Electric Future for Transport

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IDTechEx has offices across the world

It provides events, consultancy and publications on electric vehicles, energy harvesting, printed electronics and allied subjects

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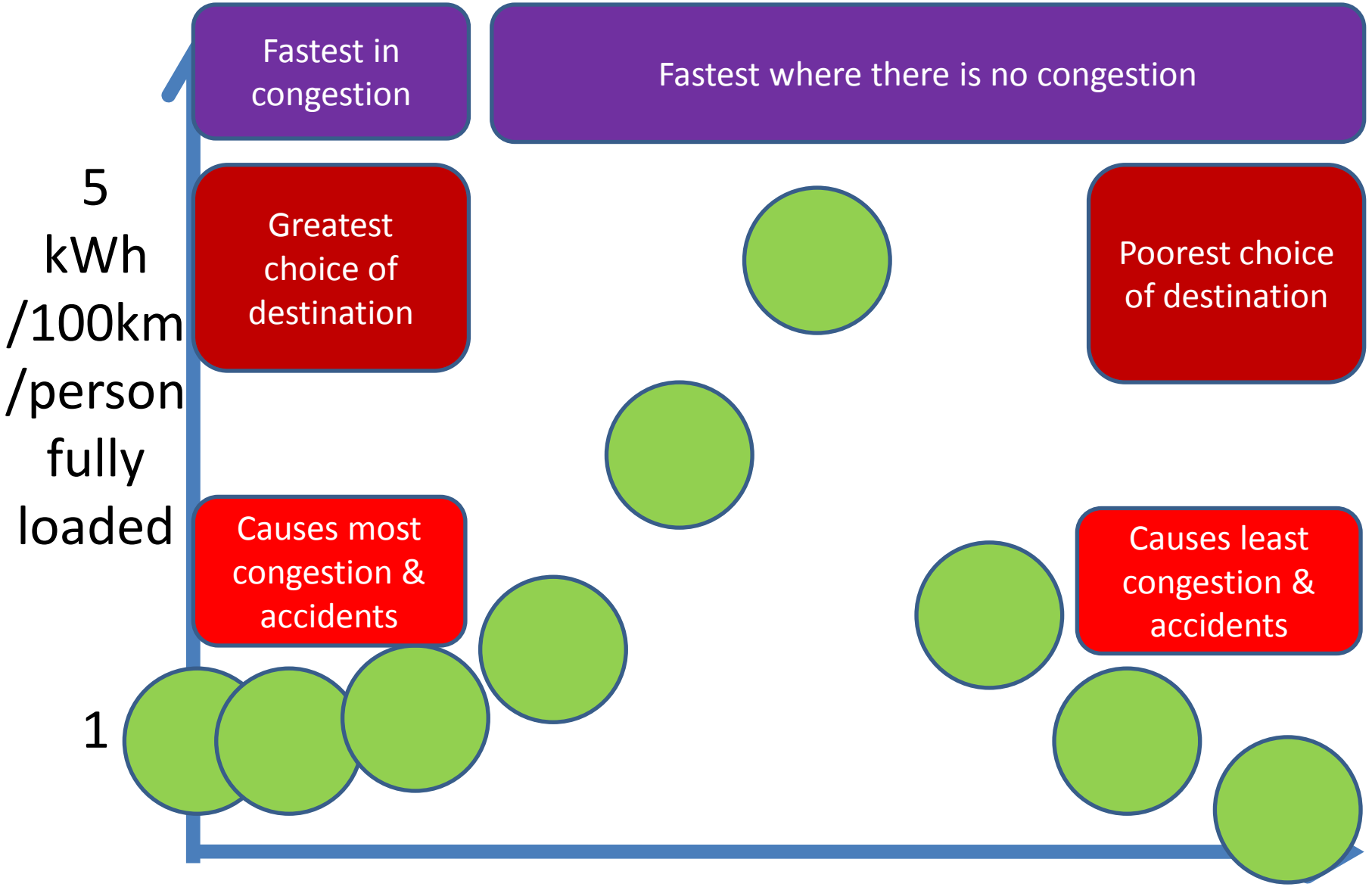

Fastest in congestion
Fastest where there is no congestion
5 kWh /100km /person fully loaded
Greatest choice of destination
Poorest choice of destination
Causes most congestion & accidents
Causes least congestion & accidents
1
Bike Scooter Mbike Microcar Midcar Largecar Smallbus Midbus Largebus

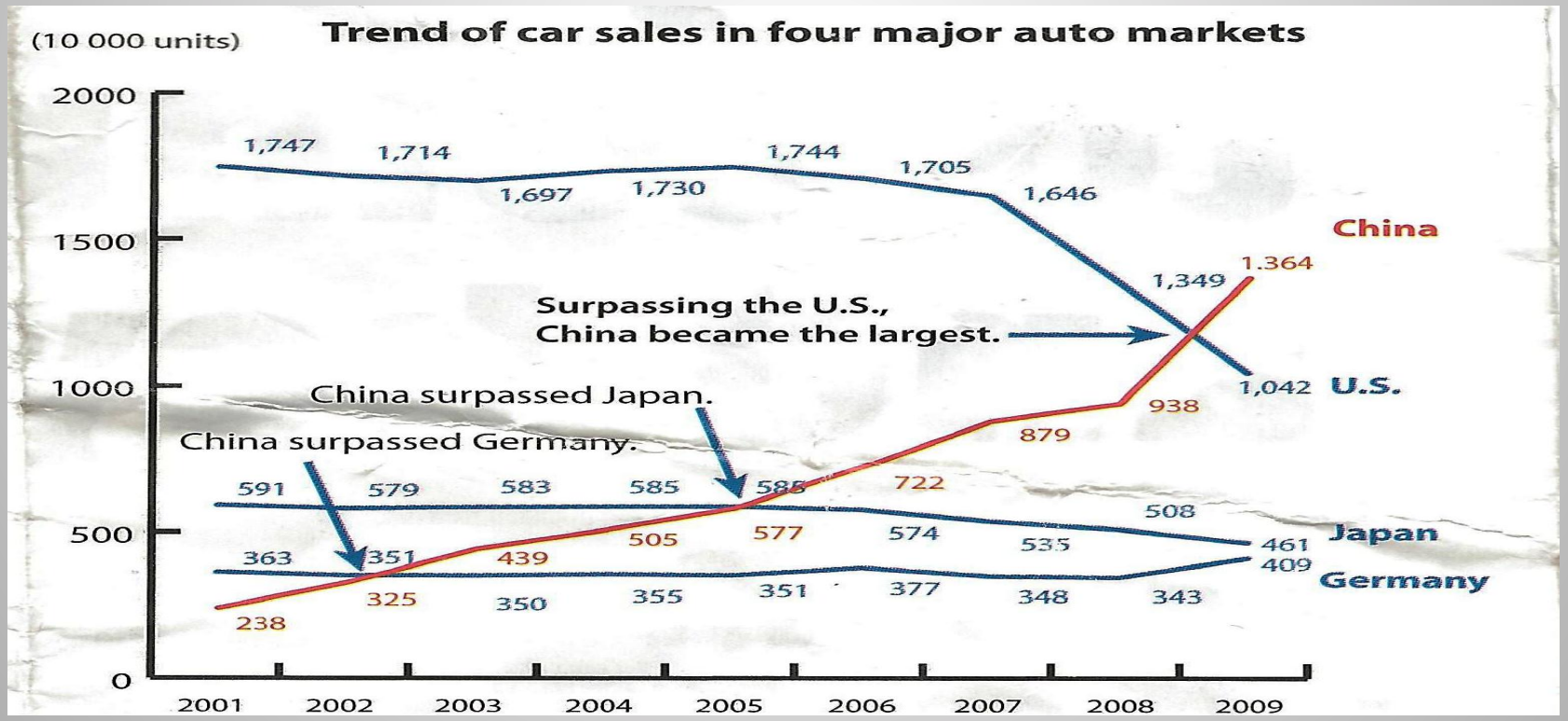
Peak car

Car registrations have peaked in many cities

Sydney becomes car free by 2020

New Zealand gave 2000 postmen ebikes

“Young people cannot use a mobile phone while driving”



Other challenges

- China can never build enough roads and parking for cars. It must prioritise subways, trains and buses
- Malaysia and parts of China banning e-bikes because of accidents and congestion
- Government support could be suddenly withdrawn and destroy the electric car industry – it happened in Japan, UK and Spain with solar panels on houses

What EVs are successful

Most attention is given to electric cars but

- More than half the market value is – and will remain - in other electric vehicles
- Increasingly, the same companies make many types of hybrid and pure electric EV.
- The world's largest electric vehicle business is $23 billion in Toyota - electric forklifts, buses, cars etc and shares the knowhow
- In ten years, most buses will be EVs but no more than 10% of cars will be EVs

Electric vehicles EVs can be pure electric or hybrid

Pure electric EVs drive the wheels/propellers with electricity all the time, usually from a battery

Hybrid EVs have another source of traction power on board –

First generation HEV has a conventional internal combustion engine – diesel or gasoline

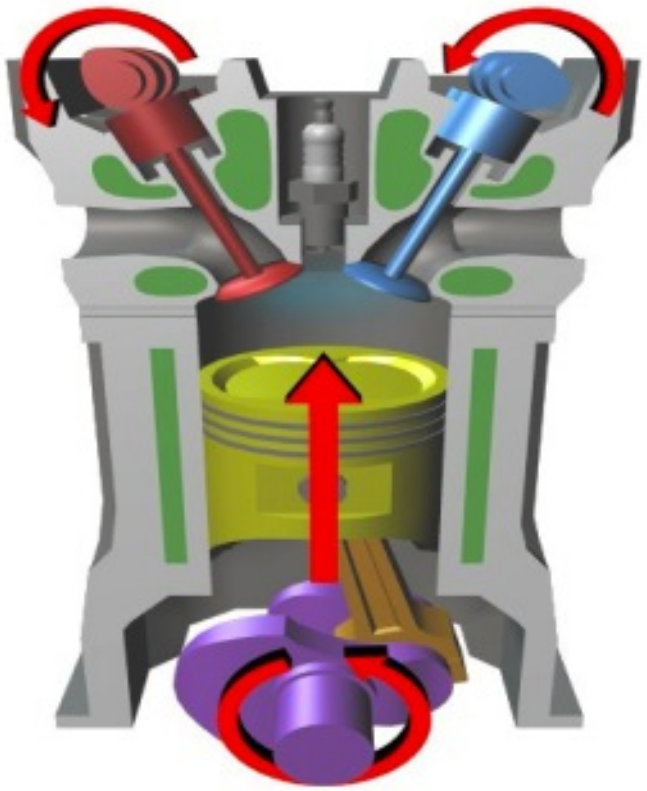
Second generation HEV has a smaller, simpler piston ICE designed to purpose

Third generation HEV has a non ICE “range extender” that is better/ cheaper eg mini gas turbine or fuel cell

Hybrid electric vehicles will gradually become more like pure electric vehicles

Small battery

Electric motor



Large battery

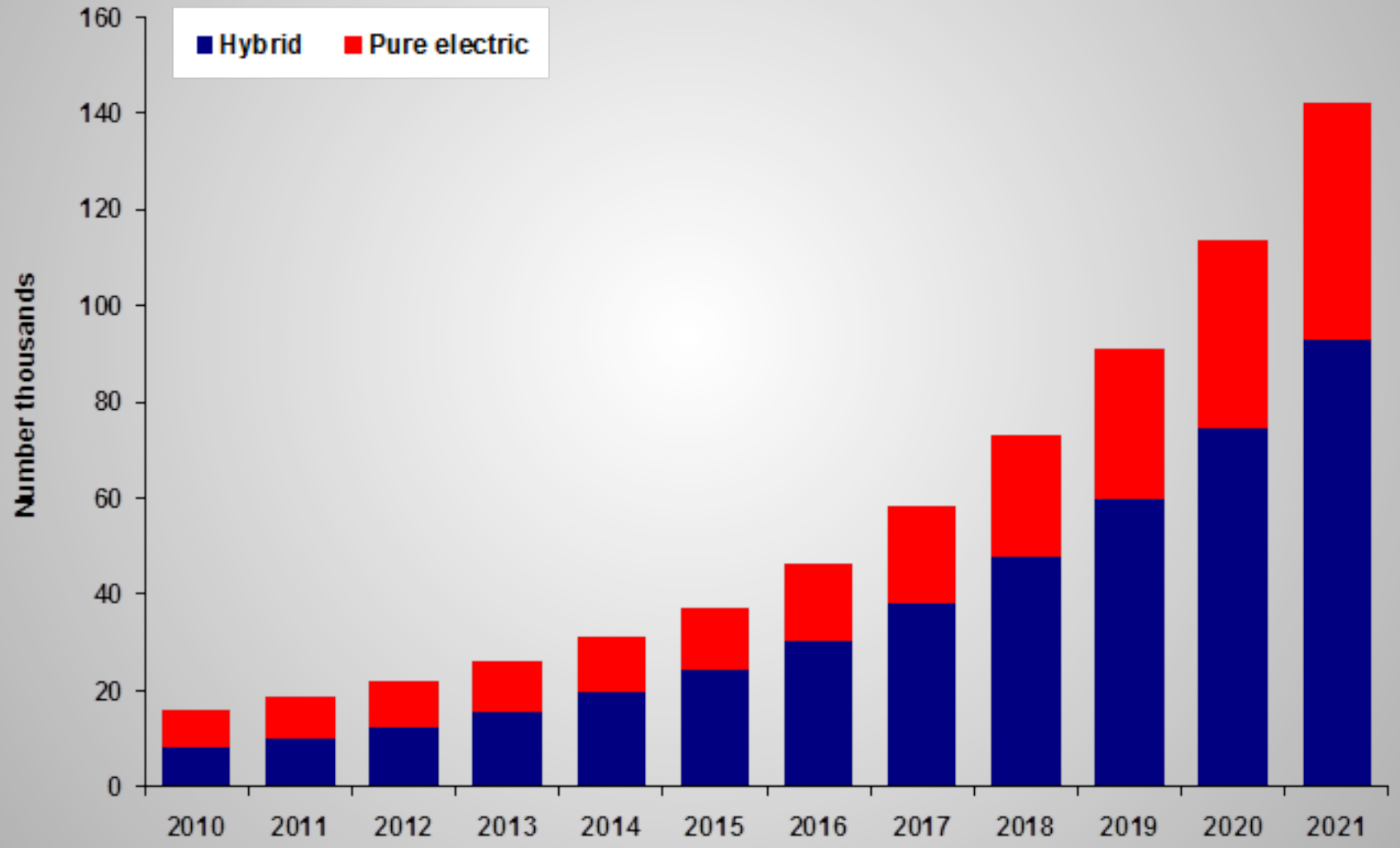
Electric motors

Electric motors

Small range extender such as a mini turbine burning many fuels

Replacing diesel and gasoline

Global electric bus market © IDTechEx

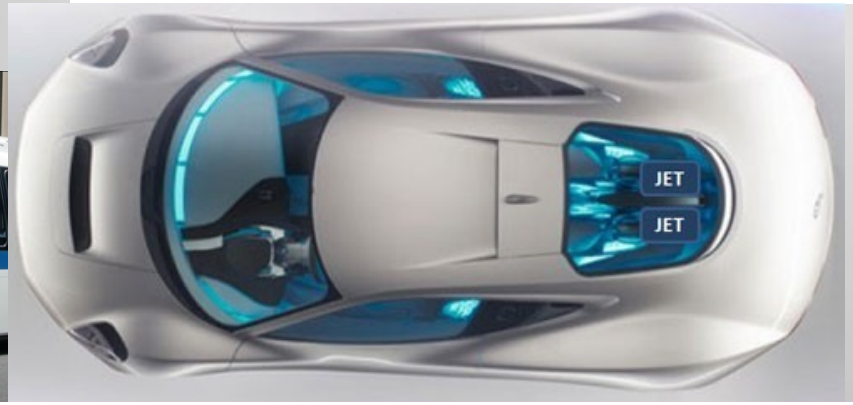


Replacing kerosene and diesel in aircraft

EVs replace oil with

Electricity from sunshine on the vehicle

Hydrogen for fuel cells



Wide choice of liquid fuels for mini turbines

Challenges

Traction batteries – Cost (up to 50% of cost), energy storage = range – 160-240 km today - safety, life

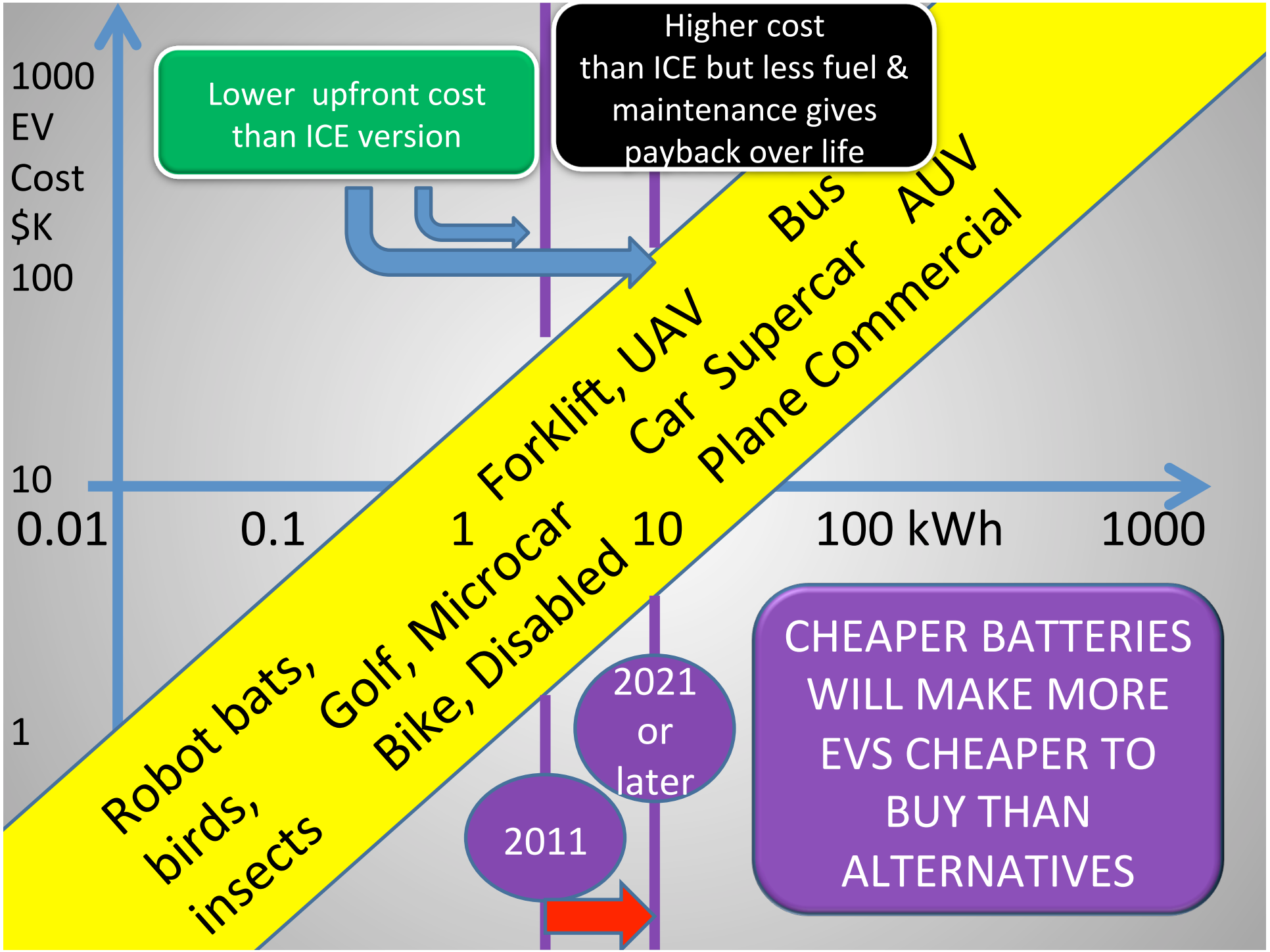
Traction motors – move to no magnets, some in-wheel

Electronic controls including battery management Systems BMS – move to printed electronics

Range extenders – cost, life, performance, start up time

Energy harvesting – photovoltaic, thermoelectric, electrodynamic, piezoelectric – cost, life, performance

Electrodynamic includes regenerative braking, shock absorbers, active suspension, plane soaring/ descending/ landing, boat sailing – propeller in reverse or hydroturbine


1000
EV
Cost
$K
100
10
1
0.01
0.1
1
10
100 kWh
1000
Lower upfront cost than ICE version
Higher cost than ICE but less fuel & maintenance gives payback over life
Robot bats, birds, insects
Golf, Microcar
Bike, Disabled
Forklift, UAV
Car
Supercar
Bus
AUV
Plane
Commercial
2011
2021 or later
CHEAPER BATTERIES WILL MAKE MORE EVS CHEAPER TO BUY THAN ALTERNATIVES

When will EVs meaningfully take over?
Global market penetration in numbers %

TYPE	2011	2021	2031
Heavy Industrial indoor	100	100	100
Heavy industrial outdoor	<1	30	80
Light Industrial/ Commercial	<1	5	40
Buses	10	30	80
Two Wheel	20	30	50
Disabled	100	100	100
Car	3	15 30 at best	50 90 at best
Golf Car	70	100	100
Marine	<1 (100 for underwater)	15	30 50 at best
Aircraft	<1	20	80

For more …..

Choose from 18 IDTechEx reports on EVs and their key components eg

"Electric Buses and Taxis 2011-2021"

"Electric Vehicle Industry Profitability 2012: Where, Why, What Next?"

Read the free

Attend "Electric Vehicles Land, Sea, Air" San Jose California March 27-28