

Thermal Gasification of Biomass United States Update

IEA Bioenergy Task 33

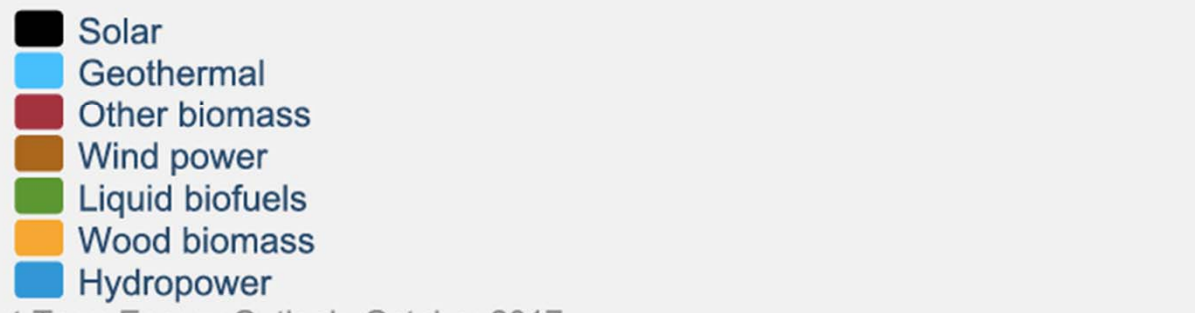
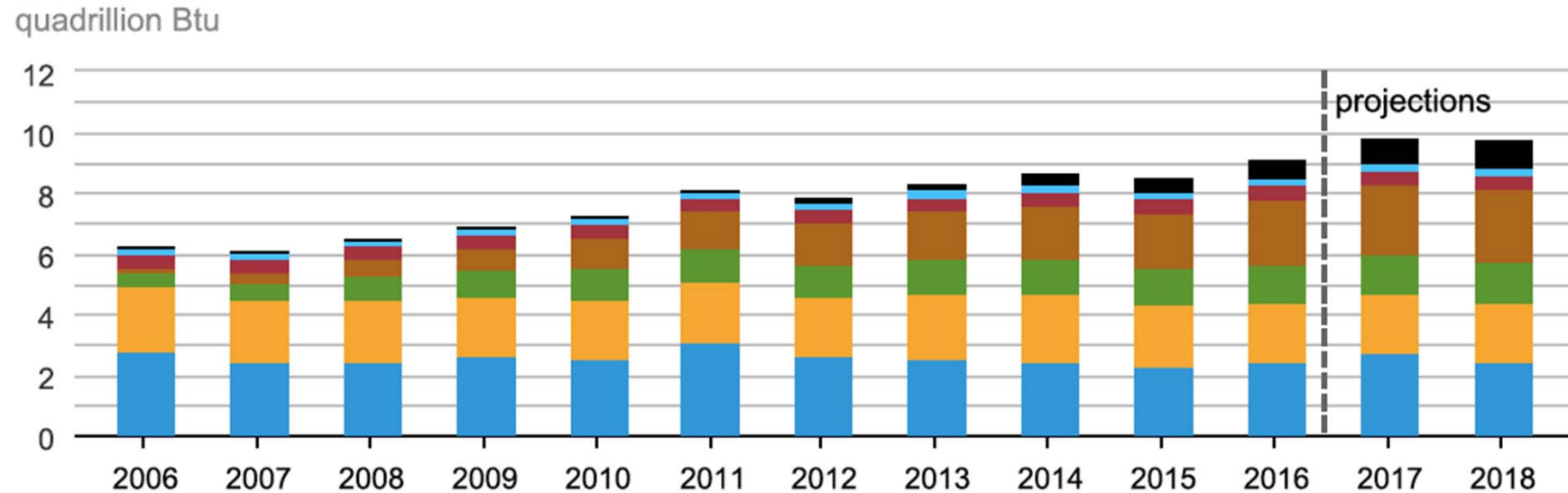
First Semiannual Task Meeting 2018

Alkmaar, Netherlands

7 May 2018

Kevin Whitty

Renewable Energy in USA



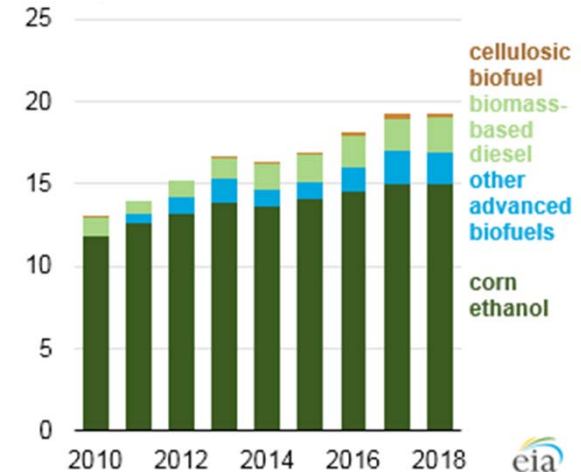
Source: Short-Term Energy Outlook, October 2017

Note: Hydropower excludes pumped storage generation. Liquid biofuels include ethanol and biodiesel. Other biomass includes municipal waste from biogenic sources, landfill gas, and other non-wood waste.

Biofuels

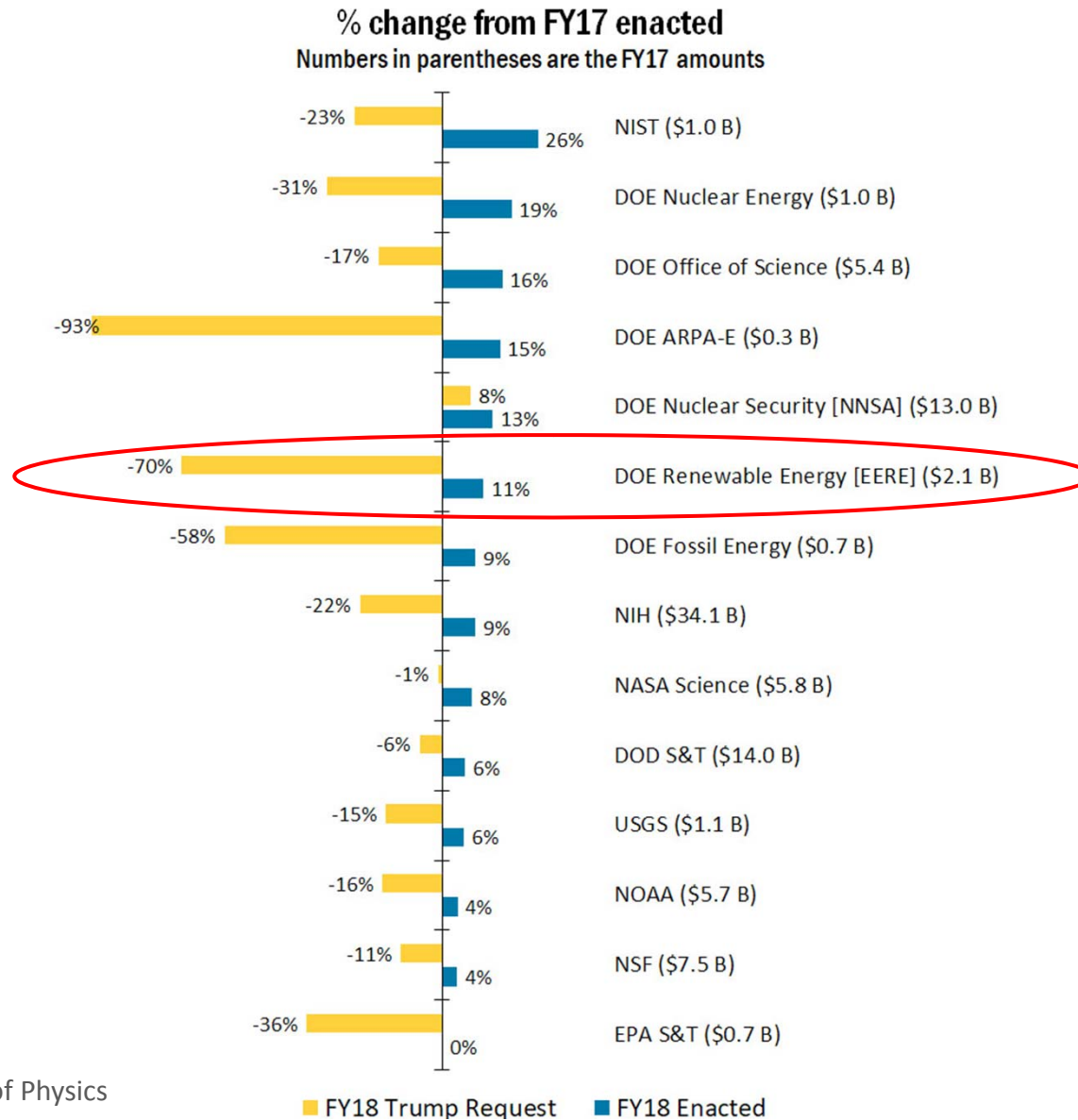
(billion gallons, ethanol equivalent)

- Renewable fuel standards
 - Tiny increase for 2018
 - Under review for future years



		Total Renewable Fuel	Portion from Advanced Biofuels		Cap on Conventional Biofuel	Date of Final Rule	
			Total Advanced Biofuels	Cellulosic			Biomass-Based Diesel
2010	S	12.95	0.95	0.1000	0.65	12.00	Nov. 2009
	F	12.95	0.95	0.0065	1.15	12.00	Feb. 2010
2017	S	24.00	9.00	5.5000	≥1.00	15.00	Nov. 2016
	F	19.28	4.28	0.3110	2.00	15.00	Nov. 2016
2018	S	26.00	11.00	7.0000	≥1.00	15.00	Nov. 2017
	F	19.29	4.29	0.2880	2.10	15.00	Nov. 2017
2019	S	28.00	13.00	8.5000	≥1.00	15.00	Nov. 2018
	P	TBD	TBD	TBD	2.10 ^d	TBD	TBD

2018 Budget – Science and R&D



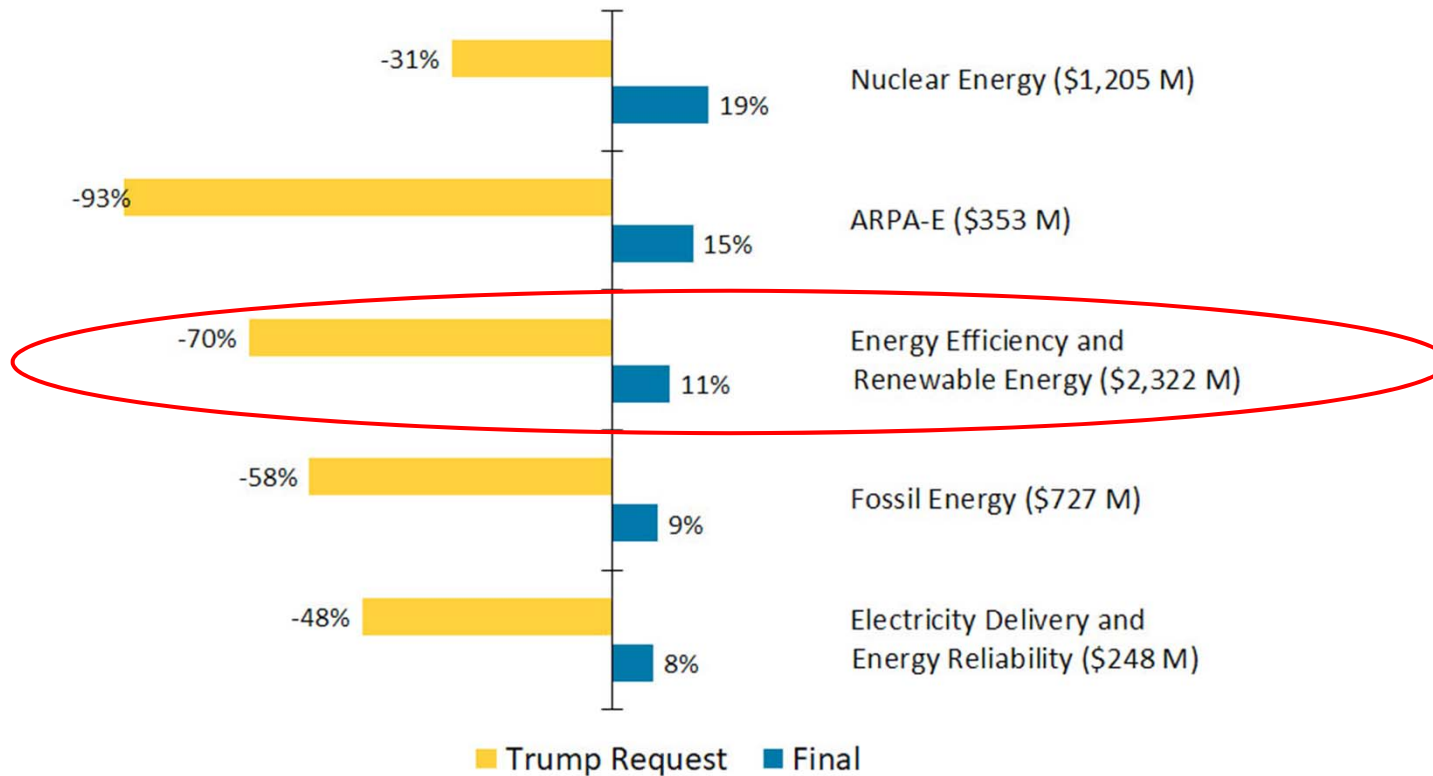
Source: American Institute of Physics

2018 Budget – Department of Energy

Final FY18 Funding: DOE Applied Energy

% change from FY17 enacted

\$ in () are the FY18 enacted amounts



U.S. DOE Bioenergy Technology Office (BETO) Updates

- Budget for FY 2017 was \$225 million, same as 2016
- Budget for FY 2018 not yet available
- Continued support for demonstration plants
 - Fulcrum Bioenergy
 - Red Rock Biofuels
- New funding solicitation released
 - BioEnergy Engineering for Products Synthesis (up to \$28 million)
 - Process Development for Advanced Biofuels and Biopower (up to \$20 million)

Fulcrum Bioenergy

Sierra Biofuels Plant, Reno, Nevada

- Waste to FT fuels
- 200,000 t/y MSW
- 10 million gallons syncrude
- TRI gasifier
- \$30 million investment by BP
- Recent \$150 million bond financing
- Offtake agreements with United Airlines, Cathay Pacific, Air BP
- Feedstock processing facility built and operational
- Financing of plant now in place and construction is commencing



Fulcrum Bioenergy Sierra BioFuels Plant

Proprietary, Proven & Efficient Fuels Process



**Material Processing
Facility Prepares MSW for
Fuels Process**



**Steam Reforming
Gasification System
Converts MSW to
Synthesis Gas**

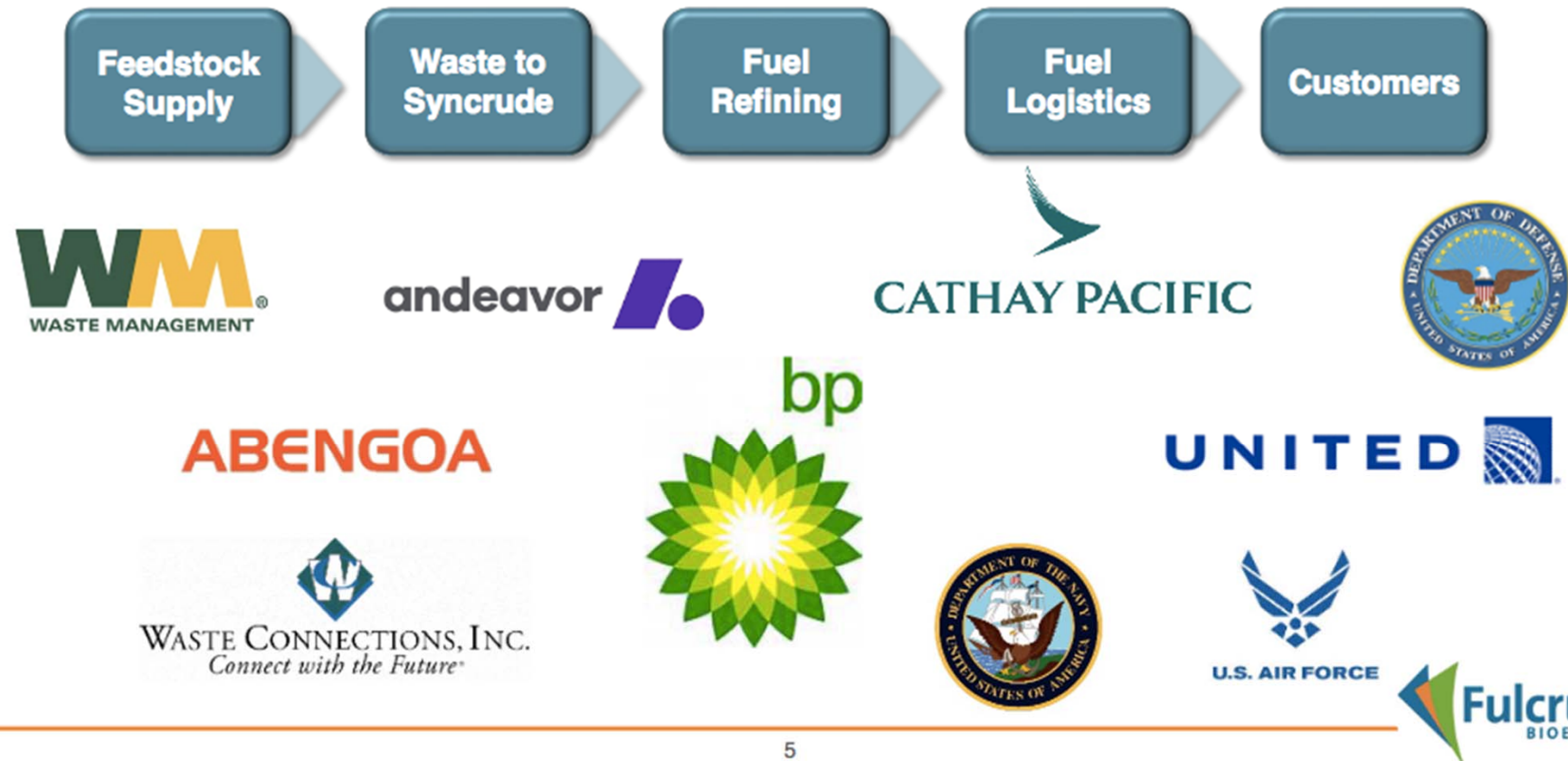


**Fischer-Tropsch Process
Converts Synthesis Gas
to Syncrude, Jet Fuel &
Diesel**



Fulcrum Bioenergy Sierra BioFuels Plant

Fulcrum's Strategic Partner Model



Fulcrum Bioenergy Sierra BioFuels Plant



- In Operation
- Construction Completed on Schedule and on Budget

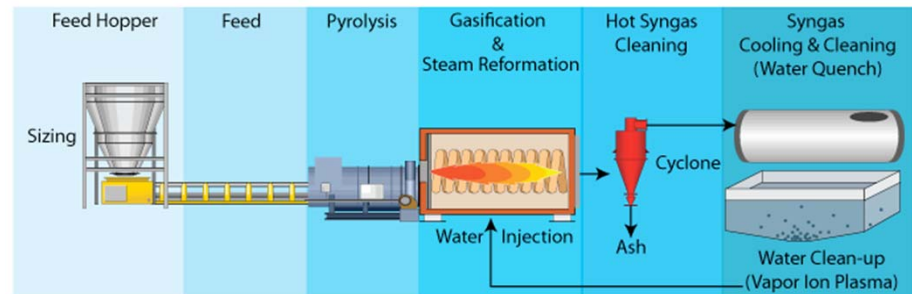


- Fully Financed
- EPC With Cost, Schedule and Performance Wrap Underway
- 11 Million Gallons per Year of Renewable Fuel in 2020

Red Rock Biofuels

Lakeview, Oregon

- Biomass to FT fuels
- Feedstock: 136,000 ton/y forest residues
- Product: 15 million gallons biofuels (aviation)
- TCG Global gasifier
- Veolocys for FT
- Partnerships with Southwest Airlines and FedEx
- Government bonds for \$245 million recently approved
- Groundbreaking summer 2018
- Scheduled for startup 2020



Former INEOS Bio

Vero Beach, Florida

- History
 - 2011: groundbreaking
 - 2012: construction complete
 - 2012: commissioning begins
 - 2013: first ethanol production
 - 2013: extended modification begins
 - 2014: restart plant
 - 2016: announced for sale
 - 2018: Frankens Energy purchases
- New Life
 - “Eco district”
 - Green power production
 - Recycle of materials from local industry
- Does not appear to any longer be gasification-based



New Planet Energy

- Original plan at Stony Point, New York
 - 4500 ton/day MSW
 - 20 million gallons diesel
- Project has been stopped for reconsideration
- Lack of local support...



www.nonewplanetenergy.org

Protect Stony Point, Rockland, and the Hudson! Stand-up for our sustainable future. Protect our environment--NOW.

NO New Planet Energy (NOPE)

NO Garbage Gasification (NOGAG)

The nation's largest plant to turn garbage into flammable and explosive fuel is proposed for the Hudson River floodplain in Stony Point.

We oppose this plant due to its bad environmental and community impacts:

MASSIVE GARBAGE TO GAS (GAG) FACILITY NEAR SCHOOL, RESIDENTIAL AREAS, HOSPITAL: This new kind of GAG processing plant and the planned rezoning would allow heavy industry, toxic emissions, hundreds of trucks, and toxic trains to enter our communities every day filled with putrid garbage near schools, homes, shopping centers, and health facilities. **No New York City garbage to gas plant in Rockland County.**

HAZARDOUS EMISSIONS & GREENHOUSE GASES: According to the company, locally, the facility would emit dangerous greenhouse gases yearly: over 69,000 tons of Carbon Dioxide, 69 tons of Nitrous Oxide and 10.5 tons of other hazardous air pollutants classified as potentially carcinogenic. **No to increased emissions.**