REAP Renewable Energy Alaska Project

PRESENTS

THE FUTURE OF COOK INLET ENERGY

NATURAL GAS SHORTAGES & RENEWABLE ENERGY SOLUTIONS

A FORUM MODERATED BY ELIZABETH ARNOLD

JANUARY 12, 2023
ANCHORAGE MUSEUM AUDITORIUM

AGENDA

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6:15PM	Introduction by Ms. Arnold
6:20PM	Panel #1: Our Current Energy Mix
7:30 PM	15-minute Intermission
7:45 PM	Panel #2: Opportunities to Diversify Our Mix
8:55 PM	Closing Remarks
9:00 PM	Forum Concludes

MODERATOR

Elizabeth Arnold is a former National Public Radio Political Correspondent and current Professor of Journalism at the University of Alaska. For twenty plus years she was a familiar voice on NPR's *Morning Edition* and *All Things Considered* and a regular presence on PBS Washington Week, covering Congress, the White House, and the American West. Arnold has received numerous awards, including a duPont Columbia Silver Baton and the Dirksen Award for Distinguished Reporting of Congress. Over the last decade, she has reported on the ecological and human impacts of global warming from some of the most remote areas of the Arctic. A recent Fellow at Harvard's Shorenstein Center on Media, Politics and Public Policy, Arnold authored the paper "Gloom and Doom: The Role of the Media in the Public's Disengagement on Climate Change." https://shorensteincenter.org/media-disengagement-climate-change/

PANEL #1

Derek Nottingham is the Director of Alaska's Division of Oil and Gas within the Department of Natural Resources, where he leads a team of roughly 100 people who lease and evaluate the state's oil and gas resources and ensures that those resources are developed for the maximum benefit of the people. Derek is an experienced reservoir engineer, and received bachelor's and master's degrees focused in petroleum engineering from Louisiana State University. Prior to working for the state, Nottingham was employed by BP for more than 11 years, most recently as reservoir development area team lead for BP at Prudhoe Bay. Before BP, Nottingham worked for Chevron for over six years, including as a reservoir engineer for the company's Cook Inlet asset.

Mark Foster was born and raised in Fairbanks and attended Stanford University where his senior report was on the economics of the Devils Canyon/Watana Susitna Hydroelectric Project (1982). Mark returned to Fairbanks in the 1980s to work on refurbishing the power plant his grandfather helped build. He was appointed to the Alaska Public Utilities Commission (now RCA) in 1990 and served in the engineering seat. He has consulted in the energy, electric and telecom sectors in Alaska and internationally since 1994, including service as chair of audit committees of power and telephone companies, retiring from his board commitments in 2020 to create opportunities for a more diverse mix of board members. He recently conducted an analysis of the cost of decarbonizing the Alaska economy by 2050 and is hopeful that the next generation will take advantage of the emerging opportunities in clean energy project and technology development.

Antony Scott, PhD is REAP's Director of Economic and Regulatory Analysis. He came to Alaska in 2000 after receiving his PhD from the University of Wisconsin, Madison, with a focus in natural resource economics. He has been conducting economic and policy analysis of Alaska energy issues ever since. Antony has worked in government as Staff Economist at the Regulatory Commission of Alaska (RCA), Commercial Analyst and Petroleum Investment Manager at the Division of Oil and Gas in the Department of Natural Resources, and most recently, as a Commissioner at the RCA. He spent several years at the Alaska Center for Energy and Power and was Director of Policy and Programs at the former Anchorage Municipal Light and Power.

PANEL #2

Chris Pike is a Research Engineer at the University of Alaska Fairbanks, Alaska Center for Energy and Power, where he directs the solar technology program. He has been conducting solar research in Alaska for over a decade. Among other areas, he's currently investigating high latitude PV performance and the co-location of agriculture and solar.

Andrew McDonnell, PhD is the co-founder and Vice President of Alaska Renewables, a Fairbanks-based company that is focused on developing clean, sustainable, and cost-reducing renewable energy projects for Alaska. Drawing on a background in Earth and environmental science, engineering, and energy systems analysis, Andrew leads the origination and ongoing development of the company's utility scale wind energy projects, engages with local communities, and shapes its strategic business development. In his prior role as an Associate Professor at the University of Alaska Fairbanks (UAF), Andrew managed a broad research, teaching, and service portfolio focused on Earth's changing ocean, climate, and biogeochemical systems. He served on Golden Valley Electric Association's Member Advisory Committee, Carbon Reduction Goal Committee, and Solar Committee, the last of which resulted in the construction of GVEA's 563 kW solar PV system. Prior to founding Alaska Renewables, he also worked as an independent consultant working to identify cost-effective decarbonization strategies and renewable energy opportunities across Alaska.

Joel Groves is a long-time Alaska resident and professional civil engineer practicing with Polarconsult Alaska, Inc. in Anchorage. One of his fields of expertise is small hydro power systems. His services range from initial reconnaissance to permitting, design and construction engineering, through to post-construction services for many proposed and existing small hydro projects throughout Alaska. In addition to his work bringing hydro to rural communities, he has been involved in all three of the existing Independent Power Producer hydro projects that exist on the Railbelt today, has participated in formal study of approximately 30 MW of small hydro sites on the Railbelt, and is familiar with the region's rich, small hydro resource potential.

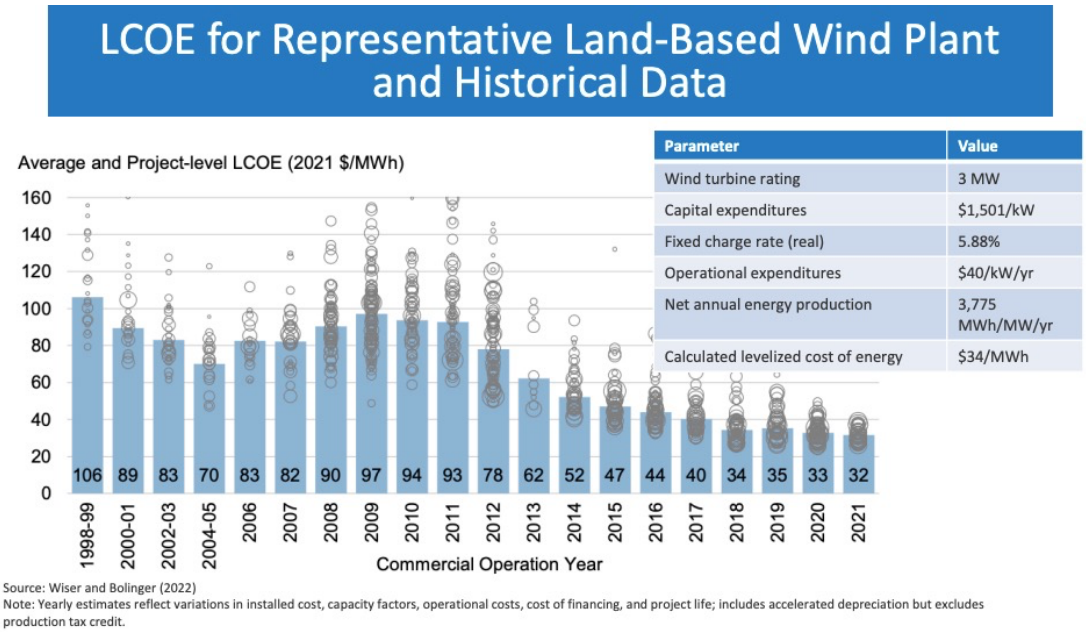
Economics of Renewable Energy in Cook Inlet

Renewable energy has long been viewed by some as a more expensive option for electricity generation in Alaska compared to fossil fuels like natural gas. However, the cost of wind, solar, and battery technology has plummeted over the last decade. Given the upward trajectory of natural gas prices in Alaska, variable renewable generation, when coupled with energy storage, promises lower costs for Alaskans compared to continuing the region's dangerous dependence on natural gas.[1] Though the future is always uncertain, substantial diversification of our energy portfolio towards renewables reduces risk and would bring economic benefits to consumers in Cook Inlet.

Renewables Keep Getting Cheaper

The last 15 years have seen dramatic decreases in the cost of utility-scale wind and solar due to technological improvements, economies-of-scale, enhanced operational efficiencies and stronger supply chains. In the United States, improvements in the manufacturing and energy-conversion efficiency of wind projects have decreased the levelized cost of energy (LCOE) by over two thirds since 2010.[2] Today, new land-based wind projects in the United States can provide power for less than $0.032/kWh, *before* available federal subsidies.[3]

Figure 1: Declining US Lang-Based Wind Prices[4]



Source: Wiser and Bolinger (2022)
Note: Yearly estimates reflect variations in installed cost, capacity factors, operational costs, cost of financing, and project life; includes accelerated depreciation but excludes production tax credit.

Figure 1 shows evolution of representative wind prices in the U.S., 2009 to 2021

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[1] *"Railbelt Renewable Portfolio Standard: Economic Analysis." Analysis North (2022) at https://www.analysisnorth.com/rps-econ.html LCOE: is a measure of the average net present cost of electricity generation for a generator over its lifetime and gives the cost of energy per energy unit.; "Cost of Wind Energy Review" NREL (2021) at https://www.nrel.gov/docs/fy23osti/84774.pdf.*

[3] "Cost of Wind Energy Review" NREL (2021) at https://www.nrel.gov/docs/fy23osti/84774.pdf.

[4] *Ibid*

Cost declines for photovoltaic (PV) solar installations have fallen even faster. Today, the average utility-scale solar power project costs less than a fifth of what it did in 2010,[5] and is roughly equivalent to the cost of on-shore wind.[6]

Figure 2: Declining US Utility-Scale Solar Prices[7]

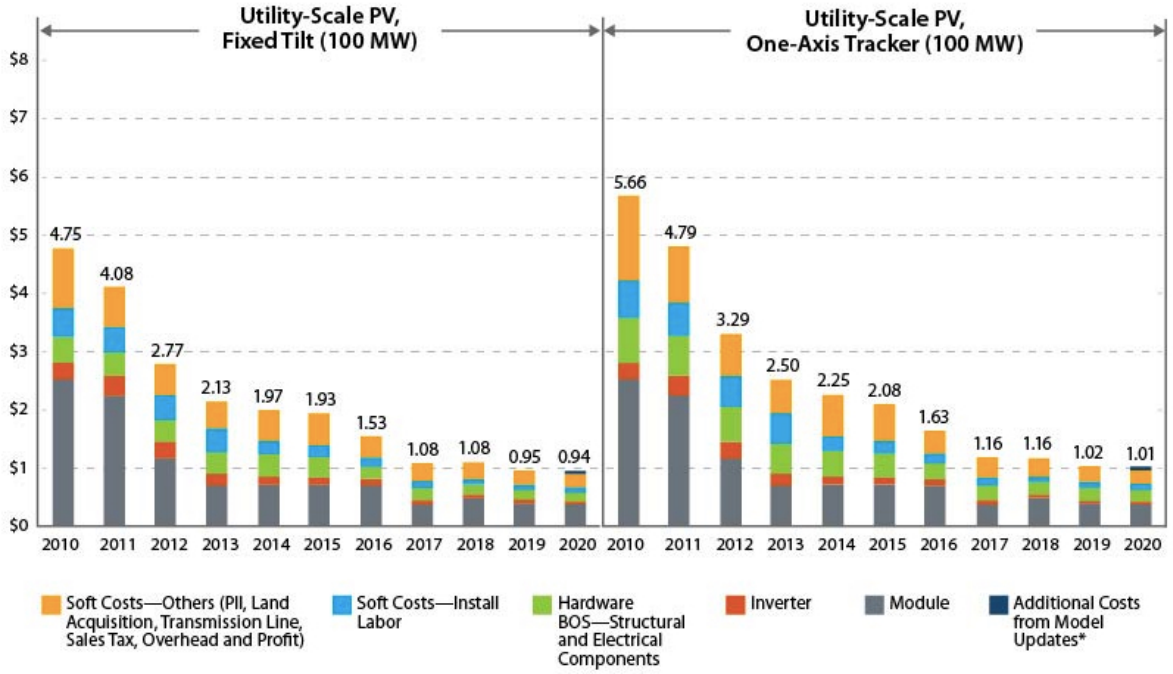

Figure 2 shows evolution of solar costs and cost components, 2010 to 2020

The International Energy Agency (IEA) similarly reports that lithium batteries, which are rapidly being installed by utilities to manage the intermittent nature of renewable generation, are experiencing similar cost declines.

[5] "Documenting a Decade of Cost Declines for PV Systems". NREL (2021). https://www.nrel.gov/news/program/2021/documenting-a-decade-of-cost-declines-for-pv-systems.html

[6] *"Annual Energy Outlook 2022." EIA (2022, March) pg. 8. https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf*

[7] "Documenting a Decade of Cost Declines for PV Systems". NREL (2021). https://www.nrel.gov/news/program/2021/documenting-a-decade-of-cost-declines-for-pv-systems.html

Figure 3: Declining Costs of Lithium Ion Batteries[8]

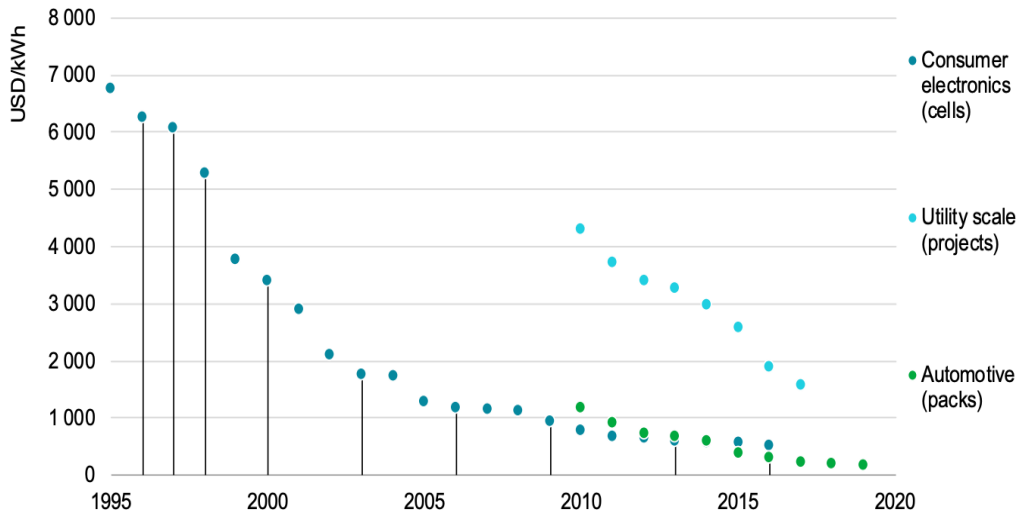

Figure 3 shows the sharp price decreases for lithium ion batteries since 1995

The investment banking community finds that, if anything, government-sponsored cost assessments actually *understate* recent cost declines. Lazard estimates that, on average, the price of utility-scale wind and solar has declined by 72% and 90%, respectively, since 2009.[9]

Both the present and the future for renewables are bright. The US Energy Information Agency (EIA) projects that the cost of both solar and wind will continue to decline for decades.[10] And, the Inflation Reduction Act's passage in 2022 has extended, and even enlarged, some federal tax credits for renewable energy, effectively ensuring that the federal government will pay for at least 30% of the capital costs for renewable energy projects for the next 10 years.

Cook Inlet Consumers Face Rising Costs and a Dwindling Gas Supply

Approximately 85% of the Cook Inlet region's electricity relies on gas produced in Cook Inlet. This dependence explains a substantial portion of the rise in electric utility costs that the region has experienced over the last 15 years. The local market price of natural gas has increased by more than 50% since 2010. Chugach Electric Association customers now pay about twice what the average American pays for electricity.

[8] "Energy Technology Perspectives 2020 – Special Report on Clean Energy Innovation: Accelerating Technology Progress for a Sustainable Future," International Energy Agency, page 81. https://iea.blob.core.windows.net/assets/7f8aed40-89af-4348-be19-c8a67df0b9ea/Energy_Technology_Perspectives_2020_PDF.pdf

[9] "Lazard's Levelized Cost of Energy Analysis – Version 15.0," Lazard, 2021. https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/

[10] "Levelized Costs of New Generation Resources, Annual Energy Outlook 2022". US Energy Information Administration. 2022. p. 14, Figure 3. https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

Figure 4: Cook Inlet Natural Gas Prices Continue to Rise[11]

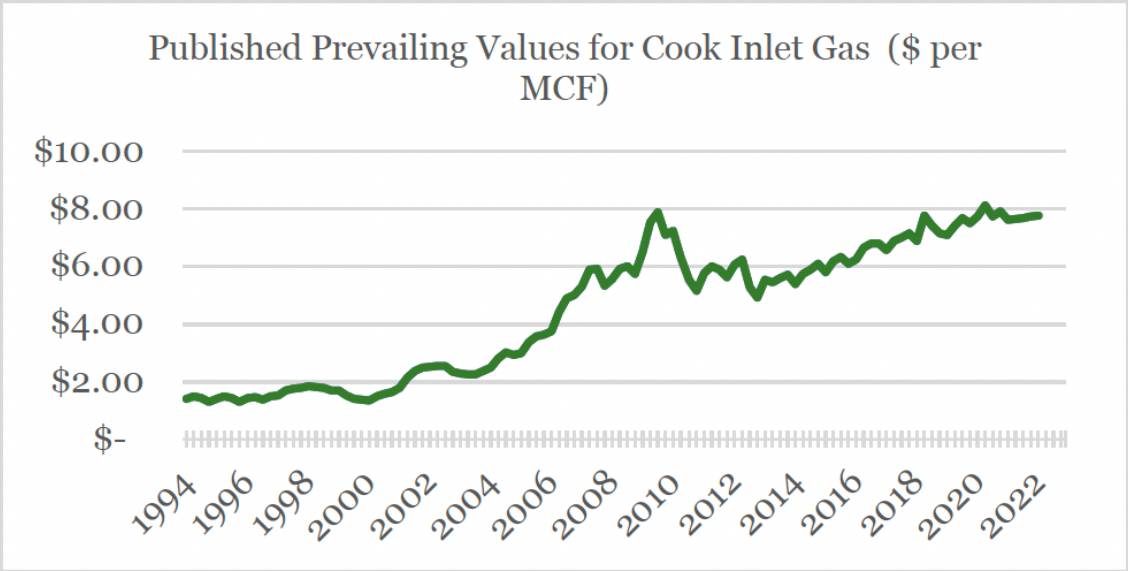

Figure 4 shows the rising price of natural gas in Cook Inlet in dollars per thousand cubic feet (MCF) from 1994 to 2022

Today, Railbelt electric utilities generally pay Hilcorp about $7.50/Mcf for gas.[12] This is roughly 45% more than what Lower-48 utilities pay for gas.[13] The likely cause is the region's small market, which fails to incentivize large capital investments in exploration and development.

For over ten years the State of Alaska's Department of Natural Resources (DNR) has accurately characterized the future trajectory of Cook Inlet natural gas prices by assessing the cost of development of future resources. In 2011, amid concern that Cook Inlet gas supply would fail to meet local utility needs, a DNR assessment projected that gas supplies would be sufficient to meet the region's needs through 2021, but prices would need to rise substantially to incentivize the necessary investment.[14] DNR's projection captured future price dynamics remarkably well.

[11] "Cook Inlet Prevailing Values." Alaska Department of Revenue - Tax Division. State of Alaska, (2022), a t www.tax.alaska.gov/programs/oil/prevailing/cook.aspx.

[12] See utility tariff filings TA540-18, TA530-8, and TA448-32 at https://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=22E11B1F-C942-497B-A0CA-1FFFD86530ED, https://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=5F6FDD69-90D8-4F15-92EC-663AE9285809, and https://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=22E11B1F-C942-497B-A0CA-1FFFD86530ED, respectively.

[13] "Natural Gas Electric Power Price", EIA (2022), at https://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PEU_DMcf_a.htm

[14] Gibson et al, "Cook Inlet Natural Gas Production Cost Study." Alaska Department of Natural Resources, Division of Oil & Gas. (2011), at https://dog.dnr.alaska.gov/Documents/ResourceEvaluation/Cook_Inlet_Natural_Gas_Production_Cost_Study.pdf

Figure 5: DNR's 2011 Assessment of Gas Price Rise Needed to Incentivize Investment

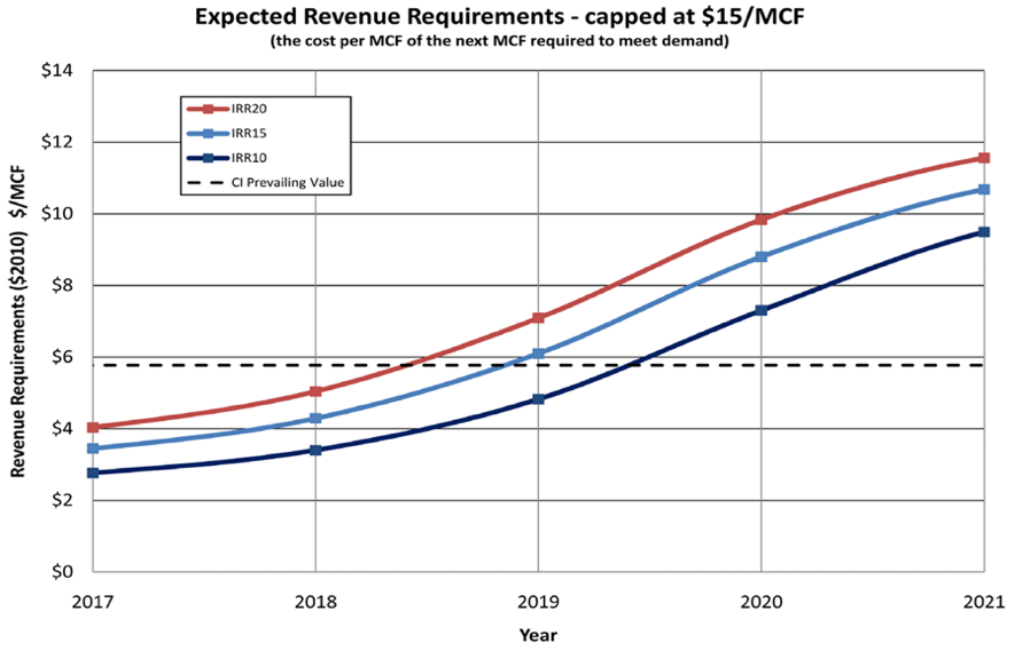

Figure 5 shows DNR's 2011 projections for the price rises necessary to incentivize the investment sufficient to meet local needs over time under different assumptions of company-required internal rates of return (IRR)

In 2018, DNR revisited its assessment of future Cook Inlet natural gas supplies. That analysis suggested that prices would continue to slowly rise through 2026, but would then need to rise sharply – probably exceeding $13-$16 per mcf – to be able to continue to meet local utility demand until the end of the decade.[15] However, even at these prices, the gas resources identified by DNR would not be sufficient to continue to meet local utility demand much past 2030.

[15] Redlinger et al, "Cook Inlet Natural Gas Availability." Alaska Department of Natural Resources, Division of Oil & Gas. (2018), at https://dog.dnr.alaska.gov/Documents/ResourceEvaluation/CI_Natural_Gas_Availability_Study_2018.pdf

Figure 6: DNR's 2018 Assessment of Gas Price Rise Needed to Incentivize Investment [16]

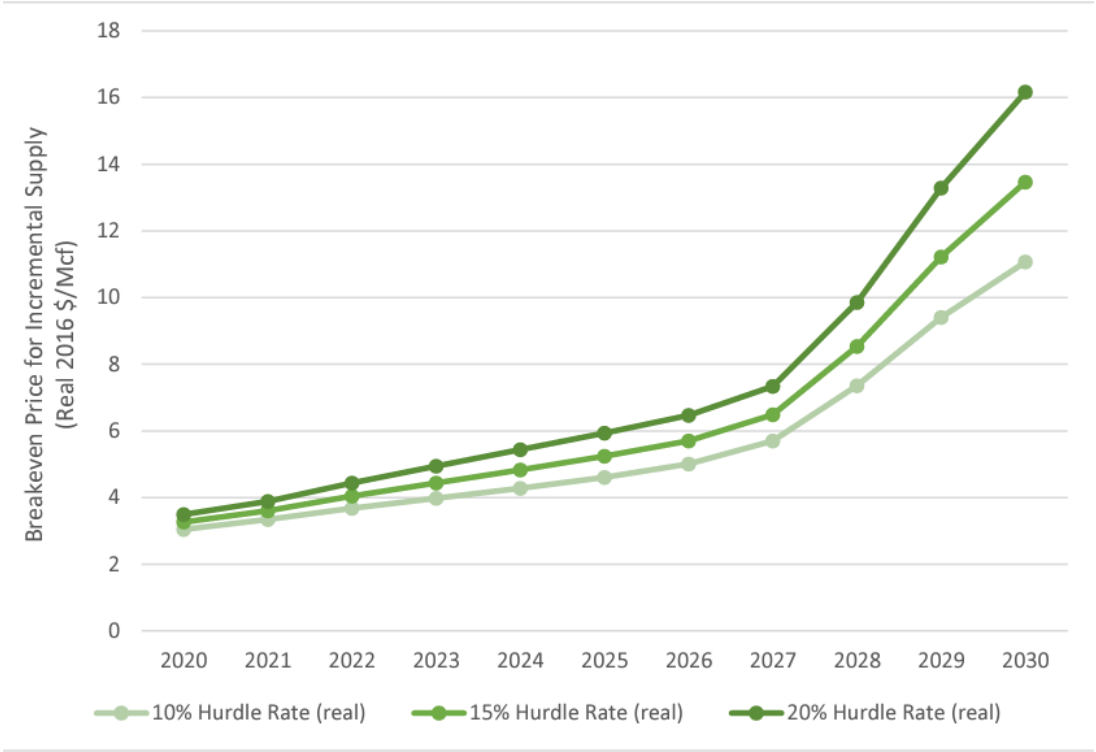

Figure 6 shows DNR's 2018 projections for the price rises necessary to incentivize investment to meet local needs over time under different assumptions of company-required IRR

DNR's general characterization of future Cook Inlet production is consistent with Hilcorp's recent announcement that it no longer has confidence that it will be able to continue to meet Cook Inlet demand as current utility contracts expire.[17] Homer Electric Association has the first gas supply contract that expires, in 2024. ENSTAR's is the last, in 2031.

If the utilities in the Cook Inlet region are forced to import liquified natural gas (LNG) for electricity generation and heat, energy prices will likely escalate, making Alaska a less attractive place to both live and invest. Since 2013, US LNG import prices from Sumas, British Columbia – the most likely source of LNG imports to Alaska – have averaged twice what Lower-48 utilities on average pay for gas.[18] Given additional transportation costs to Alaska, and the need to develop new gas infrastructure in the state, LNG imports would send Cook Inlet electricity bills to historic highs, and uncharted levels of volatility.

Renewable Energy in the Cook Inlet Region

The cost of most everything in Alaska is higher than in the Lower-48 due to limited markets, difficult logistics and reduced economies-of-scale. Nevertheless, today renewable energy does successfully compete in the Alaska marketplace. In March 2022, the RCA approved, without

[16] *Ibid.*
[17] DeMarban, Alex. "Hilcorp warns Alaska utilities about uncertain Cook Inlet natural gas supplies" Alaska Daily News (2022, May 17)
[18] "Natural Gas." *EIA (2022) at https://www.eia.gov/dnav/ng/hist/ngm_epg0_iml_ysums-nca_dmcfa.htm*

controversy, an electricity supply contract for the output of a 6MW solar farm between Matanuska Electric Association (as purchaser) and an independent solar power, Energy 49, LLC (as provider). The RCA staff recommendation that supported the Commission's approval noted that the solar contract price would be less than the variable cost of MEA's gas supply by 2029, was just and reasonable, and, should be approved. The Commission concurred.[19] The fact that Cook Inlet gas prices are now likely to be significantly higher than what Commission staff had contemplated early last year underscores the degree to which renewables can favorably compete in the Railbelt.

Alaska's economy could benefit from significant new investment in renewable energy. Research recently conducted by National Renewable Energy Laboratory (NREL) in Colorado and Analysis North in Anchorage both conclude that reaching a high penetration of renewables in Alaska's Railbelt is feasible. Analysis North has also found that it will save consumers money. It's analysis found that achieving 80% renewable penetration in the Railbelt by 2040 would require $3.2 billion in new capital expenditures over the base case scenario NREL used in its analysis, which included new transmission upgrades that the Laboratory assumed in all the scenarios it studied. Though substantial, the necessary capital investment to get to 80% renewable in the Railbelt would save $6.7 billion in natural gas costs, producing a net benefit of $3.5 billion.[20]

Figure 7: Cost and Benefits of RPS Scenario 3 [21]

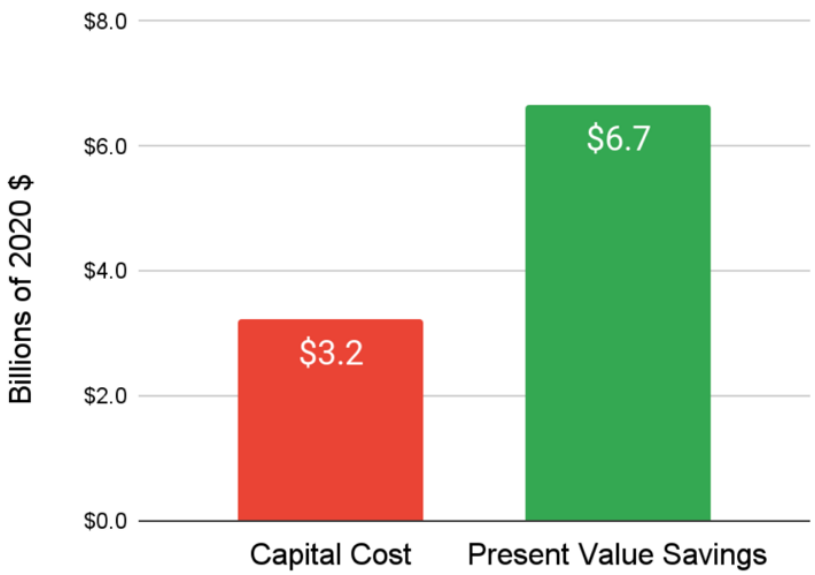

Figure 7 shows the present value of renewable energy capital cost investments, and the present value of natural gas savings that result

[19] "Tariff Action Memorandum" for TA535-18, 3/10/2022. https://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=179D912B-C930-4049-A108-E68764F19F9F

[20] *"Railbelt Renewable Portfolio Standard: Economic Analysis." Analysis North (2022) at https://www.analysisnorth.com/rps-econ.html*

[21] *Ibid.*

Analysis North's net savings estimate is in many ways conservative. It assumed that federal investment tax credits would *not* be extended, which they now have been for 10 years through the IRA. Analysis North also assumed that natural gas prices would no longer escalate after 2040 - a sharp break from the historical record. Finally, the analysis assumed that the cost of wind and solar installations would remain constant between 2022 and 2035, despite a decades-long trajectory that has steadily been bringing those prices down, a price trend that the US Energy Information Administration projects will continue.

There has never been a better time for the state's most populous region to transition to more local, stably priced renewable energy. Prices of renewables have dropped precipitously, and for the next 10 years the federal government will cover 30% of the investment cost. There are many ways to take advantage of these generous federal tax credits to confront the challenges the region faces. For example, REAP estimates that new rooftop solar on 25% of Anchorage's buildings could quickly generate about 10% of the city's residential electricity. This would boost local employment without relying on the same supply and financial resources that utility-scale installations require. Large wind and solar projects, supplemented with battery storage, can be developed relatively quickly. The more the Railbelt can rapidly reduce its dependence on Cook Inlet natural gas, the less expensive LNG the region will have to import.

The Railbelt region needs aggressive action now to install as much wind, solar and batteries as possible in the next five years, before major utility gas contracts with Hilcorp expire. Renewable energy projects will create new jobs and keep precious energy dollars circulating in the state's economy. Conversely, if the region begins to import LNG, Alaskans will send their hard-earned dollars out of state. Projects like an in-state gas line have been promised for decades but, even in the best case, will take far too long to develop to prevent the region from importing LNG. Meanwhile, wind, solar, and batteries can all be installed on relatively short timeframes. Longer lead time renewables like small hydro, geothermal, and tidal energy, can follow. The Governor and the Legislature should work now to establish a Renewable Portfolio Standard (RPS) that requires the Railbelt utilities to diversify the region's energy portfolio. An RPS will decrease the risk that the region imports LNG, and accelerate a transition to local renewable energy that supports energy independence and a vibrant economy.