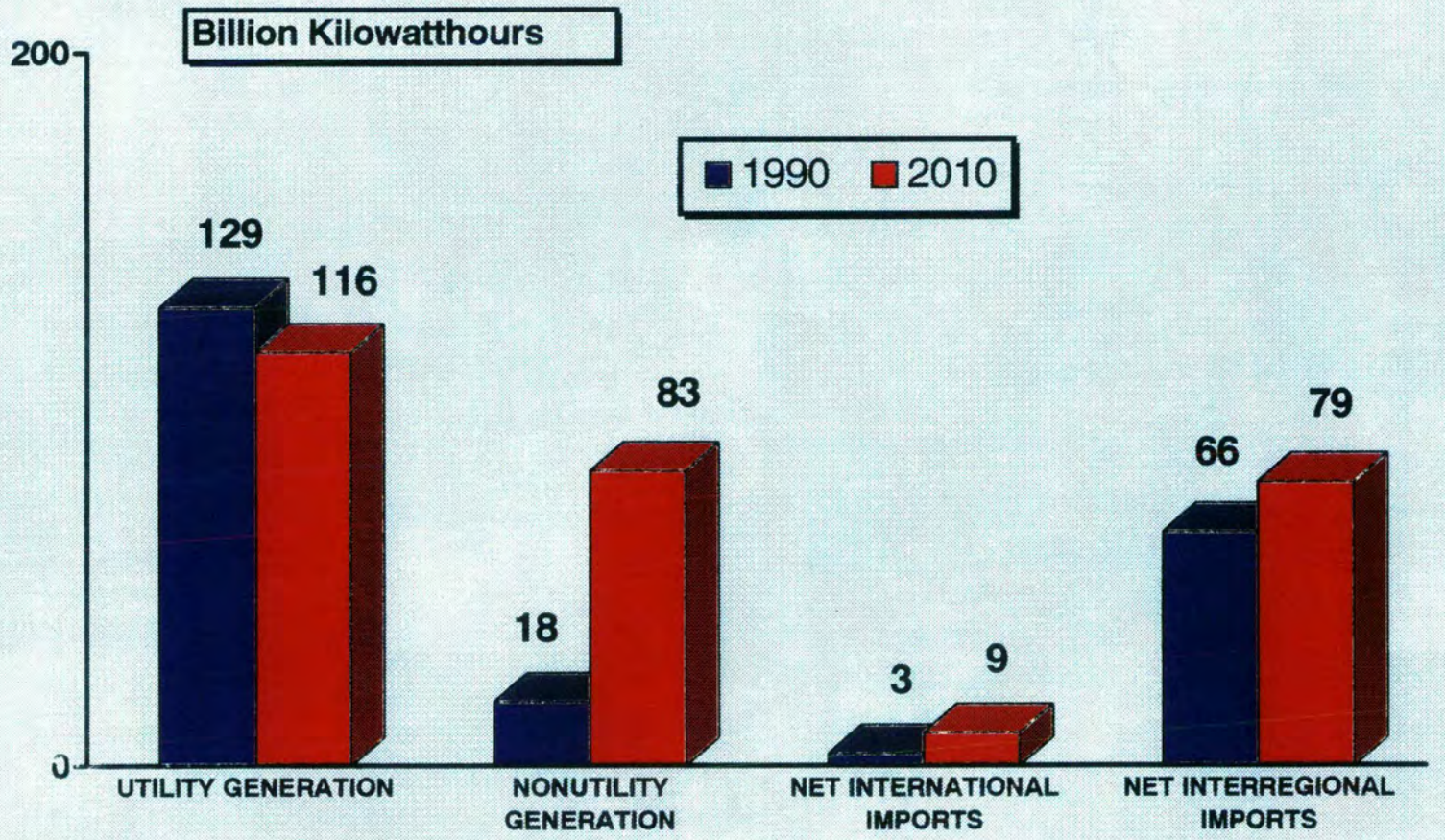
Note: Icons indicate national averages

Electricity Supply, 1990 and 2010
California - Southern Nevada



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Uncertainties

- Demand Growth
- Gas / Oil Price Expectations
- Future of DSM Programs
- Climate Action Plan
- Technological Development