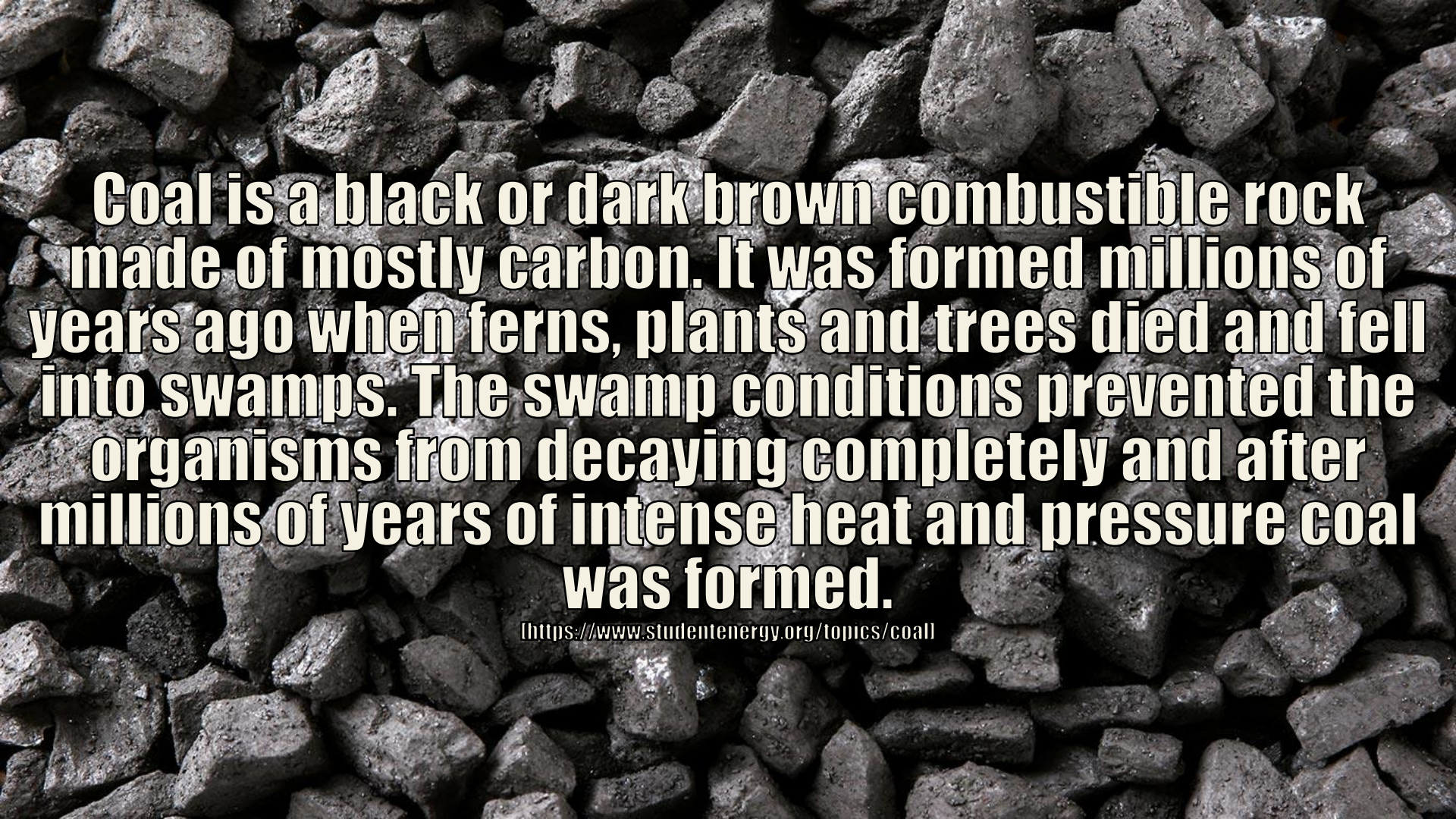


The Future of Fossil Fuel



A power station in Indiana. U.S. coal production has recovered slightly but demand for coal worldwide is expected to flatline...

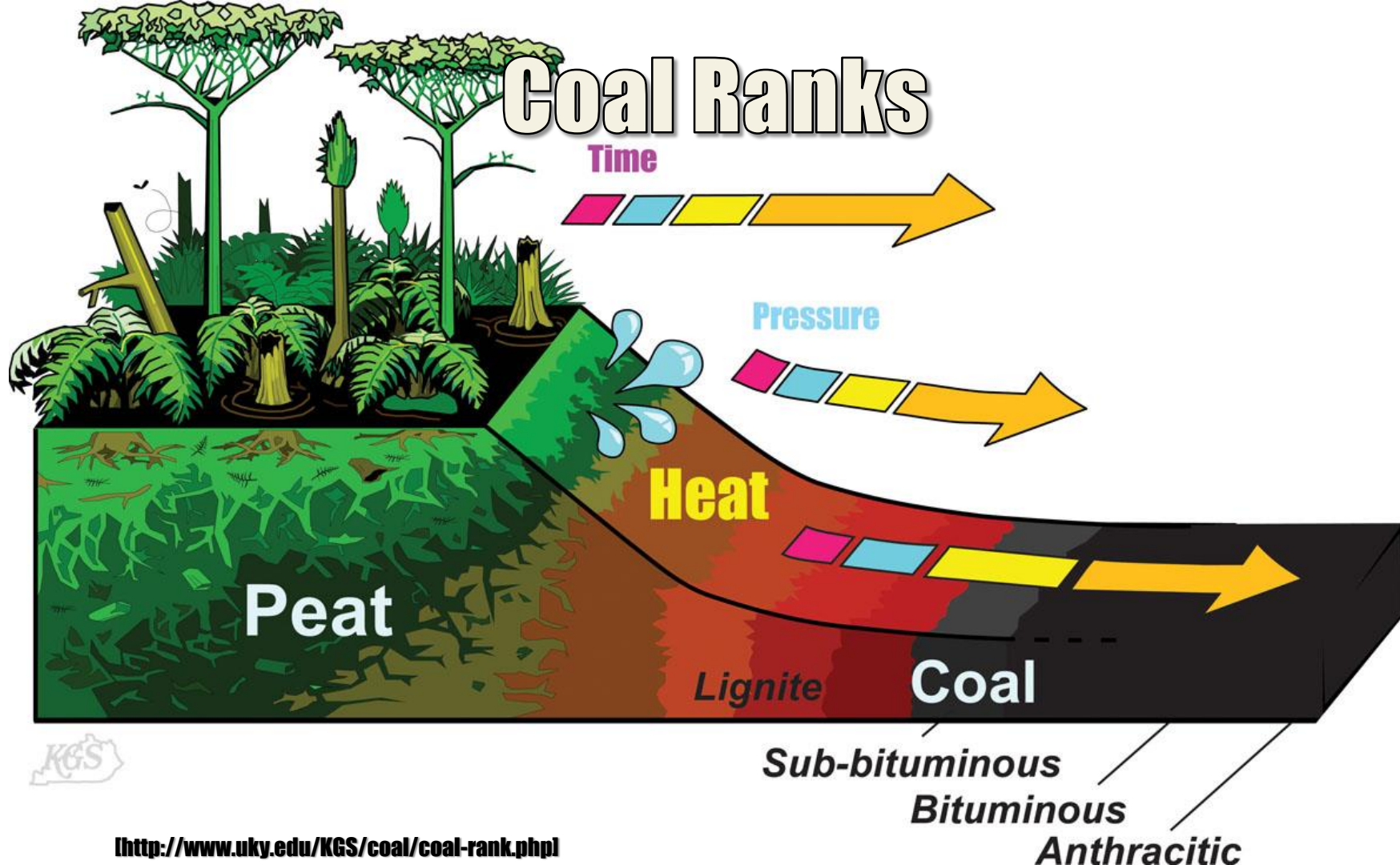
[FT montage: Bloomberg, September 19, 2017]



Coal is a black or dark brown combustible rock made of mostly carbon. It was formed millions of years ago when ferns, plants and trees died and fell into swamps. The swamp conditions prevented the organisms from decaying completely and after millions of years of intense heat and pressure coal was formed.

[<https://www.studentenergy.org/topics/coal>]

Coal Ranks

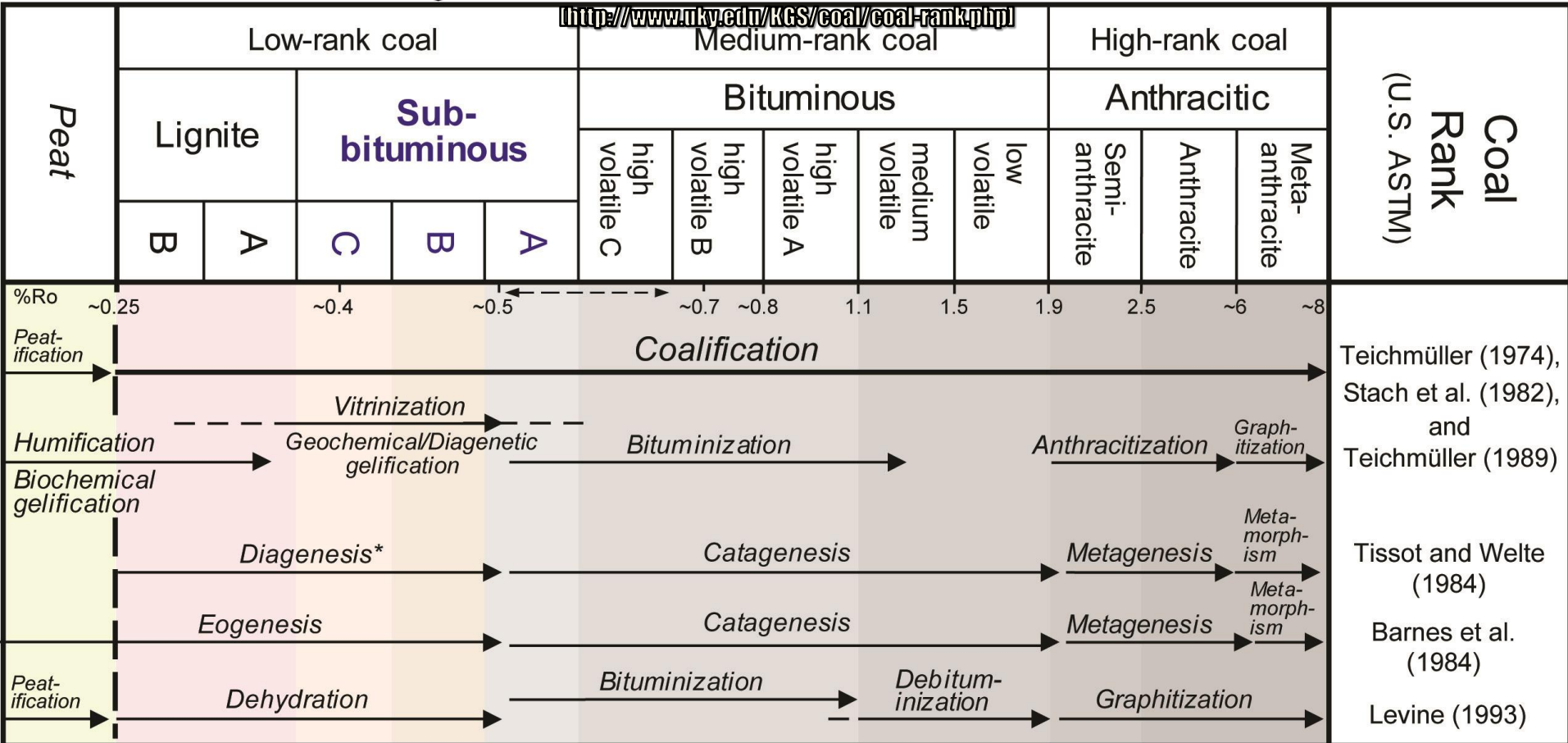


U.S. Coal Rank System

[http://www.uky.edu/KGS/coal/coal-rank.php]

Peat	Low-rank coal			Medium-rank coal					High-rank coal			Method for determining rank (dmmf) (U.S. ASTM)		
	Lignite	Sub-bituminous			Bituminous					Anthracitic				
B	A	C	B	A	high volatile C	high volatile B	high volatile A	medium volatile	low volatile	Semi-anthracite	Anthracite	Meta-anthracite		
	5,000	6,300	8,300	9,500	10,500	11,500	13,000	14,000	Less distinct for changing rank				Calorific value (Btu/lb.)	
														Volatile matter (%)
														Fixed Carbon (%)
http://www.uky.edu/KGS/coal/coal-rank.php														

Physical and Chemical Changes



A close-up photograph of anthracitic coal, showing dark, lustrous, and highly reflective fragments with sharp, angular edges.

Anthracitic Coal

[<http://www.uky.edu/KGS/coal/coal-rank.php>]

A close-up photograph of bituminous coal, showing dark, lustrous fragments with a more fibrous or layered texture compared to anthracite.

Bituminous Coal

[<http://www.uky.edu/KGS/coal/coal-rank.php>]

A close-up photograph of lignite coal, showing dark brown to black, earthy fragments with a dull, non-lustrous surface and some visible mineral inclusions.

Lignite Coal

[<http://www.uky.edu/KGS/coal/coal-rank.php>]

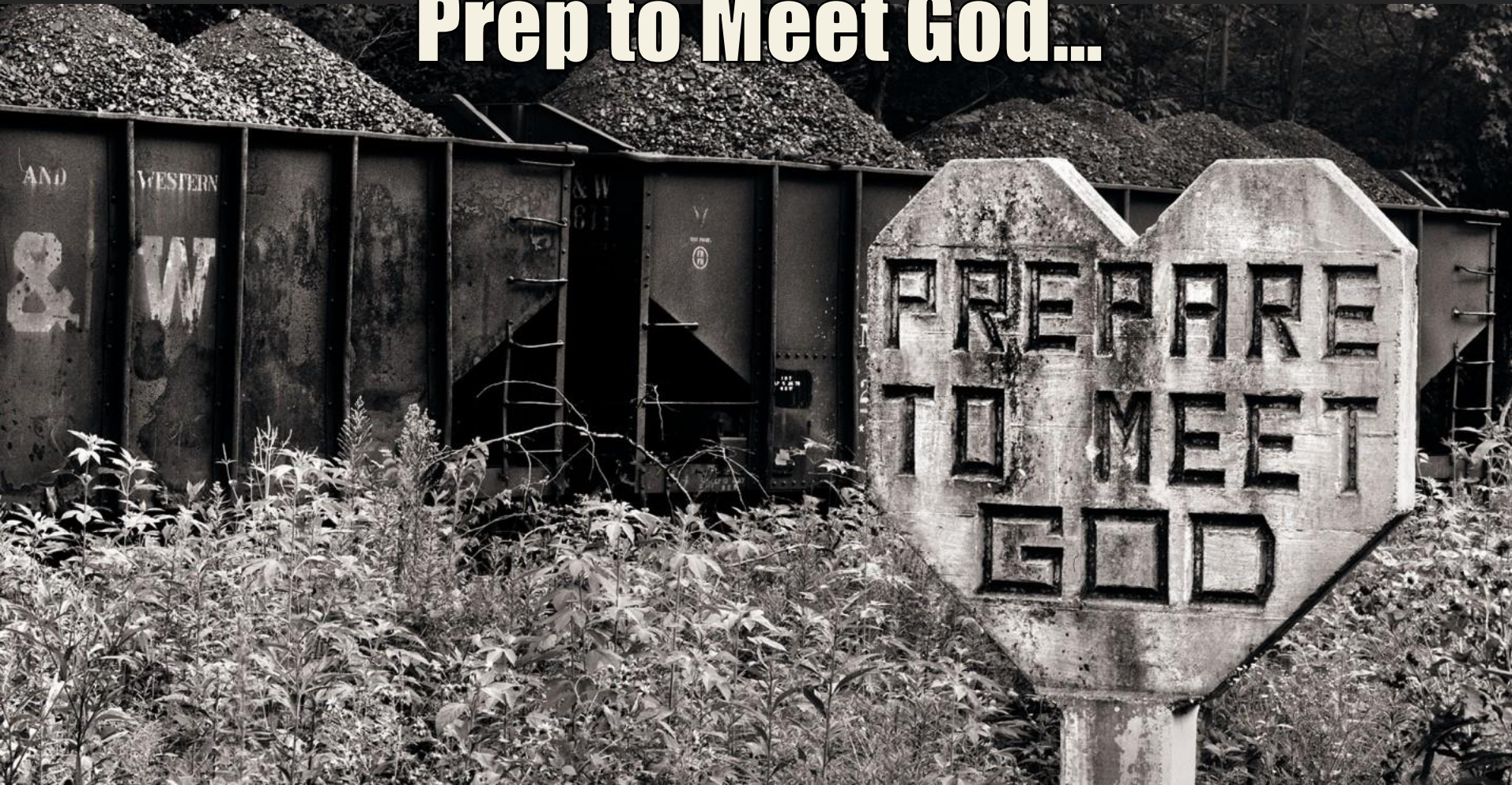
World's Biggest Coal Producers

Digging for Hope...

<https://www.youtube.com/watch?v=C4IBXpQxdSMI>



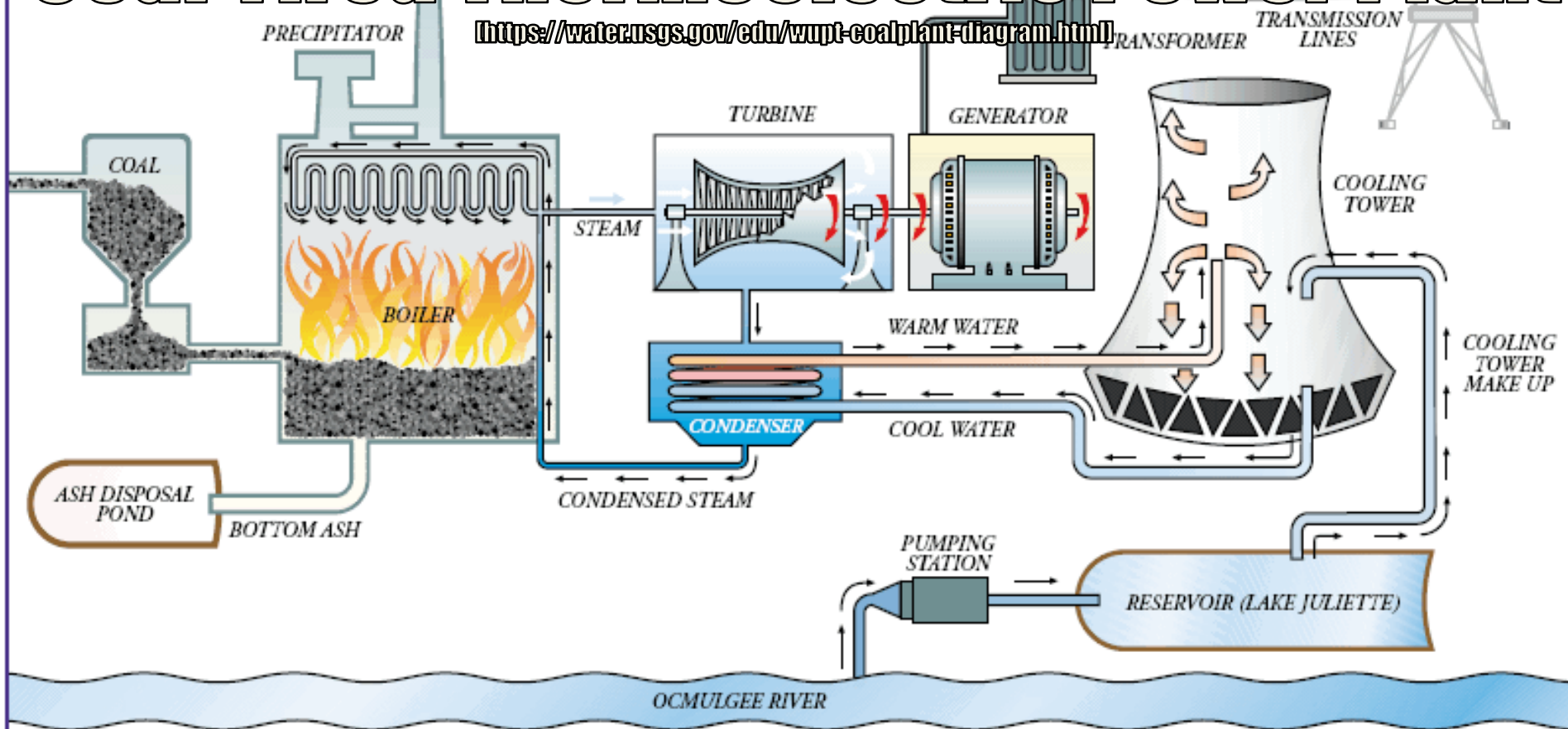
Prep to Meet God...



Plant Scherer, Georgia

Coal-Fired Thermoelectric Power Plant

<https://water.usgs.gov/edu/wupr-coalplant-diagram.html>



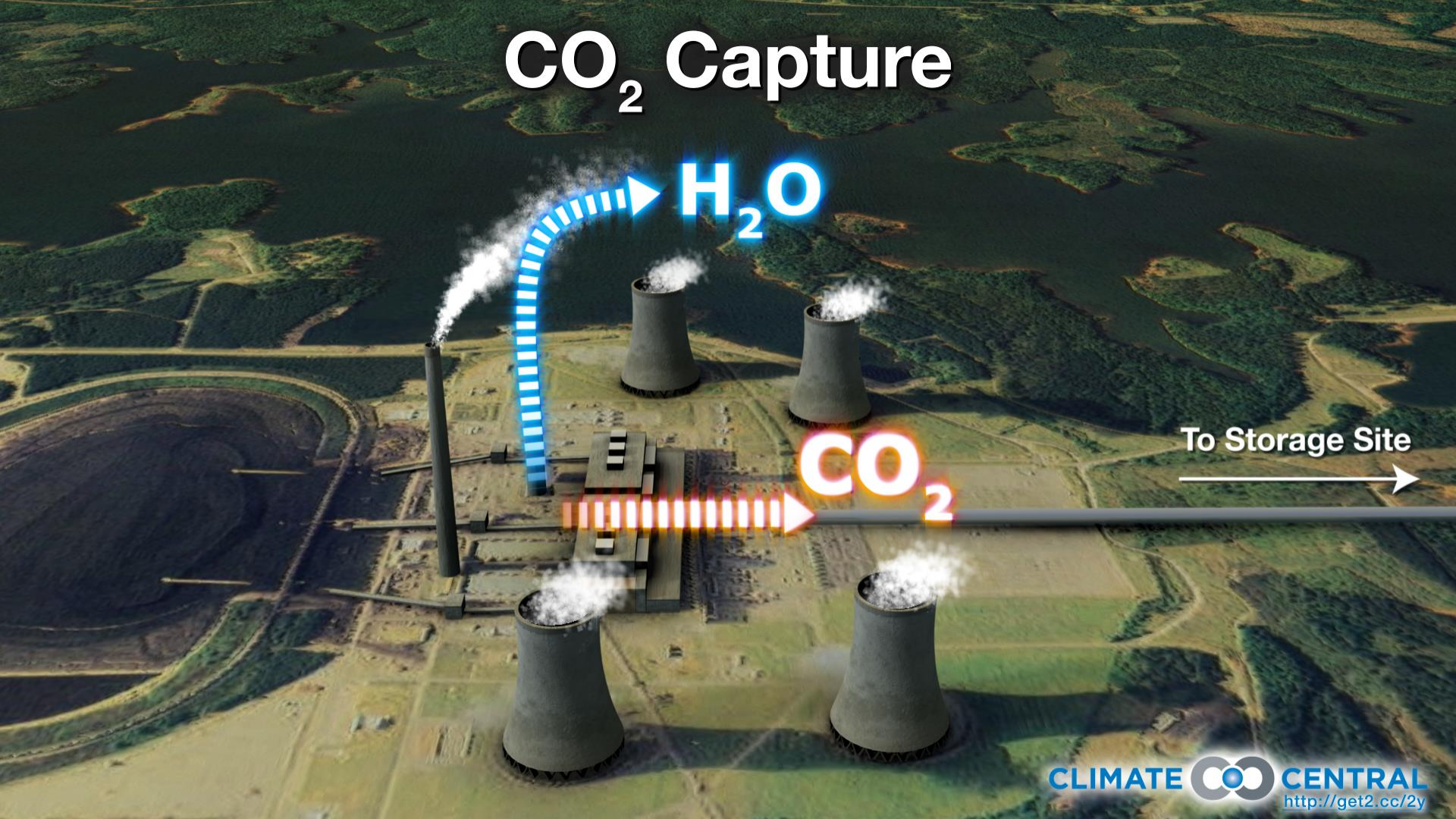
Credit: Georgia Power

Clean coal



[<https://thechronicleindia.com/>]

CO₂ Capture



To Storage Site

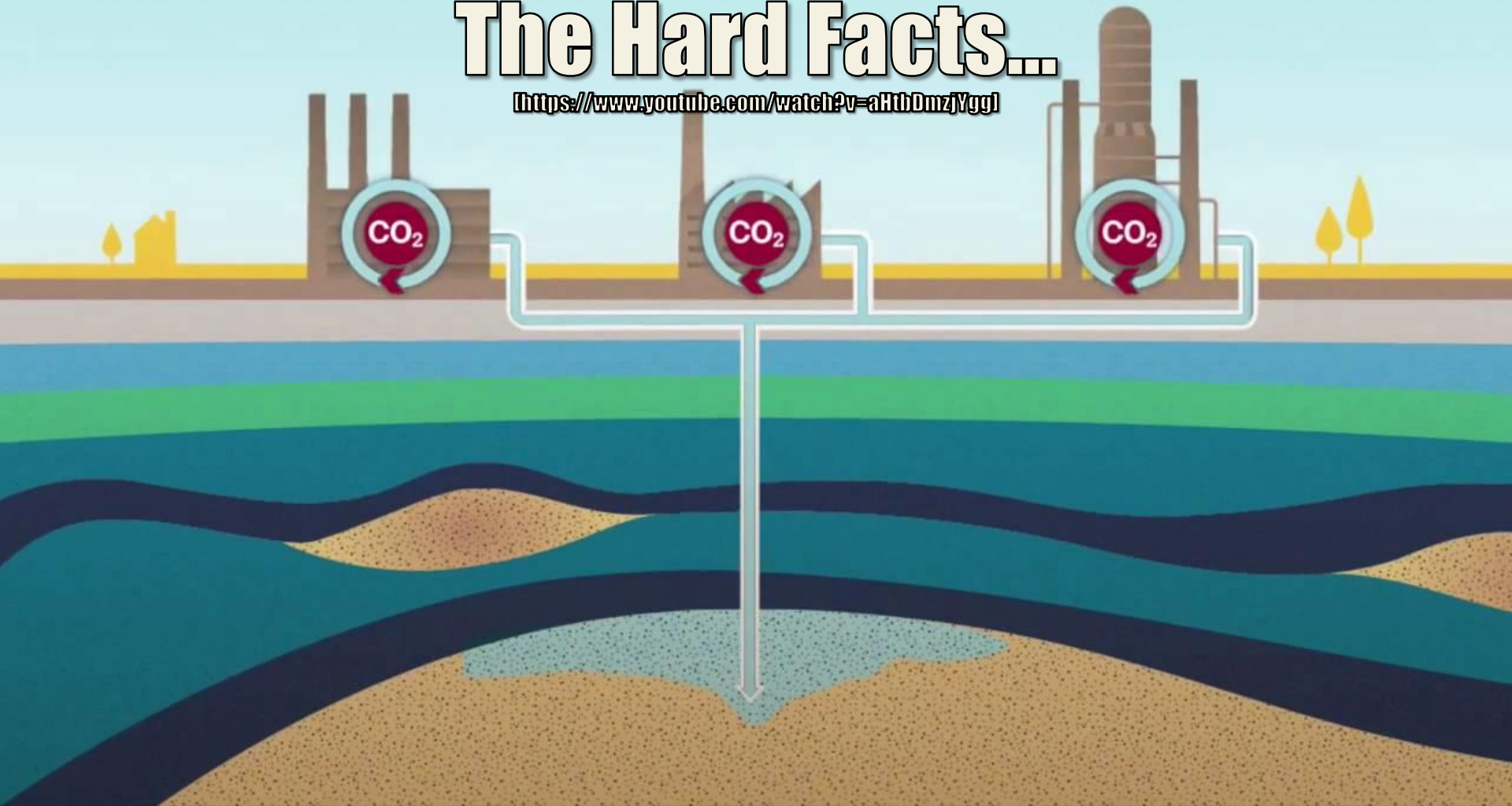
Carbon Capture & Sequestration

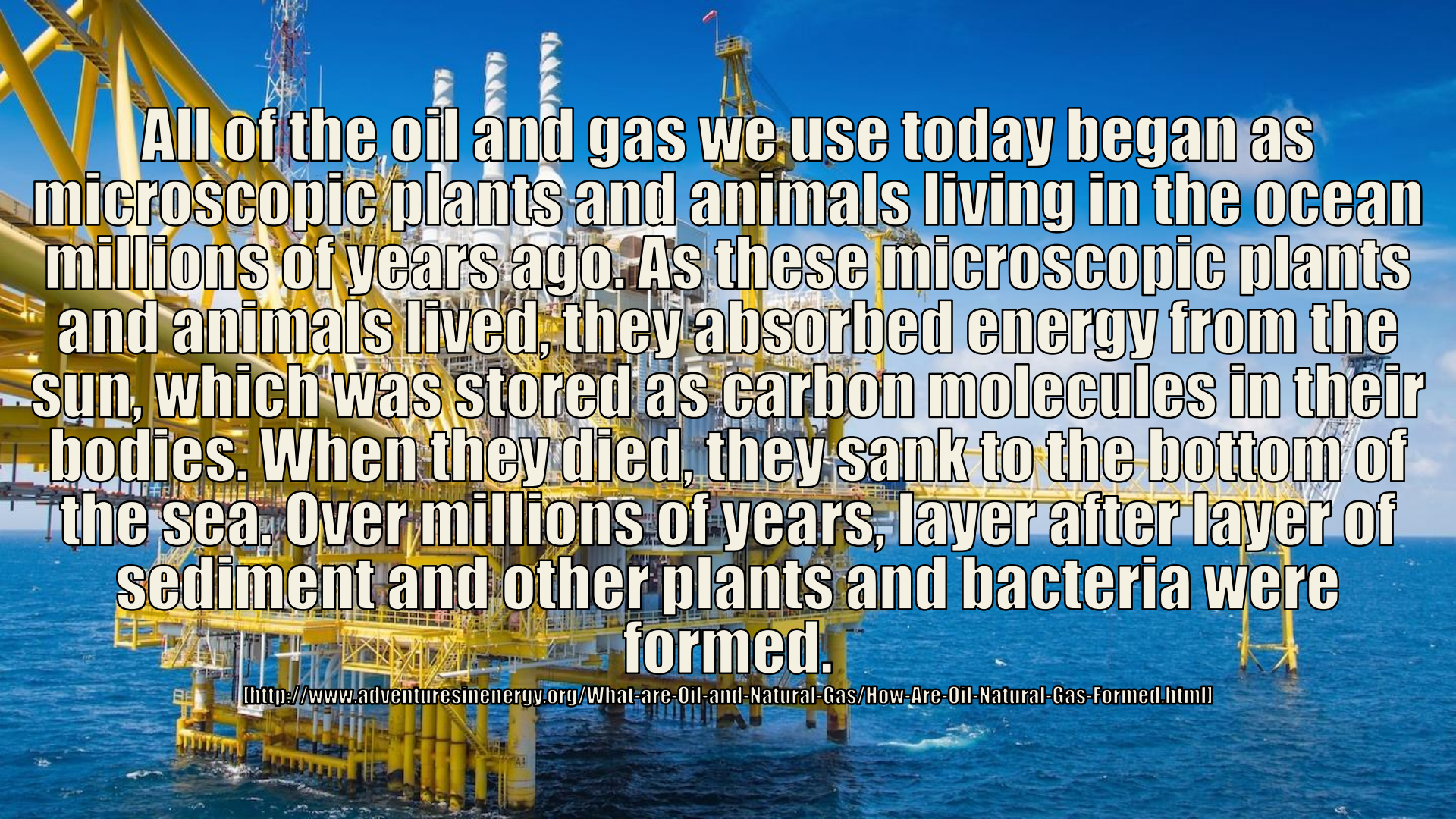
<https://www.euractiv.com/section/energy/opinion/a-catalyst-for-carbon-capture-and-storage/>



The Hard Facts...

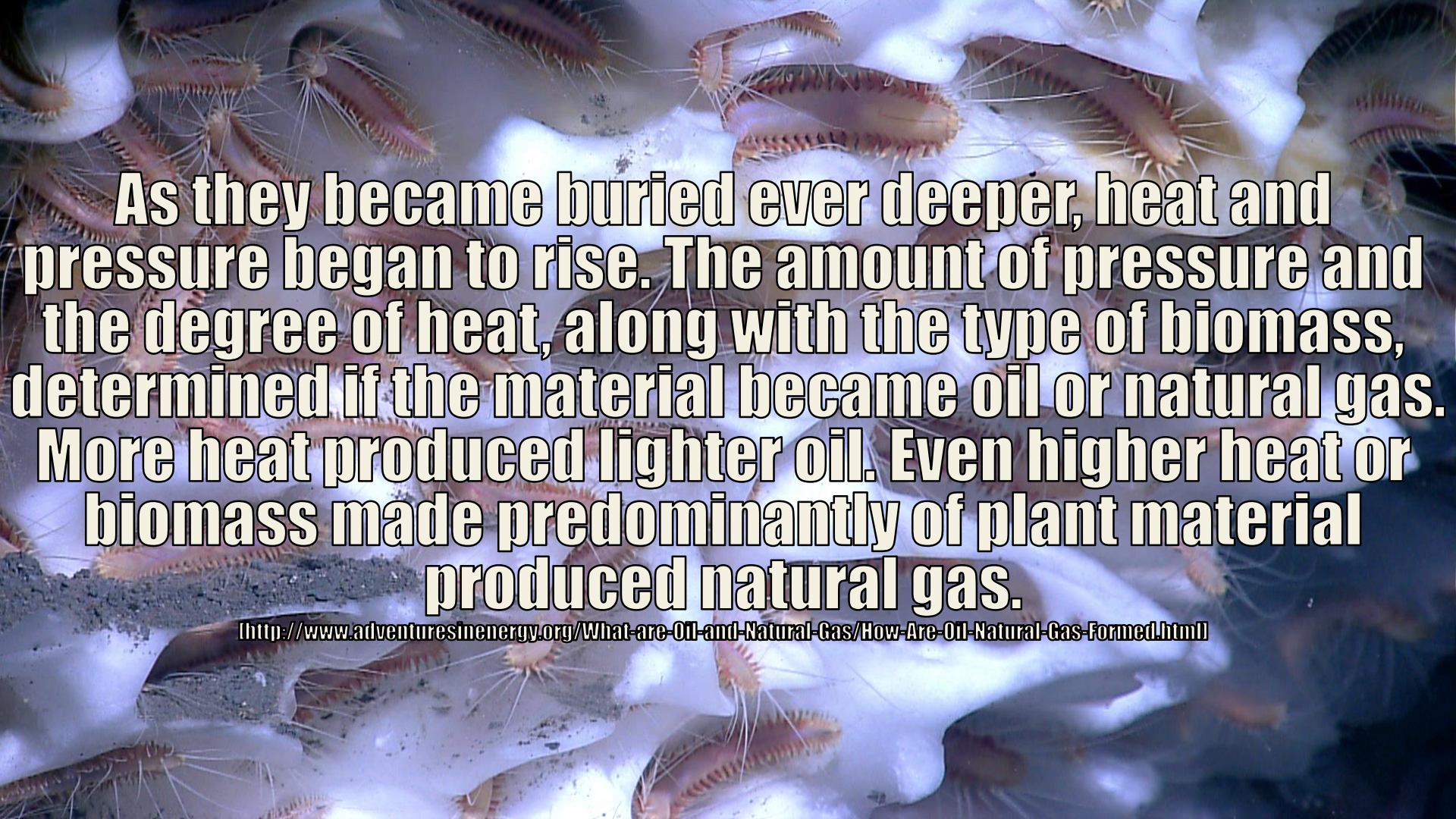
<https://www.youtube.com/watch?v=aHtbDmzjYggI>



An aerial view of a large yellow offshore oil rig in the middle of a blue ocean under a clear sky. The rig has several white smokestacks and a red flag on top. The text is overlaid on the image.

All of the oil and gas we use today began as microscopic plants and animals living in the ocean millions of years ago. As these microscopic plants and animals lived, they absorbed energy from the sun, which was stored as carbon molecules in their bodies. When they died, they sank to the bottom of the sea. Over millions of years, layer after layer of sediment and other plants and bacteria were formed.

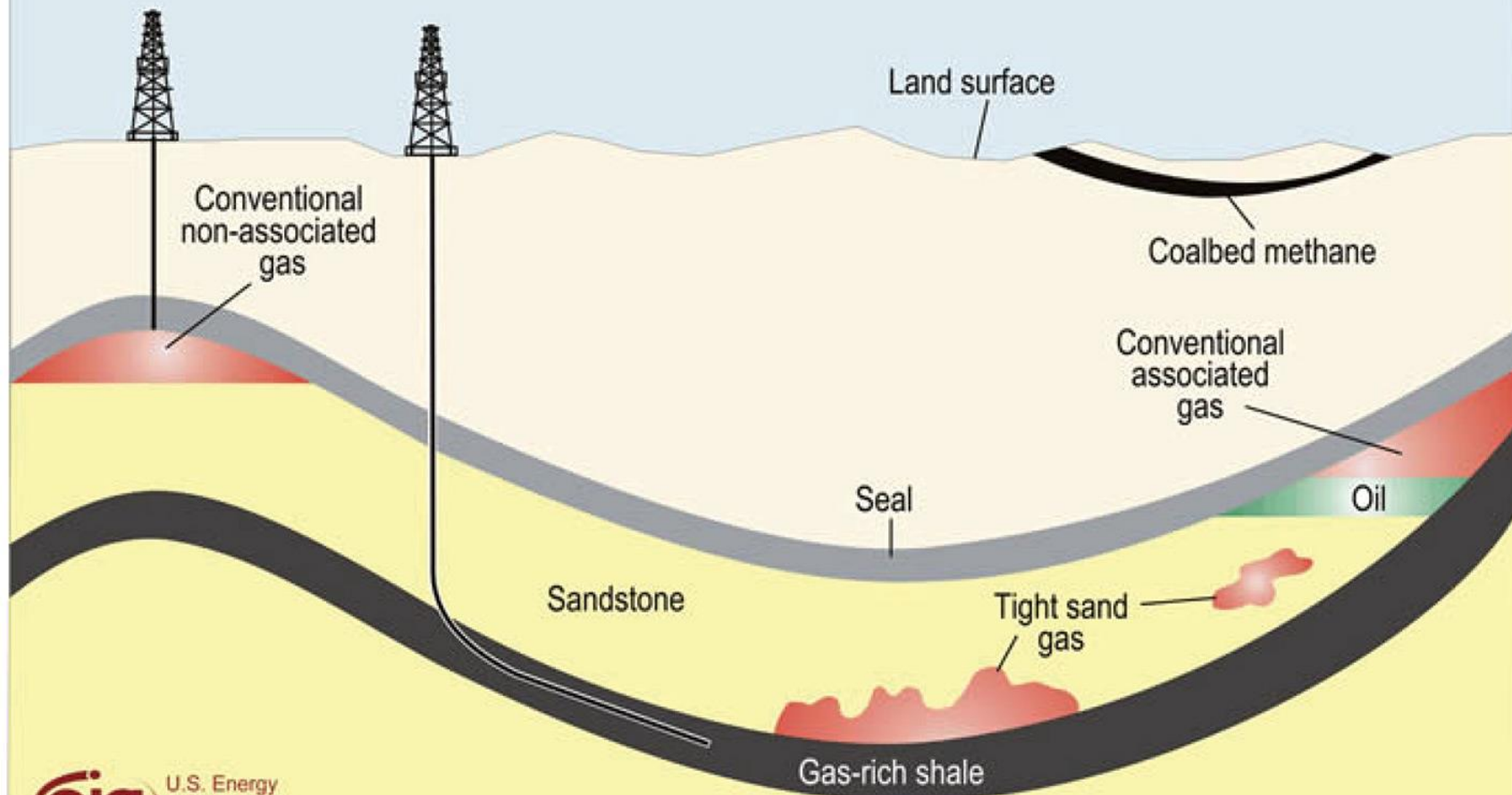
[\[http://www.adventuresinenergy.org/What-are-Oil-and-Natural-Gas/How-Are-Oil-Natural-Gas-Formed.html\]](http://www.adventuresinenergy.org/What-are-Oil-and-Natural-Gas/How-Are-Oil-Natural-Gas-Formed.html)



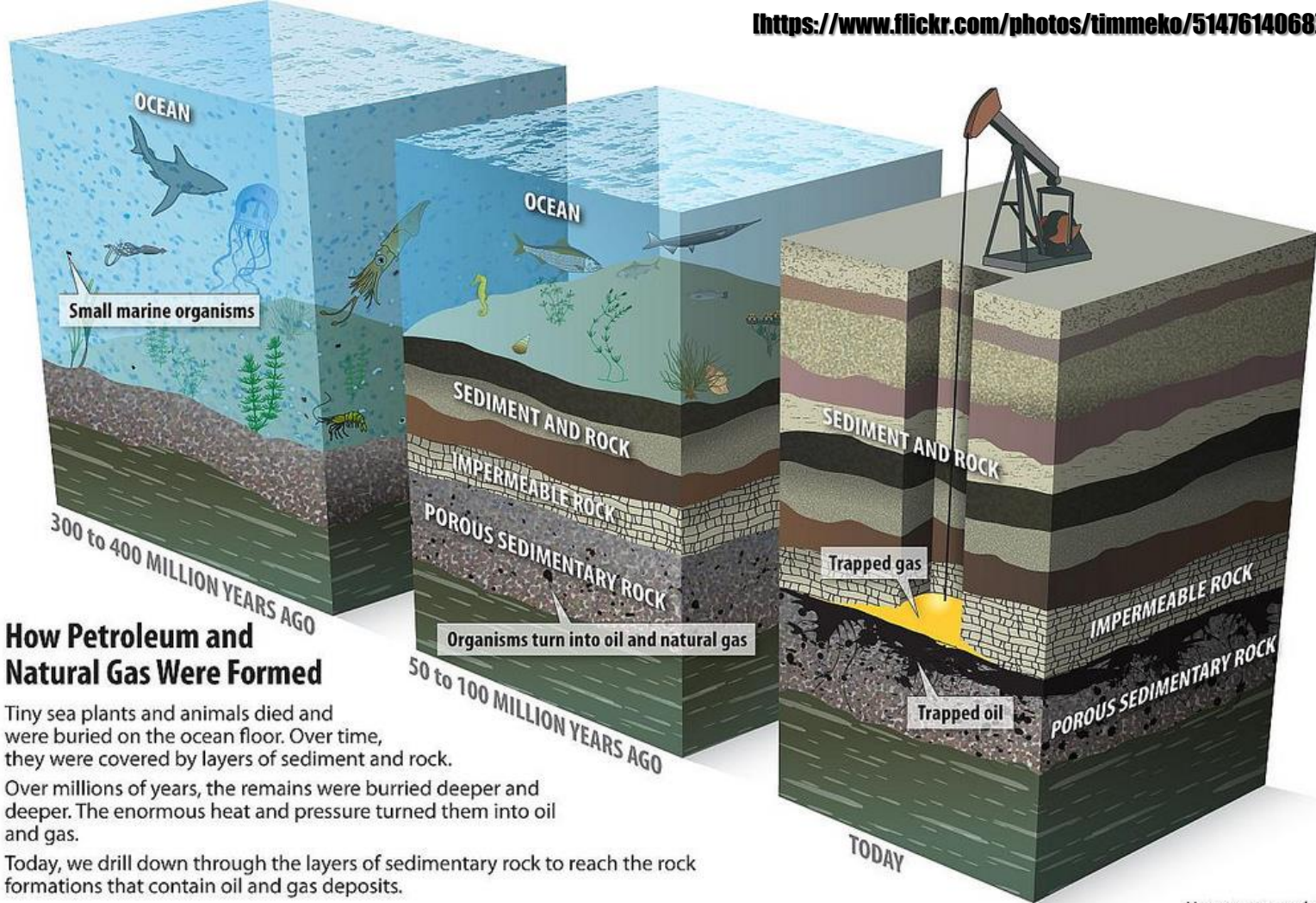
As they became buried ever deeper, heat and pressure began to rise. The amount of pressure and the degree of heat, along with the type of biomass, determined if the material became oil or natural gas. More heat produced lighter oil. Even higher heat or biomass made predominantly of plant material produced natural gas.

<http://www.adventuresinenergy.org/What-are-Oil-and-Natural-Gas/How-Are-Oil-Natural-Gas-Formed.html>

Where Natural Gas Comes From



U.S. Energy
Information
Administration



How Petroleum and Natural Gas Were Formed

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock.

Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today, we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.

Note: not to scale

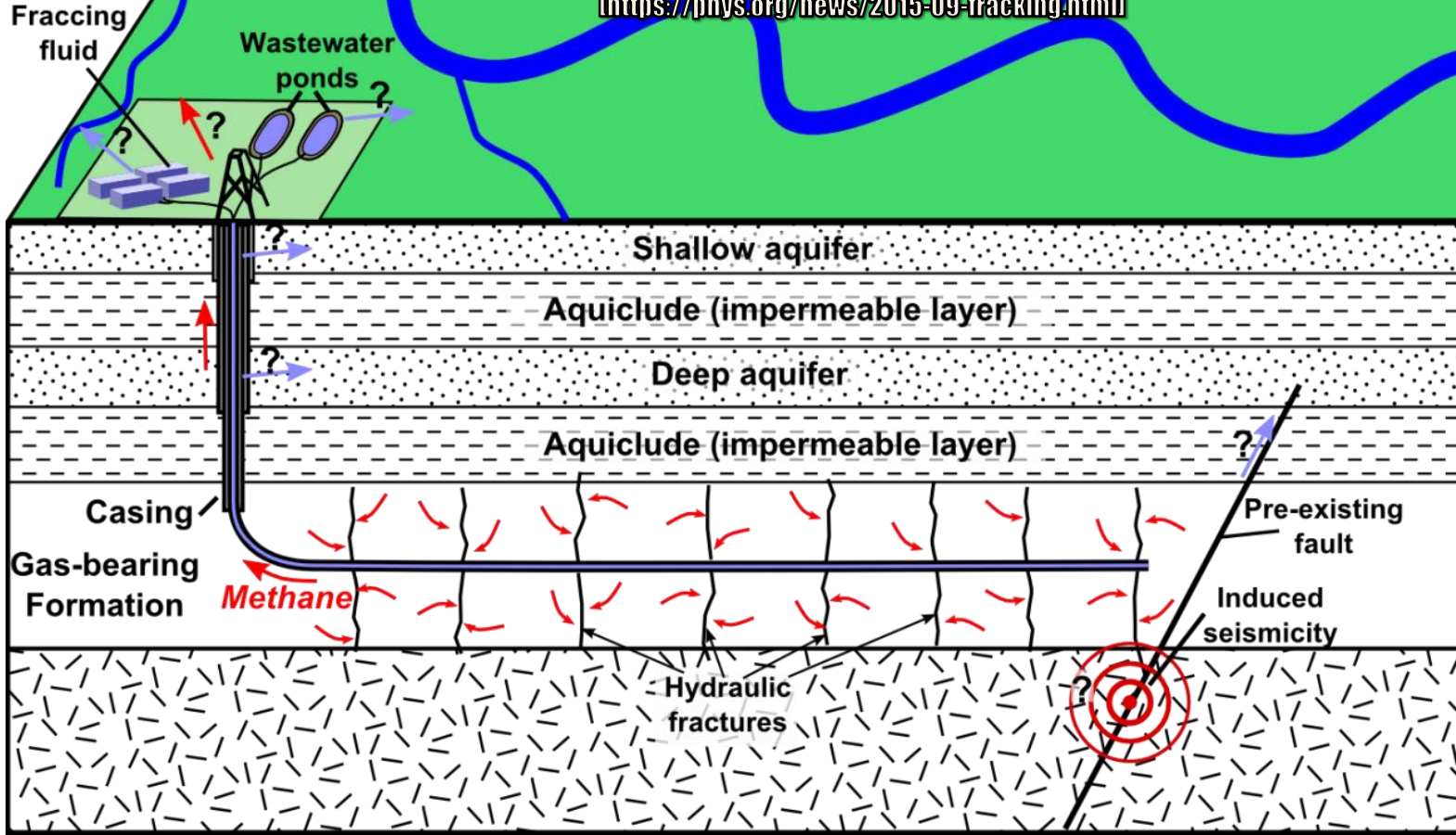


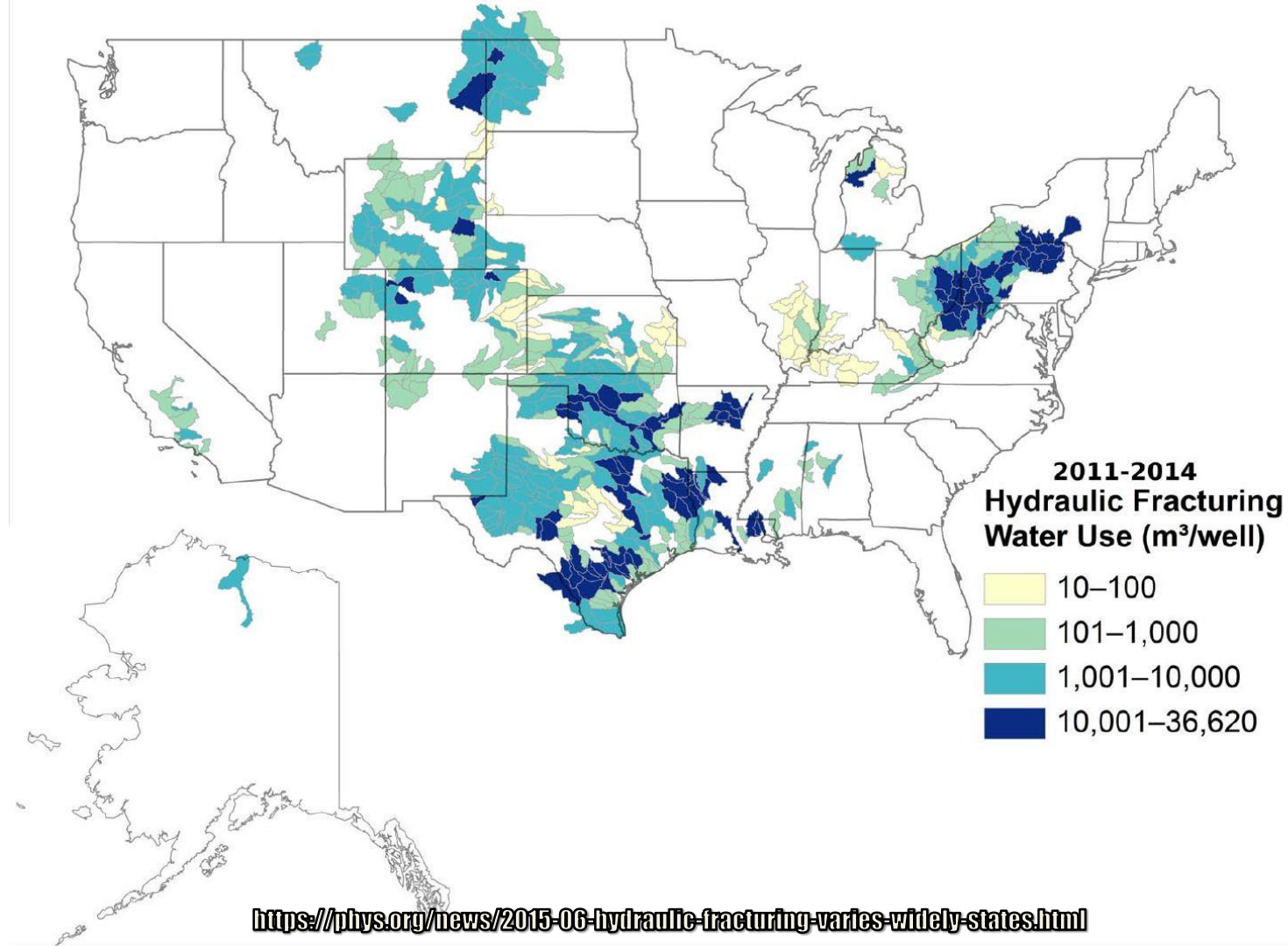
Oil companies operating in European waters are racing to comply with a 19 July deadline to implement new EU safety rules on offshore drilling. The likelihood of a major offshore accident in European waters remains unacceptably high. The European Commission in 2011 tabled legislation to tighten EU rules on offshore drilling.

<https://www.euractiv.com/section/energy/news/iri-offshore-oil-facing-countdown-to-comply-with-new-eu-safety-rules/>

Hydraulic Fracturing

<https://phys.org/news/2015-09-fracking.html>

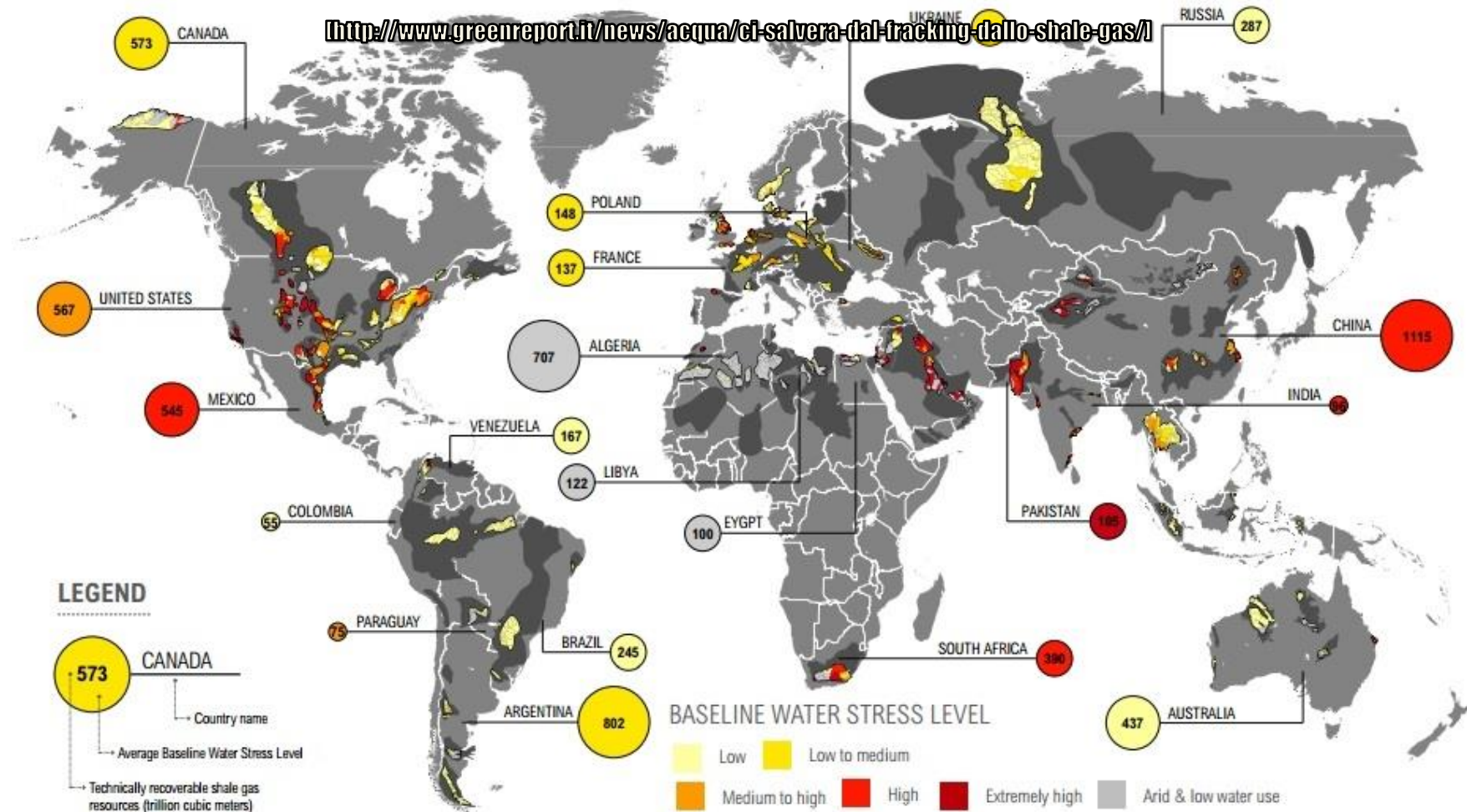




Location of World's Shale Plays, Volume of Technically Recoverable Shale Gas in the 20 Countries with the Largest Resources, and the Level of Baseline Water Stress

SHALE BASIN

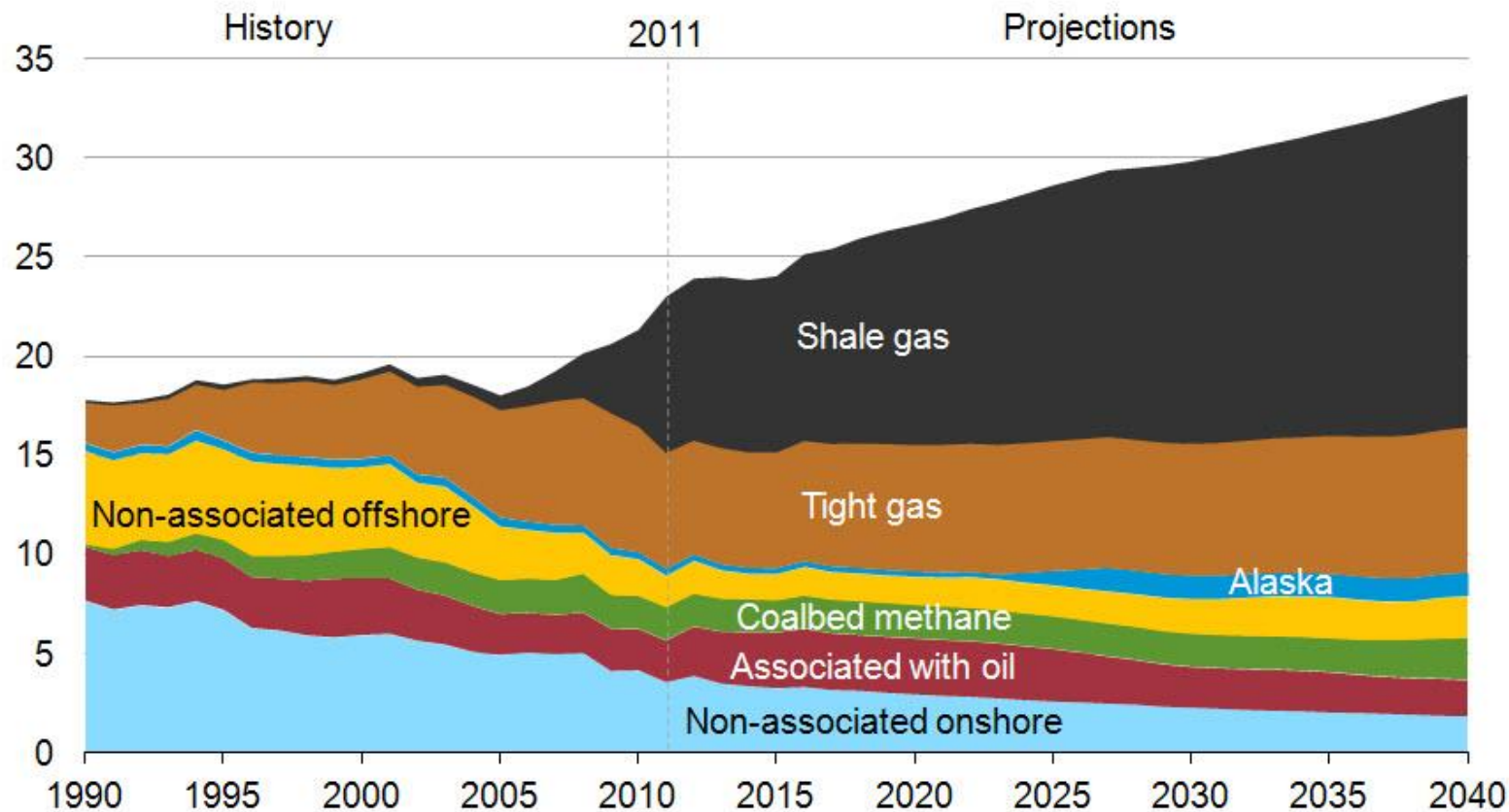
<http://www.greenreport.it/news/acqua/ci-salvera-dal-tracking-dallo-shale-gas/>



U.S. dry natural gas production

trillion cubic feet

<https://www.vox.com/cards/fracking/how-has-fracking-boosted-u-s-oil-and-gas-production>



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2013 Early Release*