



THE CORNELL BIOFUELS GAME: THE RACE TO THE PUMP!

CONCEPTS

This game created at **Cornell University** for K-12 students **teaches** the concepts and **steps involved in converting biological feedstocks into biobased transportation fuels.**

The game also **emphasizes the important benefits of research** by allowing “quick advances” for **players who land on a “Cornell R&D” spot and are advanced more rapidly toward the goal.**

The biofuel pump at the end of the game states **“We all win!”** reminding us of the **ecological benefits** that use of biofuels will bring to **the whole planet.** Biofuels are a **renewable energy** form with no net carbon emissions.

THE GAME RULES

Depending on the starting material, different conversion pathways to biofuels (ethanol, biodiesel and biohydrogen) are presented as “roads to the pump”. Interconnecting pathways are shown as bridges and side-roads, showing the flexibility of biological feedstocks.

Each player (up to 5) chooses a game-piece consisting of a miniaturized pick-up truck or other farm vehicle containing a feedstock. The starting material in your truck determines which road you take at the start. Starting materials include animal manure, forest and wood mill residues, grasses, oil seed crops and waste oils. Sequentially, each player rolls a die (numbered 1 – 6) and moves their vehicle ahead from the biomaterials origins (farm, forest, waste-recycling) through the conversion process (cutting up molecules, converting and separating) to fuel markets and to the fuel pump.

A player that lands on a **CORNELL R&D** space picks a card and follows the directions on that card. The Cornell R&D cards emphasize the involvement and strengths of Cornell University in key areas of **Sustainable Bio-industries**, and are divided in 3 categories: (1) *Farming and recycling* (Example: New improvements in the energy efficiency for the production of your feedstock: you consume less to produce more), (2) *Industrial production* (Example: Engineers have fully optimized your production streamline: rush to the market), (3) *Market Places* (Example: Scientists have developed a valuable by-product from the production-wastes: you have a new product on the market).

Following the path determined by the initial feedstock vehicle, the players proceed through the necessary steps and required technologies for a sustainable biofuel production. Finally, a second die (yes or no) concludes the game when one of the players has developed his entire bio-industrial line production and reached the market place. This final step illustrates that the biofuels can only be used in conjunction with new technologies, such as flex-fuel engines, fuel cells or biodiesel engines.

THE FIRST PRESENTATION – A HUGE SUCCESS

The game was first presented in public in September 2006 at the **WIRED-GE NextFest event** (Future of GREEN pavilion) **at the Javits Center** in New York City, attended by 100,000 people over 4 days. Cornell Research Associate, Stephane Corgie, led a team of Cornell graduate students, Sarah Munro, Marie Donnelly and Linelle Fontenelle at the event. The Cornell team guided students, teachers and families through the steps of the game. Different aspects of the game appealed to a wide range of ages, from pre-school to adults. Some children returned to the game again and again to try the game using a different biofuel truck. Children were drawn to the game by the miniature trucks –their favorite being the 'french fry-waste oil truck'. The game was well received and created a great deal of excitement and interest by parents and teachers,



many of whom requested copies of the game and even took photos to bring back to their classrooms. Indeed, the game illustrates very broad concepts including sustainability, carbon footprint, life cycle and renewable energies and links them to industrial networks and the global economy. The game is also a block-diagram that explains more detailed processes to adults and was a useful tool in answering questions and concerns of the general public in relation to what they had read and seen in the media.

The game was created by members of Professor Larry Walker's team: Dr. Stephane Corgie, Dr. Corinne Rutzke and Ph.D. Candidate, Sarah Munro. Two additional games teaching the concepts of bioenergy and bioproducts are currently under development by the team.

