Alaska Electricity Trends: preliminary data from *2021 Alaska Energy Statistics*

Available in the internet at:

Created by:
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Funding Provided by:
University of Alaska Fairbanks, Alaska Center for Energy and Power

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Main Sources of Data:

Alaska Energy Authority
Power Cost Equalization Program Data , Calendar Year 2021
http://www.akenergyauthority.org/
AEA - Various Infrastructure datasets

Energy Information Administration
EIA final data files from survey forms 860, 861 and 923.
http://www.eia.gov/electricity/data/eia860/index.html
http://www.eia.gov/electricity/data/eia923/
http://www.eia.gov/electricity/data/eia860/index.html

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Installed Capacity (MW) of utilities & operators by AEA Energy Region, 2021

AEA Energy Region	Fossil Fuel Turbines	Reciprocating Internal Combustion Engine	Hydroelectric	Wind	Solar	Storage	Region Total	Percent of Statewide Total
Aleutians	0	56	2	1	0	0	59	2%
Bering Straits	0	33	0	3	0	0	37	1%
Bristol Bay	0	40	1	0	0	0	42	1%
Copper River/C.Hubach	5	30	26	0	0	1	62	2%
Kodiak	0	39	34	9	0	5	87	3%
Lower Yukon-Kuskokwim	0	60	0	6	0	1	67	2%
North Slope	43	33	0	0	0	0	75	2%
Northwest Arctic	0	24	0	4	1	2	31	1%
Railbelt	1,589	234	191	45	2	90	2,150	68%
Southeast	113	156	234	0	0	1	503	16%
Yukon-Kuskokwim/Upper Tanana	0	27	0	0	0	0	27	1%
Total	**1,750**	**732**	**488**	**68**	**3**	**100**	**3,141**	**100%**

Source: Aggregated from Table 2.1a

Prepared for Governor's Energy Task Force
August 8, 2023

ACEP Alaska Center for Energy and Power

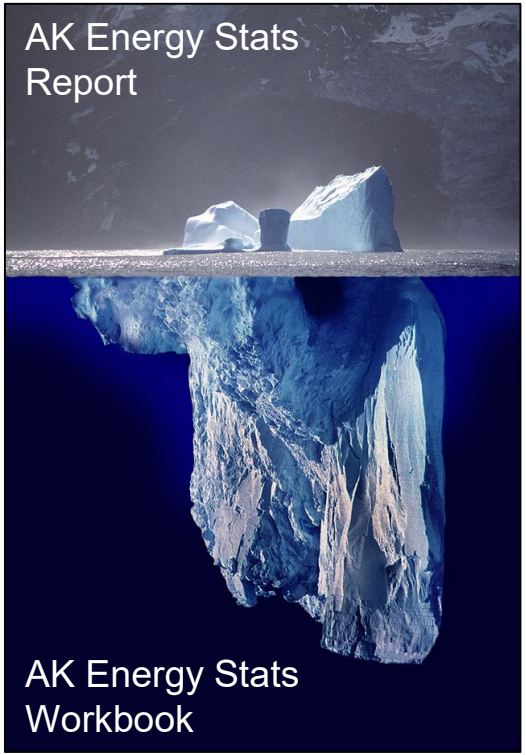
UAF UNIVERSITY OF ALASKA FAIRBANKS

Presentation Outline

- Context/Overview/History of Alaska Energy Statistics
- Data sources, What's in and what's out
- Total installed capacity (by region/source)
- Net generation (by region/source)
- Electricity Price (statewide)
- CO2 Emissions
- A few other interesting tidbits and trends
- Aspirational charts

Purpose of AK Energy Statistics

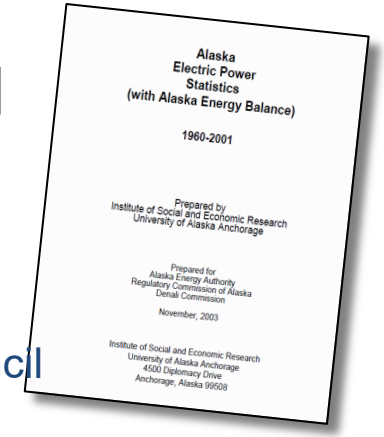
- Report factual information in a way that can be digested and interpreted, and which stakeholders can use to inform decision-making or conduct analysis
- The statistics report does **not** offer pre-analyzed conclusions
- The AK Energy Statistics Report summarizes information from the Alaska Energy Statistics Workbook



Background – 28 volumes published since 1971

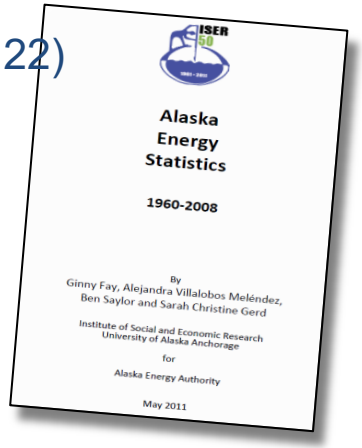
Alaska Electric Power Statistics

1971 – 1985	AK Power Administration (gaps during 70s)
1985 – 1988	AK Power Authority
1988 – 1993	AK Power Authority & AK Systems Coordinating Council
1993 – 1995	ASCC & DCRA Division of Energy
1995 – 2000	*[Not Published]*
2001	AK Energy Authority, Denali Comm, RCA, & ISER (vol. 22)



Alaska Energy Statistics

2008 – 2011	AEA & ISER (vol. 23-26)!
2012 – 2013	Workbooks only
2014 – 2021	*[Not Published] …. YET!*



Energy Security Task Force – Duties and Responsibilities

1. Establish a baseline energy portfolio for the State of Alaska.
2. Identify and evaluate potential future changes that could occur to energy supply and distribution in the state, the impacts of such changes, and the opportunity for mitigating impacts and leveraging opportunities associated with such change.
3. Identify solutions for meeting Alaska's energy needs now and in the future with a focus on affordability, reliability, and security.
4. Identify policies, programs, regulatory changes, and funding that could accelerate adoption of these energy strategies.
5. Develop and maintain a public database of taskforce information and recommend strategies for sharing energy data and information through an energy data portal.
6. Recommend a statewide energy goal, a plan to achieve it, and identify additional work that may be required to refine this vision.

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Funding Partners:

Primary Data Sources

- Alaska PCE program data collected by AEA
- USDOE, Energy Information Administration:
  - Form EIA-860 (plant and unit data)(all producers with > 1 MW installed capacity) https://www.eia.gov/electricity/data/eia860/
  - Form EIA-923 (generation and fuel use by plant) https://www.eia.gov/electricity/data/eia923/
  - Form EIA-861 and 861S (electricity generation, purchases, and sales)(limited coverage) https://www.eia.gov/electricity/data/eia861/
- Other
  - AEA powerhouse inventories
  - Utility annual reports to RCA (containing FERC Form 1 excerpts)
  - Utility COPA filings with RCA
  - ACEP Net Metered BTM (behind-the-meter) capacity reports
  - Renewable Energy Fund (REF) project reports
  - Individual Utilities
  - Additional misc sources

Excel Workbooks produced since 2011…

Regional Summaries…

Installed Capacity (MW) of utilities & operators by AEA Energy Region, 2021

AEA Energy Region	Fossil Fuel Turbines	Reciprocating Internal Combustion Engine	Hydroelectric	Wind	Solar	Storage	Region Total	Percent of Statewide Total
Aleutians	0	56	2	1	0	0	59	2%
Bering Straits	0	33	0	3	0	0	37	1%
Bristol Bay	0	40	1	0	0	0	42	1%
Copper River/Chugach	5	30	26	0	0	1	62	2%
Kodiak	0	39	34	9	0	5	87	3%
Lower Yukon-Kuskokwim	0	60	0	6	0	1	67	2%
North Slope	43	33	0	0	0	0	75	2%
Northwest Arctic	0	24	0	4	1	2	31	1%
Railbelt	1,589	234	191	45	2	90	2,150	68%
Southeast	113	156	234	0	0	1	503	16%
Yukon-Koyukuk/Upper Tanana	0	27	0	0	0	0	27	1%
Total	**1,750**	**732**	**488**	**68**	**3**	**100**	**3,141**	**100%**

Source: Aggregated from Table 2.1a

Installed Capacity by Plant and Prime Mover, 2021

AK Plant	PCE	CPCN	Utility Name	Plant Name	Interlie	AEA Energy Region	Total Capacity	Fossil Fuel Turbine	Internal Combustion	Hydroelectric	Wind Turbine	Solar PV	Batteries	Flywheel	Source	Notes
P001			Agrium US Inc	Agrium Kenai Nitrogen Operatio	Railbelt_grid	Railbelt	12	12.5	0	0	0	0	0	0	EIA860	
P014		742	Alaska Environmental Power LLC	Delta Wind Farm	Railbelt_grid	Railbelt	1.9	0	0	0	1.9	0	0	0	EIA860	
P101		8	Chugach Electric Assn Inc	Anchorage 1	Railbelt_grid	Railbelt	50	48.9	2	0	0	0	0	0	EIA860	
P102		8	Chugach Electric Assn Inc	Eklutna Hydro Project	Railbelt_grid	Railbelt	44	0	0	44.4	0	0	0	0	EIA860	
P103		8	Chugach Electric Assn Inc	George M Sullivan Generation Pl	Railbelt_grid	Railbelt	346.9	346.9	0	0	0	0	0	0	EIA860	
P109		520	Aurora Energy LLC Chena	Aurora Energy LLC Chena	Railbelt_grid	Railbelt	27	27.5	0	0	0	0	0	0	EIA860	
P120		8	Chugach Electric Assn Inc	Beluga	Railbelt_grid	Railbelt	312	312.4	0	0	0	0	0	0	EIA860	
P121		8	Chugach Electric Assn Inc	Cooper Lake	Railbelt_grid	Railbelt	19	0	0	19.4	0					
P122		8	Chugach Electric Assn Inc	International	Railbelt_grid	Railbelt	15	15	0	0	0					
P123		8	Chugach Electric Assn Inc	Southcentral Power Project	Railbelt_grid	Railbelt	203	203.9	0	0	0					
P136		720	Doyon Utilities Fort Greely	Fort Greely Power Plant	Railbelt_grid	Railbelt	7.4	0	7.4	0	0					
P137		726	Doyon Utilities Fort Wainwright	Utility Plants Section	Railbelt_grid	Railbelt	20	20	0	0	0					
P138		724	Doyon Utilities LLC	JBER Landfill Gas Power Plant	Railbelt_grid	Railbelt	11	0	11.5	0	0					
P142			Fire Island Wind LLC	Fire Island Wind	Railbelt_grid	Railbelt	18	0	0	0	18					
P146		13	Golden Valley Elec Assn Inc	Battery Energy Storage System	Railbelt_grid	Railbelt	40	0	0	0	0					
P147		13	Golden Valley Elec Assn Inc	Delta Power	Railbelt_grid	Railbelt	23	23.1	0	0	0					
P148		13	Golden Valley Elec Assn Inc	Eva Creek Wind	Railbelt_grid	Railbelt	24	0	0	0	24.6					
P149		13	Golden Valley Elec Assn Inc	Fairbanks	Railbelt_grid	Railbelt	42	36.8	5.4	0	0					
P150		13	Golden Valley Elec Assn Inc	Healy	Railbelt_grid	Railbelt	92	90	2.8	0	0					
P151		13	Golden Valley Elec Assn Inc	North Pole	Railbelt_grid	Railbelt	18	181	0	0	0					
P152		13	Golden Valley Elec Assn Inc	GVEA Solar Farm	Railbelt_grid	Railbelt	0.56	0	0	0	0	0				
P155		32	Homer Electric Assn Inc	Bernice Lake	Railbelt_grid	Railbelt	76	76.7	0	0	0					
P156			Alaska Energy Authority	Bradley Lake	Railbelt_grid	Railbelt	12	0	0	126	0	0	0	0	EIA860	
P157		32	Homer Electric Assn Inc	Nikiski Co-Generation	Railbelt_grid	Railbelt	80	80.8	0	0	0	0	0	0	EIA860	
P158		32	Homer Electric Assn Inc	Seldovia	Railbelt_grid	Railbelt	2.2	0	2.2	0	0	0	0	0	EIA860	
P159		345	Alaska Electric G & T Coop Inc	Soldotna	Railbelt_grid	Railbelt	96	50	0	0	0	0	46.5	0	EIA-860	
P197		18	Matanuska Electric Association	Eklutna Generation Station	Railbelt_grid	Railbelt	17	0	171	0	0	0	0	0	EIA860	
P235			Renewable IPP	Willow Solar	Railbelt_grid	Railbelt	1.3	0	0	0	0	1.34	0	0	AEA	
P239		108	Seward, City of	Seward	Railbelt_grid	Railbelt	15	0	15.6	0	0	0	0	0	EIA860	
P243			South Fork Hydro, LLC	South Fork Hydro (Eagle River)	Railbelt_grid	Railbelt	1.2	0	0	1.2	0	0	0	0	AEA	
P257			Tesoro Alaska Company	Tesoro Kenai Cogeneration Plan	Railbelt_grid	Railbelt	8.6	8.6	0	0	0	0	0	0	EIA860	
P267		452	University of Alaska	University of Alaska Fairbanks	Railbelt_grid	Railbelt	39	30	9.6	0	0	0	0	0	EIA860	
P268			US Air Force Eielson AFB	Eielson AFB Central Heat & Pow	Railbelt_grid	Railbelt	31	25	6	0	0	0	0	0	EIA860	
P275			0 Marathon Hydro		Railbelt_grid	Railbelt	0.1	0	0	0.16	0	0	0	0	AEA	
P296		8	Chugach Electric Assn Inc	Chugach Storage	Railbelt_grid	Railbelt	3	0	0	0	0	0	2	1	AEA	

…of plant-level & community-level data, for DIY analysis

Content:

Communities Participating in Power Cost Equalization Program by AEA Energy Regions, 202				
AEA Energy Region	PCE Eligible Active	PCE Eligible Inactive	PCE Ineligible	% Eligible Active in PCE program
Aleutians	11	1	0	92%
Bering Straits	16	0	0	100%
Bristol Bay	26	1	0	96%
Copper River/Chugach	8	0	15	100%
Kodiak	4	1	5	80%
Lower Yukon-Kuskokwim	46	2	0	96%
North Slope	7	0	2	100%
Northwest Arctic	11	0	0	100%
Railbelt	0	0	95	
Southeast	22	0	6	100%
Yukon-Koyukuk/Upper Tanana	41	1	1	98%
Total	192	6	124	
Some utilities, both in urban and rural Alaska, serve multiple communities.				

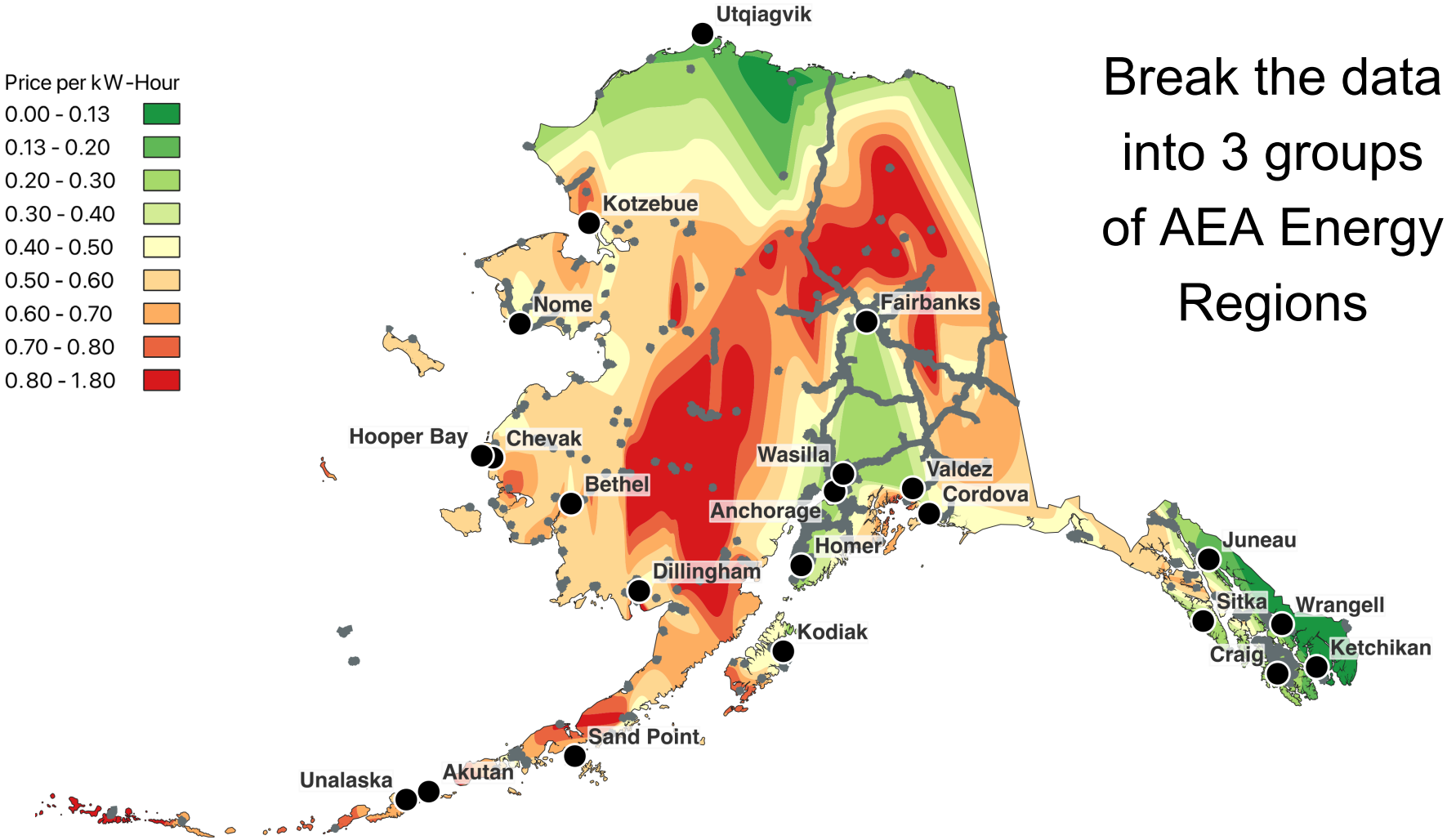
Table 1a (above) and Table 1b (right)

Effective Rate	No. of PCE Communities	Average Residential Rate	Average PCE Rate	Average Effective Rate
Less than 0.20	7	0.14	0.00	0.14
0.2-0.29	117	0.43	0.17	0.26
0.3-0.39	47	0.47	0.15	0.32
0.4-0.49	14	0.70	0.28	0.42
0.5-0.59	4	1.02	0.49	0.53
More than $0.60	3	1.00	0.38	0.62
Total	192			

What's included in *Alaska Energy Statistics (and what is not):*

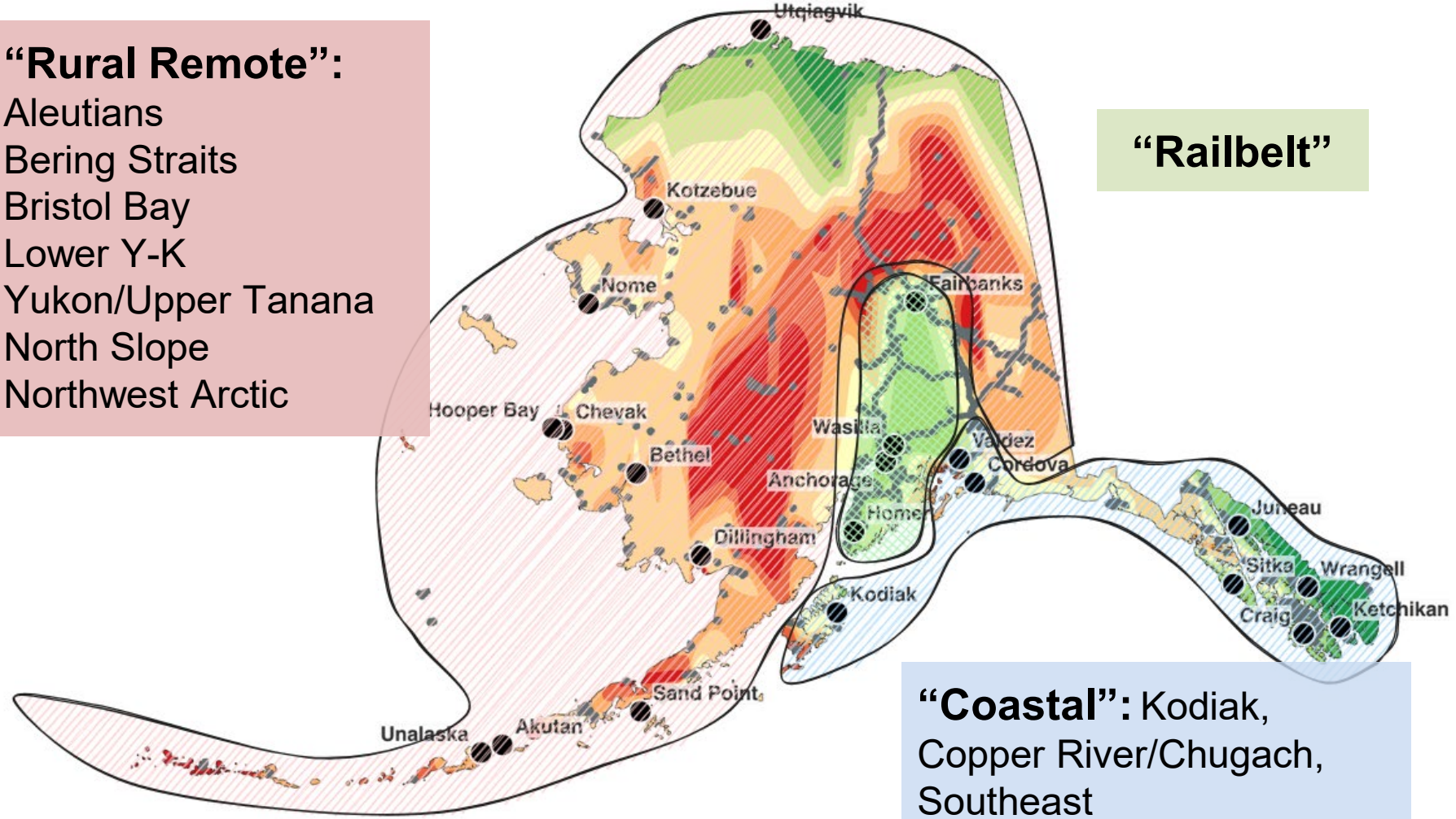
- Includes only electricity
- Excludes North Slope and TAPS oil & gas operations
- Includes Deadhorse (TDX Power is regulated)
- Excludes stand-alone industrial generation
- Currently excludes behind-the-meter (BTM) solar
- BUECI and WrangeII not included in 2021

BUECI = Barrow Utilities Electric Cooperative, Inc



Break the data into 3 groups of AEA Energy Regions

“Rural Remote”:
Aleutians
Bering Straits
Bristol Bay
Lower Y-K
Yukon/Upper Tanana
North Slope
Northwest Arctic



“Railbelt”

“Coastal”: Kodiak, Copper River/Chugach, Southeast

Total installed capacity

(Capacity is measured as nameplate, without regard for capacity factor or intermittent nature of renewables)

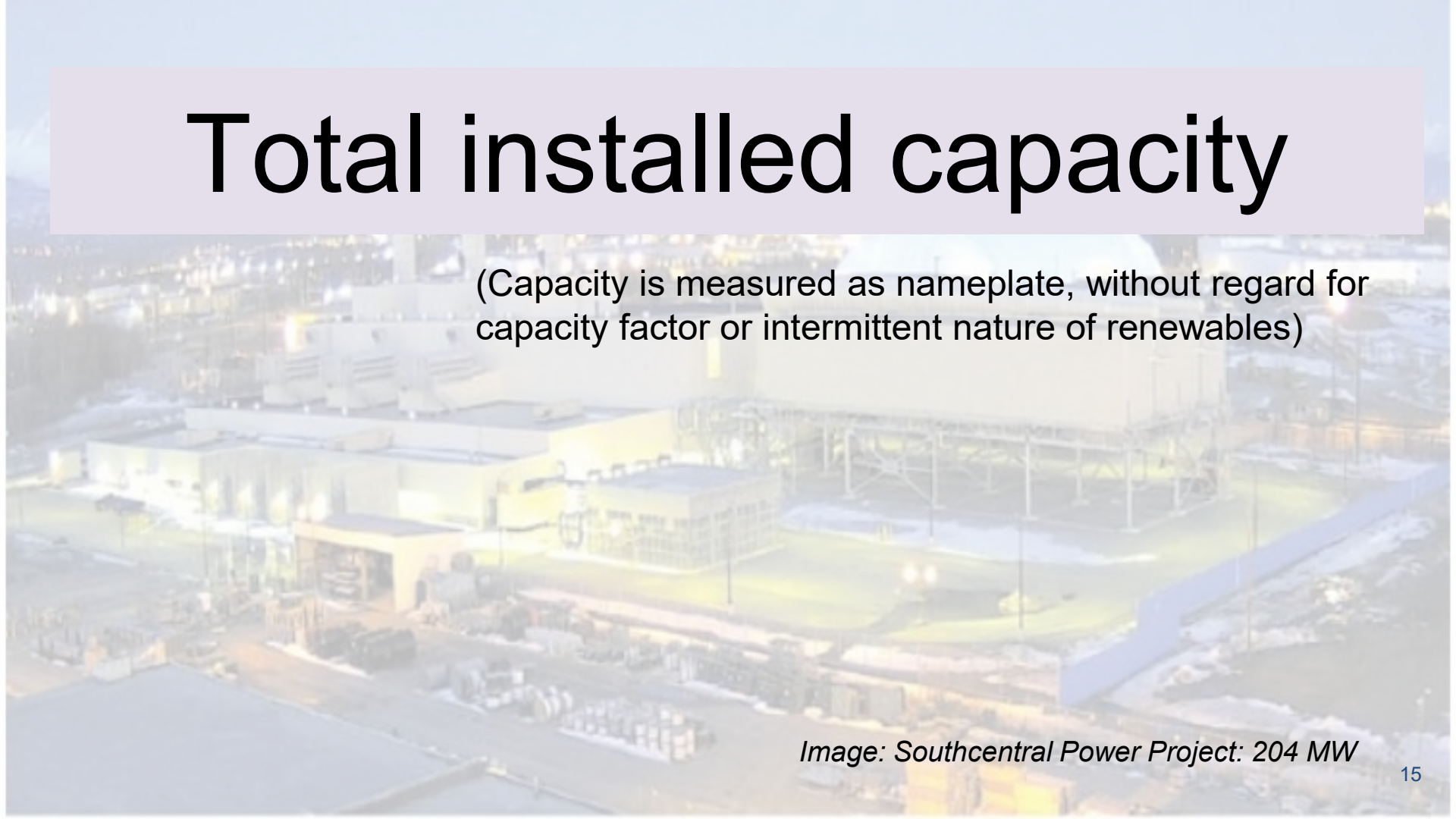
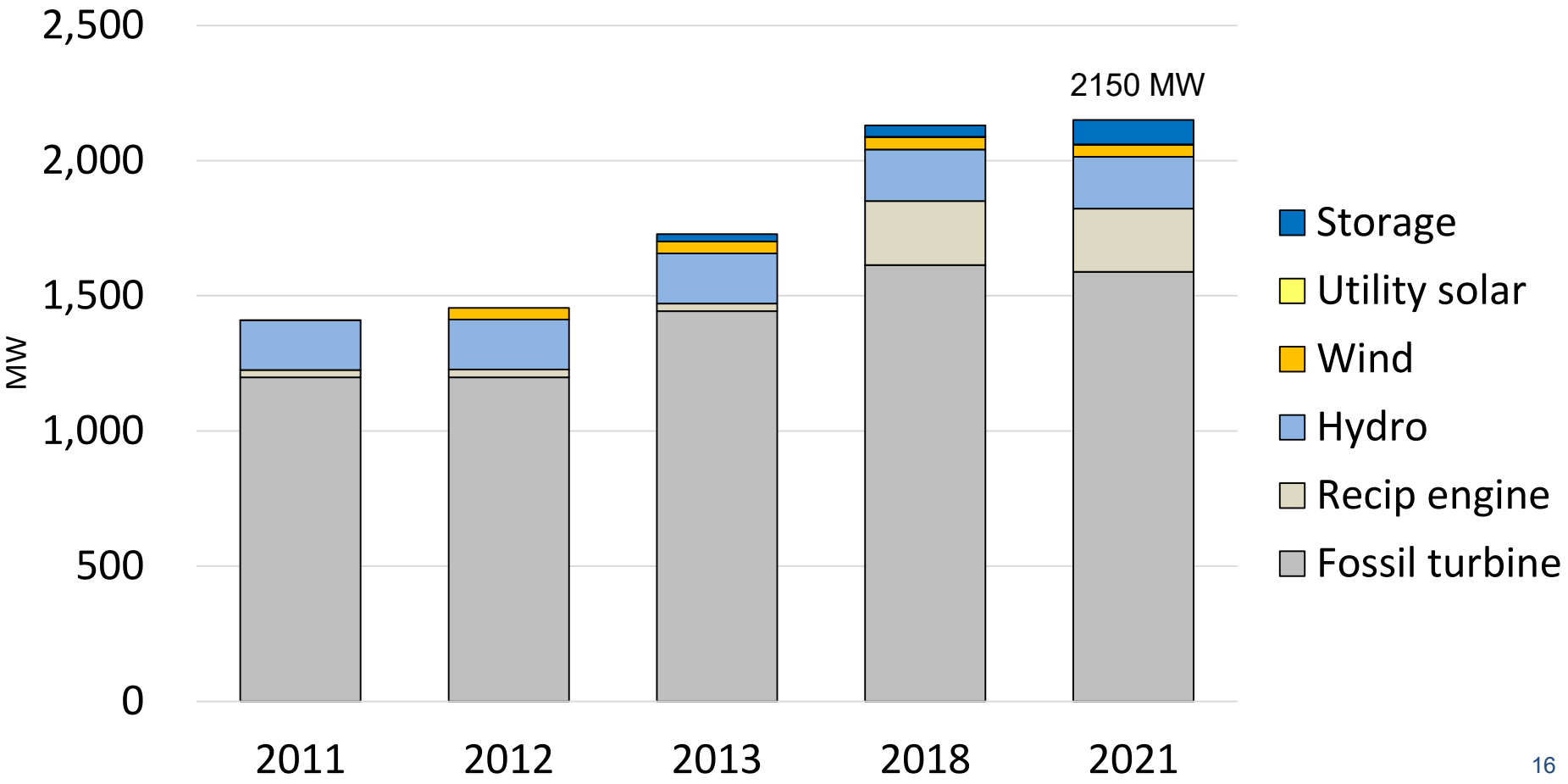
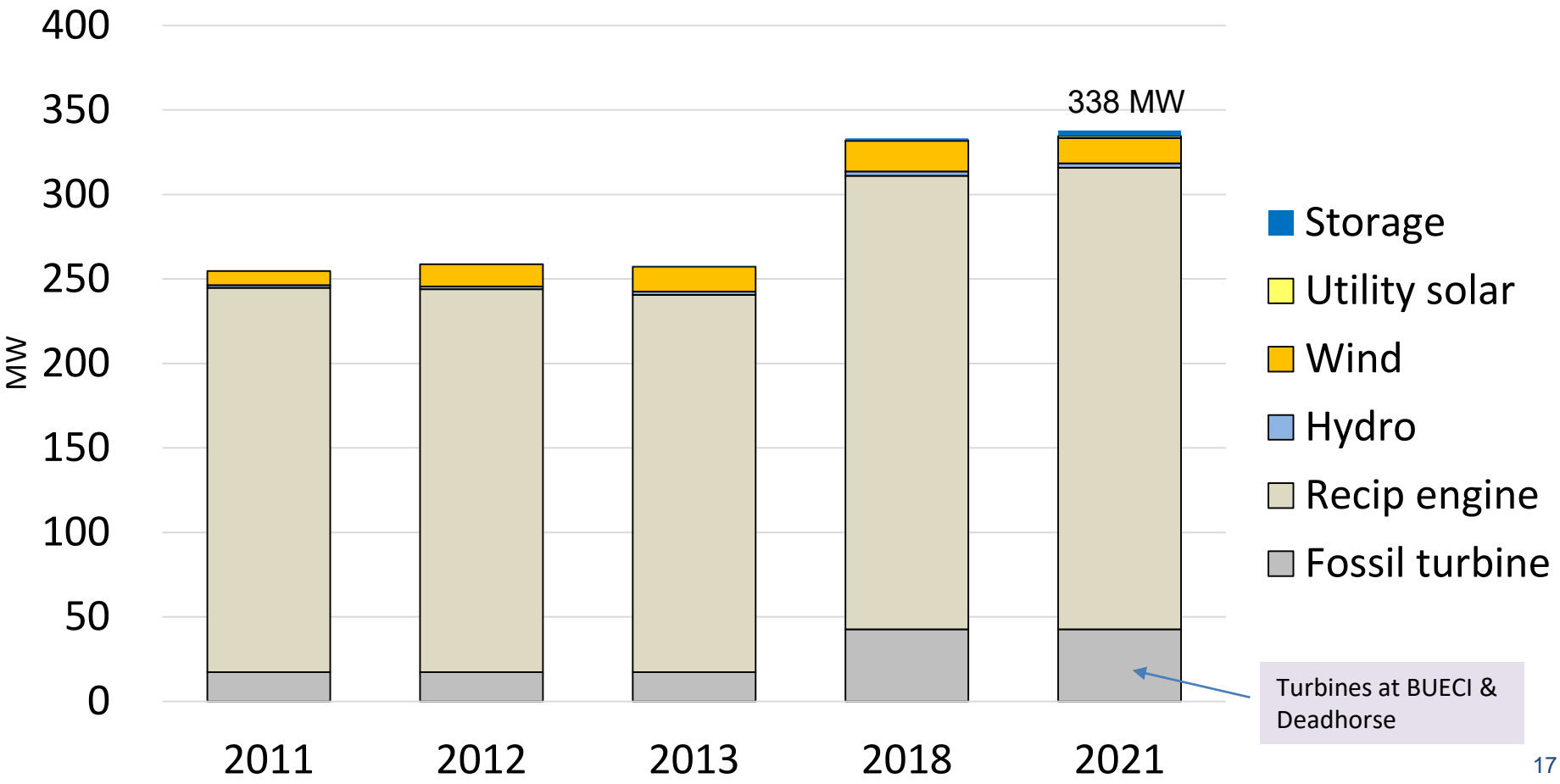


Image: Southcentral Power Project: 204 MW

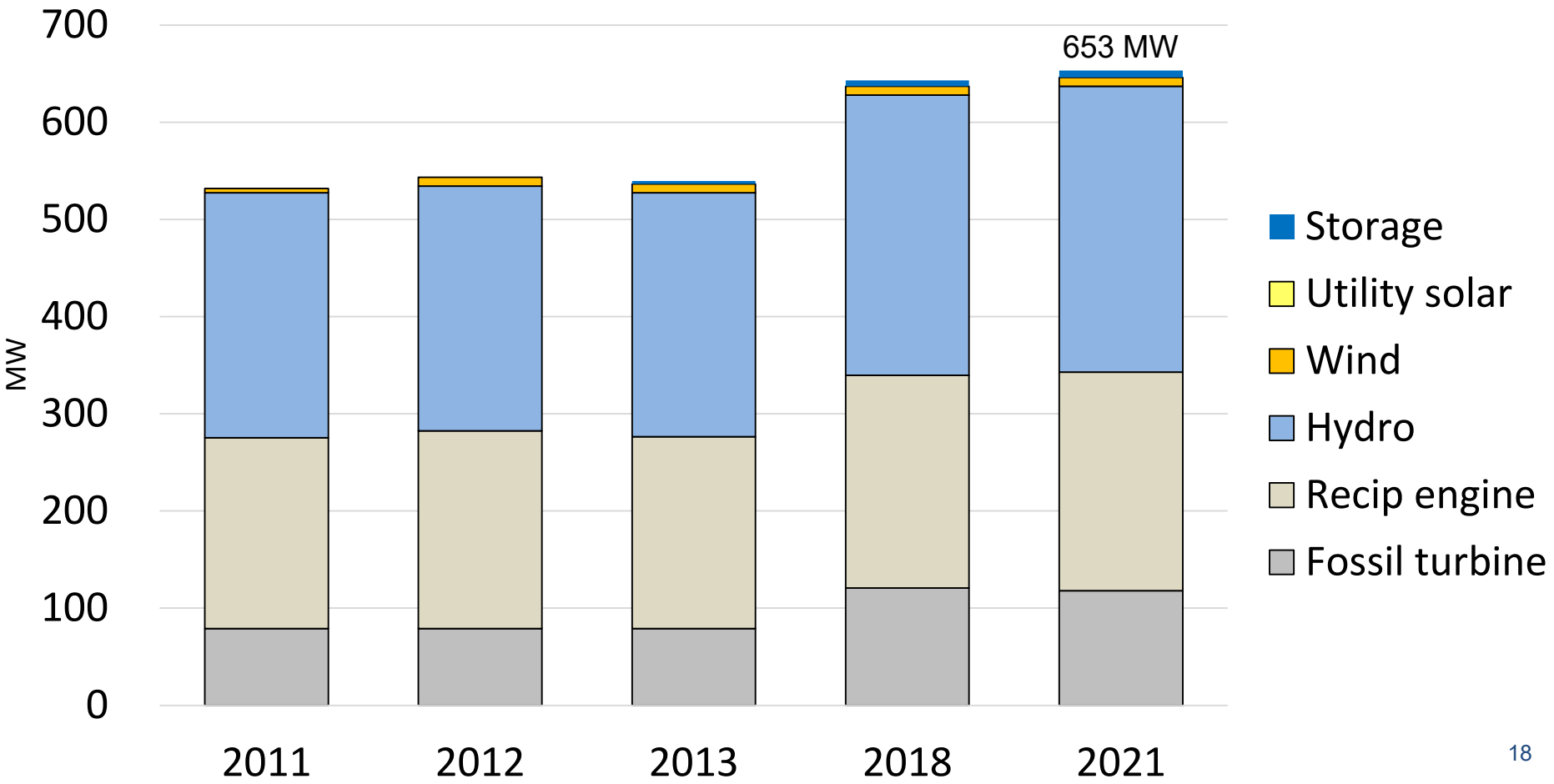
Railbelt installed capacity (MW)



Remote Rural Region Installed Capacity



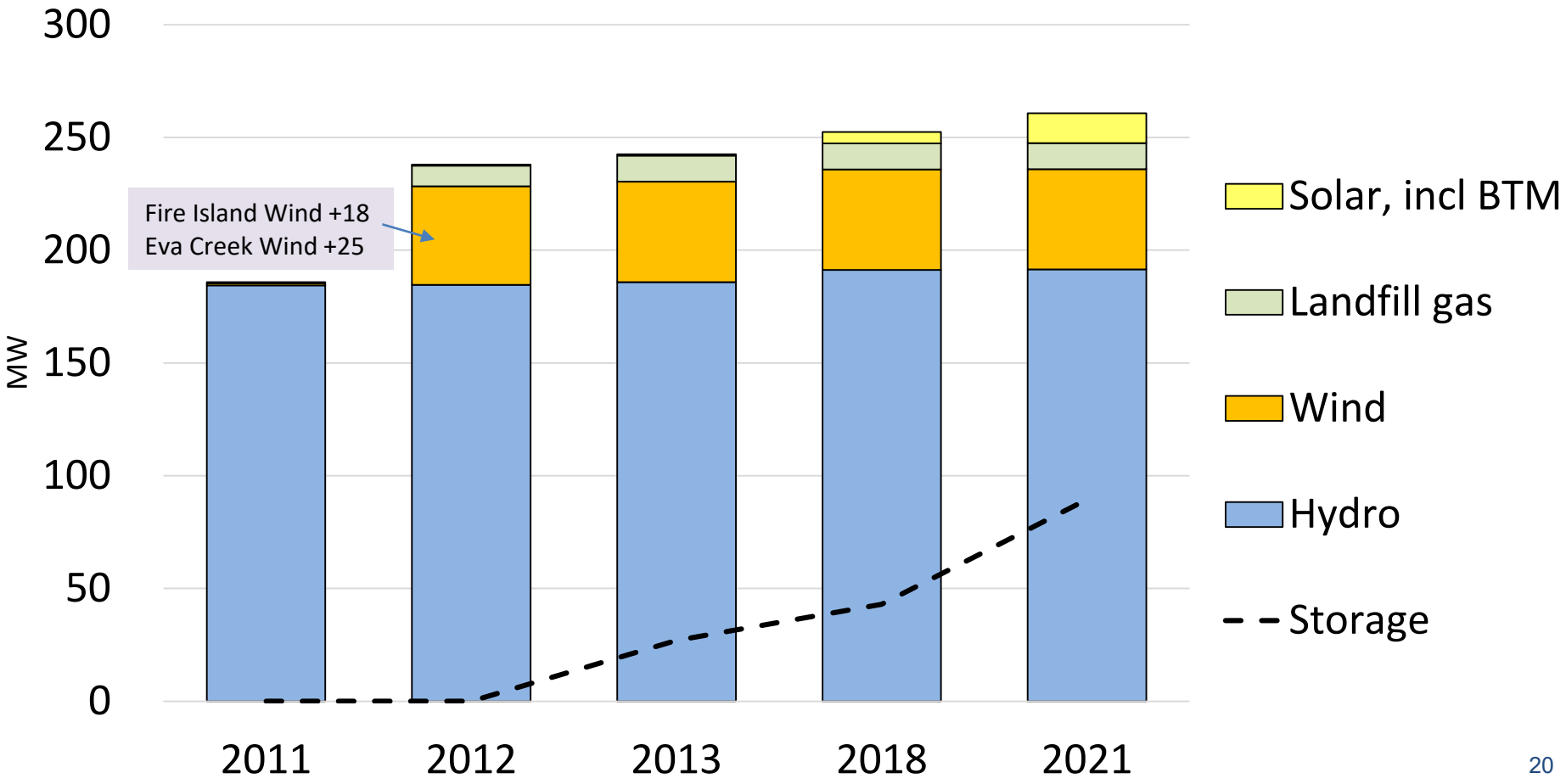
Coastal Region Installed Capacity



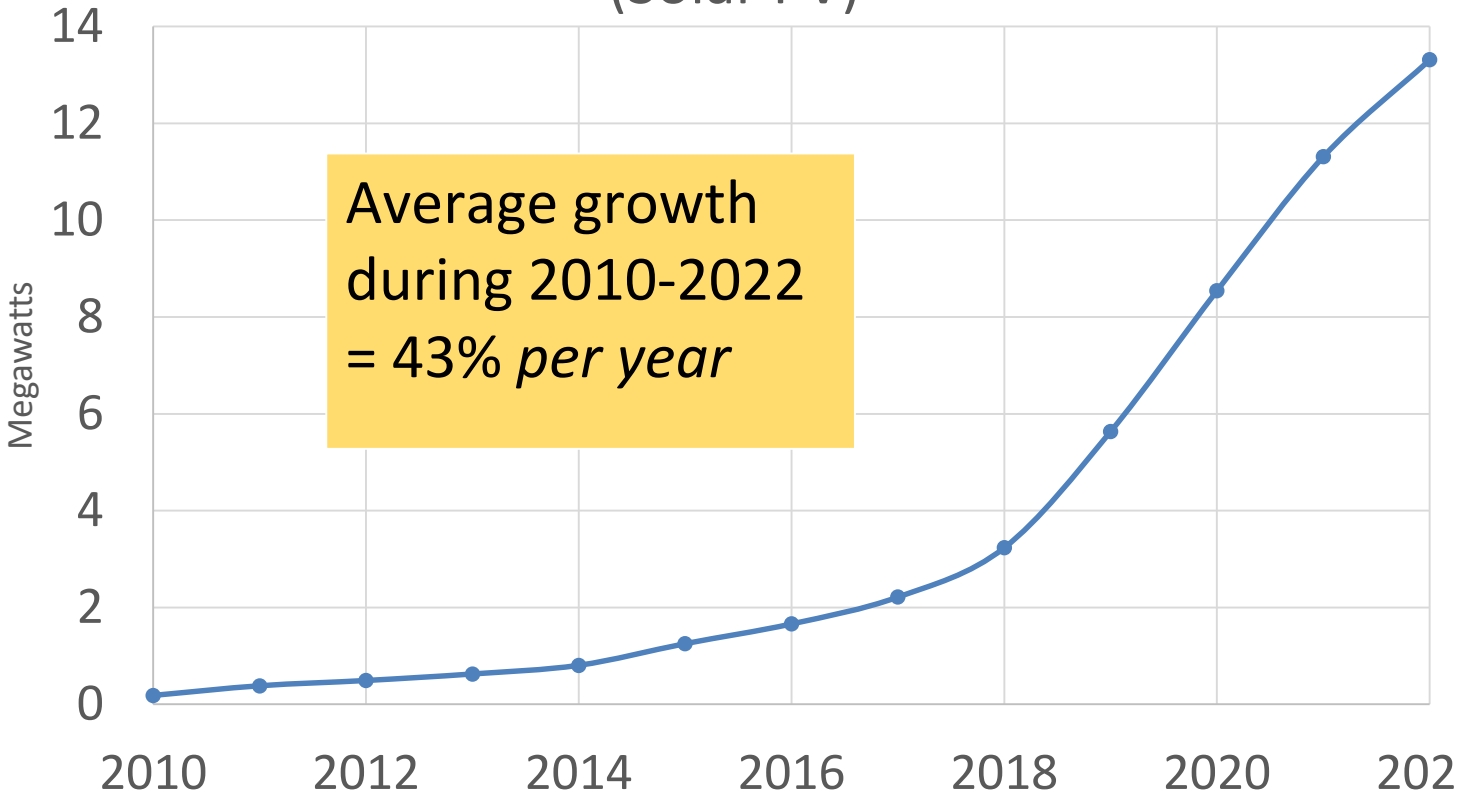
Renewable installed capacity

Credit: Amanda Byrd

Railbelt Renewables Installed Capacity

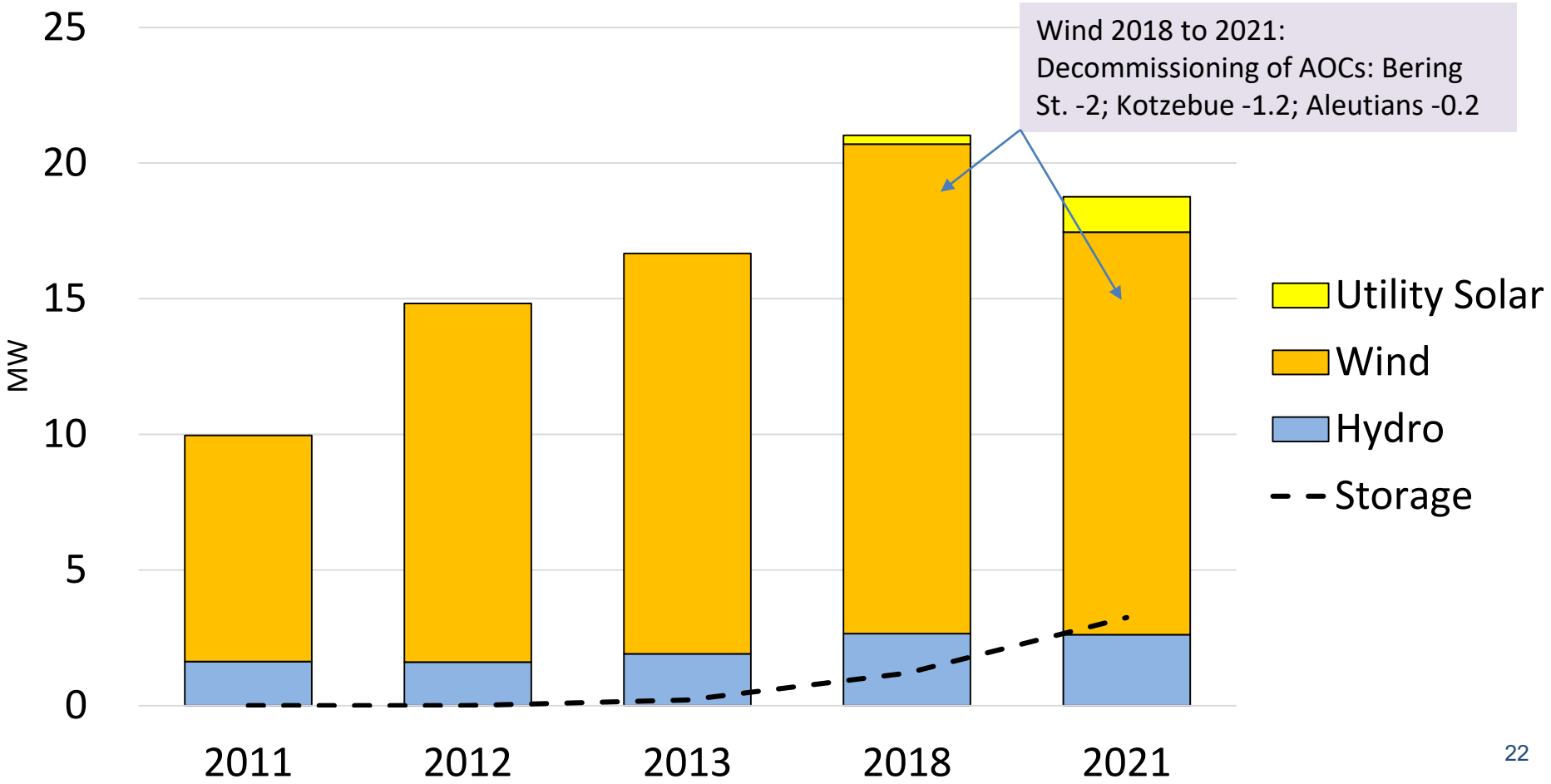


Railbelt Net Metered Installed Capacity (Solar PV)

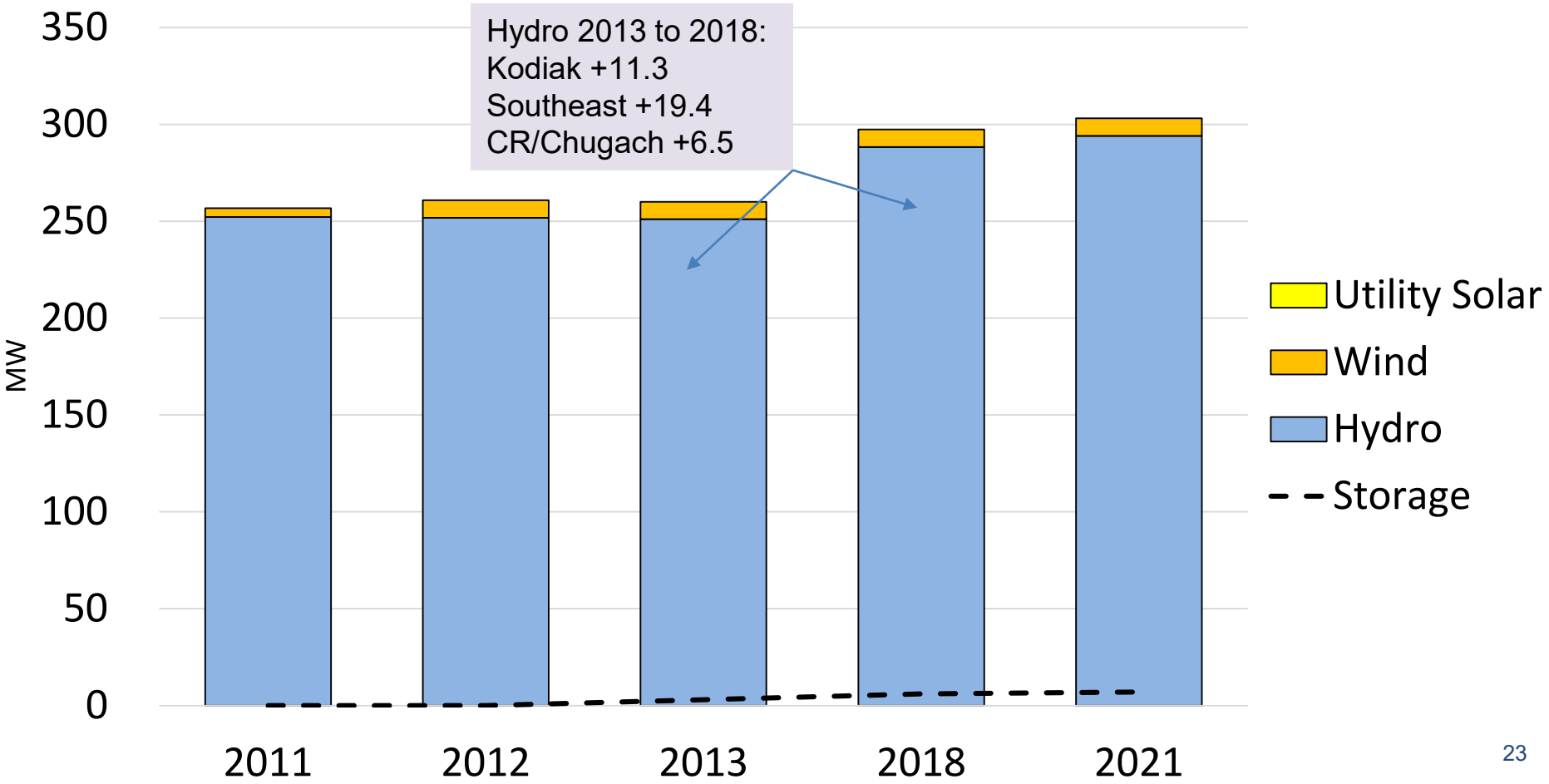


Data source – compiled by ACEP solar technologies program from individual utility RCA reporting

PCE-Eligible Region Renewables Installed Capacity



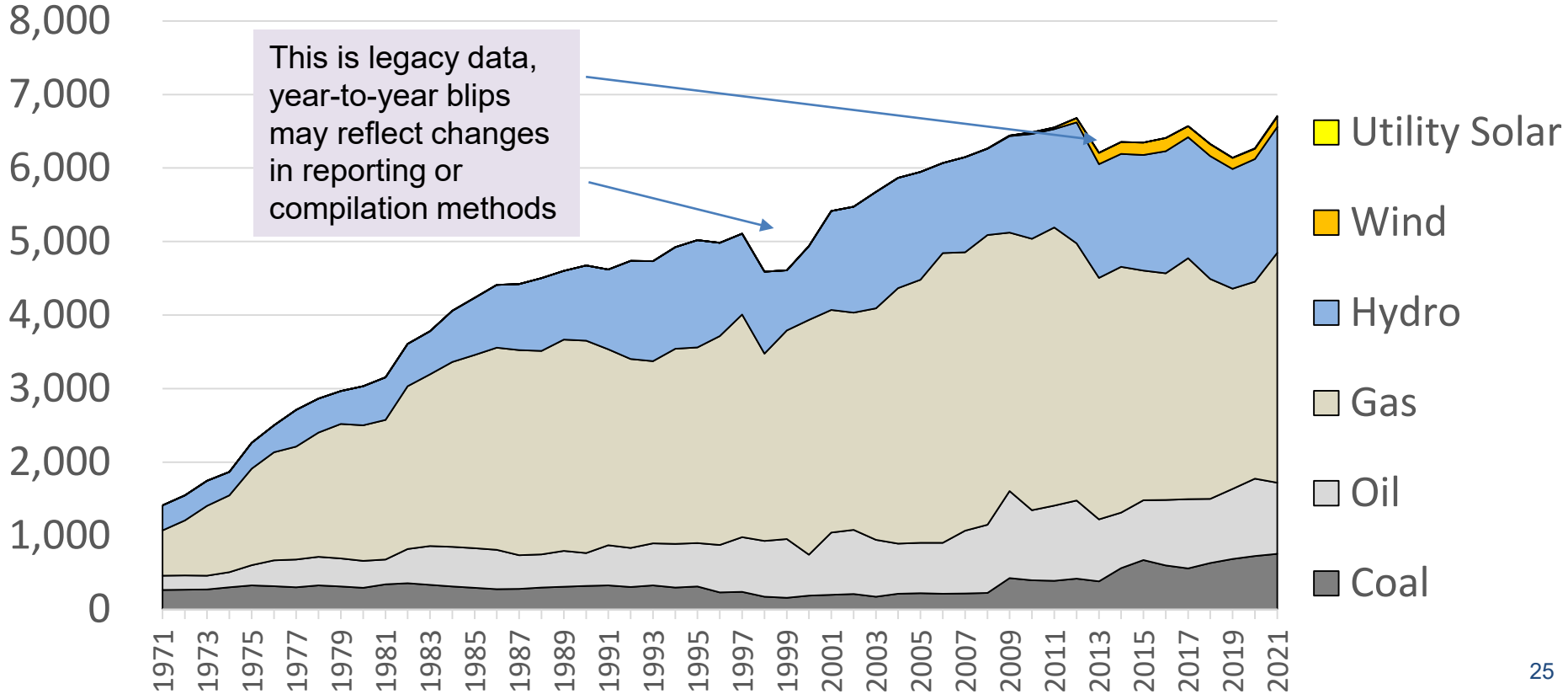
Coastal Region Renewables Installed Capacity



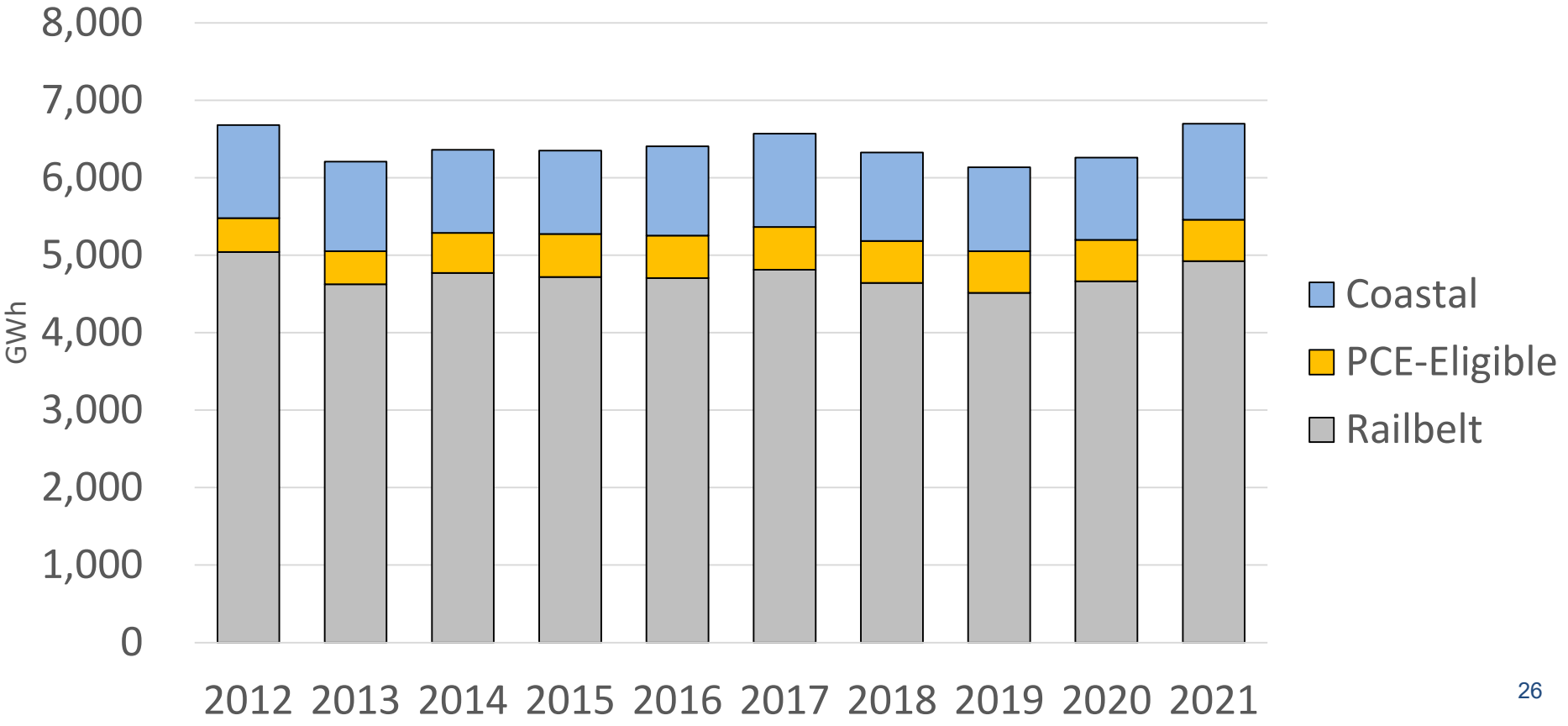
Net generation

AK Plant ID	RCA CPCN	Utility Name	Plant Name	Intertie Name	Energy Region	Oil	Gas	Coal	Hydro	Wind	Solar	Storage (MWH)	Other	Oil (gallons	Gas (mc	Coal (short tons)	Source	Number of monthly records	Communities connected to plant	Notes
P001		Agrium US Inc	Agrium Kenai Nitrogen Operations	Railbelt_grid	Railbelt															No Data
P014	742	Alaska Environmental Power	Delta Wind Farm	Railbelt_grid	Railbelt	0	0	0	0	3,654	0	0	0	0	0	0	EIA923	12	0	
P101	8	Chugach Electric Assn Inc	Hank Nikkels Plant 1	Railbelt_grid	Railbelt	1	2,251	0	0	0	0	0	0	1,344	110,760	0	EIA923	36	0	
P102	8	Chugach Electric Assn Inc	Eklutna Hydro Project	Railbelt_grid	Railbelt	0	0	0	139,994	0	0	0	0	0	0	0	EIA923	12	0	
P103	8	Chugach Electric Assn Inc	George M Sullivan Generation Plant 2	Railbelt_grid	Railbelt	0	761,372	0	0	0	0	0	0	0	5,928,673	0	EIA923	36	0	
P109	520	Aurora Energy LLC	Aurora Energy LLC Chena	Railbelt_grid	Railbelt	0	0	177,115	0	0	0	0	0	0	0	146,844	EIA923	12	0	
P120	8	Chugach Electric Assn Inc	Beluga	Railbelt_grid	Railbelt	0	2,049	0	0	0	0	0	0	0	138,262	0	EIA923	10	0	
P121	8	Chugach Electric Assn Inc	Cooper Lake	Railbelt_grid	Railbelt	0	0	0	36,381	0	0	0	0	0	0	0	EIA923	12	0	
P122	8	Chugach Electric Assn Inc	International	Railbelt_grid	Railbelt															No Data
P123	8	Chugach Electric Assn Inc	Southcentral Power Project	Railbelt_grid	Railbelt	0	1,041,694	0	0	0	0	0	0	0	8,073,094	0	EIA923	24	0	
P136	720	Doyon Utilities - Fort Greely	Fort Greely Power Plant	Railbelt_grid	Railbelt	60	0	0	0	0	0	0	0	4,158	0	0	EIA923	12	0	
P137	726	Doyon Utilities - Ft. Wainwrig	Utility Plants Section	Railbelt_grid	Railbelt	0	0	65,058	0	0	0	0	0	0	0	39,288	EIA923	12	0	
P138	724	Doyon Utilities, LLC	JBER Landfill Gas Power Plant	Railbelt_grid	Railbelt	0	38,093	0	0	0	0	0	0	0	775,141	0	EIA923	18	0	
P142	0	Fire Island Wind LLC	Fire Island Wind	Railbelt_grid	Railbelt	0	0	0	0	41,759	0	0	0	0	0	0	EIA923	12	0	
P146	13	Golden Valley Elec Assn Inc	Battery Energy Storage System	Railbelt_grid	Railbelt	0	0	0	0	0	0	(3,433)	0	0	0	0	EIA923	12	0	
P147	13	Golden Valley Elec Assn Inc	Delta Power	Railbelt_grid	Railbelt	(121)	0	0	0	0	0	0	0	7,812	0	0	EIA923	12	0	
P148	13	Golden Valley Elec Assn Inc	Eva Creek Wind	Railbelt_grid	Railbelt	0	0	0	0	56,648	0	0	0	0	0	0	EIA923	12	0	
P149	13	Golden Valley Elec Assn Inc	Fairbanks	Railbelt_grid	Railbelt	9,024	0	0	0	0	0	0	0	1,330,266	0	0	EIA923	24	0	
P150	13	Golden Valley Elec Assn Inc	Healy	Railbelt_grid	Railbelt	7,531	0	366,442	0	0	0	0	0	786,618	0	106,511	EIA923	36	0	
P151	13	Golden Valley Elec Assn Inc	North Pole	Railbelt_grid	Railbelt	464,977	0	0	0	0	0	0	0	8,453,004	0	0	EIA923	48	0	
P152	13	Golden Valley Elec Assn Inc	GVEA Solar Farm	Railbelt_grid	Railbelt						360									No Data
P155	32	Homer Electric Assn Inc	Bernice Lake	Railbelt_grid	Railbelt	0	785	0	0	0	0	0	0	0	44,166	0	EIA923	12	0	
P156	32	Homer Electric Assn Inc	Bradley Lake	Railbelt_grid	Railbelt	0	0	0	391,018	0	0	0	0	0	0	0	EIA923	12	0	
P157	32	Homer Electric Assn Inc	Nikiski Combined Cycle	Railbelt_grid	Railbelt	0	399,354	0	0	0	0	0	0	0	3,553,344	0	EIA923	24	0	
P158	32	Homer Electric Assn Inc	Seldovia	Railbelt_grid	Railbelt	224	0	0	0	0	0	0	0	14,868	0	0	EIA923	12	0	
P159	32	Homer Electric Assn Inc	Soldotna	Railbelt_grid	Railbelt	0	33,121	0	0	0	0	0	0	0	329,494	0	EIA923	12	0	
P197	18	Matanuska Electric Assn Inc	Eklutna Generation Station	Railbelt_grid	Railbelt	0	678,552	0	0	0	0	0	0	0	5,860,502	0	EIA923	12	0	
P235		Renewable IPP	Willow Solar	Railbelt_grid	Railbelt						1,217						MEA ann rept to RCA			No Data
P239	108	City of Seward - (AK)	Seward (AK)	Railbelt_grid	Railbelt	335	0	0	0	0	0	0	0	26,502	0	0	EIA923	12	0	
P257	0	Tesoro Alaska Company LLC	Tesoro Kenai Cogeneration Plant	Railbelt_grid	Railbelt	0	64,878	0	0	0	0	0	0	0	271,618	0	EIA923	12	0	
P267	452	University of Alaska	University of Alaska Fairbanks	Railbelt_grid	Railbelt	349	3	70,620	0	0	0	0	0	46,242	74	28,055	EIA923	28	0	
P268	0	U S Air Force-Eielson AFB	Eielson AFB Central Heat & Power Pla	Railbelt_grid	Railbelt	292	0	73,660	0	0	0	0	0	10,080	0	23,375	EIA923	24	0	

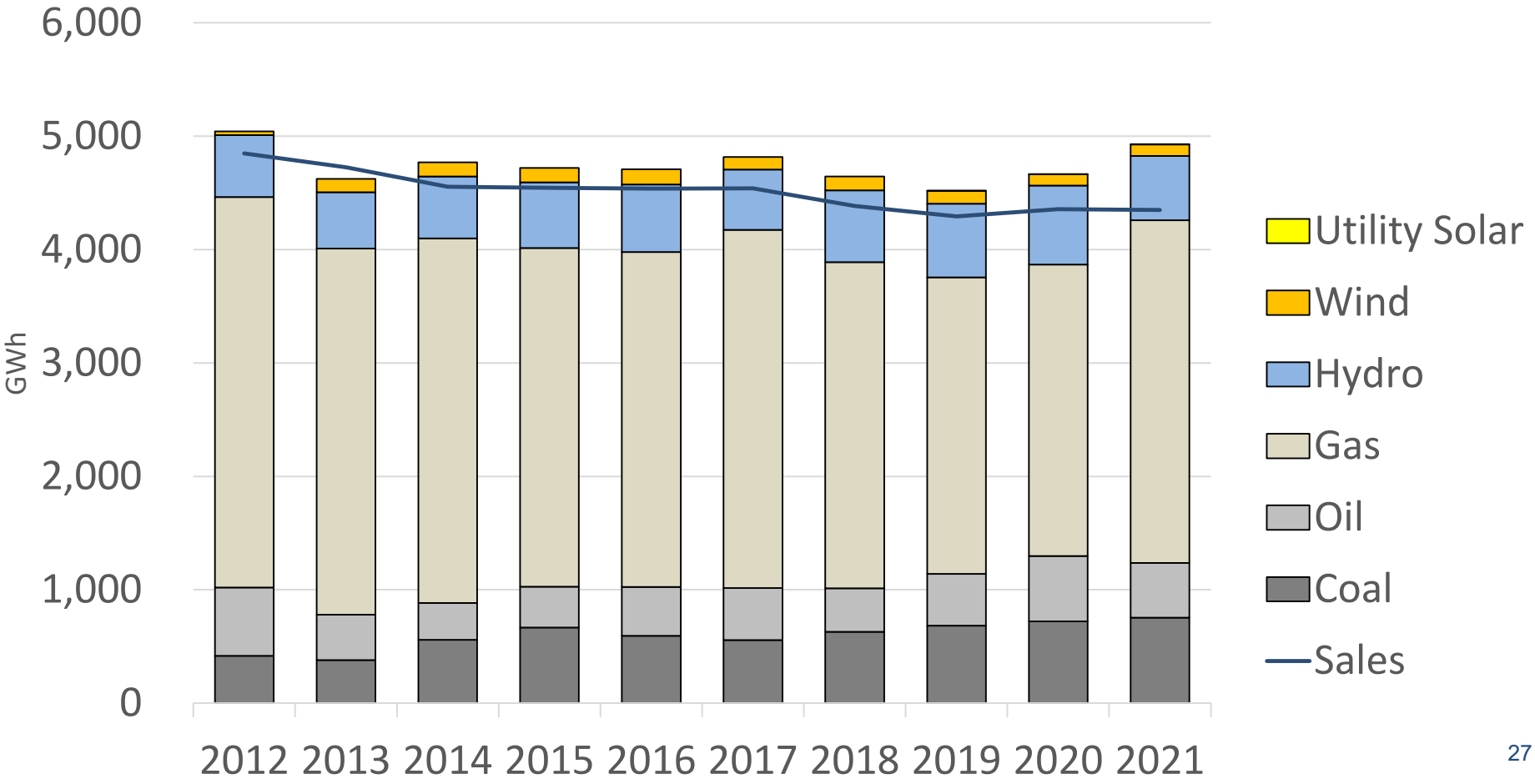
Statewide net generation by fuel, 1971-2021
GWh (= million kilowatt-hours)



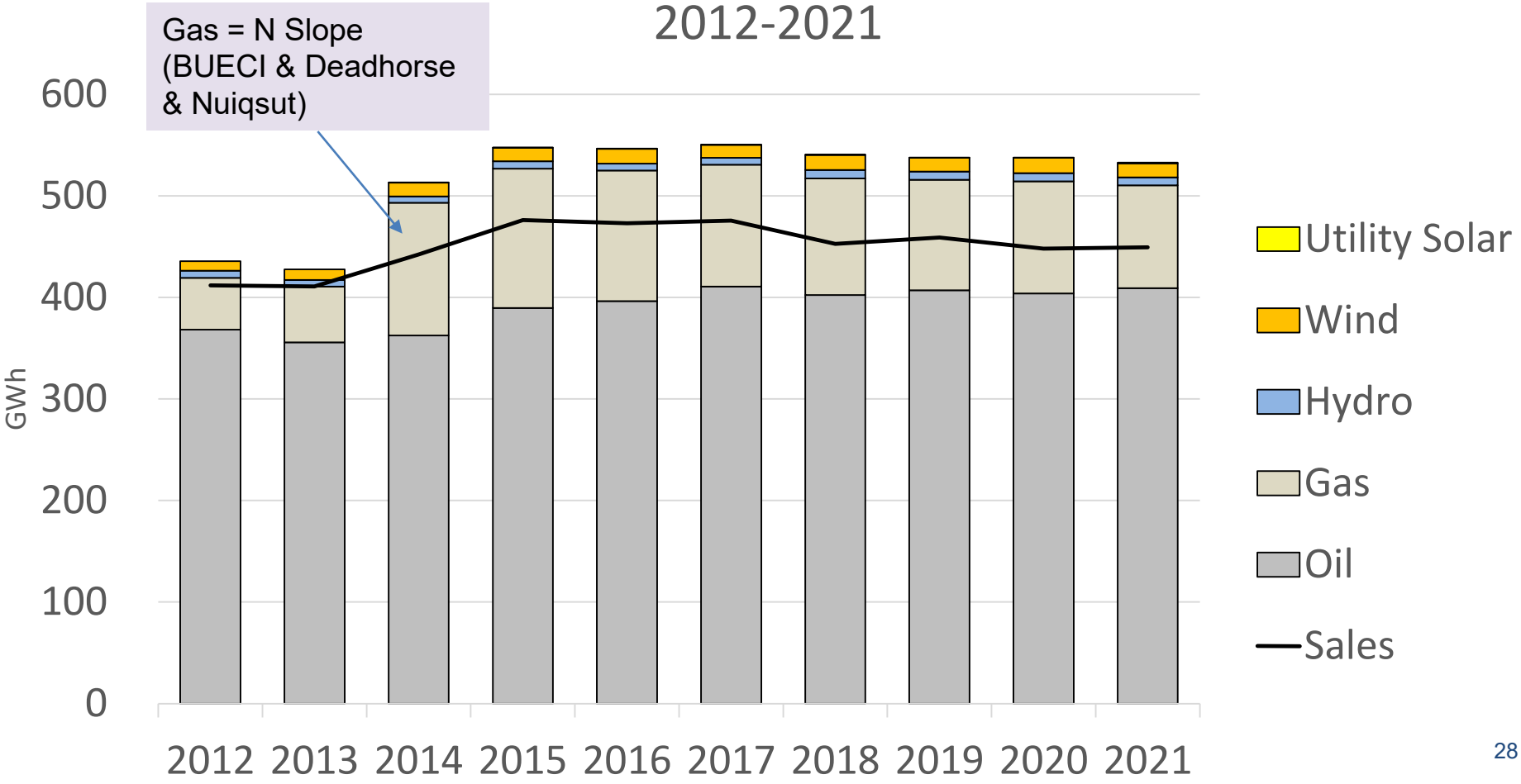
Net Generation by Region, 2012-2021
GWh (= million kilowatt-hours)



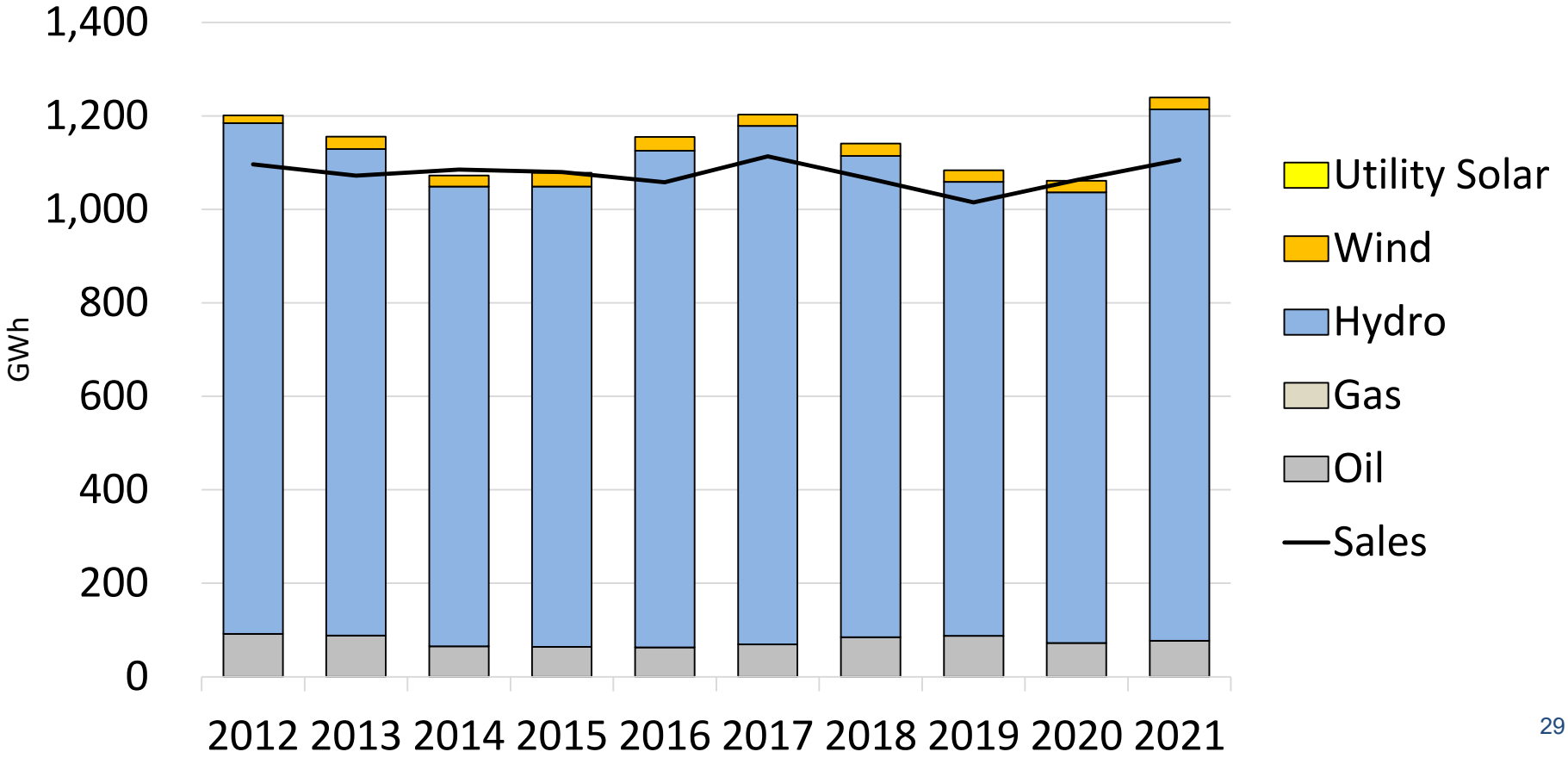
Railbelt Net Generation and Total Sales, 2012-2021



Rural Remote Region Net Generation and Total Sales, 2012-2021



Coastal Region Net Generation and Total Sales, 2012-2021

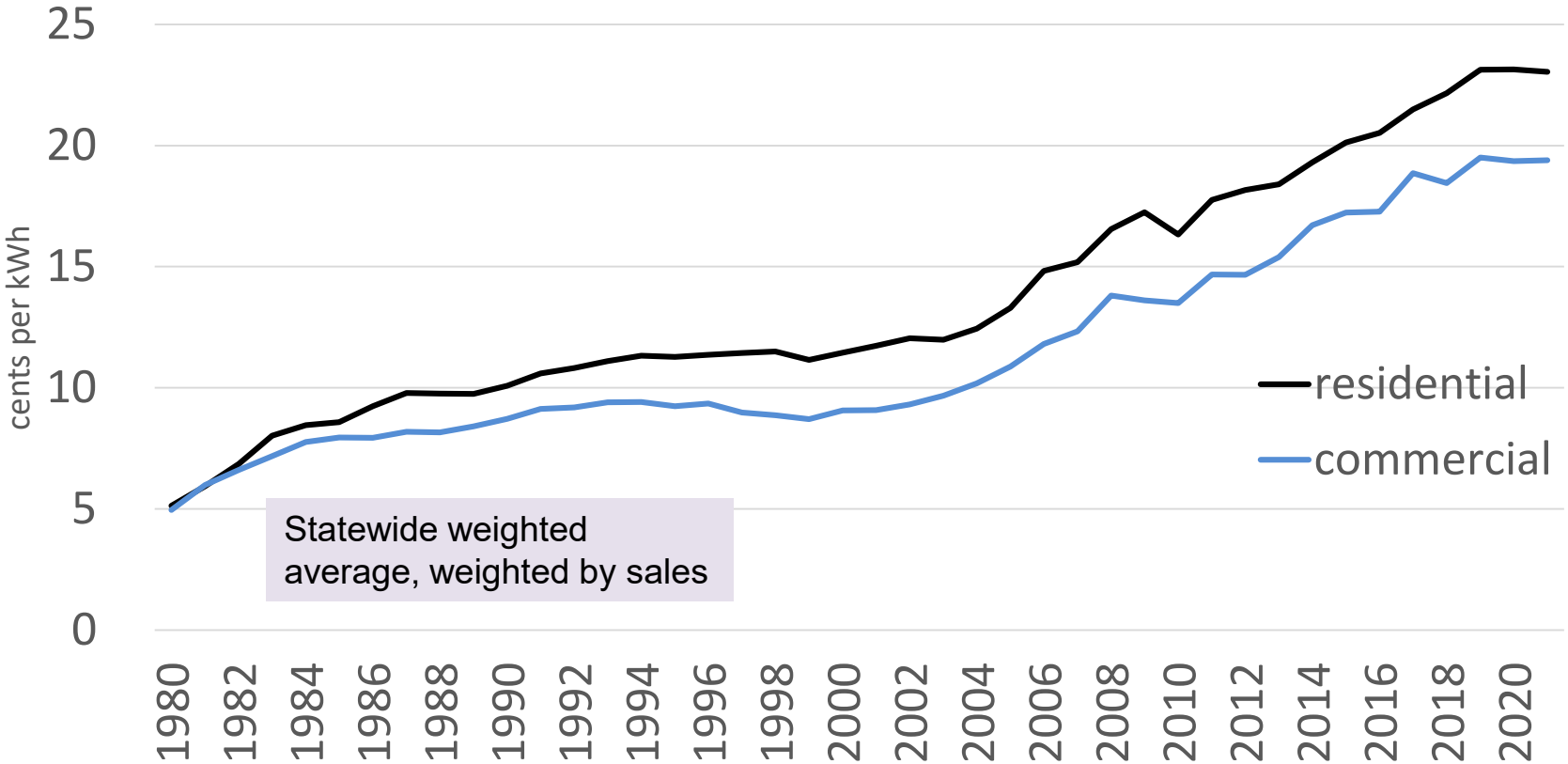


Average price

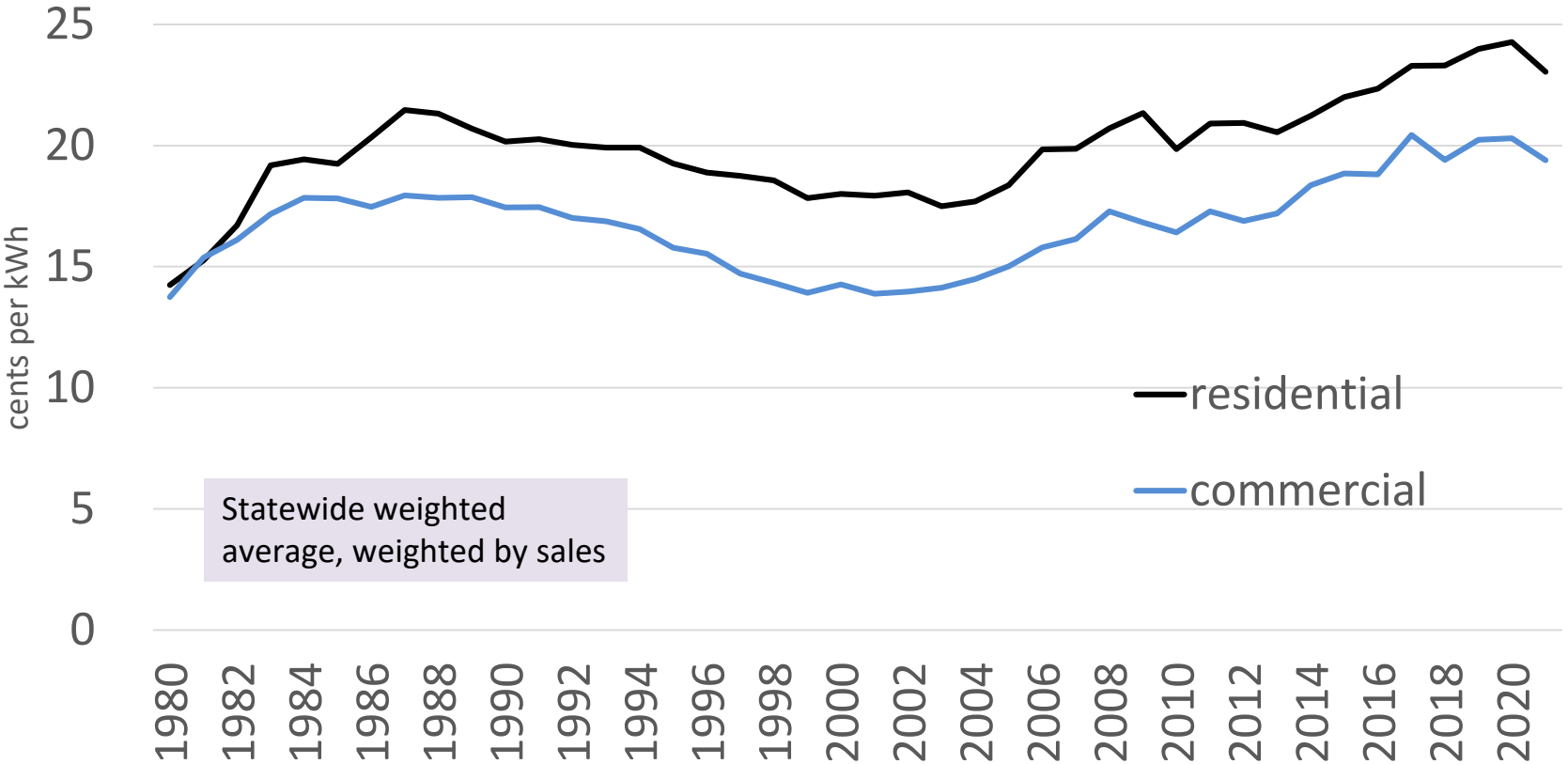
Table 2 5a Revenue, Sales and Customers by Customer Type by Operators/Utilities ($000, MWh, Accounts), 2021

AEA Reporting	PCE ID	CPCN	Utility Name	Reporting Name	Intertie name	AEA Energy Region	ACEP Region	Residential Revenue $000	Residential Sales MWh	Residential Customers	Residential $/kWh	Commercial Revenue $000	Commercial Sales MWh	Commercial Customers	Commercial $/kWh	Other Revenue $000	Other Sales MWh	Other Customers	Other $/kWh	Total Revenue $000	Total Sales MWh	Total Customers	Average Revenue $/kWh	Source	Number of monthly records	Communities reported
SR-1	0	1	Alaska Electric Light & Power Co.	Alaska Electric Light&Power Co	Juneau_grid	Southeast	Coastal	19,052	160,027	15,017	0.12	11,679	117,468	2395	0.10	14548	126,239	121	0.11	45,279	404,334	17,533	0.11	EIA861	00	Juneau, Douglas, Greens Creek (In
SR-10	0	227	TDX North Slope Generating Co	TDX North Slope Generating Co	Deadhorse_grid	North Slope	PCE					10,112	46,930	162	0.22	-	-	-		10,112	46,930	162	0.22	EIA861	00	Deadhorse
SR-100	331420	169	Alaska Village Electric	Koyuk	Koyuk_grid	BeringStraits	PCE	256	507	83	0.51	81	161	10	0.51	282	558	37	0.51	620	1,225	130	0.51	RCE	120	Koyuk
SR-101	332140	687	Koyuluk, City of	Koyukuk	Koyukuk_grid	Yukon-Koyukuk	PCE	57	60	58	0.95	36	38	5	0.95	28	29	9	0.95	121	127	71	0.95	RCE	40	Koyukuk
SR-102	332150	281	Kwethluk Incorporated d/b/a Kuigglurm Kallugvia	Kwethluk	Kwethluk_grid	Lower Yukon-K	PCE	513	987	188	0.52	201	387	1	0.52	18	34	21	0.52	732	1,408	211	0.52	RCE	120	Kwethluk
SR-103	332160	376	Kwigillingok Power Company	Kwigillingok	Kwigillingok_grid	Lower Yukon-K	PCE	396	575	103	0.67	264	395	3	0.67	26	38	18	0.67	676	1,009	124	0.67	RCE	120	Kwigillingok
SR-104	332170	353	Larsen Bay Utility Company	Larsen Bay	Larsen Bay_grid	Kodiak	Coastal									-										Larsen Bay
SR-105	332180	330	Levelock Electrical Coop	Levelock	Levelock_grid	Bristol Bay	PCE	87	102	40	0.85	129	152	6	0.85	71	83	27	0.85	287	338	73	0.85	RCE	120	Levelock
SR-106	332190	570	Lime Village Electric Utility	Lime Village	Lime Village_grid	Lower Yukon-K	PCE	1	1	12	1.77	2	1	4	1.77	4	2	4	1.77	7	4	20	1.77	RCE	20	Lime Village
SR-107	331430	169	Alaska Village Electric	Lower Kalskag	Upper Kalskag_grid	Lower Yukon-K	PCE	186	361	84	0.51	30	58	4	0.51	113	220	15	0.51	328	639	103	0.51	RCE	120	Lower Kalskag
SR-108	332200	284	TDX Manley Generating LLC	Manley Hot Springs	Manley Hot Springs_grid	Yukon-Koyukuk	PCE	173	169	81	1.02	195	190	12	1.02	117	114	22	1.02	484	474	115	1.02	RCE	120	Manley Hot Springs
SR-109	332210	321	Manokotak Power Company	Manokotak	Manokotak_grid	Bristol Bay	PCE	286	477	128	0.60	80	134	5	0.60	139	231	33	0.60	505	842	166	0.60	RCE	80	Manokotak
SR-11	331005	684	TDX Adak Generating LLC	Adak	Adak_grid	Aleutians	PCE	210	165	78	1.27	560	441	10	1.27	677	534	92	1.27	1,446	1,140	181	1.27	RCE	110	Adak
SR-110	331440	169	Alaska Village Electric	Marshall	Marshall_grid	Lower Yukon-K	PCE	286	611	107	0.48	46	95	18	0.48	379	781	23	0.48	721	1,487	148	0.48	RCE	120	Marshall
SR-111	332220	44	Mcgrath Light & Power	McGrath	McGrath_grid	Yukon-Koyukuk	PCE	409	525	188	0.78	574	737	14	0.78	483	619	90	0.78	1,466	1,880	292	0.78	RCE	120	McGrath
SR-112	331450	169	Alaska Village Electric	Mekoryuk	Mekoryuk_grid	Lower Yukon-K	PCE	158	302	89	0.52	55	106	12	0.52	218	418	31	0.52	431	826	133	0.52	RCE	120	Mekoryuk
SR-113	331160	2	Alaska Power & Telephone Company	Mentasta Lake	Slana_grid	Copper River/C	Coastal	108	161	50	0.64	131	205	4	0.64	65	102	22	0.64	299	468	76	0.64	RCE	120	Mentasta Lake
SR-114	331460	169	Alaska Village Electric	Minto	Minto_grid	Yukon-Koyukuk	PCE	157	329	76	0.48	-	-	7		194	405	18	0.48	352	734	101	0.48	RCE	120	Minto
SR-115	331470	169	Alaska Village Electric	Mountain Village	Saint Mary's_grid	Lower Yukon-K	PCE	447	903	172	0.49	182	369	17	0.49	613	1,266	47	0.49	1,241	2523	236	0.49	RCE	120	Mountain Village
SR-116	332280	22	Naknek Electric Association	Naknek, South Naknek, King Salmon	Naknek_grid	Bristol Bay	PCE	1,537	3,290	706	0.48	6,441	13,534	35	0.48	2,292	4,815	382	0.48	10,270	21,578	1,123	0.48	RCE	120	Naknek, South Naknek, KingSalmo
SR-117	332290	319	Napakiak Incinrag	Napakiak	Bethel_grid	Lower Yukon-K	PCE	299	387	104	0.77	172	228	4	0.77	45	59	13	0.77	516	669	122	0.77	RCE	120	Napakiak
SR-118	332300	625	Napaskiak Electric Utility	Napaskiak	Napaskiak_grid	Lower Yukon-K	PCE	286	409	112	0.70	145	207	8	0.70	34	49	23	0.70	465	665	143	0.70	RCE	120	Napaskiak
SR-119	331170	2	Alaska Power & Telephone Company	Nakukti Bay	Prince of Wales Is._grid	Southeast	Coastal	135	458	89	0.29	44	149	-	0.29	14	46	18	0.29	192	653	107	0.29	RCE	120	Nakukti Bay
SR-12	331010	449	Akhiok, City of	Akhiok	Akhiok_grid	Kodiak	Coastal	74	93	27	0.80	110	137	7	0.80	13	17	9	0.80	197	247	43	0.80	RCE	120	Akhiok
SR-120	332320	340	Nelson Lagoon Electrical Coop	Nelson Lagoon	Nelson Lagoon_grid	Aleutians	PCE	102	122	31	0.84	71	85	8	0.84	30	36	22	0.84	203	242	60	0.84	RCE	120	Nelson Lagoon
SR-121	331480	169	Alaska Village Electric Cooperative	New Stuyahok	New Stuyahok_grid	Bristol Bay	PCE	318	585	106	0.54	51	94	10	0.54	373	685	38	0.54	742	1,364	154	0.54	RCE	120	New Stuyahok
SR-122	332870	375	Ungusraq Power Company	Newtok	Newtok_grid	Lower Yukon-K	PCE	199	211	83	0.80	112	140	5	0.80	15	18	19	0.80	296	370	107	0.80	RCE	80	Newtok
SR-123	331490	169	Alaska Village Electric Cooperative	Nightmute	Toksook Bay_grid	Lower Yukon-K	PCE	157	300	52	0.52	15	28	7	0.52	297	568	22	0.52	468	895	81	0.52	RCE	120	Nightmute
SR-124	332330	416	Nikolai, City of	Nikolai	Nikolai_grid	Yukon-Koyukuk	PCE	145	161	40	0.90	101	112	8	0.90	68	75	10	0.90	314	348	58	0.90	RCE	90	Nikolai
SR-125	332740	242	Umnak Power Company	Nikolski	Nikolski_grid	Aleutians	PCE	25	33	14	0.75	38	50	5	0.75	18	24	7	0.75	80	107	26	0.75	RCE	80	Nikolski
SR-126	331500	169	Alaska Village Electric Cooperative	Noatak	Noatak_grid	Northwest Arct	PCE	764	844	120	0.91	114	128	7	0.91	716	791	30	0.91	1,595	1,762	157	0.91	RCE	120	Noatak
SR-127	332340	150	Nome Joint Utility Systems	Nome	Nome_grid	BeringStraits	PCE	3,147	8,780	1,754	0.36	3,456	9,640	73	0.36	4,004	11,170	384	0.36	10,607	29,590	2,211	0.36	RCE	120	Nome
SR-128	331510	169	Alaska Village Electric Cooperative	Noorvik	Noorvik_grid	Northwest Arct	PCE	489	900	137	0.54	83	154	10	0.54	456	840	36	0.54	1,029	1,893	183	0.54	RCE	120	Noorvik
SR-129	331180	2	Alaska Power & Telephone Company	Northway, Northway Village, Northway Junction	Northway_grid	Yukon-Koyukuk	PCE	241	353	90	0.68	208	305	6	0.68	236	347	37	0.68	685	1,005	132	0.68	RCE	120	Northway, Northway Village, Nor
SR-13	331020	412	Akiachak Native Community	Akiachak	Akiachak_grid	Lower Yukon-K	PCE	472	768	186	0.62	267	434	10	0.62	357	580	44	0.62	1,096	1,781	240	0.62	RCE	120	Akiachak
SR-130	332380	254	North Slope Borough Power & Light	Nuiqsut	Nuiqsut_grid	North Slope	PCE	90	685	111	0.09	465	5,069	3	0.09	14	153	83	0.09	569	6,207	196	0.09	RCE	120	Nuiqsut

Average Revenue, cents per kWh, 1980-2021
(current or "nominal" dollars)

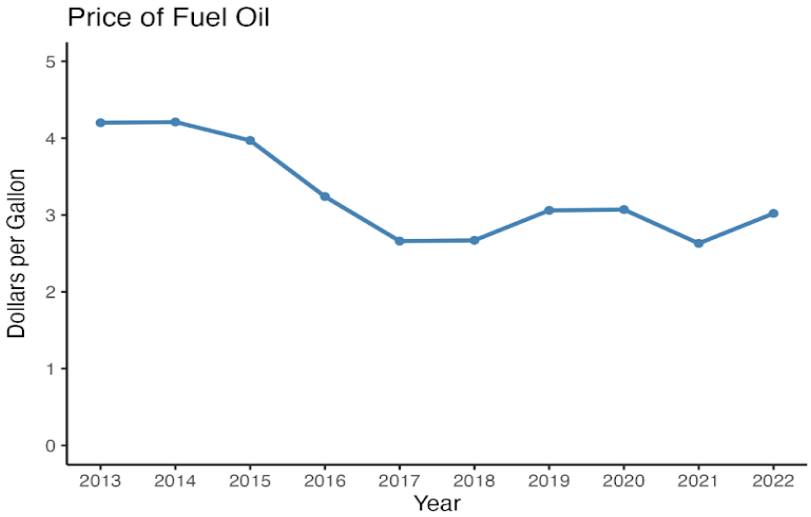


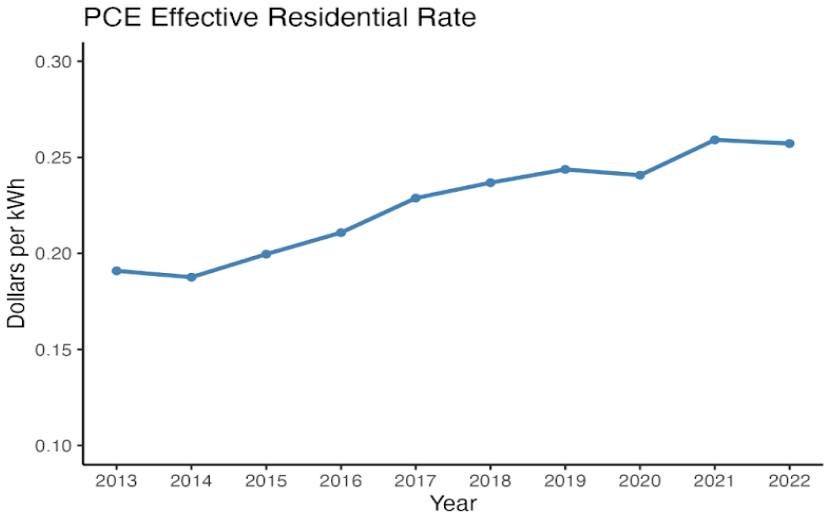
Average revenue, cents per kWh, 1980-2021 (inflation-adjusted to 2021 dollars using Urban AK CPI)

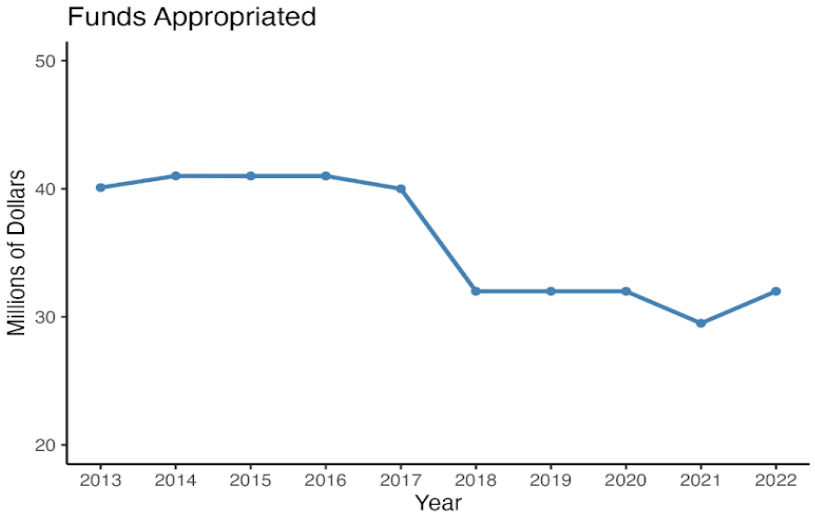


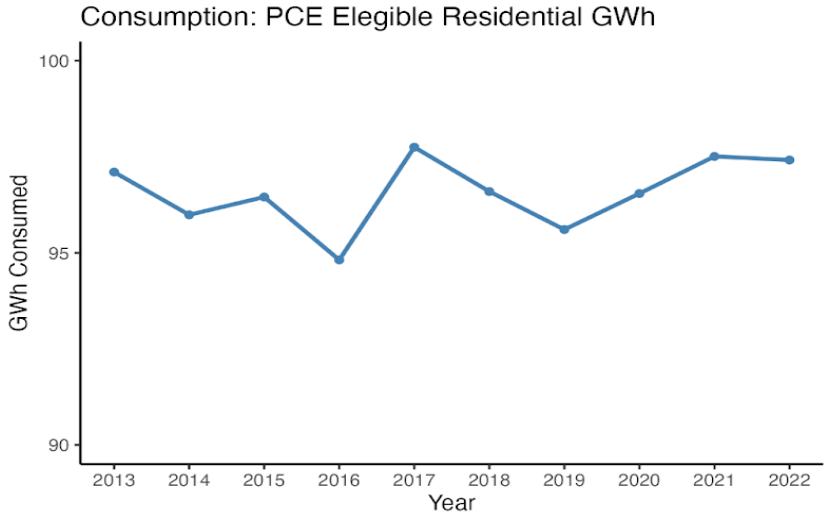
PCE Trends (2013-2022)

Data Source – AEA PCE Annual Report (2022)









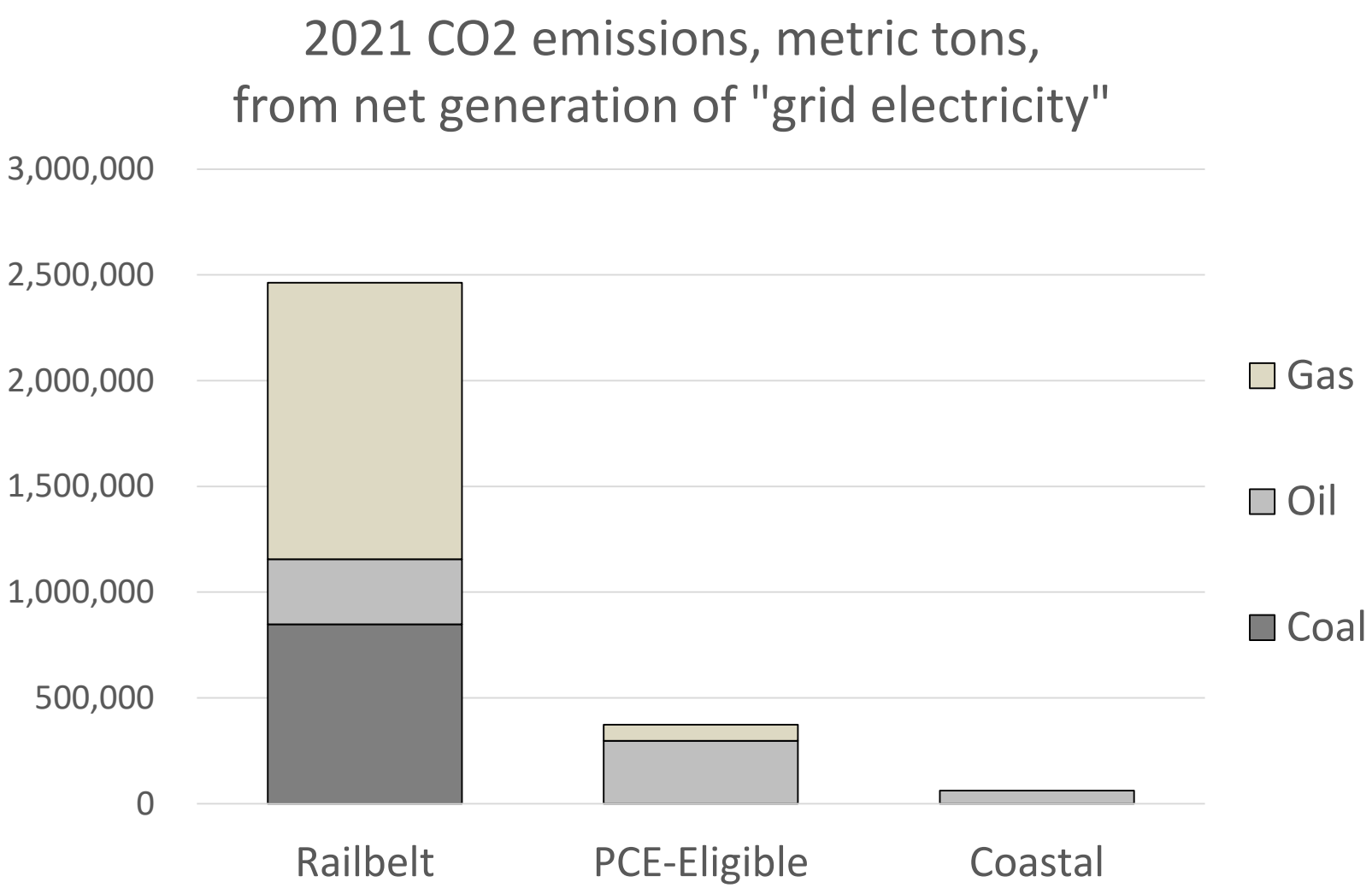
CO2 emissions

Net Generation, fuel Use, and CO2 Emissions by Plant, Prime Mover, and Fuel Type, 2021

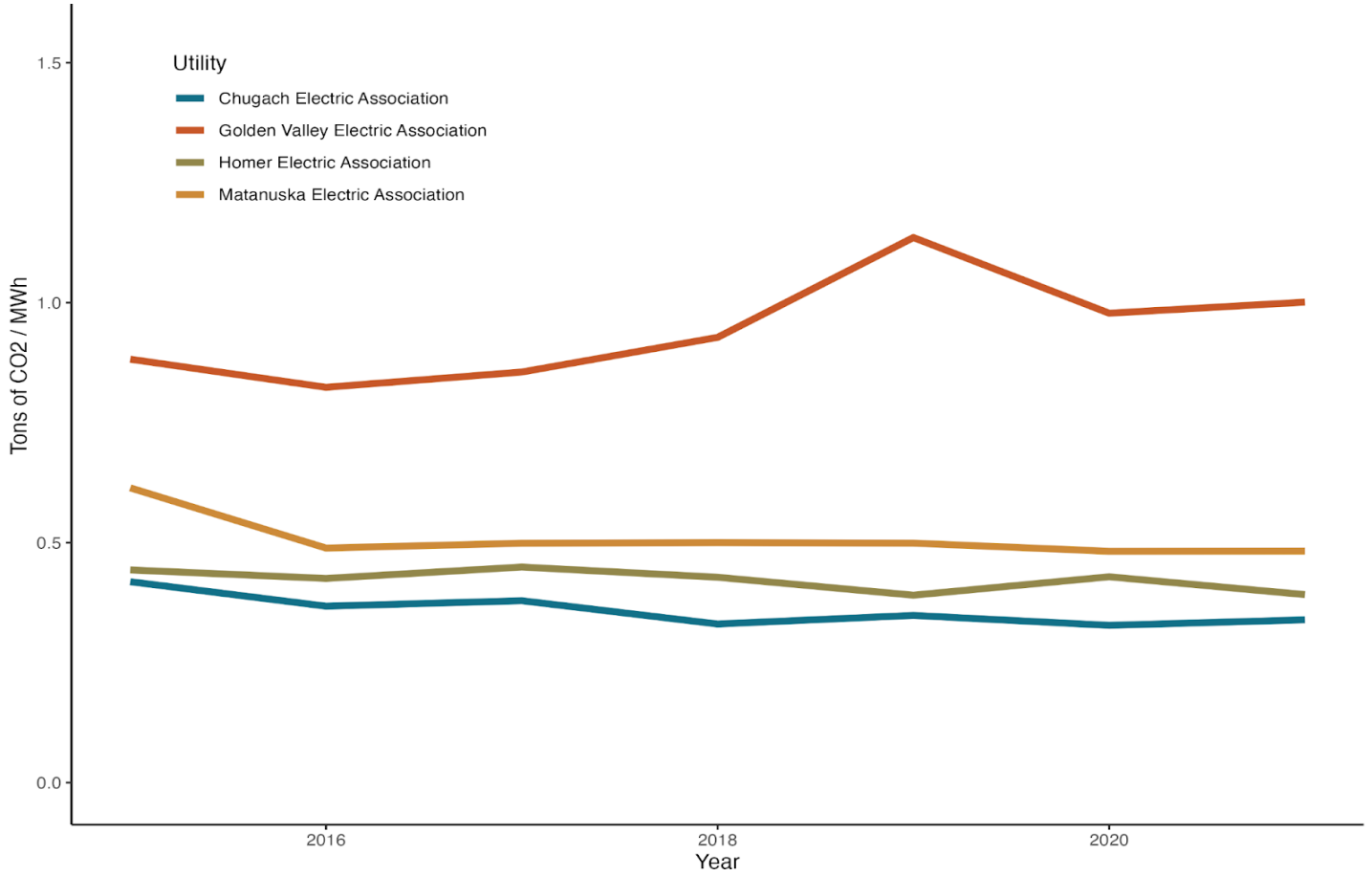
Fuel Types: AB=Agricultural By-Products, DFO=Distillate Fuel Oil, JF=Jet Fuel, NG=Natural Gas, OTH=Other, RFO=Residual Fuel Oil, SUB=Sub-bituminous Coal, WAT=Water at a Conventional Hydroelectric Turbine, WC=Waste Coal, WDS=Wood Solids, WND=Wind, WO=Waste/Othe

Prime Movers: CA=Combined Cycle, steam part, CT=Combined Cycle=turbine part, GT=Gas Turbine, HY=Hydroelectric Turbine, IC=Internal Combustion Engine, ST=Steam Turbine, WT=Wind Turbine

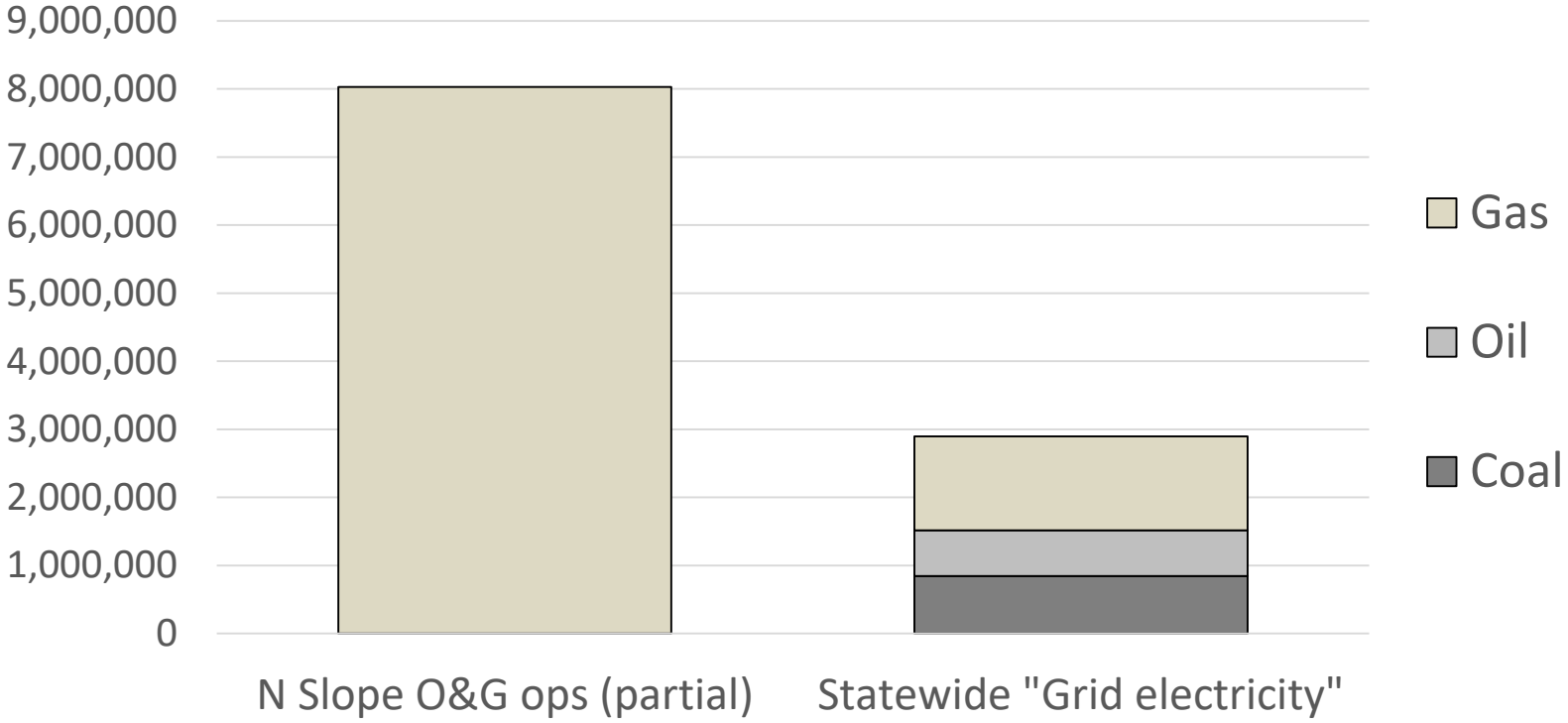
AK Plant ID	RCA CPCN	Utility Name	Plant Name	Intertie Name	Energy Region	Fuel Type	Prime Mover	Generation MWh	Generation MMBtu	Fuel Use	Fuel Units	Estimated Average Heat Content	Total Fuel MMBtu	Emission Factor kgCO2 per MMBtu	CO2 Metric Tons from Fuel
P001	0	Agrium US Inc	Agrium Kenai Nitrogen Operations	Railbelt_grid	Railbelt	NG	IC								
P001	0	Agrium US Inc	Agrium Kenai Nitrogen Operations	Railbelt_grid	Railbelt	NG	GT								
P002	449	Akhiok, City of	Akhiok	Akhiok_grid	Kodiak	DFO	IC	287	981	24270	gallons	0.138	3,349	73.15	245
P003	412	Akiachak Native Community	Akiachak	Akiachak_grid	Lower Yukon-Kuskokwi	DFO	IC	2,004	6,853	143144	gallons	0.138	19,754	73.15	1,445
P004	635	Akiak City Council	Akiak	Akiak_grid	Lower Yukon-Kuskokwi	DFO	IC	225	769	17068	gallons	0.138	2,355	73.15	172
P005	293	Akutan, City of	Akutan	Akutan_grid	Aleutians	WAT	HY	168	575	0		-	0	-	0
P005	293	Akutan, City of	Akutan	Akutan_grid	Aleutians	DFO	IC	515	1,763	43356	gallons	0.138	5,983	73.15	438
P006	1	Alaska Electric Light & Power C	Annex Creek	Juneau_grid	Southeast	WAT	HY	25,983	88,870	0		-	229,770	-	0
P007	1	Alaska Electric Light & Power C	Auke Bay	Juneau_grid	Southeast	DFO	GT	(326)	(1,115)	14742	gallons	0.135	1,990	73.15	146
P007	1	Alaska Electric Light & Power C	Auke Bay	Juneau_grid	Southeast	DFO	IC	(28)	(96)	1134	gallons	0.133	151	73.15	11
P008	1	Alaska Electric Light & Power C	Gold Creek	Juneau_grid	Southeast	DFO	IC	5	17	378	gallons	0.135	51	73.15	4
P008	1	Alaska Electric Light & Power C	Gold Creek	Juneau_grid	Southeast	WAT	HY	5,419	18,535	0		-	47,920	-	0
P009	1	Alaska Electric Light & Power C	Industrial Plant	Juneau_grid	Southeast	DFO	GT	(125)	(428)	17472	gallons	0.135	2,358	73.15	172
P010	1	Alaska Electric Light & Power C	Lake Dorothy Hydroelectric Project	Juneau_grid	Southeast	WAT	HY	87,446	299,092	0		-	773,285	-	0
P011	1	Alaska Electric Light & Power C	Lemon Creek	Juneau_grid	Southeast	DFO	IC	(549)	(1,878)	14070	gallons	0.135	1,898	73.15	139
P011	1	Alaska Electric Light & Power C	Lemon Creek	Juneau_grid	Southeast	DFO	GT	(295)	(1,009)	15204	gallons	0.135	2,053	73.15	150
P012	1	Alaska Electric Light & Power C	Salmon Creek 1	Juneau_grid	Southeast	WAT	HY	24,590	84,105	0		-	217,448	-	0
P013	1	Alaska Electric Light & Power C	Snettisham	Juneau_grid	Southeast	WAT	HY	289,785	991,152	0		-	2,562,570	-	0
P014	742	Alaska Environmental Power	Delta Wind Farm	Railbelt_grid	Railbelt	WND	WT	3,654	12,498	0		-	32,314	-	0
P015	2	Alaska Power and Telephone C	Black Bear Lake	Prince of Wale	Southeast	WAT	HY	22,727	77,733	0		-	200,974	-	0
P016	2	Alaska Power and Telephone C	Goat Lake Hydro	UpperLynnCan	Southeast	WAT	HY	14,473	49,502	0		-	127,986	-	0
P017	2	Alaska Power and Telephone C	Kasidaya Creek Hydro	UpperLynnCan	Southeast	WAT	HY	6,902	23,607	0		-	61,036	-	0
P018	2	Alaska Power and Telephone C	South Fork	Prince of Wale	Southeast	WAT	HY	6,206	21,226	0		-	54,881	-	0
P019	2	Alaska Power & Telephone Cor	Viking	Prince of Wale	Southeast	DFO	IC								
P020	2	Alaska Power and Telephone C	Craig (AK)	Prince of Wale	Southeast	DFO	IC	324	1,108	35112	gallons	0.139	4,870	73.15	356
P021	2	Alaska Power and Telephone C	False Island	Prince of Wale	Southeast	DFO	IC	696	2,381	50148	gallons	0.139	6,957	73.15	509
P022	2	Alaska Power and Telephone C	Haines	UpperLynnCan	Southeast	DFO	IC	1,390	4,754	119994	gallons	0.139	16,644	73.15	1,218
P022	2	Alaska Power & Telephone Cor	Haines	UpperLynnCan	Southeast	WAT	HY								
P023	2	Alaska Power and Telephone C	Hydaburg	Prince of Wale	Southeast	DFO	IC	12	41	3570	gallons	0.139	496	73.15	36
P024	2	Alaska Power and Telephone C	Klawock Power Generation Station	Prince of Wale	Southeast	DFO	IC	600	2,052	47124	gallons	0.139	6,535	73.15	478
P025	2	Alaska Power & Telephone Cor	Northway, Northway Village, Northwa	Northway_grid	Yukon-Koyukuk/Upper T	DFO	IC	1,096	3,749	87386	gallons	0.138	12,059	73.15	882
P026	2	Alaska Power & Telephone Cor	Skagway	Haines_grid	Southeast	DFO	IC	1,483	5,073	102616	gallons	0.138	14,161	73.15	1,036
P026	2	Alaska Power & Telephone Cor	Skagway	Haines_grid	Southeast	WAT	HY	2,501	8,556	0		-	0	-	0
P027	2	Alaska Power & Telephone Cor	Slana	Slana_grid	Yukon-Koyukuk/Upper T	DFO	IC	1,424	4,871	108393	gallons	0.138	14,943	73.15	1,093
P028	2	Alaska Power and Telephone C	Thorne Bay Plant	Prince of Wale	Southeast	DFO	IC	20	68	7308	gallons	0.139	1,013	73.15	74
P029	2	Alaska Power & Telephone Cor	Tok, Tanacross	Tok_grid	Yukon-Koyukuk/Upper T	DFO	IC	10,384	35,516	716858	gallons	0.138	98,926	73.15	7,236
P030	2	Alaska Power & Telephone Cor	Allakaket, Alatna	Allakaket_grid	Yukon-Koyukuk/Upper T	DFO	IC	662	2,264	54977	gallons	0.138	7,587	73.15	555
P031	2	Alaska Power & Telephone Cor	Bettles, Evansville	Bettles_grid	Yukon-Koyukuk/Upper T	DFO	IC	518	1,770	43056	gallons	0.138	5,942	73.15	435
P032	2	Alaska Power & Telephone Cor	Chistochina	Slana_grid	Copper River/Chugach	DFO	IC								
P033	2	Alaska Power & Telephone Cor	Coffman Cove	Prince of Wale	Southeast	DFO	IC								
P034	2	Alaska Power & Telephone Cor	Eagle, Eagle Village	Eagle_grid	Yukon-Koyukuk/Upper T	SUN	PV	10	36	0		-	0	#N/A	#N/A
P034	2	Alaska Power & Telephone Cor	Eagle, Eagle Village	Eagle_grid	Yukon-Koyukuk/Upper T	DFO	IC	866	2,963	66877	gallons	0.138	9,229	73.15	675
P035	2	Alaska Power & Telephone Cor	Gustavus	Gustavus_grid	Southeast	DFO	IC	534	1,825	37530	gallons	0.138	5,179	73.15	379
P035	2	Alaska Power & Telephone Cor	Gustavus	Gustavus_grid	Southeast	WAT	HY	2,189	7,488	0		-	0	-	0
P036	2	Alaska Power & Telephone Cor	Healy Lake	Healy Lake_gri	Yukon-Koyukuk/Upper T	DFO	IC	105	359	11238	gallons	0.138	1,551	73.15	113
P037	2	Alaska Power & Telephone Cor	Hollis	Prince of Wale	Southeast	DFO	IC								


2021 CO2 emissions, metric tons,
from net generation of "grid electricity"
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Railbelt
PCE-Eligible
Coastal
Gas
Oil
Coal

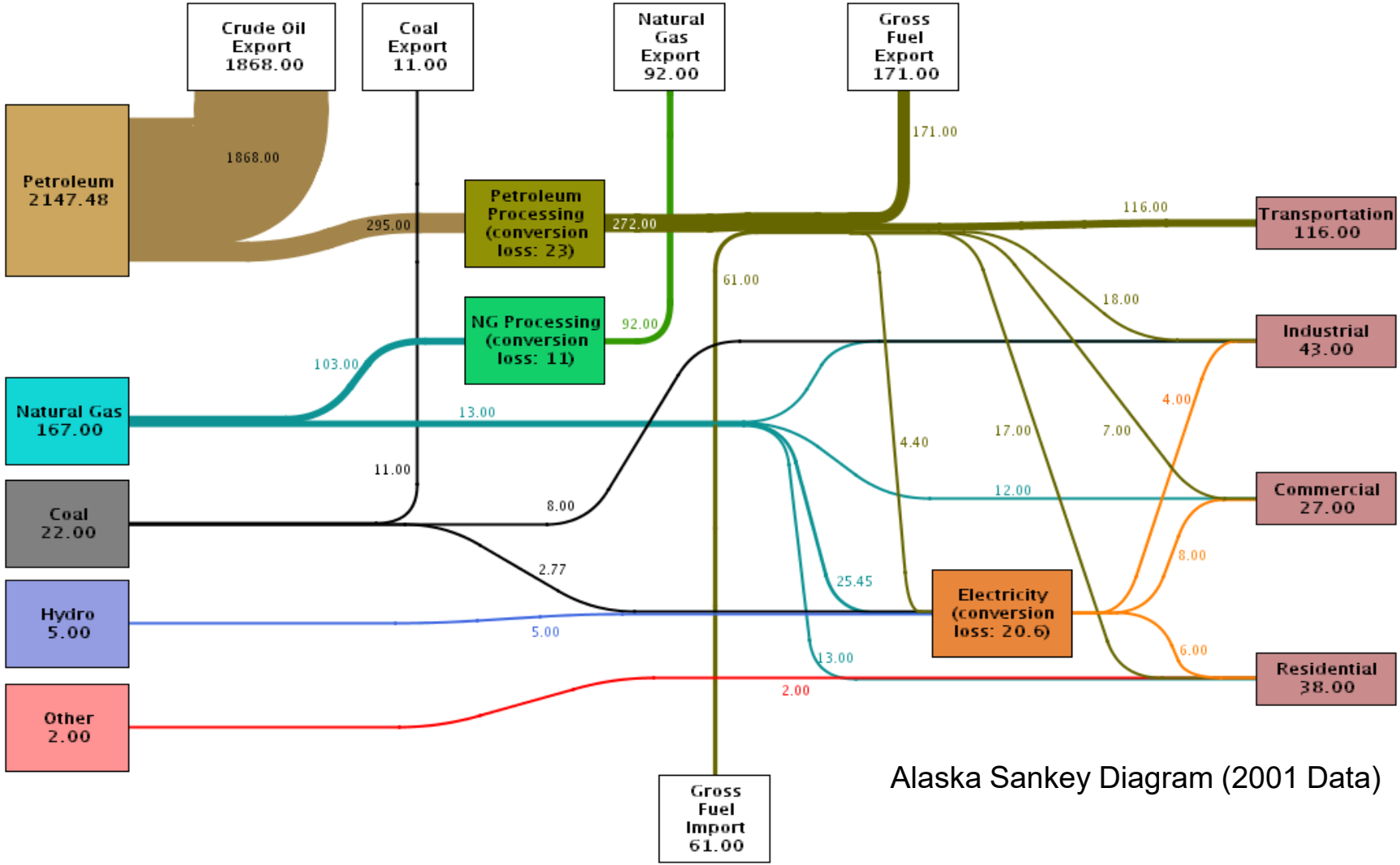
Railbelt Utilities Self-Reported CO2 Intensity



2021 CO2 emissions, metric tons, from "grid electricity" vs North Slope Oil &Gas Ops (partial)

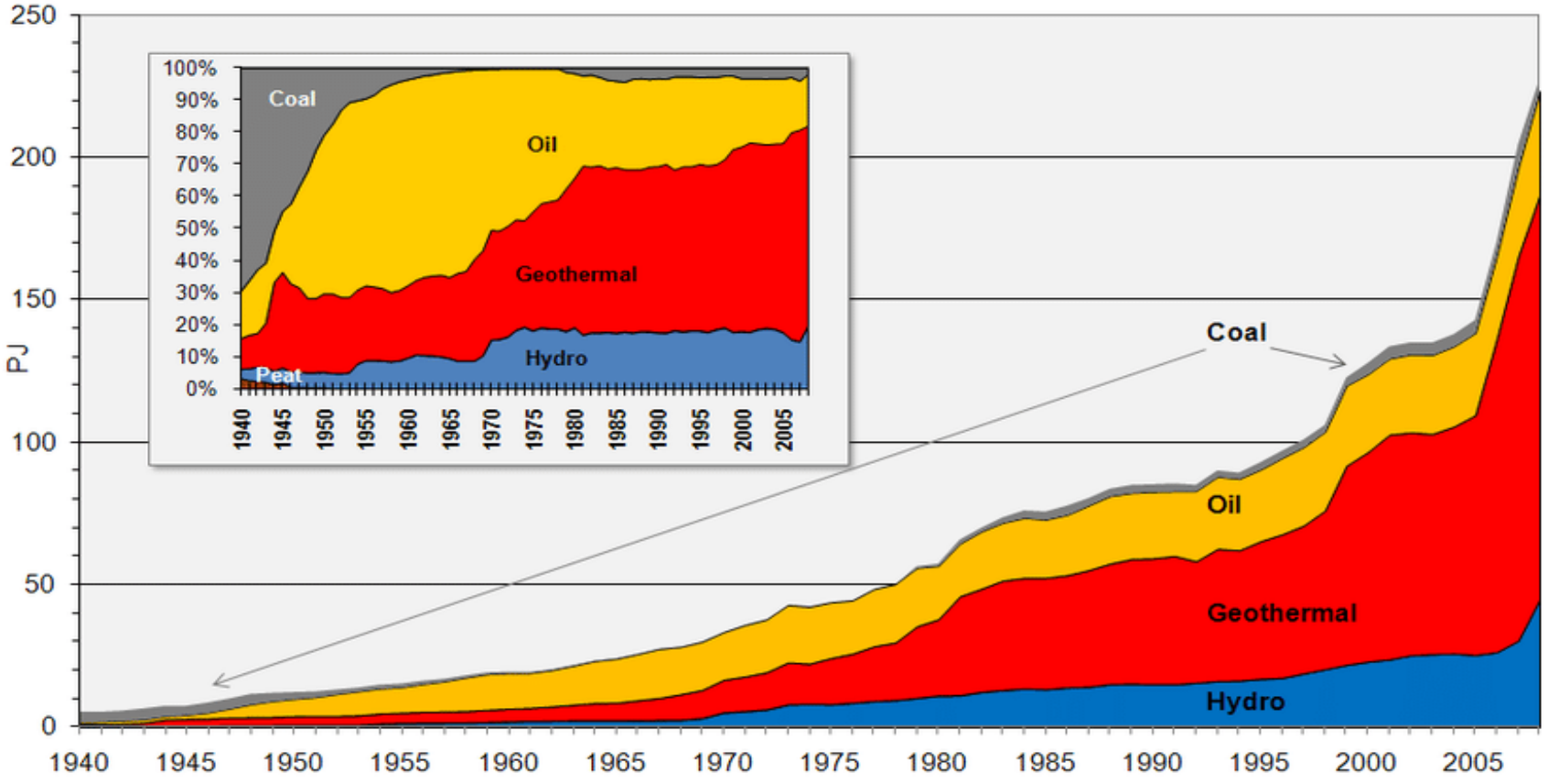


N Slope CO2 from EPA FLIGHT database https://ghgdata.epa.gov/ghgp/main.do



Alaska Sankey Diagram (2001 Data)

Example: Iceland Primary Energy Consumption



Questions/Discussion

We cannot follow a path to the future.
We have to build one.