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The U.S. Energy Act 2005: The Role of the Scientific Community in Corn Ethanol
Agenda

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ABSTRACT

The Energy Policy Act of 2005, HR 1640, is a landmark public policy in the United States of America on energy concerns which have soared since the 1970s. This act is significant because it focuses on renewable energy to combat the energy crisis. The heavy emphasis on biofuels and, in particular, ethanol is controversial. The consequences of ethanol on the environment are not clear, therefore neither is its viability as a renewable source of energy. Opponents of ethanol claim that policy makers made decisions hastily, without enough scientific input. The main question of this research paper is to investigate the degree to which the scientific community was involved in including ethanol in the Energy Policy Act of 2005. Moreover, why did ethanol appear and disappear from governmental agendas in the history of the various public policies designed to deal with the U.S. energy crisis? John Kingdon's model outlined in his book, Agendas, Alternatives, and Public Policies, is one of the most widely used theoretical frameworks in studying agenda setting and solutions in the pre-decisional processes before the enactment of public policy. The policy-streams component of his model can be used in to the investigating of the policy community, especially the scientific community. Using the methodology of Robert Yin's case study, this research paper conducts an historical case study analysis of the Energy Policy Act of 2005. This research paper employs original research into congressional testimonies, and congressional research reports to document the accounts of the activities that led to the passage of the Act. Kingdon's model is used as guide to record historical, social, and economical contexts prior to the enactment of this Act and then to find if this situation fits his model. My findings are that 1) there is strong evidence that his model is valid; and 2) scientific input had little impact on the enactment of the Energy Policy Act of 2005.

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LIST OF ABBREVIATION

Abbreviations	Name/Organization
ADM	Archer-Daniels Midland
AFV	Alternative-Fuelled Vehicle
API	American Petroleum Institute
CO	Carbon Monoxide
CO ₂	Carbon Monoxide
CAA	Clean Air Act
CGA	National Corn Growers Association
CRS	Congressional Research Service Reports
DOE	Department of Energy
EPA	Environmental Protection Agency
EPACT	Energy Policy Act
ERS	Economic Research Services
ESA	Energy Security Act
ETA	Energy Tax Act
EIA	Energy Information Administrator of the U.S. Department of Energy
GAO	Government Accountability Office
ILSR	Institute for Local Self Reliance
IPCC	Intergovernmental Panel on Climate Change
MTBE	Methyl tert-butyl ether
NASSQ	National Ambient Air Quality Standards
NEA	National Energy Act
NEPCA	National Energy Policy Conservation Act
NEPCA	National Energy Policy Conservation Act
NO	Nitrogen Oxide
NPRA	National Petroleum Refiners Association
PURPA	Public Utility Regulatory Policy Act
RFA	Renewable Fuels Associations
RFG	Reformulated Fuels Gasoline
RFS	Renewable Fuel Standard
SO ₂	Sulphur dioxide
TMI	Three Mile Island
UCS	Union of Concerned Scientists
USDA	U.S Department of Agriculture
VOC	Volatile organic compounds

Introduction

The Energy Policy Act of 2005, HR 1640, is a landmark public policy in the United States of America on energy concerns which have soared since the 1970s. The goal of this act is to address the multiple problems that preoccupied policy makers in the U.S. in regard to the energy crisis. That said, starting from the 1970s, each decade has had its own energy-related problem. At some point in the early 2000s, though, they eventually converged.

Historically and chronologically these problems are as follows. The 1970s is known as the decade of the energy crisis in terms of the security of energy. This is mainly due to a) the rise in the price of oil on the international market and b) the US's growing dependence on foreign oil. Moreover, by the end of the decade, the US, had experienced serious disruptions in its energy supply (Joksow 2001: 14). As a result, politicians in the U.S. were greatly preoccupied with resolving the energy crisis. One of the solutions suggested was to rely more on the domestic production of energy, most notably natural gas. The other solution was to search for alternative sources of energy in renewable energy sources, the agriculture sector being one such source.

In the 80s, the problems of environmental degradation – though this was noticed by researchers and government as early as the 70s – became a serious preoccupation among policy makers. Transportation, agriculture and the generation of electricity are accounted among the major causes of environmental degradation (Joksow 2001). Therefore, it was argued by the many actors involved that the production of electricity and having cars run on alternative sources of energies would reduce the dependence on fossil fuels, improve

the environment, and generally ease the energy security issue (Charles et al. 2007, Joskow 2001).

In the 90s, there were numerous reports which underlined the continuing degradation of the environment. This time, not only in terms of air quality, smog in large cities, and acid rain, but also global warming which causes major climate changes. It was argued that these effects (read 'environmental problems') would cause grave ecological disasters in the future, to the point that normal habitation on earth would be endangered. For most of the 90s, there was a new series of attempts to deal with the environmental problems. The reviews of the Federal Acts of the 90s are a clear indication of this preoccupation among policy makers. In addition, the world-wide adoption of protocols, such as those of the Kyoto Accord of the current decade, is another case in point (Sissine, CRS report 2006: Summary Section).

However by the early 2000s, despite attempts to combat the energy crisis by the means of de-regulation of the energy markets, and the implementation of various energy policies to improve energy efficiency, American consumption of oil continued to rise. In direct relation to this, the price of oil and the dependence on foreign oil continued to climb (NETL 2001: 8-2). Another problem plaguing this decade is that of ever increasing government deficit. One important source of this was and still is the U.S. Department of Agriculture's (USDA) transfer programs to farmers whose revenue continue to decline. As a result, reviving the rural economy to help farmers and creating jobs in rural areas has, once again, become serious concerns.

Furthermore, the 2000s have seen environmental problems resurface with a vengeance to the point that it has now become a major issue among policy makers.

Natural disasters, like hurricane Katrina and alarming reports on climate change are examples of the gravity of the situation. This is the decade in which the crises of the previous decades have come to a head: energy security (70s), reviving the rural economy (80s), and the environment (90s and 2000s) (Charles et al. 2007: 5739-5743).

Now, the Energy Policy Act of 2005 has emphasized the production of biofuels as part of the solution to combat the energy crisis. However, biofuels, and more particularly corn ethanol, have been the centre of much controversy; the unintended consequence of which is the famous ‘fuel versus food’ debate (Daschle et al. 2007). Some say that one of the underlying reasons why this debate even exists is that the Energy Policy Act was more in response to political pressure and lobbying, rather than to thorough scientific consideration and rigorous cost-benefit analysis (Grunwald, Time Magazine: 03/27/08).

The scientific studies such as the impact and cost-benefit analysis of biofuels are complex because these studies are very interdisciplinary: biology, earth science and various engineering fields, to name but a few. Therefore, the scientific input taken into consideration must also reflect this reality.

The goal of this research paper is to examine to what extent this scientific input has affected the process of policy making with regard to the Energy Act of 2005. A priori, the most important sources of scientific input come from the scientific community; experts who provide solutions. They are an important part of providing solutions or generating ideas for policy makers. That said, the main research question is *how important* was the role of the scientific community and their input in the final decision to adopt the Energy Act of 2005?

To this question, two main hypotheses are constructed. The first hypothesis is that scientific input did not play much of a role in the development and enactment of the Energy Policy Act 2005. This hypothesis is based on the work of Chung Li Wu (WU 2008). His basic conclusion is that scientific input plays an insignificant role despite the long list of input produced during the process of policy decision-making. For this conclusion, Chung LI Wu has based his conclusion on studies of many prominent researchers, such as Carole W. Weiss and others. These researchers have found that despite the fact that great deal of scientific data being produced during the process of a policy making but at the end policy makers don't rely on these data to make their final decision.

The second hypothesis, based on the studies by Peter M. Hass (Hass 1992), is on the cohesiveness or fragmentation of the policy community prior to the enactment of this policy. It assumes that the policy community acted in a fragmented fashion. According to Hass, cohesiveness in the policy community, except in case of the epistemic policy community, is a rare phenomenon (Hass 1992). Fragmentation in the policy community causes disagreements and, consequently, common ground is evasive, all of which will eventually lead to decisions being made based on inconclusive results.

This paper will use John Kingdon's multiple streams model of as its theoretical framework to refine and validate both hypotheses. There are two main reasons for using Kingdon's model. First, the policy streams described in his model cover a wide range of policy communities, one of the important participants being the scientific community. Moreover, his comprehensive examination of two main sectors in the U.S., transport and health, shows that the transport sector, unlike the health sector, has a fragmented policy

community (Kingdon 1995: 118- 121). This is in accordance with the result of studies conducted by Peter M. Hass.

The second reason is that Kingdon believes that policies don't come into existence as a result of rational or incremental processes even though they can, but rather, they (read policies), more often than not, are decided because an idea's time has come (Kingdon 1995: 1). The idea was generated long before the enactment of the related public policy by the policy community. The timing also depends on the convergence of all streams in what he calls "the opening of a window". It is during this opening, and contingent upon policy entrepreneurs seizing the moment, that an idea becomes public policy.

Indeed, the literature reviews undertaken prior to the writing the research paper gives evidence that his model is valid. Firstly, the review of congressional hearings showed the existence of many testimonies given by the various scientific communities. Secondly, biofuels and more specifically ethanol rose to and then fell from the agenda before becoming an integral part of the Energy Policy Act (2005). Was this due to timing or something else?

This paper, therefore, presents the following in the sequence indicated: First, there will be an introduction to Kingdon's model. Within this model the multiple streams will be explained as well as the various concepts and definition associated with them. Second, there will be a section tracing the evolution of ethanol from being a preoccupation, the discussions on it, and then rise and fall of problems that contributed to ethanol being considered a solution. For this purpose, the three decades prior to the Energy Act of 2005, are taken into consideration. One area of focus is Federal Legislation or Acts. It is

believed that these acts are valuable sources for tracing the preoccupations among policy makers. The methodology of Robert Yin's (Yin 1989) case study will also be used as a guide to drive my historical case study. His technique is used to gather data and organize it. Third, there will be a section dealing specifically with the scientific community. The goal of this section is to identify, as much as possible, the main actors that played role in the adoption of the Energy Act of 2005. Fourth, there will be an analysis of how this all fits together in order to answer the original research question. Finally, there will be a section which identifies some of the most visible policy entrepreneurs, significant actors in Kingdon's model.

Chapter-I The Theoretical Context (The Kingdon Model)

In his book, “Agendas, Alternative and Public Policies”, John Kingdon constructs a model of the analysis of the policy process. This model is based on the fundamental question of why certain issues appear, fade, and may reappear from governmental agendas; how some issues become public policies and others don't. His response is centrality of ideas and more specifically if the idea's time has come. His research is a theoretical contribution to a better understanding of pre-decisional public policy processes (Kingdon 1995: 2). According to Kingdon, public policy is the result of at least four important processes: 1) the setting of the agenda; 2) the specification of alternatives (a set of solutions); 3) policy formulation; and 4) policy implementation. His study concentrates on the first two processes (Kingdon 1995: 3).

A- Concepts Definition and Assumptions

Two concepts play an important role in his model. The first one is agenda setting and the second is alternative specifications. He defines an agenda as a list of subjects or problems to which actors both within and outside a government pay serious attention (Kingdon 1995: 3). Alternative specifications are a list of solutions to subjects or problems at hand. Agenda setting is more related to governmental agendas; they are agendas that are already out there. Alternative specifications will eventually lead to the natural selection of a shorter list which results in decisional agendas. Therefore, it is important to distinguish between them.

Kingdon's model consists of three separate streams. These independent streams traverse separate and parallel paths. They are defined as 'problem', 'policy', and

‘political’. Public policy is enacted when these parallel streams converge, creating a window of opportunity. During this opening, the role of policy entrepreneurs is critical in terms of how they seize the occasion.

How does Kingdon define these three streams? According to Kingdon, problems come to the attention of policy makers not through political pressure or ‘perceptual slight of hand’ (Kingdon 1995: 90) but rather through quasi-systematic indicators. These indicators are explained as follows. Problem streams encompass the attributes of a problem: basically, whether it is getting better or worse (the rise and fall of a problem); if it is suddenly sprung in to the consciousness of the public and the elite through one or many focusing events, and/or feedback; whether it is solvable within a set of alternatives or not. Some examples of focusing events are crisis, disasters, personal exposure, and symbols. Feedback can be both formal and informal. It is formal because existing programs are monitored within the government. Informal feedback, in particular its origin, is more complex but may contain certain elements such as the unintended consequences of previous or similar programs in dealing with a problem, and the cost of monitoring of a program. The cost of program (read budget) can act as both a promoter and constraint to solving a particular problem.

With regard to problem streams, it is also very important to distinguish between two concepts: conditions and problems. It is this distinction that defines problems. Conditions become problems when they have reached the point that government decision makers have to do something about them. Problems are defined and influenced, first, by the values that decision makers hold such as being liberal, conservative, for or against bigger government, etc. Second, how problems are

classified and presented in categories. Kingdon emphasizes that the classification of a problem within a certain category is important because this framing or categorization will increase people's perception of the problem in many respects (Kingdon 1995: 111).

The second stream is the policy stream, that is, potential solutions to problems, or a set of alternative solutions. The selection of an alternative solution or proposal in response to a problem is compared to a process similar to the natural selection in biology (Kingdon 1995: 116). Metaphorically, it is compared to 'primeval soup'. Solutions are poured in this soup by the policy community which is composed of experts or specialists within a given policy domain. The list of these specialists can be very long. It can include actors within and outside government. The policy community may be cohesive or fragmented. A fragmented policy community results in fragmented policy, instable policy (Kingdon 1995: 118- 120).

Ideas generated within policy streams, then, float around, revised and combined in this 'primeval soup'. They may eventually disappear. Only those proposals that meet certain criteria survive to the status of serious consideration. The criteria are technical feasibility and value acceptability. Technical feasibility does not mean only the cost-benefit analysis from a budgetary point of view. While budget is important, the cost-benefit analysis is mostly concerned with the implementation of policy. For instance, whether its implementation would accomplish what we want it to accomplish (Kingdon 1995: 132). Value acceptability is to do with the compatibility of a solution with the values of the specialists. One of the important examples of values is ideology

(Kingdon 1995: 133). There are also other criteria, such as political support and the anticipation of future constraints, to name only a few.

Last but not least, while these criteria are important, it is the role of policy entrepreneurs within the policy community that is essential to the survival of a solution. Regardless of the incentives entrepreneurs put forth in advocating certain proposals, ultimately it is the idea itself and not the pressure that they exert upon decision makers which ensures survival. In other words, whether an idea's time has come or not and usually these ideas are already in the minds of decision makers and, as Kingdon re-emphasizes: "there is no new thing under the sun (Kingdon, 1995: 141)". Kingdon summarizes this as such:

The policy streams thus produce a short of list proposals. This short list is not necessarily a consensus in the policy community on the one proposal that meets their criteria: rather, it is an agreement that a few proposals are prominent. Having a viable alternative available for adoption facilitates the high placement of a subject on a government agenda, and dramatically increases the chances for placement on a decision agenda. (Kingdon 1995: 144)

The third stream is the political stream which is independent of both problem and policy streams. It has its own dynamic and rules by which it operates. The most important elements that set down these streams are swings of national mood, election results, change of administration, ideological and partisan politics, change of distribution in Congress, and interest groups' campaign tactics and their impacts (Kingdon 1995: 162). National mood is a crucial element in Kingdon's description of political streams as politicians and policy entrepreneurs sense not only the national mood but its changes. Their sense of the changes in national mood (promoting or restraining a policy) is very complex because where does this mood actually reside? And, how do these people (read people in and out of government) sense its content?

In answer to these questions, Kingdon states that: “One fairly clear answer is that the mood does not necessarily reside in the mass public (Kingdon 1995: 148)”. More specifically he writes:

Politicians sense the mood from various communication that come to them, including mail, visits, trips home, newspaper coverage, and conversation with constituents. Nonelected officials take their reading of the national mood from politicians (Kingdon 1995: 163)

As for the role of interest groups, the more cohesive they act, the more they are able to influence the outcome of an agenda. This is for a simple reason: politicians like the idea of the bandwagon. The absence or presence of constituency also plays a role in either adopting or changing a policy in this process of consensus building. Consensus building in political streams occurs through bargaining. This is in contrast to policy streams where consensus takes places through persuasion (Kingdon 1995: 163).

Finally, another important element within political streams that impacts policy is the turnover in administration, key personnel, and congressional seats.

B- Nongovernmental actors (Academics, Researchers, and Consultants)

This group has more impact on policy streams. In other words, they influence the alternative specifications more than they do agenda setting. Ideas are diffused as a result of research and find their way into the circle of politicians. Bureaucrats and lobbyists harmonize solutions to problems. Most of the important researchers are known by name; they are referred to and sometimes are called to give testimonies in congressional hearings or advisory panels. Sometimes, they work with interest groups to generate

alternative specifications to their proposals. Kingdon attributes the role of this group as very or somewhat important in his model (Kingdon 1995: 54).

His model puts them (the scientific community) second after interest groups, members of congress and administration in terms of influence. For instance, in health policy and transportation studies, the increasing cost of medical care in the U.S. was a major preoccupation among policy makers in Washington. Policy makers turned to the specialists for ideas on “how to cope with it”, as Kingdon states (Kingdon 1995: 55). Their influence has both short-term and long-term effects. The long-term effect is when their proposals catch the real attention of policy makers who are in midst of planning to solve a problem for the long term. This can be done in many ways, such as publishing articles, books, which is eventually propagated to the network of policy entrepreneurs. Therefore, it is important for researchers or interest groups who want to have a significant impact to know what the most preoccupying issue or concern at hand is.

Regarding short-term impact, one of the most effective methods is to have someone from this specialist group on board (e.g. a contractor within government). For instance, some researchers take a leave of absence and work for government or agencies very close to it. In sum, some researchers have political arms that are well plugged into the circle of policy makers. Others influence through their literature, articles and conference papers. It is worth mentioning, as Kingdon did, that their role should not always be considered a positive one. There is evidence of “distrust or even disdain” from politicians towards this group of specialists. Sometimes their proposals are considered out of touch with reality, albeit rational, especially with regard to budgetary issues (Kingdon 1995: 57).

C- The Strengths and Weakness of Kingdon Model

One of the oft-cited strengths of Kingdon's model is its ability to provide a fluid and flexible model to analyze policy that often born out of irrational, incremental and predictable contexts. More importantly, the process of analysis in this model puts great emphasis on the role of human agency versus the structural and mechanical models which, to a great extent, have ignored it (Mucciaroni 1992: 482).

The other strength would be its universality. The model seems to have been able to offer a framework that it is applicable beyond its original country, the United States of America. For instance, Michael Hewlette, a researcher from Canada, has concluded that most types of policy windows identified in Kingdon's model are valid in the Canadian context: it is appropriate to apply this model to the Canadian political and social context. It provides practical applications to policy actors and analysts to use the model to guide their analysis of a policy process, and process of policy analysis (Howlette 1998: 514).

There are, however, some limitations to Kingdon's model. One of the most oft-debated limitations of Kingdon's model is his treatment of multiple streams as being too independent of each other. He states that each stream has a life of its own, with its own dynamic and rules. It is only during the window of opportunity and with the intervention of policy entrepreneurs, at the right moment that these streams interact. If this is so, then the question is, to what extent are these streams independent? Kingdon believes that these streams are independent to a great extent. However, Mucciaroni contends that they can't be that independent; if they were, then how could one explain how new views or issues enter the policy process when there are no policy windows (Mucciaroni 1992: 459-463)? Mucciaroni by criticizing this aspect of Kingdon's model, points to the need to

improve the definition of interdependency which would, in turn, improve the model. He does not suggest that Kingdon's model is ineffective in analysing public policy processes.

Moreover, Mucciaroni says that leaving three independent variables too separate from each other generates a theory with a level of specification that is too generalizable. In other words, Kingdon creates a framework that resembles conceptual slots with no clear boundary of their linkage among the slots. It allows one to fill the slots with one's own facts concerning the substantive attributes of problems and solutions as well as the circumstances of the political environment (Mucciaroni 1992: 464-474).

Finally as Mucciaroni says, the Kingdon's indicators may not be able to gauge policy streams. Some problems may lurk outside of the policy system and evolve over time. Alternatively, an indicator may continue to exist and not show a hidden problem in policy. Thus, the multiple-streams model, suggested by Kingdon, may be an effective heuristic device rather than a tool for conducting empirical investigation (Mucciaroni 1992: 475- 481).

D- Research Question

The main objective of this research paper is to answer the following question: how important was the role of scientific ideas in including ethanol as a part of the solution in the Energy Policy Act of 2005?

According to Kingdon, scientific input is part of an alternative set of solutions which comes mostly from the policy community or a community of experts. These specialists of a particular area of policy generate ideas for policy makers in order to justify the existence of a problem. In other words, they attempt to define problems: change conditions into defined problems. The ideas generated enable policy makers to adopt policy that addresses those problems. Once again, the role of policy entrepreneurs is essential in the adoption of a particular policy.

Policy communities consist of a wide range of actors. Among the most important, but not limited to, are interest groups, academics, researchers, and consultants. Kingdon puts the importance of academics, researchers, and consultants after that of interest groups in this category of nongovernmental actors. Thus, the following is my first hypothesis.

Hypothesis 1- The input from scientific research played insignificant role the final policy enactment of the Energy Act 2005. It was mostly the political pressure, values and ideology of policy makers and not scientific empirical data that helped ethanol to find its way into this act. This hypothesis is based on the research article by Chung-LI WU on the influence of scientific research on policy agendas in the US congress. He states that despite the much heralded opinion that modern scientific data should influence modern policy-making agendas, there is little evidence of scientific

knowledge plays a direct role in the enactment of policy. He bases his research on the work of many other prominent researchers in the field of science and policy making, such as Carol W. Weiss, David Whiteman, Anne Schneider and Helen Ingram. It seems there is a consensus among these researchers that while there is evidence of a great deal of scientific data being produced at different stages of policy making, the final decisions is hardly ever based on that data. Wu gives two main reasons for this:

To sum up, Congress usually does not apply scientific knowledge in the making of public policy because: first, members of Congress are more interested in adopting policies that will help them get re-elected than policies that conform to standards of rationality and efficiency; second, bargaining, compromise and the reconciliation of political interests are a necessary part of the legislative process... (Chugn-LI WU 2008: 6-7)

Moreover, with the exception of the epistemic policy community, of equal importance, according to Peter Hass, the degree of cohesiveness in the policy community is of rare phenomenon. It is this cohesiveness or not which produces the base of knowledge upon which policy makers base their decisions in designing and ultimately enacting policy (Peter M. Hass 1992: 18, 35). This was confirmed in Kingdon's model which is based heavily on the study of the health and transport sectors. The health sector has more of a cohesive policy community compared to that of the transport sector. Therefore, it is from this point that the second hypothesis is constructed in the case of Energy Policy Act of 2005.

Hypothesis 2 – The policy community acted in a fragmented fashion prior to the adoption of the Energy Act of 2005. No cohesive or common language has been found in the actions of these communities.

Furthermore, in terms of the activities and mechanisms through which policy communities organize has a significant impact on the consequences of policy.

For instance, the fragmented activities among actors result in the fragmentation of policy, whereas a close-knit community can generate a common outlook and language (Kingdon 1995: 119). This common outlook and language constitute the foundation for the creation of criteria that survive the longest.

Both of these hypotheses are attempts to refine the main research question. To answer the first hypothesis, a survey of the policy community with the highest impact is required. It is also hoped that the investigation of this main research question will lead to a better understanding of the nature of the relationship among the various participants in the policy community.

Finally, for the purpose of answering the second hypothesis, it is also hoped that the survey of the policy community will shed some light on the degree of their cohesiveness or fragmentation.

E- Method of Research

The method of research is that of a single, historical case study: the Energy Policy Act of 2005. Despite the criticism of single case studies, Robert Yin suggests that selecting a single case to study is justified when the case represents a critical test of a significant theory (Yin 1989: 47). The model chosen for this paper is Kingdon's theoretical model, a well-established theory among public policy analysts.

F- Data Collections

The method of data collection will be based on primary and secondary document sources. Examples of primary document sources are 1) congressional hearings 2)

specialized reports, such as Congressional Service Reports (CSRs) 3) articles published in specialized literature related to energy and renewable energy 4) policy related books or articles published by educational institutions. 5) documents published by various government departments, such as, energy, environment, agricultural, natural resources, and similar.

These documents permit me to determine the social, political, and institutional contexts which led up to the enactment of the Energy Policy Act of 2005.

Congressional hearings and Congressional Research Service Reports (CRS) in particular are a very important part of my research because they highlight the most important debates and issues of policy makers of that time. They also shed light upon the various actors (government and non government) that appeared in debates and discussions related to this policy.

Within the scope of this paper, it is only possible to examine the congressional hearings from the 106th to the 109th. For dates before this, the literature reviews and the Congressional Reports Service (CRSs) are the most important sources of data collection. Moreover, this date is not by accident, but by design. A preliminary review of the congressional hearings has revealed that towards the end of the 90s, new, favourable conditions had opened up for the advocates of biofuels. This is also the period in which the 106th Congress started.

Literature reviews and in particular the Congressional Research Services also contain background information and analysis prior to the development of the act. This background information contains debates that occurred prior to the adoption of the

Energy Act of 2005. It is hoped that the analysis of these debates will reveal the main actors involved in the process of policy making.

It is worth mentioning again that it is not possible to reveal all the actors, especially the “invisible actors”, in this examination of documents. For this purpose, further research mostly in the form of interviews would be required. The lack of a formal survey and interview with some of the identified actors in order to reveal the other hidden actors is one of the limitations of the methodology employed in this research paper.

Finally, the examples of secondary sources are media, the internet, known magazines, or the publications of special interest groups. Articles in nature of commentaries are also considered but only when there is more than one source of information which confirms their claim.

Chapter II - Federal Legislations

This section reviews the major Federal Legislation Acts in regard to biofuels and in particular ethanol. Appendix A has a summary of the most important acts. Appendix B has a summary of ethanol subsidies in terms of figures within the various federal and state legislations. It is most definitely not an exhaustive list because that task is beyond the scope of this research paper. The study of the Federal Legislation is important because of, as Kingdon reminds the importance of the role the executive branch plays in setting agendas. The Federal Legislation Acts are an excellent representation of these critical agendas at hands of policy makers. They can also help to trace the origin of the agendas. The following table (Table I) depicts only those acts that will often be referred throughout the following sections while attempting to track legislative acts in what concerns the evolution of the ethanol.

Table I –

<p>1978</p>	<p>The Public Utility Regulatory Policies Act (PURA): the major goal of this act is to mandate the generation of electricity from renewable sources of energy and to enforce public non-utility providers to buy electricity from smaller plants that use renewable sources of energy..</p>
<p>1990 &1992</p>	<p>The Clean Air Act 1990 contains provisions for mandating oxygenated fuel (RFG =Ethanol and MTBE). The requirements were set for 2 types of clean-burning gasoline, RFG Federal Reformulated Gasoline and Wintertime Oxygenated Fuel.</p> <p>The Energy Policy Act 1992 (EPACT) extended the fuel tax exemption and the blender's income tax credit to two additional blend rates which contained less than 10% ethanol.</p>
<p>2005</p>	<p>The 2005 Energy Policy Act reflects President Bush's general approach by creating programs and policy aimed at increasing and diversifying domestic energy production. It includes key provisions to help diversify domestic energy production through the development of renewable fuels.</p> <p>The 2005 Act creates a Cellulosic Biomass Program to encourage the production of cellulosic ethanol.</p>

The review of the history of these acts led to the safe assumption that the topic of renewable energy and, in particular that of ethanol, did not become a major preoccupation for policy makers before the 70s; notwithstanding the fact that the history of using ethanol as an alternative source of energy dates back to before the 70s. The reason is simple: there was an abundant supply of various other sources of energy, such as petroleum, natural gas, coal, hydroelectric and many others which were produced mostly domestically or imported cheaply from abroad. The importation of crude oil constituted a small percentage of its total consumption. This is the case for most of the states in the U.S. with the exception of the Atlantic and the Pacific states (Josksow 2001: 3).

The U.S dependence on foreign oil started to augment since the early 70s. It had reached its peak in 1985 making the U.S. a net importer of 60% of its oil. It is projected that this dependence will reach 75% by 2020 (Josksow 2001: 7-8).

A- Federal Legislation in the 70s

The first federal legislation to consider ethanol an alternative source of energy was the National Energy Policy Conservation Act (NEPCA) in 1975. The Nixon administration promoted it and President Ford signed it and brought it into law. The two aims of this act were to phase out lead in gasoline and address the issue of energy security which had also become an issue of national security. For Lead was found to be harmful to public health and a disruption in the supply of oil mainly due to OPEC's embargo in 1973 causing alarming problem in regard to national security. As an immediate solution to replace lead, another substance, Mmethyl tert-butyl ether (MTBE) was seriously considered, while ethanol was given some consideration (Landsberg 1989: 4).

It was not until another important federal act, in which ethanol, for the first time, was given significant attention. This act is known as the Public Utility Regulatory Policy Act (PURPA), enacted in 1978. This act was born out of the National Energy Act (NEA) in 1978. It was signed during the Carter administration. The PURPA was designed to ensure that electric power producers would generate a certain percentage of electricity from renewable energy sources. It was also designed to create a market where public non-utility providers could buy electricity generated from small power-production facilities that used renewable energy sources. This included ethanol produced from corn. The non-utility electrical producer refers to a category of power generators that were not subject to regulatory measures. In brief, the idea and development of biopower grew out of this period.

Another relevant point about the PURPA act is that despite being federal law, the implementation of it was largely left to the local states. According to two sources (Joskow 2001: 9; PURPA Wikipedia), many states did nothing to enforce this act. In fact, in many local states the result of this act was an increase in the number of cogeneration plants which overwhelmed the state regulators with bureaucratic entanglements. Cogeneration plants are non-utility producers of electricity and heat. In addition, most of the contracts under this act expired by the end of the 1980s.

However, the direct relation to ethanol subsidies can be found in the Energy Tax Act (ETA) in 1978, which developed as part of the prior act, the NEA Act. It was within this ETA Act that a federal subsidy was given to ethanol producers. More specifically, the ETA mandated that ethanol blends of at least 10% in volume or \$0.40 per gallon of gasoline be used (Duffield & Collins 2006).

These acts, during the 1970s, were enacted amid an environment in which the price of crude oil prices steadily increased, and the U.S. dependence on foreign oil was rising. In other words, the goal of all these acts was to reduce the demand for non-U.S. oil providers by relying more on domestic production which included but was not limited to energy produced from agricultural sources (Duffield & Collins 2006: no specific page). It is worth mentioning that the cost of ethanol production remained high during this period.

Finally, it has been noted that the policy instruments employed in implementing these acts in the 70s stem from the concept of energy conservation. Taxes and subsidies are the economic tools used to reinforce energy conservation (Amerman 2006: 5).

B- Federal Legislations in the 80s

In general, the 1980s is described as a decade of minimal interest in the development of renewable energy policies, if any energy policy at all. This period is known as the Regan Era (1980- 1988). In fact, the only major act regarding ethanol is the Energy Security Act (ESA) in 1980 which was signed by the Carter administration, prior to Regan's administration. This act offers insured loans to producers of ethanol.

More specifically, the Windfall Profits Tax is an important part within this act. The Windfall Profit Tax is an extension of the Ethanol Motor Fuel Excise Act adopted in 1978. Ethanol subsidies, therefore, had continued but no major changes had been made to expand the existing level of ethanol subsidies. According to at least one source- Energy Information Administrator (EIA) of the U.S. Department of Energy (DOE)- despite the fact that ethanol subsidies were continued by the federal government and the local states, most ethanol producers suffered major setbacks, to the point that nearly 50% of them

went out of business. It is reported that only 74 of 163 commercial ethanol plants remained and produced ethanol. This happened as early as 1986 (EIA 2008).

The main reason given for the failure of ethanol producers is the plummeting price of oil at the international level. This price decline had accelerated since 1985 amid in environment where the high cost of producing ethanol due to unavailability of appropriate technology had persisted (Yacobucci, CRS report 2006: CRS-6).

C- Federal Legislations in the 90s

According to many sources, the 1990s contrary to the 80s is considered the decade of the rejuvenation of interest in renewable energy, such as biofuels and, in particular, ethanol produced from corn.

One of the Federal Legislations- as a major boost to the ethanol producers- is the Clean Air Act (CAA) enacted in the 1990s (Migdon, CRS report 1993: no specific page). This act was signed under the George H.W. Bush administration. It was an extension of the Clean Air Act (CAA) of 1970 which was enacted during the 101st Congress, amended and reinforced under the Clinton administration.

The main reason for passing this act was the continuing deterioration in the air quality across major cities which were reported by the U.S. Environmental Protection Agency (EPA). This is despite the steady improvement in the air quality as result of the initial adoption of the Clean Air Acts in the 1970s (McCarthy, CRS report 2006: CRS-1). The specific problem, reported by EPA, was the increasing appearance of smog in major cities. Another problem was acid rain. Various reasons were given for these problems but the most notable one is that vehicles transmitted various pollutants, mostly in the form of

gases into the air. Large coal burning activities by factories was the other reason given. Examples of some such pollutants are sulphur dioxide (SO₂), carbon monoxide (CO₂), and nitrogen oxide (NO) to name but a few. They are also known as Green House Gases (GHGs). They have been found to be the main cause of the Ozone layer formation. Thus, they all are considered a major public health problem (EPA 2008: no specific page).

The task of implementing the CAA was left to the local states (Mayer, CRS report 1995: Summary Section). However, the federal EPA was set to determine an acceptable level of pollutants in the air. The logic behind this decision was that the local states knew best how to control the air pollution from various sources, such as transportation, urban housing, factories, etc.

As for ethanol, it is the Reformulated Fuels Gasoline (RFG) program within this act that required at least 2% oxygen in weight for each gallon of gasoline being sold. Providers have the choice of using MTBE or ethanol. The reason for this is found in the scientific research conducted by the U.S. Environmental Protection Agency (EPA). Basically, the EPA found that adding this specific percentage of oxygen makes gasoline burn cleaner: “causing [a] considerable reduction in vehicle emissions of ozone-forming and toxic air pollutants” (EPA 2008: no specific page).

In 1992, the Energy Policy Act (EPACT) came into force to serve multiple purposes. These are 1) to extend the fuel tax exemption and the blender's income tax credit to two additional blend rates which contained less than 10% ethanol already adopted under the ETA of 1978 2) to introduce a new federal tax deduction on the purchase of ‘clean-fuel-burning’ vehicles which included vehicles that burn alcohol fuels instead of gas. This was intended for both individual users and business owners who

purchase these types of vehicles; 3) to increase research and development on alternative fuel. The increase in funding was to create more cost effective technology designed to improve energy efficiency (Joksow 2001: 15). Joksow also reported that there was a strong mandate for the Energy Information Administration Department (EIAD) within the U.S Department of Energy (DOE). This was done to increase data collection efforts on all sorts of renewable energy including alcohol fuel. The EPACT had also established a number of Alternative-Fuelled Vehicle (AFV) requirements for the Federal government and the local States to use more biofuels.

Furthermore, it has been noted that the policy instruments to implement these acts in the 90s stemmed from the concept of energy efficiency. Similar to the various acts in the 70s, tax and tariffs were the economic tools to materialize these acts (Amerman et al. 2006).

D- Federal Legislation in the 2000s- The Energy Policy Act of 2005 (H.R. 1640)

This is the most important act of the current decade in regard to the expansion of alternative energy production. The objectives of this act are to reduce the U.S. dependence on foreign energy by 1) ensuring a reliable flow of energy produced at the domestic level and modernizing the infrastructure of domestic energy 2) reducing energy consumption by promoting energy efficiency and conservation. The Energy Policy Act of 2005 was enacted by the 109th Congress. The 109th Congress was overwhelmingly republican, but almost all members of the Democratic Party voted in favour of it. It was adopted on July 29, 2005. President George W. Bush signed it and made it law on August 8, 2005 (Energy Policy Act, 2005).

As for the fulfilment of the first objective, renewable energy sources, such as oil, gas, coal and nuclear energy were encouraged with a great emphasis on biofuels and in particular on ethanol produced from corn. Biodiesel is another example of renewable energy included in this act; its production was also encouraged. In brief, the Energy Act of 2005 gave the most significant budgetary increase to the production of biofuels in comparison to all other previous acts in the history of American energy policy (DOE 2006: no specific page).

The concrete manifestation of this budgetary increase is primarily for four aims. Firstly, in the expanding Biomass Research and Development Act of 2000 (section 941), the Energy Act of 2005 has increased allocation of \$200 million per year until 2015 from \$54 million in 2006. Three Federal agencies are the recipients of this fund: The United States Department of Agriculture (USDA), the U.S. Department of Energy (DOE), and the U.S. Environmental Protection Agency (EPA). This is almost a fourfold increase. Secondly, this act includes various types of grants to the local state research agencies; cellulosic biomass research being one of the most important. Thirdly, there is an increase in loan guarantees and grants (section 1512) for the construction of facilities to process and convert municipal solid waste and cellulosic ethanol into ethanol and its by-products. Fourthly, it encourages the creation of an advanced biofuels technology program by allocating \$550 million to various start-up companies (DOE 2006: no specific page).

Moreover, a number of tax incentives were also instated. First, it creates production incentives of 10 cents per gallon on the first 15 million gallons of ethanol produced each year. Second, it expands the definition of small ethanol producer from 30 million gallons to 60 million so more producers benefit from the tax incentives (section

1345-1347). Third, it provides a tax credit to buyers of new alternative-fuel vehicles starting from January 1, 2006 (section 1341). Fourth, it provided an infrastructure tax credit of up to 30% for owners of fuel stations who install alternative fuel. Finally, it offers a tax credit of \$1, 000 to purchasers of residential refuelling equipment (DOE 2006: no specific page).

As far as corn ethanol is concerned within this act, a national Renewable Fuel Standard (RFS) was established. The RFS requires that gasoline sold in the U.S. contain a specific volume of biofuels obtained from corn ethanol. In this act it was projected that the annual volume of renewable fuels would increase from 4.0 billion gallons per year in 2006 to 7.5 billion in 2012. This would be achieved through ethanol credit incentives to refiners, blenders and importers. In addition, the RFS program is based on a 'credit trading system'. This credit trading system is designed to provide a flexible means for the industry to comply with standards by allowing renewable fuels to be used wherever it is economical, and as well as of any renewable fuels (other than ethanol) in order to meet minimum requirement set by the RFS standards (DOE 2006: no specific page).

Another section within the Energy Act of 2005 (section 1506) is related to ethanol and its usage as an oxygenate additive originally adopted in the Clean Air Act (1990). The Energy Act (2005) eliminates one of the requirements of the Clean Air Act (1990), that of the standard for Reformatted Gasoline Oxygenate (RFG). As a result, the MTBE was completely removed and the mandate to use more ethanol to meet the air quality standard was reinforced. Because it is assumed that ethanol used as a replacement for fossil fuels will help with the growing environmental problems by reducing carbon monoxide and, consequently, stopping global warming.

In sum, the Energy Act (2005) is considered the most comprehensive energy policy act with regard to biofuels and alternative sources of energy. It is noted that this act is based more on tax incentives instead of taxes or tariffs which were used in the various acts of the 70s, 80s and 90s.

Chapter III- Multiple Streams Framework

A- Problem Streams

a) - Some Conditions Are Defined As Problems

It is worth recalling that Kingdon's model describes problem streams and political streams as the most important streams that influence the setting of agendas. It is within this stream that some conditions are defined and become problems. Problems, then, become important agendas and get the attention of policy makers through certain mechanisms: systematic indicators, such as formal or informal feedback, or focusing events.

The examination of the reasons behind enactment of two major energy acts in the 70s indicated the existence of at least two of these mechanisms. The first mechanism at work is that of the focusing event, of which there were two major events: the 1973 OPEC oil embargo which caused a significant increase in the price of oil; and the Iranian Revolution in 1979 which caused a major disruption in the supply of oil. These events occurred at a time when the U.S. domestic consumption was steadily rising and consequently so was its dependency on foreign oil.

Other focusing events of that period were the growing shortage of natural gas towards the end of the 70s (Joskow 2001: 8), and the accident in the nuclear power plant on Three Mile Island, Pennsylvania in March 1979 which reinforced the public opposition to using nuclear power for energy production. The combination of these focusing events caused such a major disruption in the supply of gas and oil that there were long lines at the gas stations across all the regions in the U.S. never seen before in its history (Joskow 2001: 9).

These events forced Carter, the president of the U.S. at the time, to proclaim a national shortage in the energy supply. It was reported as follows:

In April 1979, President Carter, responding to growing oil and gas shortages, announced the gradual decontrol of oil prices and proposed a windfall profits tax on producers. In July, he proclaimed a national energy supply shortage, established temperature restrictions in non-residential buildings, and went on television to address the nation to argue that energy shortages had become a major test for the nation requiring sacrifices of various kinds. (Joskow 2001: 9)

These focusing events were accompanied by the formal feedback from the U.S. Department of Energy (DOE) to policy makers on the steady rise of the American dependence on foreign oil. Given the turbulent period in the Middle-East, the region where this dependency resides, the increasing dependency on foreign oil was viewed as a matter of national security (Joskow 2001: 13). In brief, for the first time the U.S. faced an energy crisis which profoundly threatened its social and economic activities. Thus, and once again, a reliance on domestic production was stressed as part of the solution to the crisis.

Given the limitation of the domestic oil reserves in the U.S., the search for alternative sources of energy had become a preoccupation of policy makers. It is worth mentioning again, that the goal of the 1975 energy act was to make the United States energy independent, by relying on its domestic production by the 1980s.

One of the domestic sources of energy comes from renewable energy. The agricultural sources, such as grains, feeds, corn, and so forth constitute a significant portion of the sources of renewable energy. The other category includes wind, solar and nuclear. Now, given the large domestic availability of corn produced in the U.S., ethanol became a viable solution in the eyes of policy makers.

Literature reviews also indicate that environmental problems were being reported to policy makers as early as the 70s mostly regarding air quality (ChemAlliance 2007: no specific page). For example, one major problem was the formation of smog in major cities which created breathing problems especially among the elderly. As a result, a series of amendments were made to the Clean Air Act (1970). These amendments are an indication of the seriousness of the problem and how much policy makers paid attention to it.

However, according to one literature review (Martinot et al. 2005: 1), for most of the 80s, no major, new legislation was enacted. In other words, no new or major acts had been adapted to extent or even modify existing/previous acts dealing with the energy crisis, and even less so to deal with the issue of renewable energy. In brief, this decade is known as one of minimal interest not only in alternative sources of energy but in energy security issue .

Two important reasons are given for this minimal interest. One is the falling oil prices on the international market which began in 1982 and reaching its lowest level in 1986. The second reason is the unwillingness of the Reagan administration to deal with the energy crisis and environmental issues (Joskow 2001). The Reagan administration, which was in power from 1981 to 1989, repeatedly sidelined the discussion of energy security issue. The administration's stand on this issue was that the energy crisis was artificially generated due to the excessive regulation of the market, a legacy left over from the earlier administrations. Thus, the Reagan administration thought that de-regulation would ease or solve the energy crisis. Indeed, a literature review of this period

showed a series of attempts to de-regulate various energy sectors, such as those of electricity and natural gas, to name but a few.

The combination of both reasons caused serious discussion on the energy crisis and the environment to 'fade' from governmental agendas, to use Kingdon's words.

b) - Reoccurrences and Re-recognition of Problems

Kingdon described reoccurrences and re-recognition of problems as an important element in his model. Policy entrepreneurs are able to present these reoccurring problems as urgent agendas which need immediate solutions. One mechanism through which this occurs is informal feedback, for example through the steady monitoring of programs, their results and cost. Informal and formal feedback combined with focusing events can create powerful governmental agendas.

One can find evidence for the re-occurrence and re-recognition of problems in the various acts enacted during the 1990s and the 2000s, specifically the environmental problems that originated in the 1970s. This time, however, not only in terms of the quality of air and water but also the alarming issues of global warming and climate change. The other example of a reoccurring problem was the increasing dependence of farmers on government subsidies while the government deficit grew; a preoccupation that generated many discussions and debates during the congressional hearings of the 1990s and 2000s. Both problems are described as raising the external costs of government.

As for tackling the environmental problems, one can cite the enactment of the Clean Air Act Amendment (CCAA) in 1990. This act was adopted in response to reports on the air quality, increasing smog across major cities, and acid rain, from the EPA both

at the States and the Federal levels. In a descriptive section of this act, found in the American University's Trade and Environment Database, one reads:

The American public is becoming increasingly aware of air pollution as a national and international problem. Everyone familiar with hot, quiet summer days in almost any large urban areas is familiar with smog's visual blight. However, air pollution is not constrained to urban environments or even to hot summer days; it is an ongoing problem for many regions. While air pollution is visible locally, its sources are a combination of a wide variety of local and extra-local pollutants. Air pollution is far more than an impairment of visibility. It causes significant health problems, damages land and aquatic environments, primarily through the phenomena know as "acid rain," damages construction materials, paper, leather, and textiles... (Clean Air Act Amendments 1990: no specific page)

Despite the various amendments to the Clean Air Act 1990, the preoccupation with environmental problems continued well into the 2000s to the point that it became the dominant problem on governmental agendas. As for the reinforcement of the pre-existing perception of a problem, one can cite the last series of reports issued by the Intergovernmental Panel on Climate Change (IPCC), a U.N. advisory body (the New York Times: 01/20/2007). These reports come from a reputable international organization merely re-emphasised the serious discussions already under way during the 106th, 107th, and 108th congressional hearings on environmental deterioration in general and global warming in particular. In fact, there is significant evidence of environmental problems becoming the new driving force behind most federal and local states of different countries` efficiency programs created to deal with the energy crisis. As it was reported in a report delivered by Fred Sissine for the 106th congress:

On the other hand, worldwide emphasis on environmental problems of air and water pollution and global climate change, and the related development of clean energy technologies in Western Europe and Japan especially, have emerged as important influences on energy efficiency policymaking. (Sissine, CRS report 1999: summary section)

The underlying preoccupation of policy makers with environmental problems, both in the House and the Senate can also be underlined by focusing on the number of legislations and congressional hearings that took place between the 106th Congress and the first session of the 109th Congress. For instance, in only the 106th congress, there were 36 major environmental protection bills passed (Lee CRS report 2000: no specific page). In addition, there were almost 50 hearings in regard to environmental problems held, during the same period¹. All were related to environmental issues which included a wide range of topics, from the discussion on air quality to the budget of the Environmental Protection Agency. Appendix C contains the list of some of these hearings.

The second re-occurring problem was the growing cost of the federal government's farm subsidy programs and the increasing government deficit. The cost of the subsidies to farmers had skyrocketed: it became one of the most expensive government transfer programs within the USDA (Johnson et al. 2000: 33). As one report states:

USDA farm support programs represent the heart of U.S. farm policy, by virtue of their longevity and their cost. They have existed since the early 1930s. The programs remain the most expensive and visible of all Federal farm activities. Net outlays for the Commodity Credit Corporation (CCC), USDA's financing mechanism for the programs, are expected to average more than \$15 billion annually between FY1996 and FY2002, with FY2000 outlays at a historical record of \$32.3 billion. (Becker, CRS report 2001: overview section)

By early 2000, one can see the convergence of these reoccurring and re-recognition problems: the energy crisis (the 70s), the rising cost of farm programs and declining revenue of farmers (the 80s), and the environment (the 90s). Ultimately, it was

¹ Note: The number 50 is obtained by counting the number of hearings related to environmental issues. This is for the period of the 106th through 108th Congress. See Government Printing Office (GPO) site: <http://www.gpoaccess.gov/> under Congressional Bills link and type for the 106th, 107th, and the 108th Congress.

argued by many actors that these problems are intertwined. For instance, a statement such as the one below given by Keith Collin the chief economist at the U.S. Department of Agriculture, shows the link between energy crisis and that of rising crude oil prices, since the late 90s, in the agricultural sector:

The energy price increases this year are reducing farm income, and this is coming from two different sources, on the price side and on the cost side. When a consumer spends \$1 on food, about 8-cents goes to cover transportation and energy, for those energy and transportation costs after the commodity leaves the farm, in addition to the reduction in farm revenue, net farm income is also reduced by higher farm production expenses on energy. When a farmer spends \$1 on total production costs, about 3-cents goes to direct fuel and oil costs. This year we expect that is going to rise to about 4-cents, which would be the highest rate since 1986 (Collin, USA 106th Congress 2000: 36)

On the issue of the link between the environment, especially global warming, and the negative impact on agriculture for food production, one can find plenty of evidence similar to that presented by Keith Collin. For instance, the following was promoted at a congressional hearing by Debbie Reed, the legislative director of the National Environment Trust who states:

We should pursue with vigorous strategies, such as agricultural sequestration, to help offset greenhouse gas emissions in the interim. Global warming is a threat to agriculture. U.S. agriculture is a major industry. Farming contributed \$80.6 billion or .8 percent to the national gross domestic product in 2001. However, the threat of global warming and potentially severe weather events jeopardize the very livelihood of farmers in rural communities, as well as the ability of agriculture to continue to fuel U.S. prosperity (Reed, USA 108th Congress 2003: 21).

In brief, the underlying reasons, such as energy cost, agriculture and environmental deterioration, were discussed in conjunction with the on-going and frequently discussed problem of the decline in the revenue of farmers.

Lastly, the events of September 11th 2001 were followed by another series of serious focusing events. These events were 1) the dramatic rise in the price of crude oil

on the international market, due in part to the Second Gulf War with Iraq; 2) the general strike in Venezuela in late 2002; 3) the electricity black out in California in 2003; 4) the continuing demand for oil on the international market as result of the growing economic activities in emerging countries which pushed the price of oil to almost \$70 per barrel by mid 2005 (Bamberger, CRS report 2005: Summary Section). In brief, these events acted as powerful accompaniments to the existing and ever debated issue of energy security.

In sum, an analysis of the evidence presented within the problem streams indicates that there is a reliable validation of the presence of the important elements described by Kingdon. The first element is that of the role of quasi-systematic indicators, such as focusing events, with the most notable one being the rise of environmental problems which was noticed in the 1970s and continued well into the 2000s. The second element is the ever increasing involvement of some federal agencies, the most visible being the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and the U.S. Department of Agriculture (USDA). They provided both formal and informal feedback to the members of Congress on some of the most urgent issues: the continuation of environmental problems, the rise in cost (read ‘fund transfers to farmers’), to name two. At some point, these agencies provided evidence of the link among these problems. They also provided solutions and ideas on how to resolve them. The details of these solutions will be discussed in the next section.

B- Policy Streams

To return to Kingdon, a critical component in generating ideas and alternative sets of ideas is the policy community. He compares the mechanisms by which these ideas and proposals are generated to ‘primeval soup’. These ideas and proposals are presented by specialists in the policy community, but only those ideas that meet certain criteria survive. The most important criteria are technical feasibility and value acceptability. In the end, it is the idea itself and not pressure that determines the decision to create policy.

The literature review and examination of the congressional hearing documents, from the 106th to the 109th Congress, indicate that certain federal agencies more than others played a greater role in promoting ethanol as part of the solution. The most visible participants in the policy stream are the U.S. Department of Agriculture, the Department of Energy, and the Environmental Protection Agency which the following section will discuss.

a) – The Role of the US Department of Agriculture (USDA)

The role of the USDA in providing expertise and in the dissemination of information in the domain of energy policy has been critical. The foremost reason for this is the fact that the agricultural sector is one of the major consumers of energy (Dorr, Congressional Testimonies 2006: no specific page). In addition, as the evolution of energy policy in the U.S. indicates, there is increased interest in the agriculture sector producing renewable energy. It is from this point that the role of the USDA was re-emphasised. Two important entities within the USDA which conduct scientific studies in are the Office of Energy and Economic Research Services (ERS).

According to literature reviews, the first series of comprehensive (scientific) studies by the USDA on ethanol dates back to 1986 (Johnson et al. 2000: 34). This report was prepared by the Office of Energy in response to the question posed by many members of Congress: Whether or not a positive trade-off existed between the price of ethanol and the government program for the ethanol subsidy. It is worth mentioning that ethanol subsidies had been heavily blamed earlier by the U.S. Transportation Department for the reduction in funds to the Federal Highway Trust Fund program (New York Times, 1990, 1996). This report was against the continuation of ethanol subsidies by the U.S. government for two reasons: ethanol production without heavy government subsidies is not possible, and the environmental benefits are not clear (Johnson et al. 2000: 38).

Apparently, this report was quickly criticized by the advocates of ethanol and, particularly, by Robert Dole, the senator from Kansas at the time. He had requested an amendment (known as section 13) to the Farm Disaster Act of 1987 (P.L.100-45). Robert Dole and some other proponents of ethanol also had requested the removal of Earle Gavett, the chief in charge when the initial report in 1986 was released by the Office of Energy. In addition, Robert Dole had called for the formation of a panel to further study the cost-effectiveness of ethanol (Johnson et al. 2000: 39). The panel had been formed and subsequently concluded for undertaking another study but this time to be conducted by the Economic Research Service (ERS) of the USDA.

The subsequent studies conducted by the ERS – in the final version (LeBlanc et al. 1988: 37) – had concluded the feasibility of government subsidies for the ethanol. The report has also recommended continuation of government's support to ethanol production

as it benefits energy security and help reviving the agricultural economy. The environmental benefits were inconclusive.

The support of the USDA for ethanol had continued well into the 90s and 2000s. However, during this period the USDA attempted to link the suitability of ethanol to environmental problems; problems that are not fading away in this period. More specifically, this is the period in which the feasibility of ethanol in terms of the net energy balance, cost (production and transportation to outside corn-belt states), and the reduction of carbon monoxide were seriously questioned at congressional hearings. In fact, it was claimed that an increase in ethanol production may even increase the emission of carbon monoxide because to meet the projected level of production of ethanol more agricultural lands and fertilisers would have to be used². And both are believed to be a significant source of carbon monoxide emissions. Indeed, these debates were under serious consideration at congressional hearings (Note 3, No Name, USA 106th Congress 2000)³.

As the lack of clarity regarding the benefits of ethanol had been increased, the USDA became involved in another series of scientific studies which started in the mid 90s. The final report is known as “The Energy Balance of Corn Ethanol: An Update (USDA 2002)”. Basically, the recommendation for ethanol – from this report- was positive especially when combined with other governmental efforts in achieving energy efficiency. One part of conclusion reads:

We conclude that the NEV [Net Energy Value] of corn-ethanol is positive when fertilizers are produced by modern processing plants, corn is converted in modern ethanol facilities, and farmers achieve average corn yields. Our NEV estimate of

² Note: This argument of net energy balance and its calculation is a very complex; I have attempted to summarize the basic ideas and that some of the most important ones.

³ Note: See many congressional hearings from the 106th – the 108th Congress.

over 21,000 Btu per gallon could be considered conservative, since it was derived using the replacement method for valuing co-products, and it does not include energy credits for plants that sell carbon dioxide. Corn ethanol is energy efficient, as indicated by an energy ratio of 1.34; that is, for every Btu dedicated to producing ethanol there is a 34-percent energy gain. Furthermore, producing ethanol from domestic corn stocks achieves a net gain in a more desirable form of energy, which helps the United States to reduce its dependence on imported oil (Shapouri & Wang et al. 2002: 12)

There were other updates on this report, but it is beyond the scope of this paper to examine their content⁴.

b) – The US Environmental Protection Agency (EPA)

The role of the EPA in designing and monitoring the implementation of the Clean Air Act in the 70s was very important. By and large, the implementation of this act was successful, but environmental problems have continued to exist. The second important role of the EPA was marked by the enactment of the Clean Air Act in 1990. This is after the Reagan's era which had reduced the role of this agency to a minimum. More specifically, the mandate for oxygenate additives under the Reformulated Gasoline Program (RFG) requirement within this act had facilitated – once again- the EPA to play a larger role. The second example would be the beginning of the efforts to phase out the MTBE (known as the MTBE phase out period). In this period, the EPA had become involved in many studies to find a replacement for MTBE. It is also worth to mention that the MTBE was one of the solutions provided by the EPA (McCarthy et al. CRS report 2006).

⁴ Note: For instance, one can go to the National Corn Growers Association' website for more discussion on this report and subsequent ones. This can be found at: <http://www.ncga.com/ethanol/main/energy.htm>

In 1998, one important study by the Environmental Protection Agency (EPA) is known as the Blue Ribbon Panel Task Force (EPA, Blue Ribbon Panel Reports 1998). This report advocates an immediate ban on the further use of MTBE. However, there is no evidence of the rapid adoption of ethanol as a replacement. This is for various economic reasons: the hike in consumer prices, the unavailability of sufficient transportation facilities for ethanol, and the high cost of ethanol production. Discussion/debates on regarding these reasons had continued well into the 107th Congress. The members of Congress, both for and against enlarging the role of ethanol as a replacement to MTBE, cited this report on many occasions. One reason for the many references to this report is that there is no definite conclusion on the benefits of ethanol as an oxygenate additive. This is one of the essential requirements of the RFG program to improve air quality (EPA, Blue Ribbon Panel Reports 1998: Executive Summary). However, as many local states continued to ban MTBE, the role of ethanol was magnified. California⁵ was one of the pioneers in demanding this ban.

Since the original publication of this report, the Environmental Protection Agency has continued to be the provider of formal feedback to policy makers. Reviews of the Congressional hearings during the 106th to the 108th Congress reveal that the EPA was, indeed, an important visible participant in the policy community. They have supported the production of corn ethanol as an important part of the expansion of renewable energy to help the U.S. achieve all of the objectives discussed.

⁵ Note: Governor Gary Davis in 1999 requested that MTBE be completely phased out by 2004. Google search with “Governor Gary Davis in 1999 requested that MTBE be completely phased out by 2004” to read further about this.

c) – The Role of the US Department of Energy (DOE)

As it was mentioned earlier, the role of the U.S. Department of Energy, similar to that of the role of the EPA, was reduced in the Reagan Era. The other reason for the rejuvenated interest in increasing the role of the DOE is to do with its existing research and development facilities. These facilities can be used to conduct studies on sophisticated energy and related issues. The DOE's systematic research and studies on energy issues and their trends served as an important feedback mechanism to policy makers at the U.S. Congress. Significant evidence of this is in the fact that the Department of Energy (DOE) appeared in many congressional hearings from the 106th to the 109th. Further evidence of the growing presence of the DOE is the steady increase in budget allocation to the DOE which can be traced back to early 2000.

Moreover, an examination of statements and testimonials from various members of this federal agency who appeared at congressional hearings indicates that an overwhelming number were in favour of finding renewable energy sources to replace traditional fossil fuel, especially in the transportation sector. This can be seen in the statement below made by Bill Richardson Secretary of the U.S. Department of Energy during 106th and 107th congress:

Mr. Chairman, bioenergy resources already meet over 3-percent of our Nation's energy requirements, and consumption has been rising by nearly 3-percent annually since 1990. But even this growth cannot meet our growing concerns on air quality, climate change, dependence on foreign energy supplies, and the sluggish economic conditions in the Nation's farm and forestry sectors. If we are to see a meaningful decline in our future reliance on fossil fuels, if we are to lessen our vulnerability to interruptions in energy supply, if we are to kindle a whole new field of agricultural and forestry economics, then we need a cooperative national effort to develop a range of renewable energy sources, and bioenergy can be at the heart of such an effort (Richardson, USA 106th Congress 2000: 6).

Regarding ethanol produced from corn, the position of the Department of Energy (DOE) is cautionary. While there is evidence of support for the continuation of corn ethanol production, the DOE is more in favour of expanding research on the second generation of ethanol. This is known as cellulosic ethanol. Statements such as the following are examples of such evidence. The citation is taken from a testimony given to the 106th Congress by Mark Mazour, then the director of Office of Policy within the DOE:

As we work together to develop the details of our program to reduce MTBE use and increase the use of renewable sources, it will be of utmost importance that we move deliberately and carefully so that we do not create gasoline supplier price problems or other unintended consequences. As you know, we are operating in a tight gasoline market this summer, and projections indicate it is likely that motor fuel supply and demand balance in the foreseeable future will also be somewhat tight. (Mazur, USA 106th Congress 2000: 24)

Evidence that the Department of Energy (DOE) is in favour of cellulosic ethanol can be found in another statement made by Mark Mazour:

As you know, the major renewable fuel used in this country today is ethanol from the starchy parts of corn kernels. Corn ethanol production is approximately 1.5 billion gallons a year, representing about 1-percent of the energy of our annual gasoline consumption. To complement this production, the Department of Energy is engaged in a long-range research program to develop ethanol derived from cellulosic matter, including agricultural and forest residues, the organic components of municipal solid waste, and future energy crops such as fast-growing grasses and trees. (Mazur, USA 106th Congress 2000: 25)

The similar statement was also made at another Congressional hearing by David Garman, the assistant secretary for renewable energy of the DOE:

But there are limits to the amount of ethanol that can be produced from grain before encountering secondary effects such as impacts on food and feed markets and the sustainability of production on marginal agricultural lands. We want renewable to play an even greater role in displacing some of the roughly 136 billion gallons of gasoline and 33 billion gallons of highway diesel we use each

year, so we have to look beyond grain-based alcohol. (Garman, USA 108th Congress 2003: 9)

In fact, most of the facts and statements that were presented by the various experts from the DOE are based on one of the most comprehensive studies sponsored by the DOE itself: “Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions (Wang et al. 1999)”. Briefly, in this report the DOE found only marginal net positive energy in corn-based ethanol and only a moderate improvement in the reduction of carbon monoxide as a result of using corn ethanol.

d) - Interest and Lobbyist Groups : An Attempt to identify the most important

As ethanol became prominent on the list of alternative energy sources, several interest groups played a more important role than others. Clearly, they represent those that have been directly affected by the large production of ethanol, either positively or negatively. One organization which represents the interests of ethanol proponents is the Renewable Fuels Association (RFA), started in 1981. It is not a homogenous association. It is comprised of companies like Archer-Daniels Midland (ADM), a giant agri-business company and the largest producer of ethanol in the U.S. It also includes small- to mid-size farmer-owned co-operatives. The basic position of this association on ethanol can be summarized in one of statements found on its main website.

The federal ethanol program has been a tremendous success, helping to build a strong domestic energy resource. From just over 10 million gallons of production in 1979, the U.S. ethanol industry has grown to 4.0 billion gallons of annual production capacity in 2005. Today, approximately 30% of the nation's gasoline is blended with ethanol - reducing the demand for imports, stimulating economic benefits across the country, and reducing air pollution. And the federal government realizes a net gain annually due to increased tax revenues and reduced farm program costs. (RFA Website 2008)

Similar positions were held by another influential group known as the National Corn Growers Association (CGA), also a heterogeneous group. It represents many local corn grower associations at the local state level. They range from very small- to mid-size farm owners and real-estate developers who simply own land and benefit from the rising price of land (Bullock 2007: 147- 155)

There is also evidence of other groups: the Farm Bureau, Farmers Union, and the American Soybean Associations. At some point, all of them supported the cause of the two most significant associations, namely the RFA and the CGA. The following statement obtained from the 106th Congress shows the level of co-operation being forged among these groups. The 106th Congress is the period in which the highest numbers of hearings were held to discover the feasibility of ethanol. The statement reads as follow:

The Farm Bureau along with the Farmers Union, the Renewable Fuels and National Corn Growers and other organizations have been meeting in a summit, to come together with a common legislative strategy, that we have all put together a national solution to the ethanol issue. It is the Farm Bureau's belief that any legislation addressing MTBE must be national in scope. We know about states individually banning MTBE. It does not make an industry that can operate effectively or efficiently. All action should be taken on a national level (Warfield, USA 106th Congress 2000: 24)

It is also worth mentioning that the positions of the Farm Bureau and the Farmers Union on ethanol have changed over time, especially, in the years immediately prior to the adoption of the Energy Act in 2005. One factor that contributed to this shift in position was the increase in the price of corn which affected the cost of livestock production because corn is one of the principle sources of feed for livestock in the U.S. However, the position of the Soybean Association remains the same as soya is considered a primary source used in the production of biodiesel. Biodiesel is an

agricultural source of renewable energy. Its production was encouraged, the incentives for which were provided in the Energy Act of 2005.

As for the opponents of ethanol, two large groups which are affected negatively are petroleum and petro-chemical companies. The National Petroleum Refiners Association (NPRRA) and the American Petroleum Institute (API) represent such companies. Despite the high level of co-operation in these groups, they are not homogenous either. They represent Multinational companies such as, Exxon/Mobil and smaller companies. They are also involved in the exploration/drilling for, buying and selling of crude oil from foreign markets as well as its transportation/distribution and refinement in various locations.

Both the API and the NPRRA have firmly objected to the ethanol mandate and the heavy subsidies provided by the U.S. Federal Government to ethanol producers. However, the tune and form of their objections have changed over time. For example, there was a period of firm objection, as one study reports, during the period just before the enactment of the Clean Air Act in 1987:

Strong opposition from many groups such as NPRRA, Conoco, Chevron, ARCO, Marathon, UNOCAL, Amoco, National LP-Gas, Service Stations Dealers of America, National Petroleum Refiners Association, and other groups have all have opposed and provided evidence against ethanol for being high in investment costs and little gain in providing energy security or clean air mandate. (Johnson et al. 2000: 46)

Afterward, there was a period of “softening up”, to borrow from Kingdon, as MTBE, one their main products for oxygenate additive, was found to contaminate ground waters. Following this, their objection changed, and they were more in favour of arguing that the heavy subsidization of ethanol should stop and, instead, market forces should

determine the course of ethanol production (Bullock 2007: 149). This is clearly seen in transcripts of congressional hearings, specifically the 106th Congress. Equally important, it seems that their strategy shifted from that of strong opposition to the ethanol mandate to that of lobbying against The Liability Act: The Liability Act would oblige them to cover the cost of cleaning up contaminated water, to say nothing of how it would penalize them further. The following statement made by Bob Slaughter, the director of Public Policy, at the National Petrochemical and Refiners Association, shows the shift in strategy:

It is not that NPRA is anti-ethanol, because many of our members and maybe most of our members are blending ethanol and selling it in their products. Ethanol use has really increased in the past decade. The DOE and the California Energy Commission say that if MTBE is phased out, the national usage of ethanol will double just through increases in California and the Northeast, alone. This happens without an ethanol mandate (Slaughter, USA 106th Congress 2000: 16)

Moreover, the examination of the congressional hearings of both the 107th and the 108th Congress show the strong appearance of these interest and lobbyist groups. They appeared at almost every hearing on discuss energy policy, ethanol, environment-related issues, biofuels, etc...

e) - Researchers, Academics, Consultants: The Invisible Cluster

Kingdon's study on the transport and health industries described the position of this group as "a quite important position, though not in the top rank occupied by interests groups, the administration, and members of congress" (Kingdon 1995: 54). However, they are very important in terms of generating ideas.

Scientific studies on biofuels, such as the cost-benefit and impact analysis are extremely multi-dimensional. They touch upon many scientific domains, such as biology,

economic, physics, chemistry, and engineering of all sorts, to name but a few. Therefore, it makes the related formulation of policy a very cumbersome task. Policy makers need the help of many researchers to hash out solutions in order to come up with a short list of proposals.

The examination of congressional hearings reveals that indeed there is a bewildering array of scientific input that comes from many researchers⁶. Some are associated with federal agencies, often as senior consultants. Some work with interest groups. This section attempts to introduce a short list of researchers who have contributed to the policy streams. It is beyond the scope of this paper to provide a comprehensive list. To better do this task, interviews and further research are required. This list prepared is based on 1) the most controversial scientific issues discussed at congressional hearings in regard to ethanol 2) the most important scientific studies undertaken by the three important federal agencies; 3) a review of most important congressional hearings related to ethanol and biofuels from the 106th to the 109th Congress.

One of the most controversial issues related to ethanol is the net energy balance⁷. The net energy balance can be positive or negative. Among the proponents of a positive net energy balance, one finds the name of the most referred-to scientists inside government circles: Hossien Shapouri (1995, 2002) who has been associated with the U.S Department of Agriculture for years; Dr. James A. Duffield (1995, 2002) who works for

⁶ See Appendix C for the list of Congressional Hearings. Here, I am referring to the list of these congressional hearings especially their contents that I have examined.

⁷ Note: The Net Energy Balance, in the case of ethanol, refers to the amount of energy it takes to produce ethanol. It can be positive or negative. For example, if the amount of energy used is more than it takes to produce ethanol, then net energy balance is regarded as negative. The best in-depth individual analyses are contained in two recent studies: Hosein Shapouri, James A. Duffield, Michael Wang, [The Energy Balance of Corn Ethanol: An Update](#). U.S. Department of Agriculture, Economist Research Service <http://www.ers.usda.gov/Publications/AER721/> .

the U.S. Department of Agriculture's Office of Energy Policy and New Uses; and Michael Wang (2002), the director of research at Argonne National Laboratory which is funded by the DOE's Office of Energy and Transportation Research and Energy Systems Division. These scientists have found a positive net energy balance for ethanol produced from corn. Moreover, Michael Wang has contributed to many joint studies between the U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (DOE). These joint studies, in fact, have been on rise since late 1990s and have been confirmed by many sources. One such a source is the United States Government Accountability Office (GAO)⁸. These joint studies especially among the USDA and the DOE – two important visible actors- point also to the fact that there are evidences of increasing collaborations to find in what Kingdon has called an attempt to find common grounds or languages among the scientific community.

Another important figure within the USDA is Keith Collins, the chief economist, who has been a long time supporter of ethanol production benefiting the agricultural sector.

There is further evidence of important studies by other scientist such as, David Lorenz and David Morris (1992) that have been quoted and referred to by numerous interest groups at congressional hearings. Both scientists are from a non-profit organization called the Institute for Local Self Reliance (ILSR). Basically, both have argued for the positive net energy balance of corn-ethanol.

On the other hand, there are also important studies that have been used by the proponents of the negative net energy balance. These scientists are David Pimentel (1991,

⁸ Note: One can look at the following report produced by the GAO dated in June 2007 in page 11. Available on line as pdf file: <http://www.gao.gov/new.items/d07713.pdf>

2005) and Ted Patzek (2005) of Cornell University. The work of both Pimentel and Patzek is based on some earlier work done by the scientists Keeney and DeLuca. It is worth mentioning that one can find a comprehensive list of these scientists and their type of studies in regard to biofuels in one report - prepared for The World Bank- known as “ Review of Environmental, Economics and Policy Aspect of Biofuels” (Rajagopal et al. 2007).

There is also evidence of scientists working with government agencies. They are associated with the National Academy of Science, an advisory board in the absence of the Office of Technology Assessment whose funding was eliminated in 1995 (USA 109th Congress House Hearings 2006). Unlike the Office of Technology Assessment, The national Academy of Science is a private corporation consist of distinguished members of scientific community. The function of the National Academy of Science is to act as official advisor to government to review and summarize scientific and technological analyses for congressional members as well as to various other governmental departments⁹.

Congress also used various scientific and technological information from science and engineering societies inside and outside the academic setting. Interest groups and think tanks also provided their experts on many testimonial hearings related to ethanol, renewable energy and energy security issues. There is also evidence of members of congress using congressional staff who happened to have a scientific background. However, gathering information on these participants is difficult to obtain as information is disseminated in a very fragmented fashion. There are also the National Research

⁹ For more comprehensive descriptions of the works and functions performed by the National Academy of Science refer to their online Website at: <http://www.nasonline.org/site/PageServer>

Council and the Congressional Report Services whose documents are prepared for members of congress by specialists on energy and its related domains.

There is also evidence of experts from the university setting who also appeared at many congressional hearings, for instance, during the 106th Congress when the topic of eliminating MBTE and the benefit and impact of ethanol was a hot topic. There is evidence of prominent researchers, especially from the University of Illinois, who provided their expertise on biofuels and agricultural topics: Dr. Donald Holt, the associate dean of Agriculture, Consumer and Environmental Science at the University of Illinois, and Dr. Brain. E. Donnelly, the executive director, from the University Park in Southern Illinois. They testified in favour of biofuels, in particular ethanol. They argued that ethanol would help ease the energy security problem, revive the rural economy, and fight the environmental degradation caused by using fossil fuels (USA 106th Congress 2000).

Moreover, one of the most oft-cited benefits of ethanol is related to the improvement of air quality. This issue has had its fair share of discussions on its pros and cons at congressional hearings. One benefit that was discussed had to do with using ethanol as an oxygenate additive in the RFG program. It was argued that ethanol would help to reduce the gas emission from vehicles, particularly in the cities¹⁰ that are in extreme non attainment (below the requirements) of the National Ambient Air Quality Standards (NASSQ). However, this issue is controversial. It led to further studies which showed that while an oxygenate additive led to lower emissions of carbon monoxide (CO),

¹⁰ Note: Example of such cities include: Chicago, New York, Los Angeles. Basically, big metropolitan cities

it may also lead to the higher emission of other toxic gases, such as nitrogen oxide (NO_x) and volatile organic compounds (VOCs).

Ethanol-related scientific debates have -sometimes- been linked to and presented in another category: public health. Among the scientists who testified were: Dr. Dan Greenbaum, the president of the Health Effects Institute; Blake Early, an environmental consultant for the American Lung Association; Michael Graboski, the director of the Colorado Institute for Fuels and High Altitude Engine. Specifically, Dr. Dan Greenbaum talked about the health effects of ingesting ethanol on pregnant mothers and its possible co-relation to the elevation of certain cancers among this group (Greenbaum et al., USA 106th Congress 2000. 50-120). Dr. Blake Early, while emphasising the positive aspect of ethanol in reducing carbon monoxide, presented some studies which show that the use of ethanol may lead to the emission of other pollutants, such as NO_x (Greenbaum et al. USA 106th Congress 2000: 12).

Another issue that Dr. Blake Early mentioned was the increasing volatility of ethanol. Volatility causes the emission of VOCs which could exacerbate the creation of smog. He said that this fact was based on references to other studies conducted by the National Research Council. The National Research Council's report, according to him, had found that while ethanol benefitted air quality by reducing carbon monoxide, it was also likely to increase in volatility (Greenbaum et al. USA 106th Congress 2000:13).

The other issue discussed was that of second generation biofuels or cellulosic ethanol. It is believed that second generation biofuels have fewer disadvantages than first generation ethanol (read 'corn ethanol'). For instance, one issue regarding second generation biofuels was that the technology to produce it was and is limited, and very

expensive. Commenting on this issue was Dr. Joseph Romm, the director of the Center of Energy and Climate Change, whose research group reported positive developments in their research on cellulosic ethanol and especially on the process of reducing its production cost. He also collaborated closely with the Department of Efficiency and Renewable Energy within the DOE and requested more funding for his research (Romm, USA 106th Congress 2000: 56).

Clearly, the enactment of the Energy Security Act of 2001, during the subsequent period, the 107th Congress, is an indication of the close attention policy makers' paid to the research on second generation ethanol: in this act funding for research and development for biomass studies and the development of technology to lower the cost of cellulosic ethanol production increased.

During the 107th Congress, there is also evidence of the testimonies of many researchers. The topic of discussion varied from the on-going debate on the phasing out of MTBE, energy security, to environmental problems, and many more topics related directly or indirectly to these issues. Scientists, such as Pamela Williams from the Exponent Company testified to the negative effects of MTBE on ground water (Williams, USA 107th Congress 2002: 53). Others, such as Dr. David Legates, the director, Center for Climate Research of the University of Delaware, testified to the need for urgent action to combat the rapid climatic change that is taking place. For example, the issue of global warming which is believed to be caused by the excessive emission of carbon monoxide (Legates, USA 107th Congress 2002: 15). Ethanol was discussed and seen by many as part of a solution. However, some were strongly opposed and some saw corn ethanol as a short-term solution.

Finally, there is the Union of Concerned Scientists (UCS). This group seemed to increase their presence close to the beginning of the 108th Congress (Friedman, USA 108th Congress 2003: 22). The range of topics discussed by this group was wide and requires further research. Perhaps the reason for the range in topics discussed by this group is due to the fact that scientists who belong to this group come from all sorts of scientific domains. Accordingly, I found it difficult to identify their direct statements on ethanol by examining only congressional hearings.

However, according to one of the memos, released shortly after the passing of the Energy Act 2005, the UCS appears to express that the act is a failure. They believe that the Energy Act of 2005 failed to achieve any of the original objectives of the debates on energy concerns: the dependence on oil, addressing global warming, reducing the price of home heating and gasoline, and even the allocation of the funding needed to make renewable energy a viable option(UCS, CRS report 2006: no specific page). In this memo, it seems that the solution offered was mixture of short- and long-term courses of actions, such as, promoting energy efficiency and conservation, using fuel-cell vehicles, home grown agricultural waste, and dedicating crops as the backbone of clean energy and increasing the production of domestic energy. Certainly, one of the biggest disappointments for this group was a clause in the Energy Act of 2005 which repealed the mandate to electrical generators to purchase electricity produced from renewable sources. For instance, one publication on ethanol, released after the Energy Act of 2005, seemed to suggest that there are still many issues, such as food price impact, land use, etc. in regard to ethanol production that were not considered thoroughly by policy makers before enacting the Energy Act in 2005(UCS Website).

In sum, the analysis of the evidence presented in the policy streams points strongly to Kingdon's "primeval soup" regarding alternative solutions. The ideas of the most important and visible participants in this primeval soup were three federal agencies: the USDA, the EPA and the DOE, with the USDA being the most active. There is a long list of other participants, such as interests groups, who appeared mostly in the form of lobbyists but, in essence, they are what Kingdon described as policy entrepreneurs. Furthermore, there was a wide range of researchers and scientists associated with these interest groups. They belong to the invisible cluster and have poured their fair share of alternative solutions (read 'ideas') into this primeval soup. It is a very cumbersome task to identify all the participants of this invisible cluster. As already mentioned in the section on research methodology, a comprehensive qualitative methodology, such as interviews and surveys are required. In one of the following section (idea, pressure) attempts will be made to analyze these alternative solutions in light of two important criteria: technical feasibility and value acceptability but first the political stream.

C- Political Streams: The Window of Opportunity

Kingdon attributed an important role to this stream. It is within this stream that all favourable political conditions ripen to their ultimate function, the formation of policy. Some of the most important elements that influence this stream have already been mentioned in the theoretical section of this paper. Once again, these elements are national mood, the actions/tactics of interest groups, and the change of key personnel at administrative and executive levels.

The examination of the case of ethanol depicts the existence of some of these elements, the perception of national mood being a significant one. One source for such perception came from one of the U.S. government's own reporting agencies known as the Government Accountability Office (GAO). In one of the reports of the GAO presented at a congressional hearing by Jim Wells, director of Natural resources and Environment, the U.S Government Accountability Office, a few months before the enactment of the Energy Act of 2005. One reads as follows:

America's demand for energy has, in recent decades, outpaced its ability to supply energy. As a result, the country has witnessed rapid price increases and volatility in some markets, such as gasoline, and reliability problems in others, such as electricity, where the blackout in 2003 left millions in the dark. Given these recent and sometimes persistent problems, as well as concern about the impacts of energy consumption on air, water, and other natural resources, there is a growing sense that urgent action is needed. (Wells, 109th congress 2005: 6)

The other element is in relation to the actions and tactics of interest groups. These interest groups manifested diverse tactics towards the issue of ethanol, but despite this fact, there are signs of consensus among them. Regardless of whether corn ethanol is an excellent option or not, both the proponents and opponents of ethanol agreed that the U.S. is suffering an energy and environmental crisis and that something had to be done about it.

More specifically, the evolution of cohesiveness among the proponents of ethanol has been remarkable, for instance the coalition known as the Renewable Fuels Associations (RFA) which was formed. The RFA has now become the main voice of the diverse currents that had promoted ethanol.

The other element is the U.S. election of 2004. Now, given the close race between George W. Bush's (his re-election) and John Kerry, both have relied on the much needed vote of the 'swing states'. The swing states are those states where the outcome for either

of the two major parties in the U.S. is unpredictable. The opposite example of these states is, for example, California; traditionally, California votes for the Democratic Party.

Interestingly, the major producers of corn as well as ethanol are located in these ‘swing states’¹¹. Consequently, both candidates have promised to support producing more corn to be used in the production of ethanol.

In sum, the combination of these elements has created favourable political conditions to put corn ethanol, once again at the top agendas. It appears that a ‘window of opportunity’ opened for corn ethanol. In fact, this window had opened as early as the 2000s. As one senator states:

But in my tenure as a member of Congress I have never seen a better climate to increase the use of ethanol than we have here and now. We really need to strike while the iron is hot. With gas prices having reached almost two dollars a gallon and corn prices just over two dollars a bushel, we can produce a product that will help our energy supply, which is also a major focus I think that we need to keep in mind, while increasing the demand for our corn farmers (Shimkus, USA 106th congress 2000: 5).

The following section strives to present a short list of the most visible policy entrepreneurs who have taken part in keeping this window of opportunity open long enough so that a policy could be enacted.

a) - Policy Entrepreneurs

According to Kingdon, once a window of opportunity opens up, it is policy entrepreneurs that play the critical role in seizing this opportunity. They are central to the process of ‘softening-up’ that is so vital in getting the attention of policy makers. These policy entrepreneurs are found in many locations. Key policy entrepreneurs can be a

¹¹ Note: Example of such cities include: Chicago, New York, Los Angeles. Basically, big metropolitan cities

cabinet secretary, one or many senators, members of the House, lobbyists, academics, lawyers, and the list goes on (Kingdon 1995: 180). In studying the case of ethanol, one finds many policy entrepreneurs. The following list is based on the most visible actors who appeared, on many occasions, at congressional hearings when the discussion on ethanol was predominant. Literature reviews have also been conducted as a supporting element to these congressional hearings. The identification of more invisible members or even further visible individuals requires further qualitative research in the form of interviews and surveys. They are as follows:

- Keith Collins, the USDA's chief economist, academic, career bureaucrat, and agricultural policy expert. He also served as acting Assistant Secretary of Agriculture for Economics between 1993 and 1994. He appeared on numerous occasions to testify to the impact of ethanol on the agricultural sector, mostly between the 106th and the 109th Congress.
- Bill Richardson, Secretary of the U.S. Department of Energy between 1998 and 2001. He is a Democrat who served in the Clinton Administration as the U.S. Ambassador to the United Nations. Prior to that, he was a member of the U.S. House of Representative between 1983 and 1997.
- In general, all the senators and house representatives from the 'corn-belt' states who have constituencies who strongly support making ethanol the main alternative fuel for the replacement of fossil fuel. One person, in particular, known as the architect of the farm bills to promote ethanol is Robert Dole. Dole was the United States Senator from Kansas from 1969 until 1996. He served briefly as the United States Majority Leader. He was the Republican nominee in the 1996

U.S. presidential election. At that time and later, corn ethanol was being promoted with the help of another U.S. Democratic House Representative, Tom Daschle, senator from South Dakota. Both Robert Dole and Tom Daschle worked with lobbyist groups in promoting ethanol and biofuels as an alternative source of energy. He appeared on many occasions in the U.S. Senate committee at ethanol-related hearings, mostly between the 106th and 109th Congress.

- Richard Lugar, Republican and the U.S senator from Indiana. He served as Chairman of the Senate Committee on Agricultural Issues between 1995 and 2001. He joined the Ethanol Across America campaign in 2005 as an advisor¹².
- Ronald R. Warfield, president of the Farm Bureau of Illinois, and lecturer at the Agricultural Economics Department at the University of Illinois. He served on the USDA's National Agricultural Research programs and the Economics Advisory Board which advised the Secretary of Agriculture. He appeared on many occasions in the House and the Senate Committee hearings on ethanol.

Chapter IV- Ideas, pressures, and choice of solutions: an Analysis

The idea of corn ethanol becoming one of the alternative sources of energy to deal with the U.S. energy crisis falls within the vision of searching for alternative energy in the agricultural sector to overcome this crisis. By the late 90s, this vision was

¹² Note on data: Online access to the Ethanol Across America Campaign: <http://www.ethanolacrossamerica.net/>. This is a non-profit organization which promotes biofuels and ethanol education across the U.S.

strengthened as it was backed by some of the most important federal agencies in the U.S., the USDA being its most staunch supporter. That said, the DOE and the EPA have continued to defend this vision, however with subtle differences. One example of this difference is to consider corn ethanol a short-term solution, a position held by the DOE because it is argued that research and development for corn ethanol may lead to the development and production of other efficient types of ethanol, like that produced from cellulosic sources. Despite this variation, evidence of solutions presented at congressional hearings suggests that since the early 2000s, there has been a growing cohesiveness among these federal agencies on ethanol as a viable solution. Joint scientific studies by these agencies are another point in case concerning the growing level of co-operation among these federal agencies. In brief, the increase in co-operation helped open the doors to ethanol being considered a suitable solution to the energy crisis problem.

However, this is not to suggest that everything has been about ideas. Certainly, powerful pro-ethanol interest groups attempted to pressure policy makers. In fact, this research paper has shown some of those attempts. Pressure groups have also acted cohesively at some points which was one of the important factors in shortening the list of alternative solutions. At the same time, there is also evidence of other powerful interest groups which argued against the use of corn ethanol. As a result, many ideas were generated and some more than others were discussed in great depth. As mentioned earlier, there were a considerable number of hearings on the merits and side effects of ethanol during the 106th Congress alone which then continued well into the 109th Congress. Some of the ideas explored were: 1) the high cost of ethanol production, especially when it is delivered outside the corn-producing states 2) the cost-benefit analysis (the net energy

balance), both in terms of the environmental and agricultural economic impacts. A discussion was also held on second generation ethanol and its impact. Suffice it to say a long list of ideas has been discussed over many years.

Debates on the technical feasibility of ethanol did not result in a silver-bullet solution. In fact, the debates on the cost-benefit analysis of ethanol were very complex: there is still no definite conclusion to the debate on the impact of ethanol on the environment specifically with regard to climate change. One reason is that modeling the effects on the environment is extremely complex. There is no model capable of incorporating all the factors that may interfere in global warming. As one of statements to Congress prepared by the Annapolis Center on Global Climate Modeling states:

How can we understand the earth's climate system and the possible consequences of increased concentrations of greenhouse-gases in the atmosphere? We can do some things in the laboratory, but because the earth's climate system is so large and incredibly complex, we can recreate only small pieces of it in the lab for extensive study (Annapolis, USA 106th Congress 2000: 43)

A further example of the primeval soup would be the on-going controversy between the DOE and the EPA on whether or not corn-ethanol can reduce carbon monoxide, and if so, then to what extent? The DOE believes that corn ethanol while having a modest effect on the reduction of carbon monoxide will increase the emission of Nitrogen Gases which is one of the primary gases causing ozone layer formation. However, the EPA dismisses this finding. As written in one of their reports:

The controversy with renewable fuels and with ethanol specifically, is that the Environmental Protection Agency (EPA) believes that ethanol use reduces NO_x emissions, while the Department of Energy (DOE) asserts that NO_x emissions actually increase from ethanol combustion. (Amerman 2006: 3)

These examples can be extended to include issues such as that of the impact of ethanol on the agricultural economy: the controversy of food versus fuel being a primary

example. There is no comprehensive conclusion on the net energy balance of corn-ethanol; an issue that had been discussed and debated for a long time. Given the enormity of the factors to be taken into consideration, calculating the life-cycle of corn-ethanol production is extremely difficult. It can be done approximatively at the best. Indeed, policy makers have been confronted with the policy processes that Kingdon calls an “intellectual puzzle”. This puzzle is far from being solved. In brief, determining the criteria by which the technical feasibility of ethanol can be considered accurately remains an unwieldy task.

One also sees that ethanol has risen and fallen from the energy policy agenda of the U.S. There were periods that one may consider windows of opportunity. But, they disappeared: the passing of the Clean Air Act (CAA) in the early 90s. One reason that ethanol did not become a full-blown solution, as it was in the case of the Energy Act 2005, was the existence of competition from MTBE as this was produced at a lesser cost. In addition, the MTBE being the choice of the Automobile and Petro-chemical companies which have lobbied for its use for many years at the Congress (Johnson et al 2000: 45). The other reasons cited are the cost of transportation to the non-producing corn states (USA 106th, 107th congress, 2000, 2002), and the failure to convince policy makers that ethanol has a positive impact on the environment, especially in terms of reducing carbon monoxide (Johnson et al 2000: 47). In sum, the rise and fall of ethanol happened in tandem with the considerable attempts to evaluate the viability of these ideas.

One thing is certain: since the late 90s, there had been a growing consensus among all actors to adopt a new policy on energy to deal with the U.S. energy crisis; an energy crisis that, at least in the eyes of policy makers, has not diminished by the

previous energy acts that were passed. This is why a new policy must, this time, put a bigger emphasis on alternative energy produced from agricultural sources. The idea of producing energy from agricultural sources became attractive amid the declining price of these sources and the rising cost of traditional sources, like that of oil, which were conditions favourable to the generation of this idea. Therefore, if there is the possibility of evaluating the criteria of technical feasibility, these are the factors that must be taken into consideration seriously.

The other reasons must be sought in what Kingdon calls value acceptability which was expressed in one of the objectives of the Energy Act 2005. One of these objectives was that of helping farmers with their declining revenue. The revival of the agricultural economy had been on agendas for a long time, and of particular importance in the U.S. As many literature reviews and the examination of congressional hearings indicate, this issue is, indeed, of concern. It is an issue which touches upon the belief, ideology and values that are most prevalent in the U.S. but that also exist in many other European countries. The following paper clearly expresses this sentiment:

Many researchers on rural policy in OECD countries have pointed out that analysis of agricultural policy must generally be informed by an appreciation of the historical, moral and romantic place that agriculture maintains in a nation's psyche (Botterill, 2006). This has been witnessed in the United States, where the promotion of biofuels based on corn (bioethanol) and soybean (biodiesel) has been accompanied by assertions that using such fuels increases the nation's energy independence and helps farmers and their families maintain their traditional lifestyles. This, as Botterill (2006) points out, is supported by citizens with no direct links to agrarian communities, such as those living in urban centres, yet who still value agricultural activity for its own sake (Charles 2007: 5740).

In brief, there was no shortage of ideas. An idea plays a significant role, but so does timing. Certainly, two criteria, technical feasibility and value acceptability, must be taken into account in analyzing the processes of finding alternative solutions. The

evidence of these criteria in the case of the Energy Act of 2005 was presented in the various literature reviews.

Conclusion

Now, it is time to answer the main question of this research paper, that of how important the role of scientific ideas was in making ethanol part of the solution in the Energy Policy Act of 2005. An answer to this question can be given in light of the main theoretical framework of this research paper and the two hypotheses that were constructed to test this framework.

First, a brief reminder of Kingdon's model. For him, the enactment of public policy occurs when problems around an issue are recognized or defined. Then, there will be streams of solutions on how to tackle these problems. Solutions are presented by the many participants of a policy community, in particular by the experts within this community. Moreover, the political stream may create favourable political conditions which will increase the chance of there being "a window of opportunity". Policy entrepreneurs play a decisive role in keeping this window open until a short list of alternative solutions is selected. If the timing is right, then the policy will be enacted so that the solutions can be implemented.

Second, can the data collected for this research paper confirm the validity of the two hypotheses? As far as the first hypothesis is concerned, the survey of input from the policy community and scientists shows that, indeed, there was no shortage of ideas. However, the scientific input was not successful in presenting ethanol as one the most viable solutions. One obvious reason is that no definite conclusion could be drawn from the input on the benefit of corn ethanol. Policy makers were confronted with what Kingdon has called an "intellectual puzzle".

This answer leads to the second part of the first hypothesis. Did political pressure, values, and ideology play a greater role than scientific input did on adopting the Energy Act 2005? The answer, once again, is that these factors alone were not enough to make corn ethanol the most desirable solution. For, as shown in the section on policy community, a long list of the interest, pressure, and lobbyist groups were present during the decision making process in favour of corn ethanol. On the other hand, one can also see a long list of groups that have argued against corn ethanol.

One thing is sure: that in the early 2000s, these groups agreed that something had to be done about the U.S. energy crisis and its associated problems. The crisis had not disappeared as a result of past policy, but, in fact, it had become worse. Therefore, it is reasonable – as the literature review also confirms – to assume that one should take into account the factors of values and ideology. One of the most noticeable values was the romantic sentiment that people in general and policy makers in particular have about the agricultural sector. Therefore, producing more corn to be converted into ethanol has been put forth as one viable solution to increasing the revenue of farmers and hence reviving the economy of this sector.

Moreover, the evidence presented shows that corn ethanol as a solution has risen and fallen from the agenda. For example, in the 70s the U.S. government designed various programs to provide taxes and tariffs to support the production of ethanol. By the mid 80s, none of these programs had worked. Moreover, ethanol had become part of solution in the case of the Clean Air Act of 1990, but it again fell from the government agenda. If it were only for the factors of values and ideology, then, why has it taken more

than a decade to be considered again one of the main solutions offered within the Energy Act of 2005?

One plausible answer is found in what Kingdon described as “an idea whose time has come”. A “window of opportunity”, once again, opened as early as the 2000s. Some favourable political conditions were also created during this time, of which the report of the Government Accountability Office (GAO) and the 2004 election are prime examples. These only helped policy entrepreneurs who had been sitting close by, waiting to present their short list of solutions. They (policy entrepreneurs) kept this window open long enough so that a public policy could be formulated. In brief, this research paper has shown that there is much evidence of the multiple streams presented in Kingdon’s model in the policy-making process under examination.

Lastly, regarding an answer to the second hypothesis, there is evidence of increasing collaboration among the three most visible federal agencies, namely the USDA, the DOE, and the EP, in particular since late 1990s. This has been shown by pointing out the joint-studies and collaborations that these three Federal agencies have conducted- specifically among the USDA and the DOE- in the policy stream section dealing with visible cluster.

Moreover, there is also proof that the proponents and opponents of corn ethanol have organized: one of the most visible organized groups is a proponent of corn ethanol, the Renewable Fuels Association (RFA). Therefore, these evidences of collaborations point to the fact that indeed various policy community in the visible cluster have initiated attempts to act in cohesive manner. They have strived to find common languages and actions which make my second hypothesis to not have strong face validity.

However, I believe that the identification of these visible actors is not sufficient to draw definite conclusions on the validity of my second hypothesis. Further research, namely in the form of interviews and surveys is required to identify 1) the other visible actors 2) the invisible actors, which is beyond the scope of this research paper.

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Appendix A – List of the Most Important Federal Legislation

The following is the most important Federal Energy Legislations discussed in this research paper. Sources: Evolution of Renewable Energy, <http://www.choicesmagazine.org/2006-1/biofuels/2006-1-02.htm>) and US Energy Policy in 90s by Paul Joksow, and **RENEWABLE ENERGY POLICIES AND MARKETS IN THE UNITED STATES (pdf file)**

1978	<p>The Public Utility Regulatory Policies Act (PURA): the major goal of this act is to mandate the generation of electricity from renewable sources of energy and to enforce public non-utility providers to buy electricity from smaller plants that use renewable sources of energy. In other words, biopower that is generated from sources such as ethanol through the federal ethanol tax credit of up to 60 cents per gallon for businesses that sell or use alcohol as a fuel.</p>
1980	<p>The Energy Security Act (ESA): the Energy Security Act offered insured loans to small ethanol plants which produced less than one million gallons of ethanol per year.</p> <p>The Windfall Profits Tax Act gave tax credits for the production of alternative fuels and alcohol fuel blending. The Crude Oil Windfall Tax Act extended the ethanol motor fuel excise tax exemption and provided blenders the option of receiving the same tax benefit by using an income tax credit instead of the fuel tax exemption.</p>
1988	<p>The Alternative Motor Fuels Act was passed to encourage auto manufacturers to produce cars fuelled by alternative fuels, including an ethanol/gasoline blend containing 85% ethanol called E85. The law provides credits to automakers towards meeting the standards of corporate average fuel efficiency (CAFE).</p>
1990 & 1992	<p>The Clean Air Act 1990 contains provisions for mandating oxygenated fuel (RFG =Ethanol and MTBE). The requirements were set for 2 types of clean-burning gasoline, RFG Federal Reformulated Gasoline and Wintertime Oxygenated Fuel.</p> <p>The Energy Policy Act (EPACT) extended the fuel tax exemption and the blender's income tax credit to two additional blend rates which contained less than 10% ethanol. The two additional blend rates were for gasoline with at least 7.7% ethanol and for gasoline with 5.7% ethanol. The EPACT also established a number of alternative-fuelled vehicle (AFV) requirements for government and state motor fleets which encouraged using biofuels.</p>
1998	<p>The Energy Conservation Reauthorization Act amended the EPACT to include credits for the use of biodiesel fuel.</p>
2004	<p>The American Jobs Creation Act of 2004: Biodiesel received a fuel tax credit, similar to that of ethanol.</p>
2005	<p>The 2005 Act reflects President Bush's general approach by creating programs and policy aimed at increasing and diversifying domestic energy production. It includes key provisions to help diversify domestic energy production through the development of renewable fuels. The 2005 Act mandates a renewable fuel phase-in called the Renewable Fuels Standard (RFS), requiring U.S. fuel production to include a minimum amount of renewable fuel each</p>

	<p>year, starting at 4 billion gallons in 2006 and reaching 7.5 billion gallons in 2012. After 2012, renewable fuel production must grow at least at the same rate as gasoline production. The RFS provision also eliminates the requirement for reformulated gasoline to contain 2% oxygen and establishes a credit trading system</p> <p>The 2005 Act creates a Cellulosic Biomass Program to encourage the production of cellulosic ethanol. Under this provision, every one gallon of ethanol made from biomass such as switch grass, crop residues and tree crops, counts as 2.5 gallons towards satisfying the RFS. Beginning in 2013, the applicable volume of renewable fuel required by the RFS must include a minimum of 250 million gallons of fuel derived from cellulosic biomass.</p>
1978	Known as Public Utility Regulatory Policies Act- (PURA)- the major goal is to mandate generation of electricity from renewable sources of energy and to enforce public non utility providers to buy electricity from smaller plants using renewable. In other words, biopower that is generated from sources such as ethanol through federal ethanol tax credit of up to 60 cents per gallon for businesses that sell or use alcohol as a fuel.
1980	Energy security act (ESA) - the Energy Security Act offered insured loans to small ethanol plants, producing less than one million gallons per year. Windfall Profits Tax Act gave tax credits for alternative fuels production and alcohol fuel blending. Crude Oil Windfall Tax Act extended the ethanol motor fuel excise tax exemption and provided blenders the option of receiving the same tax benefit by using an income tax credit instead of the fuel tax exemption.
1988	Alternative Motor Fuels Act that was passed to encourage auto manufacturers to produce cars that are fuelled by alternative fuels, including an ethanol/gasoline blend containing 85% ethanol called E85. The law provides credits to automakers towards meeting their corporate average fuel efficiency (CAFE) standards.
1990 & 1992	Clean Air Act 1990 contain provisions for mandating oxygenated fuel (RFG =Ethanol and MTBE). Requirements set for 2 types of clean-burning gasoline, RFG Federal Reformulated Gasoline and Wintertime Oxygenated Fuel The Energy Policy Act (EPACT) extended the fuel tax exemption and the blender's income tax credit to two additional blend rates containing less than 10% ethanol. The two additional blend rates were for gasoline with at least 7.7% ethanol and for gasoline with 5.7% ethanol. The EPACT also established a number of alternative-fuelled vehicle (AFV) requirements for government and state motor fleets that have encouraged using biofuels.
1998	Energy Conservation Reauthorization Act amended EPACT to include biodiesel fuel use credits.
2004	American Jobs Creation Act of 2004 - Biodiesel received a fuel tax credit, similar to that of ethanol.
2005	2005 Act reflects President Bush's general approach by creating programs and policy aimed at increasing and diversifying domestic energy production. It includes key provisions to help diversify domestic energy production through the development of renewable fuels. The 2005 Act mandates a renewable fuel phase-in called the renewable fuels standard (RFS), requiring U.S. fuel production to include a minimum amount of renewable fuel each year, starting at 4 billion gallons in 2006 and reaching 7.5 billion gallons in 2012. After 2012, renewable fuel production must grow at least the same rate as gasoline production. The RFS provision also eliminates the requirement for reformulated gasoline to contain 2% oxygen and establishes a credit trading system 2005 Act creates a Cellulosic Biomass Program to encourage the production of cellulosic ethanol. Under this provision, every one gallon of ethanol made from biomass, such as switch grass, crop residues, and tree crops, counts as 2.5 gallons towards satisfying the RFS. Beginning in 2013, the applicable volume of renewable fuel required by the RFS must include a minimum of 250 million gallons of fuel derived from cellulosic biomass.

Appendix B -The Federal Legislation and ethanol Subsidy

Reprinted from the original source: US and French Biofuels Policy – Possibilities for the Future
By Wallace E. Tyner and Maxime Chafe, Purdue University

Table 1 – History of Ethanol Subsidy Legislation

1978	Energy Tax Act of 1978	\$0.40 per gallon of ethanol tax exemption on the \$0.04 gasoline excise tax
1980	Crude Oil Windfall Profit Tax Act and the Energy Security Act	Promoted energy conservation and domestic fuel development
1982	Surface Transportation Assistance Act	Increased tax exemption to \$0.50 per gallon of ethanol and increased the gasoline excise tax to \$0.09 per gallon
1984	Tax Reform Act	Increased tax exemption to \$0.06 per gallon
1988	Alternative Motor Fuels Act	Created research and development programs and provided fuel economy credits to automakers
1990	Omnibus Budget Reconciliation Act	Ethanol tax incentive extended to 2000 but decreased to \$0.54 per gallon of ethanol
1990	Clean Air Act amendments	Acknowledged contribution of motor fuels to air pollution
1992	Energy Policy Act	Tax deductions allowed on vehicles that could run on E85
1998	Transportation Efficiency Act of the 21st Century	Ethanol subsidies extended through 2007 but reduced to \$0.51 per gallon of ethanol by 2005
2004	Jobs Creation Act	Changed the mechanism of the ethanol subsidy to a blender tax credit instead of the previous excise tax exemption. Also extended the ethanol tax exemption to 2010.
2005	Energy Policy Act	Established the Renewable Fuel Standard starting at 4 billion gallons in 2006 and rising to 7.5 billion in 2012.

Source: (Commerce, 2006), North Dakota Chamber of Commerce.

Appendix C – List of the Congressional Hearings

106th Congress (Senate)

1. ENVIRONMENTAL PROTECTION AGENCY'S FISCAL YEAR 2000 BUDGET REQUEST
2. OPEN SPACE AND ENVIRONMENTAL QUALITY
3. ENVIRONMENTAL PROTECTION AGENCY'S FISCAL YEAR 2001 BUDGET
4. SUCCESSFUL STATE ENVIRONMENTAL PROGRAMS
5. ENVIRONMENTAL PROTECTION IN AN ERA OF DRAMATIC ECONOMIC GROWTH IN LATIN
BILL TO ESTABLISH REGION 11 OF THE ENVIRONMENTAL PROTECTION AGENCY
6. CLEAN AIR ACT: ENVIRONMENTAL BENEFITS AND IMPACTS OF ETHANOL
7. BROWNFIELD REVITALIZATION AND ENVIRONMENTAL RESTORATION ACT OF
2000
8. STREAMLINING: DEPARTMENT OF TRANSPORTATION REGULATIONS ON
PLANNING AND THE ENVIRONMENT

107th Congress (House)

1. VIEWS AND VISION OF MARK E. REY, UNDER SECRETARY FOR NATURAL RESOURCES
AND THE ENVIRONMENT, U.S. DEPARTMENT OF AGRICULTURE
2. H.R. 3558, THE SPECIES PROTECTION AND CONSERVATION OF THE ENVIRONMENT
3. NAVIGATING THE SMALL BUSINESS ENVIRONMENT: CHALLENGES AND OPPORTUNITIES
LOCAL ECONOMY, ENVIRONMENT, AND INTERGOVERNMENTAL COOPERATION: WHAT
CAN BE LEARNED FROM FORT ORD?
4. NEW CONCEPTS IN ENVIRONMENTAL POLICY

107th Congress (Senate)

5. BROWNFIELDS REVITALIZATION AND ENVIRONMENTAL RESTORATION ACT OF 2001
6. HEARING ON BIOMASS AND ENVIRONMENTAL TRADING: OPPORTUNITIES FOR
AGRICULTURE AND FORESTRY
7. THE BUSINESS OF ENVIRONMENTAL TECHNOLOGY
8. PUBLIC HEALTH AND NATURAL RESOURCES: A REVIEW OF THE IMPLEMENTATION OF
OUR ENVIRONMENTAL LAWS--PARTS I AND II PUBLIC HEALTH AND NATURAL
RESOURCES: A REVIEW OF THE IMPLEMENTATION OF OUR ENVIRONMENTAL LAWS—
PART I
9. PUBLIC HEALTH AND NATURAL RESOURCES: A REVIEW OF THE IMPLEMENTATION OF
OUR ENVIRONMENTAL LAWS--PARTS I AND II PUBLIC HEALTH AND NATURAL
RESOURCES: A REVIEW OF THE IMPLEMENTATION OF OUR ENVIRONMENTAL LAWS--
PART II
10. INNOVATIVE ENVIRONMENTAL TECHNOLOGIES
11. NOMINATION OF THREE NOMINEES TO THE ENVIRONMENTAL PROTECTION AGENCY:
LINDA MORRISON COMBS; J. PAUL GILMAN; AND MORRIS X. WINN

12. ENVIRONMENTAL PROTECTION AGENCY'S FISCAL YEAR 2003 BUDGET
13. DOE ENVIRONMENTAL MANAGEMENT PROGRAM
14. CLEAN AIR ACT: RISKS FROM GREENHOUSE GAS EMISSIONS
15. ENVIRONMENTAL ENFORCEMENT
16. OFFICE OF THE OMBUDSMAN AT THE ENVIRONMENTAL PROTECTION AGENCY
17. IMPLEMENTATION OF ENVIRONMENTAL TREATIES
18. GREEN SCHOOLS: ENVIRONMENTAL STANDARDS FOR SCHOOLS
19. NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2003: REVIEW OF ENVIRONMENTAL PROTECTION MANDATES
20. CRIMINAL AND CIVIL ENFORCEMENT OF ENVIRONMENTAL LAWS: DO WE HAVE ALL THE TOOLS WE NEED?

108th Congress (House)

1. THE ENVIRONMENT AND COMMUNITIES
2. CRISIS ON THE NATIONAL FORESTS: CONTAINING THE THREAT OF WILDLAND FIRE TO THE ENVIRONMENT AND COMMUNITIES
3. CLEARING THE AIR: THE HUMAN RIGHTS AND LEGAL DIMENSIONS OF CHINA'S ENVIRONMENTAL DILEMMA
4. REAUTHORIZATION OF THE U.S. DEPARTMENT OF JUSTICE: EXECUTIVE OFFICE FOR U.S. ATTORNEYS, CIVIL DIVISION, ENVIRONMENT AND NATURAL RESOURCES DIVISION, EXECUTIVE OFFICE FOR U.S. TRUSTEES, AND OFFICE OF THE SOLICITOR GENERAL
5. THE CRISIS ON OUR NATIONAL FORESTS: REDUCING THE THREAT OF CATASTROPHIC WILDFIRE TO CENTRAL OREGON COMMUNITIES AND THE SURROUNDING ENVIRONMENT
6. ELEVATION OF THE ENVIRONMENTAL PROTECTION AGENCY TO DEPARTMENT LEVEL STATUS: H.R. 37 AND H.R. 2138
7. THE ENVIRONMENTAL ASPECTS OF MODERN OIL AND GAS DEVELOPMENT
8. THE ENVIRONMENTAL IMPACT OF MERCURY-CONTAINING DENTAL AMALGAMS
9. FEDERAL ELECTIONS IN A POST-BCRA ENVIRONMENT
10. FISCAL YEAR 2005 ENVIRONMENTAL PROTECTION AGENCY BUDGET
11. REAUTHORIZATION OF THE U.S. DEPARTMENT OF JUSTICE: EXECUTIVE OFFICE FOR U.S. ATTORNEYS, CIVIL DIVISION, ENVIRONMENT AND NATURAL RESOURCES DIVISION, EXECUTIVE OFFICE FOR U.S. TRUSTEES, AND OFFICE OF THE SOLICITOR GENERAL

108th Congress (Senate)

1. ENVIRONMENTAL PROTECTION AGENCY'S FISCAL YEAR 2004 BUDGET
2. ENVIRONMENTAL LAWS: ENCROACHMENT ON MILITARY TRAINING?
3. GRANTS MANAGEMENT AT THE ENVIRONMENTAL PROTECTION AGENCY

4. ENVIRONMENTAL PROTECTION AGENCY: FISCAL YEAR 2005 BUDGET
5. ENVIRONMENTAL IMPACTS OF NATURAL GAS SUPPLY
6. IMPACT OF ENVIRONMENTAL REGULATIONS ON OIL REFINING
7. ENVIRONMENTAL MANAGEMENT PROGRAM: ACCELERATED CLEANUP