

Exceptional service in the national interest



Congresswoman Michelle Lujan Grisham's

Water Innovation Summit

Session VII - Economic Development Opportunities

Water and Economic Development

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Distinguished Member of the Technical Staff

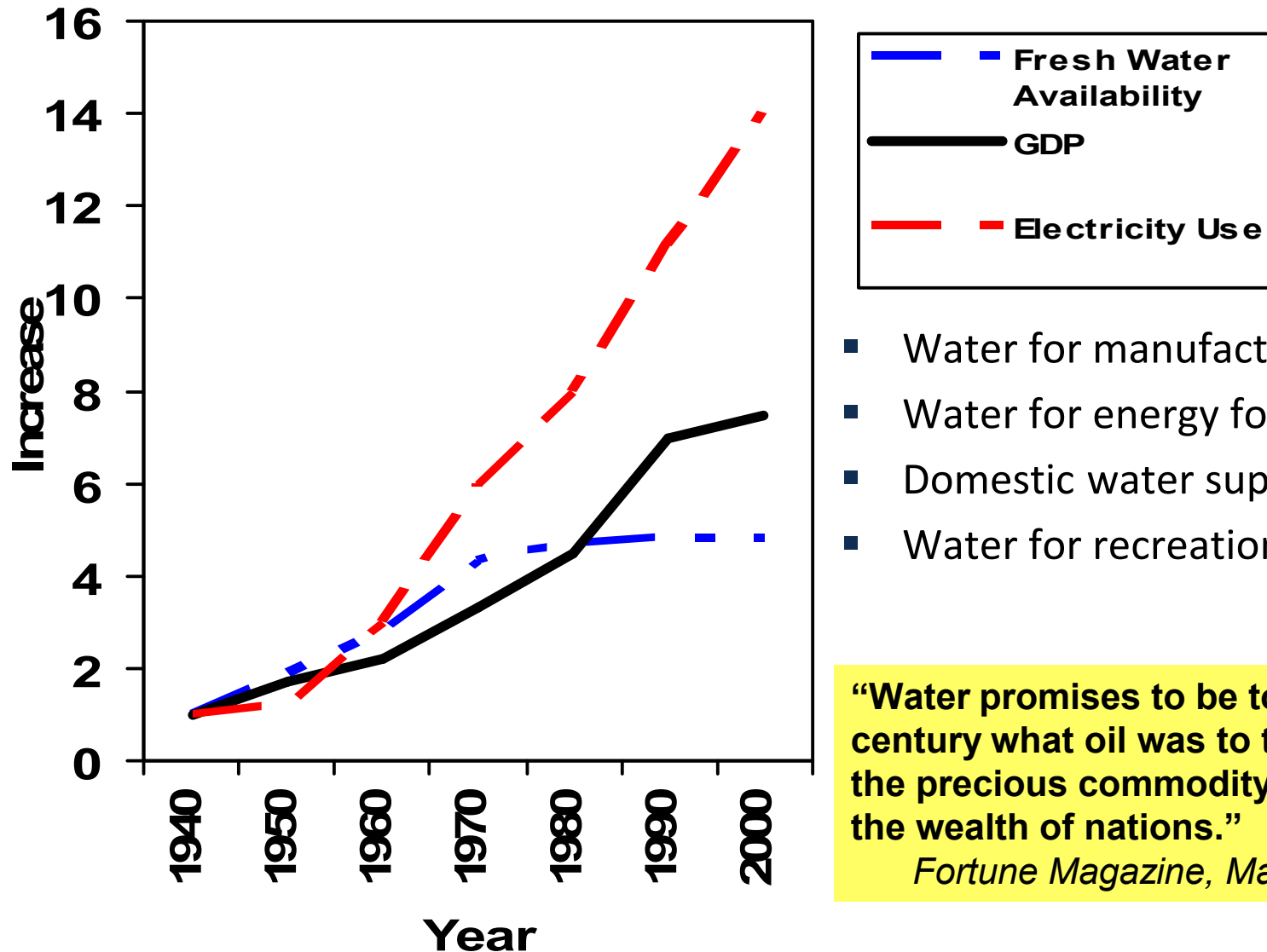
Sandia National Laboratories

October 14, 2014



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Water More than Other Resources is the Major Driver for Economic Growth and Productivity

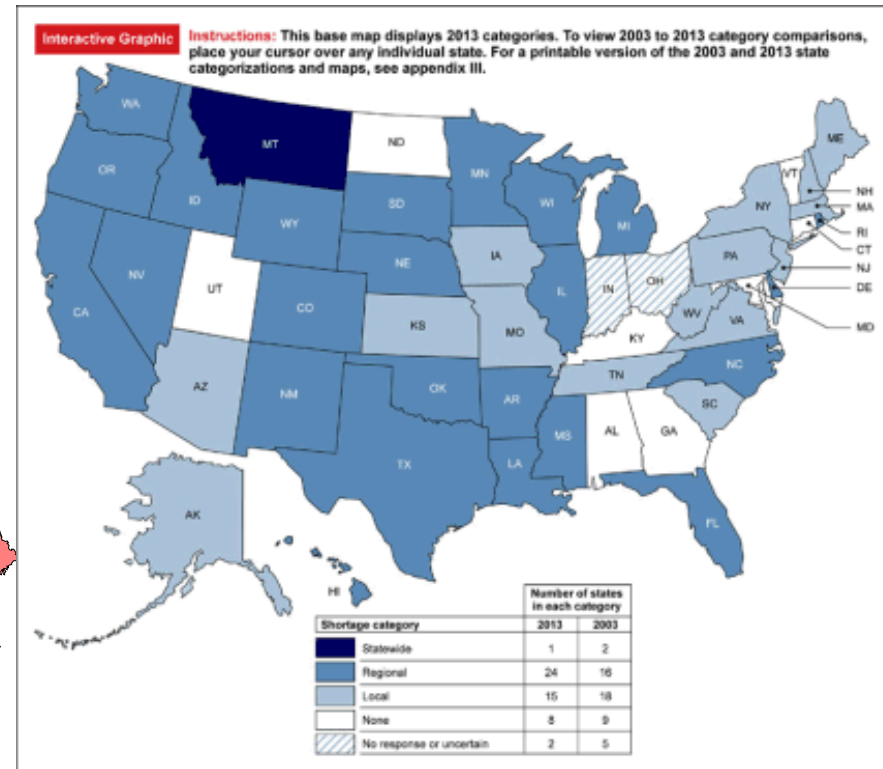


- Water for manufacturing processes
- Water for energy for manufacturing
- Domestic water supplies for workers
- Water for recreation

“Water promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations.”

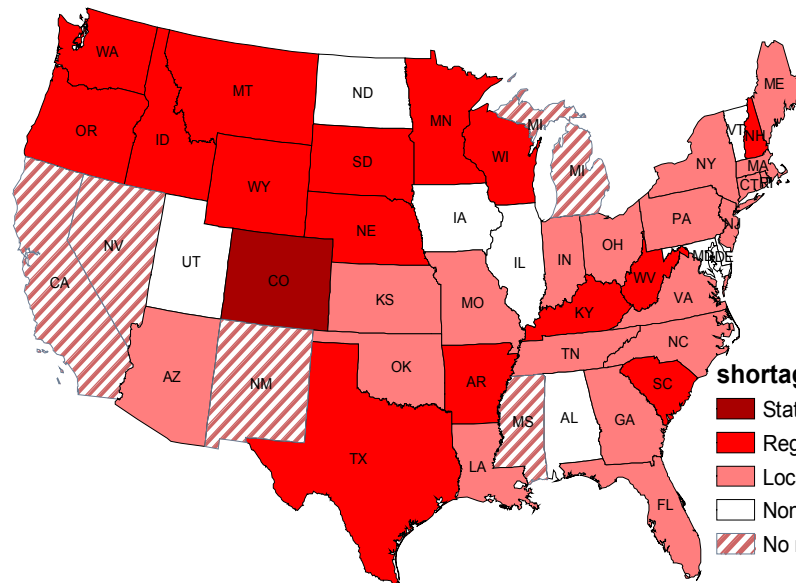
Fortune Magazine, May 15, 2000

Growing Water Stress by State



Sources: GAO analysis of state water managers' responses to GAO survey; Map Resources (map).

GAO 2013



shortage

- Statewide
- Regional
- Local
- None
- No response or uncertain

GAO 2003

Within 10 years

Today one in five people live in areas of water stress.

This is expected to rise to two in three.

Demand for water is set to outstrip supply by 40%.

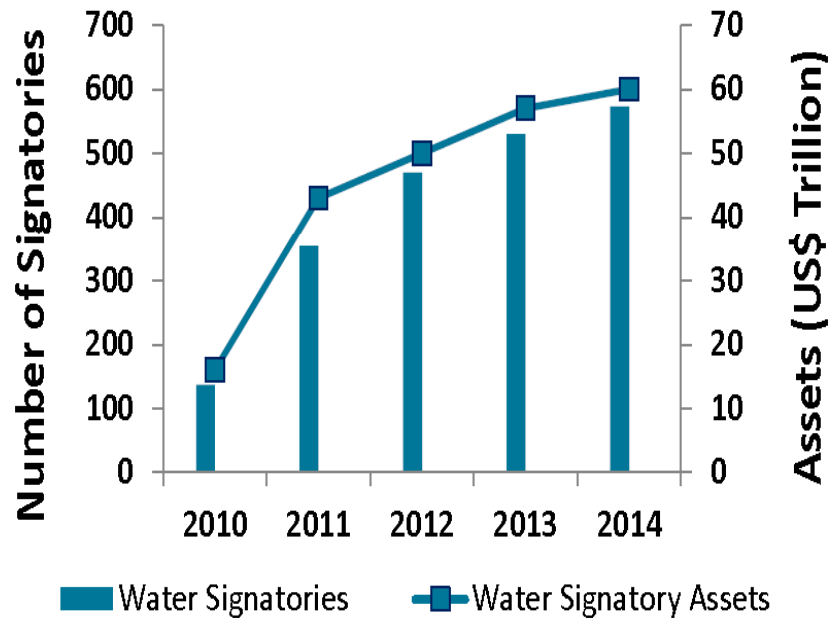
Business as usual water management will put at risk \$63trillion or 1.5 times today's entire global economy.

Water will have more rapid and unavoidable consequences for some businesses than carbon

Goldman Sachs

Investor Interest In Water Risk Is Rising

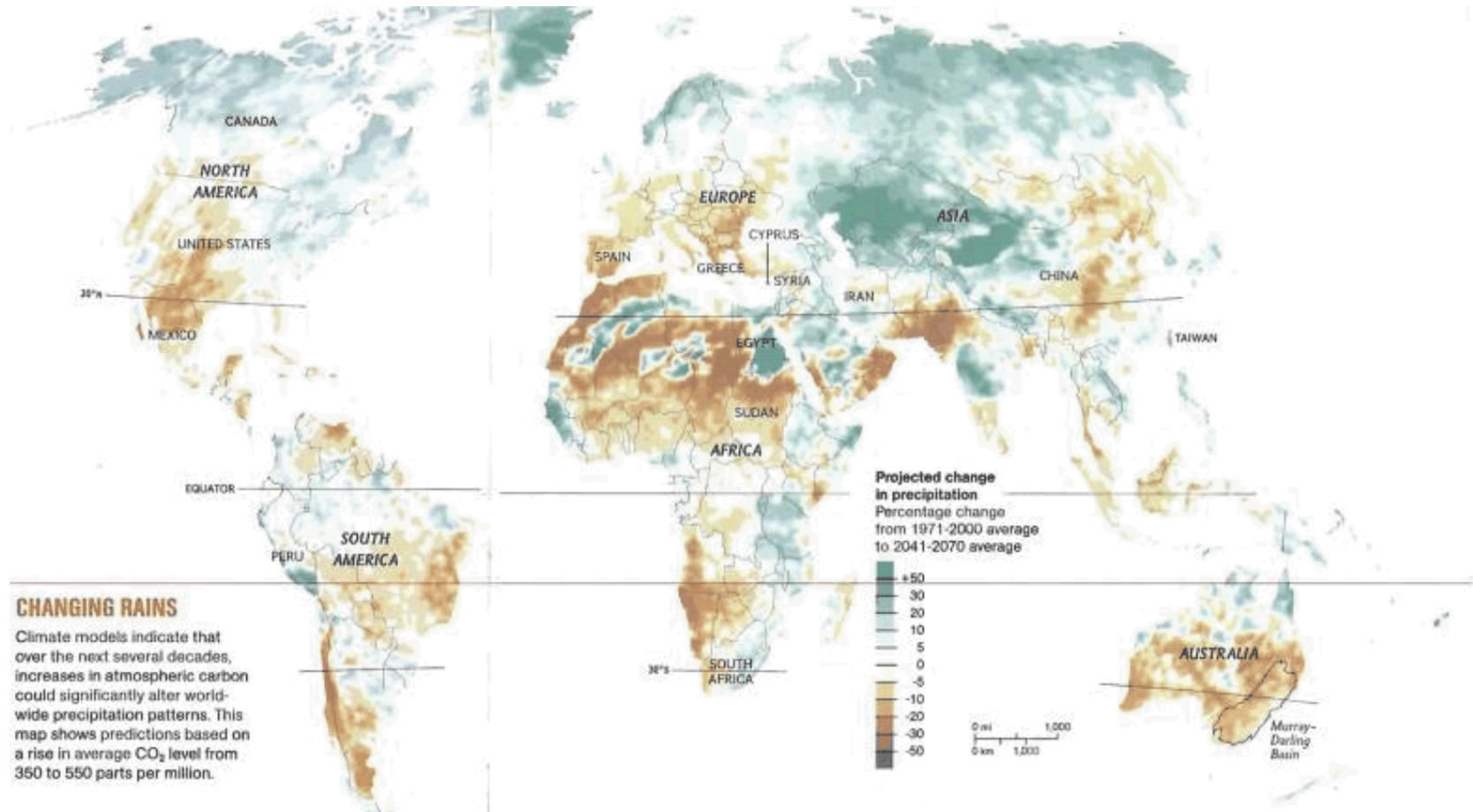
CDP Signatories & Signatory Assets: 2010 - 2014



“ Investors know how damaging inaction, inappropriate action or delaying interventions on water-related issues can be... The global economy will favor business that take a pro-active approach to water stewardship.”

- **Eurizon Capital**

Climate Changes will Impact Precipitation, Evapotranspiration, and Water Availability



Nat. Geo. April 2009 from IPCC

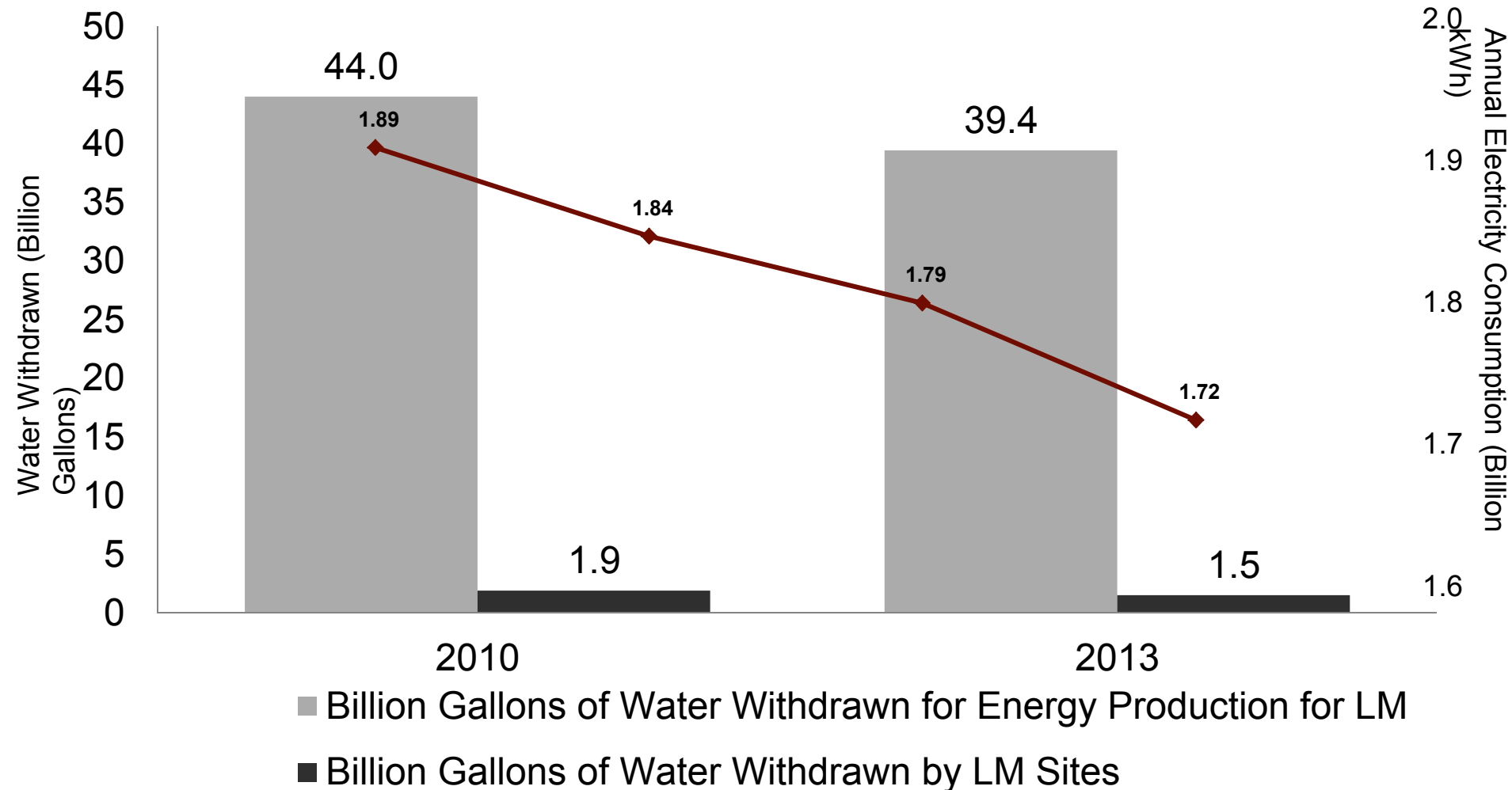
Improving Economic Development Opportunities with Limited Fresh Water Resources

- **Create New Fresh Water Supplies**
 - Creative storm water management and storage
 - Water harvesting from mountain water sheds
- **Creative Water Reuse**
 - Require industrial water reuse – produced water, electric power plant cooling water, mining water, ag water returns, frac water, etc.
 - Require domestic waste water reuse
- **Use Brackish Water for New Supplies**
 - Require brackish water use as available for non-potable applications
- **Innovative Energy Infrastructure Improvements**
 - Utilize New Mexico's extensive energy resources
- **Embrace Public Private Partnerships**
 - All efforts will require significant capital, with ROI in 10-20 yrs

Water Use and Consumption for Electric Power Generation

Plant-type	Cooling Process	Water Use Intensity (gal/MWh _e)		
		Steam Condensing		Other Uses
		Withdrawal	Consumption	Consumption
Fossil/ biomass steam turbine	Open-loop	20,000–50,000	~200-300	~30
	Closed-loop	300–600	300–480	
Nuclear steam turbine	Open-loop	25,000–60,000	~400	~30
	Closed-loop	500–1,100	400–720	
Natural Gas Combined-Cycle	Open-loop	7,500–20,000	100	7–10
	Closed-loop	230	180	
Integrated Gasification Combined-Cycle	Closed-loop	200	180	150
Carbon sequestration for fossil energy generation	~80% increase in water withdrawal and consumption			
Geothermal Steam	Closed-loop	2000	1050	50
Concentrating Solar	Closed-loop	750	740	10
Wind and Solar Photovoltaic	N/A	0	0	1-2

Industrial Water Footprint – Direct and Indirect



Thanks

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