

## Introduction

Reliable, **CLEAN ENERGY** is critical to the health, safety and welfare of residents in Coconino County. It affects the stability of everyday life from the availability of potable water to the sustainability of land use and economic development decisions. The County has a responsibility to be a leader in innovative and responsible energy and natural resource management while supporting secure and clean energy technologies for its residents.

This Energy Chapter supports growth while balancing it with the protection of natural resources. It outlines the County's strong interest in increasing energy efficiency by: 1) articulating the goals of the *Coconino County Sustainable Building Program* that work to promote energy conservation and efficiency in new and existing buildings, and 2) through support for the development of locally produced and used renewable energy projects. The policies in this chapter emphasize the value placed on the distinctive natural landscapes. They promote the conservation of natural resources, encourage sustainable development, and support development of renewable energy sources. Additionally, the policies provide guidance for the expansion of renewable energy while avoiding, minimizing, and mitigating negative impacts. Energy goals and policies related to transportation can be found within the circulation element.

In 2012, the County Board of Supervisors approved an Energy Element as an amendment to the Comprehensive Plan, which provided high levels of specificity for energy projects. This information is still found applicable and is included as Appendix D. Consulting this appendix will provide additional insight for expectations and support for decision making.

## Coconino County's Current Energy Picture

In the decade from 2000 to 2010, Coconino County's population grew by 16%<sup>1</sup> and continues at a rate of approximately 2% annually. That growth along with an increase in per capita energy consumption is increasing demand on energy providers. As of 2009, traditional energy sources make up the majority (94%) of energy generation in Coconino County. Traditional energy includes fossil fuel powered electricity generation along with natural gas, coal power, and nuclear power. Renewables account for the remaining (6%) and include hydropower, wood, solar, geothermal and combustion of waste materials.

Locally, there has been an increased interest in developing new renewable energy projects. Permits for residential solar installations have become a regular occurrence, and as of 2015, two utility-scale wind and solar energy projects have been approved by the County through **CONDITIONAL USE PERMITS**.

In the coming decade, biomass may become a part of the county's renewable portfolio. In 2014 the *Four Forest Restoration Initiative (4FRI)*, the largest forest restoration effort in our nation's history, was approved to reduce forest fuels as well as improve **ECOSYSTEM** health. The 4FRI

<sup>1</sup> U.S. Bureau of the Census. 2010. *Profile of General Population and Housing Characteristics*

43 project will produce a large supply of biomass materials with potential to fuel large biomass  
44 projects on a regional scale, especially for industry.

45  
46 Historically, Coconino County has been the site of large-scale power plants that use non-  
47 renewable fuels to generate power for the Western Area Power Authority (WAPA) power grid.  
48 The drivers for these large-scale energy production projects has been the energy demand from  
49 larger metropolitan areas in the Southwest. Moreover, these power generation projects involve  
50 complicated tradeoffs regarding the need for clean, **RENEWABLE ENERGY** and the local  
51 effects of these projects on viewsheds, neighbors, wildlife, vegetation, natural quiet, and the land.

52  
53 The majority of electricity generated in Coconino County comes from coal. The coal supply is  
54 mined in open pits by Peabody Coal on the Navajo and Hopi Reservations and in New Mexico.  
55 The coal is burned to heat water from Lake Powell and the resulting steam creates energy,  
56 providing power. Navajo Generating Station (NGS), outside of Page produces 2,250 MW of  
57 energy and is one of the largest coal plants in the country. The plant supplies energy to  
58 Arizona, New Mexico, and California, and is the energy source for pumping water in the Central  
59 Arizona Project (CAP). The Navajo Generating Station is under an agreement with the  
60 Environmental Protection Agency (EPA) to reduce harmful emissions and mitigate the plant's  
61 carbon footprint by closing one of three generators and ceasing operation of conventional coal-  
62 fired generation by December 22, 2044.

63

## 64 **Energy Conservation and Efficiency**

65 Energy conservation is the idea of doing with less or doing without. Energy efficiency involves  
66 getting more out of less by employing technologies that perform while using fewer resources.  
67 These two concepts, energy conservation and energy efficiency, present viable opportunities for  
68 residents and businesses to reduce their overall energy consumption.

69

70 Reducing energy consumption is a high priority for the County because it will reduce demand on  
71 existing infrastructure, save money and reduce the need for new infrastructure and its associated  
72 impacts. Reducing energy consumption has environmental, economic and social benefits.  
73 Because most of the energy generated in Coconino County is from fossil fuels, reducing energy  
74 consumption would reduce nitrogen oxide, sulfur dioxide, mercury and carbon dioxide  
75 emissions, and significantly reduce water use. Economically, reducing energy use saves money  
76 and minimizes utility rate increases. Social benefits include gains to health and wellness related  
77 to clean air and water.

78

79 Increasing energy conservation through behavior change is the most affordable and therefore  
80 immediately achievable energy policy. Actions as simple as turning off the lights, driving less,  
81 riding a bike, and installing programmable thermostats are all energy conservation strategies.  
82 While these changes may seem minor, when compounded with every household and business in  
83 the county, the results from adopting such strategies are significant. Individual stewardship and  
84 actions are the basis for impactful energy conservation.

85

86 To encourage energy efficiency in new construction, Coconino County adopted the *2012*  
87 *International Energy Conservation Code (IECC)* which will increase efficiency by 30% over the

88 previously adopted 2006 codes through increased requirements in insulation, air tightness of  
89 exterior walls, and increased efficiencies with lighting and heating systems. Many of Coconino  
90 County's builders have embraced building to the "energy star" standard. Likewise, individual  
91 owners and builders have participated in the County's *Sustainable Building Program* and utilize  
92 the sustainability checklist to earn the County's annual Sustainable Building Award. Using  
93 sustainable building materials and technologies can increase the value and marketability of a  
94 home or business while saving a considerable amount in energy costs over the life of the  
95 building. Substantial energy savings can be achieved through retrofitting existing buildings  
96 based on energy audits. Both major overhauls and small changes can have an impact on energy  
97 use. Energy-efficiency strategies and new technologies are critical to helping Coconino County  
98 residents maintain comfort and living standards while reducing energy use.

100 Low-cost building techniques such as passive solar, thermal mass, insulation, overhanging eaves,  
101 and use of vegetation can significantly reduce a building's energy consumption. **COCONINO**  
102 **COMMUNITY COLLEGE (CCC)** and the *Sustainable Building Program* both provide a number  
103 of courses and training opportunities on energy efficient construction methods.  
104

105 **Goal:** Reduce energy consumption by increasing energy conservation and efficiency.  
106

107 **Policies:**

- 108 1. Coconino County shall be a leader in reducing energy consumption and shall strive for  
109 buildings to be energy self-sufficient.  
110
- 111 2. The County shall continue to pursue funding opportunities for weatherization programs,  
112 educational programs for energy conservation and efficiency through the Sustainable  
113 Building Program, and coordination with educational institutions and community  
114 partners. The County shall also support educational opportunities for workforce  
115 programs, job training, and employment opportunities such as the Energy Efficiency  
116 Conservation Corp.  
117
- 118 3. Proposed subdivisions, commercial, industrial, multifamily residential and public and  
119 semi-public uses may consult with the Sustainable Building Program as part of the  
120 Planning and Zoning process. The review will include consultation on site location,  
121 project layout for maximum solar gain, building design, energy efficiency and  
122 conservation of resources.  
123
- 124 4. The County shall support, foster and adopt building efficiency programs and energy  
125 standards (including national programs such as Energy Star and LEED) that reduce per  
126 capita consumption.  
127
- 128 5. The County shall be a model of sustainable design and energy efficiency in the  
129 construction of new County buildings and renovations.  
130
- 131 6. The County encourages energy conservation in both new construction and remodel and  
132 retrofits through codes and support of incentive programs.

133  
134 7. The County will assist residents of all income levels to identify achievable strategies that  
135 reduce energy consumption.

136  
137 8. The County shall promote the conservation of water, which requires substantial energy to  
138 treat and distribute.  
139

## 140 **Generating Energy**

141 While working to reduce energy consumption is the most effective goal for the County, support  
142 for additional energy resources will be necessary if projected future energy demands are to be  
143 met. Clean and renewable energy technologies are a rapidly growing segment of the energy  
144 sector and contribute to energy independence and security through diversification and local  
145 energy production. Fortunately, the use of alternative renewable energy sources within Coconino  
146 County has been expanding due to the effects of both State and Federal energy policies and the  
147 availability of more than 300 days of sunshine and moderate wind resources.

148 Renewable energy technologies are evolving at a rapid pace. New strategies for reducing  
149 impacts to the natural environment, wildlife, viewsheds, and natural quiet are being developed.  
150 The renewable energy industry and its technologies are ever changing, and it is critical that the  
151 County ensures that best practices are being implemented in Coconino County. Two major  
152 systems of renewable energy generation are **DISTRIBUTED ENERGY SYSTEMS** and  
153 **UTILITY-SCALE ENERGY SYSTEMS** production. The following types of energy generation  
154 are relevant to Coconino County.

155 **Coal:** “Clean coal” technologies that are designed to reduce impacts of coal-based energy  
156 generation by making the large-scale burning of coal more efficient thus reducing pollution.  
157 Clean coal is one tool for minimizing impacts of this traditional energy source. However, the  
158 effectiveness of these “clean” technologies are still being researched. Two ways the County and  
159 residents can help mitigate the impacts of carbon emissions and coal-based plants are: 1) small-  
160 scale carbon off-setting through the planting of native vegetation and trees, and 2) the  
161 preservation of healthy soils. Vegetation and healthy soils provide natural air filtration and  
162 create carbon sinks or places for carbon to be stored outside the air also known as carbon  
163 sequestration. This choice of mitigation should be carefully considered to manage invasive  
164 species and water usage.  
165

166 **Natural Gas:** Natural gas is an expanding national energy sector that is applauded for having  
167 less of an environmental impact than other fossil fuels. However, hydraulic fracturing or  
168 “fracking,” has been correlated to groundwater contamination and increased seismic activity.  
169 Mineral extraction or mining operations on parcels of five or more contiguous commercial acres  
170 that include natural gas extraction and oil and coal production are currently exempt from County  
171 regulation.  
172

173 **Nuclear:** Nuclear power is another traditional energy source. While some consider nuclear

174 power to be a clean energy source due to its lack of emissions, it has other environmental impacts  
175 related to the mining and processing of uranium and the disposal of depleted nuclear fuel.  
176 Although there are no nuclear power plants in Coconino County, there are uranium mines and  
177 mining claims near the Grand Canyon. In 2012, the federal government placed a 20-year  
178 moratorium on new uranium mining claims near the Grand Canyon. However, this does not  
179 affect proven, existing claims or continued development of the existing eleven uranium mines  
180 within the County. Counties have no jurisdiction over mining operations larger than five acres.  
181

182 ***Distributed Energy Systems:*** Distributed energy is the generation of electricity in small  
183 amounts in many places. Examples of distributed energy systems include photovoltaic panels on  
184 rooftops, ground mounted wind turbines, and ground source heat pumps. Distributed energy  
185 systems can minimize the expense and negative impacts of transmission lines and land  
186 disturbance by making use of existing transmission lines and corridors. Distributed energy  
187 systems offer an option that may reduce impacts to wildlife and other natural resources as well  
188 as disperses the impacts of energy generation across the community.  
189

190 The County has taken measures to remove barriers to distributed systems such as allowing the  
191 installation of solar panels under current codes and requiring only a building permit. In addition,  
192 the *Accessory Wind Energy Ordinance* was approved by the **BOARD of SUPERVISORS** in  
193 2008, allowing for distributed wind energy systems to be installed with a building permit. Other  
194 distributed energy technologies include solar water heaters and ground source heat exchange  
195 pumps, or geo-exchange systems. There has been significant technological advances with both  
196 of these renewable energy systems making them more user friendly and cost effective. Since  
197 2011, the County has seen an increase in the number of permits issued for various types of  
198 distributed energy systems in part due to the County's code revisions and support of its  
199 Sustainable Building Program.  
200

201 In 2010, Arizona Public Service initiated the Community Power Project in the Doney Park area  
202 to conduct a study of the impacts many distributed systems would have on the grid. The project  
203 includes the installation of utility-owned photovoltaic systems on 160 single family dwelling  
204 rooftops. While the solar panels are located on individual residences, APS retains ownership and  
205 maintenance responsibilities. These homeowners have granted easements to APS in exchange  
206 for a fixed rate on their energy bills for twenty years. For any distributed energy system that is  
207 beyond an accessory use of the site, and intends to create more energy than can be used on the  
208 property, a Conditional Use Permit will be required to mitigate potential impacts. This was the  
209 case for a portion of the Community Power Project located at Cromer Elementary School that  
210 would generate more power than used on-sit. There are 1,560 solar panels produce  
211 approximately 871 kW of power, which is more power than is used on the site.  
212

213 Distributed energy systems also include **NET-ENERGY-GENERATING** buildings. These  
214 buildings generate more energy than they use by combining conservation and efficiency  
215 measures with on-site power production through renewable energy sources like solar  
216 photovoltaic, wind energy, and solar thermal (hot-water). Net-Energy will be an important part  
217 of energy conservation strategies for future development.  
218

219 **Utility-Scale Energy:** There are at least two dozen meteorological wind test towers that have  
220 been approved and constructed in various parts of the county since the early 2000's. The Perrin  
221 Wind Farm and the Cromer Elementary School portion of the APS Community Power Project  
222 are just two examples of utility-scale energy generation happening in Coconino County. The  
223 Perrin Wind Farm, consisting of 62 turbines, was approved in 2011 and became operational as of  
224 January 2012 (*see Energy Infrastructure map at the end of the Chapter*). Utility-scale solar was  
225 approved in 2011 at Cromer Elementary School and at an APS substation in Doney Park. These  
226 utility-scale projects tend to have more significant impacts on surrounding communities and the  
227 natural environment than distributed energy systems. However, there continues to be  
228 considerable interest in utility-scale energy projects. This is because they have the potential to  
229 sustain the economic viability of working ranches and create jobs, and compared to traditional  
230 energy production, they conserve water resources, minimize air pollution, and complement other  
231 sustainable goals and policies of the *Comprehensive Plan*.

232  
233 Biomass fuel is another utility-scale source of energy due to the abundance of forest products in the  
234 county. To create energy, the biomass process uses renewable materials, such as wood, plant  
235 material, and agricultural wastes through direct combustion or gasification to create gas. Forest  
236 treatments occurring over the next decade to reduce fire risk and improve forest health in the  
237 ponderosa pine forests through the *4FRI project* creates a source of fuels for biomass operations.  
238 As of 2015, no utility-scale biomass processing plants exist in Coconino County.

239  
240 Glen Canyon Dam, with a generating capacity of 1,300 MW of electricity, is the only  
241 hydroelectric power plant in Coconino County. While there are no air emissions, there are  
242 considerable environmental impacts to the Colorado River corridor and ecosystems both up and  
243 downstream. Micro-hydro plants in small river channels is a developing technology. However,  
244 Coconino County has few perennial streams and rivers so development of any new hydroelectric  
245 plants is unlikely.

246  
247 Geothermal energy utilizes the high temperatures deep within the earth as an energy source. The  
248 average temperature in the county at about four miles depth is 175 to 200 degrees Celsius, which  
249 is warm enough for utility-scale geothermal production. Development of this renewable energy  
250 source has been costly and challenging because extraction is difficult due to the depth of the heat  
251 and the amount of rock subsurface. Like other renewable energy systems, geothermal technology  
252 is rapidly evolving and many experts believe that Coconino County has some of the highest  
253 potential in Arizona for a utility-scale geothermal plant because of volcanic vents.

254  
255 The collection of gases created from decomposition occurring in landfills can be an energy  
256 source. Gases are pumped to an engine, which powers a generator connected to the electric grid.  
257 Benefits include reducing methane released into the atmosphere and turning a waste by-product  
258 into an asset to be sold. As of 2012, Cinder Lakes Landfill in Doney Park is the only feasible  
259 location for such a facility.

260  
261 **Goal:** Utilize wind and solar resources by encouraging distributed energy systems.

262  
263 **Policies:**

- 264 9. The County will review codes and ordinances on a regular basis to assure adaptability to  
265 changing technology and best practices in distributed energy systems.  
266
- 267 10. The County encourages distributed energy systems located at the point of use and on  
268 disturbed lands near existing substations and transmission to reduce the amount of  
269 infrastructure and land disturbance required for energy generation.  
270
- 271 11. The County will continue to explore, facilitate, and streamline the installation of distributed  
272 energy systems for homeowners and small businesses by providing education and resources  
273 through the Sustainable Building Program.  
274
- 275 12. The County will encourage job training programs and other educational opportunities to  
276 create a workforce of experts in distributed energy systems.
- 277 13. The County will encourage the collaboration of agencies, residents, and businesses to pilot  
278 new distributed energy projects.  
279  
280

281 **Goal:** Develop efficient and appropriate energy generation while avoiding and minimizing  
282 impacts to the natural environment, wildlife, human health and community character.  
283

284 **Policies:**

- 285 14. The siting of utility-scale projects and transmission lines shall consider the protection of  
286 viewsheds; the potential for noise disturbances to adjacent residential areas; the conservation  
287 of species, habitats and water resources; the preservation of pre-historic, historic and cultural  
288 sites; the conservation of scenic corridors; and the protection of the character of public lands.  
289 Underground collection lines are strongly encouraged.  
290
- 291 15. The County supports the development of utility-scale projects on previously disturbed lands  
292 and areas that are close to existing transmission interconnections.  
293
- 294 16. Utility-scale energy projects that allow for continuation of traditional land uses such as  
295 ranching and hunting shall be preferred over projects that assume all use of the land. The  
296 ability to retain multiple uses of the land such as combining solar rooftop installations with  
297 agreements to keep ranches intact is ideal.  
298
- 299 17. Project sites that conflict with critical wildlife habitat, sensitive species, movement corridors,  
300 riparian areas and areas of significant topographic relief such as canyons and cliffs should be  
301 avoided to prevent the need for extensive data collection and mitigation measures to reduce  
302 the risk of mortality, fragmentation of habitat, and significant long-term displacement of  
303 wildlife.  
304
- 305 18. The County encourages utility-scale renewable energy projects that engage in innovative  
306 research and operational procedures that are consistent with current best practices and  
307 scientific knowledge. These may include the use of radar activated lighting, wildlife study

308 designs that include off-project comparison sites, turbine curtailment during migratory  
309 periods, and other practices designed to improve the understanding of project impacts and to  
310 reduce these impacts.

- 311
- 312 19. In order to protect water supplies, projects utilizing water conservation methods or  
313 reclaimed water shall be preferred over more water intensive systems that require additional  
314 impervious surfaces. Page | 8
- 315
- 316 20. The County supports changes to Federal regulations which would allow for visual warning  
317 systems that utilize radar to activate aviation safety lights or other new technologies to protect  
318 viewsheds and dark skies. The County encourages the use of such technology for all projects  
319 required by the FAA to install safety lighting.
- 320
- 321 21. In order to balance impacts of projects on residents and the natural environment, the County  
322 prefers projects that can demonstrate significant energy benefits on a local and regional  
323 scale. The County will collaborate with appropriate federal and state agencies to balance the  
324 impacts of energy projects. Conditional Use Permit renewals will be required to  
325 demonstrate how they are specifically benefiting Coconino County.
- 326
- 327 22. The County will encourage legislative changes necessary to allow groups of citizens to  
328 create renewable energy special districts.
- 329
- 330 23. The County will require mitigation measures concerning air pollution, viewsheds, clear skies,  
331 collection methods, land disturbance and emissions when considering utility-scale projects.
- 332
- 333 24. The County shall encourage residents to replace existing wood stoves and fireplaces with  
334 EPA-approved units.
- 335
- 336 25. The County supports biomass energy production through the distribution of forest thinning  
337 materials to residents for firewood and for use by utility-scale facilities if the impacts of  
338 these facilities on the public health, wildlife, air quality and the natural environment of  
339 nearby communities can be avoided, minimized or mitigated.
- 340
- 341 26. The County will continue to research and support education on the various alternative  
342 energy resources and options.
- 343 27. The County will support the agreement to cease the operation of conventional coal-fired  
344 power generation at the Navajo Generating Station no later than December 22, 2044.
- 345

346

## 347 **Impacts of Energy Production**

348 The location of utility-scale projects can greatly alter their impact on wildlife. Proper siting of  
349 wind facilities and mitigation strategies such as adjusting turbine rotation speeds can minimize  
350 impacts to wildlife. There are multiple solar energy technologies including photovoltaic and

351 solar thermal generation, as well as mounting options that can increase the effectiveness of  
352 photovoltaic panels. These technologies can have significantly different impacts on the  
353 landscape. Ground-mounted utility-scale solar facilities may require extensive clearing of  
354 vegetation, grading and fencing. These facilities thus have the potential to eliminate or  
355 fragment large areas of intact **HABITAT** for a range of wildlife species and disrupt **WILDLIFE**  
356 **MOVEMENT AREAS**. Conversely, utility-scale rooftop projects avoid and minimize these  
357 impacts to land and wildlife.

358

359 Some utility-scale projects can have affiliated water impacts that conflict with existing goals and  
360 policies because of the potential for significant water availability and quality concerns. Because  
361 of the county's arid environment, lack of assured water availability and overall water quality  
362 concerns, water intensive utility-scaled energy production uses are not as favored by the County.  
363 Protection of Coconino County's water resources is a high priority as outlined in the Water  
364 Resources Chapter of the *Comprehensive Plan*.

365

366 Other impacts associated with utility-scale energy production include the introduction of noxious  
367 weeds, large area land disturbance, the construction of new roads and infrastructure, impacts on  
368 scenic viewsheds, and the potential impacts on neighbors such as noise, lighting and perceived  
369 reduction of property values. Significant environmental concerns exist in relation to traditional  
370 energy development. These concerns range from health impacts such as mercury emissions and  
371 the effects of microscopic particles on respiratory systems to the global climate-altering effects  
372 of greenhouse gases.

373

374 The need for new transmission lines and substations must be considered in any utility-scaled  
375 energy project approval. These auxiliary facilities have similar impacts to the projects  
376 themselves, such as large area land disturbance, wildlife collisions, fragmentation of habitat,  
377 disturbance of panoramic viewsheds, nighttime lights, increased noise levels and other negative  
378 impacts on neighbors. Building fewer and shorter transmission lines and substations can  
379 considerably reduce these impacts. Therefore, it is preferable for projects to be located as close  
380 as possible to existing interconnection points.

381

382 New technologies are emerging at a rapid pace. When considering projects the County will  
383 weigh the benefits against the costs in regarding the positive and negative impacts on human  
384 health, wildlife, water use and quality, economic development, vegetation, erosion, noise, views,  
385 dark skies and other treasured elements of Coconino County.

386

387 **Goal:** Increase the use of technologies and strategies to reduce pollution, environmental  
388 degradation, and negative health impacts associated with energy production.

389

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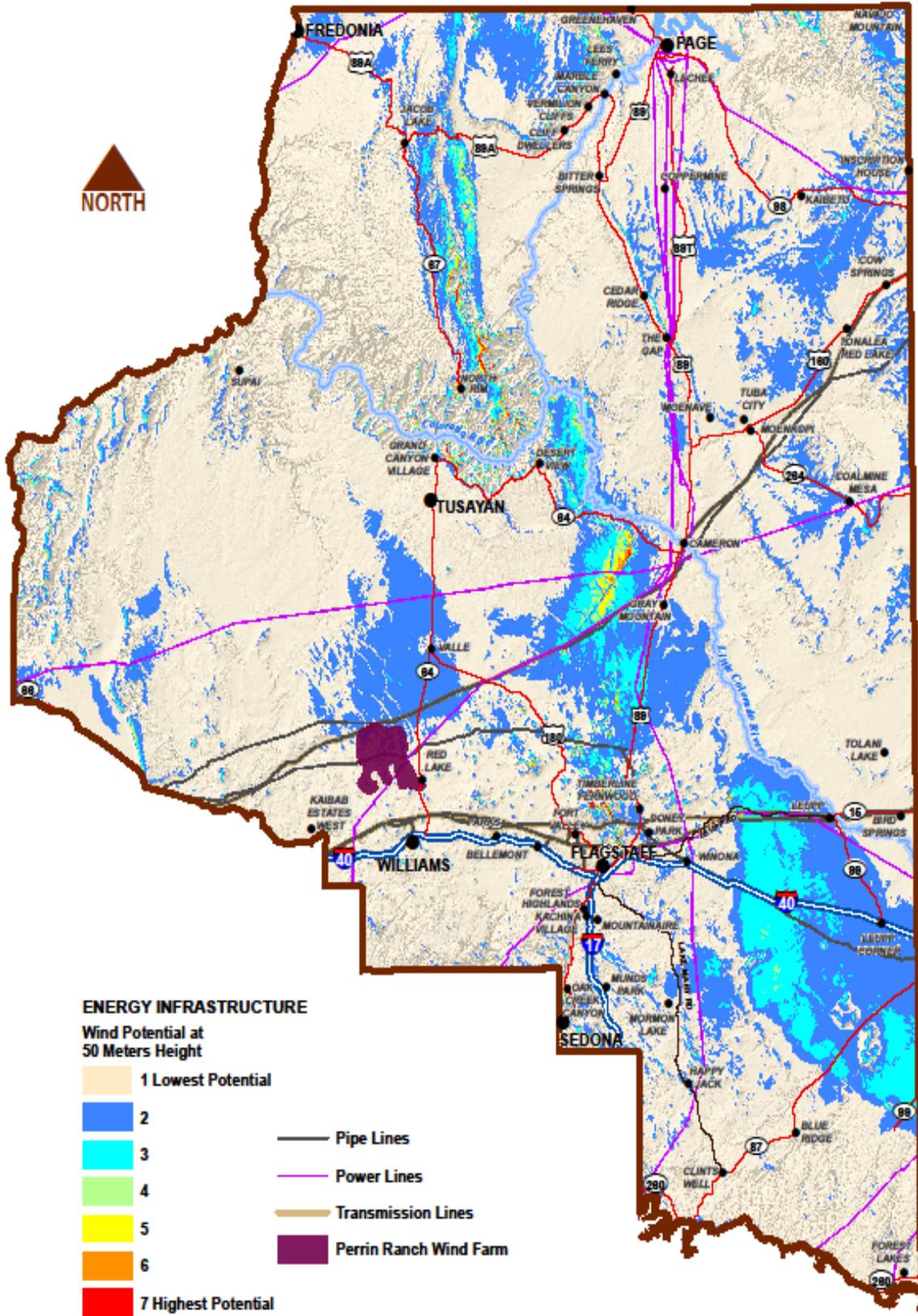
### 391 **Policies:**

392 28. The County supports technologies and procedures that protect air quality and visibility,  
393 viewsheds, public health, and the conservation of water.

394

- 395 29. The County will promote the development of small-scale carbon-off-setting techniques  
396 through land use planning, open space, and the Sustainable Building Program.

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Maps in this Comprehensive Plan are for reference and general planning purposes only. Coconino County does not provide any warranty of accuracy nor is any given or implied. Data sources are listed in the Appendix.