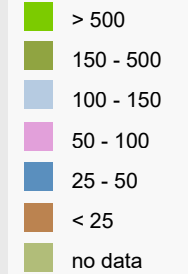


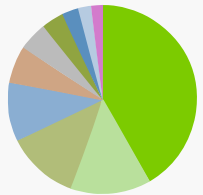
# Examples of Advanced Biochemical (2G Ethanol) Facilities and Patenting Activity in the World

Countries by patent applicants' activity in 2008-2017, patents and applications (cellulosic ethanol production):



2nd generation bioethanol plant (operational and under construction)

World commercial and demonstration 2G ethanol production capacity in 2020 by top 10 countries, million liters (%)\*:



United States	427.9 (41.7)
China	142.2 (13.8)
Brazil	125.5 (12.2)
Finland	105.2 (10.3)
Romania	63.4 (6.2)*
Italy	50.7 (4.9)
Austria	38.0 (3.7)*
Sweden	29.4 (2.9)
Spain	23.2 (2.3)
Norway	20.2 (2.0)

Total (est.): 1025.7 (100)

Source: various

\* operational and under construction



## List of some advanced 2G bioethanol facilities, million liters per year:

- 1 Iogen Corp. Ottawa, Ontario, Canada, 2.0
- 2 Woodland Biofuels Sarnia, Ontario, Canada, 0.8
- 3 DuPont Nevada, Iowa, USA, 113.6
- 4 Abengoa Bioenergy Hugoton, Kansas, USA, 94.6
- 5 Project Liberty, Emmetsburg, Iowa, USA, 75.7
- 6 KiOR Plant, Columbus, Mississippi, USA, 49.2
- 7 Ineos NP Vero Beach, Florida, USA, 30.3
- 8 *Fiberight Hampden, Maine, USA, 22.8\**
- 9 Fiberight Blairstown, Iowa, USA, 22.7
- 10 Quad County Biorefinery, Galva, Iowa, USA, 7.6
- 11 GeoSynFuels Upton, Wyoming, USA, 5.7
- 12 Alpena Biorefinery, Michigan, USA, 3.0
- 13 ZeaChem Boardman, Oregon, USA, 1.0
- 14 DuPont Vonore, Tennessee, USA, 1.0
- 15 Mascoma Rome, New York, USA, 0.6
- 16 LanzaTech Soperton, Georgia, USA, 0.1

\* under construction

## List of some advanced 2G bioethanol facilities, million liters per year:

- 17 GranBio's Bioflex 1 Alagoas, Brazil, 82.4
- 18 Raizen Energia Costa Pinto, Brazil, 40.1
- 19 CTC Sao Manuel, Brazil, 3.0
- 20 *AustroCel Hallein, Austria, 38.0\**
- 21 Inbicon Kalundborg, Denmark, 5.5
- 22 St1 Nordic Hamina, Finland, 88.8
- 23 St1 Cellulonix Kajaani, Finland, 10.1
- 24 Chempolis Oulu, Finland, 6.3
- 25 IFP Futurol Project (Bucy-Le-Long), France, 0.4
- 26 Clariant Sunliquid Project (Straubing), Germany, 1.3
- 27 Beta Renewables Crescentino, Italy, 50.7
- 28 Cargill Sas van Gent / Bergen op Zoom, Netherlands, 2.0
- 29 Borregaard ChemCell Ethanol (Sarpsborg), Norway, 20.0
- 30 Borregaard BALI Biorefinery (Sarpsborg), Norway, 0.1
- 31 *Clariant Romania (Podari), 63.4\**

\* under construction

## List of some advanced 2G bioethanol facilities, million liters per year:

- 32 IMECAL PERSEO Plant, Valencia, Spain, 18.1
- 33 Abengoa Bioenergy Salamanca, Spain, 5.1
- 34 Domsjö Fabriker, Ornskoldsvik, Sweden, 24.1
- 35 St1 Etanolix Gothenburg, Sweden, 5.1
- 36 SEKAB Ornskoldsvik, Sweden, 0.2
- 37 Longlive Group Yucheng, Shandong, China, 76.1
- 38 Tianguan Group Henan 1-2, China, 50.7
- 39 COFCO Biochemical Bengbu, Anhui, China, 6.3
- 40 Jilin Fuel Alcohol, Jilin, China, 3.8
- 41 Shandong Zesheng Project, Shandong, China, 3.8
- 42 COFCO Zhaodong, Heilongjiang, China, 0.6
- 43 LanzaTech BaoSteel Mill Shanghai, China, 0.4
- 44 LanzaTech Beijing Shougang, China, 0.4
- 45 LanzaTech Asia Mobile Demo, Gansu, China, 0.1
- 46 Praj Industries, Pune, India, 1.0

\* under construction

