

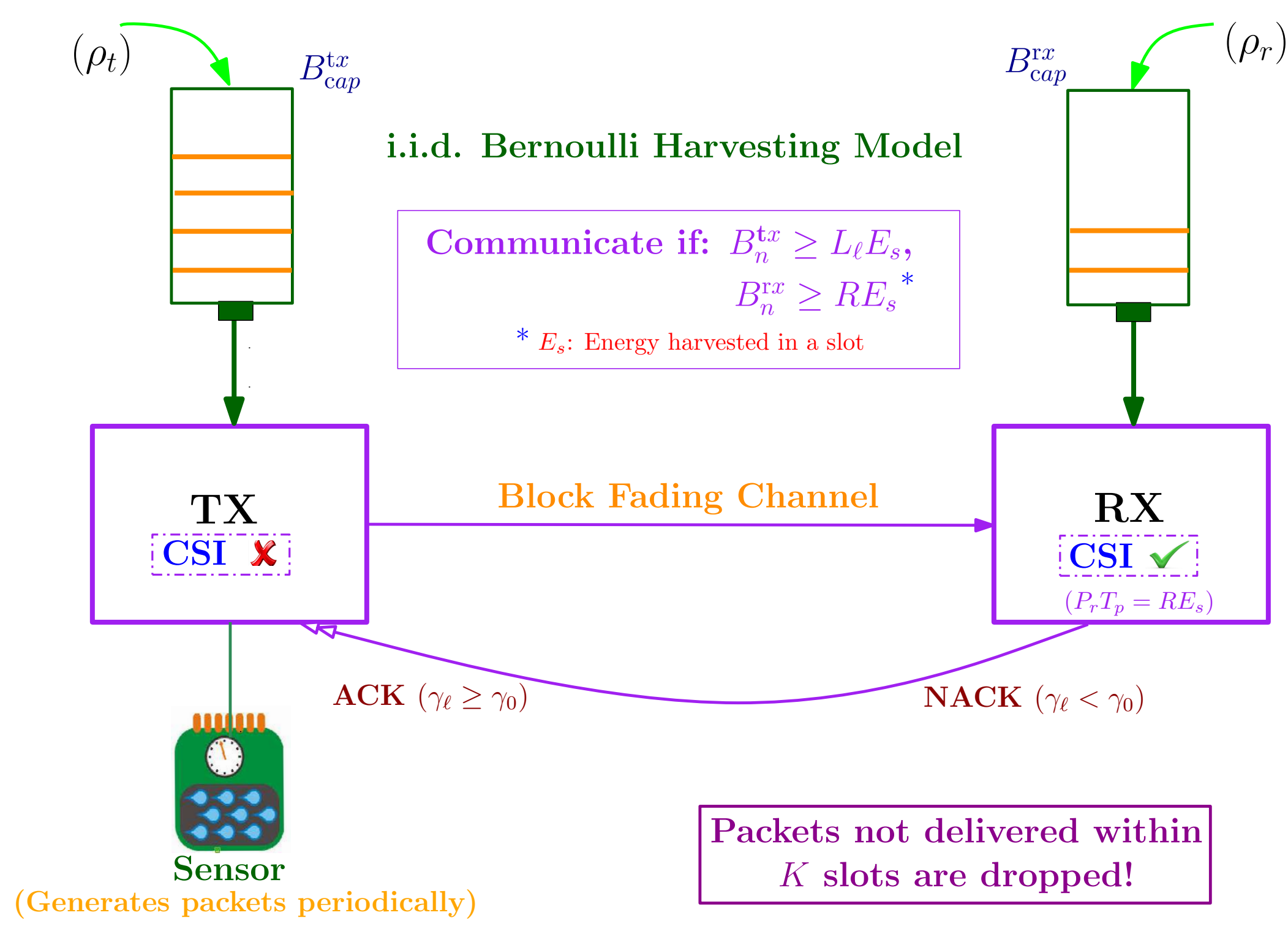


Design of Dual Energy Harvesting Communication Links with Retransmission

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System Model



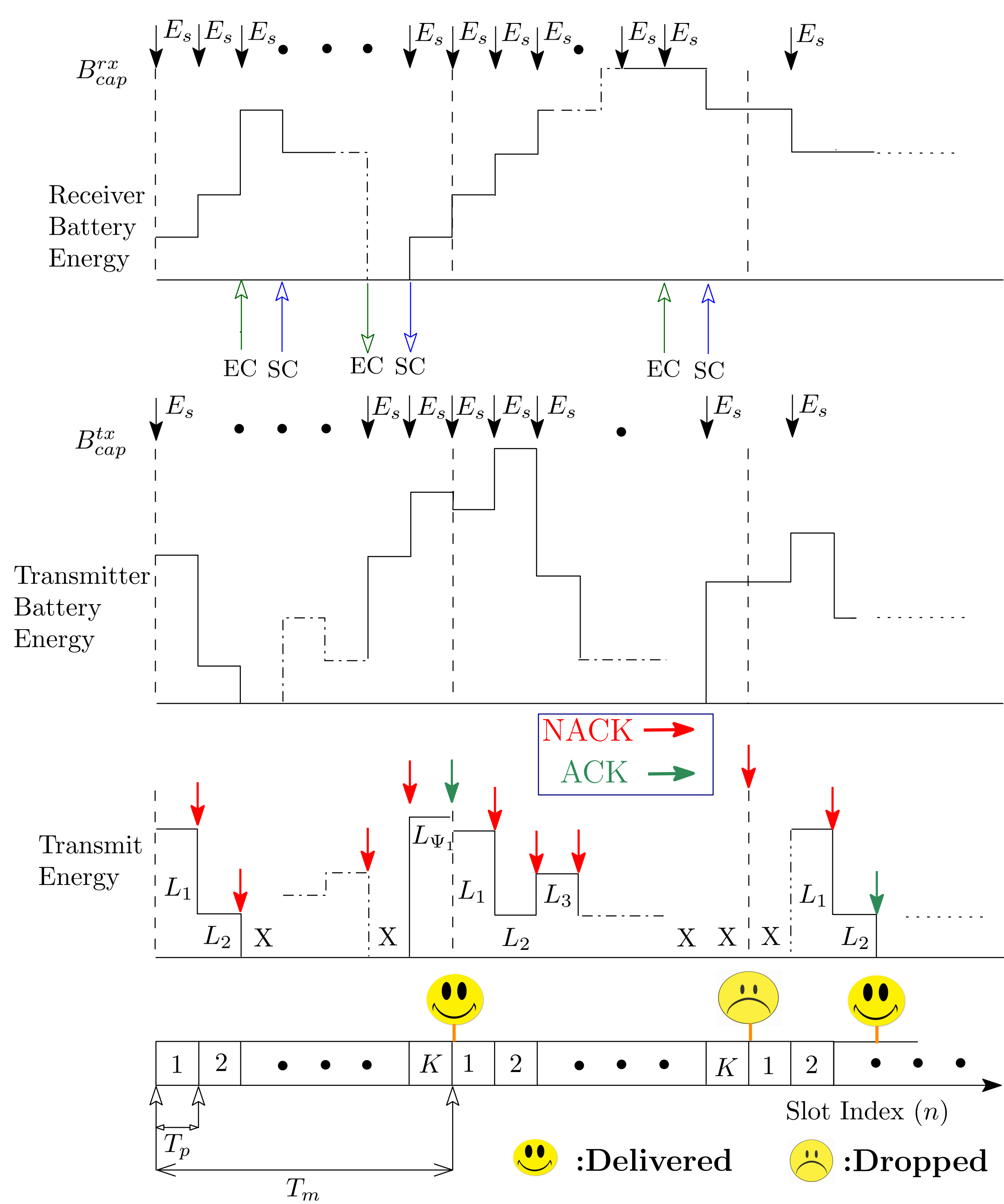
Battery Evolution and Outage

- Tx battery evolution $B_{n+1}^{tx} = \begin{cases} \min(B_n^{tx} + E_s - L_\ell E_s, B_{cap}^{tx}), & \text{with prob. } \rho_t \\ B_n^{tx} - L_\ell E_s, & \text{with prob. } 1 - \rho_t \end{cases}$
- ARQ: $p_{out} = \Pr[\gamma_\ell < \gamma_0] = \Pr[P_\ell |h_\ell|^2 < \gamma_0]$
- HARQ-CC: $p_{out} = \Pr[\gamma_{\ell,ac} < \gamma_0] = \Pr[\sum_{i=1}^\ell P_i |h_i|^2 < \gamma_0]$

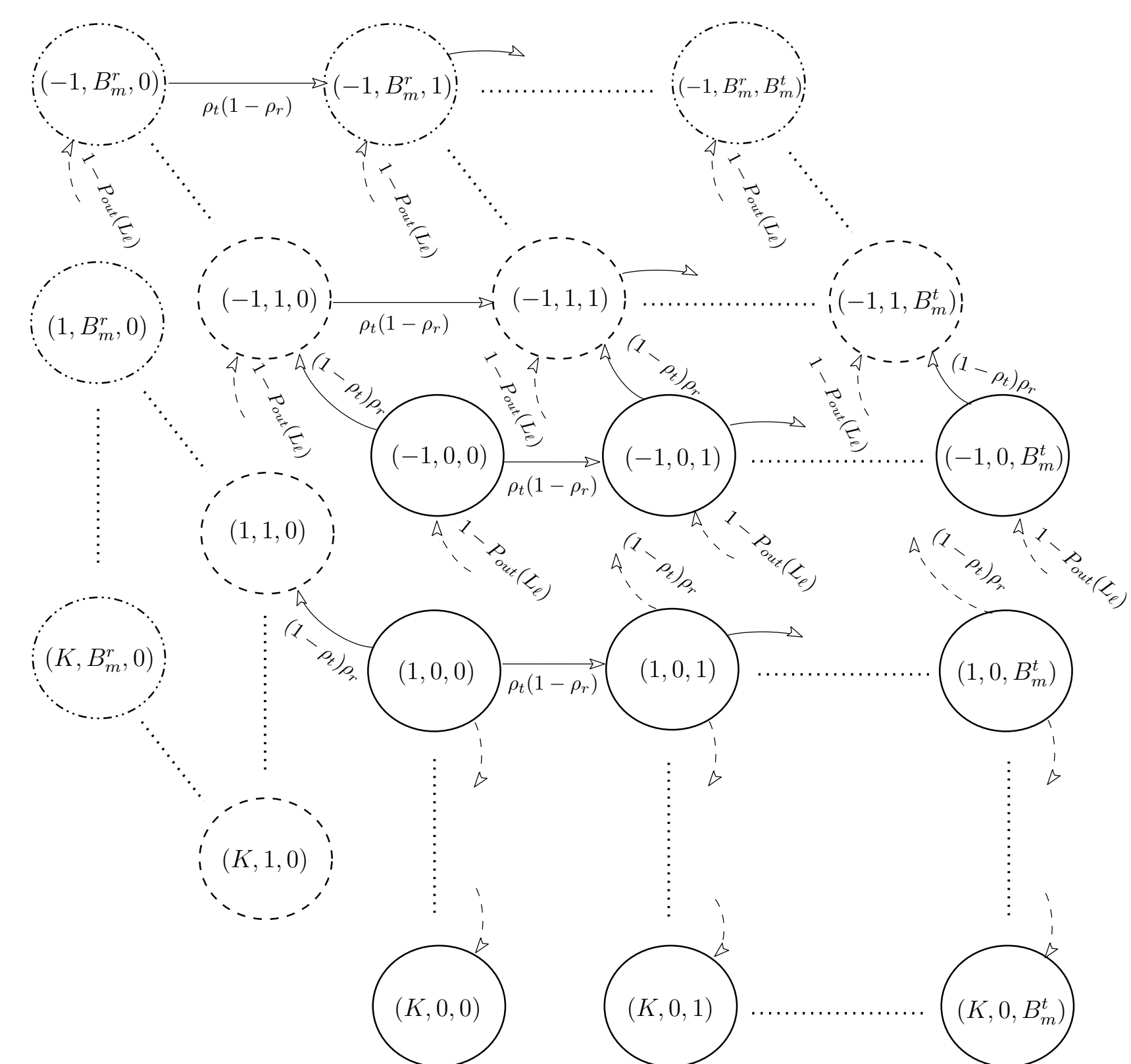
Goals

- To analyze the *packet drop probability*
- To find the optimal power control policies which minimize the PDP

System Dynamics



Packet Drop Probability



$$P_D = \sum_{(i,j) \in \mathcal{I}} \pi(i,j) P_D(K|i, j)$$

Optimal Policy Design

- $P_D \rightarrow P_D^\infty$ as $\Theta(e^{r_t^* B_{max}^t}) + \Theta(e^{r_r^* B_{max}^r})$
- In EUR the PDP can be approximated as P_D^∞
- Solve the simplified optimization problem using geometric programming

Results and Summary

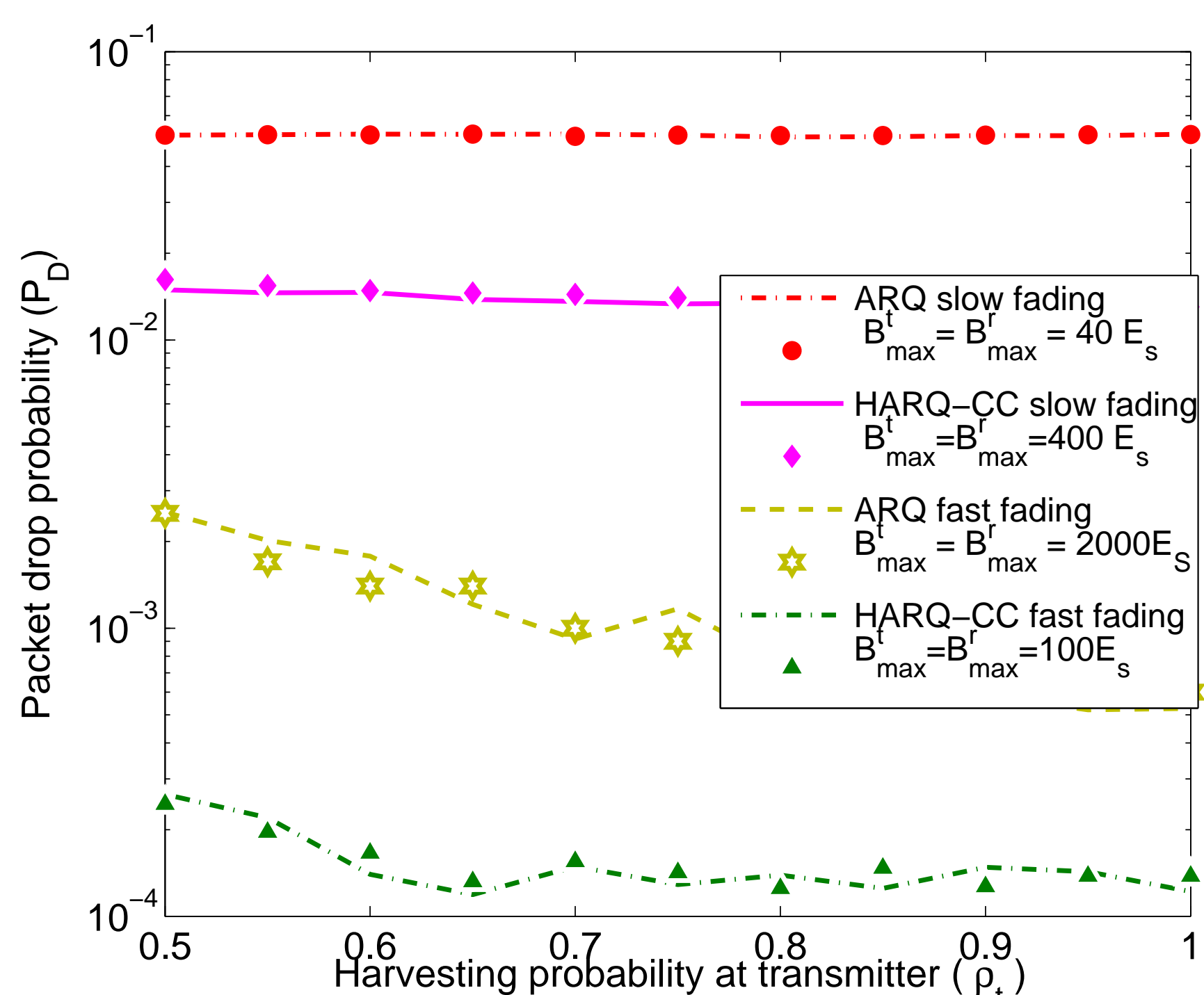


Figure: Battery Size

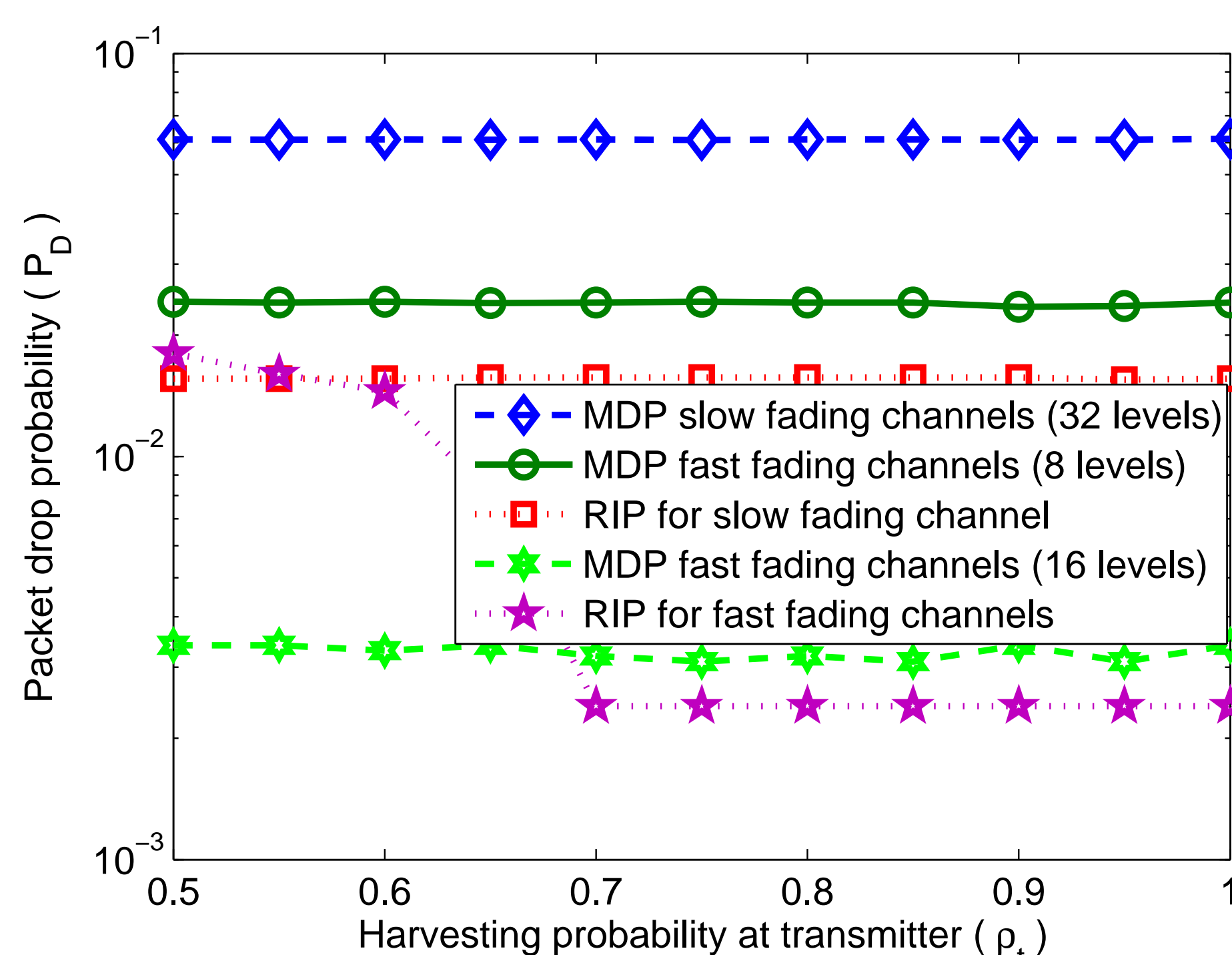


Figure: Proposed Policy Compared to MDP

- For Sufficiently large batteries it is nearly-optimal to design policies under average power constraint
- Battery size required to obtain desired performance also depends on the drift induced by the policy
- Designed RIPs outperforms the policies obtained using MDPs