Summary of 2016 IRP Metrics **September 15, 2016**

Scenarios	Cost		Financial Risk	Environmental Stewardship				Resiliency			
	20 yr PVRR ($ MN)	Rate Impact, 20 yr average ($/kWh)	Risk Exposure ($)	Average annual CO2 emissions (tons)	Average annual NOx emissions (tons)	Average annual SOx emissions (tons)	Total CO2 intensity (tons/MWh)	Planning Reserves (lowest amount over 20 yrs)*	Distributed Generation (Max DG as percent of capacity over 20 yr)	Market Reliance for Energy (Max over 20 yrs)	Market Reliance for Capacity (Max over 20 yrs)
Base	$ 10,309	$ 0.035	$ 1,461,856,693	12,883,603	13,181	11,808	0.510	15%	2%	9%	150
Robust Econ	$ 10,550	$ 0.036	$ 1,361,308,495	12,883,183	13,181	11,808	0.410	27%	2%	9%	200
Recession Econ	$ 11,042	$ 0.038	$ 1,529,366,806	3,334,067	1,925	593	0.284	3%	3%	58%	0
Streng Enviro	$ 11,990	$ 0.041	$ 1,183,639,662	3,309,326	1,910	629	0.150	15%	2%	52%	50
Adopt of DG	$ 11,092	$ 0.038	$ 1,382,467,346	13,159,800	13,332	11,808	0.459	15%	11%	9%	50
Quick Transition	$ 11,988	$ 0.042	$ 1,469,716,821	5,403,645	4,320	3,243	0.173	15%	3%	57%	0

* this Planning Reserves metric compares each scenario's resources to the Base Case peak load forecast.

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Metrics Formulas

1. Present Value Revenue Requirement (Cost)

PVRR = Present Value of Revenue Requirements 2017-2036

2. Rate Impact (Cost)

Rate Impact = $\frac{\text{Present Value of Revenue Requirements (20 year period)}}{\text{Total kWh Sales (20 year period)}}$

3. Risk Exposure (Financial Risk)

Risk Exposure = The PVRR at the 95% probability – expected PVRR

4. Average annual CO_2 emissions (Environmental)

Annual Average CO_2 Emissions = $\frac{\text{Sum of } CO_2 \text{ tons emitted}}{\text{\# of years in the study period}}$

5. Average annual SO_2 emissions (Environmental)

Annual Average SO_2 Emissions = $\frac{\text{Sum of } SO_2 \text{ tons emitted}}{\text{\# of years in the study period}}$

6. Average annual NO_x emissions (Environmental)

Annual Average NOx Emissions = $\frac{\text{Sum of } NO_x \text{ tons emitted}}{\text{\# of years in the study period}}$

7. CO_2 intensity (Environmental)

CO_2 Intensity for study period = $\frac{\text{Sum of } CO_2 \text{ tons emitted}}{\text{MWh energy generated}}$

8. Planning Reserves (Reliability)

Planning Reserves as a percent of load forecast $= \frac{\text{IPL's resources (MW) – peak utility load forecast (MW)}}{\text{utility load forecast}}$

9. DG Penetration (Reliability)

DG Penetration = $\frac{\text{distributed generation supply (MW)}}{\text{IPL resources (MW)}}$

10. Market Reliance for Energy (Reliability)

Market Reliance for energy = $\frac{\text{MWh of market purchases}}{\text{MWh of customer demand}}$

11. Market Reliance for Capacity (Reliability)

Market Reliance for capacity = total capacity purchases