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Steven J. Piet
Robert S. Cherry
Lloyd C. Brown
Craig Cooper
Harold J. Heydt
Richard D. Holman
Travis L. McLing

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Steven J. Piet, Robert S. Cherry, Lloyd C. Brown, Craig Cooper, Harold J. Heydt,

Richard D. Holman, Travis L. McLing

Idaho National Laboratory (INL), 2525 N. Fremont Avenue, Idaho Falls, ID 83415

ABSTRACT

In many ways, the mountain west (Alaska, Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Wyoming) is an energy colony for the rest of the United States: it is rich in energy resources that are extracted to fuel economic growth in the wealthier and more populous coastal regions. Federal agencies and global corporations often behave as if the mountain west is a place to be exploited or managed for the benefit of customers and consumers elsewhere. Yet, the area is not vast empty space with a limitless supply of natural resources, but rather a fast-growing region with a diverse economic base dependent on a limited supply of water. New decision processes and collaborations are slowly changing this situation, but in a piecemeal fashion that places local communities at odds with powerful external interests. Proper planning of major development is needed to insure that the west has a strong economic and cultural future after the fossil energy resources decline, even if that might be a century from now. To encourage the necessary public discussions, this paper identifies key differences between the mountain west and the rest of the United States and suggests some holistic approaches that could improve our future. This paper is designed to provoke thought and discussion; it does not report new analyses on energy resources or usage. It is a summary of a large group effort.[1]

INTRODUCTION

We will argue in this paper that the mountain western portion of the U.S. and Canada is an energy resource colony of the rest of North America. By this we mean three things. First, there is a well-defined geographic region worthy of examination and common energy-related action. Second, the region has significant energy resources, which are of enormous importance to the U.S. goal of reducing foreign energy dependence and which could drive the economy of the region. Third, many energy-resource decisions are made outside the region, primarily for the benefit of those who live outside the region. These lead to an overall conclusion that the mountain west has much to gain by more actively planning its own future. This is a broad policy recommendation with its roots in more technical issues of energy recovery, environmental protection, and regional planning.

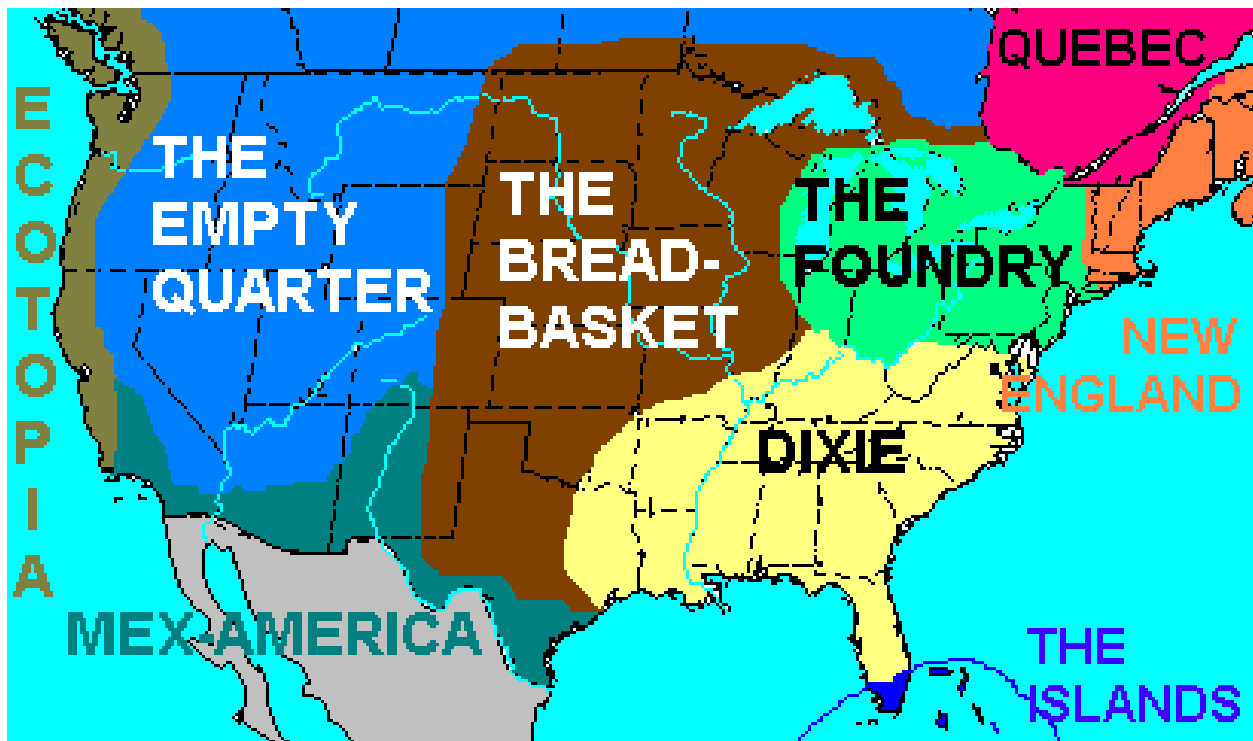


Figure 1. The Nine Nations of North America [2]

The distinctiveness of this region has been recognized by others although the exact boundaries have varied depending on the context. Perhaps most imaginatively, the region has been called the Empty Quarter [2], as illustrated in Figure 1. For the mountain west, we used a nine-state definition – Alaska, Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Wyoming. This is 50% more than the six states considered in the Western Balanced Energy Plan [3] but only 50% of the 18 states in the Western Governors Association. The common factors in this region's states are low populations, large fractions of land under federal ownership (generally the US Forest Service or the Bureau of Land Management), and generally recognized scenic attractiveness because of low levels of industrial or commercial development. Despite its great size, low population density, and cold winters, however, the region as a whole is not as unique in energy *usage* as we had anticipated; for example, transportation miles per capita are essentially the same as the overall U.S. Future work should explore commonalities with the Canadian extension of the region.

The second proposition about energy resources is well known, and in fact helps define the region throughout the databases of the Energy Information Administration. Though the mountain west may not be unusual in its energy usage, it is rich in several energy resources – hydropower, wind, solar, geothermal, uranium, oil shale, tar sands, and to some degree coal. Natural gas, petroleum, and biomass resources are also present but are more prevalent elsewhere.

The third proposition about control is the most complex. There are multiple dimensions to the tensions: between the administrative agencies at federal, state, and local levels; between competing priorities for water, air, and land; and between stakeholder groups such as land developers and recreationists of many kinds. One example is the tension over water – should it

be used to extract energy resources such as oil shale, to produce electricity via dams, to support ecosystems and fish, to grow food, to support population, to encourage recreation, or be exported to the coast? Will the demands of the numerous external stakeholders swamp our own regional preferences? As in other periods and places of colonization, effective unity against colonizers is hampered by our disparate interests and influences. Attempts at regional balancing principles, for example “Enlibra,”[4] and regional consensus in the face of national pressures have had limited success so far.[5,6,7]

HOW IS THE WEST DIFFERENT?

We summarize our initial exploration of this topic by describing colonialism, decision making issues, and traditional regional heuristics and culture.¹

Colonialism - Garreau [2] noted that key decisions are typically made outside the Empty Quarter, which is the source of raw materials for the other regions. This suggests that the Empty Quarter is an economic colony of the rest of North America. He describes the tension among environmentalists, miners, farmers, and city dwellers, which are common today. Indeed, there are few major companies headquartered in the mountain west, which we take as a sign of relatively low local corporate leadership and decision-making power. We see several signs of colonialism:

¹ Heuristics are mental short cuts, paradigms, slogans, rules of thumb that influence how we interpret and filter information, often unconsciously. Social science describes humans as “cognitive misers”, who devote as little time and energy to gathering and processing information as possible; and use subconscious heuristics to filter and process information. This can lead leads to simplistic slogans such as “no nukes”, “there’s plenty of oil,” and “solar is the answer.” These rarely solve the problem, nor contribute to comprehensive, holistic solutions. Thus, new policy should seek to use new frames that promote careful deliberation and minimize the impact of subconscious heuristics.

- Land ownership and control is elsewhere. Over 50% of the nine mountain west states is owned by the Federal government, and absentee ownership of second or third homes is common enough that some small mountain towns suffer from the resulting seasonal swings in population and employment in service jobs.
- Extraction of local resources (at relatively low value to local economies) with economic upgrading happening elsewhere. Nuclear reactors, wind mills, and solar panels are made elsewhere. Uranium enrichment had been done only in the eastern U.S., but a new plant is being built in New Mexico.
- Outsiders moving into an area, such as six of the seven authors of this paper.
- Not yet realized opportunities for further development along many possible paths
- Under-representation in the political process compared to the energy resource base
- Different political perspective(s) from other regions based on history, culture, economics.

Decision making - We note several issues complicating western decision making:

- The mountain west has had less time to evolve workable decision approaches. Its states have been “states” for three-quarters of century, on average, less than other states.²
- Political boundaries—federal, state, local, tribal—do not align with natural air, water, land, wildlife, and other responsibilities.
- Water law is separate for surface water vs. aquifers.
- Highly populated urban areas are culturally distinct from traditional rural areas.
- Agriculture and recreation/tourism as interests are not equally strong everywhere.

² The west does have some approaches such as referenda that appear to be more common than elsewhere.

Heuristics and Culture - Different norms such as those represented in traditional western art may influence decision making consciously or unconsciously:

- Decisions are and should be made at the level of the rugged individual, not communities or larger. (Figure 2a.)
- Nature dwarfs people, therefore, how can people threaten nature? (Figure 2b.)
- Nature is to be fought against or overcome, not cooperated with, in order to survive.



Figure 2. Paintings by noted western artists Charlie Russell (left) and Thomas Moran (right)

A WESTERN PERSPECTIVE ON ENERGY RESOURCES

Table 1 summarizes our assessment of energy source options from a western perspective.

Because the energy sources of the region are generally the newer ones, the mountain west should have growing energy importance, unlike areas like Texas that are dominated by declining oil/natural gas reserves. Hence, it is to the benefit of the mountain west to encourage R&D and deployment of wind, solar, geothermal, uranium, coal, oil shale, and tar sands. There is little special Western incentive to champion R&D on energy efficiency, biomass, oil, or natural gas.

The mountain west has two national laboratories that focus on several energy sources expected to

grow in importance in the next several decades. The National Renewable Energy Laboratory (NREL) in Colorado focuses on wind and solar. The Idaho National Laboratory (INL) focuses on nuclear with significant work in geothermal and unconventional fossil resources, as well as carbon sequestration.

Table 1. Summary of Energy Source Advantages and Disadvantages for the West

Source	Advantages	Disadvantages
Coal	Indigenous	Air pollution, costs from future CO ₂ sequestration. Coal may be one energy source where westerners may wish to export the resource and let someone else process (burn) it.
Oil	Indigenous	Newer oil sources require more water, e.g., oil shale, tar sands
Natural gas	Indigenous	Coal-bed-methane production generates saline waste water
Hydro	Indigenous	Strong impact on ecological systems, seasonal and yearly variations. Almost fully utilized.
Biomass	Renewable. Can use excess agricultural material	Low energy payback; wetter areas of the country have more potential than does the arid west
Wind	Indigenous; R&D at NREL no water use at installation	Intermittent; costly; windmills fabricated outside the mountain west
Solar	Indigenous; R&D at NREL no water use at installation	Intermittent; costly; land intensive; solar cells fabricated outside the West
Nuclear	Indigenous; R&D at INL (95% of U.S. uranium is in the region)	High capital cost; reactors fabricated outside the West
Geo-thermal	Indigenous; R&D at INL	High capital cost; highly location specific

CONTROLLING THE FUTURE OF THE WEST

There is a distinct set of issues that broadly affects the entire energy-producing mountain west and which deserves more study and more consideration in formulating energy-related policies.

In our full study,[1] we identified four themes that represent what we believe needs to be done.

First, the west needs to identify **better solutions** by performing holistic analyses to support energy decisions, e.g., impact on water, air quality, land values and land use, depletion of regional resources, population growth, quality of life, and economic value-added for regional economies. Recognize that “energy” is far more than “electricity” and that there are constraints

in matching energy sources to energy uses (Table 2). Address the fragmentation induced by the current briar patch [7] of federal and state agencies. Develop improved coordination at the mountain west regional scale. Recognize that the urban and rural regions within each western state have different characteristics. Address the wide range of time scales relevant to potential new policies. For example, Rose stressed the disparate time scales associated with energy challenges.[8] Consider individual decisions made daily, quarterly profit statements, 2-4-6 year election cycles, automobile life times of 10-20 years, industrial facility lifetimes of 20 to 60 years, and resource depletion ranging up to hundreds or thousands of years. Most of these are long compared to traditional human and institutional decision making time horizons.

Table 2. Ability to Use Different Energy Sources for Varying Energy Uses

		Energy source			
		Fossil (coal, oil, natural gas)	Solar (solar, hydro, wind)	Nuclear (fission, fusion)	Terrestrial (tides, geothermal)
Energy uses	Low-grade heat (homes, offices)	✓	✓	Would require “district heating”	
	Transportation	✓	Would require electrification of transportation or production of hydrogen as an energy carrier		
	Resource processing (smelting, refining, chemical feedstocks)	✓	Requires a way to obtain high- grade heat plus synthesis of feedstocks	Requires co- location plus synthesis of feedstocks	Requires a way to obtain high- grade heat plus synthesis of feedstocks
	Electricity	✓	✓	✓	✓

Second, the west needs to better **build local and regional consensus** as a way to counter colonialism. Address the question of the costs and benefits for the community; locals are not motivated solely by the dollars coming from what they can provide to the rest of the nation. Encourage people to think deeper than simplistic, polarizing slogans or heuristics. Conduct energy policy discussions in an open, transparent, and collaborative fashion.

Third, we need to better **identify and manage impacts** of development, including population growth whether from influx of permanent residents or temporary workers. Systematically integrate issues of water use and non-economic land use such as “viewsheds” into energy planning and policy. Consider how regions might assess the preferability of one nuclear plant producing 1 gigawatt of electricity (at 90% capacity factor) versus a landscape with 4,500 windmills of 1 megawatt each (at 20% capacity factor)?

Fourth, **improve potential futures** by actively considering longer term outcomes. Balance supply side and demand side in energy policy. Consider a wide range of attributes in making western energy policy (Table 3). Diversify the western energy resource base through investments in nuclear and other renewable resources³ to slowly wean the region and the country from dependence on fossil fuels. Develop energy storage systems to better use intermittent renewable energy resources prevalent in the west. Invest in a western-friendly energy R&D program.

Table 3. Possible Attributes to Consider in Western Energy Policy Making

Topic	Qualitative or Normative Issues	Measurable Issues
Water	Potential for water contamination	Water use; water pollution standards
Air	Potential for air contamination	Air pollution standards
Land	Views, various recreational uses	Ownership, wildlife impacts
Regional energy resources	Can value-added industries be established in the west, e.g., refine oil in addition to pumping it	Lifetime of western resources at planned production rates
Population	Potential for disruptive effects, e.g., moving existing communities to extract resource, unsustainable boom and bust communities	Growth rates, health impacts
Other economic	Equity, fairness among groups and states	“What’s in it for me?”
Decision making	Who decides? How reversible or adaptable is the solution? Political culture.	How long do consequences last?

ACKNOWLEDGEMENTS

³ When one considers fast breeder reactors and recycling used nuclear fuel, nuclear would appear

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as renewable as wind, solar, etc., which are limited by construction materials such as chromium.