



FOR IMMEDIATE RELEASE

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EVDRIve Announces Terra-Torque-Drive™, a Powersports Industry Unique 4-Wheel 4-Motor Torque Vectoring Technology Available For License – Tech Demonstrator Excels Compared to Today’s Products In Performance, Quiet Running, Gas Mileage & 110vac Power Availability

Banks, Oregon, U.S.A. (January 27, 2014) – EVDRIve completed development and demonstrated a powersports industry first, an “electric 4-wheel 4-electric-motor torque vectoring technology” called **Terra-Torque-Drive™**, specifically geared to 4-wheel off-road powersports vehicles, such as for the rapidly growing market segment of side by side Utility Terrain Vehicles or UTVs. **After taking recent demo rides in the EVDRIve-UTV tech demonstrator, powersports industry insiders, such as UTV OEM reps and UTV racers enthusiastically agree, that the Terra-Torque-Drive™, technology would beat almost all of today’s top “gas/mechanical powered” 4wd UTVs.** OEMs now have the opportunity to license this unique technology for integration into their own future powersports side by side UTV vehicle offerings.

Approximately 323,000 UTVs were retailed in North America in 2012, according to Power Products Marketing (PPM), a market research firm. PPM found consumer models (for example: Polaris RZR XP900) accounted for around 35% of total sales; Prosumer models (example: Deere XUV825i) garnered around 55% share, and commercial models (example: Bobcat Toolcat) were responsible for about 5% of sales. Industry insiders concur that the new EVDRIve technology could apply to all 3 market segments. Compared to the top UTVs sold today, a **Terra-Torque-Drive™**, powered UTV with EVDRIve **Range Extender (REX)** installed would excel in these areas:

- 1 - Highest efficiency 4wd drivetrain on any UTV today (least mechanical losses)
- 2 - Adjustable hill descent control (accomplished via an “electric engine braking” called “regen” putting energy back into the vehicles battery system from each of the 4 wheels)
- 3 - Dynamic torque vectoring modes both for high and low speed operation, e.g. industry unique “Zero Radius Turning” and high speed active torque vectoring allows for better and safer handling off-road
- 4 - Torque and power from -100 to +100% can be dynamically sent to any wheel, in either direction, in any combination, at any time.
- 5 - True Series hybrid with optimized internal combustion engine powered REX to allow for longer range matching or exceeding gas powered UTVs sold today. (**REX** is a high voltage specialized generator- LPG, gas or diesel powered REX engine easily adaptable, no mechanical connections to vehicle)
- 6 - 120vac power from onboard battery pack, backed up with the REX for general utility use
- 7 - Lower cost to maintain and operate - superior fuel economy, estimated average 50-100% better – for short trips, no fuel may be needed at all – plug-in to standard electric car chargers.
- 8 - Superior straight-line and rough loose material, curvy trail acceleration
- 9 - Greater river depth traversal possible due to completely sealed liquid cooled e-motors/power electronics.
- 10 - Stealthy low noise operation in electric only mode e.g. wildlife observation & hunting
- 11 - Torque vectoring software platform allows new traction capabilities to be supported like “apps” without costly mechanical NRE expenses to the OEM – OEM can provide customers software updates for new capabilities.

EVDRIve chose the 4-seat Kawasaki Teryx4 as a tech demonstration platform because of its short wheelbase, smaller turning radius, and large break over angle to minimize getting hung up on obstacles. EVDRIve modified this UTV with complete removal of the gas engine and AWD mechanical drivetrain and replaced with a 160hp peak total version of the **Terra-Torque-Drive™**. Unlike the stock Kawasaki Teryx4 UTV mechanical AWD drive, no additional mechanical losses are incurred in the **Terra-Torque-Drive™**, regardless of AWD mode from lack of transmission, driveshafts and differentials. *“Off-road UTVs are ideally suited to our torque vectoring technology where only single fixed speed reduction is required per motor-wheel to attain 55-75mph top-speeds with the type of high RPM brushless motor technology we employ,”* said COO, co-founder, Steve Tice.

The **Terra-Torque-Drive™**, is a customized version of the general and modular EVDRIve-Train architecture™ (<http://bit.ly/EVD-Arch>) used on all EVDRIve conversion projects, with an in-house developed scale-able torque vector software platform added running on the EVDRIve VCU (vehicle control unit), which supports new traction modes with inputs from all driver controls plus vehicle sensors such as accelerometers, etc. Some planned traction modes, that go beyond



what is currently running on the demonstrator: auto dynamic terrain type posi-traction control, variable inclination angle offset descent control, zero radius turns on incline, emergency 4-wheel panic braking/stop & boulder climbing.

The **Terra-Torque-Drive™**, powered e-UTV demonstrator uses 4 of the sealed liquid-cooled EVDRIve EVD35 35kW/47HP peak drive sub-systems, de-tuned to ~30kW/40HP each or delivering a total of ~160HP/120kW peak. At each motor shaft, ~66 ft-lbs peak torque is delivered. The 4 gearboxes allow ratio changes with off-the-shelf gearsets. With the currently installed single speed gearsets, at the CV joint of each wheel, a whopping 726 ft-lbs peak torque is delivered. This is the kind of torque necessary to perform Zero Radius Turns with a fully loaded vehicle and perhaps even some extreme rock climbing. *“With these gearsets, a top speed of 45mph is achieved with acceleration to this speed of less than 4 seconds if you get good traction – at zero speed all 4 wheels will break loose on dry asphalt!”* said EVDRIve’s CTO & co-founder, Bob Simpson.

In the **accompanying video to this press release**, some of the e-UTV tech demonstrator more technical features are revealed, such as: control touch screen for the **Terra-Torque-Drive™**, specifically the interface to the in-house developed VCU, shown in accompanying picture links below, and optional engine sound synthesis unit some OEMs expressed interest in, with 2 sounds demonstrated in the video, a gas turbine and V-twin motorcycle sound.

Addition of the 15kW REX not only gives the UTV full performance and range to match and exceed top UTVs on the market but also offers a feature the competition does not, that is 120vac of electrical power anywhere you need it. *“With the REX sub-system part of the Terra-Torque-Drive™, a hybrid UTV can be a true swiss-army-knife UTV, able to deliver power in remote locations for construction/utility/ranch applications, run silent for hunting/wildlife observation & with full-time 4wd torque vectoring, can deliver off-road handling and performance for sports/recreation, in summary, addressing all needs in the consumer, prosumer and commercial markets,”* said CEO, Steve Tice.

*“Similar to our 25kW REX technology installed in our Series-PHEV BMW325 tech testbed -> <http://bit.ly/PHEV-BMW-3-series> but smaller, our custom high voltage 15kW-single cylinder (ICE) powered REX for the UTV is located between the rear seats – so with this sub-system, competing against top 4-seat UTVs in **range** will not be a problem - certainly the performance meets and beats stock UTVs we have tested”* said EVDRIve’s CTO Bob Simpson. The REX gas engine can be modified to run on LPG as well offering additional emissions and operational cost advantages. EVDRIve’s REX technology supporting the hybrid e-UTV development has been already designed & proven in EVDRIve Series PHEV BMW 325i Technology Testbed here shown sealed below rear spare tire floor - no protrusion above stock floor as shown in pictures at link included above.

“Digital or Electronic Differential” - Another benefit of the EVDRIve torque vectoring technology platform is that the "Terra Torque Drive™" also supports "half the system" applications, making it a 2 wheel front or rear digital or electronic differential - with all of the potential torque vectoring functionality OEMs may want to match and exceed mechanical counterparts (diff lock, posi-traction, stability control, etc.) - with lower parasitic losses and software upgrade capabilities"

EV West is partnering with EVDRIve to deploy and demonstrate Terra-Digital-Torque-Steer™ all-wheel torque vectoring technology on full-size off-road vehicles. EV West is known for many milestones; e.g. Builders and drivers of the record breaking all-electric BMW 3-series street sedan at the Pikes Peak International Hill climb and builders of first ever electric off-road race car to run the Baja Mexican 1000 race in the National Off Road Racing Association's series. More here -> http://bit.ly/EV_West_Press

About EVDRIve Inc.

EVDRIve is a design, engineering, systems integrator and low volume manufacturing firm that develops both hybrid and electric only powertrains for new or conversion of existing vehicles which yield “no operational or performance compromises” when compared to their internal combustion engine designs. It has been developing its own systems, components and software, and focuses primarily on high performance electric drive systems in support of OEMs, commercial fleets and vehicle conversion companies. EVDRIve-Train™ is an in-house developed set of scale-able modules that makes up a vehicle powertrain. Besides the hybrid UTV, other vehicles demonstrate the versatility of the architecture. Series PHEV BMW E46 3-series tech demonstrator performs better than the original vehicle with over 10k miles of trouble-free operation. Not only is this hybrid e-BMW now higher performance in every way, it is also being primarily fueled by sunlight, truly Net-Zero on energy. On the EVDRIve R&D lab/shop, a 5.6kW rooftop mounted and grid tied solar array delivers 17k miles worth of e-BMW driving energy annually in the Portland Oregon area. There is a full range of 35HP to 800+HP EVDRIve-Train models -> <http://bit.ly/EVDrives> using different technology motor cores to suit the specific electric



power needs of commercial fleet and consumer 2-4 wheeled vehicles. Another EVDRIve-Train application is a specific conversion kit designed and installed in ENSI -> <http://www.ensindustrial.ca/> mid-size Toyota Commercial Mining Pickup Truck Chassis. For commercial fleets, EVDRIve's Smart-Boost-Battery™ and Smart-Boost-Traction™ upgrades are under \$20k installed, they lower cost of operations by 10-40% and have short ROI for fleet owners – 2 city transit fleets have been testing these systems w/ fuel usage reductions up to 17% recorded to date. Using a 65HP version of the EVDRIve-Train family, EVDRIve has also developed a motorcycle version of this powertrain technology for conversion of Honda CRF250R motocross bikes with no compromise in performance for use on real motocross tracks. This is the true enabler MX bike for Indoor/outdoor motocross parks in high density areas.

To learn more, visit the EVDRIve website at <http://EVDRIve.com>

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VIDEO:

<https://vimeo.com/68397135> which can be embedded in media stories

IMAGES:

http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-Frt_left-P1020454.JPG

<http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-P456.JPG>

<http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-rear.JPG>

<http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-naked-P1040385.JPG>

<http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-naked-P1040387.jpg>

<http://www.evdrive.com/download/EVDRIve-4-e-motor-AWD-conversion-VCU-Display.jpg>

Control Touchscreen Display and VCU -> <http://bit.ly/VCU-Touchscreen>

Powertrain Architecture -> <http://bit.ly/AWD-Architecture>,

Motor/gearbox -> <http://bit.ly/Proto-UTV-Gearboxx>

EVDRIve **Terra-Torque-Drive™** Software Platform -> <http://bit.ly/EVD-AWD>

OTHER LINKS FROM PRESS RELEASE:

EVDRIve-Train architecture™ -> <http://bit.ly/EVD-Arch>

PHEV BMW325 tech testbed -> <http://bit.ly/PHEV-BMW-3-series>

EV West Press -> http://bit.ly/EV_West_Press

EVDRIve-Train models -> <http://bit.ly/EVDives>

ENSI EVDRIve Toyota Truck Conversion kit partner -> <http://www.ensindustrial.ca/>