Supplementary Information:

A Scientific Approach for Environmental Analysis: An Asynchronous Electric Motor Case Study for Stand-by Applications

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Table S1. Brief description of ReCiPe midpoint indicators.

ID	Indicator Name	Acronym	Dimensional Unit	Description
1	agricultural land occupation	ALOP	m^2 - year	Amount of agricultural land occupied for a certain time
2	climate change	GWP_{100}	kg CO_2 - Eq	Assessment of global temperature increases because of greenhouse gas emissions
3	fossil depletion	FDP	kg oil - Eq	Reduction of fossil caused by primary extraction
4	freshwater ecotoxicity	$FETP_{inf}$	kg 1,4-DCB - Eq	Toxic effects of chemicals on freshwater causing biodiversity loss
5	freshwater eutrophication	FEP	kg P - Eq	Excessive discharge of nutrients into freshwater
6	human toxicity	HTP_{inf}	kg 1,4-DCB - Eq	Toxic effects of chemicals on human health
7	ionising radiation	IRP_{HE}	kg U235 - Eq	Effect on human health of ionising radiation (radioactivity)
8	marine ecotoxicity	$METP_{inf}$	kg 1,4-DB - Eq	Equivalent toxic substances' impact on the marine ecosystem
9	marine eutrophication	MEP	kg N - Eq	Reaction of a marine ecosystem to an excessive availability of limiting nutrients
10	metal depletion	MDP	kg Fe - Eq	System demand for primary metal
11	natural land transformation	NLTP	m^2	Amount of natural land transformed and occupied
12	ozone depletion	ODP_{inf}	kg CFC-11 - Eq	Thinning of ozone layer caused by the release of chemical compounds
13	particulate matter formation	PMFP	kg PM10 - Eq	Adverse impacts on human health caused by emissions of Particulate Matter (PM10)
14	photochemical oxidant formation	POFP	kg NMVOC - Eq	Air pollutants formed by the action of sunlight on nitrogen oxides and reactive hydrocarbons
15	terrestrial acidification	TAP_{100}	kg SO2 - Eq	Changes in soil chemical properties following the deposition of nutrients in acidifying forms
16	terrestrial ecotoxicity	$TETP_{inf}$	kg 1,4-DCB - Eq	Effects of a chemical substance on terrestrial organisms and terrestrial plants
17	urban land occupation	ULOP	m^2 - year	Level of spatial accumulation of activities for a certain time
18	water depletion	WDP	m^3 water - Eq	Depletion of available water from lakes, rivers, or groundwater caused by industrial activities

Table S2. Activities directly associated with Ecoinvent Database.

LCI phase	Activity	ECOINVENT ASSOCIATION (v.3.9)
Materials	Cast Iron	market for cast iron (GLO)
	Aluminium, primary, ingot	market for aluminium, primary, ingot (RoW)
	Copper	market for copper, cathode (GLO)
	Steel, low-alloy	market for steel, low-alloy (GLO)
	Polyethylene, low density	market for polyethylene, high density, granulate (GLO)
	Cable Material	-
	Material Mix	market for steel, low-alloy (GLO)
	Epoxy resin, liquid	market for epoxy resin production, liquid (RoW)
	Extrusion, plastic film	market for extrusion, plastic film (RoW)
Manufacturing	Sand Casting	-
	Die Casting	-
	Forging	market for forging, steel (GLO)
	Laser Cutting	laser machining, metal, with CO2-laser, 4000W power (GLO)
	Hot rolling	market for hot rolling, steel (GLO)
	Cold rolling	market for sheet rolling, steel (GLO)
	Wire drawing	market for wire drawing, copper (GLO)
	Bending	-
	Turning	market for steel removed by turning, average, conventional (GLO)
	Drilling	market for steel removed by drilling, conventional (GLO)
	Milling	market for steel removed by milling, average (GLO)
	Injection Moulding	market for injection moulding (GLO)
	Deep Drawing	market for deep drawing, steel, 3500 kN press, single stroke (GLO)
	Cable manufacturing	-
	Mix manufacturing	market for sheet rolling, steel (GLO)
	Primer Painting	-
	Epoxy Painting	-
	Finishing Painting	-

Table S3. Activities (user-defined processes) modeled with Ecoinvent Database.

LCI phase	Activity	ECOINVENT ASSOCIATION (v.3.9)
Materials	Cast Iron	-
	Aluminium, primary, ingot	-
	Copper	-
	Steel, low-alloy	-
	Polyethylene, low density	-
	Cable Material	market for cable, unspecified (GLO)—Extraction of Material Breakdown
	Material Mix	-
Manufacturing	Sand Casting	market group for heat, central or small-scale, natural gas (GLO)—Energy Flow Associated with Activity market group for electricity, high voltage (GLO)—Energy Flow Associated with Activity
	Die Casting	market group for heat, central or small-scale, natural gas (GLO)—Energy Flow Associated with Activity market group for electricity, high voltage (GLO)—Energy Flow Associated with Activity
	Forging	-
	Laser Cutting	-
	Hot rolling	-
	Cold rolling	-
	Wire drawing	-
	Bending	market group for electricity, high voltage (GLO)—Energy Flow Associated with Activity
	Turning	-
	Drilling	-
	Milling	-
	Injection Moulding	-
	Deep Drawing	-
	Cable manufacturing	market for cable, unspecified (GLO)—Extraction of Manufacturing Stage
	Mix manufacturing	-
	Primer Painting	Primer—InterZinc 52—Modeling associated with specific datasheet
	Epoxy Painting	Intermediate—Intergard 475HS MIO—Modeling associated with specific datasheet
	Finishing Painting	Finishing—Interthane 990—Modeling associated with specific datasheet

Table S4: Table showing 10 out of all 18 ReCiPe impact category outcomes for each AEM's components.

Sub-Assembly/Components		ReCiPe Midpoint (H) 1.13									
		FEP	**IRPHE**	**METPinf**	**NLTP**	**ODPinf**	**PMFP**	**POFP**	**TAP100**	**TETPinf**	**ULOP**
		kg P - Eq	kg U235 - Eq	kg 1,4-DB - Eq	m2	kg CFC-11 - Eq	kg PM10 - Eq	kg NMVOC - Eq	kg SO2 - Eq	kg 1,4-DCB - Eq	m2 - year
STATOR	Stator Core Laminations	0.11	18.47	11.52	-0.02	0.0000075	0.74	0.95	0.83	0.02	2.32
	Wirings—Filaments	0.69	12.43	307.70	-0.10	0.0000048	2.02	1.64	6.69	0.24	12.64
	Wirings—Insulation	0.00	0.27	0.09	0.00	0.0000005	0.01	0.01	0.01	0.00	0.03
ROTOR	Rotor Squirrel Cage	0.05	2.39	1.81	-0.01	0.0000037	0.35	0.48	0.72	0.00	0.90
	Rotor Core Laminations	0.05	9.27	5.28	-0.01	0.0000034	0.33	0.43	0.39	0.01	1.04
	Rotor Shaft	0.03	3.81	3.99	-0.01	0.0000028	0.25	0.32	0.26	0.02	1.53
	Key Shaft	0.00	0.02	0.02	0.00	0.0000000	0.00	0.00	0.00	0.00	0.00
	Fan	0.01	2.25	0.30	0.00	0.0000011	0.07	0.09	0.08	0.00	0.18
	Fan Clamps	0.00	0.01	0.01	0.00	0.0000000	0.00	0.00	0.00	0.00	0.00
FRAME	Electric Motor Case	0.08	17.49	2.54	-0.01	0.0000084	0.55	0.67	0.65	0.02	1.46
	Flange Drive End Shield	0.06	12.99	1.97	-0.01	0.0000063	0.41	0.50	0.49	0.02	1.14
	Non Drive End Endshield	0.04	8.95	1.25	-0.01	0.0000043	0.28	0.34	0.33	0.01	0.72
	Terminal Box	0.01	2.44	0.38	0.00	0.0000012	0.08	0.09	0.09	0.00	0.22
	Grease Fitting	0.00	0.01	0.00	0.00	0.0000000	0.00	0.00	0.00	0.00	0.00
	Grease Fitting Protection	0.00	0.00	0.00	0.00	0.0000000	0.00	0.00	0.00	0.00	0.00
	Bearing Drive End Shield	0.00	0.56	0.47	0.00	0.0000004	0.03	0.04	0.03	0.00	0.15
	Bearing Non Drive End Endshield	0.00	0.56	0.47	0.00	0.0000004	0.03	0.04	0.03	0.00	0.15
	Fan Cover	0.02	2.84	1.60	-0.01	0.0000020	0.16	0.22	0.17	0.02	0.90
	Drip Cover	0.01	0.93	0.35	0.00	0.0000007	0.07	0.09	0.07	0.00	0.20
MIX	Cables	0.07	1.46	33.03	-0.01	0.0000006	0.22	0.18	0.73	0.03	1.38
	Miscellaneous (Gaskets, Screws, etc.)	0.00	0.33	0.41	0.00	0.0000002	0.02	0.02	0.02	0.00	0.07

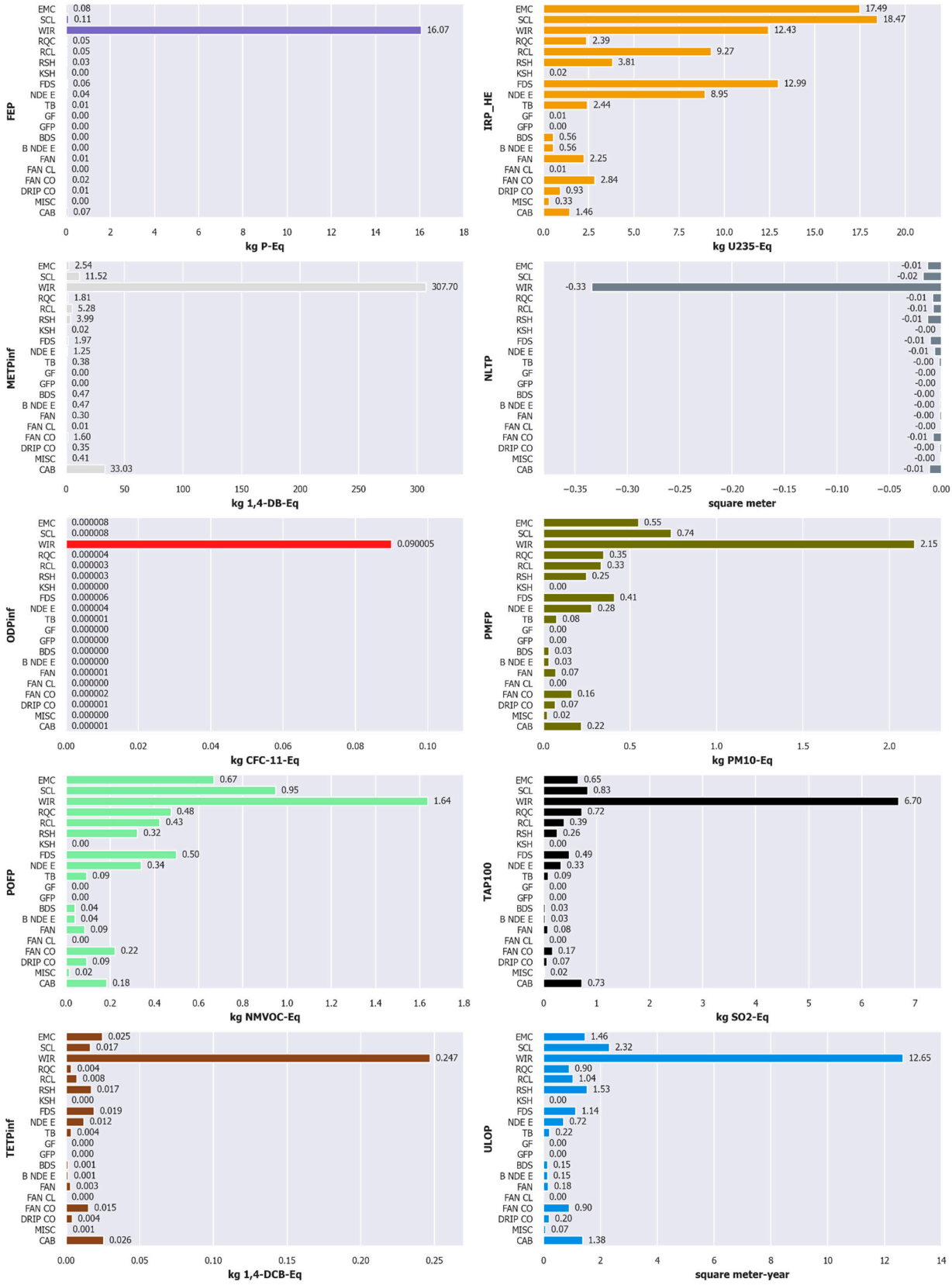

Figure S1. ReCiPe impact category outcomes of AEM's components.