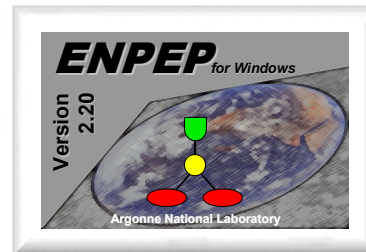


ENPEP-BALANCE: Expanded BALANCE Network with Electric Sector - Results

ENPEP-BALANCE Training Course
Singapore
December 5-9, 2011



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Electric Sector Cases - Input Data

- Case 1: Base Case (import Electric Case from the course CD)
- Case 2: Repower old and inefficient coal unit COAL1 with new AFBC unit
 - Repower in the year: 2005
 - New heat rate: 9,800 btu/kWh
 - New unplanned outages: 0.15
 - New planned outages: 35 days
 - New capital cost: 600 \$/kW
 - New life expectancy: 20 years
- Case 3: Advanced technology: Introduce Nuclear
 - Nuclear on-line year is 2007
- Case 4: Renewable technologies (dispatchable and non-dispatchable)
 - Geothermal on-line year is 2005
 - Wind becomes available in 2004
 - Solar becomes available in 2004



Electric Sector Cases - Input Data

- Wind and solar development plan for Case 4:

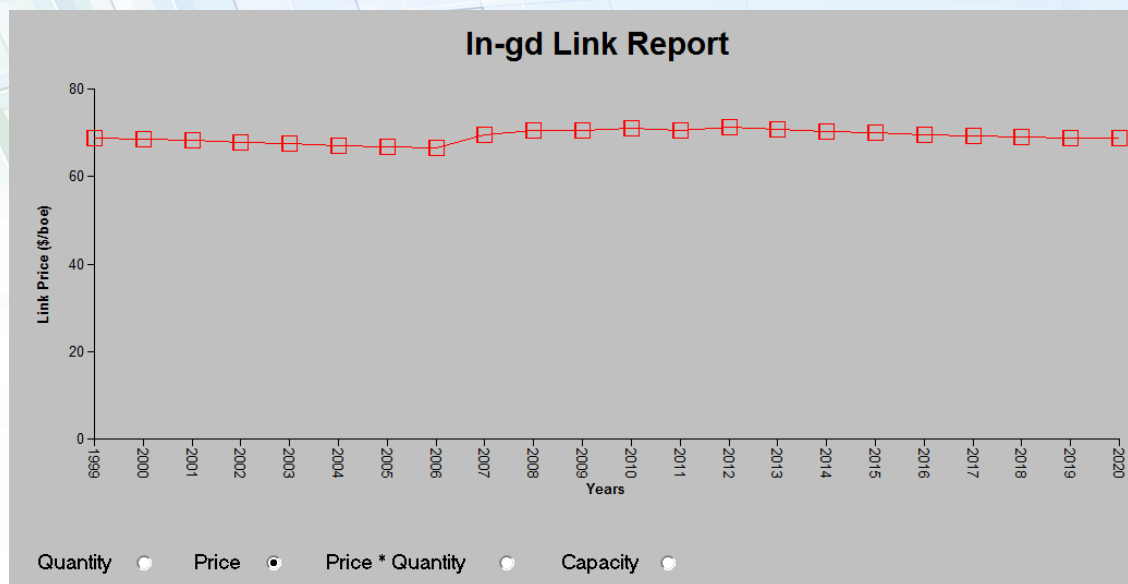
Capacity installed	Wind Farm Units	Wind	Wind	Solar Units	Solar	Solar
	#	MW	kboe-energy	#	MW	kboe-energy
2004	1	50	72.05	1	5	5.50
2006	3	150	216.15	3	15	16.50
2008	6	300	432.30	6	30	33.00
2010	9	450	648.45	10	50	55.00
2012	12	600	864.60	15	75	82.50
2014	15	750	1080.75	21	105	115.50

- Examine and compare all cases to the BASE CASE
 - Electricity price over time
 - Change in fuel consumption level and fuel mix over time
 - Electricity generation by different plant types



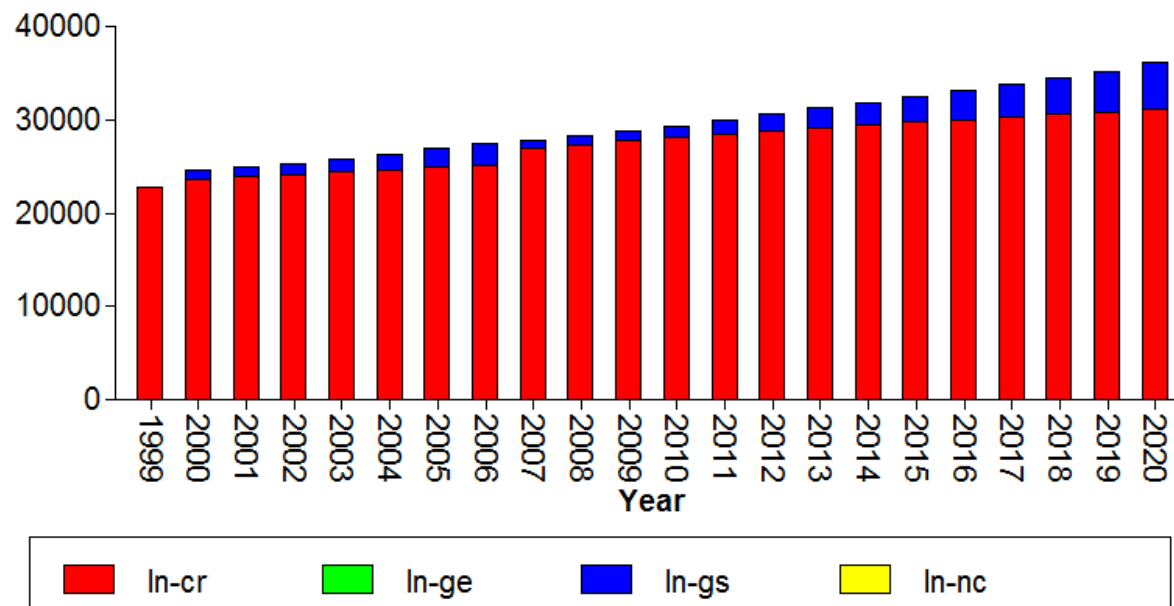
Results of Case Studies – Base Case

■ Electricity price



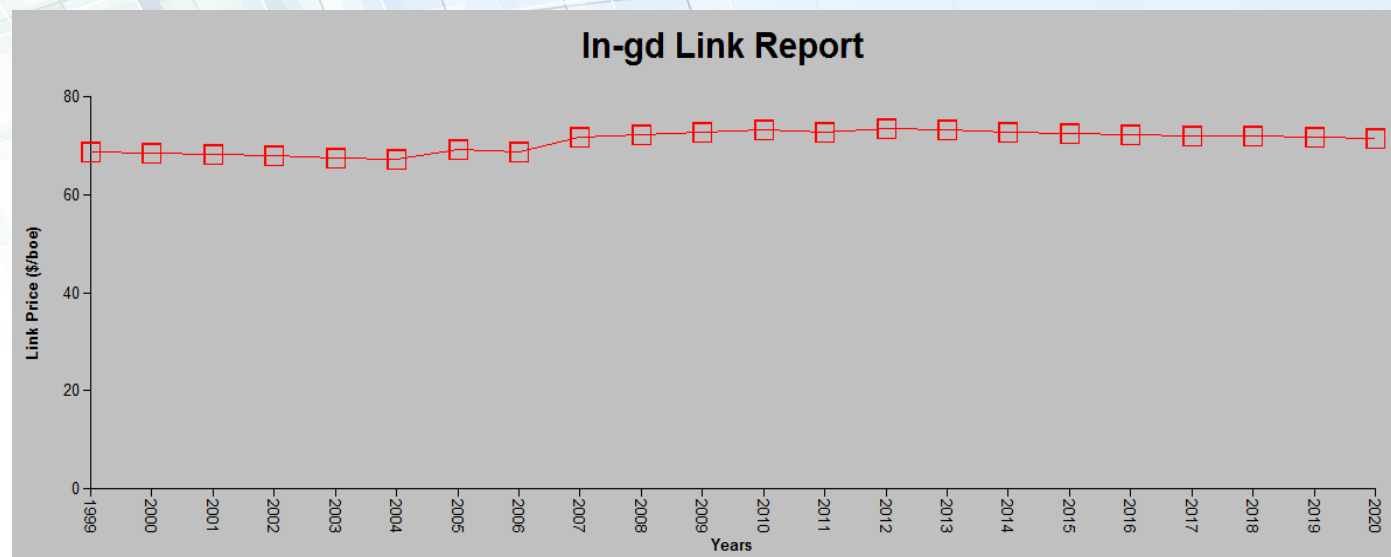
■ Fuel consumption

- Coal (In-cr)
- Geothermal (In-ge)
- Gas (In-gs)
- Nuclear (In-nc)



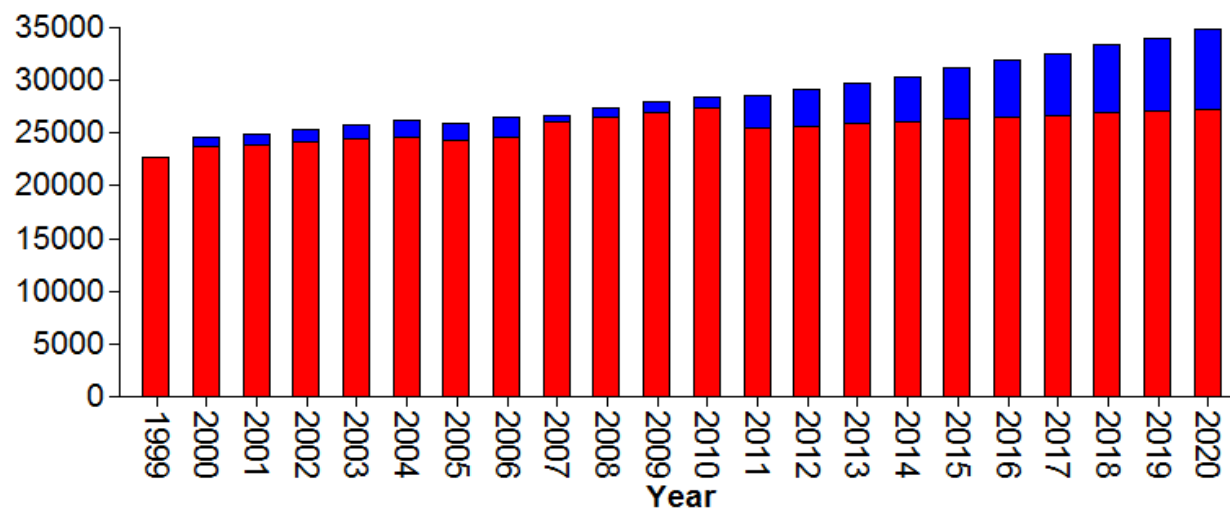
Results of Case Studies – Repowering Case

■ Electricity price

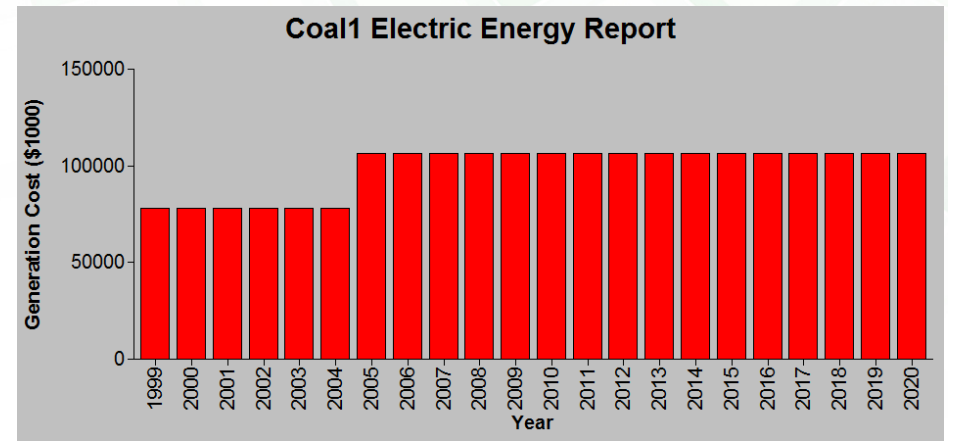
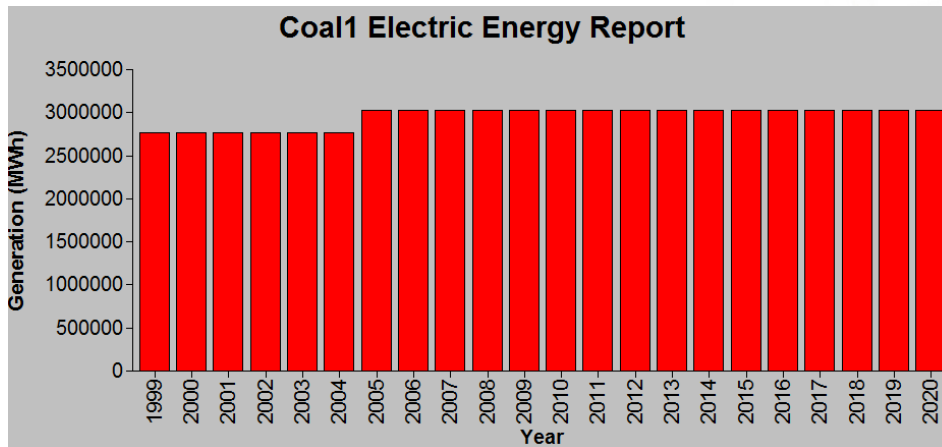
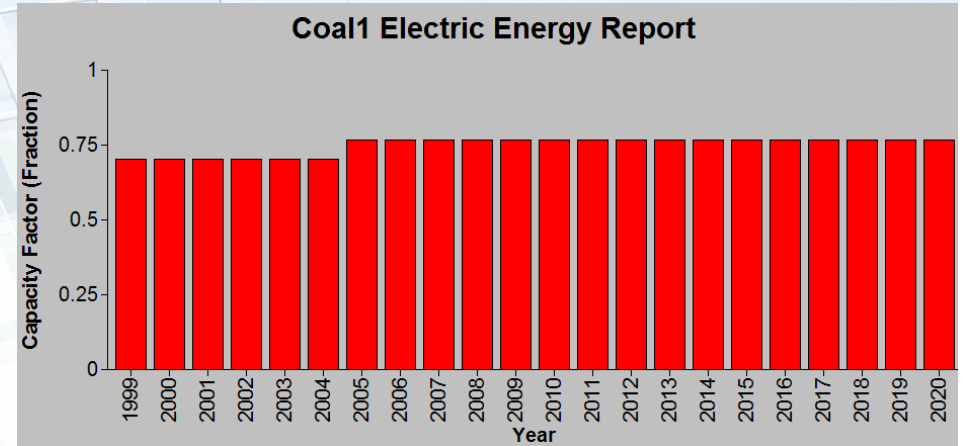
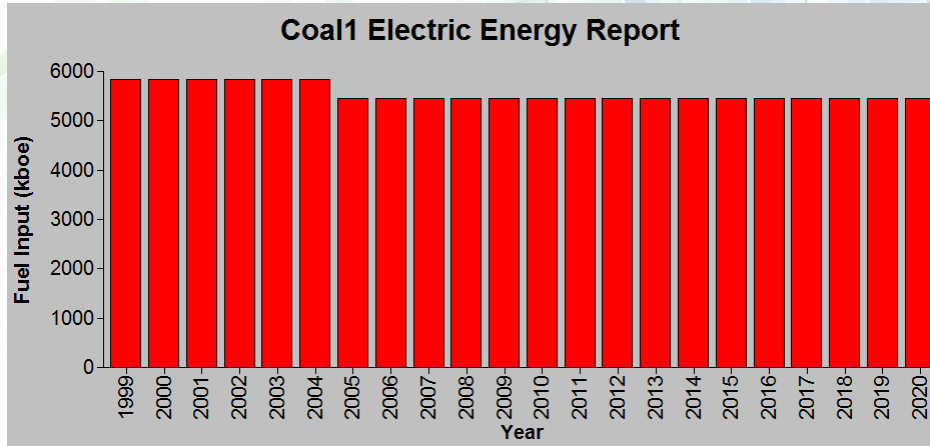


■ Fuel consumption

- Coal (In-cr)
- Geothermal (In-ge)
- Gas (In-gs)
- Nuclear (In-nc)

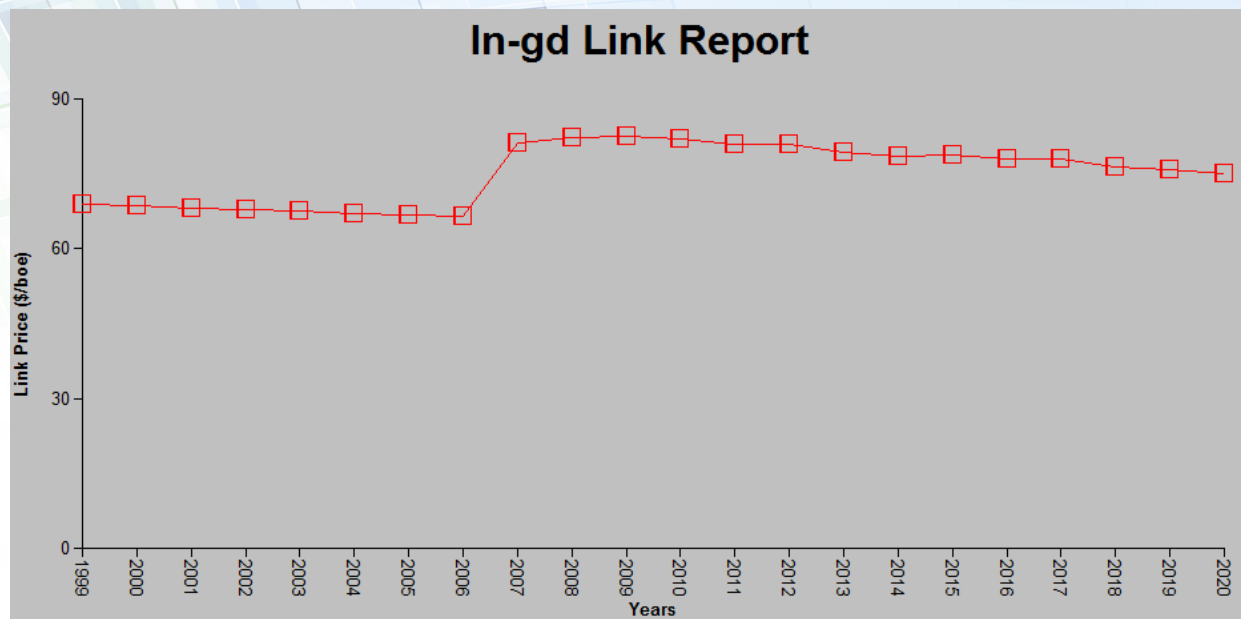


Repowering Case – Results for Coal1 Power Plant



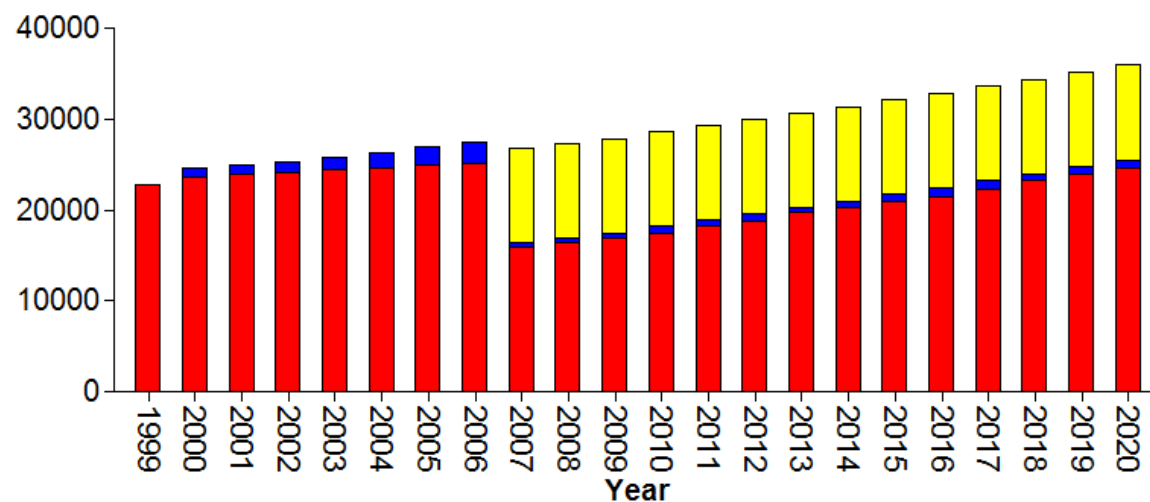
Results of Case Studies – Nuclear Case

■ Electricity price



■ Fuel consumption

- Coal (In-cr)
- Geothermal (In-ge)
- Gas (In-gs)
- Nuclear (In-nc)



In-cr

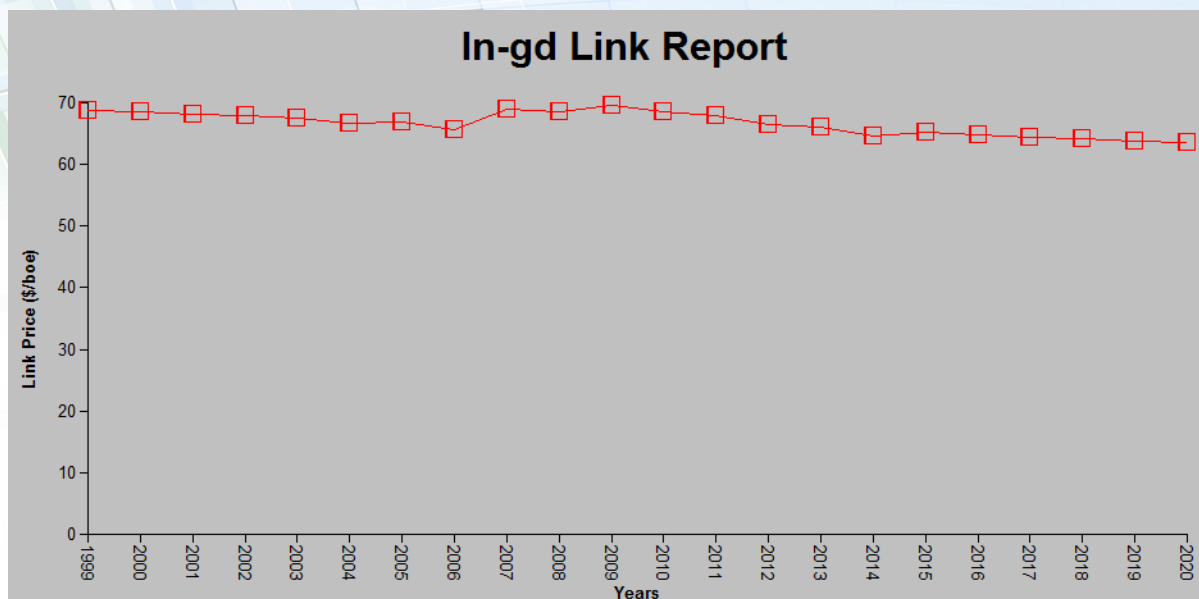
In-ge

In-gs

In-nc

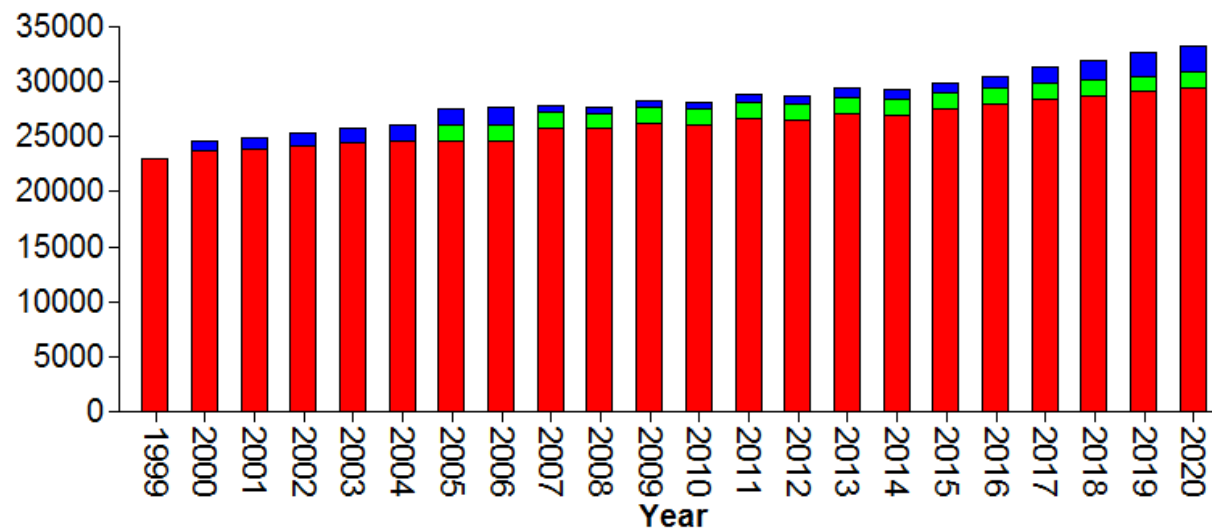
Results of Case Studies – Renewable Case

■ Electricity price



■ Fuel consumption

- Coal (In-cr)
- Geothermal (In-ge)
- Gas (In-gs)
- Nuclear (In-nc)



In-cr

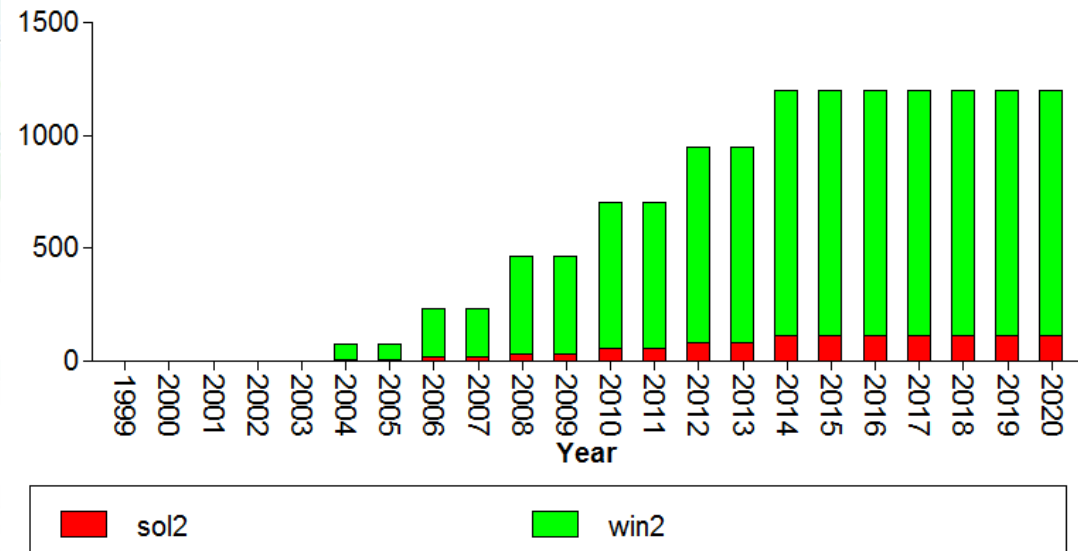
In-ge

In-gs

In-nc

Renewable Case – Electricity Generation

■ Solar and wind generation



■ Total electricity generation:

- Grid plants (In-gr)
- Solar (sol2)
- Wind (win2)

