

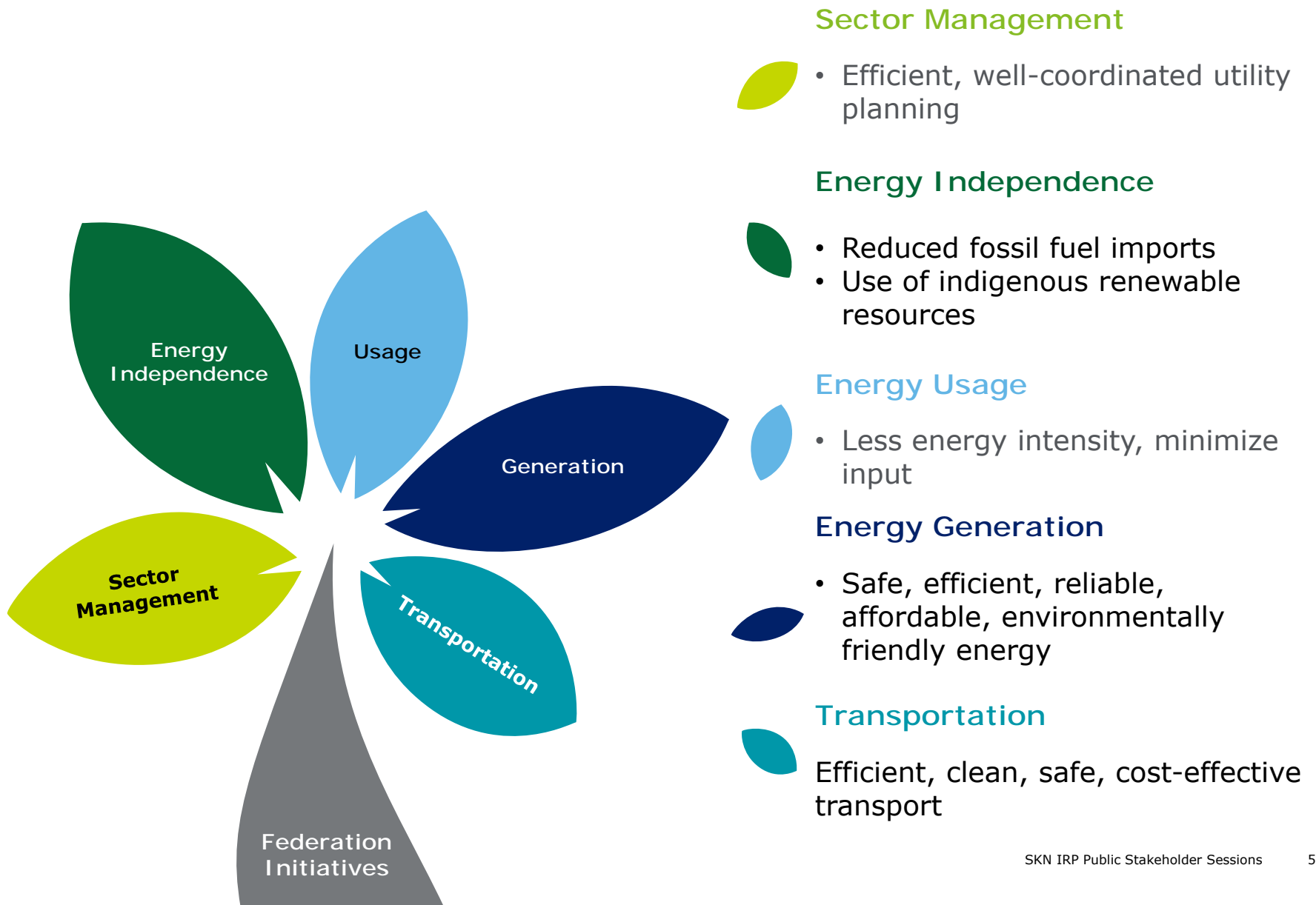
Agenda

1. **Welcome and Opening Remarks**
2. **Unique Features of Renewable Energy**
3. **Utility Planning Issues**
 - Challenges facing the utilities
 - Operations and reliability
 - Energy-based pricing and cost recovery
4. **Integrated Resource Plan for St. Kitts and Nevis**
 - Existing Generation Capacity
 - Future Capacity Options
 - Demand Growth
 - Other Potential Options
 - Interconnection
 - Interruptible Demand
5. **Public Comment and General Q&A**

Welcome & Opening Remarks

Unique Features of Renewable Energy

Initiatives by the Ministry of Public Infrastructure, Posts, Urban Development and Transport



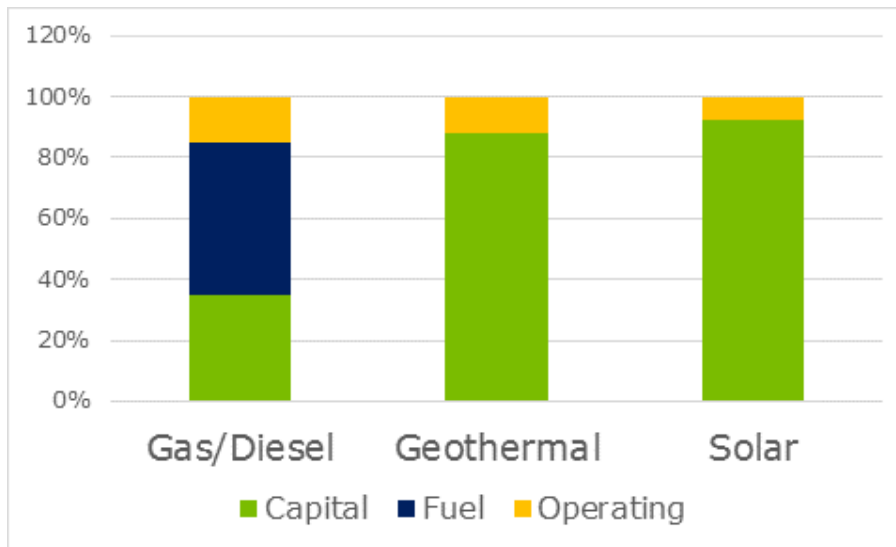
Renewable Energy Projects Have Unique Features Compared with Conventional Thermal Projects

- 1 Intermittent Energy Supply
- 2 Different Investment/Cost Structures
- 3 Ability to Scale
- 4 Technology Improvements
- 5 Planning Requirements

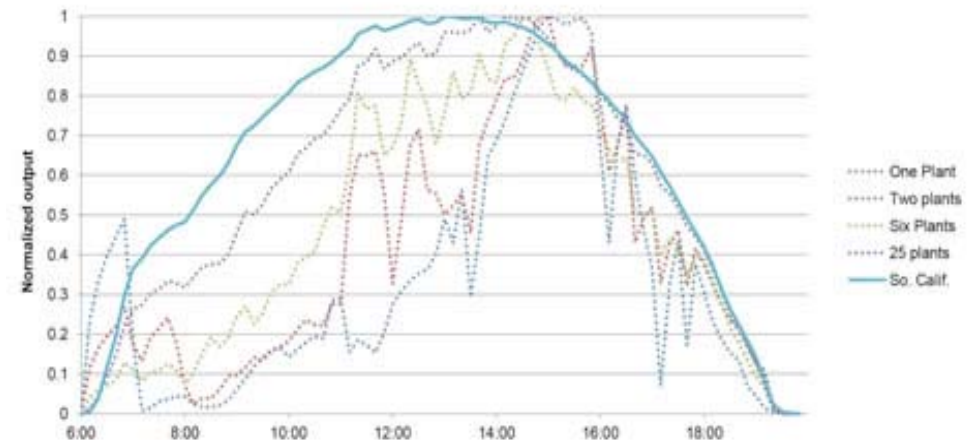


It is important to develop an understanding of how each one of these features can impact renewable energy choices and project development

- RE projects tend to have high up-front capital needs, but zero fuel costs and low operating costs
- With diesel/gas projects, roughly 2/3 of the overall cost is in the fuel



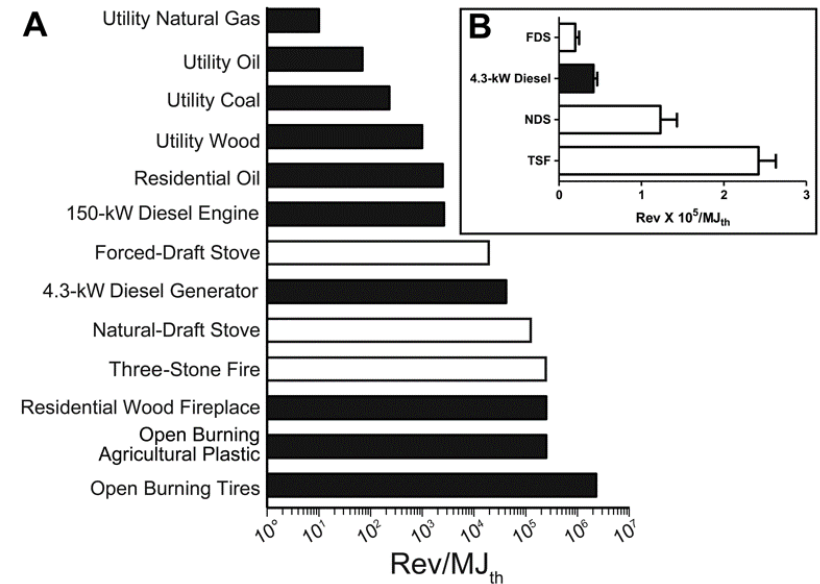
A comparison of solar power production variability in California



- Intermittent energy resources can be tough to predict and require planning and time to understand

A basic comparison of projects by fuel type

Gas/Diesel Generators	
Strengths	Challenges
Base load	Polluting Effects
Existing SKN system	Fuel price volatility
	Import dependency



A basic comparison of projects by fuel type



Geothermal	
Strengths	Challenges
Clean, renewable	Long lead times
Base load	High up-front capital
Reliable	Feasibility testing

Solar/Wind	
Strengths	Challenges
Clean, renewable	Intermittent
Scale up/down	Planning needs
Tech improvements	



Integrated Resource Planning can help determine what type of projects are best for a country for the long term

Utility Planning Issues

Unique Challenge for Electric Utilities

Electricity is virtually unique in the need to balance supply and demand continuously in real-time



Operations and Reliability

The balance has implications on how utilities work

Generation must match load

- Generation is constantly adjusted to keep pace with changing load
- “Extra” capacity (reserve margin) is needed as backup in case a unit has an unplanned shutdown

Load must match generation

- If sufficient generation is not available, load is reduced
- Power outages are not desired

Intermittent sources like wind and solar can complicate managing the balance

Utility Planning Has Evolved

Traditionally, vertically integrated utilities primarily looked only to add new, least-cost generation capacity to meet growing demand.

Demand increased because of ...

*Expanding electrification,
increasing user base*

*Increasing electric
intensity*

As systems matured, Integrated Resource Plans (IRP) became increasingly popular.

Planning extended beyond just least cost capacity to include...

demand-side options

*non-utility sources
of generation*

Challenges Facing the Utilities

01

Size and scale

Total system size can limit economies of scale

Typical unit sizes relatively large compared to load

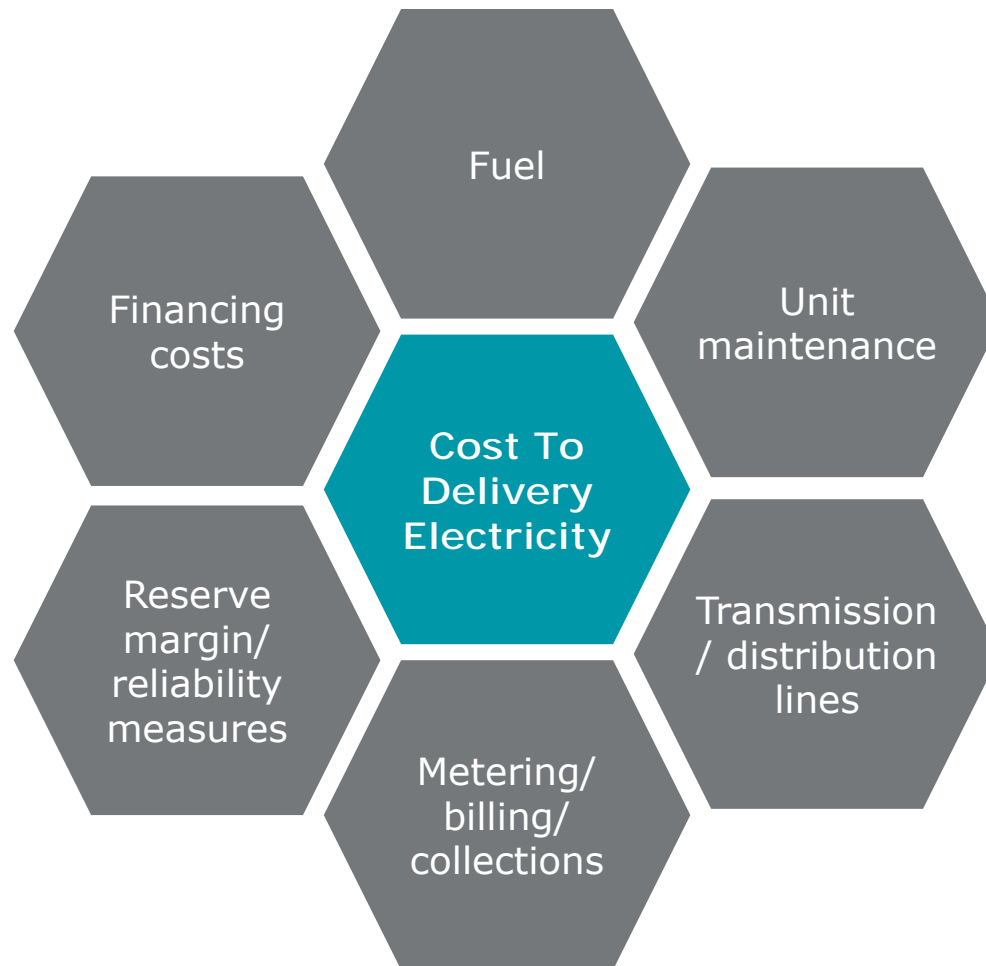
System	Peak Demand	Population
SKELEC	28 MW	35,000
NEVLEC	9 MW	11,000
ERCOT	70,000 MW	27 million

02

Transition from a fossil fuel base

Existing generation is largely diesel fueled

Energy-Based Pricing and Cost Recovery



Many of these costs are bundled together and averaged over the total energy consumed, represented as an **ECD/kWh charge**

Integrated Resource Plan

IRP Approach and Methodology

The primary premise of an IRP is to evaluate supply and demand resource options on a comprehensive basis.

The foundation of the analysis is the economic dispatch of generation options to serve demand.

- As demand increases, supply must also increase
- Costs and capacity of existing generation are critical
- Cost and characteristics of potential new supply including the possible displacement/replacement of existing supply are also important

An underlying assumption is the need for supply to fully serve the demand.

IRP Approach and Methodology

An independent analysis of development is the objective.

While the IRP for St. Kitts and Nevis will utilize standard IRP analyses and techniques, instead of the classic IRP result of a list of resources and a schedule for their deployment, this IRP will focus on the economic interactions and trade-offs among the different resource options.

The IRP will provide an analysis of the options – not a dictated single solution or prescription.

IRP Approach and Methodology

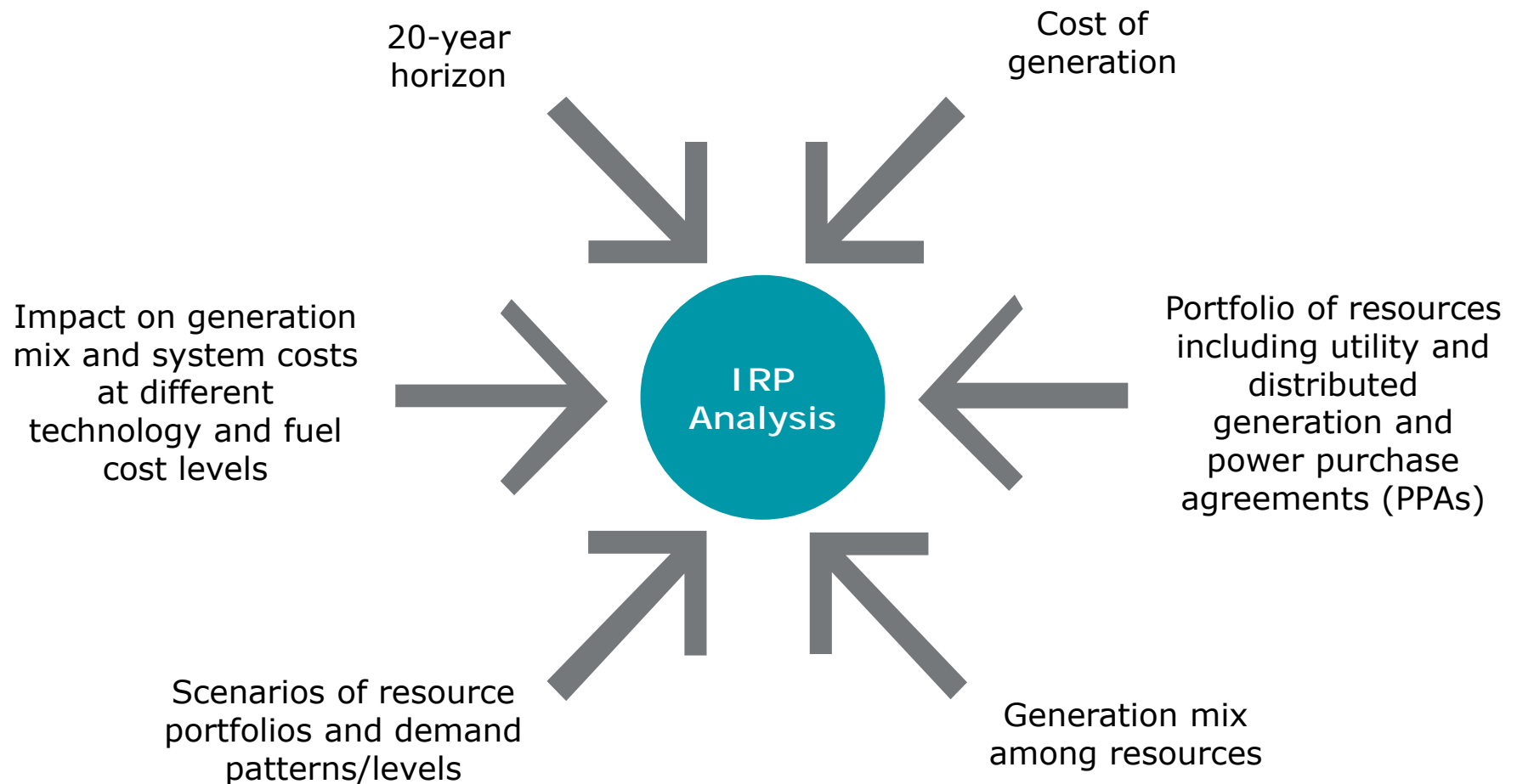


The IRP will be an independent and objective analysis of the development pathways.

- However, Stakeholder involvement is always an important component.

IRP Approach and Methodology

The analysis will be done for both utilities, St. Kitts Electricity Company (SKELEC) and Nevis Electricity Company (NEVLEC) as well as for an interconnected configuration.



Future Capacity Options

Unit Characteristics

01 Financing parameters (book life, tax life, debt/equity, interest rates)

02 Capacity

03 Heat rates/efficiency (as applicable)

04 Capital cost

05 Availability

Generation Types

01 Internal combustion diesel gensets

02 Solar PV (utility and distributed)

03 Wind

04 Geothermal

05 Waste-to-energy

NOTE: Though storage is not a generation type, consideration will be made for the potential of storage to support intermittent technologies that are generation types such as solar and wind.

Demand and Demand Growth

Organic, base demand growth rate is assumed to be modest.

Example planned large facilities

St. Kitts	Nevis
Park Hyatt	Wyndham
Embassy Suites	Candy Beach Resort
Koi	Northern Pointe

Other Potential Options

The concept of interconnecting the SKELEC and NEVLEC systems has been proposed. The major technical issues are beyond the scope of this IRP, however, areas that will be modeled include:

- Capacity of interconnection
- Utilization of interconnection
- Costs of interconnection

Is demand response a possibility?

Public Comment and Q&A

Public Comment and Q&A

Written comments and questions can be emailed to:

St. Kitts Electricity Company

info@stkittselectricitycoltd.com

Nevis Electricity Company

Jervan.Swanston@nevlec.com

Jonathan.Kelly@nevlec.com