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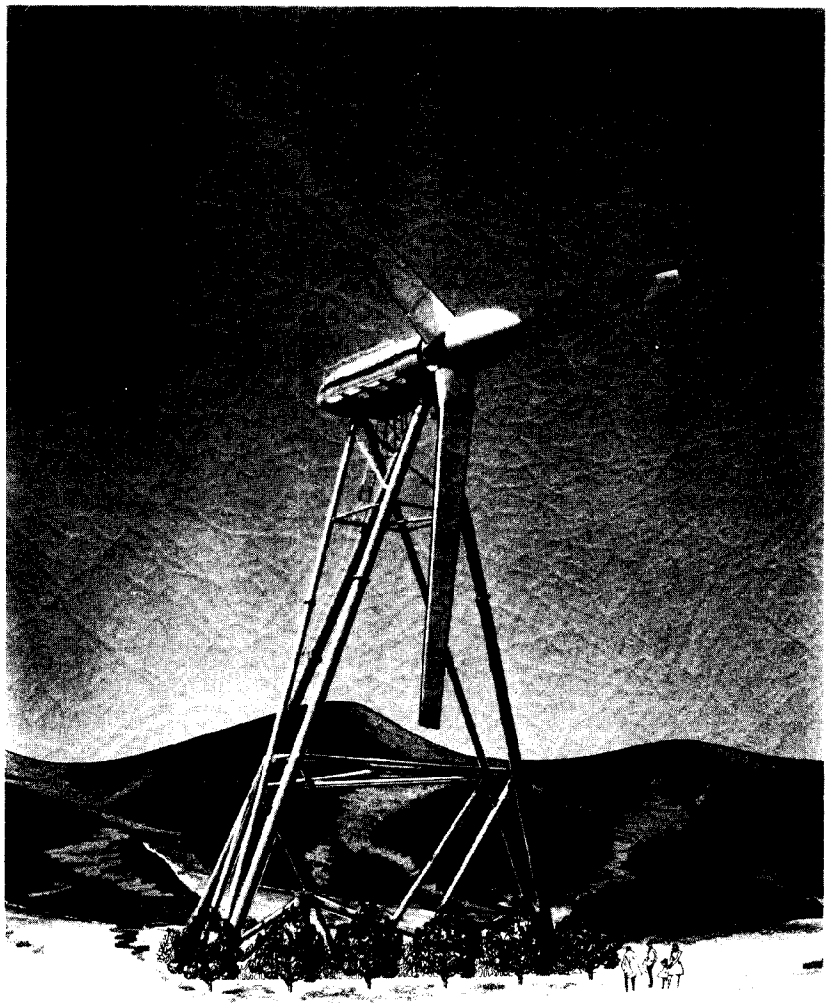
Energy Facilities In The Oregon Coastal Zone

VOLUME II
LIKELIHOOD OF ENERGY FACILITY SITING



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ENERGY FACILITIES
IN THE OREGON COASTAL ZONE

PART II
LIKELIHOOD OF ENERGY FACILITY SITING

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Cover Photo: Artist rendering of a 200-foot high three-mega watt experimental wind turbine. Courtesy of Southern California Edison.

PREFACE

Energy Facilities in the Oregon Coastal Zone is a report prepared by Mathematical Sciences Northwest, Inc. of Bellevue, Washington, under contract with the Oregon Department of Land Conservation and Development. Technical assistance was provided by the Oregon Department of Energy.

The 1976 amendments to the federal Coastal Zone Management Act requires that coastal states have an energy facility planning process. This requirement has resulted in the development of proposed amendments to Oregon's approved Coastal Management Program. As background to the program amendments, this report was developed to document the existing planning process and to identify energy facilities likely to locate in the coastal zone. Part I explains and evaluates the current planning process for energy facilities in Oregon. Part II is an analysis of energy facilities which are likely to locate in, or which may significantly affect the state's coastal zone.

Executive summaries of the report have been circulated to local officials, planning department, ports and industry. Copies of the executive summary are available from the Department of Land Conservation and Development.

September 1978

TABLE OF CONTENTS

	PAGE
INTRODUCTION	
Objectives and Methods	1
Contents of Report	1
Facility Types	2
EXISTING, FORECAST, AND PLANNED FACILITIES	3
Methodology	3
Electrical Generation	3
Existing Facilities	3
Utilities	3
Generation	3
Transmission	3
Facility Expansion and New Facilities	8
Electrical Energy Forecasts	8
High Voltage Transmission Lines	8
Electrical Generating Plants	10
Nuclear	12
Fossil Fuels	13
Conventional Hydroelectric Generation	16
Pumped Storage Hydroelectric Generation	20
Small-Scale Hydroelectric Generation	24
Biomass	24
Direct Solar	25
Ocean Power	26

TABLE OF CONTENTS

	PAGE
Geothermal Power	26
Wind Energy	26
Oil and Gas	34
Existing Facilities	34
Onshore	34
Offshore	34
Marine Pipelines	34
Tanker Traffic	34
Oil/Gas Ports, Terminals	34
Natural Gas	35
Liquified Natural Gas	35
Petroleum Refining	37
Geopressurized Gas	37
Oil Pipeline	37
OCS Platform Construction Yards	37
OCS Support Bases	37
Forecasts	37
Oil and Gas Facility Expansion and New Facilities	38
Onshore	38
Offshore	38
Tanker Traffic	38
Oil/Gas Ports and Terminals	38
Natural Gas Pipelines	41

TABLE OF CONTENTS

	PAGE
Petroleum Refineries	41
Coal Gasification	41
OCS Platform Fabrication Yards	43
OCS Support Bases	43
NEED TO LOCATE IN THE OREGON COASTAL ZONE	45
Introduction	45
Discussion of Factors	45
Conclusions	46
IMPACTS, STANDARDS AND SUITABILITY	48
Introduction	48
Summary of Significant Impacts	48
Site Suitability	51
Designation of Suitable Areas	51
EFSC	51
Other State Agencies	52
General Suitability Standards	58
Agricultural Lands	59
Forest Lands	59
Recreation Sites	59
Cultural and Historic Sites	60
Natural Areas	60
Scenic Areas and Open Space	62
Hazardous Areas	64
Energy Production Sites	67
Air and Water Quality	67

PERMITS

	PAGE
STATE PERMITS	69
FEDERAL PERMITS	69
Introduction	69
Recent Studies	69
Regulatory Roles	73
Agency Interests	74
Regulatory Activities	77

LIST OF TABLES

TABLE		PAGE
1	Energy Facilities Considered in This Study	2
2	Utilities Serving the Coastal Zone	5
3	Inventory of BPA Facilities in the Oregon Coastal Zone	7
4	Reported Plans for New and Expanded High Voltage Lines	9
5	Reported Interests in Siting Electrical Generation Facilities in the OCZ	11
6	Developed and Undeveloped Hydroelectric Generation in Oregon's Coastal Rivers	17
7	Potential Pumped Storage Sites in the Oregon Coastal Zone	22
8	Major Site Evaluation Factors for Hydroelectric Generation	23
9	Wind Energy Study Locations in the Oregon Coastal Zone	30
10	Factors Requiring Oregon Coastal Zone Location	47
11	Summary of Energy Facility Impacts	50
12	EFSC Siting Criteria for Electrical Generating Plants	54
13	Energy Facility Related Managerial and Proprietary Interests of State Agencies	55
14	Estuary Classifications	57
15	Estuary Suitability for Energy Facilities	57
16	Natural Resources Covered by State-Wide Goals	58
17	Relationship of Energy Facilities to the Water	61
18	Suitability of Energy Facilities in Coastal "Image Regions."	63

LIST OF TABLES

TABLE		PAGE
19	Relative Impact of Hazards on Various Types of Land Uses	65
20	Relative Impact of Geologic Hazards on Energy Facilities	66
21	Likely Needed State Permits	70
22	Federal Regulatory Activities for Energy Facilities	78

LIST OF FIGURES

FIGURE		PAGE
1	Electrical Utility Service Areas in the Oregon Coastal Zone	4
2	High Voltage Transmission Lines in the Oregon Coastal Zone	6
3	Land Use Designations for Nuclear Fuel Power Plant	14
4	Water Use Policy in the Oregon Coastal Zone	19
5	Diagram of a Pumped-Storage Project	20
6	Potential Pumped Storage Sites in the Oregon Coastal Zone	21
7	Known Geothermal Resource Areas in the Pacific Northwest	27
8	Wind Power Study Sites in the Oregon Coastal Zone	31
9	Northwest Natural Gas Company System Lines	36
10	Proposed OCS Planning Schedule	39
11	Principal Coal Gasification Reactions and Reactor Types	42
12	Land Use Designations for Fossil Fuel Power Plant	53

INTRODUCTION

The 1976 amendments to the Coastal Zone Management Act require that Oregon identify the energy facilities likely to locate in or significantly affect the Oregon Coastal Zone (OCZ). An extremely broad spectrum of facility types are to be considered:

> Any equipment or facility which is or will be used primarily in the exploration of or the development, production, transfer, processing, or transportation of, any energy resource; or for the manufacture, production or assembly of equipment, machinery, products, or devices which are involved in these activities . . .

OBJECTIVE AND METHODS

The objective of Task 1 was to examine the likelihood that existing energy facilities will expand operations and that new facilities will seek to locate in or affecting the OCZ. This has been accomplished through examination of existing and planned facilities, energy forecasts, existing standards regulating siting and operation of facilities, and the general suitability of the coast for the various types of facilities. During this evaluation, the significant impacts of facilities and the necessity that they be located only in the Oregon Coastal Zone was examined and documented. Finally, the permits which would be required for siting or operation have been determined.

CONTENTS OF REPORT

The evaluation of likelihood of facility siting is documented in this report. Report organization is as follows:

- Existing facilities, forecasts, and planned facilities
- Need to locate in the Coastal Zone
- Impacts, standards and suitability
- Permits

An executive summary of this report is available as a separate volume.

FACILITY TYPES

This investigation considered the 23 types of energy facilities shown in Table 1. Each is described in more detail in the following section of this report. At the outset of this study, it was decided that one type of facility--uranium fuel processing and enrichment plants--was extremely unlikely to be proposed for siting in or near the OCZ; this facility was not analyzed further. All of the other facilities are sufficiently likely that more extensive analysis was warranted.

Table 1

Energy Facilities Considered in this Study

Electrical Plants:	Fossil
	Nuclear
	Biomass
	Direct Solar
	Ocean Power
	Wind Power
	Geothermal
	Hydroelectric
High Voltage Transmission	
Oil/Gas Exploration Offshore	
Oil/Gas Exploration Onshore	
Oil/Gas Production Offshore	
Oil/Gas Production Onshore	
Oil/Gas Tanker Traffic	
Marine Pipeline	
Oil/Gas Port, Terminals	
LNG Facility	
Petroleum Refinery	
Gasification Plant	
Geopressurized Gas	
Oil/Gas Pipelines	
OCS Platform Construction	
OCS Support Base	

EXISTING, FORECAST, AND PLANNED FACILITIES

METHODOLOGY

The best source of information about future expansion of existing plants is their owners. The first step in this study, therefore, was to inventory existing and proposed facilities, and to contact the managers of these facilities to discuss expansion plans. Other industry representatives, as well as regulatory personnel at the state and federal level, were also contacted. Existing forecasts relevant to each facility type, or contacts with knowledgeable experts, were then used to complete the evaluation of pressures leading to siting or expansion applications.

ELECTRICAL GENERATION

Existing Facilities

Utilities--The Oregon Coastal Zone is served by five electrical cooperatives, one municipal utility, three people's utility districts, and two investor owned utilities (IOU), as shown in Table 2. Service areas are shown in Figure 1.

All electrical utilities serving the coastal zone were contacted to obtain information concerning their existing service area boundaries, distribution facilities, and generation facilities. Each utility was also asked about their future plans for new or upgraded transmission lines, substations, and generation facilities in the Oregon Coastal Zone.

Generation--Except for small amounts of power generated from wood waste at forest products facilities (and consumed on-site), all electricity used in the OCZ is imported from generating facilities elsewhere in the region. No large-scale electrical generation facilities exist in the OCZ and none are currently under construction.

Transmission--Transmission lines enter the OCZ from the East at various locations and traverse the coastline north-south, generally paralleling U.S. Route 101. As shown on Figure 2, the majority of the transmission lines are owned by Bonneville Power Administration (BPA) (see also Table 3) and are energized at 230 kV or 115 kV. Pacific Power and Light and the Coos-Curry Electric Cooperative also have high voltage transmission lines along the coast. The local utilities distribute this power within their service areas, using lower voltage distribution lines.

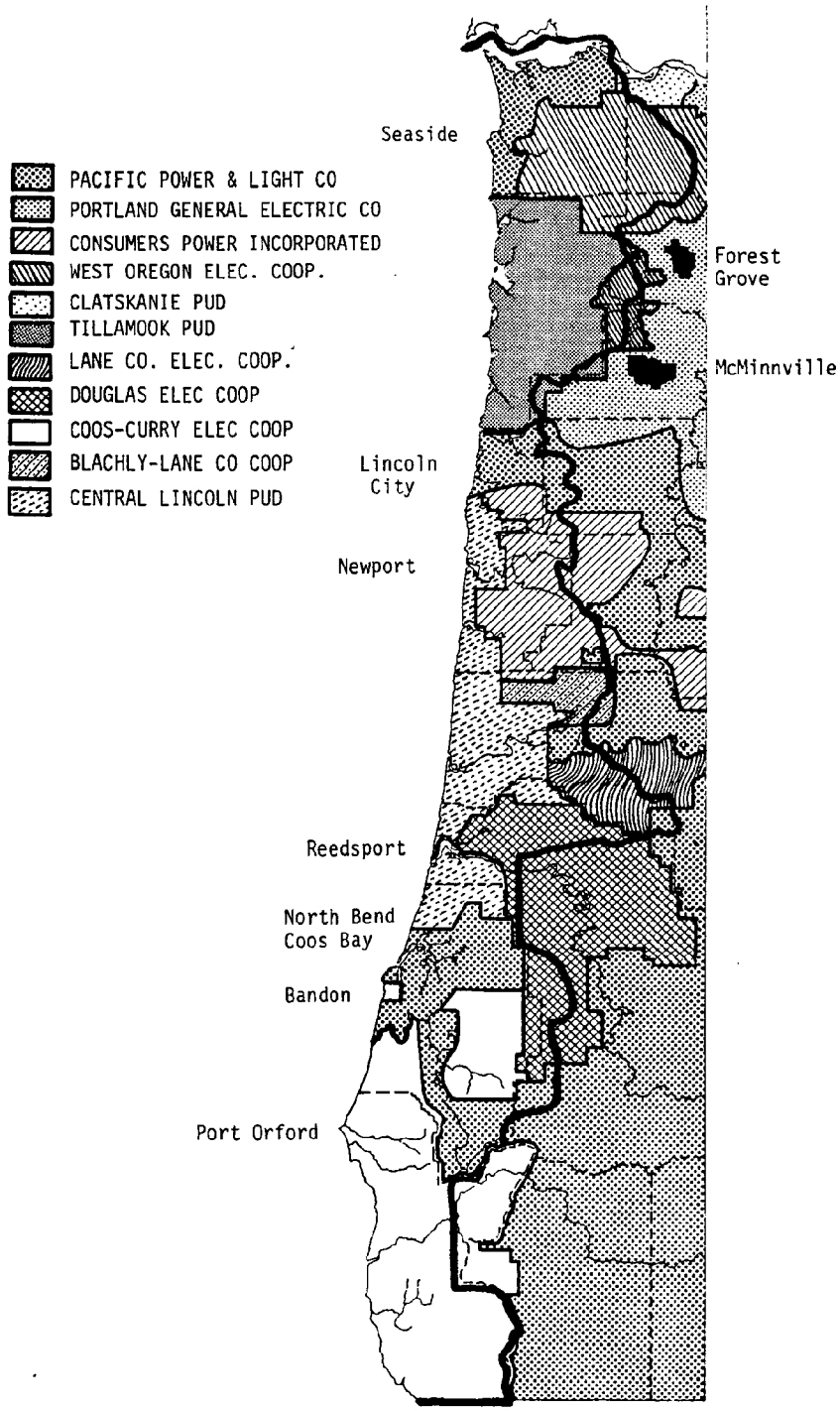


Figure 1. Electrical Utility Service Areas in the Oregon Coastal Zone.

TABLE 2

UTILITIES SERVING THE COASTAL ZONE

UTILITY	OFFICE ADDRESS
Blachly-Lane County Co-Op Electric Association	90680 Highway 99 Eugene, Ore. 97402
Consumers Power, Inc.	PO Box 1108 Corvallis, Ore 97330
Coos-Curry Electric Cooperative, Inc.	PO Box 460 Coquille, Ore. 97423
Douglas Electric Cooperative, Inc.	PO Box 1327 Roseburg, Ore 97470
Portland General Electric	121 SW Salmon Street Portland, Ore 97204
Central Lincoln PUD	255 SW Coast Highway Newport, Ore 265-5335
Clatskanie PUD	423 Nehalem Street PO Box 216 Clatskanie, Ore 97016
Tillamook PUD	1115 Pacific Avenue PO Box 433 Tillamook, Ore 97141
Bandon, City of	PO Box 67 Bandon, Ore 97411
West Oregon Electric Cooperative, Inc.	715 Maple Street PO Box 69 Vernonia, Ore 97064

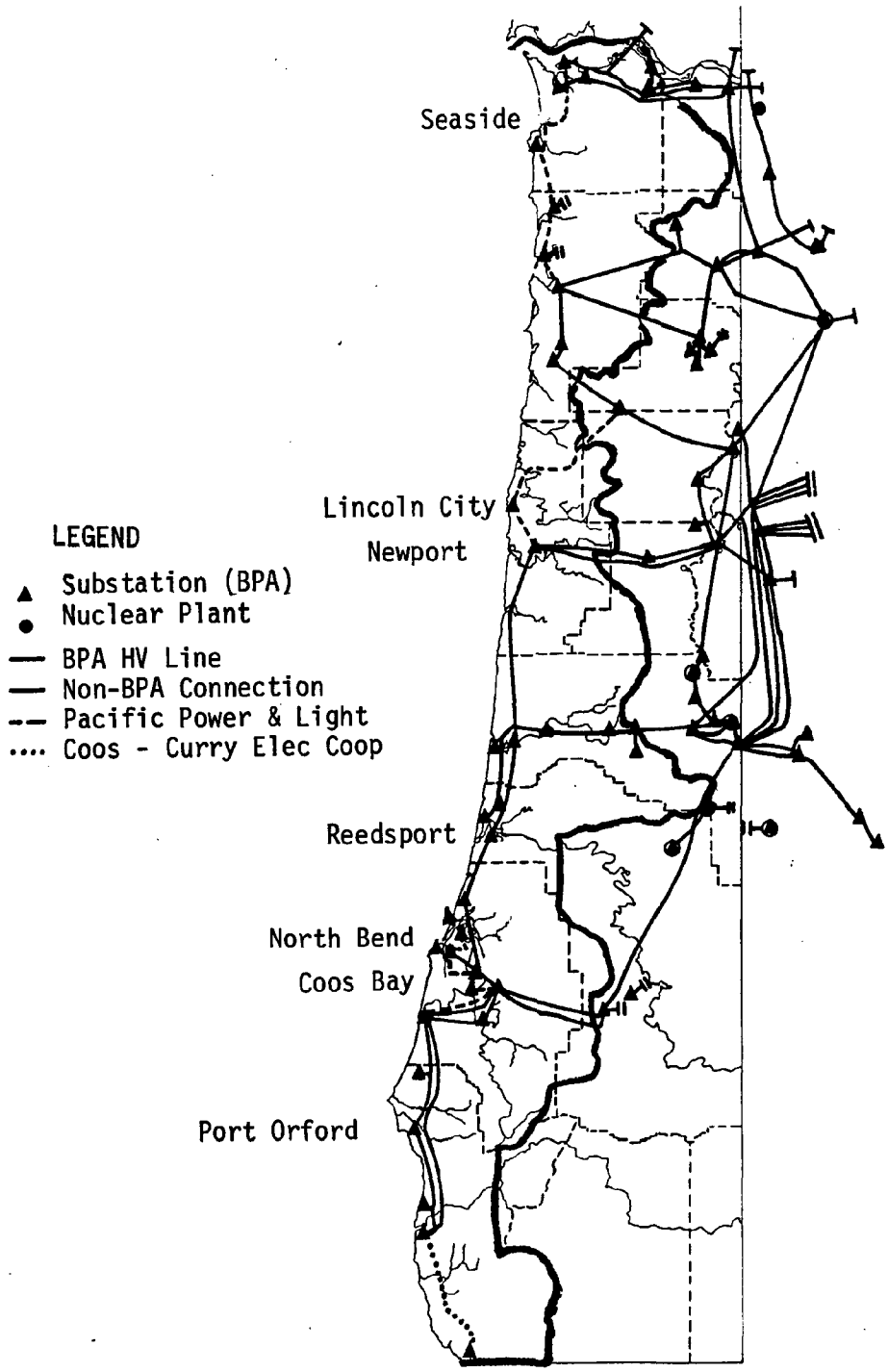


Figure 2. High Voltage Transmission Lines in the Oregon Coastal Zone.

TABLE 3

INVENTORY OF BPA FACILITIES IN THE OREGON COASTAL ZONE

SUBSTATIONS

Clatsop Substation
Garibaldi Substation
Hebo Substation
Beaver Substation
Wendson Substation
Tahkenitch Substation
Trask Substation
Rogue Substation
North Bend Maintenance Headquarters

RADIO STATIONS

Wilson River Radio Station
Mt. Hebo Radio Station
Mary's Peak Radio Station
Goodwin Peak Radio Station
Winchester Bay Radio Station
Leneve Radio Station
Cape Blanco Radio Station
Kenyon Mountain Radio Station
Gardiner Ridge Radio Station
Blue Ridge Radio Station
Johnson Peak Hydromet

TRANSMISSION LINES

Longview-Astoria
Allston-Driscoll
Allston-Clatsop
Keeler-Tillamook No. 1
Carlton-Tillamook
Santiam-Toledo
Lane-Tahkenitch
Lane-Wendson
Reston-Fairview Nos. 1 and 2
Toledo-Wendson
Tahkenitch-Wendson Nos. 1 and 2
Tahkenitch-Reedsport
Reedsport-Fairview, and Coos Tap
Fairview-Bandon Nos. 1 and 2
Bandon-Gold Beach Nos. 1 and 2

SOURCE: BPA Office of Information

Facility Expansion and New Facilities

Electrical Energy Forecasts--Energy demand forecasts for the State (DOE, 1978) do not allow separate examination of the projected electricity use in the Oregon Coastal Zone. All utilities serving the coastal zone anticipate increases in their loads over time as coastal areas continue to urbanize. (An inventory of development pressures in the coastal zone prepared by OCC&DC in 1975 indicated that developable land is generally available for urbanization.) Total electrical demand for the state is projected to grow at an average 2.3 percent annual rate over the next twenty years, and demands in the coastal zone may or may not be proportionate to this figure. The primary unknowns are whether or not local utilities will seek to site generation facilities in the zone to meet this load growth, and whether or not regional electrical interests will seek to put plants there to meet regional load growth.

High Voltage Transmission Lines--Loads are concentrated along the coast, and load growths are expected to occur in the towns along Route 101. All area utilities expect to gradually upgrade their distribution systems as new customers are added. This means a number of new substations and trunk lines are planned, but exact dates for installation are generally unavailable due to load growth uncertainties. At this time, BPA is encouraging individual utilities to take over operation of lines smaller than 230 kV, and some utilities are now planning to acquire and refurbish some of the existing BPA transmission facilities along the coast. (CH_2M Hill, 1977) When the growing loads exceed existing transmission capacity, larger or additional transmission lines will need to be brought in from the East. All such lines are expected to use existing corridors.

TABLE 4

REPORTED PLANS FOR NEW AND EXPANDED HIGH VOLTAGE LINES

Utility	Planned New HV Lines	Planned New Substations
Central Lincoln PUD	Newport Area (69 kV)	Newport; Glasgow
Clatskanie PUD	None	None
Tillamook PUD	Hebo-Neskowin (115 kV) (near future) Mohler-Tillamook-Hebo (115 kV) (long range)	To service new HV lines
Blachley-Lane County Coop	None reported	Near Blachley (1990's)
Consumers' Power, Inc.	Simpson Creek-Siletz (115 kV)	Siletz (1985); Bayview (1978)
Coos-Curry Coop	None	None
Douglas County Elect. Coop	None	None
Western Oregon Elect. Coop	None	None
Bandon	None	None
Portland General Electric	None reported	None reported
Pacific Power and Light	No specific plans reported, but expect eventual expansion of some existing N-S HV lines	None reported
Bonneville Power Admin.	None reported	None

SOURCE: MSNW interviews with utility representatives.

None of the utilities now plans to develop major new high voltage transmission line corridors, since anticipated load growth can be served by existing or upgraded existing facilities. However, if new generating plants are built, new transmission corridors could be required. Several new substations are planned for immediate or future location in areas of rapid growth; some of these will require that new service lines be routed over short distances. Table 4 summarizes utilities' plans for additional high voltage lines.

Electrical Generating Plants--Utilities retailing power in the OCZ obtain wholesale power from BPA or the two major investor-owned utilities (PP&L, PGE). All plan to continue this relationship. BPA has recently issued Notices of Insufficiency to its customers, including public utilities and cooperatives serving the coastal zone. All of these utilities, consequently, are examining new sources. The cooperatives, for example, have joined other cooperatives in the region to form the Pacific Northwest Generating Corporation, and are actively looking to purchase generation (Drake, pers. communication). There is some interest in developing electrical generation facilities in the OCZ, as summarized in Table 5. The following sections discuss in greater detail the situation for each type of electric generating facility.

TABLE 5

REPORTED INTERESTS IN SITING ELECTRICAL FACILITIES IN THE OCZ

Utility	Principal Source of Power	Interest in Developing OCZ Power Facilities
Central Lincoln PUD	BPA	None reported
Clatskanie PUD	BPA	Wants to develop wood waste cogeneration at Wauna
Tillamook PUD	BPA	Interested in cogeneration; supports wind power R&D
Blachley-Lane Co-op	BPA	None reported
Consumers' Power, Inc.	BPA	None reported
Coos-Curry Co-op	BPA	Hydropower project on Illinois River, supports wind R&D
Douglas Electric Co-op	BPA	None reported
Western Oregon Co-op	BPA	None reported
Bandon	BPA	None reported
Portland General Electric	Owns and participates in thermal, hydro	Developing wood waste cogeneration arrangements. Site suitability studies for coal, nuclear and hydro plants in OCZ
Pacific Power and Light	Owns and participates in thermal and hydro	Developing wood waste cogeneration; participation in site suitability for coal, nuclear and hydropower plants
Washington Public Power Supply System	BPA, participates in other sources	Site suitability studies for coal, nuclear plants

SOURCE: MSNW interviews with utility representatives

Nuclear--Siting of nuclear power plants is a closely regulated, highly visible and often controversial process. Environmental and socioeconomic questions are usually studied in great depth prior to granting of the many licenses needed to bring such a plant on line.

The Oregon Nuclear and Thermal Energy Council established standards for siting nuclear plants in Oregon, and developed maps of suitable and unsuitable areas based on four criteria: presence of natural resource areas, proximity to major population centers, land suitability for agriculture, and geologic hazards. Using these criteria, the council classified the coastal region north of the Coos-Curry county line as generally suitable (ONTEC, 1974). Many local portions of the coast are unsuitable due to proximity of population centers and natural resource areas. Figure 3 shows the classification patterns for the entire state.

Because of the high costs for nuclear plants, only large utilities and utility groups will be involved in siting applications. A study concluded in 1975 for the Washington Public Power Supply System (WPPSS) surveyed all of the Oregon Coastal Zone along with the entire State of Washington, northern Oregon, and northern Idaho (Pacific Northwest River Basins Commission, 1977). Twelve candidate sites were identified for future consideration if additional power plants are required to meet power needs of the region. One site was near the town of Knappa in Clatsop County.

Previous to this study, Portland General Electric studied several sites along the Oregon Coast, but has recently indicated that their main interest at present is in getting the Boardman and Pebble Springs plants on-stream (Howser, pers. comm.). The Eugene Water and Electric Board has also announced that it has abandoned interest in the Big Creek site near Florence (PNW River Basins Commission, 1975).

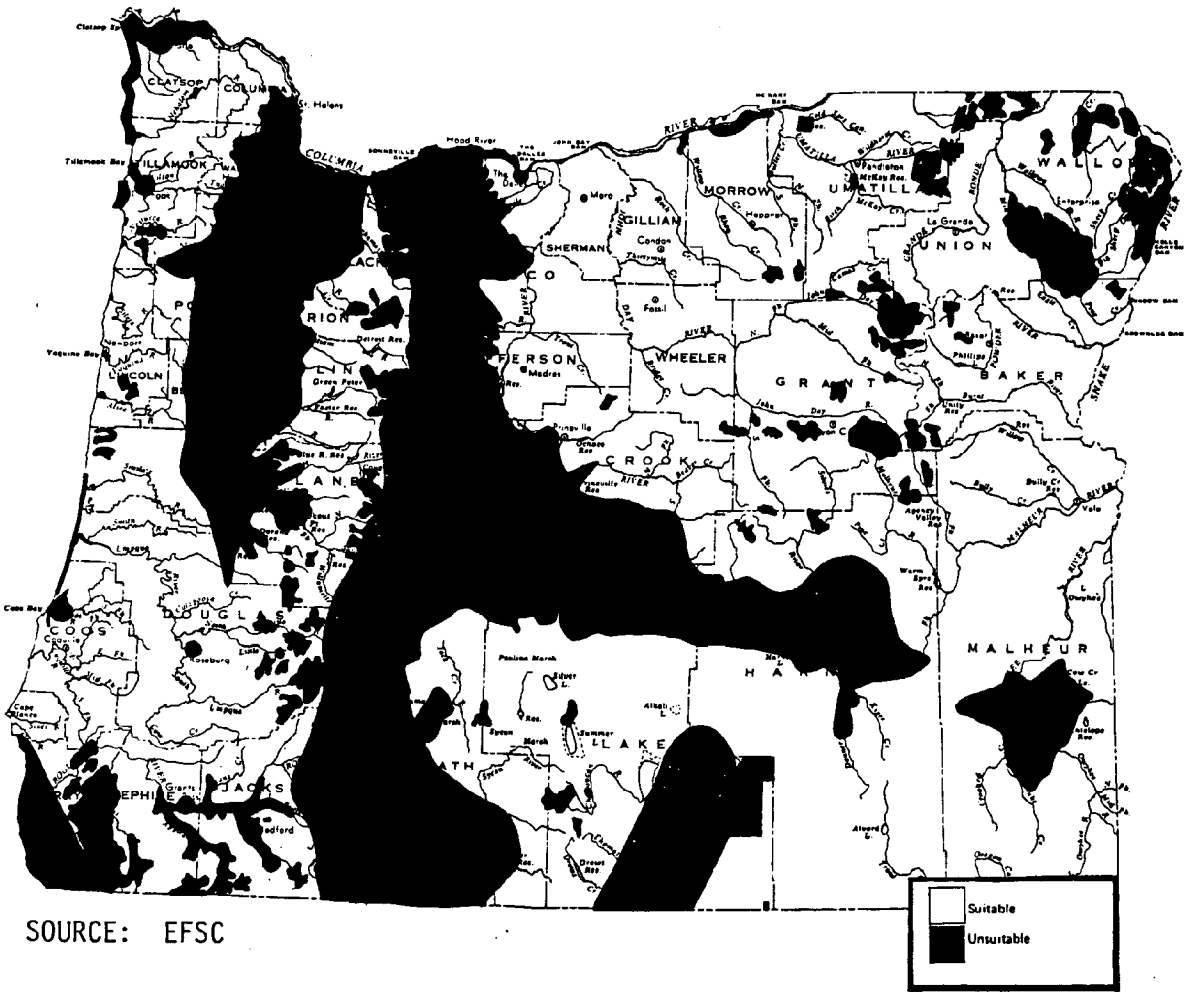
Standards established by EFSC require that (among other things) the need for power be demonstrated in order to justify site certification. Recent testimony by the State Department of Energy at hearings for the Pebble Springs plants indicates that if all plants in the region now having construction permits are built, additional generation will not be needed until 1995-95. Under projected economics, DOE estimates indicate that coal plants would be a cheaper way to meet demands occurring after that date.

Given these considerations, the likelihood that a nuclear power plant would be sited in the OCZ is low to medium.

Fossil Fuels--The only coal resources of any note in the Oregon Coastal Zone are in the Coos Bay area and near Eden Ridge. The Coos Bay subbituminous deposits have moderate heating value (<10,000 Btu/lb) and low sulfur (<1%), but present estimates are that mineable coal is less than 60 million tons (DGMI, 1975). Some 50 million tons of reserves at Eden Ridge are owned by Pacific Power and Light.

Concerning the Coos Bay reserves, Oregon Department of Geology and Mineral Industries (1975) has concluded:

> Potential future use of the coal for power is local and small in scale. For development to proceed, several obstacles will have to be overcome, including overlapping ownership, economic constraints, and the need for supporting transportation and water systems. Environmental considerations in the Coos Bay area include air and water pollution and use restrictions in the South Slough Sanctuary which limit possible future mining to certain areas and under strict conditions.



SOURCE: EFSC

Figure 3. Land Use Designations for Nuclear Fuel Power Plant.

There are sizeable low sulfur coal reserves in southern Alaska, however, which could be imported by ship as a slurry for use in coal-fired electricity generating or coal gasification plants in the OCZ. (Anderson, 1978). Locally mined coal could supplement the imported coal if the plants were located in the Coos Bay area. This type of project would be competing with nuclear and coal-fired plants elsewhere in Oregon and in the Northern Great Plains. These plants use strip-mined coal which is rail-hauled from Wyoming. Recent studies indicate Alaskan coal would be competitive with rail-hauled plains coal on the Pacific coast (Hennagin, 1978).

Besides the economics of coal-fired generation, major environmental questions would have to be resolved. The main question would be where to put the plants; the second would be whether air quality regulations could be met. Washington Public Power Supply System (WPPSS) recently completed reconnaisance surveys of the entire Pacific Northwest for coal plant sites, but completely abandoned further study of sites on the coast because of the hilly topography to the east. The presence of high ground east of a plant would make it impossible to meet air quality standards where the plume intersected the ground (Waddell, pers. comm.).

Given these considerations, the likelihood that a coal-fueled electrical generating plant would be sited in the OCZ is low.

Portland General Electric operates a combustion turbine generating plant near Clatskanie, consisting of six industrial-type units with peaking capability of about 614 MW. Fuel oil for this plant is offloaded from tankers at Port Westward, on the Columbia River. Combustion turbines are used only for peaking power, since their fuel costs make the power very expensive compared to other sources. If area utilities do experience peaking shortfalls which cannot be met by other

sources of generation, installation of combustion turbines may be their response. Because these units are not prohibitively expensive to buy and can be licensed and constructed relatively quickly, they provide an attractive option for small utilities. Depending on the outcome of regional power redistribution and new source construction, the likelihood of siting combustion turbines in the OCZ is medium.

Conventional Hydroelectric Generation--Hydroelectric power is the traditional backbone of the Pacific Northwest Power Supply System. Dams on Oregon coastal rivers (all of them outside the coastal zone boundaries) supply over 1.5 billion kWh annually (Federal Power Commission, 1976). Over 6.9 billion kWh per year of potential hydropower remains undeveloped in the Nehalem, Umpqua, Rogue and other basins (ibid.). Developed and potential hydropower sites in coastal river basins are listed in Table 6.

Economic and environmental constraints make many of the hydropower sites unfeasible. Factors used to evaluate sites are listed in Table 8. For coastal rivers, environmental limits, especially effects on anadromous fisheries, rank of great importance.

While many potential sites are known on coastal rivers, active consideration for development is limited to the Buzzards Roost (Illinois River), Ginger Peak and Trask (Trask River) sites at this time. The entire Illinois River, however, is now under study for designation as a National Wild and Scenic River, and the Coos-Curry Electric Cooperative is awaiting that decision prior to initiating further study of their dam site at Buzzards Roost. Designation of portions of the Rogue River as part of the Wild and Scenic Rivers System has precluded development of 100 MW, or 430 million KWH annually (PNW River Basin Commission, 1977).

The situation is complicated by the many water use conflicts which occur in the Oregon Coastal Zone due to the seasonal variations of surface water, the expanding demands of water consumers, the high value of the anadromous fishery, and extensive

TABLE 6

DEVELOPED AND UNDEVELOPED HYDRO-POWER IN OREGON'S COASTAL RIVERS

DRAINAGE AND RIVER BASIN PLANT OR SITE	OWNER	RIVER	DEVELOPED INSTALLED CAPACITY 2 KW	DEVELOPED AVERAGE ANNUAL GENERATION 1,000 KWH	UNDEVELOPED INSTALLED CAPACITY 2/ KW	UNDEVELOPED AVERAGE ANNUAL GENERATION 1,000 KWH
NORTH PACIFIC MAJOR DRAINAGE						
Oregon Coastal Drainage						
NEHALEM RIVER BASIN						
STONEHILL		NEHALEM			9,000	38,000
NEHALEM FALLS		NEHALEM			18,000	30,000
WAKEFIELD		NEHALEM			13,000	53,000
SLAMONBERRY		NEHALEM			30,000	85,000
SPRUCE RUN		NEHALEM			17,000	73,000
ELSIE		NEHALEM			25,000	130,000
					102,000	464,000
MINOR RIVER BASINS						
CEDAR CREEK		WILSON			18,000	96,000
GINGER PEAK		TRASK			9,500	43,000
TRASK		TRASK			76,000	108,000
CLEAR CREEK		N FK TRASK			5,330	13,000
BLAINE		NESTUCCA			15,000	70,000
EUCHRE CREEK		SILETZ			14,200	117,000
SUNSHINE CREEK		SILETZ			20,800	150,000
THE FALLS		SILETZ			20,000	100,000
TIDEWATER		ALSEA			10,000	35,000
SCOTT MOUNTAIN		ALSEA			40,000	200,000
TRIANGLE LAKE		LAKE CR			5,000	35,000
AUSTA		SIUSLAW			30,000	79,000
LOW MAPLETON		SIUSLAW R.			38,000	100,000
SWISSHOME		SIUSLAW R.			53,000	139,000
TRIANGLE LAKE		LAKE CR, SIUSLAW			17,000	44,000
UPPER SIUSLAW		SIUSLAW R.			36,000	74,000
AUSTA (NEW)		SIUSLAW R.			30,000	79,000
					407,830	1,423,000
UMPQUA RIVER BASIN						
12 RB NO 1		SMITH			5,400	24,000
LOON LAKE DIVR		MILL CR			6.500	54,000
SCOTTSBURG		UMPQUA			38,100	290,000
KELLEYS SMITH FY		UMPQUA			30,800	240,000
KELLOGG		UMPQUA			23,500	196,000
WOLF CREEK		UMPQUA			37,000	300,000
WINCHESTER		N UMPQUA			13,400	89,000
OAK CREEK		N UMPQUA			11,300	86,000
HORSHOE BEND		N UMPQUA			14,000	98,000
GLIDE		N UMPQUA			9,000	62,000
ROCK CREEK		N UMPQUA			51,000	263,000
BOUNDARY		N UMPQUA			94,000	216,000
STEAMBOAT		N UMPQUA			16,300	113,000
COPELAND DIV		N UMPQUA			24,200	175,000
SODA SPRINGS	PAC PWR & LT	N UMPQUA	11,000	71,900		
SLIDE CREEK	PAC PWR & LT	N UMPQUA	15,000	105,700		
FISH CREEK	PAC PWR & LT	N UMPQUA	11,000	62,300		
TOKETEE	PAC PWR & LT	N UMPQUA	42,500	261,000		
CLEARWATER NO 2	PAC PWR & LT	CLEARWAT.	26,000	67,000		
CLEARWATER NO 1	PAC PWR & LT	CLEARWAT	15,000	56,800		
LEMOLD NO 2	PAC PWR & LT	N UMPQUA	33,000	237,000		
LEMOLD NO 1	PAC PWR & LT	N UMPQUA	29,000	181,000		
LAKE CREEK NO1		LAKE CR			5,000	13,000
RIDDLE DIVERS.		S UMPQUA			5,800	44,000
TILLER DIVERS		S UMPQUA			6,200	40,000
DAYS CREEK	CORPS OF ENGIN	S UMPQUA			44,000	[illegible]
			185,500	1,042,700	385,500	2,303,000

TABLE 6 (Continued)

DRAINAGE AND RIVER BASIN PLANT OR SITE	OWNER	RIVER	DEVELOPED INSTALLED CAPACITY 2/ KW	DEVELOPED AVERAGE ANNUAL GENERATION 1,000 KWH	UNDEVELOPED INSTALLED CAPACITY 2/ KW	UNDEVELOPED AVERAGE ANNUAL GENERATION 1,000 KWH
MINOR RIVER BASINS						
TIOGA FORK		S FK COOS			20,000	100,000
12 RC NO 6A		E FK COQUIL			7,400	60,000
EDEN RIDGE	PAC PWR & LIT	S FK COQUIL			77,000	197,000
					104,400	357,000
ROGUE RIVER BASIN						
RAMEY FALLS		ROGUE			100,000	430,000
BUZZARDS ROOST	COOS CURRY ELE	ILLINOIS			250,000	767,000
KERBY		ILLINOIS			9,400	51,000
APPLEGATE NO 1		APPLEGATE			9,000	43,000
GOLD HILL	IDEAL CEMENT	ROGUE	2,600	11,000		
GOLD HILL		ROGUE			10,500	62,000
GOLD BAY	PAC PWR & LT	ROGUE	1,000	10,500		
GREEN SPRINGS	BUR OF RECLAM	IMIGRANT CR	16,000	61,000		
EAGLE POINT	PAC PWR & LT	LITTL BUTTE	2,813	20,000		
LOST CREEK	CORP OF ENGIN	ROGUE			49,000	303,000
PROSPECT NO 1	PAC PWR & LT	M&N FK ROG	3,760	25,000		
PROSPECT NO 2	PAC PWR & LT	M&N FK ROG	32,000	282,000	16,000	58,000
PROSPECT NO 4	PAC PWR & LT	M&N FK ROG	1,000	8,200		
PROSPECT NO 1	PAC PWR & LT	S FK ROGUE	7,200	50,000		
RITER CREEK		ROGUE			9,600	60,000
ROP CREEK		ROGUE			6,800	41,000
UNION CREEK		ROGUE			12,000	74,000
CASTLE CREEK		ROGUE			8,500	52,000
			65,273	459,200	580,800	2,391,000
TOTAL OREGON COASTAL RIVER DRAINAGE			250,773	1,501,900	1,580,530	6,918,000

[1]Annual generation potential at Days Creek (unknown)
Not included in total.

SOURCE: Federal Power Commission, 1976, Table 2.

MAP LEGEND

A....Withdrawn by Legislative Order

B....Withdrawn by Order of State Engineer

C....Domestic, Livestock, Irrigation, Power, Industrial, Mining, Recreation, Wildlife, and Fish Life

C1...Limits Power to 7½ hp.

C2...Includes Temperature Control

D....Domestic, Livestock, Irrigation (½ acre), Power (7½ hp.), Recreation, Wildlife, and Fish Life

E....Domestic, Livestock, Municipal, Irrigation (½ acre), Power (7½ hp.), Recreation, Wildlife, and Fish Life

F....Human Consumption, Livestock Consumption, Industrial, Recreation, Wildlife, and Fish Life

G....Human Consumption, Livestock Consumption, Power (7½ hp.), Recreation, Wildlife, and Fish Life

H....Natural Lakes - Domestic, Livestock, Recreation, Wildlife and Fish Life

H1...Include Power (7½ hp.)

H2...Include Power (7½ hp.) and Irrigation (½ acre)

▲ Tidal Influence Zone - Domestic, Livestock, Municipal, Irrigation, Industrial, Recreation, Wildlife, and Fish Life

■ Municipal Reservation

● Minimum Streamflow Point
Refer to individual basin policy statements for specific locations and streamflow quantities

SOURCE: OCC & DC, 1974.

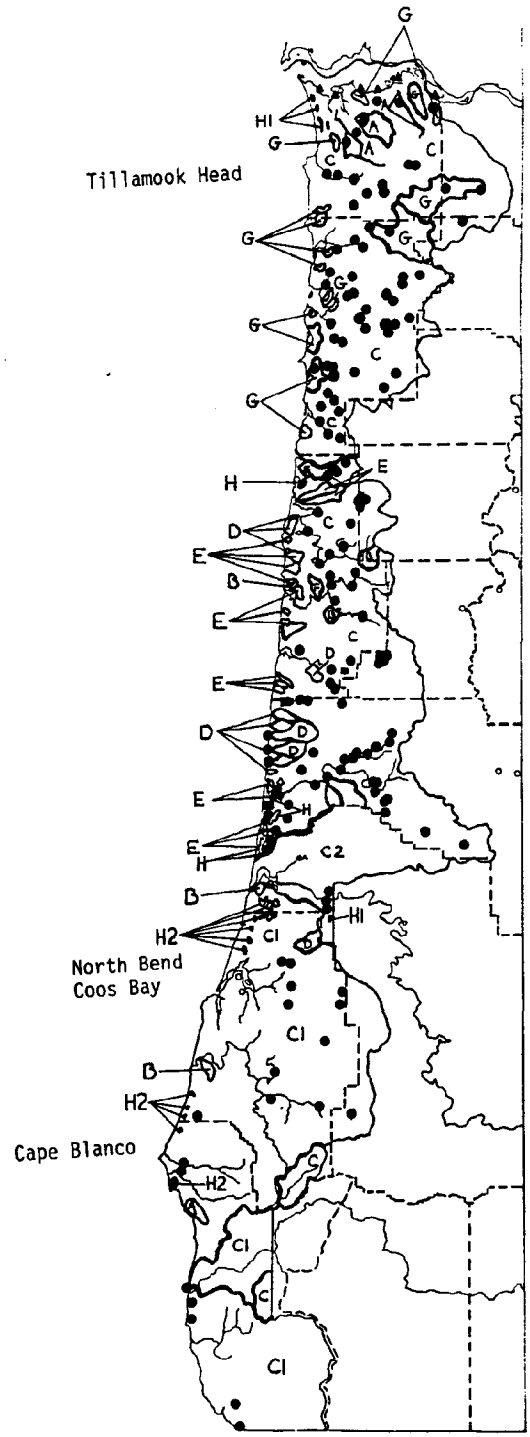


Figure 4. Water Use Policy in the Oregon Coastal Zone

recreational demands (OCC&DC, 1974). Many streams are closed to power development by the State Water Resources Board or the State Legislature (ORS 538.251). Figure 4 shows uses permitted on OCZ waters.

Oregon's coastal streams were inventoried by the State Water Resources Board (OCC&DC, 1974) and it was determined that:

> Power development, although designated as a beneficial use in most areas, has little feasibility due to the limited number of environmentally compatible project sites and today's high construction costs.

In consideration of these factors, it appears that there is only a low likelihood that new hydroelectric dams will be sited in the OCZ in the foreseeable future.

Pumped Storage Hydroelectric Generation--Because demand for electricity varies from hour to hour and day to day, excess energy from baseload facilities may be available, particularly at night and on weekends. Pumped storage is a method of storing energy during times when excess energy is available, and recovering it when needed to meet demand loads.

The layout of a typical pumped storage facility is shown in Figure 5.

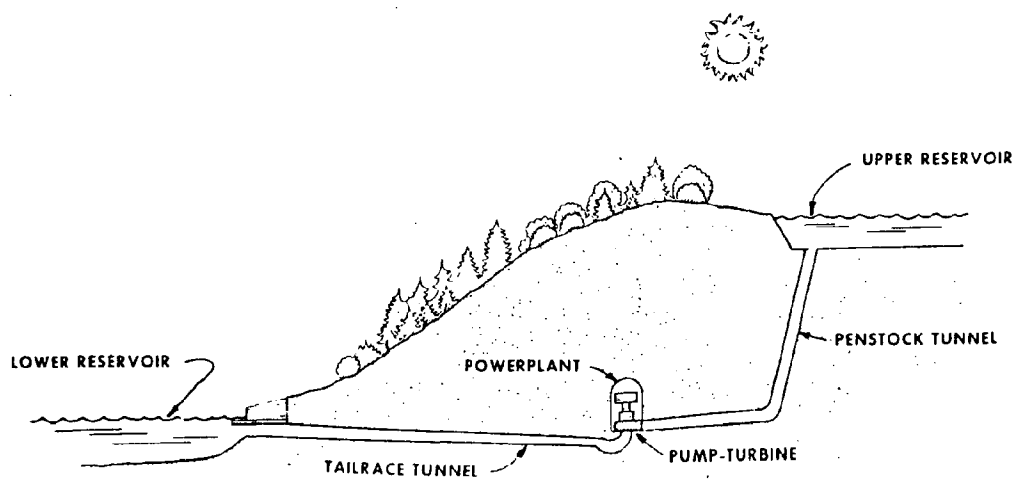


Fig. 5. Diagram of a Pumped-Storage Project

SOURCE: ACOE, 1978

In 1976, the U.S. Army Corps of Engineers completed a reconnaissance level survey of the Pacific Northwest and identified potential pumped storage sites with greater than 1,000 MW peaking capacity potential. Basic evaluation criteria shown in Table 8 were used to screen candidate sites.

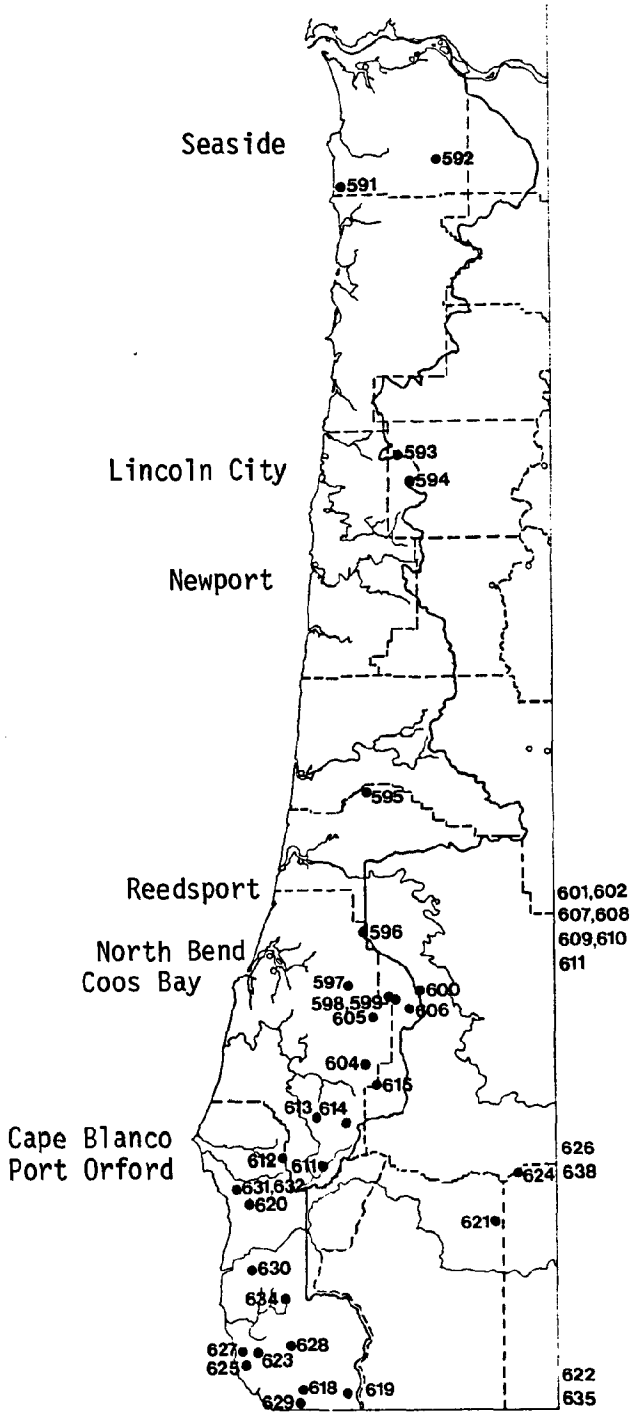


Figure 6. Potential Pumped Storage Sites in the Oregon Coastal Zone. Source: Corps of Engineers, 1976

TABLE 7

POTENTIAL PUMPED STORAGE SITES IN THE OREGON COASTAL ZONE

No.	Site Name	Size mW	Lower Reservoir	New/ Existing
Rogue Basin				
619	Buckskin Peak	1000	Illinois River	New
620	Coffee Butte	1000	Lobster Creek	New
630	Quosatana Butte	1000	Quosatana Creek	New
631	Salal Spring #1	1000	Euchre Creek	New
Umpqua Basin				
596	Beulah Creek	1000	Milliccma River EP	New
600	Long Ridge	1000	Elgarose Creek	New
Oregon Coastal and Minor Tributaries Basins				
591	Angora Peak	1000	Pacific Ocean	Existin
595	Baldy Mountain	1000	Smith River NF	New
618	Bear Wallow	1000	Winchuck River	New
592	Buster Creek	1000	Buster Creek	New
598	Callahan Road #1	1000	Williams River	New
599	Callahan Road #2	2000	Williams River	New
613	Camp #2	1000	Coquille River	New
593	Condenser Peak	1000	Siletz River	New
614	Doe Swamp	1000	Cow Creek WF	New
617	Eden Ridge	1000	Coquille River SF	New
594	Fanno Peak	1000	Valsetz Lake	Existing
606	Flourncy Valley	1000	Lookingglass Creek	New
615	Kenyon Mountain	1000	Coquille River	New
623	Lookingglass Prairie	1000	Chetco River	New
625	Morton Butte	1000	Chetco River	New
627	North Chetco	1000	Pacific Ocean	Existing
597	Old Tioga Camp	1000	Coos River	New
629	Packsacole Mountain	1000	Fourth of July Creek	New
628	Pollywog Butte	1000	Chetco River SF	New
612	Powers Ranch	1000	Salmon Creek	New
632	Salal Spring #2	1000	Elk River	New
634	Snow Camp	1000	Pistol River	New
604	Thomas Mountain	1000	Sandy Creek	New
605	Tioga Creek	1000	Tioga Creek	New

SOURCE: ACOE, 1976, Table 6

Thirty sites in or upstream from the Oregon Coastal Zone were found to have potential for development (ACOE, 1976). These sites are shown on Figure 6 and identified in Table 7. Two of these sites were considered to have the greatest promise: Eden Ridge, on the South Fork Coquille River (Site 617), and the Buster Creek site on the divide between North Fork Rock Creek and Buster Creek in the Nehalem Basin (Site 592).

Following publication of their 1976 survey, the ACOE held public hearings and refined their screening process. All OCZ sites were subsequently eliminated from further consideration. This decision resulted primarily from elimination of all sites with less than 3,000 MW potential (most OCZ sites were in the 1 - 2,000 MW range) and those with significant social or environmental impacts.

Based on these considerations, there is very little likelihood that pumped storage generating facilities will be proposed in the OCZ.

TABLE 8

MAJOR SITE EVALUATION FACTORS FOR HYDROELECTRIC GENERATION (ACOE, 1978)

Physical Site Characteristics

- Topography
- Geology
- Hydrology
- Access
- Availability of construction materials
- Land use (existing, future)
- Relocations (roads, railways, utilities, etc.)
- Existing facilities (lower reservoir)
- Penstock characteristics--length of flowline
- Reservoir capacities
- Allowable drawdown
- Plant capacity
- Operating cycle
- Proximity to load centers
- Potential for plant expansion (staged development)

Economic Features

- Construction cost
- Power benefits
- Multiple-purpose benefits
  - Water supply
  - Recreation
  - Other

Environmental Features

- Special land designation (wilderness area, national forest, etc.)
- Anadromous fish
- Resident fish
- Wildlife
- Big game range
- Ecological effects
- Aesthetics
- Water quality

Social Features

- Displacement of people
- Land ownership
- Historical and archaeological sites
- Public attitudes
- Health and safety

Small-scale hydroelectric generation--Although large new hydroelectric projects are unlikely in the Coastal Zone, significant opportunities may exist for small-scale hydroelectric generation. Such facilities could range from very small generators supplying the needs of a single nearby household up to more sizeable turbines fed from small dams and generating part of the power used by a community. Conversion of existing non-power producing dams for this purpose may also occur.

The potential for small-scale hydroelectric generation in the Oregon Coastal Zone is not known at this time, but inventories are now underway and will be completed in early 1979 (Klingman, pers. comm.). In the absense of this forthcoming information, it may be stated that it is probably quite likely that small hydroelectric generation facilities will be built; their size, number, and design is unknown.

Biomass--There appears to be ample opportunity for development of small to medium sized (<50 MW) plants which would generate electricity from surplus mill waste and forest residues from cut-over coastal forests. Potential use of more of these resources for power generation depends mainly on markets for residues, on locational and distance (i.e., transportation) factors, and on costs of competing power. Inventories of forest residues indicate large volumes (up to 225 tons/acre) are potentially available in clear-cuts in the Douglas fir forests (e.g., Dell and Ward, 1971). Large quantities of mill residues are also available (e.g., Grantham, et al., 1974), although supply/demand relationships are not stable and substantial transportation questions remain unanswered (Knapp, 1976).

Increased utilization of wood waste for power production seems probable in the future. Most or all of this will involve increased self-sufficiency within the forest products industry, but sales of surplus power from these sources will also likely increase. At this time, it appears that non-forest industry power generation plants have only a low to medium likelihood, unless public power costs increase much more rapidly than currently projected. Otherwise, incentives are lacking for local utilities to enter the biomass fuels generation business.

Another way biomass fuels could be used in the OCZ is for woody fuels to be grown and harvested specifically for use in wood or wood and coal fired thermal plants of up to 50 MW size. Research into intensive culture of species such as red alder and black cottonwood indicates that yields could approach 15 dry tons/acre on some sites (e.g., Heilman, et al, 1972), but competitive economics, particularly opportunity costs on good forest lands, are not yet favorable (Jamison, 1977). Current research (e.g., Harlow and Oliver, 1978) is seeking to screen species, soils, and cultural practices affecting biomass production and the economics of growing woody products specifically for fuel.

Given the forest-based economies of some OCZ communities, the availability of land may be a problem in realizing implementation of biomass farming. However, this may change as this type of endeavour becomes more widely practiced, since the short rotation times and long-term purchase contracts would make it less speculative than traditional forestry.

Any biomass-fueled thermal plants will be small and designed for local or regional supply.

At this time, siting of biomass-fueled thermal plants has a low to medium likelihood.

Direct Solar--Two technologies appear relevant for centralized electrical power generation in the Oregon Coastal Zone: photovoltaics and ultra-high temperature concentrators.

Photovoltaic cells are currently much too expensive for use in public power supply applications, but technology in the field is advancing rapidly. At this time, it is not possible to speculate on when this option will be feasible for use in supplying local or district centralized power in the OCZ, or whether such applications will ever be cost-effective. Consequently, this technology has a very low likelihood of being proposed in the immediate future.

Ultra-high temperature solar concentrators use paraboloid mirrors to focus all incoming solar radiation onto a single point. A steam boiler is located in the foci and the steam is used to run a conventional steam turbine. Only research prototypes are available, but this type of solar generating system shows very high conversion efficiencies, uses non-depletable energy, and could be adapted to provide power on a local or regional scale.

Because of the intermittent character of direct solar, these systems require either large amounts of storage or backup connections to conventional power sources. In the Oregon Coastal Zone, these requirements could be met by using the exiting hydro-based utility grid as a combined storage and backup system. Although the details are rather complex, the concept is quite simple: when the sun is shining, electricity is generated by the solar conversion system(s). Water which would ordinarily be used to generate this load can be saved behind the dams in the Pacific Northwest Power Supply System. When the sun is not producing electricity, the hydropower system is turned on and uses, in part, the water saved by the solar generation.

The Oregon Coastal Zone is not a particularly spectacular candidate for large scale installation of direct central generation solar power, however, because of its often cloudy weather. If and when the price of solar equipment comes down to the point it can begin to compete with new thermal power sources, any large installations will probably be placed in central or eastern Oregon. As will be discussed below, a much more logical alternative energy system for the OCZ is wind-hydro. Consequently, large scale direct solar facilities will likely not be proposed for the OCZ in the foreseeable future.

Ocean power--The presence of the high-energy Pacific Ocean shore (Stembridge, 1976) has long invited speculation about the possibility of converting the energy of waves, tides, or ocean gradients into useful energy for man's use. In some areas of the world, for example, high tides exist which have been used to drive small horizontal turbines; there is also considerable ongoing research into devices to derive useful power from the thermal and salinity gradients which exist off some coasts.

At this time, the likelihood of practical and environmentally acceptable tapping of the near-shore energy of the Pacific Ocean is very low. Thermal and salinity gradients suitable for powering generation are not found off Oregon's coasts. Technological problems remain the major obstacle for wave-power converters, and the lack of high tide and sacrificeable estuaries appears to virtually preclude development of any significant amounts of power from the tides.

Geothermal Power--Generation of power using heat derived from the earth's crust is an active possibility in the Cascade Range, but there are no known geothermal areas in the Oregon Coastal Zone (see Figure 7). Consequently, this type of facility has very low likelihood.

Wind Energy--Wind Energy Conversion Systems (WECS) are devices which extract kinetic energy from moving air (wind) and transform it into mechanical, electrical, or potential energy which is useful to man. Historically, many types of WECS and many applications have been devised, but the facilities of most interest for OCZ energy planning are the large (100-10,000 kW) wind machines which could generate electricity for use by a local utility or for transmission offsite via the Pacific Northwest Grid.

Only a few large WECS have been built, and the technology is still in the prototype stage.

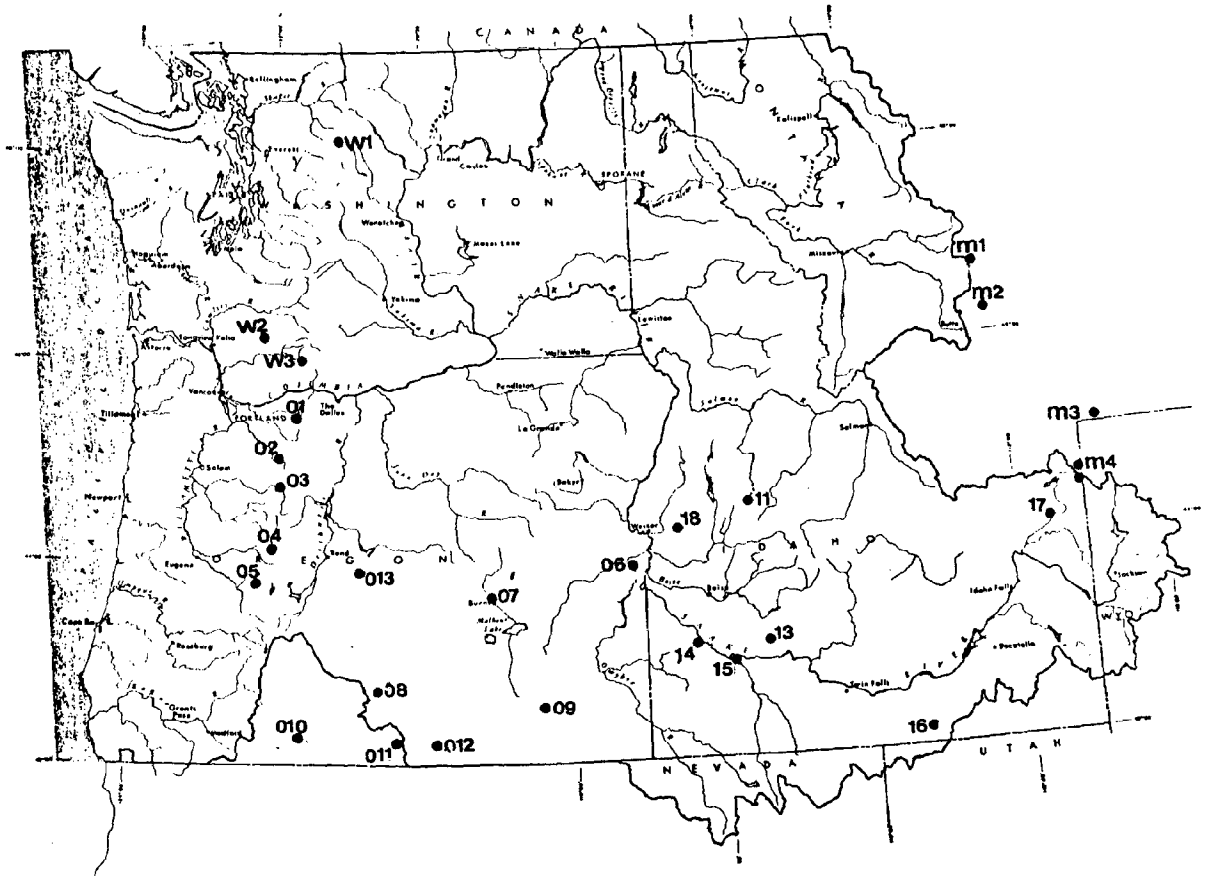


Figure 7. Known Geothermal Resource Areas in the Pacific Northwest.

SOURCE: PNW River Basins Commission, 1977.

If the expected technical and cost breakthroughs are achieved, wind energy could undoubtedly play an important role in the energy future of Oregon and the Oregon Coastal Zone. In some configurations, WECS may already be cost-competitive with conventional thermal generation (Hewson, 1977).

Components of WECS include the airfoil or blades (which may be of many types and configurations), the generator, support structures, transmission facilities and/or energy storage facilities. Storage is needed if power demand cannot rise and fall with the wind. Options include batteries, flywheels, pumped storage hydro, hydrogen gas, hot water, chemical salts, and compressed air (either in tanks, underground in caverns or aquifers, or undersea in inflatible bags). Transmission facilities are needed to hook the WECS into a utility grid.

WECS could be located on land or on offshore platforms (similar to OCS drilling platforms). Offshore WECS could produce either electricity or hydrogen gas for transferral to mainland distribution system. Because even the largest single WECS unit requires less than 15 acres (Coty, 1976), such units could be located atop the ridges in the Coastal Range or near the communities which would use the energy.

Site Requirements--Although small wind machines have been and are being used in diverse locations with widely varying available wind power, the relatively high costs associated with larger WECS require careful evaluation of potential sites and acquisition of data about wind characteristics. Consequently, only sites with average wind speeds above 10 mph (4.4 m/s) are being actively considered by researchers and potential sponsors. Sites with higher winds are most likely to be chosen for initial wind machine siting and testing (Hewson, 1977; Hirshfield, 1977).

Site configuration and topography is also important (Golding, 1955). Most large WECS have blades which sweep an area extending up to 100 m above the ground level, and turbulence characteristics at various levels strongly influence the useful output and operating life (and hence cost) of blades, gearings, and support structures.

Site selection must also consider rail or road access and foundation (soils) characteristics (Golding, 1955), as well as distance to point of use or grid hookup. If hydrogen gas is to be produced, pipeline routing and hookup should be a major planning consideration.

In the Pacific Northwest, an integrated hydroelectric-wind system would provide significant economies while retaining the environmental benefits (and costs) of both sources. This would be the most likely large-scale application for wind power in this region. In this scheme, WECS would be built in as many locations as possible and hooked directly into the existing hydro-based power utility. When the wind blows, the wind power would flow into the grid, allowing the turbines at the dams to be shut down. Water thus saved (i.e., stored) would be used for peaking and when the wind energy is low. Additional turbines could be installed in the dams equivalent to the average energy provided by the wind, thus significantly increasing the capacity of the utility (Coty, 1976; Hewson, 1977; and Peterson et al., 1978).

Because of the locally intermittent nature of winds, multiple-unit systems of WECS are required if wind energy is to have a major role in State or Regional energy generation. Since each site has seasonally varying power availability, the WECS network sites must be selected to provide reduced overall power generation fluctuations and increased average system capacity factors. Capacity factors are the ratio of total rated generating capability to actual energy output from the entire system (Peterson, et al., 1978).

OCZ Wind Energy Potential-- The Oregon coast, coastal range, and offshore areas are naturally windy. Wind power availability studies conducted since 1971 have shown that there are a large number of sites with strong and persistent winds along the Oregon coast, particularly along the southern Oregon coast, and that offshore areas in relatively shallow water (25 fathoms or less) also are good windy sites. In the Coastal Range, moderate to strong wind sites have been documented at Mt. Hebo, Prairie Mountain, McCulloch Peak, and Mary's Peak (Hewson, et al., 1977). Peterson et al. (1978) rate the OCZ as having high (> 400 W/m^2, 70% of the time or more) effective wind power density during winter and spring, and high-moderate (300 - 400 W/m^2, 50% of the time or more) during summer and fall. Coastal sites are therefore the only sites in the Pacific Northwest which have very good year-round potential.

Wind power study sites in the OCZ are listed in Table 9 and located in Figure 8. According to Hewson (1973, 1977), prevailing winds blow parallel to the coast rather than perpendicular to it, and for this reason the offshore or shoreline locations appear to have the best wind.

TABLE 9

WIND ENERGY STUDY SITES IN THE OCZ

	Station	Elevation	Period of Record
2.	Columbia River Lightship	0 m MSL	1968-74
3.	Astoria	2	1953-57, 73
4.	Wickiup Ridge	820	1971
5.	Tillamook Head	370	1972
6.	Cape Lookout Ridge	290	1975-76
7.	Mt. Hebo	960	1973-74
8.	Cannery Mountain	325	1972
9.	Cape Foulweather	152	1973
10.	Yaquina Lighthouse	22	1973-75
11.	Yaquina Tower	73	1975-76
12.	Yaquina Comm. Station	113	1973-76
13.	Florence Jetty	4	1975-77
14.	Cape Blanco Coast Guard	61	1968-72
15.	Cape Blanco Airport	61	1976
18.	Mary's Peak	1250	1976
19.	Prairie Mountain	975	1976-77

SOURCE: Hewson, et al, 1977

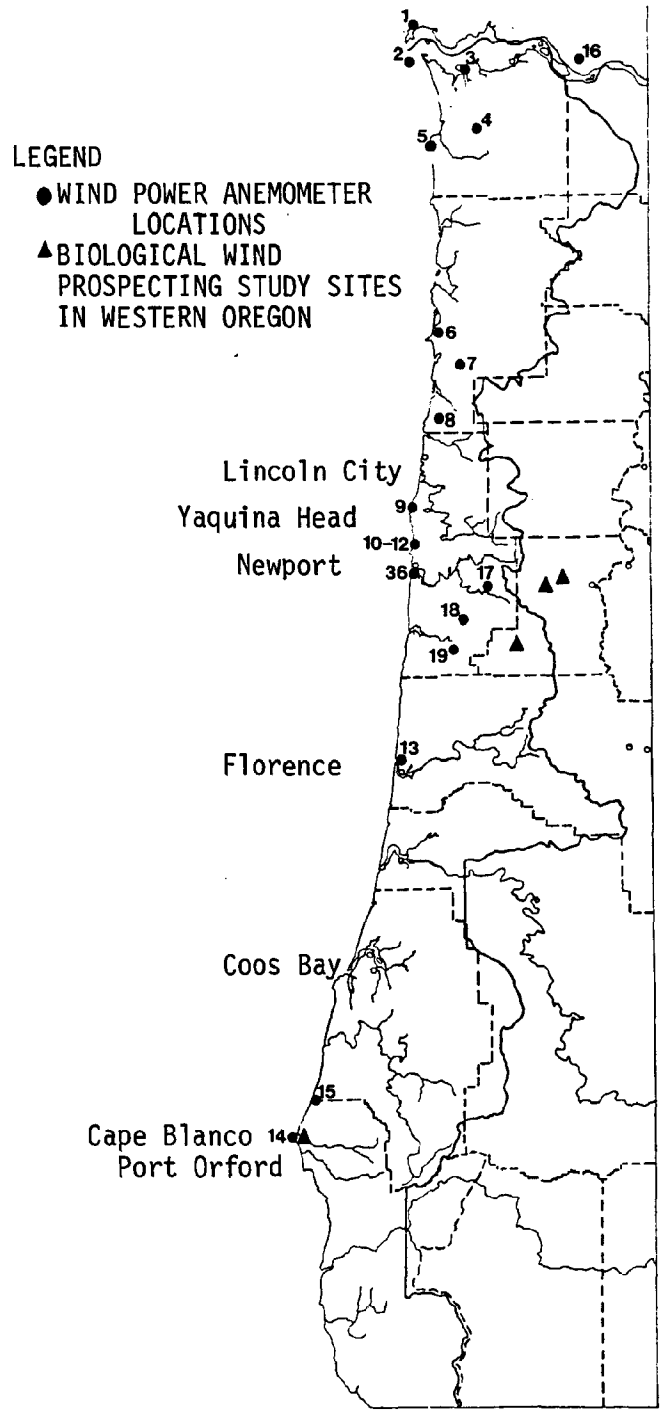


Figure 8. Wind Power Study Sites in the Oregon Coastal Zone.

In addition to their work with anemometer-equipped sites, Hewson, Wade and Baker (1977) are also examining the use of wind-affected vegetation (flag trees, etc.) as a wind energy indicator for non-instrumented sites. This work is important because few weather stations are located in the remote or high elevation exposed situations where wind energy is most prevalent on the land. Biological wind prospecting study sites in the OCZ (see Figure 8) include Yaquina Head, Prairie Mountain, and Cape Blanco.

Peterson et al. (1978) used weather data from five of the best sites in the Pacific Northwest to simulate power availability from a multiple-unit system. They also calculated wind variability and the amount of hydro storage necessary to smooth the wind power fluctuations. Seasonal, monthly, daily and hourly power production were simulated for wind turbines with varying wind speed ratings. Results from this study showed that regionally dispersed wind sites do provide smoothing of fluctuations in wind-generated power, but that even on a regional basis these are positive correlations among sites. Overall system generation varies enough, particularly on a daily basis, that energy storage is required to further smooth the output. Peterson et al. evaluated the use of hydro storage, supplied either from existing reservoirs or from potential future pumped storage sites (see above). In each case, they determined the number of wind generators which could be utilized in conjuction with each storage unit, then calculated combined net wind-hydro system power production. If existing hydro storage were used, then the annual energy production per wind generator of 125-feet diameter would be about 1470 MWh ; for 200-feet diameter generators, about 3760 MWh could be expected annually. Thus, a 200-unit wind generator farm with 200-feet blade diameter wind turbines could produce about 752,000 MWh annually. Peterson et al. estimate that 6 to 30 million acre-feet of storage in existing reservoirs would be used to provide power regulation for such a system.

If pumped storage units were constructed at all sites identified by the Corps of Engineers in their recent survey (1976) and the maximum number of wind generators which they could support are installed, Peterson et al. (1978) estimate annual energy production for each 125-feet-diameter wind turbine to be 940 MWh; for each 200-feet-diameter unit it is 2406 MWh. Useable annual energy production by each pumped storage unit would be about 330,000 MWh.

It should be noted that wind generators would not be located at the hydro storage sites in either example, but rather at locations having large values of wind power density. Therefore, it is possible to envision wind generator farms located in the coastal zone, while the storage-regulatory hydro facilities are at existing locations elsewhere in the region.

The major environmental constraint to widespread development of wind energy generation is that about 15 acres is needed for each large (1-5 megawatt) wind generator, both to insure adequate spacing between machines, and to provide safety buffer zones. Most of this area would be avilable for agricultural purposes or other uses, depending on the site. In the Coastal Zone, shorelands suited to wind energy generation are also prime scenic areas. While wind turbines may be aesthetically acceptable in some cases, it is not highly likely that large wind farms could be located in these scenic areas. Installation of wind turbines in upland areas, however, might be more acceptable.

Based on the above consideration, it appears that siting of large wind generators in the Oregon Coastal Zone has a medium to high likelihood in the intermediate future. Siting of wind generator farms is less likely and if done will be still further in the future. Wind technology developers are now building prototype models and are several years away from building commercial models. Once reliable equipment is available and generating costs ($/KWh) are reduced, wind energy could become very important for the Coastal Zone.

OIL AND GAS

Existing Facilities

Onshore-- Oil and gas exploration and production is almost non-existent in the Oregon Coastal Zone. Wells have been drilled in all coastal counties, but no important finds have been made (DOGAMI, 1973, 1974, 1975).

Offshore-- There has been a recent proposal to explore the lower Columbia River area off the Oregon and Washington shores, but generally very little excitement has been generated by this or previous exploratory efforts. Federal and State offshore drilling from 1961 to 1969 resulted in some small finds but no production, and no federal leasing in the Oregon OCS is planned at this time. (Newton, 1967; BLM OCS Office, personal communication).

Marine Pipelines-- Because there is no oil to bring ashore, there are no marine pipelines in the OCZ.

Tanker Traffic-- Oil tankers carrying Alaskan and other crudes now travel up the Columbia River to the Chevron USA asphalt refinery at Portland. Tankers and barges with refined petroleum products, mostly from refineries in the Puget Sound area, use the Columbia River to reach the Chevron USA distribution terminal at Portland. Petroleum transport on the Columbia River averaged 2.9 million barrels crude equivalent in 1974-76 (ACOE, 1978).

Petroleum products are also shipped to major coastal ports, particularly Coos Bay, and this traffic is increasing (Falcons, pers.comm.). Over 2 million barrels of petroleum products was received at Coos Bay in 1977.

Oil/Gas Ports, Terminals-- No deepwater oil ports exist in Oregon. Ports which presently handle petroleum products and/or crude oil include: Portland, St. Helens, Astoria, Newport, Umpqua, and Coos Bay (Oregon Department of Transportation, 1972).

Portland- A 40-foot channel and turning basins provide access for tankers up to 75,000 tons deadweight. Petroleum receipts of 25.8 million barrels from domestic sources were reported in 1972 (ODOT, 1972). Tank farm facilities and an asphalt refinery at Portland are owned by Chevron USA. The tank farm is part of a petroleum products warehousing and distribution center.

St. Helens- The Port of St. Helens includes the 850-acre Beaver Army facility at Port Westward, which is currently being used by Portland General Electric for delivery of fuel oil for the Beaver electric generating plant near Clatskanie.

Astoria- The Port of Astoria received over 120 thousand barrels of fuel oils and other petroleum products in 1970 (ODOT, 1972).

Newport- Authorized to a depth of 40 feet, Yaquina Bay is the home of a large recreation and fishing fleet, as well as the Northwest Natural Gas Company's LNG facility at McLean Point on the north side of the bay. This facility is designed for importation of LNG, but the necessary dock facilities have not been authorized or constructed at this time.

Umpqua- Located at Reedsport, the Port of Umpqua is authorized to 22 feet and receives fuel barges destined for the International Paper Company plant at Gardner.

Coos Bay- The Port of Coos Bay has five berths serving oil tankers. Refined products are offloaded to small tank farms owned by Texaco, Standard, and Union oil companies, and by Oregon Coast Towing. Oil from these facilities is trucked inland.

A port expansion program is currently underway at Coos Bay in the North Spit area, with initial construction on a planned marine industrial park scheduled to begin in the near future (Falcons, pers.comm.; Klampe, pers. comm.).

Natural Gas-- Natural gas service to the Oregon Coastal Zone is limited to the Astoria-Seaside area and the Lincoln City-Newport area. Each of these sections of the coast is supplied via a pipeline from the main service area of Northwest Natural Gas Company, as shown in Figure 9. Northwest Natural Gas Company (NWNG) obtains natural gas from the Northwest Pipeline Corporation (not affiliated with NWNG), which has a pipeline running north-south from the Portland area to Grants Pass. The gas comes from fields in the Four Corners Region of the southwestern U.S., and from Canada. Northwest Pipeline Corporation is participating in development of the proposed Northwest Alaskan Pipeline, and NWNG anticipates the availability of portions of the North Slope gas during the 1980's (NWNG, 1977).

NWNG also operates a small propane system in the Coos Bay-North Bend area, serving about 75 customers via four separate underground distribution systems. The propane is brought in by railroad car (Gibbs, pers. comm.).

Liquefied Natural Gas (LNG)-- NWNG recently constructed and now operates an LNG facility at Newport, Oregon. This plant is designed for the dual purposes of (1) storing natural gas in liquid form during the summer, for winter use ("peak shaving"), and (2) serving as a receiving terminal for importation of LNG by ocean tanker (Gibbs, Letter of 6-12-78). The liquification and storage facilities have been in operation since

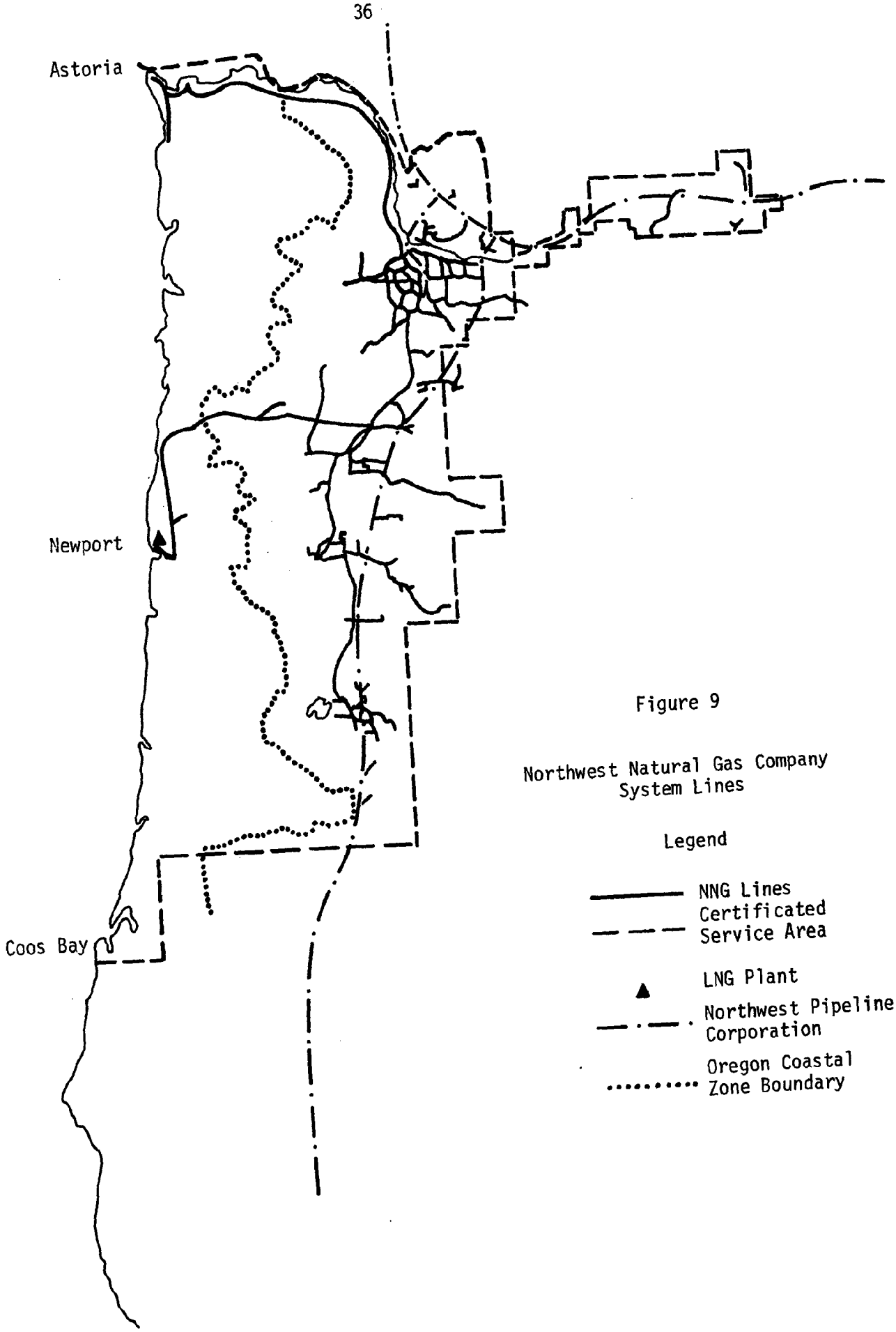


Figure 9

Northwest Natural Gas Company System Lines

July of 1977, and provides storage equivalent to 1,045 million cubic feet of gas. Gas is piped to Newport, then liquified and stored. During the winter when demands are high, the gas is vaporized at the plant and distributed through the utility's sytem, thereby "shaving" the delivery amounts required from Northwest Pipeline Corporation.

Petroleum Refining-- There is one refinery in Portland which influences the Oregon Coastal Zone. It is an asphalt refinery with 14,000 bpd crude capacity, and is supplied by tankers from Alaska and elsewhere.

Geopressurized Gas-- Natural gas can be stored underground in naturally occuring caverns or in suitable confined aquifers. The gas is injected for storage, then pumped out as needed. No use is currently made of this storage technique in the OCZ.

Oil Pipelines-- No oil pipelines are located in the OCZ.

OCS Platform Construction Yards-- There are no facilities for fabrication or assembly of drilling platforms for use in OCS oilfield exploration or production. Platform repairs have been done at Portland.

OCS Support Bases-- No support facilities are located in or affect the OCZ, although during the 1960's bases were located at Astoria, Coos Bay and Newport (Newton, 1967).

Forecasts

Oregon Department of Energy

Published forecasts of petroleum consumption in Oregon (DOE, 1978) do not itemize for individual products or areas within the State. Current and historic petroleum movement within the Oregon Coastal Zone is predominantly transfer of refined products to Portland and the larger coastal ports, but some crude is also moved to the refinery at Portland. Future activity will depend on local and regional demand, world-wide marketing patterns, availability of petroleum products, and other factors exogenous to the Oregon Coastal Zone; consequently no breakdowns are available for petroleum activity projections for specific ports.

Oil and Gas Facility Expansion and New Facilities

Onshore-- Barring discovery of major deposits of oil and gas in the OCZ, it is not likely that oil exploration activity onshore will expand, nor that production facilities will be sited.

Offshore-- As reflected in the latest schedule of OCS leasing activities (see Figure 10), there is very little interest at present in oil and gas exploration on the Oregon Outer Continental Shelf. Some areas previously explored off Coos and Douglas Counties and in the Columbia River area may still be considered to have potential, but for the immediate future. siting of offshore exploration rigs has medium likelihood, while siting of offshore production rigs and the attendant pipelines, supply bases, and tanker traffic is not likely.

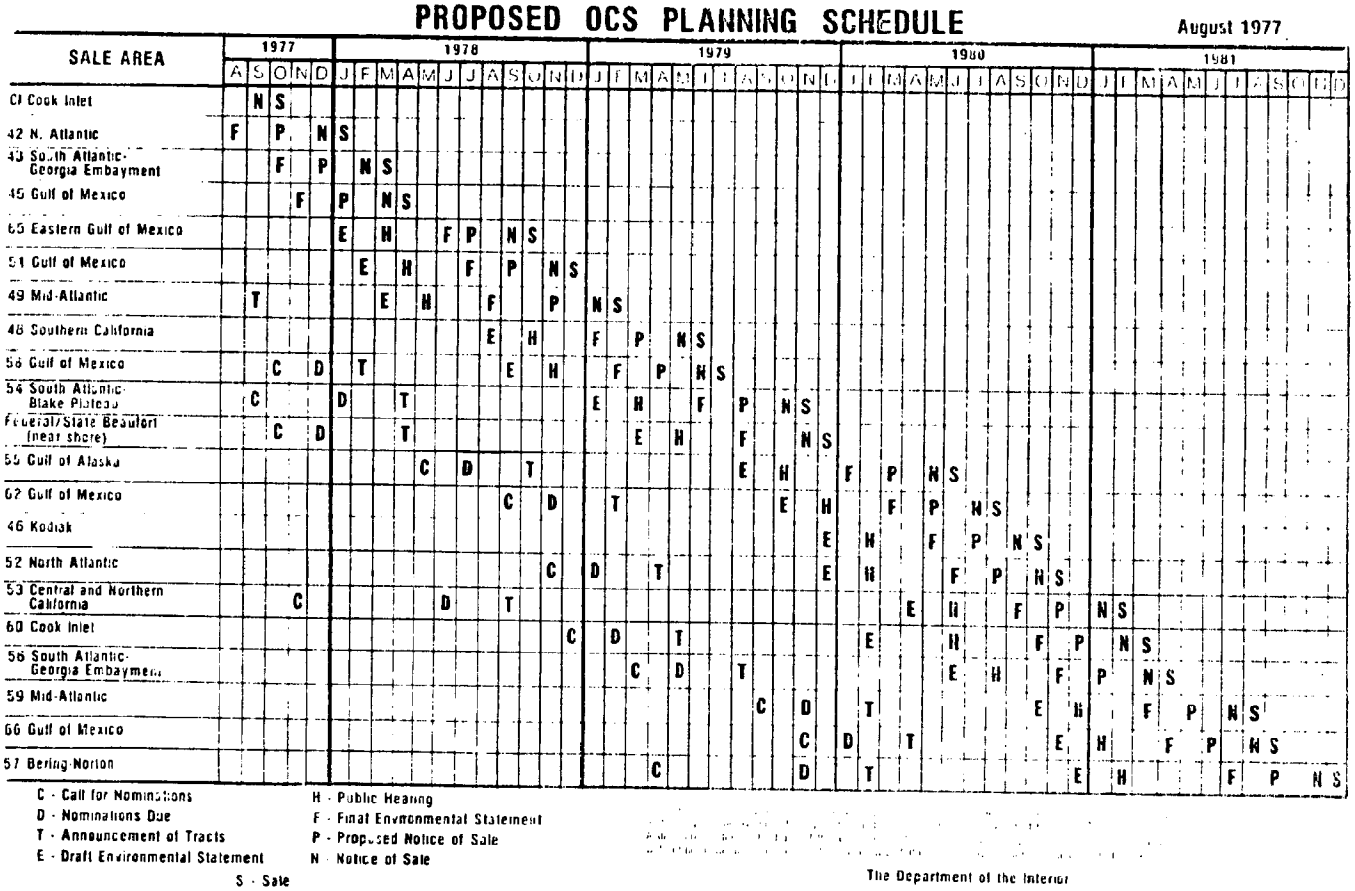
Tanker Traffic-- Notwithstanding the above, the tanker and oil barge traffic in the OCZ will likely increase, particularly on the Columbia River. As discussed below, there are two proposed new facilities which may be built on the Columbia River and which would receive Alaskan crude shipped or barged up the river. Increases in coastal tanker traffic from Alaska to California will depend in part on the fate of schemes for supplying Alaskan oil to the interior U.S.A. If pipeline terminals are located in Washington, less traffic will traverse the coast. If California terminals are chosen, more coastal traffic can be expected.

Oil/Gas Ports and Terminals-- Expansion or new construction of oil and gas terminal facilities at existing ports is highly likely. Expanded LNG handling capability at Newport, a tanker offloading and rail transhipment complex at Port Westward (Port of St. Helens) and a new refinery at Rainier near the Longview bridge are being proposed at this time. All of these projects have important environmental and social consequences, but it appears probable that one or more will be built. These and related projects are described briefly below.

Rainier-- The Cascade Energy Company has obtained permits for construction of a 30,000 barrel-per-day refinery at Rainier, and expects to begin construction in the fall of 1978 (Caribou Four Corners Co., telephone conversation of 6-22-78). Alaskan crude would be moved to the facility by barge and tanker.

Portland-- No expansion of oil handling facilities is planned (DOT, 1972; Chevron U.S.A. 1978).

Figure 10


PROPOSED OCS PLANNING SCHEDULE
August 1977
SALE AREA
1977
1978
1979
1980
1981
A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
61 Cook Inlet
42 N. Atlantic
43 South Atlantic-Georgia Embayment
45 Gulf of Mexico
65 Eastern Gulf of Mexico
51 Gulf of Mexico
49 Mid-Atlantic
48 Southern California
58 Gulf of Mexico
54 South Atlantic-Blake Plateau
Federal/State Beaufort (near shore)
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak
52 North Atlantic
53 Central and Northern California
60 Cook Inlet
56 South Atlantic-Georgia Embayment
59 Mid-Atlantic
66 Gulf of Mexico
57 Bering-Norton
C - Call for Nominations
D - Nominations Due
T - Announcement of Tracts
E - Draft Environmental Statement
S - Sale
H - Public Hearing
F - Final Environmental Statement
P - Proposed Notice of Sale
N - Notice of Sale
The Department of the Interior

St. Helens-- The General American Transportation Company (GATX) has proposed to upgrade the existing dock at the old Beaver Army Terminal at Port Westward, and to build four 175,000-barrel storage tanks, a rail car loading facility, and breasting dolphins for off-loading Alaskan crude from tankers. Crude would be stored at the tank farm, then loaded onto large oil tank rail cars and hauled to refineries in Montana and Minnesota.

Because of the potential damage from oil spills at the facility and upstream in the Columbia River along the Burlington Northern Railroad route, environmental impact studies are currently underway.

This application has recently been inactivated by GATX, thereby reducing the the likelihood of eventual siting. Likelihood now appears low-medium. There is some speculation that GATX may develop a joint facility with Cascade Energy at Rainier.

Astoria-- No additional plans for expanded oil terminal facilities are reported for the Port of Astoria, but the Port is involved with assisting Brown and Root Company in siting of a deep-sea oil well drilling platform assembly area in the Skipanon Slough Area (Burger, 1976).(See below for further discussion of platform assembly areas.)

Newport-- Northwest Natural Gas Company intends to complete their LNG plant at McLean Point in Yaquina Bay by addition of docking and LNG offloading facilities (Gibbs, Letter of 6-12-78). This will reportedly take a minimum of two years and will involve obtaining permits from various agencies (See Section on Permits). No additional tanks would be built at the site (Gibbs, personal communication 5-31-78). Likelihood of import facility siting is medium to high, based on facility existence, and tempered by concerns over LNG transport hazards.

Umpqua-- No expansion or development of oil shipping facilities is planned for Reedsport (Vaughn, pers. comm.).

Coos Bay-- The Port of Coos Bay has done preliminary studies of the possibility of building an additional deep water berth in the North Spit Area for handling of petroleum tankers (Klampe, personal communication, 6-26-78). This project is in the conceptual stages and no timetable is available. Land owned by the Port on the North Spit is zoned for this use and could be developed fairly easily for deepwater berths.

Natural Gas Pipelines-- Northwestern Natural Gas Company is currently seeking to add new customers (NNWG: Annual Report, 1977). They do not plan, at this time, to expand their main service system in the OCZ, although their certificated service area does encompass the OCZ from Cape Arago northward. Because natural gas competes with currently cheap electricity for space heating and other uses, immediate expansion of the NWNG pipeline system is not likely. Based on uncertain future supplies of natural gas beyond the next two decades, long-term expansion is also not likely.

Petroleum Refineries-- The presence of surplus Alaskan crude oil due to lack of suitable refinery capacity on the West Coast may stimulate new construction. One plan is known at this time affecting the Oregon Coastal Zone: the proposed Cascade Energy Company refinery at Rainier. This facility is currently being financed and reportedly has obtained the necessary permits (Kowalczyk, ODEQ, personal communication, 6-21-78). Start of construction is scheduled for Fall of 1978 if financing is secured. Feedstocks would be mainly crudes barged in from Alaska (Caribou Four Corners Co., Telephone Conversation of 6-22-78).

The likelihood of other refineries locating in the Oregon Coastal Zone is not very high, since facilities locating there would be isolated from product delivery systems. Only discovery of a major oil field off Oregon's coast would possibly stimulate siting of additional refineries.

Coal Gasification-- Gaseous fuels with low (100-200 Btu/ft^3), medium (300-650 Btu/ft^3) or high (900-1,050 Btu/ft^3) energy content can be produced from coal. Two-stage processes are used to prepare low and intermediate gases, involving coal preparation and gasification. A third stage, upgrading, is required for high-Btu gas. Figure 11 shows the principal reactions and reactor types.

Gasification requires large amounts of water, as steam, which provides the hydrogen needed to produce the methane gas. There are many different processes now being tested, and water use varies considerably. To produce 250×10^9 Btu/day of low Btu gas using the Koppers-Totzek process, for example, would require 10.5×10^3 tons per day of coal and 463,000 gallons per day of water. A Lurgi High-Btu plant producing 250×10^6 cubic feet per day would use 18 million gallons per day (All data from: Science and Public Policy Program, 1975).

Both coal and water would be limiting within the Oregon Coastal Zone (DGMI, 1975), and the solid waste and air pollution impacts of a gasification plant are also substantial. If these problems could be overcome, the most likely way such a plant or plants might be feasible is using slurried coal imported by ship from Alaska.

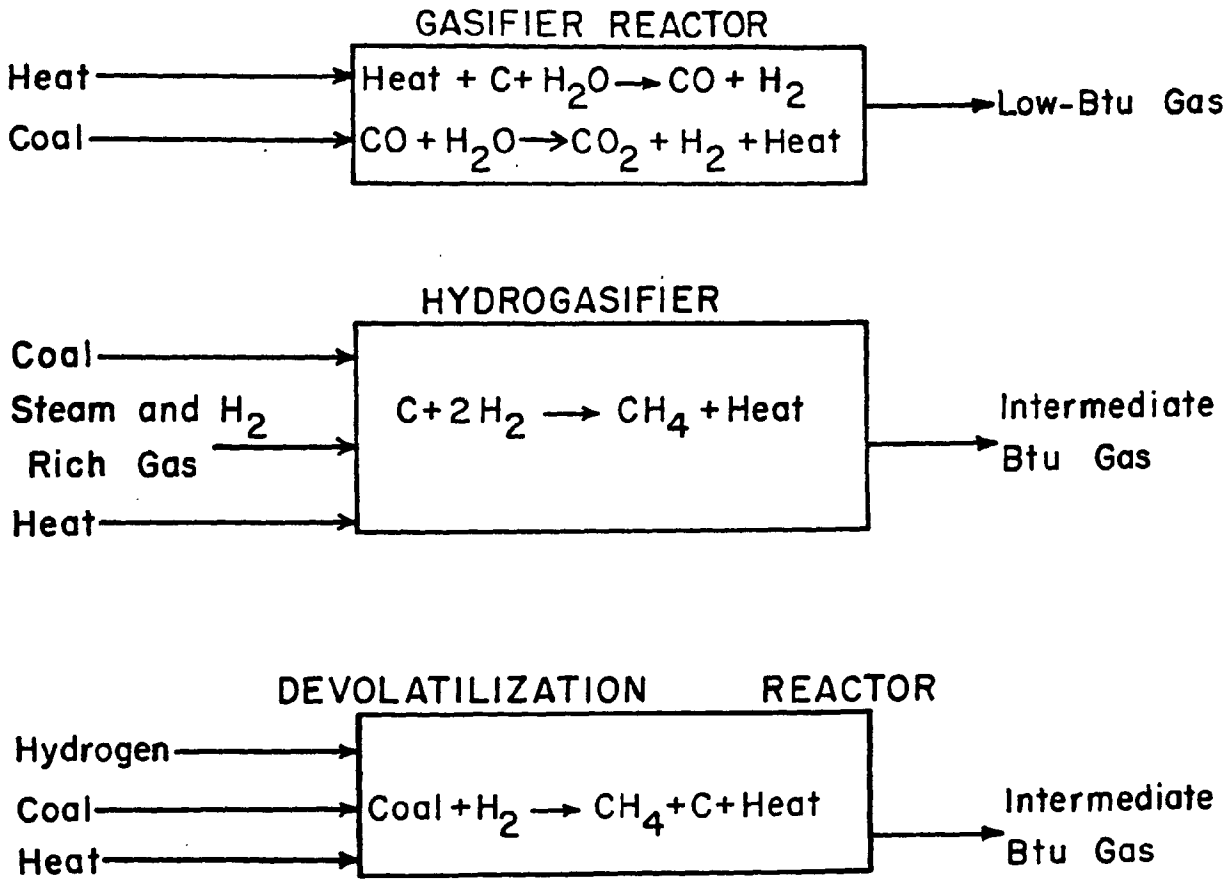


Figure 11

Principal Coal Gasification Reactions
and Reactor Types

SOURCE: The Science and Public Policy Programs, 1975, Figure 1-27.

The materials balances and the competitive feasibility of this type of project are not well documented. Likelihood of coal gasification facilities is therefore low for the foreseeable future.

OCS Platform Fabrication Yards--Brown and Root Company has proposed to build a steel platform fabrication yard near Warrenton. Such facilities consist of 50-1000 acres of cleared flat land, with support buildings and shops, and access to the sea via at least 30 feet of channel. Support infrastructure, including roads, railhead, powerlines, etc. are needed. Platforms are built in modules near the wharf, then loaded onto barges and towed to the drill site.

As described in the FACTBOOK (NERBC/RALI, 1976), construction of fabrication yards is not begun until oil fields are well established since all platforms are "custom-made." The Warrenton yard, if built, will supply steel platforms for Alaskan OCS production (Ubank, personal communication, 6-21-78).

The proposal is in the EIS stage at this time. Following public hearings in early 1978, the plans were revised to reduce filled land from 550 acres to about 200 acres. This revision amounted to selection of an "alternative" to the original proposal (Ubank, ibid).

At this time, the existing proposal appears highly likely after (or if) Alaskan OCS production begins in earnest. Additional yards in the OCZ are possible but not likely, due to the large land requirements and the existence of other yards elsewhere on the Pacific Coast.

OCS Support Bases-- Support bases are transfer points for materials and labor for offshore oil exploration and production rigs. Temporary bases support exploration rigs, permanent bases supply the oil field during the production phase (NERBC/RALI, 1976). Bases generally use leased space at existing wharfs, and include, besides the wharf, adjoining open land and buildings for storage, and small office buildings.

Service bases are usually located as close as possible to offshore operations, to cut down travel costs. Therefore, if and when oil exploration and/or production activity begins again off Oregon's coast, companies would identify ports with vacant land available at the waterfront. Because relatively small boats (<200 feet) are generally used for supply purposes, large harbors would

not be needed and might in fact be disadvantageous because of congestion. Many of the commercial fishing ports on Oregon's Coast would be ideal support base sites, except that transportation requirements may not be met at some ports. Road and/or rail access is essential, since large quantities of materials must pass through the base enroute to the rig.

If OCS activity should increase nearby, and depending on availability of wharf space, any of Oregon's coastal ports which are classified for development could become host to temporary supply bases; the larger ports (Tillamook, Umpqua, Astoria, Coos Bay, Newport) would be more likely candidates for permanent bases.

Overall likelihood of siting OCS support bases is low-medium, based on low likelihood of OCS activity.

NEED TO LOCATE IN THE OCZ

INTRODUCTION

Some of the likely energy facilities, primarily those associated with offshore petroleum development, are limited in their siting options and must locate in the OCZ if they are to be built at all; others are more flexible and could be sited elsewhere. The objective of this section is to report which facilities are technically limited to coastal zone locations, and which would have technically feasible alternative locations.

The examination for need to locate in the OCZ considered the following factors:

1. Dependency on coastal waters
2. Safety
3. Proximity to oil or natural gas fields
4. Location of markets
5. State and/or federal siting regulations
6. Type and amount of required land
7. Competing uses of land use, environmental or recreational resources affected by siting, construction, expansion or operation

DISCUSSION OF FACTORS

Dependency on Coastal Waters - This factor includes those facilities which, by definition, are built in or use coastal waters, or which must have access to the open ocean.

Safety - No facilities were found to require OCZ location for safety reasons. Although the coast is attractive for nuclear plant siting because of its largely rural, low density settlement patterns, inland sites are also available.

Proximity to Oil and Gas Fields - Facilities which, by definition, are located at or near oil fields were included here, along with support facilities which are nearly always located using proximity as a major factor. Oil ports, petroleum processing facilities, and pipelines are not absolutely dependent on proximity, but siting will be strongly influenced by oil field location.

Market Location - Energy product distribution systems are dependent on market locations. If these markets are in the OCZ, the facilities must be located in the OCZ as well. Similarly, pipelines from terminals in the OCZ must also be located in the OCZ.

Siting Regulations - Siting regulations treat each facility in its natural context, so facilities which are, by definition, located in the OCZ are included in this category. For other facilities, non-OCZ location is an available option.

Type and Amount of Land Required - Nominal physical space requirements can be met elsewhere for any land-based facility. However, some facilities do require location at a port or near deepwater channels, or otherwise along the coast. Actual or potential availability of such sites was not considered in this evaluation.

Competing Uses of Resources - This category would apply only if all non-OCZ sites were already reserved for environmental or recreational purposes, which is not the case for any of the energy facilities under examination.

CONCLUSIONS

Results of this evaluation are contained in Table 10. Using the seven factors given above, some types of energy facilities could only be sited in or near the Oregon Coastal Zone.

- Ocean Power Generating Facilities
- Offshore Oil/Gas Exploration
- Offshore Oil/Gas Production
- Oil/Gas Tanker Traffic
- Marine Pipelines and Landfalls
- Oil/Gas Port and Terminal Facilities
- OCS Platform Construction Yards
- OCS Support Bases
- Electrical Transmission Lines to OCZ Market Areas
- Petroleum Pipelines with Terminals in OCZ

TABLE 10

FACTORS REQUIRING OREGON COASTAL ZONE LOCATION

Type of Facility	Dependency on Coastal Waters	Safety	Proximity To Oil/Gas Fields	Market Location	Siting Regulations	Type of Land Required	Competing Uses of Resources	Other	Summary: If Allowed, MUST BE SITED in OCZ
Electrical Plants: Fossil	No	No	---	No	No	No	No		No
Nuclear	No	No	---	No	No	No	No		No
Biomass	No	No	---	No	No	No	No		No
Direct Solar	No	No	---	No	No	No	No		No
Ocean Power	Yes	No	---	(Yes)	---	---	No		Yes
Wind Power	No	No	---	No	No	No	No	--Availability of Wind	No
Geothermal	No	No	---	No	No	No	No		No
Hydroelectric	No	No	---	No	No	No	No		No
High Voltage Transmission	No	No	No	Yes	No	No	No		Yes
Oil/Gas Exploration Offshore	Yes	No	Yes	No	Yes	---	No		Yes
Oil/Gas Exploration Onshore	No	No	(Yes)	No	No	---	No		(No)
Oil/Gas Production Offshore	Yes	No	Yes	No	Yes	---	No		Yes
Oil/Gas Production Onshore	No	No	Yes	No	No	---	No		(Yes)
Oil/Gas Tanker Traffic	Yes	No	Yes	Yes	---	---	No		Yes
Marine Pipeline	Yes	No	Yes	Yes	Yes	Yes	No		Yes
Oil/Gas Port, Terminals	Yes	No	Yes	Yes	Yes	Yes	No		Yes
LNG Facility	No	No	(No)	No	No	No	No		No
Petroleum Refinery	No	No	(No)	No	No	No	No		No
Gasification Plant	No	No	No	No	No	No	No		No
Geopressurized Gas	No	No	No	No	No	No	No		No
Oil/Gas Pipeline on Land	No	No	No	Yes	No	No	No	Terminal Location	Yes
OCS Platform Construction	Yes	No	Yes	Yes	---	Yes	No		Yes
OCS Support Base	Yes	No	Yes	Yes	---	Yes	No		Yes

NEED FOR LOCATION in the OREGON COASTAL ZONE. "Yes" means the facility must locate in the OCZ and nowhere else in Oregon due to the indicated factor. "No" means the facility could technically locate elsewhere. Items in parenthesis mean the factor is a major consideration but is not absolutely proscriptive.

IMPACTS, STANDARDS, AND SUITABILITY

INTRODUCTION

The pressures and technical requirements which may stimulate expansion or location of energy facilities in the Oregon coastal zone have been presented in the previous sections. In this section, we examine the constraints which will be placed on these development pressures by the natural limitation of the environments of the coastal zone, and by standards which regulate siting of the facilities. The objective of this section is to provide a general assessment of the suitability of coastal environments as sites for energy facilities. Policy implications of this assessment are discussed in Volume I.

SUMMARY OF SIGNIFICANT IMPACTS

The coastal zone will be directly and indirectly impacted by construction and operation of any energy facilities within the zone and by some types of facilities located outside the zone. Obviously, the significance and type of impact will be highly dependent upon the location, size, design, operation, and impact mitigation characteristics of each individual facility. Similar facilities located in two different topographic, cultural or resource type areas will have measurably different impacts. Consequently, the evaluation given here is general and must be supplemented by site-specific studies. Any interactions among facilities will also strongly influence the impacts which may be realized.

Three systems may be affected by an energy facility siting decision: social, economic, and environmental. For purposes of this analysis, the social and economic systems are represented by the following impact categories:

- Population influx in localized area
- Alteration of local employment patterns
- Need for new or improved public facilities
- Altered traffic patterns or need for new transportation facilities, including navigation
- Increased use pressure on recreational facilities
- Increased or threatened increase in risks to public safety and property, including beaches, marine facilities and navigation corridors
- Substantial changes in energy use patterns, energy efficiencies and/or conservation

Impact categories for natural systems include:

- Air Quality Degradation
- Water Quality Degradation
- Water Consumption
- Fish and Wildlife Habitat Alteration
- Radioactive Releases
- Thermal Releases
- Aesthetic Impacts
- Noise
- Solid Waste Generation/Disposal

Table 11 presents a summary evaluation of likely significant impacts of each facility type. This table was constructed by considering environmental assessments for existing and proposed facilities, and by examination of the nature of each type of facility. As stated above, this evaluation is a generalization and may not be applicable in an individual situation. However, it does provide a minimum structure for detailed evaluation of any proposals.

In Table 11, impacts which are likely to be significant are coded "Y". Impacts which may occur, or which may be significant, in some instances, are coded "M". Dashed entries indicate only minor impacts, or that significant impacts are highly unlikely. Some impacts can or must be largely or entirely eliminated (mitigated) in order to receive necessary state or federal permits. Air quality degradation and thermal releases, for example, are strictly regulated. Likely impacts listed in Table 11 presume applicable mitigation efforts.

TABLE 11

SUMMARY OF ENERGY FACILITY IMPACTS

FACILITY TYPE	SOCIO-ECONOMIC IMPACTS								ENVIRONMENTAL IMPACTS									
	Population Influx	Altered Employment	Need for Public Facilities	Altered Transportation	Risks to Public Safety	Risks to Public Resources	Recreation Pressure	Altered Energy Use	Air Quality	Water Consumption	--Toxic Subst.	--Thermal	--Erosion/Sed.	Fish, Wildlife Hab.	Radioactive Rel.	Noise	Solid Waste	Aesthetics
Electrical Generation																		
Fossil Fuel	Yt	Yt	Yt	M	M	-	-	Y	Y	Y	M	Y	M	M	M	Y	Y	Y
Nuclear	Yt	Yt	Yt	M	M	-	-	M	-	M	M	Y	M	M	M	M	Y	M
Biomass	M	M	M	M	-	-	-	Y	Y	M	-	M	M	M	-	-	M	M
Hydroelectric	Y	Yt	Yt	Y	M	Y	M	M	-	Y	-	M	Y	Y	-	M_t	-	Y
Direct Solar	-	-	-	M	-	-	-	Y	-	-	-	-	-	M	-	-	-	Y
Ocean Power	-	-	-	M	M	M	-	-	-	-	-	M	-	M	-	-	-	M
Wind Power	-	-	-	M	-	-	-	Y	-	-	-	-	M_t	M	-	-	-	Y
Geothermal	-	-	-	M	M	M	-	Y	M	M	M	M	M	M	-	M	-	-
High Voltage Transmission Lines	-	-	-	M	M	-	M	Y	-	-	-	-	M_t	Y	-	M	-	Y
Oil/Gas Exploration																		
Onshore	Mt	Mt	Mt	Mt	Mt	Mt	Mt	-	Mt	Mt	Mt	-	Mt	Mt	-	Mt	Mt	Mt
Offshore	Mt	Mt	Mt	Mt	-	M	Mt	-	Mt	Mt	Mt	-	-	M	-	Mt	-	M
Oil/Gas Production																		
Onshore	Y	Y	Y	Y	M	M	-	-	M	M	M	-	M	M	-	M	M	Y
Offshore	Y	Y	Y	Y	Y	Y	M	-	M	M	M	-	-	M	-	-	M	M
Oil/Gas Tanker Traffic	-	-	M	Y	Y	-	M	-	M	-	M	-	-	M	-	-	-	-
Marine Pipeline	-	-	-	-	-	M	-	-	-	-	M	-	-	M_t	-	-	-	-
Oil/Gas Port, Facil. & Rail Transshipment	Y	Y	Y	Y	Y	Y	M	-	Y	Y	Y	-	M	M	-	M	Y	Y
LNG Plant	M_t	M	M	Y	M	M	-	Y	M	-	M	-	-	M	-	M	-	M
Refinery	M	M	M	-	M	M	-	M	Y	Y	M	-	-	M	-	M	-	Y
Gasification Plant	M	M	M	M	-	M	-	-	Y	Y	-	M	-	-	-	M	M	M
Geopressurized Gas	-	-	-	-	M	M	-	-	-	-	M	-	-	-	-	-	-	-
Pipelines	M_t	M_t	M_t	M	M	M	-	-	M_t	-	M	-	M	Y	-	-	-	M
OCS Platform Construction	Y	Y	Y	M	-	-	M	-	Y	Y	M	-	M	M	-	Y	Y	Y
OCS Support Base	Y	Y	Y	Y	-	-	M	-	M	Y	M	-	-	M	-	M	M	M

Y = Significant impacts likely
M = May be significant impacts
- = Significant impacts unlikely
t = Impacts probably temporary

SITE SUITABILITY

Both the project sponsors and the state must evaluate the suitability of land or offshore sites for location of particular energy facilities. Prior to proposing a site, sponsors will have established, at least to some extent, that it meets their own criteria as to location, availability, price, size and configuration, transportation access, etc.

The State has two general avenues for evaluation of site suitability. First, specific lands may be designated in advance as suitable or unsuitable for sites, based upon various specified criteria. In the second approach, as each application is reviewed, it may be evaluated against established land use plans and policies to see whether the proposal is compatible. The first course, advance designation of areas as suitable or not, has been taken by the State Energy Facilities Siting Council (EFSC) for fossil and nuclear electrical generation facilities, and by the State Land Conservation and Development Commission (LCDC) for estuaries. This approach is also being taken by local planning entities as they establish comprehensive land use plans. For other facilities and resource types, advance designation of specific areas for use by energy facilities has not been done, and applications for siting will be evaluated in a reactive mode.

It is the purpose of this section to briefly describe both processes--proscriptive designation and reactive evaluation--and to relate both to the ability of resources of the coastal zone to host these developments.

DESIGNATION OF SUITABLE AREAS

State Land Use Planning Goal 5, Guideline A-3 reads:

> Natural resources and required sites for the generation of energy (i.e. natural gas, oil, coal, hydro, geothermal, uranium, solar and others) should be conserved and protected; reservoir sites should be identified and protected against irreversible loss.

EFSC - The Energy Facilities Siting Council has responsibilities for issuance of site certificates for the following energy facilities:

- Electric power generation plants with nominal capacity greater than 25,000 kW
- Nuclear installations
- High voltage ($\geq$230 kV) transmission lines over 10 miles in length

- Solar collectors occupying 100 acres or more
- Petroleum product pipelines greater than 5 miles in length, 6 or more inches in diameter
- Gas pipelines greater than 5 miles in length, 16 or more inches in diameter

In 1974, EFSC's predecessor, Oregon Thermal and Nuclear Energy Council, designated broad areas of the state as suitable or not suitable for thermal and nuclear plants. These areas are shown in Figures 3 and 12.

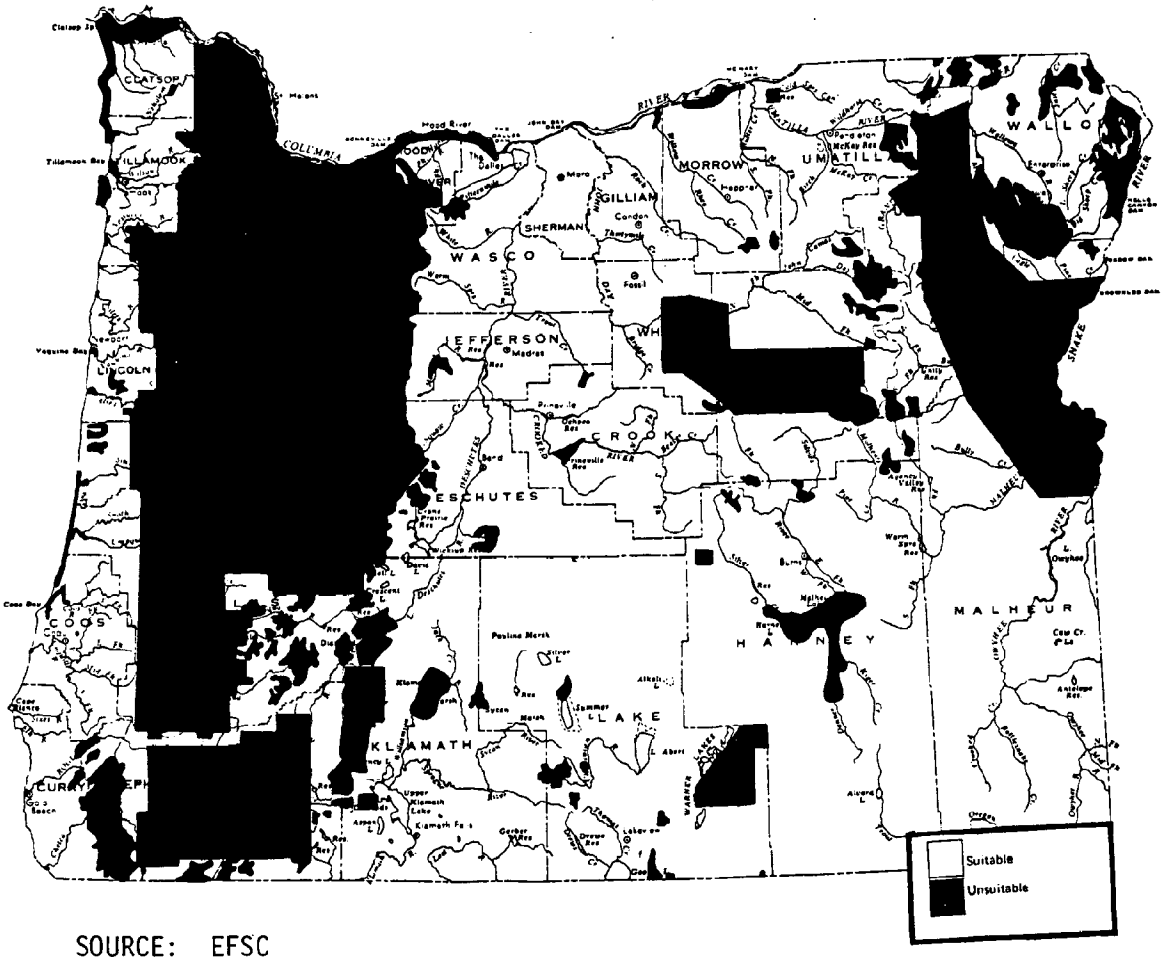
Their suitability analysis was done at a large scale and did not consider specific resource types. Criteria used for excluding areas from consideration for nuclear or large thermal were:

1. Natural Resource Areas - Excluded lands protected, reserved, or identified as valuable for natural values
2. Meteorology - Excluded fossil fuel plants from areas with existing air pollution concerns
3. Population Proximity - Excluded nuclear plants from heavily populated areas
4. Geologic Hazard - Excluded nuclear plants in active seismic areas.
5. Agricultural land - Must be conserved.

Areas which were not excluded by these criteria were designated as "suitable," with the broad caveat that all individual projects, even if proposed in "suitable" areas, would be reviewed in detail against the criteria listed in Table 12.

EFSC will not consider applications for energy facilities at sites in areas designated as unsuitable; if an applicant wishes to locate a nuclear or fossil fueled thermal plant in an area so designated, the applicant must convince EFSC to change the designations. All applications for areas designated as "suitable" must be reviewed against the standards in Table 12.

Other State Agencies-- EFSC does not have jurisdiction over many of the energy facilities which may seek to site in the Oregon Coastal Zone. Therefore, the non-EFSC facilities are controlled at the State level by individual State agencies with managerial or proprietary interests in lands or resources. Specific energy facility related authorities of State agencies are summarized in Table 13.



SOURCE: EFSC

Figure 12. Land Use Designations for Fossil Fuel Power Plants.

TABLE 12

EFSC SITING CRITERIA FOR ELECTRICAL GENERATING PLANTS

(1) There must be a need for the proposed facility

(2) Risk of injury to the public health and safety will be reduced to the extent which is reasonably practicable

(3) Disruption or adverse impacts on the environment will be reduced to the extent which is reasonably practicable. Endangered plants or species locations may not be used

(4) Beneficial use of wastes and by-products will be made

(5) Siting will conform to state-wide planning goals and comprehensive land use plans and zoning ordinances of political subdivisions in which the facility is to be located

(6) Historic or archaeological sites are not to be adversely impacted if the facility can be relocated

(7) Water use shall not infringe on existing water rights of others

(8-9) (These standards refer to the ability of the applicant to complete the project.)

(10) The project will not severely disrupt the social and economic well-being of affected communities and individuals.

(Rule 345-75-025, Adopted July 19, 1977)

TABLE 13

ENERGY FACILITY RELATED MANAGERIAL AND PROPRIETARY INTERESTS OF STATE AGENCIES

AGENCY	INTERESTS	STATUTES (ORS)
Department of Economic Development	Port Planning	777.835
Department of Environmental Quality	Sewage treatment	454.101-454.755
	Solid waste control	459.005-459.995
	Air pollution control	468.275-468.345
	Water pollution control	468.700-468.779
	Oil spillage Control	468.780-468.795
Dept. of Transportation	Scenic areas	377.505-377.530
	Outdoor Recreation Resources	390.010-390.110
	Ocean Shores;state recreation areas	390.605-390.760
	Scenic waterways	390.805-390.865
Dept. of Geology and Mineral Industries	Tidal lands jurisdiction	520.055
	Oil/gas drilling permits	520.005-520.025
Dept. of Forestry	Forest practices act	527.610-527.730
Dept. of Fish and Wildlife	Wildlife refuges	501.005-501.045
	Fishways	509.600-509.640
	Fisheries conservation zones	506.750-506.755
Division of State Lands	Drilling bases	272.551
	Natural area preserves	273.562-273.597
	Historical materials	273.705-273.742
	Mineral and Geothermal Resources	273.775-273.780
	Submersible and submerged lands	274.005-274.940
	Removal of material, filling	541.605-541.665
Water Resources Dept.	Water appropriation for power	543.010-543.620
	Water policy, classification and withdrawals	536.210-536.440
Department of Energy	Siting of certain types of energy facilities	469.010-469.992

Overall land use planning is controlled by the State-wide land use goals and guidelines. These are administered by the State Land Use Conservation and Development Commission (LCDC) and are to be implemented at the local planning level. All other state agencies must also comply with the Goals so they effectively permeate the entire state permit and review hierarchy.

The Goals and Guidelines address social welfare, ecological protection, coordination of planning, and, in some cases, permitted uses of resource areas. Four of the Goals specifically pertain to coastal resources--16 (Estuaries), 17 (Coastal Shorelands), 18 (Beaches and Dunes) and 19 (Ocean Resources), but all 19 goals are relevant to evaluation of energy facility siting or expansion applications. With the exception of Goal 16, which specifies the level of development and the uses permitted in the States' major coastal estuaries, the statewide goals provide only general guidance for development of local comprehensive plans. The goals thus provide general criteria for the evaluation of site suitability.

Goal 16 - On October 7, 1977, LCDC adopted an administrative rule classifying Oregon Estuaries. As provided in Statewide Goal 16, LCDC established four management units and assigned each of the major estuaries on the coast to specific management units. This has the effect of specifying the most intensive level of development or alteration allowable within each estuary.

Estuary classifications are shown in Table 14. The likely effect of this rule on siting of energy facilities in each estuary type is shown in Table 15.

TABLE 14

ESTUARY CLASSIFICATIONS

NATURAL	CONSERVATION	SHALLOW-DRAFT	DEEP-DRAFT
Sand Lake	Necanicum River	Tillamook Bay	Columbia River
Salmon River	Netarts Bay	Depoe Bay	Yaquina Bay
Elk River	Nestucca River	Siuslaw River	Coos Bay
Sixes River	Siletz Bay	Umpqua River	
Pistol River	Alsea Bay	Coquille River	
	Winchuck River	Rogue River	
	(Nehalem Bay)	Chetco River	

TABLE 15

ESTUARY SUITABILITY FOR ENERGY FACILITIES

ENERGY FACILITIES	NATURAL	SHALLOW-DRAFT	DEEP-DRAFT
Fossil Generator (on fill)	No	No	Maybe
Nuclear (on fill)	No	No	Maybe
Direct Solar	--	--	--
Biomass (on Fill)	No	No	Maybe
Ocean Power (Tidal Power)	No	Maybe	Yes
Wind Power (on Platform)	No	Maybe	Yes
Geothermal	--	--	--
Hydroelectric	--	--	--
Oil and Gas Explor/Production	No	Yes	Yes
Marine Pipeline Landfalls	No	Yes	Yes
Oil/Gas Port	No	Maybe	Yes
LNG Plants	No	Maybe	Yes
Gasification Plant (on fill)	No	No	Maybe
OSC Platform Construction Yards	No	No	Yes

GENERAL SUITABILITY STANDARDS

The Statewide goals and guidelines provide standards for use of lands and other resources in the Oregon Coastal Zone. In this section, each goal is reviewed for its suite suitability implications.

TABLE 16

NATURAL RESOURCES COVERED BY STATE-WIDE GOALS

Resource	Goal	Inventoried and Mapped
Agricultural Lands	3	OCC & DC
Forest Lands	4	OCC & DC
Recreation Sites	8	OCC & DC
Cultural and Historic Sites	5	OCC & DC
Natural Areas and Wilderness	5	ONTEC, OCC & DC, ONHP
Scenic Areas and Open Space	5	OCC & DC
Estuaries	16	OCC & DC
Coastal Shorelands	17	OCC & DC
Beaches and Dunes	18	OCC & DC
Ocean Resources	19	OCC & DC
Energy Production Sites	5	Various
Hazardous Areas	7	OCC & DC, DGMI
Air, Water and Land Quality	6	DEQ

OCC & DC = Oregon Coastal Conservation and Development Commission
ONTEC = Oregon Nuclear and Thermal Energy Council
ONHP = Oregon Natural Heritage Program
DGMI = Oregon Department of Geology and Mineral Industries
DEQ = Oregon Department of Environmental Quality

As shown in Table 16, the resources have generally all been inventoried and mapped by Oregon Coastal Conservation and Development Commission (OCC & DC), the Oregon Nuclear and Thermal Energy Council (ONTC), or the Oregon Natural Heritage Program (ONHP). Although many studies have been done to locate energy production sites, this information has not been collected into a comprehensive inventory. Some of that work has been done in the present study, but still there is not detailed inventory available.

The result is that proposed energy production sites may be competing with any of the other resource designations covered by Statewide goals, and there is no clear directive about how priorities are to be assigned.

In this section, each resource type is examined briefly and energy facility siting implications are discussed.

Agricultural Lands

Goal 3 specifies that all lands inventoried as being in agricultural use and having soils in classes 1-IV are to be zoned agricultural and kept for this use. Any conversion, such as to energy facility site, requires that an exception be obtained from the Department of Land Conservation and Development. Distribution systems (pipelines and high voltage lines) would generally be permissible.

Forest Lands

Goal 4 provides that forest productivity is a highly desirable land use and is not to be sacrificed unless absolutely necessary. Rights-of-ways are allowed if forest productivity is not precluded, and no new utility corridors are allowed through forest lands until existing corridors are fully utilized. Forest lands are generally too steep to be used for most of the other types of energy facilities. Wind energy sites will logically be located in uplands and may require conversion of forest lands to low-growth vegetation types.

Recreation Sites

Goal 8 requires an inventory of recreation opportunities and utilization of areas of high recreation potential for this purpose. Upland, coastal shoreland, riverine and marine recreation resources abound in the Oregon Coastal Zone. The OCC & DC inventories (1974b, c, d) and the State Parks System Plan (1976) have detailed information about locations of recreation resources. Most large energy facilities preclude some or all forms of recreation, and this impact must be carefully weighed. The uniqueness of a recreation opportunity is probably the most sensitive indicator of the magnitude of such impacts, followed by the quantity of recreation impacted.

Cultural and Historic Sites

The coast is rich in tradition and in sites evoking the important facets of the past. Indian and white cultures have provided a fragile legacy which requires careful management. The OCC & DC inventory of Historical and Archaeological Resources of the Oregon Coast (1975) lists sites of national, statewide, county, and local importance in each county. Disturbance of some of the sites is prohibited by state and federal law, and EFSC has designated historical and archaeological sites as unsuitable for location of power generating facilities.

Non-EFSC energy facilities should avoid such sites as well, and local plans should fully consider cultural and historical values.

Natural Areas

Natural areas receive high priority in several goals. These include Goal 5 which specifically requires management of natural areas for natural values if no competing uses are proposed; Goal 16 which establishes certain natural estuaries; Goal 17 which provides that "major marshes, significant wildlife habitat, coastal headlands, exceptional aesthetic resources, and historic and archaeological sites shall be protected;" Goal 18 which requires that beach and dune use "be based on the capabilities and limitations of beach and dune areas...and the need to protect areas of critical environmental concern, areas having scenic, scientific, or biological importance, and significant wildlife habitat;"and Goal 19 which requires that fisheries, biological, aesthetic and recreational resources (among others) in the marine environment be conserved.

Inventories of estuaries, coastal shorelands, and dunes and beaches have been prepared by OCC & DC (1974a, 1973, 1975b), and land use planning is well along in many shoreline areas (OCC & DC, 1975c). These inventories and plans must be consulted in evaluating sites proposed for energy facilities.

General priorities of use in coastal areas are as follows (highest to lowest):

1. Promote uses which maintain the integrity of estuaries and coastal waters;
2. Provide for water-dependent uses;
3. Provide for water-related uses;
4. Provide for non-dependent, non-related uses which retain flexibility of future use and do not prematurely or inalterably commit shorelands to more intensive uses;
5. Provide for development, including non-dependent, non-related uses, in urban areas compatible with existing or committed uses;

6. Permit non-dependent, non-related uses which cause a permanent or long-term change in the features of coastal shorelands only upon a demonstration of public need.

Table 17 shows how energy facilities relate to these priorities.

TABLE 17

RELATIONSHIP OF ENERGY FACILITIES TO THE WATER

	WATER DEPENDENT	WATER RELATED	(Non-Water Related)
Power Generation			
Fossil			
Nuclear			
Biomass			
Solar			
Ocean	X		
Wind		X	
Hydro	X		
Transmission Lines			X
Oil Exploration (offshore)		X	
Oil Production (offshore)		X	
Oil Transport		X	
Oil Ports		X	
Marine Pipeline		X	
Refineries			X
LNG Facilities			X
OCS Platform		X	
OCS Supply		X	
Pipeline			X

EFSC prohibited siting of nuclear and fossil-fueled plants in designated natural areas. The following types of designated areas are found in the OCZ and would be excluded by EFSC for electrical generation plant siting:

National Parks and Monuments
Wilderness Areas (USFS)
Roadless Areas
Outstanding Natural Areas (BLM)
Research Natural Areas (USFS)
Wild/Scenic Rivers (Federal and State)
Estuarine Sanctuaries (Federal and State)
Endangered Species Habitat
USFS Special Interest Areas (Botanical, Geological)
National Wildlife Refuge System
Oregon Natural Area Preserves
Oregon Parks Primary Resource Conservation Areas
Areas of Critical State Concern (None exist)
Nature Conservation Preserves

In addition, valuable but otherwise unprotected sites identified by the Oregon Natural Heritage Program (1977) should be given careful consideration by local planners and by State officials charged with reviewing site applications.

Scenic Areas and Open Space

Goal 5 requires that scenic and open space be specifically addressed by plans. Energy facilities located on land or in nearshore areas will affect both qualities and may in some instances be unsuitable due to aesthetic conflicts.

Five types of "Image Regions" have been mapped in the Oregon Coastal Zone (OCC & DC, 1974d), ranging from areas with potential for outstanding coastal experience to lands with only weak coastal association. Recommended land uses in each type of image region range from strict preservation of existing vistas to unrestricted uses. Industrial sites are most restricted under this system, being generally limited to areas of subtle or weak coastal aesthetics, while water-oriented uses (e.g., oil ports, OCS supply bases) are allowed in areas which are more visually associated with the coast. Table 18 illustrates the working of the image regions with regard to energy facilities. Maps showing image regions are contained in the Visual Resource Analysis of the Oregon Coastal Zone (OCC & DC, 1974d).

TABLE 18

SUITABILITY OF ENERGY FACILITIES IN COASTAL "IMAGE REGIONS"

	POTENTIAL FOR HIGH QUALITY COASTAL EXPERIENCE				
	Exceptional	Obvious and Strong	Less Obvious	Subtle	Weak
Electric Generation					
Fossil Fuel	No	No	No	Yes	Yes
Nuclear	No	No	No	Yes	Yes
Direct Solar	No	No	Yes	Yes	Yes
Biomass	No	No	Yes	Yes	Yes
Wind	Maybe	Yes	Yes	Yes	Yes
Ocean Power	No	Yes	---	---	---
Hydro	No	No	---	---	---
High Voltage Transmission	No	No	No	Yes	Yes
Oil Exploration	No	No	No	Yes	Yes
Oil Ports, Terminal	No	No	Yes	Yes	Yes
Refinery	No	No	No	Yes	Yes
LNG Facilities	No	No	No	Yes	Yes
Marine Pipeline, Landfall	No	No	Yes	Yes	Yes
Land Pipeline	No	No	Yes	Yes	Yes
Oil Platform Const. Yard	No	No	Maybe	Yes	Yes
OCS Support Bases	No	No	Yes	Yes	Yes

Hazardous Areas

Goal 6 requires that land uses in areas subject to geologic hazards or natural disaster be compatible with these factors.

Geologic Hazards - The Oregon Department of Geology and Mineral Industries has inventoried geologic hazards of the Oregon Coastal Zone and published geologic legend maps and discussions for all lands in the coastal zone. In 1974, the Department evaluated land use implications of eight types of hazards:

- Erosion (stream, wind, wave)
- Deposition (stream, wind, wave)
- Mass Wasting (landslide, mantle creep, rockfall)
- Ground Water (high table, ponding, salt water, pollution)
- Soil (compressible, weathered, thin)
- Bedrock (lithology, faults)
- Flooding (stream, tidal)
- Earthquakes

In addition to the reports issued by DGMI, a recent detailed study of shoreline erosion along the coast is available (Stembridge, 1976).

When a facility is proposed for a particular site, these documents can be used for a preliminary evaluation of potential geologic hazards.

The first step is to determine potential geologic hazards at the site, using the appropriate hazards maps from DGMI. The next step is to use Table 19 to ascertain the relative significance of the hazard(s) for land uses associated with the proposed energy facility. The final step is to verify hazards or lack of hazards through on-site evaluation by experts. Existence of hazards may or may not eliminate the site from consideration, depending on specific circumstances. In all cases, presence of hazards must signal caution for permitting agencies and facility designers. Approval of the proposal would then include appropriate conditions to ensure that potential impacts are reduced or eliminated through proper engineering.

For quick reference, Table 20 summarizes the likely relative significance of the geologic hazards for various energy facilities. This table is based upon Table 19.

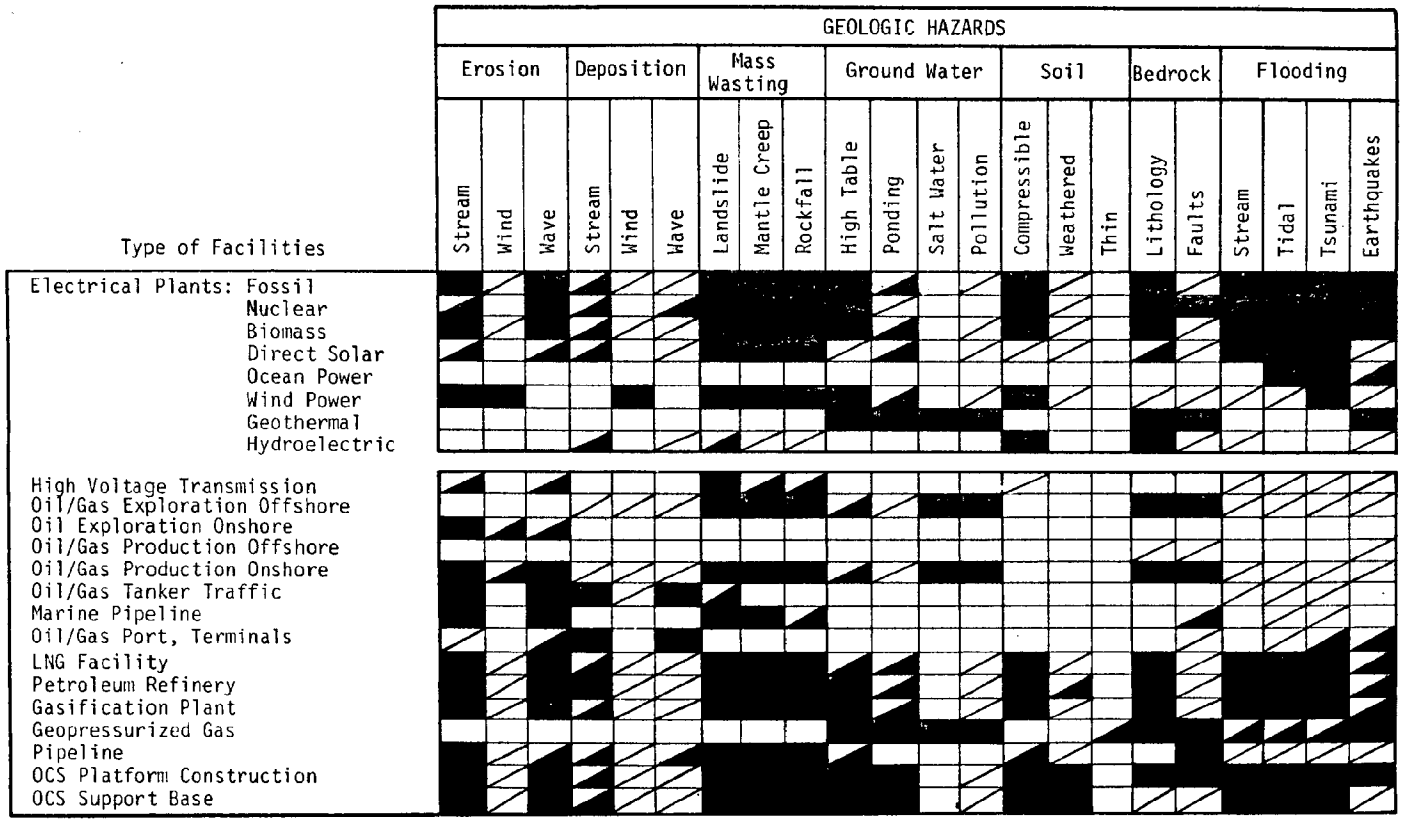
TABLE 19

RELATIVE IMPACT OF HAZARDS ON VARIOUS TYPES OF LAND USES

Relative significance of hazard to land use: ● High ◒ Moderate ○ Low N/A

	LAND USES																			
	Erection of Large Structures				Regional Uses					Linear Developments					Material Discharge			Material Extraction		
	Industrial	Commercial	Dams	Nuclear plants	High density subdivision	Low density residential	Airports	Forestry and crops	Reservations	Channels	Pipelines	Roads and highways	Railroads	Power lines	Solid waste disposal	Septic tanks	Dredge spoils	Ground water	Metallic mining	Nonmetallic mining
GEOLOGIC HAZARDS																				
Erosion																				
Stream	●	●		◒	●	◒	○	●	○		◒	◒	◒	◒	◒		○		○	○
Wind	○	○			○	○	○	○	○						◒					○
Wave	●	●		●	●	●	○	○	○		◒	◒	◒	◒	○		◒			
Deposition																				
Stream	◒	◒	◒	◒	◒	◒		●	○	●		○								
Wind	○	○			◒	◒	◒		○	○		○								
Wave	○	○	○	◒	○	○	○		○	●	◒									
Mass wasting																				
Landslide	●	●	◒	●	●	●		◒	○		●	●	●	●	◒	◒			●	●
Mantle creep	●	●	○	●	●	◒		○	○		◒	◒	◒	◒	○	○			○	○
Rockfall	●	●	○	●	●	◒		○	●		●	●	●	◒					●	●
Ground water																				
High table	●	◒		●	●	◒			○						●	●			●	●
Ponding	◒	◒		○	●	◒	●	○	○			○			◒	●			○	○
Salt water																		●		
Pollution	○	○			●	●			○									●		
Soil																				
Compressible	●	●	●	●	●	●	●		○		◒	◒	◒	○						
Weathered	○	○		○	○	○					○				●	●				
Thin					○	○									●	●				
Bedrock																				
Lithology	●	○	●	●	◒	○									●	●				
Faults	○		○	●											○					
Flooding																				
Stream	●	●	○	●	●	◒	●	◒	○		○	◒	○	○	●	◒			○	◒
Tidal	●	●		●	●	◒	●	○	○		○	○	○	○	○	○		○		◒
Tsunami	●	●		●	●	●	●	○	●	○	○	○	○	○	○	○		○		◒
Earthquakes	◒	○	○	●	○	○	○		○		○	○	○	○	○				○	○

SOURCE: DGMI, 1974



Relative Significance of Hazard

- High
- Moderate
- Low
- Not Applicable

TABLE 20

RELATIVE IMPACT OF GEOLOGIC HAZARDS ON ENERGY FACILITIES
(After ODGMI, 1974, Table 2)

Energy Production Sites

Goal 5 requires identification and conservation of sites suited for energy production. As discussed in the first section of this report, inventories are available for hydroelectric dam sites (FPC, 1976), for pump-storage sites (ACOE, 1976, 1978), for fossil fuel plants (PNWRBC, 1977), nuclear sites, wind power (Peterson, 1978), and geothermal. Information about oil and gas areas is also available, and port planning takes into account the potential for increased petroleum transfer facilities.

However, no comprehensive inventory of all energy production resources in the OCZ has been compiled. The analysis presented in the first section of this report was derived from many separate sources, and that information could be used as the basis for such an inventory. The next step, dedication of sites for eventual use for energy facilities, is much more complex and would require major additional effort.

Air and Water Quality

Goal 6 requires that wastes and process discharges meet existing state or federal environmental quality statutes, rules and standards, and that such discharges "shall not (1) exceed the carrying capacity of such resources, considering long range needs; (2) degrade such resources; or (3) threaten the availability of such resources."

Air Quality - ONTC (1974) determined that meteorological concerns would not, a priori, preclude fossil-fuel power plants from siting anywhere in the coastal zone, since no appreciable air quality problems now exist. Judgments are to be made on individual proposals for individual sites.

That process would apply today for any proposed energy facility. DEQ has federally-designated responsibility for enforcement of air quality standards in Oregon, and they would have to issue permits for emissions from any proposed facilities. Determination of compliance with New Source Performance Standards, Prevention of Significant Deterioration (PSD) Standards, and standards (to be promulgated in 1979) for volatile organics will require detailed modeling of the emissions and the affected airsheds.

Because of the PSD requirements, fossil-fuel plants and other heavy air pollutant emitters may be precluded from siting in the coastal lowlands, since plumes would invariably intersect pristine uplands located downwind. (Waddell, WPPSS, personal communication 6-26-78)

Water Quality - DEQ has responsibility for protection of water quality. This responsibility makes DEQ a prime actor in evaluating the suitability of sites for petroleum-related facilities, since most freshwater, estuarine, and marine ecosystems have little tolerance for chronic or massive injections of hydrocarbons due to accidental or routine discharges. DEQ also has review and permit authority for all sewage systems and waste discharge systems, and has strict standards for each.

Water quality considerations will strongly influence the acceptability of energy facilities, particularly thermal plants and oil transfer and storage facilities (pipelines, terminals, tank farms, etc).

The State Water Resources Board is responsible for allocation of water in the State, and for energy facilities which use large quantities of water (e.g., gasification plants, refineries, and certain types of thermal generating plants), the fact that water supply in the OCZ is often critical may be a strong deterrent to siting there. Many surface waters in the OCZ are withdrawn from allocation or are otherwise excluded from allocation for industrial or power production use (OCC & DC. 1974c). Facilities must carefully consider whether adequate and dependable water is available.

PERMITS

Permits for siting, construction and operation of energy facilities are required from various federal, state and local authorities, depending upon the type of facility, design characteristics, location, and operating patterns.

STATE PERMITS

Table 21 summarizes the state permits which would likely be required for each type of facility. This list is generalized and other (or fewer) permits might actually be involved for an actual proposal.

The state maintains a Permit Coordination Center at the Intergovernmental Relations Division. For large Non-EFSC developments, such as several covered by this study, there is also a Master Application procedure available. For facilities which are under the jurisdiction of EFSC, granting of site certification is preceded by an interagency coordination process, during which all agencies specify conditions in certification which are required for the facility to comply with the agency's standards. Once an EFSC certificate is granted, issuance of individual state agency permits is mandatory.

FEDERAL PERMITS

Introduction

Depending on location and design, energy facilities locating in the Oregon Coastal Zone could require permits from a wide variety of federal agencies. In addition to permits, such facilities could also require federal approvals, leases, right-of-ways, and/or preparation of environmental impact statements under the National Environmental Policy Act. These authorities are in addition to state and local entities which may have jurisdiction over some aspect of the facility.

Recent Studies

The Northwest Federal Regional Council has completed a three-volume report dealing with the regulatory and licenising requirements affecting bulk energy facilities. Volume I (NFRC 1978a) covers thermal power plants, while Volume II (NFRC 1978b) evaluates interstate petroleum pipeline systems. Volume III deals with marine oil (port) transfer facilities. These reports discuss federal and state permit requirements in detail.

TABLE 21

LIKELY NEEDED STATE PERMITS

● Probably needed
○ May be needed

FACILITY	ASSUMPTIONS	ENERGY SYSTEMS PERMIT / Department of Energy / Alternative Energy Device Tax Credit	Energy Supplier Weatherization and Energy Conservation Services	Energy Facilities Siting Certificate	LAND USE PERMIT / Department of Environmental Quality / Permit for Activities in Wilderness Area	Department of Forestry / Permit to Clear Right-of-Way	Easement (Permanent) on State-Owned Forest Land	Permit to Enter Closed Area	Special Use Permit	Department of Geology & Mineral Industry / Permit to Drill Geophysical Test Hole	Permit to Drill Geothermal Well	Permit to Drill New Oil or Gas Well	Permit to Drill Stratigraphic Test Hole	Department of Transportation / Parks and Recreation Branch	Land Use Changes, etc. Near Scenic Waters	Ocean Shore Development Permit	Ocean Shore Products Removal Permit	Ocean Shore Pipelines, Cables, Conduit	Division of Lands	Geothermal Exploration on State Lands	Geothermal Lease on State Lands	Oil and Gas Exploration on State Lands	Oil, Gas and Sulphur Lease on State Upland	Oil, Gas and Sulphur Lease on Tidal and Submerged Lands
Electrical Plants Fossil Fuel	Coal (On Coast)			●						○							●							
	Gas Turbine (Upland)			○			○	○	○	○														
Nuclear	On Coast			●						○							●		●					
Biomass	Co-Generation at Pulp Mill																							
	Biomass Farm on State Forest						●	●	●	●														
Direct Solar	Central Photovoltaic (Private Upland)			●																				
Wind Power	Multiple Units (Uplands)			○			●	●	●															
	Coastal Headlands			○												○		●						
Geothermal	Uplands			●			●	●	●											●	●			
Hydro				●			○	○	○															
High Voltage Transmission	Existing Corridor																							
	New Corridor			●			●	●	●					○				●						
Oil/Gas Exploration	Uplands				○	○		○	●	●		●	●									●		
	Marine Submerged Land									●		●	●									●		
	Oregon OCS																							
Oil/Gas Production	Uplands				○		●		●			●											●	
	State Submerged Lands											●												●
	Oregon OCS																							
Oil/Gas Tanker Traffic	Columbia River																							
	Along Coast																							
Marine Pipeline	Landfall at Existing Port			○														●						
Oil/Gas Port and Terminal Facilities	Deepwater Port in State Water																							
	Deep Draft Port Tank Farm															●		●						
	Deep Draft Port LNG Facility									●						●		●						
Petroleum Refinery	At Existing Port									●						●		○						
Gasification Plant	Coal Imported From Alaska at Existing Port									●						●		○						
Geopressurized Gas	Aquifer Storage											●	●			○		○						
OCS Platform Construction																●		●						
OCS Support Base	Temporary																	○						
	Permanent																	○						
Pipeline				○														○						

TABLE 20
(Continued)

FACILITY	ASSUMPTIONS	PLANT-RELATED PERMITS / Department of Commerce / Building Codes Division: Boiler or Pressure Vessel; Operate	Boiler or Pressure Vessel, Installation	Building Permit and Plans Review	Electrical Permit/Label	Elevator	Mechanical Permit	Plumbing Permit	State Fire Marshall / Explosives	Flammable and Combustible Liquids (Handle, Store, Distribute)	LPG Containers	LPG Delivery Trucks	LPG Fitters	LPG Installer	LPG Tank Installation	Department of Environmental Quality / Solid Waste Disposal Facility Plans Approval	Solid Waste Disposal Site Permit	Hazardous Waste Disposal	TRANSPORTATION / Public Utility Commissioner / Rail-Air Program: Permits for Rail-Highway Intersection	Department of Transportation / Aeronautics Division: Approval of Airport/Heliport Sites	Registration/License for Airport Heliport Sites	Highway Division: Permit to Perform Operations on H.D. Property (Pipeline, Pole Lines, etc.)	Road Approach Construction Permit
Electrical Plants Fossil Fuel	Coal (On Coast)		●	●	●	●	●	●								●	●	●	○				●
	Gas Turbine (Upland)				●	●	●	●		●													●
Nuclear	On Coast		●	●	●	●	●	●								○		●					●
Biomass	Co-Generation at Pulp Mill		●	●		●										●	●						
	Biomass Farm on State Forest					●																	●
Direct Solar	Central Photovoltaic (Private Upland)					●		●															
Wind Power	Multiple Units (Uplands)				○	●		●															
	Coastal (Headlands)				○	●		●															●
Geothermal	Uplands		●	●		●		●	●														●
Hydro						●	●	●	●														●
High Voltage Transmission	Existing Corridor																						
	New Corridor																						
Oil/Gas Exploration	Uplands					●			●									●					●
	Marine Submerged Land					●			●									●					
	Oregon OCS																	●					
Oil/Gas Production	Uplands					●		●	●									●					●
	State Submerged Lands					●		●	●									●					
	Oregon OCS																						
Oil/Gas Tanker Traffic	Columbia River																						
	Along Coast																						
Marine Pipeline	Landfall at Existing Port					●				○													
Oil/Gas Port and Terminal Facilities	Deepwater Port in State Water					●	●	●		●								●					
	Deep Draft Port Tank Farm					●	●	●		●								●					
	Deep Draft Port LNG Facility					●	●	●		●		●	●	●	●			●					
Petroleum Refinery	At Existing Port	●	●		●	●	●	●		●						●		●	○				●
Gasification Plant	Coal Imported From Alaska at Existing Port	●	●		●	●	●	●		●						●		●	○				●
Geopressurized Gas	Aquifer Storage	●	●			●		●	●									●					●
OCS Platform Construction		●	●		●	●	●	●		●						●	○	●	○				●
OCS Support Base	Temporary				●	●			●							●		●		●	●		
	Permanent				●	●		●	●							●		●	○	●	●		
Pipeline										●													●

TABLE 21
(Continued)

FACILITY	ASSUMPTIONS	AIR QUALITY Department of Environmental Quality: Air Contaminant Discharge Permit	Notice of Construction and Approval of Plans for Air Contaminant Sources	Indirect Source Construction Permit	WATER QUALITY Department of Environmental Quality: Sewage Disposal Systems	NPDES Water Pollution Discharge Permit	Water Pollution Control Facilities Permit	Department of Fish and Wildlife: Explosives or Harmful Substances in Water	Division of Lands: Permit for Filling or Removal in State Waters: a. Fill	b. Removal	c. Fill and Removal	d. Flood Repair/Erosion Control	Marine Board: Permits for Boat Use in Federal and State Wild/Scenic Rivers	Department of Water Resources: Permit to Appropriate Ground Water	Permit to Appropriate Public Waters	Sale of Hydroelectric Project	License for Hydroelectric Project	Review of Plans for Major Hydraulic Structures	Permit to Construct Reservoir	Transfer of Water Rights	Permit for Non-Conforming Water Well
Electrical Plants Fossil Fuel	Coal (On Coast)		●	●		○	●	●		○					●	●					
	Gas Turbine (Upland)		●	●																	
Nuclear	On Coast		○	●		○	●	●		○					●	●					
Biomass	Co-Generation at Pulp Mill		●	●			●	●													
	Biomass Farm on State Forest					○									●	●				○	
Direct Solar	Central Photovoltaic (Private Uplands)																				
Wind Power	Multiple Units (Uplands)																				
	Coastal (Headlands)																				
Geothermal	Uplands		●	●			○	○													
Hydro										●						●	●	●	●	●	○
High Voltage Transmission	Existing Corridor																				
	New Corridor																				
Oil/Gas Exploration	Uplands		○	○			○	○	○												
	Marine Submerged Land						○	○													
	Oregon OCS																				
Oil/Gas Production	Uplands		●	●			○	●													
	State Submerged Lands		●	●			○	●													
	Oregon OCS																				
Oil/Gas Tanker Traffic	Columbia River																				
	Along Coast																				
Marine Pipeline	Landfall at Existing Port			○				○	○												
Oil/Gas Port and Terminal Facilities	Deepwater Port in State Water		○	●		○	○	○													
	Deep Draft Port Tank Farm			●		○	○	○		●											
	Deep Draft Port LNG Facility			●		○	○	○		●											
Petroleum Refinery	At Existing Port		●	●	○	○	●	●		●											
Gasification Plant	Coal Imported From Alaska at Existing Port		●	●	○	○	●	●		●											
Geopressurized Gas	Aquifer Storage					●		●						●							
OCS Platform Construction			●	●			●	●		●											
OCS Support Base	Temporary			●		○	○	○													
	Permanent			●		○	○	○		●											
Pipeline									○	●											

Two other studies (Booz, Allen and Hamilton, 1975; Resource Planning Associates, 1976) examined ways to streamline the federal permitting process for energy facilities. Completed prior to formation of the Federal Department of Energy, these reports nevertheless contain a detailed review of agency interests and regulatory activities.

Regulatory Roles

In one way or another, the federal government is involved in regulation of most of the energy facilities considered in this study. This regulation may be either direct, as in the role of the Nuclear Regulatory Commission (NRC) in licensing any type of nuclear fueled power plant, or advisory, as in the role of the Fish and Wildlife Service (FWS) in reviewing and approving other agencies' permits (e.g. Army Corps of Engineers (ACOE) dredge and fill permits).

Any project which touches upon federally managed lands will require some type of permit or clearance from the managing agency (e.g. U.S. Forest Service [USFS], Bureau of Land Management [BLM], Bureau of Indian Affairs [BIA], etc.). Similarly, the federal agencies review and comment on all projects at the local, state or federal level which may affect their resources, jurisdictions, or missions. Some agencies become involved mainly through enforcement of standards or laws governing some attribute of an energy facility (e.g. Occupational Safety and Health Administration [OSHA] enforces safety laws at all facilities).

Agency Interests

Federal Energy Regulatory Commission (FERC)

FERC is an independent component of the Department of Energy and regulates petroleum and natural gas in interstate commerce. For interstate projects, FERC issues certificates authorizing construction, extension, acquisition, operation and abandonment of transmission and storage facilities. FERC also reviews water rights transfers affecting federal hydroelectric generation capacity.

Economic Regulatory Agency (Federal Department of Energy)

ERA administers pricing and allocation regulation for petroleum and coal and reviews electrical facilities for need.

Bonneville Power Administration (BPA)

BPA is the marketing agency for power generated at federal hydropower facilities in the Pacific Northwest, and also operates a large transmission system. BPA becomes involved if hookup to the grid is anticipated or if BPA rights-of-way are affected.

Nuclear Regulatory Commission (NRC)

Design of nuclear steam supply systems, plants, siting and construction are regulated by NRC, which also issues operating licenses.

U.S. Forest Service (USFS)

USFS issues right-of-way easements and special use permits for lands under its jurisdiction.

Bureau of Land Management (BLM)

BLM issues right-of-way easements and special use permits for lands under its jurisdiction.

Bureau of Indian Affairs (BIA)

BIA issues right-of-way easements and special use permits for lands under its jurisdiction.

Bureau of Reclamation (BR)

Where facilities involve lands or facilities within irrigation projects developed by BR, right-of-way easements and facility permits are required from BR.

National Park Service (NPS)

Any activity affecting properties administered by the NPS requires a permit. In addition to parks, monuments, recreation areas, and memorials, NPS jurisdiction includes sites on the Register of Historic Places and the National Registry of Natural Landmarks.

U.S. Coast Guard (USCG)

All bridges and other facilities affecting navigation and safety in the nation's waterways require USCG permits. The Coast Guard also inspects and certifies drill rigs, enforces laws covering oil transport vessels, and approves oil spill control plans.

Army Corps of Engineers (ACOE)

The Corps of Engineers is responsible for processing applications and issuing permits for authorizing structures and work in or affecting navigable waters of the United States. This includes all construction in or affecting streams and coastal shores and waters, and the discharge or dumping of dredging materials.

Fish and Wildlife Service (FWS)

Any action which may affec+ fish and wildlife must be reviewed and approved by FWS.

National Marine Fisheries Service (NMFS)

All ACOE permits are reviewed and must be approved by NMFS.

U.S. Geological Survey (USGS)

Mineral resources extracting, including oil and gas removal, is under the management authority of the USGS, which must approve all plans for such activities.

Environmental Protection Agency (EPA)

EPA reviews the actions of the State Department of Environmental Quality in issuance of permits for waste water discharge, point and non-point sources of water pollution, and emissions affecting air quality.

Federal Aviation Administration (FAA)

Any activity which will affect air transportation or aircraft safety must be reported to the FAA for evaluation and clearance.

Federal Communications Commission (FCC)

Installation of microwave systems or use of radio communications equipment in construction or operation requires FCC authorization.

Interstate Commerce Commission (ICC)

ICC approval is required for tariff, rate of depriciation and fair value base rate for pipelines carrying petroleum or other products in interstate commerce.

Office of Pipeline Safety (OPS)

The design and construction of pipelines must be approved by OPS (Department of Transportation).

Occupational Safety and Health Administration (OSHA)

OSHA sets standards for safety practices at all facilities.

Department of Justice (JD); Federal Trade Commission (FTC)

Questions of industry structure and competition are reviewed by FTC and JD.

Securities and Exchange Commission (SEC)

Financial aspects of publicly held corporations involved in facilities development are scrutinized by SEC.

Council on Environmental Quality (CEQ)

CEQ reviews and coordinates EISs prepared by land management or regulatory agencies.

Regulatory Activities

The major activities of federal agencies in regulatory energy facilities are summarized in Table 22, which has been derived from the studies cited above, particularly the report by Booz, Allen and Hamilton (1975).

It should be noted that this table is merely a guide and is not definitive--any particular facility might be regulated by more or fewer agencies. Also, while the permit process is relatively well documented for existing types of facilities (e.g. nuclear plants, oil refineries, etc.), the likely permit process is much less certain for facilities which have yet to be commercially sited (e.g. direct solar, wind generators, and ocean power).

TABLE 22

FEDERAL REGULATORY ACTIVITIES
FOR ENERGY FACILITIES

	FERC	NRC	USFS	USCG	ACOE	FWS	NMFS	USGS	BLM	BIA	BR	NPS	EPA	FAA	BPA	FCC	ICC	OPS	OSHA	JD	FTC	SEC	CEQ
Fossil-Fueled Power Plant	P		F		P	A	A		F	F	F	F	A	A					S	S	S	S	E
Nuclear Power Plant		P	F		P	A	A	C	F	F	F	F	A	A					S	S	S	S	E
Direct Solar Generating			F			A	A		F	F	F	F		A					S	S	S	S	E
Biomass Fueled Power Plant	P		F		P	A	A		F	F	F	F	A	A					S	S	S	S	E
Wind Energy System			F			A	A		F	F	F	F		A		A			S	S	S	S	E
Ocean Power Plant				P	P	A	A		F										S	S	S	S	E
Hydroelectric Gen. Plant	P		F		P	A	A		F	F	F	F	A						S	S	S	S	E
Geothermal Power Plant			F		P	A	A	P,M	F	F	F	F	A	A					S	S	S	S	E
Hi-Voltage Elect. Trans. Lines	P		F		P	A	A	P	F	F	F	F		A	F				S	S	S	S	E
OCS Survey and Exploration					P	A	A	P,M	F										S	S	S	S	E
Production					P	A	A	P,M	F					A					S	S	S	S	E
Federal Lands O/G Survey & Expl.			F		P	A	A	P,M	F	F	F	F		A					S	S	S	S	E
Production			F		P	A	A	P,M	F	F	F	F		A					S	S	S	S	E
State/Private Lands and Water																							
Survey and Exploration			F		P	A	A	P	F	F	F	F		A					S	S	S	S	E
Production			F		P	A	A	P	F	F	F	F		A					S	S	S	S	E
Oil Deepwater Ports				P	P	A	A												S	S	S	S	E
Marine O/G Pipelines	P				P	A	A		P									S	S	S	S	S	E
Onshore Trunk Pipelines			F		P	A	A		F	F	F	F						S	S	S	S	S	E
Onshore Interst. Pipelines	P		F	P	P	P	A		F	F	F	F	A	A	F	F	A		S	S	S	S	E
Oil Refineries	P				P	A	A						A	M					S	S	S	S	E
Onshore O/G/LNG Ports	P		F		P	A	A		F	F	F	F		A				S	S	S	S	S	E
LNG Pipelines	P		F		P	A	A		F	F	F	F						S	S	S	S	S	E
Gasification Plants	P		F		P	A	A		F	F	F	F	A	A					S	S	S	S	E
OCS Platform Yard					P	A	A		F	F	F		A	A					S	S	S	S	E
OCS Support Bases			F		P	A	A							A					S	S	S	S	E

Key:

P = Permit

F = Permit, Lease, or R-O-W for its land

A = Major Approval or Clearance

M = Manages Lease of Federal Lands

C = Consultative Role

S = Enforces Standards or Laws

E = Distributes and Coordinates EISS

SOURCES: Booz, Allen and Hamilton (1975); Resources Planning Associates (1976); Northwest Federal Regional Council (1978).

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