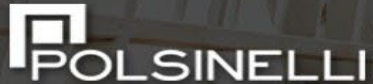


Solar Energy

Where have we been and where are we going?

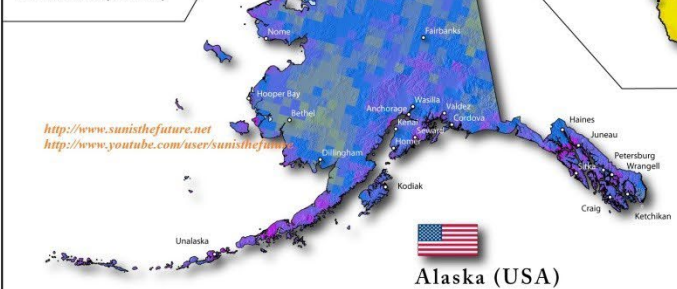
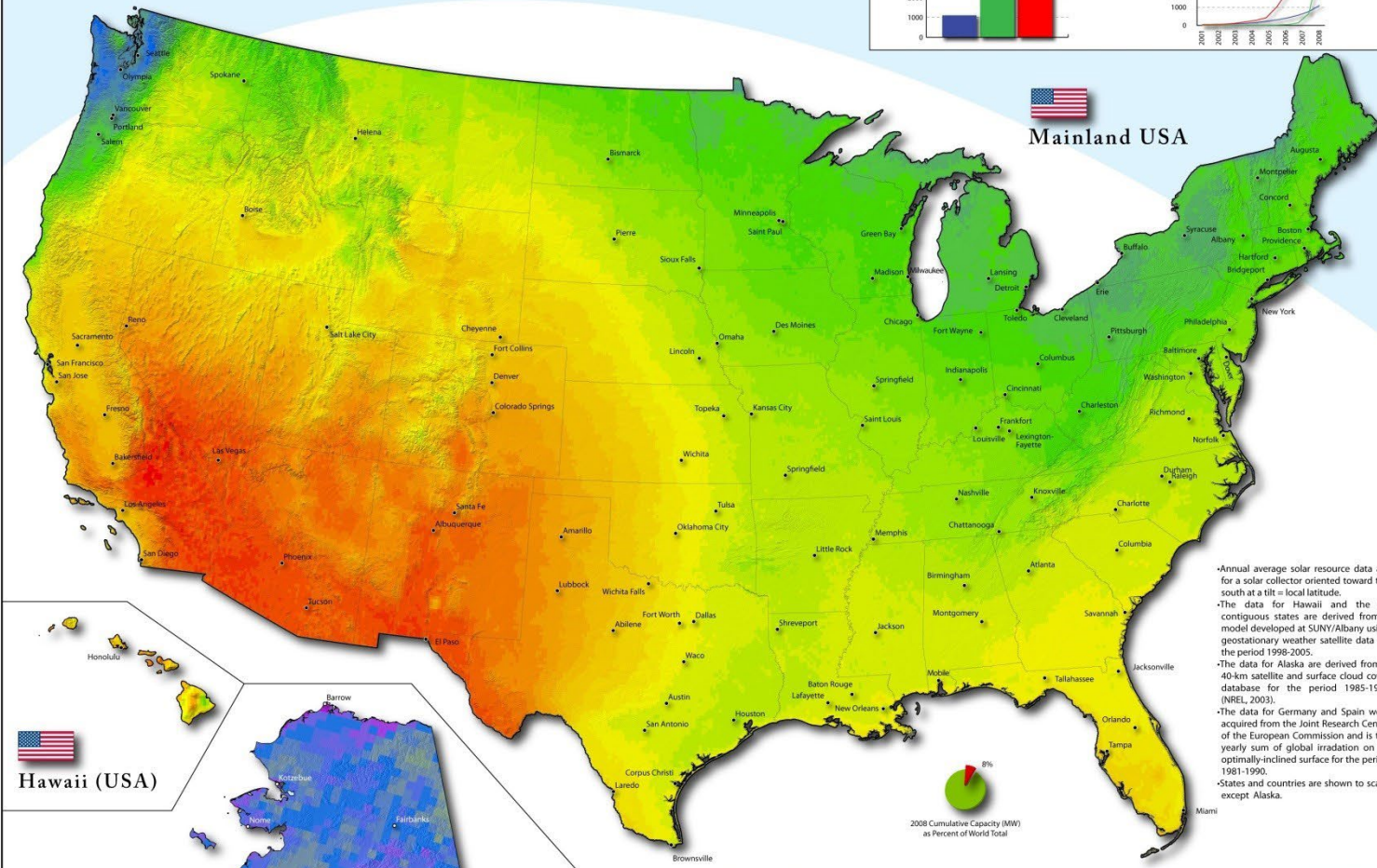
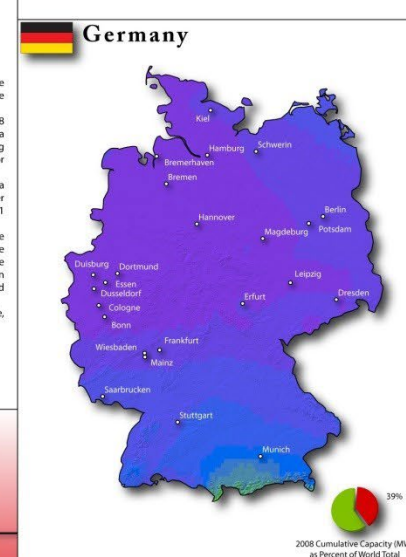
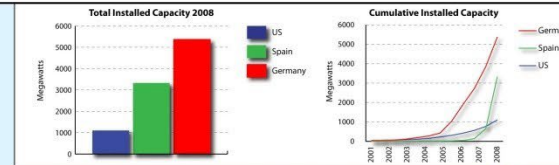


Kansas Renewable Energy Conference

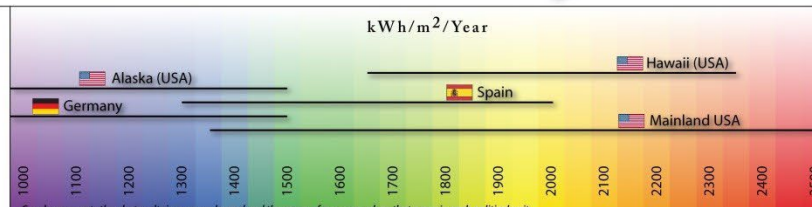
Alan Claus Anderson
Energy Law Practice Group
Vice Chair

Solar Resource

Photovoltaic Solar Resource The United States of America, Spain and Germany



• Annual average solar resource data are for a solar collector oriented toward the south at a tilt = local latitude.
 • The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005.
 • The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2003).
 • The data for Germany and Spain were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradiation on an optimally-inclined surface for the period 1981-1990.
 • States and countries are shown to scale, except Alaska.



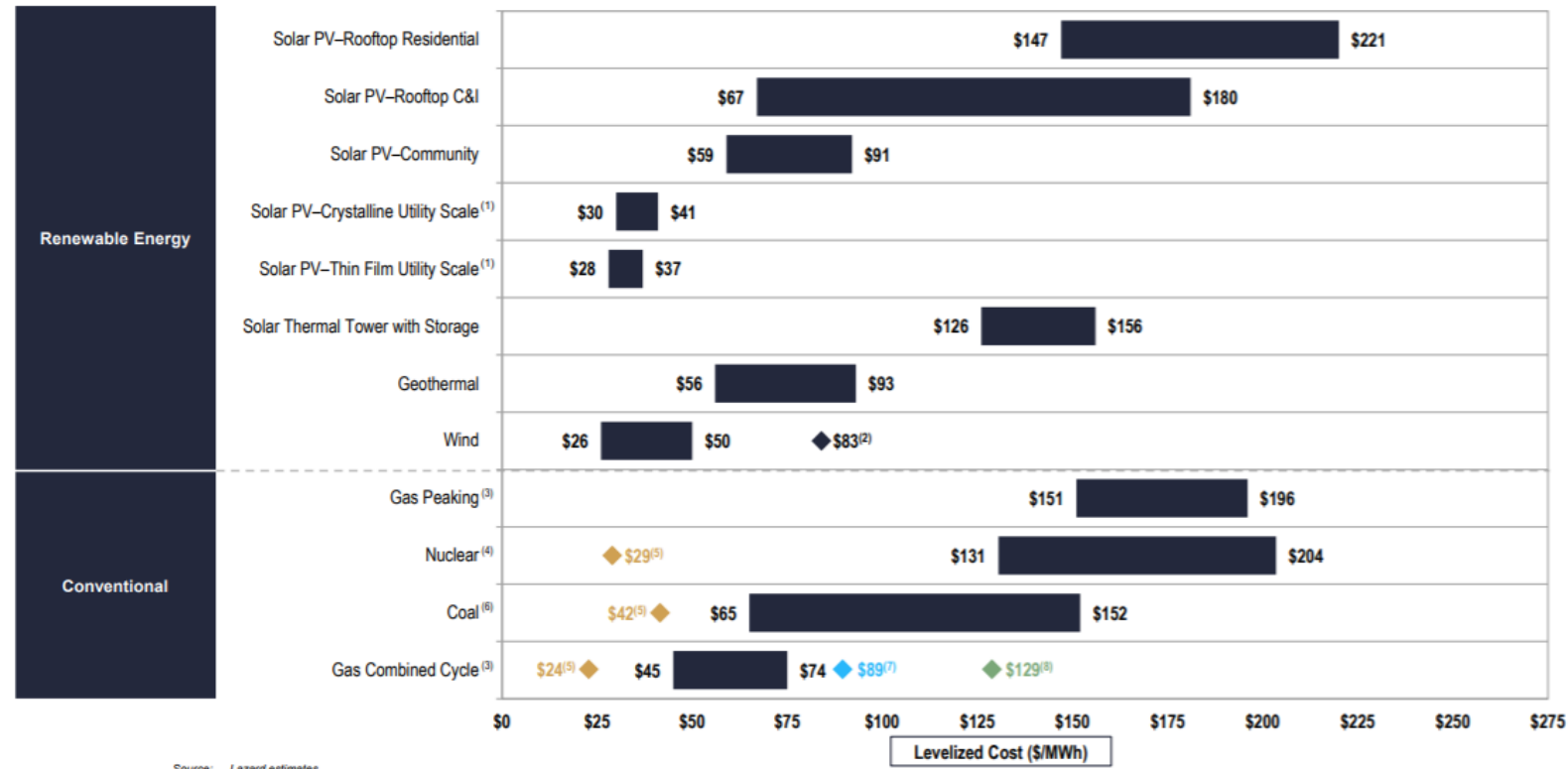
Wind and Solar are Lowest Cost

LAZARD

LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 15.0

Levelized Cost of Energy Comparison—Unsubsidized Analysis

Selected renewable energy generation technologies are cost-competitive with conventional generation technologies under certain circumstances



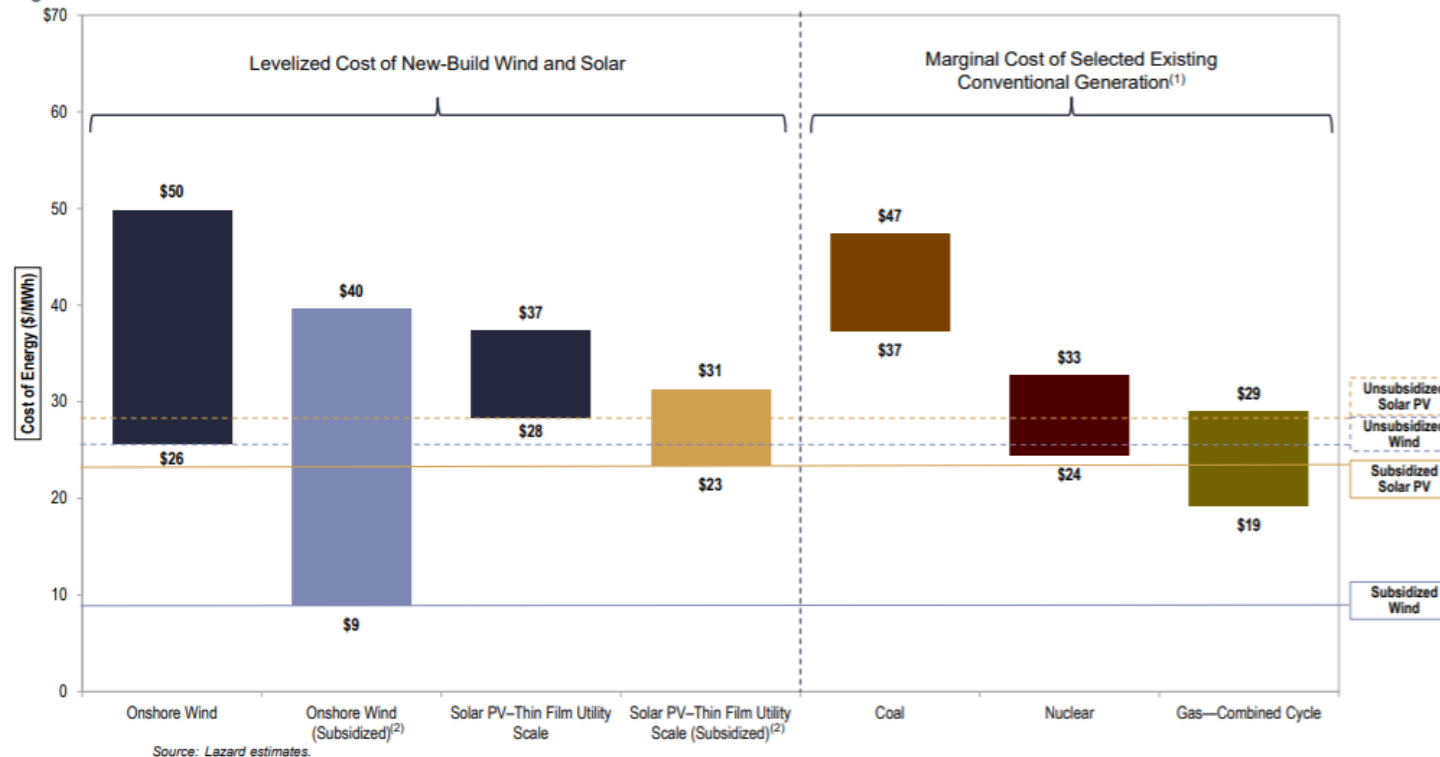
Renewable New Build vs Conventional Operation

LAZARD

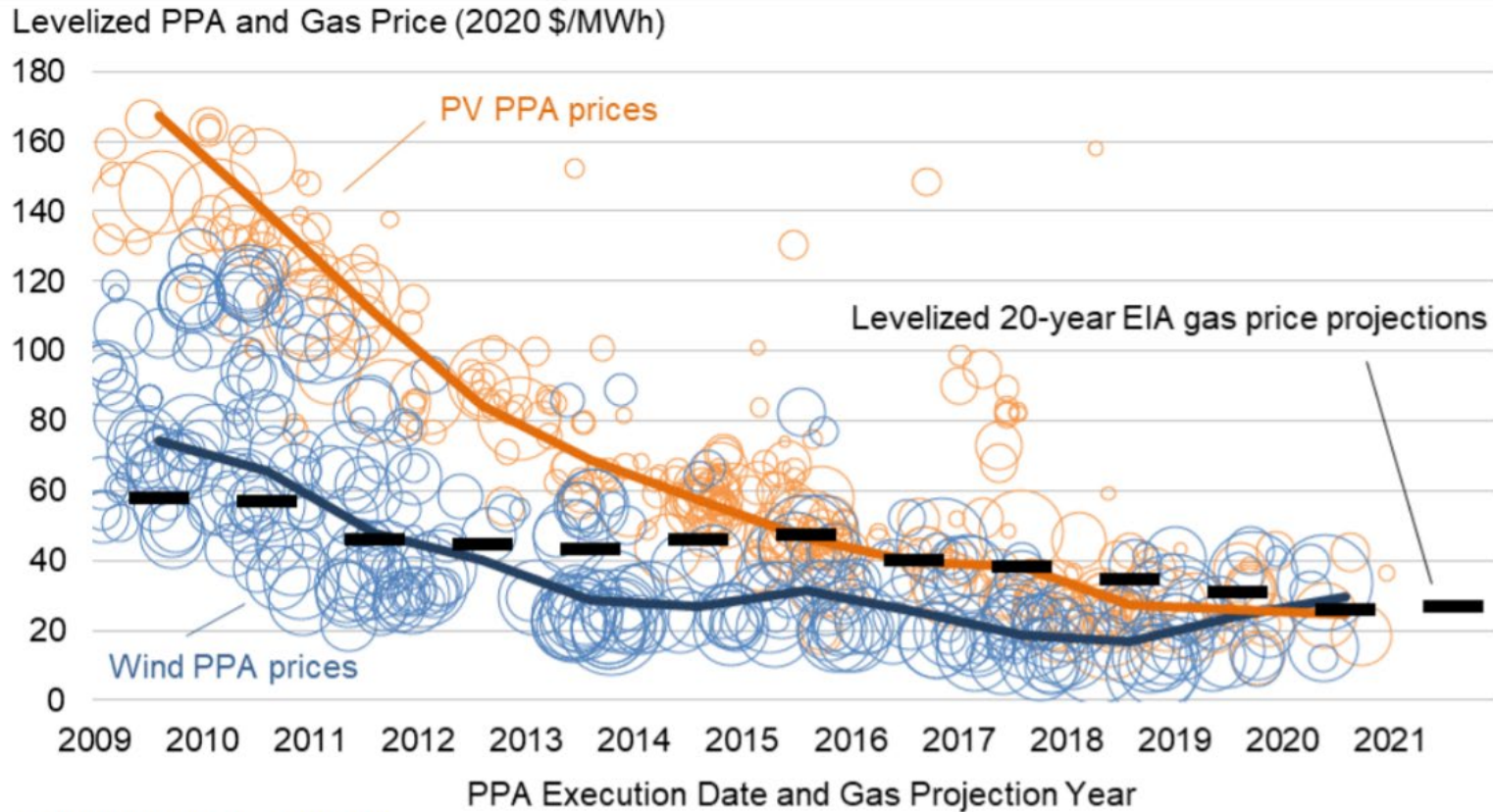
LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 15.0

Levelized Cost of Energy Comparison—Renewable Energy versus Marginal Cost of Selected Existing Conventional Generation

Certain renewable energy generation technologies have an LCOE that is competitive with the marginal cost of existing conventional generation



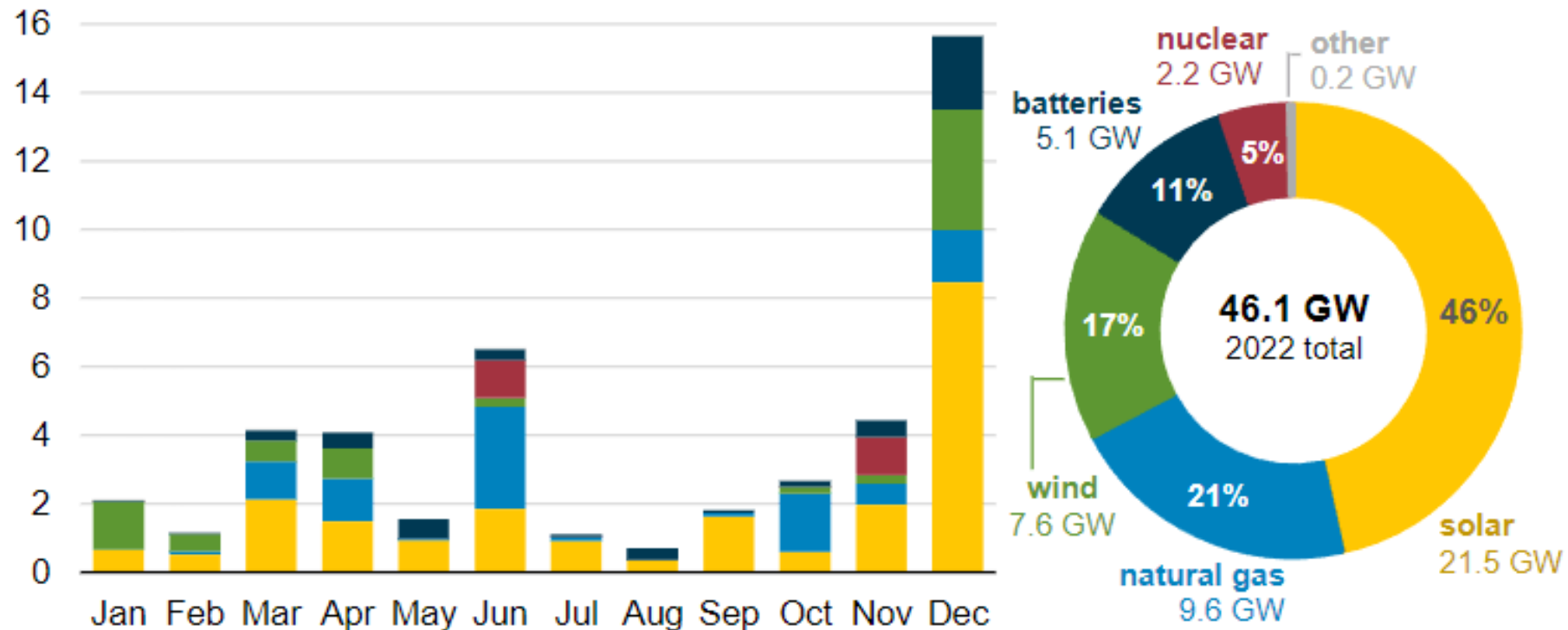
Levelized PPA Prices and Gas Price Projections



Source: Berkeley Lab, FERC, EIA

The Near Future - Additions

Planned U.S. utility-scale electric generating capacity additions (2022)
gigawatts (GW)



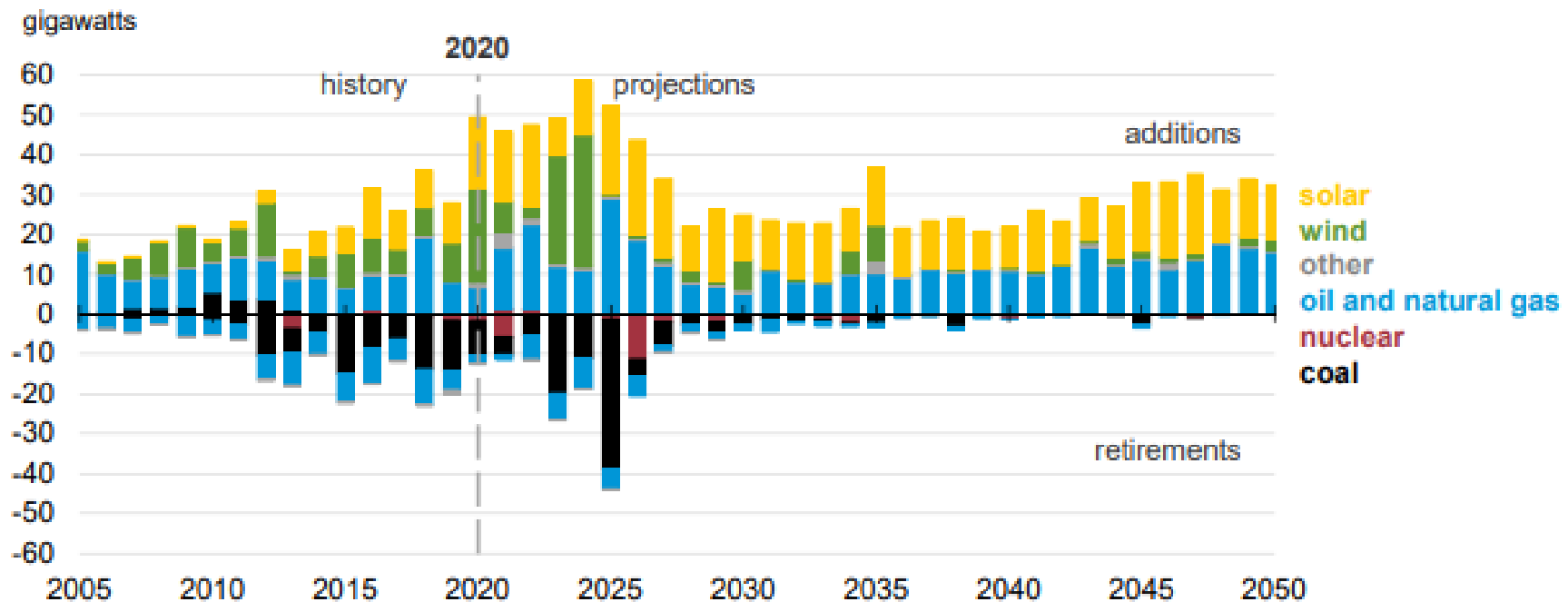
Source: U.S. Energy Information Administration, [Preliminary Monthly Electric Generator Inventory](#), October 2021



U.S. retiring and new generating capacity

Annual electricity generating capacity additions and retirements

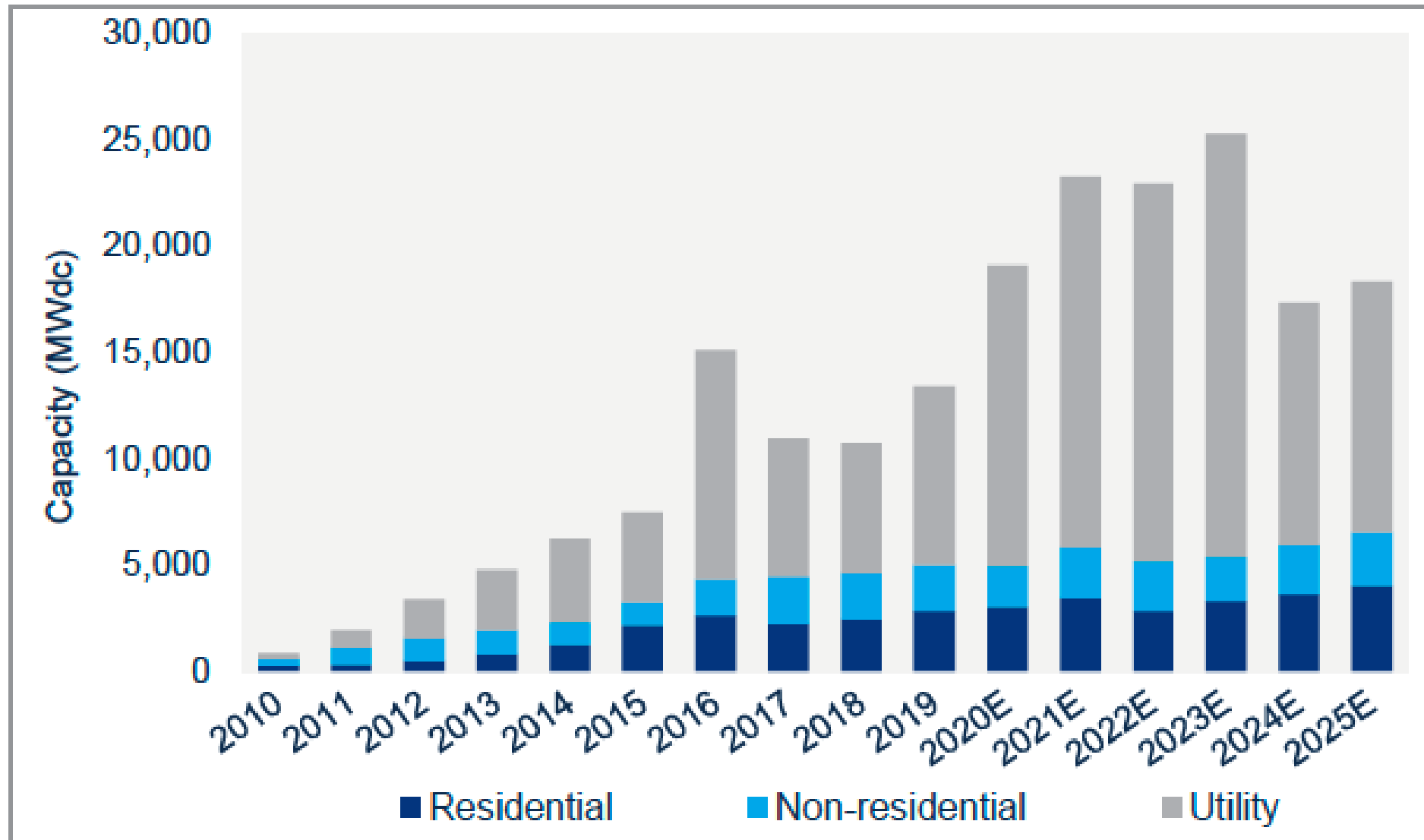
AEO2021 Reference case



Source: Form EIA-860M, Monthly Update to the Annual Electric Generator Report, July 2020

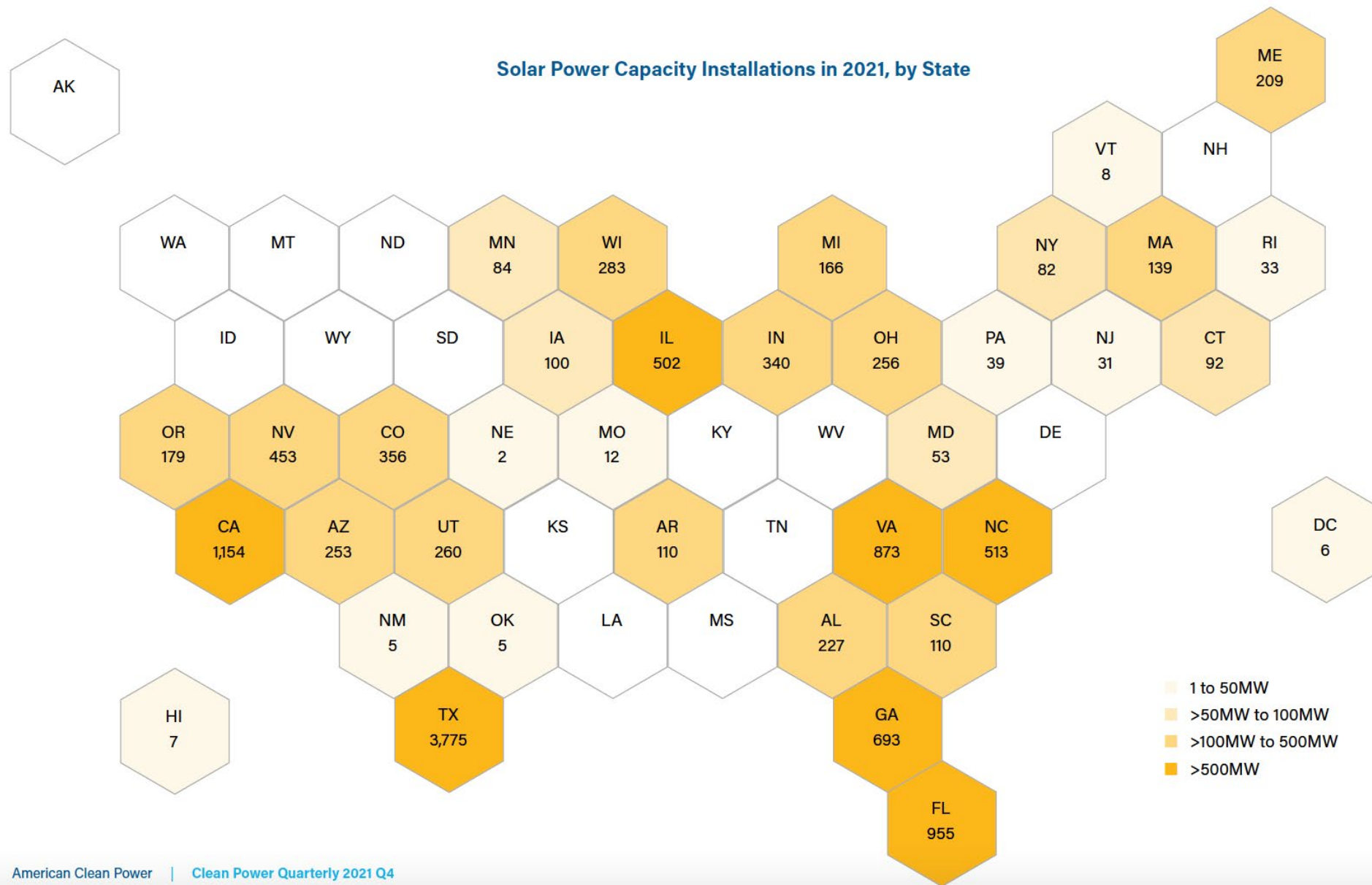
Solar Installations by Type

U.S. PV installation forecast, 2010-2025E

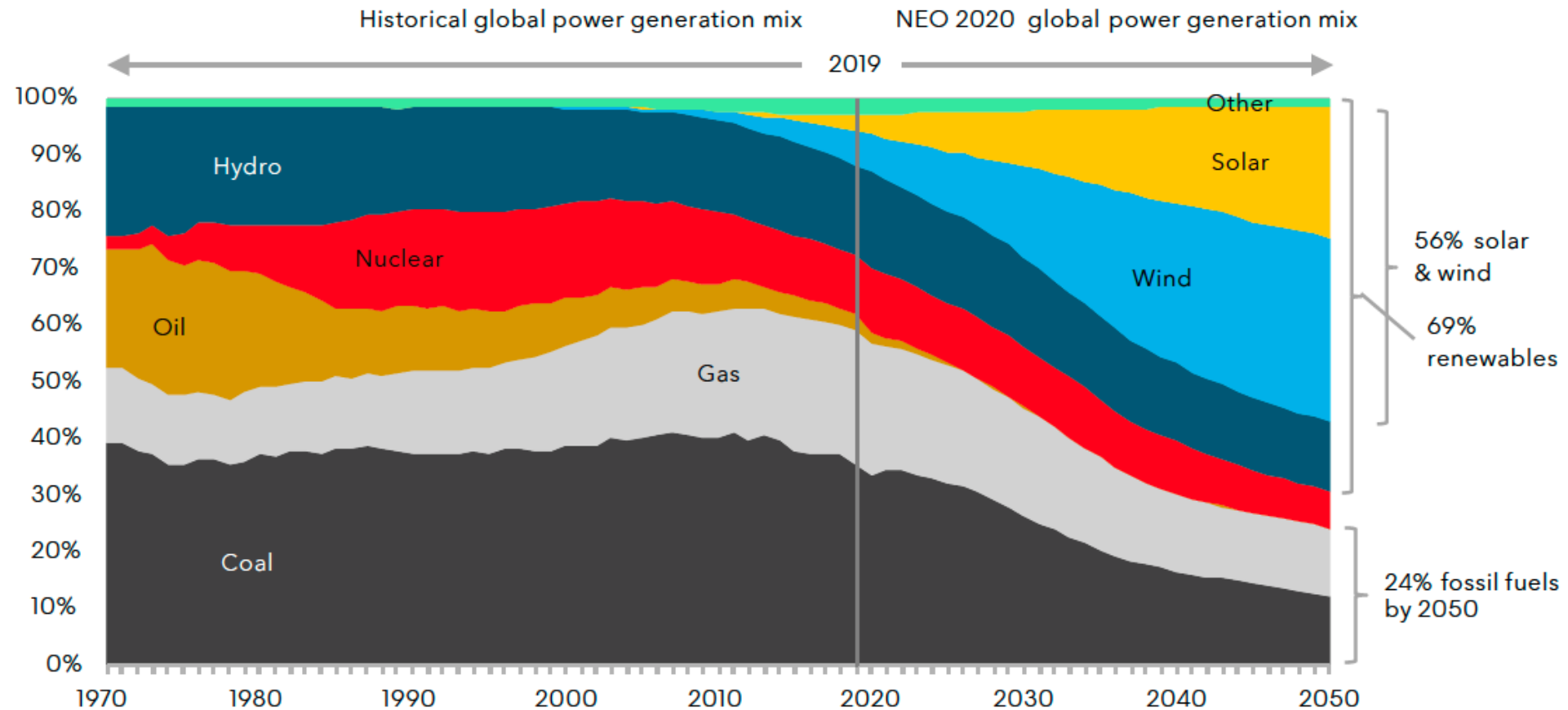


Source: Wood Mackenzie

How about Kansas?



Where are we going?



(Source: BloombergNEF)