

Mitsubishi Outlander PHEV

(or Plug-in Hybrid Electric Vehicle)

Think forward - Drive forward

**The first self-power generating
Twin Motor (permanent) 4WD
Plug-in Hybrid Electric Vehicle**

Data subject to final EU homologation

Features availability may vary according to market and model

- Summary -

- ❖ **AT a GLANCE**
- ❖ **BACKGROUND** **From i-MiEV to Outlander PHEV**
- ❖ **ARCHITECTURE** **No compromise**
- ❖ **MODUS OPERANDI** **Automatic**
- ❖ **REAL LIFE** **Long haul**

TECHNICAL SPECIFICATIONS (see separate file)

AT a GLANCE

I - Timing:

- October 2009: First preview through Concept-PX MiEV @ Tokyo Motor Show
- November 2011: Second preview through Concept-PX MiEV II @ Tokyo Motor Show
- September 2012: World premiere @ Paris Motor Show
- December 2012: Order books opened in Europe
- January 2013: First market introduction (Japan)
- January 2013: Start of Production of J-spec. version
- August 2013: Start of Production of EU-spec. version
Production volume @ Okazaki plant doubled to 4,000 units/month (or nearly 50,000 units/year)
Successful entry in the 2013 Asia Cross Country Rally
- October 2013: First EU market introductions (The Netherlands, Nordic countries,...)
- December 2013: 10,000+ orders in Europe - launch to be continued over H1 2014

II - Highlights:

- **Self-charging** “Twin motor 4WD” crossover with EV-based architecture (drive-by-wire, no gearbox,...)
- **The first “Dual Design” car**, i.e.: designed from the outset for Internal Combustion Engines AND Plug-in Hybrid EV Technology
- **Best of:**
 - o **EV technology from i-MiEV** (zero tailpipe CO₂ emissions, maximum torque from standstill, quietness, smart automatic energy management,...)
 - o **4WD technology from Lancer Evolution** (all-weather active safety,...)
 - o **SUV convenience from Pajero/Montero/Shogun** (interior space & versatility, cargo volume, commanding driving position, ...)

- **Choice of petrol ICE over Diesel ICE** (global sales + packaging, weight saving, NVH,...)
- **No compromise packaging** (from 463 l cargo volume,...):
- **High level of safety:**
 - o Permanent Twin Motor (electric) 4WD + Super-All Wheel Control system + low center of gravity + 55/45 weight distribution
 - o 5-star Euro NCAP rated
 - o Safety assist features
- **Automatic selection** of (alternative) Drive Modes, according to driving conditions
- **Multiple charging choice** (on-the-go, regenerating, charge mode, normal plug-in, quick plug-in)
- **Long haul** abilities (824 km driving range – all Drive Modes combined)
- **Low impact** (44 g/km – 1.9 l/100 km)
- **Award recipient** - “2014 RJC Technology of the Year” and “Innovation Award – 2013/2014 Car of the Year Japan” in its home market.

III – Product overview:

- **Layout:**
 - o At the front:
 - Electric motor + inverter (60 kW/82 ps - 137 Nm)
 - Electric generator
 - 2.0 liter MIVEC DOHC petrol engine (89 kW/121 ps - 190 Nm)
 - Power Drive Unit
 - o In the middle, under the floor:
 - 12 kWh, 80 cells, 300 V Lithium-Ion air-cooled battery pack
 - 45 l fuel tank (vs. 60 l for Outlander ICE 4WD)
 - o At the rear:
 - Electric motor + inverter (60 kW/82 ps - 195 Nm)
 - Rear Motor Control Unit
- **Advanced Operating System** (« PHEV OS »), developed from the « MiEV OS » of i-MiEV

	Pure EV Mode	Series Hybrid Mode	Parallel Hybrid Mode
Max. energy from Battery (to Fr & Rr Motors)	up to 60 kW (split between front & rear motors)	up to 60 kW (split between front & rear motors)	up to 60 kW (split between front & rear motors)
Max. energy from Generator (to Battery via ICE)	0	up to 60 kW (battery charging 3 to 10 mn activation)	up to 60kW
Max. energy from ICE (to front wheels)	0	0	up to 89 kW

NB : The Outlander PHEV power system never runs at max. output of all its various elements as the PHEV OS will always look for the best combination of Drive Modes - and therefore power source - according to driving conditions. As a result, there is no such concept as « maximum total output ».

- **Three available Drive Modes - automatically activated by the PHEV OS :**

- « Pure EV Mode » (up to 120 km/h - where legal)
 - Car powered by front & rear motors (i.e. permanent electric 4WD)
 - Energy sourced from battery

- « Series Hybrid Mode »
 - Car still powered by front & rear motors (i.e. still permanent electric 4WD)
 - ICE engaged to run generator, to charge battery on-the-go
 - Automatically activated - for 3-10 mn max.
 - Speed above 120 km/h (where legal)
 - Sudden power demand (above 60 kW)
 - System bias to switch back to Pure EV Mode as often/soon as possible
 - ICE also punctually activated to keep catalytic converter in optimum condition

- « Parallel Hybrid Mode »
 - Car powered by ICE (to front wheels via Multi-Mode front Power Drive Unit)
 - Front & Rear motors to assist ICE (i.e. still permanent electric 4WD)
 - Automatically activated above 120 km/h*
 - *Depending on state of charge level.
 - System bias to switch back to Series hybrid Mode (or Pure EV Mode below 120 km/h) as often/soon as possible
 - ICE also engaged to charge through generator, using surplus torque

- **Multiple charging choice :**
 - Automatic « on-the-go » charging, in « Series Hybrid » and « Parallel Hybrid » Modes

 - Standard on-board dual plug-in charger for :
 - Normal charging (± 5 hours for 100% charge - 230V – 10 A)
 - Quick charging (± 30 mn for 80% charge)

 - « Battery Charge Mode »:
 - Driver-activated (switch on center console)
 - Autonomous self-charging through ICE
 - Handy when no external power source is available (outdoor activities,...).
 - Can also be activated when the vehicle is stationary
 - Can recover 80% charge in ± 40 mn

 - Regenerative Braking (cannot be controlled when Adaptive Cruise Control (ACC) is active.
 - Activated either when lifting off accelerator pedal or when braking
 - Degree of regeneration controlled by driver :
 - « B » position on shifter with two selectable levels
 - Six incremental steps through steering wheel-mounted paddles

- **Additional EV features :**
 - « Battery Save Mode » :
 - Driver-selected to switch to « Series Hybrid Mode » or « Parallel Hybrid Mode » to save on electricity, allowing to later enter CO₂-restricted city centers or quiet residential areas, or simply to enjoy nature in full silence.

- Remote monitoring through dedicated WiFi smartphone app (available in Europe through the App Store, Google Play, or the Mitsubishi Remote Control Website: http://www.mitsubishi-motors.com/en/products/outlander_phev/app/remote/)
 - « Acoustic Vehicle Alerting System » (« AVAS ») to warn pedestrians
 - Electric hot water-powered heater.
 - Illuminated twin charge port (regular and quick) recess behind lid - with charging indicator (on/off lamp) and energy level gauge show charging status and level.
 - 5 m standard charging cable with heat insulation, GND OPEN detector features and safety gauge.
 - PHEV system designed to support long-term Vehicle-to-Grid (V2G) smart grid protocol – not available in Europe yet.
- **Unique Twin Motor 4WD drivetrain :**
- No gearbox
 - Permanent 4WD from independent front and rear motors
 - Drive-by-wire 4WD operation, controlled by PHEV Operating System
 - Multi-Mode Power Drive Unit-activated front wheels in « Parallel Hybrid Mode »
 - Optimal Fr/Rr torque split
 - Lancer Evolution-derived S-AWC («Super All Wheel Control») to improve driving stability and handling precision - « 4WD LOCK » function available.
 - Under-floor mid-mounted battery pack helps with low(er) center of gravity (- 30 mm vs. Outlander ICE) and excellent Fr/Rr weight distribution (55% - 45%).
- **SUV versatility :**
- Commanding driving position
 - Minimum ground clearance : 190mm
 - Towing capacity (braked): 1,500 kg un-restricted.
- **Further development of Outlander architecture :**
- Improved body rigidity
 - Re-tuned suspension for improved ride comfort, stability and NVH
 - 4.0 mm thick front door glass
 - Sound-proof windshield glass
 - Better noise insulation (wind noise, road noise,...)

- **Premium safety :**

- Impact :
 - Reinforced underbody construction (Supporting the extra weight of the drive battery and additional on-board motor, delivering the superior quietness and advanced driving comfort that drivers have come to expect from a PHEV)
 - Four-member battery frame directly connected to the chassis
 - Battery pack safely located under the floor, within the wheelbase
 - 5-star Euro NCAP rated

- Traction battery :
 - Cooling unit, operated through an independent unit (air cooled)
 - Four-member battery frame directly connected to the chassis,
 - New sealed drive battery pack construction
 - Rigid sheet metal and solid frame-weld construction battery pack tray
 - Protective battery pack tray coating

- Safety Assist:
 - Acoustic Vehicle Alerting System (“AVAS”) to warn pedestrians
 - Forward Collision Mitigation system (“FCM”)
 - Lane Departure Warning system (“LDW”)
 - Adaptive Cruise Control system (« ACC »)

- **No compromise**

- Minimum impact :
 - 44 g/km – tailpipe CO₂ emissions
 - 1.9 l/100 km

 - Maximum usability :
 - 52 km range minimum / 120 km/h maximum (where legal) in « Pure EV Mode »
 - 824 km of total range (all Modes)*
 - 1,500 kg braked towing capacity (un-restricted usage)
 - Similar cargo space as Outlander ICE (463 l or only 14 liters less vs. 5-seater)
 - Similar interior space as Outlander ICE
- *measured as per EU homologation

IV – Design & Features*

- The PHEV look...:

- Specific “Technical Silver” color (i.e. metallic glacier blue)
- Specific 18” alloy wheels
- Specific chromed upper and mid front grille
- Color-keyed lower body (bumpers and sills)
- Chromed door handles
- Clear LED rear combination lamps
- Charging hatch (right rear side)
- PHEV badging

- ... and feel:

- Joystick-type shifter
- Unique upholstery (incl. off-white leather)
- Unique accent trim (incl. “crystal fiber” look)
- High contrast instrument panel w/ power gauge and Multi-information PHEV display
- Mitsubishi Multi Communication (“MMCS”) display w/ PHEV functions
- Mitsubishi Remote Control - through dedicated smartphone app.

* Features availability may vary according to market and model

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.../...

V - Outlander PHEV vs. Outlander ICE:

	Outlander PHEV 4WD 5-seater	Outlander 2.0 CVT 4WD 5-seater	Outlander 2.2 DiD A/T 4WD 5-seater
Overall weight**	1,810 kg	1,490 kg	1,585 kg
Cargo volume (5-seater)**	463 l	477 l	477 l
Towing capacity (braked)**	1,500 kg	1,600 kg	2,000 kg

Output**	- ICE : 121 ps - F/motor : 82 ps - R/motor : 82 ps	150 ps	150 ps
Torque**	- ICE : 190 Nm - F/motor : 137 Nm - R/motor : 195 Nm	195 Nm	360 Nm
Range*	- EV : 52 km - Total : 824 km	895 km	1,035 km
Fuel cons. (combined)*	1.9 l/100 km	6.7 l/100 km	5.8 l/100 km
CO₂ emissions (combined)*	44 g/km	155 g/km	153 g/km
Max. speed (where legal)**	170 km/h	185 km/h	190 km/h
0 – 100 km/h**	11"0	12"6	11"7
120 – 140 km/h (where legal)**	6"5	7"2	7"4

*EU homologation

**MMC measured

BACKGROUND

From i-MiEV to Outlander PHEV

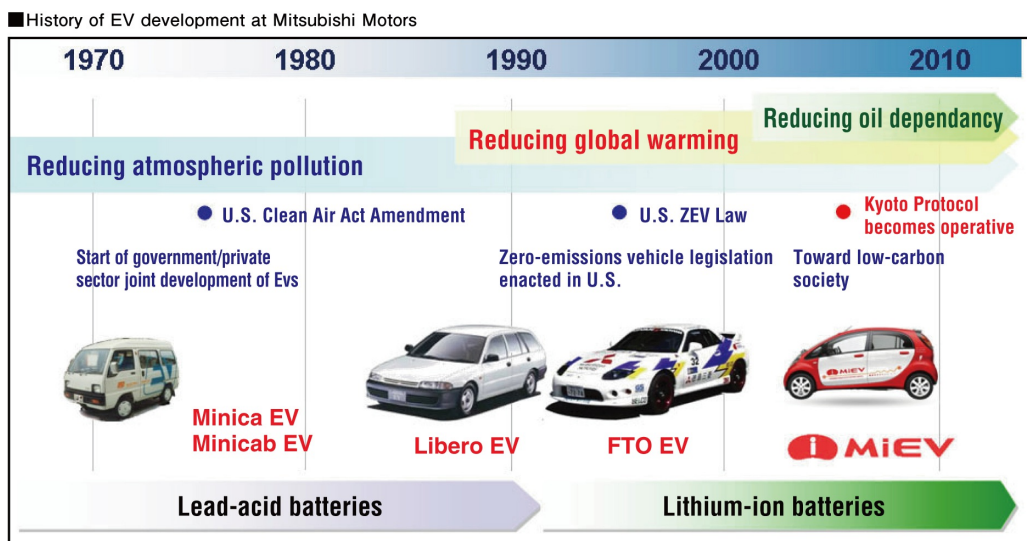
Previewed through two successive concept cars (Concept-PX MiEV in 2009 and Concept-PX MiEV II in 2011), Outlander PHEV is the latest in a long line of electric vehicles at Mitsubishi Motors and a natural evolution from the seminal i-MiEV 100% electric runabout.

1966...

As a reminder, work on the development and production of EVs at Mitsubishi started before Mitsubishi Motors was spun off from Mitsubishi Heavy Industries (MHI)* when MHI was commissioned in October 1966 to build EV prototypes and conduct testing programs using improved battery technology.

*In 1970, the automobile division of Mitsubishi Heavy Industries Ltd. was spun off to become today's Mitsubishi Motors Corporation

MHI joined hands with Mitsubishi Electric Corporation and Japan Storage Battery Co., Ltd. (GS Yuasa Corporation today) and started work on developing an EV designed as a city car and special-purpose service vehicle for the near future. After the completion of 10 prototypes in May 1971 the newly formed MMC delivered twelve E12-type electric vehicles, based on the Minivan production model) powered by lead-acid batteries.



This 1971 inaugural EV program that was followed by several others all laying the foundations for today's i-MiEV and Outlander PHEV and all consistent with the issues the world was then stumbling on:

- Air pollution in the 70's and 80's
- Global warming in the 90's and 2000's
- Energy security today

Fast forward to 2006 when the "i MiEV" R&D program was announced, becoming the tangible outcome of these forty years of extensive EV R&D and then to July 2009 when the final i-MiEV was officially launched after 500,000+ km of testing.

From thereon, MMC engineers and marketers could gather real-life customer data around the world to better apprehend their expectations and the next steps MMC should make to popularize EVs (driving range, etc,...).

Global reshaping

In this context, the role of the Japanese institutions shall be underlined as MMC's EV R&D efforts contribute to the ambitious objectives set to incorporate Japan by the Ministry of Economy, Trade and Industry (or "METI") in its "Next Generation Vehicle Strategy 2010" (<http://www.meti.go.jp/english/press/data/pdf/N-G-V2.pdf>), formulating Japan's new strategy for medium- to long-term actions that should be taken by auto and related industries and society in general.

Beyond. Mitsubishi Motors Corporation is rather well equipped to embrace the structural re-shaping affecting the global auto industry, whether geographical or environmental with its long-standing tradition of pioneering technologies and a presence in 160+ world markets,

From the specific demands of the newly emerging markets (affordable, robust yet contemporary vehicles) to the renewed interest of mature areas (down-sized / lighter / more fuel-efficient automobiles), MMC has pragmatically committed its engineering resources to satisfy these new needs, as highlighted in its "Jump 2013" business plan with clear targets (20% of EVs, HEVs and PHEVs by 2020,...).

Covering a wide spectrum, Mitsubishi Motors is engaged in a multitude of global solutions such as:

- Global platforms:
 - o B-Segment Global Small (Space Star***, ...)
 - o C/D-Segment Project Global* (ASX**, New Outlander, ...)
- Downsizing:
 - o Taking the Outlander crossover concept one notch below with the C-Segment ASX*
 - o Returning to the roots of the B-Segment with the clever 3710 mm long Space Star
- Weight reduction:
 - o Significant gains in all areas for the quieter, safer and better equipped New Outlander (about -100 kg max.) or Space Star (about – 120 kg vs. Colt)
- Fuel economy / Lower emissions:
 - o “Auto Stop & Go” made available to a wider range of models and powertrains
 - o Continuing refinement of MMC’s own highly efficient 4N13/4N14 Clean Diesel engines
 - o Further development of petrol engine architecture (New MIVEC engines available with New Outlander, Space Star)
- Alternative powertrains:
 - o Expansion of the Mitsubishi range of EVs
 - o Introduction of Mitsubishi’s EV-based Plug-in Hybrid technology (New Outlander, ...)

*New Outlander, Lancer & Lancer Evolution, Delica D:5, ASX**

***RVR” in some markets or “Outlander Sport” in the US.

*** “Mirage in the UK

Contributor

In the specific area of electric vehicles, Mitsubishi Motors Corporation takes the view that EV-based vehicles (EVs, HEVs, PHEVs) shall not be considered in isolation but as part of a wider eco-system where they would contribute to more responsible/efficient energy utilization as well as to healthier environment and life-style.

Joining forces with forward-thinking partners, MMC backs smart several green initiatives, such as :

- **Infrastructure promotion :**

MMC became one of the founding members of the CHAdeMO association (<http://www.chademo.com/indexa.html>) whose aim is to promote electric vehicles through technical improvements of quick chargers, standardization activities of charging methods and international extension of members' knowledge related to quick-charger installations.

Formally established on March 15th, 2010 CHAdeMO is a 230+ member strong global organization (as well as 30+ so-called "observers") including business entities and government bodies, such as automakers, electric utilities, charger manufacturers, charging service providers, and other supporting groups.

- **Technology R&D:**

o **MiEV House :**

First seen at the 2009 Tokyo Motor Show, the MiEV House is a concept for a "smart house" that tackles energy and global warming challenges by managing energy usage between the house itself, "smart appliances," EVs/PHEVs and "smart grids".

It all happens at the same time through EMS (Energy Management System - a smart interface turning EVs/P-HEVs on-board energy capacity into supplemental contributors to electric smart grids) and EIS (Electric Vehicle Integration System – to constantly monitors the residual charge in an EV/P-HEV traction battery and optimizes battery charging to match the owner's schedule for using her/his vehicle).

o **Wireless charging :**

WiTricity Corporation, IHI Corporation and Mitsubishi Motors Corporation have agreed to join forces to research and develop easily deployable electric vehicle wireless charging systems readily compatible with electric grids which will make life easier for EV users in the future.

Wireless charging systems allow transfer of energy from a source placed on or under the ground, to a vehicle equipped with an energy capture device. Charging occurs automatically when the vehicle is parked, with no physical contact between the vehicle and the charging source.

- **Solar power charging :**

In June 2011, Mitsubishi Electric & Electronics USA, Inc. (Mitsubishi Electric) and Mitsubishi Motors North America, Inc. (MMNA) today debuted a solar-powered charging station for electric vehicles at the MMNA headquarters in Cypress, California. The charging station is powered by 96, 175W photovoltaic modules from Mitsubishi Electric.

Mitsubishi Electric's solar panels are made with 100 percent lead-free solder, and have one of the higher sunlight-to-energy conversion ratios in the industry, adding to the project's efficiency and sustainability.

- **Demonstrator projects :**

Together with different partners, Mitsubishi Motors is also involved in high level EV pilot projects around the world (smart communities, monitoring, EV showcases,...).

Whether in :

- Estonia (supply of 507 i-MiEVs to the Estonian Government under Kyoto Protocol's « Green Investment Scheme »),
- Spain (« ZEM2ALL » project in Malaga),
- France (« Lyon Confluence» project in Lyon),
- Malta (« Life+» project),
- Russia (70 i-MiEVs used as official zero-emission commuters at the G20 Summit, etc.),
- Canada (country's largest Electric Vehicle project run with Hydro-Québec)
- United States (« University of California's Smart Grid Living Laboratory Project », etc.),
- Japan (« M-tech Labo » smart grid demonstration system at MMC's Nagoya plant, etc.),
- Etc,...

... just to name a few, these are the right sort of real-life demonstrators designed to preview the mid- to long-term large-scale introduction of energy conservation technologies and renewable energy as well as the dissemination of next-generation vehicles, such as its own range of electric cars (i-MiEV, Outlander PHEV, etc,...).

ARCHITECTURE

No compromise

After materializing its own 40+ years of EV development first with i-MiEV in 2009 (followed by « K-car » class electric LCVs for the Japanese domestic market), Mitsubishi Motors decided to set it sight on larger electric vehicles...

... More ambitious automobiles meant to take stock of the constrains of today's batteries (hence the **Plug-in Hybrid Electric** powertrain), while being suitable for long distance travelling with 5 passengers and their luggage (hence the **crossover** format) in complete safety (hence the **Twin Motor 4WD** drivetrain), all with the unique convenience of **automatic power generating on-the-go...**

MMC « Dual Design »

A unique proposition in the marketplace – and recognized as such in Japan with the “2014 RJC Technology of the Year” and “Innovation Award – 2013/2014 Car of the Year Japan” - the new Mitsubishi Outlander Plug-in Hybrid Electric Vehicle is neither an adaptation of an existing ICE-powered vehicle, nor a dedicated Plug-in Hybrid or Range-Extender EV showcase.

More challenging than either, it is rather a further variant of New Outlander – next to the petrol or Diesel ICE options - and developed as such from the start of the program – an engineering feat stemming from MMC's « Dual Design » philosophy whereby all-new Mitsubishi Motors architecture shall accommodate indifferently ICE and alternative (EV, HEV or PHEV) powertrains as well as the constrains of several charging possibilities, incl. the high voltage quick plug-in charging.

First of that new breed, Outlander is the first mainstream car from a major manufacturer envisaged from the outset with built-in provision for either Internal Combustion or Plug-in Hybrid Electric powertrains. As a result, only a modicum of updates were required for the PHEV variant:

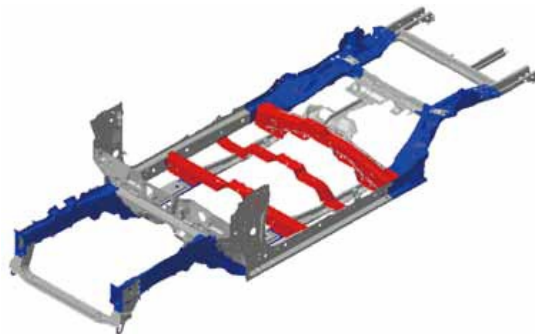
- **Packaging** :
 - o There are minimal differences in occupant and luggage space thanks to layout improvements including a rear-positioned fuel tank and slimmer under-floor-mounted drive battery.
 - o As a result, the cargo volume is only reduced by 14 liters (463 l vs. 477 l), the cargo floor is higher by an imperceptible 19 mm, the rear seat floor is higher by only 45 mm whilst the ground clearance is similar (190 mm) to that of the 2.2 DiD 4WD version.

- **Suspension:**

- The addition of rebound springs to reduce body control and further specific tuning improve ride comfort and stability.
- The rear suspension also features an extra anti-vibration bush and special newly designed cross-members that cut back on mechanical and road noise.

- **Body construction:**

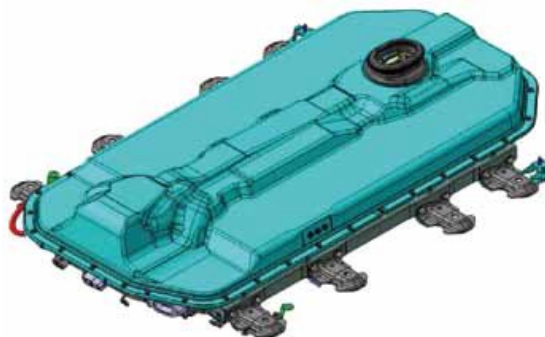
- Reinforced underbody construction to support the extra weight of the drive battery and additional on-board motor, delivering the superior quietness and advanced driving comfort expected from a PHEV:



- **Passive safety :**

Compared with the solutions employed for i-MiEV, Outlander PHEV enjoys the added benefits of:

- New sealed drive battery pack construction to allow the watertight battery pack meets demanding soft-riding standards.



- Metal battery pack tray made of rigid sheet metal associated to a solid frame-weld construction to increase the durability of the battery pack while also sufficiently blocking electromagnetic waves.
- Protective battery pack tray under-coating to help protecting the battery from flying rocks and other road debris.

Beyond Hybrid(s)

To put things into perspective, today's hybrid vehicles sit in-between EVs (whether traditional or with « range extension » capability) and conventional ICE-powered vehicles.

All use their ICE as main motive force and can be divided into the following categories :

- 2WD Series / Parallel (front ICE + supporting front motor)
- 4WD Series / Parallel (front ICE + supporting rear motor)
- 4WD Series / Parallel (front ICE + supporting front & rear motors)

- 2WD Plug-in Series / Parallel (front ICE + supporting front motor + plug-in charging)
- 2WD Plug-in Series / Parallel (front ICE + supporting rear motor + plug-in charging)
- 4WD Plug-in Series / Parallel (front ICE + supporting rear motor + plug-in charging)

All of them respectable concepts developed by highly reputable companies, they share nonetheless common shortcomings, no matter their layout:

- Compromised packaging from ICE-based architecture (battery and EV hardware added to existing gearbox, transmission, etc,...)
- Driving pattern relying essentially on ICE (Parallel Mode activated most of the time) with only a supporting role for their electric motor(s)...
- ... Logically, the scope of their Series Mode (where traction comes solely from the motors) is finite
 - limited to the existing capacity of their batteries with no possible extension except for plug-in charging for those so-equipped.
- Residual « on-the-go » charging possibilities only (essentially through regenerative braking + alternator) for the HEVs, as well as for PHEVs, themselves very much dependant on external plug-in power supply.

They are also very different from « Range-Extender » EVs where the motive force comes solely from the motor(s), supplemented by an ICE used to spin a generator to feed the traction battery...

EV-based layout

This is also very different from Mitsubishi Motors' Outlander PHEV, where – being an EV at heart – motion comes primarily from the permanent Twin (electric) Motor 4WD system whilst the petrol ICE is either supplemental (to drive the generator to recharge the traction battery) or to drive the front wheels with the front and rear motors always activated..

... but also very different from Mitsubishi Motors' Outlander PHEV, where – being an EV at heart – the Series Hybrid and Parallel Hybrid Modes are only engaged for a limited period of time to suit specific driving conditions, with a system biased to return to Pure EV Mode as soon and as often as possible,

... but also very different from Mitsubishi Motors' Outlander PHEV, where – being an EV at heart – charging occurs in a conventional way (via regenerative braking or plug-in – normal or quick-charge) but also continuously « on-the-go » or through the clever « Battery Charge Mode », all reducing the vehicle's reliance on outside power sources to the bare minimum.



Taking some of its cues from the i-MiEV textbook, Outlander PHEV can boast a no-compromise EV-specific architecture,

In that sense, it does away with the traditional format of engine + gearbox + final drive for a « purer » layout of (front to rear):

- **At the front :**
 - o Electric motor + inverter (60 kW/82 ps - 137 Nm), located on the left side of the engine compartment, transaxle style,
 - o Generator, positioned next to the motor
 - o 2.0 liter MIVEC DOHC petrol* engine (89 kW/121 ps - 190 Nm), located on the right side of the engine compartment,
 - o Multi-Mode front Power Drive Unit to offer optimum performance in three different driving modes with two different power sources.
- **In the middle, under the floor :**
 - o 12 kWh, 80 cells, 300 V Lithium-Ion air-cooled traction battery pack
 - o 45 l fuel tank (vs. 60 l for Outlander ICE 4WD)
- **At the rear, under the cargo area:**
 - o Electric motor + inverter (60 kW/82 ps - 195 Nm) with no intrusion in the cargo area.
 - o Rear Motor Control Unit, taking advantage of the electric motor characteristic to enable smooth driving.

Targeting global markets (where in proportion customers favor petrol over Diesel), Mitsubishi Motors made the choice of a petrol ICE for its PHEV system. At that already very low level (1.9 l/100 km), the possible gain in terms of fuel economy brought by a Diesel engine was also seen as marginal. Lastly, packaging and NVH performance made the petrol ICE a better choice vs. A Diesel PHEV powertrain.

Electric primary force

Outlander PHEV's Twin Motor 4WD system employs independent front and rear electric motors as primary force to drive the front and rear wheels.

This innovative layout features neither conventional gearbox nor driveshaft, the system being electronically-controlled through the PHEV Operating System (« PHEV OS »). The elimination of the propeller shaft (or connective mechanism) lowers friction-induced power loss while greatly enhancing response and control.

Taking advantage of the inherent ability of electric motors to instantly deliver maximum torque, this configuration delivers acceleration figures lower than either the 2.0 l petrol engine with impressive environmental performance.

	Outlander PHEV 4WD 5-seater	Outlander 2.0 CVT 4WD 5-seater	Outlander 2.2 DiD A/T 4WD 5-seater
Fuel cons. (combined)*	1.9 l/100 km	6.7 l/100 km	5.8 l/100 km
CO₂ emissions (combined)*	44 g/km	155 g/km	153 g/km

0 – 100 km/h**	11"0	12"6	11"7
120 – 140 km/h (where legal)**	6"5	7"2	7"4

*EU homologation

**MMC measured

Total (four wheel) control

Mitsubishi Motors' PHEV system uses a newly developed drive-by-wire Twin-Motor Four-Wheel-Drive system mated to Mitsubishi's S-AWC ("Super All Wheel Control"). Based on the four-wheel-drive technology developed and honed in the Lancer Evolution, S-AWC integrates control of the 4WD, ASC ABS and AYC (Active Yaw Control) systems.

In addition, working in tandem with the PHEV system, a S-AWC distributes power to the front and rear wheels, as well as the left and right wheels to improve driving stability and handling precision. In effect, S-AWC reduces differential limiting force and front-wheel slippage while optimizing front-rear power distribution to ensure powerful takeoff acceleration.

Furthermore, a "4WD LOCK" function enhances response through front / rear drive power transfer that improves traction and straight-line stability on snow, dirt and other slippery road surfaces.

Last but not least, the under-floor location of the traction battery brings additional benefits, namely: increased passive safety (as for i-MiEV, they are de facto shielded from any impact) as well as improved active safety, lowering the center of gravity (- 30 mm vs. Outlander ICE) and contributing to an excellent Fr/Rr weight distribution (55% - 45%).

MODUS OPERANDI

Automatic

Just as for i-MiEV, electronics play a vital role in making Mitsubishi Motors' Plug-in Hybrid Electric technology a daily reality through a further development of its sophisticated operating system (« PHEV OS »): the brain behind that allows for a smooth and fully automatic drive, managing seamlessly the S-AWC system, the shift between drive modes as well as the numerous charging possibilities – some unique in the market.

« PHEV OS »

The operating system gathers data and information from all the major EV components to provide integrated management of the car's performance.

This advanced management system constantly monitors battery status and the energy recovered from the regenerative brakes while regulating output to ensure smooth and powerful acceleration from a full stop. As a result the system optimizes and minimizes energy consumption to deliver the most appropriate actual on-road performance.

Outlander PHEV applies further advanced system from the PHEV OS from MiEV, including a function for plug-in charging, whether normal or through a quick-charger. It controls not only battery and motors, but also engine and generator.



EV – Series – Parallel

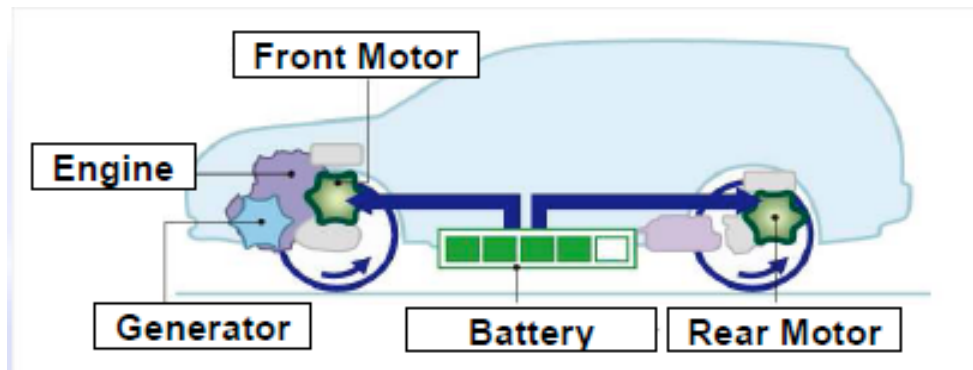
The PHEV OS also automatically selects Outlander PHEV's three driving modes ("EV", "Series Hybrid", and "Parallel Hybrid", enhancing driving performance and fuel economy with no driver intervention required.

All modes are engaged alternatively, the PHEV OS shifting constantly between them back and forth seamlessly in a split second, according to battery level as well as driving conditions, with a bias to return to EV Mode as soon and as often as possible.

In details:

- « **Pure EV Mode** »

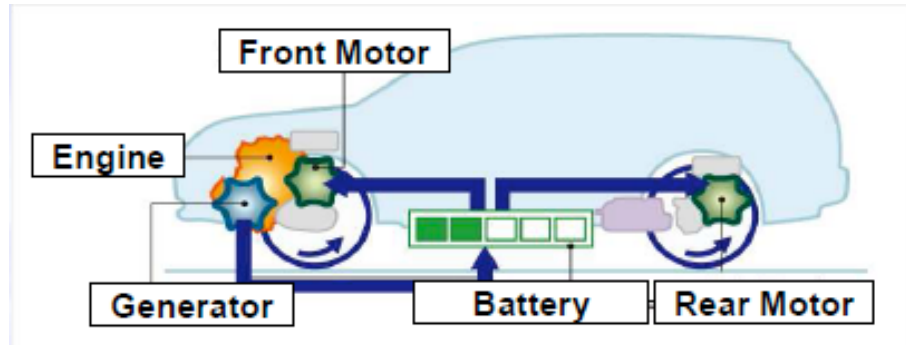
- Whatever the circumstances, the PHEV OS will always start the car in this « Pure EV Mode » where driving is electric-only :



- The car is powered by both front & rear motors (i.e. permanent electric 4WD)
- The energy is sourced from the traction battery
- The maximum speed is governed to 120 km/h (where legal)
- Outlander PHEV offers an appreciable 52 km driving range in Pure EV Mode (EU standard homologation) i.e, within the average daily distance for most European drivers. Individual driving style and therefore its impact on PHEV OS' automatic selection of Modes may translate in either shorter but also longer EV range.

- « **Series Hybrid Mode** »

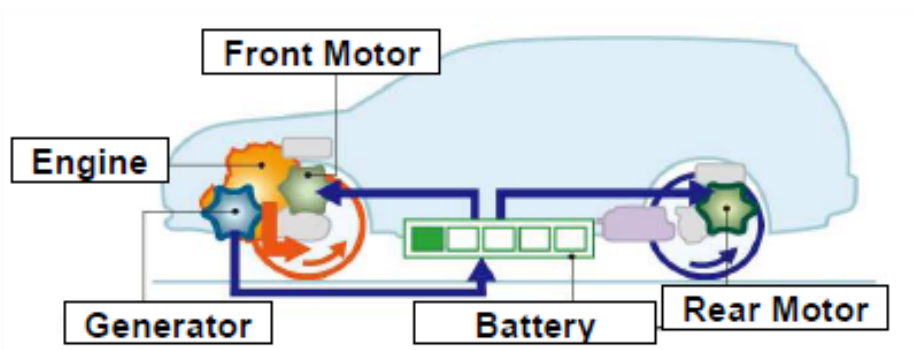
- The car is still powered by its front & rear motors (i.e. permanent electric 4WD) :



- The ICE is automatically engaged solely to run the generator, in order to charge the battery « on-the-go »(it also stops automatically) :
 - ✦ In case of sudden power demand (above the 60 kW supplied by the battery) such as passing or driving uphill, all situations interpreted the PHEV OS as a power drain, to be compensated.
- The system is biased to switch back to Pure EV Mode as often/soon as possible
- The ICE is also punctually activated to keep the catalytic converter in optimum condition

« **Parallel Hybrid Mode** »

- The ICE being inherently more efficient at high engine speeds than the electric motors, it then takes over as primary motive power, driving the front wheels via the Multi-Mode front Power Drive Unit :



- Notwithstanding, the front & rear motors are still in motion to assist seamlessly the ICE (i.e. still permanent electric 4WD)
- As for the two other modes, « Parallel Hybrid » is automatically activated for steady high power demand such as long distance motorway cruising.
- The system is biased to switch back to « Series hybrid Mode » (or « Pure EV Mode » below 120 km/h – where legal) as often/soon as possible
- The ICE is also engaged to run the generator, in order to charge the traction battery using surplus torque

It should be noted that the Outlander PHEV power system never runs at a maximum output, i.e. combining all its various components (ICE + front motor + rear motor) at the same time. Instead, the PHEV OS will always look for the best combination of Drive Modes - and therefore power source - according to driving conditions.

As a result, there is no such concept as « maximum total output » as sometimes seen elsewhere but rather a sourcing of energy within a given range, using a matching combination of power sources:

	Pure EV Mode	Series Hybrid Mode	Parallel Hybrid Mode
Max. energy from Battery (to Fr & Rr Motors)	up to 60 kW (split between front & rear motors)	up to 60 kW (split between front & rear motors)	up to 60 kW (split between front & rear motors)
Max. energy from Generator (to Battery via ICE)	0	up to 60 kW (battery charging 3 to 10 mn activation)	up to 60kW
Max. energy from ICE (to front wheels)	0	0	up to 89 kW

Limited charging...

As often reported, « range anxiety » remains a handicap for potential **Electric Vehicle** customers, even with today's driving range of 150+ km for most of them, i.e. superior to the average daily driving distance in Europe.

The same applies to another form of EV anxiety, related to the lack of charging infrastructure in many an area, including at home....

... To some extent, **Hybrid Vehicles** offer some relief, providing cleaner driving than ICE-powered cars through their (assisting) electric motor and small battery pack. In the end though, their Pure EV driving range remains negligible (a mere 2-5 km). They also rely mostly on regenerative braking to recover some electric power.

... One step beyond, **Plug-in Hybrid Vehicles** allow for a considerably longer range (20-50 km) through bigger batteries. In addition to regenerative braking, a few of them can also recover some limited capacity (up to 20 km of range or so) « on-the-go » but ultimately, all remain nonetheless dependent on rather lengthy external charging : if none is available and the battery goes down to its minimum level of charge, they revert to being simple Hybrids with all the limitations it brings (see above).

... **Range-Extender EVs** propose an interesting alternative in the sense that they are Electric Vehicles at heart (the motor(s) provide(s) the car with motive power), able to cover slightly longer distances (40-80 km) of electric driving, supported by an auxiliary ICE simply tasked to run a generator « on-the-go » for an extended 500+ km range. However, their EV-only powertrain limit their total driving range to a lower level than Outlander PHEV whose wide scope of charging possibilities and automatic modulation between the various motive power combinations / Drive Modes allow for 800+ km. Furthermore, the absence (for the time being) of on-board quick-charging make them also dependent on rather lengthy external charging

... vs self-power generating

Adding to all these propositions, Mitsubishi Motors now introduces its **Plug-in Hybrid Electric** solution – first with Outlander PHEV – taking all existing charging possibilities (as of yet) and motive power combinations even further under one roof.

Taking advantage of the car's sophisticated electronic architecture, it also brings some others, still unique in the composite Hybrid/Plug-in Hybrid/Range-Extender EV sector (like Quick Charging or a full-fledged « Battery Charge Mode »).

All functionalities are monitored by the on-board PHEV Operating System (« PHEV OS ») to provide clean and efficient long range driving, no matter the availability of an external charging source or not :

- **Automatic « on-the-go » charging, in « Series Hybrid » Mode :**
 - o The ICE is automatically engaged, solely to run the generator, in order to charge the battery (it also stops automatically) :
 - In case of sudden power demand (above the 60 kW supplied by the battery) such as passing or driving uphill, all situations interpreted the PHEV OS as a power drain, to be compensated.
 - o The system is biased to switch back to Pure EV Mode as often/soon as possible

- **Automatic « on-the-go » charging, in « Parallel Hybrid » Mode :**
 - o The ICE is also engaged to run the generator, in order to charge the traction battery using surplus torque.
 - o The system is biased to switch back to « Series hybrid Mode » below 120 km/h – where legal) as often/soon as possible, to continue charging.

- **« Battery Charge Mode »:**
 - o Driver-activated/deactivated (switch on center console)
 - o Autonomous self-charging through ICE
 - o Handy when no external power source is available (outdoor activities,...).
 - o Can also be activated when the vehicle is stationary
 - o Can recover 80% charge in ± 40 mn

- **Standard on-board dual plug-in charger :**
 - o Normal charging (± 5 hours for 100% charge - 230V – 10 A)
 - o Quick charging (± 30 mn for 80% charge):
 - Will automatically stop charging once the battery reaches 80%.
 - A special battery cooling unit, operated through the electrical air conditioning system, keeps the traction battery cool even when the engine is stopped in order to reduce wear of the battery during rapid charging and other high-temperature situations.

- Connecting the car to the power network – for either type of charging – is very easy as Outlander PHEV is equipped with a Normal charge port and a Quick charge port next to each other, located behind a flap on the right side of the vehicle.

A courtesy lamp comes on automatically when the lid is opened for convenient nighttime charging. A charging indicator (on/off lamp) and energy level gauge also show charging status and level.

- **Regenerative Braking** (cannot be controlled when Adaptive Cruise Control is active) :
 - Activated either when lifting off accelerator pedal or when braking
 - Degree of regeneration controlled by driver :
 - ☛ « B » position on shifter with two selectable levels
 - ☛ Six incremental steps through steering wheel-mounted paddles
 - System tuned to retain as much as possible a natural brake pedal feel

*Taking into consideration the regular topping up brought by Regenerative Braking

To complete its full EV palette, Outlander PHEV also offers additional functionalities :

- **« Battery Save Mode »**: Driver-selected to save on electricity, allowing to later enter CO₂-restricted city centers or quiet residential areas, or simply to enjoy nature in complete EV silence.
- **« Acoustic Vehicle Alerting System » (« AVAS »)** to warn pedestrians of approaching vehicle below 35 km/h.
- **ECO mode**: as fitted to Outlander ICE, puts the air conditioner in energy-efficient mode and moderates acceleration to improve fuel efficiency.
- **WiFi remote monitoring** through dedicated **smartphone app** (iOS 4.1.0 or later, Android 2.1.0 or later/available in Europe through the App Store, Google Play, or the MITSUBISHI Remote Control Website: http://www.mitsubishi-motors.com/en/products/outlander_phev/app/remote/):
 - Drivers can use their smartphone like a remote controller to set the charging timer from a remote location.

- Scheduling night charging when power demand and rates are low can lower power costs and reduce energy consumption during peak hours.
- This feature also allows monitoring of the battery level or remaining charge time information from anywhere (depending on distance between driver and car, & area of operation).
- **Electric hot water-powered heater.**
 - The heating system uses heat from the engine but can also keep occupants warm when the engine is off by circulating hot water through an electric water pump.
 - The pump also supplements the heat generated by the engine in cold weather and can be operated via the Mitsubishi Remote Control (see above)
- **Illuminated twin charge port** (Normal charging and Quick charging) recess behind lid - with charging indicator (on/off lamp) and energy level gauge show charging status and level.
- **5 m standard charging cable** with heat insulation, “GND OPEN” detector features and safety gauge.

Long term

Knowing the importance of integrating EVs within complete environmentally-friendly eco-systems equipped with appropriate infrastructure, MMC intends to plan long term, designing its Plug-in Hybrid Electric system to support forthcoming Vehicle-to-Home (V2H) smart grid protocol – not available in Europe yet.

Shorter term, the wide scope of charging possibilities and automatic modulation between the various motive power combinations / Drive Modes offered by Outlander PHEV makes MMC's choice of the mid-size crossover format even more pertinent with the real-life possibility for 5 people and their 463 l of luggage to travel over long distances (824 km – EU homologated – range) in great comfort and permanent 4WD active safety, with only minimal fuel consumption and CO₂ emissions.

REAL LIFE

Long haul

In essence, Outlander PHEV brings together the best of Mitsubishi Motors technology

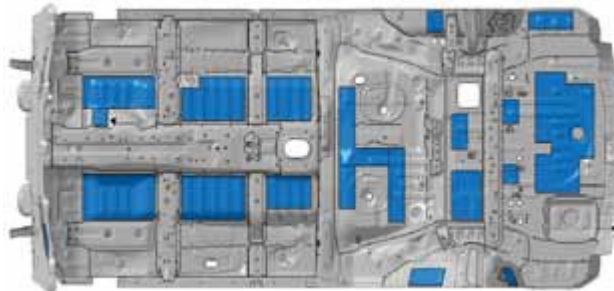
- **EV technology from i-MiEV** (zero tailpipe CO₂ emissions, maximum torque from standstill, quietness, smart automatic energy management,...)
- **4WD technology from Lancer Evolution** (all-weather active safety,...)
- **SUV convenience from Pajero/Montero/Shogun** (interior space & versatility, cargo volume, commanding driving position, ...)

Smooth

From this blend, results a singular driving experience, where sophistication of technology meets down-to-earth practicality for real-life usage...

... Sharing the same wind-tunnel-honed body as its Outlander ICE-powered cousins, Outlander PHEV adds obviously the quietness of an electric vehicle in Pure EV mode, to the point where the need arose to further suppress wind and road noise, made obvious by the silent drive. Hence a further development of Outlander's construction, incl. :

- o 4.0 mm thick front door glass (instead of 3.5 mm)
- o Sound-proof windshield
- o Better noise insulation (wind, road,...), incl. ::
 - Additional damping materials to cover the floorboards:

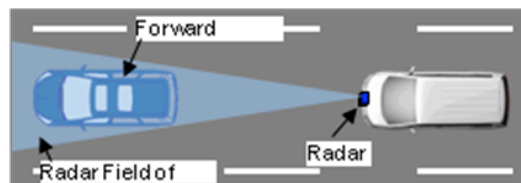


- New flat wiper blades to cut down on wind noise,
- Additional sound-absorbing and insulating materials in the engine compartment, wheel housing and other areas to also reduce noise level,
- Re-tuned suspension for improved ride comfort, stability and NVH :
 - The addition of rebound springs and further tuning contribute to a higher level of ride comfort and stability.
 - The rear suspension also features an extra anti-vibration bush and special newly-designed cross-members to reduce mechanical and road noises.

Outlander PHEV's smooth driving experience is further enhanced by the inherent seamless nature of its electronically-controlled accelerations and modulation between driving modes (EV, Series Hybrid or Parallel Hybrid), without any sort of gear shift shock.

Safe

Designed to accommodate both ICE and PHEV drivetrains, the new generation Outlander remains obviously just as safe in either format. In particular, it retains Mitsubishi Motors' Forward Collision Mitigation system (FCM*) first introduced in 2012 with Outlander ICE, acknowledged by Euro NCAP through its "Advanced Rewards" in June 2013.



The FCM system - using the same 77 GHz radar used by the Adaptive Cruise Control system - detects obstacles on the road in front of the Outlander and will automatically apply the brakes when necessary to help prevent a collision or to help reduce the severity of a collision.

FCM can help avoiding a collision when the car is driving at less than 30km/h and the system detects a stationary object. With respect to other moving vehicles, FCM can also help to avoid a collision when the speed difference between the vehicle being detected and the Outlander is less than 30 km/h. Where the speed difference is greater than 30 km/h, FCM cannot help prevent a collision, but can help to reduce the severity of that collision.

* The FCM system cannot cover all driving and traffic situations, all types of objects, or all weather and road conditions.

*The FCM system cannot detect all vehicles. FCM works best detecting passenger size or larger vehicles.

Together with other advanced safety features such as Adaptive Cruise Control (ACC) system and Lane Departure Warning (LDW) system – to be later deployed on future models as well.- the FCM system complements Mitsubishi’s continuous development of its various safety-related initiatives and innovations, whether for its proprietary RISE (**R**einforced **I**mpact **S**afety **E**volution).structure*, the fine-tuning of active safety-related areas or the regular introduction of new passive safety features.

As a reminder, Outlander PHEV was also awarded a 5-star rating by Euro NCAP in November 2013.

Polished

The most elevated member of the Outlander family, Outlander PHEV remains nonetheless an Outlander with only a modicum of visual changes, meant to echo its refined ride through polished fittings and features (*Features availability may vary according to market and model)...

... whether exterior :

- Specific “Technical Silver” color (i.e. metallic glacier blue),
- Specific 18” alloy wheels,
- Specific chromed upper and mid front grille,
- Color-keyed lower body (bumpers and sills),
- Chromed door handles,
- Clear LED rear combination lamps,
- Charging hatch for Normal and Quick charging ports (right rear side),
- PHEV badging.

... or interior:

- Joystick-type shifter (satin silver/black finish),
- Unique upholstery (incl. available off-white leather),
- Unique accent trim (incl. “crystal fiber” look),
- High contrast instrument panel with power gauge and Multi-information PHEV display (Drive-by-wire shift indicator, Energy flow indicator, Battery level indicator, Cruising range indicator, etc,...)
- Mitsubishi Multi Communication (“MMCS”) display with high-definition 7-inch WVGA screen display and PHEV functions (Energy monitor, Energy flow indicator, Cruising range area indicator, Charge point display, etc,...)

■ Mitsubishi Motors’ RISE is a uni-body design that brings dramatic advance in multi-directional impact safety performance. In summary, RISE is meant to disperse energy loads during side and rear crashes and controls distortion, enhancing occupant protection and also helping to protect the fuel system during a rear impact.

Trustworthy

Making the best use of real-life experience with i-MiEV since 2009 (and 500,000+ km of testing prior to that), MMC engineers made sure there wouldn't be any hardship either in terms of ownership experience:

- **Premium safety :**

- o Impact :
 - Reinforced underbody construction (Supporting the extra weight of the drive battery and additional on-board motor, delivering the superior quietness and advanced driving comfort that drivers have come to expect from a PHEV)
 - Four-member battery frame directly connected to the chassis
 - Battery pack safely located under the floor, within the wheelbase
- o Traction battery :
 - Cooling unit, operated through an independent unit (air cooled)
 - Four-member battery frame directly connected to the chassis,
 - New sealed drive battery pack construction
 - Rigid sheet metal and solid frame-weld construction battery pack tray
 - Protective battery pack tray coating

- **Low cost of ownership :**

- o In Europe and taking *the Netherlands* as an example, a complete charge costs about €3 from empty to full charge.
- o Overall running costs are just as low Outlander PHEVs putting less stress on its mechanical parts (ICE essentially) whilst the EV and electronic components are basically maintenance free.
- o Fuel consumption is significantly lower than its ICE equivalent and ultra-low emissions can generate various subsidies (depending per country) :

	Outlander PHEV 4WD 5-seater	Outlander 2.0 CVT 4WD 5-seater	Outlander 2.2 DiD A/T 4WD 5-seater
Fuel cons. (combined)*	1.9 l/100 km	6.7 l/100 km	5.8 l/100 km
CO₂ emissions (combined)*	44 g/km	155 g/km	153 g/km

*EU homologation

- Last but not least, MMC offers a specific 5 year – 100,000 km warranty on all EV components, in addition to its regular warranty (same as for all other Mitsubishi Motors vehicles) on the usual non-EV components....
- ... a real-life reliability duly proved during the grueling 2013 Asia Cross Country Rally (or “AXCR”) which took place August 10th - 16th between Thailand and Laos which Outlander PHEV successfully completed (http://www.mitsubishi-motors.com/special/motorsports/asia_cross.html)

User friendly

Neither an adaptation of an existing ICE-powered vehicle (compromised by definition), nor a dedicated Plug-in Hybrid or Range-Extender EV showcase, Outlander PHEV is a very realistic proposition for real-life users.

- Compared with Outlander ICE, there are minimal differences in occupant and luggage space thanks to layout improvements including a rear-positioned fuel tank and slimmer under-floor-mounted drive battery.
- As a result, the cargo volume is only reduced by 14 liters (463 l vs. 477 l minimum), the cargo floor is higher by an imperceptible 19 mm and the rear seat floor is higher by only 45 mm.
- The only limitation result from the location of the rear motor and ancillaries which do not allow any longer for a 7-seater version - Outlander PHEV is a 5-seater only. The volume of the underfloor storage box has also been reduced from 73 l to 35 l.
- On the road, the ground clearance is similar (190 mm) to that of the 2.2 DiD 4WD version – handy for soft-roading (where allowed) or in case of emergency situation.
- Just as important for long haul family touring and very important for many a European customer, Outlander PHEV allows for a towing capacity of $\pm 1,500$ kg (braked), unrestricted in duration.
