Table I: Technical Targets for Catalyst Coated Membranes (CCMs): Automotive

All targets must be achieved simultaneously

Characteristics	Units	Calendar year		
		2002 status[a]	2005	2010
Membrane Areal Resistance in cell, operating temperature	Ω-cm^2	0.1	0.1	0.1
RT	Ω-cm^2	0.07	0.07	0.07
-20^o C	Ω-cm^2	0.01	0.01	0.01
Cost[b]	$/kW	200	100	10
Operating Temperature	^{o}C	80	120	120
Durability	hours	1000[d]	>4000[e]	>5000[f]
Survivability[c] temperature - lower upper	^{o}C	–20 ?	–30 175	–40 200
Total catalyst loading (both electrodes)	mg/cm^2 g/kW(peak)	0.8 2	0.4 0.5	0.1 0.08
Performance @ 0.25 power (0.8V)	mA/cm^2 mW/cm^2	125 100	250 200	400 320
Performance @ full power	mW/cm^2	400	800	1280
Extent of Performance degradation over lifetime	%	10	10	10
CO tolerance (steady state—w/o air bleed)[g]	Ppm	100	2000	5000
Recoverability CO (transient)[g]	Ppm	500	10000	10000
Thermal cyclability in presence of condensed water		yes	yes	yes

Notes:

a) Status is present day 80^{o}C unless otherwise noted; targets are for new membranes/CCMs
b) projected to mass manufacturing, 500,000 stacks
c) Indicates temperature from which bootstrapping stack must be achieved
d) Continuous operation
e) Includes thermal cycling
f) Includes thermal and realistic driving cycles
g) CO tolerance requirements assume capability of fuel processor to reduce CO. Targets for the stack CO tolerance are subject to trade-offs between reducing CO in the fuel processor and enhancing CO tolerance in the stack. It is assumed that H_2S is removed in the fuel processor