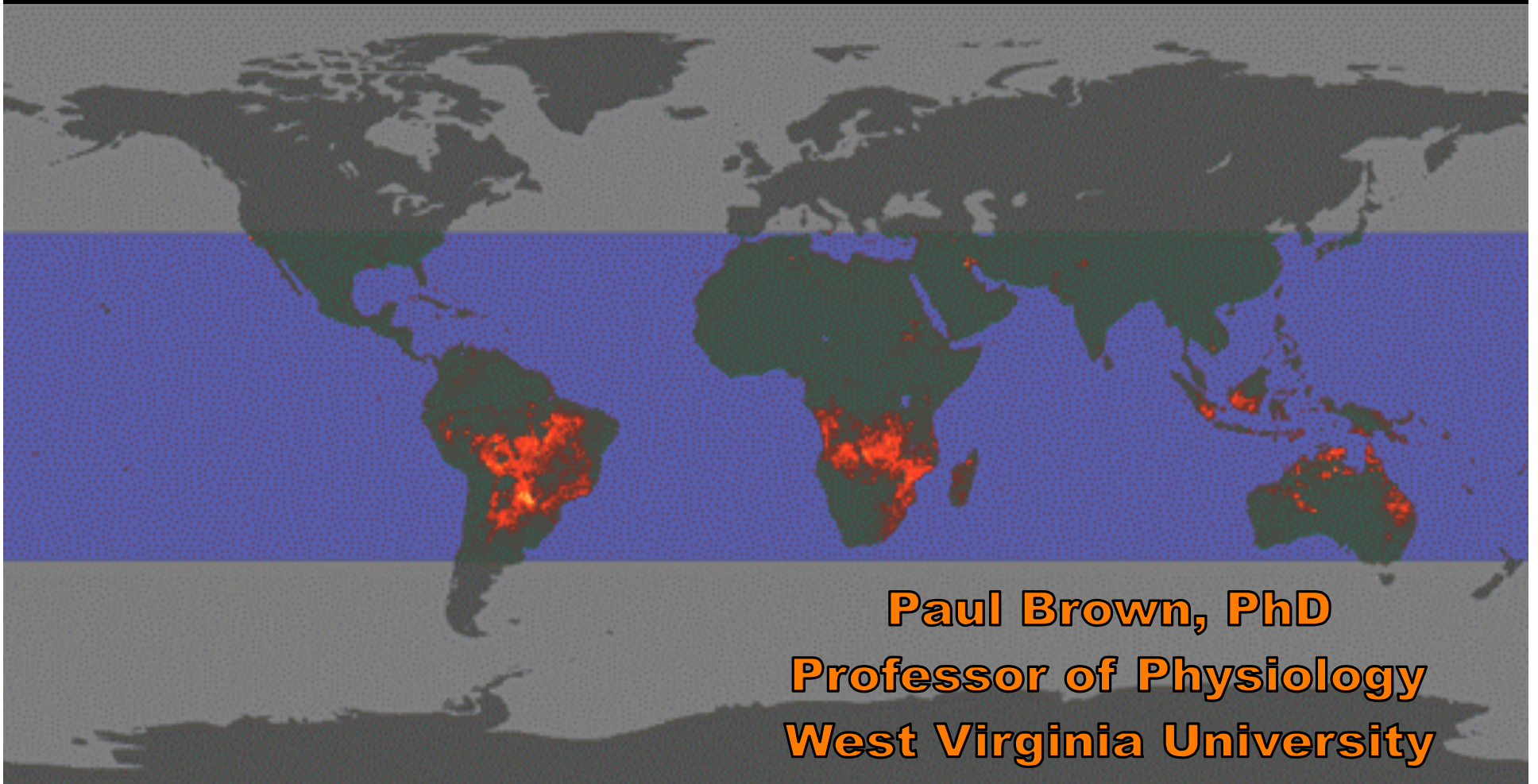


Your Carbon or Your Life: Ammonia vs. Emissions



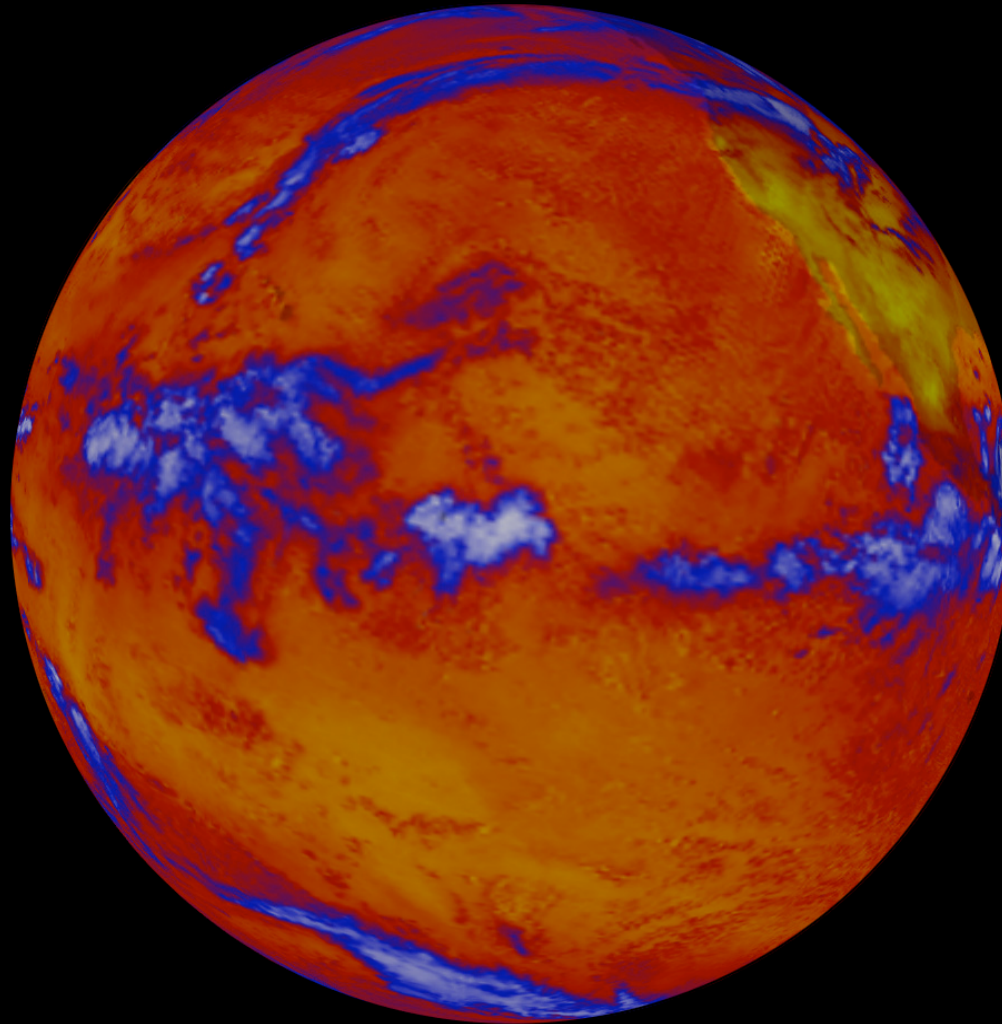
I'm a brain scientist, interested in the bases of **human behavior.**

In the last five years, I've devoted most of my energy to the problems of global warming, the current mass extinction, and the population explosion, all of which threaten survival of life on Earth.

The cause of all these problems is maladaptive **human behavior.**

For those of you who are dedicated to bringing about the use of anhydrous ammonia as fuel, I have an urgent request.

Please hurry. It's urgent.



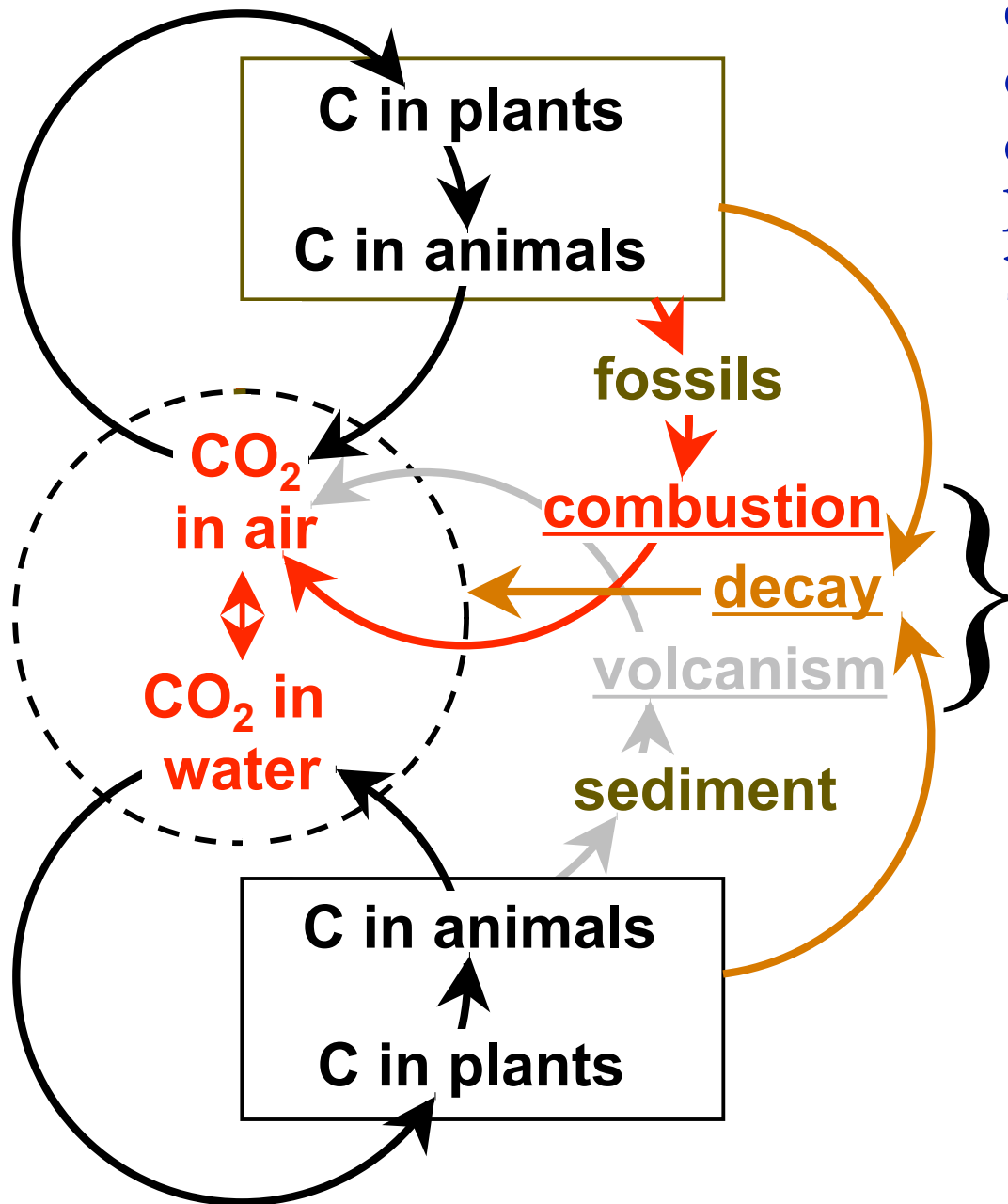
***Anhydrous ammonia* can help save the planet.**

UN Intergovernmental Panel on Climate Change (IPCC): 2500 leading scientists from around the world (shared 2007 Nobel Prize with Al Gore)

(2001) Humans have changed Earth's climate since the pre-industrial era.

Greenhouse gases [will] cause abrupt, devastating, irreversible effects.

Mitigation and adaptation are advised, but barriers to their implementation will have to be overcome.



Earth's ecosystem evolved a carbon cycle over billions of years, that was stable longer than we've been on the planet.

ALL 3 HAVE CAUSED MASS EXTINCTIONS BY PUTTING TOO MUCH CO₂ INTO THE ATMOSPHERE

We rely on the ecosystem to clear CO₂ from the air, but it didn't evolve to handle this much CO₂.

Greenhouse gas levels are now higher than any time since our species evolved 120,000 years ago, and our emissions are skyrocketing.

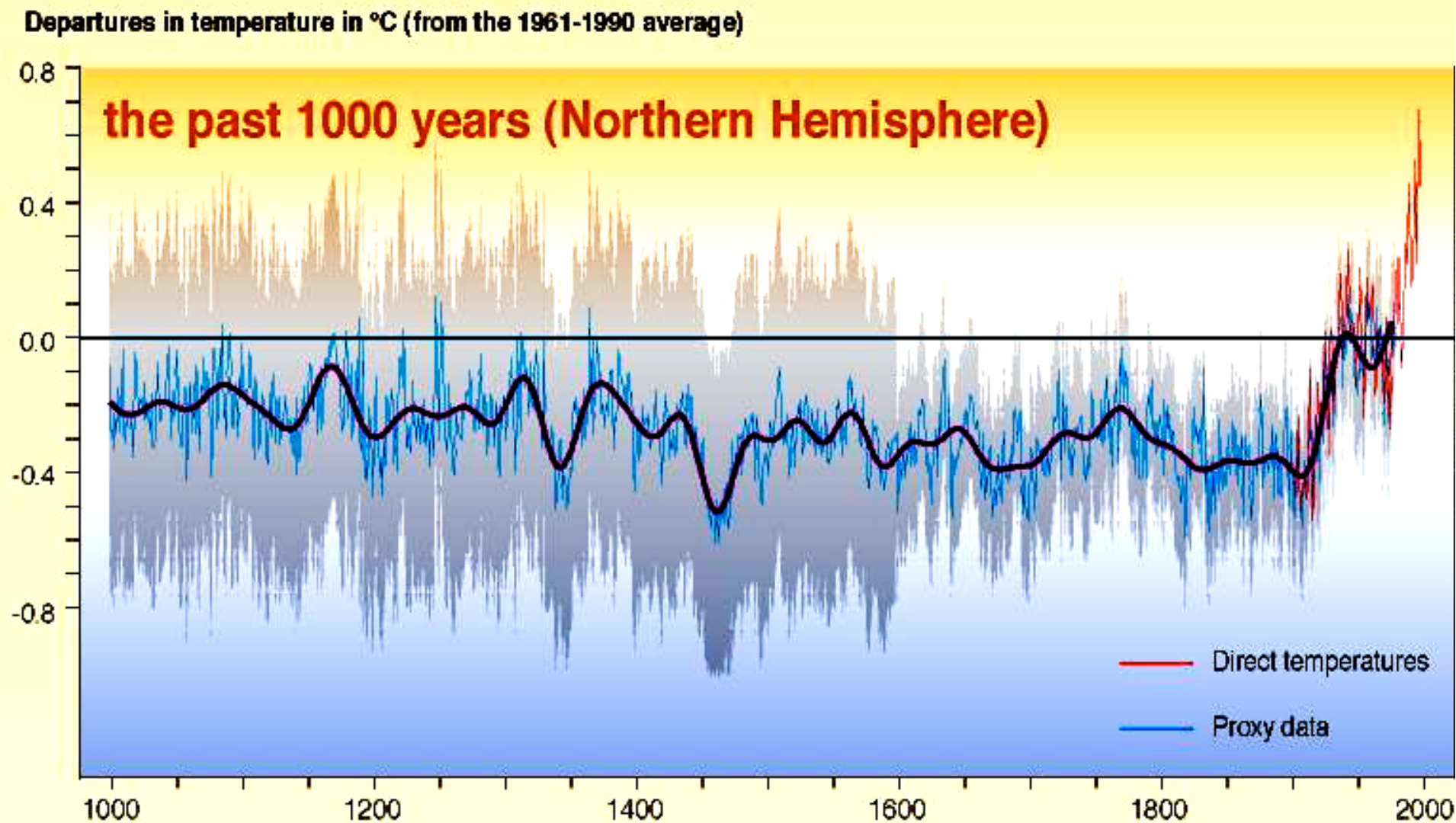
Positive feedbacks are accelerating global warming and ecosystem collapse.

We have started Earth's sixth mass extinction.

We only have a short time to reverse warming. It can't be done overnight, so we can no longer delay.

We can't negotiate with Mother Nature.

GLOBAL WARMING (IPCC)



GLOBAL WARMING POSITIVE FEEDBACKS

The two main positive feedbacks for global warming are due to loss of albedo and methane release. Others will soon come into play.

Once positive feedback exceeds a certain level, it becomes a runaway process, beyond our ability to reverse.

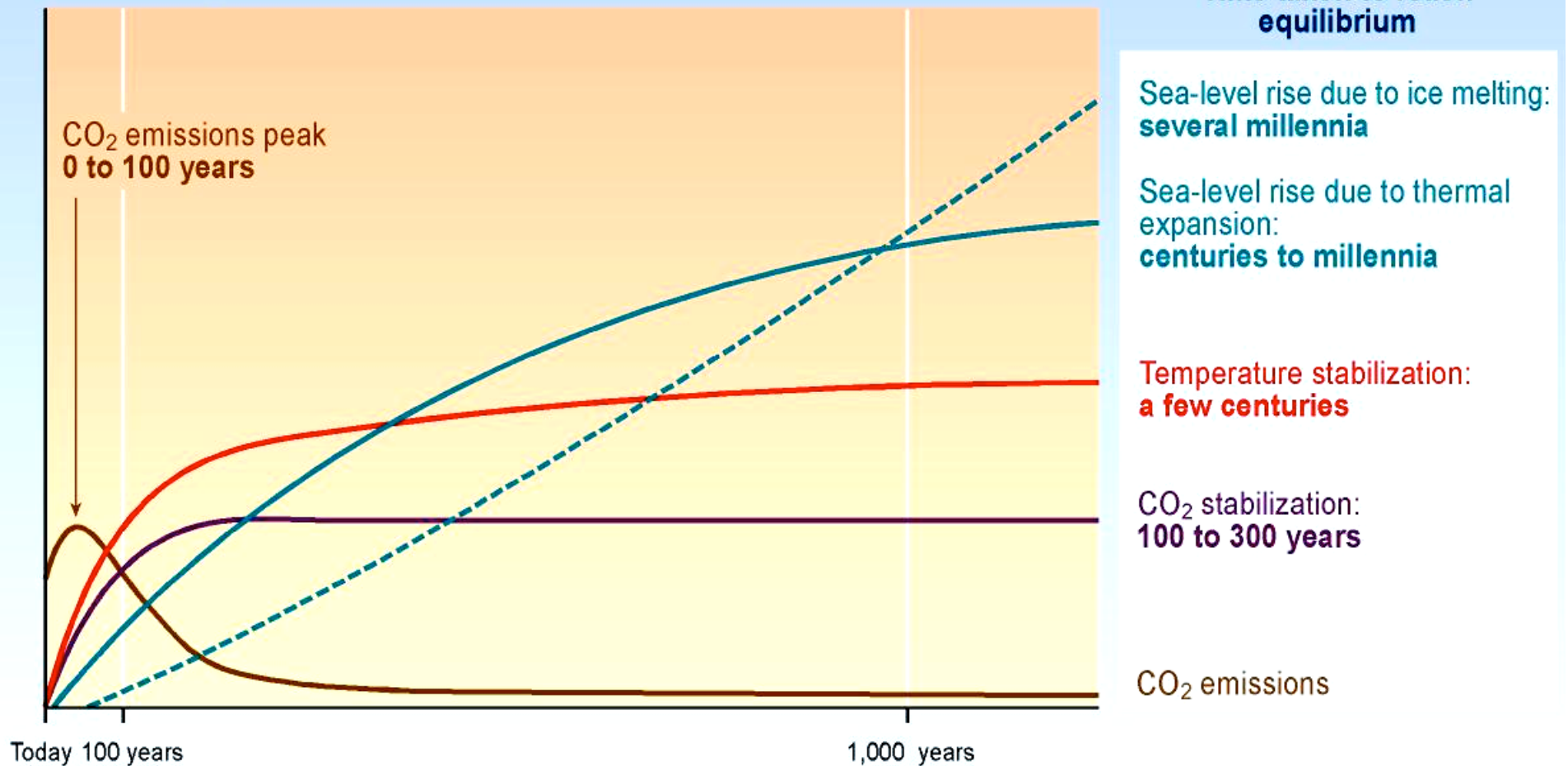
We don't know when global warming will reach the runaway stage, or even whether it's reached that stage already.

IF WE STOP BURNING CARBON: (IPCC)

CO₂ concentration, temperature, and sea level continue to rise long after emissions are reduced

Magnitude of response

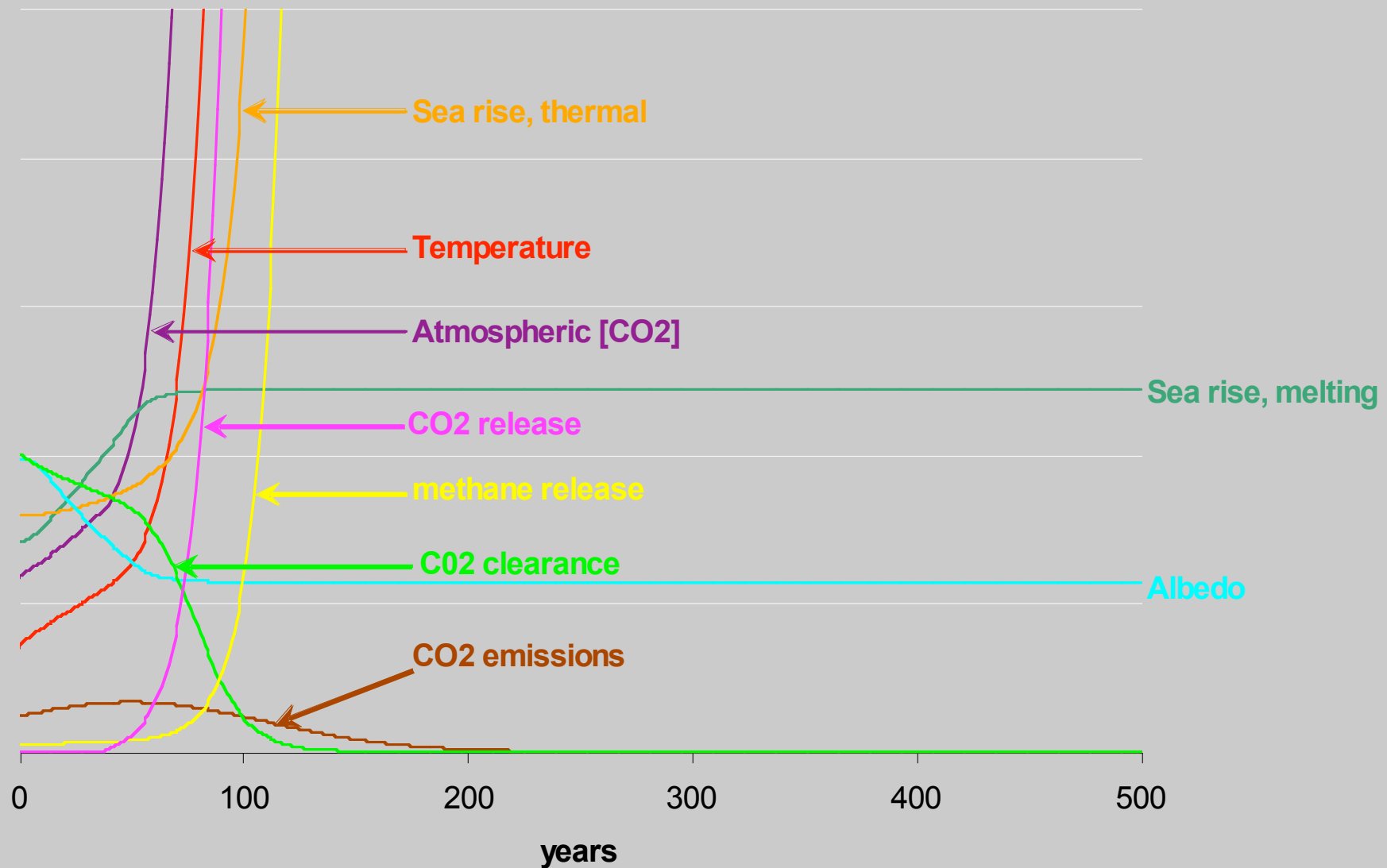
Time taken to reach equilibrium



**This projection is overly optimistic,
because it didn't take positive
feedback into account.**

Runaway Global Warming

Feedback added



Jim Hanson, top climate researcher at NASA: “One more degree of warming and we’re done for.”

In the last 30 years, we’ve warmed 0.6 degrees. Without positive feedback or increased CO₂, it will take 50 years to warm one more degree. With positive feedback, it could take as little as 20 years.

It doesn't take a brain scientist to know what we need to do.

Developed countries must stop burning carbon in 5 years, 10 years for developing countries. We must restore net negative feedback in 20 years. Even then, there will be major damage due to the Earth's physical inertia.

ACTION TIMELINE

10 years to stop carbon combustion worldwide, 5 years in developed countries.

20 years for net negative climate feedback *if possible*.

Many decades for habitat restoration.

100 - 250 years for population reduction to 1/10 (ca. 1700 AD level) of current 6.5 billion.

NET NEGATIVE FEEDBACK

There are two more things we must do to reverse global warming: remove atmospheric CO₂ and enhance albedo.

**Remove atmospheric CO₂:
properly managed forests**

**Increased albedo:
artificial surface reflection**

CO2 ABATEMENT

Implement new forest management for maximum growth rate and maximum lumber output. Reforest all available land.

Sequester wood.

ALBEDO ENHANCEMENT

Convert all man-made surfaces: roofs, pavements, etc., for high reflectivity (paint them white).

It would be nice to have paint that's white in sunlight, black in the dark.

Reforestation will ensure good cloud cover (more albedo) by increased transpiration.

ENERGY

The obstacle to carbon-free energy in the past has been the intermittent nature of renewable sources such as wind and sunlight.

The carbon power industry has been complacent, because they would always be needed to take up the load when these renewable electricity supplies fall below demand.

Anhydrous ammonia provides the missing link for a carbon-free energy economy.

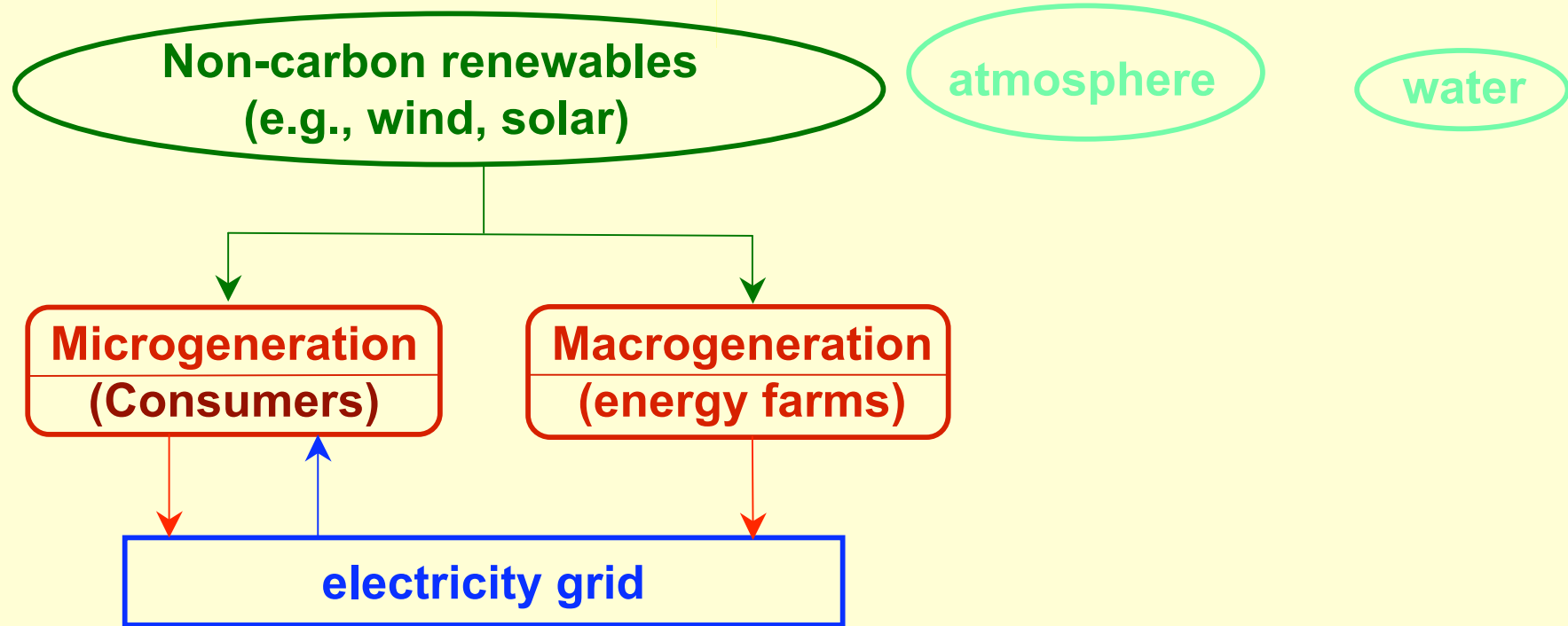
A NON-CARBON RENEWABLE ENERGY CYCLE

**Non-carbon renewables
(e.g., wind, solar)**

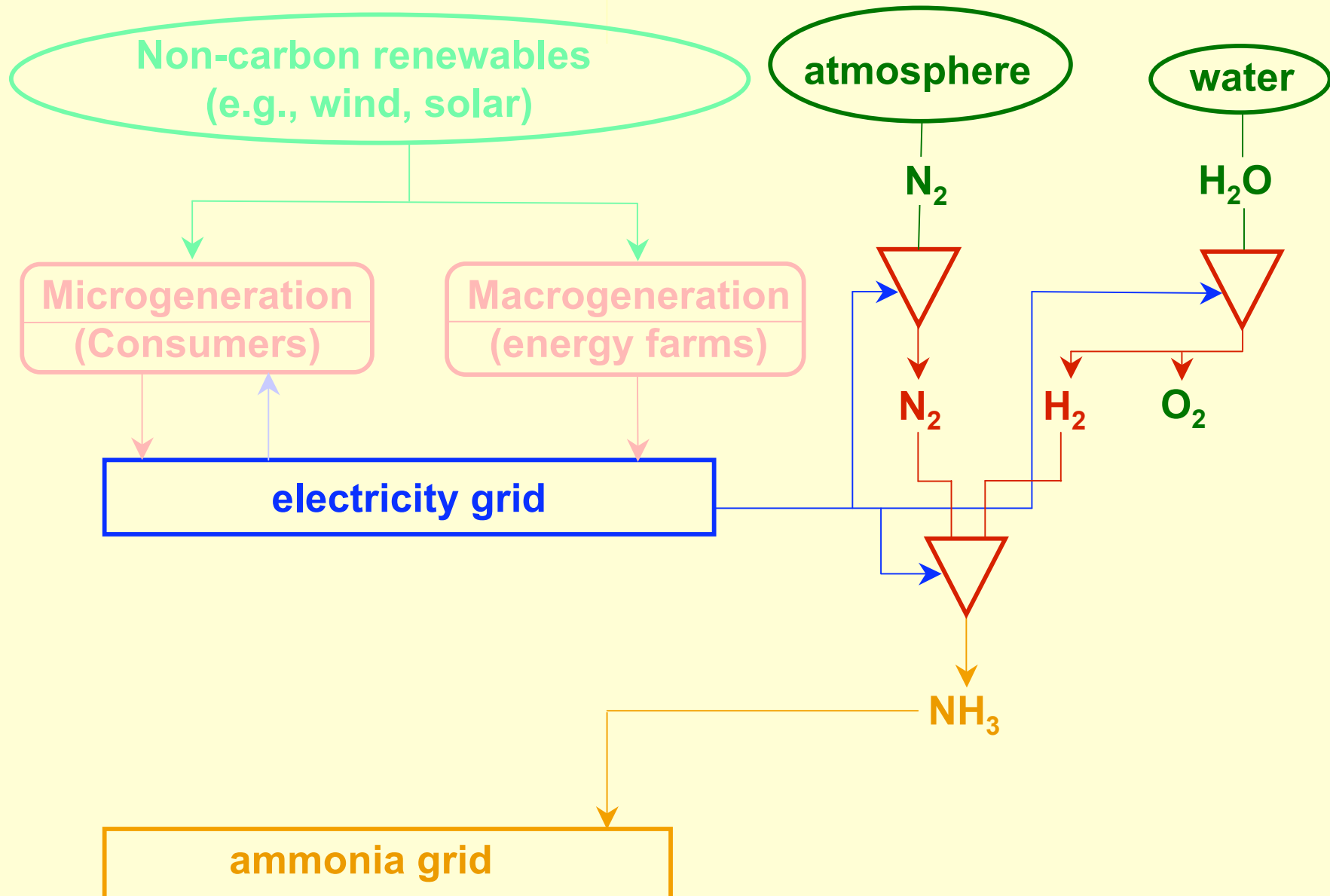
atmosphere

water

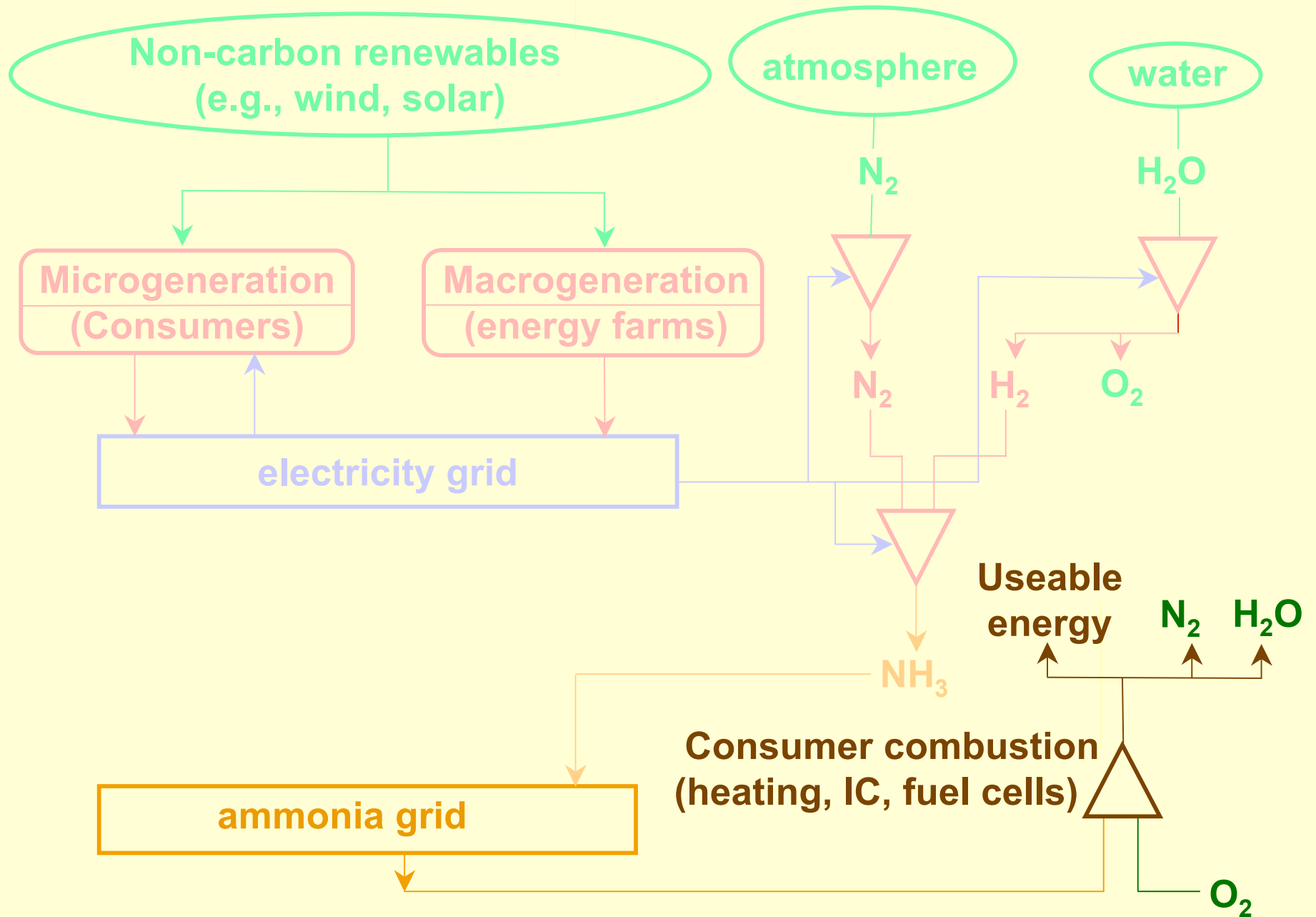
A NON-CARBON RENEWABLE ENERGY CYCLE



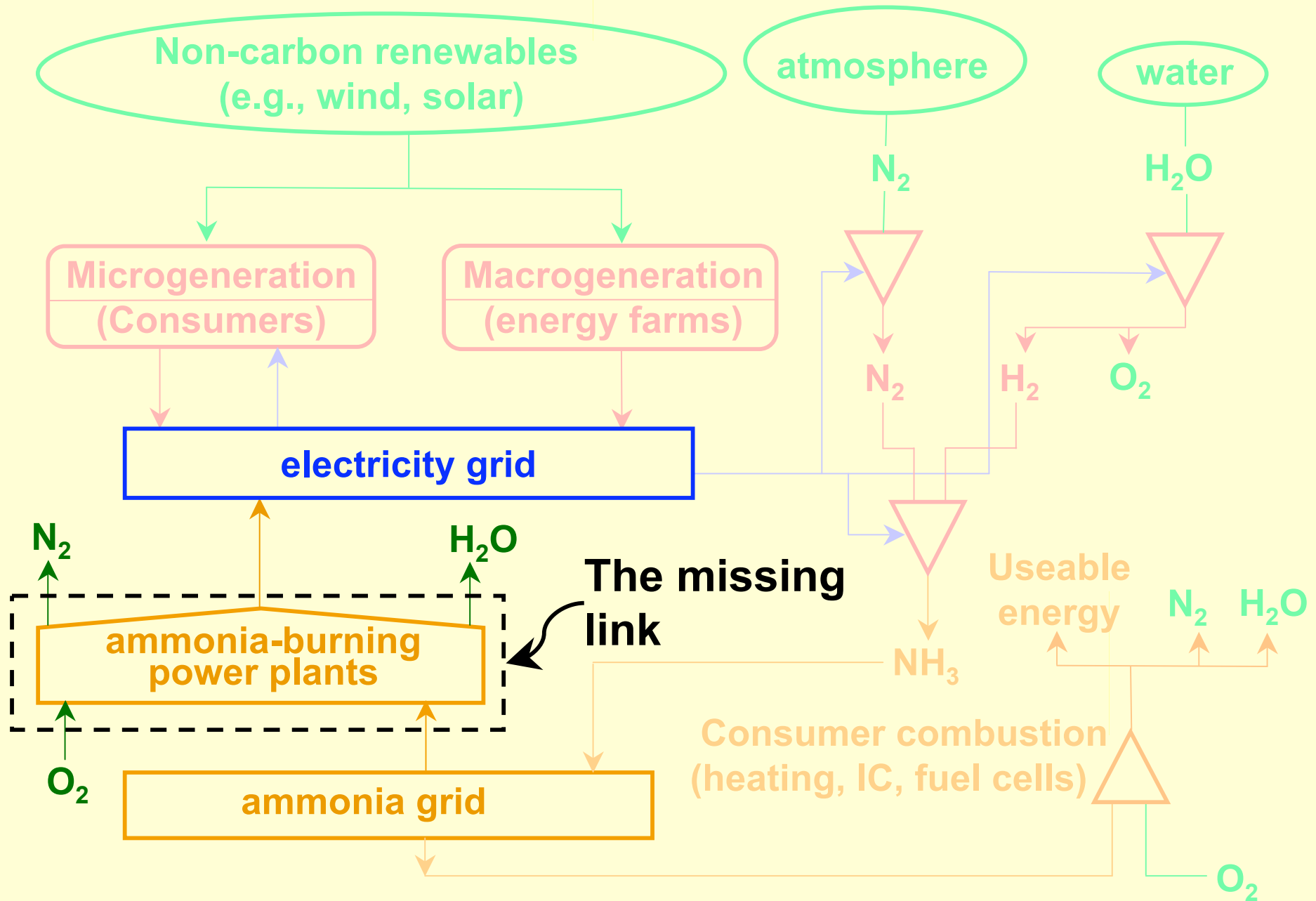
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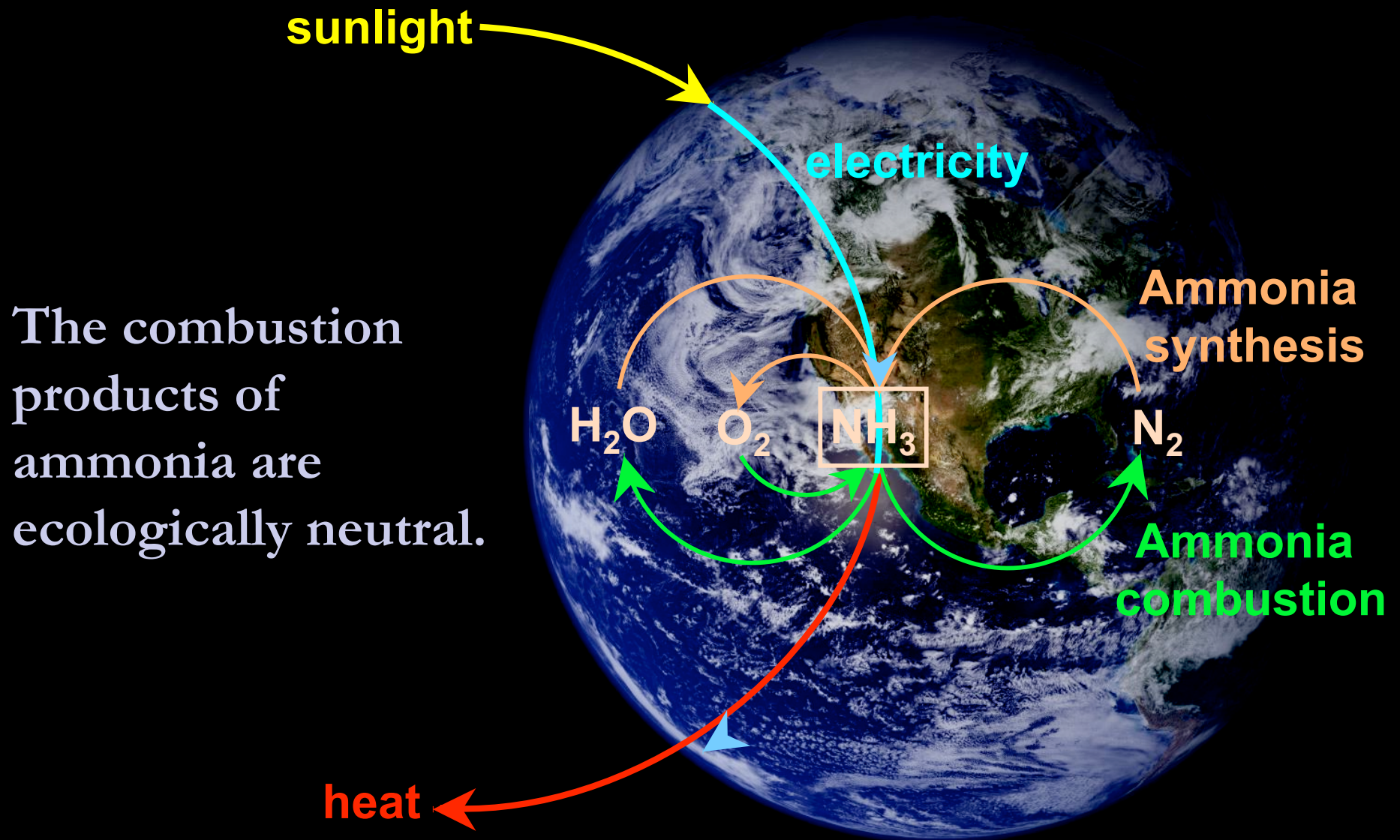
A NON-CARBON RENEWABLE ENERGY CYCLE



A NON-CARBON RENEWABLE ENERGY CYCLE



THE BEAUTY OF THE AMMONIA CYCLE



- The smart thing for the fossil fuel and power industries to do would be to retool for green electricity and NH_3 and lobby for government help.
- Some companies already have started.
- Entrepreneurs will be happy to drive the others into extinction.

Please hurry. It's urgent.



Anhydrous ammonia can help save the planet.