High-Power Ignition Summary

A typical automotive coil stores about 50 mj of energy for delivery.
It does this:
1) in the breakdown spark;
2) followed by the arc discharge of above 200 ma;
3) closing with the glow discharge of typically 50 ma.
The efficiency of the three discharges are:

1) 90% breakdown,
2) 50% arc discharge,
3) 30% glow discharge.

The Pulstar pulse plug has a relatively high breakdown spark.
At 50 pF, and 20 Kv breakdown voltage, it has a 10 mj of energy which it delivers.
(Actually 9 mj because of its 90% efficiency.)
A side benefit, the breakdown spark is a low erosion spark, enabling long electrode life.
Typically, the current peaks at the order of 1000 amps, with a period of about 10 nanosecods.
The power of the Pulstar discharge is 10 mj/10 nsecs = 1 Megawatt
This very high power is what makes the Pulstar so effective.
The result is that a shock wave is produced, and fuel ignitability is enhanced.
See Maly and Ziegler, C47/83, IMechE 1983, University of Stuttgart, W. Germany.
There are many other references.
In our early work we ran tests in combustion bombs, and we found a typical lean limit extension from 21:1 AFR to 23:1 AFR.
We had Champion make 70 pf plugs for us, but they were enormous, and totally impractical.
Enerpulse, Inc. being able to make a practical 50 pF plug, is a great tribute to their entrepreneurship and patience.
I've lost count of the number of times I have asked to have such a plug made.
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