

High hopes for low carbon?

“Nobody said it was easy

No one ever said it would be this hard”

THE SCIENTIST - COLDPLAY

It is better to use CO₂ as a product than to store it underground.

Scientists are exploring solutions along three different pathways.

One of these is to use the greenhouse gas as a nutrient for algae in order to produce biofuels. It should be possible to prevent 10% of annual emissions, argues Marga Edens, Vice President Corporate Responsibility of RWE AG.

Dr. Bunsen Honeydew. Remember him? He was my favourite Muppet character. In each show, he used to greet us in his Muppet Labs, “where the future is being made today”. He truly was a free spirit, who was far ahead of his time with solutions for problems that did not (yet) exist. Will there ever be a need for a banana sharpener or a gorilla detector? Probably not. But whatever surprises the future has in store for us, Dr. Honeydew already had them in his sights today. For me, he proved how important unconventional thinking is: a willingness to look beyond the more obvious solutions. To put it more strongly: the need to question established views at every turn and to keep an open mind.

I would like to apply this mindset now to re-examine a familiar environmental problem: CO₂ emissions, and their continued increase worldwide. In P+, issue 4 (March/April 2014), I took a detailed look at the link between CO₂ and the consequences of climate change, such as heatwaves, persistent drought, heavy rainfall, flooding and off-the-charts hurricanes. I, like many others, also called for a reduction in the amount of CO₂ that we dump into our living environment. It is therefore explicitly not my intention to question the effect that CO₂ is assumed to have on climate. However, I also do not want to simply assume that we can achieve the necessary reduction in CO₂ emissions by 2050 by means of a far-reaching decarbonisation of our energy and transport sectors. For now, I will take the amounts of CO₂ and

their damaging impact as a given. What I would like to do is ask whether we have an alternative solution for these still very large quantities of CO₂, other than the generally-accepted capture and storage option. Is there something else we can do with CO₂ rather than burying it in the ground? Can we make something with it? Can we productise CO₂? Can we replace storage with usage? Usage on an industrial scale, as a result of which large volumes of CO₂ can, with the help of some creative science, have a positive impact on our environmental balance-sheet?

The current common or garden applications for CO₂ are familiar to us all. In the food and beverage industry, CO₂ provides the fizz in our soft drinks, decaffeinate our coffee and keeps perishable produce at the right temperature. That’s cool, but completely inadequate as a means of combating global warming. This is why scientists have started a quest for other ways of recycling CO₂ on a large scale. Key to their innovative approach is the need to develop solutions that are actually beneficial. There must be a guarantee that this kind of new application does not result in more CO₂ being produced than is already available from power plants and industry. This kind of new application also creates its own demand for energy. It must be guaranteed that the extra energy required does not cause more CO₂ than the total amount that can be processed in the new application. If renewables are used to fulfil this

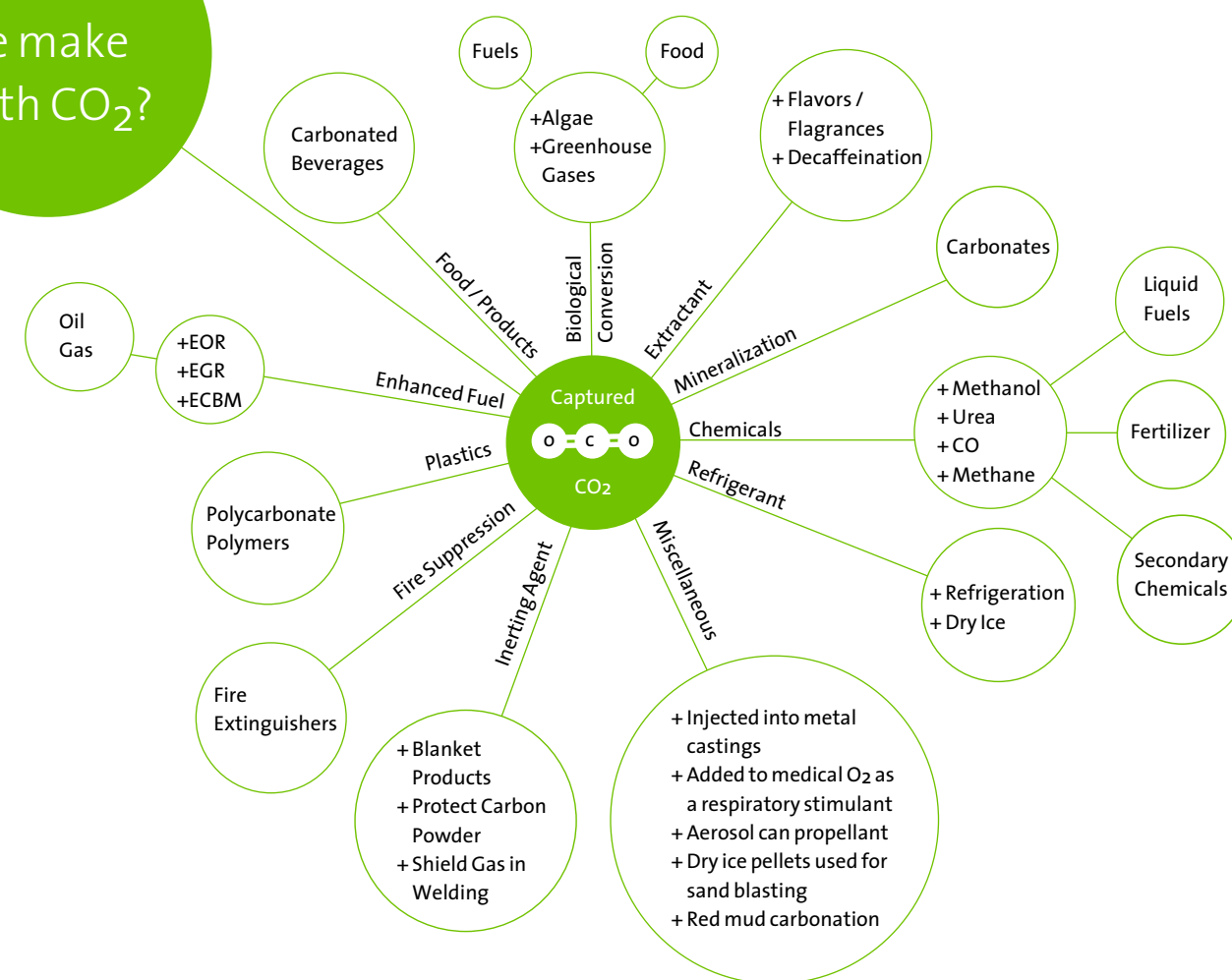
need for energy, the application could actually be carbon-negative!

For the utilisation of CO₂, scientists are exploring three major pathways: non-conversion CO₂ use (primarily enhanced oil recovery), converting CO₂ into (bio-renewable) fuel and using CO₂ as a feedstock for chemicals. The graphic shows all of the current and future applications of CO₂ together.

In enhanced oil recovery (EOR), CO₂ is used to force the residual oil from a mature field. CO₂ is injected into the ground (in other words, stored), as a result of which the remaining oil is pushed to the surface. According to the International Energy Agency (IEA), this method can be used to produce between 5 and 20% extra oil and increase the exploitability of an average oil field by up to 50%. In the case of EOR, CO₂ is actually used more as a means to an end (the main aim is to increase production). The CO₂ used (according to IEA estimates, with a cumulative potential ranging from several to hundreds of gigatons) is stored permanently underground and is not used for an alternative, innovative purpose. This is why the two other methods of making CO₂ productive are more interesting.

The conversion of CO₂ into fuel delivers new products that can be manufactured in several different ways. Stimulating the growth of micro-algae is one of the most well-known examples. The IEA anticipates that by around 2050, 27% of all transport fuel will originate

What can we make with CO₂?



from biomass-based sources (compared to 2% now), which alone can prevent two gigatons of CO₂ emissions every year. Other methods of CO₂-to-fuel conversion can achieve significantly greater reductions in emissions. Even more mind-boggling is the transformation of CO₂ into concrete, tangible, everyday products, like memory foam for cushions and mattresses, for example. That “Dream Process” is currently under development by Bayer, using CO₂ originating from the nearby RWE coal-fired power plant. The resulting material can consist of as much as 40% CO₂. On a global scale, the conversion of CO₂ into memory foams, plastics and building materials could ultimately process between 1 and 2% of emissions.

If we add together the proven CO₂ utilisation potential of all three pathways, we reach around 3.7 gigatons per year. That is approxi-

mately 10% of current annual worldwide CO₂ emissions. Even if we take into account much more complicated applications that will not become available for at least a decade, we are still forced to conclude that the utilisation of CO₂ will not solve our emission problem. When I consider all of the utilisation options, I never fail to be astounded by our scientific ingenuity. I had never thought that I would ever be able to sleep or even live in CO₂. Despite that, CO₂ utilisation is at best an interesting addition to CO₂ capture and storage and not a fully-fledged alternative. If we do not want CO₂ to become another “natural resource” hidden in the ground, the solution to the CO₂ problem will ultimately need to come from an absolute reduction in our CO₂ emissions. There are no magic solutions. Hard work and effort will be necessary. But, to quote my other Muppet hero, Kermit the Frog: “It’s not easy being green.” ■



Marga Edens is Vice President Corporate Responsibility of RWE AG and Chair of the Board of Directors of Bettercoal.