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South African Photovoltaic Industry Association

SAPVIA IRP Presentation

Dr Chris Haw

Date: 13th December 2016

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Contents

- **Comment on IRP methodology**
- Comment on Allocation
- PV as a load following solution
- **Arbitrary Technical Constraints**
- The myth of Intermittency of Solar PV
- **Cost inputs to the IRP**
- **Embedded Generation**
- Conclusions

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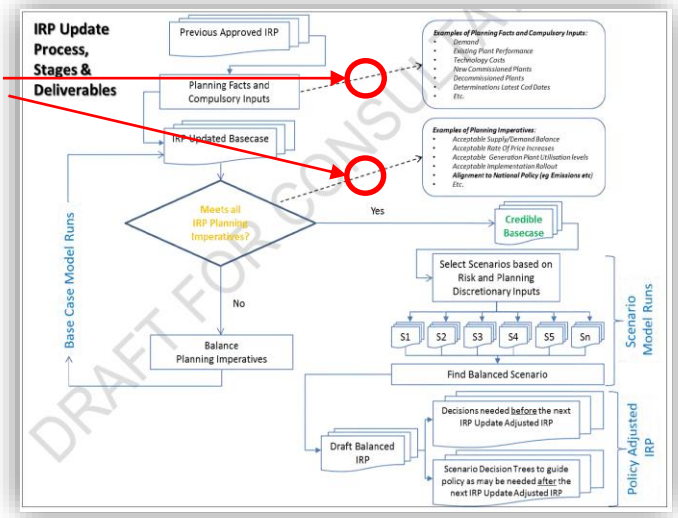
IRP Methodology

- IRP currently adds constraints to the Base Case Model
- SAPVIA recommends that the Base Case should reflect the **unconstrained Least Cost** model.
- It is then possible to add constraints and monitor the relative associated cost increase
- This is essential for prudent planning and best value to RSA.



BASE CASE model should be unconstrained and each constraint should be quantified as to what cost it comes at

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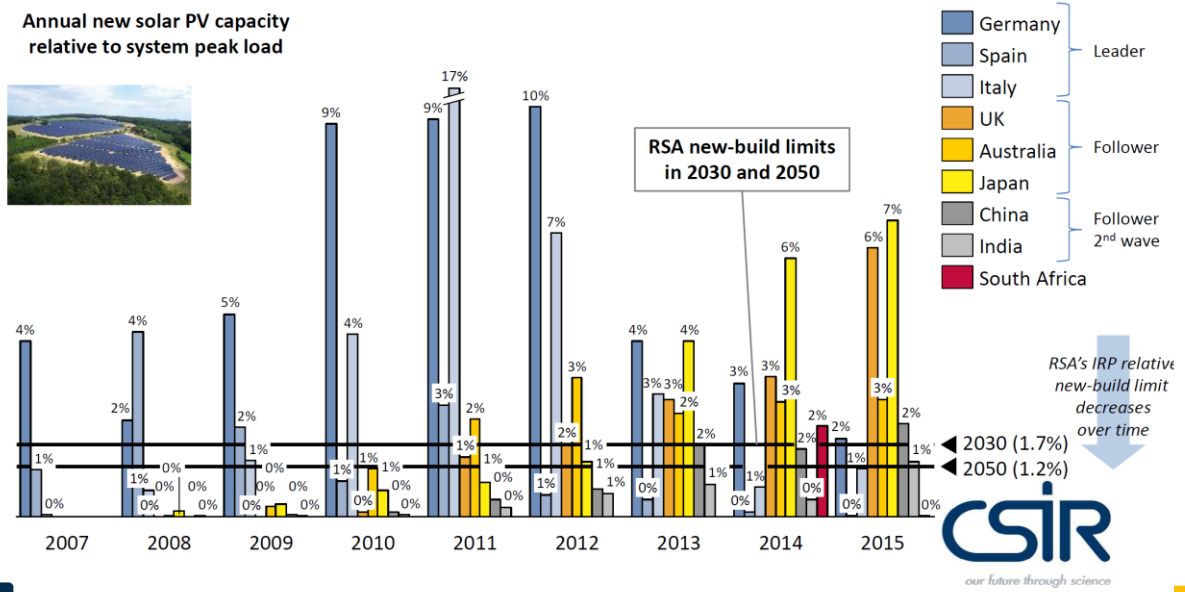
Arbitrary Technical Constrains are applied

- IRP imposes **new build limits** on PV and Wind, but not other technologies.
- No justification is provided for these limits, yet even in 2030 relative PV/peak load is less than most nations in 2015



Sources: SolarPowerEurope; CIGRE; websites of System Operators; IRP 2016 Draft; CSIR analysis

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Incorrect pricing assumptions

Table 7: Option Cost Conventional Power Plants

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> 2050 Prices are **higher** than what is available in the market today.
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Incorrect PV Cost Assumptions

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IRP is 40% higher than market

IRP cost assumptions are incorrect by 35 years!

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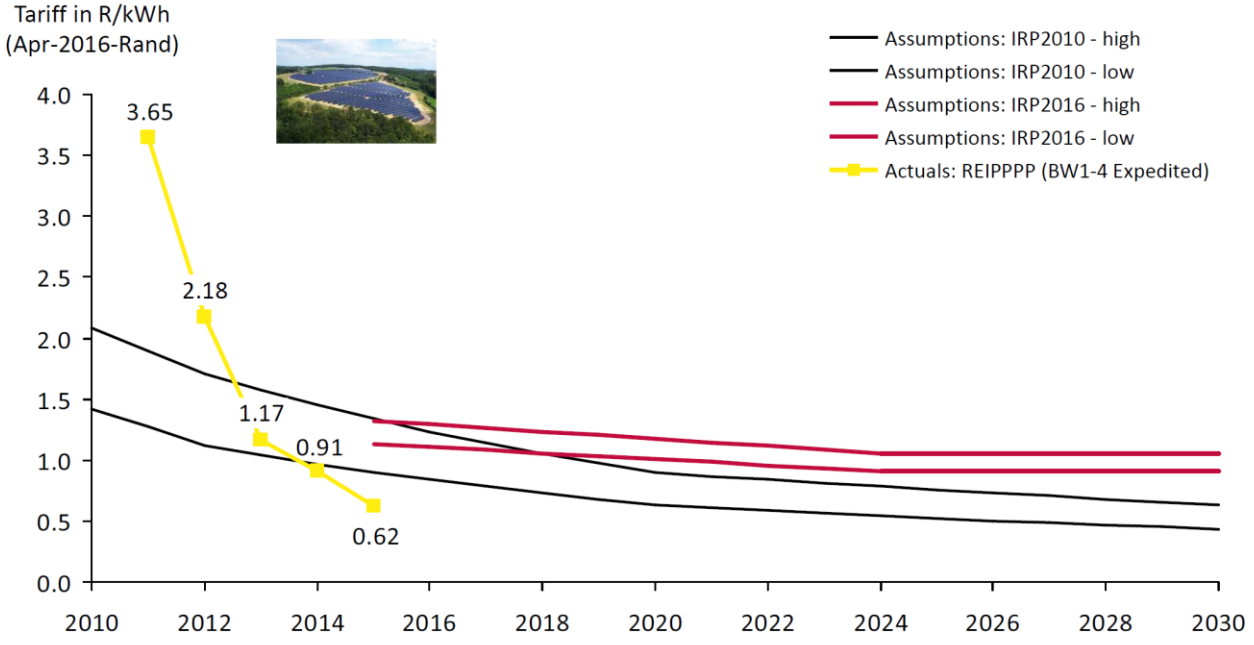
Incorrect Cost Assumptions



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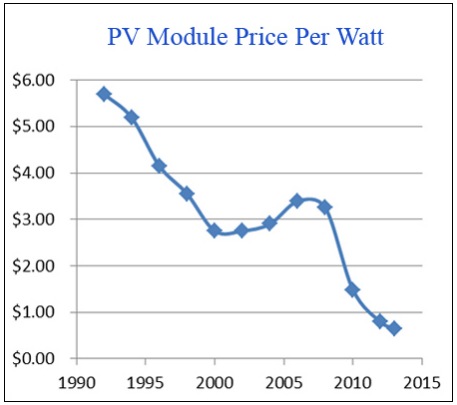
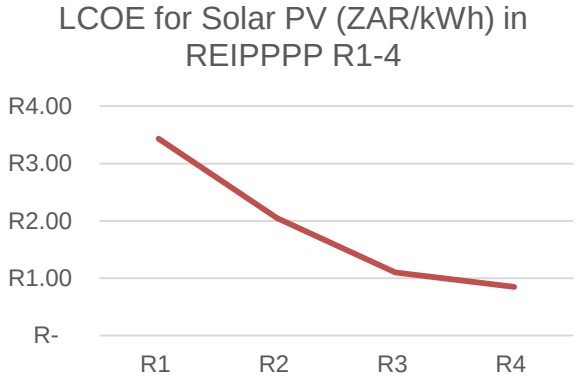
Historical learning rates



AVG reduction – 10% p.a.



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IRP proposes a learning rate of 0.65% p.a.; SAPVIA proposes to use the IRP2010 learning rate applied from 2016 to current market prices

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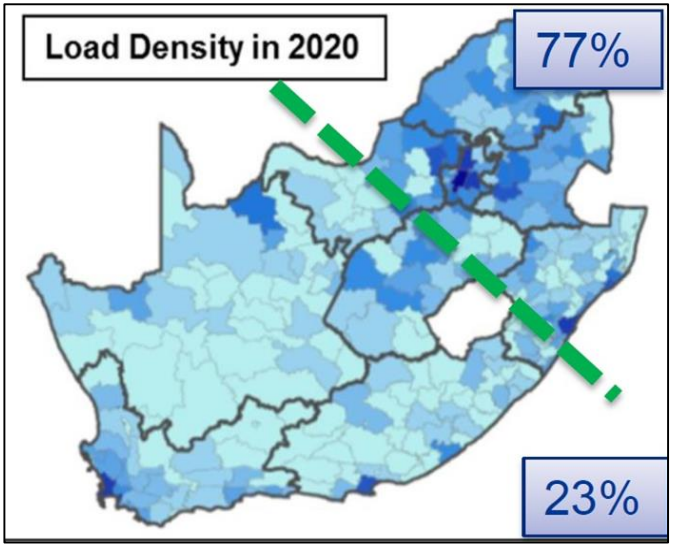
Embedded Generation



- Embedded Generation market estimated at **60MW** 2016.
- Installed system costs are already comparable to large REIPPPP projects
- Far easier grid integration and utility scale projects
- Closer to load = less losses
- IRP does not adequately make provision for these efficiencies or plan for embedded generation.

Solar PV can be deployed closer to the load density

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Conclusions

- IRP planning methodology must start with **least cost unconstrained model** and remove or justify **arbitrary artificial constraints**.
- IRP must use **correct and comparable cost assumptions** and learning rates for solar PV
- Solar PV as an **embedded generation** source offers significant benefits which are not quantified.
- Solar PV energy is one of the **least cost** and **least regret** pathways for the country to meet its emissions commitment.
- SAPVIA believes the IRP allocates too little capacity to PV; based on PV's performance in the REIPPPP program to date, government is obligated to use **correct assumptions** and properly consider the future benefits of solar PV.

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Thank-you

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Appendix

SUBMISSION VERSION – Containing all slides

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SAPVIA IRP Response

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Summary

- SAPVIA endorses the SAREC comments - call for unconstrained models to be utilised for decision making – support least cost modular, flexible gas/renewables mix to achieve a number of macro-economic policy objectives (Green Economy, industrialisation, localisation, SMME, etc).
- IRP does not appear to be consistent on use of Overnight Costs vs Total Project Costs and pricing assumptions for CAPEX and OPEX for PV are higher than what they should be.
- Inconsistency in annual allocation and gap in allocations (2021-2023) signals a slow down in roll-out – detrimental to economic growth.
- Appendices not published – doesn't allow for accurate examination and modelling especially IRR's.
- Learning rate applied to PV (0.65% p.a.) is very low compared to historical figures

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IRP Methodology

- SAPVIA recommends that the Base Case should reflect the unconstrained Least Cost model.
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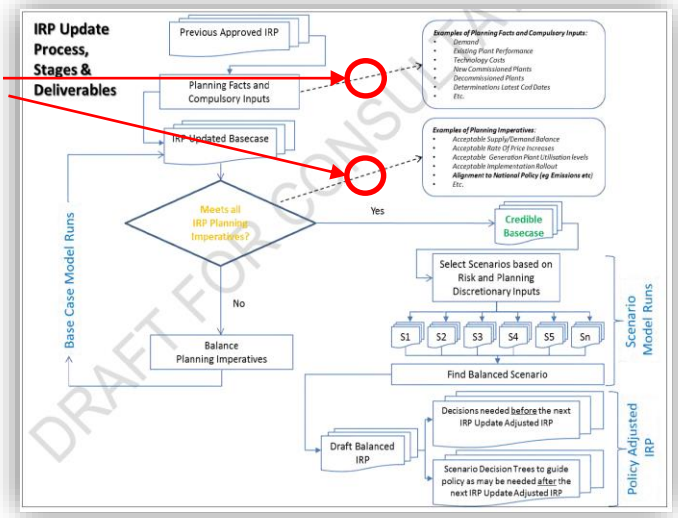

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Arbitrary Technical Constrains are applied

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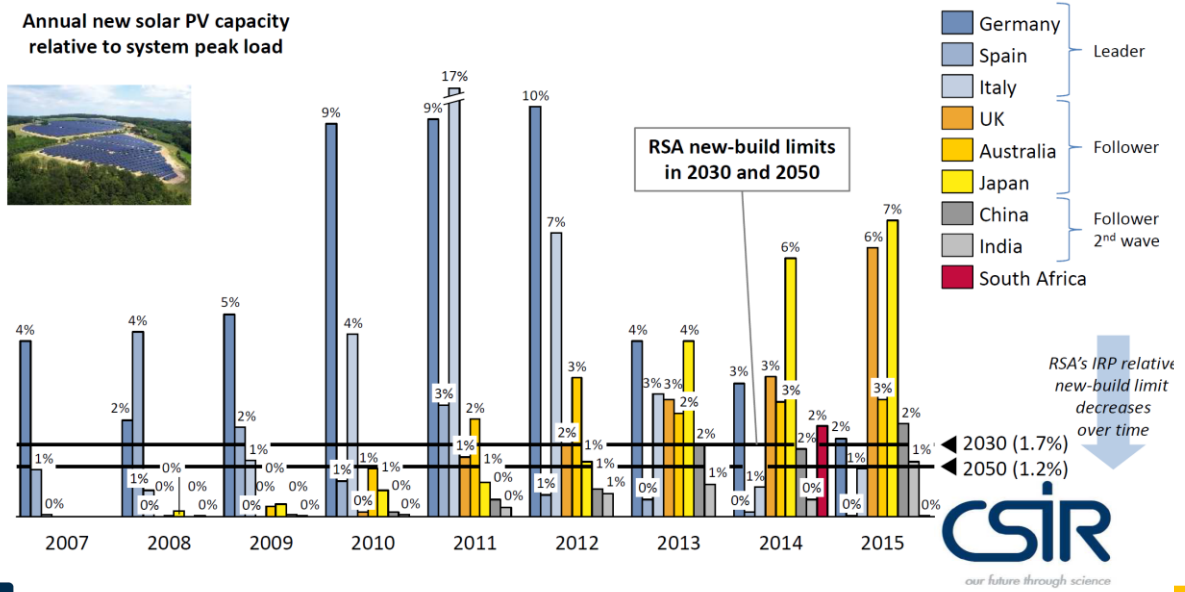

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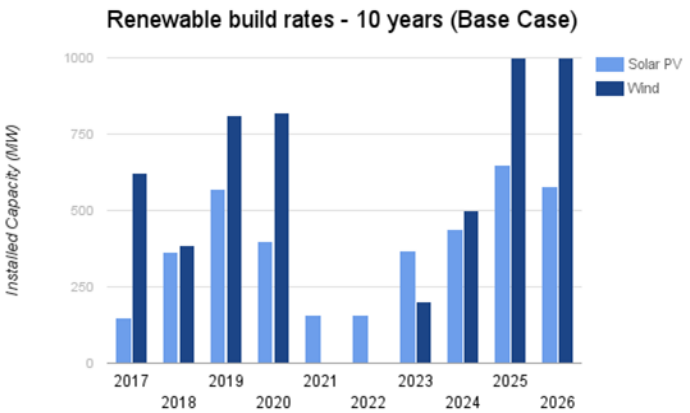
Gap in Allocation



- Artificially constrained model, wrong pricing = Very little solar in 2021-22
- Impact:
  - Reduced orders for local factories
  - Likely to result in factory closures with associated job losses
  - Retards localisation efforts (who would set up support industries sit idle for 2 years?)
  - Skills transfer compromised
- Need stable or increasing annual roll out to maximise localisation benefits

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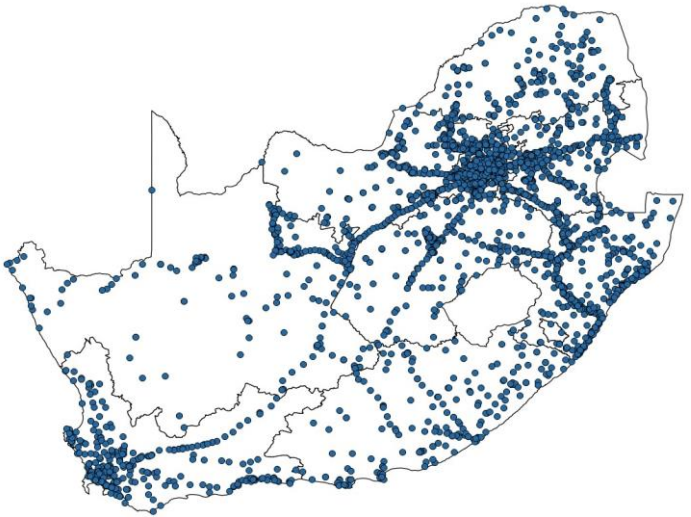
PV can follow the Grid

- Installed Distribution transformation capacity 101 197 MVA1.

  1: Eskom Integrated Report 2016.

- PV offers an easier grid connection option than most other generation technologies
- IRP needs to consider the real costs of connection at different scales and value of distributed generation



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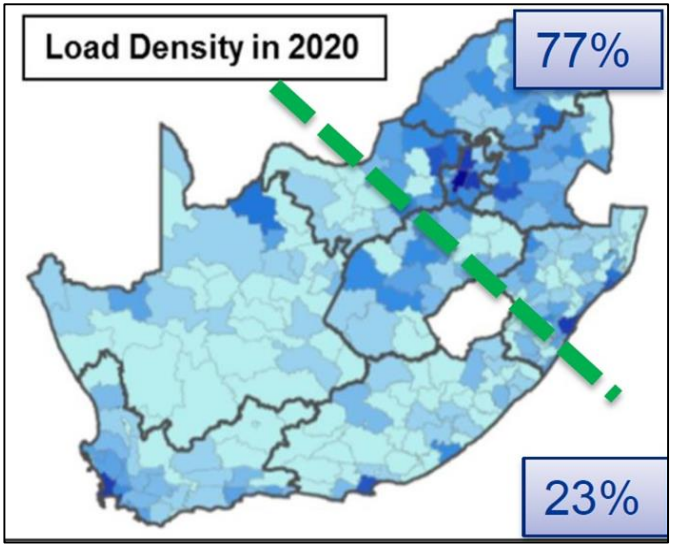
Load Density Map



- Map of projected load density across the country.
- Solar PV can easily supply load areas further away from larger generation.
- Need to match grid development and costs with the load projections – solar can follow the grid more easily.
- Unconstrained IRP combined with consistent, predictable roll-out (1000MW pa) will deliver least cost energy **AND** development benefits.
  (DoE IPPO November 2016)

Solar PV can be deployed closer to the load density

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Arbitrary Technical Constraints

- There are hundreds of distribution level substations with suitable transformation capacity that can receive small solar PV plants.
- The connection equipment is relatively simple, the vast majority of which can be done under the Self-Build process, which allows the developer or Independent Power Producer to construct the infrastructure and Hand-Over to Eskom.
- We accept there are load flow constraints at a significant number of these substations, however, even if only 10% of the above were immediately available, this still represents 10GW of transformation capacity.
- A significant number of the IPPs so far are connected at Transmission level

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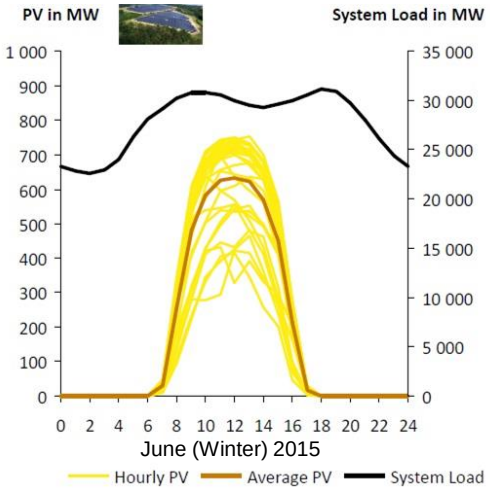
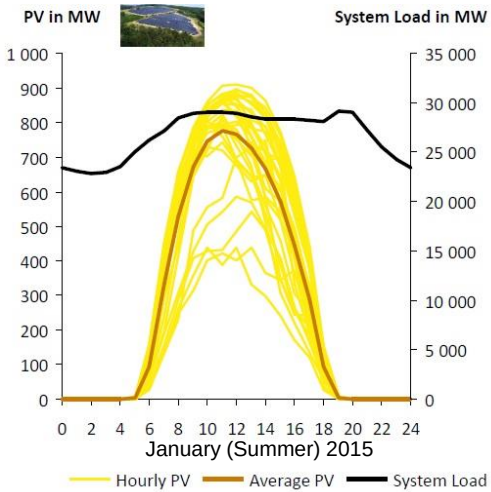
The myth of Intermittency





Geographical spread creates greater certainty in average solar contribution

Source: Financial benefits of renewables in South Africa in 2015-CSIR

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Supply/Demand Balance

Eskom System Operator contracts various types of generation or demand side managed load reserves in order to balance supply and demand to maintain the stability of the national grid. When considering the effect of renewables, likely future developments in our grid must be taken into account:

- A combination of flexible, affordable generation capacity (CCGTs)
- More affordable electrical storage (especially at residential levels)
- Smarter consumer products able to switch and interface with a load management system.

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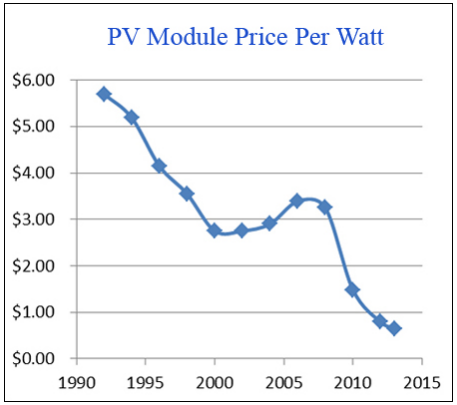

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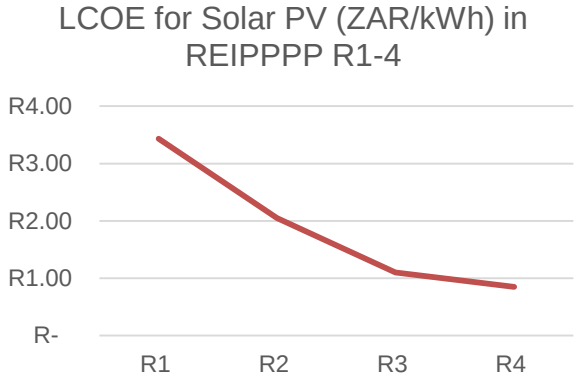

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Embedded Generation

- Clarity is required as to when embedded Generation is allocated, and how this is allocated. Industry cannot grind to a halt when the Minister publishes a note that the EG cap has been reached. This will result in
  - Companies shutting down
  - Layoffs
  - Degrading localization as equipment will no longer be procured.
- Continuity in long term roll-out of the EG sector should be included in the IRP. SAPVIA has recommended 100MW pa be included in the IRP based on cost reductions and current growth of the market i.e. 50MW pa
- Scale up of sector achievable based on number of entities in SA (March 2016. pqrs.co.za)

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Embedded Generation

- There should be no arbitrary bureaucratic halt on Embedded Generation as this has tremendous benefits such as:
  - It is end of grid load reduction (self-consumption);
  - It is privately financed (no ESKOM / treasury risk / support required);
  - It has the highest sustainable job creation potential;
  - It has the highest opportunities for new SMEs.
- SAPVIA believes any size private generation should be addressed this way to stimulate this industry, as a ministerial approval for every large industrial self consumption project would unnecessarily delay implementation and create resource constraints within the Ministry

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Conclusion

- SAPVIA believes the IRP allocates too little capacity to PV; based on PV's performance in the REIPPPP program to date, government is obligated to use **correct assumptions** and properly consider the future benefits of solar PV.
- Solar PV energy is one of the least cost and least regret pathways for the country to meet its emissions commitment.
  - REIPP demonstrates how PV has promoted inclusive economic growth, particularly in regions suffering low economic development/growth.
  - IRP must reflect the latest tariffs (not EPRI), latest accurate costs as submitted.
- PV satisfies the need for a more modular, flexible and responsive energy mix to meet the increasingly unpredictable and variable nature of the global market dynamics.
  - Technologies which are modular and scalable, quick to build, require little by way of Government or Eskom capex investment - the private sector bears the risk of delivery.

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Conclusion

- The growth of renewable energy, particularly when partnered with a quick responding complimentary technology such as gas allows for an alternative baseload combination to be considered:
  - Need unconstrained models: industry can deploy 1200MW pa for 10 years
  - Caters for the introduction of battery storage in the medium to long term time horizon.
- IRP needs to be responsive - ensure that the country receives value for money whilst ensuring a significant benefit flow to South Africa, and achieving a range of NDP objectives – industrialisation, Green Economy, emerging Black industrialists, SMME development.