

The background of the entire image is a deep blue space scene. In the lower-left corner, the curved horizon of the Earth is visible, showing a thin layer of white clouds and a blue atmosphere. The rest of the background is filled with numerous small, bright white stars of varying sizes, creating a starry night sky effect.

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Renewable Energy Technology and Policy for the Future



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Roger Hanshaw concentrates his legal practice on the environmental and technical issues that arise in business transactions, as well as regulatory compliance matters and litigation for a diverse client base. Knowing that an advanced science degree is critical in representing clients in the science-driven field of environmental law, he holds a Ph.D. in chemistry from the University of Notre Dame. Hanshaw is a certified professional parliamentarian and a member of the West Virginia House of Delegates, where he currently serves as the 58th Speaker.

Energy has played a critically important role in the economic and cultural fabric of the Appalachian region since before America became a nation. The rivers and mountains of West Virginia, Pennsylvania, Maryland, Ohio, Kentucky and Virginia powered the nation and provided fuel for the manufacturing and transportation industries as America transformed itself from an agrarian society into a global industrial powerhouse. Appalachian coal, oil and natural gas provided fuel for the nation's steel mills and electrical generation facilities for generations, while our rivers moved raw materials and finished goods to market all over the eastern United States. Today, fossil fuels still play an important role in powering the world, but renewable energy is rapidly changing the face of the global economy, and it presents tremendous opportunity all across Appalachia.

Renewable energy technology is evolving rapidly. For example, in 2008, solar electricity generation in the United States totaled

approximately 0.34 gigawatts. Today, the United States generates over 97 gigawatts of solar power. Solar technology allows us to harvest light energy and convert it into electric power. That evolution of solar technology, and the incredible pace of that technological progress, has been fascinating from a technical perspective. What began as a way to simply heat water to produce steam by focusing light with mirrors has evolved into the 21st-century photovoltaic cell industry. This ongoing march toward technological progress continues, not just with solar electricity, but with all forms of energy.

The Appalachian Mountains have long been recognized as a source of energy for the nation, but for two centuries, that energy was largely confined to coal, oil and natural gas. Today, the region's ridgetops and mountains are home to a growing wind energy industry. The communities and citizens of Appalachia have powered the nation – and the world – for centuries, and our ability to provide power into the next century is growing daily. The combination of wind, solar and fossil energy now being produced in the Appalachian Region makes our portion of the United States a critically important part of the national energy strategy.

Aside from all the opportunity that exists here for alternative energy development, the past two years have helped us identify key weaknesses in these industries, not just in Appalachia, but across the United States. Supply chain disruptions have plagued nearly every industry in all parts of the world, and renewable energy has been no exception. As global manufacturing gravitated toward China and other parts of Asia over the past 40 years, our domestic capacity to respond quickly to supply chain disruptions eroded. Today, major



Detail photo of photovoltaic cells.



Application-specific integrated circuit (ASIC) rigs used for cryptocurrency mining.

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photovoltaic cell manufacturers in China are unable to quickly meet the demand for solar cell installation, not just in the United States, but elsewhere in the world. The growing demand for renewable energy in the United States is presenting not only an opportunity to create new direct job opportunities in those industries, but also new manufacturing jobs. Wind turbines for wind-based energy generation and photovoltaic cells for solar energy must be produced domestically if the United States is to be a leader in those industries. These realities present both opportunities and challenges for business leaders and policymakers alike.

As the Appalachian Region seeks to reshape its economy and recruit new economic opportunities, alternative energy must be a focus for leaders in

both business and government. The United States Department of Labor estimates that by 2050, 80 percent of today's high school graduates will work in industries that do not yet exist. While frightening to some, that reality should be exciting because it represents such an incredible opportunity for West Virginia, Pennsylvania and the surrounding region to embrace entirely new industries and new jobs.

As only one example of the opportunities 21st-century industries are creating for the region, consider the billions of dollars traded around the world each day in cryptocurrency. This industry, today worth a global aggregate approaching \$3 trillion, did not even exist a decade ago. Today, cryptocurrency industry players are traveling the United States seeking new places to operate as a result

of policy changes elsewhere in the world. The incredible demand for electricity created by this single industry, coupled with the growing societal pressures for decarbonization and environmental sensitivity, are resulting in huge new markets for alternative, non-fossil sources of electricity.

Alternative energy is already a growing segment of the American economy, and there is no end in sight today. Pressures to reduce carbon emissions are no longer just felt by multinational Fortune 500 companies. Today, nearly every industry and every business is facing pressure to provide more of its energy supply from alternative sources. That reality is good for this growing industry and presents interesting opportunities for states looking to reinvent themselves and their economies. **V**