Gal Luft, co-director at the Institute for the Analysis of Global Security and a senior adviser to the U.S. Energy Security Council said that though a Chavez departure may already be well factored into prices, it won't "translate into market calmness before it is clear what the nature of the new leadership is."

Clarity over who will be running state-oil producer PDVSA will be equally important, Luft said. "The company has been battered by terribly ineffective personnel changes and removal of competent leadership which has been replaced by political appointees," he said. "Once we begin to see changes in the company's leadership, reflecting professionalism and competence, that could mean the company is making a U-turn, becoming attractive for investors."

Meanwhile, a former executive at PDVSA told CNBC that Venezuela has lost its ability to influence global oil markets because years of under investment in the OPEC (Organization of Petroleum Exporting Countries) member's petroleum industry has constrained production.

"Venezuela is a weak OPEC hawk, as it has no sufficient production to influence prices," said Gustavo Coronel, a founding member of the board of state-oil firm Petroleos de Venezuela. "Venezuela is no longer a factor that can really upset the markets as it was the case 20 years ago."

Gustavo Coronel outlined in the July 2012 JES what it will take for PDVSA to recover.