WASHINGTON - As we come to grips with the tragedy wrought by Hurricane Katrina, three of the worst structural flaws in the nation's energy system must be examined: the overconcentration of oil and gas infrastructure in the part of the country most prone to natural disasters, the lack of refining capacity and the near-complete dependence of vehicles on petroleum.

The coastal states of the Gulf of Mexico are home to 47 percent of the nation's refining capacity. Nearly one-third of U.S. offshore oil and 20 percent of offshore U.S. natural gas are produced in the region. Sixty percent of U.S. oil imports, more than 7 million barrels per day, come through the gulf's ports. The 700-million-barrel Strategic Petroleum Reserve (SPR) - the nation's blood bank, created to supply oil in times of emergency - is split among four major sites: two in Texas, two in Louisiana.

When a storm hits - even one weaker than Katrina - oil and gas operations in the gulf screech to a halt. Oil rigs are evacuated, refineries are shut down and tankers are turned back. The damage is often overwhelming. Offshore platforms drift away, pipelines are ruptured, refineries are flooded and suffer unavoidable blackouts, and ports and terminals become clogged with silt.

Worse, many of the pipelines used to carry oil from gulf to locations nationwide are the same pipelines that connect our economy with its emergency oil stockpile. When those pipelines are damaged and pumping stations don't have electricity to pump oil, the SPR cannot perform its mission.

There are historical reasons why so much of our energy infrastructure has been concentrated in the gulf region.

The refineries there are geographically the closest to Mexico and Venezuela, two of the largest crude suppliers to the United States, as well as to a large part of America's onshore and offshore oil fields.

Unlike many states where siting and construction of new refineries faces local opposition, states such as Louisiana, Texas and Mississippi traditionally have been hospitable to the oil industry and have faced fewer not-in-my-backyard issues.

No new refinery has been built in the United States in three decades. Our economy and our thirst for refined petroleum products are growing faster than our refining capacity. Refineries today operate at full throttle, and when one or more go offline - nine refineries shut down because of Katrina - there is nothing to stop the prices of gasoline, diesel and jet fuel from going through the ceiling.

To expand the nation's refining capacity, federal and state governments should work together to improve regulatory practices and streamline the permitting process associated with refinery construction or expansion. As the refining sector expands, geographical diversity should become a key consideration in
site choice.

The configuration of the SPR also should be re-evaluated. There is no shortage in the lower 48 states of underground locations where oil can be stored. Building such reserves and the pipeline infrastructure that allows smooth withdrawal will be a costly endeavor, but worthy in light of the risks.

The impact of Katrina on the fuel market will be felt for many months, and in the near term, there is very little the Bush administration can do other than to ease refining regulations, curb the proliferation of boutique fuels and, yes, encourage motorists to conserve.

But in the medium to long run, it is critical that we act expeditiously to diversify our sources of transportation fuel beyond petroleum. Vehicles that can run on blends of gasoline and alcohols made from coal or agricultural products can use the latter when gasoline supply is compromised.

In Brazil, for example, most cars can operate interchangeably on ethanol and gasoline. Since U.S. electricity is essentially not generated from petroleum, advanced hybrids that literally may be plugged in add the electricity grid as yet another alternative transportation fuel resource.

Winston Churchill once wrote that "safety and certainty in oil lies in variety and variety alone." If the United States wants to better insulate itself from oil supply disruptions, which thus far have precipitated every recession since World War II, it should seek such variety not only in the sources of the petroleum it imports but also in the locations of its petroleum infrastructure and the types of fuel that the transportation sector can use.

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