Mass of homogeneous sphere:	$M = \rho V = \frac{4}{3}\pi\rho r^3$	[1]
Schwarzschild radius:	$r_S = \frac{2GM}{c^2} \therefore \frac{r_S}{r} = \frac{2GM}{rc^2} = \frac{2G}{rc^2}\cdot\frac{4}{3}\pi\rho r^3 = \frac{8\pi G\rho}{3c^2}r^2$	[2]
Escape velocity:	$v_{esc} = \sqrt{\frac{2GM}{r}} \therefore v_{esc}^2 = \frac{2GM}{r} = \frac{r_S c^2}{r} \therefore \frac{r_S}{r} = \frac{v_{esc}^2}{c^2}$	[3]
Lorentz factor:	$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$	[4]
Relativistic *mass*:	$m = \gamma m_0$	[5]
Kinetic energy:	$E_k = mc^2 - m_0c^2 = \gamma m_0c^2 - m_0c^2 = (\gamma-1)m_0c^2$	[6]
	$\therefore \frac{E_k}{m_0c^2} = \gamma - 1 \therefore 1 + \frac{E_k}{m_0c^2} = \gamma \therefore \gamma = \frac{m_0c^2+E_k}{m_0c^2}$	[7]
substitute [4]:	$\therefore \sqrt{1-\frac{v^2}{c^2}} = \frac{m_0c^2}{m_0c^2+E_k}$	[8]
Escape energy vs. *radius*:	$\sqrt{1-\frac{v_{esc}^2}{c^2}} = \frac{m_0c^2}{m_0c^2+E_{esc}}$	[9]
using [3]:	$\therefore \sqrt{1-\frac{r_S}{r_{esc}}} = \frac{m_0c^2}{m_0c^2+E_{esc}} \therefore 1 - \frac{r_S}{r_{esc}} = \left(\frac{m_0c^2}{m_0c^2+E_{esc}}\right)^2$	[10]
	$\therefore \frac{r_S}{r_{esc}} = 1 - \left(\frac{m_0c^2}{m_0c^2+E_{esc}}\right)^2$	[11]
from [2]:	$\frac{r_S}{r_{esc}} = \frac{8\pi G\rho}{3c^2}r_{esc}^2$	[12]
	$\therefore r_{esc}^2 = \frac{3c^2}{8\pi G\rho}\cdot\left[1 - \left(\frac{m_0c^2}{m_0c^2+E_{esc}}\right)^2\right]$	[13]
	$\therefore r_{esc} = c\cdot\sqrt{\frac{3}{8\pi G\rho}}\cdot\sqrt{1-\left(\frac{m_0c^2}{m_0c^2+E_{esc}}\right)^2}$	[14]

An object with rest mass m_0 and *kinetic energy* E_{esc} can/will escape if it is at a *distance* of at least r_{esc}.

For a neutron star, we've got:	$\rho = \rho_N = 1.392134 \times 10^{18}$ kg/m³	[15]
and of course:	$c = 299792458$ m/s	[16]
as well as:	$G = 6.67408 \times 10^{-11}$ m³/kg/s³	[17]
so:	$c\cdot\sqrt{\frac{3}{8\pi G\rho}} = 299792458\cdot\sqrt{\frac{3}{8\pi\cdot 6.67408\times10^{-11}\cdot 1.392134\times10^{18}}} = 10745\text{ m}$	[18]

This value equals the *critical black hole radius* as calculated in http://henk-reints.nl/astro/HR-on-the-universe.php.

Suppose this object is an electron originating from a decaying neutron of a neutron star without obtaining *energy* from the star's *binding energy*. Then:

Electron *mass*:	$m_0 = m_e = 9.10938356 \times 10^{-31}$ kg	[19]
so:	$m_0c^2 = m_ec^2 = 8.18710565 \times 10^{-14}$ J	[20]
Neutron decay *energy*:	$E_{dec} = (m_n - m_p - m_e)c^2 = 0.78257\text{ MeV} = 1.2538 \times 10^{-13}$ J	[21]

First assume the electron obtains all this *energy*. Then:

	$r_0 = 10745\cdot\sqrt{1-\left(\frac{8.18710565\times10^{-14}}{8.18710565\times10^{-14}+1.2538\times10^{-13}}\right)^2} = 9871\text{ m}$	[22]
Its corresponding *mass* equals:	$M_0 = \frac{4}{3}\pi\rho r_0^3 = 7.234\times10^{30}\text{ kg} \approx 3.637M_\odot$	[23]

So a neutron star with a diameter that exceeds 19.74 km and thus a *mass* above 3.637 times that of our sun cannot lose any electrons by neutron decay because *gravitation* definitely wins that game. Above this size a ball of neutronium would not be able to disintegrate. That's why I do still not really understand what the big bang actually was. The *IniAll* must have had a *radius* of nearly 3 astronomical units.

In practice, the electron antineutrino takes away roughly 50% of the neutron decay *energy* on average, yielding: $r_1 = 10745 \cdot \sqrt{1 - \left(\frac{8.18710565\times10^{-14}}{8.18710565\times10^{-14}+\frac{1.2538\times10^{-13}}{2}}\right)^2} = 8856\ \mathrm{m}$ [24]

corresponding to a *diameter* of: $d_1 = 17.71\ \mathrm{km}$ [25]

and its corresponding *mass* is: $M_1 = \frac{4}{3}\pi\rho r_1^3 = 4.050 \times 10^{30}\ \mathrm{kg} \approx 2.036 M_\odot$ [26]

To me it is remarkable that this *mass* is within the tolerance of the lower bound of the TOV-limit as stated on https://en.wikipedia.org/wiki/Tolman%E2%80%93Oppenheimer%E2%80%93Volkoff_limit#History (as of 2019-08-27): The mass of the pulsar PSR J0348+0432, at 2.01±0.04 solar masses, puts an empirical lower bound on the TOV limit.

Below this *mass*, a neutron star would be prone to evaporation by neutron decay. This could mean twice the solar *mass* is a lower *mass* limit for neutron stars to be able to stay alive at all. But the neutrons in a neutron star are definitely not free neutrons, so they may have a far longer *decay time*, which would also avoid this evaporation.