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Supplementary Technical Overview of the *StarDrive Dynamo's* Method of Operation

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The only part of the EDF Generator ("StarDrive") technology that we are developing which is truly complex is: how to produce an external DC Field voltage across the device's housing which is much greater than that produced by its internal field coils and magnetic rings. In short, this difficult objective must be achieved using certain 'classical' vacuum tube design and operating principles. Without going into greater detail than necessary, the following list of key points will hopefully illuminate the methodology adequately for present purposes:

1) The positive axial collector housing sections of an EDF Generator or *StarDrive Dynamo* must be stripped of electrons much faster than the corresponding negative charge can be replaced by corona or arc discharge from the device's peripheral negative emitter-ring housing section. This creates a huge cumulative voltage imbalance across the housing, by an electronic principle called '*instantaneous charge differential'*, which can be up to many thousands of times larger than the Primary Array voltage used to charge the housing's positive collectors.

2) Accomplishing this fundamental objective first requires that the collectors be connected to hot tungsten cathodes whose characteristic electron emission is greatly enhanced by impregnating them with any of a number of special alkali-metal compounds, as compared to the emission rate of the much cooler rotor-mounted field emitters that charge the negative housing section.

3) To sustain a corresponding *much-elevated housing-to-rotor voltage differential* at a desired equilibrium value, the electrons stripped from the collectors must then fall into a potential well created by rotor-mounted "field ballast capacitors", the total storage value of which is figured according to a classically-derived electrostatic formula that relates the desired Field voltage to the equal areas of the negative and positive housing sections and to the given field coil voltage.

4) Finally, the dimensions of the ballast capacitors must be such that the electric field intensity within their dielectrics is equal to or greater than the desired Field intensity across the housing, which (assuming the charge stored therein is equal and opposite that on the housing) thereby provides an 'equal and opposite force*' which supports the *"primary voltage expansion ratio"* defined by the primary-cathode to field-emitter electron emissivity ratio. *[$E = V/d$, and $E = F/q$; so, $F = Vq/d$]

For safety reasons, the Field voltage utilized in all *air-cooled* StarDrive *Generators* will be limited by design to 850 VDC, and to 1,400 VDC in the larger *liquid-cooled* StarDrive *Dynamos*. With regard to the 24-kW Generator prototype model, such units will operate with a net field coil potential difference of 540 – 640 volts applied to the stator circuit's main HV busses. In part due to the odd dual-capacitive geometry of the 'primary power system', the peak theoretical induced rotor voltage should be about **1/3** of the HV buss voltage, or +213 VDC (max.), and the corresponding "start" (or no-load) portion of this 'ideal' induced rotor voltage that will be impressed on the primary anode rings is projected from strike-voltage analyses *and* recent experimentation to be +77.5 to 90 volts (or ~**1/7** of the HV buss voltage). With the primary cathodes at ground potential, or zero volts, this will also be the 'driving' Primary Array voltage, the "run" (load-current) value of which is likewise projected at +47.5 to 77.5 volts. [It should be noted that the potential difference across the vacuum chamber will tend to equal the Primary Array voltage, with the inner surfaces of the housing's Emitter Ring at a zero-volt or 'ground' potential (due to the Faraday shielding principle).]

Since the potential on the housing collectors must equal one-half of the Field voltage, the voltage drop across our prototype's power resistors will be 425 VDC – which is equal to the input voltage of the custom solid-state inverter that will provide the Generator's usable AC power output. The output inverter will therefore be connected (in parallel) between the collector end of the power resistors and the primary cathodes. The *primary voltage expansion ratio,* or the ratio of Field voltage to Primary Array voltage, will be between about 9- and 18-to-1, and the level of primary cathode chemical treatment required to achieve this ratio can readily be determined once the necessary *cathode work function* is calculated using the venerable Richardson-Dushman emission current density equation.