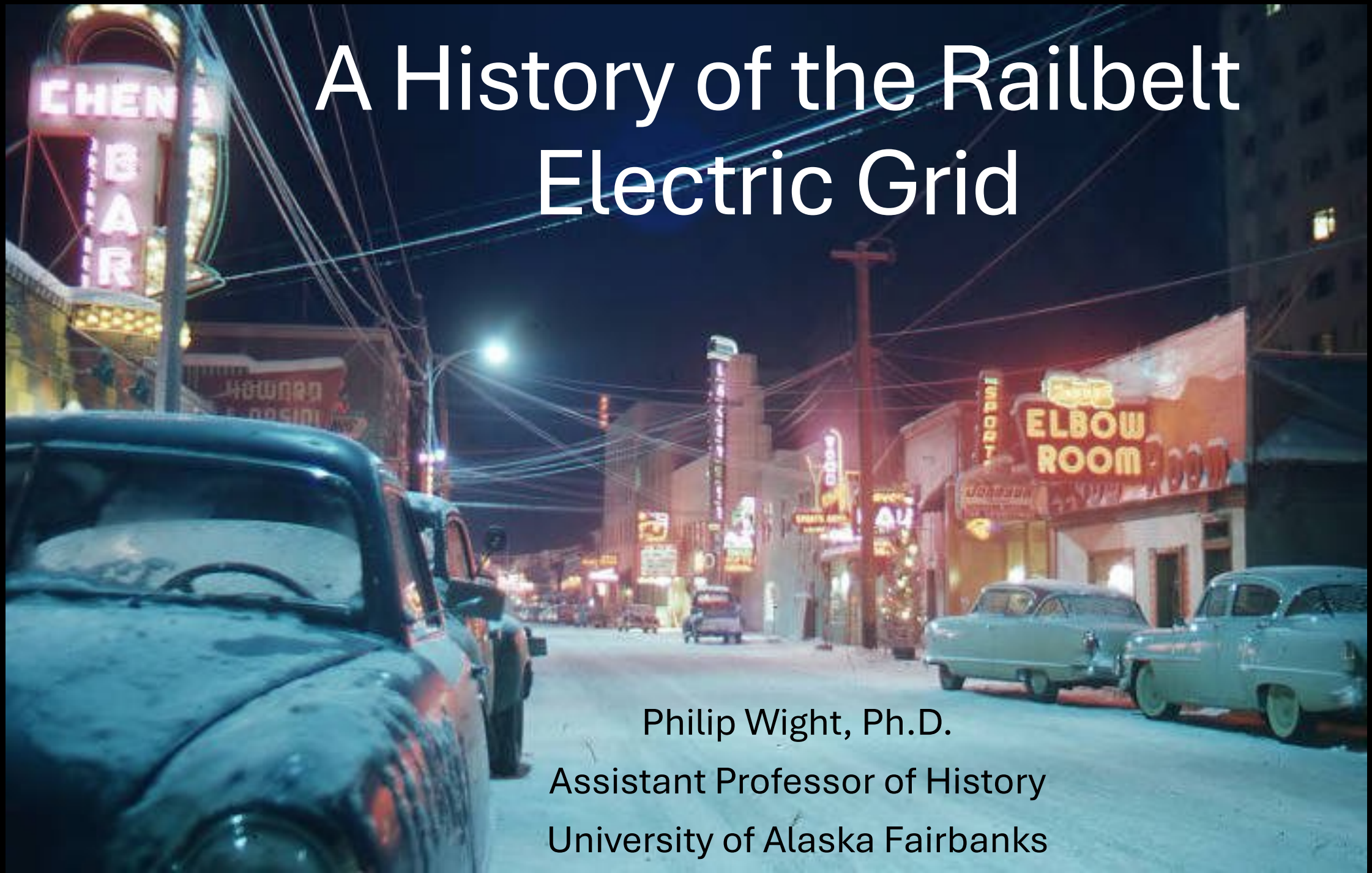
A History of the Railbelt Electric Grid



Philip Wight, Ph.D.
Assistant Professor of History
University of Alaska Fairbanks

Archives, University of Alaska, Fairbanks

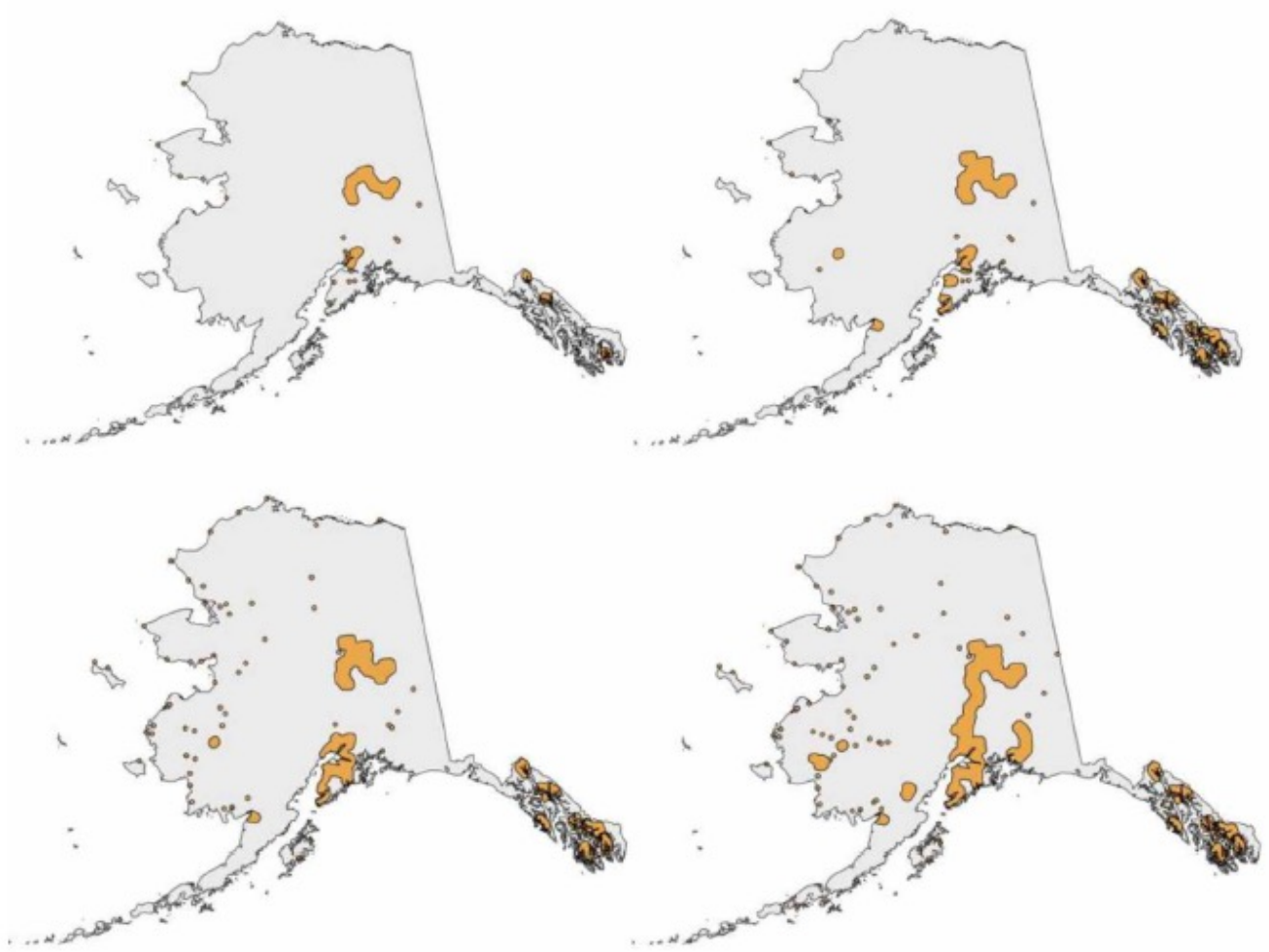
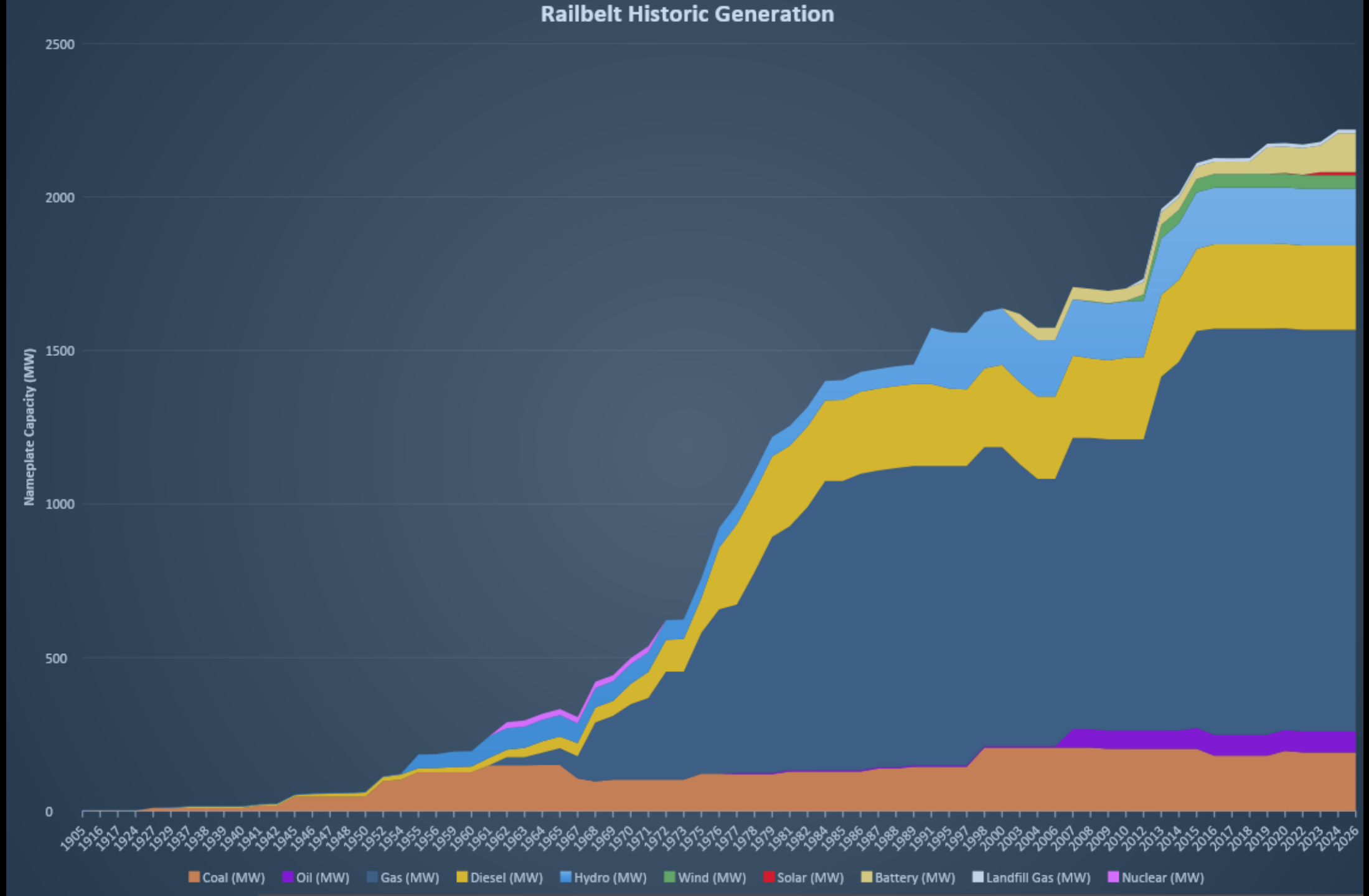


Figure 2.1. Electric grid build-out in Alaska. From upper left going clockwise: 2a) Alaska electric grid infrastructure in 1930; 2b) Alaska electric grid infrastructure in 1950; 2c) Alaska grid infrastructure in 1970; 2d) Alaska electric grid infrastructure present day. Source: Alaska Center for Energy and Power, UAF.

From Holdmann, “Renewable Energy Development in Alaska”, UAF MA Thesis, 2019.

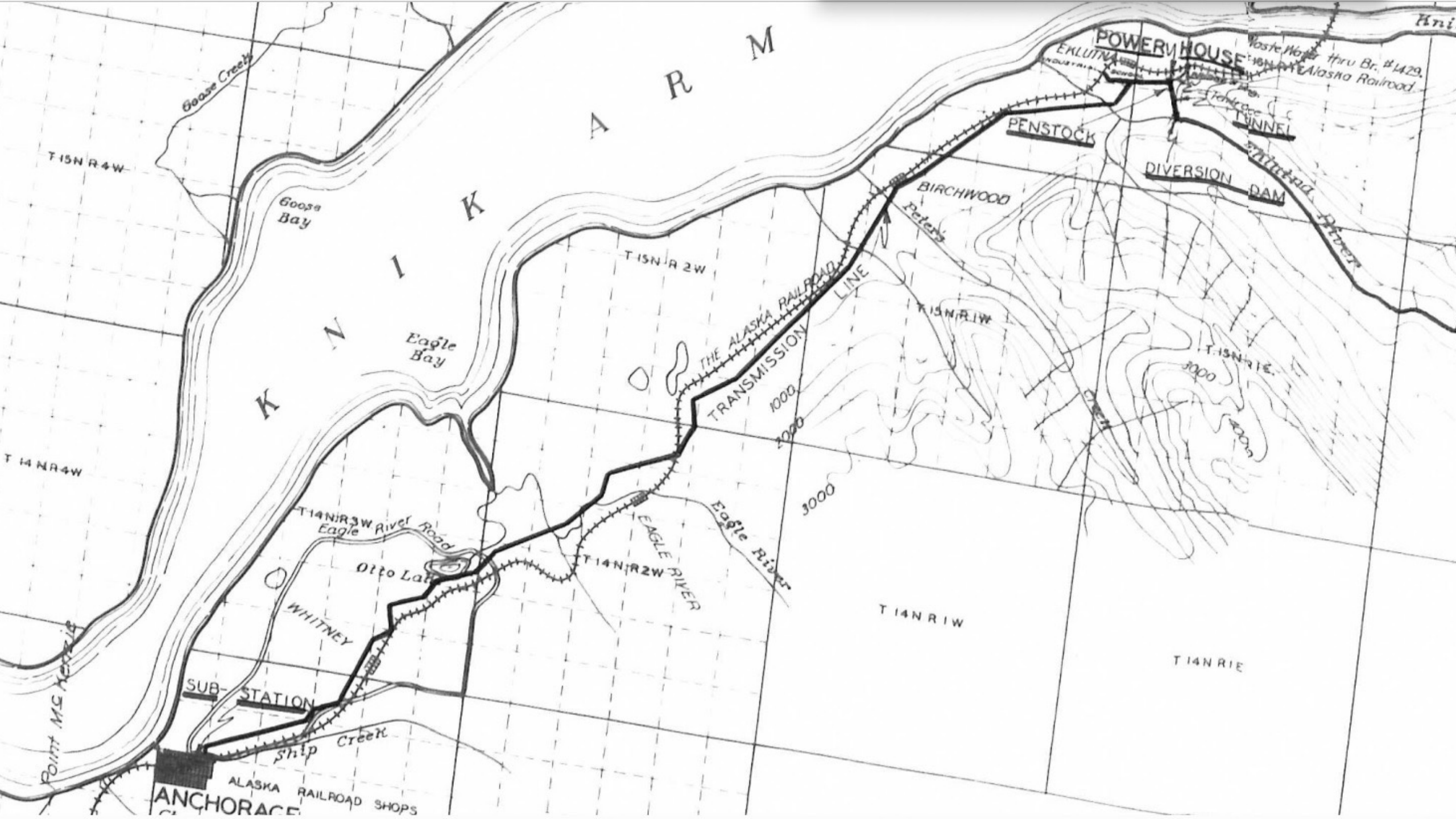
Alaska's Railbelt Utilities

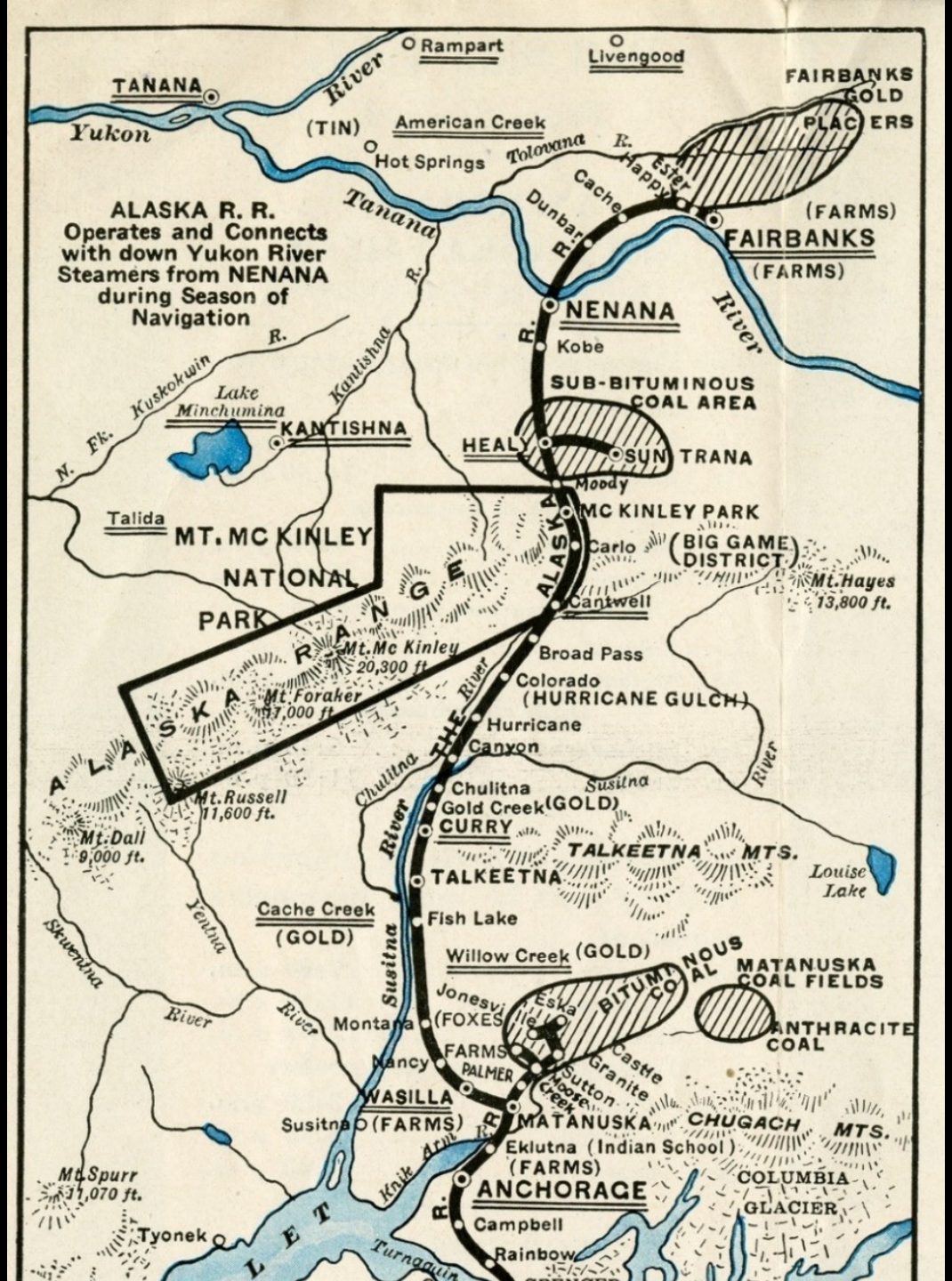
- Follows the road system from Fairbanks through the Kenai Peninsula
- Serves more than 75% of Alaskan's energy needs
- 4 major utility cooperatives (co-ops)
  - **GVEA** - Golden Valley Electric Association
  - **MEA** - Matanuska Electric Association
  - **CEA** - Chugach Electric Association
  - **HEA** - Homer Electric Association


Railbelt Historic Generation
Nameplate Capacity (MW)
2500
2000
1500
1000
500
0
1905 1916 1917 1924 1927 1929 1937 1938 1939 1940 1941 1942 1945 1946 1947 1948 1950 1952 1954 1955 1956 1959 1960 1961 1962 1963 1964 1965 1967 1968 1969 1970 1971 1972 1973 1975 1976 1977 1978 1979 1981 1982 1984 1985 1986 1987 1988 1989 1991 1995 1997 1998 2000 2003 2004 2006 2007 2008 2009 2010 2012 2013 2014 2015 2016 2017 2018 2019 2020 2022 2023 2024 2026
Coal (MW)
Oil (MW)
Gas (MW)
Diesel (MW)
Hydro (MW)
Wind (MW)
Solar (MW)
Battery (MW)
Landfill Gas (MW)
Nuclear (MW)

1916-1929	**AK Railroad & coal access, FE Co & Eklutna, first transmission**
1952-1962	5x DoD CHPP plants, Eklutna & Kenai hydro, Kenai-ANC 115 kV
1975-1984	Pipeline Boom: 784 MW oil & fossil gas generation buildout
1985-1991	“Bradley Belt”: Alaska Intertie & Bradley Lake hydropower
2012-2016	660 MW: Fossil and landfill gas, utility-scale wind, Healy 2 restart

“Golden Eras” of Railbelt Generation & Transmission Buildout

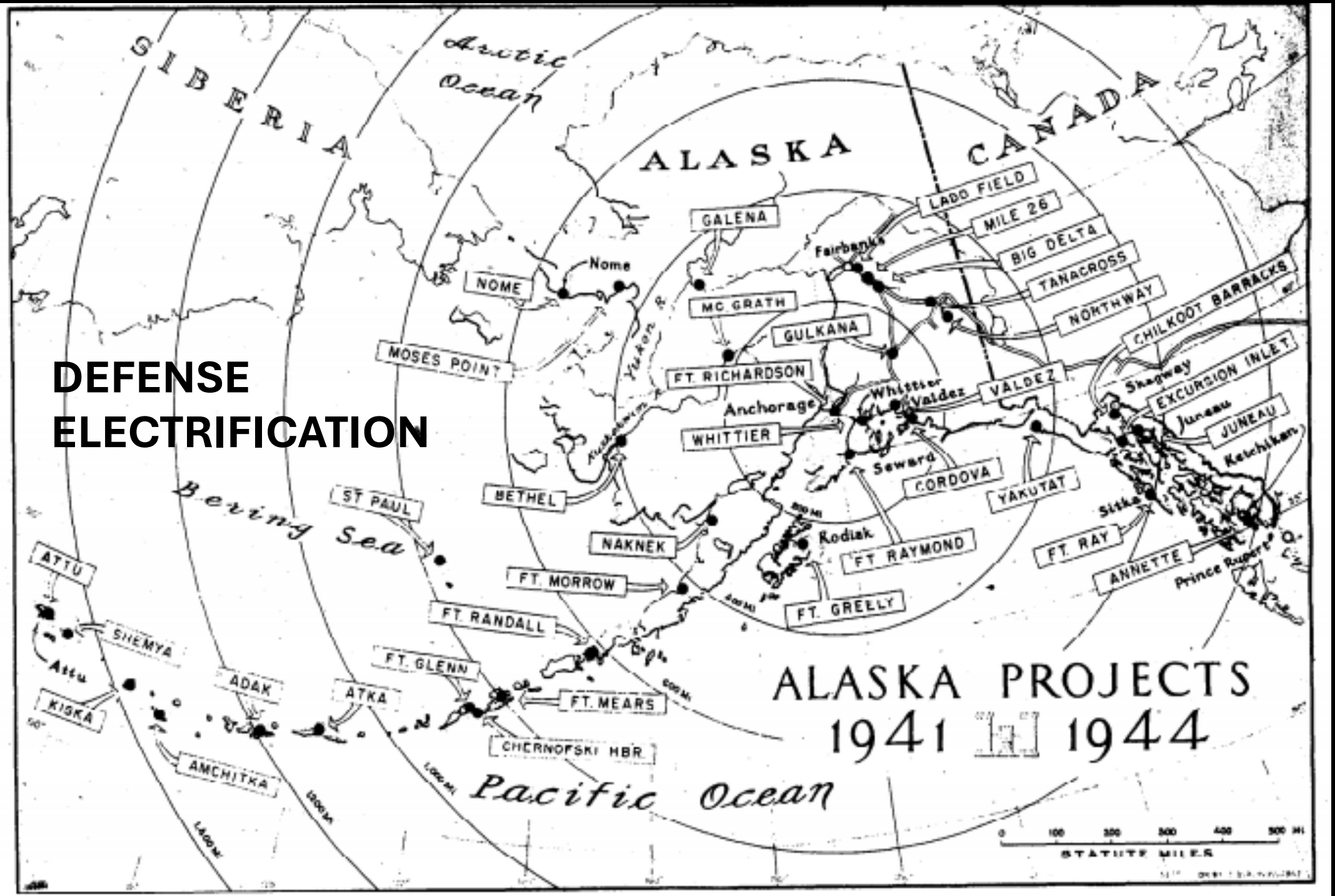

K N I K A R M
Goose Creek
Goose Bay
Eagle Bay
Point McKenzie
T 15N R 4W
T 14N R 4W
T 15N R 2W
T 14N R 3W
T 14N R 2W
T 15N R 1W
T 14N R 1W
T 15N R 1E
T 14N R 1E
THE ALASKA RAILROAD TRANSMISSION LINE
Eagle River Road
Otto Lake
WHITNEY
SUB-STATION
Ship Creek
ALASKA RAILROAD SHOPS
ANCHORAGE
EAGLE RIVER
Eagle River
BIRCHWOOD
Peters Creek
POWER HOUSE
EKLUTNA INDUSTRIAL
Waste Water thru Br. #429 Alaska Railroad
Tailrace
TUNNEL
PENSTOCK
DIVERSION DAM
Eklutna River
1000
2000
3000
4000



Map for Alaska Railroad brochure, late 1940s or early 1950s.

The Alaska Engineering Commission's 900 KW Steam plant in 1916. University of Washington Special Collections.


68 RC Million Dollar Gold Dredge Este

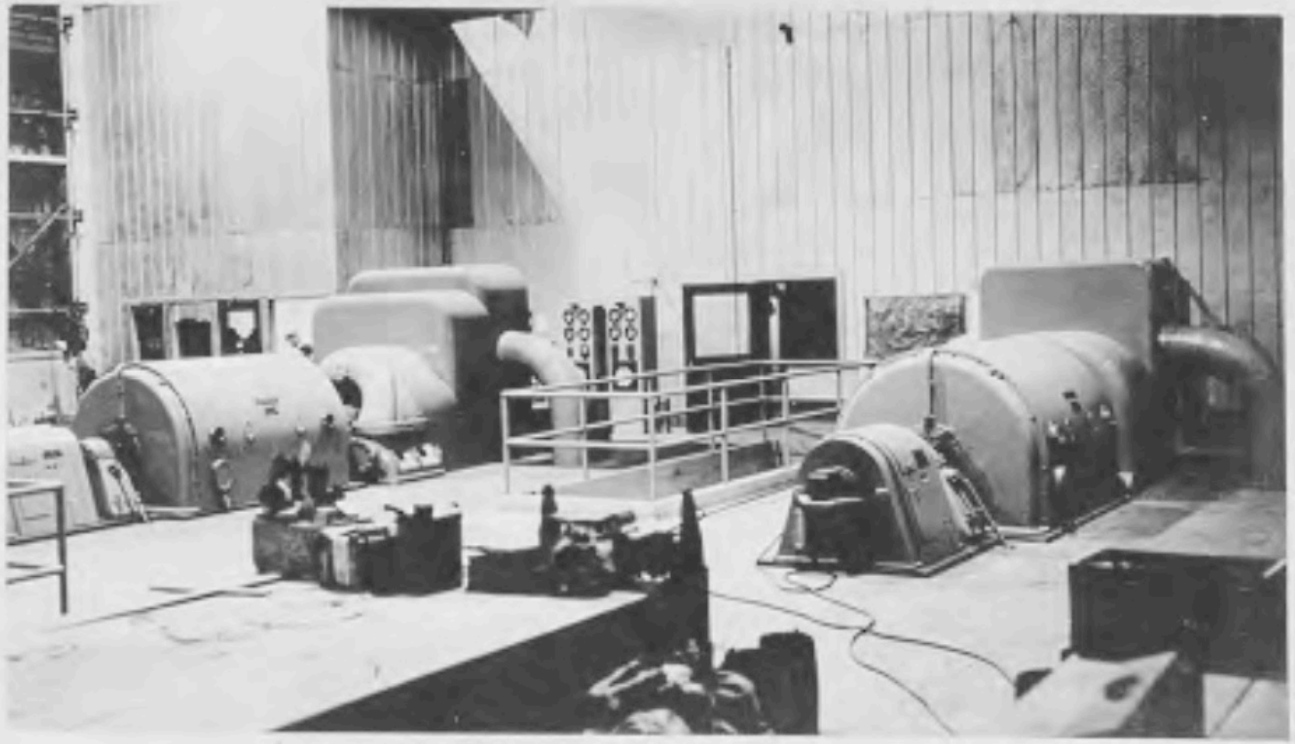

DEFENSE
ELECTRIFICATION
SIBERIA
Arctic Ocean
ALASKA
CANADA
Bering Sea
Pacific Ocean
GALENA
NOME
Nome
MOSES POINT
MC GRATH
GULKANA
FT. RICHARDSON
Anchorage
WHITTIER
Whittier
Valdez
VALDEZ
Fairbanks
LADD FIELD
MILE 26
BIG DELTA
TANACROSS
NORTHWAY
CHILKOOT BARRACKS
Skagway
EXCURSION INLET
Juneau
JUNEAU
Ketchikan
Seward
CORDOVA
YAKUTAT
Sitka
FT. RAY
ANNETTE
Prince Rupert
BETHEL
ST PAUL
NAKNEK
Kodiak
FT. RAYMOND
FT. GREELY
FT. MORROW
FT. RANDALL
FT. GLENN
FT. MEARS
CHERNOFSKI HBR
ATTU
SHEMYA
Attu
KISKA
ADAK
ATKA
AMCHITKA
ALASKA PROJECTS
1941 1944
STATUTE MILES

Major military power projects, 1941-1961

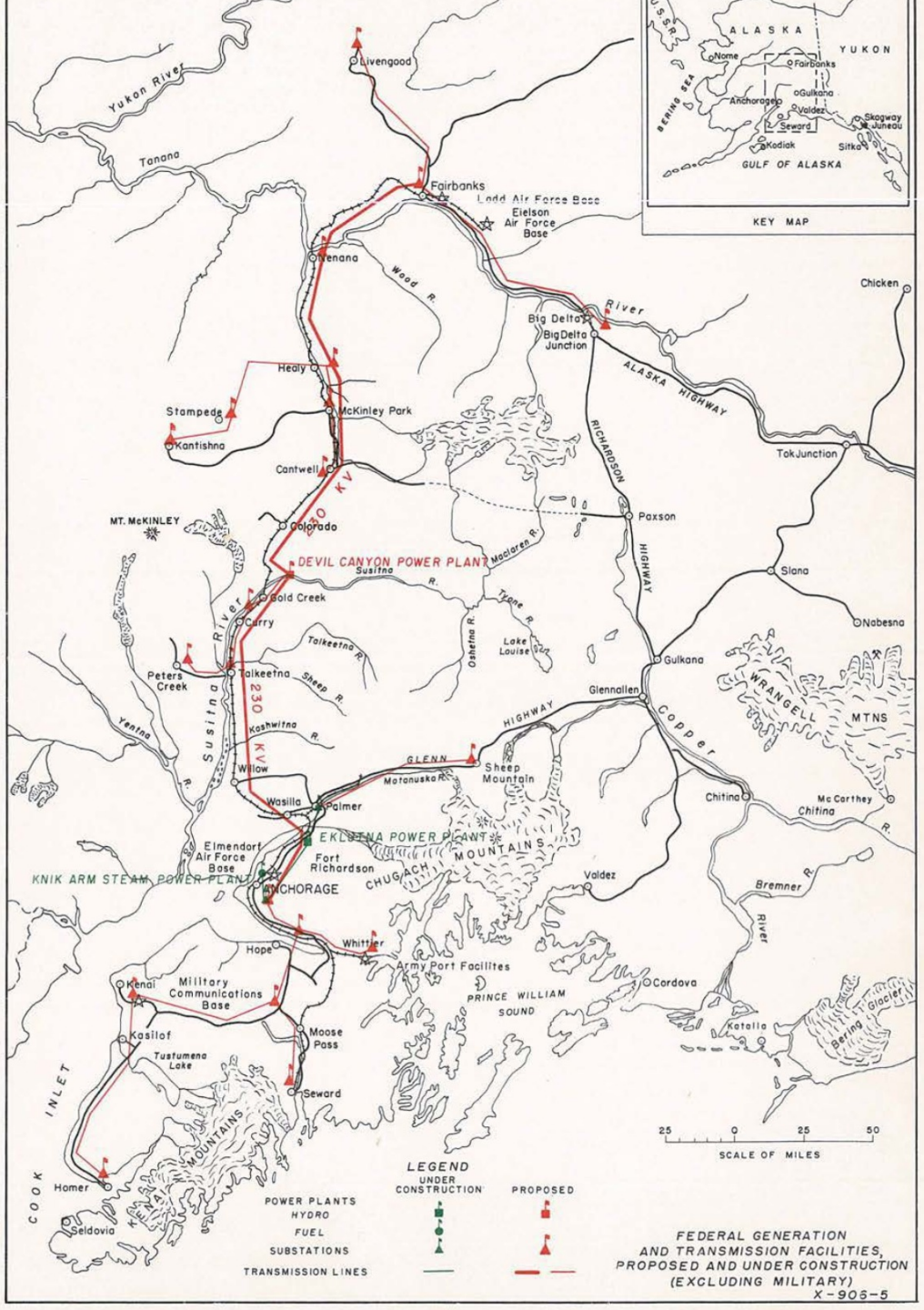
- Ladd Airfield/ Fort Wainwright – ~27 MW coal
- Fort Richardson – 38.6 MW coal (later gas)
- Elmendorf AFB – 23.5 MW coal (later gas)
- Eielson AFB – 10 MW coal
- Ft Greely—20 MW nuclear
- Clear AFS –22.5 MW coal

Central power and heating plant. Fort Richard
Alaska. 1-21-42

(C494B)

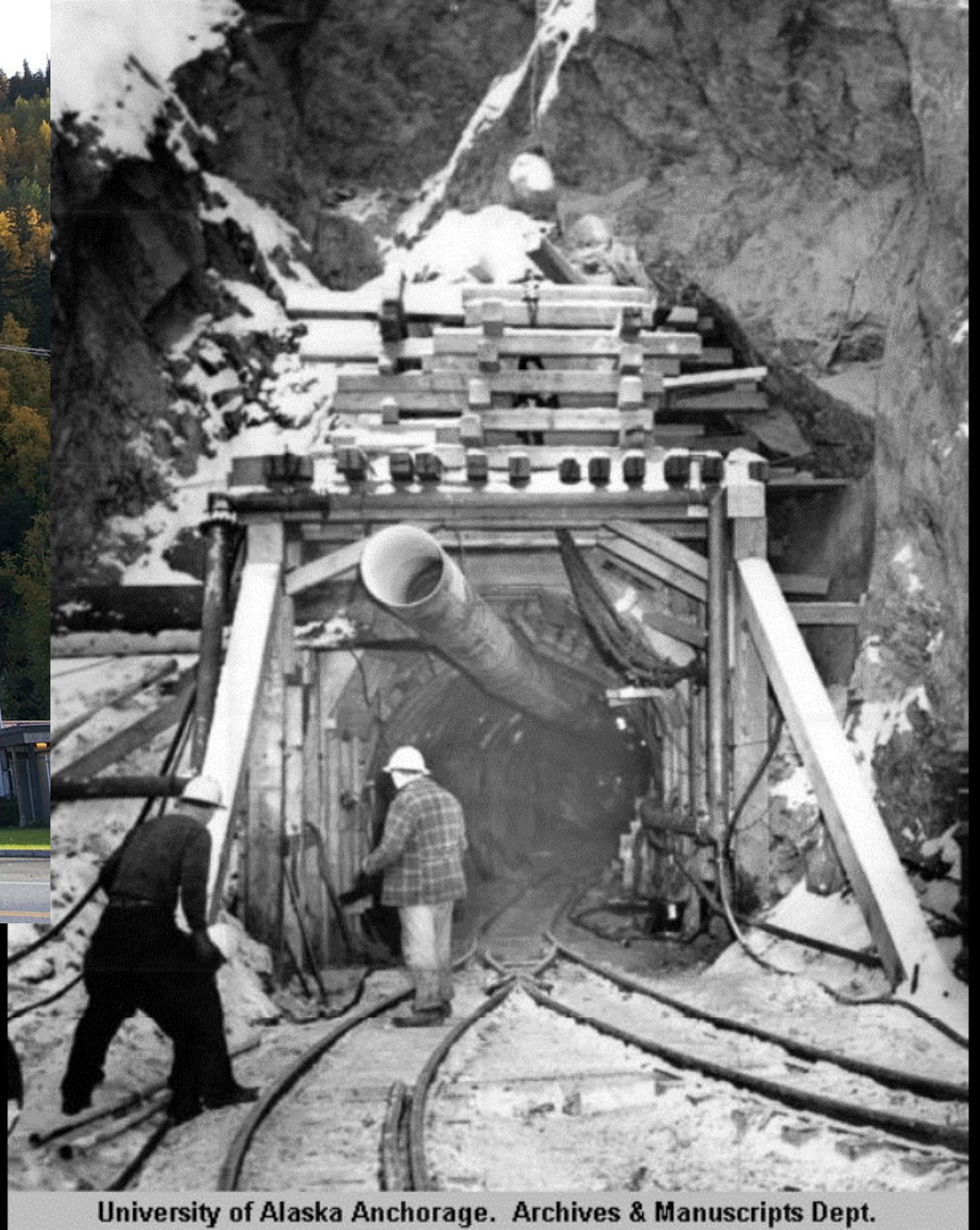


(C511) Power Plant - generator room, condensing turbine #1 on left and non-condensing turbine #2 on right. Fort Richardson, Alaska. 1-15-42



"Federal Generation and Transmission Facilities Proposed and Under Construction (Excludes Military)". Source: Joseph M. Morgan, "Susitna River Basin: A Report on Potential Development of Water Resources in the Susitna River Basin of Alaska", Bureau of Reclamation, August 1952.

Constructing the power tunnel for the Eklutna hydroelectric plant, 1951-1954. →



Cook Inlet TIDAL POWER

as Proposed by

Roy W. Johnson

CONSULTING ENGINEER

ARCTIC BLDG. SEATTLE, WN.

1954

Little Susitna River

PROVIDES YEAR ROUND PORT FACILITIES

REDUCES ICE FLOW

ALASKA R.R.

FORT RICHARDSON

DIKE & TIDAL GATES 6 MILES LONG

Knik Arm (HIGH BASIN)

ANCHORAGE INDUSTRIAL SITES

IN AT HIGH TIDE

ALL THE TIME

INTERNATIONAL AIRPORT

Cook Inlet 17 TO 42 FT. RANGE OF TIDE

SHIP LOCKS

POWER HOUSE & DIKE 3 MILES

1,000,000 KW CONTINUOUS POWER

2,000,000 KW HALF TIME POWER

DIKE & TIDAL GATES 7 MILES

FIRE ISLAND INDUSTRIAL SITES

OUT AT LOW TIDE

TO SEWARD

Turnagain Arm (LOW BASIN)

KENAI PENINSULA

ANCHORAGE AREA SHOWN ABOVE

SIBERIA

CANADA

ALASKA

Cook Inlet

KENAI PENINSULA

Gulf of Alaska

PNEUMATIC CONCRETE SEAL

SHEET PILE FOUNDATION CELLS

TIDAL GATE CONSTRUCTION

75 Years

SEPTEMBER 6, 1991

BRADLEY LAKE HYDROELECTRIC IS ENERGIZED

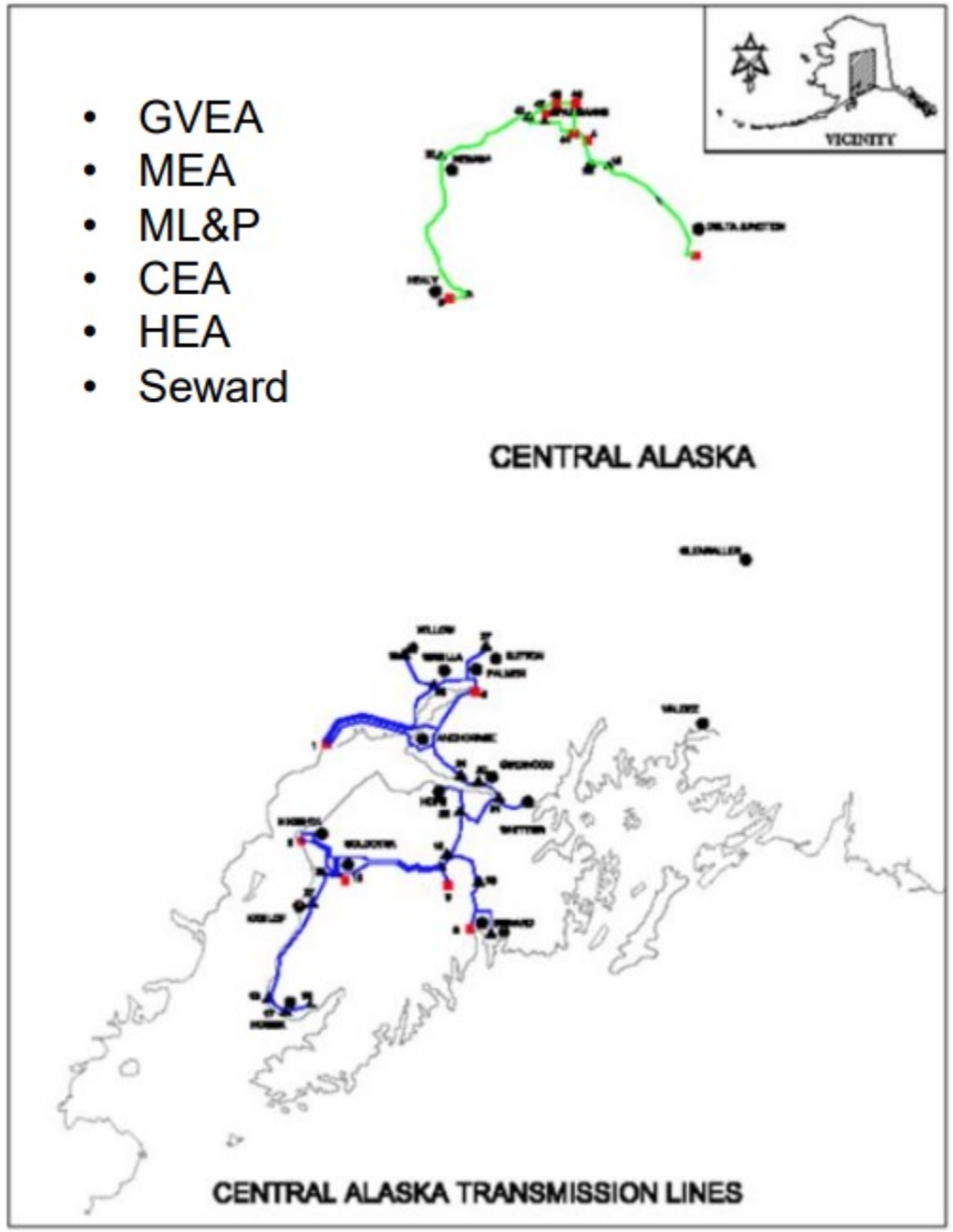
The largest of seven hydroelectric facilities in Alaska, transmitting electricity to residents from Homer north to Fairbanks.

Source: AEA

1984 Intertie construction

Alaska Railbelt – 1970s

- GVEA
- MEA
- ML&P
- CEA
- HEA
- Seward

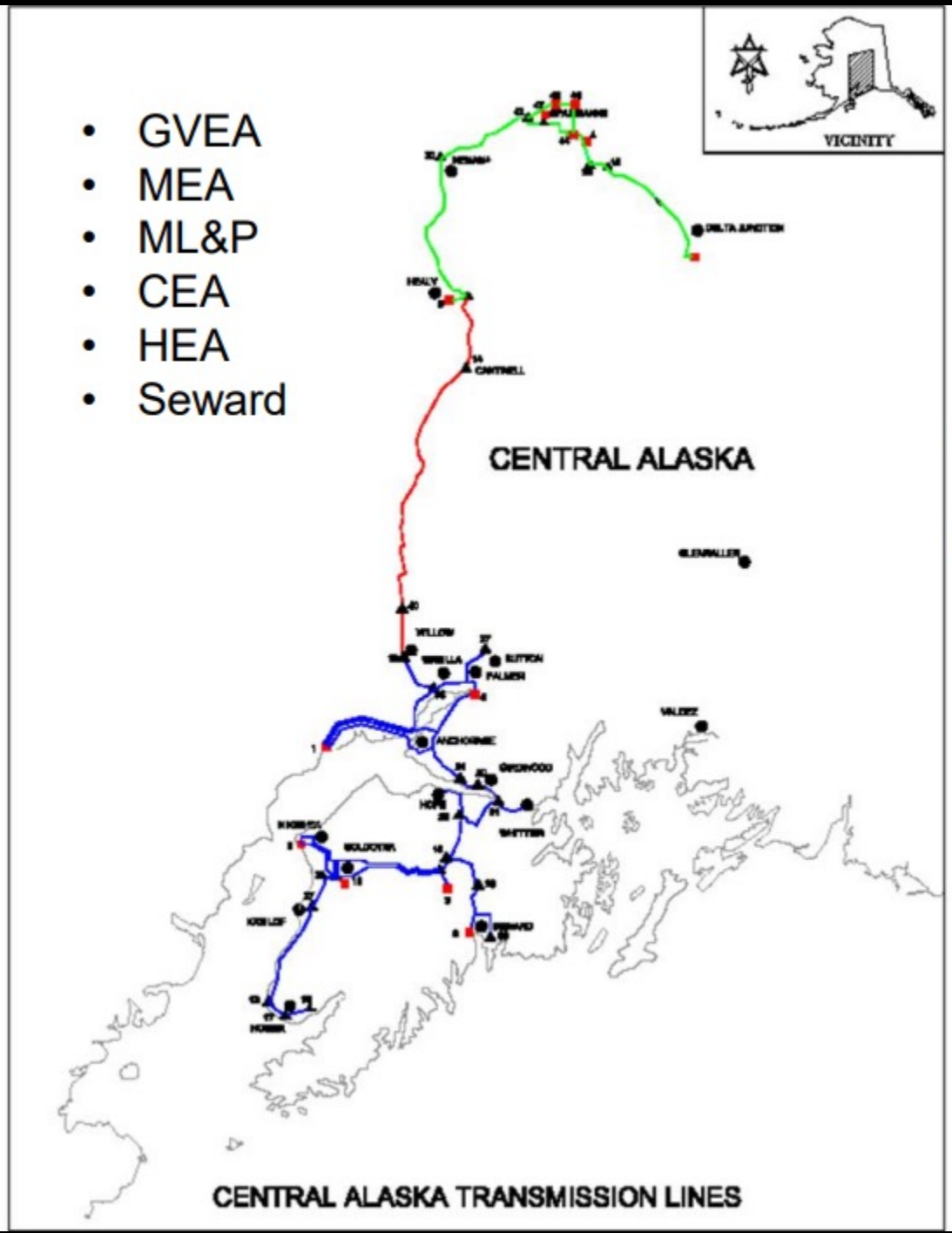


- Pre-Intertie

GVEA
Golden Valley Electric Association
Your Touchstone Energy® Cooperative

Alaska Railbelt – 1980s

- GVEA
- MEA
- ML&P
- CEA
- HEA
- Seward

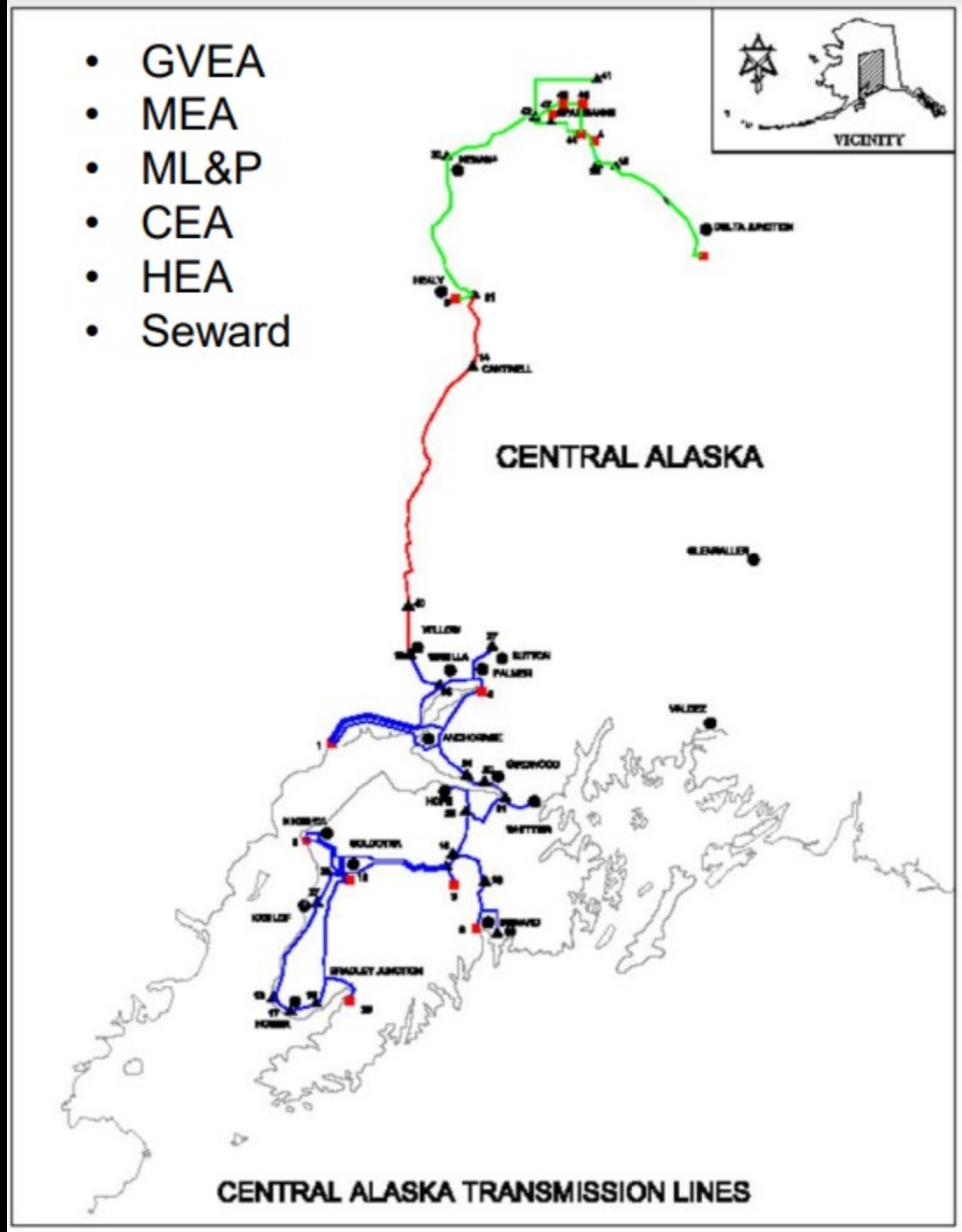


- Alaska Intertie Built
- Alaska Intertie Agreement

GVEA
Golden Valley Electric Association
Your Touchstone Energy® Cooperative

Alaska Railbelt –1990s

- GVEA
- MEA
- ML&P
- CEA
- HEA
- Seward



Added……

- Bradley Lake Hydro
- Bradley Transmission Lines
- Ft. Knox Gold Mine

GVEA
Golden Valley Electric Association
Your Touchstone Energy® Cooperative

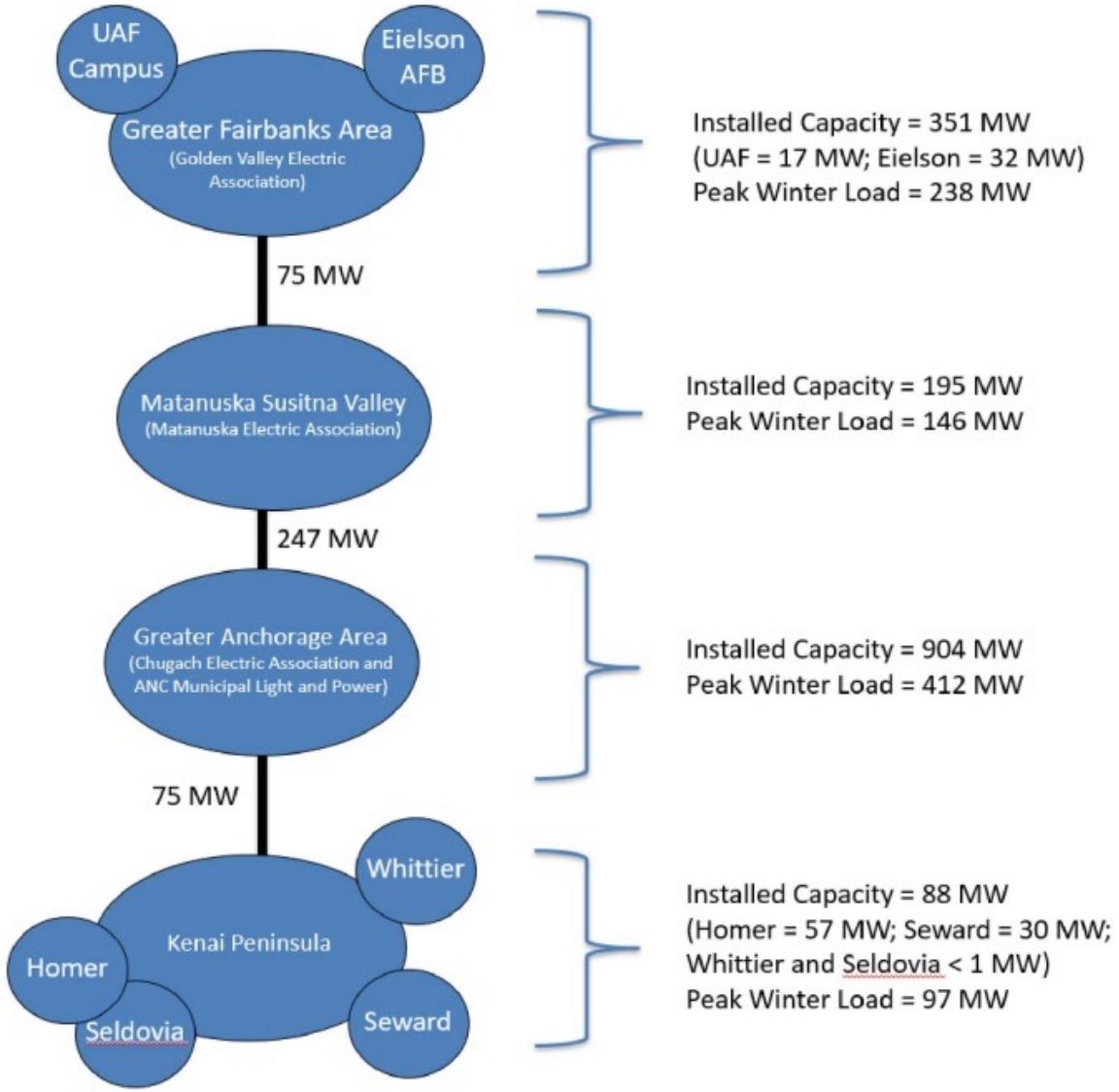
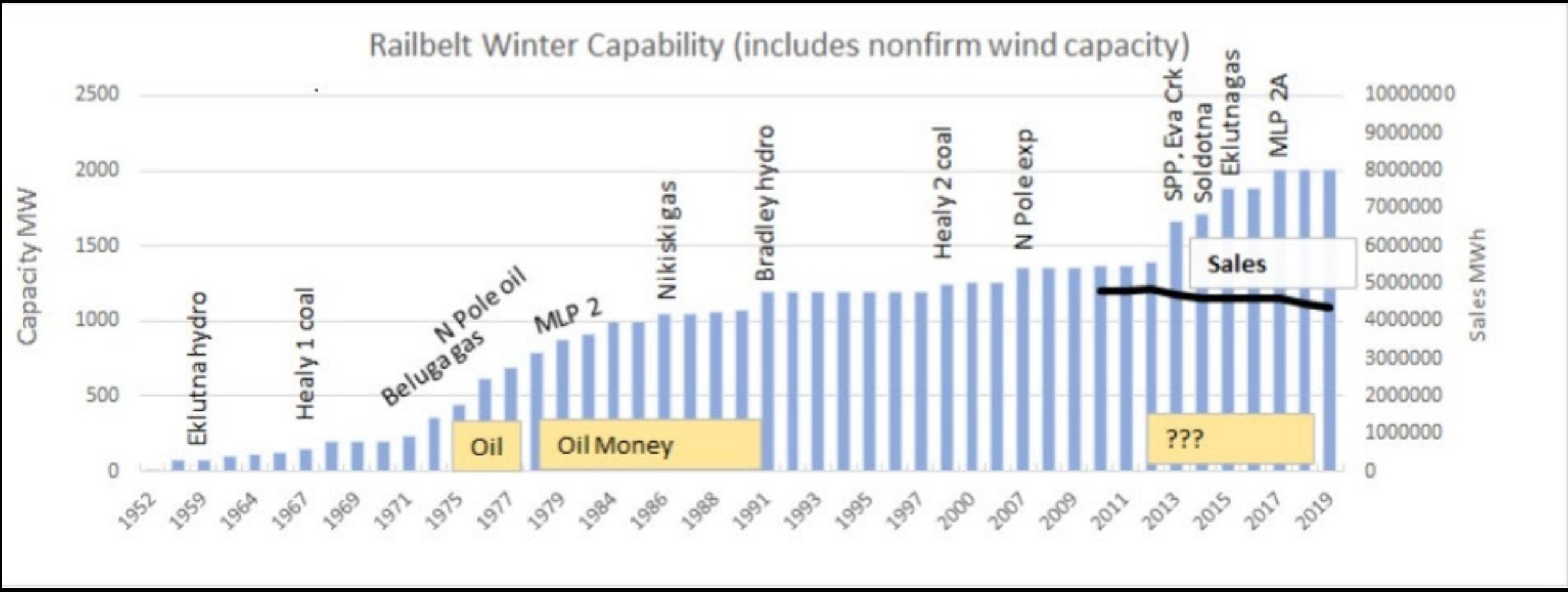


Fig. 2. ***Diagram depicting the interconnection of utilities with nested microgrids in the Alaska railbelt, including installed generation and transmission capacity and peak load.***
Source: Alaska Center for Energy and Power, UAF.


Railbelt Winter Capability (includes nonfirm wind capacity)
Capacity MW
Sales MWh
2500
2000
1500
1000
500
0
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
Eklutna hydro
Healy 1 coal
Beluga gas
N Pole oil
MLP 2
Nikiski gas
Bradley hydro
Healy 2 coal
N Pole exp
SPP, Eva Crk
Soldotna
Eklutnagas
MLP 2A
Sales
Oil
Oil Money
???
1952
1959
1964
1967
1969
1971
1975
1977
1979
1984
1986
1988
1991
1993
1995
1997
2000
2007
2009
2011
2013
2015
2017
2019