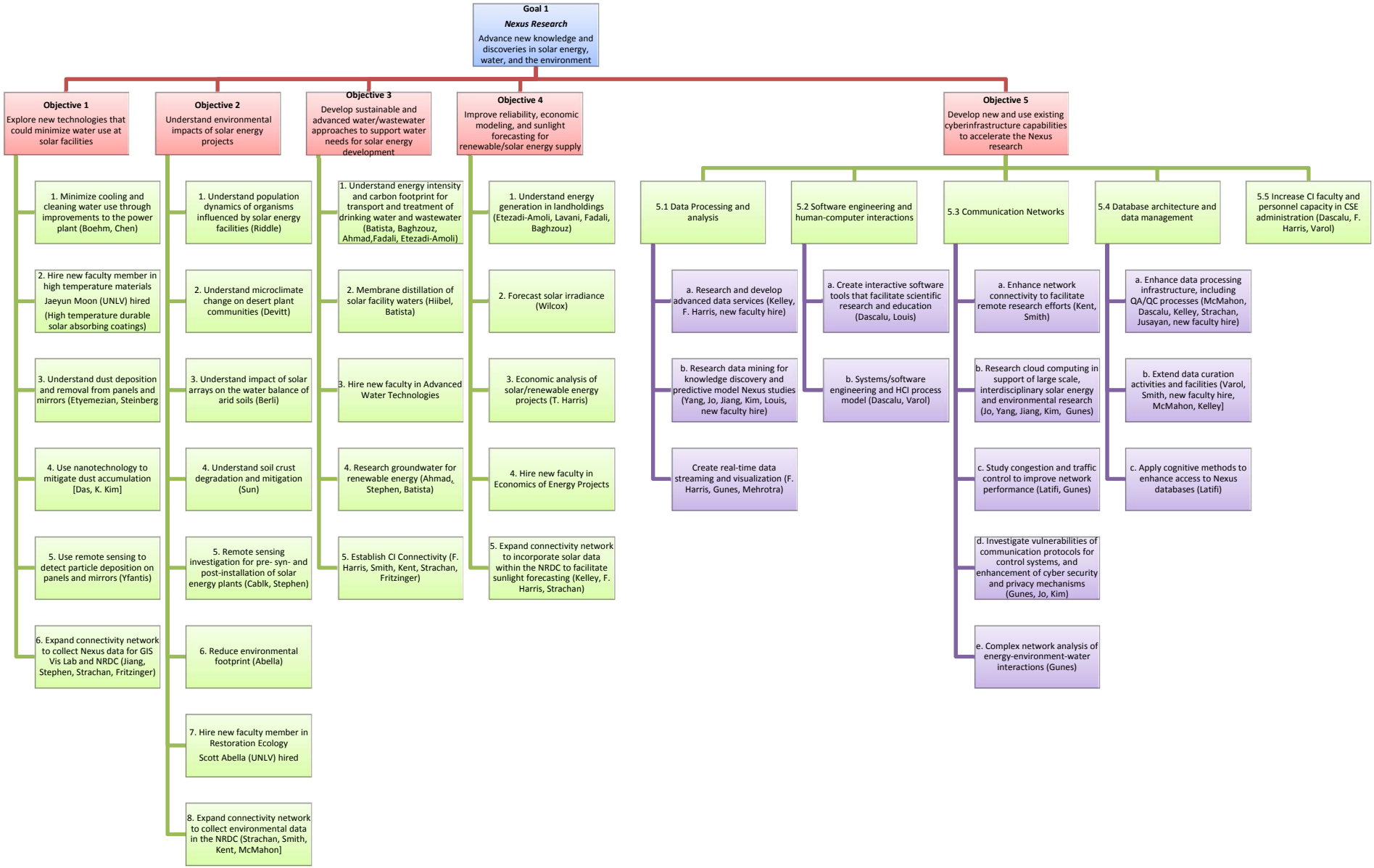
Goal 1
Nexus Research
Advance new knowledge and discoveries in solar energy, water, and the environment
Objective 1
Explore new technologies that could minimize water use at solar facilities
1. Minimize cooling and cleaning water use through improvements to the power plant (Boehm, Chen)
2. Hire new faculty member in high temperature materials
Jaeyun Moon (UNLV) hired
(High temperature durable solar absorbing coatings)
3. Understand dust deposition and removal from panels and mirrors (Etyemezian, Steinberg
4. Use nanotechnology to mitigate dust accumulation [Das, K. Kim]
5. Use remote sensing to detect particle deposition on panels and mirrors (Yfantis)
6. Expand connectivity network to collect Nexus data for GIS Vis Lab and NRDC (Jiang, Stephen, Strachan, Fritzinger)
Objective 2
Understand environmental impacts of solar energy projects
1. Understand population dynamics of organisms influenced by solar energy facilities (Riddle)
2. Understand microclimate change on desert plant communities (Devitt)
3. Understand impact of solar arrays on the water balance of arid soils (Berli)
4. Understand soil crust degradation and mitigation (Sun)
5. Remote sensing investigation for pre- syn- and post-installation of solar energy plants (Cablk, Stephen)
6. Reduce environmental footprint (Abella)
7. Hire new faculty member in Restoration Ecology
Scott Abella (UNLV) hired
8. Expand connectivity network to collect environmental data in the NRDC (Strachan, Smith, Kent, McMahon]
Objective 3
Develop sustainable and advanced water/wastewater approaches to support water needs for solar energy development
1. Understand energy intensity and carbon footprint for transport and treatment of drinking water and wastewater (Batista, Baghzouz, Ahmad,Fadali, Etezadi-Amoli)
2. Membrane distillation of solar facility waters (Hiibel, Batista)
3. Hire new faculty in Advanced Water Technologies
4. Research groundwater for renewable energy (Ahmad, Stephen, Batista)
5. Establish CI Connectivity (F. Harris, Smith, Kent, Strachan, Fritzinger)
Objective 4
Improve reliability, economic modeling, and sunlight forecasting for renewable/solar energy supply
1. Understand energy generation in landholdings (Etezadi-Amoli, Lavani, Fadali, Baghzouz)
2. Forecast solar irradiance (Wilcox)
3. Economic analysis of solar/renewable energy projects (T. Harris)
4. Hire new faculty in Economics of Energy Projects
5. Expand connectivity network to incorporate solar data within the NRDC to facilitate sunlight forecasting (Kelley, F. Harris, Strachan)
Objective 5
Develop new and use existing cyberinfrastructure capabilities to accelerate the Nexus research
5.1 Data Processing and analysis
a. Research and develop advanced data services (Kelley, F. Harris, new faculty hire)
b. Research data mining for knowledge discovery and predictive model Nexus studies (Yang, Jo, Jiang, Kim, Louis, new faculty hire)
Create real-time data streaming and visualization (F. Harris, Gunes, Mehrotra)
5.2 Software engineering and human-computer interactions
a. Create interactive software tools that facilitate scientific research and education (Dascalu, Louis)
b. Systems/software engineering and HCI process model (Dascalu, Varol)
5.3 Communication Networks
a. Enhance network connectivity to facilitate remote research efforts (Kent, Smith)
b. Research cloud computing in support of large scale, interdisciplinary solar energy and environmental research (Jo, Yang, Jiang, Kim, Gunes)
c. Study congestion and traffic control to improve network performance (Latifi, Gunes)
d. Investigate vulnerabilities of communication protocols for control systems, and enhancement of cyber security and privacy mechanisms (Gunes, Jo, Kim)
e. Complex network analysis of energy-environment-water interactions (Gunes)
5.4 Database architecture and data management
a. Enhance data processing infrastructure, including QA/QC processes (McMahon, Dascalu, Kelley, Strachan, Jusayan, new faculty hire)
b. Extend data curation activities and facilities (Varol, Smith, new faculty hire, McMahon, Kelley]
c. Apply cognitive methods to enhance access to Nexus databases (Latifi)
5.5 Increase CI faculty and personnel capacity in CSE administration (Dascalu, F. Harris, Varol)