Theorem Random variates from the exponential power distribution with parameters λ and κ can be generated in closed-form by inversion.

Proof The exponential power(λ, κ) distribution has cumulative distribution function

$$F(x) = 1 - e^{1-e^{\lambda x^{\kappa}}} \qquad\qquad x > 0.$$

Equating the cumulative distribution function to u, where $0 < u < 1$ yields an inverse cumulative distribution function

$$F^{-1}(u) = \left(\frac{\ln(1 - \ln(1-u))}{\lambda}\right)^{1/\kappa} \qquad\qquad 0 < u < 1.$$

So a closed-form variate generation algorithm using inversion for the exponential power(λ, κ) distribution is

generate $U \sim U(0, 1)$
$X \leftarrow (\ln(1 - \ln(1 - U))/\lambda)^{1/\kappa}$
return(X)

APPL verification: The APPL statements

```
X := ExponentialPowerRV(lambda, kappa);
CDF(X);
IDF(X);
```

verify the inverse distribution function of an exponential power random variable.