



## **New Directions In Nuclear Energy**

### **Panel Discussion**

**Jim Conca**

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**Nick Touran**

**Derek Sutherland**

**UFA Ventures, Richland**

**NuScale Power, Corvallis**

**TerraPower, Bellevue**

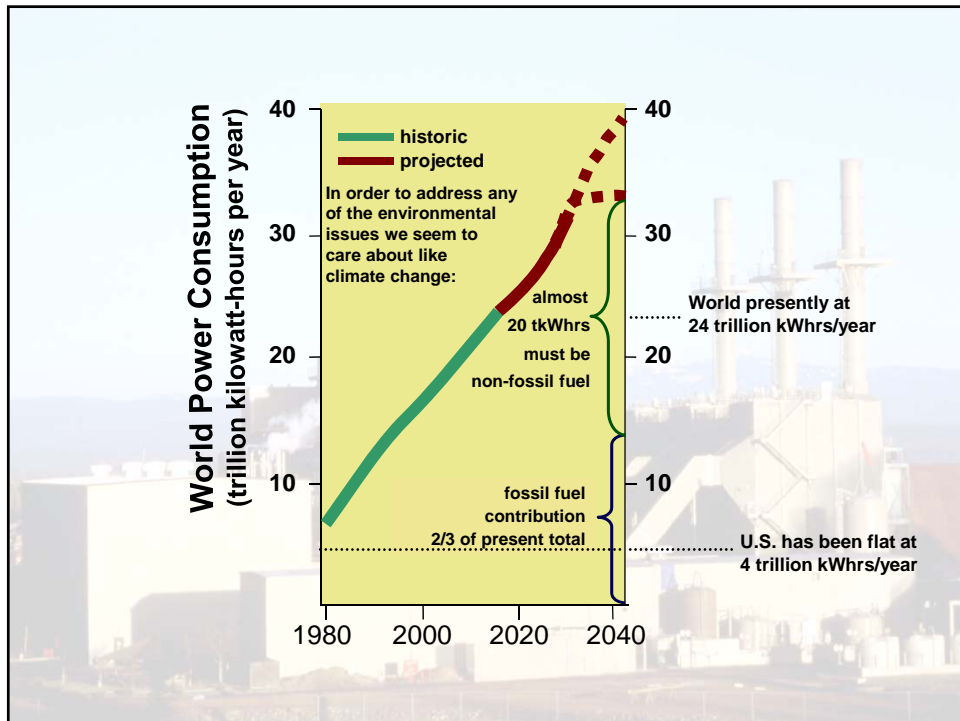
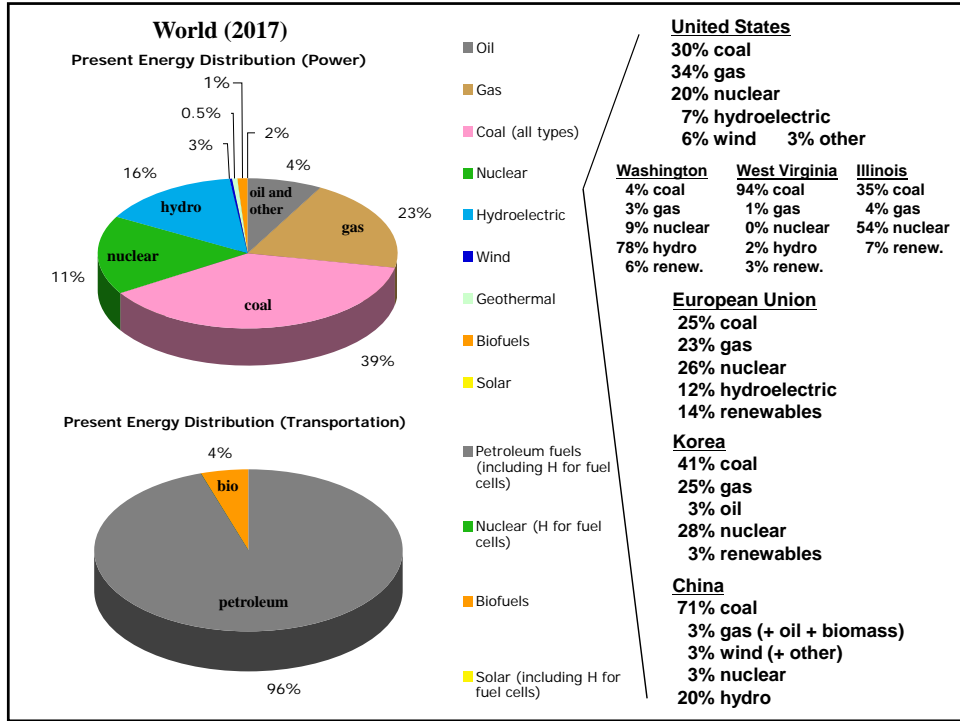
**CTFusion, Seattle**

## **Global Energy Distribution**

as indicated by nighttime electricity use



from the generation of 24 trillion kWhs/year, going to 35 trillion kWhs/year by 2040



Map of Global Energy Poverty

It takes 3,000 kWhs per person per year to lift someone out of poverty

Source: United Nations

Map of Global Energy Poverty

It takes 3,000 kWhs per person per year to lift someone out of poverty

**What Paris COP21 was about is how to give these people 3,000 kWhs/person/year without giving them coal, and who's going to pay for it.**

**This is the only way to eradicate global poverty**

Source: Kay Chemush for the U.S. Department of State

**With modern efficiencies, conservation and technologies, 3,000 kWh/year can provide an HDI > 0.8, > 6,000 kWh/year is unnecessary and wasteful**

Access to energy is essential to quality of life

It requires about 3,000 kWhrs/yr to have what we consider a good life.

Human Development Index (HDI)

Annual Electricity Use (kWh/Capita)

Prosperity  
Education  
Life span

75% of the world's population of over 7 billion people is below 0.8 on the U.N. Human Development Index (HDI)

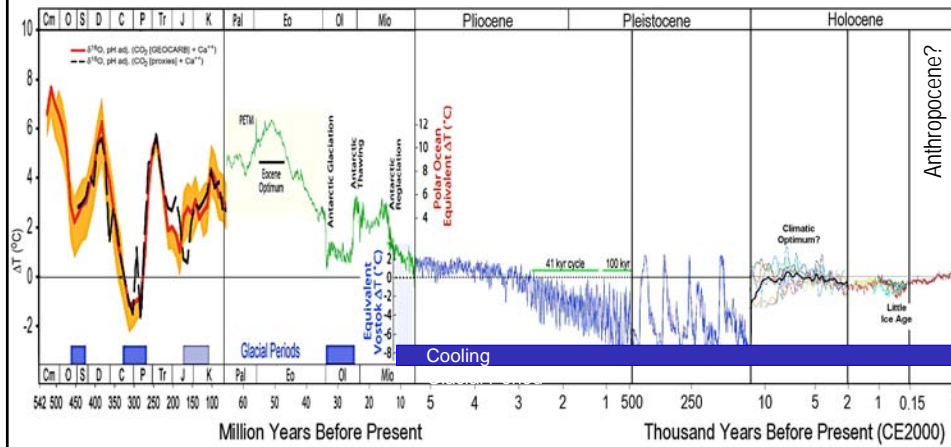
Source: United Nations Development Program; McFarlane 2006

How much energy do we need by 2040? - what levels are needed to end poverty, war and terrorism, i.e., raise everyone up to 0.8 HDI?

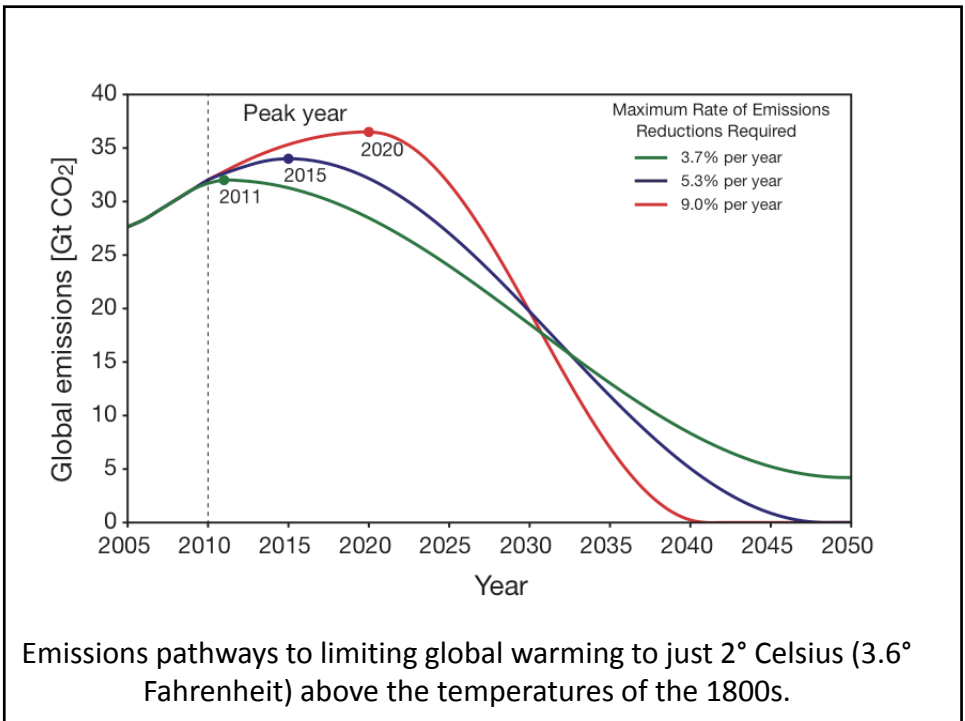
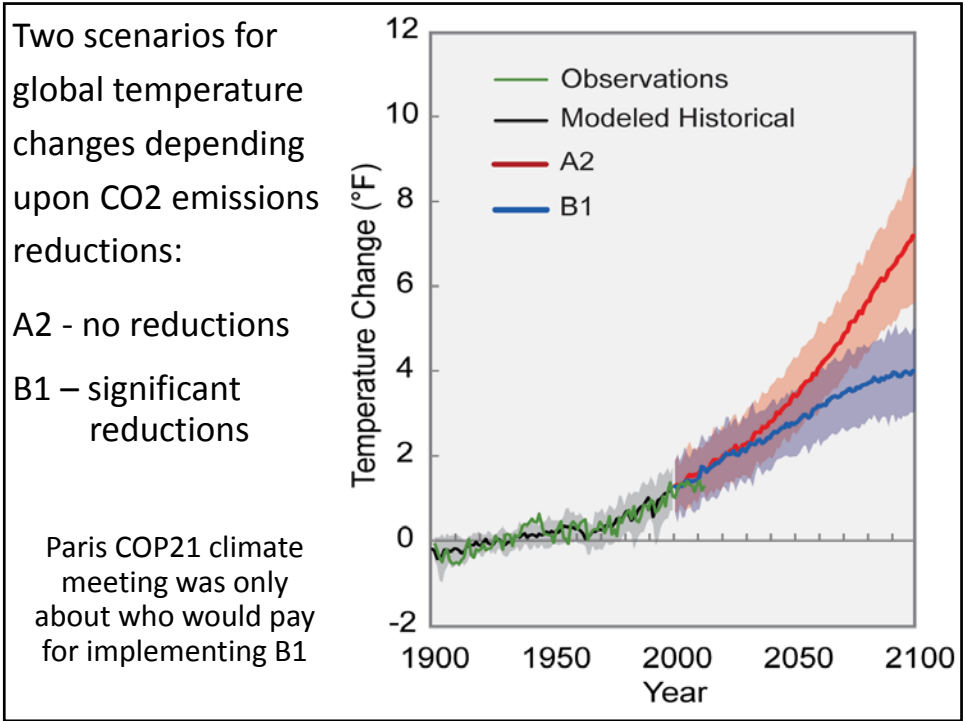
Subpopulation group	Energy/capita needed to raise HDI to >0.8 or maintain at 0.9	Approximate subpopulation	Annual energy requirement
Industrialized world - cut to	6,000 kWhrs/yr	1,000,000,000	6 tKW-hrs
Intermediate - maintain	3,000 kWhrs/yr	1,000,000,000	3 tKW-hrs
Developing world - increase to	3,000 kWhrs/yr	4,500,000,000	13.5 tKW-hrs
Those born by 2040 - achieve	3,000 kWhrs/yr	3,500,000,000	10.5 tKW-hrs
<b>Total Annual Global Energy Requirement</b>			<b>33 tKW-hrs</b>

### Climate Change is not a new phenomenon

Temperature of Planet Earth

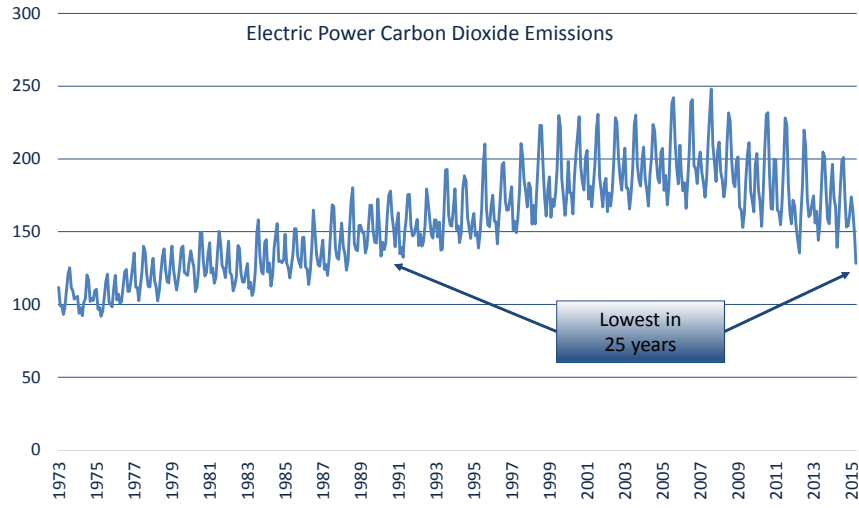


Relative changes in global average temperature for the past 550 million years based on various methods from various researchers. The time scale is vastly different for each of the five general time segments, going from hundreds of millions of years per segment, to millions of years, to thousands of years. Note that the Earth has generally been warmer than it is today, and that we have been in a major cooling period for the last 10 million years, with glaciation the last 2.3 my.



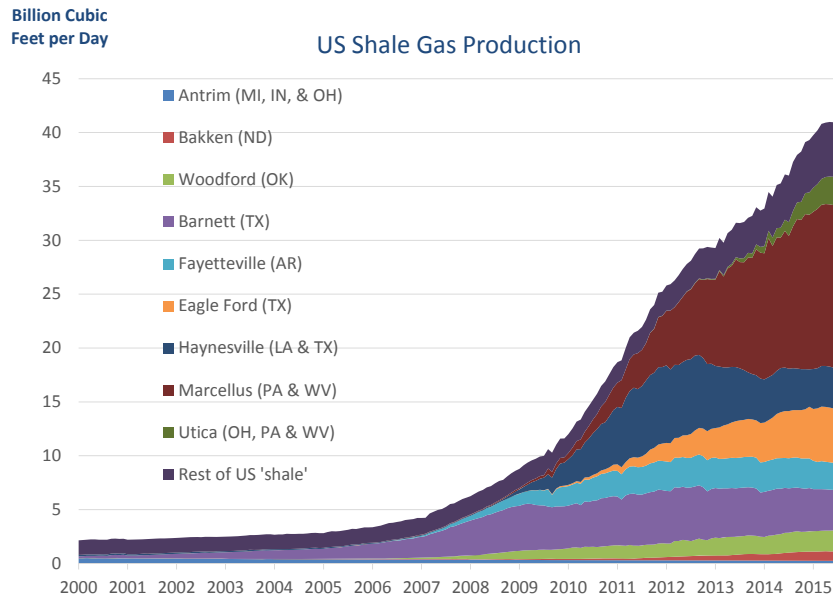
Emissions pathways to limiting global warming to just 2° Celsius (3.6° Fahrenheit) above the temperatures of the 1800s.

U.S. Electric sector monthly CO2 emissions are at a 25-year low as natural gas overtakes coal's share of power generation and we have implemented significant efficiency and conservation policies



Source: [Energy Information Administration](#) and American Gas Association

### Huge shale gas production



Source: Richard Meyer, AGA, US Department of Energy, Energy Information Administration.



**What is the fastest growing energy source in the world?**



