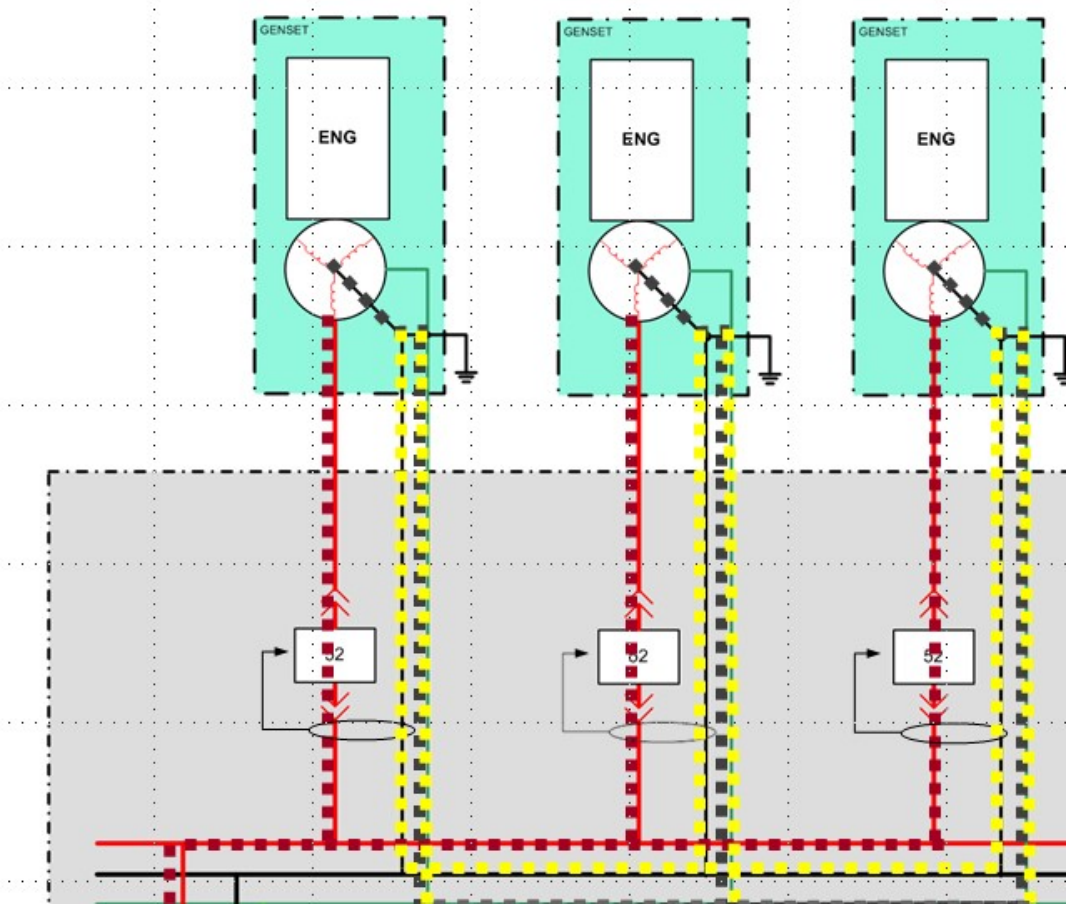
Bonding for Separately-Derived Parallel Generator Applications

You can use the 2014 and earlier NEC versions to justify your position that paralleled generators should have a common bonding point.

Here's the thought process (references are from the 2014 NEC):

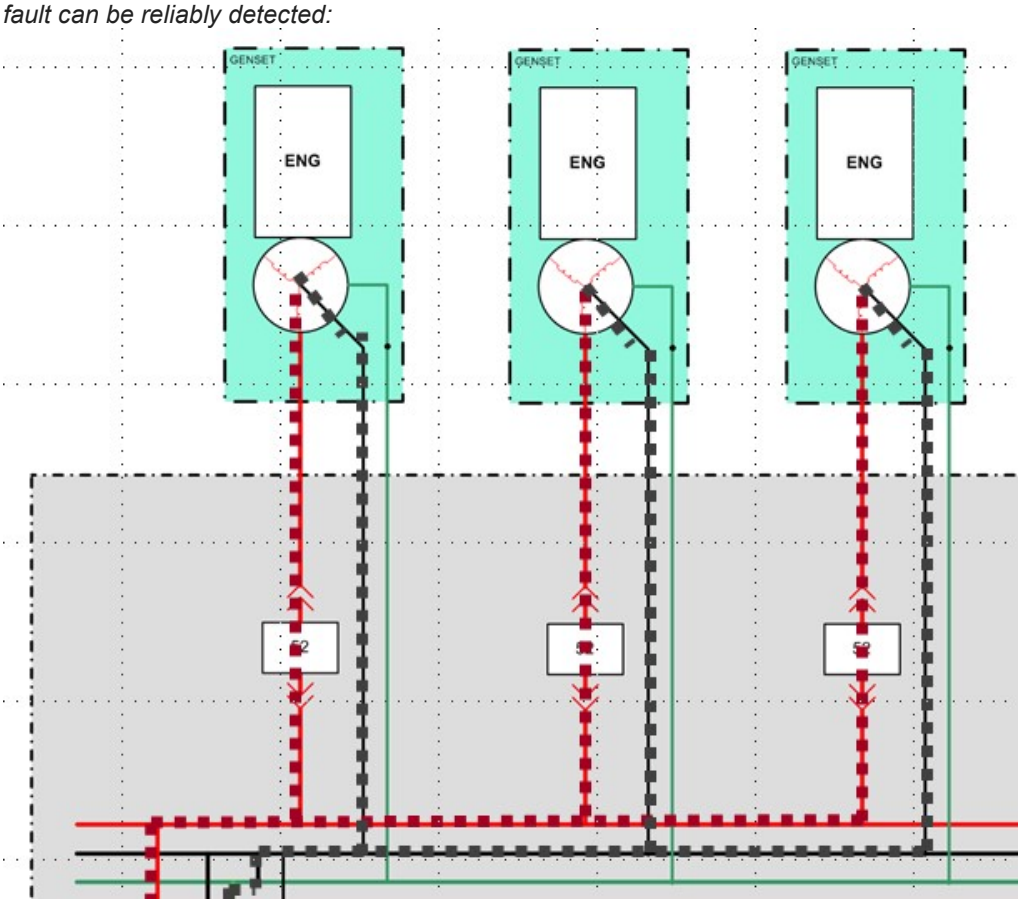
1. 250.4 (A)(3): (3) Bonding of Electrical Equipment. Normally non–current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the electrical supply source in a manner that establishes an effective ground fault current path. *Note that the requirement is a single bonding point. This is because any time there are multiple current paths for ground fault current there will be a possibility of a portion of the circuit operating at higher than ground potential, causing a shock risk.*
2. 250.30 Grounding Separately Derived Alternating-Current Systems. In addition to complying with 250.30(A) for grounded systems, or as provided in 250.30(B) for ungrounded systems, separately derived systems shall comply with 250.20, 250.21, 250.22, or 250.26, as applicable. Multiple separately derived systems that are connected in parallel shall be installed in accordance with 250.30. So,for parallel generator sets connected in 3-wire systems or 4-wire systems with switched neutral transfer switches, you have no choice, you must comply with 250.30.
3. 250.30 (A)(1) states: (1) System Bonding Jumper. An unspliced system bonding jumper shall comply with 250.28(A) through (D). This connection shall be made at any single point on the separately derived system
4. Unfortunately, they go on to say: ...from the source to the first system disconnecting means or overcurrent device, or it shall be made at the source of a separately derived system that has no disconnecting means or overcurrent devices, in accordance with 250.30(A)(1)(a) or (b). *So, the system is obviously intended to have a single neutral to ground bond, but the location description makes a multiple source system seem like it should have a bond at each generator, which violates 250.4 (A)(3).*
5. *Perhaps the saving grace is that 250.30 (A)(6) states:* (6) Grounding Electrode Conductor, Multiple Separately Derived Systems. A common grounding electrode conductor for multiple separately derived systems shall be permitted. *So, if you consider each generator as a separately derived system, it is OK to have a single bonding point for the group of them. I actually think when multiple generators form a parallel system, the generators and parallel breakers are a single system that feeds the system loads, and it's best to design around that concept.*
6. 250.35 Permanently Installed Generators states: A conductor that provides an effective ground-fault current path shall be installed with the supply conductors from a permanently installed generator(s) to the first disconnecting mean(s) in accordance with (A) or (B). (A) Separately Derived System. If the generator is installed as a separately derived system, the requirements in 250.30 shall apply. *Again stating that a single return path is required ("an").*

It's worth noting that as systems get larger and ground fault protection gets required, the location of the bonding point for the generator becomes more important. If the bonding point is at each generator (rather than the system bus), the neutral conductors between the generators becomes an alternate path for ground fault current, and the ground fault system will either be de-sensitized by or result in nuisance trips on a random basis:



The red line is normal current path, black is intended ground fault path, and yellow shows the alternate path.

By moving the bonding point to the main system bus, there is no ambiguity in the ground fault path, so ground fault can be reliably detected:



However, if you try to use a breaker with ground fault protection as the required generator ground fault protection for 1000A and larger breakers, it is easy to see that the system will not detect a ground fault between the bonding point and the generators, unless the generator ground fault protection is monitoring the bus neutral to ground bonding point.

Bottom line, in the changes for 2017 we wanted to have some better clarity on best practices, because the obvious and most common solution (bond at the generator) will result in a system that is prone to nuisance ground fault trips.

Finally, it is worth noting that generators can't be damaged by an external ground fault condition, so it is best practice for even single outdoor generators to have their neutral bonding point locating where the conductors enter the building, so a downstream ground fault with have lowest possible impedance, most reliable return path to ground.