

# ION Engineering

**Bold Science for Clean Energy**

**Dr. Alfred (Buz) Brown, CEO**

Carbon Capture Roundtable & Symposium  
Colorado Clean Energy Solutions Series  
October 1, 2009





# ION Engineering

- A new company based in Boulder, CO
- Core technology licensed from CU Boulder
- Bringing to market a better way to capture CO<sub>2</sub> and other contaminants from flue gas and natural gas streams

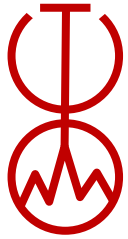
Clean-up

Raw natural gas that is acid or sour  
Syngas from coal, biomass, municipal waste

Capture

Coal and gas-fired power plants  
Other industrial CO<sub>2</sub> capture





# Carbon capture is “old tech”

## CO<sub>2</sub> removal during natural gas processing

**Aqueous - amine  
solvents used in 95% of  
acid/sour gas processing**

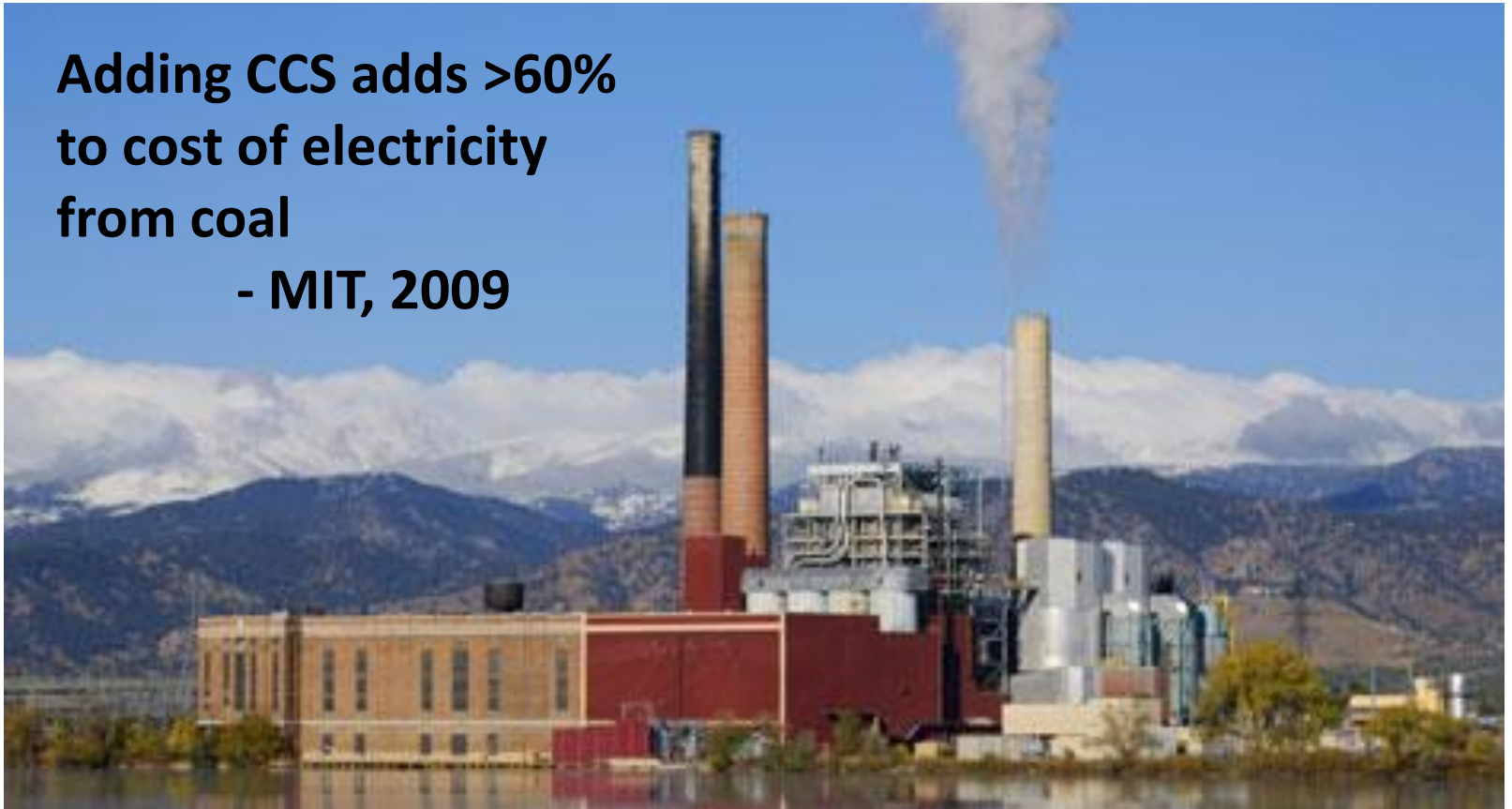




# But translated to power plants...costly

**Adding CCS adds >60%  
to cost of electricity  
from coal**

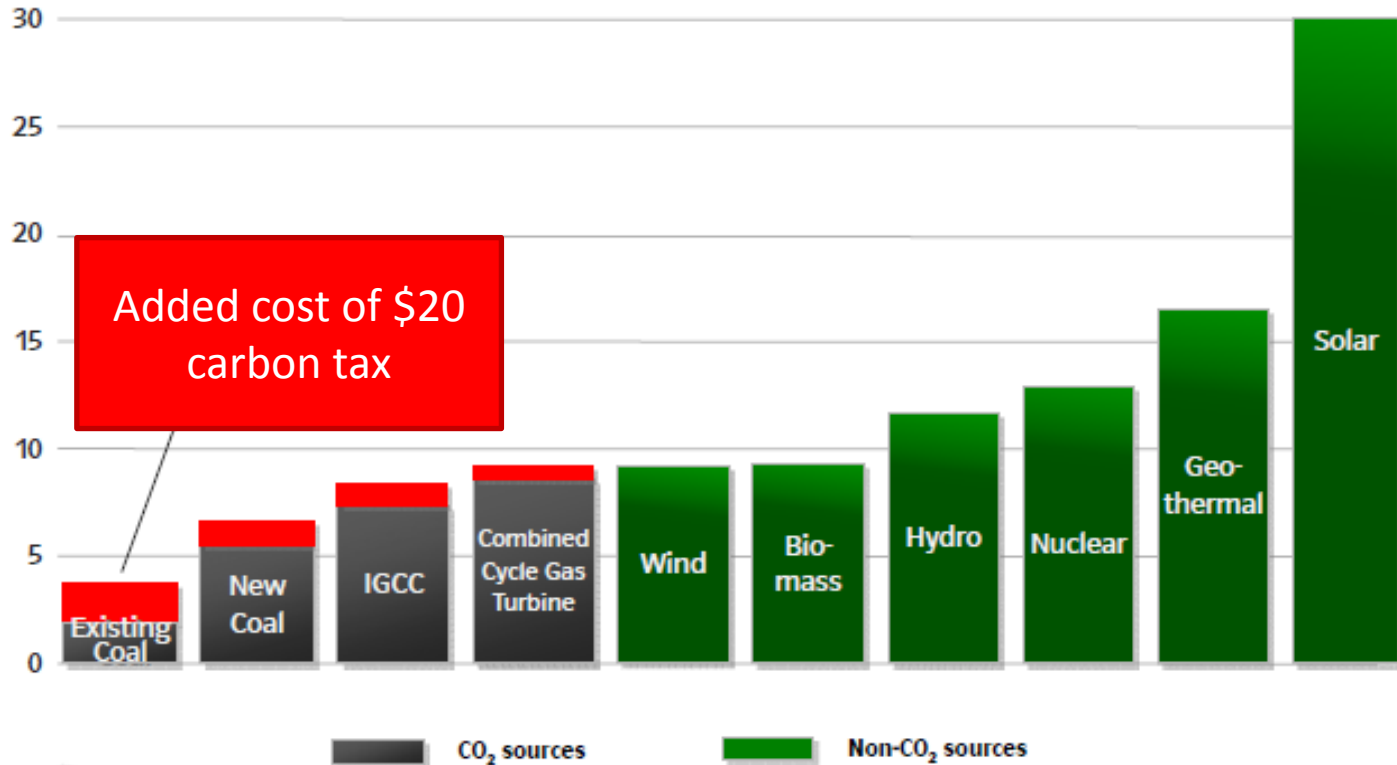
**- MIT, 2009**



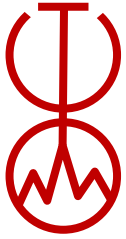


# Existing fossil-fuel fired plants provide 70% of U.S. electricity (49% from coal)

Generation Costs  
¢/kwh

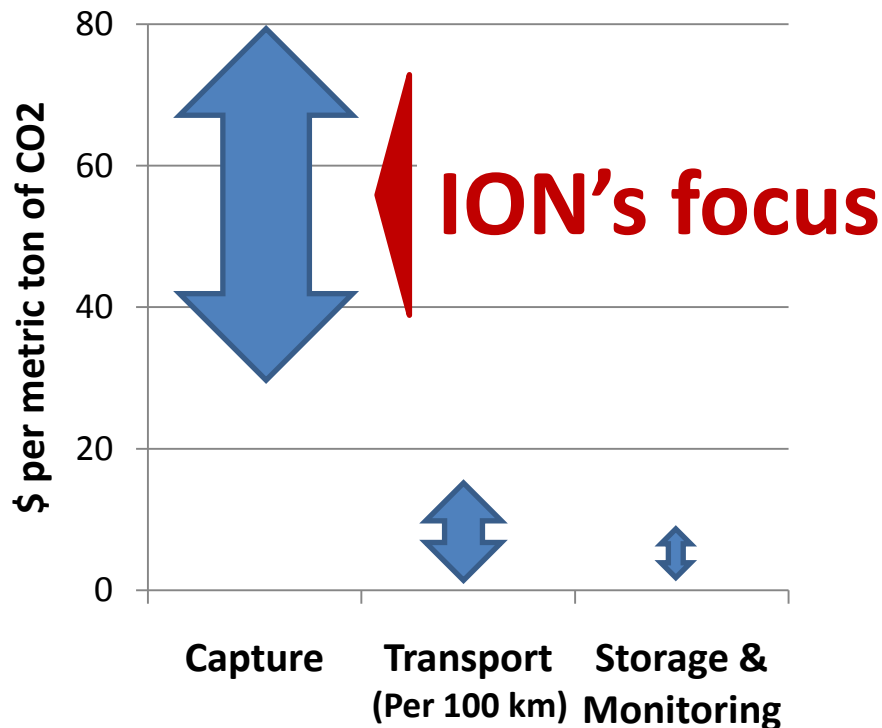


Sources: Kentucky's Carbon Footprint, E.ON US, July 14, 2009; EIA Generation by Energy Source (2008)



## Most of the cost is in capture

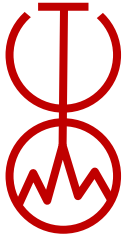
### Cost Ranges for CCS



A portfolio of options are emerging for CO<sub>2</sub> storage and use

- Sequestration
- Mineralization
- Algae to fuel
- Conversion to polymers etc...



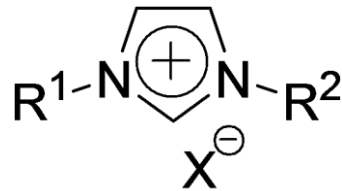


# Ionic liquid – amine mixtures

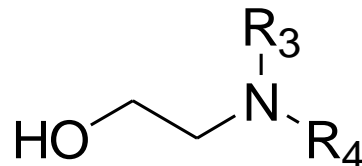
Ionic Liquids (IL's) = *do not evaporate, nonflammable thermally stable*


## ION's CO<sub>2</sub> capture solvents

Ionic Liquids

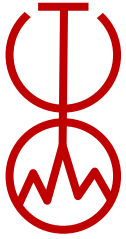


Amines

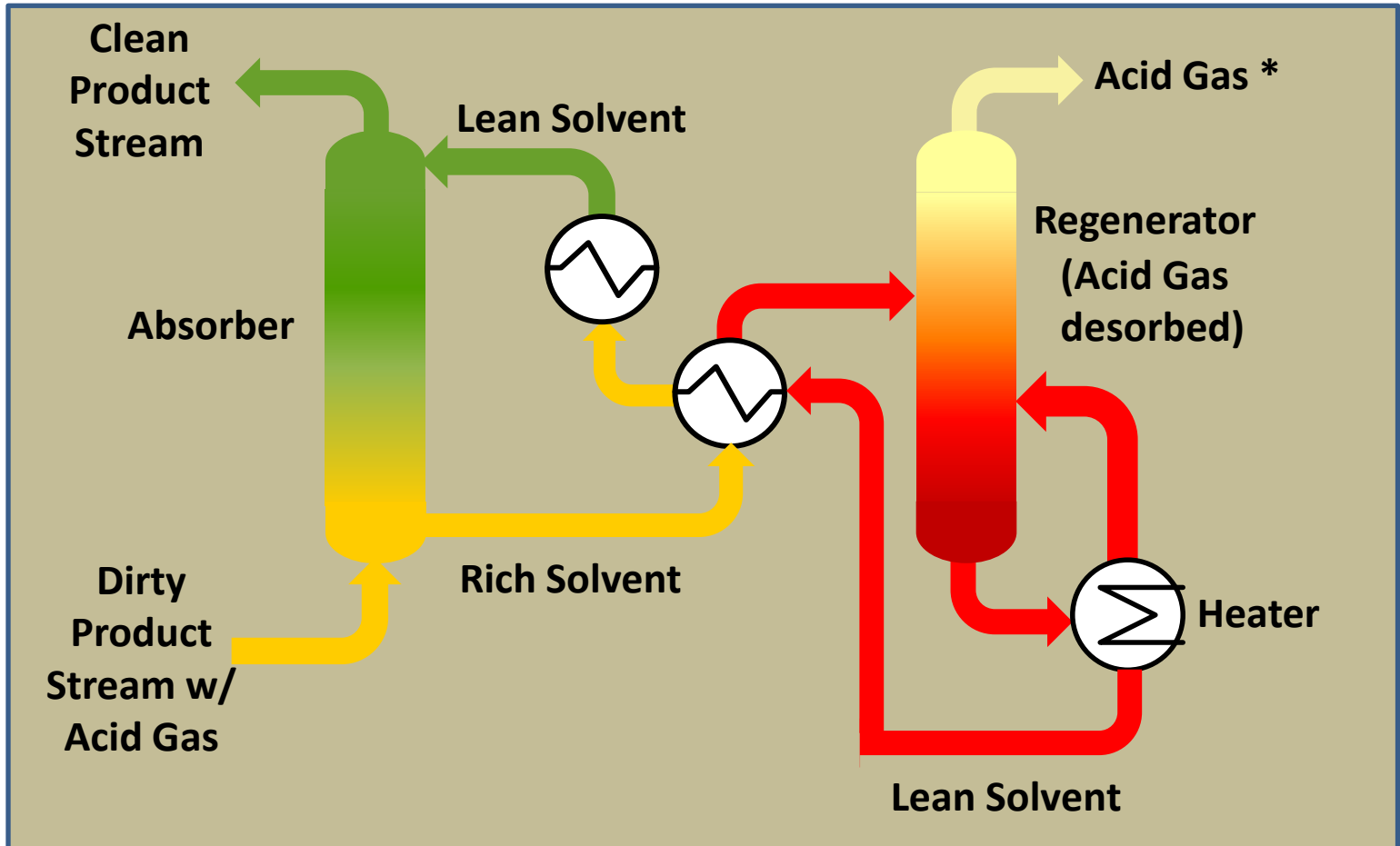


- 
- Low energy requirements
  - High reaction rate
  - Reduced corrosion
  - Low solution losses

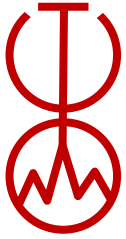




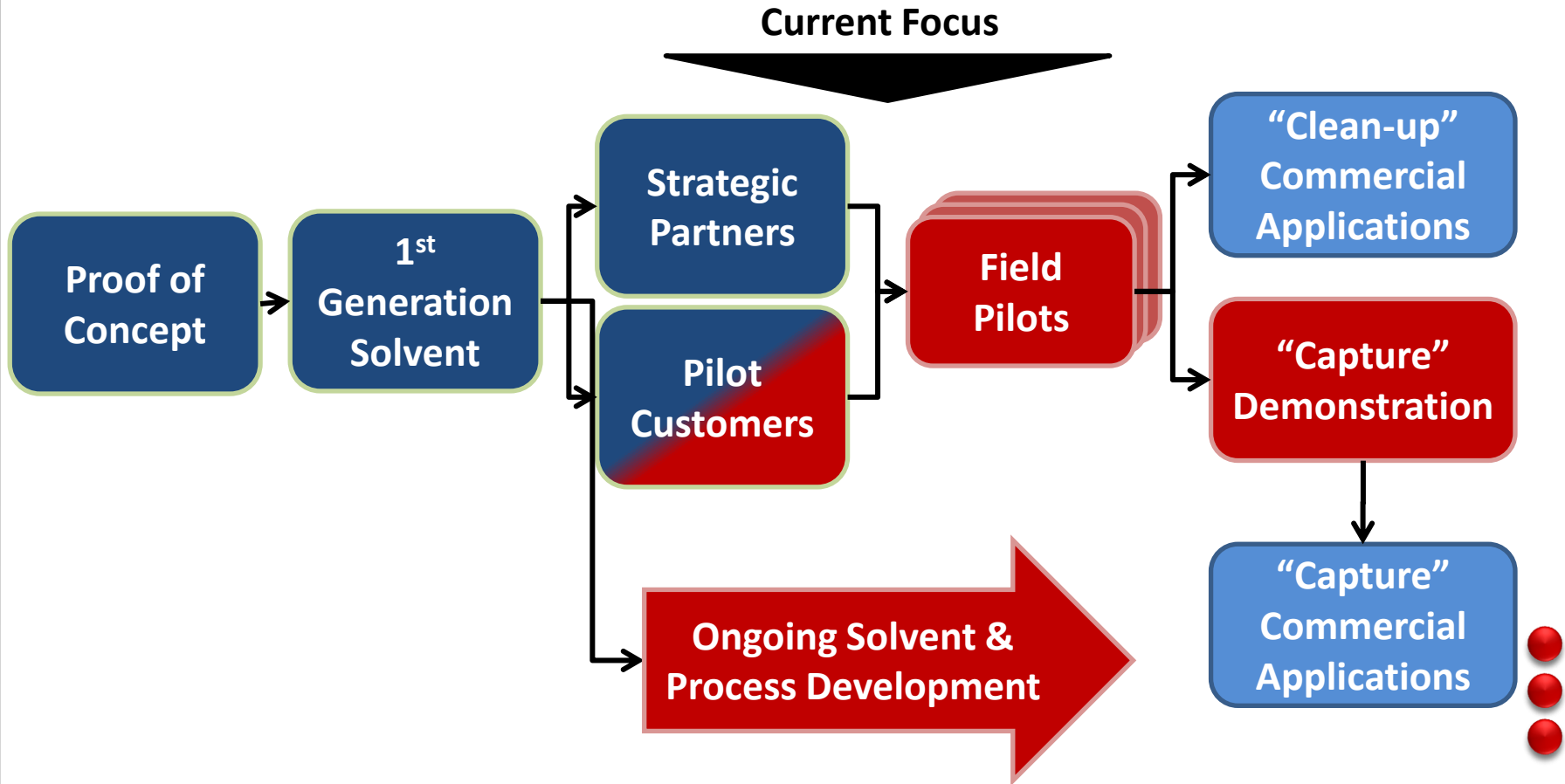
# ION's flue gas CO<sub>2</sub> capture process design







# Development and Commercialization





# ION Engineering

## Thank You

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