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Forum Juridicum: Conservation of Irreplaceable Natural Resources

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Conservation of Irreplaceable Natural Resources*

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History records the fact that the standard of living of any nation or civilization is directly proportionate to the amount of energy it produces and utilizes. When man used only his own natural strength, his standard of living was extremely low. But as he began to use the power of domesticated animals and to employ new mechanical means such as the lever and the wheel to convert the energy into more useful power, his standard of living increased. As man learned to produce greater power from natural resources and fuels, his standard of living increased to its present day level.

Natural resources and fuels have become an integral part of our present day economy and are absolutely essential to the defense of our country.

We are standing today on the threshold of the atomic era. There are some who would have us believe that atomic energy will soon replace all other energy producing sources. That is not true. Atomic energy will only complement and enlarge the other energy producing sources we have today and the need for oil, gas, coal and other natural resources will grow and increase with the atomic age.

When the automobile was invented, some predicted the end of the horse. Yet there are more working horses in America today than ever before in our history (and I am not speaking of Santa Anita or Churchill Downs). When the airplane was invented, some predicted the end of the automobile. Yet, today, we have more and better automobiles and more and better airplanes than ever before in history. Atomic energy cannot be produced or utilized without more and better petroleum and petroleum products and as the atomic era develops, the demand for petroleum will develop and grow with it.

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**Louisiana Commissioner of Conservation.

Any state or nation owes its greatness to two things: one is its natural resources, and another is the resourcefulness and industry of its people. So long as our natural resources are plentiful, the nation is strong; but as its resources become depleted, the nation must depend more and more upon the resourcefulness and industry of its people.

In Louisiana we have no ad valorem or property taxes on mineral rights. Instead we tax the act of severing the minerals or other natural resources from the soil. The principal portion of the funds derived from this source is placed in the school fund for the construction of schools and the education of our children. As we use the resources with which nature has endowed us, we dedicate a portion of the funds derived from the sale of these natural resources to the education of our children to better prepare them for an economy in which the natural resources will be less plentiful or more costly or difficult to discover and produce.

We also believe that the severance tax method is conducive to conservation. If you have a wasting resource, which is subject to an annual property tax, there is always the incentive to dissipate it rapidly. But if it is subject to the payment of a tax only when it is produced and only when it is used, then the tendency is to conserve the natural resource.

When we speak of oil and gas and coal and other underground minerals, we refer to them as exhaustible and irreplaceable natural resources, meaning that they exist in the reservoirs in which nature has placed them in finite exhaustible quantities, and, when we deplete a reservoir, the resources are gone forever. They cannot grow back like crops or timber; that is, they cannot grow back within the time of man. They may grow back within geological time, but certainly not within the life of man.

Conservation does not mean hoarding — it means wise, prudent and provident use. In our every day living and business activity it is necessary that we use some of our natural resources. But in doing so, it is our obligation to generations of the future to use these irreplaceable natural resources frugally, prudently, and with provision for the future.

Provision for the future means development of new reserves to replenish the depleted reservoirs. To accomplish proper con-

servation, we must create and sustain a healthy industry which will discover and develop new reserves and maintain the reserve-producing capacity necessary for our everyday economy and for our national defense.

The question is often asked, why don't we keep the oil that we now have and import the oil which we need? There are several basic reasons why that is not feasible. In the first place, reserves of petroleum do not consist merely of a certain amount of oil in the oil reservoirs in California or a certain amount of oil now known to exist in the mid-continent area or in the oil reservoirs of the other states of the nation. The petroleum reserve of this nation consists of the reserve-producing capacity of the petroleum industry itself. We must keep a healthy domestic producing oil and gas industry if we are to maintain petroleum reserves and if we are to have these natural resources available when they are needed for domestic economy or for national defense.

Let us consider the lesson taught by the recent disturbance in the Middle East. When the Suez Canal was closed and one Middle Eastern pipeline was disabled, it created a crisis in the supply of petroleum. The deficiency could not be filled by free world oil produced in the South American countries nor in the Central American countries because they were incapable of producing that much more oil. The deficiency could only be supplied from the reserves of oil in this country.

In November of last year Louisiana set about to furnish its share of the oil needed to meet the Middle East crisis. By our best estimate, we needed 200,000 barrels of oil per day in addition to the amount that was already being produced. The record will show that in December of 1956 Louisiana produced 6,030,000 barrels of oil for the oil lift for Europe, which was almost exactly 200,000 barrels per day. During the remaining months of the Middle East Crisis, Louisiana produced more than 200,000 barrels of oil per day for the oil lift for Europe in addition to its normal production of 750,000 barrels per day.

If we do not use our reserve-producing capacity, if we do not use the industry which furnishes us this reserve-producing capacity, it becomes weak, like an unused muscle. You cannot just shut off an oil well as you shut off the water tap in your home. If oil production is shut in too long, the producing ca-

pacity will be lessened or lost. So we must have a continuous production in order to maintain the industry which gives us the natural resources and reserves that we have and need in this country.

Secondly, we must remember the petroleum industry's contribution to the economy of this country. The petroleum industry itself is one of the largest industries in the United States. It pays wages and salaries to many people; it buys a lot of steel, coal and all other products that are produced throughout the country; and it is a major contributing factor to the economy and prosperity of our nation.

Let us make a comparison with the automobile industry. We could not shut down our automobile industry merely because we could get a flood of low-priced foreign cars into this country at this time. If we did, the effect upon our economy would be a completely new depression. The same would be true if we should shut down the domestic petroleum producing industry; we would have a depression within a very short time because the domestic petroleum producing industry contributes so much to the economy and prosperity of our country.

A third reason why we cannot store our domestic oil and import the oil we need is the fact that imported oil does not pay its share of the cost of government. One of the most important economic factors in our business economy today is the cost of government. No business deal of any consequence can be transacted at present without calculating the taxes involved and the amount which must be contributed to the ever-increasing cost of government, both national and local.

To give an illustration of how little foreign oil contributes to the support of our national government: During the year 1954 there was imported into this country approximately one million barrels of crude oil and products per day. The import duty that the United States received from that enormous quantity of imported oil was only one-sixth (1/6th) of the amount which the United States received from bonuses, rentals and royalties from leases off the coast of Louisiana alone. In other words, the Louisiana coastal area contributed more than six times as much to the support of our national government during 1954 as all of the oil imported into this country.

If we say that conservation is not hoarding but is wise and provident use, then how do we accomplish conservation of our natural resources? It is done in Louisiana by three means: First, by the prevention of avoidable waste; second, by securing the maximum ultimate recovery from a reservoir; and third, by increasing proven reserves and encouraging a search for new reserves and replenishing the supply.

We have in Louisiana a model conservation statute. In defining waste, it recognizes both aboveground waste and underground waste. The aboveground waste would consist, first, of the flaring of gas. Every well which produces any quantity of oil also produces some gas. In the early days of the industry this oil well gas was flared or burned to keep it from creating a dangerous explosive situation. Of course, the gas burned in flares was completely wasted. Some of that flaring may be necessary because the gas may not be in quantities or have sufficient pressures to justify its being transported to a market. In other words, many miles of pipeline may be required to transport the gas to a market, or the gas may need to be compressed before it reaches the greater pressures required for it to enter a gas gathering or transmission system, and the cost of transporting or compressing the gas may exceed its value. The flaring of such gas would be an unavoidable necessity, not waste.

In order to determine whether flaring of oil well gas is excusable for economic reasons in particular instances, we make a quarterly study of gas utilization in Louisiana. We ask every company to report the amount of gas that it produces, including the casinghead gas from oil wells. We make a study of the uses of that gas and whether it is returned to the earth or whether it goes to a market, and the amount that is actually vented or flared into the air. When we find an instance in which we believe that the volumes of casinghead gas produced will justify the cost of transporting that gas to a market, we insist that the producer provide a market for the gas within a reasonable time, or we shut in his wells.

As an illustration of what can be accomplished in this manner we have a small field near Shreveport which has been producing since 1905. It produces from small stripper wells. The average well produces from one to five barrels of oil daily with small quantities of low-volume gas. We have induced a company

to build a gasoline plant in that low-volume gas field and it is now extracting 22,000 gallons of gasoline a day from the low volumes of casinghead gas produced from these one to five barrel stripper wells. Ordinarily, we think of gas plants which process the gas produced from gas wells producing from a million to ten million cubic feet per day. But when we are able to utilize the casinghead gas from stripper wells to operate a gasoline plant it is really true conservation.

In many instances we have shut down oil fields that are producing too much casinghead gas, either to determine whether some type of pressure maintenance or cycling operations should be conducted in the reservoir, or to determine whether or not there is a waste of gas sufficient to justify a market. Such an order was issued affecting the Colquitt Field less than two weeks ago prohibiting further production of oil.

The most important factor in determining whether specific volumes of casinghead gas can be provided with a market is the economic factor. Natural gas has not yet reached its proper economic level among the energy and fuel resources of the nation. For many years natural gas has been underpriced but it is rapidly approaching its proper economic level. As the price of natural gas increases towards its proper economic level among the energy and fuel resources of the nation more and more of the gas now being flared will find its way to a market and we will have greater utilization and conservation of this vital natural resource.

Another physical waste aboveground is the inefficient storage or production of oil. Our statute also recognizes as physical waste the drilling of unnecessary wells. If the oil within a specific reservoir can be efficiently and economically drained by the drilling of 100 wells, it would be considered waste under our statute to drill 200 wells to produce the same amount of oil which can be produced from 100 wells.

To give an extreme illustration, one of the largest fields in the United States had almost 30,000 wells drilled in it. This was done in the early days when conservation was in its infancy. If the regulatory body of that state had then been provided with adequate statutory authority, the field could easily have been drained with 3,000 properly spaced wells. If you will recall, during the last war the great shortage that existed in steel equip-

ment or if you will visualize the enormous capital investment required for 30,000 wells, it will not be difficult to realize that the drilling of 30,000 wells to drain a reservoir which could have been produced through 3,000 wells would definitely constitute physical waste.

Another aboveground waste recognized by our statute is the production of oil in excess of transportation or market facilities or of reasonable market demand. A limitation of the amount of oil and gas which can be produced in a state and the allocation of that production to individual wells is called proration.

In Louisiana we receive from all purchasers of oil from within the state nominations as to the amount of oil which they need for their market requirements, and, from these nominations and other data available, the Commissioner of Conservation determines what is the reasonable market demand for oil and gas produced in Louisiana. The amount of oil and gas which can be produced within the state is limited to the market demand thus established and the total allowable of production is then allocated to individual wells on the basis of acceptable formulas.

The oil-producing states having market demand statutes are very often criticized for limiting their production to the amount reasonably necessary to satisfy the market demands, the specific criticism being that this is a price-fixing device. Actually, the restriction of production to market demand has no relation to price and the price is never considered in establishing the market demand; but this restriction of production is a conservation measure designed to prevent waste and an analysis of the facts will demonstrate this.

When oil and gas exists in the reservoir under the ground where nature has placed it, it is not subject to evaporation, deterioration, nor subject to loss by fire or other natural perils. But when oil and gas is brought to the surface of the earth and placed in aboveground storage, it is subject to evaporation, deterioration, and loss by fire and other perils.

The need for restricting oil production to the volumes currently consumed by the industry and to available storage, transportation, and market facilities, in order to prevent waste, is just as simple a fact as the fact that you cannot put two gallons of water in a one gallon pail. Lease storage tanks, terminal facilities, pipe lines and refinery storage have specific capacities.

Refineries have specific capacities and operate at capacities designed to satisfy the market demand for products. When the storage and transportation facilities become full, they can accommodate only the amount of oil that is removed through the refining process. The amount of oil that is produced to above-ground storage and transported to market must be that amount which the market itself can reasonably absorb in its normal process of refining and distributing. If we maintain above ground more oil than the industry can reasonably store, transport, and use in its normal process, then actual physical avoidable waste will occur in the excess oil stored above ground.

Another purpose of proration is to insure the ratable take of oil and gas from the various producers so that each producer is given an equal opportunity to produce and market his proportionate share of the market demand. If one company were deprived of a market outlet for its production in a field and other producers were able to market their share of the production, actual physical waste could occur in the oil and gas produced by the producer who had no market outlet. In order to insure that each producer secure his proportionate share of the market it may be necessary that the Commissioner order the purchasers in the field to take their requirements ratably from all producers. We do not believe that the Commissioner can require a purchaser to take the full allowable for a field but the purchaser can be required to buy whatever production he needs from a particular field ratably from all producers in the field.

Proration of gas presents a different problem from oil proration in that natural gas cannot be stored as readily as oil. It is therefore necessary that greater flexibility be employed in gas proration allowing over-production during the colder months in which the demand may be greater, to be balanced out during the warmer months when the demand for natural gas may be less. Balancing provisions had been inserted in various such orders affecting gas fields, which were based upon semi-annual periods beginning at the date the order was issued. After many years of this procedure we had varied types of balancing provisions covering periods beginning almost every month in the year so we decided to adopt a statewide gas proration order providing uniform methods and identical periods for balancing production from all gas fields in the state.

In many states the colder months are used as the base period and balanced against the summer months on the theory that more gas would be produced during the cold winter months and the production from the wells could be brought into balance by reducing the production during the warm summer months. We felt that the more practical approach was to use semi-annual periods of approximately equal overall temperatures combining three cold months and three warm months to form the base period as well as the balancing period. In order to determine which particular months should be employed in this formula, we made a study of the volume of gas produced during a six-months period of the year beginning with each month in the year and compared it with the succeeding semi-annual period. From this study it was determined that the first six months of each year would more nearly balance out against the last six months of the year than any other semi-annual period. The order was then promulgated using the period from July 1 to January 1 as the base period and January 1 to July 1 as the balancing period. This order has worked so well that, although we produced 1.9 trillion cubic feet of gas during the past year, at the end of the balancing period only a fraction of 1% of the wells in Louisiana had over-produced an established tolerance of 1% of its annual allowable, or four days production.

The Louisiana Conservation Statute recognizes underground waste as well as aboveground waste. Underground waste might consist of (a) production of oil or gas in excess of the maximum efficiency rate, (b) premature abandonment of wells, or (c) improper use or dissipation of reservoir energy.

In conservation of oil and gas it is just as necessary, probably even more necessary, to conserve the energy in the reservoir as it is to conserve the oil and gas itself. When oil exists in the underground reservoirs in which nature has placed it, the oil will not, of its own energy, migrate through the formation into the well bore and up through the tubing as many as 1, 2, 3, and 4 miles to the surface of the earth. There must be some type of expulsive force to produce this movement of the oil. We must so utilize the expulsive force that the greatest amount of oil will be produced through maximum utilization of this native energy.

One field in the United States which was produced to completion during the early days of the industry, when the aim was rapid production rather than intelligent conservation, pre-

sents an excellent example of the need of proper utilization of natural forces in accomplishing the maximum recoveries of oil. That field was produced by bringing wells in as gushers and allowing them to produce at open flow rates as long as the volumes of oil produced could be sold. The field produced approximately 300 million barrels of oil to the stage of depletion. Some years after the field had been dissipated, some companies decided to make a study to determine how much of the oil in the reservoir had been actually recovered and they drilled wells to the formation and took cores and formation samples to determine whether there had been any oil left underground. To their great amazement it was found that although they had produced 300 million barrels of oil from the reservoir, over 500 million barrels had been left undeground and was not recoverable because the reservoir energy had been improperly dissipated.

There is one well in Louisiana now producing from a formation approximately four miles underground. I have seen news releases where wells projected to depths of five miles have been planned. You can well imagine the amount of energy necessary to lift a column of oil five miles high.

There are three types of reservoir energy and expulsive forces which are employed in the production of oil. One consists of a hydrostatic head of water exerting pressures on the oil or gas from underneath. Another would be a gas cap on top of a reservoir of oil creating an expulsive force by natural gas expansion. The third consists of gas in solution with oil which expands and creates energy when the gas is released from solution.

A crude but demonstrative illustration of energy produced by a release of gas from solution is furnished by soda water. You know there is a time in their life when children cannot drink a Coca-Cola or other bottle of soda in the normal fashion by removing the cap and drinking the soda through a straw. They take an ice pick and drive it through the cap on the bottle and shake the bottle and drink the soda as it skeets through the hole in the top. That illustrates how liquid may be produced by the release of solution gas. The soda is a liquid with gas in solution. If you shake the soda the gas will be released from solution and it will escape through the hole in the top of the bottle. Even though you hold the bottle straight up the gas will not emerge from the top as free gas but will bring liquid with it.

If you continue to shake the bottle, and hold it right side up, the gas will give out a long time before the liquid. In other words, you will have depleted the gas and have brought up only a small amount of liquid. That is the same thing which happens in an underground reservoir. If the gas is allowed to escape from the top of the formation, the reservoir energy will be dissipated with only a small production of liquids and tremendous amounts of oil will be left underground.

In some instances it is advisable to supplement the reservoir energy by injecting or re-injecting gas into the reservoir (which is known as gas cycling or re-cycling) and by re-injecting water or other fluids into the formation for pressure maintenance purposes.

One field in Louisiana which is a rather small reservoir presents an excellent illustration of preservation of reservoir energy by water injection. By primary recovery methods with maximum utilization of natural reservoir energy, this reservoir would produce 120 million barrels of oil. By injecting water into the aquifer and supplementing the natural reservoir energy to maintain reservoir pressures at a point which will prevent solution gas from escaping prematurely, an additional 90 million barrels of oil will be recovered which would otherwise have been left underground. That is just like finding a completely new oil field with 90 million barrels of recoverable oil.

There are 91 such pressure maintenance or cycling projects in Louisiana in which the reservoir energy is being supplemented to effect greater recovery of oil. There are only 404 such projects in the United States produced as poolwide units. The reason that Louisiana has so many more, percentagewise, than any other state is because our statute gives the Commissioner of Conservation authority to create and force integrate poolwide conservation units for cycling gas and to regulate all secondary recovery operations.

When a new field is discovered in Louisiana, the Conservation Statute requires the Commissioner, after public hearing and notice to interested parties, to divide the field into drilling and production units. Each production unit should be the maximum area which can be efficiently and economically drained by one well in order to prevent the drilling of unnecessary wells. When the Commissioner has created a pattern of drilling and produc-

tion units, all separately-owned tracts within each unit are thereby pooled and unitized so that each person entitled to production from any tract within the unit is entitled to receive his share of the total production from the entire unit.

If there is a dispute among the owners of drilling rights within a single well-drilling unit thus created by the Commissioner of Conservation, the parties may apply to the Commissioner for a special order force pooling all drilling rights. At one time it was thought that a forced pooling order was necessary in order to allow the various parties entitled to the production to share in the unit production in the absence of a voluntary pooling agreement or pooling designation. However, under cases recently decided by the Louisiana Supreme Court, the creation of single well drilling and production units by the Commissioner of Conservation has the effect of pooling and unitizing all separately owned interests within each unit without the necessity of a special forced pooling hearing.

The Commissioner also has the right to force pool and unitize complete reservoirs for cyling of gas. He does not have specific statutory authority to force pool the entire reservoir for the injection of water or other fluids but we believe that the Commissioner does have that right as a necessary implementation of an order preventing waste of oil and reservoir energy in fields in which pressure maintenance or other secondary recovery methods would be ordered by the Commissioner.

Louisiana is the second state in the nation in production of gas. Louisiana is normally the third state in the nation in production of oil but during the Middle East Crisis, when additional oil was needed for the oil lift for Europe, Louisiana became the second state in the nation in total production of oil. But since the decline in market demand after the settlement of the dispute over the Suez Canal, adjustment of Louisiana production to its existing market has put us back in third place in total production of oil, being exceeded only by California and Texas. On the basis of area, that is, square mile for square mile, Louisiana has more oil and gas reserves than either Texas or California and produces more oil and gas on the basis of area than either of these states.

This presents a rather serious question in conservation. If Louisiana is producing more oil and more gas per square mile

of area than any other state in the nation, are we producing our reserves at too rapid a rate? So long as the petroleum industry which uses our oil and gas production contributes more to the economy of our state and through exploration increases the reserves of oil and gas in our state, we are not producing at too rapid a rate but are maintaining a healthy situation. For example, in 1955, although Louisiana produced 1.7 trillion cubic feet of gas, we had a net increase in gas reserves in excess of this production by 5.6 trillion cubic feet. In 1956 we had a tremendous increase in oil reserves. The total net increase in oil reserves for the United States as a whole was 422 million barrels and Louisiana had a net increase in oil reserves that year of 420 million barrels, just 2 million less than the nation as a whole, including Louisiana.

Louisiana is not only a great *producer* of gas, it is also a great *consumer* of natural gas. Louisiana is now the second state in the nation in total consumption of natural gas. It consumes more natural gas than New York, New Jersey, and Pennsylvania combined and more than Michigan, Illinois, and Wisconsin combined. The City of Lake Charles, Louisiana, having a population of less than 100,000 people, with its industrial environs, consumes more natural gas than New York City. These statistics may seem incredulous but they are accurate. The difference in gas consumption in these areas is the industrial consumption of the Gulf South.

Large quantities of gas are now moving from Louisiana to northern and eastern states but those large volumes are only about half of the gas produced in Louisiana, and Louisiana markets consume half of its natural gas production.

Natural gas has been struggling to find its proper economic level among the fuel and energy resources of the nation. Strong efforts have been made to limit the price of gas by federal administrative procedures. Because of the fact that a far greater market exists for natural gas in the natural gas producing states than in the eastern and northern consuming states, greater volumes of gas will not move into these northern and eastern consuming states unless gas is permitted to reach its proper economic level among the fuel and energy resources of the nation.

When we discuss gas markets and the movements of natural gas through the long transmission lines and the quantities of

gas that are being communicated to the markets served by these long transmission lines, we should not consider only the immediate supply of gas from existing reserves but we must consider the replenishment of reserves that are depleted by normal everyday use. Gas supply is not like a light switch or a water tap that can be turned off and on at will. Gas supply and reserves are the development of many years of work and it must be considered in long range perspective and viewed in trends rather than immediate problems.

We are most hopeful that a solution to the problem of an equitable price for natural gas can be reached in order that natural gas may continue to flow in interstate markets. There is a growing tendency among gas producing companies in Louisiana to search for intrastate markets. We maintain a study of the amount of gas produced in Louisiana, the volumes which are consumed in the state and the volumes which are transported outside of the state. This study is made for conservation measures as we are determined that there shall always be available in our state the reserves and volumes of gas necessary for the economy of our state.

With the tremendous new discoveries of gas reserves that have been made in Louisiana in recent years, there should be ample supplies, both for the intrastate and interstate markets for many years to come. However, if we are to maintain its reserves at a point necessary to supply both the intrastate and interstate markets, we must exercise good conservation and gas must be permitted to reach its proper economic level among the fuel and energy resources of the nation.