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the project was shelved altogether in 1985. The funds previously appropriated for Susitna were reserved in the "Railbelt Energy Fund".

The Devil Canyon – High Watana Project

Prior to initiation of field studies and FERC license application for the two-dam Devil Canyon - High Watana scheme, the Alaska Power Authority spent approximateiy $30 million on alternative studies. The studies focused on the Susitna basin with various permutations of dam locations and dam heights to find the optimum development of the basin's potential. In addition to these investigations, the Power Authority also conducted assessments of other energy projects that could be constructed (see non-Susitna alternatives, below) and which would comprise the "yardstick" against which to measure the optimum Susitna project. Later, FERC staff conducted similar independent assessments during the licensing phase of the project.

Power Authority and FERC studies concluded that, based on load projections at the time, Cook Inlet natural gas would begin to run out by the turn of the century, and that coal-fired generation would be the next increment of power for the Railbelt if left to the financial resources of the utilities. However, financing aside, net present worth analysis found the Devil Canyon – High Watana hydropower to be economically superior to all of the alternatives – Susitna and non-Susitna (including coal-fired generation). The ability to finance the Susitna project was the limiting factor. Individual electric utilities were not envisioned to have access to financing of the magnitude required to develop the project, and a large State equity contribution was viewed as essential. Whether the economic advantage of Susitna over coal would hold today, given advancements in the coal technology and the potential of an export market form the Cook Inlet fields, is an open question. However, all studies at the time concluded that the Devil Canyon – High Watana two-dam scheme was the best long term plan for meeting the future electrical energy needs of the Railbelt.

Optimum Full basin Development -- The Power Authority's proposed Susitna development scheme would have Watana built first and then, as demand dictated, Devil

Canyon would follow years later. In some respect this is the Achilles heal of the two-dam scheme. Watana is a much larger project than Devil Canyon, but the success of the two dams project depends on the capacity of the upstream Watana reservoir -- roughly ten times that of the Devil Canyon reservoir. Collectively the two projects would have an installed capacity of 1,620 MW. If Devil Canyon were built first, it would largely act as a very tall run of the river project and be capable of generating only 900 GWH annually. With the limited storage capacity of Devil Canyon, most of the summer freshet energy would be wasted. But, with Watana upstream providing reservoir capacity for both projects, the firm annual energy of Devil Canyon becomes 2,800 GWH spread evenly throughout the year more closely matching the composite Railbelt utility load curve. Power from both of the projects would be brought to the Anchorage and Fairbanks load centers by way of a double circuit double tower 345 KV transmission system, a portion of which was constructed in 1983. Watana is the more expensive of the two projects, but its increment of generation would be 1,020 MW, a very large initial component for the Railbelt utility system to absorb.

The following paragraphs briefly describe each of the two elements of the High Watana – Devil Canyon project.

High Watana -- Watana would be an 885 foot high rock fill dam with an impervious core, located at river mile 184, approximately 2 5 miles upstream of the Tsusena Creek confluence. Figure 3 shows the basic elements of the project. The crest length of the dam would be 4,100 feet long and the total volume of the structure would be approximately 62 million cubic yards. Watana would create a reservoir 48 miles long with a surface area of 38,000 acres and a total storage capacity of 9.5 million acre-feet. Maximum reservoir drawdown would be 120 feet for a live storage of 3.7 million acre-feet.

The power house would be located underground on the north bank of the river and would house six 170 MW Francis turbines. Flow to the power house would be by way of six concrete lined 17 foot diameter penstocks with inflow control provided by a concrete multi-gate intake structure.

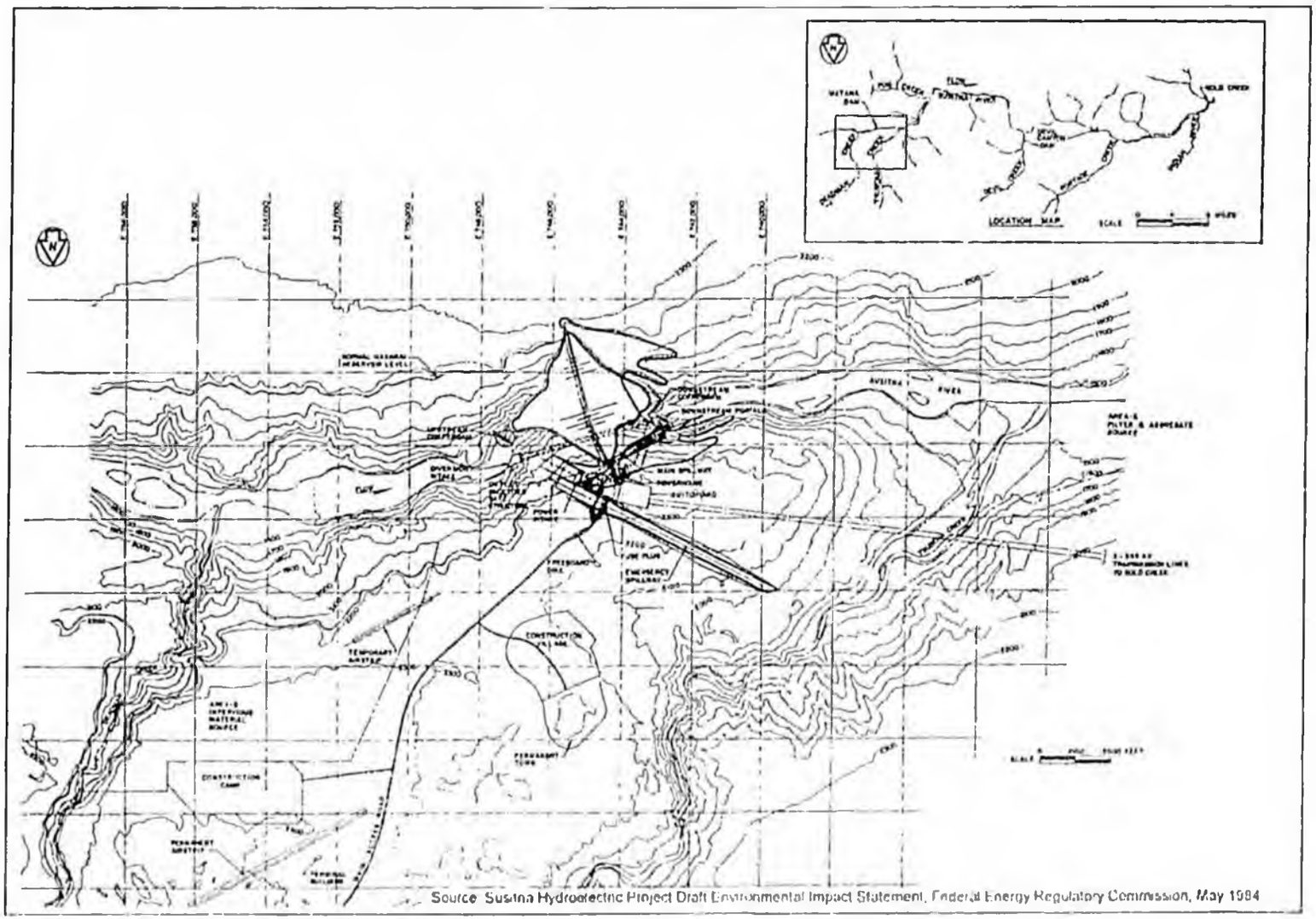


Figure 3 – Watana Facilities Plan

Three separate outlet structures would have the capability of passing the 50-year, 10,000-year and probable maximum floods respectively. Construction of the project would be carried out over a nine year period and require a construction camp capable of housing 3,300 workers and a permanent town capable of housing 130 operations workers for both of the projects. The total cost of Watana was estimated to be $4,062 million (1982 dollars).

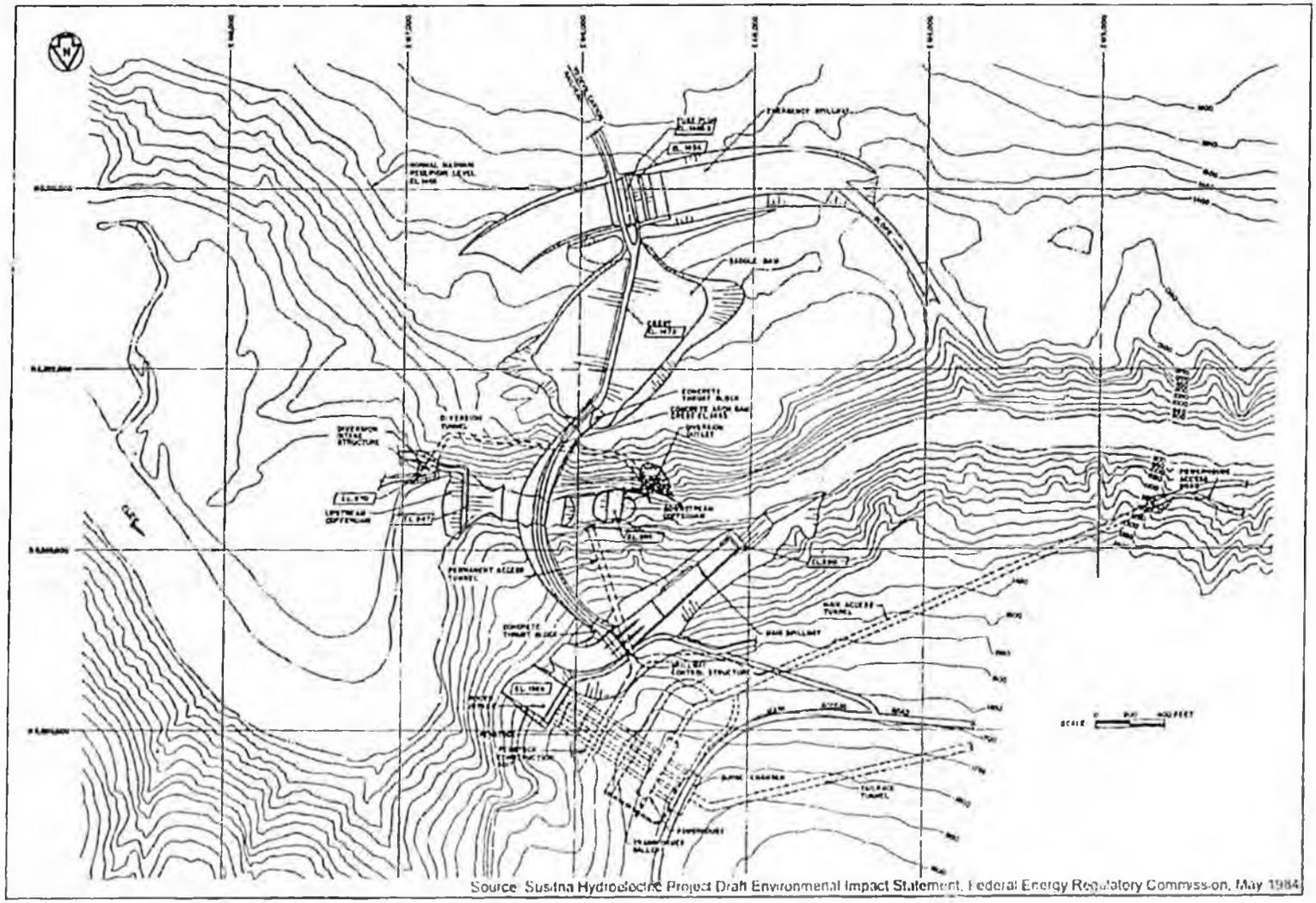
Devil Canyon -- Devil Canyon would be a 646 foot high double curvature thin arch concrete dam located at river mile 152 on the Susitna River, approximately 14.7 miles upstream from where the Alaska Railroad crosses the river at Gold Creek and approximately 32 river miles downstream from Watana. Project development would be timed to meet growing energy demand in the Railbelt. Upstream Watana would not be physically or economically dependent on the ultimate development of Devil Canyon, and Devil Canyon could be delayed indefinitely. The thin arch structure (Figure 4) would tie into gigantic thrust blocks on each abutment. A 245 foot high rock fill saddle dam would be tied into a south bank concrete thrust block, providing closure to higher terrain.

The Devil Canyon would form a 26 mile long reservoir with a surface area of 7,600 acres and a storage capacity of 1.1 million acre-feet. Appurtenant structures would be designed to accommodate a 50 foot reservoir drawdown yielding a live storage capacity of 350,000 acre-feet. However, because of the massive storage capacity upstream at Watana, Devil Canyon would be operated at its full pool elevation to maximize the project's head. There would rarely be a need to draw down the Devil Canyon reservoir.

The project would include an underground powerhouse in the north abutment housing four 150 MW Francis turbines for a total installed capacity of 600 MW. As with the Watana turbines, the Devil Canyon turbines would have a 15 percent overload capability.

Devil Canyon would take six years to construct and would require a camp capable of housing 1,800 workers. Total estimated cost of Devil Canyon is $1,503 million (1982 dollars).

Site Access -- There is no surface access to the two dam sites at the present time. Nearest access is by way of the Denali Highway, which traverses the basin about forty



Source: Susitna Hydroelectric Project Draft Environmental Impact Statement, Federal Energy Regulatory Commission, May 1984

Figure 4 – Devil Canyon Site Layout

miles north of the two dam sites, and the Alaska Railroad, which crosses the Susitna River at Gold Creek, 14.7 miles downstream from Devil Canyon.

Access to the Watana site would include a new railhead at Cantwell, where a 40 acre lay-down yard would be constructed. From there, road access would be by way of 22 miles of existing road along the Denali highway and then 41 miles of new road to the dam site. A permanent airfield would be built at the Watana site to accommodate construction and eventual operation of the project.

From the Watana camp, a suspension bridge would cross the river downstream from the dam site, and a new road approximately 20 miles long would connect to the Devil Canyon site. In addition, a new railroad spur would be built from Gold Creek to the Devil Canyon Site.

The Alaska Department of Fish and Game anticipated controlled access to the sites, but it is probable that the recreation value of the sites would be such that public pressure to gain access to the sites would prevail.

The Upper Susitna Environment and Project Impacts

The Upper Susitna river basin comprises an area of approximately 6,160 square miles and supports an average annual stream flow at the basin outlet below the Devil Canyon dam site of approximately 6.5 million acre-feet. Summer stream flow is roughly ten times that of winter flows. The basin is bordered on the north by the Alaska Range, the Talkeetna Mountains to the southwest, and flat low relief areas to the southeast. By the time that the river enters the Cook Inlet, it has grown to be the sixth largest river in Alaska and is supported by an entire drainage area of approximately 19,000 square miles.

General characteristics -- A description of the upper Susitna area is described in the June 1978 Corps of Engineers Plan of Study (written earlier by E. Yould when employed with the Corps):

> "Most of the basin has a well-defined branching stream pattern with a main channel emanating from glacial headwaters in the extreme northern segment of the divide. Below the glaciers, the braided stream traverses a high plateau

composed of aggraded alluvial sediment, and then meanders several miles south to the confluence with the Oshetna River. It then takes a sharp turn to the west and flows through a steeply cut, degrading channel until it exits the basin at Gold Creek. The contributing glacial area comprises only 4 percent of the entire basin, but summer glacial melt provides a considerable portion of the total stream flow. By contrast, the flat, glacially carved Lake Louise area in the southeastern portion of the basin provides comparatively little flow from its 700-square-mile area.

The mountains within the basin reflect the influence of the Pleistocene Ice Age, during which glacial advancement over the topography planed the mountains and gave the basin surface a rounded and smoothed appearance. The highest elevation within the basin is 13,326 feet, and the lowest elevation is 740 feet. The basin relief implies a steep channel slope; however, variability of the slope compared to other mountain streams is somewhat reversed. The aggraded channel in the upper reaches of the basin has channel slopes in the range of only 4 to 7 feet per mile while the lower basin channel [where Devil Canyon and Watana would reside] drops as much as 37 feet per mile. The deeply incised river channel below the Tyone River contrasts with the many traditional Alaskan U-shaped valleys remnant of glacial advances."

Field Investigations -- In 1980 the Alaska Power Authority established a 100 person field camp at the Watana dam site for the purpose of supporting field crews investigating aspects of the project. The camp was brought in during the winter time by way of low pressure tire "rollagons." In addition to the mobile camp at Watana, tent camps were established at strategic locations throughout the basin. During the 1981 and 1982 field seasons, numerous biologic, geologic, seismic, and fish and wildlife investigations were performed both in the area directly impacted by the projects, and downstream. Extensive sonar and physical fish counts were conducted during this period. Wildlife inventories were conducted from the air, and detailed flora and fauna investigations were performed by scientists on test plots and from the air using infrared technology.

Fish -- All five Pacific salmon species spawn in the Susitna drainage. However, the strong hydraulic current in the 75 mile canyon stretch of the river above Gold Creek prevents anadromous fish from ascending the drainage basin above the point in the river

where the dams would be built. In contrast, the habitat downstream of the project sites supports a fishery that is heavily harvested by commercial, sport, and subsistence users. While the dams may not directly impede migration of salmon into the upper basin, post project physical changes to the flow regime below the projects would impact the downstream fishery. Impacts would attenuate at locations farther downstream from the dams as the moderating influence of the rest of the basin begins to dominate project releases. Impacts would be a result of significant change to the water temperature, and its resultant impact on salmon fry of those species that winter over before migrating to the ocean. Impacts would also accrue from a loss of fish rearing habitat due to increases in turbidity during reservoir filling and from stream channelization and a loss of side sloughs resulting from the diminution of normal peak runoff events. There would also be the infrequent impact that fish may suffer from nitrogen supersaturation that could occur during spillway bypass events.

Conversely, through mitigative measures the dams also would provide the opportunity to open up the otherwise unused habitat above the dam sites for salmon spawning and rearing. There was also the potential to establish a world class fish hatchery below the project sites that could help transform the Cook Inlet fishery into a world class resource. These mitigative or enhancement measures were not included as part of the FERC license application.

Seven resident fish species were found throughout the Susitna basin including the impoundment stretch of the river. The project would directly impact habitat of the resident fish populations in the impoundment areas as well as downstream from the projects. As with the salmon species, these impacts would attenuate with distance downstream from the project sites.

Absent fish hatcheries or propagation of salmon spawning habitat in the basin above the dam sites, ultimately FERC staff concluded that is was "not possible to assess whether the Susitna Hydroelectric project would result in an average long term decrease or increase in populations of salmon presently spawning in the Susitna River Basin." FERC did conclude that there would be a loss of anadromous fish during the initial filling of the Watana reservoir. Resident fish impacts would largely be confined to direct loss of main

stem habitat in the area of the dams and reservoirs, and shifting of these fisheries to higher elevation lake type environments associated with the project's reservoirs.

Wildlife -- Field inventories indicated that the upper Susitna and project site supports a diverse wild life typical of southcentral Alaska, including big game animals, fur bearers, various bird species, and small mammals. Except for the peregrine falcon, which uses the upper basin as a flyway, no endangered species were found. However, project features and reservoirs would permanently withdraw habitat from use by various key wildlife.

Moose are the most important large animal species in the Susitna basin that would be affected by the project . An estimated 2,200 moose in the project area would be directly impacted, and as many as an additional 9,000 moose could be indirectly impacted.

The Nelchina caribou herd, with an estimated population of 20,000, ranges throughout the area, but their total habitat is much broader, extending throughout the Copper River Basin. As such, the project would create little direct impact on the herd. Brown bear would suffer a small loss of denning habitat and could have some of their range patterns inhibited by the reservoirs. They would also loose some moose predation in the reservoir areas. Black bears could be the most impacted large mammal species in the upper Susitna basin, as a large amount of their lowland habitat adjacent to the Susitna River would be lost. The studies estimated that 55% of known black bear dens would be inundated by the reservoirs.

Dahl sheep, wolves, raptors, water fowl, and other indigenous wildlife would experience various levels of stress from the project. Enhanced hunter access would put more pressure on all big game species and birds in the basin, as would be the case for the fisheries as well.

Alternatives to Susitna

Certainly the Railbelt utilities had the capability to develop coal alternatives, but it was probably only a State sponsored effort through the Alaska Power Authority that a capital intensive renewable energy project such as hydropower, geothermal, or tidal power could

be realized. Thus, to ensure that the two-dam scheme was the best non-thermal alternative for the Railbelt, the Power Authority and later FERC, looked at a number of energy alternatives and even attempted to assess the cumulative impacts of some of the more promising alternatives. Not only did the alternative studies substantiate the economics of Susitna, but they also allowed the assessment of the cumulative impacts that would occur if Susitna were not built. Environmental groups often make a compelling argument regarding the adverse environmental impacts of a Susitna or similar type project, but they rarely address the adverse impacts that would accrue if the project were not built.

Geothermal studies focused on areas near the Railbelt that contained hot igneous systems. These included Mt. Drum and Mt. Wrangell in the Copper River basin, and Mt Redoubt (Double Peak) and Mt. Spur in the Cook Inlet area. Most of the geothermal studies were based on existing research by others, but ultimately all of the sites were found to be a) very expensive to develop, and b) lacking adequate exploration to prove up the resource. Little effort was made to assess the environmental impact that might be associated with any of the geothermal projects.

Tidal power received a more rigorous review. The legislature appropriated $500,000 over and above the Susitna funds to study the tidal power potential of the Cook Inlet area. The Power Authority, through its contractor, studied 16 sites throughout Cook Inlet area with cumulative energy potential exceeding 168,000 GWH. The Power Authority developed conceptual designs for each site and reconnaissance level cost estimates. A site at Sunshine, on Turnagain Arm, was found to be the best site for tidal power, but the economics of this alternative were inferior to the Susitna hydroelectric project, and environmental impacts to fish and whale blockage were deemed potentially significant.

The Power Authority also looked at solar power, peat, and non-structural alternatives such as energy conservation and load management. It also considered many of these alternatives as part of coal and natural gas scenarios but later rejected them as inferior to Susitna.

The non-thermal alternative that received considerably more attention than those mentioned above was that of non-Susitna hydropower alternatives. The Power Authority identified 91 potential hydro sites available to the Railbelt market. After four screening iterations, the Authority narrowed these sites down to the most promising 18 sites and ranked them according to environmental impact and economic attractiveness. FERC staff later selected the top five from this list and evaluated them in depth individually and in combination against the Susitna two-dam scheme. The following table is a summary of the hydropower projects selected by FERC for more detailed comparative analysis.

Alternative	Estimated total cost of project (Million $, 1982)	Total installed capacity (MW)	Average annual energy demand (MWH)
Johnson	319	210	929
Chakachamna	905	333	1,300
Snow	305	100	375
Keetna	519	100	420
Browne	681	100	418

No combination of these hydroelectric sites, even in conjunction with thermal alternatives, proved economically superior to the proposed Susitna plan, and many were predicted to have serious adverse environmental impacts. Some of these projects were even analyzed as though they were an element of a staged development of the Susitna project. For instance, in one analysis Chakachamna was considered as the second stage development of Susitna in lieu of Devil Canyon.

In summary, the Susitna two-dam scheme was found to be economically superior to virtually all energy alternatives on the basis of a 50-year net present-worth analysis. Once again, there is no guarantee that the outcome would be the same if the economic alternatives analysis were performed today:

- Capital costs have certainly changed with inflation as have the cost of building materials, not only for Susitna but for other alternatives, as well.

- Environmental protection laws and sensitivities have continued to evolve, generally becoming more restrictive.
- Cook Inlet natural gas has proved more abundant than was estimated in the Susitna studies, but its pricing is estimated to approach "Henry hub" levels within the next decade.
- More importantly, however, is the international cost of fuel that drives the shadow value of thermal alternatives to Susitna. In 1984, FERC estimated that the real cost of oil would escalate at one percent over inflation and that this would drive the cost of natural gas.
- The cost of coal was not projected to escalate at this same rate as oil, as there was not viewed to be a significant export market for coal. In fact, in retrospect, the price of oil in real dollars was higher in the early 1980s than it is today at $70 per barrel. Cook Inlet coal, on the other hand, is showing signs of establishing an export market and its cost will likely break out of its historical flat trend.

Could Susitna be Scaled Down?

Like all of the Railbelt utilities, Chugach management is attempting to assess what generation can best serve its customers' needs in the foreseeable future. Natural gas availability is projected to decline, and the cost is likely to rise. North Slope natural gas may become a reality, but there is no guarantee that it will be economically feasible to bring a spur line to the Cook Inlet area. Coal may well become more available, but the capital cost of coal generation facilities is high. In addition, the cost of mined coal may escalate with increased global market demand. Chugach has experienced the benefits of hydropower options such as Cooper Lake, Bradley Lake and Eklutna, but no other such options are being considered for the Railbelt at this time. Other renewable energy options such as Fire Island wind generation may prove beneficial, but such options cannot be expected to meet Chugach consumers' base load needs.

Susitna could meet all of the needs of Chugach, but does it represent a realistic option? Susitna is very large, very expensive, and requires a long lead time to develop. However, much of the front end work has already been done by the State of Alaska. It is possible that a revised FERC license application to construct the project could be crafted

from the State's earlier FERC submittal. Putting aside some of the institutional questions at this time, could Susitna be reformulated to better meet the needs of Chugach and the Railbelt?

Reformulate Susitna -- If it can be accepted that the Devil Canyon – High Watana scheme is the optimum basin development, then it must be realized that any deviation from this scheme will have an economic penalty. On the other hand, a scaled down version of the project may still prove economically superior to other non-Susitna options but better fit the present and near term load characteristics of Railbelt utilities and be more readily financed. Therefore, ignoring the issue of whether Susitna would still be the superior choice for the long term needs of the Railbelt, what are some of the changes that can be made to the Susitna project to make it more amenable to development at this point in time?

The following is a subjective review of changes that could be made to the project. Full review would require formulation of new cost estimates and reservoir regulation analysis to test the sensitivity of options.

Build Watana in Two Stages

The Power Authority actually analyzed this possibility but rejected it for economic reasons, i.e., the full project fared better in the net present worth analysis. Watana would first be built to a height of 450 feet and increased to its full proposed height of 880 feet later, as demand dictated. Under this scenario, the first stage development would be burdened with a design that would accommodate the larger ultimate development. In addition, the shorter dam would still need a spillway fully capable of passing the probable maximum flood. This spillway would then be abandoned in deference to the ultimate spillway that would accommodate the higher dam. The cost of the oversized powerhouse and all hydraulic works would accrue to the smaller project. Not only would this impart an economic penalty on the first project built, but if for some reason the second phase were not built, the large storage capacity available in the upper elevations would be forgone limiting the economic benefit of Watana as well as a subsequent downstream Devil Canyon dam. One advantage of building in this fashion, however, is that it would not

foreclose the possibility of building Vee and Denali upstream in lieu of the higher Watana. It must be recognized that it is still an open question, raised by the Power Authority, whether or not Denali is a viable dam site.

Build Devil Canyon First

As discussed earlier, the Devil Canyon cost was estimated to be $1.5 billion as compared to Watana's $4.0 billion price tag. However, by reversing the order of construction, many of the initial project features originally allocated to Watana (as a first project built) would now be part of the Devil Canyon development cost. At a minimum, this would include access roads, camp facilities, transmission lines, and hydraulic works to accommodate floods that might otherwise not occur with Watana upstream. In addition, river closure at Devil Canyon would entail a significantly increased structural work without Watana upstream, resulting in higher project costs. As a general rule, it is always best to build upstream projects first, as these structures can then help control the river during closure for subsequent downstream projects. In reverse, each closure upstream of a dam is every bit as complex as the first dam built.

This option also suffers from the limited storage capacity at Devil Canyon. As part of the two-dam scheme, Devil Canyon could generate 2.8 billion KWH firm annual energy, but as a first project built, Devil Canyon's inability to store water during the summer would be such that its firm annual energy would be only 900 million KWH. In essence, it would be a high head run-of-the-river project. If Watana were never built upstream, it would be an open question as to whether Devil Canyon would ever pay for itself. A complicating factor would be the annual sediment load of the Susitna River and its impact on Devil Canyon's storage capacity. The average annual sediment load flowing past the Devil Canyon site is estimated to be 5,000 acre feet per year. Over a one hundred year period of time, assuming that Watana were not built upstream, and further assuming a 100% trap efficiency, the Devil Canyon reservoir would become almost fifty percent filled with sediment. Most of this sediment would filter out in the active storage zone, further reducing the amount of summer storage available to firm up annual power generation.

Build a Series of Smaller Projects

This option holds the greatest promise for finding a scaled down basin development that can better meet the demands of Chugach an Railbelt utilities. In its studies, the Power Authority actually looked at 11 different dam sites in the upper Susitna basin. It even looked at one scheme that would include High Watana with a 30 mile power tunnel and the elimination of Devil Canyon. Environmentally, this was found to be a superior scheme, but it certainly did not lend itself to staged development. Unfortunately, the Power Authority eliminated the Denali site as a potential project. This decision needs to be revisited. With Denali storage upstream, any number of smaller projects could be built downstream, with each dam being built at the maximum reservoir elevation required to facilitate the next downstream project. There are a number of dam sites that could be evaluated in the 90 mile stretch of river upstream from Gold Creek. There would naturally be a tradeoff between multiple small dams and, for instance, the original Bureau of Reclamation 4-dam scheme consisting of Devil Canyon, Watana, Vee and Denali. Without a Denali or High Watana type project, numerous small projects on the main stem of the river would act primarily as run-of-river projects. The almost 7,000 cubic feet per second (cfs) average annual stream flow that presently flows past Gold Creek would occur in the ratio of about 20,000 cfs summer flow to 2,000 cfs winter flow. Without upstream storage capacity, much of this summer flow would go unused. If Chugach and the other Railbelt utilities were seriously interested in revisiting Susitna, the first order of business would be to review the viability of Denali as a legitimate dam site. If Denali is determined to be viable, it would then be prudent to reassess the original 4-dam scheme, or perhaps a series of smaller projects in the Gold Creek to Vee stretch of river.

Steps to Bring a Scaled Down Susitna to Fruition -- As originally envisioned by the Power Authority, Susitna hydropower could be an excellent long term option for Chugach and the rest of the Railbelt utilities. However, Susitna has some obvious drawbacks:

- It is a very capital intensive project.
- Although it may be shown to be the economically superior option for Railbelt utilities, the initial cost of power, if debt financed, would probably be significantly higher than the existing cost of power.
- It is beyond the ability of the Railbelt utilities to finance.

- Even if the financial and economic issues could be adequately addressed, it would require the total commitment of all of the Railbelt utilities to bring the project forward.

For these and other reasons, it would appear that the only realistic option for reconsidering a Susitna project is through some sort of partnership with the state government. The defunct Alaska Power Authority would need to be reconstituted from the existing Alaska Energy Authority, or a separate Authority could be established specifically for developing Susitna. Alternatively, if properly structured, the utilities may conclude that a G&T or JAA could serve as the organizational structure to bring the project forward, perhaps in partnership with the State. At any rate, the implementing organization would need the singular focus of bringing Susitna forward. It would also be absolutely imperative that all of the Railbelt utilities were in agreement that the project should go forward. Active dissent would torpedo any efforts to enlist Legislative appropriations for the project.

The State currently has $34 billion in the permanent fund, a surplus source of revenue, and the prospect for an even greater source of revenue if the North Slope natural gas pipeline is constructed. A portion of these funds could be dedicated to a substantial equity contribution to a Susitna project or some other financial mechanism to reduce to cost of power sold to consumers in the early years after the project starts generating power. The State could look at the project as the "bricks and mortar" equivalent of the Permanent Fund, with the benefit flowing directly to Alaska citizens. There is even the option that the State could be paid back some or all of any contribution that it were to make to the project at such time that inflation diminishes the impact of the front end cost of the project. There is increasing pressure to curtail worldwide carbon emissions, to develop renewable resources, and to decrease dependence on foreign oil. Few countries or other states have a Susitna project in their backyards. With the high cost of oil, changing public attitudes toward energy consumption, and prospective financial resources of the State of Alaska, there may well be a window of opportunity opening up for development of Susitna -- if Chugach and the other Railbelt utilities choose to pursue it in earnest.

YOU'RE THE MASTER; THIS IS YOUR UNIVERSE

TOMORROW'S SMART GARAGE IS READY TO OBEY YOUR EVERY WHIM

PAUL KENDALL

The garage of the future will still shelter your car and serve as a place to store your lawn mower and other indoor-outdoor equipment. But according to visionaries we interviewed at organizations ranging from the Ultimate Garage to the Electric Power Research Institute, in 10 years your garage will also be a savvy service center. Multiple power systems will ensure that your house consumes—and generates—energy as efficiently and inexpensively as possible. A team of robots will automatically take out the trash, accept and sort deliveries and trim your lawn—but only if it needs it. And sensors will valet-park your vehicles and keep watch on their condition. All you'll have to do is sit back and enjoy the ride. —CHARLES WOEPSE

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Pull up to your garage, press the park button, and infrared beams help your car guide itself into position. Once parked, your car transmits to a diagnostic station in the garage. The system's display tells you when it's time for regular maintenance—like a 300,000-mile tune-up—and warns you if something needs attention, presenting all your options. If you're handy, use the touch-screen [3] to display your car's manual, and order parts if necessary; it will then walk you through the repair. If you'd rather not sully your mitts, beam the diagnosis to your repair shop for an eshmam. The mechanics can use their own computers to do a more in-depth remote diagnosis and notify you if and when you need to bring it in. A handheld camera lets you send visual as well as electronic information.

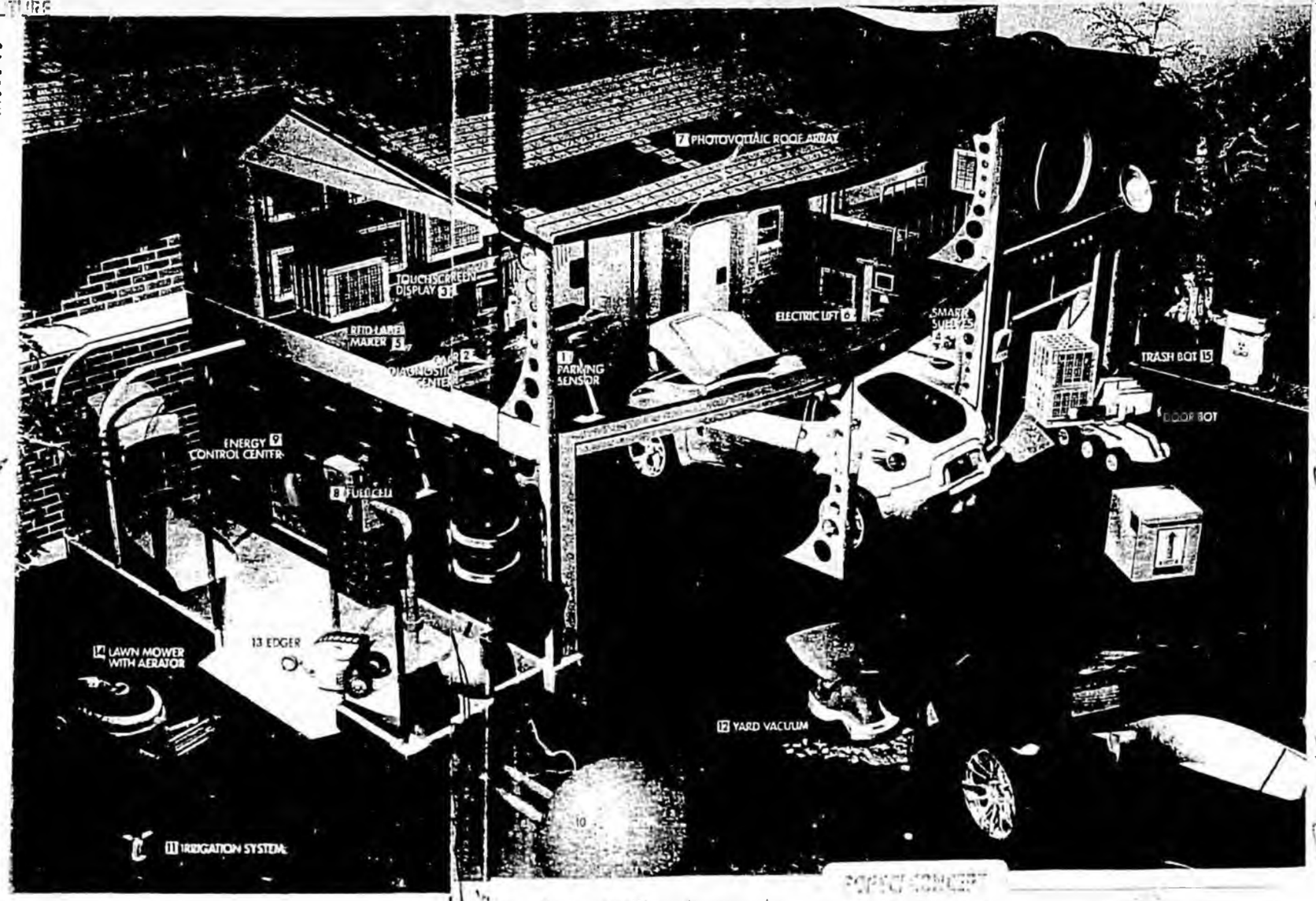
Shelves [4] have built-in scales to keep track of how much fertilizer, grass seed and other lawn-care products you've used. They automatically scan Radio Frequency Identification (RFID) tags in product labels as items are removed and replaced and update the inventory on your home computer. An RFID label maker [5] lets you inventory the contents of your own storage boxes so you know exactly where you stashed the holiday decorations. To maximize storage space, all these boxes, as well as bikes, boats and other recreational toys, are stored on the second story with the help of an electric lift [6].

Your home will still be connected to the grid, but it will also include two of its own power-generating systems: a photovoltaic roof array [7] that can deliver energy directly to your home and a hydrogen fuel cell [8]. A central controller [9] coordinates these systems. When the sun is shining and you need power, the solar rooftop system supplies it. If it's a blue-sky day and nobody's home, the solar energy powers a reformer, which extracts hydrogen from water; the hydrogen is stored safely in a subterranean tank [10], as a last resort, if it's cloudy and your fuel cell's out of hydrogen, the controller finds out through the Internet which utility has the lowest rates at that instant, and draws from the grid.

The irrigation system [11] goes online to check National Weather Service reports and municipal water restrictions, using the information to decide when to water. A small army of robotic lawn-maintenance bots can make decisions based on the same data, and automatically groom your yard accordingly. You'll have single-function bots [like a yard vacuum [12] and edger [13], as well as a mower that takes attachments such as an aerator [14]. The bots rest on their charging stations between jobs.

A robotic mesh can [15] sit on a charging station by the back door to the house. It has an automated routine to wheel itself to the curb on collection night.

Think of the door bot as a robotic gopher. It stashes packages from the delivery guy. Once he keys in a one-time code and leaves your packages in a double-secure storage bay, the bot scans the embedded RFID tags and automatically puts the boxes in the correct shelf or in the fridge or freezer. It finds and retrieves items for you from the yard and boot storage room. And it fetches and puts away your tools.



YOU'RE THE MASTER; THIS IS YOUR UNIVERSE

TOMORROW'S SMART GARAGE IS READY TO OBEY YOUR EVERY WHIM

Paul Kendall

The garage of the future will still shelter your car and serve as a place to store your lawn mower and other indoor-outdoor equipment. But according to visionaries we interviewed at organizations ranging from the Ultimate Garage to the Electric Power Research Institute, in 10 years your garage will also be a savvy service center. Multiple power systems will ensure that your house consumes—and generates—energy as efficiently and inexpensively as possible. A team of robots will automatically take out the trash, accept and sort deliveries and trim your lawn—but only if it needs it. And sensors will alert cars your vehicles and keep tabs on their condition. All you'll have to do is sit back and enjoy the ride. —CHARLES WARDELL

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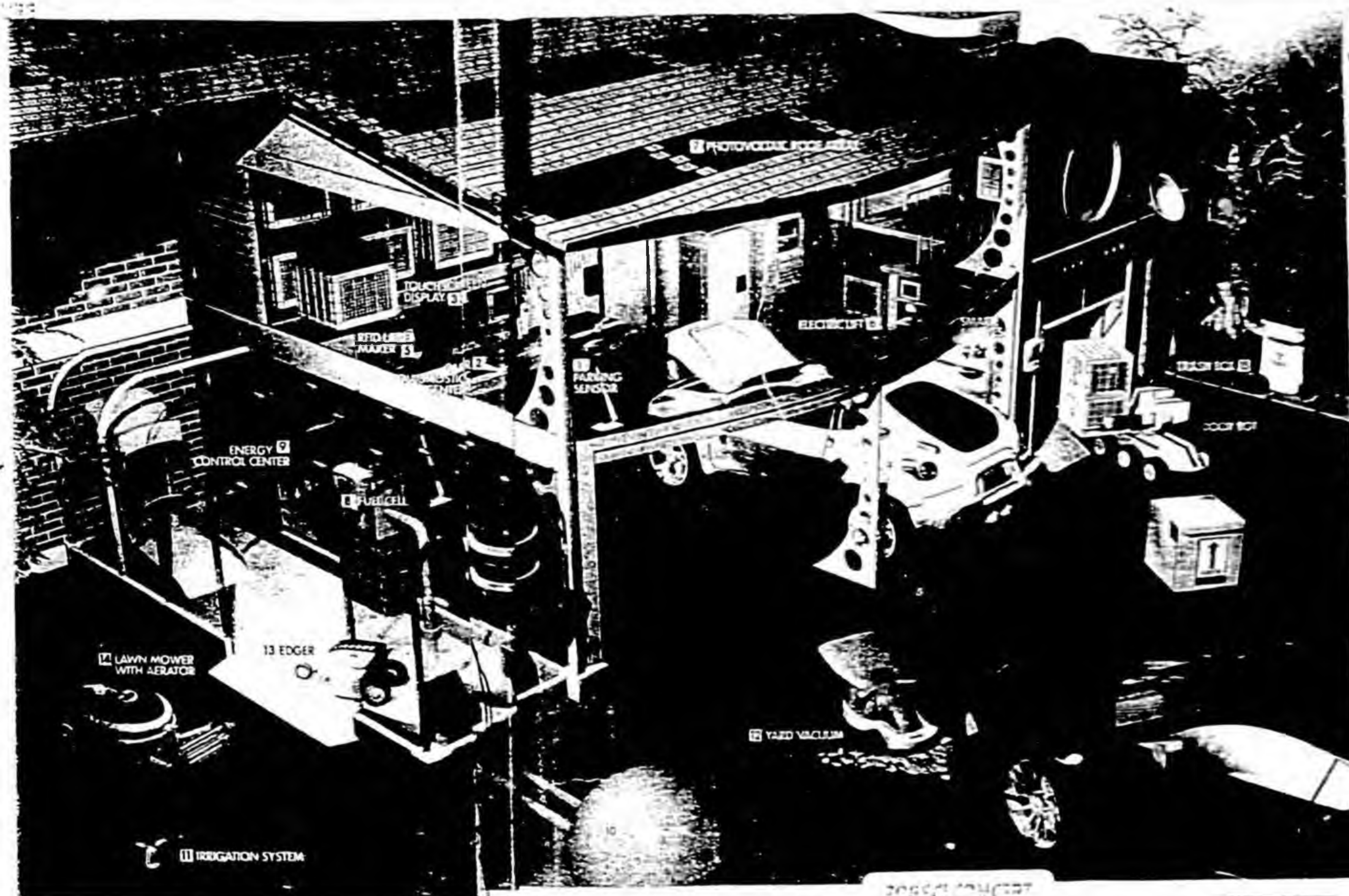
Pull up to your garage, press the park button ... beams help your car guide itself into ... [2]. Once parked, your car transmits ... diagnostic station in the garage ... the system's display tells you when it's time for regular maintenance—like a 300,000-mile tune-up—and warns you if something needs attention, presenting all your options. If you're handy, use the touchscreen [3] to display your car's manual, and order parts if necessary; it will then walk you through the repair. If you'd rather not sully your mitts, beam the diagnosis to your repair shop for an estimate. The mechanics can use their own computers to do a more in-depth remote diagnosis and notify you if and when you need to bring it in. A handheld camera lets you send visual as well as electronic information.

SMART STORAGE Shelves [4] have built-in scales to keep track of how much fertilizer, grass seed and other lawn-care products you've used. They automatically scan Radio Frequency Identification (RFID) tags in product labels as items are removed and replaced and update the inventory on your home computer. An RFID label maker [5] lets you inventory the contents of your own storage boxes so you know exactly where you stashed the holiday decorations. To maximize storage space, all these boxes, as well as bikes, boats and other recreational toys, are stored on the second story with the help of an electric lift [6].

HOME POWER SYSTEM Your home will still be connected to the grid, but it will also include two of its own power-generating systems: a photovoltaic roof array [7] that can deliver energy directly to your home and a hydrogen fuel cell [8]. A central controller [9] coordinates these systems. When the sun is shining and you need power, the solar roofing system supplies it. If it's a blue-sky day and nobody's home, the solar energy powers a reformer, which extracts hydrogen from water; the hydrogen is stored safely in a subterranean tank [10]. As a last resort, if it's cloudy and your fuel cell's out of hydrogen, the controller finds out through the Internet which utility has the lowest rates at that instant, and draws from the grid.

YARD WORK The irrigation system [11] goes online to check National Weather Service reports and municipal water restrictions, using the information to decide when to water. A small army of robotic lawn maintenance bots can make decisions based on the same data, and automatically groom your yard accordingly. You'll have single-function bots like a yard vacuum [12] and edger [13], as well as a mower that takes attachments such as an aerator [14]. The bots rest on their charging stations between jobs.

A robotic trash can [15] sits on a charging station by the back door to the house. It has an automated routine to wheel itself to the curb on collection night.



POPSCI CONCEPT

Think of the door bot as a robotic ... It fetches packages from the delivery ... Once ... a one-time code and ... your packages in a double-secure ... The bot scans the embedded RFID tags and automatically puts the boxes on the correct shelf or in the fridge or freezer. It finds and retrieves items for you from the second-floor storage room. And it fetches and puts away your tools.

Home Refueling Station — Reforming to Hydrogen via Nat Gas Electrolysis From Water Line. Phill Nat Gas pump for home use by Paul D. Kendall — Fuel Maker — Available now!

Paul Kendall — Economic Independence

Pop Science July 2004 Pg 21

Date

HYDROGEN USE IN ALASKA

Project 40902 Final Report

Christopher F. Blazek
Timothy D. Donakowski
Martin Novil
Edward J. Daniels

Prepared by
Institute of Gas Technology
IIT Center, 3424 S. State Street
Chicago, Illinois 60616

Date Published — November 1981

Prepared for the
U.S. DEPARTMENT OF ENERGY
And

STATE OF ALASKA

Under Contract No. DE-AC02-80CS91201

Table ES-1. DEMONSTRATION COMMUNITY COSTS

Stage of Project	Item	Size or Number	Cost,* 10^3
Preliminary Investigations	None	--	--
Field Studies	None	--	--
Offsite R&D	Appliance Testing	6 month	100
Demonstration Project			
Phase I	H_2 Storage	4×10^6 SCF	1,600
	Fueling Station	1	50
	Automobile Conversions	25	50
	Three-Wheeler Conversions	45	90
	Boat Conversions (gasoline)	25	50
	Boat Conversions (diesel)	15	300
Phase II	Alternate Wind Power System ($1100/kW + 60 Mills/kW hr)	220 kW	240
	Electrolyzers (current technology)	1600 SCF/hr	100
Phase III	H_2 Storage	35×10^6 SCF	8,000
	Distribution System	400 people	720
	Furnace Conversions	100	40
	Water Heater Conversions	100	15
	Range	100	15
Phase IV	Alternative Wind Power System	1900 kW	2,100
	Electrolyzers	14,000 SCF/hr	870
Phase V	Alternative Wind Power System	500 kW	550
	Electrolyzers	1500 SCF/hr	100
	H_2 Storage	260,000 SCF	280
	Fuel Cell System ($600/kW)	150 kW	90
Evaluation	None	—	—
		Subtotal	14,360
	Freight + Contingency (30%)		4.300
Support Staff		Total	1,030 19,690

* Assumes 1 month storage.

COMPUTER IMAGE BY CHUCK CARTER

The world's water supply

If all earth's water fit in a gallon jug, available fresh water would equal just over a tablespoon—less than half of one percent of the total. About 97 percent of the planet's water is seawater; another 2 percent is locked in icecaps and glaciers. Vast reserves of fresh water underlie earth's surface, but much of it is too deep to economically tap.

LITTLE CYCLONES END SEVEN-GAME LOSING SKID

See SPORTS, C1

THE TRIBUNE

WHERE ARE OUR LEADERS ON THIS $?

VOL. 136 – NO. 302 | AMES, STORY COUNTY, IOWA | WEDNESDAY, JUNE 23, 2004 50¢

Paul D. Kendall

Cutting-edge energy

Proposed wind and hydrogen plant for Ames would be world's first

Paul Kendall

By BETH ANDERSON
Staff Writer

The Ames Laboratory is proposing to build the world's first wind and hydrogen energy plant in Ames under a three-way partnership with the city and Iowa State University.

Tom Barton, the director of the Ames Lab, went before the Ames City Council Tuesday to seek support for a project that could provide inexpensive electricity for the city, be a source of hydrogen for research and place Ames in the international spotlight for renewable energy.

INSIDE: ANGRY CROWD OF HOMEOWNERS CONFRONTS COUNCIL OVER SIDEWALKS.

Page A6

"It could be a win-win-win deal," Barton said.

The council unanimously approved a motion to move the project forward, directing staff to work with the Ames Lab.

The proposed project would erect two wind turbines in west Ames that would provide electricity by converting water to hydrogen.

But the Ames plant will go beyond the standard wind turbines because of its ability to store energy using underground hydrogen fuel cells as "batteries," Barton said. The hydrogen could then be reconverted into electricity on demand.

With the go-ahead from the city, the plant could be up and running within 18 months or less, he said.

ENERGY please see page A8

Energy: Federal funding likely

Continued from page A1

6/23/04 Paul Kendall

Major funding for the project would likely come from the U.S. Department of Energy, which is working on a White House mandated Hydrogen Fuel Initiative to develop the technology needed to find a practical and inexpensive way to convert water into hydrogen fuel.

Barton gave no cost estimate for the proposed Ames project, but said that each of the three entities would play a part in its creation.

ISU will be asked to provide land for the project, possibly one of the university farm sites north of Lincoln Way on County Line Road.

The city would acquire all needed permits and allow connection to the intercity power grid, according to the proposal.

Because each wind turbine could produce as much as $100,000 worth of electricity a year, it is conceivable that Ames could someday have the option to sell part of the energy to other municipalities, Barton said.

The energy plant would be developed and operated by the Ames Lab, which would use the hydrogen produced to continue its research, particularly in a search for a hydrogen hybrid metal.

The Ames Lab is a Department of Energy laboratory operated by ISU on the Ames campus.

Its roots go back to the 1940s, when Ames produced more than 2 million pounds of uranium for the Manhattan Project.

Staff writer Beth Anderson

can be reached at 232-2161, ext. 354, or at banderson@amestrib.com.

(1)

BP Gas and power - Renewables & Hydrogen
Renewables & **Hydrogen** products and services - **BP** ... **BP** Gas and power Products and Services Renewables & **Hydrogen** ... ensure **BP** is ready to offer **hydrogen** to ...
bp.com/sectiongenericarticle.do?categoryId=3050016&contentId=3050076 - 36k - Cached

BP Global - Press - Introducing hydrogen power
BP's plan to generate electricity from **hydrogen** and capture carbon dioxide could ... electricity using **hydrogen** manufactured from natural gas to create " ...
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Ford Motor Company - Press Release - FORD AND BP OPEN FIRST HYDROGEN ...
With **BP** providing **hydrogen** fuel, this event will provide a chance to see ... fuels" said Maria Curry-Nkansah, **BP's hydrogen** business development manager. ...
media.ford.com/newsroom/release_display.cfm?release=24585 - 19k - Cached

BP's only UK hydrogen station demolished - AutoblogGreen
BP's only UK **hydrogen** station demolished. Posted Jun 11th 2007 8:16PM ... For the past three years, **BP** has had a **hydrogen** filling station at Hurnchurch in ...
autobloggreen.com/2007/06/11/bps-only-uk-**hydrogen**-station-demolished - 17k - Cached

People's Daily Online -- China's first hydrogen refueling station goes ...
A website by the People's Daily newspaper; China, business, world, science, ... said Bill Fitzharris, general manager of **BP hydrogen** transport technology. ...
english.people.com.cn/200611/09/eng20061109_319883.html - 28k - Cached

Singapore Environment Institute
... world's largest energy company, **BP** sees **hydrogen** as offering the potential to ... this position, he leads the **BP hydrogen** programme, directs the existing project ...
www.**nea.gov.sg**/cms/sei/PSS4.htm - 12k - Cached

California Hydrogen
... announcement. **BP** had already announced plans for two such **hydrogen** power ... near **BP's** current oil-refining operations that heavily use **hydrogen** to produce ...
www.**cleanfleetreport.com**/vault/carson.htm - 11k - Cached

Ford and BP Open Hydrogen Station in Taylor, Another Milestone in ...
With **BP** providing **hydrogen** fuel, this event will provide a chance to see ... fuels," said Maria Curry-Nkansah, **BP's hydrogen** business development manager. ...
prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/...&EDATE= - 9k - Cached

Green Car Congress: BP and Rio Tinto Form JV for Hydrogen-Fueled Power ...
Online news, ... **BP** and Rio Tinto have formed a new jointly-owned company, **Hydrogen** ... **BP's** previously announced **hydrogen**-fueled power projects in ...
www.**greencarcongress.com**/2007/05/no_tinto_and_b.html - 19k - Cached

Media.Ford.com: FORD & BP TO BUILD HYDROGEN FLEETS & FUELING STATIONS ...
OFFICIAL NEWS, PHOTOS, VIDEOS, MEDIA KITS, EXECUTIVE BIO&146;S, PRESS ... to place up to 30 **hydrogen**-powered vehicles, and **BP** plans to build a network of ...
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BP.com/us - We're a global energy leader discovering alternative fuels.

Paul D. Kenhall
3-5-08
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Two oil giants plunge into the wind business - The Boston Globe
... some of the biggest players in wind power in the United States, accelerating a ... five generators of wind power, while BP's Alternative Energy group -- launched ...
boston.com/news/.../03/02/two_oil_giants_plunge_into_the_wind_business - 40k

Clipper Windpower Completes Sales Contract With BP For Delivery of 300 ...
... or 300 MW, of Clipper's 2.5 MW Liberty wind turbines to BP for delivery in 2009. ... In the United States, BP's wind portfolio includes the opportunity to develop ...
prweb.com/releases/2007/9/prweb556233.htm - 48k - Cached

BP Alternative Energy Acquires Wind Energy Co.
... 2005 to bring together BP's low-carbon electricity businesses. ... a small wind farm on a small acreage that gets sweeping winds year around in SW Indiana? ...
www.renewableenergyaccess.com/rea/news/story?id=47040&src=rss - 35k - Cached

ALTERNATIVE ENERGY BLOG - Solar-Energy-Wind-Power.com: $4b Investment ...
... strong opinions on alternative energy resources including wind power, solar energy, wave energy, geothermal & other ... BP is making its first major investment ...
alt-e.blogspot.com/2006/07/4b-investment-in-wind-power-by-bp.html - 38k - Cached

Clipper Windpower Press Release
... COMPLETES SALES CONTRACT WITH BP FOR DELIVERY OF 300 MW OF WIND TURBINES IN 2009 ... In the United States, BP's wind portfolio includes the opportunity to develop ...
www.clipperwind.com/pr_092607.html - 10k - Cached

BP Breaks Ground On First Wind Project in Texas
BP broke ground today on its first wind project in Texas. ... BP believes that sustainable energy alternatives and the development of the wind ...
www.renewableenergyaccess.com/rea/news/story?id=49928&src=rss - 33k - Cached

Rocky Mountain News - Denver and Colorado's reliable source for ...
BP's foray into the local wind industry came about recently when it bought ... BP's wind energy investment here is on top of its continued focus to increase ...
rockymountainnews.com/drmn/energy/article/... - 36k - Cached

North American Windpower: Content / Projects & Contracts / BP Plans To ...
BP Plans To Begin Building Five Wind Farms In 2007 ... a wind project developer under BP PLC, has announced that it expects to begin ...
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... International is the worldwide information magazine for the wind energy industry. ... first application at scale of Clipper's new C-96 wind turbine technology for BP. ...
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ENN: BP Breaks Ground On First Wind Project in Texas
... new Texas wind power facility will see 24 2.5 megawatt wind turbine generators, ... BP believes that sustainable energy alternatives and the development of the wind ...
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BP p.l.c. - Information & Fact Sheet - Hoover's
BP is also BO (Big Oil). It is the world's second largest integrated oil concern, behind Exxon Mobil. The company, which was formed in 1998 from the merger of British...
www.hoovers.com/bp/--ID__58872--/free-co-factsheet.xhtml

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BP Breaks Ground on First Wind Project in Texas " Earth 911
Houston, TX — BP broke ground today on its first wind project in Texas. ... BP believes that sustainable energy alternatives and the development of the wind ...
earth911.org/blog/.../bp-breaks-ground-on-first-wind-project-in-texas - 44k - Cached

energyme.com :: BP wind projects for 2007
Your single source for ... BP's US wind portfolio includes the opportunity to develop ... the year, BP acquired two US wind development companies ...
www.energyme.com/energy/2007/200700025.htm - 10k - Cached

Yankton Press & Dakotan: Story
BP brings capital and expertise to Clipper's effort at developing wind ... 200MW in 2008 which it will use on other projects in BP's global wind business. ...
www.yankton.net/stories/080906/community_20060809038.shtml - 27k - Cached

BP Alternative Energy Buys US Wind Company
... will allow BP to accelerate its plans to develop a leading wind power business in North America. ... BP Alternative Energy announced it had reached ...
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Wind Energy
Harnessing the power of wind.. (Skandia) It is the ultimate renewable resource. ... Sharp, Kyocera, and BP are also large manufacturers of solar modules, but this ...
www.wikinvest.com/concept/Wind_Energy - 64k - Cached

BP and Rio Tinto unite to develop clean energy projects

■ **VENTURE:** Company initially will look into hydrogen-fueled power.

The Associated Press

LONDON — Oil producer BP and miner Rio Tinto will be working together to develop clean power projects around the world, the companies said Thursday.

The joint venture will initially focus on hydrogen-fueled power generation, using fossil fuels and carbon capture and storage technology to produce new large-scale supplies of clean electricity.

"Projects such as these have the potential to help deliver the carbon emission reductions which companies and countries around the world are now seeking," said BP Chief Executive Tony Hayward.

BP said that previously announced hydrogen-fueled power projects in Peterhead, Scotland, and Carson, Calif., will become part of Hydrogen Energy. Rio Tinto will make a cash payment to BP of about $32 million, subject to post-completion adjustments.

The new company will be based in Weybridge in southeast England and will initially have a staff of 75 transferred from the parent companies.

Lewis Gillies, formerly head of BP's hydrogen power business, will be chief executive of Hydrogen Energy and Peter Cunningham, formerly head of business evaluation for Rio Tinto, will become chief financial officer.

Paul D. Kendall

from page 20

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fill. According to Perez,
time limit for FERC to re-
proposal, but he hopes to
ponse by April. If they do
approval, CAISO would
to acquire the stakehold-
which would most likely
o three months, and then
le the proposal with FERC.
on President Bush's recent
he Union address, which
generating more renew-
y. Perez believes FERC will
e proposal.

"If you've been following all the action in Washington, D.C., the action has been renewables, renewables and renewables," he says. "Here we're coming with a proposition that will facilitate renewable development. If I were a betting man, I would bet they would pass it."

– Shelley Paventy

PAUL D. KENDALL

NAW 02-07

Wind Power Increases Worldwide

Reports from the American Wind Energy Association (AWEA), the European Wind Energy Association (EWEA) and the Global Wind Energy Council (GWEC) show solid growth in wind power markets around the world.

In terms of new installed capacity in 2006, the U.S. continued to lead with 2,454 MW, followed by Germany (2,233 MW), India (1,840 MW), Spain (1,587 MW), China (1,347 MW) and France (810 MW), according to GWEC's annual figures for 2006.

AWEA reported in its recent market forecast that wind power generating capacity in the U.S. increased 27% to 11,603 MW in 2006 and is expected to increase an additional 26% in 2007.

"iPods, flat screen televisions and other highly sought technologies are creating a demand for electricity that is beginning to eclipse our current supply," says Randall Swisher, executive director of AWEA. "Wind is a proven, cost-effective source of energy that also alleviates global warming and enhances our nation's energy security."

The forecast indicates the U.S. wind energy industry invested approximately $4 billion in new installations, making wind energy the second largest source of new power generation in the country, behind natural gas.

AWEA's industry outlook also found that:

- Texas accounted for nearly a third of the new wind power installed in 2006,
- new utility-scale turbines were installed in a total of 29 states across the country and
- the top five states in new installations were Texas (774 MW), Washington (428 MW), California (212 MW), New York (185 MW) and Minnesota (150 MW).

GWEC's annual figures for 2006 reveal that 15,197 MW of wind energy was installed in 2006 around the world, bringing the total installed wind energy capacity for more than 70 countries to 74,223 MW – up from 59,091 MW in 2005. The countries with the highest total installed capacity are Germany (20,621 MW), Spain (11,615 MW), the U.S. (11,603 MW), India (6,270 MW) and Denmark (3,136). Thirteen countries around the world can now be counted among those with over 1,000 MW of wind capacity, with France and Canada reaching this threshold in 2006.

According to EWEA, 7,588 MW of wind power capacity, worth approximately 9 billion euros, was installed last year in the European Union (EU) – an increase of 23% compared to 2005. The cumulative wind power capacity operating in the EU increased by 19% and now exceeds 48,000 MW.

AAER To Open Plant

Bromont, Quebec-based wind turbine manufacturer AAER Inc. has signed a ten-year lease agreement, with an option for an additional five years, with Olymbec Inc., the owner of buildings that housed the former Hyundai plant in Bromont.

Under the terms of the agreement, AAER has leased 111,141 square feet to be used for the assem-

ission, the RPS requires each in-stor-owned utility to increase its ocurement of eligible renewable nerating resources by 1% of load r year to achieve a 20% goal. Bue-Vista will provide over 38 MW of nd power to the state's electricity stomers.

"We are very glad to partner with &E in the first and important re-owering in the Altamont area," says ike Garland, head of Babcock & own's North America Infrastruc-re Group, the developer of the oject.

Ontario Project Started

Acciona Wind Energy Canada c., a renewable energy project de-loper and affiliate of Acciona S.A., d Suncor Energy Products Inc., a holly owned subsidiary of Suncor nergy Inc., have started construc-on on a 76 MW wind farm located ar Ripley, Ontario.

Foundations for the 38 2 MW nercon wind turbines are now be-g poured. Pending weather condi-ons, construction will take a brief break during the winter months and is expected to be complete this summer, with the project commissioning scheduled for late 2007.

The wind farm is located in Haron-Kinloss township, approximately 220 kilometers west of Toronto. The project is expected to have the capacity to power 24,000 homes and offset 66,000 tons of carbon dioxide per year.

In addition, Suncor and Acciona will submit an application for funding from the Canadian government's recently announced ecoEnergy Renewable Power Initiative, which supports wind power development in Canada.

MARCH-07

BP Plans Five Wind Farms

NAW 02-07

BP Alternative Energy North America Inc., a wind project developer under BP PLC, has announced that it expects to begin construction on five wind power projects in the U.S. in 2007.

According to BP Alternative Energy, the projects are expected to deliver a combined capacity of approximately 550 MW. Construction is currently underway on the 300 MW Cedar Creek project, a development venture between BP Alternative Energy and Babcock & Brown, in Weld County, Colo. The 274 turbines that the project calls for will be erected on a 32,000-acre site. According to Governor Bill Ritter, D-Colo., who supports the wind farm, it will create up to 250 jobs and has the capacity to power 120,000 homes.

The remaining projects include a 65 MW wind farm in North Dakota, a 60 MW joint project with Clipper Windpower in central Texas, a 100 MW project in western Texas, and the Yaponcha wind power project in California. The Yaponcha project consists of repowering an existing wind energy facility in San Gorgonio Pass – the company expects the facility to have a capacity of 20 MW.

"Our 2007 build program surpasses our target and does so a year ahead of schedule," says Robert Lukefahr, president of BP Alternative Energy. "It is a testament to the caliber of people working in our business and the opportunities in the U.S. wind sector."

BP Alternative Energy adds that it plans to deploy 150 MW of Clipper Liberty wind turbines in the projects as part of the supply and joint development agreement it entered into in 2006 with Clipper Windpower.

NBP, TransAlta Enter PPA

Calgary, Alberta-headquartered TransAlta Corp., a generator of electricity from a variety of sources, including renewable energy, has entered into a 25-year power purchase agreement with New Brunswick Power, a New Brunswick-based power supplier. The agreements represent the province's second power purchase agreement.

Under the terms of the agreement, TransAlta will provide 75 MW of wind power to New Brunswick Power. TransAlta will construct, own and operate a wind power facility in the Kent Hills area of New Brunswick. Natural Forces Technologies Inc., a local Atlantic Canada wind developer, is TransAlta's co-development partner in the project.

The 25-turbine wind farm is subject to regulatory and environmental approvals, and is expected to begin commercial operation by the end of 2008, the companies say. Once complete, it will provide a capacity of 220,000 MWh per year, which is enough electricity to meet the needs of approximately 13,000 homes. The

ıe proposed facilities
sota Power's electric
near Hewitt, Minn.,
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LLC would build,
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40 MW

ı Energy Co., a Des
ased electric utility
ıf MidAmerican En-
Co., is seeking ap-
Iowa Utilities Board
40 MW of wind en-
s power supply.

"In addition to the environmental benefit of adding new wind energy production in Iowa, customers of MidAmerican Energy will continue to benefit from electric rate stability," says Greg Abel, president of MidAmerican Energy Holdings. "The last electric rate increase MidAmerican Energy customers experienced was in 1995, and we propose adding the new wind energy while maintaining electric rate stability until 2014, which is nearly 20 years of electric rate stability for MidAmerican Energy customers."

In addition, the company has announced plans to erect a wind turbine for renewable energy generation at the Iowa State Fairgrounds. The Iowa State Fair wind turbine will be built in part due to the voluntary customer donations to MidAmerican Energy's Renewable Advantage program. Since its inception in 2004, more than $150,000 has been donated to the program. MidAmerican Energy will fund the remaining $743,000 required to erect the wind turbine and make a $4,000 annual payment for the easement for the wind turbine site, the company says.

Construction of the turbine is scheduled to begin this spring and be completed in time for this year's fair, MidAmerican Energy adds.

JUNE - 07

BP Orders Wind Turbines

Vestas Americas A/S of Portland, Ore., has received an order from BP Alternative Energy North America Inc. for 50 V90-3.0 MW wind turbines to accelerate the growth of BP's U.S. wind portfolio.

According to the companies, delivery of the turbines will commence in the fourth quarter of this year. Vestas will supply and commission the 50 wind turbines as well as maintain and service them for five years.

"The V90-3.0 MW turbine is an important part of our growth in the North American marketplace, and we are pleased that BP has included this turbine type in its wind portfolio," says Jens Soby, Vestas Americas' president.

THERE IS NO SUCH THING AS WATER! - ONLY VARIOUS HYDROGEN COMPOUNDS!

PAUL D KENDALL

PAUL D. KENDALL
222-7882
4-12-07
TO: ACIA REVIEW

8. TECHNOLOGY DEVELOPMENT

*"...the discovery with which we are dealing involves forces of nature too dangerous to fit into any of our usual concepts." (The Congressional Record of 1875, concerning the discovery of gasoline).**

HYDROGEN?

* Quoted by Anthony M. Moos in *Fuel Cells*, Vol. II, ed. G. J. Young, (New York: Reinhold Publishing Corporation, 1963).

[redacted]

THESE FIGURES ARE NOT VERIFIED!

NEED VALIDITY!

PAUL D. KENDALL

11-16-07 ENERGY OUTLAYS

	ENERGY	Annual Nat Avg	Annual AK Avg	X X SFHOM Annual SFHOM Avg	Monthly SFHOM	Annual X 1,000 homes = cu ft. nat gas
42	Natural Gas		175,000 cu ft.	150,000 cu. ft.	12,500 cu. ft.	150,000,000 cu. ft.
	1 cu.ft.=1,031 btu		180,425,000 btu	154,650,000 btu	12,887,500 btu	154,650,000,000 btu
			175 Mcf	150 Mcf	12.5 Mcf	150. MMcf
48	*Electricity		8,500 Kwh	7,200 Kwh	600 Kwh	7,200,000 Kwh
	1 kwh=3,412 btu		29,002,000 btu	24,566,400 btu	2,047,200 Btu	24,566,400,000 btu
			28,130 cu. ft.	23,828 cu. ft.	1,986 cu. ft.	23,828,000 cu.ft.
			28.1 Mcf	23.828 Mcf	1.986 Mcf	23.828 MMcf
54	Gasoliine	468 gal.	1,500 Gal	1,000 Gal	250 Gal.	1,000,000 Gal
	1 Gal=124,000 btu		186,000,000 btu	124,000,000 btu	31,000,000. btu	124,000,000,000 btu
	=1203cu ft		180,407. cu. ft.	120,272. cu. ft.	30,068. cu. ft.	120,272,000 cu. ft.
			180.4 Mcf	120.3 Mcf	30.1 Mcf	120.3 MMcf
60	Water					
	Sewage					
	Property Taxes					

66 ---

* check on gas amount to produce – power loss in transmission

Paul D. Kendall

3/5/08

Old Booklet

HISTORY AND DEVELOPMENT OF STEAM BOILERS

TALK BY S.T. MACKENZIE

SALES MANAGER

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

TO

NORTH CAROLINA SOCIETY OF ENGINEERS

WILMINGTON, N.C., AUGUST 5. 1954

BULLETIN [illegible]

History and Development of Steam Boilers

by S.T. Mackenzie

Each state in the union has its own particular claim to fame, but when I think of "North Carolina" there always comes into my mind a picture of good, sound progress symbolizing a spirit that is cognizant of tradition, but not hopelessly chained to it; a spirit dedicated to advancement but not always seeking the new merely for the sake of change.

There are many things which make North Carolina a great state. Its people, its resources, its enterprises. Important among the elements that have contributed to the rapid growth of your state is the presence of many engineers and their organization into societies such as you have here. Progress doesn't just happen. It takes enterprise. It takes thought. It takes courage. Most of all, it takes engineers. Without engineers to translate dreams into practical, working, economical reality, we would be a poorer, weaker nation.

We cannot single out any branch of engineering as being a greater contributor than any other to our mutual progress. We are all too interdependent, need each other too much to draw any fine distinctions.

No place is this better illustrated than in the subject which I am discussing today: "The History & Development of Steam Boilers". Perhaps I should have called it: "More Steam - Less Muscle".

Offhand, nothing sounds quite so commonplace as steam boilers. They've been around for years. It might be more exciting to talk about supersonic jets, gas turbines, moon rockets, or what have you.

But lets put this steam boiler in perspective. Why was it important? Why is it important today? Why will it be important in the future? I think we can see the answers to these questions quite clearly if we just go back to our fundamentals for a moment.

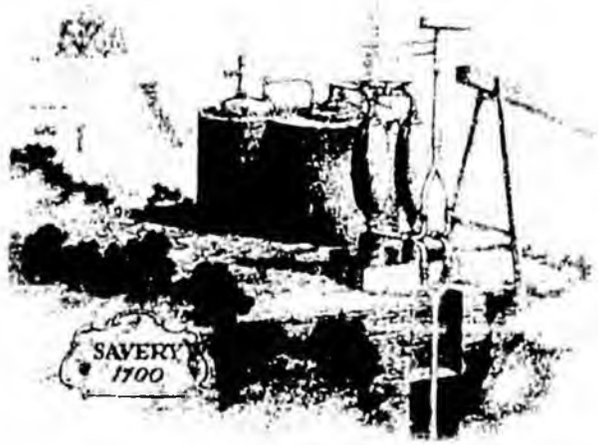
When did men first begin to develop the steam boiler in earnest? Why, when they really needed energy on a scale greater than that which could be supplied by human and animal muscles. Of course, as long ago as 150 B.C., Hero of Alexandria suggested this boiler and reaction turbine, but the society of the times was not ready for it. It was not until nearly 18 centuries later, in 1629 that Branca made this drawing of an impulse turbine. By this time, however, many conditions existed which sparked the rapid development of this new source of energy: Mining for ores and minerals had expanded to a really great scale and large quantities of fuel were needed for smelting. In addition, considerable fuel was needed for space heating and cooking. Industrial and military growth, especially in England, also demanded ever greater amounts of fuel. By the middle of the 1600's forests were being rapidly denuded and it became increasingly necessary to find some other basic source of energy. Thus despite the fact that 300 years ago people were executed in England for burning coal because it produced highly noxious and dangerous fumes, the dynamics of historical growth made it essential to remove these restrictions, and coal mining began to increase.

As coal began to be mined on a large scale, mines became deeper and deeper, and were often flooded with water. The English, in particular, were faced with a very serious curtailment of their growing industrial, military and political might if they could not find some economical way to pump the water out of their coal mines. The importance that was attached to this problem can be seen from the great number of men who were working on it and by the many, many patents that were issued on machines to pump water by the use of "the expansive power of steam."

This mutual dependence of fuel and machine is not always correctly explained. It is true that the development of machinery created a demand for fuel, but it is even more significant that the need for more fuel created a demand for machinery. The early machines used wood and

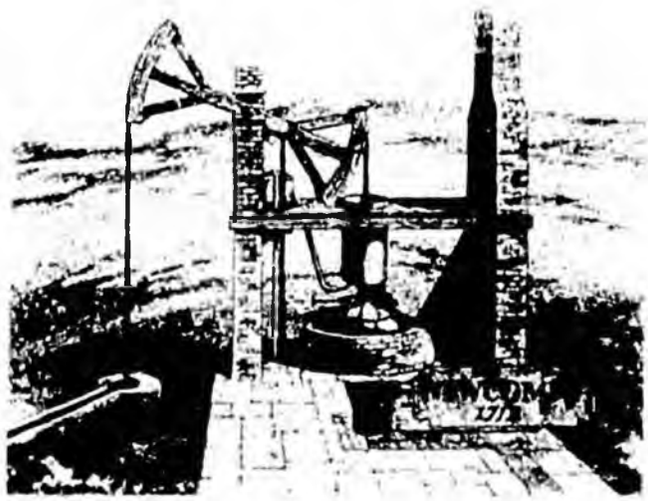
charcoal as fuel. Many years elapsed before the application of machine power to fuel procurement could bring production of fossil fuels up to a high enough point to displace wood.

Incidentally, these early developers were fully aware of the nature of the energy they were using. Their machines were invariably referred to as "fire engines", since it was the energy of the fire that was being harnessed and transmitted through the medium of steam.



SAVERY

Savery's steam engine of 1698 used the vacuum -- achieved by alternately forming steam in a cylinder and then chilling it -- to pump water from mines. His might be considered the first practical engine, and it was actually used in various locations.



NEWCOMEN

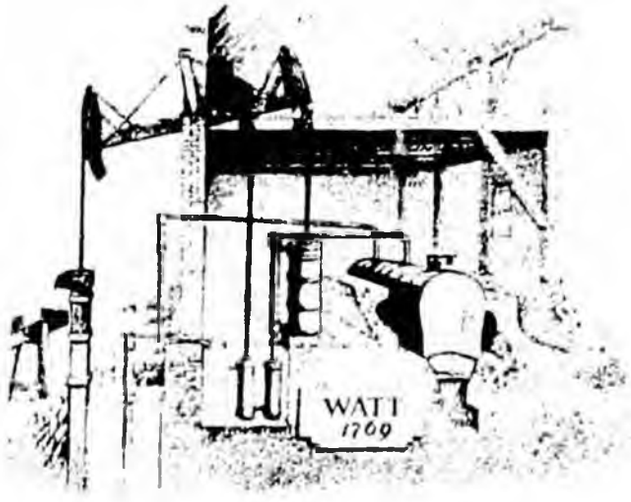
The first important development for securing useable energy through the medium of steam, however, originated with Thomas Newcomen, an iron monger living in Dartmouth, England. His first engine was based upon the concept that if steam were admitted to a cylinder in which was fitted a piston, and then a jet of water were admitted and the steam condensed, the pressure of the atmosphere on top of the piston would force the piston down the cylinder and thereby produce power which could be utilized for the then most important purpose of pumping water from coal mines.

Newcomen produced what is probably the first commercial steam engine and in 1712 had one operating in a mine at Cornwall in England. Note that the boiler for this engine - referred to as the Haycock type because of its shape -- was really a plain copper brewers kettle. Pressure was that of the atmosphere. The success of Newcomen was due to his conception of a device that would use steam at or below atmospheric pressure, thus accommodating his needs to the construction abilities and materials of the day.

WATT

The next significant development in the steam engine came through the efforts of Watt, whose genius and enterprise really put the steam engine on the market in a large way. Watt's partnership with Bolton, who was an excellent business man with capital and machine and foundry facilities, produced a combination that brought about a very rapid development in the entire field of steam power.

Watt began his experiments with the steam engine in 1760, but commercial realization came about 1790 and this is regarded as the beginning of the industrial revolution -- only 165 years ago.



Watt's principal concept was that if the steam could be condensed in a separate shell distinct from the cylinder itself, the heat lost by the cooling of the cylinder in Newcomen's engine would be saved and that the amount of power could be increased to whatever extent pressure increase was permitted by improvements in boiler design. The condenser separate from the cylinder itself produced a saving of approximately 1/3 in the coal required for a given duty.

Among Watt's many contributions to engine improvement, perhaps the most important was his device to translate the reciprocating motion into a rotative motion. This development of the so-called rotative engine permitted its introduction into mills and factories where belts and pulleys could transmit the power to rotating machinery. Thus began the process of substituting energy for man's muscles -- a process still with us, and perhaps still in its infancy.

Watt's records show that he fully realized the advantage of higher pressure steam but he never built a boiler for these higher pressures and expended all of his efforts on the engine. He used the Waggon type boiler which produced large amounts of steam at about 5 pounds pressure.

Watt studied the scientific end of his problem probably more than any one who preceded him and developed tables showing the expansion of steam and changes in volume at various pressures. Incidentally, as we will discuss later, the investigation of steam properties is today an important necessity.

TREVITHICK

The next outstanding figure was Richard Trevithick, who as a boy of eight went to work in one of his father's mines in an English mining district. There he received as much engineering training as was available in those days, since his father was manager of several mines and thus Richard was permitted to travel from engine house to engine house and observe the pumping engines, principally of Newcomen design.

Trevithick realized the problem was still largely one of manufacturing the boiler. Whereas copper was the only material heretofore available, hammered wrought-iron plates could now be used although the maximum length was 2 ft. Rolled-iron plates became available in about 5/16" thickness in 1795.

In 1800 Trevithick made an engine for 65 lb pressure, having a 25" cylinder and a 10 ft. stroke. This same high pressure made possible the successful construction of a high pressure engine and boiler mounted together. This boiler was built in 1804 and had a cast iron cylindrical shell with the rear end dished.

CORNISH BOILER

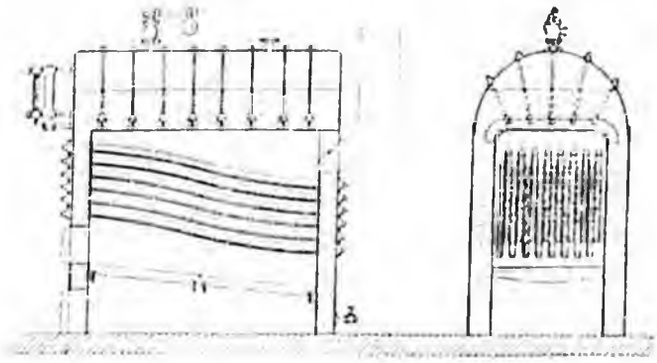
As the demand increased for larger and larger amounts of power, it was necessary to build larger and larger boilers, or put up with the inconvenience of a multiplicity of small units. Here is a typical Cornish boiler. Later developments saw the flue broken up by many gas tubes to increase heating surface as much as possible. This was essentially the design in widespread use up to about 1870. However, fire-tube boilers were limited in capacity and pressure. Also, because all of the steam was concentrated in one big shell, parts of which were exposed to radiant heat, they were subject to disastrous explosions.

WATER TUBE BOILERS

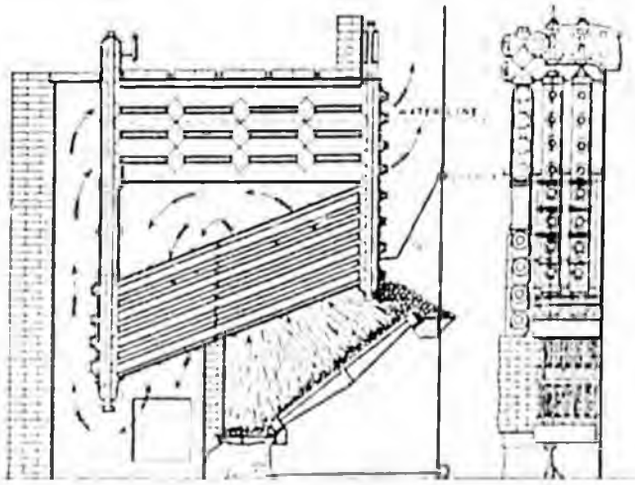
This question of boiler capacity and safety was of basic importance, and it is no exaggeration to say that for a time failure to develop adequate boilers threatened to halt industrial progress.

However, man is an inventive creature, and the moment a challenge arises, he sets to work with might and main to lick it.

The way to overcome the deficiencies of the fire tube boiler was to use a water tube boiler.

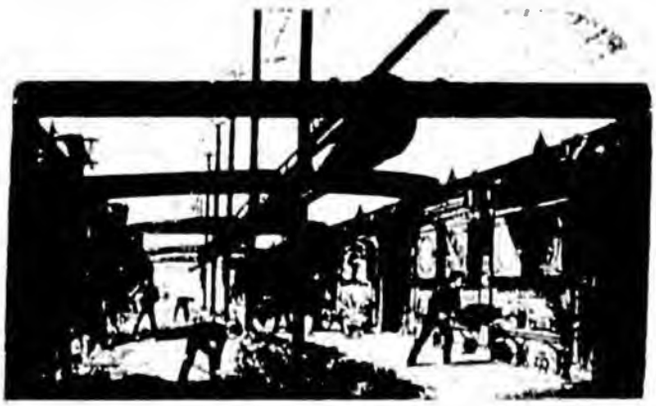


In 1856 a water tube boiler was designed and patented by Stephen Wilcox, although it was not built until several years later. The drawing shows a sinuous tube at an incline rather than a straight tube.

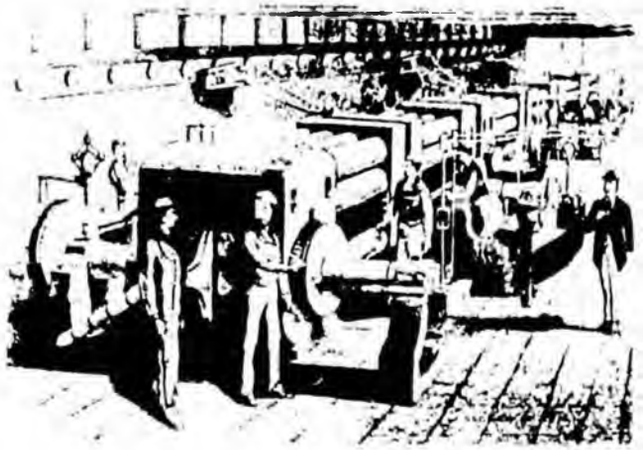


In 1867 Stephen Wilcox patented a straight tube boiler with tubes at 15 degree slope and arranged with handholes in the header so that there was access to the tubes for cleaning. The horizontal cast iron tubes at the top of the unit served in place of a steam and water drum. The vertical rows of inclined steam generating tubes were also of cast iron and were cast en-bloc. Internal tubes or cores were placed within the inclined tubes to aid circulation.

Stephen Wilcox clearly understood the forces involved in natural circulation. With this knowledge, he was able to design safe, economical boilers that could produce the large quantities of steam that an expanding industry needed to run its processes and improved engines.



The greater amounts of steam available from water tube boilers, their safety and increased economy thus gave a great impetus to industrial expansion in the period between 1870 and 1900. These boilers were important elements in the rapid growth of electrical generation for power and lighting.



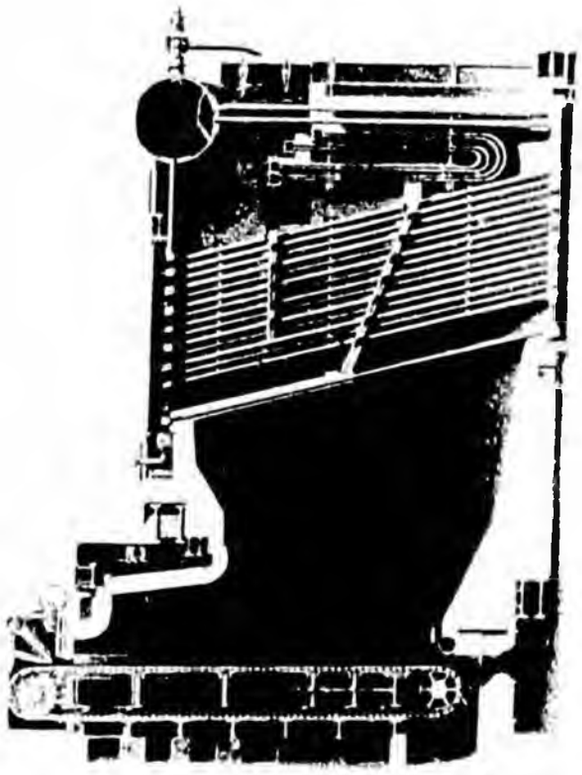
75 years ago, when Edison, using water tube boilers as his source of steam, harnessed the steam engine to the electric dynamo, he began a whole new era in energy production. At the same time, he opened up new concepts in the field of energy distribution. Two great problems were being solved:

A) How to manufacture useable energy economically

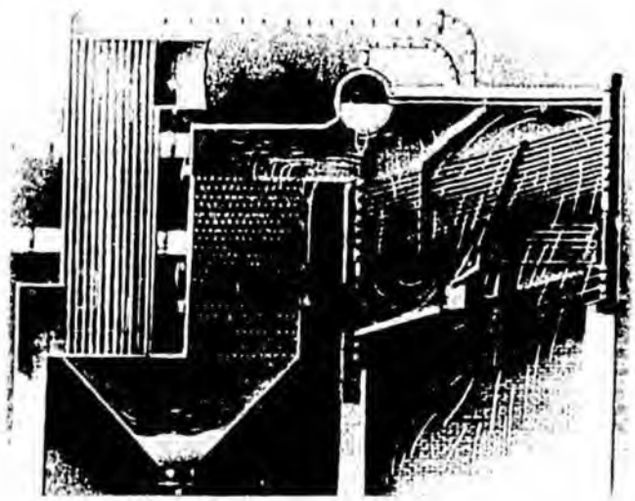
B) How to transport it cheaply and safely over great distances

We are still in the middle of this great engineering advance.

With the development and application of the steam turbine, in the early 1900's, higher steam pressures and temperatures were needed for most economical operation. Superheaters were added to boilers as a means of heating steam above the saturation temperature. To meet the demands for greater steam output, boilers were increased in size, and hand firing gave way to stoker firing.

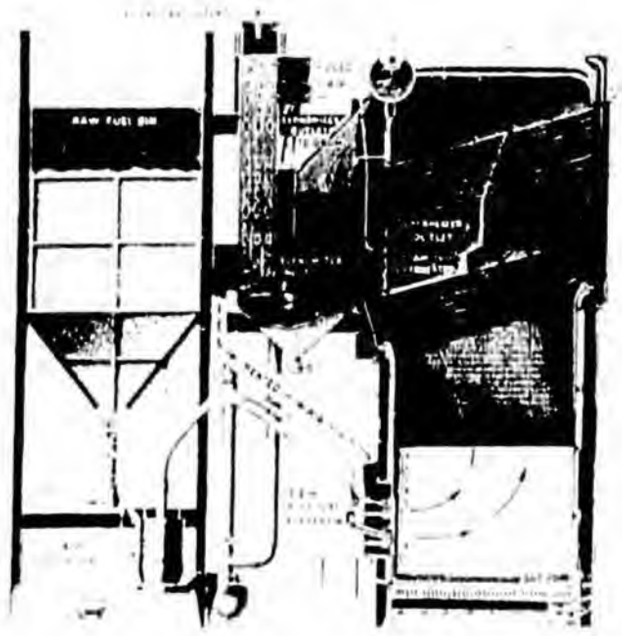


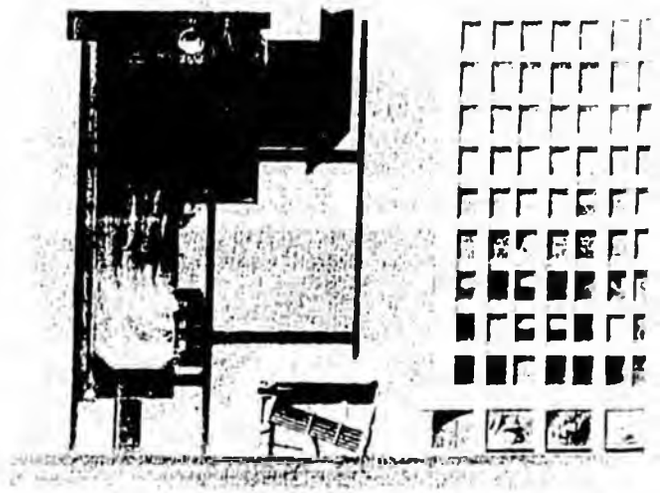
Higher steam pressures and temperatures, together with greater steam outputs, were resulting in higher heat losses up the stack. Part of these losses could be recovered by adding more boiler surface, but it was generally found to be more economical to add an economizer or an air heater, and often both. Feedwater passing through the economizer absorbed considerable heat before entering the steam drum. Preheating the incoming air for combustion greatly improved furnace efficiency. Later, in the 20's many units were equipped with reheaters, to reheat the steam after it had passed part way through the turbines, thus improving turbine efficiency.



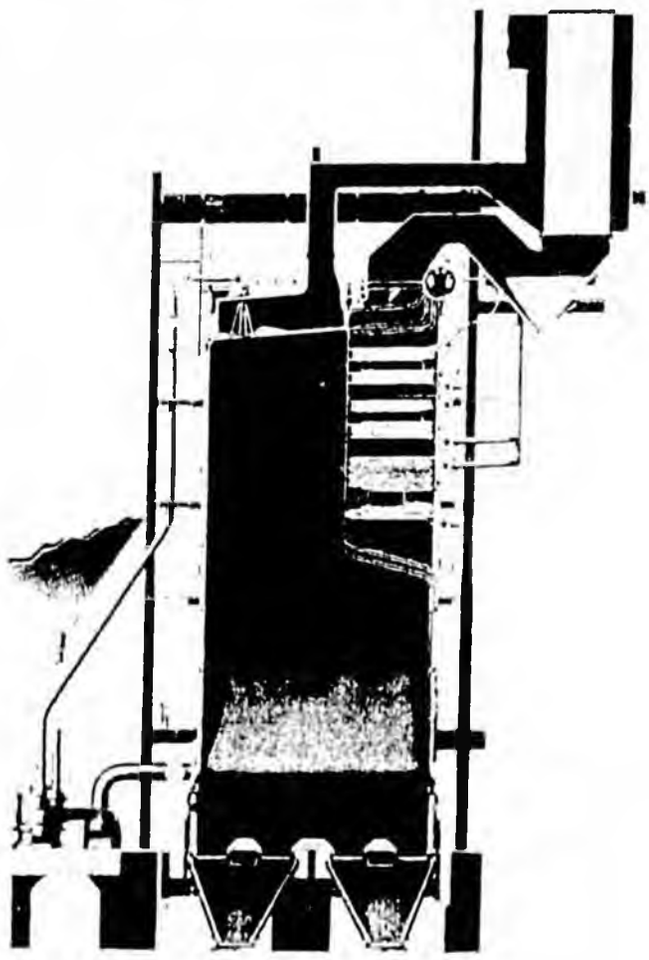
Burning coal in powdered form had long attracted the interest of boiler engineers as a means of simplifying and improving combustion efficiency. Pulverized coal-firing made rapid strides in the 1920's. Not only was efficiency improved, but a wider variety of coals could be used, and steam output was increased without excessive increases in boiler size. Early applications retained brick-lined furnaces. These were often air-cooled in an effort to reduce punishment on the brickwork. But it was evident that new types of furnaces were needed if full advantage were to be obtained from this method of firing.

The need for improved furnace linings led to the development of water-cooled furnaces. Many different stages were passed through in this development, including a combination of part water-cooled and part refractory furnaces; tubes covered with metal or refractory-lined blocks; tubes embedded in plastic refractories, and bare-tubes backed with refractories. An important feature was that the tubes forming the water-cooled surface were an integral part of the boiler system, and the heat they absorbed was fully utilized to make steam.



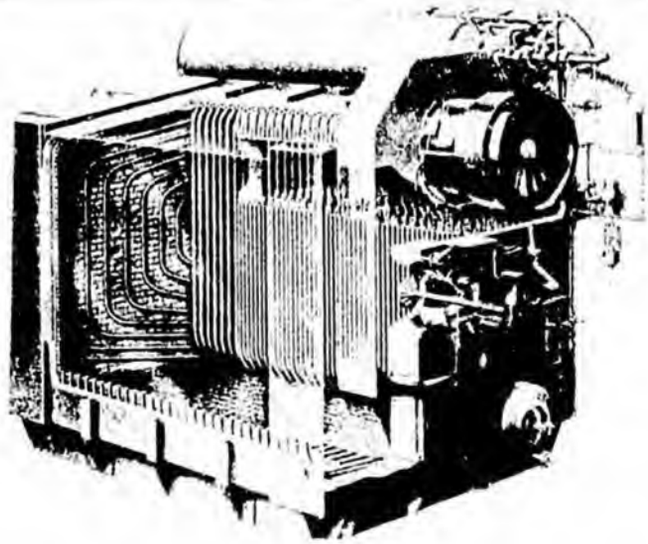


In addition to the steps outlined, progress in steam generation is being furthered by continuous work on such problems as ash and slag control; improved firing methods; metals for higher pressures and temperatures; steam purification; circulation; and many others. Thus, at the mid-point of the 20th Century, the modern central station boiler represents a great advance over the first units used by Edison 75 years ago. Its height often exceeds that of a ten-story building. Its furnace may consume as much as 20 carloads of coal per day -- and its capacity may be over 1,700 000 pounds of water evaporated, per hour. Design pressures extend as high as 2700 psi, and steam temperatures of 1100 F are becoming common.

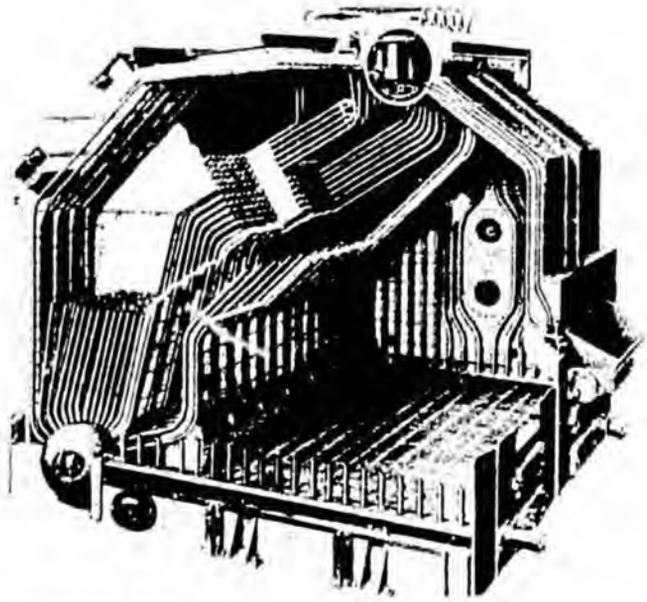


The Radiant Boiler is typical of present day central station designs. It is essentially a large water-cooled furnace with a superheater, economizer, and air heater. Reheaters are often added to improve turbine efficiency. An important feature is the high degree of reliability, so that single-boiler-per-turbine installations, with no standby units or cross-connecting piping, have become standard practice. Boilers are often not taken off the line from one year to the next, except for mandatory annual inspections.

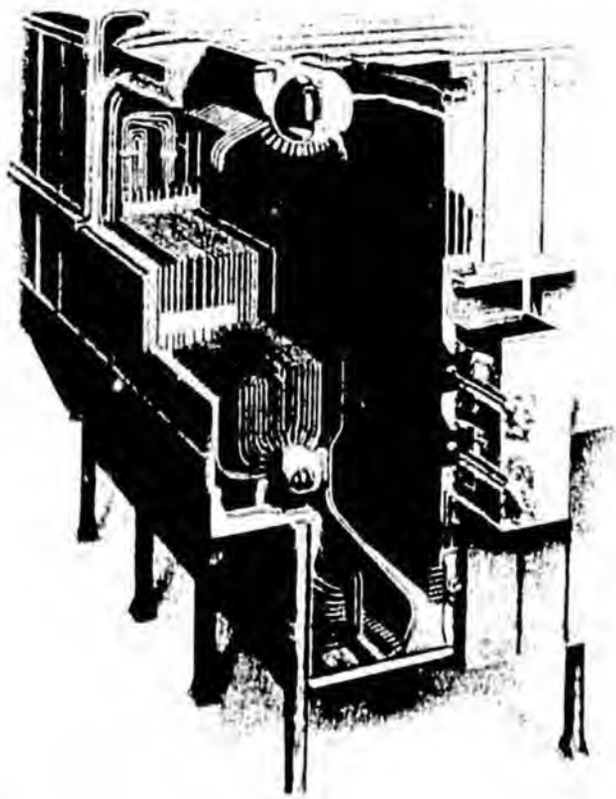
At the other end of the scale is the package unit, used for the heating and steam process needs in many industrial plants, hospitals, and large buildings. It is a fully automatic self-contained unit that is shipped completely assembled requiring a minimum of work in the field to place it in operation.

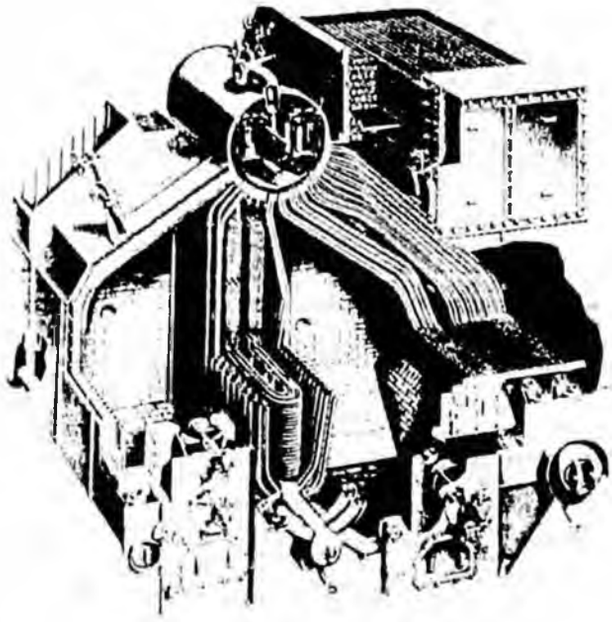


Important in modern boiler practice is the fact that the features of economy and durability developed in large central station units have also been incorporated in smaller boilers for industrial use. Typical of the units which are available for economical steam generation in the moderate-capacity range is this Integral-Furnace Boiler, which is adaptable to steam requirements ranging between 8000 pounds and 50,000 pounds per hour.

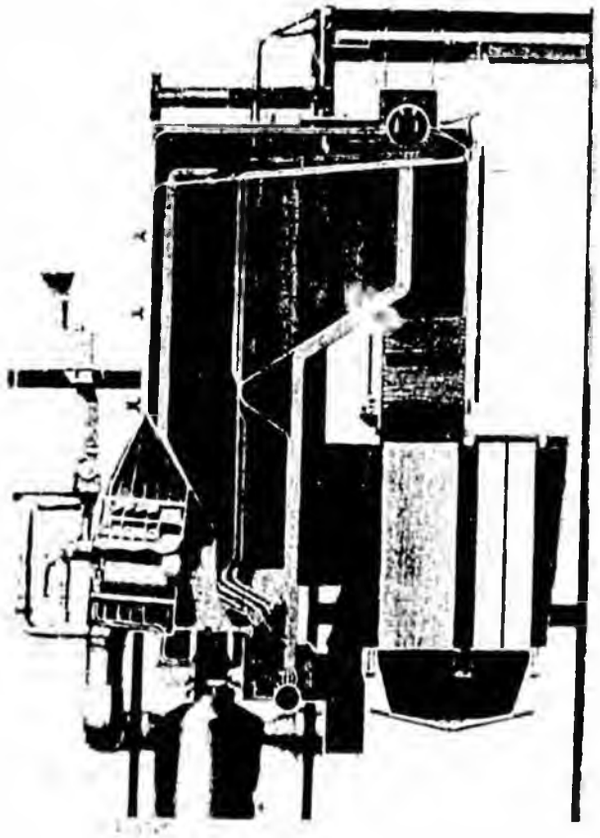


This larger Integral-Furnace Boiler, is used in large industrial plants and many central stations. It is adaptable for steam requirements up to 350,000 pounds per hour, pressures to 1150 psi, and temperatures to 910 F. The hopper bottom design contributes greater furnace cooling area, providing for a self-cleaning furnace and continuous dry-ash removal.

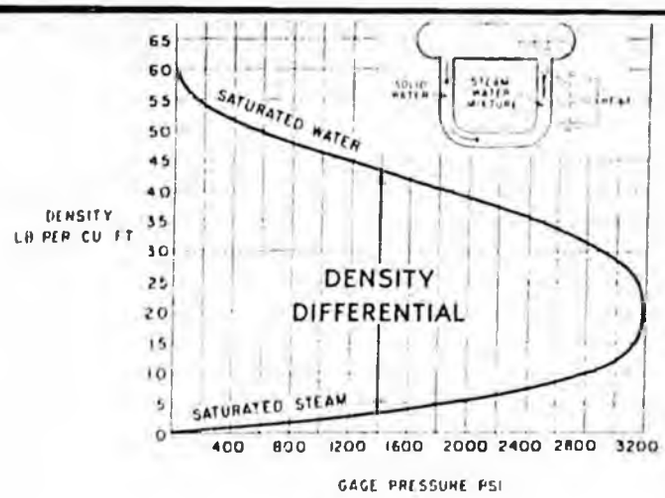




Boilers for Naval and Merchant Marine use call for special designs because of the need for compactness, lightweight, and the high degree of maneuverability required for vessels at sea and in port. The Single-Uptake, Controlled-Superheat Boiler is one of a series of designs contributing to the high degree of economy embodied in American Naval and Merchant vessels.

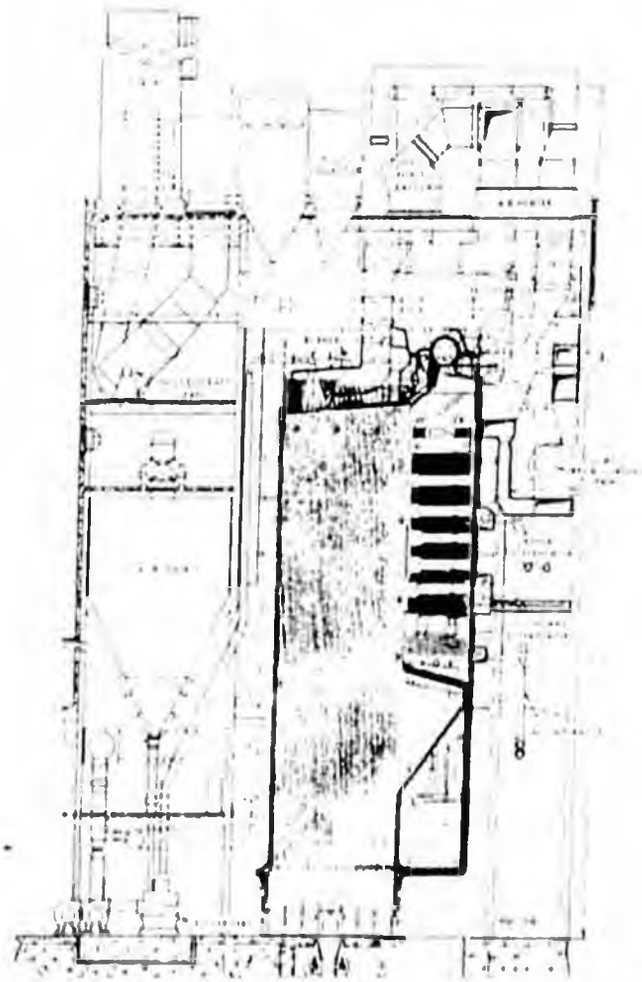


The Cyclone Furnace is typical of the manner in which constant attention to the all important matter of greater economy in steam generation is forever leading to new inventions. Crushed coal, blown spirally at great speed into the Cyclone Furnace, is embedded in a coating of slag, where it burns rapidly in a continuous blast of high-temperature air travelling at 200 mph. The Cyclone Furnace traps 90% of the ash in the form of molten slag, which can be readily drained off, and gases passing up to the stack are relatively free of fly-ash.



One important feature is common to all these units: They operate with natural circulation. No pumps are needed to force the water through the tubes. The water flows because of the differences in density between water on the one hand, and the steam-water mixture on the other. However, as water and steam pressure goes up, this density differential becomes less and less, until it disappears at the critical pressure of 3206 psi. For a while, this threatened to delay progress toward the use of higher steam pressures. However, in the mid 1930's The B&W Co., developed the Cyclone Steam Separator, which is located inside the Steam Drum. This causes the steam-water mixture to whirl in a cyclone action. Heavy, dense water is directed downward, and the light steam rises. With this device, it was possible to build boilers for natural circulation to pressures as great as 2700 psi.

So here is where we stand today. This great boiler might be taken as a symbol of progress since Stephen Wilcox first developed his water tube boiler only a century ago. It supplies steam at 2000 psi, 1050 F to run a reheat turbine generating 217,000 kilowatts. It burns 80 tons of coal an hour, which is ground in these pulverizers to talcum powder fineness. This coal is blown into a furnace which operates under pressure, another great forward step in recent years. Instead of using two fans - one to push air in, the other to draw gases out, only a forced draft fan is used. This means significant savings in construction costs, fuel costs and contributes to operating simplicity.



The steam is superheated to 1050 F and, after passing through the high pressure turbine, returns to the reheater where its temperature is again raised to 1050 F so it can do its work efficiently in the low pressure turbine. Now I toss off this steam figure of 1050 F very lightly. But did you ever think of the kinds of metals needed to contain steam at this temperature -- which is so high that the pipes carrying it actually glow in the dark? Behind that simple statements stands a whole history of technological development without which power progress would have been seriously curtailed.

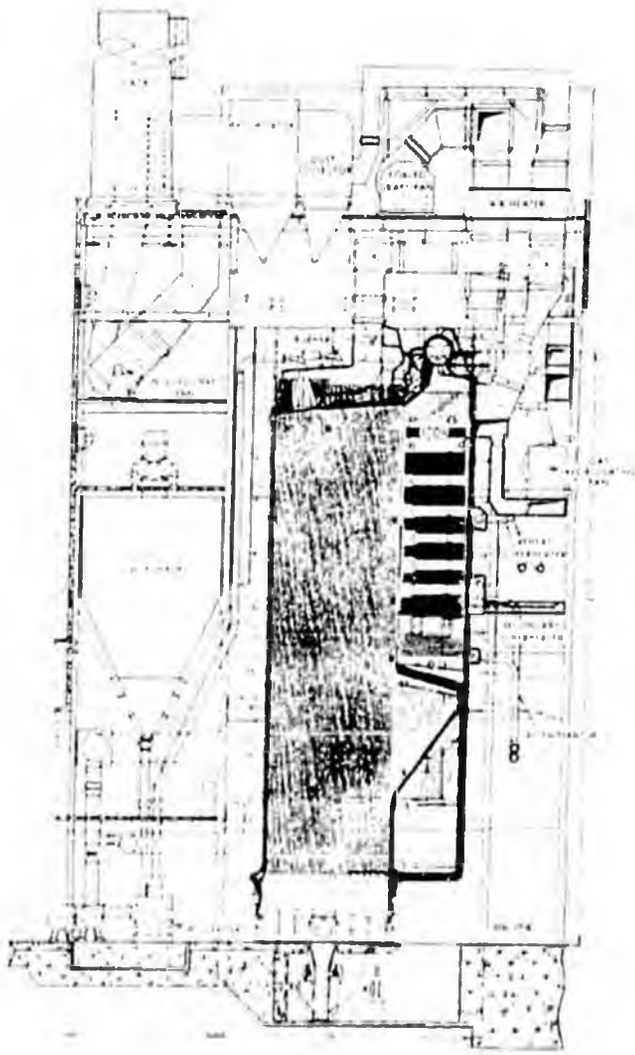
This unit has an efficiency of about 90 per cent. In other words, it is taking just about all of the heat out of the fuel that is economically possible.

This boiler and its associated turbo-generator produce a kilowatt-hour for about 9000 Btu. Only thirty years ago it took 18,000 Btu to do the same job. Surely this is a great forward step -- one of which we as boiler designers are proud -- but of which each of you as engineers can also be proud, because it is the achievement of the entire profession working with devoted cooperation that has made it possible.

These great energy-machines are a key to the power and well-being of our nation today.

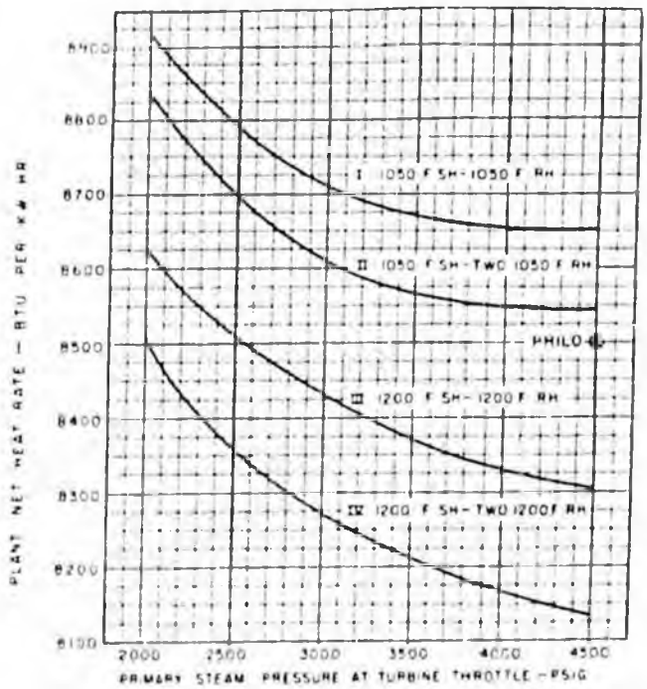
Now, I believe I have shown why steam boilers were important in the past and why they are important today. What of the future?

I would like to touch on two important developments -- one of immediate interest and the other having a longer range significance.



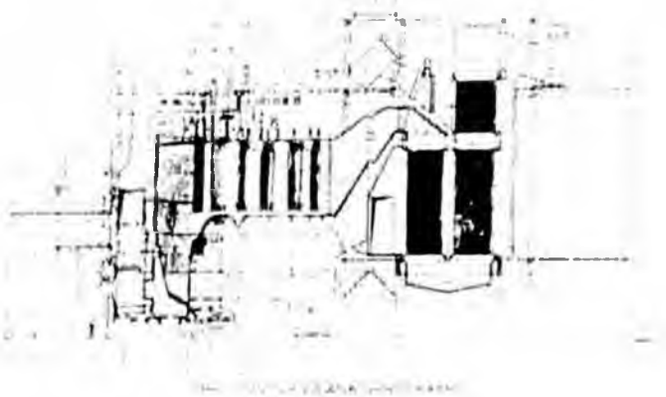
This collection of curves points out rather well the direction in which we must go for further development in conversion of energy from fuel to electricity. It shows plant net heat rates for various combinations of pressures, temperatures and reheat cycles.

Where the top curve intersects 2000 psi is just about where we stand today. As you can see, merely increasing pressure is not going to give as much gain in heat rate. We have to increase both the temperature and the pressure. For example, if we used 4500 psi pressure and 1200 F steam temperature, with two reheats to 1200 F, we would have a heat rate of about 8100 Btu per net kilowatt-hour. However, while we are ready with superheater and reheater alloys for these conditions, the turbine manufacturers are, very understandably, not quite ready for the entire jump. Therefore, for the next step, we are going to 4500 psi, 1150 F, with the first reheat to 1050 F, and the second to 1000 F. The heat rate for these conditions will be about 8500 Btu per kilowatt hour.



EFFECT OF STEAM PRESSURE AND TEMPERATURE
PLANT NET HEAT RATE

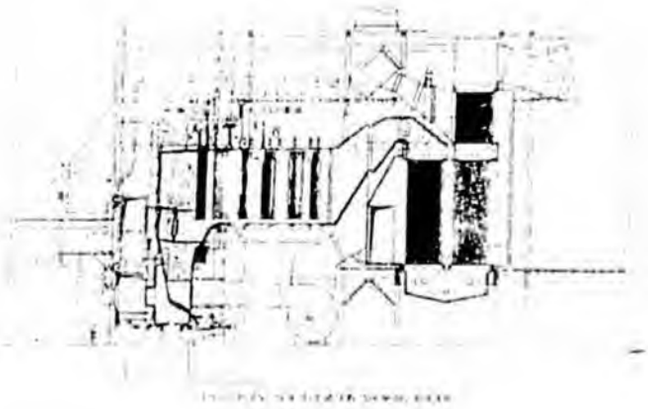
Previously we pointed out that at the critical pressure of 3206 psi, and 705 F, steam has the same density as water and therefore can no longer be separated from the water. This means that an entirely new kind of steam generator is needed. As a matter of fact, it is no longer possible to use the word boiler since water does not boil at these pressures. It instantly becomes steam.



To meet these conditions, B&W has developed the Universal Pressure Steam Generator, which can operate with equal facility both above and below the critical pressure. While this picture of the unit may seem quite complicated, you can think of it as being merely one long tube. Water enters at one end, changes to steam at some intermediate point, and becomes superheated on its way to the outlet end.

There is nothing new about this principle. Men have been working with it since at least 1824. In my own Company, we began experimental work in 1916. As the man says, the idea is simple. All that has to be worked out are the details. Believe me, the details have taken, and are taking, some working out!

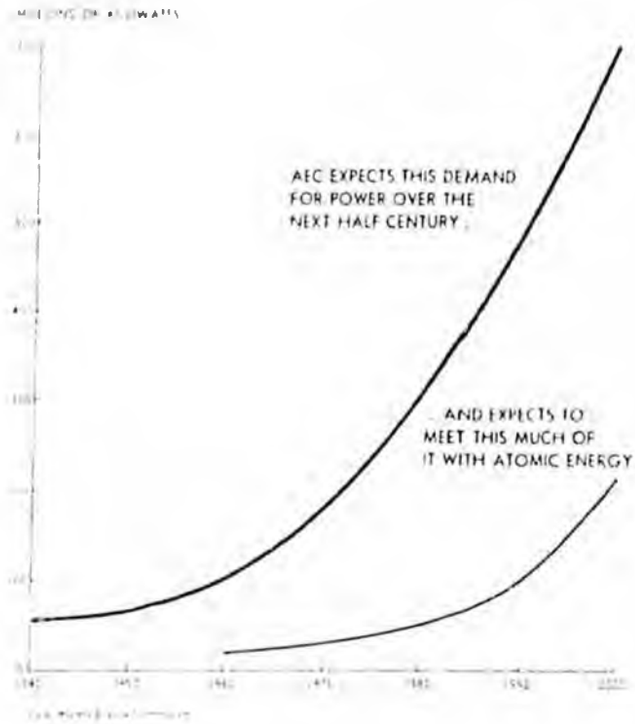
The first Universal Pressure Unit is being installed in The Philo Plant of The Ohio Power Company on The American Gas & Electric System. Fabrication has begun and it is expected that the unit will be ready for operation early in 1956. This new installation will generate 120,000 kilowatts -- three times as much as the 30 year old unit it will replace. It will fit in the same space, require little additional cooling water, and will require about 40% less fuel per kilowatt-hour. Thus will begin another entirely new era in energy conversion.



Now I know that many of you are thinking "What about Atomic Energy?" I have no doubt that when our prehistoric ancestors saw a volcano blowing its top, one or two of the less frightened, more intelligent among them might have wondered dimly how that great energy could be harnessed. As we have already seen, tens of thousands of years passed before somebody decided that steam was the way to do the job.

In the same fashion, when we saw the terrible might of atomic fission released over Hiroshima, we were anxious to know how this great force could be tamed. Again, the answer is steam or its equivalent.

Too many people without a full knowledge of the facts have been writing about the glowing benefits to be expected from Atomic Energy. And certainly there will be many blessings in the future. But as practical, every day men, charged with immediate decision, we must keep our feet on the ground and take each step carefully.



This curve shows the rate at which the Atomic Energy Commission itself expects Atomic Energy to begin to supplement fossil fuels in the development of energy. Progress may actually be somewhat faster, but this is a fair guide of what we might expect.

The question is one of economics. How much does it cost to build an Atomic plant to generate electricity compared with a fossil fuel or hydro plant? How much will it cost to keep the plant running, including cost of fuel? Because of the great technological advances I have already described in conventional power plants, Atomic Energy plants will really have to go some, especially in the U.S., to justify their cost.

Despite this, we believe the AEC is sound in going ahead with a plant to generate 60,000 kw. As you know, Westinghouse has the responsibility for this development, and the plant will be at Shippingport, Pa. on the Duquesne Light Co. system. Two of the boilers are being built by Babcock & Wilcox Company and two by Foster-Wheeler Corp.

As this diagram shows, heat from the reactor will be used to generate steam in special boilers which will supply it to conventional turbo-generator units. While the overall construction and operating costs may be high, much will be learned from this plant that will be of considerable assistance in the development of the industrial use of Atomic Energy.

I have ranged far in this discussion of the development of the steam boiler. It would not be fair to conclude without taking a look around home.

Nobody gets very far these days, industrially or domestically, if he is not close to an electric switch.

Behind that switch is a turbo-generator, a steam boiler and a sound, progressive power company that can give its customers economical, dependable service at all times.

In North Carolina, there has been a 19% population growth since 1945. In the same time, the number of electric customers has doubled.

Your great power companies, such as Carolina Power and Light and Duke, which are among the outstanding utilities in the United States, have been able both to provide this power and keep its costs within bounds, despite the great increases in cost of construction, fuel and operation.

Behind your electric switch lies North Carolina's present and future growth and prosperity, and your emancipation. "More Steam - Less Muscle".

North Carolina has grown fast in all ways

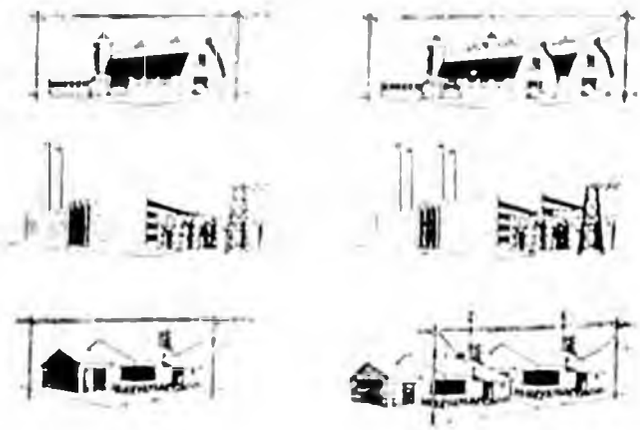
19% population growth since end of 1945

3,467,000
POPULATION END OF 1945

4,126,000
PRESENT POPULATION (ESTIMATE)

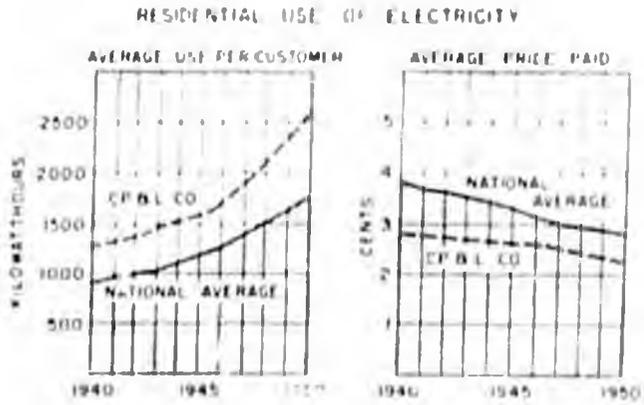
North Carolina has grown fast in all ways

100% ELECTRIC CUSTOMER GROWTH SINCE END OF 1945



ELECTRIC CUSTOMERS END OF 1945

PRESENT ELECTRIC CUSTOMERS



HYDROCARBON PROCESSING

VOL. 70

JANUARY-JUNE

1991

JUNE 1991

Hydrocarbon Processing

Process Control

Estimate benefits
These five methods pass credibility tests

Reactor control
Fuzzy approach uses nonexact expressions

Integrated plant
Better productivity is the big payoff

Lab info system
Factors in selection outline enhancements

Oil fractionator
Modular control is now multivariable

[R]VATE NICKEL IN FCC FEEDS

[M]ANAGEMENT PREP REVISITED

[M]EMBRANE RECOVERS HYDROGEN

YEAR → 1991 Paul D. Kendall

Membranes recover hydrogen

Conoco uses membrane separation to recover the hydrogen that would otherwise be lost in hydroprocessing's purge stream

K. G. Shaver, Conoco Inc., Ponca City, Okla.,
G. L. Poffenbarger, MEDAL, Houston, Texas and
D. R. Grotewold, Liquid Air Engineering Corp.,
Houston, Texas

A MEMBRANE-BASED hydrogen recovery system (HRS)[1] offers a simple, reliable and economical answer to the demand for increased hydrogen supply. The system can deliver a reliable supply of 95+% pure H_2 from offgas streams containing from 15% to 80% H_2. The [illegible] purity level of a membrane-based HRS allows maximum versatility in the plant use of recovered H_2. Simple, low-cost installation and an advanced, low-maintenance design contribute to HRS efficiency and economy.

An important application for the membrane-based HRS is in connection with hydroprocessing units. More hydrogen will be needed when hydroprocessing severity is increased to meet stringent government-mandated product specifications. Traditionally, the hydrogen is supplied as a byproduct from naphtha catalytic reforming, or as a primary product from steam reforming of light hydrocarbons. **The HRS** offers an additional supply of hydrogen by recovering the amount lost in the purge stream from a hydroprocessor's hydrogen recycle loop.

A joint venture between Dupont and members of the Air Liquide Group created the Medal membrane-based HRS.

DuPont –
Air Liquide –
Medal
Conoco

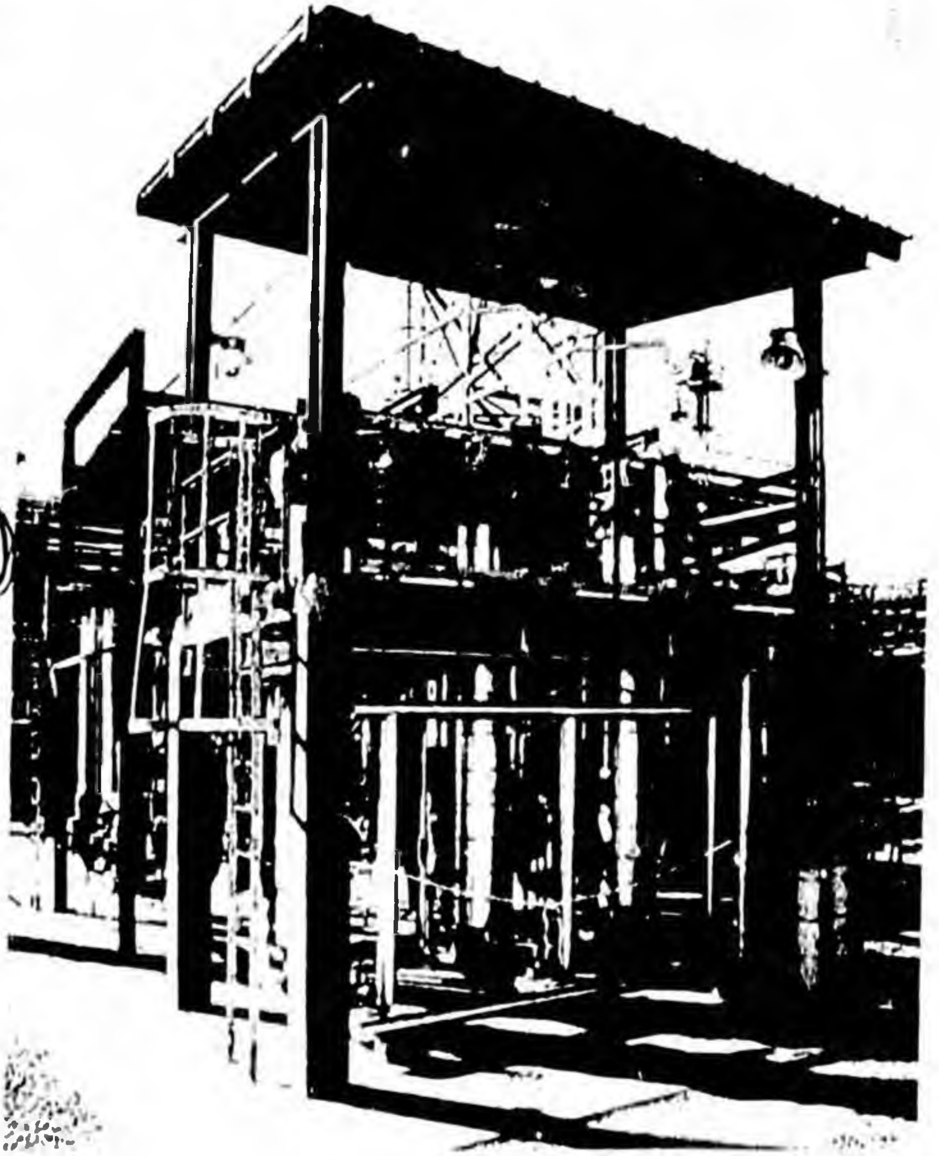


Fig. 1—View of MEDAL membrane-based hydrogen recovery system.

The process has proven reliable since its startup in December of 1987 at Conoco's Ponca City, Okla., refinery. The process proved remarkably cost-efficient: a simple payback was achieved in just 1.7 years.

The Conoco experience has demonstrated the profitability of the HRS, which continuously exceeds design specifications for hydrogen recovery, even with a feed rate variation from 8 to 20 MMscfd. A view of the HRS is shown in Fig. 1. Fig. 2 shows the historical feed and hydrogen product stream compositions and Fig. 3 shows the historical hydrogen recovery rate.

Operating benefits. The installation of a membrane-based HRS offers several inherent advantages to hydroprocessing

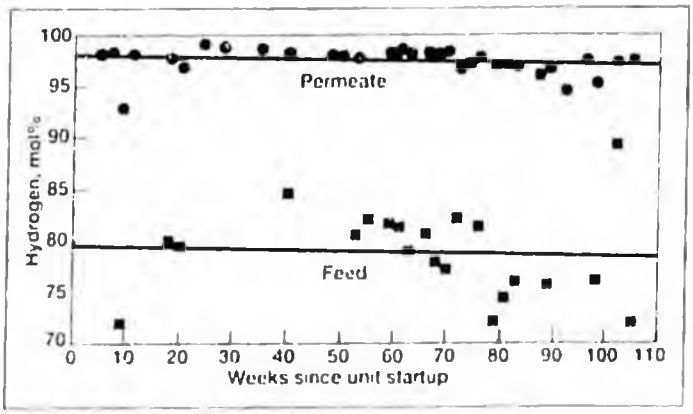


Fig. 2—Permeate retains its high hydrogen purity

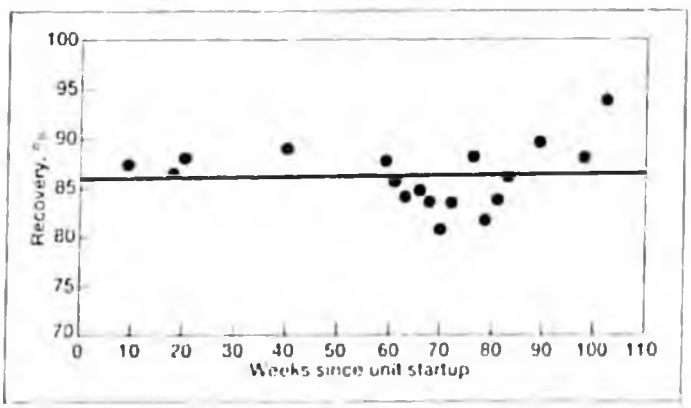


Fig. 3—Unit continues to give high hydrogen recovery

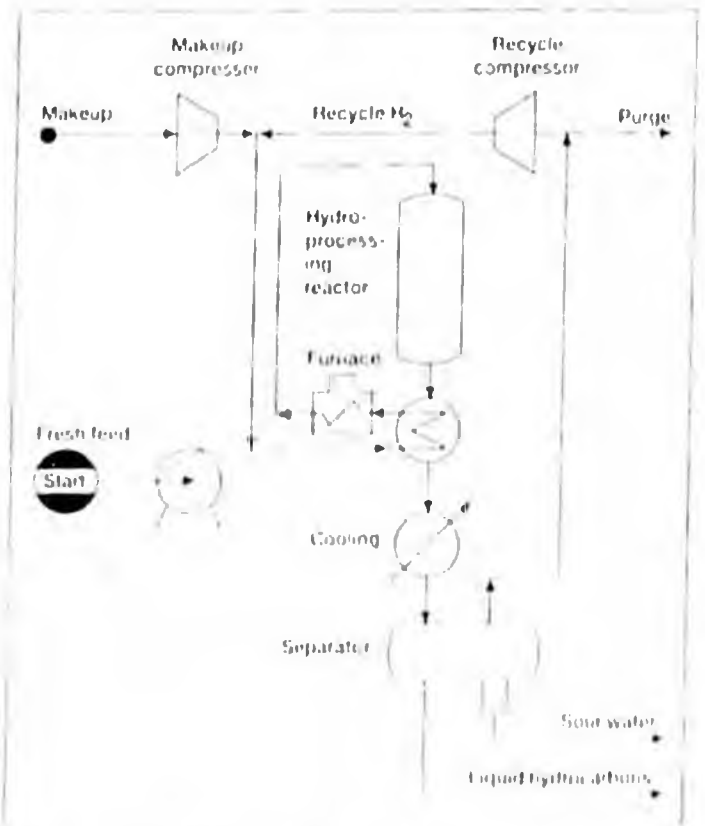


Fig. 4—Typical flow diagram for hydroprocessing

units. Improved product quality, increased catalyst life, greater feedstock flexibility, higher productivity, incremental hydrogen economy (the difference between hydrogen's fuel gas value and its feedstock value), and reduced power consumption have all followed the adoption of this technology.

Specific operational benefits for the Conoco commercial HRS include:

- Added value resulting from the upgrade of the coker distillate product from the gas oil hydrotreater (GOHDT) to higher quality gas oil.
- Decreased coking of the GOHDT catalyst due to a lower operating temperature accompanying the higher hydrogen partial pressure. Catalyst life has increased. This translates to increased run lengths and fewer turnarounds.
- Enhanced light cycle oil hydrodesulfurizer (LCOHDS) productivity. Fewer passes of dark oil feed through the unit are required to meet product API and color specifications.
- Longer times between regeneration of the LCOHDS unit due to the decreased operating severity possible through use of higher hydrogen concentration in the unit.
- Decreased energy consumption in the GOHDT makeup compressor due to recycle of the LCOHDS purge. The higher hydrogen purity stream allows lower volumetric flowrates of makeup gas to be compressed.

In comparison to other hydrogen recovery systems, the Conoco refinery HRS has minimal utility and maintenance costs. Utilities include low-pressure waste steam for the feed preheater, electricity for heat tracing on piping and vessels during HRS inactivity, and instrument air. Maintenance for the membrane system has been limited to routine inspections, recalibration of instruments and filter element change out. The onstream efficiency of the HRS has equaled the feed gas availability.

Table 1 identifies the quantifiable economic benefits of the HRS.

TABLE 1—HRS economics

Investment, $	662,000
Debits, $/yr	
Steam consumption	22,000
Lost hydrogen fuel value	75,000
Maintenance and overhead	29,000
Total	126,000
Credits, $/yr	
Gas oil HDT product upgrade	396,000
LCO HDS product upgrade	74,000
Reduced power consumption	42,000
Total	512,000
Earnings, $/yr	386,000
Simple payback period, yr	1.7

TABLE 2—Typical hydroprocessing unit operating conditions

Operating temperature, °F	500-800
Operating pressure, psig	100-3,000
Chemical hydrogen consumption, scf/bbl of feed	200-2,000
Purge stream hydrogen content, mol%	60-90

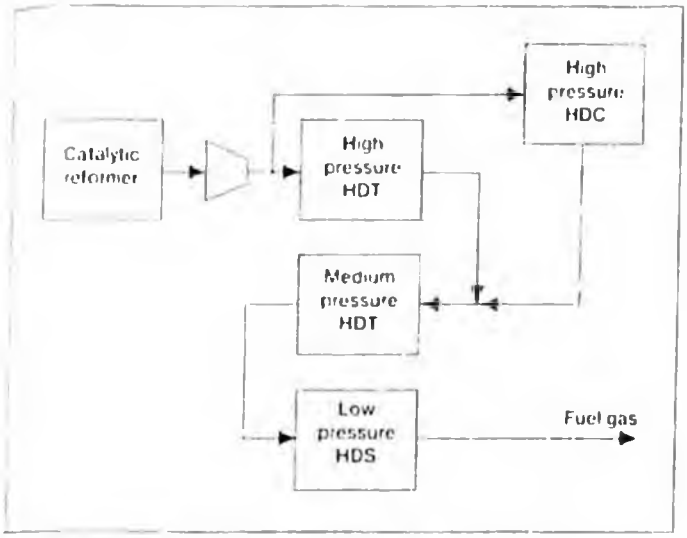


Fig. 5—Hydrogen shared among several refinery units

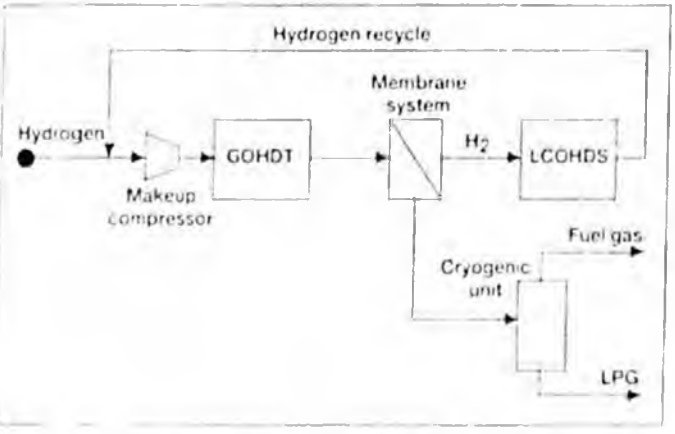


Fig. 6—Membrane system added between two treating units

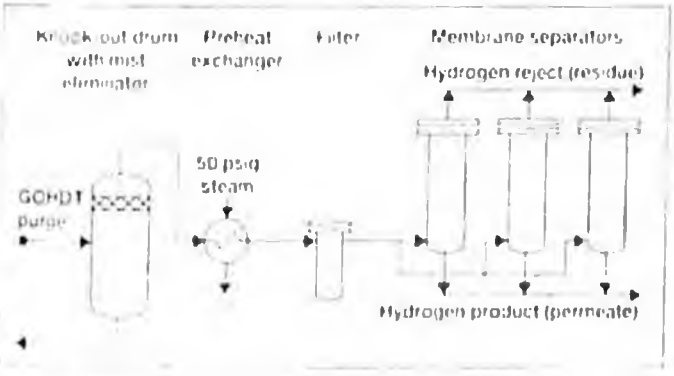


Fig. 7—Flow diagram of hydrogen recovery system

Hydroprocessing background. Hydrogen consumers such as hydrotreaters, hydrodesulfurizers and hydrocrackers remove impurities and upgrade low-value distillate streams to more valuable feedstocks or products. The severity (temperature and pressure required to accomplish the conversion process) of a hydroprocessing unit varies with the conditions of the feedstock. High-pressure hydrocrackers are often used to convert higher boiling point materials into motor fuels.

lower pressure hydrotreaters catalytically stabilize remove objectionable elements from petroleum products or feedstocks. Table 2 and Fig. 4 show typical hydroprocessing conditions and a typical flow scheme.

In the hydroprocessing unit, hydrogen is combined with the hydrocarbon feed and heated before being fed to the hydroprocessing reactor. In the reactor, hydrogen is consumed in desulfurization, hydrogenation, hydrocracking and other side reactions. Unconsumed hydrogen is separated from the reactor liquid products and recycled back to the reactor. The recycled hydrogen is combined with fresh makeup hydrogen prior to being fed to the hydroprocessing reactor. A portion of the recycled hydrogen is purged to prevent inert buildup.

Most refineries amine treat the recycle stream to remove undesirable sulfur compounds and then take advantage of the pressure energy contained in the purge stream by using it as makeup hydrogen for lower pressure hydroprocessing operations. Fig. 5 shows an integrated refinery hydroprocessing hydrogen system.

The high-pressure hydrogen purge stream from a hydroprocessing unit is an ideal candidate for hydrogen recovery. With membrane technology, hydrogen separation is driven by a partial pressure difference. The recovered hydrogen can be returned to the hydroprocessing unit reactor loop as makeup or used as a high purity hydrogen stream for other hydroprocessing applications.

Hydrogen partial pressure is a key design and operating consideration for a hydroprocessing unit. For new hydroprocessing units, the hydrogen partial pressure required to achieve the desired conversion directly affects equipment sizes, pressure classifications and costs. Incorporating membrane-based HRSs into the design of new hydroprocessing units keeps operating pressure at an economic level.

In existing hydroprocessing units, hydrogen partial pressure directly affects operating severity, compression costs and liquid throughput. Installation of a membrane-based HRS reduces operating costs and/or increases liquid throughput by raising the hydrogen partial pressure in the reactor.

A membrane-based HRS was the preferred technology to recover high purity hydrogen from Conoco's GOHDT purge by using the available pressure drop to the LCOHDS.

Previously, at Conoco's Ponca City refinery, a GOHDT high-pressure purge stream, containing 71 mol% hydrogen, fed the LCOHDS and the cryogenic liquified petroleum gas (LPG) recovery unit. The purge stream was let down from the GOHDT to the LCOHDS and used on a once-through basis in the LCOHDS before being purged to the fuel system.

Conoco's design specification for the HRS was to produce a stream containing 95 mol% hydrogen from the GOHDT high pressure purge stream (75% recovery of hydrogen). The available pressure drop from the GOHDT to the LCOHDS provided the driving force for the membrane separation. Fig. 6 illustrates the present GOHDT-LCOHDS system.

The HRS hydrocarbon product stream is sent to the cryogenic recovery unit for recovery of LPG. The hydrogen product from the HRS is sent to the LCOHDS and, again, used on a once-through basis. Because of the high purity of the hydrogen fed to the LCOHDS, the LCOHDS offgas remains 90+ mol% hydrogen. The high purity of the offgas allows for optimum hydrogen utilization by recycling this stream to the GOHDT makeup compressor. The addition of this recycle effectively increases the capacity of the membrane unit.

Design philosophy. The feed pretreatment section contains a knockout drum, a feed preheater and a dry gas filter. Feed gas enters the pretreatment section at the knockout drum to

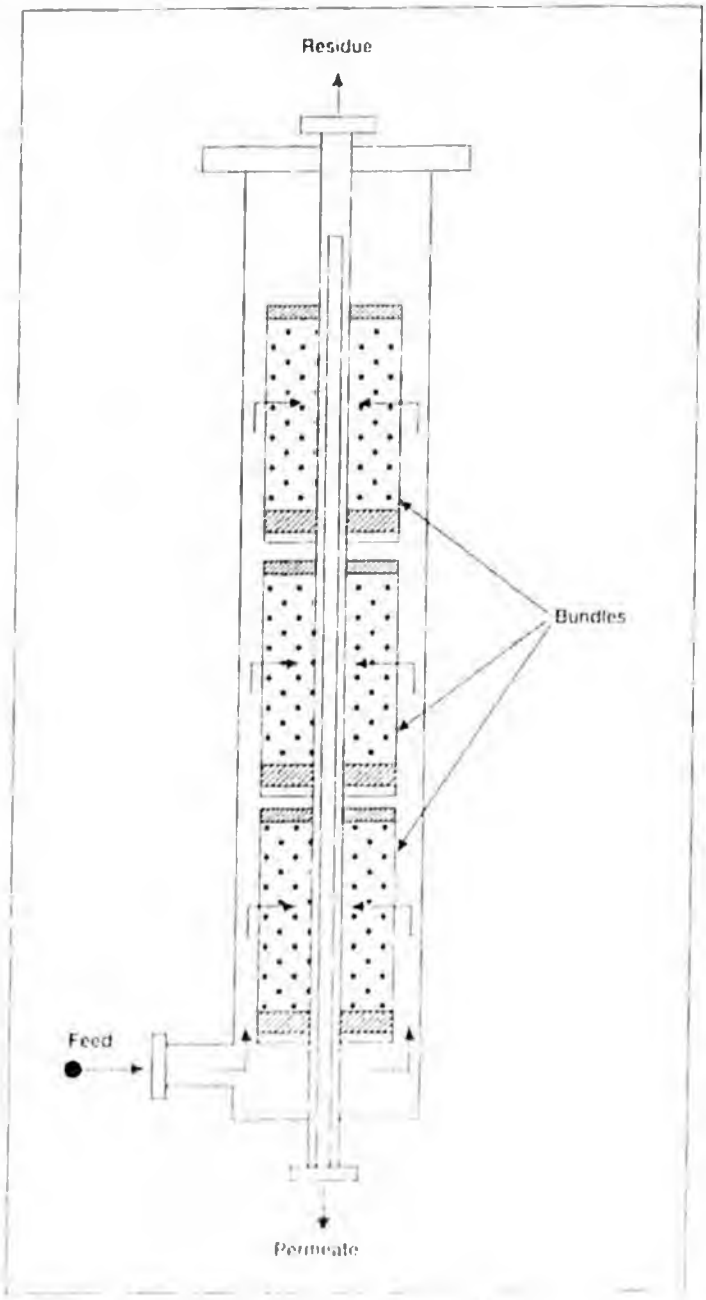


Fig. 8—Permeator uses radial crossflow separation

eliminate liquid slugs and remove entrained liquid droplets. The feed gas then passes through the preheater to provide superheat, and finally to the dry gas filter to remove any particulates before entering the membrane separation section. Fig. 7 shows a flow schematic of the HRS.

At the membrane separation section, the gas is distributed for processing into three permeator vessels. The permeators use hollow fiber membranes contacted in a radial crossflow pattern as illustrated in Fig. 8. The 12-inch diameter commercial bundles resemble tube cartridges and consist of a collection of millions of hollow fibers formed together for installation into a permeator vessel.

Feed gas enters the side of the permeator vessel, is distributed into the annulus between the fiber bundle and the vessel wall, and continues to flow radially inward. As the feed gas contacts the hollow fibers, the more permeable hydrogen diffuses through the wall of the hollow fiber and is carried through the fiber bore, exiting the fiber at a lower pressure. The less permeable hydrocarbons flow around the fiber walls to a perforated center tube, exiting the permeator at approximately feed pressure.

The HRS was designed for maximum flexibility and on-line reliability. The pretreatment section was designed to handle 150% of the normal feed flowrate and the membrane separation section was sized to surpass design specifications. The feed gas preheater is a hairpin type exchanger which is specified for compactness and uses waste steam. It is operated as a flooding condenser. Unit capacity can be easily increased by connecting additional membrane separators in parallel to the existing separation skid.

The HRS is designed as a modular, skid-mounted unit. The Conoco Refinery's HRS consists of two sections: a feed pretreatment skid and the membrane separation skid. The installed unit encompasses an area of approximately 12 feet by 30 feet.

Conoco refinery personnel's experience in hydrotreating operations was used to establish the design and integration of the HRS. For example, since the amine contactor used to treat the GO/HDT purge stream had a history of foaming and carrying over liquid slugs downstream, design specifications included a knock-out drum with a mist eliminator pad and liquid level control as protection for the recovery system.

The membrane performance parameters were evaluated and quantified at a pilot facility also located in Conoco's Ponca City refinery. The pilot facility is highly instrumented and computer-controlled for real-time data acquisition from multiple commercial scale membrane bundles. Tests, using actual field gas streams with compositions ranging from 18 to 80 mol% hydrogen and pressures up to 1,100 psig, led to the development of a computer model and performance maps for this membrane system.

Summary. Conoco's Ponca City refinery substantially reduced the capital investment requirement for recovering hydrogen by installing hydrogen membrane technology. A comparison of hydrogen recovery and purification technologies indicated that the hollow-fiber membrane was superior for this application. Low capital investment, low utility costs, high hydrogen recovery, consistent hydrogen product purity, minimal maintenance costs and high flexibility support the MEDAL HRS alternative. ■

The authors

Kimbra G. Shaver *is a process engineer for Conoco Inc., Ponca City, Okla., where she provided marketing and technical support to the MEDAL hydrogen membrane group. Holder of a BS degree in chemical engineering, she is currently working on refining projects and troubleshooting process operations at Conoco's Denver refinery. She is a member of AIChE.*

Gary L. Poffenbarger *is a business manager for MEDAL, Houston, Texas, where he coordinates engineering, R&D, manufacturing and sales personnel. He holds a BS degree in chemical and petroleum refining engineering from Colorado School of Mines. Before the MEDAL joint venture was formed, he was with Conoco's Denver refinery and then moved to DuPont to help develop membrane separation.*

Delbert R. Grotewold *was an applications engineer with Liquid Air Engineering Corp. at the time this paper was prepared. His responsibilities included membrane trials at customer sites. He is now with Belz Process Chemicals, Inc., West Lanus, Texas. Holder of a BS degree in chemical and petroleum refining engineering from Colorado School of Mines, he is a member of AIChE.*

HB

337

STATE OF ALASKA

DEPT. OF HEALTH AND SOCIAL SERVICES

OFFICE OF THE COMMISSIONER

SARAH PALIN, GOVERNOR

P.O. BOX 110601
JUNEAU, ALASKA 99811-0601
PHONE: (907) 465-3030
FAX: (907) 465-3068

Sectional Analysis
HB 337, Version N, Health Care Transparency Act

Section 1

Provides for Legislative findings and intent to mandate an evaluation of the state's health care needs, propose reforms, and improve health care in Alaska by establishing the Alaska Health Care Commission for the purpose of developing a comprehensive policy that better meets the current and long-range health care needs in the state.

Sec. 2 AS 18.05.010(b)

Requires the Department of Health and Social Services to implement a statewide health plan under AS 18.09, which is a new chapter creating the Alaska Health Care Commission.

Sec. 3 AS 18.07.031(e)

Amends definition of "expenditure" under the Certificate of Need program.

Sec. 4 AS 18.07.111(8)

Under the Certificate of Need program, applies the definition of "health care facility," if the hospital facility, or center is located in a municipality or borough that has a critical access hospital or that has a population of 60,000 or fewer persons (excluding recipients of military or Indian Health Service health care); and nursing homes, residential psychiatric treatment centers; excludes Alaska Pioneers Homes, offices of private physicians or dentists, and military and tribal health entities.

Sec. 5 AS 18.07.111

Amends definitions of facilities in which Certificate of Need applies, including: ambulatory surgical facility, critical access hospital, independent diagnostic testing facility, intermediate care facility, kidney dialysis center, nursing home, office of private physicians (50 percent owned and operated by physicians), and psychiatric hospital.

Sec. 6 AS 18

Adds new **Chapter 9**, Statewide Health Information Office; **Article 1**.
Sec. 18.09.100 Establishes an Alaska Health Care Information Office in the Department of Health and Social Services to provide consistently updated health care facility information to aid consumers of health care services, and information to encourage personal responsibility in prevention and healthy living.

Sec. 18.09.110 Requires the department to establish and maintain a database on an Internet website about health care facilities services and cost. Information in the data base includes health care facility information; health care providers licensed in Alaska; a list of not more than 1500 commonly prescribed medications in the state and the cost; a list

of not more than 250 most commonly conducted medical procedures in the state and the cost; hospital ratings; consumer education information on health, insurance information, clinics that cater to uninsured and self-pay patients; and quality of health care facilities; and information regarding prevention and healthy living.

Sec. 18.09.120 Requires health care facilities to provide the department information related to the facility's health care services for placement on the database developed under AS 18.09.110.

Sec. 18.09.130 The Department of Administration, the Department of Commerce, Community and Economic Development, and the Department of Labor and Workforce Development, and the Department of Law shall provide information for placement on the database regarding adverse actions taken against a health care facility or against licensed professionals practicing in health care facilities in the state and cooperate with the department in performance of its duties under AS 18.09.100- 18.09.130.

Article 2
Sec. 18.09.900 Allows the Department of Health and Social Services to adopt regulations under AS 44.62 to carry out purposes of this chapter.

Sec. 18.09.990 Provides definitions of facilities from which the department would collect information.

Sec. 7

Establishes a 16-member Alaska Health Care Commission within the Department of Health and Social Services. The purpose of the Commission is to consider the spectrum of health care related issues and formulate policy recommendations to be presented to the legislature and executive branch; to develop a statewide plan to address the quality, accessibility and affordability of health care for all citizens of the state; to provide an annual report to the legislature that includes a comprehensive list of policy options considered by the commission; and to review and approve facility health care information for placement on the department's Internet database established under AS 18.09.110.

Section 2 also specifies that the plan contain a health care policy and a strategy for encouraging: personal responsibility and reductions in health care costs; access to safe water and wastewater systems; development of a sustainable health care workforce; accessible quality health care; and an increase in the number of residents who are covered by insurance.

Membership of the commission includes the department medical director (chair), a representative of the Mental Health Trust Authority appointed by the authority, a representative of the University of Alaska health education and training programs appointed by the university; seven public members including: one member representing the Alaska Native Tribal Health Consortium appointed by the consortium, one member

representing the Alaska Primary Care Association appointed by the association, one member representing the Alaska State Nurses Association appointed by the association, one member representing the health insurance industry appointed by the governor, two health care consumers or advocates appointed by the governor, one of whom will be a small business owner in the state; six members of the legislature, three appointed by the president of the senate and three appointed by the speaker of the house of representatives. Terms of office are staggered terms of three years.

The commission shall employ an executive director who is not a member of the commission: and is classified as partially exempt.

The Health Care Commission sunsets June 30, 2014.

Sec. 8

Directs the commissioner of the Department of Health and Social Services and Department of Law to immediately take steps to seek dismissal of pending administrative appeals and court actions concerning the issuance of certificates of need, as appropriate, under AS 18.07, as amended.

Sec. 9

Allows the Department of Health and Social Services to adopt regulations necessary to implement changes made by this Act.

Sec. 10

Provides for the department of contract with an entity to conduct a comprehensive study of the effects of the certificate of need program in the state, and provide a copy of the study to the legislature.

Sec. 11

Section 9 takes effect immediately (for the development of regulations).

Sec. 12

Except as provided in sec. 11, the Act takes effect July 1, 2008.

Changes in the CS for House Bill 337, N amended

HB337 original	HB 337 CS, Version N, amended
Creates **Health Care Commission** to review health care policy and develop a plan – 10 members • DHSS Med. Officer (Chair) • DOA rep • DCCED rep • DOL rep • 3 public members (1 small business owner) • House ex-officio, • Senate ex-officio, • Gov. office ex-officio July 1 effective date	**Section 7:** **Page 9 lines 10 - page 10, line 6** Changes composition of the **Health Care Commission: 16** members: • DHSS Med. Director (Chair) • **MHTA (appointed by MHTA)** • **UA health ed (appointed by UA)** • 7 public members o **ANTHC (appointed by ANTHC)** o **AK Primary Care Assoc (appointed by Assoc)** o **AK St. Hosp. & Nursing (appointed by Assoc)** o **Health Ins. (Gov appointed)** o **AK Nurses Assoc. (appointed by Assoc)** o **2 health care consumers (1 small business owner) (appointed by Gov.)** • **6 members of legislature** o 3 House representatives o 3 Senate representatives **Commission sunsets June 30, 2014**
Creates **Health Info office**: health info on web site on health care facilities, costs on health care, licensed facilities, July 1 effective date	**Section 6:** **Pages 5-7** Modifies info gathered to focus on: • Access to health care, • Cost of health care , **update monthly** • **Up to 1500 common prescribed med.** • **Up to 250 common medical procedures** • Quality of health care • **Hospital ratings including infections and mortality** • **Consumer education info on topics** • **Prevention and healthy living info**
Repeals Certificate of Need, immediate effective date	**Section 3,4:** **Pages 3- 5** • Retains CON statewide EXCEPT for municipality or borough of 60,000 or more: (Anchorage, Mat-Su, Fairbanks) • EXCEPT retains CON statewide for: • Nursing Homes • RPTC • Adds statutory definitions for health care facilities that are subject to CON • Exempts federally funded or operated military and Tribal health facilities • DHSS conduct study effects of CON program **Effective July 1, 2008**

4/5/08

Alaska Health, Education & Social Services Committee

Testimony on Certificate of Need

by

Robert James Cimasi
MHA, ASA, CBA, AVA, CM&AA, CMP

January 29, 2008

ONLINE

Testimony Related to Alaska House Bill 337: *An Act establishing the Alaska Health Care Commission and the Alaska Health Care Information Office; relating to healthcare planning and information; repealing the certificate of need program for certain healthcare facilities; and providing for an effective date"*

January 31, 2008

By Robert James Cimasi, MHA, ASA, CBA, AVA, CM&AA, CMP

Good afternoon Madam Chair and Members of the Alaska House of Representatives. Thank you for the opportunity to speak before the Alaska House Health Education & Social Services Committee regarding the proposed House Bill 337: "*An act establishing the Alaska Health Care Commission and the Alaska Health Care Information Office; relating to healthcare planning and information; repealing the Certificate of Need program for certain healthcare facilities; and providing for and effective date.*[1]"

My name is Robert James Cimasi. I am President of Health Capital Consultants, a national healthcare economic and financial consulting firm located in St. Louis, MO. On August 16, 2001, I was appointed to serve on the Acute Care Focus Group of the Missouri Certificate of Need Technical Advisory Committee (CONTAC) for the Missouri Health Facilities Review Committee (MHFRC). Over the past few years my firm has conducted dedicated, focused research resulting in a comprehensive reference manual & sourcebook encompassing the statutory, regulatory, administrative, and legal aspects of Certificate of Need (CON) regulation from its inception in the late 1960's to the present. Elements of this research on CON were published in December 2005, as *"The U.S. Healthcare Certificate Of Need Sourcebook"* which summarizes numerous studies, monographs, and research reports regarding CON regulations, as well as, law review, bar journal articles, and in excess of 700 published legal cases related to CON. Attached to your handouts is a brief description of my professional qualifications.

Over the years, the scope of my professional activities including testimony in court, before legislative, and agency hearings, has required and permitted me and my firm to conduct extensive research and analysis in the areas of healthcare delivery, public health planning, healthcare economics, and market competition; as well as, other Certificate of Need (CON) related topics. Based on these activities and experiences, it is my informed view that this committee should vote to advance House Bill 337 (hereinafter referred to as the PROPOSED BILLS).

CON is a failed public health policy which is bad for Alaska citizens and patients for several key reasons. The following topics should be addressed:

1. **CON's History as A Failed Health Planning Policy;**
2. **The Effects of CON Repeal in Several States;**
3. **The Federal Trade Commission's Repeated Denunciation of CON;**
4. **CON Has Failed to Lower Healthcare Costs;**
5. **CON is Anti-competitive;**

[1] Health Care Plan/Commission/Facilities by Alaska House of Representatives , Alaska House of Representatives, January 2008, http://www.legis.state.ak.us/basis/get_bill.asp?bill=HB%20337&session=25 (2008)

6. **CON is a Barrier to Healthcare Innovation;**
7. **CON Reduces Access and Patient Choice; and,**
8. **CON Hasn't Improved Healthcare Quality.**

Testimony Related to Alaska House Bill 337: *An Act establishing the Alaska Health Care Commission and the Alaska Health Care Information Office; relating to healthcare planning and information; repealing the certificate of need program for certain healthcare facilities; and providing for an effective date"*

1. CON's History as Failed Health Planning Policy

CON legislation was put in place nationally as a result of a Federal mandate in 1974. Based on over three (3) decades of experience, it is now clear that the CON process does not offer the better, more efficient solution to reducing healthcare cost that its proponents have proudly proclaimed. As Duke Professor of Law Clark Havighurst concludes "*Protectionist regulation, long discredited in other areas, is particularly misguided in healthcare, where health insurance greatly increases the profitability of monopoly and imposes the resulting higher costs on unwilling premium payers. To use cross-subsidies to finance even worthy (let alone unworthy) health care projects is to put public burdens unfairly (regressively) on the backs of working Americans.*"[2]

By 1986, the federal government had shifted its attitude toward CON regulation. Over a decade later, the federal CON legislation previously passed in 1974 had failed. The National Health Planning Act was repealed due to *"mounting empirical evidence that certificate of need cost containment objectives were not being realized."*[3]

Instead, the application of CON regulation has only encouraged erroneous outcomes, to the detriment of Alaska's public interest, on the basis of insufficient valid data, flawed methodology, arbitrary and capricious standards, and the ambiguity of unrestricted agency discretion in an atmosphere of political influence. The Alaskan CON process' almost total lack of applicable, valid empirical data; the absence of generally accepted methodological standards of economic and financial analysis, and the lack of consideration of all required pertinent variables, are based on statutes and rules that are so fatally flawed and so clearly based on arbitrary and capricious standards as to be unreasonably burdensome on the citizens and patients of Alaska. Your passage of House Bill 337 would relieve this onerous situation.

2. Effects of CON Repeal

The Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine published a study of the certificate-of-need program in the state of Washington on January 8, 1999. The results of this study are published as the "*Effects of Certificate of Need and Its Possible Repeal*". This meta-study, one of the most comprehensive efforts recently conducted in the area of CON, *"examined the effects of CON and its possible repeal on the cost, quality, and availability of five health services – hospitals, ambulatory surgery, kidney treatment, home health, and hospice – as*

[2] "Monopoly Is Not The Answer," By Clark C. Havighurst, Health Affairs, August 9, 2005.
[3] *See* Aaron S. King, *Medical Market Failure in Maine: Is the Dirigo Reform Act's Certificate of Need a Market Correction?*, 22 Me. B.J. 156 (2007).

well as on charity care and health services in rural areas."[4] esults of this study were based on literature review, interviews, and information from healthcare providers and healthcare economic experts in the State, as well as an analysis of eight (8) states which completely or partially repealed their CON laws (i.e. Arizona, Indiana, Ohio, Pennsylvania, Tennessee, Texas, Utah, and Wisconsin).[5] The study found that CON *"has not controlled overall healthcare spending or hospital costs."* It also found *"conflicting or limited evidence about the effects of CON on the quality and availability of other healthcare services or about the effects of repealing CON."*[6]

The study does not predict the effects of CON repeal; however, the study reflected that CON has been shown to restrict the supply of some specific health services in some areas, and inferred that, perhaps as a result, supply surges occurred in some specific health services of some areas.[7] Some supply surges were experienced in psychiatric hospitals and nursing homes (Utah); nursing homes and open heart surgery (Arizona); home health (Tennessee); hospitals, ambulatory surgery centers, dialysis, and pediatric services (Ohio); hospitals and psychiatric hospitals (Wisconsin) and nursing homes and psychiatric hospitals (Texas) after the repeal of CON.[8] These finding were not consistent in every state that completely or partially repealed their CON laws that was included in the Washington study.

> *"Not all states experience surges after repeal. When surges do occur, they tend to moderate over time"...In addition, initial surges are sometimes followed by periods of shakeout and stabilization. Therefore, while short term supply increases do appear at times after CON repeal, such surges have been insufficiently studied to determine if there are any persistent effects on cost (or on other goals such as quality and access).*[9]

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[4] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, p. i.

[5] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, p. ii, 6.

[6] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, p. iii.

[7] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, p. 10.

[8] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, p. 13.

[9] "Effects of Certificate of Need and Its Possible Repeal", Joint Legislative and Audit Review Committee and the Health Policy Analysis Program of the University of Washington's School of Public Health and Community Medicine, Jan. 8, 1999, pp. 11, 13.

A 1998 empirical study, which examined health spending between the late 1970's and 1993 and looked at spending prior to and directly after state CON laws were repealed, stated:

> *"The major findings about CON can be summarized as follows: first, we found no surge in expenditures after CON was lifted; second, despite a statistically significant reduction by mature programs on acute spending per capita, there was no corresponding reduction in total per capita spending (apparently due to offsetting expenditures on non-hospital services)...We found that mature CON reduced hospital bed supply per capita population, but could detect no increase in bed supply following the removal of CON.*[10]

Further, the study authors found that established CON programs increased cost per adjusted patient day and also cost per admission.

According to a Conover and Sloan 1998 study, there was no empirical support that CON saved any money. Further, researchers concluded "There is no evidence of a surge in acquisition of facilities or in costs following removal of CON regulations . . . CON regulations generally have no detectable effect on diffusion of various hospital-based technologies. It is doubtful that CON regulations have had much of an effect on quality of care, position of negative."[11] Experts have surmised that CON may increase the cost of health care. Administrative costs associated with state-level oversight and litigation expenses increase to the costs.[12] This is compounded by the problem that the CON approval process is highly technical in nature.

3. The Federal Trade Commission's Repeated Denunciation of CON;

3.1 FTC and DOJ Joint Hearings and Report on Healthcare Competition and CON

In November 2002, FTC Chairman, Timothy J. Muris, announced that the FTC would hold joint hearings with the DOJ on competition in healthcare in 2003.[13] On July 23, 2004, following the conclusion of the hearings lasting over six (6) months, the FTC and DOJ (agencies) issued a joint report on July 23, 2004, entitled "*Improving Health Care: A Dose of Competition*" in which the agencies recommended that states decrease barriers to entry into provider markets. The agencies encouraged states to reconsider whether CON programs *"best serve their citizens' health care*

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[10] "Does Removing Certification-of-Need and Regulations Lead to a Surge in Health Care Spending?" Conover, Christopher J., Sloan, Frank A., Journal of Health Politics, Policy and Law, vol. 23, no. 3, June 1998, p. 455

[11] Christopher J. Conover, Frank A. Sloan, *Does Removing Certificate of Need Regulations Lead to a Surge in Health Care Spending?*, 23 J. HEALTH POL. POL'YY & L. 455 (1998).

[12] *See* Aaron S. King, *Medical Market Failure in Maine: Is the Dirigo Reform Act's Certificate of Need a Market Correction?*, 22 Me. B.J. 156 (2007).

[13] "FTC Chairman Announces Public Hearings on Health Care and Competition Law and Policy to Begin in February 2003" Federal Trade Commission, www.ftc.gov/opa/2002/11/murishealthcare.htm. (Accessed Aug. 5, 2004).

needs".[14]

Following testimony at numerous hearings from industry representatives and legal, economic, and academic experts on the healthcare industry and health policy, the agencies concluded that the burdens placed on competition by CON programs "*generally outweigh*" its "*purported economic benefits*". *The agencies suggested that instead of reducing costs, there is evidence that CON programs actually drive up costs by "fostering anticompetitive barriers to entry".*[15]

The agencies expressed concern that CON programs raise healthcare costs because they appear to be used to shield healthcare providers from competition. The agencies expressed further concern that CON programs tend to prevent entry into the market by enterprises that may be able to provide higher quality care, and the report contended that CON programs may delay the introduction of new technology. In support of their conclusions, the agencies relied upon empirical studies that showed CON programs generally failed to control costs and actually appear to result in higher healthcare costs.[16]

Subsequent to the FTC's July 23, 2004 report, on May 24, 2005 , the FTC delivered a statement before the SubCommittee on Federal Financial Management, Government Information, and International Security of the Committee on Homeland Security and Governmental Affairs, U.S. Senate on New Entry Into Hospital Competition, the agency stated , " *vigorous competition can have important benefits in the hospital arena, just as in the multitude of markets in the U.S. economy that rely on competition to maximize the welfare of consumers. Competitive pressures can lead hospitals to lower costs, improve quality and compete more efficiently. Competitive pressures also may spur new types of competition. In hospital markets, some new entrants specialize and prove only a limited portion of the in-patient and out-patient services that general hospitals tend to provide."*[17] Specifically, the FTC testimony emphasized that, "*Overall, testimony at the FTC/DOJ Hearings identified a number of benefits that SSHs [single specialty hospitals] may offer to consumers, with no significant controversy about the potential for SSHs to provide those benefits. Rather, as discussed in more detail below, debate about SSHs generally centered on how they may affect the functioning of general hospitals."*[18] Ultimately, the FTC testimony related to the efficacy of CON concluded that,

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[14] "Improving Health Care: A Dose of Competition" A Report by the Federal Trade Commission and the Department of Justice, July 2004, Executive Summary, p. 22.

[15] "Improving Health Care: A Dose of Competition" A Report by the Federal Trade Commission and the Department of Justice, July 2004, ch. 8, pp. 1-2.

[16] "Improving Health Care: A Dose of Competition" A Report by the Federal Trade Commission and the Department of Justice, July 2004, ch. 8, p. 4.

[17] Prepared Statement of the Federal Trade Commission Before the SubCommittee on Federal Financial Management, Government Information, and International Security of the Committee on Homeland Security and Governmental Affairs, U.S. Senate on New Entry Into Hospital Competition, May 24, 2005, p. 3.

[18] Prepared Statement of the Federal Trade Commission Before the SubCommittee on Federal Financial Management, Government Information, and International Security of the Committee on Homeland Security and Governmental Affairs, U.S. Senate on New Entry Into Hospital Competition, May 24, 2005, p. 8.

> *"The Commission believes that CON programs generally are not successful in containing health care costs, and that they can pose anticompetitive risk. As noted above, CON programs risk entrenching oligopolists and eroding consumer welfare. The aim of controlling costs is laudable, but there appear to be other, more effective means of achieving this goal that do not pose anticompetitive risks. Indeed, competition itself is often the most effective method of controlling costs. A similar analysis applies to the use of CON programs to enhance health care quality and access."*[19]

These Federal findings, by the FTC and DOJ, are only one of the significant pronouncements in the last several years that support the rational justification to eliminate CON and support a level playing field for providers in fostering *"a dose of"* market competition in healthcare.

3.2 Previous FTC Studies of CON

The FTC's unfavorable review of CON as a failed health policy planning mechanism is not a new event. Beginning in the late 1980s, the FTC issued several studies on CON and stated that, *"Market forces generally allocate society's resources far better than decisions of government planners."*[20]

3.3 The FTC's Recommendations That States Repeal CON

The FTC has consistently recommended that the states remove their CON regulations. In a 1987 letter to Virginia officials they stated, *"Any potential benefits of CON regulation are likely to be outweighed by the adverse effects of such regulation on competition in health care markets. Consequently, CON regulation is likely to harm consumers on balance by increasing the price, and decreasing the quality, of health services in Virginia."*[21] The FTC has issued similar statements before numerous states considering the repeal of CON laws.

4. CON Has Failed To Lower Healthcare Costs

After nearly thirty (30) years of study, the preponderance of healthcare economic analysis has clearly indicated that CON laws have failed to achieve their stated objectives. In an article reviewing CON laws and their application to modern markets, Patrick J. McGinley, Esq. wrote, *"In searching the scholarly journals, one cannot find a single article that asserts that CON laws*

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[19] Prepared Statement of the Federal Trade Commission Before the Subcommittee on Federal Financial Management, Government Information, and International Security of the Committee on Homeland Security and Governmental Affairs, U.S. Senate on New Entry Into Hospital Competition, May 24, 2005, p. 18.
[20] Press Release from the Federal Trade Commission, Aug. 10, 1987
[21] Press Release from the Federal Trade Commission, Aug. 10, 1987

succeed in lowering healthcare costs."[22]

In fact, a 2003 study headed by David C. Grabowski entitled *"The Effects of CON Repeal on Medicaid Nursing Home and Long-Term Care Expenditures"* found no significant increase in either nursing home or long-term care Medicaid expenditures in states that repealed their CON and moratorium laws.[23]

This confirmed the findings of an earlier 1998 study by Christopher J. Conover and Frank A. Sloan that mature CON laws resulted in a "*two percent (2%) reduction in bed supply but higher cost per-day and per admission, along with higher hospital profits.*"[24]

Additionally, a recent report commissioned by, and presented to the Georgia CON Commission by William S. Custer, Ph.D., entitled, "*Report of Data Analysis to the Georgia Commission on the Efficacy of the CON Program*," dispels many of the continuing myths propounded by CON advocates which assert that CON controls healthcare costs. Dr. Custer described his findings related to the overall strategy of CON regulation as the management of the allocation of health care resources and prevention of the duplication of services by creating artificial barriers to market entry, resulting in monopoly of players already present in the market.[25] Further, in response to the Georgia Commission's request for Dr. Custer to study the efficacy of CON, Dr. Custer concluded that, contrary to the purpose of CON, basic economic theory suggests that monopolies generally have higher process and lower quality than firms in more competitive markets.[26]

Although one of the original purposes of CON was to restrict supply of hospital beds and services, the authors concluded that there does not seem to be a statistically significant correlation between a lower number of hospitals or hospital bed supply and the presence of CON regulation in the acute setting.[27] Of the states studied, while Georgia experienced the most rapid growth in the number of ambulatory surgery centers, it is important to highlight that the study

[22] "Beyond Health Care Reform: Reconsidering Certificate of Need Laws In a Managed Care Competition System", McGinley, PJ , Florida State University Law Review, 1995.
[23] "The Effects of CON Repeal on Medicaid Nursing Home and Long-Term Care Expenditures", Grabowski, David C., Ohsfeldt, Robert L., Morrisey, Michael A., Inquiry-Excellus Health Plan, vol. 40, no. 2, Summer 2003, p. 147.
[24] "Does Removing Certification-of-Need and Regulations Lead to a Surge in Health Care Spending?" Conover, Christopher J., Sloan, Frank A., Journal of Health Politics, Policy and Law, vol. 23, no. 3, June 1998, pp. 463, 466.
[25] "Report of Data Analysis to the Georgia Commission on the Efficacy of the CON Program," By William S. Custer, Ph.D. et al, October 2006, p.5.
[26] "Report of Data Analysis to the Georgia Commission on the Efficacy of the CON Program," By William S. Custer, Ph.D. et al, October 2006, p.5.
[27] "Report of Data Analysis to the Georgia Commission on the Efficacy of the CON Program," By William S. Custer, Ph.D. et al, October 2006, p.7.

found that there was "***not a statistically significant relationship between CON rigor and the number or growth of ASCs.***"[emphasis added].[28]

Recently, the proponents of CON have suggested that CON is necessary to protect charity care provided by community hospitals. However, this assertion has been strongly rebuked. Recently, a working paper prepared by the FTC concluded that, "*Most noticeable in all of the results is the lack of any statistically significant evidence for the cross-subsidization hypothesis. The data provides no statistically significant evidence that increased competition leads to reductions in charity care. The claim that hospitals will use market power to increase services to the poor is largely unsupported by this data.*"[29]

As stated by Clark C. Havighurst, a William Neal Reynolds Professor Emeritus of Law at Duke University School of Law, *"The huge enterprises that U.S. hospitals have become are largely unaccountable for the amounts of revenue they raise or the uses to which they put that money. Indeed, they are major contributors to ever-rising healthcare costs. Using CON regulation to maintain their ability to extract resources from the economy only to pour them back into more health care would keep costs under control. Competition is the best way both to limit dominant hospitals' claims on gross domestic product (GDP) and to restore voters and their representatives the power to decide just what extras are worth paying for."*[30]

Aside from its ineffectiveness in reducing costs and its inability to promote charity care, CON itself incurs large administrative and indirect costs as an added burden on available healthcare funding. As Christopher J Conover, an assistant research professor with the Center for Health Policy, Law and Management in the Terry Sanford Institute of Public Policy at Duke University, recently stated, "*There is a significant amount of literature on the benefits and costs of regulation in the U.S. economy, with the first efforts to estimate the overall impact dating back to the mid-1970s. From this work it is known that regulations impose a considerable burden on U.S. businesses and consumers: the impact of regulation on the overall economy will approach $1 trillion in 2004.*" Specifically, Conover found that, CON regulations had a net cost of approximately $110 million, with no value to consumers. "*The most recent studies that use the most credible statistical methods and most recent data find no impact of CON regulation on health spending (and concomitantly no increase in health spending among states that have elected to drop CON regulation), so zero was used as the expected value.*"[31] The cost of attorneys, consultants, lobbyists and internal staff to healthcare organizations for CON

[28] "Report of Data Analysis to the Georgia Commission on the Efficacy of the CON Program," By William S. Custer, Ph.D. et al, October 2006, p.8.
[29] "Hospital Competition and Charity Care," Working Paper No. 285By Christopher Garmon, Bureau of Economics Federal Trade Commission, October 2006, p.18.
[30] "Monopoly Is Not The Answer," By Clark C. Havighurst, Health Affairs, August 9, 2005.
[31] "Health Care Regulation A $169 Billion Hidden Tax," By Christopher J. Conover, Policy Analysis, No. 527, CATO Institute, October 4, 2004, pp.2, 8.

applications is considerable. Litigation and lobbying on both sides of the CON debate are other significant costs.

CON was originally conceived in the old payment structure plan of fee for service. With the advent of managed-care and the sea change it has brought to healthcare, CON is more useless now than ever. CON has devised what economist call the "Roemer Effect" which essentially means if there is a hospital bed to be filled, doctors will find a way to do so to increase their revenue. Yet managed care, with capitation payment schemes, has eliminated the "Roemer Effect" and the incentive to provide unnecessary or "duplicative" services. Physicians and hospitals are under pressure to constrain and control their expenses, not balloon them.[32]

5. CON is Anti-competitive

Competition creates choices for consumers and raises quality standards as providers compete for patient loyalty. A 1993 study found that hospitals in more competitive markets had average costs below those of less competitive markets.[33] According to Professor Carolyn Madden, *"[T]here is ... agreement across all perspectives of [health economics theory] on one issue: the negative consequences of too much concentration of economic power."*[34]

The evidence presented by Ellen S. Campbell and Gary M. Fournier in their 1993 study entitled, *"Certificate-of-Need Deregulation and Indigent Hospital Care,"* commented on CON's anticompetitive effect, in suggesting that overall CON policy is absent of a *"clear, economic, and legal standard to distinguish between an action to deny an applicant in order to prevent investments that would raise costs by unnecessary duplication, and actions motivated by the anticompetitive effect of such denial...[T]he trouble is that agency decisions can often accomplish the latter while claiming the former."*[35]

As Duke Professor of Law Clark Havighurst concludes, *"But CON regulation was itself not clearly intended to suppress competition that is inconvenient for certain hospitals. Ostensibly, at least, the original rationale for enacting CON laws in the regulation-ridden 1970s was policymakers' belief that market forces could not be trusted to defer overinvestment in health facilities. Since that time, cost reimbursement have been replaced by prospective payment (even for capital expenditures), removing a major cause of the problem that first occasioned CON regulation. In addition, private health plans have developed the ability to steer patients to cooperative, low –cost providers, thereby signifying a "need" for the latter's facilities and*

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[32] *See* Aaron S. King, *Medical Market Failure in Maine: Is the Dirigo Reform Act's Certificate of Need a Market Correction?*, 22 Me. B.J. 156 (2007).

[33] "California Providers Adjust To Increasing Price Controls", Zwanziger J, Melnick G, Bamezai A., Health Policy Reform: Competition and Controls, AEI Press, 1993, pp. 241-58.

[34] Madden CW. "Excess capacity: markets, regulation, and values." Health Services Research. February, 1999.

[35] "Certificate-of-Need Deregulation and Indigent Hospital Care", Campbell, Ellen S., Fournier, Gary M., Journal of Health Politics, Policy and Law, vol. 18, no. 4, Winter 1993, pp. 922-923.

services and belying the old notion that supply can create its own demand. Thus, whatever, might have been the case in the earlier era, it is far from obvious today that CON regulation is needed to avoid excess capacity."[36]

Market competition in healthcare delivery provides economic empowerment to patients and payors by providing access; encouraging innovation and the investment of capital in overall cost saving technologies; and, by creating choices for consumers which, in turn encourages providers to raise quality standards as they compete for patient loyalty. When patient choice is diminished, decisions about appropriate pricing/costs, access, quality, and beneficial outcomes become the sole purview of elite groups of oligopoly decision makers who, in the absence of healthy competition, are free to ignore market demands and patient needs. That circumstance is what drives the acceleration of costs.

6. CON is a Barrier to Healthcare Innovation

Because CON acts as a barrier to entry for new market entrant competitors, it slows the introduction of new healthcare facilities, equipment, and services and thus acts as a barrier to healthcare innovation. Famed economist Michael Porter wrote in the Harvard Business Review:

> *"In industry after industry, the underlying dynamic is the same: competition compels companies to deliver increasing value to customers. The fundamental driver of this continuous quality improvement and cost reduction is innovation. Without incentives to sustain innovation in healthcare, short-term cost savings will soon be overwhelmed by the desire to widen access, the growing health needs of an aging population, and the unwillingness of Americans to settle for anything less than the best treatments available. Inevitably, the failure to promote innovation will lead to lower quality or more rationing of care – two equally undesirable results."*[37]

CON repeal would remove unnecessary and irrational constraints and costly regulatory barriers to innovation; to investment in new technologies; to quality services; and, to cost-effective improvements, which, as the technology of healthcare advances, offer the true and valid opportunity to provide cost-effective quality healthcare to Alaska's citizens.

7. CON Reduces Access and Patient Choice

The fundamental and simplistic, yet flawed, idea of CON was straightforward: lower costs by "reducing duplication". However both competition and patient choice, by definition, require "duplication" of providers. Denial of patient choice in Alaska is tightly correlated with the barrier to entry posed by CON. New medical provider entrants, no matter how efficiently and

[36] "Monopoly Is Not The Answer," By Clark C. Havighurst, Health Affairs, August 9, 2005.
[37] "Making competition in health care work." By Michael Porter, et al. Harvard Business Review, July/Aug. 1994, p. 131.

creatively they might contribute to higher quality, more beneficial outcomes, and lower overall healthcare costs, face substantial opposition by these established oligopoly interests, who, historically, have actively strived to limit competition with the resulting impact of denying patient choice for Alaskans and their families.

Excess capacity is a value-laden term, not an absolute standard. In a February 1999 article published in Health Services Research, Professor Carolyn Madden summarized a number of studies of excess capacity saying, *"Without a clear statement of this standard [e.g., the correct number of hospital beds], we cannot determine what constitutes too many. The research literature provides no clear statement."*[38]

Access issues are especially important in rural areas where patients must travel long distances and have little choice of provider. Access is closely linked to patient choice. When choice is diminished, decisions about access, quality, and beneficial outcomes are made in isolation by healthcare businesses. In the absence of healthy competition, they are free to ignore patient needs and demands.

Under CON laws, patients are *de facto* limited to accept the services that existing providers wish to offer them when making major healthcare decisions for themselves and their families because their geographic region may be determined by CON administrators to lack a sufficient utilization ratio to allow alternative market entrants.

8. CON Hasn't Improved Healthcare Quality

CON proponents, faced with irrefutable empirical data and evidence that CON has utterly failed, now have attempted to shift their ever-changing arguments to a new focus, that CON protects quality. They claim that by limiting the number of locations for highly technical surgeries and procedures, that each location and surgeon gains a greater level of experience with these procedures, which results in better quality outcomes. Part of this argument by CON proponents is based on the disingenuous quoting of research from *"The Dartmouth Atlas of Healthcare"* which does not support this assertion. Further, there have been a number of studies which contradict these assertions.[39] An article, in the March 2003 issue of Health Affairs entitled, *"Why Competition Law Matters To Health Care Quality"* once again refutes the validity of these CON proponents latest desperate move to maintain this failed policy.[40]

Healthcare economists know that in the absence of sustained competition, large provider systems have little or no incentive to offer the highest quality at the lowest price. Effective health policy

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[38] Madden CW. "Excess capacity: markets, regulation, and values." Health Services Research. February, 1999.
[39] "Is volume related to outcome in health care? A Systematic review and methodologic critique of the literature", Annals of Internal Medicine, Sept. 17, 2002, p. 511.
[40] "Why competition law matters to health care quality", Health Affairs, Vol. 22, no. 2 (March/April 2003), p. 31.

planning should let the quality of services and beneficial outcomes define the level of competition, not the present failed system of CON review.

CON essentially serves as an ineffective means for rationing healthcare access to facilities, equipment (often innovation and technology) and services, thereby acting to ration care. Expanded access to healthcare and innovative new technologies has transformed modern lifestyles, improved the quality of life and life expectancy in the U.S., and contributed to increased productivity in the U.S. workforce. A CON regulatory system that has demonstrated that it cannot control costs, even by irrationally rationing healthcare, has now, in desperation, turned to the "Quality and Safety" issues as the "refuge of a scoundrel."

9. Summary

CON, although began with the best intentions, has failed in its goals of reducing costs, improving access and quality of care, and preventing duplication of medical services.[41]

In my view, the Alaska House of Representatives Health Education and Social Services Committee has an opportunity on behalf of the citizens of the State of Alaska to thoroughly investigate and eliminate a clearly failed health planning policy, which has undoubtedly cost the taxpayers of Alaska more than had CON never existed and impeded healthcare access for Alaska patients and their families. The Federal government, who first imposed CON on all the states, learned this early on after the change from a "cost plus" to a "prospective payment system" and has repeatedly denounced this failed health planning policy. CON has not achieved its stated purpose of reducing overall healthcare costs, as demonstrated by the preponderance of empirical evidence. Further, CON has caused severe regulatory interference in the healthcare market economy of Alaska in an uninformed, irrational, unfair and capricious manner.

I close by making a request of this committee and a commitment. The request is to urgently ask you to advance the efforts to repeal CON in Alaska. I commit to you that I will make available to you whatever related performance data, information and research related to the history of CON and its implementation in the State of Alaska as you may request. I urge you to get informed on this issue and offer to make myself and my staff available to any of you that may wish additional information in support of my position. I remain confident that once you have the facts, CON regulation in Alaska will be repealed.

Respectfully Submitted,

[41] *See* Aaron S. King, *Medical Market Failure in Maine: Is the Dirigo Reform Act's Certificate of Need a Market Correction?*, 22 Me. B.J. 156 (2007).

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Providing Solutions in the Era of Healthcare Reform

EXPERIENCE

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Mr. Cimasi holds a Masters in Health Administration from the University of Maryland, the Accredited Senior Appraiser (ASA) designation in Business Valuation, as well as, the Certified Business Appraiser (CBA), Accredited Valuation Analyst (AVA), the Certified Merger & Acquisition Advisors (CM&AA), and the Certified Medical Planner (CMP) professional designations (see *Professional Designations* section below). He is a nationally known speaker on healthcare industry topics, who has served as conference faculty or presenter for such organizations as the American Society of Appraisers (ASA), the Institute of Business Appraisers (IBA), the American Institute of Certified Public Accountants (AICPA), the National Association of Certified Valuation Analysts (NACVA), the American College of Healthcare Executives (ACHE), the National Society of Certified Healthcare Business Consultants(NSCHBC), the Academy Health, Healthcare Financial Management Association (HFMA), the American Association of Ambulatory Surgery Centers (AAASC),Physician Hospitals of America (PHA) f/k/a American Surgical Hospital Association (ASHA), National Litigation Support Services Association (NLSSA), as well as many other national and state healthcare industry associations and professional societies, trade groups, companies and organizations. He has been certified and has served as an expert witness on cases in numerous states, and has provided testimony before federal and state legislative committees. In 2006, Mr. Cimasi was honored with the prestigious *Shannon Pratt Award in Business Valuation* conferred by the Institute of Business Appraisers and was recently elevated to its College of Fellows in 2007. Mr. Cimasi is the author of *A Guide To Consulting Services for Emerging Healthcare Organizations* (John Wiley & Sons, 1999), *The Valuation of Healthcare Entities in a Changing Regulatory and Reimbursement Environment* (IBA Course 1011 text - 1999), and the author of *An Exciting Insight Into the Health Care Industry and Medical Practice Valuation* (AICPA course text 1997, rev. 2006.) He has authored chapters on healthcare valuation in The Handbook of Business Valuation (John Wiley & Sons), *Valuing Professional Practices and Licenses: A Guide for the Matrimonial Practitioner, 3rd ed., 1999* (Aspen Law & Business), and *Valuing Specific Assets in Divorce* (Aspen Law & Business) and has been a contributor to The Guide to Business Valuations (Practitioners Publishing Company). *Physician's Managed Care Success Manual: Strategic Options, Alliances, and Contracting Issues* (Mosby), and numerous other chapters. He has written published articles in peer review journals, frequently presented research papers and case studies before national conferences, and is often quoted by healthcare industry professional publications and the general media. Mr. Cimasi's latest book, *The U.S. Healthcare Certificate of Need Sourcebook*, was published in 2005 by Beard Books.

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ROBERT JAMES CIMASI, MHA, ASA, CBA, AVA, CM&AA, CMP

EDUCATIONAL BACKGROUND

- University of Maryland, College Park, Maryland – Masters of Science in Health Administration
- Lindenwood College, St. Charles, Missouri – Bachelor of Arts in Valuation Science
- Meramec Community College, St. Louis, Missouri – Associate Degree in Real Estate Appraisal

PROFESSIONAL DESIGNATIONS

- **ASA**—Accredited Senior Appraiser, Designated in: Business Valuation, American Society of Appraisers (ASA)
- **CBA**—Certified Business Appraiser, Institute of Business Appraisers (IBA)
- **AVA**—Accredited Valuation Analyst, National Association of Certified Valuation Analysts (NACVA)
- **CM&AA**—Certified Merger & Acquisition Advisors (CM&AA)
- **CMP**—Certified Medical Planner, Institute of Medical Business Advisors, Inc.

PARTICIPATION IN PROFESSIONAL SOCIETIES & ORGANIZATIONS

- **AAASC**—American Association Ambulatory Surgery Centers
- **AAHC**—American Association of Healthcare Consultants
- **AAPS**—Association of American Physicians and Surgeons
- **ABA**—American Bar Association
- **ACHE**—American College of Healthcare Executives
- **ACM**—Association of Computing Machinery
- **AH**—Academy Health f/k/a Academy for Health Services Research and Health Policy
- **AHLA**—American Health Lawyers Association
- **AHPA**—American Health Planning Association
- **AM&AA**—The Alliance of Mergers and Acquisition Advisors
- **ASA**—American Society of Appraisers - Member of ASA Business Valuation Standards Subcommittee
- **HFMA**—Healthcare Financial Management Association
- **IBA**—Institute of Business Appraisers – Fellow, Editorial Review Board for *Business Appraisal Practice* (BAP) Journal of the IBA, National Governor at Large
- **ICBC**—Institute of Certified Business Counselors
- **MGMA**—Medical Group Management Association
- **NACVA**—National Association of Certified Valuation Analysts; member of the Litigation Forensics Board
- **NAFE**—National Association of Forensic Economists
- **NSCHIBC**—National Society of Certified Healthcare Business Consultants, F/k/a National Association of Healthcare Consultants (NAHC)
- **NBVG**—National Business Valuation Group
- **SHSMD**-Society for Healthcare Strategy and Market Development
- **SLBVR**—St. Louis Business Valuation Roundtable (Co-founder)
- **SLSAE**—St. Louis Society of Association Executives
- **TMA**—Turnaround Management Association

BOOKS AND CHAPTERS PUBLISHED

- *"Research and Financial Benchmarking in the Healthcare Industry,"* chapter in Healthcare Organizations: Financial Management Strategies. David Marcinko, M.D., Ed. STP Specialty Technical Publishers (2007).
- *"Market Competition in Healthcare,"* chapter in Healthcare Organizations: Financial Management Strategies. David Marcinko, M.D., Ed. STP Specialty Technical Publishers (2006).
- *"Research and Financial Benchmarking in the Healthcare Industry,"* chapter in Healthcare Organizations: Financial Management Strategies. David Marcinko, M.D., Ed. STP Specialty Technical Publishers (2006).
- *"Valuation of Hospitals in a Changing Reimbursement and Regulatory Environment,"* chapter in Healthcare Organizations: Financial Management Strategies. David Marcinko, M.D., Ed. STP Specialty Technical Publishers (2006).
- The U.S. Healthcare Certificate of Need Sourcebook. Beard Books (2005).