

# BACKGROUND

## THREE MAJOR BARRIERS TO ELECTRIC VEHICLES' ADOPTION

1. CRITICAL MINERAL SUPPLY / SCARCITY OF RAW MATERIALS
2. LACK AND RELIABILITY OF CHARGING INFRASTRUCTURES
3. AFFORDABILITY / HIGH BATTERY PRODUCTION COSTS

## TOYOTA'S 1:6:90 RULE


THE SAME MATERIALS NEEDED TO MAKE ONLY ONE BATTERY ELECTRIC VEHICLE, COULD INSTEAD BE USED TO MAKE SIX PLUG-IN HYBRID OR NINETY HYBRID ELECTRIC VEICHLES !

# PROBLEM

HYBRID POWERTRAINS HAVE MANY ADVANTAGES

1. HIGHER FUEL EFFICIENCY AND MILEAGE OF AN ICE
2. NO RANGE ANXIETY AND LOWER COSTS OF AN EV
3. POTENTIAL USE AS AN ELECTRIC GENERATOR

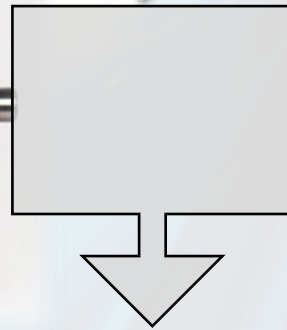
VERY CONVENIENT FOR OFF-ROAD AND MARINE APPLICATIONS !



**BUT THERE ARE NO SIMPLE, COMPACT AND INEXPENSIVE  
TECHNOLOGIES TAILORED FOR THESE APPLICATIONS**

# SOLUTION

MOST ECONOMICAL AND VERSATILE GEARLESS PARALLEL  
HYBRID POWERTRAIN WITH ON DEMAND ELECTRIC GENERATOR



**ENGINE STARTER MOTOR**

**ON DEMAND ELECTRIC GENERATOR**

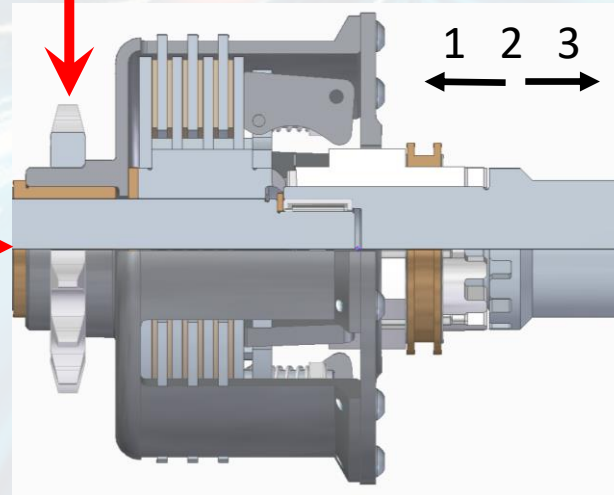
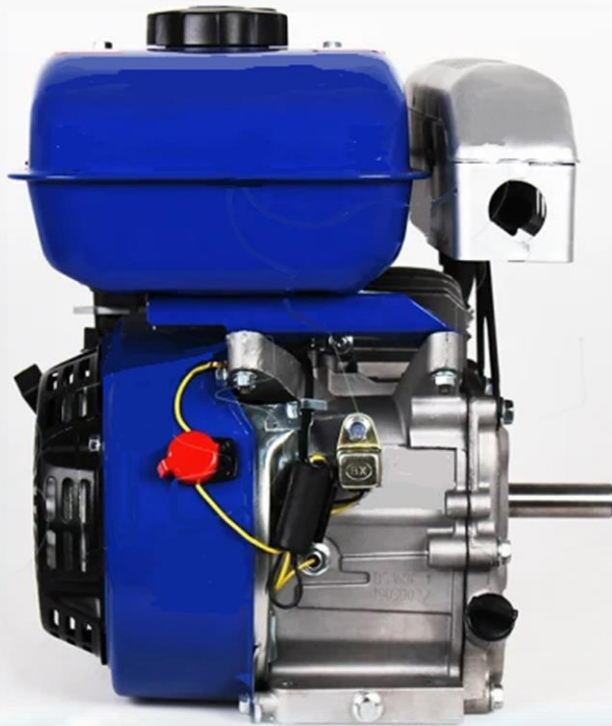
**FORWARD AND REVERSE PROPULSION**



# PATENTED DESIGN

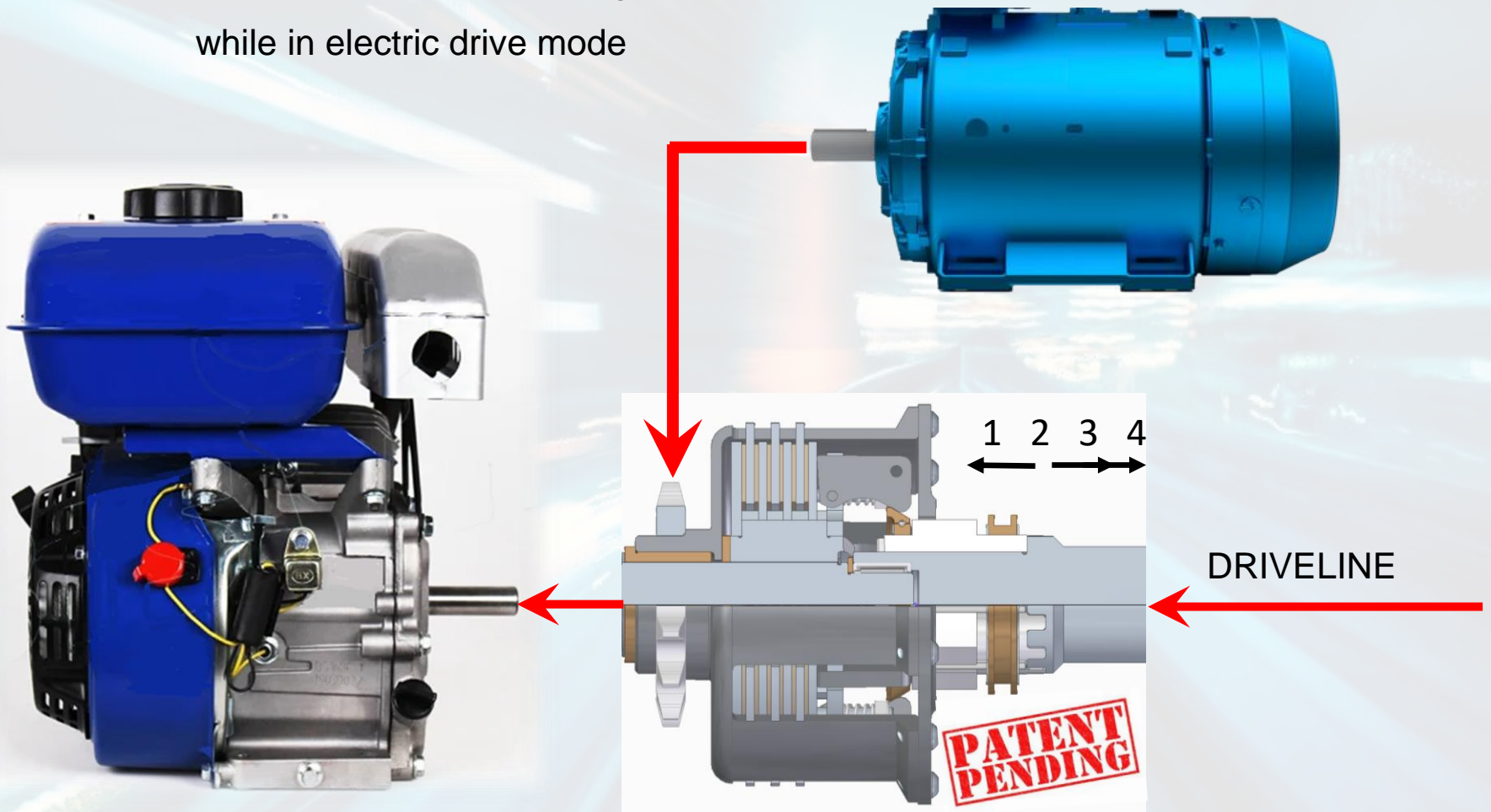
Clutch working positions:

1. Engine start
2. Generation
3. Propulsion



# DESIGN ADVANCEMENTS

Fourth position to start the engine  
while in electric drive mode



# TECHNOLOGY ROADMAP

2020

- IDEA AND CONCEPT DEVELOPMENT (TRL 1 & 2)
- PROVISIONAL PATENT APPLICATION

2021

- DESIGN AND BUILT OF THE FIRST FUNCTIONAL PROTOTYPE (TRL 3)
- FIRST PATENT APPLICATION

2022

- DESIGN AND BUILT OF A SECOND MORE ADVANCED PROTOTYPE (TRL 4)
- GRANTED US PAT NO. 11,505,054 B2

2023

- CONTROL SYSTEM MODELING AND DEVELOPMENT (TRL 5)
- ADDITIONAL PROVISIONAL PATENT APPLICATIONS

2024

- CONTROL SYSTEM INTEGRATION IN A MINIMUM VIABLE PRODUCT (TRL 6)
- MINIMUM VIABLE PRODUCT TESTING AND DEMONSTRATION (TRL 7)



# MINIMUM VIABLE PRODUCT

GEARLESS ATV / GENERATOR COMBO UNIT WITH A SINGLE ELECTRIC MOTOR  
TO START THE ENGINE, RECHARGE THE BATTERY AND REVERSE THE MOTION !



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