

# Frequently Asked Questions

## Frequently Asked Questions

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## What are the key features of your EAS™ – Electric Assist System?

**EAS™ consists of** an electric motor, batteries and a control system (patent pending) that provides electric power to the drive shaft **SIMULTANEOUSLY** with power from the gasoline engine in your vehicle.

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## What is EAS™?

“**EAS™**” means **Electric Assist System**. The **Electric Assist System** (patent pending) (that is, “**EAS™**”) is used to convert combustion engine vehicles to combined gasoline/electric hybrid vehicles. **EAS™** is an economic and environmental breakthrough of great proportion.

**EAS™** – Improves vehicle performance by

- Substantially [improving fuel economy](#)
- Through reduced fuel consumption, **reducing emission of environmental pollutants**, including “**greenhouse gases**”
- **Extending the vehicle’s useful life** by reducing engine wear
- **Capturing normally wasted kinetic energy** through power regeneration when the vehicle is braking, resulting in reduced brake wear

For example, in our Delivery Truck Prototype, NetGain converted a post-1995, gasoline engine, rear wheel drive, automatic transmission vehicle to a combined gasoline/electric hybrid vehicles. Another example is NetGain’s Blazer Prototype.

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## How does EAS™ Work?

With the objective of enhancing fuel economy (as well as pollution reduction), the [EMIS™](#) regulates power from the batteries to the motor, strategically powering the electric motor to assist the internal combustion engine in accelerating the vehicle.

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## What is the electronics package or “EMIS™”?

**EMIS™** refers to the **E**ngine/**M**otor **I**nterface **S**ystem or “**EMIS™**”. **EMIS™** is a patent pending technology developed by NetGain Technologies, LLC that utilizes an electric motor configured into the drive train of a conventional vehicle to assist the Internal Combustion Engine (ICE) by applying strategic amounts of electrical assist power when it is most beneficial to the fuel economy of the vehicle.

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## How does EMIS™ work?

**EMIS™** interfaces to a conventional vehicles on-board computer system to ascertain the current demands being requested of the internal combustion engine by the driver. Based upon numerous parameters, **EMIS™** instantaneously determines the amount of electrical assist power that can be applied to the drive train electric motor in order to seamlessly assist the internal combustion engine.

The electrical assist power is applied in a totally transparent manner and the driver is normally not even aware of the electrical assist. The system is so transparent, that there are no changes needed to the driver’s normal driving routine. The amount of additional power that can be supplied is limited by the size of the electric motor, the power capabilities of the motor controller, and the batteries that are installed.

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## What are the fuel economy benefits of EAS™?

Fuel efficiency gains are greatest when the vehicle operates in first and second gear, that is, when **EAS™** does the most to *assist* the internal combustion engine. **EAS™** reduces dependency on the internal combustion engine during the engine’s worst fuel efficiency period by *assisting* with the electric motor’s torque. During this period, the electric motor will materially reduce load on the internal combustion engine and transmission, thereby lowering fuel consumption (as well as emissions reduction). Consequently, deployment of **EAS™** results in better fuel economy (as well as emissions reduction), and reduced wear and tear on the engine and transmission.

In general, **EAS™** generates fuel economy gains that depend upon the fuel efficiency of your existing combustion engine versus the efficiency of the electric motor. The difference in their respective efficient use of energy is what gives rise to the fuel efficiency gains. Typically, electric motors are more efficient than combustion engines. However, some combustion engines are more efficient than other combustion engines. For instance, a gasoline combustion engine is generally less efficient than a diesel combustion engine. Diesel combustion engine vehicles will derive fuel efficiency gains upon conversion using **EAS™**. However, in the context of a similar use of **EAS™** in a gasoline combustion engine vehicle, **EAS™** would be expected to generate higher fuel efficiency gains in the gasoline engine vehicle.

Moreover, engines using E85 will also derive significant fuel efficiency gains in the same manner described, above.

### **So how does this save energy?**

The gasoline engine is least efficient during startup and periods of acceleration, so by adding electric assist during these critical times **EAS™** will increase the overall efficiency of the vehicle. The electric motor is most efficient during startup periods of acceleration.

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### **How does that save me money?**

In two ways, first of all the cost of electricity is about \$1.00/gallon (depending on where you live and your electricity rates) so with the cost of gasoline at \$3 - \$4/gallon there is an immediate savings due to the lower cost of electricity. Secondly, we apply electricity at the times when the gasoline engine is least efficient so that the electricity has the greatest effect.

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### **What tests have you performed and what were the results?**

A dynamometer and measured distance courses were both used to test performance. Using scientific methods, like an installed portable gas tank that can be weighed between test runs, numerous tests using the same driving patterns (based on a modified New York City Drive Cycle (NYCDC)) were conducted. Depending on the conditions (that is, load, number of stops/starts, speed, terrain, and etc) measured savings of between 15% and 26% savings on the usage of gasoline were obtained.

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### **Has NetGain quantified and validated the fuel efficiency gains associated with use of EAS™?**

Yes! NetGain has validated and quantified the projected efficiency gains associated with the use of **EAS™** in the context of our Delivery Truck Prototype. We validated the projected fuel efficiency gains using two distinct methods – using a dynamometer and using a real world, repeatable road course, both deploying the drive cycle developed by David Cloud and Mel Gehrs (the “Cloud/Gehrs Drive Cycle”).

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## How do NetGain’s quantified and validated fuel efficiency gains associated with use of EAS™ apply to my intended use of EAS™?

NetGain’s results apply in the context of our Delivery Truck Prototype driven as described above. However, there are limitless possible uses for **EAS™** and each use will give rise to its own unique fuel efficiency gains and emissions reduction that results from reduced consumption of carbon based fuel.

However, here are some generalizations to keep in mind:

### Generalizations Regarding Projected **EAS™** Benefits for Your Intended Use

| Attribute of Your Use | Implication   |
|-----------------------|---|
| Vehicle Attributes:   |   |
| Engine Efficiency     | On a theoretical basis, the less efficient your combustion engine is when converting fuel to power a vehicle, in comparison with the more efficient electric motor is in converting electricity to power a vehicle, the higher your projected <b>EAS™</b> generated fuel efficiency gain. For example, let’s say that your gasoline engine has 20% efficiency, then you will derive more benefit than will a diesel combustion engine with 40% efficiency. However, both will derive benefit from <b>EAS™</b> use of an electric motor with a nearly 90% efficiency rating. |
| Aerodynamics          | If your vehicle has lower aerodynamic attributes, then your vehicle will have higher resistance to moving forward. This will increase your projected <b>EAS™</b> generated fuel efficiency gain. Fuel efficiency gains are greatest when <b>EAS™</b> does the most to assist the internal combustion engine. Prolonged increased resistance to forward movement of the vehicle will extend the time during which <b>EAS™</b> will assist the internal combustion engine.  |
| Drive Cycles/Courses  |   |
| Stop and Start        | The more your drive cycles involve start and stop events, the higher your projected <b>EAS™</b> generated fuel efficiency gain. Fuel efficiency gains are greatest when the vehicle operates in first and second gear; that is, fuel efficiency gains are greatest when <b>EAS™</b> does the most to assist the internal combustion engine.   |
| Terrain               | The more hilly or mountainous your drive cycle is, the higher your projected <b>EAS™</b> generated fuel efficiency gain. Fuel efficiency gains are greatest when <b>EAS™</b> does the most to assist the internal combustion engine. Going up a hill will extend the time during which <b>EAS™</b> will assist the internal combustion engine.  |

## Weather

Generally, increased wind and similar weather related forms of resistance to the vehicle moving forward will tend to increase your projected **EAS™** generated fuel efficiency gain. Fuel efficiency gains are greatest when **EAS™** does the most to assist the internal combustion engine. Prolonged increased resistance to forward movement of the vehicle will extend the time during which **EAS™** will be needed to assist the internal combustion engine.

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## **What is the expected fuel economy savings I'll get with EAS™ and how much will it cost?**

**EAS™** was originally conceived as an offering to fleet vehicles that travel an average of 84 miles per day and average 6-8 miles per gallon. The expected payback period for vehicles in this initial target audience is approximately 30 months (without the benefit of any tax credits or other government subsidies. In general, the greater your gas mileage, the lower the potential fuel savings benefit of **EAS™**. With continued optimization of the system and as production volume increases, NetGain projects that critical component quantities may bring the cost down for normal passenger vehicles to the point where they may experience a similar payback period.

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## **With the price difference between electricity and gasoline, why not use the electric motor exclusively.**

Unfortunately, the limiting technology today for electric and hybrid vehicles is the low power density of batteries. Typically, a vehicle with a tank full of gasoline can drive about 400 miles (your mileage may vary based on vehicle and driving patterns between refills. All electric vehicles, even those with the new higher power density batteries still are limited to less than 100 miles between recharges. To bridge that gap, while waiting for battery technology to greatly improve, **EAS™** was designed as a system that leverages the strength of both the electric motor and gasoline engine.

It is also important to recognize that with NetGain's **EAS™** technology, if the batteries are depleted due to driving distance/patterns, the vehicle is not "stranded" on the road, but it would continue to operate by just using the internal combustion engine (with the corresponding decrease in efficiency)

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## **How does EAS™ result in reduced greenhouse gas pollution?**

The output of CO<sub>2</sub> from a vehicle's internal combustion engine is reduced in proportion to the reduced amount of fuel used by the vehicle.

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## How much does the system cost and what is the projected “return on investment” or “payback period”?

The **EAS™** system costs for all components will vary based on the vehicle manufacturer, make and model. For Class II type delivery trucks, using fleet pricing for all the components, including **EAS™**, the estimated cost will range from \$5,100 to \$6,100.

To determine payback, annual miles driven, current fuel consumptions and price of gasoline are three main factors that need to be estimated.

**EAS™** was originally conceived as an offering to fleet vehicles that travel an average of 84 miles per day (280 days per year) and average 6-8 mile per gallon. The expected payback period for vehicles in this initial target audience is 28 to 36 months.

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## How will the system adapt to future battery technologies such as Fuel Cells?

The **EAS™** system is battery technology and battery chemistry independent. When fuel cells become financially and technically viable alternatives to batteries, or other technology surfaces, such new technology can easily be substituted for the existing battery system.

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## How challenging is **EAS™** as a technology?

**EAS™** is not challenging. In fact, **EAS™** is so **EAS™**y, it can usually be installed in less than a day by a certified mechanic. It's so simple, the hood doesn't even need to be opened!

- **EAS™y to understand**
  - **EMIS™** regulates power from the batteries to the electric motor, strategically powering the electric motor to assist the internal combustion engine in accelerating the vehicle.
  - **EAS™** reduces dependency on the internal combustion engine during the engine's worst fuel efficiency by *assisting* with the electric motor's torque.
  - Deployment of **EAS™** results in better fuel economy (as well as commensurate pollution reduction), and reduced wear and tear on the engine and transmission.
  - Reduced load on the engine/transmission and increased fuel economy mean fewer repairs and longer useful lives.
- **EAS™y to install**
  - **EAS™** is a set of components which can be installed by a trained mechanic in less than a day (currently estimated to be 4-6 hours by a properly trained mechanic)

- **EAS™y to use** – There are no required changes in driving habits or special driving methods to learn. **EAS™** operates autonomously, without the need for driver input or other attention
- **EAS™y to deploy** – **EAS™** is manufacturer neutral in that **EAS™** is able to adapt to almost any vehicle manufacturer’s design. **EAS™** is, to a large degree, electric motor, fuel, battery manufacturer and other component (excepting only **EMIS™**) independent. With the **EAS™** system's patent pending technologies, the choice of DC electric motor, fuel, battery and other component (excepting only **EMIS™**) sources can be determined by the owner, based on the existing vehicle and relationships with suppliers.

In fact, **EAS™** is so **EAS™y** to install, a properly trained mechanic can deploy **EAS™** and become “green” (or environmentally friendly) in less than a day in the ordinary course of the vehicle’s normal maintenance cycle.

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### **How difficult are EAS™ and EMIS™ to install?**

**EAS™** is designed to be simple to install, and requires minimum change to the existing vehicle. If all parts are available (electric motor, motor supports, modified drive shaft, battery boxes, batteries, cables, connectors, electric motor controller, etc.), the entire installation can be done in 4-6 hours by a certified mechanic.

**EMIS™** connects with the vehicle’s (i) existing OBD connector (that is, **On Board Diagnostic computer**) using a standard OBD plug, (ii) **EAS™** electric motor controller, (iii) 12-volt power supply, (iv) reverse tail light, and (v) brake light.

Mounting the motor properly is critical to the performance of the system. NetGain’s **EAS™** installation guide explains what is required to ensure superior performance. The **EAS™** electric motor has a uniquely designed shaft to make vehicle modification easier.

The location of the **EAS™** batteries will depend on the vehicle and its physical layout.

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## **Are there other benefits to EAS™ ?**

If the vehicle's **EAS™** batteries are depleted due to driving distance/patterns, the **EAS™** Hybrid Vehicle, and its driver, passengers and other cargo, are not "stranded" on the road. After the batteries are depleted, the **EAS™** Hybrid Vehicle is driven using only the internal combustion engine (with the corresponding decrease in efficiency during this period of operation without the benefit of the **EAS™** electric motor). Because the **EAS™** Hybrid Vehicle has both the fuel tank and the **EAS™** batteries, the overall range of a single refuel trip of the **EAS™** Hybrid Vehicle exceeds that of the original vehicle.

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## **What vehicles will EAS™ and EMIS™ work on?**

**EAS™** and **EMIS™** have been developed to work on all rear wheel drive vehicles with automatic transmissions that have been manufactured after 1995.

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## **How much battery power does EAS™ using EMIS™ require?**

**EAS™** using **EMIS™** requires 48 Volts or 72 Volts of additional battery power. Flooded batteries (batteries that require water to be added) are NOT recommended for use with this system. Battery boxes must be secured to the vehicle. Normally, these are placed under the vehicle along the frame rails. In most cases this will lower the vehicles center of gravity and improve handling characteristics.

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## **How can EAS™ using EMIS™ assist a vehicle with only 4/6 batteries, and for how long?**

As mentioned, **EAS™** using **EMIS™** STRATEGICALLY applies power, only when it is most beneficial to fuel economy. The electric motors that we have developed for this system can produce up to 135 ft. lbs. of additional torque at 1450 RPM's! Most applications require FAR less than this amount of torque.

The amount of time that **EAS™** using **EMIS™** can assist the vehicle is determined in large part to the capacity of the batteries that are used, and how these batteries are maintained. As a rule of thumb, about 1 mile for every 2 Ahrs of battery capacity is expected.

NetGain's current offering of **EAS™** does not use brake regeneration, nor does NetGain currently offer a charge sustaining solution; the current components offered by NetGain anticipate that the batteries will be recharged as needed, which in most cases would be daily when the vehicle is not in use. That is, the current version of **EAS™** produces a "plug-in electric hybrid". However, **EAS™** can be used in combination with brake regeneration and other charge sustaining technologies.

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## **How long does it take to recharge the batteries?**

The recharge time of the batteries depends upon numerous factors, such as the chemistry of the battery, how deeply discharged the batteries are, temperature, the state of battery equalization, the battery charger being used, and more. Our experience has shown that the typical charge time may run anywhere from 1-hour to 6-8 hours – depending upon the combination of factors, described above.

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## **How can I use EAS™ if I have a front-wheel drive vehicle?**

A solution for front-wheel drive vehicles as well as standard transmission vehicles is in development. No time frame has been established for release of these products.

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## **Can I use EAS™ with a manual transmission vehicle?**

**EAS™** has been tested on automatic transmission vehicles. There are safety and performance related concerns surrounding its application to manual transmission vehicles that currently limit making **EAS™** available for use in manual transmission vehicles.

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## **Is EAS™ or EMIS™ covered by a warranty?**

Both **EAS™** and **EMIS™** are patent pending technologies. NetGain intends to educate the market regarding both. After an appropriate amount of time, NetGain will sell and/or license such patent pending technologies to third parties, enter into strategic partnerships and more. NetGain expects that such third parties and strategic partners will address warranty issues in the context of their particular use of such patent pending technologies.

To the extent that **EAS™** and **EMIS™** are made available to the market for use by persons who desire to use it in the context of their intended use, this will be done without warranty and subject to hold harmless agreements that will benefit NetGain and others. This is primarily due to the fact that such persons have complete control over their use and installation of **EAS™** and **EMIS™**, and NetGain and others are not in control of such uses and installations. It is assumed that such persons are sophisticated and knowledgeable users; to that end, each such person will be required to represent this before any sale is to occur.

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## How do you know that EAS™ and EMIS™ work?

Two prototype versions of our **EAS™** system have been built and tested. The first is a smaller system for a Chevy Blazer and the second is for a 10,000 lbs Grumman delivery van.

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**Where can I purchase, license or learn more about EAS™, EMIS™, or rights to EAS™ or EMIS™ patent pending technology?**

| Interested Party                         | EAS™ & EMIS™   |  | EMIS™  |  |
|--|--|--|--|--|
|  | Purchasing or Licensing of   |  | Order Size   |  |
|  | Patent Pending Technology  |  | Less Than 50   | 50 or More   |
| Automobile and Truck Manufacturers       | <a href="mailto:businessdevelopment@NetGainTechnologiesLLC.com">businessdevelopment@NetGainTechnologiesLLC.com</a> |  |  | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
| Delivery Vehicle and Other Fleet Owners  | <a href="mailto:businessdevelopment@NetGainTechnologiesLLC.com">businessdevelopment@NetGainTechnologiesLLC.com</a> |  |  | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
| End Users                                | Not Applicable   |  | NetGain Technologies, LLC<br>Suite 101<br>900 North State Street<br>Lockport, IL 60441<br>Attn: George Hamstra<br><br>Phone: 630.243.9100<br>Fax: 630.685.4054<br>Email:<br><a href="mailto:GHamstra@NetGainTechnologiesLLC.com">GHamstra@NetGainTechnologiesLLC.com</a> | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
| Environmentalist Groups                  | <a href="mailto:businessdevelopment@NetGainTechnologiesLLC.com">businessdevelopment@NetGainTechnologiesLLC.com</a> |  |  | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
| Governments & Departments of Government  | <a href="mailto:businessdevelopment@NetGainTechnologiesLLC.com">businessdevelopment@NetGainTechnologiesLLC.com</a> |  |  | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
| Manufacturers of Fuel                    | <a href="mailto:businessdevelopment@NetGainTechnologiesLLC.com">businessdevelopment@NetGainTechnologiesLLC.com</a> |  |  | <a href="mailto:sales@NetGainTechnologiesLLC.com">sales@NetGainTechnologiesLLC.com</a> |
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