Budget Justification
California State University, Bakersfield

A. **SENIOR PERSONNEL:**

Principal Investigator: Professor Ehsan Reihani (Annual Salary $116,100 for 8 month academic work calendar) will be the Principal Investigator (PI) of this project and will provide overall direction and oversight of the research and the outcomes. The PI will commit/requests 1.6 academic months or 20 percent effort per year. The PI will also mentor and co-supervise three undergraduate student researchers (USRs) each year. Salary support is requested commensurate with the level of effort. Fringe benefits are applied at the CSUB composite rate of 48% for academic year salary.

B. **OTHER PERSONNEL:**

Undergraduate Student Researchers (3 annually)
Three undergraduate students will participate each year, supporting research activities during both academic terms and summer. Their duties include developing software test harnesses, simulation frameworks, hardware validation, and data analysis, directly aligned with the project's educational and research goals. Compensation is calculated as:

- Academic year: 20 hrs/week × $20/hr × 30 weeks = $12,000 per student.
- Summer: 20 hrs/week × $20/hr × 15 weeks = $6,000 per student, plus fringe at 16%.

This yields $36,000 in academic wages plus $20,880 in summer support (inclusive of fringe) each year.

C. **FRINGE BENEFITS:**

CSUB utilizes a 48% composite rate for Faculty Academic Year Salary and a 16% composite rate for Faculty, Staff, and Student Summer Salary.

D. **EQUIPMENT:** Not applicable.

E. **TRAVEL**

Funds are requested to support dissemination of results at major national conferences, consistent with NSF's emphasis on broad dissemination. The PI will attend three conferences per year, and each year three undergraduate students will attend one conference each to present research outcomes. Estimated costs are $2,700 per traveler per trip, including airfare ($750), lodging ($333 × 3 nights), registration ($500), per diem ($55 × 4 days), and ground transport ($100). Total domestic travel is $16,200 annually and $64,800 over four years. Typical venues include the IEEE Power & Energy Society General Meeting (Chicago, San Diego, or Portland), the

American Control Conference (Atlanta, Seattle, or Denver), and ACM/IEEE machine learning conferences (NeurIPS, AAAI, or IEEE CDC). These venues are directly relevant to microgrid control, power systems, and physics-informed machine learning.

F. **PARTICIPANT SUPPORT COSTS:** Not applicable.

G. **OTHER DIRECT COSTS:**

1. Materials and Supplies: $10,000 per year ($40,000 total) is requested for computing peripherals, hardware adapters for inverter interfacing, small-scale test equipment, cloud credits for simulation campaigns, and consumables (storage, cables, and boards). These items are critical for developing and validating the physics-informed neural ODE, reinforcement learning, and multi-agent optimization frameworks

2. Publication Costs/Documentation/Dissemination: $5,000 is requested in Year 3 for page charges and open-access fees associated with disseminating results in high-impact journals (e.g., *IEEE Transactions on Smart Grid*, *IEEE Transactions on Control of Network Systems*, *Nature Scientific Reports*).

3. Computer Services: Request $10,000 per year for computer and AI services. $10,000 annually ($40,000 total) is requested for high-performance cloud computing, data storage, AI, and specialized software licenses (e.g., TensorFlow Federated, ONNX runtime optimization, and optimization solvers). These services are required for federated learning training on HPC clusters and deployment of models to real-time embedded hardware

H. **INDIRECT COSTS:**

Indirect costs are based on University negotiated rates with the cognizant federal agency and are applied at a rate of 48% for the entire project period using the modified total direct cost (MTDC) formula as per the approved rate. Modified total direct costs exclude equipment, capital expenditures, charges for patient care, student tuition remission, participant support costs, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of $25,000.