

## ATTACHMENT D: Biofuel Specification

### Biofuel Fuel Specification\*

Property	Test Method	Units	Min Value	Max Value
Viscosity, max.	ISO3104	mm <sup>2</sup> /s @40°C		100
Injection viscosity, min.		mm <sup>2</sup> /s	1.8 – 2.8	
Injection viscosity, max.		mm <sup>2</sup> /s	24	
Density, max.	ISO3675 or 12185	kg/m <sup>3</sup> @ 15°C		991
Ignition properties	FIA test			
Sulfur, max.	ISO8754	% m/m (ppm)		0.0015 (15)
Total sediment existent, max.	ISO10307-1	% m/m		0.05
Water, max. before engine	ISO3733	% v/v		0.20
Micro carbon residue, max.	ISO10370	% m/m		0.50
Ash, max.	ISO6245/LP1001	% m/m		0.05
Phosphorous, max.	ISO10478	mg/kg (ppm)		.002 (2)
Silicon, max.	ISO10478	mg/kg		15
Alkali content (Na + K), max.	ISO10478	mg/kg		30
Flash point (PMCC), min.	ISO2719	° C	60	
Cloud point, max.	ISO3015	° C		**
Cold filter plugging point, max.	IP309	° C		**
Copper strip corrosion (3 hrs @ 50°C), max.	ASTM D130	Rating		1b
Steel corrosion (24/72 hrs @ 20, 60 and 120°C), max.	LP2902	Rating		No signs of corrosion
Acid number, max	ASTM D664	mg KOH/g		15.0
Strong acid number, max.	ASTM D664	mg KOH/g		0.0
Iodine number, max.	ISO3961	g iodine/100 g		120
Synthetic polymers	LP2401 ext. and LP3402	% m/m	Report	=
Esterification	EN14103	% mass	97.5	
Monoglycerides	D6584	% mass		0.8
Diglycerides	D6584	% mass		0.2
Triglycerides	D6584	% mass		0.2

\* The specifications for biofuel represent the minimum fuel requirements necessary. If any proposal(s) for biofuel is determined to be potentially feasible, Hawaiian Electric would engage in further discussions with the bidder to ensure that the fuel quality is acceptable

\*\* Cloud point and cold filter plugging point have to be at least 10°C below fuel injection temperature