

## Discrete logic solving system (DLSS)

### Lockheed Martin DLSS – advanced analog I&C modernization for U.S. nuclear plants

DLSS® provides non-digital, 1E safety I&C applications that protect nuclear power plants by monitoring, calculating and actuating protective elements to ensure safety measures are operational when needed.

#### Challenge

As nuclear plant operators prepare for life extension, they need highly reliable, low-risk and cost effective instrumentation and control (I&C) modernization solutions. Solutions that meet current licensing and regulatory requirements having long service life with ample product support. Additionally, existing obsolete equipment may need to be replaced before completion of digital modernization projects.

#### Solution

Framatome and Lockheed Martin join forces to bring U.S. nuclear plants an advanced analog modernization solution, DLSS. As an international leader in the nuclear industry with proven I&C solutions installed in more than 100 plants worldwide, Framatome is the official channel to market for DLSS in the U.S. Customers can look to Framatome to integrate DLSS into a range of non-digital safety I&C system upgrades that support their plant modernization strategies. Lockheed Martin's DLSS is a non-digital system implemented in custom hardware-based logic that has a familiar PLC-like form, fit and function without any programmable elements. DLSS offers applications without software-like components which eliminate complexity, as well as risk of software common-cause failure.

The system is designed, qualified and produced under a 10 CFR 50 Appendix B Quality Assurance Program, and customized to suit both new and retro-fitted applications under the 50.59 modification process. DLSS components can be assembled in separate divisions with application-specific discrete voting logic, while adhering to precise safety requirements for implementation of plant systems such as:

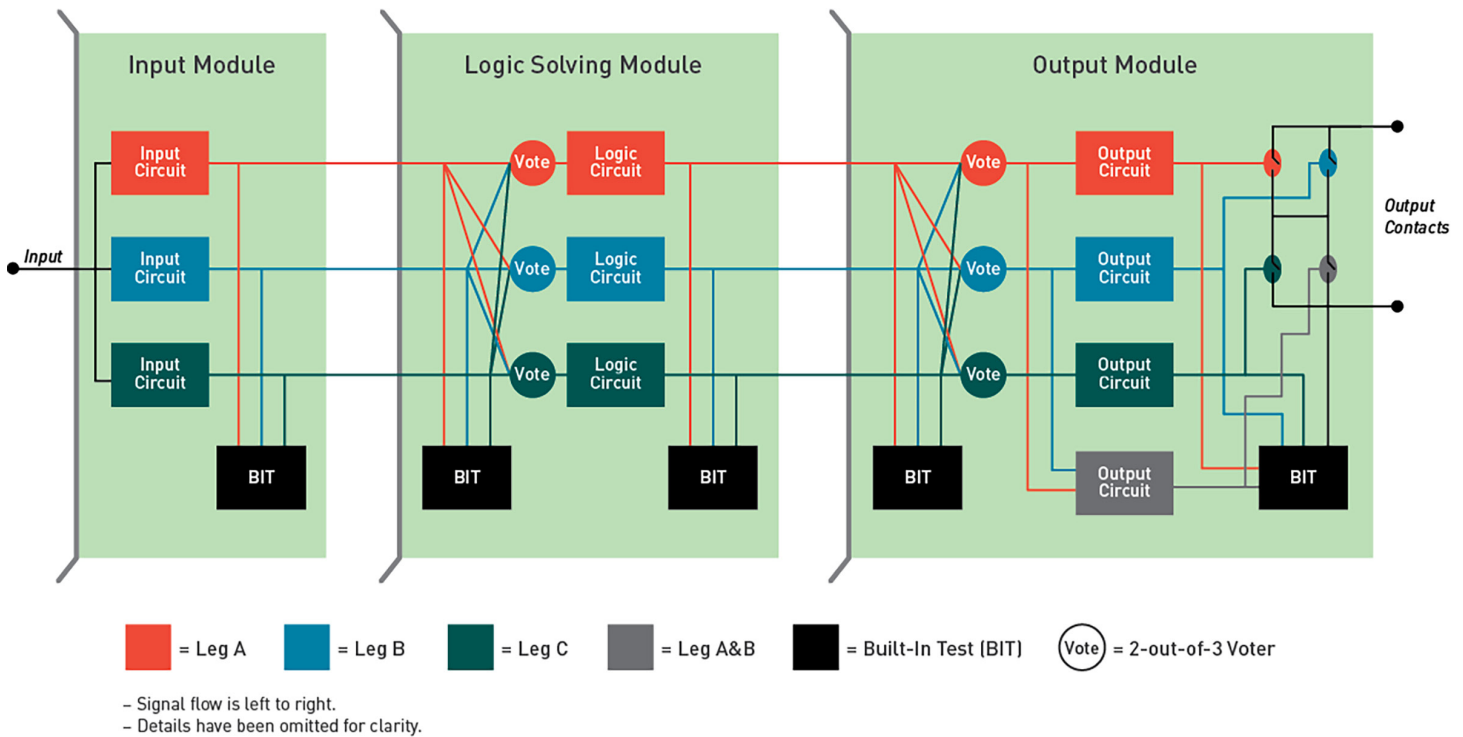
- Load shedding and emergency load sequencing
- Engineered safety features actuation systems
- Control systems for safety chillers
- Diverse instrumentation and control systems



#### Customer benefits

- Avoids plant relicensing process; reduces risk of extra cost/lost time
- 10 CFR 50 Appendix B compliance minimizes regulatory risk
- Integration by Framatome experts adds project confidence
- Modular design means customization that suits new and retro-fitted applications
- Software common-cause failure risk eliminated due to no operating system or programmable components
- Modern analog electronics enhance safety, reliability and efficiency
- Built-in redundancy supports system diversity and improves reliability
- Built-in-Test (BIT) to detect faults
- Elimination of single point vulnerabilities

**Your performance**  
is **our** everyday **commitment**



## Features

DLSS is a unique non-digital design approach offering a hardware-based architecture, solid-state electronics, and analog and discrete logic circuits. It is built with a simple configuration of common input/output modules and application-specific logic solving modules.

- Non-digital, hardware-based architecture limited to discrete solid-state electronics
- Triple Modular Redundancy (TMR) for fault tolerance
- Built-in Test (BIT) to detect faults
- Hot Standby and Hot Swap capabilities
- Decentralized BIT isolates faults to Lowest Replaceable Unit (LRU)
- Superior reliability through stringent derating criteria
- Visual indicators at the LRU-level to report faults
- Common platform approach reusable/deployable to multiple applications
- Operates without FPGA, microcontroller or microprocessor running software (i.e. no programmable components)
- Long service life with decades of product support

## Making obsolescence history

Framatome successfully replaced an ESFAS system in two units at a U.S. customer site in 2019 and 2020. This replacement of an obsolete analog system with modern analog systems integrating DLSS proved that under 50.59, a complete 1E system could be designed and replaced in less than two years.

## Key figures

**100+** reactors worldwide use our complete instrumentation solutions

**1,300** professionals in support as a global team on 17 sites in 9 countries



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